Research

Minimally invasive surgery in the management of osteogenic benign neoplasm of spine

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Abstract

Osteogenic benign vertebral neoplasm is a relatively rare entity with a spectrum of treatment options. Optimal treatment decision is vital for definitive tissue diagnosis, reducing recurrence, and avoiding post-operative spinal instability. In this article, we describe the indications and advantages of minimally invasive spine surgery (MISS) in benign vertebral tumours.

Background

Osteogenic benign neoplasm of the spine is common in the second decade of life with male preponderance [1]. Although minimally invasive techniques including radiofrequency ablation are available, en-bloc resection is warranted in certain situations where differentiation between osteoid osteoma and osteoblastoma is weak, as osteoblastoma can be locally aggressive with growth potential and a higher chance of recurrence [2]. Conventional open surgery in this case is associated with disruption of normal anatomy with collateral damage to the soft tissue including muscles and ligaments [3]. Considering the younger age of the individuals affected by this lesion, all measures to prevent the collateral damage should be taken and we describe the utilization of the principles of minimally invasive spine surgery (MISS) for the same.

Case Presentation

Case 1

A 20-years-old male presented with pain in left thoracic region of back for the past 6 months that was more during the night time and significantly relieved with NSAIDs. Constitutional symptoms and history of significant trauma were absent. General examination revealed no neurocutaneous markers, ligamentous laxity and gait

disturbance. Examination of spine and neurology were normal except for tenderness in the upper thoracic spine at T3–4 level (corresponds to the spine of scapula) and painful restriction of movement. With infection and neoplasm as differentials laboratory investigations were done and markers for infection were negative. Magnetic resonance imaging (MRI) (Fig. 1) with computed tomography (CT) (fig.2) revealed an osteoblastic lesion with nidus in the left pedicle of third thoracic (T3) vertebra which is characteristic of osteoid osteoma.

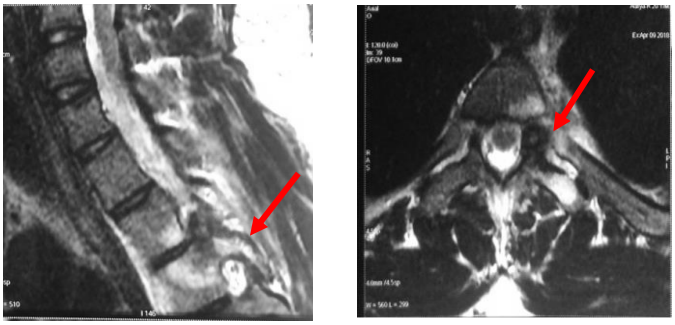

Fig. 1. MRI showing lesion with surrounding edema in left pedicle of T3 vertebra.

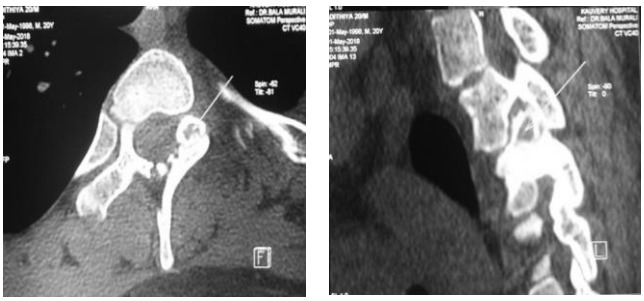

Fig. 2. CT images showing nidus.

Considering the close proximity to the thoracic spinal cord, surgical excision and biopsy was preferred over CT guided radiofrequency ablation. Complete resection of the lesion with clear margins (Fig. 3) was achieved with unilateral minimally invasive spine surgery using the quadrant retractor (Fig. 4), sparing the normal bony and soft tissue anatomy on the contralateral side. Histopathological examination confirmed the diagnosis of osteoid osteoma. The patient had very little surgical site pain that eliminated the need for ICU stay and opioid analgesics. At 2-years follow-up visit, he was completely symptom-free with no signs of recurrence or spinal instability.

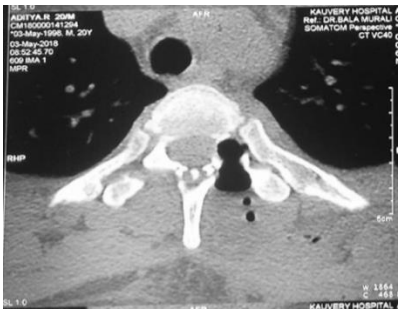

Fig. 3. Post-operative CT image showing complete removal of nidus.

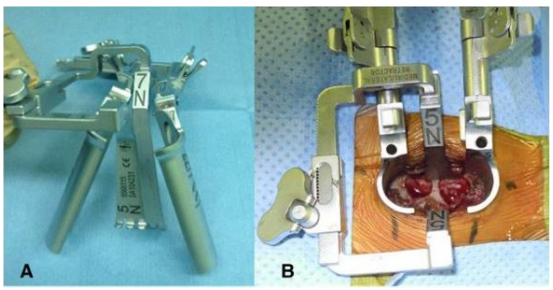

Fig. 4. METRxTM Quadrant retractor system.

