Retinal detachments in southern New Zealand: do poorer patients have poorer outcomes?

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ABSTRACT

AIMS: To investigate associations between socioeconomic status, retinal detachment type and post-operative visual outcomes in southern New Zealand.

METHODS: A retrospective review of all cases of rhegmatogenous retinal detachments in Dunedin Hospital over two years was performed. Patient demographics and macula involvement at presentation were the primary outcome measures. The New Zealand Deprivation Index was used to group patients into low (30% least deprived), medium (middle 40%) and high (30% most deprived). Patients were excluded if they were not from New Zealand, or had traumatic detachments.

RESULTS: During the study period, 95 retinal detachments in 94 patients were managed in Dunedin Hospital. Only 15% of retinal detachments occurred in the most deprived. More deprived patients had longer delays before assessment in hospital (mean of 29.8 days versus 10.1 days for the least deprived and 12.8 days for the medium category, overall p=0.025). There was no evidence of an association between deprivation and macula-off status (overall p=0.650) or visual acuity at one or three months (p=0.063 and p=0.328 respectively). Nor was there an association between referral pathway and macula-off status (p=0.242).

CONCLUSIONS: Retinal detachment in southern New Zealand may be less common amongst those with the most deprived socioeconomic status who also experience longer delays till first treatment; but there was no association between socioeconomic status and patients being macula-off at presentation, or having poorer visual outcomes. More targeted patient education towards our most deprived citizens may reduce delays in treatment, and result in better visual outcomes.
This finding typically goes against the common pattern, whereby a higher socioeconomic deprivation is typically associated with a higher incidence of disease and notably in ophthalmology and visual impairment.5,9,10

This study is a retrospective review into presenting RRD which were referred to, and managed in, Dunedin Hospital over a 2-year period. It aims to investigate the socioeconomic and demographic characteristics of RRD in southern New Zealand and identify if patients presenting with macula-off RRD are more at risk being from a higher level of socioeconomic deprivation. Furthermore, it investigates if there is an association between macula-on or -off RRD and referral source (ie, optometrist or medically-trained physicians), along with the visual outcome at one and three months post-operatively.

Methods

Participants were selected from all patients undergoing surgery for RRD at Dunedin Public Hospital. This is the only tertiary centre catering for the Southern District Health Board (DHB) which covers the regional provinces Otago and Southland, covering a population of 297,423.11 The Southern DHB covers the largest geographic area of all DHBs across the country, spanning over 62,356 square kilometres, and as such, patients are referred to our service through a variety of local and often rural services.12 All cases were reviewed and operated on by one vitreoretinal surgeon.

Data was collected over a two-year period, from September, 2012,–October, 2014, and included patient demographics, source of referral, duration of symptoms, type of RRD at presentation, post-operative visual acuity, and post-operative complications. Post-operative complications included re-detachments and anatomic failure, and these re-detachments underwent further ocular operations for repair. Reoperation data included removal of heavy liquid/oil which occurred approximately two weeks after the initial primary repair, and washout or gas exchange either due to a significant hyphaema, or significant ocular hypertension respectively.

The refractive error, to identify myopic status, was assessed based on referral information and clinical history and documentation. Myopic status was defined as a minimum of -0.5 dioptres of sphere.

Socioeconomic deprivation was measured using the New Zealand Deprivation Index, 2013 (NZDep2013). This measures the deprivation within a meshblock or geographically-defined area in New Zealand. A deprivation score is created using 8 variables from the latest 2013 census, which takes into account income, employment, communication, transport, support, qualifications, home ownership and living space. The deprivation score is defined into deciles from 1–10, with 1 being the least deprived and 10 the most deprived. For the purposes of this study, deprivation deciles were grouped 1–3, 4–7 and 8–10 equating to low, medium and high levels of deprivation respectively.13

Inclusion criteria: all patients who developed rhegmatogenous retinal detachment, including retinal dialyses, who were managed at Dunedin Hospital. There was no minimum size of RRD included, but was instead clinically assessed by a single vitreoretinal surgeon and deemed appropriate to operate, either requiring a pars plana vitrectomy or scleral buckle. Patients who had previously undergone intraocular surgery, including previous retinal surgery, were included.

Exclusion criteria: patients were excluded if they were treated solely with laser retinopexy. Non-New Zealand residents, or any patient who presented with tractional and/or traumatic retinal detachments, ie, globe rupture or penetrating eye injury, and exudative retinal detachments were also excluded. Note: no patient was treated by pneumatic retinopexy.

As one patient provided information on two detachments, mixed-effects logistic regression models with a random patient effect, were used to examine associations between NZDep2013 group and each of macula-off detachment and visual acuity at 1 month and 3 months. Mixed-effects logistic regression was also used to investigate any association between referral pathway and macula-off. Length of symptoms for patients (not RRDs) was compared between
NZDep2013 groups using a Kruskal-Wallis test, with post-hoc Dunn’s tests. In order to investigate whether any association between deprivation and the length of symptoms was explained by referral pathway as a potential mediator, adjusted linear regression models using log-transformed length of symptoms were also investigated after residual diagnostics were examined. All statistical analyses were conducted using Stata 13.1 and two-sided p<0.05 was considered statistically significant.

