CONTENTS

This Issue in the Journal
3 A summary of the original articles featured in this issue

Editorial
6 The era of ERAS: a new standard of perioperative care
Tim W Eglinton

Original Articles
8 Fast-track elective colectomy: single-surgeon experience of 100 consecutive cases
Primal P Singh, Andrew G Hill
16 The role of capsule endoscopy in small bowel pathology: a review of 122 cases
Mohammad I Khan, Megan Johnston, Robert Cunliffe, Adrian Claydon
27 A dedicated dermatology clinic for renal transplant recipients: first 5 years of a New Zealand experience
Paul D L Maurice, Tracy Fenton, Nicholas Cross
34 Wrapped in controversy: trends in fundoplication at myotomy for achalasia in Christchurch, New Zealand
Lotte J Steffens, Ramadan Oumer, Ross Roberts
44 Endovascular aortic repair: can we predict who will not get long-term benefit?
Nur A B Haji Mohd Yasin, Ian A Thomson, Sophia Leon de la Barra
53 Index cholecystectomy: a continuing challenge for a provincial hospital
Magdalena M Sakowska, James McKay, Sarah Lake, Alf Deacon
60 Outcomes of open carpal tunnel decompression
Nikhil Nanavati, Karen Walker-Bone, Helen Stanworth, Christopher Williams

Viewpoint
68 Flatulence on airplanes: just let it go
Hans C Pommergaard, Jakob Burcharth, Anders Fischer, William E G Thomas, Jacob Rosenberg

Clinical Correspondence
75 A rare neoplasm of the thyroid gland
Angela Mweempwa, Jagdish Prasad, Shahidul Islam
79 Empyema and psoas abscess in a previously undiagnosed diabetic patient
Lisa Liu, Zi Wei Goh, Bronwen Rhodes

83 Medical image. Reflex anoxic seizures are annoying
Tilak de Almeida, Victoria Pennock, Jonathan R Skinner

Letters

86 The important persisting problem of smoking in cars with children: new data from a multi-year national survey of young people
Benjamin Healey, Richard Edwards, Nick Wilson, George Thomson, Janet Hoek, Steve Taylor

90 Do all antidepressants cause QT prolongation—how good is the evidence?
Paul Glue, Chris Gale

92 Low yearly completion rate of HDC investigations is a cause for concern
Stuart McLennan

100 Years Ago in the NZMJ

95 Maori Nurses

Methuselah

96 Selected excerpts from Methuselah

Obituaries

98 Caleb Lewis Tucker
100 Michael David Henry Holdaway
102 Simon David Prior

Notices

104 2013 NZMJ Publication Dates and Themes
105 Reviewers for the New Zealand Medical Journal in 2012
This Issue in the Journal

Fast-track elective colectomy: single-surgeon experience of 100 consecutive cases
Primal P Singh, Andrew G Hill

In 2005, the senior author (Andrew Hill) initiated an Enhanced Recovery After Surgery (ERAS) or ‘fast-track’ programme for elective colonic surgery at the Manukau Surgery Centre aimed at improving perioperative care (before, during, and after surgery). We reviewed the senior author’s experience of elective colectomy conducted within the ERAS programme and evaluated clinical outcomes. 100 consecutive patients were reviewed. The median age of patients was 70 years (range: 16–92). The median day to discharge was 3 days while total hospital stay was 4 days which incorporated 21 readmissions for mostly minor complications. Major complications occurred in only 8 patients and included 4 anastomotic leaks. In one surgeon’s experience, elective colectomy performed within an optimised perioperative care environment achieves shorter hospital stay with a low rate of major complications.

The role of capsule endoscopy in small bowel pathology: a review of 122 cases
Mohammad I Khan, Megan Johnston, Robert Cunliffe, Adrian Claydon

Small bowel capsule endoscopy (CE) has been introduced in NZ in all of the tertiary and some secondary centres over the last few years. We describe our experience with CE from a single centre in NZ. In this 2-year, retrospective, study of 122 consecutive patients, data was collected on multiple variables from the patient clinical, laboratory, and radiology records. We found, in line with international findings, that CE is the best minimally invasive procedure for small bowel imaging currently available.

A dedicated dermatology clinic for renal transplant recipients: first 5 years of a New Zealand experience
Paul D L Maurice, Tracy Fenton, Nicholas Cross

Patients who have had a kidney or indeed any solid organ transplant are at increased risk of developing skin cancer. Previously kidney transplant recipients were referred on an ad hoc basis to the dermatology department once they had developed skin cancer. We have set up a specialist dermatology clinic for kidney transplant recipients which aims at prevention and earlier diagnosis and treatment of skin cancer. This involves a full baseline skin examination of patients soon after their kidney transplant. A number of skin cancers of which the patient was unaware have been detected in this way. Patients are also educated on early recognition of skin cancer and the need for sun protection. They are given a direct access phone number so that they can access our clinic should they develop skin lesions of concern at any time. We believe that our clinic offers a cost effective way of achieving earlier diagnosis and treatment of skin cancer in kidney transplant recipients.
Wrapped in controversy: trends in fundoplication at myotomy for achalasia in Christchurch, New Zealand
Lotte J Steffens, Ramadan Oumer, Ross Roberts

This paper investigates the changing trend in surgical procedures performed in Christchurch for achalasia, an uncommon condition affecting the movement of food from the mouth to the stomach via the oesophagus. Which operation should be performed is controversial and this audit shows procedures performed in Christchurch between 1997 and 2009 are in keeping with development of the evidence in the literature. The advantages and disadvantages of the different procedures are discussed and compared with the trends in Christchurch. The complication rates and re-intervention rates of the various procedures are also discussed.

Endovascular aortic repair: can we predict who will not get long-term benefit?
Nur A B Haji Mohd Yasin, Ian A Thomson, Sophia Leon de la Barra

This retrospective study aims to review our Endovascular aortic repair (EVAR) experience from 2000 to December 2009 in Dunedin Public Hospital as well as assessing the applicability of Mount Sinai score and the American Society of Anesthesiologists physical status classification (ASA) in finding which patients will most likely benefit from EVAR. The overall mortality at 30 days was 1.8% and this is comparable to other centres. The Mount Sinai score and smoking status were both found to be significant predictors of mortality. We believe that smoking status should be added to long-term risk predicting models.

Index cholecystectomy: a continuing challenge for a provincial hospital
Magdalena M Sakowska, James McKay, Sarah Lake, Alf Deacon

There is considerable international and national evidence to suggest that those being admitted with gallstone disease to hospital should have their operation at that first admission. This has been achieved at larger centres around NZ but smaller centre still struggle to meet international standards of care. At Nelson hospital, 17% of patients with acute gallstone disease had their gall bladder removed on their first presentation. There was a high rate of readmission for those who were sent home without getting their gallbladder removed at first presentation highlighting that these patients have a high likelihood of recurrent symptoms requiring emergency department care or even hospital admission.

Outcomes of open carpal tunnel decompression
Nikhil Nanavati, Karen Walker-Bone, Helen Stanworth, Christopher Williams

A questionnaire comprising of 6 sections was sent to 256 eligible participants who had undergone open carpal tunnel decompression. Of these, the majority (80.9%) had symptomatic improvement. However, it was found that 19.1% of candidates had
persistent symptoms and it was shown that low mental health scores may be a key reason for this.
The era of ERAS: a new standard of perioperative care

Tim W Eglinton

Many readers of the Journal will remember their general surgical rounds as students or resident medical officers, fondly or otherwise, pacing after a suited consultant surgeon. There was always a fear of making cardinal errors such as removing drains, nasogastric tubes or urinary catheters too early. Or worse, feeding a patient before their bowel had functioned!

Surgical ward rounds are a very different scenario in the second decade of the new millennium. For better or worse, surgeons remain the last bastions of the suit amongst clinicians, but the orders they are barking have changed. In the past decade many aspects of conventional perioperative care have been overhauled and replaced with modern recovery concepts, collectively known as ‘fast track’ or ‘enhanced recovery’ protocols.

Enhanced recovery after surgery (ERAS) encompasses a range of evidence-based perioperative interventions that aim to minimise the physiological stress response, reduce complications and accelerate recovery. Enhanced recovery begins in the preoperative period with extensive patient education on the perioperative journey.

The preoperative period has also seen changes in long established surgical practices such as preoperative fasting and mechanical bowel preparation. Neither are utilised in ERAS programmes for colonic surgery; instead, patients are given carbohydrate loading drinks to stimulate anabolic metabolism.

Intraoperatively, most pathways advocate minimal incisions, avoidance of drains and tubes, restricted use of intravenous fluid, and the use of epidural or intrathecal analgesia. Postoperatively, early mobilisation, enteral nutrition, early removal of urinary catheters, and multimodal analgesia with minimal opiate use are the mainstays of ERAS programmes.

Andrew Hill and his team at Middlemore Hospital have led the introduction of ERAS in New Zealand. In this issue of the Journal Professor Hill presents his results in a case series that confirms excellent outcomes can be achieved using this system in the New Zealand setting. Patients were discharged at a median third postoperative day with low morbidity and an acceptable readmission rate. Based on Cr-possum and ASA scores, the cohort assessed did not appear highly selected and represented a standard range of patients likely to present to major New Zealand hospitals for colectomy.

The paper provides a useful summary of the Middlemore protocol and its multimodal interventions and could provide a starting point for institutions looking to introduce ERAS. This report assesses the overall outcomes of ERAS and not the relative contributions of the individual components of the pathway to improving outcomes. However, this does reinforce that ERAS is a multimodal approach and a detailed
review of the evidence base underlying the individual components has recently been published by the newly formed ERAS society.\(^2\)

It is noteworthy that such short hospital stay was achieved in the Middlemore series without the use of any total laparoscopic surgery. In recent years, a number of large randomised trials have demonstrated reductions in hospital stay and other short term benefits with laparoscopic over open colectomy.\(^3\) These trials have, for the most part, employed conventional perioperative care regimes, raising the question whether the benefits of laparoscopic surgery are still evident in ERAS programmes.

Our own data from Christchurch showed reduced hospital stay was achieved in patients selected for laparoscopic surgery compared with open surgery when both were managed within an ERAS pathway (median discharge day 3 for laparoscopic versus day 7 for open surgery).\(^4\) However, more randomised data is necessary to determine whether the benefits of laparoscopic surgery are further enhanced or in fact nullified by ERAS.

The prospect of further enhancement in perioperative care and the potential additive benefits of minimally invasive surgery have made the once inconceivable scenario of 23 hour day stay colectomy a realistic possibility. Reports have emerged of this practice\(^5\) but its feasibility and safety remain open to debate. What is not open for debate is the goal of ERAS; to improve patient outcomes in terms of morbidity and overall wellbeing. Any benefits that accrue such as reduced hospital stay and costs must be considered worthwhile secondary outcomes.

As the era of ERAS evolves, whether patients will be discharged on the day of colectomy remains to be seen. Whatever the future brings, however, it is highly likely the surgeon discharging them will still be wearing a suit.

**Author information:** Tim W Eglinton, Consultant Surgeon, Christchurch Hospital, and Senior Lecturer in Surgery, University of Otago, Christchurch

**Correspondence:** Dr Tim Eglinton, Department of General Surgery, Christchurch Hospital, PO Box 4345, Christchurch, New Zealand. Fax: +64 (0)3 3640352; email: tim.eglinton@cdhb.health.nz

**References:**

Fast-track elective colectomy: single-surgeon experience of 100 consecutive cases

Primal P Singh, Andrew G Hill

Abstract

Aims In 2005, the senior author (AGH) initiated an Enhanced Recovery After Surgery (ERAS) or ‘fast-track’ programme for elective colonic surgery at the Manukau Surgery Centre aimed at improving perioperative care. We reviewed the senior author’s experience of elective colectomy conducted within the ERAS programme and evaluated clinical outcomes.

Methods Using a prospectively maintained database, consecutive patients who underwent elective colonic resection by the senior author within the ERAS programme at the Manukau Surgery Centre between December 2005 and March 2012 were reviewed. Demographic and operative data were recorded and clinical outcomes including complications, hospital stay and readmissions were evaluated for 30 days postoperatively.

Results 100 consecutive patients were reviewed. The median age of patients was 70 years (range: 16–92) and the most common indication for surgery was malignancy (81 cases). Right-sided colectomy was performed in 52 cases while 45 patients had a left-sided colectomy and 3 patients underwent subtotal colectomy. The median day to discharge was 3 days while total hospital stay was 4 days which incorporated 21 readmissions for mostly minor complications. Major complications occurred in only 8 patients and included 4 anastomotic leaks.

Conclusion In one surgeon’s experience, elective colectomy performed within an optimised perioperative care environment achieves shorter hospital stay with a low rate of major complications.

Over the past decade, evolution of perioperative care in the field of colonic surgery has seen the development of Enhanced Recovery After Surgery (ERAS) or ‘fast-track’ programmes.1–3 These programmes incorporate a multidisciplinary approach to perioperative care and combine evidence-based practices into a multimodal perioperative care pathway that aims to reduce surgical stress and accelerate postoperative recovery with decreased hospital stay, reduced morbidity and shortened convalescence.

The development of ERAS programmes has focused on optimising individual components of perioperative care including patient education, anaesthesia, fluid management, analgesia, nutrition and ambulation.4–5 This has led to changes in many traditional aspects of surgical care, such as preoperative bowel preparation, the use of nasogastric tubes, placement of drains, enforced bed rest, and graduated diets which have been shown to be unnecessary or even harmful.6
In December 2005, the senior author (AGH) initiated an ERAS programme for colonic surgery at the Manukau Surgery Centre (MSC), an elective surgical unit of Counties Manukau District Health Board (CMDHB) in Auckland, New Zealand. This programme incorporated strategies of perioperative care based on ERAS principles and used a coordinated approach in conjunction with surgical, anaesthetic and nursing staff.

This programme has since become the standard of care for patients undergoing elective colonic resection at CMDHB. This paper reviews the senior author’s experience of elective colectomy conducted within the ERAS programme and reports operative and clinical outcomes.

**Methods**

**Patients**—Using a prospectively maintained database of patients undergoing surgery within the fast-track programme, we reviewed consecutive patients who underwent elective colectomy by the senior author within the ERAS programme at MSC since it was established in December 2005.

**Table 1. Components of Enhanced Recovery After Surgery (ERAS) programme**

<table>
<thead>
<tr>
<th>Preoperative</th>
<th>Intraoperative</th>
<th>Postoperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative assessment in a dedicated outpatient session</td>
<td>Epidural anaesthesia – mid or low thoracic</td>
<td>Structured nursing pathway</td>
</tr>
<tr>
<td>Education with written information given and specific daily milestones discussed</td>
<td>Short acting anaesthetic agents</td>
<td>All intravenous fluid stopped when patient arrives on ward</td>
</tr>
<tr>
<td>Preoperative discharge planning and social situation explored</td>
<td>Prevention of hypothermia, active warming blanket</td>
<td>Vasopressors in preference to intravenous fluids to treat epidural-related hypotension</td>
</tr>
<tr>
<td>Nutritional assessment</td>
<td>Conservative fluid regimen – 1500mL crystalloid and 500mL colloid unless otherwise indicated as per ERAS anaesthetic protocol</td>
<td>Early oral feeding with supplementation – started on day of operation</td>
</tr>
<tr>
<td>Careful medical assessment and optimisation</td>
<td>Prophylactic antiemetics at induction</td>
<td>Prophylactic antiemetics</td>
</tr>
<tr>
<td>Ward visit/meet nursing staff</td>
<td>Intravenous dexamethasone (8mg) at induction</td>
<td>Opioid sparing analgesia/nonsteroidal anti-inflammatory drugs</td>
</tr>
<tr>
<td>Patients admitted to hospital on morning of surgery</td>
<td>Transverse incision for right-sided open cases if appropriate; selective use of laparoscopy for left-sided cases</td>
<td>Early removal of urinary catheter – on postoperative day 1</td>
</tr>
<tr>
<td>Avoidance of prolonged preoperative fasting – nil by mouth for only 2 hours preinduction</td>
<td>Avoidance of drains/nasogastric tubes</td>
<td>Timed removal of epidural – on postoperative day 2</td>
</tr>
<tr>
<td>Carbohydrate loading – two 200mL PreOp® drinks on the morning of surgery</td>
<td>Prevention of hypothermia, active warming blanket</td>
<td>Early mobilisation with nursing and/or physiotherapy input</td>
</tr>
<tr>
<td>Avoidance of mechanical bowel prep</td>
<td>Conservative fluid regimen – 1500mL crystalloid and 500mL colloid unless otherwise indicated as per ERAS anaesthetic protocol</td>
<td>Discharge criteria defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Tolerating adequate oral intake and passing flatus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Adequate analgesia on oral medication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Adequate and safe mobility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Follow-up in surgical outpatient clinic within 7 days of discharge</td>
</tr>
</tbody>
</table>

Exclusion criteria for this ERAS programme were patients with serious comorbidities (American Society of Anesthesiologists [ASA] score 4 or 5), those needing a stoma, rectal lesions (defined as...
<15cm from the anal verge), and those unable to participate in the preoperative education and goal setting components of ERAS because of cognitive impairment or a significant language barrier.

**Perioperative care**—Patients managed within the ERAS programme received structured perioperative care as outlined in Table 1. This focused on better patient education, optimisation of preoperative status, avoidance of unnecessary physiological stressors, early oral feeding and early mobilisation. Discharge planning was discussed with patients preoperatively with establishment of daily milestones. Patients were planned for discharge on postoperative day 3 once discharge criteria were met.

**Outcomes**—Age, gender, ASA score, Colorectal Physiological and Operative Severity score for the enUmeration of Mortality and morbidity (Cr-POSSUM), indication for surgery, stage of disease, operation type and technique were recorded for all patients. Postoperative complications up to 30 days after surgery were recorded using predefined criteria and graded using the Clavien-Dindo classification system. In patients with multiple complications, the highest complication grade is reported in the final analysis. The day of discharge was recorded as well as readmissions, defined as return to hospital within 30 days postoperatively requiring a hospital stay of 24 hours or more. Total hospital stay was calculated based on day stay of index admission plus hospital stay on readmission. Results are reported as mean (standard deviation) or median (range) as appropriate.

**Results**

Between December 2005 and March 2012, 100 patients underwent elective colectomy by the senior author at MSC within the ERAS programme. A further 78 patients undergoing colonic resection over the same time period were excluded from the ERAS programme due to the formation of a stoma, significant co-morbidities requiring monitoring in an intensive care unit postoperatively, or emergency resection. Baseline characteristics for the included patients are shown in Table 2. The median age of patients was 70 years (range 16–92) with 52 patients being female. Most patients had an ASA score of 2 (55 patients) and the overall median Cr-POSSUM score was 17 (range 13–25). The most common indication for surgery was malignancy (81 cases) with the majority of patients having stage II (39 cases) or stage III (24 cases) disease. Fifty-two patients underwent right-sided colectomy, 45 patients had a left-sided colectomy and 3 patients underwent subtotal colectomy. Seventeen cases were hand-assisted laparoscopic left/sigmoid colectomies while the remainder of operations were performed open.

The median day of discharge was 3 days (range 2–60) and 75 patients were discharged by day 5 after surgery (Table 3). Median total hospital stay was 4 days (range 2–60) which included 21 readmissions. Table 4 summarises reasons for readmission, day of readmission and their duration. Twelve readmissions were after postoperative day 8 and the median length of stay during readmission was 4 days (range 1–28) with 16 patients readmitted for 7 days or less.

Fifty-three patients developed a complication within 30 days postoperatively with 45 patients having minor (grade I-II) complications and 8 patients having major (grade III-V) complications (Table 3). Four patients had an anastomotic leak which required reoperation. The rate of complications in patients discharged by day 3 and day 5 was 44% and 41%, respectively.
Table 2. Patient characteristics

<table>
<thead>
<tr>
<th>Variables</th>
<th>n=100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median [range]</td>
<td>70 [16–92]</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>48</td>
</tr>
<tr>
<td>Female</td>
<td>52</td>
</tr>
<tr>
<td><strong>ASA score</strong></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>16</td>
</tr>
<tr>
<td>II</td>
<td>55</td>
</tr>
<tr>
<td>III</td>
<td>28</td>
</tr>
<tr>
<td>IV</td>
<td>1</td>
</tr>
<tr>
<td><strong>Cr-POSSUM, median [range]</strong></td>
<td>17 [13–25]</td>
</tr>
<tr>
<td><strong>Indication for surgery</strong></td>
<td></td>
</tr>
<tr>
<td>Malignancy</td>
<td>81</td>
</tr>
<tr>
<td>Diverticular disease</td>
<td>13</td>
</tr>
<tr>
<td>Non-malignant polyp</td>
<td>4</td>
</tr>
<tr>
<td>Other*</td>
<td>2</td>
</tr>
<tr>
<td><strong>AJCC stage</strong>^</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>7</td>
</tr>
<tr>
<td>II</td>
<td>39</td>
</tr>
<tr>
<td>III</td>
<td>24</td>
</tr>
<tr>
<td>IV</td>
<td>6</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td></td>
</tr>
<tr>
<td>Right-sided colectomy</td>
<td>52</td>
</tr>
<tr>
<td>Left-sided colectomy</td>
<td>45</td>
</tr>
<tr>
<td>Subtotal colectomy</td>
<td>3</td>
</tr>
<tr>
<td><strong>Surgical technique</strong></td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>83</td>
</tr>
<tr>
<td>Hand-assisted laparoscopic</td>
<td>17</td>
</tr>
<tr>
<td><strong>Operation time (minutes), mean [SD]</strong></td>
<td>103 [32]</td>
</tr>
</tbody>
</table>

AJCC, American Joint Committee on Cancer; ASA, American Society of Anesthesiologists; Cr-POSSUM, Colorectal Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity; SD, standard deviation.

* Inflammatory appendiceal mass (n=1), mucinous neoplasm of appendix (n=1) with no malignancy on final histology.

^ Five patients for whom the indication for surgery was malignancy were not able to be staged according the AJCC colorectal cancer staging system for the following reasons: 2 patients with malignant polyps resected on colonoscopy had no residual malignancy on histology after surgery, 1 patient had a right hemicolectomy for carcinoid tumour of the appendix with the final histology showing no residual carcinoid, 1 patient had metastatic melanoma to the caecum and small bowel, and 1 patient had pseudomyxoma peritonei following a right hemicolectomy for mucinous adenocarcinoma of the appendix.

