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IS SANDWICH TECHNIQUE A RELIABLE OPTION TO NOTORIOUS GIANT CELL TUMOUR?? PROSPECTIVE STUDY AT TERTIARY LEVEL ORTHOPAEDIC INSTITUTE

Orthopaedics

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ABSTRACT

Aim: To assess and evaluate effectiveness of sandwich technique in giant cell tumour and compare our result with available literature by MSTS score. **Patients and methods:** 27 cases of giant cell tumour treated with sandwich technique at orthopaedic department, S.M.S Medical College, Jaipur from January 2015 to december 2016 were included who fulfilled the inclusion criteria after taking informed written consent. **Results:** With 23 patients (92%) had excellent result with MSTS score of 26-30 and 2 patients had score of 15-20, the mean MSTS score was 27.4 out of 30 (standard deviation, 3; range, 19–30). None of the patient showed clinical and radiological evidence of recurrence at the end of 1 year. **Conclusion:.** The early functional results are very encouraging with no recurrence. This indicates significant improvement in quality of life, emotional status and functional ability of the patients. Thus, the sandwich technique appears to be a viable alternative to wide resection.

KEYWORDS

Giant cell tumour, Bone cement, Sandwich technique

INTRODUCTION:

Sir Astley Cooper in 1818 first described Giant cell tumours (GCT) of the bone [1]. Later Nelaton showed their local aggressiveness, and Virchow revealed their malignant potential[2]. GCT represents approximately 5% of all primary bone tumours[2,3]. More than half of these lesions occur in the third and fourth decades of life, age group 15 to 40 year and there is slight female predominance(1.5:1) [3]. GCTs are benign tumours with potential for aggressive behaviour, high recurrence rate despite well curettage & adjuvants use and capacity to metastasize. There is no widely held consensus regarding the ideal treatment. There are advocates of varying surgical techniques ranging from intra-lesional curettage to wide resection. The goals of treatment are eradication of the tumour, preservation of limb function, and prevention of local recurrence and distant metastasis.

Local control without sacrificing joint function had traditionally been achieved by intralesional curettage with autograft reconstruction by packing the cavity of the excised tumour with morselized iliac corticocancellous bone. Regardless of how thoroughly performed intralesional excision leaves microscopic disease and hence has a reported recurrence rate as high as 60%. This had led surgeons to enhance their surgical procedure with use of chemical or physical adjuvants such as liquid nitrogen, acrylic cement, phenol, hydrogen peroxide, locally delivered chemotherapy, or radiation therapy [1,4].Extended curettage with adjuvants significantly decrease recurrence rate and improved functional outcome specially in cases where enough subchondral bone usually more than 1cm was there to prevent cement and other adjuvants cause late articular degeneration. But with lesion with close proximity to articular cartilage, there is always very high chances of late articular degeneration and joint disruption in revision surgery in case of recurrence.

To try and forestall this potential problem of late articular degeneration in subarticular lesions where the amount of residual subchondral bone after an extended curettage is less than 1 cm, a multilayer reconstruction technique(sandwich technique) is recommended [5]. A mixture of morselized auto and allograft (about 1 cm thick) is packed adjacent to the subarticular surface. A layer of gelfoam is layered over this and the remaining cavity is packed with cement. This helps reduce heat damage from the curing cement and the subarticular bone graft. Another perceived advantage is, that should recurrence occur, the danger of damage to articular cartilage during removal of cement is reduced.

AIMS AND OBJECTIVES

The present study is designed to assess and evaluate effectiveness of sandwich technique in giant cell tumour and compare our result with available literature by MSTS score.

MATERIAL AND METHODS

This hospital based randomized controlled study was held in the Department of Orthopaedics of Sawai Man Singh Medical College and Hospital, Jaipur from January 2015 to December 2016. It included 27 cases of giant cell tumour which treated with sandwich technique.

INCLUSION CRITERIA

1. Patients with history swelling around end of long bones with or without pain.
2. Biopsy report reveal giant cell tumour.
3. Patient willing for surgery.

The patients were subjected to routine blood investigations including total and differential leukocyte counts, blood haemoglobin level, renal profile, lever function test, calcium, phosphate, alkaline phosphate, chest x-ray and ECG. Measurements (cm) were taken of the height, width and depth of the lesion and documented. MRI scan is done of all patients to know extent of tumour. Written consent was obtained from patients before starting treatment. As a rule, pre-operative confirmation of diagnosis was performed using J-needle aspiration cytology or open biopsy in all patients except for 5 patients who had been biopsied at another laboratory and were later referred to us for definitive management. 2 cases are recurrence which are treated somewhere else primarily.

