



Osteosarcoma in New Zealand: an outcome study comparing survival rates between 1981–1987 and 1994–1999

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Abstract

Aim To review the data and outcome of patients with osteosarcoma in New Zealand from 1994 to 1999 and to compare this to data retrieved from a similar study from 1981 to 1987.

Methods Data from 1994–1999 was obtained from the New Zealand Cancer Registry; raw data was also retrieved from the 1981–1987 study.

Results There were 96 cases in the 1981–1987 cohort and 84 cases in the 1994–1999 cohort. Overall, 5-year survival from osteosarcoma improved from 32.3% to 44.0% between the cohorts. When the cohorts were compared, there was a trend toward improved outcome in most subgroups

Conclusions The outcome in patients with osteosarcoma in New Zealand has improved over the study period and is similar to that seen in the overseas literature.

Osteosarcoma is the most common non haemopoietic primary tumour of bone. The estimated incidence is approximately 4–5 per million, occurring most commonly in the second decade of life (ages 11–20).¹

The most recent WHO Classification of Tumours defines eight different types of osteosarcoma:¹ *conventional osteosarcoma* which is further delineated into three subtypes depending on the predominant matrix present—osteoblastic (50%), fibroblastic (25%), and chondroblastic (25%); *telangectatic, small cell, low grade central, parosteal, periosteal, high grade surface, and secondary osteosarcoma*.

The treatment of osteosarcoma is changing as the knowledge of chemotherapy advances, and surgical techniques and prosthetics improve. The treatment commonly involves pre- and post-surgical chemotherapy in combination with surgery (either limb salvage or amputation).

In this study, we wanted to compare the data on patients with osteosarcoma treated in New Zealand from 1994–1999 to data collected from a similar study of a cohort from 1981–1987, and then assess if there had been an improvement in 5-year outcomes.³

In particular, we wanted to assess if a more specific histological classification had lead to improved outcomes being reported in certain groups

Method

Data was collected from the Cancer Registry at the Ministry of Health. From 1994, reporting of documented cancers became a legal requirement; data was collected from 1994 until July 1999. The raw data from 1981–1987 was also retrieved and analysed for comparison.

Information was gathered on patient age at diagnosis, age at death, sex, tumour site, histological classification, and treatment type. The coding of information and classification systems used by the

Cancer Registry had not changed between the two cohorts and this was used to enable comparison. The overall 5-year outcome was collated.

Parosteal and periosteal osteosarcomas were excluded because of their different behaviour and better outcome.¹ In addition, osteosarcoma of the skull, facial bones, and mandible were excluded (as they are not treated by orthopaedic surgeons) as well as soft tissue osteosarcomas and osteosarcomas of an unknown site.

Statistical analysis was performed on the 5-year outcome results using the Fisher's exact test to analyse whether a statistically significant improvement had occurred. Patients with Paget's osteosarcoma were excluded from this analysis.

