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Case Report

Medial femoral condyle fracture following traumatic allogenic bone transfer – A case report

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ABSTRACT

Open fractures can cause an “out-in” injury, wherein a foreign body can penetrate the skin causing fracture. There are few reports of allogenic bone getting embedded in soft tissue, but one causing fracture to the host bone has not been reported till date. We present a case, wherein a large cortical bony fragment from one individual penetrated the thigh of another person causing fracture of medial femoral condyle during a head-on collision involving two motorbikes.

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1. Introduction

Open fractures following road traffic accidents are very common and mechanism of injury is “in-out” where the fractured bone fragments penetrates the soft tissue, conversely the opposite mechanism can occur where foreign body can penetrate the skin causing an “out-in” injury making treatment options difficult. There are few reports of allogenic bone getting embedded in soft tissue following road traffic accidents^{1–3} and bomb blast injuries^{4–6} but one causing fracture has not been reported till date. We present a case, wherein a large cortical bony fragment from one individual penetrated the thigh of another person causing fracture of medial femoral condyle during a head-on collision involving two motorbikes.

2. Case report

A 20 year old male patient initially treated elsewhere was brought to the causality, 24 h after a road traffic accident (2 wheeler vs 2 wheeler motor vehicle collision). The person on the opposite bike had an open comminuted fracture femur and head injury due to which he expired in another hospital.

On examination, two sutured wounds were found over the postero lateral aspect of the right thigh; i) one over the middle 1/3rd measuring 4 cm and ii) the other measuring 2 cm on the lower 1/3rd of thigh. A superficial abrasion over the antero-medial aspect of patella was also noted. The Knee joint was swollen with painful restriction of movements and intact distal neurovascular status.

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Preoperative blood screening revealed a nonreactive hepatitis B, C and human immuno deficiency virus (HIV) screening and radiographs of the knee joint with femur showed comminuted fracture of medial femoral condyle with large cortical fragments in the middle and lower thirds of thigh.

In view of comminution and unclear fracture morphology, the patient was subjected to computer tomography with 3D reconstruction which revealed comminuted medial condylar fracture with allogenic cortical bone fragments, one abutting the medial femoral condyle and another in middle third of thigh, both corresponding to the sutured wounds (Figs. 1 and 2). Doppler study of the right lower limb was normal.

2.1. Stage 1

Patient was subjected to surgery under spinal anaesthesia in lateral decubitus position; exploration was started through previously sutured wounds and the proximal fragment of size 2 inches was removed without much difficulty. The distal fragment which was abutting the medial condyle was not accessible and incision was extended connecting both the previous wounds. After deep exploration the 4 inch fragment was found in the medial head of gastrocnemius, which was completely crushed. The medial condyle had a triangular indentation caused by the cortical allogenic fragment and care was taken not to damage the common peroneal nerve and femoral artery (Fig. 3). A thorough wash was given and wound sutured in single layer over drain.

2.2. Stage 2

The patient was made supine and the medial condylar fracture was explored through a curved incision after incising the medial retinaculum.

The fracture fragment had a medial collateral ligament attachment.

The fracture surfaces were prepared after removing all free bone fragments and the fracture was stabilized with two 4.5 mm lag screws (Fig. 4). An image intensifier was used to check for allogenic bone remnants before closure. The knee joint was immobilized for 6 weeks and Patient was counselled regarding the risk of blood borne infections and necessity for subsequent screening.

Suture removal was done on 12th post-operative day and mobilization started from 4th week. Sequential radiographs were taken and the fracture union was assessed. At the end of 3 months, the knee flexion was 120° (Fig. 5) and the patient had full flexion at final followup of 9 months.

3. Discussion

Among Open injuries encountered in road traffic accidents, inside out autologous bone penetrating ones are most common and their treatment protocols have been extensively described in literature.

Penetrating wounds from non-organic sources are frequent in motor vehicle accidents and often such injuries involve the distal limbs.² Allogenic cortical bone fragments acting as a projectiles have been reported to cause soft tissue injuries^{1–6} and they are more likely to occur with bomb blasts and high energy accidents in the recent times. An allogenic bone fragment penetrating the skin and leading to bony injury as in our case has never been reported till date.

Because of its mechanical properties and light weight, cortical bone has been used in arrowheads and spearheads in war fare and hunting.⁶ The same properties are applicable in bomb blast injuries where bony fragments act like secondary projectile.⁶ unlike in high energy collisions where the bony

Fig. 1 – Pre-OP X-ray of right thigh with knee AP & lateral views showing medial condyle of femur fracture with allogenic cortical bone on postero-medial aspect of knee.

Fig. 2 – Pre-OP CT Scan; A) 3-D reconstruction showing relation of allogenic bone to patients medial condyle. B) Axial view showing medial condylar fracture due to indentation of allogenic cortical bone.

fragments directly come in contact with opposite person's body parts producing outside-in allogenic bone penetration causing soft tissue damage³ and very rarely bony injury similar to our case where the allogenic cortical fragment pierced the

cancellous bone of femoral condyle. In the present case, as a result of head on collision, the Femoral shaft of one patients pierced the cancellous medial condyle of the other patient - leading to fracture. The force of penetration and strength of

Fig. 3 – Intra-operative pictures showing allogenic cortical bone fragments.

Fig. 4 – Post-operative X-ray AP & lateral views of knee.

cortical bone vs cancellous bone were the preceding factors leading to the fracture.

One of the major difficulties with penetrating foreign bodies is the identification of the foreign material on radiographs² and differentiating the autologous bone fragments from allogenic particularly when there is fracture comminution like our case where computer tomography with 3D reconstruction played a vital role. Another concern when dealing cases like these is blood borne disease transmission where screening of both the patients for HCV, HBV and HIV has to be done. Braverman et al reported a case in which a penetrating bone fragment was found to be from a patient who tested positive for hepatitis B.⁵

In our case the opposite person's status was not known so he was administered hepatitis immunoglobulins and retroviral therapy from the day of admission as per recommendation of Health Protection Agency⁶ and discontinued after three days, on finding out the haematological status of expired person. The patient was counselled to undergo screening for the above three mentioned diseases at regular intervals.

Polymerase chain reaction (PCR) should be performed on allogenic bone fragments for possible transmissible diseases.⁶ But in our case as the haematological status of both the patients was known and DNA tissue typing was not done for the bone fragments as the other individual was not alive.

Among Previous publications¹⁻³ describing penetrating allogenic bone injury, the injuries were caused by motor vehicle crash and fragments of fractured bone of an adjacent injured individual were traumatically speared in to soft tissue. The peculiarity of our case is that cortical allogenic fragment which had sharp ends pierced the soft tissue and cancellous bone of medial femoral condyle leading to fracture which was treated with ORIF with two 4 mm screws.

4. Conclusion

Treating doctor should be aware of the possibility of penetrating injury to soft tissue and bone by cortical allogenic bone and problem of hematological disease transfer, which should be

Fig. 5 – Functional outcome at 3 months follow up.

addressed promptly as per guidelines provided by health protection agency. CT 3D reconstruction might prove very helpful in identifying the fracture morphology and differentiating allogenic bone from autologous bone fragments.

Declaration

We Authors Declare that this is the original manuscript case report carried out at our institute, which is not presented, published or sent for publication to any scientific committee/conference/journal. We also declare that there are no financial liabilities and no conflicts of interest involved in this case report. Ethics committee clearance from our institution and Patient's Consent for publication of his photos and details of the case for publication were taken by the authors.

Conflicts of interest

All authors have none to declare.

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