

## Acute Osteomyelitis in Closed Fracture of Adult Humerus- Case Report and Review of Literature

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**Abstract:** Acute osteomyelitis developing in a closed fracture is extremely rare. Only twenty six such cases have been reported in literature so far with most cases being associated with immunodeficiency or polytrauma along with a potential source of infection though none of them involved the humeral shaft. We report a case of acute osteomyelitis of shaft of humerus in an unpre-disposed 50 year old male without any apparent source of infection following closed diaphyseal humeral fracture. Acute osteomyelitis was managed with antibiotics. However it later on complicated into chronic osteomyelitis which was treated with debridement and sequestrectomy. Bony defect was addressed later when all signs of infection had disappeared with acute docking and onlay fibular grafting with plating. Union was seen at 10 weeks post op with satisfactory functional results. The pathogenesis of this complication after closed fractures is actively debated and is thought to involve proliferation of microorganisms already residing in host tissues or their translocation from microfissures in skin in the setting of low resistance due to inflamed soft tissue after trauma. Hence this complication should be considered if excessive or prolonged pain and swelling with signs of inflammation develop where no other obvious infection is apparent. Also onlay fibular grafting along with plating successfully addressed bony defect in our case.

**Keywords:** acute osteomyelitis in closed fracture, bony defects, gap nonunion, humerus, onlay fibular graft with plating

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### I. Introduction

Acute osteomyelitis developing in the setting of a closed fracture is rare. Although trauma may be a predisposing factor for acute osteomyelitis, [1] [2] fractures have not been incriminated in the etiology of acute osteomyelitis [2] [3]. Twenty six cases of acute osteomyelitis developing in closed fractures have been reported in literature so far [4] [5] involving both children and adults. Thirteen cases have been reported to occur in adults, of which two cases involved the humeral neck and one involved the humeral head and neck. [4] [5]. We encountered a case of acute osteomyelitis of the shaft of humerus in an adult following closed fracture which has not yet been reported. We aim to highlight the mode of presentation of such a rare case, and discuss the subsequent management strategy using fibular graft.

### II. Case report

A 50 years old male presented with closed, displaced fractures of diaphysis of the humerus with minimal comminution few hours after a fall. At presentation a thorough clinical examination was done and the limb was supported in a U slab. There was no clinical evidence of any systemic or local infection in the patient either at the time of presentation or in the immediate pre injury period. After few hours, patient became restless with increasing pain and developed high fever; local examination revealed warm, red overlying skin with severe tenderness and tense swelling that had increased in size than at the time of presentation. A wide bore needle was inserted into the haematoma that aspirated frank pus. After taking blood samples for bacteriological examination and culture sensitivity testing, intravenous 3<sup>rd</sup> generation cephalosporin was started immediately and other general measures were instituted to take care of high fever, dehydration, pain etc. After stabilization an incision and drainage with thorough irrigation of the abscess was done. The skin was closed over a drain and pus was sent for culture and sensitivity. The limb was supported in a POP slab. The general condition of the patient improved and pain subsided. Appropriate antibiotic was started as per pus culture and sensitivity report which revealed growth of *Staphylococcus aureus*. Blood cultures were negative. However after 14 days, the wound started draining pus. A diagnosis of acute osteomyelitis was made. Antibiotics as per report were continued parentally and daily dressing of the wound was started. The drainage of pus gradually reduced in quantity but never stopped.

At around 6 weeks after first surgery, X-ray of the arm was done which revealed signs of osteomyelitis at the fracture ends with periosteal reaction near the fracture margins and the comminuted fragments appeared dead. A second operation was planned to debride all the necrotic and infected tissues. Through an antero-lateral incision, the bony ends were exposed. Radical debridement with sequestrectomy was done and the wound was kept open to drain. The limb was immobilized in a plaster immobilizer. Wound toileting was done regularly

with normal saline mixed with 10% povidoneiodine and hydrogen peroxide. Within 2 weeks, the wound stopped draining and healthy granulation tissue appeared. The wound subsequently healed by secondary intention and the general condition of the patient also improved.

After 3 months from the last discharge the patient was reviewed to formulate strategy for reconstruction. X-ray showed gap between the fragments and they appeared osteoporotic [Fig. 1]. As the gap appeared to be less than 2.5 cm, acute docking, reconstruction with a medially placed onlay fibula fixed with a plate on the lateral surface was planned. After preparation of the patient, the fracture was exposed through an antero-lateral incision. Intervening soft tissue was excised. The bone ends were freshened till bleeding occurred. Medullary canal was reamed with a hand reamer. Fibular graft was placed medially and fixed with plate [Fig. 2]. Postoperative period was uneventful and the patient was followed up at 2, 6 and 10 weeks.

