Al-Azhar International Medical Journal

Volume 5 | Issue 1 Article 19

2024
Section: Orthopedics

# Endoscopic Assisted Management of Benign Osteolytic Bone Lesions

Ahmed Mohamed Shawky
*orthopedic Surgery department Police authority hospitals, Cairo, Egypt*, Dr.shawkey@yahoo.com

Mahmoud Seddik Hassan
*Professor of orthopedic surgery - Faculty of medicine - Al-azhar University*

Amro Ahmed Fouaad Attia
*Assistant professsor of orthopedic surgery - Faculty of medicine - Al-azhar University*

Ahmed Ismail Hammouda
*Lecturer of orthopedic surgery - Faculty of medicine - Al-azhar University*



## How to Cite This Article

Shawky, Ahmed Mohamed; Hassan, Mahmoud Seddik; Attia, Amro Ahmed Fouaad; and Hammouda, Ahmed Ismail (2024) "Endoscopic Assisted Management of Benign Osteolytic Bone Lesions," *Al-Azhar International Medical Journal*: Vol. 5: Iss. 1, Article 19.
DOI: https://doi.org/10.58675/2682-339X.2202

ORIGINAL ARTICLE

# Endoscopic-assisted Management of Benign Osteolytic Bone Lesions

Ahmed Mohamed Shawky Mohamed [a,*], Mahmoud Seddik Hassan [b], Amro Ahmed Fouaad Attia [b], Ahmed Ismail Hammouda [b]

[a] Department of Orthopedic Surgery, Police Authority Hospitals, Egypt
[b] Department of Orthopedic Surgery, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

**Abstract**

*Background*: **Benign lytic bone lesions manifest in various clinical and histopathological forms. The most common lytic lesions are unicameral bone cysts, giant cell tumors, aneurysmal bone cysts, fibrous dysplasia, osteoblastomas, and enchondromas. They are rarely symptomatic and usually diagnosed accidently on imaging. Treatment options range widely from conservative treatment with regular follow-ups to many surgical interventions without significant established consensus to support any of them.**

*Aim*: **This study evaluates the outcome of endoscopic-assisted management of benign osteolytic bone lesions with a 2 year of follow-up.**

*Patients and methods*: **In this prospective study, 20 patients with benign osteolytic lesions underwent endoscopic-assisted curettage and space filling either by cement or bone graft. The functional outcome is assessed using the Musculoskeletal Tumor society score and follow-up continued for 2 years to assess the precedence of complications and recurrence.**

*Results*: **The functional outcome of the studied patients according to the Musculoskeletal Tumor Society score ranged from 18 to 30 with a mean of 27.10 ± 3.28(SD), while the preoperative mean score is 18.3 ± 1.64 (SD); 17 (85%) patients scored excellent (≤26), one (5%) patient scored good (22), and two (10%) patients scored poor (<20).**

*Conclusion*: **In this study, the endoscopic-assisted curettage of osteolytic lesions showed a shorter healing time, faster recovery, and a lower rate of complications than conventional open curettage and the functional outcome is relatively comparable.**

*Keywords:* Endoscopic curettage, Endoscopy, Osteolytic lesions, Space filling

## 1. Introduction

Benign lytic bone lesions are relatively uncommon and have a wide and different range of clinical presentations and pathological diagnosis. The WHO classification of bone lesions relies on the biological activity of the lesions, dividing them into 'intermediate' (locally aggressive)' and 'intermediate (very rarely metastatic).' Other classifications depend on the type of matrix production or otherwise clinical, radiological criteria and histological features.[1,2]

These tumors also can be classified based on their cell origin: bone-forming, fibrous origin, cartilage-forming, and also vascular. The incidence of benign lesions is difficult to calculate because of being mostly asymptomatic and hard to detect, these bone lesions are mostly painless but they may present with pain, which may be activity-related or caused by periostitis.[3,4]

Plain radiograph is the first and the most important diagnostic tool for osteolytic lesions. The two most important aspects of evaluating a bone tumor are the location of the tumor and the age of the patient. Radiologic appearance on plain film helps differentiate benign from malignant lesions. The tumor border is one of the key factors to

Accepted 10 January 2024.
Available online 15 March 2024

* Corresponding author at: 11th building, Street no. 9 Madinet El-Mwazfen, Helwan, Cairo, 11731, Egypt.
E-mail address: dr.shawkey@yahoo.com (A.M.S. Mohamed).

