ScientificScholar®
Knowledge is power
Publisher of Scientific Journals

www.surgicalneurologyint.com

Surgical Neurology International

Editor-in-Chief: Nancy E. Epstein, MD, Clinical Professor of Neurological Surgery, School of Medicine, State U. of NY at Stony Brook.

SNI: Spine

Editor
Nancy E. Epstein, MD
Clinical Professor of Neurological Surgery, School of Medicine, State U. of NY at Stony Brook

SNI
Open Access

Original Article

Spinal osteoid osteoma: Surgical resection and review of literature

Abhinandan Reddy Mallepally, Rajat Mahajan, Sandesh Pacha, Tarush Rustagi, Nandan Marathe, Harvinder Singh Chhabra

Spine Services, Indian Spinal Injuries Centre, New Delhi, India.

E-mail: *Abhinandan Reddy Mallepally - mabhi28@gmail.com; Rajat Mahajan - rajatmahajan17@gmail.com; Sandesh Pacha - sandesh.pacha1@gmail.com; Tarush Rustagi - tarush.rustagi@gmail.com; Nandan Marathe - nandanmarathe88@gmail.com; Harvinder Singh Chhabra - issicon@isiconline.org

***Corresponding author:**
Abhinandan Reddy Mallepally, Spine Services, Indian Spinal Injuries Centre, New Delhi, India.

mabhi28@gmail.com

Received : 10 August 2020
Accepted : 29 August 2020
Published : 25 September 2020

DOI:
10.25259/SNI_510_2020

Quick Response Code:

ABSTRACT

Background: Osteoid osteoma (OO) is a rare benign tumor of the spine that involves the posterior elements with 75% tumors involving the neural arch. The common presenting symptoms include back pain, deformity like scoliosis, and rarely radiculopathy.

Methods: From 2011 to 2017, we evaluated cases of OO managed by posterior surgical resection while also reviewing the appropriate literature.

Results: We assessed five patients (three males and two females) averaging 36.60 years of age diagnosed with spinal OOs. Two involved the lumbar posterior elements, two were thoracic, and one was in the C3 lateral mass. All patients underwent histopathological confirmation of OO. They were managed by posterior surgical resection with/without stabilization. No lesions recurred over the minimum follow-up period of 24 months.

Conclusion: Surgical excision is the optimal treatment modality for treating spinal OOs. The five patients in this study demonstrated good functional outcomes without recurrences. Further, the literature confirms that the optimal approach to these tumors is complete surgical excision with/without radiofrequency ablation.

Keywords: Gross total resection, Osteoid osteoma, Posterior elements, Radiofrequency ablation, Resection, Spinal involvement, Tumor

INTRODUCTION

Osteoid osteoma (OO) is a benign tumor which accounts for 10–40% of spine tumors; the majority involve the lumbar spine (59%), and especially the neural arch (75%). Typical clinical presentations include night pain/back pain/stiffness markedly relieved by nonsteroidal anti-inflammatory medications. Treatment options for OO include conservative management with anti-inflammatory agents, surgical curettage, partial excision, marginal or gross total *en bloc* excision, and with/without radiofrequency ablation.[1] Here, we reviewed five cases of OO, along with their clinical presentations, radiographic appearances, surgical management, and outcomes along with an appropriate focused review of the literature.

MATERIALS AND METHODS

After approval from the Institutional Review Board, five patients' clinical symptoms, radiological studies (MR/CT), surgical details (posterior decompressions/resections), outcomes/pain scores, and recurrence rates were studied from 2011 to 2017. We also did a literature review regarding the relevant articles in PubMed and Medline databases [Table 1].[1-16]

RESULTS

The five patients who all presented with back pain attributed to OO averaged 36.6 years of age and included three males

Table 1: Summary of literature.