At 10 weeks postoperatively, signs of both clinical and radiological union were present [Fig. 3,4] however the patient had developed elbow stiffness due to prolonged immobilisation. Twelve months after injury the patient regained 70 percent elbow flexion and 80 percent extension range of movements.

### III. Discussion

Acute osteomyelitis is a frequent complication of open fractures however it is extremely rare after closed fractures and literature review revealed only 26 reported cases [4]. About half the reported cases involved children and long bones were more commonly affected however only 2 cases involved humerus [4]. Involvement of the humeral diaphysis has not yet been reported. The *Staphylococcus* group is reported to be the most common organism responsible for osteomyelitis in closed fractures in adults [4] [6]. Patients who developed infections after closed fractures were either paediatric patients with an antecedent infection of the respiratory or the urinary tract, or immunocompromised adults [4] [7] [8] [9] [10]. Acute osteomyelitis occurring in closed fractures in healthy adults is very rare.

The source of the organism responsible for the infection in healthy adults has not yet been conclusively identified. It has been reported in literature that healthy non injured tissue and body fluids are not bacteria free [11] [12] [13] but they do not elicit a host inflammatory response probably because the bacterial load remains below a certain critical threshold. Another probable source could be the host skin microflora. These microorganisms can penetrate the epidermis to translocate to deeper tissues through micro injuries or fissures eventually settling in perivascular spaces and lymph nodes. [6]

Fracture results in the activation of the local lymphoid tissue, resulting in dilated lymphatics, enlarged lymph nodes, and mobilization of cells within the nodes thus providing a possible mechanism for the movement of bacteria to the fracture site. [12] Bacteria surviving and residing within host phagocytic cells may also be transported to the damaged tissue during the inflammatory phase [6]. Moreover fracture associated soft tissue damage and its pathophysiological consequences also result in decreased resistance to bacterial load [14].

Most of the reported cases have been managed with intravenous antibiotics with or without multiple debridements [9] [5] [13]. Prognosis in children is considered to be favourable [15]. Our case was managed by initial incision and drainage and parenteral antibiotics. Radical debridement with sequestrectomy and regular aseptic dressing was later required when chronic osteomyelitis set in. Gap non-union which developed in our case could have been addressed in several ways. Cancellous bone grafting, microvascular fibular transfer, Ilizarov external fixator and free non-vascularised fibular transfer were some of the options. Nonvascularised fibular cortical grafting technique have the advantage of being technically simpler and it avoids the time consuming process of microvascular anastomosis (which also requires special instruments and surgical skills that may not always be available) [16]. It is also more readily accepted by patients than the Ilizarov apparatus. It was believed that cells in a large autogenous graft died and that the graft acted as a scaffold for the ingrowing cells with osteogenic property. However some cells with osteogenic potential near the surface of the cortical graft do survive and success depended largely on intimate contact of graft with living vascular bone [17]. A latent period of three months from the last discharge is mandatory to prevent reinfection before fibular grafting. Onlay bone graft can be used for nonunions of the shaft of any long bone, and the technique is similar for all; only the size of the graft and the number of screws are modified to suit the individual bones. Fibular grafts provide structural and probably osteoinductive support to enhance healing [18]. Moreover, combined with internal fixation the technique provides a wide area of firm contact between the endosteal surface of the graft and the native bone and is of advantage when treating nonunions with bony defects [17]. No appreciable donor site morbidity was evident in our case similar to observations made by other workers.

### IV. Conclusion

The notion that infection does not occur with closed fractures may be an oversimplification. Osteomyelitis in closed fractures should be considered if unremitting pain and swelling with signs of inflammation develop after the fracture has been initially managed and no other obvious infection is apparent. The risk factors and mechanisms inducing bacteria to evoke an inflammatory response and cause an infection

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needs to be studied further. Such cases can be managed with initial incision drainage, parenteral antibiotics and immobilisation with radical debridement if required later. Bony defects can be effectively treated with fibular onlay cortical graftwith plating and has good patient acceptance.

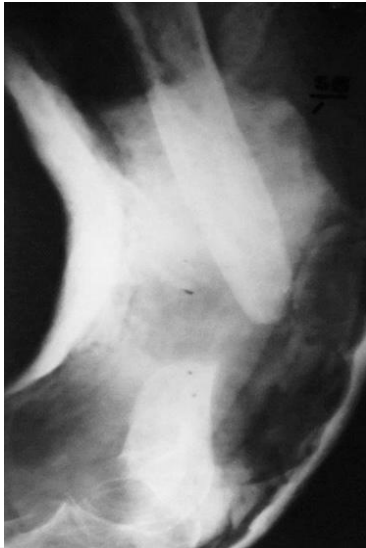


Figure 1-Preoperative xray



Figure 2-X-rayshowing immediate postoperative status- plate fixation with medial onlay graft



Figure 3-X-ray showing healed non-union



Figure 4- X-Ray showing absorption of graft after union

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