

Management of Rare Case of Solitary Metastasis Shaft of Humerus with Pathological Fracture with Intercalary Resection and Nail Cement Implantation: A Case Report

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ABSTRACT

Solitary humerus metastasis presenting with pathological fractures are relatively rare. Pathological fractures are invariably fixed in view of early mobilization, pain relief, part of palliative protocol, and disease activity debulking. Pain relief was better with plate osteosynthesis with bone cement compared to intramedullary nailing. Complication rates were equal with both these procedures including local and systemic complications. Complication rates are higher with nonlocking intramedullary nailing. Here we report a case of 70-year-old male presenting with pathological fracture humerus which was diagnosed later to be a metastatic lesion with adenocarcinoma lung. Evaluation and approach to this case is challenging to orthopedic surgeons without extensive knowledge in tumor and metastatic aspects. Hence this case report would be a valuable concise brief of this case presentation, approach, and step by step management with a brief literature review.

Keywords: Intercalary, Metastasis, Nail cement spacer, Pain relief, Solitary metastasis.

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INTRODUCTION

Humerus is the second most common among the sites of metastasis following spine and pelvis. Pathological fracture of humerus is 15–29% common among all the regions.^{2–4} The conservative treatment options had poor results including longer healing time and poor healing rates, very little improvement in function, less significant pain relief as the disease process is still persisting in the parent bone.^{2,3}

Osteosynthesis is the current gold standard procedure for disseminated disease without contraindications for this procedure.^{1,2}

There has been a debate between intramedullary nailing and osteosynthesis in view of results which were similar.

Ethical Consideration

The procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000.

CASE DESCRIPTION

History and Examination

Mr X is a 70-year-old gentleman who was a businessman by occupation presented with severe pain over R arm following trivial fall. He had complaints of swelling, difficulty in moving the nearby joints. There was no open injury and he can able to move his fingers, shoulder, and elbow with pain and difficulty. On examination, warmth, tenderness was present over the right mid-arm, ROM of the adjacent joints was painful which was localized at the mid-arm region. No history of injuries else were. He is known case of T2DM on regular medications. Nil significant family history of any chronic disorders.

Investigations and Course of Stay

He was investigated with a plain radiograph of the affected extremity. It showed a pathological fracture over the shaft of humerus

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with an osteolytic lesion around the fracture site (Figs 1 and 2). There was significant osteoporosis over the entire humerus.

Oncologist was consulted then, he suggested MRI of full length humerus with blood investigations including markers for multiple myeloma. General surgeon, gastroenterologists, and pulmonologist consultations were made to rule out any tumor and to look for primary lesion.

MRI–suggested hypodense lesion T1 at the diaphysis region with soft tissue extension—mostly suggestive of Metastasis, Lymphoma, Osteosarcoma.

After these consultations, patient was investigated with PET scan, USG thyroid, CT-chest, CT-abdomen and pelvis, stool occult blood to look for signs of primary lesion and metastatic lesions.

CECT–chest suggested? Squamous cell carcinoma in right lower quadrant. Bronchoalveolar lavage and biopsy did which showed EGFR TKI positive tumor. So patient has been started on erlotinib, afatinib as 1st line chemotherapy drugs and maintenance therapy for 4–6 cycles for tumor bulk reduction and as a palliative therapy.

CECT abdomen was normal and there were no lesions in breast, prostate, thyroid, and adrenals.

Onco-orthopedician later advised and performed a bone and soft tissue biopsy which showed atypical epithelial cell malignancy to rule out gastrointestinal/respiratory tract primary.

Surgery

We planned for a procedure which should involve fixation of shaft of humerus to stabilize the fracture (Fig. 3), removal of tumor load (debulking), filling the space with cement mantle supported by a nail.

One week after the biopsy we performed open reduction internal fixation with locking compression long PHILLOS plate after tumor excision and filled the space with K-nail cement mantle.

Procedure

Under GA, parts painted and draped, supine position, anterolateral approach used which included the biopsy site. Biopsy tract was excised in total. Tumor site exposed. Soft tissue and bone samples taken and sent for HPE and culture and sensitivity.

