

Benign Aggressive Lesions of Femoral Head and Neck: Is Salvage Possible?

Abstract

Background: Benign aggressive bone lesions of the femoral head and neck are mostly seen in young adults and warrant treatment for pain, impending fracture or established fracture, and disease clearance. It becomes challenging to treat them effectively while attempting salvage of the femoral head and yet achieving long term disease control with minimum complications. We describe our technique and experience in dealing with these lesions which can achieve the above-mentioned goals and can be easily replicated. **Materials and Methods:** We analyzed 15 cases of surgically treated, biopsy-proven benign, locally aggressive lesions affecting the femoral head and neck in skeletally mature individuals. All cases were treated with extended curettage through anterolateral modified Smith–Petersen approach along with tricortical iliac crest bone graft (combined with fibular graft in some cases) reconstruction with or without suitable internal fixation. **Results:** All, except one, patients were available for follow up. The age ranged from 18 to 43 years and the follow up ranged between 24 and 124 months (average 78 months). These included aneurysmal bone cysts (9), giant cell tumors (4), and fibrous dysplasia (2). The indication was pain (8), with impending (2) or established pathological neck femur fracture (5). In all cases, there was satisfactory healing of lesion and timely rehabilitation. Nonunion, avascular necrosis or local recurrences were not seen. The MSTTS functional score was good or excellent in all (range 26–29, average 28). **Conclusion:** Benign aggressive lesions affecting femoral head and neck in young and middle-aged adults pose a treatment challenge. A sturdy, lasting reconstruct with acceptable functional outcome and minimal recurrence rate can be achieved by salvaging the femoral head and neck using curettage and reconstruction, obviating the need for replacement at such an early age.

Keywords: Benign aggressive lesion, femoral neck, treatment

MeSH terms: Femur head, femur neck, tumors, giant cell tumors, fibrous dysplasia of bone

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Introduction

Benign aggressive neoplasms of the femoral head and neck, which are not a clinical rarity, do pose a treatment challenge.¹ These lesions are usually found in young adults and present usually with symptoms of pain, with or without impending pathological fracture, or established pathological fracture [Figure 1]. Given the nature of presentation of these lesions and the age group affected, the treatment protocol followed for these is expected to give a robust, long standing, permanent, satisfactory outcome with minimal complications.

There are few studies in the English literature that focus on this peculiar problem.¹⁻⁷ Most of them describe intralesional methods with various approaches and enumerate reconstructive options for patients with benign bony

lesions affecting the femoral head and neck. All these studies aim to salvage the femoral head and neck. The choice of approach has been either lateral^{1,3} or anterior combined with lateral approach.² The reconstructive modalities, however, have been different. Some prefer using synthetic bone grafts,^{1,2} while some have used only autografts³ while others have used a combination of autografts and allografts.⁴⁻⁷ However, there seems to be an inclination toward the use of various types of fixation modalities to augment the strength of the reconstruct and allow early mobilization.^{1,2,5,7}

The nature of blood supply to the femoral head and neck is also one factor that needs to be considered while treating these lesions. The branches of anterior and posterior circumflex femoral arteries that run along the femoral neck are a point of concern with regard to long term outcomes of treating the benign aggressive lesions in this location. The approach and cortical

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Figure 1: X-ray of the hip joint along proximal thigh (a and b) showing benign bone lesions of the femoral head and neck usually cause symptoms due to pain or impending/established pathological fracture

window need to be made keeping this blood supply in mind so that the possibility of nonunion and avascular necrosis is not a concern.

We describe our approach to benign aggressive lesions of femoral head and neck using one single modified anterolateral approach for approaching the anatomical area, for harvesting tricortical iliac crest autograft, and inserting the appropriate fixation device. The aim was to gain adequate exposure to the lesion, avoid second incision for autograft harvest if possible, reduce costs of synthetic grafts which are required in large quantities, and yet achieve the goal of robust, permanent reconstruction with minimal complications.

Materials and Methods

Of all the 248 benign aggressive lesions treated by our Orthopaedic Oncology Unit between December 2005 and 2014, 15 (6%) were found to be in the femoral head and neck region. In all cases the workup included, apart from the routine radiographs, a magnetic resonance imaging scan of the affected area, routine laboratory investigations, and a needle biopsy from anterolateral approach to establish the histopathological diagnosis.