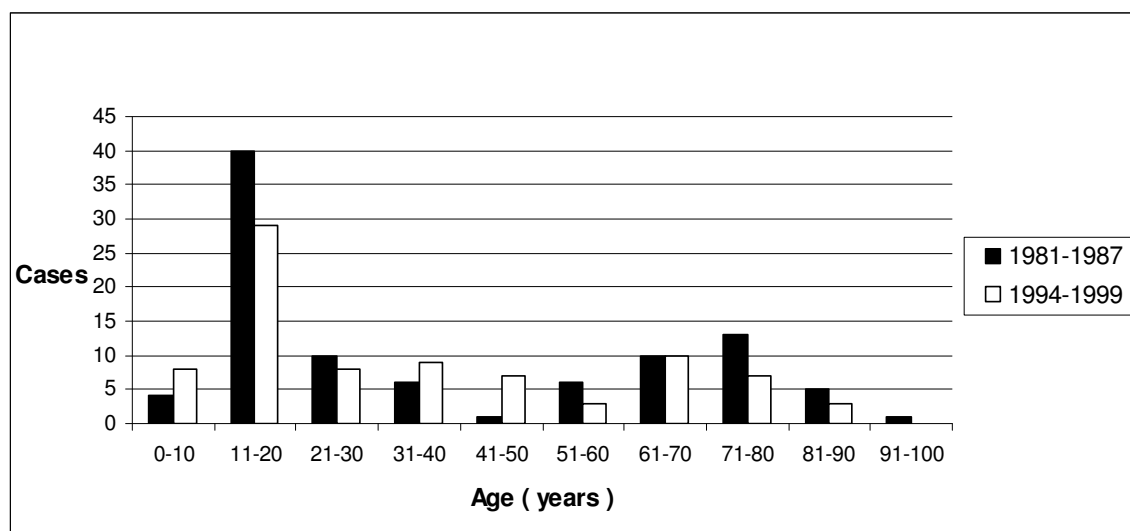
Results

1981—1987 data

Of the original 104 cases in the 1981–87 study period, 4 skull osteosarcomas, 1 mandibular osteosarcoma, 1 soft tissue osteosarcoma, 1 osteosarcoma from an unknown site, and 1 sarcoma not specified were excluded, thus leaving 96 cases of osteosarcoma (61 males and 35 females).

The age distribution of the cases is typical; it shows a peak in the second decade of life and a further smaller peak in the seventh and eighth decades (Figure 1).

Figure 1. Age distribution of New Zealand osteosarcoma cases

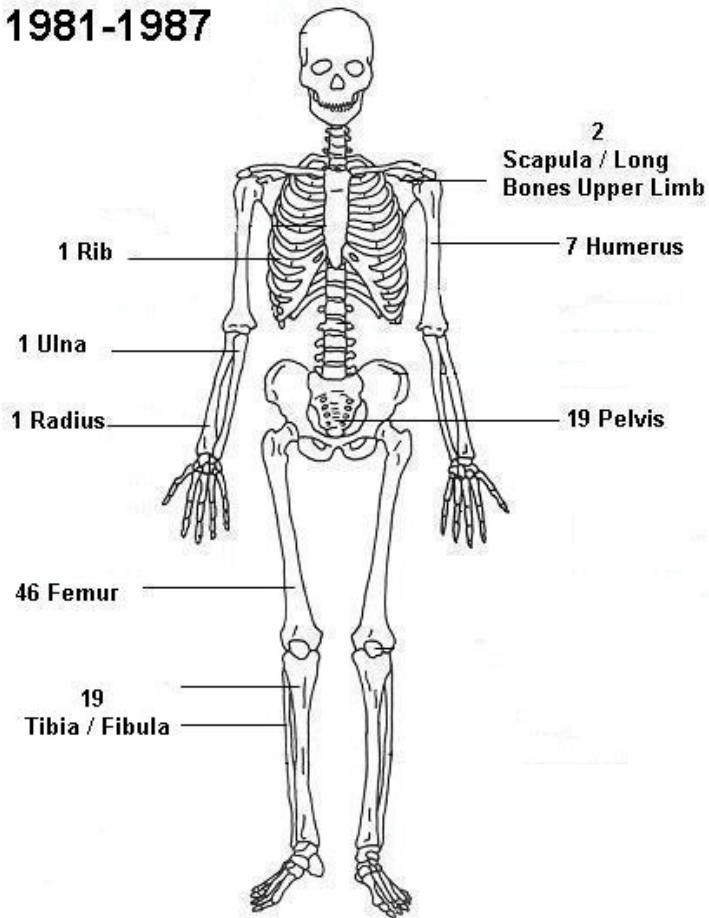


As shown in Figure 2, there were 76 tumours in the appendicular skeleton and 20 in the axial skeleton.