Through wash given, tumor site debulking done, debridement of soft tissue done. Wide excision with >5 cm margins were made and bone cut was made with a bone saw. Then after freshening the ends and clearing up the medullary canal. K-nail sizing was done and Length was measured under C-arm guidance. Harrington rod cutter was used to cut the K-nail and it was inserted through

both the medullary canal as a space filling, length maintaining fixation device. Then fixation done with a long PHILLOS (SYNTHE) plate. Then PMMA (SIMPLEX) bone cement was used to cover the bone defect as per the contour of the surrounding humerus in a circumferential pattern. Wound was closed with a drain.

Postoperatively patient's neurovascular condition was normal. Patient had reasonable pain relief as assessed by VAS.

Postoperative X-rays were good. No implant misalignment or cement spilling. Sutures were removed at POD 14.

Patient was regularly followed up at a period of 3, 6, 12, 16, and 20 weeks with serial X-rays. He was later referred to Regional Cancer Centre (Trivandrum) where he was given a course of chemotherapy for six cycles. They gave a 3-year survival rate of 30–50% as prognosis, which my increase with chemotherapy.

Patient reviewed to OPD at 6 weeks, and we took a radiograph which showed normal implant positioning, and VAS score improved to 9/10 and significant functional improvement is there for the patient.

At 3 months follow-up, patient is asked to encourage normal day to day activities involving overhead abduction other activities of daily living.

Implant and nail cement incorporation was found to be good in the postoperative period for 6 months (Fig 4).

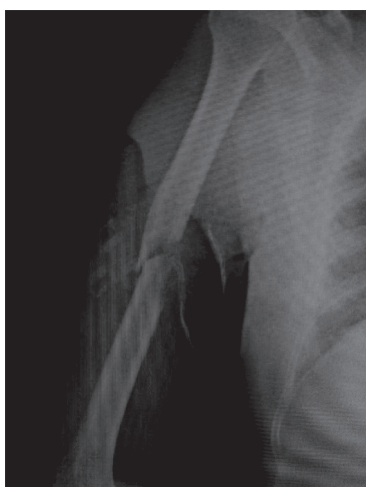


Fig. 1: AP view humerus showing fracture at shaft

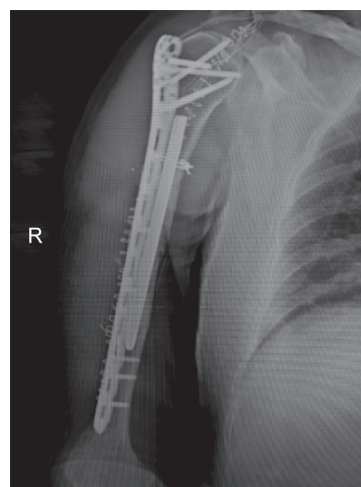


Fig. 3: Post fixation of pathological fracture



Fig. 2: AP view of internal rotated shoulder showing pathological fracture shaft of humerus