Table 3. Hospital stay and postoperative complications

<table>
<thead>
<tr>
<th>Variables</th>
<th>n=100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge day, median [IQR]</td>
<td>3 [3–6]</td>
</tr>
<tr>
<td>Total Hospital stay, median [IQR]</td>
<td>4 [3–7]</td>
</tr>
<tr>
<td>Readmission</td>
<td>21</td>
</tr>
<tr>
<td><strong>Complication</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>53</td>
</tr>
<tr>
<td>No</td>
<td>47</td>
</tr>
<tr>
<td>Complication grade*</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>---</td>
</tr>
<tr>
<td>I</td>
<td>3</td>
</tr>
<tr>
<td>II</td>
<td>42</td>
</tr>
<tr>
<td>III</td>
<td>3</td>
</tr>
<tr>
<td>IV</td>
<td>5</td>
</tr>
<tr>
<td>V</td>
<td>0</td>
</tr>
<tr>
<td>Minor complication (Grade I–II)</td>
<td>45</td>
</tr>
<tr>
<td>Major complication (Grade III–V)</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complication aetiology</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wound</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urinary retention</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ileus</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anastomotic leak</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdominal/pelvic collection</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiorespiratory</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other†</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IQR, interquartile range

* Complication grade definitions:12,13 Grade I: any deviation from the normal postoperative course without the need for pharmacologic treatment or surgical, endoscopic, and radiological interventions. Grade II: requiring pharmacologic treatment with drugs other than such allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included. Grade III: requiring surgical, endoscopic, or radiological intervention. Grade IV: life-threatening complication (including central nervous system complications) requiring intermediate care/intensive care unit-management. Grade V: death of a patient.

† Complications classified as other: stapleline bleed (n=2), constipation, abdominal pain, bladder leak, urinoma and deconditioning.

Table 4. Readmissions

<table>
<thead>
<tr>
<th>Reason for readmission</th>
<th>Day of readmission (day after surgery)</th>
<th>Duration of readmission (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wound infection/dehiscence (n=6)</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td>Abdominal pain (n=2)</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Constipation (n=2)</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td>Deconditioning (n=2)</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>7</td>
</tr>
<tr>
<td>Stress ulcers in oesophagus and duodenum</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Ileus</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Anastomotic leak</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Pleural effusion/empyema</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>Small bowel obstruction</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Incidental and asymptomatic pulmonary embolism on post-op staging CT</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Pelvic collection</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>Nausea secondary opioids</td>
<td>24</td>
<td>5</td>
</tr>
</tbody>
</table>
Discussion

This paper reports one surgeon’s experience of elective colectomy performed within an established ERAS programme. Using a multimodal and structured perioperative care pathway, the majority of patients achieved the planned discharge on postoperative day 3 and 75% were discharged by day 5 after surgery. Most postoperative complications were minor and only 8 patients developed a major complication.

A common criticism of ERAS programmes is that they only include medically well patients undergoing uncomplicated surgery who are suitable for an early discharge. This series of consecutive patients demonstrates that an ERAS programme for colonic surgery can be applied to most patients and achieves effective and consistent results.

The median age of patients in this series was 70 years and medical comorbidities were common with 83 patients having an ASA score of II or III. The Cr-POSSUM score also reflects operative risk and we have previously investigated its predictive value in our setting.14

Based on the overall Cr-POSSUM score, the expected operative mortality in this patient cohort was 2.5%. Despite this, the majority of patients achieved the planned discharge on day 3 after surgery and these patients had a lower complication rate than the overall study cohort (44% vs. 53%). This is consistent with the work of Delaney and colleagues15 who have evaluated fast-track management specifically in patients with high levels of comorbidity undergoing complex abdominal and pelvic colorectal procedures and also showed benefits with early discharge without an associated increase in morbidity.

The rate of readmissions in this series is higher than the anticipated 10%-16% reported in previous studies conducted within our ERAS programme.8,16,17 However, similar rates have been reported in other studies of fast-track management in colorectal surgery.18-21 All but two of the 21 readmissions involved minor complications requiring only conservative management and the median total hospital stay was increased by only 1 day.

While some complications leading to readmissions may have manifest during a longer index hospital stay, most readmissions occurred after postoperative day 8 when most patients would be expected to be discharged home even with traditional perioperative care. Better education of patients and admitting junior surgical staff may have prevented a number of these readmissions.

Given the increasing demand for appropriate utilisation of healthcare resources, measures for quality of surgical care have focused on improved recovery parameters such as length of hospital stay, postoperative morbidity and time to return to work. The cost-benefits associated with such improvements are important and have been seen with fast-track programmes in various surgical settings.1

A previous cost-effectiveness analysis evaluating our current ERAS programme for colonic surgery has also demonstrated significant cost reduction with an overall saving per patient of almost $7000.22 The majority of these savings were achieved
through reduction in total hospital stay (from 8 days to 4 days) and lower rates of complications including ileus, urinary tract infections and cardiopulmonary complications.

As shown in this previous study, initial setup costs for implementation of the ERAS programme were roughly $2000 per patient for the first 50 patients going through this programme. These costs included a visit to an established ERAS unit in Denmark, employing a research fellow full-time to co-ordinate the programme, and having a dedicated outpatient clinic slot to carry out the pre-operative assessment and education.

In summary, ERAS programmes aim to optimise perioperative care using evidence-based interventions that reduce surgical stress and hasten patient recovery. In one surgeon’s experience, elective colectomy performed within an ERAS programme in a New Zealand public hospital has consistently achieved shorter hospital stay with a low rate of major complications.

Competing interests: Nil.

Author information: Primal P Singh, Research Fellow, Department of Surgery, South Auckland Clinical School, Middlemore Hospital, University of Auckland; Andrew G Hill, Professor and Colorectal Surgeon, Head of South Auckland Clinical School, Department of Surgery, Middlemore Hospital, University of Auckland

Acknowledgement: Primal Singh is a recipient of the Auckland Medical Research Foundation Ruth Spencer Medical Research Fellowship.

Correspondence: Dr Primal P Singh, Department of Surgery, South Auckland Clinical School, University of Auckland, Private Bag 93311, Middlemore Hospital, Otahuhu, Auckland 1640, New Zealand. Fax: +64 9 276 0066; Email: dr.parrysingh@gmail.com

References:


The role of capsule endoscopy in small bowel pathology: a review of 122 cases

Mohammad I Khan, Megan Johnston, Robert Cunliffe, Adrian Claydon

Abstract

Aim Small bowel capsule endoscopy (CE) has been introduced in New Zealand (NZ) in all of the tertiary and some secondary centres over the last few years. We describe our experience with CE from a single centre in NZ.

Methods In this 2-year, retrospective, study of 122 consecutive patients, data was collected on multiple variables from the patient clinical, laboratory, and radiology records. Pillcam of Given Imaging Diagnostic System (Given Imaging Ltd, Yogneam, Israel) was used to image the small bowel. Descriptive statistics were used to analyse the data.

Results Good preparation was noted in 69% of the cases. The most common indication for referral was obscure GI bleeding (70%). The overall diagnostic yield for relevant findings was 52%, with angioectasia as the most common specific finding (37%). The diagnostic yield in those with overt bleeds improved with inpatient status (74%). Incomplete examinations were noted in 12% and were significantly more common in the male gender. Preliminary imaging (barium, CT/MR) was noted to have a lower diagnostic yield. Enteroscopies were considered in 25% of the patients post CE procedure.

Conclusion Apart from a lower diagnostic yield in patients with overt bleeds, our data is consistent with that reported in literature and support the role of CE as the minimally invasive gold standard investigation for small bowel imaging.

Capsule endoscopy (CE) was first approved as a diagnostic tool for small bowel imaging in year 2000 in the United States. At that time the small bowel was considered a particularly difficult area to examine and the imaging modalities used included sonography, computed tomography (CT), enterography (CT/MR), enteroclysis and push enteroscopy. Apart from the potential for complications, these modalities have a low diagnostic yield.

Subsequent studies have now established CE as the gold standard for small bowel imaging. The procedure is painless, does not require sedation, is easy to perform and for the first time enables exploration of the entire small bowel at high magnification. Oesophageal and colonic capsule endoscopies have also been recently introduced for imaging the upper and lower gastrointestinal (GI) tracts respectively.

The two main clinical areas where CE has made a significant impact are in the diagnostic workup of patients with obscure GI bleeding and those with suspected small bowel inflammation mainly due to early Crohn’s disease. The former include patients with overt or occult GI bleeding with normal upper and lower endoscopies. The latter include patients with chronic diarrhoea with a clinical and laboratory setting...
suggestive of small bowel inflammation/ulceration (high inflammatory markers and high faecal calprotectin levels) rather than irritable bowel syndrome.\textsuperscript{7}

The role of small bowel CE has also been explored in other clinical settings including non specific abdominal pain, unexplained weight loss, suspected celiac disease and for surveillance in patients with small bowel tumors.\textsuperscript{5–11}

In New Zealand (NZ) small bowel capsule endoscopy has been introduced in all tertiary and a few of the secondary centres. To date, no data has been published from these centres apart from an abstract publication in 2009 from Waikato Hospital.\textsuperscript{12} We present our 2-year experience with 122 consecutive patients from a single centre in New Zealand.

\textbf{Patients and Methods}

This is a single centre, retrospective study, of 122 consecutive patients referred for small bowel capsule endoscopy to our unit from December 2009 to December 2011. All patients had previously undergone diagnostic procedures including gastroscopy, colonoscopy and CT or MRI examinations. Each patient was given a study leaflet explaining the nature of the procedure and an informed consent was signed. Routine history and physical examination was not performed on the day of the procedure.

All outpatients had a bowel preparation with 2 litres of polyethylene glycol and started on clear fluids from the afternoon before the procedure. Metoclopramide, in oral dosage of 10mg was routinely given before the study. Inpatient were not routinely given prokinetics or bowel lavage but were given at the discretion of the requesting gastroenterologist. Clear fluids were started 2 hours after the capsule ingestion and a light snack given at 4 hours. Normal dietary habits were resumed after 8 hours. The bowel preparation in the study was graded as good, fair, or poor depending upon the adequacy of the examination. Any light contamination impairing views was also recorded.

A patency capsule was administered first before the study in patients with suspected small bowel strictures. A CE placement device was used to deliver the capsule in patients with swallowing difficulties and those with gastroparesis. Contraindications to the study included patients with known intestinal strictures and those presenting with clinical and radiological evidence of small bowel obstruction.

Patients were grouped according to their main presentation. Patients with obscure GI bleeding were stratified into those with overt bleeding and those with occult bleeding, either with accompanying iron deficiency anaemia or a low ferritin/FOB positive stool test. Patients with chronic diarrhoea (including those with suspected Crohn’s disease) and those with chronic non specific abdominal pain were classed separately. All other presentations including weight loss, suspected GI malignancy and suspected celiac disease were grouped together in the “Other” category.

All the studies were performed by our endoscopy nurses according to the current protocol of our unit. The Given Imaging Diagnostic System (Given Imaging Ltd, Yogneam, Israel) was used; it involves the pillcam capsule, a data recorder worn by the patient during the study, and a work-station used to process and analyse the images using the Rapid 6 Reader software.

Each study was read independently by two of the three gastroenterologists with expertise in the procedure. The CE images of the oesophagus, stomach and the colon were also read. The results were discussed and a combined report was later written. Data for the study was collected from the patient’s clinical, laboratory and radiology records and the Rapid 6 Reader software.

CE findings in the study were classed as:

- Relevant – if they accounted for the patient’s presentation, e.g. vascular ectasias in a patient with iron deficiency anaemia or fresh blood in the lumen in patients with overt bleeds;
- Significant – if they were not relevant to the clinical presentation but still important to be noted, e.g. ulcers, polyps or neoplasms; and
- Normal – this class included those with a normal study and also those with insignificant findings (e.g. venous lakes, prominent vessels, prominent mucosal folds, submucosal bulges, red spots etc).
Cases with relevant/significant findings in the Upper GI tract or colon but missed on prior endoscopies were also recorded. If more than one lesion was found during a study, then only the most relevant lesion was counted. In our study ‘ulcers’ and ‘aphthous ulcers’ were counted together, separate from erosions and ‘fresh blood in the lumen’ was counted as a relevant finding. The completion status of the study was classed as Complete - when the capsule reached the caecum and Incomplete when either the capsule did not leave the stomach or failed to reach the caecum. A plain abdominal X-ray was taken if the patient did not report passing out the capsule 5 days after ingestion.

A comparative analysis of CE findings was made, both with the imaging studies (barium/CT or MR Enterography) done up to a year before the CE examination for the same indication and with the faecal (calprotectin) and plasma (CRP) inflammatory markers done prior to the CE study. Procedure-related complications and post CE procedures recommended by the reporting gastroenterologist were also noted.

Results

Table 1 shows the indications for referral according to the gender, age category and inpatient status of the examination. The status of bowel preparation in different indications is also noted.

The most common indication for referral was obscure GI bleeding (70%, N=86) which was sub-classified into overt bleeding (n=33), iron deficiency anaemia (n=39) and those with no anaemia but low ferritin (n=14).

Patients referred with predominant diarrhoea, for workup for suspected enteropathy (n=18) and patients with non-specific abdominal pain (n=10) were the other significant groups. Rare indications, including suspected celiac disease and studies in Peutz Jegher patients were grouped into the ‘other’ category.

Table 1. Summary statistics, acuity status and bowel preparation

<table>
<thead>
<tr>
<th>Variables</th>
<th>Obscure GI bleed (N=86)</th>
<th>Predominant diarrhoea (N=18)</th>
<th>Abdominal pain (N=10)</th>
<th>Other indications (N=8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overt</td>
<td>Occult</td>
<td>Anaemia</td>
<td>Low ferritin</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>25</td>
<td>19</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Female</td>
<td>8</td>
<td>20</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;40 years</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>40–75 years</td>
<td>17</td>
<td>26</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>&gt;75 years</td>
<td>14</td>
<td>9</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Acuity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatients</td>
<td>14</td>
<td>39</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>Inpatients</td>
<td>19</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Preparation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>21</td>
<td>29</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Fair</td>
<td>11</td>
<td>9</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Poor</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

In our study 69% of the studies had good preparation, 29% had fair preparation while the rest had poor preparation. Light contamination, causing suboptimal views was noted in five patients (4%). No relationship was noted between the quality of preparation and the indication for the procedure.

Inpatient CE examination were carried out in 25 (20%) patients. Nineteen of them were for overt bleeds. The diagnostic yield improved with inpatient examination in only the sub-group with overt bleeds (up to 74%). In the non-GI bleed studies only
one out of the six patients with inpatient study had relevant findings. Majority of the inpatient examinations were carried out in male patients (76%). This was because presentation with overt bleeds was significantly more common in males (70%).

The overall diagnostic yield of CE studies for findings relevant to the clinical indication in our study was 52%. Relevant gastric and colonic findings, picked on CE examination but missed on prior endoscopy were 2% and 6% respectively. Table 2 shows the influence of gender, age, inpatient status and indication for referral on the diagnostic yield of the study.

Highest yield was seen in patients referred for overt bleeds (66%) and lowest yield in those referred for non-specific abdominal pain (8%). The total diagnostic yield (small bowel, stomach and colon) of relevant/significant findings was more in inpatients (75%) and the elderly (80%) but was not affected by the gender of the patient.

Table 2. Diagnostic yield by gender, age, acuity and indication

<table>
<thead>
<tr>
<th>Variables</th>
<th>Relevant and significant findings</th>
<th>Normal and insignificant findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>41</td>
<td>22</td>
</tr>
<tr>
<td>Females</td>
<td>34</td>
<td>25</td>
</tr>
<tr>
<td>Age category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;40 years</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>40–75 years</td>
<td>43</td>
<td>29</td>
</tr>
<tr>
<td>&gt;75 years</td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td>Acuity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatients</td>
<td>56</td>
<td>41</td>
</tr>
<tr>
<td>Inpatients</td>
<td>19</td>
<td>6</td>
</tr>
<tr>
<td>Indication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overt bleeds</td>
<td>27</td>
<td>6</td>
</tr>
<tr>
<td>Anaemia</td>
<td>27</td>
<td>12</td>
</tr>
<tr>
<td>Low ferritin</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>

We only calculated the frequency of specific findings in those studies where the findings were relevant/significant to the indication for the study. If more than one finding was reported, then the most relevant/significant finding was counted. Overall angioectasias (36%) and ulcers/apthous ulcers (32%) were the most frequent specific findings (Figure 1).

For specific indications, the most frequently reported specific finding in those with overt bleed was fresh blood in the lumen (38%), and angioectasia (35%), in iron deficiency was angioectasia (52%), and in those with predominant diarrhoea was ulcer (75%).
Barium and CT/MR studies of the small bowel were done in 19 cases (16%), mainly in those with indications other than suspected GI bleeds (Table 3). Findings were consistent with the CE findings in 12 cases (63%) and false negative in seven cases (37%). No false positive cases were reported. As shown in the Table 3 most studies were done for cases presenting with predominant diarrhoea, where both the concordance and the false negative rates were 50%.

CRP and faecal calprotectin measurements were also recorded in the subgroup of patients presenting predominantly with diarrhoea and non-specific abdominal discomfort (data not illustrated). In those with predominant diarrhoea, faecal calprotectin was raised in all but one case (when measured) compared to CRP levels which were recorded as normal in 56% (9 out of 16 measured) of the cases. However, the faecal calprotectin levels correlated correctly with CE findings in only 64% of the cases. In five cases (35%) the faecal calprotectin was falsely elevated, that is, the levels were significantly raised but the CE examination was unremarkable.

Table 3. Preliminary imaging

<table>
<thead>
<tr>
<th>Variables</th>
<th>Obscure GI bleeds</th>
<th>Predominant diarrhoea</th>
<th>Abdominal pain</th>
<th>Other indications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overt</td>
<td>Occult</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anaemia</td>
<td>Low ferritin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imaging</td>
<td>not done</td>
<td>32</td>
<td>36</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>concordant</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>false negatives</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>false positives</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
The reading gastroenterologists suggested consideration of enteroscopy in their reports (push enteroscopy, single balloon or double balloon enteroscopy) in 31 (25%) patients post CE examination. All of these patients had relevant findings on their CE examinations. Also, one patient with suspected celiac disease was referred for repeat OGD and duodenal biopsies. As shown in Figure 2, most of these patients belonged to the categories of overt bleeds (45%) and iron deficiency anaemia (39%) and none belonged to the categories of non-specific abdominal pain or the ‘others’ category.

Figure 2. Patients considered for enteroscopy (n=31)

Table 4 shows the effect of different variable on the completion rate of the procedure. The overall completion rate and those with obscure GI bleeds in our study was 88%. The completion was rate was not significantly different between inpatients (84%) and outpatients (90%) and across different age categories, but was higher in females (95%) than in males (80%).

Table 4. Factors affecting completion of the capsule endoscopy examination

<table>
<thead>
<tr>
<th>Variables</th>
<th>Complete</th>
<th>Incomplete</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acuity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inpatient</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Outpatient</td>
<td>86</td>
<td>11</td>
<td>97</td>
</tr>
<tr>
<td>Indication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bleed – overt</td>
<td>28</td>
<td>5</td>
<td>33</td>
</tr>
<tr>
<td>Iron deficiency anaemia</td>
<td>34</td>
<td>5</td>
<td>39</td>
</tr>
<tr>
<td>Low ferritin</td>
<td>14</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td>16</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>8</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Other indications</td>
<td>7</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>51</td>
<td>12</td>
<td>63</td>
</tr>
<tr>
<td>Females</td>
<td>56</td>
<td>3</td>
<td>59</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;40 years</td>
<td>17</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>40–75 years</td>
<td>63</td>
<td>9</td>
<td>72</td>
</tr>
<tr>
<td>&gt;75 years</td>
<td>27</td>
<td>4</td>
<td>31</td>
</tr>
</tbody>
</table>
CE placement device was used in four cases for either a swallowing disorder or gastroparesis. Three patients, with suspected small bowel Crohn’s disease with strictures had a patency capsule study prior to CE examination which was successful in all the three cases. No procedure related complications were noted in any of our cases.

Discussion

The advent of capsule endoscopy in year 2000 dramatically changed the diagnostic evaluation of small intestinal diseases. CE is currently the minimally-invasive gold standard investigation for both obscure GI bleeding and suspected inflammatory conditions of the small bowel.13,14

Our report of an overall diagnostic yield of around 50% for relevant findings, with obscure GI bleed as the most common reason for referral (70% of the cases), and angioectasia as the most commonly reported relevant lesion (37%), is consistent with that reported in literature.15,16

Studies with sub-stratification of patients referred for overt bleeds have shown that CE studies within two weeks of an overt bleed have higher diagnostic yield than delayed studies.17 Pennazio has reported a diagnostic yield of 92% in patients with ongoing bleeding compared to 29% in patients with previous overt bleeds.18 Apostolopoulos has similarly found a higher yield in overt inpatient bleeds (93%).19 In our study the overall diagnostic yield was 66% in patients with overt bleeds.

Inpatient CE examination were carried out in 57% of these cases. Our diagnostic yield in the subset of inpatients with overt bleeds was higher (74%) but still below the over 90% yield reported in literature.19 Studies have also reported a higher overall diagnostic yield and a higher pick up of missed lesions (in the stomach and the colon) in inpatient studies.20 In our study, the diagnostic yield for inpatients only improved in the subset of overt bleeds.

The 2005 consensus on obscure GI bleeding recommends careful examination of both the upper and lower GI tracts in reading small bowel CE examinations in patients with obscure GI bleeds.29 This is based on the observation that small bowel CE examinations have picked up a reasonable number of missed lesions within the reach of upper and lower endoscopies.30

We report a miss rate of 2% and 6% for gastric and colonic lesions respectively. We have excluded from this category proximal small bowel lesions within the reach of upper GI endoscopy. In our study, not all patients had the localisation device during the study and it was, therefore, not always clear whether any proximal small bowel lesion noted during the CE study was within the reach of the prior endoscopic examination.

Age and gender has been reported in literature to influence the transit time, diagnostic yield and the pick up rates of missed lesions (gastric and colonic) outside the small bowel.31,32 In our study, the highest percentage of presentations with overt bleeds were in those over 75 years of age (45%). Males presented more often with overt bleeds (45% versus 14% in females) and had a significantly higher number of incomplete examinations (19%) compared to females.
In our study the pick up rate of relevant findings was higher with increasing age category and the inpatient status but was not affected by gender.

There has been controversy about the use of formal preparation of small bowel for the CE examination. A recent meta-analysis has favoured formal preparation over just fasting the patient overnight. All of our outpatients and majority of inpatients had 2 litres of polyethylene glycol on the day before the procedure. We classed the bowel preparation as good, fair and poor. Our study noted poor preparation in only three cases. Newer and more detailed scoring systems for the quality of examinations are now available in literature.

About 15% to 30% of the CE examinations are incomplete. It is important to identify the risk factors for incomplete examinations. Factors known to be associated with incomplete procedures include a prior history of bowel obstruction, previous bowel surgery, male gender, old age, opiate medications and inpatient status.

In our series, incomplete examinations constituted 12% of the studies. Male gender was the only variable that influenced the completion rate of the examination. Age, inpatient status, and the indication for referral did not affect the completion rates in our study. Data on the comorbid status and medications, factors that could also potentially affect the transit time of a CE study, were not collected in our study.

Preliminary non-CE small bowel imaging studies have a lower diagnostic yield in the evaluation of small bowel pathologies. Our results on such studies with an overall concordance of 63% with the CE examinations is consistent with the literature. A pooled meta-analysis of prospective comparative studies in 2010 has demonstrated superior diagnostic yield of CE compared to push enteroscopy, colonoscopy with retrograde ileoscopy, small bowel follow through examinations and CT/MR enterography in patients with suspected or established Crohn’s disease. In our 10 patients with suspected enteropathy and preliminary small bowel imaging, five patients had concordant findings on the subsequent CE study and five had normal (false negative) findings.