**Results**

**Demographics**

There were 98 cases of RRD seen at Dunedin Public Hospital, of which three cases were excluded as they were visiting tourists, leaving a total of 95 RRD in 94 patients. One patient presented with simultaneous bilateral RRDs and both are included in analyses were appropriate. The mean (SD) age was 55.5 (17.1) years, ranging between 12 and 89 years. There were 61 males (65%) compared to 33 females (35%). There were 48 macula-on detachments (51%), 41 macula-off detachments (43%) and 6 macula splitting detachments (6%). 55 RRD occurred in the right eye, compared to 41 RRD in the left.

Table 1 shows the prevalence of myopic refractive error compared by deprivation group, which was not significant (p=0.102). Nor was there evidence that myopic refractive error was associated with macula-off detachment (data not shown, p=0.228). Similarly, within this table there was no significance found when looking at the prevalence of previous ocular surgery compared by deprivation group (p=0.841). Nor was there evidence that previous ocular surgery was associated with macula-off detachment (data not shown, p=0.281).

Table 2 shows the distribution of RRD and deprivation status. From mixed logistic regression, there was no evidence that the proportion of macula-off/splitting versus macula-on differed by NZDep2013 category (p=0.650).

**Referral source and type of RD**

Among the source of referrals, optometrists were the most common referrer with
39 patients (41.4%), 30 were referred by medical physicians (32%), 11 were referred by ophthalmologists (public and/or private) (11.7%), 7 were self-referrals (7.4%) and 7 incidentally noted on examination for other reasons (7.4%).

Table 3 shows the referral source and type of detachment. Looking at the distribution of macula-on versus macula-off/splitting, there was no evidence of a difference between medical physician and other referrals (p=0.242).

Table 4 shows the distribution of referrers by deprivation groups. There was no evidence of an association between referrer and deprivation groups (Fisher’s Exact p=0.242).

Table 5 shows the deprivation status and duration of symptoms.

Table 6: Deprivation status and visual outcome

The mean duration of symptoms before assessment in hospital was 10.1 days in the low deprivation group, 12.8 days in the medium deprivation group and 29.8 days in the high deprivation group. This differed overall (Kruskal-Wallis p=0.025) with Dunn’s test showing pairwise differences between low and high (p=0.011) and medium and high (p=0.003), but not between low and medium (p=0.333). In a linear regression model using log-transformed symptom duration, although the resulting model residuals were not ideal, similar results in terms of significance were obtained to the above when looking at deprivation (overall p=0.015; low versus high p=0.010; medium versus high p=0.005; low versus medium p=0.905). These results were relatively unaffected in terms of statistical significance and also in terms of the model coefficients when also adjusting for referral source as medical physician versus other (overall p=0.012; low versus high p=0.008; medium versus high p=0.004; low versus medium p=0.951), although again the model residuals were marginal in terms of acceptability.

Deprivation and visual outcome

Table 6 shows visual acuity at one and three months post. There was a tendency for means to differ at one month (p=0.063) but no evidence at three months (p=0.328).

Table 7 shows the reoperation rates and complications in regards to anatomic failure. There was only one case of anatomic failure seen in the high deprivation group. In total, 8% of the population re-detached and underwent another oper-
ative procedure, 6% required removal of oil/heavy liquid and 4% required a washout or gas exchange due to hyphaema or significant ocular hypertension. There was no evidence of an association between having any event and deprivation (Chi-squared p=0.473) or for the type of event and deprivation amongst those with an event (Fisher's exact p=0.495).

**Discussion**

In this study of RRD within southern New Zealand, the overall incidence was 15.97 per 100,000 population, this lies within the reported normal range from 5–18.2 per 100,000 population.1,2

Reviewing the patient demographics, there was a ratio of 1.85 male to female (p=0.729). This pattern is consistent with international research, which found a similar gender ratio in a larger population, 1.68:1 (p=<0.0001).3 Likewise, a meta-analysis of previous studies detailing the difference in sexes and retinal detachments reported a male predominance between 52–59% (p=<0.001).2 There was a predominance of detachments occurring in the right eye compared to the left, 51 versus 44 eyes (54%), although non-significant, this predominance of right eyes fits within a international meta-analysis 53.5%–56.7% (p>=0.0001).3

Looking at the length of symptom duration prior to hospital presentation, the low deprivation group was seen earliest, with a mean of 10.1 days, with the medium deprivation group following closely at 12.8 days, however the high deprivation group presented significantly later at 29.8 days. This was significant when comparing between the low and high deprivation groups (p=0.011) and the medium and high deprivation groups (p=0.003), and overall (p=0.025). This may be due to a number of reasons, including lower levels of education and limited access to services due to financial constraints. There was no evidence that also adjusting for referral source (medical physician versus other) explained this difference, and so referral pathway does not appear to mediate this association.