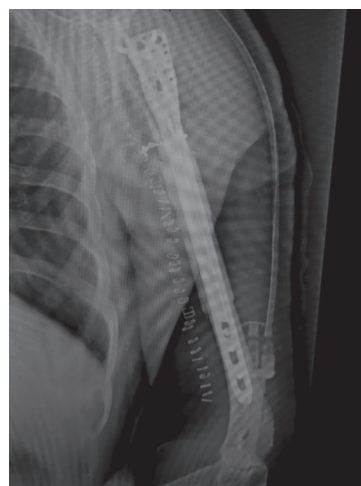


Fig. 4: Internally rotated shoulder view of shaft of humerus post ORIF

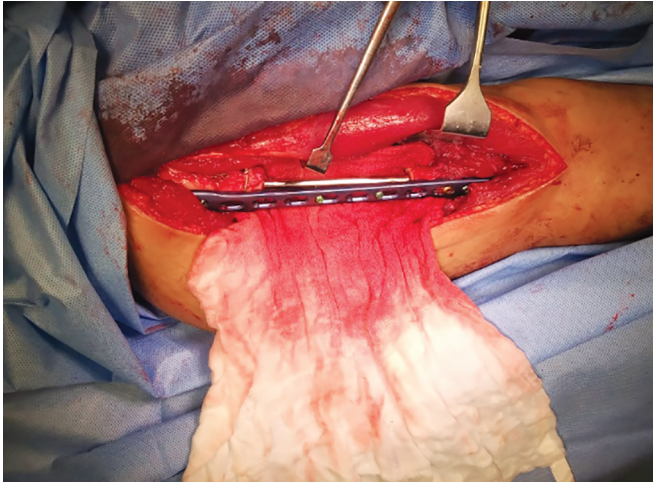


Fig. 5: Placement of nail plate assembly post fixing the fracture

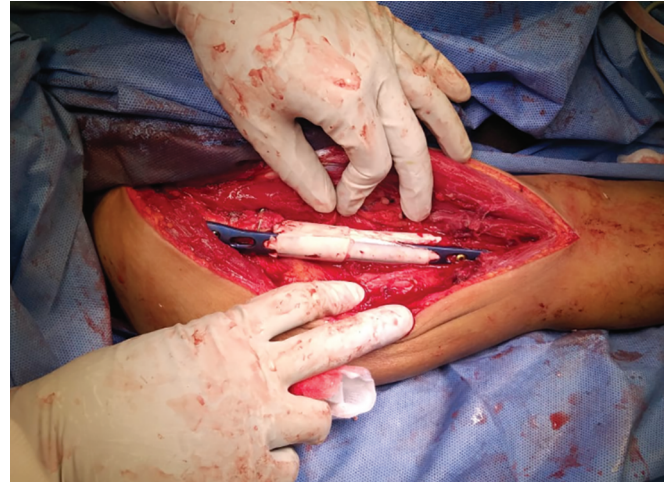


Fig. 6: Placement of nail plate assembly with cementing

DISCUSSION

Metastasis commonly occurs in spine, pelvis and, long bones. Out of which humerus is second most common long bone. There are two recognized criteria for impending pathological fracture. Harrington's criteria and Mirel's criteria where they will provisionally fix the fracture if the grading is higher.

A 6-month survival rate for prostate, breast, renal, and lung are 98%, 89%, 51%, and 50%, respectively.¹

A lot of complications can arise secondary to pathologic fractures and their surgical management. From a surgical point of view, failure of fixation or refracture can occur secondary to poor healing potential or local progression of the disease. Implants can become infected, which requires long-term antibiotics and/or removal of hardware and revision depending on patient prognosis. Additionally, complications such as venous thromboembolism may arise secondary to poor mobility during the recovery period. Specific to prosthesis as described by Henderson et al., there are five accepted modes of failure: type 1, soft tissue failure; type 2, aseptic loosening; type 3, structural failure; type 4, periprosthetic infection; type 5, tumor progression⁵ if cement is used, complications related to underlying allergy or pulmonary sequelae have been reported and hence anesthetist should be alerted intraoperatively. Bone cement implantation syndrome refers to clinical sequelae characterized by hypoxia and hypotension shortly after pressurizing cement within the bone. This syndrome has been reported in up to 75% of oncologic patients undergoing cemented hip arthroplasty and may be fatal if not managed appropriately it can also occur with this procedure.

Closed static interlocking nailing (unreamed) was the procedure of choice in the older times for metastatic lesions of humerus. Plate osteosynthesis was not preferred earlier as screw purchase was a problem and loss of fixation can occur. But advancements with

locking plates have improved the fixation stability and it offers a new improved version of fixation.

CONCLUSION

The multidisciplinary approach to this subset of patients is important in the management. Proper recognition of the pathological condition is the prime requisite for the treating orthopedician. Treatment of primary tumor if recognized should be at most important for the patient survival or to reduce the disease activity. If a tumor is suspected, sufficient expertise is needed for a proper management and reconstruction protocols. Nail cement spacer with long PHILOS seems to be effective procedure in the management of these metastasis of shaft of humerus (Figs 5 and 6).

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