Faecal calprotectin is a non-invasive surrogate marker for intestinal inflammation and has been used in differentiating organic from functional bowel disorders. It is considered a better marker of intestinal inflammation than CRP measurement and is raised in almost all types of intestinal inflammation, including the enteropathy associated with NSAID use. In our patients, faecal calprotectin levels were raised in all but one cases, with a true positive rate of 64% and false positive rate of 36%. We noted poor concordance between plasma CRP levels and faecal calprotectin levels.

Our study was not designed to report on patient outcome as complete follow-up after the study was not available on all the patients. We did record the consideration for further enteroscopic intervention in 25% of the patients as suggested by the reporting gastroenterologists after the CE examinations. Predictably, those with overt bleeds constituted the highest group (45%), followed by those with occult bleeds presenting as iron deficiency anaemia (39%). However, it does not mean that the other CE examinations were not effective in influencing the outcome. Some bleeds with relevant findings were left for conservative management based on their comorbidities after discussion with the patients.
In literature, about 40% of the patients will have a change in management based on the CE findings.\textsuperscript{35} In our view, also important is the ability of a negative CE examination to reassure the patients by ruling out serious pathologies like small bowel tumours and, therefore, eliminating the need for further testing.

Limitations of our study included the retrospective nature of the study, lack of data on the comorbid conditions of patients, the timing of the examination or the most recent bleeding episode of the patient and the lack of routine grading system for the quality of preparation. Data on medications that may have precipitated a GI bleed (anti-platelets, anticoagulants) or may have influenced the transit time of the procedure (opiates) were also not collected.

**Competing interests:** Nil.

**Author information:** Mohammad I Khan; Gastroenterologist, Tauranga Public Hospital, Tauranga; Megan Johnston; Medical Student, University of Otago, Dunedin; Robert Cunliffe; Gastroenterologist, Tauranga Public Hospital, Tauranga; Adrian Claydon; Gastroenterologist, Tauranga Public Hospital, Tauranga

**Correspondence:** Dr Mohammad Imran Khan, Gastroenterologist, Tauranga Public Hospital, Tauranga, New Zealand. Email: imran.khan@bopdhb.govt.nz

**References:**


A dedicated dermatology clinic for renal transplant recipients: first 5 years of a New Zealand experience

Paul D L Maurice, Tracy Fenton, Nicholas Cross

Abstract

Aim Cancer following organ transplantation is a growing public health concern. We describe the first 5 years’ experience of a dedicated dermatology clinic for renal transplant recipients, the first of its type in New Zealand.

Methods Data from patients seen in the clinic were collected on a nephrology/dermatology database.

Results 86 of 99 transplant recipients had a baseline dermatology assessment. Seventy-one skin cancers (45 squamous, 25 basal cell carcinomas, 1 melanoma) were found in 17 patients. Eighteen of these were an incidental finding at the baseline post-transplant examination of 7 patients: they had not been noted either by the patient or by their nephrologist. A further 44 cancers were found in 13 patients at follow-up examinations in the dedicated clinic. Squamous and basal cell carcinomas received definitive treatment after 26 and 38 days (median) respectively. A brief analysis showed this to be a cost-effective way of diagnosing and treating skin cancer in this cohort of patients.

Conclusion The clinic is enabling prompt diagnosis and cost-effective treatment of skin cancers developing in renal transplant recipients and is also identifying significant numbers of pre-existing skin cancers in these patients.

Skin cancer, in particular squamous cell carcinoma (SCC), is the commonest post-transplant malignancy and is a growing public health concern. A recent New Zealand study of 384 renal transplant recipients (RTRs) showed that 25% had developed at least one non-melanoma skin cancer (NMSC) by 10 years post-transplant, with a 15% case fatality rate for SCC. Following their first NMSC, they develop further NMSCs at a rate of 1.7 per year. Post-transplant skin malignancies are likely to become even more common as a result of increasingly potent immunosuppression, longer patient and graft survival and increasing age of recipients at transplantation.

In an attempt to address this issue, the UK-based National Institute for Health and Clinical Excellence recommend the following. “All patients with a high risk of developing skin cancer should be counselled effectively by a dermatologist or a clinical nurse specialist (CNS) about sun protection before they develop any skin lesions, and should have annual checks carried out thereafter. Transplant patients who have precancerous skin lesions or who have developed a skin cancer should be seen in a dedicated ‘transplant patient skin clinic’, either in the transplant centre or in a hospital closer to the patient’s home, according to the choice of the patient. Close links should be established between the transplant centre, local physician and dermatologist for the management of transplant patients postoperatively.”
The European Skin Care in Organ Transplant Recipients (OTRs) Network and the International Transplant Skin Cancer Collaborative recommend a comprehensive baseline skin examination, education on photoprotection and self-examination of the skin, and follow-up at appropriate time intervals determined by the individual’s risk for skin cancer development.\textsuperscript{4}

In accordance with these recommendations, we set up a dedicated dermatology clinic for RTRs and now report on our first 5 years’ experience.

The aims of this observational study were to assess the:

- Proportion of RTRs being seen within a target of less than 6 months after transplant,
- Range of lesions and the time to treatment of skin malignancies, and
- Factors associated with skin cancer in this population.

**Patients and Methods**

A dedicated clinic for RTRs, the first of its type in New Zealand, was set up in the Dermatology Department, Christchurch Hospital in October 2006. The service was developed by a dermatologist with a special interest in skin cancers in RTRs and a CNS in dermatology.

The CNS has had 10 years’ experience in dermatology and has assisted in both multidisciplinary team clinics for skin cancer and “one-stop” skin lesion clinics. Prior to her involvement with the dedicated dermatology clinic for RTRs she underwent a peer review of skin examination by the consultant dermatologist.

All adult patients transplanted at Christchurch Hospital between 26 April 2006 and 14 January 2011 were included in the study. The immunosuppressive protocol used for all patients was prednisone, mycophenolate mofetil and either cyclosporin or tacrolimus.

Referrals to the clinic were made on discharge following transplantation. The proportion seen within the target 6 months of transplantation was calculated. We collected patient demographic details and skin cancer risk factors. All RTRs received a baseline full skin examination (FSE) and education on photoprotection and recognition of skin cancer. The type and site of skin cancers were recorded. All were treated surgically and confirmed histologically. SCC-in-situ was excluded. Primary consultations were performed by the CNS. Patients with possible skin cancer were also seen by the dermatologist.

Follow-up appointments with the dermatologist were offered to patients deemed to be at higher risk of skin cancer and a FSE was carried out every time. Patients have direct self-referral clinic access should they develop any suspicious skin lesions. Data were entered prospectively into the joint nephrology-dermatology database (Proton\textsuperscript{™} Clinical Computing Ltd, Sydney, Australia).

Patients with and without skin cancers were compared using descriptive statistics, t-tests for continuous variables and Chi-squared tests for categorical variables. Where continuous variables were highly skewed, medians and interquartile ranges (IQR) were compared using Mann-Whitney U tests. All statistical calculations were performed using SAS v9.1.3 software (Cary, NC, USA).

**Results**

Of the 99 patients transplanted during the study period, 13 were not seen for a baseline dermatology check for reasons including death, loss of graft within 3 months, distance from home to clinic and failure to attend clinic.

Median time between transplant and baseline dermatology assessment was 5.6 months (IQR 4.3 to 8.2). Fifty-six patients (65\%) were seen within 6 months and 75 patients (87\%) within 12 months of transplantation.
The main reason for not being seen within 6 months was delay in referral to the dermatology clinic. This improved during the course of the study with 91% and 100% seen within 6 and 12 months respectively in the second half of the cohort. There was no difference in the proportion of patients with skin cancer in those whose review was delayed beyond 6 months after transplantation (21% vs 16% of those seen within 6 months, p = 0.8).

Table 1. Demographic and clinical data, collected at baseline dermatology assessment, by skin cancer

<table>
<thead>
<tr>
<th>Variables</th>
<th>Skin cancer, n=17 (19%)</th>
<th>No skin cancer, n=69 (81%)</th>
<th>P†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years (mean±SD)</td>
<td>61.9±7.7</td>
<td>50.5±12.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Male, n (%)</td>
<td>11 (65)</td>
<td>42 (61)</td>
<td>1.0</td>
</tr>
<tr>
<td>Retransplant, n (%)</td>
<td>1 (6)</td>
<td>3 (4)</td>
<td>1.0</td>
</tr>
<tr>
<td>Immunosuppression‡</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclosporine n(%)</td>
<td>13 (76)</td>
<td>42 (61)</td>
<td>0.3</td>
</tr>
<tr>
<td>Tacrolimus, n(%)</td>
<td>4 (24)</td>
<td>27 (39)</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>17 (100)</td>
<td>52 (75)</td>
<td>0.08</td>
</tr>
<tr>
<td>Māori/Pacific Island</td>
<td>0</td>
<td>11 (16)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>0</td>
<td>6 (9)</td>
<td></td>
</tr>
<tr>
<td>Outdoor work, years (median [IQR])</td>
<td>8 (0–20)</td>
<td>0 (0–10)</td>
<td>0.2</td>
</tr>
<tr>
<td>Ever sunburn</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤16 yrs, n (%)</td>
<td>13 (76)</td>
<td>39 (58)</td>
<td>0.3</td>
</tr>
<tr>
<td>&gt;16 yrs, n (%)</td>
<td>12 (71)</td>
<td>37 (55)</td>
<td>0.3</td>
</tr>
<tr>
<td>Ever sunbed, n (%)</td>
<td>4 (24)</td>
<td>12 (18)</td>
<td>0.7</td>
</tr>
<tr>
<td>Ever phototherapy, n (%)</td>
<td>0</td>
<td>3 (5)</td>
<td>1.0</td>
</tr>
<tr>
<td>Any warts, n(%)</td>
<td>6 (35)</td>
<td>12 (18)</td>
<td>0.2</td>
</tr>
<tr>
<td>Skin phototype§</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-II</td>
<td>12 (71)</td>
<td>22 (31)</td>
<td>0.02</td>
</tr>
<tr>
<td>III-IV</td>
<td>5 (29)</td>
<td>40 (58)</td>
<td></td>
</tr>
<tr>
<td>V-VI</td>
<td>0</td>
<td>7 (10)</td>
<td></td>
</tr>
<tr>
<td>Ever smoked, n (%)</td>
<td>6 (35)</td>
<td>32 (48)</td>
<td>0.4</td>
</tr>
<tr>
<td>Blue/grey eyes, n(%)</td>
<td>10 (59)</td>
<td>30 (43)</td>
<td>0.4</td>
</tr>
</tbody>
</table>

† T-tests, Mann Whitney U tests or Fisher’s exact tests as appropriate.
‡ All patients also taking mycophenolate mofetil and prednisone.
§ Fitzpatrick phototypes: I always burns, never tans; II usually burns, sometimes tans; III sometimes burns, usually tans; IV never burns, always tans; V moderate constitutive pigmentation; VI marked constitutive pigmentation.

Seventy-one skin cancers (45 SCC, 25 BCC, 1 melanoma) were found in 17 patients. Demographic and clinical data for patients with and without skin cancer are given in Table 1.
Twenty-seven of the 71 skin cancers occurred in two patients (16 and 11 respectively). Eighteen (3 SCC, 15 BCC) were found in seven patients at the baseline assessment. These were an incidental finding on examination: the patients had not complained of, or been referred for, these lesions. Forty-four (35 SCC, 9 BCC) were found in 13 patients during the period of follow-up in the dedicated dermatology clinic. Seven (6 SCC, one melanoma) were found in five patients in other clinics (GP, nephrology, head and neck surgery). Two cancers (1 SCC, 1 BCC) in two patients were found by the patient, one of whom self-referred to the dermatology clinic and the other consulted his GP. Figure 1 summarises the location of detection of skin cancer by histology.

Figure 1. Numbers of skin cancers detected at baseline assessment, in dermatology follow-up clinics and in other clinics

Thirty-one of the 71 skin cancers were on sites other than the face, neck or hands.

To assess the efficiency of the clinic process, the time from initial observation to definitive treatment was calculated for the 62 skin cancers that were found in either the dermatology baseline or follow-up clinics.

Thirteen of these skin cancers (SCCs) developed sequentially over the lower legs of one patient and were removed in stages by the surgical team, so it was not possible to calculate the time interval for each individual lesion. SCCs (n=25) and BCCs (n=24) received definitive treatment in a median of 26 (IQR 0 to 56) and 38 (IQR 10 to 83) days respectively. One patient presented to her nephrologist with a nodular melanoma 2 months after her transplant and this was excised by the plastic surgeons after 26 days (Breslow thickness 4.1mm).
A brief analysis was performed to assess the cost-effectiveness of the dedicated clinic. The CNS detected 18 skin cancers in seven patients at the baseline assessment. Our CNS’s 4-hour session costs 41% of the amount for a senior dermatologist, so this is clearly a cost-effective way of detecting skin cancers in this cohort of patients.

Early diagnosis of skin cancer in the specialist clinic also allowed a greater proportion of these to receive surgical treatment as an out-patient procedure within the dermatology department, as compared to an out-patient procedure in plastic surgery which would be required for larger more advanced lesions. At the time of writing, the cost for the former is 22% of the amount for the latter. Early diagnosis of skin cancer will also reduce the likelihood of subsequent more expensive procedures, such as major surgery or radiotherapy, but this is difficult to quantify.

Discussion

Skin malignancy after organ transplantation is a significant cause of morbidity and mortality. In 2000, only 21% of UK centres provided skin cancer surveillance for RTRs. Although this had increased to 66% in 2006, the UK data compared poorly with Australian data, where 97% of centres provided skin surveillance.5

In this study we assessed the performance of a dedicated dermatology clinic at diagnosing and treating skin cancer in a cohort of RTRs. Prior to establishing this clinic, there was no routine dermatological assessment of RTRs in Christchurch Hospital. Patients were only referred to the Dermatology Department once they had developed skin cancer.

We aimed to see RTRs within 6 months of their transplant. A case could be made for screening patients pre-transplant. It is possible that the patient with the incidentally noted melanoma had this prior to her transplant and it would therefore have been diagnosed at that stage by a FSE. However, this is difficult to organise in patients who are transplanted at short notice when a cadaveric kidney becomes available and we believe that seeing all patients within 6 months of their transplant is an acceptable compromise. The proportion of our patients seen within the aimed 6 months of transplant increased during the study period.

Forty-four percent of skin cancers in our series were on covered body sites, confirming the importance of a FSE in all RTRs. Nurse practitioners can be trained to identify and triage suspicious skin lesions and to educate patients on photoprotection and self-examination.6

The finding of 18 pre-existing skin cancers (of which both the patient and the referring nephrologist were unaware) in seven of our patients at the baseline assessment indicates the importance of this exercise. The preponderance of BCCs over SCCs at the baseline check and the converse at follow-up examinations is consistent with the observation that, while BCCs are commoner than SCCs in the normal population, the opposite is true in the immunosuppressed.1

Of the patients who used the direct-dial phone number to contact the CNS, one had skin cancer, the remainder had benign lesions requiring reassurance only. The large majority of skin cancers developing after the baseline check were found incidentally at follow-up examinations, reinforcing the need for patients to self-examine the skin regularly and to use the dedicated phone number for any lesions of concern.
Although most skin cancers in this series were managed in a satisfactory time frame, the patient with melanoma waited 26 days for treatment. A multidisciplinary review of this case resulted in a fast-track plastic surgery service for RTRs with suspected skin cancer being established.

The other key function of the clinic was patient education. All Christchurch patients receive verbal and written information about skin cancer risk from the nephrology nurse pre-transplant. Although retention of information was not assessed in this study, others have demonstrated that this is poor for advice given in this way, with only 54% of 202 RTRs recalling advice and only 30% knowing why RTRs need to photoprotect. The authors recommended that RTRs should be seen by a dermatologist 6 months post-transplantation for a skin examination and advice on sun protection. According to one study, skin cancer awareness and compliance with photoprotective measures were higher in RTRs who had attended a specialist dermatology clinic than in those who had not.

There is as yet no direct evidence that specialist clinics offering intensive education reduce the risk of skin cancer in RTRs, but this is likely to be the case in view of the fact that regular application of sunscreens has been shown to reduce the incidence of actinic keratoses (generally accepted as precursors of SCC) and SCCs.

Long-term data collected from clinics such as this will help to determine whether intensive education on sun protection and skin self-examination will reduce the incidence of skin cancer in RTRs.

Competing interests: Nil.

Author information: Paul DL Maurice, Consultant Dermatologist; Nicholas Cross, Consultant Nephrologist; Tracy Fenton, Clinical Nurse Specialist in Dermatology; Department of Dermatology, Christchurch Hospital, Christchurch

Correspondence: Dr Paul Maurice, Department of Dermatology, Parkside Outpatients, Private Bag 4710, Christchurch Hospital, Christchurch 8001, New Zealand. Fax: +64 (0)3 3641141; email: paul.maurice@cdhb.govt.nz

References:

Wrapped in controversy: trends in fundoplication at myotomy for achalasia in Christchurch, New Zealand

Lotte Steffens, Ramadan Oumer, Ross Roberts

Abstract

Aim A surgical approach to the management of achalasia involves myotomy, typically with added anti-reflux procedure. The most appropriate fundoplication in this setting (total Nissen, partial anterior Dor, or partial posterior Toupet) remains controversial. We present the trends in fundoplication procedures performed at myotomy in Christchurch between 1997 and 2009, and compare this with the literature.

Methods 34 cases of achalasia managed with myotomy and various types of fundoplication in Christchurch between 1997 and 2009 were separated into two temporal groups, and the type of surgery in each group analysed. Data was obtained from the clinical records on specific short and long-term postoperative complications.

Results There is a decrease over time in myotomy without fundoplication and in total Nissen fundoplications performed. The number of posterior fundoplications remains equal over both time periods; however the proportion of anterior fundoplications is significantly increased in the later group. Three cases of mucosal perforation occurred during myotomy associated with anterior fundoplication, and reintervention rates were highest in myotomy only and anterior fundoplication patients.

Conclusion Trends in anti-reflux surgery in Christchurch reflect the development of the evidence base in the literature. The change in fundoplication procedure is not clearly explained by the complication rates.

Achalasia is characterised by the absence of oesophageal peristalsis and an inability of the lower oesophageal sphincter (LES) to relax normally during the initiation of swallowing. Whilst the underlying pathophysiology is incompletely understood, the most commonly postulated hypothesis is of neurodegeneration: an irreversible loss of ganglion cells in the myenteric plexus of the oesophagus due to autoimmune or infectious mechanisms. The ensuing absence of peristalsis, failure of LES relaxation, and elevated LES pressures cause oesophageal stasis and progressive dilation.

Incidence in western populations is estimated at one to three per 100,000 people. Typical presentation is with progressive dysphagia, although regurgitation, weight loss, vomiting, and chest pain have been reported.

The primary management principle of achalasia is resolution of the functional obstruction of the LES, allowing food to enter the stomach under gravity, whilst avoiding iatrogenic gastro-oesophageal reflux disease (GORD) by rendering the LES too loose. Management may involve pharmacotherapy such as sublingual calcium channel blockers and isosorbide dinitrates, endoscopic techniques such as botox injection and pneumatic dilatation, and surgical management.
The first myotomy for achalasia was performed in 1913 by German surgeon Ernest Heller as combined anterior and posterior myotomies, and later modified by Zaaijer to a single anterior myotomy. Whilst this technique successfully treated dysphagia, it was subsequently noted that patients suffered reflux on long-term follow-up, and hence various anti-reflux procedures have been added: total 360-degree fundoplication, and anterior and posterior hemi-fundoplications.

**Methods**

This case series includes 34 patients undergoing myotomy for oesophageal achalasia in Christchurch between 1997 and 2009. Data was collected retrospectively from both Christchurch Hospital and private clinics within Christchurch, where cases were identified by clinical coding including the words/phrases: achalasia, myotomy, and oesophageal dilatation.

This case series does not include all patients undergoing myotomy in Christchurch during this time period: paediatric patients were excluded, not all private clinics were incorporated, and patients lost to follow up (e.g. left the district) were excluded.

Cases involving surgical management were extracted, and categorised into two groups by year of surgical procedure: 1997–2002 and 2003–2009.

Anti-reflux procedures performed were categorised into one of the following types: 360 degree total (Nissen) fundoplication, anterior (Dor) fundoplication including wraps of 90–180 degrees, posterior (Toupet) fundoplication including 180–270 degree wraps, and myotomy without anti-reflux procedure. Comparisons were drawn between the raw numbers and proportions of varying types of anti-reflux procedure performed during each time period.

Information was then obtained from the clinical notes on specific short and long-term perioperative complications. Short term complications analysed included: mortality, inadvertent intraoperative mucosal perforation, postoperative leak, and conversion to open surgery.

Long-term complications analysed were the need for reintervention in the form of repeat myotomy, subsequent balloon dilatation, or redo of fundoplication. Ethical approval was granted.

**Results**

The procedures in this series were performed by two surgeons during both time periods. Despite being a small case series, there were appreciable differences in the frequency of procedures conducted in each temporal group.

In 1997–2002 there were three total fundoplications completed (at 20% of all myotomies), compared with none during 2003–2009 (Table 1). The number of posterior fundoplications is equal between the groups, however in 2003-2009 there was a greater percentage of anterior wraps (13 anterior wraps; at 68% of all myotomies) completed than in 1997-2002 (four anterior wraps; at 27% of all myotomies).

It was more common during 1997–2002 to complete no anti-reflux procedure than during 2003–2009 (Table 1). These trends are presented graphically in Figure 1.
Table 1. Anti-reflux procedures performed at myotomy during 1997–2002 and 2003–2009

<table>
<thead>
<tr>
<th>Years</th>
<th>n</th>
<th>No anti-reflux procedure (%)</th>
<th>Total fundoplication (%)</th>
<th>Posterior fundoplication (%)</th>
<th>Anterior fundoplication (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997–2002</td>
<td>15</td>
<td>2 (13)</td>
<td>3 (20)</td>
<td>6 (40)</td>
<td>4 (27)</td>
</tr>
<tr>
<td>2003–2009</td>
<td>19</td>
<td></td>
<td></td>
<td>6 (32)</td>
<td>13 (68)</td>
</tr>
</tbody>
</table>

Note: Numbers are raw data, followed in brackets by percentage of all myotomies performed within that period.

Figure 1. Graph showing types of fundoplication performed at myotomy during 1997–2002 and 2003–2009, as a percentage of all myotomies performed in each temporal group

![Graph showing types of fundoplication performed at myotomy](image)

Intraoperative or postoperative complications occurred in 10 patients (29%). Short-term complications were few: mucosal perforation affected three patients undergoing myotomy with anterior fundoplication (18% of all anterior fundoplications) (Table 2). No patients with alternative fundoplication types were affected; the overall perforation rate was 9%. There were no perioperative deaths or postoperative leaks amongst the case series, and no cases required conversion from laparoscopic to open surgery.

Surgical reintervention rates were also low. Both myotomy only patients subsequently underwent revision fundoplication, with one additionally undergoing repeat myotomy. One posterior fundoplication was converted to Nissen fundoplication for persistent reflux.
Several patients underwent balloon dilatation postoperatively: three anterior fundoplication patients (18%), one posterior fundoplication patient (8%), and one myotomy only patient (Table 2).