OPERATIVE TECHNIQUE

Torniquet was used in all patients. Before applying torniquet limb had been elevated for 3 to 4 minutes. The surgical technique of sandwich technique was contemplated by entering either from the limiting cortex or the side of erosion, as appreciated on a radiograph or MRI and then gradually enlarging the entry to a wide cortical window that provides visualization of the entire tumour cavity and permits digital palpation of the inner tumour walls. In recurrent lesion 2 case old surgical scar mark excised. The intraosseous tumour bulk was scooped out completely with a large curette until smooth cortical bony surface with punctate bleeding was visible, ensuring the undersurface of window.

The cavity was then enlarged in all directions using a high-speed burr, with care to avoid contamination of the surrounding soft tissues. Meticulous care was taken to ensure that all the involved bone and the possible contaminated surrounding soft tissue was excised. The curetted material was re-sent for histopathological examination. The cavity is cleaned multiple time with gauge soaked with H2O2 and later cavity was cleaned with 5% phenol, and phenol soaked gauze was placed inside the cavity for 2 minutes. In case of pathological fracture we use hydrogen peroxide. Care was taken not to spill the phenol to the surrounding tissues. Iliac crest is prepared for tricortical corticocancellous structural allografts. Largest fitting size of graft

were placed at subchondral level and rest of graft placed under it. All major pieces were fixed with multiple k wires. A layer of gel foam was laid over the allograft, and the remaining cavity was packed with CMW-1 cement. If strength of bone is compromised internal fixation is done with help of locking plate or k wire out of 27 patients we fix 10 patients with locking plate, 8 patients fixed internally with k wire and 7 patients doesn't need any supportive fixation.

AFTER SURGERY

Plain radiographs were taken post-operatively. Appropriate antibiotics were administered and sutures were removed after 2 weeks. Range of motion exercises of the joint above and below the lesion were started after suture removal. Non weight bearing with a pair of axillary crutches was allowed as soon as pain subsided on the third or fourth post-operative day and continued for 2 weeks and later on shifted on partial weight bearing. This was followed by cane support for 3–4 weeks. After a total period of 6-8 weeks, full weight bearing without support was allowed depending upon graft consolidation on x-ray. Patients were followed up every 4 week for 6 months, then every 3 month for next 6 month with radiographs and clinical examination.

Outcome analysis:

- Clinical evidence of recurrence
- Radiological evidence of recurrence.
- Evaluation of complications: infection, decrease range of motion around joint.
- Patient satisfaction at the end of the study at 1 year with help of MSTS scoring Musculoskeletal Tumor Society (MSTS) score, which involves 6 parameters (pain, function, emotional acceptance, use of walking aids, walking ability, and gait). Scores for each parameter range from 0 to 5. (higher score indicate excellent outcome)

OBSERVATIONS AND RESULT:

Between January 2015 and December 2016, 15 women and 12 men (F:M=1.25:1) aged 20 to 45 (mean +¬SD 26.59+ 5.83) years underwent intralesional curettage, use of phenol, and reconstruction using the sandwich technique. There were GCT of the proximal tibia (n=12), distal femur (n=13), distal tibia(n=2) . According to the Campanacci grading system(4) 1 tumours were classified as grade I (with a well defined margin and an intact cortex), 16 were grade II (with a relatively well-defined margin but no radiopaque rim, and the thinned and moderately expanded cortex), and 10 were grade III (3 with indistinct borders with cortical destruction and 4 associated with an extra-articular pathological fracture.). A total of 27 patients entered the study, 2 patients were lost in follow up (1 distal femur and 1 proximal tibia) due to non compliance and with a minimum follow up of 1 year. The largest lesion measured 10* 9* 6 cm and smallest lesion measured 5 * 4 * 3 cm on plain radiographs. Nearly all lesions showed cortical expansion. Out of 25 patients 7 patients did not need any internal fixatation and 18 patients fixed with either k wires or locking plate or both. With 23 patients had MSTS score of 26-30 and 2 patients had score of 15-20, the mean MSTS score was 27.4 out of 30 (standard deviation, 3; range, 19–30). None of the patient showed clinical and radiological evidence of recurrence at the end of 1 year. Two patients developed a superficial infection which was managed with prolonged antibiotic therapy. Two patients develop knee stiffness which was managed with knee mobilization exercises.