https://doi.org/10.58675/2682-339X.2202

differentiate between benign and malignant lesions; a well-defined edge indicates slow tumor growth that suggests benignity.[5]

Other imaging modalities like computed tomography (CT) are useful for an accurate evaluation of the bone and detection of subtle minor calcifications. They are also helpful in the differential diagnosis of tumors. Also, MRI has a role for further characterization by visualization of radiologic features of benign lesions such as fluid levels, chronic hemorrhage, and small reactive zones in the bone.[5,6]

Core needle biopsy has emerged as a less invasive and less costly alternative technique to obtain tissue for diagnosis. Studies have shown that it is an effective means of obtaining diagnostic tumor tissue in adults and advances in imaging modalities have improved and enhanced the ability to perform such procedures with image guidance with good sensitivity.[7]

Performing intralesional curettage and wide local end bloc resection is well accepted treatment options in the management of benign, locally aggressive, and, in some cases, low-grade malignant tumors. Patients who undergo intralesional extended curettage are found to recover faster and have better function than other patients who undergo wide local resection. However, recurrence is still the major challenge after curettage, despite advances in surgical options and local adjuvants.[8,9]

Endoscopic-assisted curettage has been reported in the limited number of articles. It has been used to treat cystic lytic lesions at different bones. Endoscopic-assisted curettage (ESAC) was introduced as an assisting method with curettage in the management of benign bone lesions.[1]

## 2. Patients and methods

In this study, 20 patients presented with benign osteolytic lesions treated by endoscopic-assisted curettage from January 2020 to June 2020.

A detailed history was taken from patients paying attention to their complains and analyzing them. The main dominant complaint was pain. Patients were then assessed clinically (generally and locally).

The inclusion criteria of the cases were:

(1) No age limit.
(2) Presence of a benign osteolytic bone lesion.

Exclusion criteria of the cases were:

(1) Axial skeleton lesions.
(2) Malignant osteolytic lesions.
(3) Pathological fractures.

### 2.1. Radiographic assessment

Plain radiograph antero-posterior (AP) and lateral views and MRI and CT in some lesions may also be indicated for assessing the extent and nature of the lesion and planning for management.

### 2.2. Laboratory investigations

Laboratory investigations included routine preoperative labs, serum calcium, serum phosphorus, serum alkaline phosphatase, erythrocyte sedimentation rate (ESR), and C-reactive protein.

### 2.3. Tumor workup

Tumor workup includes a CT chest, a bone scan, and tissue diagnosis in query lesions by CT-guided core biopsy.

The objectives of surgery in this study is extended curettage of the lesion, space filling either by bone graft or bone cement and fixation by plate and screws in defects occupying more than one-third of the bone circumference or weight bearing areas.

### 2.4. Surgical technique

IV antibiotic is administered with induction of anesthesia. The patient is positioned in an appropriate position for the affected bone and for the planned approach A tourniquet is used if it could be applied and without exsanguination of the affected limb.

A minimally invasive approach is used, either for the skin, soft tissue and bone, or only for the bone (Fig. 1) to decrease morbidity through two to three portals according to the size of the lesion. Extended curettage is performed up to the normal bone using a high-speed burr, confirmed by fluoroscopy and by magnification provided by an endoscope.

The lens size used is either 2.7 or 4.0 mm with a 30° angled lens at one portal. Working tools like curette, shaver, baskets, and high speed burrs used to assess other portals and finally the curettage is examined in different directions especially in metaphyseal large lesions through the small bone window to preserve bone stock and to decrease the need for internal fixation. Hydrogen peroxide is used as an adjuvant for curettage.

