Original article

Wide resection versus curettage in giant cell tumor with pathological fracture? A systematic review and meta-analysis

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ABSTRACT

Introduction: Currently there is no consensus if wide resection and curettage in giant cell tumor have effect on local recurrence rate in the presence of a pathological fracture.

Material and method: We conducted a comprehensive review and meta-analysis of papers which reported outcomes in patients of giant cell tumor with and without a pathological fracture. The odds ratio (OR) of local recurrence between wide resection and curettage group in giant cell tumor with pathological fracture was calculated.

Results: 05 eligible papers were selected for final analysis. This included patients, of whom (18.0%) had a pathological fracture. The pooled OR for local recurrence between patients of pathological fracture treated with wide resection and curettage was 0.298% (95% Confidence interval (CI) 0.0669–1.329, $p=0.97$).

Conclusion: Wide resection and curettage in patients of giant cell tumor with pathological fracture has difference in local recurrence rates. However the presence of a pathological fracture should not be only influential factor in the decision making to perform wide resection or curettage. A proper planning and judicious approach is required in giant cell tumor with pathological fracture for deciding the appropriate treatment method.

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1. Introduction

The prevalence of pathological fractures ranges between 9% and 30% of patients with giant cell tumor (GCT) of extremities.^{1–9} Pathological fracture leads to severe pain, immobilization of limb, decreased ambulation, affects activities of daily living and quality of life. Presence of a pathological fracture may lead traditionally to the local hematoma formation causing spread of tumor cells to adjacent tissue and joint contamination. Microcirculation of tumor due to the pathological fracture can lead to transfer of the tumor to distant sites and lead to distant metastasis.^{1,12} The timing of pathological fracture and fracture displacement could have impact over the treatment and prognostic significance. Also there could be difference in outcomes between the patients who had a pathologic fracture on presentation and those who sustained a fracture during the period of treatment. The treatment of pathological fracture consists of immediate immobilization with a cast or a splint to

avoid possibility of tumor dissemination and prevent joint contamination and reduce pain and swelling. Bone union after fracture leads to reduced pain and swelling over affected bone and extremity. Pathological fracture is considered as a prognostic factor and has treatment implications on patients with giant cell tumor.^{5–10} The development of pathological fracture is often regarded as a poor prognostic factor which has been associated with higher local recurrence rate.^{5–8} There is a common belief that immediate and aggressive tumor removal may impede disease progression and hence, wide resection has been advocated as the treatment for patients with a pathological fracture. GCT is peri-articular bone tumor, a strategy of wide resection may necessarily entail en bloc resection of the adjacent joint and fusion or reconstruction, with their associated morbidity and complications.^{8,10,11} The recent development in implants and surgical techniques of mega-prosthesis joint replacement surgery has improved the function and rehabilitation. On the other hand joint salvage with curettage surgery as a treatment modality is beneficial for the preservation of the joint.^{5,6}

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Fig. 1. Flow chart of the search for relevant articles.

adjuvants is considered difficult in the presence of a pathological fracture.^{14,15} There may be higher rate of higher local recurrence rate after curettage surgery due to formation of local haematoma and chances of contamination of adjacent soft-tissues and joints with tumour.^{9,17} Wide resection achieves better surgical control of the disease so there is lower risk of recurrence compared with curettage.^{18–21}

We conducted a comprehensive review and meta-analysis of papers which reported outcomes on patients with local recurrence rate between wide resection and curettage of giant cell tumor with pathological fracture.^{8–22}

Campanacci et al. reported a possibility that a pathological fracture was the risk factor in giant cell tumor.¹⁰ Also the results of studies shows that giant cell tumor with pathological fracture has higher local recurrence rate as compared to non fracture.^{8,9} The results of Deheshi et al. found comparable recurrence rates in the giant cell tumor with pathological fracture and non fracture groups.⁶ Dreinhöfer et al. reported that the local recurrence rate in patients with fractured in giant cell tumor was similar to that in patients with non-fractured group.⁷ So there is consensus on whether pathological fracture is poor prognostic marker and whether there is difference in local recurrence rates.