Table 2. Short and long-term complications following Heller myotomy and various fundoplication procedures

<table>
<thead>
<tr>
<th>Variables</th>
<th>n</th>
<th>Short term</th>
<th>Long term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mucosal perforation (%)</td>
<td>Repeat myotomy (%)</td>
</tr>
<tr>
<td>No anti-reflux procedure</td>
<td>2</td>
<td>0</td>
<td>1 (50)</td>
</tr>
<tr>
<td>Total fundoplication</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Posterior fundoplication</td>
<td>12</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Anterior fundoplication</td>
<td>17</td>
<td>3 (18)</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Data are raw numbers followed in brackets by percentage within each type of fundoplication across both temporal groups.

Discussion

Today a laparoscopic Heller myotomy is considered the primary treatment modality for achalasia. However, the addition of an anti-reflux procedure, and more specifically which type, has long been a topic of controversy.

Myotomy involves a 6–8 cm longitudinal division of the longitudinal and circular muscle fibres of the oesophagus, typically extended onto the proximal stomach, via a laparoscopic approach, thereby exposing the submucosa beneath. The oesophagus is rendered vulnerable and without the protection against gastric content normally provided by an intact LES. Stricture, dysplasia, and in the most severe cases Barrett’s oesophagus and adenocarcinoma can result, and hence most myotomies have an anti-reflux procedure added.

Several studies have shown a high incidence of reflux when myotomy is performed without fundoplication. Burpee and colleagues conducted a retrospective review of 54 patients undergoing Heller myotomy without fundoplication. They found that 30% reported significant heartburn, while 60% had objective evidence of reflux: either oesophagitis observed on gastroscopy or positive 24-hour pH recordings. A significant proportion of those with objective evidence of reflux reported no symptoms, demonstrating the often silent nature of reflux, a concerning feature also raised by other authors.

In a prospective follow up of 40 patients also undergoing myotomy without fundoplication, Lindenmann et al. found that 45% had objective evidence of postoperative reflux on pH monitoring, however fewer than 5% reported clinical symptoms of reflux.

In following up 21 similar patients, Kjellin et al. found that 57% had reflux on pH monitoring when no fundoplication was added, 62% of whom were asymptomatic. In contrast with these findings, an early meta-analysis comparing the incidence of
GORD in myotomy patients with and without an anti-reflux procedure, found no statistically significant difference in either reflux symptoms or pH studies.\textsuperscript{9}

Falkenback and colleagues\textsuperscript{12} conducted a randomised controlled trial of 20 patients, comparing Heller myotomy alone and in combination with 360-degree Nissen fundoplication. No patients receiving fundoplication required acid-reducing medications postoperatively, whilst more than half of the myotomy only group did. 24 hour oesophageal pH monitoring at 3-year follow up showed pathological acid reflux in 13\% of the myotomy only group, compared with 0.15\% of the myotomy plus fundoplication group.

An unacceptable rate of reflux occurs in patients undergoing myotomy without fundoplication,\textsuperscript{10} and Heller myotomy plus Nissen fundoplication relieves dysphagia whilst providing superior reflux control.\textsuperscript{12}

Richards and colleagues\textsuperscript{14} published results of a randomised controlled trial of 43 patients comparing myotomy alone with myotomy plus Dor anterior fundoplication. They found pathological reflux on 24 hour pH monitoring in 48\% of myotomy only patients, compared with 9\% of myotomy plus Dor patients,\textsuperscript{14} corresponding to a significant reduction in the risk of reflux with the addition of a Dor procedure (relative risk 0.11). The incidence of dysphagia postoperatively was similar between the two groups, suggesting that oesophageal emptying was not impaired by anterior fundoplication.

A recent systematic review and meta-analysis of 64 articles reporting the outcomes of 4871 achalasia patients managed surgically\textsuperscript{15} found that the addition of an anti-reflux procedure decreased the incidence of reflux symptoms from 31\% to 9\%, without altering the resolution of dysphagia. pH monitoring revealed the incidence of reflux after myotomy without fundoplication was 42\% versus 15\% after myotomy plus fundoplication.

The incidence of postoperative GORD measured either subjectively or objectively was lower when a fundoplication was added, whilst conferring no increased morbidity.\textsuperscript{15}

Other authors argue against the necessity of an anti-reflux procedure in this setting, citing that fundoplication is only required in poorly performed myotomy.\textsuperscript{16} Cade\textsuperscript{17} carried out a prospective single-surgeon case series on 124 patients undergoing Heller myotomy without anti-reflux procedure, and found 8\% of patients report reflux significant enough to warrant proton pump inhibitor (PPI) treatment. He argues that the commonest symptom postoperatively is not reflux, but dysphagia—a symptom which even partial fundoplication will amplify rather than treat, and hence a fundoplication is contraindicated.\textsuperscript{17}

The author attributes the low incidence of reflux in his series to surgical technique: limited extension of myotomy onto the stomach and limited hiatal dissection.

However, fewer than half of patients in this series underwent gastroscopy. A significant proportion of reflux is silent, with poor correlation of symptoms with severity of GORD on objective assessment.\textsuperscript{6,9,10}

Whilst subjectively rated as mild, 49\% of patients nonetheless complained of some degree of reflux postoperatively, and follow-up was for 6 months. Therefore the
possibility remains that significant GORD was missed either because it was asymptomatic or developed beyond the follow up period.

Diamantis et al also argue that the need for fundoplication can be circumvented by surgical technique. Their prospective observational study of 33 patients followed up for 2 years post myotomy without anti-reflux procedure found no GORD, either symptomatically or on gastroscopy.

Their technique involved extension of the myotomy for only 5 mm onto the stomach compared with up to 2–3 cm by other surgeons, which like Cade, they argue is important in avoidance of reflux.

While our case series includes only two myotomy only patients, the subsequent addition of a fundoplication procedure in both is consistent with evidence from the literature of persistent reflux in myotomy without fundoplication.

If one accepts the most reliable evidence from randomised controlled trials and meta-analysis suggesting a fundoplication after Heller myotomy is fundamental in reducing the incidence of reflux, the question remains: which type of fundoplication offers the best outcome?

As the propulsive action of the oesophagus is already impaired in achalasia, the addition of a mechanical obstacle to the LES in the form of a total fundoplication carries the risk of inducing dysphagia, the very symptom which myotomy aims to relieve. A partial wrap creates less resistance to oesophageal emptying than total fundoplication.

Zhu et al followed 64 patients undergoing myotomy with either total or partial fundoplication for 6 years. A higher incidence of symptomatic dysphagia was found in the Nissen group compared with the partial fundoplication group, as well as increased oesophageal dilation on both endoscopy and radiologically.

A total fundoplication is thought to add too much resistance at the LES, while a partial wrap confers the desired anti-reflux benefit without causing oesophageal emptying difficulty. Other observational studies also show increased rates of dysphagia following Nissen fundoplication, and the re-operation rate may be as high as 29%.

The results of several prospective observational studies contradict this theory, reporting good outcomes after total fundoplication in achalasia. However, duration of follow up is medium term and variable (3 to 6 years), and concern remains that dysphagia may arise as a late complication.

Topart et al found recurrence of dysphagia on long-term follow up (10 years) of patients undergoing total fundoplication, despite excellent early symptom relief. They concluded that a Dor fundoplication should be utilised to avoid causing oesophageal dysfunction secondary to outflow obstruction.

Of interest, in our series no total fundoplication patients underwent subsequent balloon dilatation, unlike 14% of partial fundoplication patients. Whilst the number of total fundoplications is small (n = 3), this may reflect an absence of recurrence of dysphagia.
Rebecchi and colleagues investigated this controversy in a randomised controlled trial comparing Heller myotomy with Nissen fundoplication versus Heller myotomy with Dor fundoplication.

A total of 144 patients were followed up for 5 years and rates of reflux symptoms were low overall: 5.6% in the Dor fundoplication group and 0% in the Nissen group. No patients in either group had evidence of oesophagitis on gastroscopy, and neither clinical nor objective evidence of difference in reflux between the groups reached statistical significance.

Symptomatic dysphagia at 5 years was higher in the Nissen group (15%) than in the Dor group (2.8%). Hence both procedures achieved acceptable control of reflux, yet recurrence of dysphagia was considerably increased in the Nissen group. Thus the best level of evidence available demonstrates that partial fundoplication is superior to total fundoplication as an anti-reflux procedure in conjunction with myotomy.

Proponents of the Toupet posterior wrap claim it is a more effective anti-reflux procedure than anterior fundoplication, that the myotomy is prevented from closing by suturing the fundoplication into its edges, and that full mobilisation of the oesophagus allows for easier myotomy under improved vision. Other authors argue that leaving the myotomy exposed may result in development of oesophageal diverticulae over the long term.

Advocates of the Dor anterior wrap highlight the lack of posterior dissection required, making it a simpler operation in which the posterior oesophageal attachments remain intact. It has the added advantage of providing a covering over the exposed mucosa of the myotomy, preventing diverticulae formation.

Given a mucosal perforation rate of 5% to 10% with myotomy, some authors argue an anterior fundoplication occludes any unrecognised perforation. Others claim that a Dor procedure is inferior as it may lead to adhesion formation between the myotomy and fundoplication.

The mucosal perforation rate in our series is 9%, consistent with rates reported in the literature. All perforations occurred during myotomy with anterior fundoplication; however it is unclear whether anterior fundoplication was planned as the original procedure or added to provide additional protection once perforation was recognised.

Hunter et al reviewed 37 patients undergoing partial fundoplication at one centre: 80% posterior and 20% anterior. They report good results overall with 90% relief of dysphagia, and no difference in symptom resolution between the two groups. Other observational studies compare Dor with Toupet, however performing different length myotomies in the two groups, rendering any conclusion of superiority subject to bias.

Richardson et al followed up postoperative symptoms of 44 patients receiving Heller myotomy with various anti-reflux procedures for a mean duration of 37 months: without fundoplication, posterior Toupet, anterior Dor, and modified Dor (suturing the fundus onto the crus of the diaphragm rather than oesophagus only). Whilst the modified Dor group had better reflux control and the Toupet group had the worst dysphagia and reflux scores, these findings did not reach statistical significance.
Other authors of observational studies have found no statistically significant difference between outcomes following Dor and Toupet.\textsuperscript{32}

A recent randomised controlled trial of anterior Dor versus posterior Toupet hemi-fundoplication including 85 patients showed no significant difference in oesophageal symptoms between the two groups. Dor fundoplication was associated with a higher rate of abnormal reflux at pH monitoring when compared with Toupet, however this difference did not reach statistical significance.\textsuperscript{35}

The rarity of achalasia makes such randomised controlled trials difficult to conduct, and hence evidence based management principles have been slow to emerge. Both partial fundoplications are currently being used, and further high level evidence is required before a firm recommendation can be made regarding the superiority of either. Despite the lack of quality evidence, several authors strongly recommend an anterior fundoplication over posterior.\textsuperscript{7,19,20}

Between 1997 and 2009 anti-reflux surgery at myotomy in Christchurch has shown a trend of decreasing total and increasing anterior fundoplications, and a decrease in myotomy performed without fundoplication. There was no change in surgeons performing the procedures to explain the change in technique. Nor do the complication rates explain the change in practice, with the greatest number of complications occurring in the most commonly performed procedure during the later period.

The observed trend reflects the development of the evidence base in the literature: early myotomy was conducted without fundoplication, with later addition of total fundoplication, a subsequent move in favour of partial fundoplication, and a more recent emergence in popularity of the Dor anterior fundoplication. The most commonly advocated operation for achalasia today is a Heller myotomy combined with a Dor anterior hemi-fundoplication,\textsuperscript{7,8} and trends in Christchurch are in keeping with this.

This is a small case series and ongoing surveillance of anti-reflux surgery is required to thoroughly investigate the robustness of the aforementioned trends and exclude effect due to chance. By nature of retrospective study design, the follow-up period is longer for the 1997–2002 patients, and long-term complications may be yet to develop in the more recently operated group.

Categorisation into types of fundoplication (total, anterior and posterior) herein does not take into account the variation in surgical technique within each category. A larger case series would allow further detailed categorisation and more comprehensive examination of both the trends in fundoplication and complication rates.

**Competing interests:** Nil.

**Author information:** Lotte Steffens, House Officer, Christchurch Hospital; Ramadan Oumer, Surgical Registrar, Department of Surgery, Christchurch Hospital, Christchurch; Ross Roberts, Consultant Upper Gastrointestinal Surgeon, Department of Surgery, Christchurch Hospital, Christchurch

**Acknowledgements:** Database of achalasia patients collated by Mr Steve Kelly and Kim King (Department of Surgery, Christchurch Hospital) as well as Alex Heulson (Gastroenterology Department, Christchurch Hospital).
Correspondence: Lotte Steffens, C/- RMO Unit, Christchurch Hospital, Riccarton Ave, Private Bag 4710, Christchurch 8140, New Zealand. Email: Lotte.Steffens@cdhb.govt.nz

References:


Endovascular aortic repair: can we predict who will not get long-term benefit?

Nur A B Haji Mohd Yasin, Ian A Thomson, Sophia Leon de la Barra

Abstract

Aim The aim of this study is to review our endovascular aortic repair (EVAR) experience in Dunedin Public Hospital as well as assessing the applicability of Mount Sinai score and the American Society of Anesthesiologists physical status classification (ASA) in finding which patients will be most likely to benefit from EVAR.

Methods A retrospective study of 54 patients who had EVAR from 2000 to December 2009 in Dunedin Public Hospital was conducted. Univariate, bivariate and multivariate regressions analyses were used in assessing the data with the occurrence of postoperative complications and mortality as the primary outcome variable.

Results The overall mortality at 30 days was 1.8%. The Mount Sinai score and smoking status were both found to be significant predictors of mortality.

Discussion The Mount Sinai score was a good predictor for mortality as it factors in the patient’s comorbidities. This study indicates that smoking status was an important factor and it should be added to long-term risk predicting models.

Endovascular aortic repair (EVAR) was initially described by Volodos et al and Parodi et al in 1991.1,2 Since then, the technique was developed and embraced as an alternative to open repair.

Randomised controlled trials comparing open repair and endovascular repair such as the DREAM trial and EVAR trial 1 have showed lower mortality rates at 30 days in the endovascular group.3–5 However, follow-up studies, including those mentioned previously, which looked at the long-term comparison between the two treatment modalities showed little difference in all-cause mortality and complication rates.6–8

Is there an objective way of finding patients who will have long-term survival and gain the most benefit from their EVAR? Risk-scoring systems have been developed to determine risk levels for patients undergoing AAA surgery and for the purpose of this study, we assessed the scoring system developed by Egorova et al at Mount Sinai School of Medicine and the American Society of Anesthesiologists physical status classification (ASA) System.9,10

In this paper, we aim to:

- Review the endovascular aortic repair experience in Dunedin Public Hospital and the ethnicity of population sample and discuss its potential impacts;
- Assess the utility of the Mount Sinai’s scoring system as a predictor for postoperative complications and mortality;
• Assess the utility of the American Society of Anesthesiologists’ physical status classification (ASA) system as a predictor for postoperative complications and mortality; and

• Assess the impact of gender and smoking status in predictive models for Mount Sinai and American Society of Anesthesiologists’ physical status classification (ASA) system.

Methods
A retrospective study of all endovascular aortic repairs operated in Dunedin Public Hospital from 2000 to December 2009 was conducted. Most of the information was gathered from patients’ discharge summaries, clinical records and the Otago clinical audit system.

We collected data on age, gender, ASA score, AAA size, previous cerebrovascular disease, peripheral vascular disease, history of renal failure with or without dialysis, history of congestive heart failure, history of chronic obstructive pulmonary disease, history of liver disease, diabetes mellitus, hypertension, history of ischaemic heart disease, mortality at 30 days, 1 year, 3 years and 5 years, and postoperative complications. Only comorbidities present at the time of operation were recorded. Outcomes such as mortality, post-op complications and length of stay were followed up until April 2010.

Descriptive statistics are presented to describe the EVAR experience and ethnicity of the study population compared to the general population of New Zealand.

Separate logistic and linear regression models were used to assess the utility of ASA and Mount Sinai. All means are reported as ± SD (standard deviation). The primary outcome variables are the occurrence of postoperative complications and mortality. As a binary variable, logistic regression was applied. First, univariate analysis was performed to assess the utility of the scoring system as a predictor of the outcome variable. Then, bivariate analyses were performed to assess if inclusion of gender or smoking status improved the predictive model. A similar methodology was followed to assess mortality and post-op complications. Any descriptive statistics reporting mean values are reported ± standard deviation (SD).

Results
Fifty-four patients were included in the study with 10 females and 44 males. This gave an average case load of 5 cases per year but a trend to more cases per year as time passed. Mean follow-up period was 44.9 ± 33.7 months. The mean age was 78.2 ± 6.4 years old and similar for both genders. The mean AAA size was 5.8 ± 0.7 cm.

The study population was wholly comprised of New Zealand-European individuals which reflects the demographic of Otago’s population where 79.6% is New Zealand-European.11

In an attempt to quantify the state of the patients’ health, we assessed the Mount Sinai score and ASA category. The Mount Sinai’s scoring system was based on a Medicare patients dataset comprised of 66,943 cases and uses the risk factors in Table 1.

Each factor was valued from 1 to 7, and the sum of all the factors were correlated with a 30-day postoperative mortality rate determined from the dataset analysis.
Table 1. The score for each risk factor in the scoring system developed by Egorova et al\textsuperscript{12}

<table>
<thead>
<tr>
<th>Factor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal failure with dialysis</td>
<td>7</td>
</tr>
<tr>
<td>Renal failure without dialysis</td>
<td>3</td>
</tr>
<tr>
<td>Clinically significant lower extremity ischaemia</td>
<td>5</td>
</tr>
<tr>
<td>Heart failure</td>
<td>3</td>
</tr>
<tr>
<td>Age of 85 or more</td>
<td>3</td>
</tr>
<tr>
<td>Age of 75 to 84</td>
<td>2</td>
</tr>
<tr>
<td>Age of 70 to 74</td>
<td>1</td>
</tr>
<tr>
<td>Chronic liver disease</td>
<td>3</td>
</tr>
<tr>
<td>Female gender</td>
<td>2</td>
</tr>
<tr>
<td>Neurological disorders</td>
<td>2</td>
</tr>
<tr>
<td>Chronic pulmonary disease</td>
<td>2</td>
</tr>
<tr>
<td>Hospital annual volume in EVAR of less than seven procedures</td>
<td>1</td>
</tr>
<tr>
<td>Surgeon experience of less than three EVAR procedures</td>
<td>1</td>
</tr>
</tbody>
</table>

Our mean Mount Sinai score was 5.57 ± 2.83. The median ASA score of patients at the time of procedure was 3. Other patients’ characteristics obtained were diagnosis of Type 2 diabetes mellitus, hypertension, and IHD; and the rates were 9%, 50% and 44% of the patients respectively.

The overall mortality over the 9 years was 31%. Mortality rates were 1.8% at 30 days, 9% at 1 year, 17% at 3 years and 20% at 5 years. All the deaths were not related to aortic aneurysm, except for the one mortality with mycotic aneurysm at 30 days. The other causes of mortality are shown in Table 2.

The death related to aneurysm surgery was an 87-year-old gentleman whose cause of death was sepsis and multiorgan failure after an EVAR which proceeded to open surgery for an initially unrecognised mycotic aneurysm. This was the only mortality at 30 days.

Table 2. Causes of mortalities

<table>
<thead>
<tr>
<th>Causes</th>
<th>Number of mortalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metastatic cancer</td>
<td>5</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>4</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>3</td>
</tr>
<tr>
<td>End stage renal failure</td>
<td>2</td>
</tr>
<tr>
<td>Exacerbation of COPD\textsuperscript{†}</td>
<td>2</td>
</tr>
<tr>
<td>Mycotic aneurysm</td>
<td>1</td>
</tr>
</tbody>
</table>

\textsuperscript{†}COPD: Chronic Obstructive Pulmonary Disease.

Twenty-one patients had complications postoperatively and 1 had complications intraoperatively requiring laparotomy. The postoperative complications and managements are shown in Table 3.
Table 3. Postoperative complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Number</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endoleak Type 1b</td>
<td>3</td>
<td>2 conservative and 1 graft extension</td>
</tr>
<tr>
<td>Endoleak Type 2</td>
<td>5</td>
<td>3 conservative and 2 by embolisation</td>
</tr>
<tr>
<td>Endoleak Type 4</td>
<td>1</td>
<td>Conservative</td>
</tr>
<tr>
<td>Pseudoaneurysm</td>
<td>1</td>
<td>Thrombin injection</td>
</tr>
<tr>
<td>Groin haematoma</td>
<td>8</td>
<td>Conservative</td>
</tr>
<tr>
<td>Groin seroma</td>
<td>2</td>
<td>Conservative</td>
</tr>
<tr>
<td>Atelectasis</td>
<td>1</td>
<td>Medical</td>
</tr>
<tr>
<td>Exacerbation of COPD</td>
<td>1</td>
<td>Medical</td>
</tr>
</tbody>
</table>

The patient with the intraoperative complication had an aortic tear from the moulding balloon which required open laparotomy to oversew the perforation. Later, on CT he was also noted to have a left common iliac pseudoaneurysm which was treated using endoluminal stents placed in the common iliac artery together with embolisation of the internal iliac artery. Follow-up scans later revealed endoleak type 2 which was treated by embolisation.

Predictors of postoperative complications—The mean Mount Sinai score and ASA score of patients with postoperative complications compared to those with no complications as well as the p-value of the differences are summarised in Table 4.

Table 4. Mean score of patients with postoperative complications and those without

<table>
<thead>
<tr>
<th>Patients</th>
<th>MSS</th>
<th>ASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>With complication</td>
<td>5.91 ± 2.6</td>
<td>2.59 ± 0.59</td>
</tr>
<tr>
<td>Without complication</td>
<td>5.34 ± 3.0</td>
<td>2.59 ± 0.50</td>
</tr>
<tr>
<td>P-value†</td>
<td>0.469</td>
<td>0.984</td>
</tr>
<tr>
<td>P-value‡ with gender included</td>
<td>§</td>
<td>0.718</td>
</tr>
<tr>
<td>P-value‡ with smoking status included</td>
<td>0.115</td>
<td>0.146</td>
</tr>
</tbody>
</table>

† Using univariate logistic regression, ‡ Using bivariate logistic regression, § Already included in scoring system.
GAS, MSS, Mount Sinai Score; ASA, American Society of Anesthesiologists physical status classification (ASA) System.

The result showed that the difference in the mean Mount Sinai score and ASA between patients with complications and those without complications were not statistically significant. The inclusion of gender in ASA did not alter the result. Similarly, the inclusion of ‘ever smoked’ status in Mount Sinai score and ASA did not make them better predictors.