These 15 cases were those where an intralesional treatment and reconstruction with an aim to save the femoral head was thought to be the best option of treatment. This decision was taken based on the involvement pattern of the femoral head and neck. The cases wherein reasonable bone stock was expected to be left behind after curettage to allow biological reconstruction to work were included. Recurrent cases which satisfied these criteria were included. Cases with large extra osseous lesion component with no residual bone stock and

cases where articular cartilage damage or joint involvement was evident were excluded from this series.

The pathological diagnoses of these 15 cases included aneurysmal bone cysts (9), giant cell tumors (4), and fibrous dysplasia (2). Eight patients had intractable pain, two had pain with impending fracture while five patients had established pathological neck femur fracture. These pathological fractures were a result of trivial trauma. Two of these cases (one each of giant cell tumor and fibrous dysplasia) were recurrent lesions, treated earlier at other centers while the rest were primarily treated at our centre. The average time taken for the surgery was 155 min and average blood loss was 480 ml. The followup ranged between 24 and 124 months (2–10 years) with an average of 78 months (6.5 years).

All cases were operated in supine position on a fracture table after obtaining an informed written consent from the patients. The operative approach was the same for all cases. The iliac crest, the hip, and the proximal half of the femur were painted and draped. In five cases, early on in our series, fibula graft was harvested as well for reconstruction. A lazy “S-” shaped incision was made [Figure 2] starting over the iliac crest behind the iliac tubercle which was extended anteriorly till the anterior superior iliac spine. Thereafter, it was curved laterally to follow the tensor fascia lata fibers till the base of greater trochanter and then curved laterally over the shaft of femur.

A modified Smith–Petersen approach was used to approach the hip anteriorly. This was through the internervous plane which lies between the sartorius and rectus femoris medially and the tensor fascia lata and gluteus medius

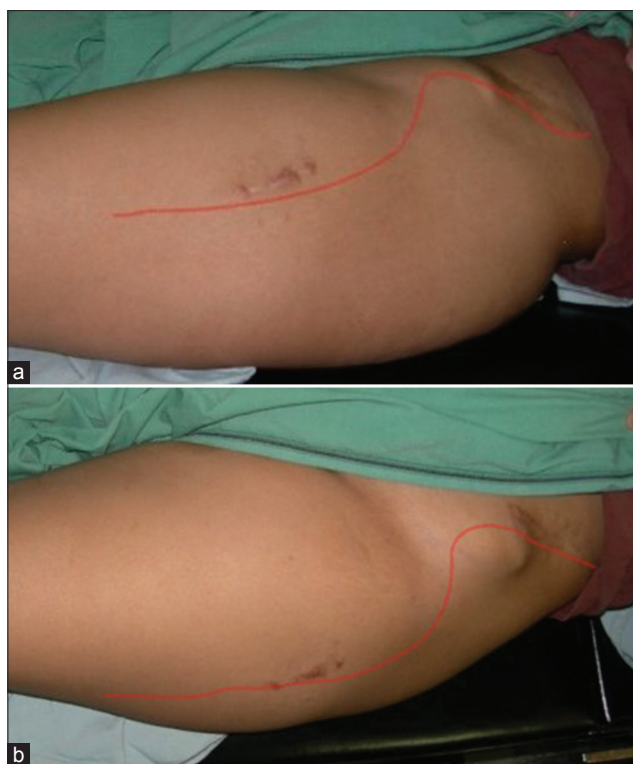


Figure 2: Clinical photographs (a) Side view (b) Front view: showing “S-” shaped incision

laterally. The glutei were elevated from their origin at the iliac crest while keeping their insertion on the femur intact. The distal part of the incision was deepened upto the bone. The gluteus medius continuity with the vastus lateralis was maintained by splitting the insertion in half. Care was taken to avoid injuring branches of the circumflex femoral artery. The hip was exposed using an “L-” shaped incision on the capsule. Drill holes and osteotome were used to make an appropriately sized window on the anterior aspect of the femoral neck. The dimensions of the defect post curettage varied as per the size of the lesion. On an average, the size was around 8 cm × 5 cm × 3 cm. A thorough manual curettage was done using sharp curettes which was further extended using a high-speed burr. Adjuncts such as pulse lavage and hydrogen peroxide were used wherever indicated while phenol-alcohol and argon laser were not used at all in our series. After ascertaining the completeness of curettage, an adequately sized tricortical iliac crest bone graft was harvested from the exposed iliac crest region, shaped to fill the defect completely [Figure 3a and b].