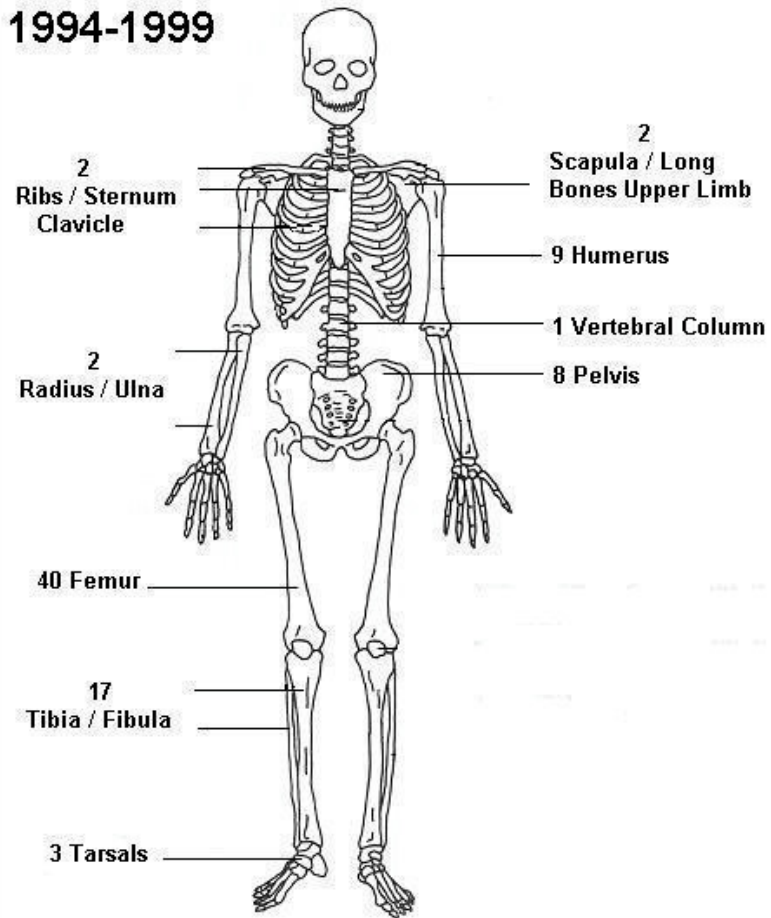
There were 89 cases of osteosarcoma which were not specified histologically. Four osteosarcomas originated from Paget's disease, and 3 were telangiectatic osteosarcomas.

Figure 2. Sites of osteosarcoma

1981-1987



1994-1999



Staging was documented at the time of diagnosis. Of the 98 cases, 66 were tumours were intracompartmental. There were 11 cases where the tumour was extracompartmental and 17 cases had metastases. The staging was not specified in 4 cases.

Treatment consisted of combinations of chemotherapy, surgery and radiotherapy. No specific data was available for the type of surgery performed or the chemotherapy regime used.

1994–1999 data

In the 1994–1999 study period there were 97 registered cases of osteosarcoma. Of the original cohort, 6 mandibular osteosarcomas, 2 maxillofacial osteosarcomas, 1 abdominal osteosarcoma, and 1 soft tissue osteosarcoma were excluded. In addition, 3 cases were excluded because the diagnosis was made at autopsy. Thus 84 cases remained (46 males and 38 females). A similar bimodal age distribution to the 1981–1987 cohort was found (Figure 1).

There were 73 tumours in the appendicular skeleton and 11 tumours in the axial skeleton (Figure 2). Histologically, there were 67 cases of osteosarcoma not otherwise specified; 6 cases were chondroblastic osteosarcoma, 5 were fibroblastic osteosarcoma. Four osteosarcomas originated from Paget’s disease and there were 2 telangectactic osteosarcomas.

The tumour was intracompartmental in 22 cases while 8 cases were extracompartmental and 23 cases had metastases. The staging was not specified in 31 cases.

The modality of treatment of cases in the 1994–1999 cohort was similar to the 1981–1987 cohort. No specific data was available on the type of surgery performed or the chemotherapy used. Compared to the 1981–1987 cohort, many more patients had chemotherapy combined with surgery plus there was a significant reduction in the use of radiotherapy (Table 1).

Table 1. Treatment modality comparison between 1981–87 and 1994–99 cohorts

Treatment	1981–87	1994–99
Chemotherapy	11	7
Surgery	30	12
Radiotherapy	23	1
Chemotherapy + surgery	14	45
Chemotherapy + surgery + radiotherapy	0	1
Chemotherapy + radiotherapy	11	0
Surgery + radiotherapy	2	0
Treatment not specified	5	18
Total	96	84

Outcome

All patient groups demonstrated an improved outcome in the later cohort, except those with metastatic disease.

Patients with axial tumours had a poorer outcome when compared to those with appendicular tumours. However both those with axial tumours and those with appendicular tumours showed an improvement in outcome in the later cohort.

There were twice as many pelvic osteosarcomas in the earlier cohort which may partially account for the improved outcome in the later cohort.