Predictors of mortality—During the follow-up period of the study, a total of 17 patients died. The mean for Mount Sinai score and ASA score of patients who died compared to those who survived as well as the p-value of the difference are summarised in Table 5.
Table 5. Mean score of patients with postoperative complications and those without

<table>
<thead>
<tr>
<th>Patients</th>
<th>MSS</th>
<th>ASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deceased</td>
<td>6.94 ± 3.46</td>
<td>2.65 ± 0.49</td>
</tr>
<tr>
<td>Survived</td>
<td>4.95 ± 2.29</td>
<td>2.57 ± 0.55</td>
</tr>
<tr>
<td>P-value†</td>
<td>0.022</td>
<td>0.608</td>
</tr>
</tbody>
</table>

† Using univariate logistic regression MSS, Mount Sinai Score; ASA, American Society of Anesthesiologists physical status classification (ASA) System.

Results in Table 5 indicate that the Mount Sinai scoring system was a statistically significant predictor for survival, whereas the ASA was not.

Bivariate and multivariate regressions were carried out and the outcomes of these analyses are as follows. A bivariate regression of smoking status with Mount Sinai score as shown in Table 6 showed that it was a stronger predictor of long-term mortality than itself.

Table 6. Bivariate analysis of the scoring systems with smoking status

<table>
<thead>
<tr>
<th>Scoring system</th>
<th>Smoking status ASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-value for MSS</td>
<td>0.138</td>
</tr>
<tr>
<td>P-value for ASA</td>
<td>0.025</td>
</tr>
</tbody>
</table>

MSS: Mount Sinai Score.

A summary of multivariate regression of mortality for each scoring system with gender and smoking status is shown in Table 7. These results indicate that smoking status was a statistically significant predictor of mortality and that neither the scoring system nor gender were significant predictors in this study.

Table 7. Multivariate analysis of mortality by scoring systems, ever smoked status and gender

<table>
<thead>
<tr>
<th>Patients</th>
<th>Scoring system</th>
<th>Smoking status</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-value for MSS</td>
<td>0.105</td>
<td>0.033</td>
<td>0.516</td>
</tr>
<tr>
<td>P-value for ASA</td>
<td>0.437</td>
<td>0.026</td>
<td>0.706</td>
</tr>
</tbody>
</table>

GAS: Glasgow Aneurysm Score; MSS: Mount Sinai Score; ASA: American Society of Anesthesiologists’ physical status classification (ASA) system.

Smoking as a predictor of mortality—Among patients who ever smoked, 50% (n=8) died, compared to only 11.1% (n=2) of non-smokers. Univariate regression with mortality indicates this is a significant difference (p=0.021). Inclusion of age (p=0.698) or gender (p=0.868) did not improve this model or change the results. A survival curve illustrating the differences between the smoking and non-smoking groups is shown in Figure 1 below.
Discussion

The overall mortality at 30 days was 1.8%. This is comparable to the overall mortality rate at 30 days of large randomised studies which ranges 1.2–2.1%. The overall endoleak rate was 16% with endoleak type II being the most common. This is similar to reports in other studies. Given that the whole study population was New Zealand European, the baseline characteristics are expected to be similar to European studies. As suggested in a couple of studies, the EVAR outcomes can differ between different groups of ethnicity partially due to anatomical variation.

In light of this, we cannot be certain if the EVAR experience in Dunedin can be generalised to the whole population of New Zealand, which is not only made up by New Zealand European (67.6%), but by Māori (14.6%), Asian (9.2%) and Pacific peoples (6.9%). Future studies in a more heterogeneous region of population are needed.

With regards to predicting the significant 31% long-term mortality in this elderly group of patients, analysis showed that the difference between the mean Mount Sinai score among deceased patients over a mean follow-up of 44.9 months, and those who survived was statistically significant. This was suggestive that a higher Mount Sinai score correlated with increased mortality risk both in the immediate 30 days post-
operation as well as in the long term. This is expected as higher Mount Sinai scores indicates more extensive comorbidities a patient has and therefore decreased survival rate.

On the impact of smoking status, it was found that smoking was a statistically significant predictor of mortality and it is suggested that smoking status be added to long-term risk predicting models.

Our analysis was quite limited to comparing patients who have smoked to non-smokers and admittedly, there are varying levels of smoking exposure within the ‘ever smoked’ group. A more detailed study which incorporates pack-year data is needed to ascertain if the worse prognosis is true for all level of exposure.

The study result showed that those who have smoked fared worse than non-smokers. When compared to the natural history of non-operative management of abdominal aortic aneurysm survival curve, it showed that the ‘ever smoked’ group did gain survival benefit from EVAR. However, our study population is small in comparison to the population size of this natural history study which comprises of 198 patients. Also, the mean AAA size for the latter was 6.5 cm in comparison to our study mean of 5.8cm. Due to these factors, the difference seen in the survival curves below may be overestimated.

Figure 2. Survival curves of patients treated with EVAR who smoked and never smoked with natural survival curve of patients with AAA treated conservatively.
Conclusion

This study showed that the EVAR experience in Dunedin Public Hospital is comparable to other centres and further reinforced that the overall mortality at 30 days is very low with the EVAR procedure. However, larger studies in more heterogeneous regions are needed before the experience can be generalised to the whole New Zealand population.

This study also suggested that the Mount Sinai scoring system is applicable to the New Zealand-European population in predicting 30-day mortality as well as long-term mortality. Smoking status was a strong negative predictor for long-term mortality and should be considered preoperatively.

Competing interest: None

Author information: Nur A B Haji Mohd Yasin, Resident Medical Officer, Vascular Department, Dunedin Hospital, Dunedin; Ian A Thomson, Consultant, Vascular Department, Dunedin Hospital, Dunedin; Sophia Leon de la Barra, Statistician and Research Fellow, Preventive and Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin

Acknowledgement: We thank Dr Neil Morrison who has played a significant part in the endovascular aortic repair experience at Dunedin Hospital.

Correspondence: Nur Azri Bin Haji Mohd Yasin, RMO Office, Dunedin Hospital, Private Bag 1921, Dunedin 9054, New Zealand. Fax: +64 (0)3 4747025; email: azrivasin@gmail.com

References:


Index cholecystectomy: a continuing challenge for a provincial hospital

Magdalena M Sakowska, James McKay, Sarah Lake, Alf Deacon

Abstract

Aims To review the management of acute gallstone disease at a provincial New Zealand centre and compare to current national/international practice.

Methods All patients presenting to Nelson Hospital with acute gallstone-related pathology were identified from the study period. The first presentation within the audit period was defined as the index admission. Length of stay and interventions were recorded. Waiting lists were compared.

Results Between January 2004 to December 2010, 390 patients were admitted with acute gallstone-related pathology to Nelson Hospital. The index cholecystectomy rate was 17% (57/329) after exclusion of 61 ineligible patients; 158/329 patients subsequently underwent elective cholecystectomy, with patients waiting a median time of 97 days (range 7–1922). There were 132 Emergency Department visits (median one (range 0–8)), and 59 readmissions with acute gallstone-related pathology for those waiting for cholecystectomy. Of the 37 admitted with gallstone pancreatitis, 11 underwent cholecystectomy within 2 weeks of index admission. Waiting lists remained unchanged over time.

Conclusions Nelson Hospital has a low rate of index cholecystectomy. High numbers of patients represent to the emergency department or are readmitted whilst waiting for definitive surgery. Patients presenting with gallstone pancreatitis fail to receive treatment in accordance with international management guidelines.

Current best practice for acute gallstone disease is cholecystectomy at index admission.\(^1,2\) Delaying surgery results in recurrent episodes of pain or gallstone-related pathology, with up to 42% of untreated patients re-attending Emergency Departments (ED) and 70% returning for further inpatient management.\(^3\)

Current guidelines recommend that those presenting with mild acute biliary pancreatitis, should undergo cholecystectomy within 2 weeks if not at index admission.\(^4-6\) due to the risk of a subsequent episode of acute biliary pancreatitis which may be severe, life-threatening or even fatal.\(^7\)

Delaying surgery has no advantage as there is no difference in overall complications for early versus delayed laparoscopic cholecystectomy including conversion rates to open procedures, rates of bile duct injury and perioperative mortality.\(^1,2\) Furthermore, in those with calculus cholecystitis where symptoms fail to resolve with initial nonoperative treatment, conversion rates approach 45%.\(^2\) Thus failure of nonoperative treatment or delaying surgical treatment at index admission results in longer hospital stays and greater overall costs without added value care for the patient.\(^1\)
Since studies have alleviated some fears about increased morbidity with index laparoscopic cholecystectomy for acute gallstone disease, the barriers that remain to prompt surgical treatment must now be the lack of resources and/or infrastructure within public health institutions. The purpose of this paper was to review the management of acute gallstone disease management at Nelson Hospital over a 7-year period and compare to current national practice.

**Methods**

All patients presenting to Nelson Hospital with acute gallstone-related pathology were identified from the Nelson Hospital audit database by International Classification of Diseases – 10th revision (ICD-10) from January 2004 to December 2010. Gallstone-related disease was defined by ICD-10 codes as follows: cholelithiasis (k80x: which included choledocholithiasis with/without cholangitis), cholecystitis (k81x), and acute biliary pancreatitis (k85.1).

A free-text search of audit data (filled out by clinicians) was also used in case of incorrect coding using keywords gallst*, chole*, common duct and pancr*. Where data were missing or ambiguous, individual notes were recalled and systematically analysed.

Basic demographic data were collated as was length of stay. All gallstone-related admissions, ED visits, outpatient visits, subsequent admissions and interventions were recorded. The first presentation within the audit period was defined as the index admission. Thus, cholecystectomy performed during the index admission was classified as index cholecystectomy.

Admissions, ED visits, and outpatient visits, after the index presentation were classified as subsequent events. Follow up data were collected up until and including December 2010. Waiting lists were reviewed over the same time frame and shown as the number of patients awaiting cholecystectomy for gallstone-related pathology at the end of each calendar month.

Nominal data are presented with percentages in parentheses (where the denominator is ≥50) and analysed. Continuous data is presented as median (range).

Ethical approval was not required as this study met the definition of an audit and quality assurance-related activity as detailed by the New Zealand National Ethics Advisory Committee guidelines.

**Results**

Between January 2004 and December 2010, 390 patients were admitted with acute gallstone-related pathology to Nelson Hospital (total of 465 admissions). The median age of these patients was 62 (range 14–94), 217 (56%) of these patients were female. Sixty-one patients were not included in the analysis due to pregnancy (n=1), frailty/not fit (n=23), had opted for private treatment (n=18), were tourists and preferred treatment at their home centre (n=7) or declined for other reasons (n=12). Fifty-seven of 329 (17%) patients underwent cholecystectomy at index admission. Eight (14%) underwent an open cholecystectomy and 6/49 were converted from laparoscopic to open. The remainder were treated nonoperatively with a combination of antibiotics, gut rest and intravenous fluids. The median hospital stay for those undergoing index cholecystectomy was 5 days (range 0–41).

Figure 1 shows the number of index cholecystectomies performed per year.
Those who did not undergo index cholecystectomy (272/329, 83%) were either waitlisted for elective cholecystectomy or for further review as an outpatient. Of these, 158 subsequently underwent elective cholecystectomy waiting a median time of 97 days (range 7–1922) with 12 (8%) outliers waiting more than 1 year. Figure 2 shows the number of patients waiting for elective cholecystectomy at the end of each calendar month. No trends were detected.
Figure 2. Number of patients waiting for elective cholecystectomy at the end of each calendar month

During subsequent follow up of the 272 patients who did not undergo index cholecystectomy, there were a total of 132 ED visits (median ED visits 1 [range 0–8]), and 59 readmissions with acute gallstone-related pathology. Those who re-presented acutely, 11 (19%) underwent subsequent cholecystectomy on that acute admission.

There were 37 patients admitted with mild biliary pancreatitis. These 37 patients accounted for a total of 74 admissions during the study period with gallstone-related pathology. Eleven of 37 underwent cholecystectomy within 2 weeks of index admission.

Discussion

The index cholecystectomy rate at Nelson Hospital (17%) remains low when compared to the current practice seen at tertiary centres such as Christchurch (78%), Auckland (66%) and Middlemore (67%) Hospitals.

The lack of acute surgical facilities at this secondary centre contributes to this shortfall. Nelson Hospital has no dedicated acute surgical theatre; any acute operating is negotiated with other specialties, slotted in between elective lists, onto occasional extras lists or at the end of elective lists that have finished early.

If an acute patient is unwell enough to warrant an urgent operation, elective lists are cancelled. After hours operating time is available but this is not an ideal time to be performing acute cholecystectomy which may additionally require an intraoperative.
cholangiogram. Secondly, low numbers of acute admissions, when compared to tertiary centres, mean that at this hospital, the acute general surgeon on call will, realistically, continue to have clinics, endoscopy lists and even elective lists scheduled concurrently either in public or private. These in turn would need to be cancelled in order to offer an acute cholecystectomy service whether the consultant surgeon is required to perform or supervise the operation. Lastly, there is no in-house endoscopic retrograde cholangiopancreatography (ERCP) service.

All patients requiring common duct clearance with ERCP need to be triaged and transported to a tertiary centre for a next available list which may be up to 2 weeks away for non-urgent patients. By the time this occurs, the patient may no longer be an inpatient, or the window of operating opportunity (within 72 hours of onset of symptoms especially for cholecystitis) elapses and patients are subsequently waitlisted for elective cholecystectomy once their inflammation has settled.

Taking all this into consideration, patients who are not definitively treated with cholecystectomy, as seen in this study and by others, will represent with recurrent symptoms and this will ultimately contribute to their unnecessary suffering, affect their potential contribution to society be that financial or other, and be an additional financial burden on the health institution.

It may be unrealistic to offer an acute cholecystectomy service at a hospital to size of Nelson. A more practical solution could be one where patients are given a definitive date for surgery, for example, 6 weeks after the onset of acute symptoms.

Surgery within 72 hours from onset of symptoms is safe as the oedema facilitates dissection, beyond this time, maturation of inflammatory tissues increases risk of bile duct injury and rates of conversion to open procedures. By 6 weeks, the inflammation is settled bringing these risks back to a safe baseline.

If patients are waiting a median of 80 days to undergo elective cholecystectomy, this increases the likelihood of a second attack, further delaying definitive treatment. For those with mild biliary pancreatitis, a date should be secured within 2 weeks of presentation as stipulated by current international guidelines. Another solution could entail a dedicated weekly list for acute cholecystectomy, accepting a slightly longer waiting time until surgery but facilitated by a surgeon with upper gastrointestinal subspecialty training.

Given the relative inaccessibility of ERCPs at this centre, surgical common duct exploration could be undertaken by that specialist as this has been shown in a meta-analysis to be an equivalent treatment to ERCP in terms of duct clearance, mortality and overall morbidity for those with choledocholithiasis at time of intraoperative cholangiogram. Any such change needs to be driven by clinicians.

Unlike data published from Christchurch Hospital, no effect on waiting lists can be seen at Nelson Hospital. A clinician driven change towards index cholecystectomy at Christchurch Hospital is thought to have prevented waiting lists from ballooning out to numbers seen pre-waiting list cuts. Any effect on waiting lists at Nelson is likely to be difficult to detect given the low numbers of acute presentations seen (10-fold less than at Christchurch Hospital) and the seasonal effects on the population.
Overall, when compared to tertiary centres, different constraints exist at this provincial hospital contributing to the low index cholecystectomy rate. Representation rates are unacceptably high particularly for those presenting with gallstone pancreatitis as they fail to receive treatment in accordance with international management guidelines.

If at all possible, patients should be advocated for by the attending surgeon to undergo acute cholecystectomy and Nelson Hospital needs to urgently review the provision of an in-hours acute theatre to facilitate this. Other potential solutions include assuring elective surgical treatment within the minimum safe operating time frame.

Competing interests: Nil.

Author information: Magdalena M Sakowska, General Surgical Registrar, Department of General and Vascular Surgery; James McKay, House Surgeon, Department of General and Vascular Surgery; Sarah Lake, Clinical Audit; Alf Deacon, Consultant General Surgeon, Department of General and Vascular Surgery; Nelson Hospital, Nelson/Marlborough District Health Board, Nelson

Correspondence: Dr Magda Sakowska, General Surgical Trainee, Department of General & Vascular Surgery, Palmerston North Hospital, 50 Ruahine Street, Private Bag 11036, Palmerston North 4442, New Zealand. Email: magda.sakowska@xtra.co.nz

References:

Outcomes of open carpal tunnel decompression

Nikhil Nanavati, Karen Walker-Bone, Helen Stanworth, Christopher Williams

Abstract

Background Carpal tunnel syndrome (CTS) is the commonest peripheral neuropathy in the UK. The aim of this study was to characterise the satisfaction and evaluate the symptoms of postoperative patients having undergone open carpal tunnel decompression.

Method A questionnaire comprising of 6 sections was sent to 241 eligible participants. Subjects were asked to provide their demographic information and to quantify preoperative and postoperative numbness and tingling. The target population was also asked to indicate areas of postoperative numbness and tingling on a Katz hand diagram. Symptom severity and quality of life scores were also assessed.

Results This study received 89 usable responses. From analysis of the Katz hand diagrams it was possible to distinguish that 17 subjects (19.1%) had ‘persistent’ symptoms following carpal tunnel decompression and 72 subjects (80.9%) showed signs of symptomatic improvement. The 17 individuals with persistent symptoms were further assessed for significance between variables. Of these, most were of older age, mainly female, unemployed, with lower mental health and vitality scores. With significance testing, it was shown that lower mental health scores may contribute to a poorer response to surgery (p=0.096).

Conclusion Most subjects experienced a positive response to surgical intervention, however, it may be necessary to screen patients for signs of depression before undertaking any surgery. By taking a more holistic preoperative assessment and aiding patients to seek treatment for any mental health conditions, this study postulates that outcomes of open carpal decompression could be improved.

Carpal tunnel syndrome (CTS) is a peripheral mononeuropathy due to compression of the median nerve below the carpal ligament. This results in symptoms of pain, paraesthesia and hypoaesthesia in the median nerve distribution of the hand. Most patients complain of paraesthesia of the thumb, index finger, middle finger and radial half of the ring finger. The palm is usually not affected.

The pathophysiology of CTS relates to increased tissue pressure within the limited space of the carpal tunnel. Any form of tissue expansion, tendon swelling or synovial inflammation can result in median nerve compression. Intermittent or sustained high tissue pressures within the tunnel have been found to impair microvascular circulation in the median nerve and lead to random initiation of action potentials, local demyelination and axonal loss.1

In European studies, the prevalence of CTS in the general population was estimated at 3%.2 It is approximately three times more common in women than men, with the prevalence being greater in patients over 55 years of age and obese subjects.3 There is a significant financial impact associated with CTS. In 2005/2006 an estimated 3.7
million UK working days were lost due to musculoskeletal disorders affecting the upper limbs or neck. Depending on the position and activity of the body, the upper limbs are subject to repetitive stresses such as those involved in keyboard entry or mouse use. The cumulative effect of these stresses is a significant burden on health and social costs.

Along with the increasing carpal tunnel decompression rates, this syndrome poses a significant burden on health and social costs. Treatment of CTS includes both conservative and surgical options. The American Academy of Neurology recommends splinting, activity modification, non-steroidal anti-inflammatory drugs (NSAIDs), diuretics if oedema exists and local steroideal injection as conservative forms of treatment. However, a recent Cochrane Review found the initial response rate to a single steroid injection to be incredibly varied, with one paper finding symptom recurrence occurred in 8–100% of subjects.

Surgical management should be offered to patients that are either unresponsive to conservative and/or steroideal treatment or patients with progressive motor deficit (with or without fixed sensory loss). Carpal tunnel decompression is considered to be the definitive treatment for CTS and can be performed by two separate techniques. Open carpal tunnel release (OCTR) traditionally involves performing a long palmar curvilinear incision, allowing for division of transverse carpal ligament, along with the overlying structures from the skin to median nerve. This procedure is usually performed under local anaesthetic as a day case.

Endoscopic carpal tunnel release (ECTR), performed via a single-portal or two-portal technique, allows for division of the transverse carpal ligament from within the carpal tunnel, leaving the overlying structures intact. By preserving these structures, postoperative morbidity may be decreased, allowing for more rapid recovery and return to work. Studies have demonstrated the long-term outcomes of both techniques not significantly dissimilar, with the possible advantage of earlier recovery following ECTR only limited to a few days.

Following surgical decompression, recurrence of CTS is rare; however it may be more common following ECTR. Several main reasons associated with recurrence of CTS have been identified (Box 1). The complication and failure rate of surgical decompression has been estimated at 0% to 19% (during a follow-up period of around 12 months of ‘open’ surgery) with up to 12% requiring re-exploration of open tunnel release.

**Box 1. Main reasons for recurrence of CTS**

1. **Misdiagnosis**: symptoms may be due to another cause
2. **Surgical error**: commonest error is failure to fully divide the transverse carpal ligament
3. **Delay of treatment**: beyond the point when the median nerve function is recoverable
4. **Surgical complication**: inadvertent nerve/vessel lacerations, infections, painful scarring and complex regional pain syndrome
Several outcome measures have been used to measure the effectiveness of treatment, with the most commonly used being self-reported symptom questionnaires, hand diagrams, records of daily activities and quality of life assessments.

The objectives of this study were to evaluate the symptoms and categorise the satisfaction of patients who had recently undergone OCTR in the Brighton/Sussex University Hospital Trust.

Methods

Study design—This was a retrospective study of outcomes following open carpal tunnel decompression. Patients were eligible for inclusion in this study if they had undergone CTS surgery (unilateral or bilateral) in the study period 1/1/2007 to 31/12/2007. All subjects were identified from the hospital database and sent an anonymous questionnaire and covering letter explaining the nature and purpose of the study. No patients were sent a reminder.

Questionnaire—The questionnaire was a 10 A4 page document, consisting of 6 sections and took roughly 5–10 minutes to complete. Section 1 enquired about demographics; including age, weight, smoking status, alcohol consumption and employment status. Section 2 assessed the essential information about the subject’s surgery for CTS. In case of a confounding effect, information was also collected regarding any other surgical procedures that may have been performed at the same time. The third section established any signs and symptoms of CTS preoperatively and postoperatively. The questions also focussed on the need for further interventions since the operation, effects on employment and activities of daily living. The questions were adapted from a validated questionnaire for epidemiological research into CTS found to be specific for identifying symptoms involving the median nerve. In addition, any patient who reported symptoms of numbness or tingling experienced within the last 7 days were asked to illustrate the location of symptoms on a Katz hand diagram. The questionnaire also enquired about symptoms over a longer duration, allowing for a measure of consistency to determine whether signs and symptoms had been constant or subject to change. This was measured in the form of the ‘symptom severity scale’ - a tool demonstrated to have good reproducibility, consistency and validity in carpal tunnel syndrome. The final section was a measure of quality of life and consisted of two domains of the SF-36 a questionnaire widely used to measure generic quality of life, with questions exploring the subjects mental health status and vitality.

Analysis—All of the data was analysed by use of descriptive statistics and graphs. With regards to the Katz hand diagrams, the data could only differentiate between a positive (shaded) and a negative (not shaded) response. It was then necessary to re-examine the diagrams with positive results to classify the symptoms according to a validated rating system. Each subject’s symptom severity scale was calculated to provide scores, which were then subdivided into quartiles, enabling further comparisons to be made. A cross-section between mental health, vitality and symptom severity scale was also studied.

