

Results of cement augmentation and curettage in aneurysmal bone cyst of spine

Saumyajit Basu, Dharmesh R Patel, Gaurav Dhakal, T Sarangi

ABSTRACT

Aneurysmal bone cyst (ABC) is a vascular tumor of the spine. Management of spinal ABC still remains controversial because of its location, vascular nature and incidence of recurrence. In this manuscript, we hereby describe two cases of ABC spine treated by curettage, vertebral cement augmentation for control of bleeding and internal stabilization with two years followup. To the best of our knowledge, this is the first case report in the literature describing the role of cement augmentation in spinal ABC in controlling vascular bleeding in curettage of ABC of spine. Case 1: A 22 year old male patient presented with chronic back pain. On radiological investigation, there were multiple, osteolytic septite lesions at L3 vertebral body without neural compression or instability. Percutaneous transpedicular biopsy of L3 from involved pedicle was done. This was followed by cement augmentation through the uninvolved pedicle. Next, transpedicular complete curettage was done through involved pedicle. Case 2: A 15-year-old female presented with nonradiating back pain and progressive myelopathy. On radiological investigation, there was an osteolytic lesion at D9. At surgery, decompression, pedicle screw-rod fixation and posterolateral fusion from D7 to D11 was done. At D9 level, through normal pedicle cement augmentation was added to provide anterior column support and to control the expected bleeding following curettage. Transpedicular complete curettage was done through the involved pedicle with controlled bleeding at the surgical field. Cement augmentation was providing controlled bleeding at surgical field during curettage, internal stabilization and control of pain. On 2 years followup, pain was relieved and there was a stable spinal segment with well filled cement without any sign of recurrence in computed tomography scan. In selected cases of spinal ABC with single vertebral, single pedicle involvement; cement augmentation of vertebra through normal pedicle has an important role in surgery aimed for curettage of vertebra.

Key words: Cement augmentation, controlled bleeding, curettage, aneurysmal bone cyst of spine

MeSH terms: Bone neoplasms, bone cements, bone cysts, spine

INTRODUCTION

Aneurysmal bone cyst (ABC) is a destructive, vascular pathology of bone, representing 1-2% of primary bone tumour.¹⁻³ ABC is characterized by multilocular, sponge like appearance consisting of blood filled cavities separated by thin, fibrous septa. The core of the tumor consists of soft, fleshy and vascular tissue.⁴ Bleeding appears to come from the soft tissue lining the cysts and may be profuse and difficult to control until all the lining has been removed.⁴

Curettage is one of the treatment modality for ABC of spine. Problems encountered during curettage are bleeding due to vascularity, need for reconstruction and risk of recurrence.⁵ In this paper, we have described two cases with 2 years followup of ABC spine treated with vertebral cement augmentation for control of bleeding during curettage and internal stabilization. To the best of our knowledge, there are no cases reported presenting this technique to control blood field in a vascular spinal tumor like ABC.

CASE REPORTS

Case 1

A 22-year-old male presented with nonradiating chronic low back pain, since 9 months. There was increase in severity after falling down around 4 months back. On examination there was deep tenderness at L3 level without any deformity. Straight leg raising test was normal. There was no neurological deficit. X-ray, computed tomography (CT) scan and magnetic resonance imaging (MRI) findings [Figure 1A] suggested an expansile, multitrabeculated osteolytic lesions, with thinned out cortex at L3 vertebral body and left pedicle (probably ABC). Fine-needle aspiration cytology was done elsewhere,

Neuro-Spine Unit, Park Clinic, Minto-park, Kolkata, West-Bengal, India

Address for correspondence: Dr. Dharmesh R Patel,
6th Floor Reception, Park Clinic, Minto Park, Kolkata - 700 017, West Bengal, India.
E-mail: dharmeshjetani@gmail.com

Access this article online	
Quick Response Code:	Website: www.ijonline.com
	DOI: 10.4103/0019-5413.173523