In five cases, early on in our series, the ipsilateral fibula graft was harvested as well for reconstruction. In other cases, tricortical iliac crest graft was harvested using the standard technique. As far as possible, tricortical struts were used to fill the defect. The length of tricortical iliac crest and fibula graft was decided and trimmed on table so as to best fill the defect in a compact manner. On an average, the grafts measured about 7–9 cm in length. In cases where no implant was used, the bone grafts impacted

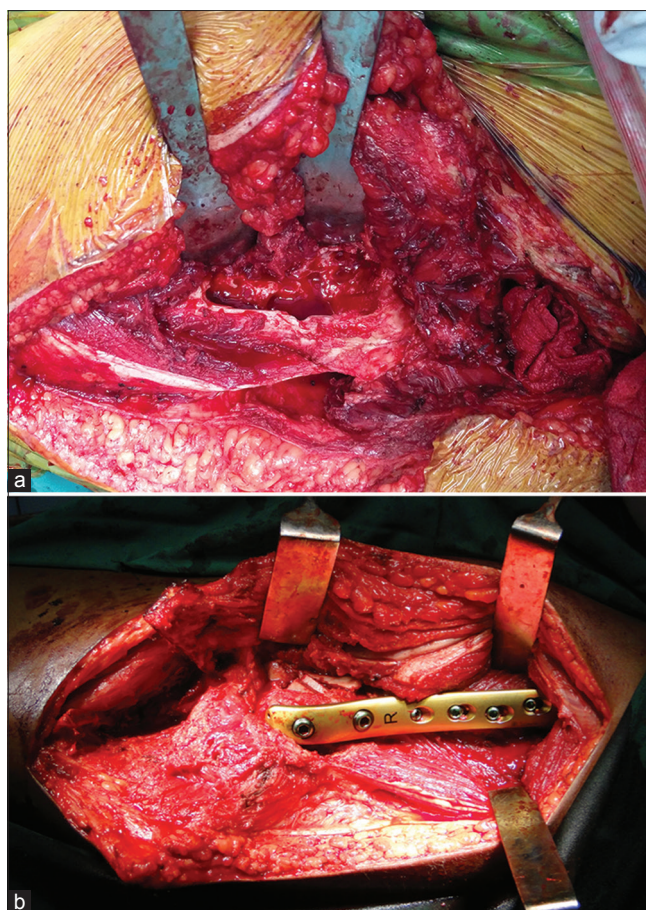


Figure 3: Intraoperative photographs showing (a) Modified Smith–Petersen approach. An adequately large window, the size of which is dictated by the size of the lesion, is made over the anterior aspect of the proximal femoral shaft and neck using saw and burr (b) Completed modified Smith–Petersen approach. The abductors are reflected from the iliac crest, in continuity with the vastus lateralis distally. The iliac crest defect is a result of autograft harvest. The anterior window in the femoral neck is used for curettage and inserting autograft struts. A proximal femoral locked plate is inserted using the same approach

in the defect and the residual host bone provided sufficient strength to preclude the use of internal fixation. The grafts required no suture or biomaterial to be used to keep the grafts together. The guide wires of the fixation device were then passed under image intensifier control from the intact lateral cortex of the trochanter, and appropriate fixation was carried out with the intention of providing additional stability to the reconstruct. The fixation modality was not used in three cases where the residual host bone strength was found to be satisfactory. In others, the fixation modality included cannulated cancellous screws ($n = 3$), sliding hip screw devices ($n = 6$), proximal femoral trochanteric locking compression plate ($n = 1$), or screws with lateral cortical plate ($n = 2$). Whenever a sliding hip screw (dynamic hip screw [DHS]) and plate were used, we preferred to use a pediatric DHS so as to allow maximum defect to be filled by the grafts. In the recent cases in our series, a proximal femoral trochanteric-locked compression plate was also used for fixation [Figures 4 and 5].