Author	Title	Study design	Level involved	Procedure done	Outcome
Yang *et al.*, 2018	RFA OO at C1	Case report	C1 Rt lateral mass	Radiofrequency ablation	Complete relief
Fielding *et al.*,[10] 1977	OO-C	Case report	C1 posterior element	*En bloc* resection	Complete relief
Amirjamshidi *et al.*,[11] 2010	OO C1 and C2	Case report	C1-1-Lateral mass C2-3 case Vb, Dens – 2 Lateral mass – 1	Hemilaminectomy. Anterior retropharyngeal approach	Complete relief
Etemadifar *et al.*,[12] 2015	Surgery 19 cases of OO	Case report	Cervical – 25% Thoracic –35% Lumbar – 35% Sacrum – 5%	Open excision	Complete relief
Zou *et al.*, 2016[13]	1 Case OO	Case report	Rt L5 lamina	Posterior surgical resection	Near-total relief
Nebreda *et al.*,[14] 2018	1 case OO L4 transverse process	Case report	Left transverse process L4	Surgical excision	Complete relief
Zhang *et al.*,[15] 2016	Scoliosis secondary to lumbar OO	Case report	Inferior articular process L5	Surgical excision	Complete relief
Gasbarrini *et al.*,[3] 2011	Osteoid osteoma of the mobile spine	Retrospective review	26 – cervical 27 – thoracic 28 – lumbar Vb – 18 Pars – 59 Spinous process – 4	Surgical excision	Complete relief
Rehnitz *et al.*,[7] 2013	CT-guided RFA of OO in 77 patients	Retrospective cohort	Thoracic – 3 posterior arch Lumbar – 2 Sacral – 1	CT-guided radiofrequency ablation	Complete relief
Wang *et al.*,[9] 2017	Percutaneous RFA for spinal OO	Retrospective study		Radiofrequency ablation	Complete relief
Schaffer *et al.*,[16] 2010	1 case cervical spine OO	Case report	C5 posterior element	Surgical excision	Complete relief
Albisinni *et al.*,[18] 2017	Spinal OO: efficacy and safety of RFA	Prospective study	7 cervical 12 thoracic 28 lumbar 14 sacral Posterior element	Radiofrequency ablation 57 cured 4 relapse – 2 underwent surgical excision, 2 radiofrequency ablation	Near total relief in all cases
Rybak *et al.*,[8] 2010	Thermal ablation of spinal OO	Retrospective study	3 cervical 6 thoracic 7 lumbar 1 sacral 2 in Vb 1 in dens Other in posterior elements	Radiofrequency ablation	Complete cure

(Contd...)

Table 1: *(Continued)*.

Author	Title	Study design	Level involved	Procedure done	Outcome
Cové *et al*.,[1] 2010	Spinal OO treated with percutaneous CT-guided thermocoagulation.	Case report	Lumbar	Radiofrequency ablation	Complete relief
Laus *et al*.,[6] 1998	6 cases of cervical OO		Cervical	6 cases surgical excision 1 c4 vertebral body, 2 transverse process c5 and c6, 3 cases pedicle 3 radiofrequency ablation 2 spinous process c2 1 case c3 vertebra	Complete relief
Alexander *et al*.,[4] 2009	Percutaneous core excision and RFA in spinal OO	Prospective study 4.2±1.6	L3, l4 articular process and lamina D9 pedicle L3 vertebral body C5 articular process	4 patients radiofrequency ablation 3 core excision	Complete relief
Faddoul *et al*.,[2] 2017	RFA in spinal OO: a prospective study	Prospective study 12 months	Left L4, L5, Right D10, D11 pedicle D9 vertebral body L1, L4 isthmus C7 facet	Radiofrequency ablation	Complete relief
Kadhim *et al*.,[5] 2016	Surgical resection spinal OO	Retrospective cohort	6 Cervical 1 thoracic 3 lumbar C2, c3, c7, d6, l5, l3 pedicle C2 spinous process C3 lateral mass L5 lamina, l3 lamina	Surgical excision 1 c2 pedicle osteoid osteoma had recurrence	Complete relief

and two females. Lesions were located in the posterior elements of the lumbar (two patients), thoracic (two patients), and cervical spine (one patient) [Table 2]. The histopathological examination confirmed OO in all cases. All patients had good clinical outcomes with VAS scores improving to <2 postoperatively [Table 3].

Case 1

A 26-year-old male presented with low back pain with CT scan showing a L4 pedicle lesion with lysis of pars [Figure 1]. He underwent intralesional curettage, bone grafting, and bilateral pedicle screw fixation.

Case 2

A 63-year-old female presented with back pain with CT scan showing a hyperdense sclerotic lesion at the right D9 pedicle/lamina. Transpedicular biopsy with posterior D8-D10 fusion was done [Figure 2].

Case 3

A 43-year-old male presented with a CT scan demonstrating hyperdense left sided C3 lateral mass for which he underwent a curettage without instrumentation [Figure 3].

Case 4

A 15-year-old female presented with a left-sided L5 laminar lesion for which she underwent decompression in the form of L5 laminectomy with transforaminal lumbar interbody fusion [Figure 4].

Case 5

A 26-year-old male with pain in thoracic region underwent left T10 hemilaminectomy with bone grafting and D8 to D10 fusion [Figure 5].

