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Metastatic Hip Disease in the Elderly: Does Uncemented Hip Hemiarthroplasty have a Role?

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Abstract

Purpose: Metastatic femoral neck fractures in the elderly population are typically managed with cemented hip hemiarthroplasty. With the paucity of similar studies, this study aims to review the clinical outcomes of uncemented hip hemiarthroplasty in patients with metastatic infiltration of the femoral head or neck and review the literature regarding the outcomes and survival in this patient subset.

Methods: This retrospective study includes 14 cases of uncemented hip hemiarthroplasty in 14 patients with either displaced femoral neck fractures or symptomatic metastatic lesions causing impending fractures. Patients were 9 females and 5 males, with a mean age of 76.9 years at the time of surgery. All the patients had known primary malignancies in the form of prostate cancer (3 cases), GIT cancer (3 cases), lung, and lymphoma and multiple myeloma (2 cases, each), renal, and breast cancers (1, each). All cases had their radiographs and clinical data assessed for this study. Two cases received long stems and 12 received conventional stems. Eleven cases received bipolar, and 3 received unipolar hemiarthroplasty.

Results: After a mean follow up of 48.8 months since the time of surgery, one case developed an asymptomatic, radiologically evident proximal femoral osteolytic lesion that was noticed 57 months postoperatively. Another case developed asymptomatic acetabular wear that was discovered 8 months postoperatively. None of the cases developed periprosthetic fractures, infections, aseptic loosening, or dislocations and none of the cases required revision. The 1- and 5-year patient survival for the study cohort were 78.5 and 50% respectively.

Conclusion: Uncemented hip hemiarthroplasty is a reasonable treatment option for metastatic, pathological fractures involving the femoral head and neck, provided that the stem-femur interface is metastasis-free, adequate primary implant stability is achieved, and proper systemic tumor management is utilized. The disease-specific mortality risk in patients with metastatic bony pathology, however should be sensibly considered before the surgery to achieve satisfactory expectations.

Keywords: Metastatic carcinoma; Femoral neck; Fracture; Uncemented; Hip Hemiarthroplasty.

Introduction

Bone metastasis is a devastating complication of systemic malignancies and usually comprises increased morbidity and mortality [1]. Being the most common location of long bone metastasis [2], proximal femoral metastasis could result in pathologic proximal femoral fractures as a first presentation, especially in elderly patients. Surgical management of metastatic proximal femoral fractures usually includes endoprosthetic replacement to achieve early restoration of mobility, along with improvement of the patient's quality of life [3]. In such patients, either Hemiarthroplasty (HA) or Total Hip Arthroplasty (THA) could be utilized, depending on several factors such as the presence of acetabular involvement, patient activity level, expected patient survival, and surgeon's choice [4,5].

Hip hemiarthroplasty (HA) is the most common treatment option for displaced femoral neck fractures in the elderly, with overall good outcomes [6-8]. While there is no consensus regarding the best fixation technique for arthroplasty in pathologic fractures, cemented implants are widely considered as gold standard in metastatic fractures given the improved primary stability, the possibility to fill up osteolytic lesions, the ability to bypass metastatic skip lesions and the theoretical capacity to avoid the potential lack of bony osseointegration required in uncemented fixation in the involved metastatic, or irradiated bone [9,10].

Uncemented implants are widely utilized worldwide in primary and revision hip arthroplasty with successful outcomes that are comparable to cemented arthroplasty while allowing for a shorter surgery along with evading the risk of the potentially fatal Bone Cement Implantation Syndrome (BCIS) [11]. Despite their good outcomes, even in irradiated and metabolically impaired bone [9,10], there is a paucity of studies that reported their usage in endoprosthetic replacement in metastatic proximal femoral fractures. To our knowledge, the only available studies that focused on the utility of uncemented implants in metastatic hip disease reported on the short-term outcomes and included both hemiarthroplasty and total hip arthroplasty cases [12-14], which are different procedures in terms of patients' characteristics, surgical settings, and potential intraoperative and postoperative complications. The purpose of this study is to report our single-center midterm outcomes of uncemented hip hemiarthroplasty in a series of patients who presented with pathological hip fractures or lesions secondary to metastatic disease.

Materials and methods

After Institutional Review Board approval, a retrospective study was performed to evaluate all hemiarthroplasty patients in the electronic medical records of our level-1 trauma center, using CPT codes. All the cases were reviewed against our inclusion and exclusion criteria to extract the cases and data relevant to this study. Data collected included patients' demographics, clinical information, and radiographic evaluation. Detailed information about follow-up and post-operative clinical courses was collected for all cases.