Appropriate space filling is used, either bone graft in latent lesions or bone cement for active or aggressive lesions. Internal fixation is carried out in

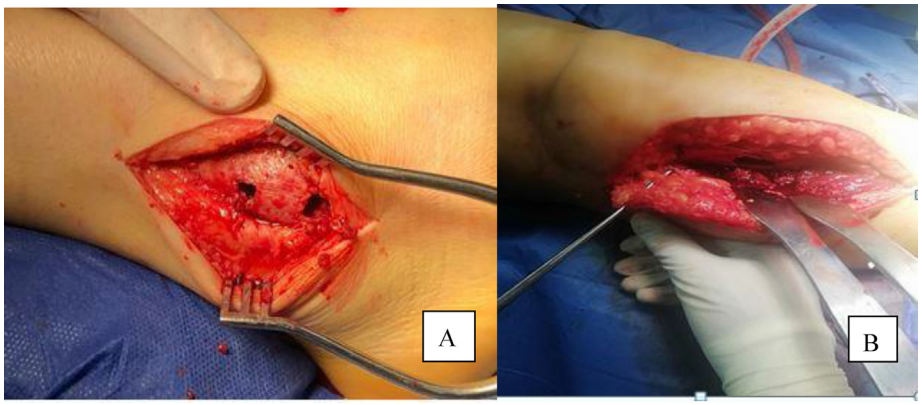


*Figure 1. (A) Bone windows in lateral malleolus lesion and (B) bone window in proximal tibia lesions.*

indicated cases in large defects exceeding more than one-third of the bone circumference or the bone or weight bearing areas. Fluoroscopy is used for better localization of the lesions intraoperatively and assessment of fixation implants if needed.

There was no significant blood loss in any of the cases; hence, no cases required blood transfusion postoperatively.

### 2.5. Postoperative protocol

The patient was nursed in the ward with IV antibiotics and analgesics as needed and the patient is followed-up clinically (generally, wound follow–up and neurovascular status).

Postoperative radiograph (AP-lateral) is performed before discharge, hospital stay ranged from 1 day to 2 days, and sutures were removed after 2 weeks.

A temporary splint is applied for 3–4 weeks in cemented lesions and till appearance of early consolidation signs in grafted lesions in lesions in the lower extremity. No early weight bearing is allowed till good consolidation union is achieved.

### 2.6. Method of evaluation

The Musculoskeletal Tumor Society (MSTS) scoring system is a well-accepted scale to assess functional results of patients with musculoskeletal tumors.

## 3. Results

The age of the participants ranged from 5 to 49 years with a mean age of 21.80 ± 13.17 (SD); 10 of them were males and 10 were females (Table 1).

*Table 1. Age and sex distribution of included patients.*

| | No. = 20 |
|---|---|
| Age | |
| Mean ± SD | 21.80 ± 13.17 |
| Range | 5–49 |
| Sex | |
| Female | 10 (50.0%) |
| Male | 10 (50.0%) |

Regarding site of the lesion and histopathological diagnosis shows different sites and diagnoses of lesions (Table 2).

In this series, operative time ranged from 45 to 120 min with mean time ±SD of 70.25 ± 21.61 (SD).

It appeared that the need for fixation significantly increases the operative time in patients needed fixation. The operative time ranged from 60 to 120 min with a mean of 86.88 ± 21.20 (SD), while in patients that did not require fixation the operative time

*Table 2. Description of sites and diagnoses of lesions.*

| | No. (%) |
|---|---|
| Site | |
| Proximal tibia | 3 (15.0%) |
| Proximal femur | 6 (30.0%) |
| Distal radius | 2 (10.0%) |
| Distal tibia | 2 (10.0%) |
| Metacarpal | 2 (10.0%) |
| Proximal humerus | 1 (5.0%) |
| Calcaneus | 1 (5.0%) |
| Distal fibula | 1 (5.0%) |
| Talus | 1 (5.0%) |
| Distal humerus | 1 (5.0%) |
| Diagnosis | |
| Simple bone cyst | 7 (35.0%) |
| Enchondroma | 3 (15.0%) |
| Giant cell tumor | 3 (15.0%) |
| Aneurysmal bone cyst | 5 (25.0%) |
| Chondromyxoid fibroma | 1 (5.0%) |
| Chondroblastoma | 1 (5.0%) |

ranged from 45 to 85 min with a mean of 59.17 ± 13.62 (SD).

Regarding the need for fixation, eight (40%) patients, all of them in the lower limb, needed fixation. In correlation with defect length in the eight patients who needed fixation, the defect length (cm) ranged from 4 to 12 cm with a mean of 7.00 ± 2.45 (SD). Meanwhile in the 12 patients, who did not need fixation, the defect length ranged from 3 to 8 cm with a mean of 4.88 ± 1.55 (SD) in those who required internal fixation, while 12 (60%) patients did not require internal fixation.