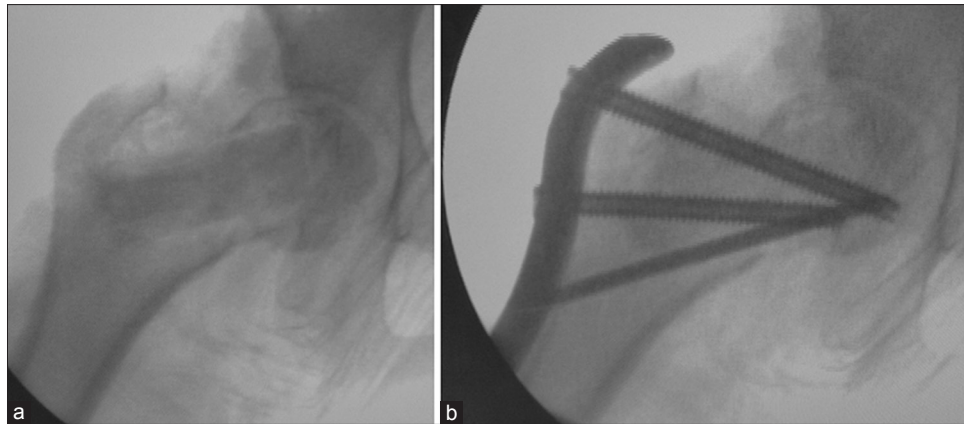


Figure 4: (a) X-ray of the hip joint showing tricortical iliac crest grafts impacted in the defect (b) Fluoroscopic view showing the internal fixation device through the same approach