Results

In total, 241 eligible subjects were identified from the hospital database. Returned questionnaires were received from 103 respondents (response rate 43%). Of these, 14 candidates were deemed ineligible due to inappropriate coding of operations they had received, leaving 89 responses suitable for analysis.

Demographics—The mean age of respondents was 62.44 years with a sex ratio of 1:2.14 (M:F). The mean body mass index (BMI) was 30.50 for females and 33.68 for males. 55.1% of subjects had a positive smoking history. 67.4% of subjects drank alcohol with a mean of 14.29 units consumed per week. 58.4% were currently employed.
Pre and postoperative symptoms—The majority of patients (59.5%) undergoing carpal tunnel decompression experienced numbness and tingling for at least 9 months prior to surgery. Postoperatively, patients reported experienced differing degrees of symptoms. The majority (40.5%, n=36) reported only experiencing symptoms of paraesthesia for less than 7 days directly following their operation. However, 28.1% (n=25) of patients complained of experiencing symptoms for 28 days or more.

Since CTS surgery, 15.7% (n=14) subjects had consulted a doctor about symptoms of numbness and tingling postoperatively, whilst 6.7% indicated they had received physiotherapy or manipulation for postoperative symptoms. One subject reported receiving a steroid injection for symptoms of paraesthesia, whilst one other stated that they underwent a further surgical intervention for their postoperative symptoms.

Postoperative morbidity—Of 32 individuals currently working, only two subjects had taken time off work within the last 12 months, with a further one person indicating they had taken one year off work because of their symptoms of CTS. Four respondents were subjected to enforced changes at work due to their symptoms.

Nine percent of subjects reported experiencing difficulty sleeping due to their symptoms. Activities of daily living, such as shopping, and skills involving manual dexterity were both reported to be “difficult” for 29% (n=26) of subjects with four respondents reporting these tasks as “impossible”.

In the 7 days prior to completing the questionnaire, 30.3% (n=27) of subjects reported having experienced numbness in the fingers or thumbs, lasting for at least 3 minutes. In addition, 15.7% of respondents had experienced some degree of paraesthesia in their hands or arms.

Postoperative symptom severity scale—34.8% of subjects reported a sensation of numbness in their hand since the operation, the majority referring to this sensation as ‘moderate’ in severity. In addition, 33.7% of subjects reported a sensation of “tingling” in the hand since the operation, 83% of these describing the sensation as ‘mild’ or ‘moderate’ in severity. Furthermore, 34.8% of subjects noted they had experienced mild/moderate postoperative nocturnal numbness or tingling.

Quality of life measures—Mental health scores and vitality scores were divided into tertiles whereby the first group had the lowest (best) scores and the third group the highest (worst) scores.

Data showed that the majority of subjects suffering from numbness and tingling for 28 days or more also had the lower mental health (n=18/23) and vitality scores (n=15/22). Subjects that experienced numbness and tingling for less than 7 days had the highest mental and vitality health scores.

Further data analysis—From the Katz hand diagrams, it was possible to determine that 19.1% (n=17) of subjects still had symptoms consistent with CTS following surgical decompression. Through evaluation of these subjects, a set of risk factors attributable to a diagnosis of CTS was established. This also enables one to have a better idea of individuals that would have a more positive response to surgical intervention.
Table 1. Factors associated with differing outcomes of carpal tunnel decompression

<table>
<thead>
<tr>
<th>Factors</th>
<th>Improved symptoms (n=72)</th>
<th>Persistent symptoms (n=17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)</td>
<td>61.42</td>
<td>66.76</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female (%)</td>
<td>67.6</td>
<td>70.59</td>
</tr>
<tr>
<td>Male (%)</td>
<td>32.4</td>
<td>29.41</td>
</tr>
<tr>
<td>Mean BMI (body mass index)</td>
<td>32.19</td>
<td>29.4</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive smoking history (%)</td>
<td>53.52</td>
<td>64.71</td>
</tr>
<tr>
<td>Alcohol intake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean units/week</td>
<td>11.02</td>
<td>7.66</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Currently employed (%)</td>
<td>46.5</td>
<td>17.65</td>
</tr>
<tr>
<td>Tertiles of vitality scores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st tertile (%)</td>
<td>41.94</td>
<td>26.67</td>
</tr>
<tr>
<td>2nd tertile (%)</td>
<td>32.26</td>
<td>20.00</td>
</tr>
<tr>
<td>3rd tertile (%)</td>
<td>25.8</td>
<td>53.33</td>
</tr>
<tr>
<td>Tertiles of mental health scores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st tertile</td>
<td>39.06</td>
<td>6.67</td>
</tr>
<tr>
<td>2nd tertile</td>
<td>26.56</td>
<td>40.00</td>
</tr>
<tr>
<td>3rd tertile</td>
<td>34.38</td>
<td>53.33</td>
</tr>
</tbody>
</table>

Table 1 has been constructed to evaluate the differences between the whole sample, individuals that improved and those with persistent symptoms. This table shows that subjects with persistent symptoms had a higher mean age, were predominantly female, mainly unemployed and had a reduced BMI. It also shows that subjects with persistent symptoms had lower qualities of life scores.

Table 2 was devised to display significance testing (with 95% confidence intervals) carried out between individuals that improved and those with persistent symptoms. No values of significance were recorded, however mental health scores did start to approach values of significance (p=0.096).

Means were tested for normality using a Kolmogorov-Smirnov test. The test of means for the categories ‘BMI’ and ‘Units of alcohol consumed per week’ produced values <0.05 (i.e. negative normality). It was therefore necessary to compare these means using a nonparametric independent sampling technique and in this case, a Mann-Whitney test was used for significance testing.
Table 2. Comparisons between the characteristics of subjects that improved postoperatively and those with persistent symptoms

<table>
<thead>
<tr>
<th>Factors</th>
<th>Improved symptoms (SD)*</th>
<th>Persistent symptoms (SD)*</th>
<th>Significance testing (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)</td>
<td>61.42 (14.39)</td>
<td>66.76 (16.6)</td>
<td>P=0.23</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female (%)</td>
<td>67.6 (n/a)</td>
<td>29.41 (n/a)</td>
<td>P= 0.81</td>
</tr>
<tr>
<td>Male (%)</td>
<td>32.4 (n/a)</td>
<td>70.59 (n/a)</td>
<td></td>
</tr>
<tr>
<td>Mean BMI</td>
<td>32.19 (7.57)</td>
<td>29.4 (4.16)</td>
<td>P=0.9</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive smoking history (%)</td>
<td>53.52 (n/a)</td>
<td>64.71 (n/a)</td>
<td>P=0.4</td>
</tr>
<tr>
<td>Alcohol intake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean units/week</td>
<td>11.02 (18.77)</td>
<td>7.66 (10.60)</td>
<td>P=0.3</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Currently employed (%)</td>
<td>46.5 (n/a)</td>
<td>17.65 (n/a)</td>
<td>P=0.231</td>
</tr>
<tr>
<td>Tertiles of vitality scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st tertile</td>
<td>41.94</td>
<td>26.67</td>
<td>P=0.21</td>
</tr>
<tr>
<td>2nd tertile</td>
<td>32.26</td>
<td>20.00</td>
<td></td>
</tr>
<tr>
<td>3rd tertile</td>
<td>25.8</td>
<td>53.33</td>
<td></td>
</tr>
<tr>
<td>Tertiles of mental health scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st tertile</td>
<td>39.06</td>
<td>6.67</td>
<td>P=0.096</td>
</tr>
<tr>
<td>2nd tertile</td>
<td>26.56</td>
<td>40.00</td>
<td></td>
</tr>
<tr>
<td>3rd tertile</td>
<td>34.38</td>
<td>53.33</td>
<td></td>
</tr>
</tbody>
</table>

*(SD – standard deviation).
* Categorical values analysed by Chi-squared (σ²) at 95% confidence interval.
Continuous variables analysed by student’s t-test at 95% confidence interval.

Discussion

This study investigated postoperative outcomes following open carpal tunnel decompression at Brighton/Sussex University Hospitals Trust. A questionnaire was sent out to a selected population and the data was analysed to assess patient satisfaction, as well as to evaluate postoperative morbidity and recurrence.

The study population supports previous data that CTS predominates in female subjects. The BMI of the female subjects was high, further supporting data regarding risk factors for CTS. In addition, older age, positive smoking history and alcohol consumption, all appear to contribute to an increased likelihood of developing CTS.

Immediately following carpal tunnel decompression, postoperative symptoms appear to vary. The majority of patients only reported experiencing symptoms for less than 7 days following surgery. However, a number of patients did experience symptoms for greater than 28 days, with a proportion of these seeking further medical advice and treatment.

Over one-quarter of the study population still encountered difficulty shopping and performing tasks involving manual dexterity. Rather surprisingly, nearly one third of patients were still experiencing significant episodes of paraesthesia lasting over 3 minutes.
Positive Katz hand diagrams were re-assessed to determine those subjects with “persistent” symptoms (n=17), still showing postoperative indications of CTS, compared to those with “improved” symptoms (n=72). Differences were analysed between the two outcome groups (Table 1). It was found that subjects with persistent symptoms were of a higher mean age, predominately female, had lower BMIs, and lower quality of life scores, than those with improved symptoms.

Significance testing was performed for the two groups to establish any associations between outcomes and variables (Table 2). Although no values of significance were recorded, mental health scores appeared to show evidence of nearing significance (p=0.096).

**Limitations**—The study was hindered by the time restrictions placed on the research, reducing the time available for investigating a larger sample of patients. The relatively small sample size limits the scope of these results. This study attained a response rate of 35% that may account for less reliable results if one were to assume the non-responders have done well.

The bulk of this research is quantitative with a focus on outcomes of open carpal tunnel decompression and is not intended for generalisation and representation of other surgical procedures or surgical patients’ views.

**Implications**—This data supports and supplements evidence for risk factors of CTS. The research gives a better indication of subjects that are more likely to respond to surgical intervention compared to those that may not. A subject’s age, previous smoking status, employment status and quality of life all appear to influence outcomes of surgical intervention.

With significance testing, it was shown that lower mental health scores may contribute to a poorer response to surgery. It may therefore be necessary to screen patients for signs of depression before undertaking any surgery. By taking a more holistic preoperative assessment and aiding patients to seek treatment for any mental health conditions, this study postulates that outcomes of open carpal decompression could be improved.

In addition, subjects that had persistent symptoms may also have been initially misdiagnosed with CTS. There is a need for further evaluation of symptoms before considering surgical intervention and the need for exclusion of differential diagnoses should be emphasised.

Therefore, by performing depression screenings, excluding other causes of symptoms, assessing certain demographics, amalgamated with nerve conduction studies and current guidelines, overall surgical outcomes for patients could potentially be improved. In addition, there may be a place for a ‘wait and see’ approach, allowing for follow-up of patients over a short period, prior to committing to surgical intervention. There is however still a need for further research to be carried out in this field to support and further assess the results acquired in this study.

**Competing interests:** Nil.

**Author information:** Nikhil Nanavati, Core Surgical Trainee, Yorkshire and Humber Deanery, England; Karen Walker-Bone, Honorary Consultant Rheumatologist, Brighton/Sussex University Teaching Hospital, Brighton, England; Helen Stanworth,
Foundation Trainee, Harrogate District Hospital, Harrogate, North Yorkshire, England; Christopher Williams, Consultant Orthopaedic Surgeon, Brighton/Sussex University Teaching Hospital, Brighton, England

Correspondence: Mr Nikhil Nanavati, Ward 27, Bradford Teaching Hospital, Duckworth Lane, Bradford, West Yorkshire, BD9 6RJ, United Kingdom. Email: nikhil101@doctors.org.uk

References:

Flatus is natural and an invariable consequence of digestion, however at times it creates problems of social character due to sound and odour. This problem may be more significant on commercial airplanes where many people are seated in limited space and where changes in volume of intestinal gases, due to altered cabin pressure, increase the amount of potential flatus. Holding back flatus on an airplane may cause significant discomfort and physical symptoms, whereas releasing flatus potentially presents social complications.

To avoid this problem we humbly propose that active charcoal should be embedded in the seat cushion, since this material is able to neutralise the odour. Moreover active charcoal may be used in trousers and blankets to emphasise this effect. Other less practical or politically correct solutions to overcome this problem may be to restrict access of flatus-prone persons from airplanes, by using a methane breath test or to alter the fibre content of airline meals in order to reduce its flatulent potential.

We conclude that the use of active charcoal on airlines may improve flight comfort for all passengers.

The release of intestinal gases (i.e. flatulence) can constitute an embarrassing problem both for the person farting and for persons in the near presence due to sound and odour. Intestinal gas may also cause physical discomfort or even pain for the person farting. When performed in a small closed environment over longer periods of time, e.g. on a spacecraft, it may even in the worst case scenario cause explosion danger. Flatus is gas derived from the intestines expelled by the anus. The average human produces 0.7–1 litres of intestinal gas per day. Flatus primarily consists of nitrogen and CO\textsubscript{2}, however smaller amounts of O\textsubscript{2}, H\textsubscript{2}, CH\textsubscript{4} and other gases are also present. The gas components that are responsible for the unpleasant “classic” odour of flatus are sulphur-containing gases.

Studies have not been able to prove that men produce larger amounts of flatus than women, while in contrast it has been shown that women’s flatulence odour is significantly worse compared to that of men. The average person passes gas about 10 times a day with no difference between men and women, and no difference between younger and older people. Flatulation could pose a significantly larger problem on commercial airplanes than on the ground due to several obvious factors:

- In airplanes many people are seated closely together in a confined small space;
- Commercial airlines have banned smoking on airlines which increases the risk of nasally detecting even small amounts of intestinal gases;
Modern aircraft are built with increasing sound isolation which increases the possibilities of sound detection; and

Approximately 50% of cabin air on airplanes is recirculated which keeps a great deal of the odour inside and adds to distribution of flatulence.\(^7\)

It is plausible that the amount of intestinal gas produced per person is greater at airplane cruising altitude (e.g. 30,000 feet above sea level) compared with ground altitude (Figure 1). This may be surmised from a study of the elementary laws of physics: when increasing in altitude (e.g. being aboard an airplane) the pressure will fall equivalent to the increasing altitude.

**Figure 1. The relationship between volume and air pressure**

<table>
<thead>
<tr>
<th>Volume of gas while in the air</th>
<th>Volume of gas while on the ground</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image1" alt="Image" /></td>
</tr>
<tr>
<td></td>
<td><img src="image2" alt="Image" /></td>
</tr>
</tbody>
</table>

The modern aircrafts are able to counteract this by the use of pressurised-cabins, but these are only able to maintain a pressure no lower than 565 mmHg (equivalent to an altitude of 8000 feet).\(^8\) This fall in pressure in the cabin will, according to the *ideal gas law* (Figure 2), expand the volume proportionally of any existing gas (in this case intestinal gas).

Assuming that the majority of people have a competent ileocecal valve which prevents intestinal gas from passing from the colon back into to the small intestine, this larger amount of intestinal gas will have to be released via the anus into the cabin air. The common problem of odours from such flatus may therefore present a significant problem in an aircraft due to the lower partial pressure within the cabin.

The purpose of this study is to describe the problem of flatulence aboard airplanes and to suggest possible solutions which may minimise the problem.
Figure 2. The ideal gas law

\[ P \times V = n \times R \times T \]

\( P \) = the pressure of the gas, \( V \) = volume of the gas, \( n \) = amount of gas (number of molecules), \( R \) = ideal gas constant, \( T \) = temperature of the gas. A decrease in the pressure of the gas (\( P \)) will according to the ideal gas law produce an increase in the gas volume (\( V \)) in order to fulfil the ideal gas law.

The pressure on ground is 760 mmHg and the pressure in a cabin pressure at cruising altitude is about 565 mmHg (equivalent to 8,000 ft).³

Background

In the literature, there have been several publications over the years postulating the reasons for the production of flatus in humans such as swallowed air, bacterial fragmentation, diffusion of gases from the blood into the intestinal lumen, gastrointestinal secretion and ingestion of certain types of foods.⁹

It is known, that some types of food have greater flatulent potential than others. Studies have shown that food with a high-fibre content produces increased amounts of intestinal gases.¹⁰ A direct relation between the volume of flatus and the volume of beans consumed exists. The gas accountable for increased flatus volume by beans is primarily carbon dioxide.⁹ On the contrary it is known, that flatulence can be reduced by an increasing content of carbohydrate in the diet.²

Phonetically, there are roughly two different kinds of flatulence: “sneaking a fart” which is a silent method where the person in a very controlled manner minimises the amount of intestinal gas passed by the anus per time unit, in contrast to a “loud fart” where a large amount of intestinal gas is passed through anus in a short period of time.

It is known that burning intestinal gas (e.g. use of fire) may reduce the odour however this is not practical or recommended either on land or on an airplane. For patients with a stoma it is well recognised that active charcoal imbedded in the air filter of the stoma pouch can reduce the odour from the stoma.¹¹ In fact some airlines have active charcoal filters installed in the ventilation system.⁷ In that light we suggest a new method to reduce the nuisance and social unpleasantness from the flatulence on airplanes by the use of active charcoal.

Possible strategies to cope with flatulence on an airplane

Holding back—This option is obviously alluring, however it holds significant drawbacks for the individual such as discomfort and even pain, bloating, dyspepsia and pyrosis just to name but a few resulting abdominal symptoms. Moreover problems resulting from the required concentration to maintain such control may even result in subsequent stress symptoms. Furthermore the ability to restrain a fart may be impaired by flatus incontinence or falling asleep on the airplane. Persons susceptible to such flatus incontinence may be especially vulnerable to the effect of air holes, turbulence, coughing and sneezing.
On a more serious note, the physiological responses to distended intestine are elevated blood pressure and pulse, and reduced oxygenation of the blood, which can be serious for people already at risk for cardiovascular complications. Furthermore, flatus retention has been suggested as a major factor in the origin of sigmoid diverticular disease.12

With all these factors in mind, the risks and drawbacks of holding back flatus are obvious and there is actually only one reasonable solution for an individual when experiencing the urge to flatulate on an airplane: just let it go.

Letting go—As described earlier, there are several drawbacks in holding back flatus, but it’s not without its implications to let it go when on an airplane. Obviously proximity to other passengers may cause conflict and stigmatisation of the flatulating individual.

The sound of the fart is unpleasant for the person farting whereas the odour is unpleasant for the co-passengers. Moreover, farting imposes a risk for soiling and may require damage control in the airplane toilet.

Strong odour of flatulence may also impair the level of service from the cabin crew and thereby secondarily impair the QOL (quality of life) while onboard the aircraft. This problem may be even more significant in the cockpit since the pilots may encounter the opposite of a win/win situation.

On one hand, if the pilot restrains a fart, all the drawbacks previously mentioned, including diminished concentration, may affect his abilities to control the airplane. On the other hand, if he lets go of the fart his copilot may be affected by its odour, which again reduces safety onboard the flight.

Assistive technologies

Luckily solutions exist to diminish the drawbacks of letting go the fart. It is known that letting go the fart through a normal seat cushion (as if sitting on a sofa) can absorb up to 50% of the odour thereby reducing the inconvenience. One effective solution would be the use of rubber pants with an attached air container for the collection of the gas, however this seems somewhat extreme.

Active charcoal has the ability to absorb odours from intestinal gases.5 Therefore, airline companies can enhance comfort for passengers on airplanes by installing active charcoal in the passenger seats.

It has been shown, that charcoaled lined cushions effectively limit the escape of sulphur containing gasses (odour) into the environment.5 This would be especially relevant to counteract the impact of air holes and turbulence, where passengers are requested to stay in their seats for safety reasons. However being seated at such times may also be advisable for another reason, since, as described earlier, there is a greater risk of uncontrolled flatulence occurring in these situations. However, such charcoal containing cushions may not be effective in all situations, since the effect of the charcoal cushions requires high fart permeability through the trousers or skirt.

When wearing textiles of low fart permeability (e.g. leather pants), the fart cannot escape through the textiles and a “tunnel effect” will be created, when the fart escapes either by the legs of the trousers or at the waist. This problem may also be relevant in
the more exclusive parts of airplanes (i.e. business class, first class) where seats often are leather covered. In this situation the fart is repelled by the leather cushion inhibiting absorption, thereby creating a less comfortable experience.

Secondly the half-life (T½) of the fart may require significant time in the seat of the flatulent person. This may not be advisable for people with tendency to deep venous thrombosis, who are recommended to stay physically active during flight. Furthermore children are difficult to keep seated for longer periods.

When leaving the seat for stretching exercises (which is recommended on longer flights) the social problems of flatulence are reduced, since the odour is distributed over a larger area. This minimises the risk of locating the responsible farter, however this does not solve the problem of odour in the cabin of the flight. Hence other solutions are required.

Solutions to these problems may be use of charcoal elsewhere apart from the seat cushion. For example implementation of charcoal in socks or blankets may limit the previously described “tunnel effect”.

Implementation of charcoal in underwear may be useful at all times, since this reduces the odour at its source. However the effectiveness of underwear containing active charcoal may be limited when wearing G-strings or when not wearing underwear at all.

Some of these products are already commercially available, but motivation for purchasing such items may be lacking since the harm is primarily done to fellow passengers.

**Alternative solutions**

It has been shown, that methane production in intestinal gas can be detected by methane breath tests and this method may be used to divide airplane passengers into flatulent and non-flatulent flyers. By implementing this technology it would be possible to provide restrictions for flatulent people since they are responsible for obnoxious smells onboard airplanes.

If allowed onto the airplane, these passengers may be restricted to concealed areas, e.g. in the back of the plane near the toilets. In case of overbooking, it would seem sensible to abandon flatulent people for the sake of flight comfort and safety. In line with CO₂ quotas, as the flatulence contains large amounts of CO₂, passengers may be allowed to buy ‘flatus quotas’ to be allowed to produce this gas onboard the airplane, and thus have similar rights as non-flatulent co-passengers.

The fibre contents of a common airline meal are 23% of recommended daily value. This is not very high. However, knowing that high fibre content produces flatulence, the amount of fibre in airline meals could be reduced even further. Furthermore, lactose should be avoided since this substance can create excessive gas production in lactose intolerant people.

Modern planes are becoming increasingly silent. Therefore these odour reducing interventions are only sufficient if, at the same time, one is able to control the production of sound (producing a silent fart). The exercise of the pelvic ring is essential to maintain the ability to fart silently. For people with a weak pelvic floor,
decoys can be performed such as coughing, sneezing, verbal outbreaks or spontaneous applause.

Conclusion

In conclusion, the indoor climate in airplanes may be improved by implementation of active charcoal in airlines seats or even in accessories such as underwear, socks and blankets.

The future frequent flyer may develop the ability to “sneak a fart” by wearing charcoal-lined underwear thus experiencing a comfortable flight in harmony with fellow passengers.

Competing interests: Nil.