In correlation of defect length and the need for fixation among the 8 patients who needed fixation, the defect length ranged in cm from 4 to 12 cm with a mean of 7.00 ± 2.45 (SD), while in 12 patients who did not need fixation the defect length ranged from 3 to 8 cm with a mean of 4.88 ± 1.55(SD) (Table 3).

The functional outcome of the studied patients according to MSTS score ranged from 18 to 30 with a mean of 27.10 ± 3.28 (SD), while the preoperative mean score was 18.3 ± 1.64 (SD).

Seventeen (85%) patients scored excellent (≤26), one (5%) patient scored good (22), and two (10%) patients scored poor (<20).

There is nonsignificant statistical difference in cemented and grafted patients and also in patients who required fixation and the patients who did not require fixation.

It is found the functional outcome is slightly affected by the healing time in the grafted group (Table 4).

The functional outcome is significantly affected by the presence of complications; the score of noncomplicated cases ranged from 26 to 30 with a mean of 28.25 ± 1.61 (SD) while in complicated cases the score ranged from 18 to 28 with a mean of 22.50 ± 4.43 (SD) (Table 5).

### 3.1. Complications

The overall rate of complications in this study was 20%. Early complications included one patient who complained of mild tendinitis in the peroneus longus tendon, managed conservatively, and one patient suffered of stiffness of the knee, which improved by physiotherapy.

Late complications included: One patient developed late deep infection managed by debridement and metal removal, and one patient suffered ankle arthritis due to cement leak. His diagnosis was an aneurysmal bone cyst in the talus, managed surgically by secondary ankle arthrodesis due to the presence of cement leak.

In this study, there were no cases complicated by early infection, local recurrence or fractures either intraoperatively or postoperatively.

### 3.2. Case presentation

Figure 2: A 40-year-old lady presented with a history of chronic right knee pain increased by activity and decreased by rest. She sought medical advice and was prescribed medical treatment with no improvement. On presenting to our hospital a plain radiograph was requested, which showed a huge osteolytic lesion in the proximal tibia and then further treatment was initiated.

*Table 4. Relationship of functional outcome with healing time in grafted patients.*

| | Functional outcome | | Test value | *P*-value | Significance |
|---|---|---|---|---|---|
| | Mean ± SD | Range | | | |
| Healing time (month) | | | | | |
| 2 months | 30.00 ± 0.00 | 30–30 | 6.452 | 0.026 | S |
| 3 months | 28.67 ± 1.63 | 26–30 | | | |
| 5 months | 25.00 ± 1.41 | 24–26 | | | |

*P* value greater than 0.05: nonsignificant (NS); *P* value less than 0.05: significant (S); *P* value less than 0.01: highly significant (HS) [one-way ANOVA test].

*Table 5. Relationship of functional outcomes with the presence of complications.*

| | Functional outcomes | | Test value | *P*-value | Sig. |
|---|---|---|---|---|---|
| | Mean ± SD | Range | | | |
| Complications | | | | | |
| Noncomplicated | 28.25 ± 1.61 | 26–30 | 4.408• | 0.000 | HS |
| Complicated | 22.50 ± 4.43 | 18–28 | | | |

*P*-value >0.05: nonsignificant (NS); *P*-value <0.05: significant (S); *P*-value< 0.01: highly significant (HS): [independent t-test].

*Table 3. Relationship between defect length and need for fixation.*

| | Nonfixation no. = 12 | Fixation No. = 8 | Test value | *P*-value | Significance |
|---|---|---|---|---|---|
| Defect length (cm) | | | | | |
| Mean ± SD | 4.88 ± 1.55 | 7.00 ± 2.45 | −2.385 | 0.028 | S |
| Range | 3–8 | 4–12 | | | |

*P* value greater than 0.05: nonsignificant (NS), *P* value less than 0.05: significant (S), *P* value less than 0.01: highly significant (HS) [Chi-square test].


*Figure 2. (A) Preoperative radiograph, (B) intraoperative picture show a small bone window, (C) early endoscopic picture showing cyst membrane, (D) burr used to extend the curettage, (E) completion of curettage up to the normal bone, (F) histopathology of the lesion, (G) final follow-up radiograph, (H) final follow-up clinical photograph.*

The patient underwent endoscopic-assisted extended curettage using a high speed burr following curettage using a curette and adjuvant hydrogen peroxide usage. The cavity was filled with bone cement and internal fixation was done. Histopathology revealed a simple bone cyst.