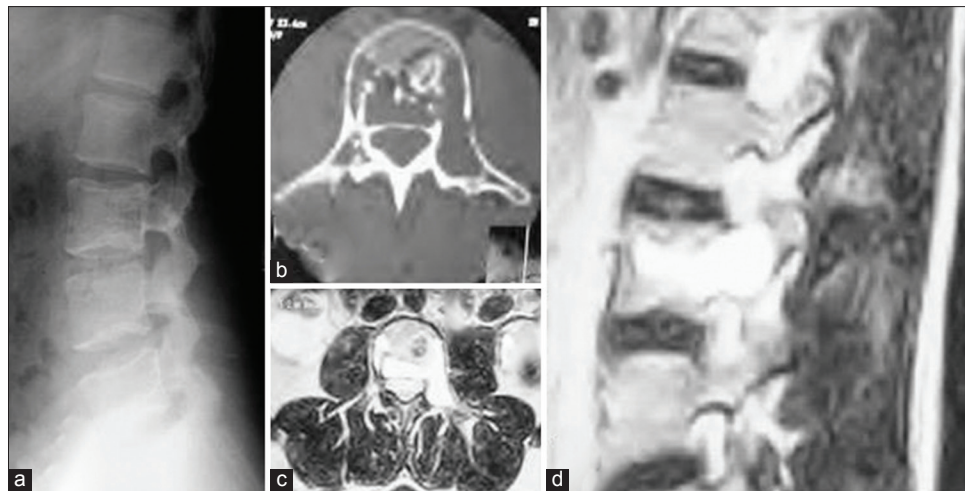


Figure 1A: Case 1 - A 22 year-old male patient with chronic back pain (a) X-ray lumbosacral spine lateral view and (b) axial computed tomography scan image showing osteolytic lesion at L3 vertebra (c and d) magnetic resonance imaging T2-weighted axial and sagittal showing hyper intense lesion with multilobulated cavity filled with fluid

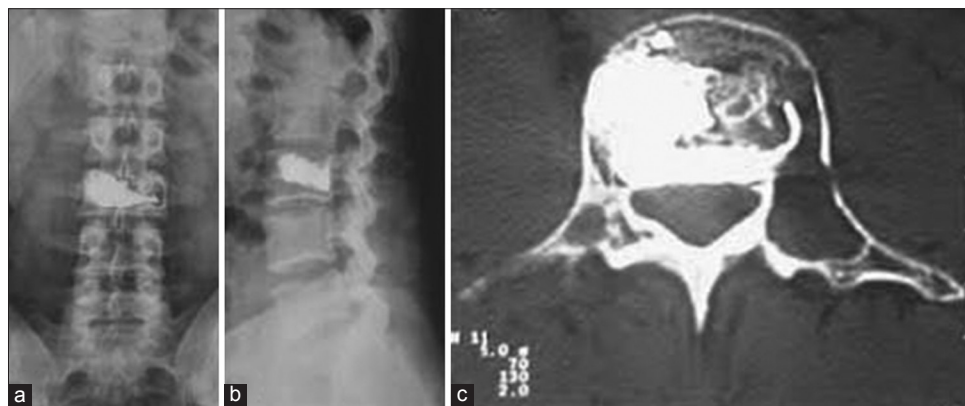


Figure 1B: Case 1 - (a and b) postoperative X-ray lumbosacral spine anteroposterior and lateral views showing well placed cement, (c) computed tomography scan on followup showing placement of cement

which was inconclusive. We did a transpedicular biopsy of L3 vertebra from the left pedicle followed by cement augmentation through the right (normal) pedicle was completed for internal stabilization and to control expected bleeding during curettage. After solidification of cement (around 12-15 min), curettage was completed from the left (involved) pedicle and a second sample. On histopathological review, the diagnosis of ABC was confirmed with findings of blood filled cavity, lined wall of fibrous tissue, macrophages, giant cell and island of bone. On followup, pain was relieved and there was stable spinal segment with well filled cement. CT scan done on followup [Figure 1B], confirmed good filling of cavity and no any signs of recurrence.