Author information: Hans C Pommergaard, PhD Student, Department of Surgery, Herlev Hospital, University of Copenhagen, Herlev, Copenhagen, Denmark; Jakob Burcharth, PhD Student, Department of Surgery, Herlev Hospital, University of Copenhagen, Herlev, Copenhagen, Denmark; Anders Fischer, Consultant Surgeon, Department of Surgery, Herlev Hospital, University of Copenhagen, Herlev, Copenhagen, Denmark; William E G Thomas, Consultant Surgeon, Sheffield Teaching Hospitals NHS Trust, Sheffield, England; Jacob Rosenberg, Professor, Department of Surgery, Herlev Hospital, University of Copenhagen, Herlev, Copenhagen, Denmark

Correspondence: Professor Jacob Rosenberg, Department of Surgery, Herlev Ringvej 75, DK-2730 Herlev, Denmark. Email: jacob.rosenberg@regionh.dk

References:


A rare neoplasm of the thyroid gland
Angela Mweempwa, Jagdish Prasad, Shahidul Islam

Abstract
Burkitt’s lymphoma of the thyroid gland is a rare malignancy. We present a case of a 58-year-old female who developed a rapid enlargement of her thyroid gland. Core biopsy confirmed the diagnosis of Burkitt’s lymphoma. The tumour resolved after three cycles of chemotherapy. This case report emphasises the importance of considering lymphoma when dealing with thyroid nodules and goitres, as its management is different from that of other thyroid pathologies and delaying treatment has an impact on prognosis.

Primary thyroid lymphoma is a rare neoplasm, accounting for 1–5% of all thyroid malignancies. Diffuse large B-cell lymphoma is the most common histological subtype, occurring in up to 70% of all thyroid lymphomas. This is followed by extranodal marginal zone lymphoma of mucosa associated lymphoid tissue. Burkitt’s lymphoma is a less common histologic subtype, constituting 4% of all primary thyroid lymphomas. It is highly aggressive and is the fastest growing tumour. It can grow rapidly and lead to airway compromise and tumour lysis syndrome.

Case report
We report a case of Burkitt’s lymphoma of the thyroid gland. A 58-year-old woman with a background of benign goitre presented with a rapidly enlarging thyroid mass for 2 months that was causing dysphagia and dyspnoea. She denied weight loss, fever and night sweats. Physical examination revealed a multinodular goitre. She did not have any lymphadenopathy, hepatosplenomegaly or abdominal masses.

Initial laboratory parameters are shown in Table 1. Ultrasound showed significant enlargement of the thyroid gland with multiple nodules in both lobes and the isthmus. Neck computed tomography (CT) scan demonstrated a left thyroid mass measuring 7×5×8 cm (Figure 1). Monotonous lymphoid cells suspicious for lymphoma were seen on fine needle aspiration (FNA).

The diagnosis of non-endemic Burkitt’s lymphoma was confirmed with core biopsy and a positive MYC gene rearrangement in 100% of the cells examined. MYC is a transcriptional regulator that has an essential role in cell cycle control. Translocations involving the MYC gene lead to its overexpression and this is a defining feature of Burkitt’s lymphoma. Further workup which included a bone marrow biopsy, cerebrospinal fluid analysis and staging CT scan of the chest, abdomen and pelvis did not reveal involvement of other organs.

She was treated according to the modified Magrath protocol for Burkitt’s lymphoma, low risk disease, which involved having 3 cycles of R-CODOX-M (rituximab, cyclophosphamide, vincristine, doxorubicin, high-dose methotrexate).
A repeat CT scan 4 weeks after completion of treatment has shown complete resolution of the tumour mass (Figure 2).

### Table 1. Abnormal laboratory parameters

<table>
<thead>
<tr>
<th>Variable (units)</th>
<th>Result</th>
<th>Reference range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antithyroglobulin antibodies (IU/mL)</td>
<td>249.3</td>
<td>0–4</td>
</tr>
<tr>
<td>LDH (after core biopsy) (U/L)</td>
<td>445</td>
<td>170–430</td>
</tr>
<tr>
<td>Epstein Barr Virus nuclear antigen</td>
<td>Positive</td>
<td></td>
</tr>
</tbody>
</table>

LDH – lactate dehydrogenase.

**Figure 1. Neck CT showing the left thyroid mass displacing the trachea (arrowed)**

**Figure 2. Neck CT showing resolution of left thyroid mass**
Discussion

Diagnosis and staging of Burkitt’s lymphoma are urgent because treatment needs to be started promptly.\textsuperscript{6} There is a high risk of tumour lysis syndrome and prophylaxis should be started once the diagnosis is confirmed.\textsuperscript{5} Core biopsy is the advised modality for tissue diagnosis as FNA does not provide enough material for histopathology and immunohistochemistry.\textsuperscript{7,8} Staging must include CT scans of the chest, abdomen and pelvis. It is also essential to examine the bone marrow and cerebrospinal fluid for involvement.

In contrast to differentiated thyroid cancer where the mainstay of treatment is surgery, the current approach for lymphoma of the thyroid is to treat in the same manner as lymphoma involving other organs. The primary modality of treatment of lymphoma in the modern era is combination chemotherapy.

As Burkitt’s lymphoma is a rapidly proliferating tumour, treatment requires rapidly cycling and intensive chemotherapy. One of the regimens used is the modified Magrath protocol in which patients are stratified into low and high risk groups, depending on the tumour site and extent, level of LDH and performance status.\textsuperscript{6} Low risk patients receive 3 cycles of CODOX-M (cyclophosphamide, vincristine, doxorubicin, high-dose methotrexate) and high risk patients are treated with 2 alternating cycles of CODOX-M and IVAC (ifosfamide, cytarabine, etoposide, intrathecal methotrexate).\textsuperscript{9,10} Rituximab (monoclonal chimeric antiCD20 antibody) is also added to this regimen.

This case report emphasises the importance of considering lymphoma when dealing with thyroid nodules and goitres, as its management is different from that of other thyroid pathologies and delaying treatment has an impact on prognosis.

Author information: Angela Mweempwa, House Officer, Department of Medicine, Tauranga Hospital; Jagdish Prasad, Consultant Surgeon, Whakatane Hospital, Whakatane; Shahidul Islam, Haematologist, Department of Haematology, Waikato Hospital, Hamilton

Correspondence: Dr Angela Mweempwa, Department of Medicine, Tauranga Hospital, Cameron Rd, Tauranga 3143, New Zealand. Email: angela.mweempwa@bopdhb.govt.nz

References:


Empyema and psoas abscess in a previously undiagnosed diabetic patient

Lisa Liu, Zi Wei Goh, Bronwen Rhodes

Abstract

A 48-year-old man presented with a 2-month history of polyuria, polydypsia, chest pain, fever, cough and extreme weight loss. He was diagnosed with diabetic ketoacidosis and investigations revealed widespread infection with an empyema complicated by bronchopleural fistula, and iliopsoas, suprapubic and periarticular abscesses. *Streptococcus milleri* was cultured from all sites. A multidisciplinary medical and surgical approach was required for treatment. This case highlights the immunosuppression, and life-threatening complications arising from undiagnosed diabetes mellitus.

Diabetes mellitus is a systemic illness known to affect over 200,000 New Zealanders and possibly another 100,000 who are undiagnosed. It is generally accepted that patients with diabetes mellitus are more susceptible to infections, especially by rare organisms or at unusual sites.

We present a case of a patient whose first presentation with diabetes was with diabetic ketoacidosis (DKA) complicated by empyema, iliopsoas, suprapubic and periarticular abscesses.

Case report

A 48-year-old Samoan man presented with polyuria, polydipsia, fevers, productive cough, right-sided chest pain and weight loss of 40 kg over a 2-month period. He was a non-smoker and drank no alcohol. He had no past medical history although he did have a strong family history of diabetes.

Figure 1. CT chest showing bilobed right-sided empyema with gas and collapsed lower lobe
He was found to have DKA with a beta-hydroxybutyrate of 8.82 mmol/L and an HbA1c of 191 mmol/mol. His C-reactive protein was 480 g/L and chest imaging demonstrated pneumonia along with a loculated right effusion. An 18 Fr Seldinger chest tube drained frank pus with a pH 6.58 and a positive culture of *Streptococcus milleri* with mixed anaerobes. On day 3 his chest drain started to bubble and subsequent CT scan (Figure 1) demonstrated a bronchopleural fistula.

He then developed abdominal discomfort, and on day 8 a CT abdomen (Figure 2), and later a MRI abdomen, demonstrated a large right iliopsoas collection connecting to a suprapubic and right periarticular hip collection. Two percutaneous drains were inserted. All drains again cultured *S. milleri*.

**Image 2. CT abdomen showing large right-sided iliopsoas abscess (arrowed)**

A joint operation between the general, orthopaedic and cardiothoracic surgeons was performed on day 24 involving a washout of the right hip periarticular collection and psoas abscess, and a right thoracotomy for repair of the bronchopleural fistula. He made a rapid improvement and was discharged on insulin and ongoing intravenous antibiotics.
Discussion

The incidence of empyema is thought to be increasing although the reason for this is not known. Case series from Japan, Canada and New Zealand demonstrate that *S. milleri* is a common isolate in community-acquired empyema with 12–50% of cases culturing this organism.

Most patients with *S. milleri* empyema have an underlying illness or predisposing factor such as smoking, excessive alcohol intake, chronic obstructive pulmonary disease (COPD), diabetes mellitus or immunosuppression. This patient was immunocompromised secondary to undiagnosed diabetes mellitus.

Bronchopleural fistula (BPF) is relatively rare but is associated with severe or necrotizing pneumonia. It carries high morbidity and mortality. We proceeded to surgery due to an ongoing air leak. Success rate of surgery has been reported between 80 to 95%.

The incidence of psoas abscess is unknown due to its rarity but has been described as 12 cases per 100,000 people with a male predominance. A psoas abscess can occur through haematogenous spread (primary) or through direct contact (secondary) such as from kidney or bowel.

Presenting symptoms are generally non-specific with fevers, back/thigh/abdominal or hip pain, groin swelling, vomiting and limited mobility. If there is suspicion, examination should include the psoas sign. This is positive when there is worsening pain on extension and internal rotation of the hip, or pain with hip flexion on the affected side. The psoas sign was absent in this case which made diagnosis more difficult.

Due to nonspecific symptoms, the diagnosis of psoas abscess is often delayed and this may contribute to the documented high mortality. In one study the length of time to diagnosis was 6–34 days.

This case illustrates the need for a multidisciplinary approach and involved input from physicians, radiologists, general, cardiothoracic and orthopaedic surgeons. Undiagnosed diabetes can be life-threatening through both DKA and the risk of severe infection.

Author information: Lisa Liu, House Officer; Zi Wei Goh, House Officer; Bronwen Rhodes, Respiratory Physician; Christchurch Hospital, Christchurch

Acknowledgements: We thank the departments of general medicine, cardiothoracic, general surgery, orthopaedics, diabetes and radiology for their involvement in this patient’s care.

Correspondence: Bronwen Rhodes, Respiratory Department, Christchurch Hospital, PO Box 4710, Christchurch 8001. Fax: +64 (0)3 3640914; email: Bronwen.rhodes@cdhb.govt.nz

References:


Reflex anoxic seizures in a toddler

Tilak de Almeida, Victoria Pennock, Jonathan R Skinner

Abstract

We report a toddler with frequent pallid type breath-holding or reflex anoxic seizure episodes successfully treated with pacemaker implantation. A rhythm strip (from an ambulatory ECG monitor that shows an 18-second period of asystole) is shown.

A 10-month-old girl, with normal neurological development following an uneventful perinatal period, presented to our Emergency Department with a 2-month history of syncope and seizures. They were occurring up to several times a day. Most episodes were precipitated by crying while others were caused by a sudden startle without crying; some were associated with breath-holding.

Over the next few months it became clear that most of the spells occur following a sudden startle without a tantrum or crying. Most episodes were associated with loss of consciousness and arcing of the back. Post event she was unsteady and would sleep for about an hour.

Her inter-episode ECG, EEG and iron profile were all normal. At age 14 months, one such episode was captured on a Holter monitor, as shown below.
The ambulatory ECG rhythm strip shows an 18-second period of asystole. The arrow indicates activation of the monitor by the child’s mother during an episode.

These episodes are pallid-type breath-holding episodes or reflex anoxic seizures. Pallid-type breath-holding spells are a form of cardioinhibitory neurocardiogenic syncope. It is a parasympathetically mediated event causing asystole in response to a sudden startle. During this self-reverting transient asystole, the infant goes pale, loses consciousness and may have a seizure.

The other common type is the cyanotic type of breath-holding, where the infant cries and holds their breath in expiratory apnoea resulting in cyanosis and loss of consciousness. Breath-holding spells have been reported to occur in up to 4% of children. It is said that 20% of infants experience both types of spells with one type predominating.

In both types, almost all these families require reassurance and avoidance of precipitating situations only, as almost all of these toddlers grow out of these events.

Atropine has been tried as a treatment with limited success, and administration is difficult. Cardiac pacemaker implantation is reserved for the most severe forms.

The episodes were causing immense anxiety to the caregivers of our patient. Atropine sulphate orally was initiated which reduced the frequency of episodes from 10-15 fortnightly to 6-8 per fortnight.

At specialist cardiology consultation, pacemaker implantation was recommended, and whilst the caregivers considered this option an oral beta-blocker was tried without success.

Atropine has been tried as a treatment with limited success, and administration is difficult. Cardiac pacemaker implantation is reserved for the most severe forms.

The episodes were causing immense anxiety to the caregivers of our patient. Atropine sulphate orally was initiated which reduced the frequency of episodes from 10-15 fortnightly to 6-8 per fortnight.

At specialist cardiology consultation, pacemaker implantation was recommended, and whilst the caregivers considered this option an oral beta-blocker was tried without success.

As the episodes continued on an almost daily basis, the family elected for pacemaker implantation. A dual-chamber epicardial pacemaker with rate drop detection was implanted at the tertiary hospital cardiology unit. At follow-up the mother reported complete resolution of spells after the pacemaker was implanted. She said that the placement of the pacemaker had “changed all our lives for the better.”

Breath-holding spells are usually innocent disorders that show resolution with time. However, in the isolated severe case unresponsive to medication and associated with seizures and family anxiety, pacemaker intervention should be considered.

Author information: Tilak de Almeida, Senior Medical Officer in Paediatrics, Waikato District Health Board, Hamilton; Victoria Pennock, Paediatric Registrar; Waikato District Health Board, Hamilton. Jonathan R Skinner, Cardiologist, Greenlane Paediatric and Congenital Cardiac Services, Auckland District Health Board, Auckland.

Correspondence: Dr Tilak de Almeida, Department of Paediatrics, Waikato District Health Board, Pembroke Street, Hamilton, New Zealand. Email: tilak.dealmeida@waikatohealth.govt.nz

References:


The important persisting problem of smoking in cars with children: new data from a multi-year national survey of young people

There appears to be a strong case for legislating for smokefree vehicles with children based on past New Zealand research (as recently reviewed). Since this review, data from a series of five national surveys reiterates the size of the problem, especially for Māori and Pacific young people exposed to smoking in vehicles.

However, some authors (Glover et al.) have suggested action is not necessary because child in-vehicle exposure is “almost snuffed out”. They made this claim on the basis of an observational study of vehicles which found a point prevalence of 2% of adults smoking while children were present.

To further inform considerations of this issue, we analysed unpublished data from the national-level annual ASH survey of New Zealand’s Year-10 students from 2006-2012. In these school-based surveys, 14 and 15 year olds were asked whether, in the past week, others had smoked around them in a car or van. Students who reported exposure on at least 1 day in the past week were classified as exposed to secondhand smoke (SHS).

In each of the past 7 years, well over 20% of participants reported such exposure (Figure 1). For Māori, Pacific and those students from low decile schools, a much higher proportion reported exposure (unpublished data, forthcoming). Although prevalence has been declining, the level of decline has been so slow that a simple linear extrapolation suggests it will be 2028 before it drops below 2% (i.e., beyond the smokefree nation goal of 2025).

To put these percentages into perspective, 22% of the 2012 Year-10 student population equates to around 13,000 adolescents (or 260 50-seat busloads) being exposed to in-vehicle SHS during a typical week. Furthermore, this estimate includes only Year-10 students. The total number would likely approach six figures if data for children aged 0 to 13 years were available. Statistics New Zealand estimates the 0–14 year old population was just over 892,000 as at June 2012, so even if the average exposure levels across the full age range was only half of that reported by Year-10 students there are approximately 100,000 children exposed each week.

Results on frequency of exposure from the in-vehicle exposure ASH survey question fielded in 2011 indicate that exposure to SHS in cars occurs frequently: over 50% of children who had been exposed in the previous week reported being in a smoky vehicle on three or more occasions during the prior week and one in every four stated they were exposed to SHS in vehicles each day.
Figure 1. Proportion of Year-10 students (aged 14–15 years) reporting exposure to in-vehicle secondhand smoke during the prior week (national survey data)*

* Point estimates were adjusted for ethnicity and school-level socioeconomic status. Clustering at the school level had no substantive influence on estimate uncertainty. To our knowledge, vehicle exposure results for these years from the ASH snapshot survey have not been published previously. “Don’t know” responses were treated as missing in this analysis.

The ASH survey measures large, nationally representative cohorts; over 25,000 students respond each year and, apart from a small level of under-response from children attending lower SES schools, the demographic profile of respondents is very close to that of the national Year 10 population. This, in addition to the consistency in exposure prevalence levels obtained over multiple years and reported in comparable surveys, provides some reassurance that the self-reports reasonably reflect actual levels of in-vehicle SHS exposure amongst this population.

So how can survey-based estimates differ so much from the 2% average point-prevalence reported by Glover et al? It comes down to a mix of interpretation, potential for measurement error, and the fact that point-prevalence studies are different from and underestimate cumulative daily or weekly exposure rates.

First, the 2% figure used by Glover et al is the proportion of all cars in which both adult smoking occurred and children were present. Yet a more appropriate measure to describe is the proportion of cars where smoking was observed among cars with children in them. With this denominator, the average point prevalence in Glover et al’s study was five times higher (10% [63/629]). In fact, it reached 22% (58/269) in one of the three areas monitored (Manurewa).

Second, as acknowledged by Glover et al, vehicle observation research has significant measurement limitations; small children can be difficult to see and quick judgements have to be made about ages, among other things. Those limitations are likely to
systematically undercount infants who may be missed, and possibly also older adolescents, who may be more likely to be classified as adults.

Finally, and most importantly, observations of smoking in vehicles greatly underestimate the population prevalence of in-vehicle smoking within the period they cover, because smoking may cease before, or begin after, the observation point in a trip, or may occur on subsequent trips. In that regard, comparing point-in-time observational data with survey reports of past-week experience is like comparing a photo snapshot taken from the roadside to an all-week in-vehicle video. There is no accurate way to establish daily or weekly estimates of proportionate exposure for a given population from hour-long observations without knowing the joint distribution of three things: the percentage of the population travelling at different times, the frequency of travel, and the likelihood of in-vehicle smoke exposure on a given trip. This is why, as Patel et al.\textsuperscript{13} state, “a survey of high school pupils appears to remain the best indicator of child exposure to SHS in a vehicle over a week.”

Furthermore, SHS exposure measurements based on recall of regular exposure over a defined time period have face validity, in that such measures have been used in most epidemiological studies which have explored and demonstrated the adverse health effects of SHS exposure. Nevertheless, observational studies still have a role and can be used to compare point-prevalence in different places at a certain time (as per other NZ work\textsuperscript{13,14}), or the same place over different times for monitoring trends.

In summary, the national survey data presented here and previous New Zealand research indicates that SHS exposure in vehicles remains a serious and very commonly experienced hazard to children in this country. It also is likely to be contributing to health inequalities. As articulated previously,\textsuperscript{1} there is a strong public health case for New Zealand to follow the international trend in legislating against this hazard.

Benjamin Healey
Senior Research Fellow
Department of Marketing, University of Otago
ben.healey@otago.ac.nz

Richard Edwards
Professor
Department of Public Health, University of Otago

Nick Wilson
Associate Professor
Department of Public Health, University of Otago

George Thomson
Associate Professor
Department of Public Health, University of Otago

Janet Hoek
Professor
Department of Marketing, University of Otago
Acknowledgements: The authors thank the students who participated in all of the ASH surveys. The ASH surveys have been funded by the Ministry of Health.

References:
Do all antidepressants cause QT prolongation—how good is the evidence?

Recently Medsafe’s Medicines Adverse Reactions Committee (MARC) published an assessment of QTc prolongation and antidepressants, and concluded that “QT prolongation… is a risk of treatment with most of the antidepressants approved for use in NZ”.

A more detailed set of minutes from this meeting has been also published.

Good quality data to support these conclusions are available for citalopram and escitalopram. For the remaining drugs, data are of poor quality, or have to be inferred from unusual circumstances (e.g. associated with very high blood levels after overdose, which may also involve ingestion of other drugs). Ideally, statements on QTc prolongation would be based on data generated in a Thorough QT study, which is methodologically demanding. Alternatively, large simple trial designs can be used to evaluate cardiac safety of drugs. Inference of QTc prolongation from in vitro HERG binding data may be less than ideal, as some drugs which are potent HERG inhibitors have no clinical cardiac safety signals, or have negative Thorough QT data.

Realistically, the relationship between therapeutic use of most antidepressants and changes in QTc cannot be assessed at this time, and MARC’s statement in Prescriber Update appears to be unnecessarily alarming. If unchallenged, we are concerned that this might unnecessarily influence doctors’ prescribing habits, or dissuade patients from valuable therapeutic options for depression or anxiety.

Paul Glue
Professor and Hazel Buckland Chair in Psychological Medicine

Chris Gale
Senior Lecturer in Psychological Medicine

Dunedin School of Medicine, University of Otago, Dunedin

Competing interests: In the last 3 years, Professor Glue was on the Scientific Advisory Board of Demerx Pharmaceuticals, and attended scientific advisory boards for Janssen. Dr Gale has been on speakers’ bureaux for Lilly and Janssen, and has had travel costs supported by Lilly.

References:


Low yearly completion rate of HDC investigations is a cause for concern

The annual report of the Health and Disability Commissioner (HDC) for the year ended 30 June 2012 showed a continuing low amount of investigations being completed each year, with 44 investigations being completed out of a total of 1380 complaints closed.¹

The reduction of HDC investigations, both in absolute numbers and as a percentage of the total number of complaints closed each year, can be starkly seen by reviewing investigation figures (gained from HDC annual reports) since 2001:

- Year ended 30 June 2001 – 538/1338 (40%)
- Year ended 30 June 2002 – 234/1299 (18%)
- Year ended 30 June 2003 – 345/1338 (26%)
- Year ended 30 June 2004 – 178/1162 (15%)
- Year ended 30 June 2005 – 172/1158 (15%)
- Year ended 30 June 2006 – 116/1110 (10%)
- Year ended 30 June 2007 – 89/1273 (7%)
- Year ended 30 June 2008 – 100/1295 (8%)
- Year ended 30 June 2009 – 112/1378 (8%)
- Year ended 30 June 2010 – 51/1524 (3%)
- Year ended 30 June 2011 – 27/1355 (2%)
- Year ended 30 June 2012 – 44/1380 (3%)

The original provisions of the HDC Act concerning investigations proved to be too inflexible and the first Commissioner, Robyn Stent, left office with more than 600 open files, including more than 400 investigations. The second Commissioner, Ron Paterson, assumed office in March 2000 and spent his first years clearing the backlog of files.²

Amendments made to the Act in 2003 provided HDC with greater flexibility in handling complaints, requiring a preliminary assessment of a complaint follow by a decision to (1) refer the complaint to another agency; (2) refer the complaint to the provider; (3) refer the complaint to an advocate; (4) call a mediation conference; (5) take no action on the complaint; or (6) investigate the complaint.³ These changes lead to an evident decline in formal investigations which has continued over the years.