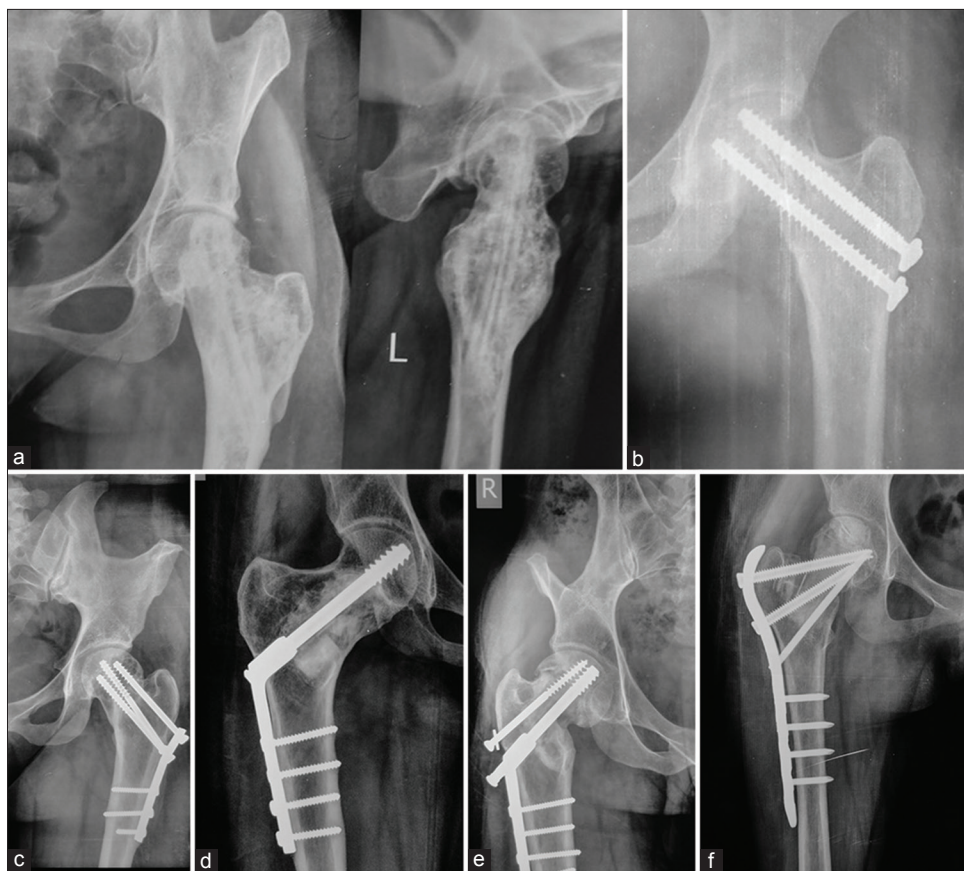


Figure 5: X-ray of the hip joints anteroposterior view showing (a) Iliac crest graft with fibular strut. No internal fixation done (b) Tricortical iliac crest with cannulated cancellous screws (c) Tricortical iliac crest and fixation with screws through a lateral cortical plate (d) Tricortical iliac crest grafts with a sliding hip screw device (e) Tricortical iliac crest grafts with a sliding hip screw device and derotation screw (f) Tricortical iliac crest grafts with proximal femoral locking compression plate

All patients were followed up every 3 months for the first 2 years, 6 monthly for the next 3 years, and annually thereafter. All patients were mobilized immediately in the postoperative period. They were advised non weightbearing ambulation for the first 6 weeks and gradually increasing weightbearing thereafter over the next 6 weeks. Ankle and knee range of motion exercises were started early in the postoperative period and abductor-strengthening exercises were initiated

after 4–6 weeks. Follow up visits included clinical and radiographic examination of the affected area. Complication such as infection, local recurrence, avascular necrosis of the femoral head, bone graft donor morbidity, and implant-related issues were carefully looked for. The functional scoring was done using the Musculo-Skeletal Tumor Society Scoring system (MSTS scoring system).⁸

Table 1: Clinical details of the patients

Case number	Age of patient (years)	Histopathological diagnosis	Presentation with pathological fracture	Side	Surgical procedure done	Followup (months)	Complications	MSTS score
1	18	Aneurysmal bone cyst	Impending	Left	Curettage, ICBG, CC screws, lateral plate	108	Nil	28
2	21	Giant cell tumor	Yes	Left	Curettage, fibular strut, ICBG, Paed DHS	Lost to followup	Lost to followup	NA
3	18	Aneurysmal bone cyst	No	Right	Curettage, fibular strut, ICBG, Paed DHS	96	Early limp, disappeared with physiotherapy	27
4	23	Aneurysmal bone cyst	No	Right	Curettage, ICBG, CC screws	48	Nil	29
5	27	Aneurysmal bone cyst	Yes	Right	Curettage, fibular strut, ICBG, Paed DHS	36	Early limp, disappeared with physiotherapy	26
6	18	Giant cell tumor	Yes	Right	Curettage, ICBG, femoral trochanter plate	24	Early limp, disappeared with physiotherapy	26
7	35	Fibrous dysplasia	No	Right	Curettage, ICBG, CC screws	50	Nil	29
8	43	Aneurysmal bone cyst	Yes	Left	Curettage, ICBG, DHS	72	Nil	27
9	35	Giant cell tumor	No	Right	Curettage, fibular strut, ICBG	116	Nil	29
10	37	Aneurysmal bone cyst	No	Left	Curettage, ICBG	96	Nil	29
11	18	Fibrous dysplasia	Impending	Left	Curettage, fibular strut, ICBG	124	Nil	28
12	32	Aneurysmal bone cyst	No	Left	Curettage, ICBG, CC screws	108	Nil	27
13	25	Giant cell tumor	No	Right	Curettage, ICBG, CC screws, lateral plate	96	Nil	29
14	24	Aneurysmal bone cyst	No	Right	Curettage, ICBG, Paed DHS	60	Nil	28
15	18	Aneurysmal bone cyst	Yes	Right	Curettage, ICBG, Paed DHS	48	Nil	26

ICBG=Iliac crest bone graft, CC=Cannulated cancellous, Paed DHS=Paediatric dynamic hip screw, NA=Not available, MSTS=Musculo-Skeletal Tumor Society



Figure 6: Clinical photographs showing functional result (a) cross legged sitting (b and c) Good range of movement at hip and knee