Table 2: Demographic, clinical details, and location of lesion across the cohort.

Age (years)	Male	Symptom	VAS	Location	Site
26	Male	Back pain, leg pain	7	Lumbar	Right L4 pedicle
63	Female	Back pain	7	Thoracic	Right D9 pedicle and lamina
43	Male	Neck pain, arm pain	6	Cervical	Left C3 lateral mass
15	Female	Back pain	7	Lumbar	Left L5 lamina
26	Male	Back pain	7	Thoracic	Left D10 lamina

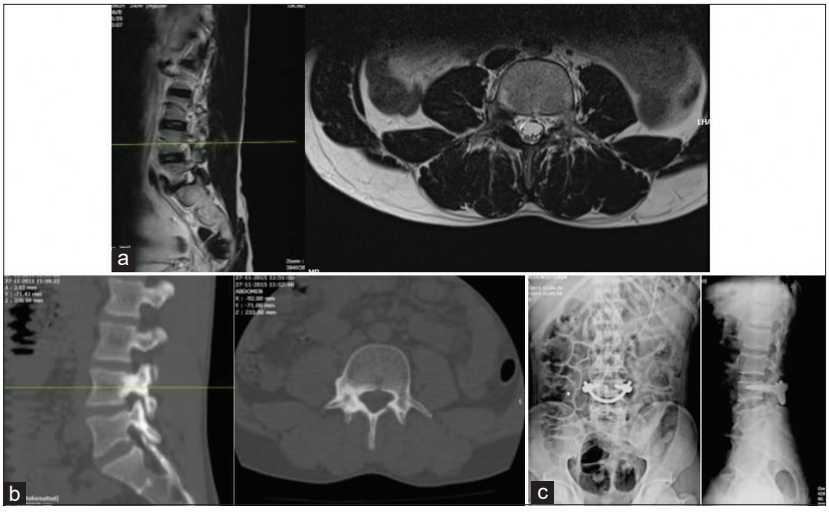

Figure 1: (a) Preoperative sagittal and axial T2-weighted MRI showing osteoid osteoma at L4 pedicle with pars lysis. (b) Sagittal and axial CT scan showing osteoid osteoma involving L4 pedicle with lysis of pars (c). (c) Postoperative X-ray showing bilateral pedicle screw fixation with the left pars bone grafting.

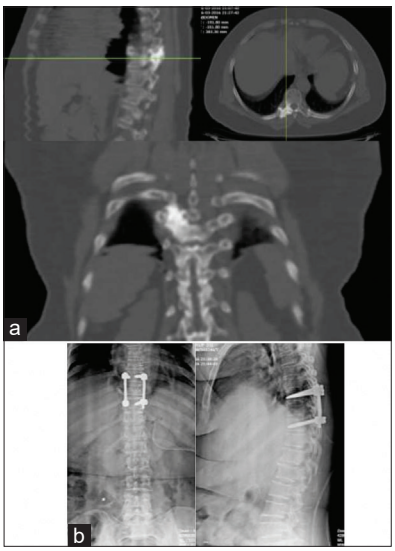

Figure 2: (a) Preoperative CT scan (sagittal/axial/coronal) showing osteoid osteoma involving the right D9 pedicle and lamina. (b) Postoperative X-ray showing pedicle screw stabilization at D8 and D10 level.

DISCUSSION

OO is a benign skeletal neoplasm consisting of a highly vascularized nidus of connective tissue surrounded by sclerotic bone. The size of the nidus (15 mm) distinguishes it from osteoblastoma. OO comprises 10% of all benign bone tumors and only 1% of all spinal tumors. It mainly involves the lumbar spine with predilection for posterior elements seen in 75% of cases.[1,2] Pars interarticularis is the most common site of involvement. OOs are usually seen in patients under the age of 30 with a male preponderance (sex ratio – 2–4:1).[3] The most common clinical symptom is night pain (up to 80–100%) believed to be due to prostaglandin/prostacyclin production) and painful scoliosis (63–70%). Nonsteroidal anti-inflammatory drugs effectively relieve pain by pain reducing inflammation.[3] Radionuclide bone scanning remains the most sensitive tool for localization. It reveals focal increased uptake surrounded by a decreased uptake due to the sclerotic bone known as the "Double density" sign.