Case 2

A 16-years-old boy who had mid back pain for past 3 months with no specific aggravating or relieving factors and no constitutional symptoms, presented with deformity in his upper back. Clinical examination revealed painful thoracic scoliosis with convexity towards right and apex at T7–8 level which exacerbated with Adam's forward bending test. Neurological examination was normal and laboratory markers for infection were negative. Radiological investigations (Figs. 5 and 6) exposed osteolytic lesion in posterior elements of T7 vertebra with extensive edema in adjacent bone and soft tissue.

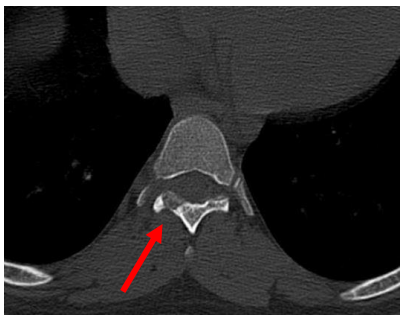

Fig. 5. CT image showing lytic lesion in neural arch of T7 vertebra.

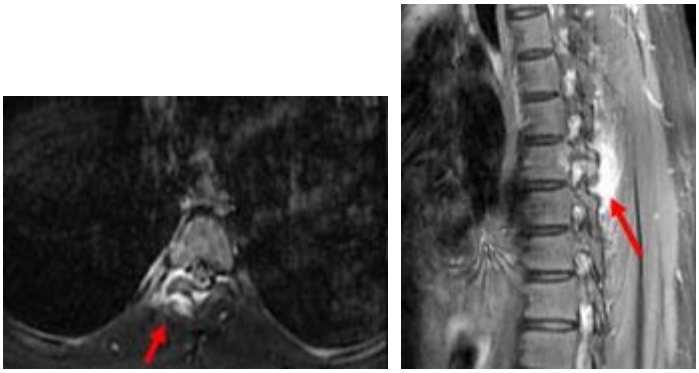

Fig. 6. Extensive perilesional edema in MRI suggestive of aggressive nature.

The aggressive nature of the lesion and inconclusive imaging diagnosis warranted total excision and biopsy, and hence the same was done utilizing minimally invasive spine surgery with quadrant retractor. The right half of lamina, inferior facet and part of pedicle of the T7 vertebra were removed to achieve clear margins (Fig. 7), which would have led to instability unless stabilized with implants in case of conventional open surgery. Histopathological examination showed sclerotic bony trabeculae admixed with fragments of anastomosing trabeculae of osteoid and woven bone rimmed by osteoblasts and scattered osteoclastic giant cells in the stroma which are features of osteoblastoma. The post-operative period was uneventful and the patient was mobilized out of bed on the same day of surgery.

Fig. 7. Post-operative CT image showing total tumour excision.

Discussion

Osteoid osteoma and osteoblastoma are benign bone forming tumours with characteristic nidus and are differentiated by the size of the lesion and nidus, and surrounding sclerosis [4]. The treatment options vary between the two; while osteoid osteoma can be managed with conservative measures (NSAIDs) expecting spontaneous regression [5], minimally invasive methods including CT guided percutaneous drilling [6] and radiofrequency (RF) ablation, and surgical excision, osteoblastoma needs total excision owing to its locally aggressive growth potential and recurrence chance [2].

Many authors advocate RF ablation as a superior treatment option for osteoid osteoma citing least invasiveness and quicker recovery [7]. However, RF ablation has reported disadvantages including a higher chance of recurrence, inadequate pain relief and infeasibility near neurovascular structures [8]. Lesion involving the pedicles and posterior neural arch usually drapes the duramater and RF ablation is contraindicated in lesions within 1 cm of vicinity to neural structures. Surgical excision of the lesion is devoid of these impediments, but traditional open surgery is associated with bigger scar, blood loss, muscle and ligament damage, excessive bone resection and resultant spinal segmental instability. In case of intra-operative segmental instability and to prevent post-laminectomy kyphosis, instrumented fusion is needed in open surgery.

MIS surgical excision was done in both cases which had the advantages of smaller skin incision, less muscle retraction and resultant damage, preservation of skeletal anatomy and less blood loss. Post-operative CT scan revealed complete removal of the tumour and preservation of entire spinous process, contralateral lamina, facet joint complex and posterior ligamentous complex. The integrity of these structures obviated the need for instrumented stabilization which is advantageous in two ways; chance of adjacent segment degeneration is reduced due to salvage of segmental mobility and better follow-up radiological imaging is facilitated with avoidance of implant-related metal artefact in MRI and CT scan.

Conclusion

MISS excision in osteogenic benign vertebral tumours has the proven advantage of complete clearance and hence less recurrence rate, adequate biopsy specimen, and feasibility of access near neurovascular structures compared to radiofrequency ablation and superior to open surgery in terms of preserving native anatomy and avoiding instrumented fusion. Hence, MISS tumour excision should be considered as the treatment of choice in indicated cases of vertebral osteogenic tumours.

Conflict of interest

Nil

Reference

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