Inclusion criteria

1 Patients who underwent hemiarthroplasty for a hip fracture or metastatic hip lesions, and

2 Patients who had a diagnosis of metastatic bone disease involving the proximal femur.

Exclusion criteria

1 Patients in whom the metastatic disease has developed or was discovered after the index HA surgery.

2 Patients who received cemented hemiarthroplasty implants

Results

A total of 14 cases (14 patients) of metastatic hip disease that underwent uncemented HA for femoral neck fractures or pathologic lesions fit the selection criteria and have been retrieved from our database. Of these patients, 9 were female and 5 were male with a mean age of 76.9 years (range 57.5-93.3) at the time of primary HA surgery. All cases had a known primary systemic malignancy in the form of prostate cancer (3 cases), GIT cancer (3 cases), lung, and lymphoma and multiple myeloma (2 cases, each), renal, and breast cancers (1, each). Apart from the systemic malignancy, ten patients had additional significant, frequently combined medical comorbidities as shown in Table 1. The mean BMI for the patients was 26.8 (range, 16.2-38.3).

Table 1: Medical comorbidities in the study patients.

Diabetes Mellitus	4
Chronic Kidney disease	3
Heart failure	2
Severe or Morbid obesity (BMI≥35)	2
Hypothyroidism	2

Thirteen patients had been diagnosed with femoral neck fractures secondary to low-energy trauma (fall while walking) while one patient presented with chronic hip pain without fracture. At presentation, all cases had pelvic radiographs and/ or CT scans, along with long film femoral radiographs for exclusion of acetabular and skip femoral shaft osteolytic lesions that could impede the stability of the HA implant. All cases had radiologically evident pathologic lesions involving the femoral head and/ or neck, being either osteolytic or osteosclerotic (Figures 1-3).

Eleven cases were treated with bipolar, and 3 cases were treated with unipolar HA. Ten cases received uncollared while 4 received collared stems. All the cases received uncemented stems, with 12 receiving conventional and 2 receiving long stems to bypass femoral diaphyseal skip metastatic lesions. The posterolateral hip approach was utilized in 12 cases while the direct lateral approach was utilized in 2. The average blood loss was 225 ml (range, 50-1000 ml). During the surgery, care was taken to achieve proper implant fill and fit. The surgeon should be prepared to shift to a cemented stem in case a metastatic femoral lesion potentially affecting the implant primary or secondary stability is noticed. Two cases suffered intraoperative metaphyseal proximal femoral fissure fractures that were managed intraoperatively with cerclage wiring without further impact on the implant stability or the postoperative regimen. All of the patients started partial, assisted weight bearing as tolerated from the second postoperative day and continued their systemic treatment for the primary malignancy as advised by the oncology physicians. Two patients received postoperative irradiation for bone lesions, performed at 6 months in one patient and at 1 year postoperatively in the other.

The mean follow up for all of the cases is 48.8 months. At their final clinical follow up, all patients were able to bear weight

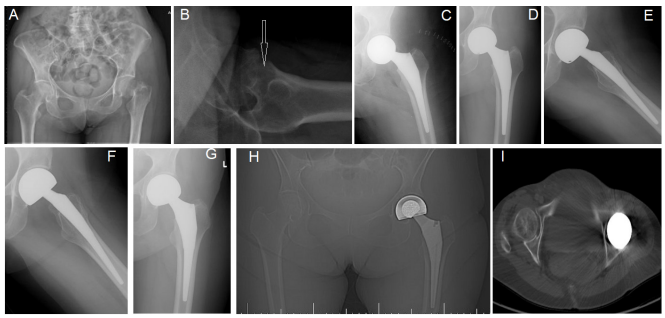

Figure 1: **(A,B)** Plain pelvic and hip X-rays of a 75.5-year-old female who presented with displaced left femoral neck fracture secondary to metastatic cancer colon. Note the femoral neck query osteolytic lesion (arrow). **(C)** Immediate postoperative plain hip X-ray showing uncemented HA. **(D,E)** Six-week and **(F,G)** One-year postoperative radiographs showing stable implants without complications. **(H, I)** Four-year Computed tomography images of the pelvis showing stable implants and absence of acetabular erosion.