Outcome was also broken down in terms of histological classification for the later cohort. Cases of osteosarcoma in Paget's disease had the poorest 5-year outcome (25%). The group of osteosarcomas not otherwise specified had a 5-year outcome of 42.3%—this is lower than the 5-year outcome of cases with fibroblastic osteosarcomas (60.0%), chondroblastic osteosarcomas (50.0%), and telangectactic osteosarcomas (50.0%).

Statistical analysis

Using Fisher's exact test, the improvement in 5-year outcome between age groups within the cohorts reached statistical significance in only in those patients older than 40 years (Table 2).

Table 2. Outcome statistics

Variables	1981–1987 cohort			1994–1999 cohort			Fisher's exact test‡
	Cases	5-year outcome		Cases	5-year outcome		
All tumours (total cohort)	96	31	32.3%	84	37	44.0%	0.12
Primary tumours*							
Age <40 years	60	28	46.7%	54	28	51.9%	0.71
Age >40 years	32	3	9.4%	26	8	30.8%	0.050
Appendicular skeleton	73	29	39.7%	70	32	45.7%	0.50
Axial skeleton	19	2	10.5%	10	4	40.0%	0.14
Metastatic disease all ages	16	2	12.5%	22	2	9.1%	1.00
<40 yrs non metastatic †	51	26	51.0%	20	13	65.0%	0.31
>40 yrs non metastatic †	21	3	14.3%	9	2	22.2%	0.62
<40 yrs non metastatic appendicular †	45	24	53.3%	20	12	60.0%	0.79
>40 yrs non metastatic appendicular †	15	3	20.0%	7	2	28.6%	1.00

*Cases of Paget's osteosarcoma excluded; †Unspecified staging not included; ‡Probability that the difference in 5-year outcome is significant.

Discussion

The most important finding in this study was the improved 5-year outcomes for patients presenting in New Zealand with osteosarcoma. This improvement was seen throughout most age ranges and stages at presentation but did not reach statistical significance, except in those patients older than 40 years

The outcome of osteosarcoma continues to improve with better treatment. Kotz et al have demonstrated an improvement in survival rates in primary osteosarcoma from 24% in 1965 to 62% in 1994.² Despite ongoing developments in the field of

chemotherapy and surgery, the overall survival rates of 55–70% have not changed significantly in the last 15 years, however.⁴

One of the aims of this study was to assess if histological classification had any effect on the outcome. This was not possible due to the small numbers of specific histological subtypes. No comparison could be made between the two cohorts, as the classification had changed in the intervening period to become more specific. The review of subtypes found a poorer outcome of osteoblastic osteosarcomas compared to other subtypes. The reason for this is unclear.

There has been little literature surrounding this topic. Hauben et al found that (in 570 patients less than 40 years of age) survival was not affected by histological type.⁵ Our results of overall outcome in the 1994-1999 cohort are comparable to other studies.

For patients aged less than 40 years with a primary osteosarcoma of an extremity, the 5-year survival rates range from 55–71% in prospective trials.^{6–9} Our results compare favourably (60% for similar patients).

Older patients (>40 years) with osteosarcoma generally do not survive as long as younger patients. Our 5-year survival results for older patients are lower than those in other studies in the literature where a 5-year survival rate of 41.6% is quoted in one study.¹⁰

Patients with metastatic disease also have poorer outcomes. In two studies, the 5-year survival was 24% and 29%, respectively.^{11,12} Again, this rate is higher compared to our results.

Caution is necessary when comparing our outcome results with other studies, as the patient inclusion criteria in those studies are often very specific and they have higher numbers of cases. Specifically, the numbers of patients older than 40 years and those with metastatic disease are much smaller in the New Zealand cohorts, which makes comparison difficult.

Indeed, the main limitation of this study is its small number of cases. Furthermore, incomplete data was available on the staging of these tumours, histological grade, and on the presence of skip lesions which thus made comparisons difficult.

We also acknowledge that more accurate results could have been obtained if more defined data about histological grade, staging, and treatment regimes were available.

Despite these reservations, we have shown a trend toward an improved outcome of patients with osteosarcoma treated in New Zealand which is similar to reports in the literature from other countries.

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