Case 2

A 15-year-old female, presented with acute onset, nonradiating back pain, aggravated by movement, for last 3 weeks and rapidly progressive lowerlimb weakness with difficulty in walking since 4 days. She had tenderness at D9-D10 with painful limited movements. Neurological examination revealed

spastic lower limbs, muscle power in all groups, on right side was 2/5 and left side 3/5, lower abdominal reflexes were absent, planters on both sides were extensor, both knee and ankle jerks were brisk, spinothalamic sensations were decreased below D10 by about 70%. Joint position sense in lower limbs was lost. Radiological investigation showed [Figure 2A] an osteolytic expansile, septate lesion involving D9 vertebral body, right pedicle and facet with decrease in height of D9 body leading to cord compression. Loculi with fluid-fluid levels in dependent regions were appreciable. At surgery, pedicle screwrod fixation was done from D7 to D11. At D9 level, through the right pedicle, cavity of the cyst was opened, biopsy was taken. There was profuse bleeding from the cavity which was not controlled by coagulation and pressure packing. Next, we approached the left pedicle for cement augmentation by a Jamshidi needle. We did cement augmentation of the highly vascularized body with care to avoid cement leakage in canal like monitor under fluoroscopy, cement injected slight more viscous state. After solidification of the cement and completion of exothermic reaction, we started curettage from right pedicle and found that

bleeding was stopped and surface of cyst wall was easily visible. Now, we were able to approach cyst wall for second biopsy sample collection and we could complete curettage of the cyst. Decompression of spinal cord was done. Posterolateral fusion was added. Postoperative neurology improved and mobilization was started on the 2nd postoperative day. Histopathological examination suggested diagnosis of ABC. Followup CT scan had confirmed, good filling of cavity with no sign of recurrence [Figure 2B].

DISCUSSION

Management for ABC spine is controversial.⁵ We hereby report an option of cement augmentation in selected cases treated with curettage. Goal of curettage is complete removal of cavity lining. Due to increased vascularity, it is often difficult to visualize the cavity following continuous bleeding from

the cavity surface. Increased vascularity occurs as a result of abnormal vessels lining the cavity as describe above. This bleeding is controlled after removal of cavity wall completely.^{4,5} Second problem is a need for reconstruction of spine after aggressive vertebral curettage.⁵ Recurrence after curettage is also an important issue to be addressed since recurrent rates are higher than those in complete en bloc vertebral removal.⁶ The treatment of recurrence remain curettage but it is important to diagnose the recurrence earlier.

To solve the above problems, we have done cement augmentation from the uninvolved pedicle, prior to curettage of the ABC cavity. Cement solidification is an exothermic reaction. The heat released during this reaction is good enough to potentially heat up the cement by several degrees during setting.⁷ Eriksson *et al.* study⁸ suggests that the high temperatures thus achieved can give rise to thermal necrosis of the surrounding tissue. Further this may also promote endothelial cell damage.⁹ The necrosis and endothelial damage promotes coagulation pathway locally. It results in vascular coagulation of vessels of the vertebral body and therefore control of bleeding during curettage. This controlled bleeding also allowed good curettage of the remaining cavity after filling with cement in our cases. In addition to controlled bleeding, local rise in temperature on the inner surface of the cavity produces antitumor effect due to the necrosis of the bony area in contact with cement.¹⁰ According to San Millán Ruíz *et al.* antitumor effect of



Figure 2A: Case 2 – A 15-year-old female with acute back pain (a and b) sagittal and axial computed tomography showing osteolytic lesion in D9 magnetic resonance imaging T2-weighted axial (c) and sagittal (d) showing hyperintense lesion in D9



Figure 2B: Case 2 (a) Postoperative X-ray anteroposterior and lateral views showing implant and cement *in situ* (b) followup computed tomography scan sagittal and axial cuts showing implant and cement *in situ*



Figure 3: Schematic representation of (a) Preoperative (b) after cement augmentation and curettage showing position of needle, cement and cavity

polymethylmethacrylate (PMMA) cement is also attributed to the cytotoxicity of the PMMA monomer.¹¹ Further, cement bone interface is well defined healing of the lesion on followup images.^{12,13} It is well known that cement augmentation provides filling of defect and stabilization alone or in combination with fixation. This may obviate complex and morbid reconstruction surgery after extensive curettage and resection.