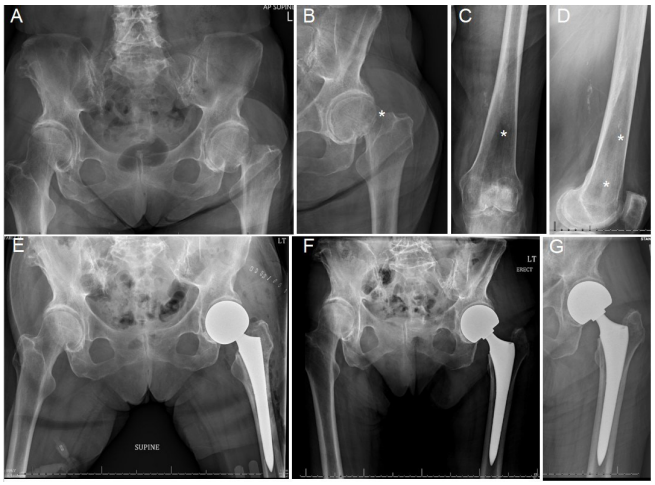

Figure 2: **(A-D)** Plain pelvic, hip, and femur X-rays of a 79-year-old female who presented with displaced left femoral neck fracture secondary to metastatic GIT cancer. Note the femoral neck query osteolytic lesion and the distal femoral shaft skip lesions (asterisks*). **(E)** Immediate postoperative plain pelvic X-ray showing uncemented unipolar HA. **(F)** Six-week and **(G)** Eighteen-week postoperative radiographs showing stable implants without complications.

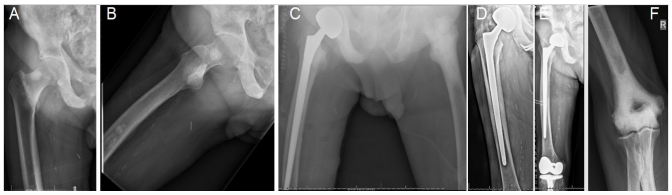

Figure 3: **(A-B)** Plain hip X-rays of an 80-year-old male who presented with hip pain secondary to metastatic prostate cancer. Note the femoral neck and shaft osteosclerotic lesions. **(C)** Immediate postoperative plain pelvic X-ray showing uncemented, long-stem bipolar HA. **(D)** Eight-week and **(F)** Nine-month postoperative radiographs showing stable implants without complications. **(F)** Plain elbow radiograph that was taken 1 year after the index HA surgery for chronic elbow pain showing osteosclerotic distal humeral metastatic lesion.

with or without assistive devices. None of the patients reported chronic hip or groin pain and none of the cases required revision for any reason. Two patients developed asymptomatic (radiologically discovered) complications. One of them, a 79-year-old female with metastatic lung cancer had developed a new proximal femoral metaphyseal osteolytic lesion that was noticed 57 months postoperatively and managed with chemotherapy and bisphosphonates. The other patient was a 67-year-old female who developed acetabular wear that was discovered 8 months postoperatively without further consequences. None of the patients developed postoperative infections, pathologic fractures, dislocation, or aseptic loosening. The 1- and 5-year patient survival for the study cohort were 78.5 and 50% respectively.

Discussion

This is a retrospective series of 14 cases of uncemented hip hemiarthroplasty in 14 patients with metastatic hip disease. After a mean follow up of 48.8 months, one case developed an asymptomatic, radiologically evident acetabular erosion and one developed a new metastatic osteolytic lesion around the HA stem shoulder, and both of the cases were managed conservatively. None of the patients developed dislocations, infections, postoperative periprosthetic fractures, or aseptic loosening. The 1- and 5-year patient survival for the study cohort were 78.5 and 50% respectively.

Systemic cancers mostly metastasize to the lungs, liver, and bone, in order of frequency [15]. Common cancers that metastasize to the bone include lung, kidney, breast, prostate, and thyroid [16]. Other malignancies that frequently cause pathological hip fractures include multiple myeloma, which is the most common primary bone malignancy, and lymphoma [17]. The most common long bone location that is affected by metastasis is the proximal femur [2].

Perioperative medical complications occur in higher incidences among patients with pathological fractures secondary to malignant infiltrations [18-20]. Also, the life expectancy in patients with systemic malignancies significantly decreases in cases of malignant bone infiltration [16,21]. The ideal surgical management in such a patient' subset should present sensible expectations and allow for improved patient quality of life while decreasing the surgical risks and potential complications. In pathological femoral neck fractures secondary to metastatic disease, hip HA provides an adequate treatment option with overall good outcomes that are comparable to THA [19], with a potentially easier surgical technique and fewer perioperative complications. While there is no consensus regarding the best implant fixation method in patients with metastatic hip disease, many surgeons prefer cemented implants, given their excellent primary and secondary stability, independence on bone ingrowth in such unfavorable pathologic bone, as well as their good, reported outcomes [8,22,23]. Cemented arthroplasty has several unique disadvantages, however, including the longer surgery duration, difficult revision surgery, and the potential pulmonary embolization with BCIS [24-28], which is of high concern in oncologic patients in particular, given the proven high incidence of BCIS symptoms among patients with bone and lung metastases, reaching 74% in one study [18].