Results

We treated 15 cases of benign bone lesions of femoral head and neck between December 2005 and December 2014 by intralesional curettage and reconstruction. Ten were female patients and 5 were male. In six cases, left hip was involved while in the other nine the right hip was involved. The age ranged from 18 to 43 years (median 24 years). All, except one, patients were available for

follow up. In all cases, there was satisfactory healing of the lesion and timely rehabilitation. All patients could ambulate full weightbearing without support at the end of 3 months. The initial abductor lurch that three patients exhibited temporarily in the early postoperative period later reduced and disappeared with abductor-strengthening exercises. Complications such as nonunion of the pathological fracture, avascular necrosis of the femoral head, or local recurrences were not seen in any of the

patients. There was no bone graft donor-site morbidity seen in any of these patients. There was no infection or implant-related complication. All the grafts incorporated well on the long term follow up in cases where implants were or were not used. Only plain radiographs were done to assess the graft status postoperatively. The MSTS functional scoring was done at every follow up visit of the patient after 6 months from the date of surgery. This was good or excellent in all the 14 cases that were available for followup (MSTS score range 26–29, average 28) [Table 1] [Figure 6]. The implants were not removed in any of our patients and they posed no problem in our series.

Discussion

Though not the most common site for benign lesions, the proximal femur when affected by these forms a complex situation. It may further get complicated by an impending or established fracture. Usually seen in the young adult population,^{1,7} it becomes imperative to salvage the femoral head and neck. Any treatment modality that is used needs to address the two most crucial principles of oncology, i.e., obtaining adequate disease clearance to ensure minimal disease recurrence and achieving good functional outcome with the aim of a long lasting reconstruct. Resection and reconstruction with prosthesis, though the easiest way to get around these lesions, means a restricted lifestyle and increased possibility of complex revision procedures later. There are few publications addressing the management of benign bone lesions of femoral head and neck;¹⁻⁷ Almost all authors unanimously support the need of salvaging the diseased Femoral head and Neck. They describe various surgical approaches and means of reconstruction. The most common approach seems to be a dead lateral^{1,3} approach. Though Nakamura *et al.*¹ and George *et al.*³ have achieved excellent results, there have been some local recurrences in their series (11% and 8%, respectively). This suggests that the local recurrence rate at the proximal femur probably is not different compared to that of other anatomical sites. This may be a result of some microscopic disease left behind in the Femoral head and Neck when a lateral transtrochanteric approach is used. A complete disease clearance may be difficult to be ascertained with this approach. Hu *et al.*² have described a combined approach wherein they have used an anterior approach to curette the disease from the femoral neck and have used a separate lateral approach over proximal femur to insert the fixation device. In an average followup of 34 months, using an allograft for reconstruction, they have experienced two superficial infections, two screw back outs, and one patient had a limp postoperatively.

The choice of reconstruction of the void has differed in all the series that have been published in the literature.¹⁻⁷ The choice of reconstruction was autograft fibula, pure

allografts or a combination of auto- and allo-grafts. Except for George *et al.*,³ who rely on the impacted fibular strut in the curetted cavity to act as a fixation device, all authors have felt the need of augmenting the reconstruct by internal fixation devices. They have been mostly screws or sliding hip screw devices.^{1,2,6} Wai *et al.*⁶ have focused on the subgroup of pathological femoral neck fractures due to benign bone lesions and have found that a uniform approach of curettage and reconstruction with fixation has worked well in these situations and it is possible to achieve good disease control and functional outcome with no complications of recurrence, nonunion, or avascular necrosis of the femoral head.

