A rare injury of posterior four part fracture dislocation of shoulder following electrical injury- Did infection had role in humeral head salvage?

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Abstract

Posterior dislocation of shoulder and fracture dislocations are rare injuries. Seizure disorders, high energy trauma and electrical shock are important etiologies for such injuries especially in bilateral cases. In four part fracture dislocations and in electrical shock injuries, chances avascular necrosis of humeral head is really high. In this article, we report posterior four part fracture dislocation of shoulder with anatomical neck completely displaced posteriorly following electrical shock in 36 year old female. Patient was operated with open reduction and internal fixation with minimal implants. Patient developed infection postoperatively with methicillin resistant staphylococcus aureus (MRSA) and emergency debridement was done. Four month postoperative, infection healed completely and radiology showed partial union of fractures with no signs of humeral head avascular necrosis. Constant-Murley Clinical Method of Functional Assessment of the Shoulder showed a average score of 54 (out of 100) at four months. There have been reports on infections leading to increased bony vascularity and hence we assume that infection might had a role in humeral head salvaging as seen in our case.

Case presentation

36 year old female presented with history of electrical injury ten days before. She underwent primary aids in primary health centre at her village where dressings for deep burns on her left forearm and right hand were done. On examination at our hospital, we found deep burns on her left forearm and right hand. There was swelling over right shoulder with painful restricted movements without external wound on shoulder. On X-rays and computed tomography (CT) scan, patient had four part fracture dislocation shoulder with anatomical neck completely fractured and displaced posteriorly (figure 1a, b and c). After proper preoperative workup and consent, we planned for open reduction and internal fixation. Deltopectoral approach was used. After reduction, fixation of head to the shaft was done with 2 thick Kirschner (K)-wires. Greater tuberosity with its muscular attachment was fixed to shaft with five number ethibond sutures. Lesser tuberosity with its muscular attachment was anchored to shaft of humerus with stainless steel wires (figure 2). Raw areas on left forearm and right hand were skin grafted at same setting after closure of main surgical site. Tip of right index finger showed gangrenous changes and hence was amputated at line of demarcation. Postoperatively, on day eight, patient started showing signs of infection. Wound inspection showed gross collection of sero-purulent material. Patient was posted for emergency debridement and intraoperative culture report showed methicillin resistant staphylococcus aureus (MRSA) organism. Wound was left open partially to allow drainage of collections and daily irrigation with saline. Daily dressing of the wound for nearly eight weeks with proper intravenous linezolid antibiotic for six
weeks caused complete wound healing. At the same time patient was put on pendulum exercises seventh day postoperatively once acute pain subsided. Gradual range of movement exercises were started at three weeks and at two months, patient was allowed to do light duties. At three months, patient was allowed to resume her daily duties and her routine work. However functional assessment done with Constant-Murley Clinical Method of Functional Assessment of the Shoulder at five months showed average score of 54(out of 100). CT taken at four months shows partial union of fractures and more importantly no signs of avascular necrosis of head of humerus(figure 3a and b). Grafted raw areas on left forearm and right hand healed completely(figure 4).

Discussion

Posterior dislocation shoulder and posterior fracture dislocation shoulders are rare injuries. Triple ‘E’ syndrome namely epilepsy, electrical shock and high energy trauma are most important documented etiologies for such injuries in bilateral cases[2]. Unilateral posterior four part fracture dislocation shoulder following electrical injuries have been rarely documented in the literature. Mechanism of such injuries in electrical shock involves either by direct fall on shoulder following electrical injury or by strong tonic muscular contractions surrounding shoulder especially flexors, adductors and internal rotators. In our case both mechanisms might have caused her posterior four part fracture dislocation of right shoulder.

In fractures involving anatomical neck of humerus, incidences of avascular necrosis of head are quite high. In four part fracture dislocations of shoulder, the chances of avascular necrosis of humeral head are predicted to be 90%. Moreover humeral head avascular necrosis following electrical injury has been documented in literature[4]. In addition to that late presentation to the hospital is another bad prognostic factor as it might increase chance of avascular necrosis of humeral head. Therefore, in our case, we had very high possibility of head of humerus going for avascular necrosis with potential contributing factors like fracture at anatomical neck of humerus which was completely detached from rest of the neck as found intraoperatively, four part fracture dislocation, electrical injury and delayed presentation to the hospital.

Treatment of such injuries is complex and multifactorial. Treatment options involve conservative, closed reduction and percutaneous fixation, open reduction and internal fixation, hemiarthroplasty and total shoulder replacement. In patients where there is high likelihood of avascular necrosis of humeral head has to be managed by hemiarthroplasties[5]. Even though there was high chance of avascular necrosis of humeral head in our patient, we decided to salvage head by doing open reduction and internal fixation mainly because of her age.

There have been few researches which shows that infection increases bony vascularity in fractures though studies are limited[6]. Gilbert et al found that infection was associated with increased bony vascularity particularly in distal fragments[6]. There are no other studies which demonstrates effect of infection on bony vascularity. The possible mechanism which might increase perfusion at bone following infection are enhanced inflammatory changes which inturn might increase angiogenesis. However further studies are needed to understand exact mechanism underlying this. We, in our case too partly assume that postoperative infection with MRSA might have increased perfusion at humeral head making it viable even after having such a high contributing risk factors for avascular necrosis.

Conclusion

Posterior dislocation shoulder is rare injury and posterior four-part fracture dislocations are still rare. Most documented posterior four part fracture dislocations are bilateral whereas unital injuries are reported less in literatures. Infection has a role in increasing vascularity at fracture site as shown in literature. In our case too we assume infection had role in humeral head salvaging by increasing vascularity at fracture site evenafter having such high chances of avascular necrosis.

References


Illustrations

Illustration 1

Figure 1. a. Preoperative X-ray showing posterior four-part fracture dislocation shoulder, band c. CT showing severely displaced fracture dislocation with head of humerus facing posteriorly.

Illustration 2

Figure 2. Immediate postoperative X-ray showing fracture being fixed with minimal implants (with K-wires and stainless steel wires)
Illustration 3

Figure 3. a and b CT scan taken at four months showing partial union of fractures with head of humerus showing no signs of avascular necrosis.

![CT Scan Illustration]

Illustration 4

Figure 4 showing completely healed raw areas on left forearm and right hand post skin grafting. Tip of right index finger had gangrenous changes and was amputated.

![Healed Raw Areas Illustration]