## 4. Discussion

Yearly, millions of patients present to healthcare providers complaining of symptoms related to the presence of benign bone lesions, which is considered a challenge for orthopedic oncology surgeons because of the absence of evidence-based treatment options.[10]

Patients with painful lesions not responding to analgesics or at increased risk of pathologic fracture may require surgical intervention.[10]

The aim of treating lytic lesions is to prevent their progression. But, conventional open surgical intervention has more risk of complications, is more invasive and damaging to the soft tissue and bone, and may affect the efficacy of surgery and function in the long term.[10]

Few articles have reported about minimally invasive intervention for the treatment of benign bone tumors.[11]

Hisaki and colleagues published a case series of 30 patients diagnosed with aneurysmal bone cysts with a median operative time of 107.8 (range, 47.0–197.0 min), while the mean operative time in this study was 70.25 ± 21.61(SD), which ranged from 45 to 120 min, which is relatively shorter.[12]

In the 10 patients in this study in whom the defect was filled by bone graft, the average healing time in months was 3.4 ± 0.51 (SD), ranging from 2 to 5 months, which is comparable to the healing time reported by Hisaki and Masaaki series, where the healing time mean was 3.2 months ± 1.7 (SD)[12]

In this Hisaki and colleagues series, the percentage of healed lesions (classified as A and B (70%) according to the modified Neer score) of the patients is significantly lower than in this study (90%).[12]

In this study by Hisaki and colleagues, the rate of complication was 16.6%, which is slightly lower than in this study but comparable. These complications include three recurrence cases out of 30 (10%), which required redo surgery. The other complications were one patient presented with a pathologic fracture and one patient complained of transient nerve palsy.[12]

In another series reported by Hisaki and colleagues conducted on 37 patients diagnosed with simple bone cysts, the median operative time was 88.8 (range, 42.0–186.0 min), which is comparable to this study.[13]

The healing time in this series is slightly shorter than the reported time Hisaki and colleagues, for whom the average healing time was 4 months ± 2.4 (SD).[13]

In this Hisaki and Masaaki series, the percentage of the healed lesions classified as A and B represented 83.7%, which is slightly lower than this study.[13]

The rate of complication in this Hisaki and colleagues series was 35%, which is significantly higher than this study including 7 (18%) cases of recurrence: 6 of them required a redo surgery, 2 cases retained deformity, one patient was with transient nerve palsy, and two cases developed postoperative pathologic fractures that required internal fixation.[13]

The functional outcome in this study according to the MSTS score ranged from 18 to 30 with a mean of 27.10 ± 3.28 (SD); 17 (85%) patients scored excellent, one (5%) patient scored good, and two (10%) patients scored poor.

Min-hao Wu and colleagues reported a postoperative functional score according to MSTS of 25.5 ± 1.9 (SD), which is comparable to this study.[10]

Norio Yamamoto, Katsuhiro Hayashi *et al*. reported a recurrence rate of 10% in a case series of 20 patients, all of them were diagnosed with osteoblastoma treated by open curettage which is higher than this study.[14]

Hongbo He, Hao Zeng *et al*. published a comparative study for the management of giant cell tumors around the knee treated by extended curettage versus segmental resection. The study included 93 patients: 69 treated by extended curettage and 24 treated by segmental resection while in this study there were no recurrence cases.[15]

The results showed six patients with recurrence (1 in the resection group, 5 in the curettage group) and the rate of non-oncological complication was 28% in the extended group and 16.7% in the resection group which is higher rate than this study.[15]

The mean MSTS score of the two groups, in the extended curettage group) was 28.2 points, while in the resection group it was 26.5 points, which are comparable to this study.[15]

In a series of 26 patients treated by endoscopic curettage reported by Hazem Farouk and colleagues, the diagnosis in these patients included unicameral bone cyst, giant cell tumor, aneurysmal bone cyst, cystic fibrous dysplasia, intraosseous lipoma, non-ossifying fibroma, and chondroblastoma.[16]

The rate of complication was 7.6% which is lower than that reported in this study. The complications included one case who developed intraoperative fracture and one case of local recurrence that underwent a redo surgery.[16]

The postoperative mean functional score was 28.6 with a 2.25 standard deviation, which is comparable to this study.[16]

### *4.1. Limitations*

The study has some limitations including the small number of patients, heterogeneous in diagnosis, and absence of a control group. Excision of the tumor tissue through a small skin incision and bone window may have the risk of tumor cells seeding within the tract. Besides, the technique requires prior experience in endoscopic and tumor surgery.

