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. 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...
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 intrasional 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].
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.\textsuperscript{[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).\textsuperscript{[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.\textsuperscript{[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.\textsuperscript{[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

\begin{table}[h]
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\begin{tabular}{|l|c|c|c|c|}
\hline
Age (years) & Male & Symptom & VAS & Location & Site \\
\hline
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 \\
\hline
\end{tabular}
\caption{Demographic, clinical details, and location of lesion across the cohort.}
\end{table}

\textbf{DISCUSSION}

OO is a benign skeletal neoplasm consisting of a highly vascularized nidus of connective tissue surrounded by

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1}
\caption{(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.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure2}
\caption{(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.}
\end{figure}
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).
underwent fusion with instrumentation. Literature shows that the rate of recurrence of OO is higher after intralesion resection compared with en bloc resection.\(^1,2\) 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.\(^3,4-9\)

**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.

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Nil.

**Conflicts of interest**

There are no conflicts of interest.

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