In the year ended 30 June 2010, Commissioner Paterson’s final year (his last day as Commissioner was 31 March 2010), there was an alarming sharp decline in investigations closed, with 51 investigations completed, a 54% decrease from the previous year. The current Commissioner, Anthony Hill, assumed office in July 2010 and his first year saw a further sharp decline with only 27 investigations being closed, a 47% decrease from the previous year. This year has only seen a very small increase in the number of investigations closed.
In New Zealand’s unique legal environment, a HDC investigation is one of the few opportunities consumers have when things go wrong to have an official and independent finding of accountability in relation to the matter. An investigation normally results in “a formal “opinion”, which includes any attribution of culpability to the provider in the form of a finding of breach of the Code”.

The low amount of investigations being carried out raises concerns that access to HDC investigations has become too restricted. The 2009 HDC satisfaction survey also found that one reason for complainants’ dissatisfaction with the HDC process was being denied an investigation. Indeed, commentators were already calling for the ability of complainants to access HDC investigations in appropriate cases to be strengthened when the latest investigation figure (from the year ending 2009) was 112.

The Commissioner is empowered, following a preliminary assessment, to choose the option that he or she considers will best achieve the aim of facilitating “the fair, simple, speedy, and efficient resolution” of a specific complaint. This will clearly not always be a formal investigation, even in cases of suspected or probable breaches of the Code of Rights.

On a great many occasions, alternative dispute resolutions mechanisms (such as advocacy or mediation) or referring the matter to another agency or to the provider to resolve the matter directly with the complainant will be best suited to achieving this goal. Section 38(1) of the Act also enables the Commissioner to take no action on the complaint if he or she considers action or further action is unnecessary or inappropriate. As HDC has noted, “[i]n practice, before a decision is made to take no further action on a complaint, considerable information is gathered and assessed, and preliminary expert clinical advice may be obtained.”

This process does not require the formalities of an investigation and thus involves less time and cost, which may play a factor in decision making given the financial constraints on the office. However, it also does not result in an official opinion on whether or not there was a breach of the Code of Rights, but rather an ‘education letter’ highlighting any issues and aspects of care needing review. An apology or other follow-up action is also frequently requested.

A formal investigation is often not the most appropriate way to handle a complaint. However, the current amount of investigations being conducted is concerning and requires further examination.

Stuart McLennan
Research Associate
Institute for Biomedical Ethics
University of Basel
Basel, Switzerland
s.mclennan@unibas.ch

References


Maori Nurses

*From Dominion Notes. Published in NZMJ 1912;9(41):83–7.*

The movement to erect a Maori Hospital and Training Home for Maori nurses at Lansdowne, near Masterton, in connection with which Mrs. Tai Te Tau is taking a leading part, is being well supported. About £1100 will be required for the building, and of this amount over £300 has been collected from Maoris who are interested in the project, Mr. Ngata, M.P., having contributed £100.

In addition, Mr. Puhara Te Tau has given two acres of land at Lansdowne for a site for the hospital and Mr. and Mrs. Tai Te Tau and relatives have decided to donate the income from forty acres of their land to the upkeep of the institution. It is hoped to collect a sum of £500 from the Maoris, and this will carry a Government subsidy, which will leave about £100 to be obtained.

It is proposed to ask assistance from the European population in connection with the collecting of this amount (says the Masterton Times). Mrs. Tai Te Tau hopes to have the building erected before the winter.

Maori patients suffering from any kind of ailment or injury will be treated at the institution, and Maori girls will be taught the art of nursing.
Fish consumption, long chain omega 3 fatty acids, and risk of cerebrovascular disease

Evidence from observational and experimental studies on the benefits of fish consumption and long chain omega 3 fatty acids for cerebrovascular disease has been conflicting. This systematic review and meta-analysis has collated evidence from 44 relevant studies.

The conclusion was that higher fish consumption was moderately (12% reduction) but significantly associated with a reduced risk of incident cerebrovascular disease. Dietary, circulating biomarkers and long chain omega 3 fatty acid supplements were not significantly associated with cerebrovascular risk.

BMJ 2012;345:e6698.

Is there a relationship between the use of statins and strength, balance, and falls in older people?

Older adults have increased falls risk because of age-related muscle decline, impaired balance, co-morbidities, medication use and increasing frailty and it has been postulated that statins may exacerbate age-related muscle decline, potentially increasing falls risk. There is conflict in the literature—hence this study.

Five hundred community-dwelling people aged 70–90 years provided information about their medication use and undertook tests of lower limb strength, postural sway, leaning balance (maximal balance range and coordinated stability tests) and functional mobility.

After 12 months follow-up the researchers report that statin use was not associated with muscle weakness, postural sway, reduced mobility or falls. Statin users, however, had poorer leaning balance which may potentially increase fall risk in this group.


Can cardiovascular disease in patients undergoing dialysis be reduced by treatment with cinacalcet?

Disorder of mineral metabolism, including secondary hyperparathyroidism, are thought to contribute to extraskeletal (including vascular) calcification among patients with chronic kidney disease.

This study evaluates the possibility that the calcimimetic agent cinacalcet might reduce the risk of death or nonfatal cardiovascular events in such patients.
The investigators randomly assigned 3883 patients with moderate-to-severe secondary hyperparathyroidism who were undergoing haemodialysis to receive either cinacalcet or placebo.

Disappointingly, the researchers report that cinacalcet did not significantly reduce the risk of death or major cardiovascular events. Those treated with cinacalcet had significantly more hypocalcaemia and gastrointestinal adverse reactions.


Thyroid disease and risk of new onset atrial fibrillation

The association between hyperthyroidism and atrial fibrillation (AF) is well known. This large cohort study from Denmark addresses the incidence of AF in relation to the whole spectrum of thyroid function. It includes data from over 500,000 adults who underwent thyroid function screening over a 10-year period. They report that the incidence rate ratio (IRR) of AF was 1.41 in the patients with overt hyperthyroidism and 1.30 those with subclinical hyperthyroidism. The IRR for the euthyroid patients was 1.00. The rates for subclinical hypothyroidism and overt hypothyroidism were respectively 0.88 and 0.67.

The risk of AF in the overtly hyperthyroid patients was 30% and 23% for the subclinical hyperthyroid patients. Nice to have the well known confirmed by some factual data.

BMJ 2012:345:e7895.
Caleb Lewis Tucker

MBChB (NZ) 1943, FRCS (Eng) 1949, FRACS 1957, MCCM (NZ) 1980, FAFPHM

Caleb Lewis Tucker died on 23 November 2012 at the age of 93 years. He was born in Ashburton on 12 May 1919, the second of four children. He was educated at Ashburton High School and Otago University, and began his medical career as a house surgeon at Palmerston North Hospital (1944–1946). This was a time when infectious diseases such as diphtheria were still common. His success in saving the life of a teenager from this disease was described in the BMJ.\(^1\)

Caleb successfully applied for a surgical course at the Middlesex Hospital in London. He fortuitously secured a place as a ship’s surgeon which enabled him to arrive in time.

He was amused to relate that on the ship his main work was putting temporary fillings into crew members’ teeth, and that the ship drifted for a while when its steering mechanism broke down as they rounded Cape Horn.

In progressing towards his FRCS he worked at St Mary’s Hospital for Women and Children, Plaistow; Middlesex Hospital; Miller General Hospital, Greenwich; Canadian Red Cross Hospital, Taplow; the Derbyshire Royal Infirmary; Lambeth Hospital, London; and Woolwich Memorial Hospital, Shooters Hill.\(^2\) He married Josephine Penn in England in 1951.

Caleb returned to New Zealand where he served as locum surgeon-superintendent at Ashburton Hospital, and then at Oamaru Hospital as a surgeon from 1951–54 and as surgeon-superintendent from 1955–1964. He enjoyed the challenge of a wide variety of surgical procedures, which included treating injuries sustained by workers from the Benmore Hydro Project, and operating on an 80-year old woman with colon cancer whose 100\(^{th}\) birthday party he and his wife later attended.\(^3\)

Caleb worked with colleagues to establish free-of-charge dental services within Oamaru Hospital, a pioneering service model which was adopted elsewhere in New Zealand.

After 13 years in Oamaru, Caleb was appointed as Superintendent-in-Chief of the Wellington Hospital Board where he remained from 1965 until his retirement in 1984. During this time a range of new services and facilities were initiated. These included the extension of chest surgery into cardiac surgery and of acute renal dialysis to chronic dialysis; the expansion of cardiac diagnostic testing and diabetes services; the setting up of an epidemiology unit and a rheumatology unit; the establishment of
gastrointestinal endoscopy and vascular surgery; the development of alcohol and drug addiction services and cytogenetic services; the creation of improved geriatric facilities and an intensive care unit; the setting up of community health centres such as at Waitangirua; the development of special paediatric services at Puketiro; and the building of Kenepuru Hospital, the Wellington Women’s Hospital, a new psychiatric unit at Wellington Hospital, and a new block at Hutt Hospital.

A major development during this period was the establishment of the University of Otago’s Clinical School which enabled medical students to do their fourth and fifth years in Wellington. Caleb always had a caring approach to younger members of the profession, encouraging them in their professional development.

Throughout his life, Caleb’s personal values and his dedication as a health professional were grounded in his Christian faith. In 1971 he founded a local branch of the Christian Medical Fellowship of which he became a long-serving secretary. He had a lifetime interest in supporting health services and colleagues working in the third world.

In his retirement Caleb continued to pursue many of his interests including the challenge of gardening on his Wellington hillside property. Into his last year of life he continued to read medical journals and relevant books which he donated to the library at the medical school in Wellington.

Unfortunately his last years were limited by hearing loss and his last few months by a stroke. His well attended funeral at Wellington’s Central Baptist Church was a celebration of his long and productive life.

We are grateful to Caleb’s family (Josephine, Mark, John and Anne) and to Dr R B W Smith (Wellington) and Dr N A Wilson (Wellington) for this obituary.

Notes:
2. For further details on Caleb’s career at this time and subsequently, see: http://www.ccdhb.org.nz/hhist/staff/TuckerCL_SMO08Reunion.html
Michael David Henry Holdaway

ONZM, FRCP, FRACP; 1932–2012

For a child and their family to be faced with the devastating news that their child has cancer is surely one of the worst possible scenarios imaginable and, 25 years ago, families in the south receiving such news faced a very lonely and traumatic experience. This changed under the caring hands of Associate Professor David Holdaway.

From 1973 until his retirement in 1998 families throughout Otago and Southland had the dedicated service of Assoc Professor Holdaway as their paediatric oncologist. Known affectionately by patients and parents alike as “Prof Holdaway” or simply as “Prof”, he and his team pioneered a treatment programme for cancer children that placed importance on not only medical excellence, but the welfare of both the child and their family. No child or their family were to walk that road alone any more.

Prof Holdaway could see there was a desperate need for additional support for the family as a unit, given its importance in the ongoing wellbeing of the sick child in their journey for wellness. In August 1988, he was instrumental in the setting up of the Otago-Southland Division of the Child Cancer Foundation.

A major fundraising event began leading to a four-unit accommodation facility opened for the use of families outside Dunedin who had children under treatment for childhood illnesses. Such was the regard within the child cancer community for Prof Holdaway, it was unanimously agreed it carry the name “Holdaway House”, a name carried on today at the current CCF administration centre in London St, Dunedin.

Prof was always acutely conscious that many of his families travelled substantial distances for treatment. This meant families were often separated for many weeks or even months, and the extreme and demanding nature of chemotherapy and radiotherapy treatment meant siblings or wider family, and parental employment and family finances often suffered greatly.

Whenever he deemed it was medically safe for a child to travel home and receive some of their treatment near their home, he would go to extraordinary lengths to achieve this. This was particularly appreciated by families, particularly if a child later became palliative.

As soon as possible after diagnoses, Prof would arrange a family meeting, where he would use easily understood analogies to fully inform both parents and siblings. He had the unique ability to make families feel their child was particularly special and precious.

Prof was known to write letters to bereaved siblings to be opened when they reached an age where questions, doubts and fears may need to be addressed, illustrating his caring nature. He always made himself available to these families and worked long
hours, often seven days a week. This meant on many occasions his own family made sacrifices in order for him to dedicate so much time to the care of his young patients.

When Dunedin's Primary Care Child Cancer Service status came under threat during the 1990s Prof Holdaway was a dedicated advocate for the retention of services, and fought long and hard for this. When it became evident, however, that all child cancer primary care would be transferred to Christchurch he was insistent that the additional burdens being placed on both the child and its family, due to the change in locality, were fully addressed.

Prof continued to support the foundation after his retirement in many ways, and during the annual fundraising appeal, he personally manned the hospital site, extracting generous donations from his past colleagues. He was a compassionate, quiet and modest man, who dedicated his life to the welfare and wellbeing of not only children with cancer but many children with other ailments throughout Otago and Southland. Many hundreds of families had their lives touched by this remarkable and kind man.

Born in Marton in 1932, David Holdaway was the youngest of three boys, educated in Marton, attended secondary school at Nelson College and graduated from the University of Otago Medical School in 1957.

He decided at an early age that he wanted to be a doctor. As a young child he spent several years in hospital suffering from Perthes Disease (disease of the hip) followed by a great deal of time in leg callipers. His empathy around illness and its challenges, especially in young children, was evident early in his life.

He attained medical qualifications in both New Zealand and the United Kingdom (working as ship doctor to assist in getting to the UK), along with an impressive history of medical practice overseas, which included Canada, United States and Papua New Guinea. His special interest lay in the fields of infectious diseases and paediatrics.

David Holdaway is survived by his wife Shirley, son Simon, daughters Sarah and Penelope and three grandchildren.

This obituary first appeared in The Southland Times under the heading Prof's kindness touched many. We appreciate the reprint permission.
Simon David Prior

Simon Prior was an archetypical GP who specialised in obstetrics and paediatrics after being born into a Wairarapa medical dynasty.

The miracle of new life never left Dr Prior. He often told friends and colleagues at Masterton Medical Centre: “The day the magic of new life ends is the day I will retire.”

Because of his interest in obstetrics, his Masterton practice remained forever young. He wanted to be the last GP obstetrician left standing in the country.

At the time of his death, he was well poised to achieve this ambition as he was one of about 30 New Zealand GPs still actively involved in delivering babies. Before he was overwhelmed by his brief illness, for 58 years Dr Prior was an active, healthy person.

On the day he was admitted to Wellington Hospital last month, he proudly proclaimed he had never taken a sick day in his life.

He was the flagship member of a family boasting four generations of doctors. His father, Owen Prior, was a Masterton-based doctor, as was his grandfather, Norman Prior. Two of his three children, David and Sarah Prior, are also doctors and complete the fourth generation direct line of doctors for the Prior family.

The family has provided more than 100 years of continuous medical service to the same community. Dr Simon Prior never reached retirement age. He was blown over by an unforeseen cancer which ravaged his body in the last six weeks of his life.

The son of Helen and Owen Prior was brought up in a liberal home in Masterton’s Cole St, where he developed lifelong traits such as a sense of humour, a sharp mind, generosity of spirit, love of music and sport and a hatred of prickly Onehunga turf weeds.

During summer, in his younger days, Dr Prior attacked and eradicated the weeds from his Masterton property using only a putty knife and wearing nothing more than a pair of speedos.

From his boyhood home, he and his friend, Craig Stevens, would cycle to Maxwell’s Garage six days a week to catch the bus to Rathkeale College on the outskirts of Masterton.

At college, Dr Prior excelled as a gifted academic, sportsman and very capable guitar-playing musician before moving to Dunedin to study medicine at Otago University.
During university holidays, he worked as a porter at Masterton Hospital before returning as a house surgeon in 1977-78 and going on to set up a practice as a GP in Perry St.

In Masterton, he delivered babies for 30 years and was many things to many people. He was a much-loved husband, father, son, friend, GP to thousands and general-practice obstetrician to thousands of others.

He was also a teacher, counsellor, bird fancier, keen cook and a lover of small, fluffy dogs. He loved watching top-level cricket at Wellington's Basin Reserve and keeping an eye on major sporting events on television.

At dinner time around the family table there was often a debate about the top-10 greatest bands of all time. For Dr Prior, his top eight—The Beatles, The Rolling Stones, Led Zeppelin, Pink Floyd, Queen, The Doors, The Eagles and Creedence Clearwater Revival—never changed.

There was also a constant procession of trainee interns, medical students and others through his home and surgery, all of whom he had quietly mentored over the years. A reluctant computer user, he regularly worked late at night, typing up his hand-written patient notes. Some days he saw up to 40 people come through his surgery door.

His Salvador Dali sense of humour came to the fore during a trip to Spain. When wife Robyn, the daughter of a Marton pharmacist, entered a restaurant or a room, he would repeatedly leap to his feet and acclaim - "Bravo! My wife!"

Throughout his life he played in bands, including a boyhood band known as The Virgin Would and How's Your Father?, and sang in barbershop quartets, including one with his three children.

When his class of fifth-year Otago medical students split up in 1975, the barbershop quartet of which he was a member performed at the Southern Cross Hotel farewell dinner. The group chose two songs for the big haere ra dinner that were just a little naughty. They performed the outrageously funny and down-to-earth "mud, glorious mud" Hippopotamus Song and Life Presents a Dismal Picture. The latter song is a medical-themed parody on life's fickle nature sung to the tune of Hark, the Herald Angels Sing.

At the funeral service at Rathkeale College in Masterton, a member of this 1975 quartet, Poleon Yee from Wellington, sang a final verse for his old medical-student friend. Dr Prior, a man who retained his sense of humour to the last, would have loved the fact there was a full house of about 800 mourners on hand to enjoy the music and humorous stories at his farewell.

He was a man able to make light of the gravity of his own illness. In a final poignant Christmas message to friends and family written on December 22, this humane man wrote: “I'm good on the meaning of life now.”

Sources: Prior family, Craig Stevens, Tim Baily Gibson, Ian Pike and Poleon Yee.

This obituary was written by Tim Donoghue; it first appeared in The Dominion Post under the heading Popular GP loved life to full. We appreciate the reprint permission.
### 2013 NZMJ Publication Dates and Themes

Themes are also available for viewing in the “How to Contribute” link on the left side of the NZMJ homepage.

<table>
<thead>
<tr>
<th>2013 Publication Dates (NZ Medical Journal)</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>25</td>
</tr>
<tr>
<td>February</td>
<td>15 Surgery</td>
</tr>
<tr>
<td>March</td>
<td>15 Workforce and medical education</td>
</tr>
<tr>
<td>April</td>
<td>19 Infectious diseases</td>
</tr>
<tr>
<td>May</td>
<td>10 Child health</td>
</tr>
<tr>
<td>June</td>
<td>14</td>
</tr>
<tr>
<td>July</td>
<td>12 Respiratory disease</td>
</tr>
<tr>
<td>August</td>
<td>2 Long term effects of trauma</td>
</tr>
<tr>
<td>September</td>
<td>13 Cancer</td>
</tr>
<tr>
<td>October</td>
<td>18 Pacific Island health</td>
</tr>
<tr>
<td>November</td>
<td>1</td>
</tr>
<tr>
<td>December</td>
<td>13 Obesity</td>
</tr>
</tbody>
</table>
Reviewers for the New Zealand Medical Journal in 2012

The Editorial Board (F Frizelle, T Buckenham, R Mulder, L Beckert, J Connor, J Reid) and Editorial Team (F Frizelle, B Edwardes, S Bagley) thank all those who generously gave their time and expertise in reviewing papers for the New Zealand Medical Journal in 2012. (We apologise to anyone whose name has been inadvertently omitted from the following list.)

Abel G   Clarke C   Fernyhough L   Hunt P   Mann J
Adams J   Clarke R   Findlay M   Huria T   Mark S
Adamson S   Cole D   Fink J   Imlach   Marsh L
Aitken A   Conway C   Fitzharris B   Gunasekara F   McCall J
Alchin J   Cormack D   Fletcher V   Inder M   McGee R
Allison R   Coulter G   Frampton C   Jones D   McGill A-T
Anderson K   Cram F   Fraser A   Joyce P   McGregor D
Ardagh M   Crampton P   Fraser T   Keall M   McLean RM
Ashton T   Crengle S   Frazer G   Keast A   McMillan W
Atkinson C   Cromhout A   Freebairn R   Keenan J   Meeks M
Austin N   Cross N   Gale C   Kelly S   Melhuish M
Bagg W   Croucher M   Ganly P   Kenealy T   Melton I
Bagshaw P   Crowe M   Geddes J   Kennedy R   Menkes D
Bagshaw S   Crozier I   Gee P   Kerr Andrew   Mercer P
Balasingam A   Cumming J   Gentles D   Kerse N   Merry A
Barber A   Cundy T   George S   King B   Metcalfe S
Barrow M   Cunningham   Gilbey A   King T   Milschaf K
Beasley M   W   Gilling P   Kira G   Mills G
Beasley R   D’Souza A   Gladding P   Kiro C   Milson P
Beasley S   Daley V   Glover M   Klein H   Moller P
Begg E   Davis A   Glue P   Koea J   Moltano A
Bergin P   Davis P   Gommans J   Kool B   Moore A
Bird P   Day A   Gordon M   Krebs J   Moore ML
Bissett I   Deacon A   Green G   Kyle C   Morton J
Bisson M   Dennett E   Green T   Lainchbury J   Murphy R
Blackmore T   Derraik J   Grundy K   Lamb D   Nacey J
Blake J   Dickson N   Hammond   Langley J   Nunn C
Blakely T   Ditchburn M   Tooke G   Lawton B   O’Beirne G
Bolland M   Donnelly S   Harman R   Leekey E   O’Donnell C
Booth M   Doogue M   Harry R   Leggett M   Ockelford P
Borrowczyk J   Dovey S   Harwood M   Lennon D   Palmer S
Braatvedt G   Eagleton C   Hay N   Leow L   Parry S
Bridgman P   Edwards J   Hayes J   Lintott C   Paterson HR
Brockway B   Egan R   Heath A   Looi V   Paterson R
Burgess C   Eglington T   Highton J   Lowe C   Payinda G
Burt M   Elder D   Hill A   Lyall P   Pelosi C
Campbell AJ   Ellis C   Holt S   Lynn K   Perez D
Chambers S   Ellis PM   Hooper G   Lysnkey M   Pitama S
Chapman B   Ernst E   Horne JG   MacFarlane M   Pithie A
Chapman P   Evans H   Hosking J   MacFarlane S   Polonowita A
Charlewood R   Fad J   Houghton L   MacLennan B   Poole G
Child S   Fanslow J   Huckle T   Macleod S   Poole P
Chin P   Ferguson C   Hulme-Moir   MacMillan A   Priest P
Civil I   Fergusson D   M   Malcolm J   Pryke J