Surgical intralesional excision has been the commonly accepted treatment for a long time.[3,5] The goal of OO surgery is to remove the nidus entirely without causing pathologic fracture, especially of the facets and pedicles or disrupting the adjacent uninvolved tissues. The posterior approach was carried out in all the surgical patients. Three patients underwent laminectomy and one patient underwent lateral mass partial resection of tumor [Table 3]. Four patients

Table 3: Procedure done and the outcome.

Case No.	Treatment	Recurrence	VAS at latest follow-up	Complications
1	Posterior surgical curettage and bilateral pedicle screw fixation with left pars bone grafting with stabilization using V rod	No recurrence	1	None
2	Posterior transpedicular biopsy and posterior stabilization D8 to D10	No recurrence	1	None
3	C3 left lateral mass partial excision with curettage	No recurrence	1	None
4	Posterior decompression L5 laminectomy and transforaminal lumbar interbody fusion with stabilization L5-S1	No recurrence	1	None
5	Left hemi laminectomy D10, with bone grafting and fixation D9 to D10 left side	No recurrence	2	None

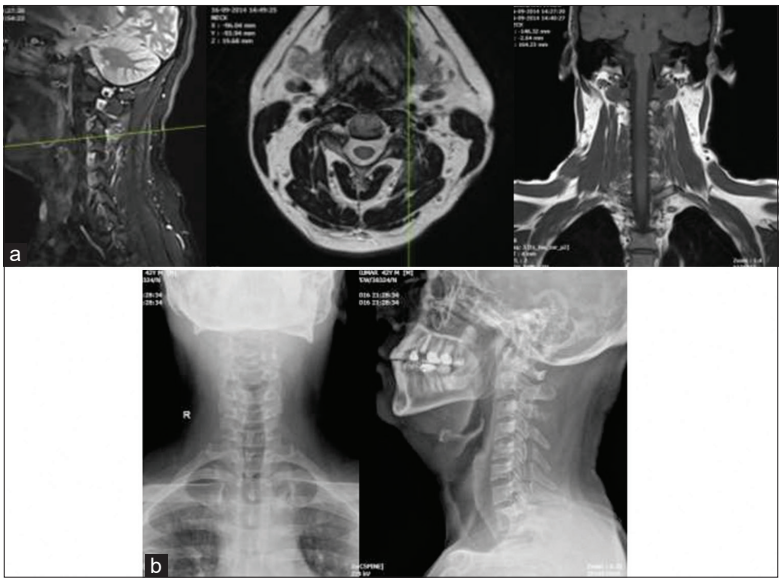

Figure 3: (a) MRI showing lesion involving C3 lateral mass on the left side. (b) Postoperative AP and lateral X-ray following curettage and excision without stabilization for C3 osteoid osteoma.

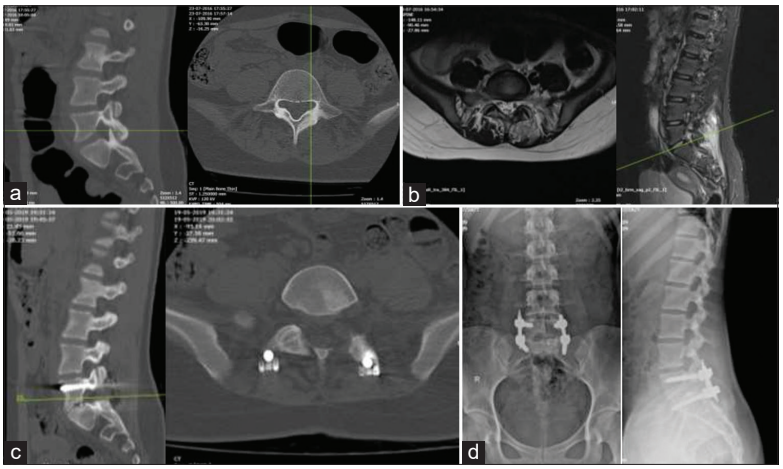

Figure 4: (a) Sagittal and axial CT scan demonstrating osteoid osteoma involving left L5 pedicle and lamina. (b) Sagittal and axial T2-weighted MRI showing lesion involving left L5 pedicle and lamina. (c) Postoperative CT scan demonstrating complete excision of lesion. (d) Postoperative AP and lateral X-ray showing pedicle screw fixation (L5, S1).