DISCUSSION:

The demographics of the current study were similar to previous studies[1,2,6]. In our series, the most common site of predilection was also around the knee joint (92.5%), and most patients were in their second and third decade; female slightly outnumbered men. GCT has historically been approached in a suitably aggressive manner. With the advent of bulk cortico-cancellous and massive osteoarticular allografts and later with the increased availability of endoprosthetic devices, en bloc resection often comes to replace intralesional procedures for local control of long bone GCT. Gitelis et al[7] reported no local recurrences after the treatment of 20 long bone GCT patients with en bloc resection after a mean follow-up of 92 months. Most recently, Mankin and Hornicek et al [8] reported a local recurrence rate of 6% in such cases. Because of the relatively high rate of major complications and the adverse functional effects of en bloc resection other modality of treatment gain popularity. Intralesional curettage alone has a high recurrence rate of 60%[9] whereas marginal/wide resection is associated with functional disability. Preservation of joint function is an advantage of intralesional curettage compared to wide resection. Intralesional treatment of long bone GCT gained renewed interest after the widespread introduction of PMMA [10] packing for this clinical situation in 1969, O'Donnell etal[10] reported a 25% local recurrence rate after the treatment of 60 GCT patients with curettage and packing with PMMA. However, acceptable rates of local control are still reported with allograft or autograft packing [11] or even no packing. In a recent study, Prosser etal[12] retrospectively reviewed 137 GCT patients treated primarily with curettage without adjuvant therapy over a 27-year period and reported an overall 19% local recurrence rate. In another recent study of 38 patients by Kafichitsas etal[13] in 2010, they reported a recurrence rate of 23.8% in bone cementing after curettage which was significantly lower than 52.9% recurrence rate of patients treated with cancellous bone filling or curettage alone. The benefits of decreased morbidity and improved function associated with intralesional procedures have been in general, thought to outweigh the disadvantage of a higher local recurrence and re-operation rate than was traditionally associated with en bloc procedures[14].

In our study, intralesional curettage and reconstruction with the sandwich technique achieved a good functional outcome (92.3%). To ensure thorough curettage, adequate exposure through a wide cortical window is necessary, followed by breaking the bony ridges in the tumor using a high-power burr. The use of 5% phenol decreases recurrence[15]. as phenol causes protein coagulation and necrosis and damages DNA. Structural autograft is laid in the subchondral region and overlaid with a layer of gel foam, and the rest of the cavity is filled with polymethylmethacrylate(PMMA) bone cement. The heating effect of cement destroys remaining tumour cells.The bone graft in the subchondral region helps maintain joint function and prevents articular degeneration. Care must be taken to prevent inadvertent cortical breach or removal of the posterior fibroperiosteal pseudocapsule during curettage. The posterior periosteum acts as a biological barrier, preventing the escape of bone graft or cement filled in the cavity. The risk of neurovascular injury by phenol increases if the posterior periosteum is deficient. Intact posterior periosteum is crucial for the reconstitution of the posterior cortex, especially after bone grafting[9]. The small crevices within this layer, potentially containing tumor cells, were treated with 5% phenol for 10 minutes. The cavity can be reconstructed with autograft, bone cement. The advantage of autograft is that if it is successfully incorporated, the reconstruction is permanent, and easily detecting recurrence . The benefits of bone cement include immediate weight bearing and its cytotoxic and thermal effects to minimise the risk of recurrence, but it is associated with degeneration of articular cartilage in the subchondral region of the weight bearing area[16]. Applying a layer of bone graft and gel foam not only protects the underlying articular cartilage from the thermal effect of the curing cement, but also supports the weakened subchondral area. A variety of adjuvant measures have been employed and reviewed for effectiveness. These additional steps include: mechanical burring, electrocautery, and/or the application of a variety of substances like hydrogen peroxide, phenol, and liquid nitrogen. Ward etal[5] reported a 6.4% rate of local recurrence after intralesional resection of GCT consisting of curettage, burring, hydrogen peroxide application, electrocautery, phenol irrigation, and reconstruction with PMMA. We used high speed burr and phenol or H2O2 as adjuvants in all our cases. But the use of phenol was restricted to patients with those without a breach in cortex and without any soft tissue extension. There is a theoretical concern of phenol toxicity following rapid absorption through cancellous bone. In one patient skin burn occur during use of phenol.

In all our cases, a pre-operative biopsy was performed which reported GCT in all 25 cases. Post operatively, all excised masses were sent for histopathological examination which confirmed it as GCT indicating 100% accuracy in confirming the diagnosis. The soft tissue which could have been contaminated with tumor cells during the biopsy should be included in the excision surgery.

Conclusion:

The early functional results are very encouraging with a rating of 92% (>23/25) with no recurrence. This indicates significant improvement in quality of life, emotional status and functional ability of the patients. Thus, the sandwich technique appears to be a viable alternative to wide resection.

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