We evaluated the local recurrence rate between wide resection and curettage in patients of giant cell tumor with pathological fracture. The comparison of local recurrence rates between wide resection and curettage in patients of giant cell tumor with pathological fracture showed pooled OR of 0.298%. The meta-analysis showed a difference in the risk of local recurrence in the wide resection group compared to curettage group but this difference did not reach statistical significance.

Van der Heijden et al. reported that curettage was associated with a higher rate of local recurrence when compared with wide resection.¹⁵ The complication rate was significantly lower, including that of loosening of the prosthesis, failure of an allograft and pseudoarthrosis, and poor post-operative function.¹⁵ Dreinhöfer et al. suggested that extensive surgery; en-bloc resection and

Fig. 2. Forest plot comparing local recurrence rates between the wide resection and curettage group in patients of giant cell tumor with pathological fracture; CI, confidence interval.

reconstruction with tumor prosthesis, was not necessary for giant cell tumor with pathological fracture as the first operation.⁷ The role of extensive treatment should be considered only when a local recurrence occurs after a curettage surgery.⁷ The results of Jeys et al. suggest positive rationale of extended debridement for patients with intact and small breaches in the cortex of the distal femur and patients with pathological fractures may require more aggressive surgery.³ Van der Heijden et al. proposed that the use of curettage with adjuvant therapy was a reasonable option for treating a GCT even in the presence of pathological fracture.¹⁵ Resection should only be considered in patients with soft-tissue extension of the tumour, complex fractures, local recurrences, and in those in whom structural integrity cannot be regained by reconstruction.¹⁵

The results of meta analysis by Salunke et al. has concluded that, there is no difference in local recurrence rates between patients who have a GCT of the bone, with and without a pathological fracture at presentation and curettage is an acceptable form of treatment. However there are no studies in the literature which have looked at the other outcomes of wide resection and curettage surgery in giant cell tumor with pathological fractures except local recurrence. The functional outcomes, postoperative infection and repeat surgery rate and other complications between wide resection and curettage group in giant cell tumor with pathological fractures are not reviewed in the literature. So the study comparing these other important outcomes could be a topic of further research.

The current study had few limitations. There are no RCTs performed on current topic so we included have to retrospective cohort and case-control studies. So this meta-analysis was performed to study the prognostic effect of a pathological fracture in giant cell tumor. Inherent biases could exist, in terms of patient selection, heterogeneous treatment regimes and loss to follow-up. Newcastle-Ottawa scale was used and showed that the quality of

Table 3
Study characteristics.

Study	Follow-up (year)	Total (n)	Local recurrence (total, %)	Pathological fractures (n)
Xing et al. ¹	4.8	276	11	51
Torigoe et al. ²	3	35	23	7
Jeys et al. ³	–	54	30	12
Blackley et al. ⁴	6.7	59	12	17
McDonald et al. ⁵	9.2	221	21	31

Table 4

Local recurrence rates, pathological fracture with wide resection versus curettage.

Study	Pathological fractures (n)	LR pathological fractures (%)	Pathological fracture WR (n)	Pathological fracture Curettage (n)	LR Pathological fracture WR (%)	LR Pathological fracture, Curettage (%)
Xing et al. ¹	51	5.9	33	18	3	11
Torigoe et al. ²	7	29	1	6	0	33
Jeys et al. ³	12	25	0	29	0	14
Blackley et al. ⁴	17	23.5	7	5	0	20
McDonald et al. ⁵	31	6.5	23	8	4	13

the evidence was good. The studies used different methods of reconstruction, different types of adjuvant treatment, different sites of involvement and the variable extent of involvement of the soft-tissues and adjacent joint. So we used a random effects model in the meta-analysis which allows the true effect size to vary from study to study. The small sample sizes of some of the studies which were included may predispose to a Type II error, owing to insufficient power. This was one of the main reasons why we chose to perform a meta-analysis.

5. Conclusion

Wide resection and curettage in patients of giant cell tumor with pathological fracture has difference in local recurrence rates. There is need of studies in the literature showing comparison of other important outcomes of wide resection and curettage surgery in giant cell tumor with pathological fractures except local recurrence. However the presence of a pathological fracture should not be only influential factor in the decision making to perform wide resection or curettage. A proper planning and judicious approach is required in giant cell tumor with pathological fracture for deciding the appropriate treatment method.

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Conflict of interest

None.

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