There appeared to be a pattern of more retinal detachments occurring in the more affluent populations; 85% compared to the high deprivation group, 15%. This corresponds similarly with research in Scotland, where 84% of all detachments occurred in the more affluent populations (p<0.0001).5 The medium deprivation group received the highest number of retinal detachments compared to all groups, making up just under half (49%) of all retinal detachments in our study. This finding may be partially explained by the medium deprivation group having also the highest number of myopes, given the associated risk of RRD with myopia.6

Within the low and medium deprivation groups the rate of macula-off detachments was similar, 41% and 40% respectively, compared to the high deprivation group at 57%. This was not statistically significant, though is suggestive that more deprived patients are more likely to be macula-off at presentation. This association was also reported by Mitry et al in a Scottish population, where those from the most deprived group were significantly more likely to present with macula-off detachments compared to the least deprived, 65% versus 51% respectively (p=0.0089). This is likely a result of delays in initial assessment and treatment observed in this study and places the more deprived patients at risk of a worse visual outcome.5

With regard to referral source of retinal detachments and its association with

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**Table 7: Deprivation status versus reoperation rates and complications**

<table>
<thead>
<tr>
<th>Deprivation</th>
<th>Re-Detachment</th>
<th>Removal of Oil/Heavy Liquid</th>
<th>Washout/Gas Exchange</th>
<th>Anatomic Failure</th>
<th>Any</th>
<th>None</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>3 (9%)</td>
<td>4 (12%)</td>
<td>2 (6%)</td>
<td>0 (0%)</td>
<td>9 (26%)</td>
<td>25 (74%)</td>
<td>34</td>
</tr>
<tr>
<td>Medium</td>
<td>4 (9%)</td>
<td>1 (2%)</td>
<td>2 (4%)</td>
<td>0 (0%)</td>
<td>7 (15%)</td>
<td>40 (85%)</td>
<td>47*</td>
</tr>
<tr>
<td>High</td>
<td>1 (7%)</td>
<td>1 (7%)</td>
<td>0 (0%)</td>
<td>1 (7%)</td>
<td>3 (21%)</td>
<td>11 (79%)</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>8 (8%)</td>
<td>6 (6%)</td>
<td>4 (4%)</td>
<td>1 (1%)</td>
<td>19 (20%)</td>
<td>75 (80%)</td>
<td>95</td>
</tr>
</tbody>
</table>

* Note the medium deprivation group contains one patient with bilateral detachments.
socioeconomic status, no statistically significant difference was found between referral source and type of retinal detachment (p=0.242). We did observe a non-significant trend of ophthalmologists and optometrists referring in more macula-on detachments, at 73% and 55% respectively, compared to medically trained physicians (such as general practitioners (GP) and emergency department physicians) at 33%. In New Zealand, there is public funding for GP visits and hospital visits, though no public funding for optometry or private specialist visits, limiting the most deprived groups’ access to these practitioners. This may relate to the finding above of delays in initial hospital treatment for more deprived groups, as optometrists and private ophthalmologists are more likely to be able to assess and refer at an earlier stage than generally trained physicians. This may follow on explaining the higher rates of macula-off detachments found in the more deprived group, however we found no significant evidence of any association between referrer and deprivation group (p=0.328). To our knowledge, no research has previously looked at the referral source of detachments and a larger study is most likely needed to find if this pattern is of clinical significance.

The visual outcome at one month post surgery was similar when comparing the low and medium deprivation groups having a logmar visual acuity of +0.33 and +0.37, respectively, whilst the high deprivation group had a logmar of +0.52. Again, this trend was not significant (p=0.328), but did suggest that those in the most deprived group have worse visual outcomes, likely as a result of delays in treatment and subsequently increased risk of macula-off RRD. We did not find any association with regard to complications and reoperation rates between socioeconomic groups (p=0.473).

In this study the majority of retinal detachments occurred in the more affluent populations. We observed a higher proportion of macula-off detachments occurring in the most deprived population group compared to their less deprived counterparts. Despite this lack of significance, the above mentioned pattern fits with international research.1 We also noted a non-significant trend of a worse visual outcome at one and three months in the most deprived group compared to the low and moderately deprived. Importantly, we found that the most deprived population groups presented significantly later when compared to their counterparts. This has significant implications given that we know that Ross found the visual recovery in relation to increasing duration of detachment declines in an exponential fashion14 and Saidkasimova et al also found that visual recovery and successful surgical repair are affected by delayed presentation.9 These results suggest that more education, support and targeting of patients in high areas of deprivation is required to improve understanding, presentation times and outcomes for these patients.

Competing interests: Nil
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