Figure 5: (a) Sagittal MRI showing lesion involving the D10-D11 facet. (b) Postoperative CT scan following excision of lesion and fixation at D9 and D11 vertebral level.

underwent fusion with instrumentation. Literature shows that the rate of recurrence of OO is higher after intralesional resection compared with *en bloc* resection.[3,5] We did not have any recurrence in our series. No patient deteriorated neurologically after surgical excision. Although percutaneous CT-guided radiofrequency ablation is also accepted as the standard treatment for OO due to fewer complications and shorter length of hospital stay, the risk of thermal damage to adjacent neurovascular structures remains.[4,6-9]

CONCLUSION

OO is a rare benign tumor, commonly involving the posterior elements of the lumbar, thoracic, and cervical spine in descending order of frequency. Gross total surgical excision with/without radiofrequency ablation is the optimal treatment, resulting in good functional outcomes and rare recurrences.

Declaration of patient consent

Institutional Review Board permission obtained for the study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Cové JA, Taminiau AH, Obermann WR, Vanderschueren GM. Osteoid osteoma of the spine treated with percutaneous computed tomography-guided thermocoagulation. Spine (Phila Pa 1976) 2000;25:12836)
2. Faddoul J, Faddoul Y, Kobaiter-Maarrawi S, Moussa R, Rizk T, Nohra G, *et al*. Radiofrequency ablation of spinal osteoid osteoma: A prospective study. J Neurosurg Spine 2017;26:313pin
3. Gasbarrini A, Cappuccio M, Bandiera S, Amendola L, Van Urk P, Boriani S. Osteoid osteoma of the mobile spine: Surgical outcomes in 81 patients. Spine (Phila Pa 1976) 2011;36:2089-93.
4. Hadjipavlou AG, Tzermiadianos MN, Kakavelakis KN, Lander P. Percutaneous core excision and radiofrequency thermo-coagulation for the ablation of osteoid osteoma of the spine. Eur Spine J 2009;18:345 P.
5. Kadhim M, Binitie O, O'Toole P, Grigoriou E, De Mattos CB, Dormans JP. Surgical resection of osteoid osteoma and osteoblastoma of the spine. J Pediatr Orthop B 2017;26:362hop
6. Laus M, Albisinni U, Alfonso C, Zappoli FA. Osteoid osteoma of the cervical spine: Surgical treatment or percutaneous radiofrequency coagulation? Eur Spine J 2007;16:2078 ost
7. Rehnitz C, Sprengel SD, Lehner B, Ludwig K, Omlor G, Merle C, *et al*. CT-guided radiofrequency ablation of osteoid osteoma and osteoblastoma: Clinical success and long-term follow up in 77 patients. Eur J Radiol 2012;81:3426 adi
8. Rybak LD, Gangi A, Buy X, La Rocca Vieira R, Wittig J. Thermal ablation of spinal osteoid osteomas close to neural elements: Technical considerations. AJR Am J Roentgenol 2010;195:W293tge
9. Wang B, Han SB, Jiang L, Yuan HS, Liu C, Zhu B, *et al*. Percutaneous radiofrequency ablation for spinal osteoid osteoma and osteoblastoma. Eur Spine J 2017;26:1884usr
10. Fielding JW, Keim HA, Hawkins RJ, Gabrielian JC. Osteoid osteoma of the cervical spine. Clin Orthop Relat Res 1977;128:163-4.
11. Amirjamshidi A, Roozbeh H, Sharifi G, Abdoli A, Abbassioun K. Osteoid osteoma of the first 2 cervical vertebrae. Report of 4 cases. J Neurosurg Spine 2010;13:707-14.
12. Etemadifar MR, Hadi A. Clinical findings and results of surgical resection in 19 cases of spinal osteoid osteoma. Asian Spine J 2015;9:386-93.
13. Zou MX, Lv GH, Li J, Wang XB. Osteoid osteoma at the posterior element of lumbar spinal column in a young boy. Spine J 2016;16:e651-2.
14. Nebreda CL, Vallejo R, Mayoral-Rojals V, Ojeda A. Osteoid osteoma: Benign osteoblastic tumor of the lumbar l4 transverse process associated with radicular pain: A case report. Pain Pract 2018;18:118-22.
15. Zhang H, Niu X, Wang B, He S, Hao D. Scoliosis secondary to lumbar osteoid osteoma: A case report of delayed diagnosis

and literature review. Medicine (Baltimore) 2016;95:e5362.
16. Schaffer V, Wegener B, Dürr HR. Classical surgical resection of osteoid osteoma of the cervical spine. Acta Chir Belg 2010;110:603-6.

How to cite this article: Mallepally AR, Mahajan R, Pacha S, Rustagi T, Marathe N, Chhabra HS. Spinal osteoid osteoma: Surgical resection and review of literature. Surg Neurol Int 2020;11:308.