

Primary Aneurysmal Bone Cyst of the Spine in Children: Outcomes of an Updated Modern Surgical Technique

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Background: Aneurysmal bone cysts (ABCs) are benign but locally aggressive lesions. Treating children with spinal involvement poses significant risks due to the proximity of the lesion to the spinal cord and the need to preserve spinal stability after surgery. This study reports the outcomes of an aggressive initial surgical technique for the treatment of aneurysmal bone cysts in children, as a way to reduce rates of reoperation. Major previous studies do not report outcomes on a uniform treatment approach and the patient population consists of both adults and children.

Question/ Purpose: The main objective was to report updated outcomes of an aggressive initial modern surgical management as a way to reduce rates of reoperation in pediatric spinal ABCs. We compared a four-step approach consisting of intralesional curettage, high-speed burr, wall electro-cauterization, and bone grafting, to the traditional approach of curettage and bone grafting. The secondary objective was to investigate whether the addition of phenol to the 4-step approach improved clinical outcomes.

Patients and Methods: We retrospectively reviewed twenty-nine cases of pathology-proven primary spinal ABCs surgically treated in a tertiary pediatric tumor center over a 24 year period (January 1990 to September 2014).

Results: The study group was composed of 12 males (41%) and 17 females (59%) with a mean age of 12.2 years (range 3.2 to 18.5) at the time of diagnosis and a mean postoperative follow up of 4.1 years (range 0.04 to 15.9). Seven of the ABCs were localized in the cervical region (24%), 8 in the thoracic region (28%), 11 the lumbar region (38%) and 3 in the sacral region (10%). Based on the Enneking staging system for benign tumors, 19 patients were Stage II (66%) while 10 patients were Stage III (34.5%). Overall, the mean time to presentation from onset of symptoms was 15.8 weeks. Pain was the universal presenting symptom for all 29 patients; 9 patients (31%) presented with reported radicular pain, 8 patients (28%) with sensory symptoms, 6 (21%) with motor weakness, 2 (7%) with long tract signs and 1 patient (3%) with bladder dysfunction. Regardless of the technique used, the presence of sensory symptoms at the time of presentation was a statistically significant factor in terms of recurrence rate ($p=0.016$). Seven patients (24%) presented with some degree of spinal deformity (mean Cobb angle 13.7°). Twenty one patients (72%) underwent the 4-step approach, while 8 patients (28%) were treated with the traditional technique. The mean blood loss was 825mL in the traditional group and 455mL in the 4-step group, $p>0.05$. There was one neuromonitoring change in each group, $p>0.05$, with no residual deficits at latest follow up. The recurrence rate was 50% (4/8 patients) with the traditional technique and 19% (4/21) in the 4-step group, $p=0.164$. In the 4-step group, 12/21 patients (57%) who additionally received phenol had slightly lower mean blood loss (368mL) and recurrence rates (17%), $p>0.05$.

Conclusion: This is the largest pediatric series of primary spinal ABCs. Although the recurrence rate with the modern technique is lower (19% vs 50%), the small number of patients did not allow us to prove statistical significance. The addition of phenol did not improve recurrence rates; we support that it can be a safe and helpful adjunct, especially in aggressive spinal ABCs. We suggest that addressing spinal ABCs in pediatric patients with a 4-step approach of intralesional curettage, high-speed burr, electrocautery and bone grafting (with or without phenol) is a safe technique that may decrease long term recurrence and reoperation rates, compared to the traditional technique of intralesional curettage and bone grafting.