To the best of our knowledge, only three previous studies reported the outcomes of uncemented hip arthroplasty in metastatic hip disease [12-14], combining HA, Proximal Femoral Replacement (PFR), and THA cases. Thein et al. [12] retrospectively reviewed 60 cases in 57 patients with metastatic hip disease

who received either uncemented THA or HA (28 and 32, respectively) and found no prosthesis failure or operation-related major complication at a short, mean follow up of 18.6 months. Larsen et al. [13] retrospectively compared the outcomes of 18 cemented (8 HA, 3 THA, 7 PFR) versus 23 uncemented arthroplasties (16 HA and 7 PFR) and found no significant differences regarding the incidence of complications, 30-day mortality, intraoperative blood loss, transfusion requirements, and patient-reported outcomes after a minimum follow up of 6 months. In another study, Baptista et al. [14] reviewed the outcomes of 34 uncemented and hybrid (25 and 9, respectively) hip arthroplasties (26 THA, 8 HA) in patients with infiltrative hip diseases secondary to metastasis or multiple myeloma and reported favorable outcomes in patients who underwent uncemented hip arthroplasty, without mentioning the study mean follow up duration. As stated, the previous three studies reported collectively on THA and HA cases, which are different entities. THA is usually performed in younger, healthier, and more active individuals. The surgical setting, as well as intra and postoperative outcomes, differs between THA and HA [29]. To our knowledge, this is the only study that reported exclusively on the outcomes of uncemented HA in patients with metastatic hip disease.

Despite the small series, the most interesting finding in this study is the absence of aseptic loosening in such cases with a potentially impaired bone metabolism. Another interesting finding is the relatively low incidence of clinical or radiological acetabular erosion, given the associated osteoporosis that could be present with metastatic hip disease, either due to the pathology, systemic chemotherapy, or local radiotherapy. Osteoporosis and osteomalacia are known risk factors for acetabular protrusion in native hips [30]. When it comes to acetabular wear after hip arthroplasty, the effect of pre-existing osteoporosis is controversial [30-32]. The incidence of acetabular wear in the current study (7.1%) is comparable to the reported incidence after hip hemiarthroplasty in general, which ranges between 0.7% to 66% [32-36].

Considering the results of the current study, hemiarthroplasty remains a viable option for the management of femoral neck fractures in metastatic hip disease patients. Patients' expectations, however regarding the implant survival and and the surgery outcomes should be presented in light of the primary pathology. It is understood that a patient with metastatic hip disease should undergo proper radiographic investigations before deciding on HA to exclude acetabular, proximal femoral metaphyseal, or femoral shaft involvement by the metastatic disease. Using CT scans, long film femoral radiographs, and even MRI should be performed to detect the presence of acetabular or skip femoral lesions and hence, allow the surgeon to choose the suitable implant, whether a THA, HA, or PFR [37]. It is understood too, that utilizing a sound surgical technique and achieving proper implant primary stability are mandatory for the success of any uncemented hip procedure.

Patients with metastatic bone disease often have weak bone, and care should be taken during insertion of a press fit implant to avoid iatrogenic intraoperative fracture, which may necessitate adding fixation with plates and screws, cerclage wires [38] or revision to a longer stem implant. In presence of femoral diaphyseal metastatic infiltrations, it may be advisable to utilize long stems rather than short [39] or conventional stems to decrease the chance of postoperative periprosthetic fractures with potential disease progression. On the other hand, in case acetabular infiltration was suspected pre or intraoperatively, total hip arthroplasty, with or without acetabular augments for potential defects [40], would be indicated.

This study has several limitations. This is a small series and is limited by the noncomparative and retrospective study design. A large prospective randomized study may be required to better evaluate the outcomes of prosthetic replacement in patients with metastatic hip disease when compared to the general population.

Conclusion

Uncemented hip hemiarthroplasty is a viable treatment option in patients with metastatic hip disease with pathological femoral neck fractures or impending fractures whenever the acetabulum and the stem-femur interface are free from infiltration. Achieving rigid primary implant stability is mandatory to obtain favorable outcomes.

Conflicts of interests: None to declare.

Funding sources: None to declare.

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