In our first case, during surgery there was profuse bleeding from the cavity which limited us from proceeding on with surgery. We did cement augmentation from the opposite side [Figure 3]. We found that after the completion of cement solidification and the exothermic reaction, complete hemostasis was achieved. Part of the cyst lining in contact with the cement is likely to be damaged and necrosed by the exothermic reaction of cement. We were able to complete the curettage of the remaining cyst. Evaluating the volume and distribution of cement in the affected vertebral body, it was found to be sufficient for the stabilization of spine. We have found the same advantage in the second case. As there was collapse of the body; we have taken extra care to avoid leakage of cement with proper monitoring under image intensifier, cement injection in more viscous consistency and vertebroplasty after decompression laminectomy to provide direct visual monitoring. In both the cases after 2 years, we had done CT scan and X-ray to see whether there is any further destruction. However, we did not find any recurrence in both the cases. However, due to slow growth in the ABC and the young age of the affected population, long term followup (>5 years) is recommended to address recurrences.^{14,15}

In our experience of these cases, cement augmentation in addition to curettage is useful in selected cases of ABC with single vertebral involvement, single pedicle involvement.

REFERENCES

1. Jaffe HL, Lichtenstein L. Solitary unicameral bone cyst: With emphasis on the roentgen picture, the pathologic appearance and the pathogenesis. *Arch Surg* 1942;44:1004-25.
2. Vandertop WP, Pruijs JE, Snoeck IN, van den Hout JH. Aneurysmal bone cyst of the thoracic spine: Radical excision

with use of the cavitron. A case report. *J Bone Joint Surg Am* 1994;76:608-11.

3. Mohan V, Arora MM, Gupta RP, Izzat F. Aneurysmal bone cysts of the dorsal spine. *Arch Orthop Trauma Surg* 1989;108:390-3.
4. Hay MC, Paterson D, Taylor TK. Aneurysmal bone cysts of the spine. *J Bone Joint Surg Br* 1978;60-B: 406-11.
5. Liu JK, Brockmeyer DL, Dailey AT, Schmidt MH. Surgical management of aneurysmal bone cysts of the spine. *Neurosurg Focus* 2003;15:E4.
6. Oliveira AM, Perez-Atayde AR, Inwards CY, Medeiros F, Derr V, Hsi BL, *et al.* USP6 and CDH11 oncogenes identify the neoplastic cell in primary aneurysmal bone cysts and are absent in so-called secondary aneurysmal bone cysts. *Am J Pathol* 2004;165:1773-80.
7. Vallo CI. Theoretical prediction and experimental determination of the effect of mold characteristics on temperature and monomer conversion fraction profiles during polymerization of a PMMA-based bone cement. *J Biomed Mater Res* 2002;63:627-42.
8. Eriksson RA, Albrektsson T, Magnusson B. Assessment of bone viability after heat trauma. A histological, histochemical and vital microscopic study in the rabbit. *Scand J Plast Reconstr Surg* 1984;18:261-8.
9. Dahl OE, Garvik LJ, Lyberg T. Toxic effects of methylmethacrylate monomer on leukocytes and endothelial cells *in vitro*. *Acta Orthop Scand* 1994;65:147-53.
10. Belkoff SM, Molloy S. Temperature measurement during polymerization of polymethylmethacrylate cement used for vertebroplasty. *Spine (Phila Pa 1976)* 2003;28:1555-9.
11. San MillánRuiz D, Burkhardt K, Jean B, Muster M, Martin JB, Bouvier J, *et al.* Pathology findings with acrylic implants. *Bone* 1999;25:85S-90.
12. Remedios D, Saifuddin A, Pringle J. Radiological and clinical recurrence of giant-cell tumour of bone after the use of cement. *J Bone Joint Surg Br* 1997;79:26-30.
13. Puri A, Agarwal M. Treatment of giant cell tumor of bone: Current concepts. *Indian J Orthop* 2007;41:101-8.
14. Boriani S, De Iure F, Campanacci L, Gasbarrini A, Bandiera S, Biagini R, *et al.* Aneurysmal bone cyst of the mobile spine: Report on 41 cases. *Spine (Phila Pa 1976)* 2001;26:27-35.
15. Tillman BP, Dahlin DC, Lipscomb PR, Stewart JR. Aneurysmal bone cyst: An analysis of ninety-five cases. *Mayo Clin Proc* 1968;43:478-95.

How to cite this article: Basu S, Patel DR, Dhakal G, Sarangi T. Results of cement augmentation and curettage in aneurysmal bone cyst of spine. *Indian J Orthop* 2016;50:99-102.

Source of Support: Nil, **Conflict of Interest:** None.