In the present series, we have used one modified approach to give a good exposure to the diseased area in the proximal femur. In many cases, it was found that the greater trochanter was not involved by the disease, and hence a dead lateral approach for biopsy and consequently the final intralesional treatment were not preferred to spare this good bone from being removed at the time of definitive procedure. Furthermore, the ease and completeness of intralesional curettage is better with the anterior approach to the femoral head and neck.² The same approach gives easy access to the iliac crest for harvesting tricortical bone grafts. The modified Smith–Petersen approach being through internervous plane has minimal chances of damaging any muscle or nerve and hence has lesser chances of postoperative limp. Using autograft also reduces the need of costly bone graft substitutes for filling these relatively large defects. Use of autograft also means easier, permanent incorporation. Use of allografts warrants having access to bone banks which may not be universally available. There are also concerns about some immunological discharge and infection risks with allografts.¹ George *et al.*³ and Jaffe and Dunham⁴ have employed autograft fibula effectively. However, this means that a separate incision at a distant location must be made for procuring the same. In five cases, early on in our series, we also relied on fibular strut autografts for reconstruction. However, with increasing experience of solely using tricortical iliac crest strut grafts, we stopped using fibular struts later. In three cases in our series, we have not used an internal fixation device because the intraoperative stability of the reconstruct was deemed to be good enough to allow early rehabilitation without addition of an implant. However, with large defects and with established pathological fractures, internal fixation helps in adding stability to the reconstruct and helps in earlier rehabilitation.^{1,6}

In the present series, we have seen that the modified anterior approach gives us an excellent exposure to achieve a complete curettage of the femoral head and neck lesions. It gives us easy access to the iliac crest for procuring bone grafts as per the requirement of the case. This approach also has minimal risk of damaging any muscle or nerve and hence reduces any chances of

residual limp postoperatively. It gives us access to the proximal femur for inserting fixation devices. It also helps in sparing the lateral trochanteric bone stock if it is uninvolved by the lesion to begin with, which otherwise would be removed if a dead lateral transtrochanteric approach is used. We had no local recurrences in the average 6.5-year follow up. All the fractures united well, patients had an excellent functional outcome with no limp or implant-related issues. Avascular necrosis of hip was not encountered in any of our patients. Most of these fractures are trivial injuries with low-velocity trauma. It is unlikely that the vascular supply of femoral head is largely affected to cause avascular necrosis. The carefully executed modified anterolateral approach also prevents any injury to the branches of femoral circumflex artery, which ensures virtually no risk of any vascular damage or its sequelae. The excellent functional outcome in our patients with no complications whatsoever, which has one of the longest follow ups among the published series, is the evidence that this is an approach that should be used more often while dealing with similar situations. To the best of our knowledge, this is the first series that has described such an approach in the benign lesions of femoral head and neck.

Conclusion

The benign aggressive lesions affecting femoral head and neck in young and middle-aged adults are challenging to treat. Salvaging the femoral head and obtaining a sturdy, lasting reconstruct with excellent functional outcome and minimal recurrence rate can be achieved by doing curettage, reconstruction, and fixation through a single modified anterolateral Smith–Petersen approach.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have

given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Nakamura T, Matsumine A, Asanuma K, Matsubara T, Sudo A. Treatment of the benign bone tumors including femoral neck lesion using compression hip screw and synthetic bone graft. *SICOT J* 2015;1:15.
2. Hu YC, Lun DX, Zhao SK. Combined anterior and lateral approaches for bone tumors of the femoral neck and head. *Orthopedics* 2012;35:e628-34.
3. George B, Abudu A, Grimer RJ, Carter SR, Tillman RM. The treatment of benign lesions of the proximal femur with non-vascularised autologous fibular strut grafts. *J Bone Joint Surg Br* 2008;90:648-51.
4. Jaffe KA, Launer EP, Scholl BM. Use of a fibular allograft strut in the treatment of benign lesions of the proximal femur. *Am J Orthop (Belle Mead NJ)* 2002;31:575-8.
5. Shih HN, Cheng CY, Chen YJ, Huang TJ, Hsu RW. Treatment of the femoral neck and trochanteric benign lesions. *Clin Orthop Relat Res* 1996;328:220-6.
6. Wai EK, Davis AM, Griffin A, Bell RS, Wunder JS. Pathologic fractures of the proximal femur secondary to benign bone tumors. *Clin Orthop Relat Res* 2001;393:279-86.
7. Jaffe KA, Dunham WK. Treatment of benign lesions of the femoral head and neck. *Clin Orthop Relat Res* 1990;257:134-7.
8. Enneking WF, Dunham W, Gebhardt MC, Malawar M, Pritchard DJ. A system for the functional evaluation of reconstructive procedures after surgical treatment of tumors of the musculoskeletal system. *Clin Orthop Relat Res* 1993;286:241-6.