A longer follow-up duration in a larger series is recommended to evaluate if the oncological and functional outcomes are better than conventional approaches or not.

### *4.2. Conclusion*

The endoscopic-assisted curettage of osteolytic lesions is a good option in the management of benign osteolytic lesions with a shorter healing time, faster recovery, and fewer rates of complications than conventional open curettage. It is a less morbid procedure and the functional outcome is relatively comparable.

## Disclosure

The authors have no financial interest to declare in relation to the content of this article. The article processing charge was paid for by the authors.

## Authorship

All authors have a substantial contribution to the article.

### Conflicts of interest

There are no conflicts of interest.

## References

1. Amro A. Role of endoscopy in osteolytic bone lesion management. *Al-Azhar Int Med J*. 2021;2:25–30.
2. De Salvo S, Pavone V, Coco S, et al. Benign Bone tumors: an overview of what we know today. *J Clin Med*. 2022;11:699.
3. Eyesan S, Idowu O, Obalum DC, Nnodu OE, Abdulkareem F. Surgical consideration for benign bone tumors. *Niger J Clin Pract*. 2023;14:146–150.
4. Subramanian S, Kemp AK, Viswanathan VK. *Bone cyst.' StatPearls [Internet]*. StatPearls Publishing; 2019.
5. Ghares S, Qasim J, Hussein A. Clinicopathological assessment of primary pediatric bone tumor in a sample of Iraqi patients. *World J Pharmaceut Res*. 2021;11:97–111.
6. Vidoni A, Pressney I, Saifuddin A. Paediatric bone lesions: diagnostic accuracy of imaging correlation and CT-guided needle biopsy for differentiating benign from malignant lesions. *Br J Radiol*. 2021;94:1120.

7. Parsons LN, Vo N, Moe DC, Jarzembowski JA. Adequacy and accuracy of core biopsy in children: a Radiologic/Pathologic correlation study. *Pediatr Dev Pathol*. 2019;22:137–141.
8. Chen CJ, Brien EW. Early postoperative compilations of bone filling in curettage defects. *J Orthop Surg*. 2019;14:1.
9. Zhou L, Lin S, Zhu H, et al. The blood pressure and use of tourniquet are related to local recurrence after intralesional curettage of primary benign bone tumors: a retrospective and hypothesis-generating study. *BMC Muscoskel Disord*. 2022;23:1.
10. Wu M, Xiao L, Zhang C. The minimally invasive endoscopic technique for the treatment of symptomatic benign bone lesions: preliminary results from a retrospective study. *J Bone Oncol*. 2020;24:100–313.
11. Errani C, Chehrassan M, Donati DM. Minimally invasive technique for curettage of benign bone tumors using endoscopic technique. *Prog Orthop Sci*. 2015;1:15.
12. Aiba H, Kobayashi M, Waguri-Nagaya Y, et al. Treatment of aneurysmal bone cysts using endoscopic curettage. *BMC Muscoskel Disord*. 2018;19:1.
13. Aiba H, Kobayashi M, Waguri-Nagaya Y, et al. Treatment of simple bone cysts using endoscopic curettage: a case series analysis. *BMC Muscoskel Disord*. 2018;13:1.
14. Zekry KM, Yamamoto N, Hayashi K, et al. Surgical treatment of chondroblastoma using extended intralesional curettage with phenol as a local adjuvant. *J Orthop Surg*. 2019; 27:3.
15. He H, Zeng H, Luo W, et al. Surgical treatment options for giant cell tumors of bone around the knee joint: extended curettage or segmental resection? *Front Oncol*. 2019;9:946.
16. Farouk H, Saladin M, Ebeid W, et al. All-endoscopic management of benign bone lesions; a case series of 26 cases with minimum of 2 years follow-up. *SICOT J*. 2018;4:50.