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Case Report

Plate mouse

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ABSTRACT

Fracture shaft humerus when surgically fixed is known to go into non-union and one of the main reasons of this is implant failure. The causes of implant failure may lie in the fracture personality, faulty implant material or choice, dubious surgical technique & faulty mechanics of fixation. Implants may break and cut-through but a unique type of implant migration from one surgical compartment to the other or one anatomical part of body to the other has not been hitherto reported. A 45-year-old male, farmer by occupation, was operated for fracture shaft of humerus 15 years back. He presented to us because of pain due to subcutaneous presence of plate in forearm. X-ray of the elbow with forearm showed that the plate used for fixation of humerus had migrated from one body part to another that is from arm to forearm. The patient on deliberation regarding the pros and cons of surgical treatment options, chose not to get his humerus non-union resolved surgically. This was because he could do his activities related to farming reasonably well.

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1. Introduction

Fracture shaft humerus is known to go into non-union. Some of these non-union's are really difficult to treat & it is in these difficult non-union's that a variety of implant failures are seen. Implants may break and cut-through but a unique type of implant migration as documented here has not been reported before.

2. Case report

A 45-year-old male, farmer by occupation, was operated for fracture Shaft of humerus 15 years back. No previous records could be made available to us. The patient had a lacerated

wound on anterior aspect of arm which was sutured initially. According to the patient after the lacerated wound healed and sutures were removed, a plate and screw type of implant was used. The postoperative period was uneventful and he was discharged from hospital after suture removal. He was immobilized in plaster for 2 months, after which the limb was mobilized and he was allowed to do light activities with an above elbow brace with hinge. This was continued for another 2 months after which his limb was freed of splints. He was allowed to do heavy activities after a period of 6 months post surgery. He used to lift weights initially with pain for 1 year, later without pain though with some audible click at fracture site. He consulted the operating surgeon for this audible click and was advised to undergo second surgery, but patient refused as he was able to do his daily activities. After 15 years

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he presented to us because of pain due to subcutaneous presence of plate in forearm. On examination there were two non-adherent surgical scar marks in an inverted Y-shape over the middle of arm, with a lateral bony prominence becoming apparent on abduction of shoulder (Fig. 1). Palpation of the humeral shaft from proximal to distal revealed discontinuity in the distal third of the humerus; rotation could not be transmitted proximally while moving the distal fragment. On holding the proximal shaft of humerus in left hand and distal supracondylar humerus fragment in the other hand painless free mobility could be elicited between the two fracture fragments in all planes. A smooth linear hard object was felt antero-lateral to the elbow and proximal forearm (Fig. 1).

X-ray of the elbow with forearm to our utter surprise showed following findings: 1) There was atrophic non-union of fracture distal one-third humerus. 2) The distal fragment was osteoporotic, irregular, pointed and angulated anteriorly. 3) The proximal fragment also showed a cystic/lytic area pseudoarthrotic type with a single 4.5 mm cortical screw in it. 4) But the real astonishing thing was that the plate used for fixation of humerus had migrated from one body part to another that is from arm to forearm. 5) Distal forearm bones and proximal humerus were normal (Fig. 2).

On further clinical examination the muscle power at elbow that is of biceps and triceps was near MRC grade 3 (Fig. 3) and normal in supinator and pronators in upper limb. True muscle power of elbow flexors and extensors can only be best estimated as humerus the lever over which these muscle act was broken & so the elbow could be moved only through half the range of motion. Muscles acting at shoulder, hand and wrist revealed grade 5 power. The other peculiarity which became apparent while testing this power was that as the patient flexed his elbow, he brought the distal and proximal fragment into contact. The contracted biceps & triceps splinted the

fracture site in flexion and extension thus enabling him to demonstrate grade 3 power at elbow (Figs. 3 and 5II).

Range of motion at elbow, could only be tested after holding the distal fragment separately, as otherwise the passive motion occurred at the fracture site. It was 10–120°. There was no neurovascular deficit.

After discussion patient was offered implant removal, osteosynthesis of fracture with ilizarov & bone transport for non-union humerus. He was ready only for implant removal & not for any lengthy procedure for non-union humerus which gave no guarantee to its success. So only the subcutaneous impinging implant was removed leaving screws which were deeply incarcerated in soft tissues; as their removal entailed risk to adjacent neurovascular structures. The patient was happy after implant removal and returned to his daily activities as before. He could do his tasks of carrying weights with elbow extended and could transport them from one place to another. He could also lift weights upto 5 kg in semi-abducted position of shoulder & semiflexed elbow position. He was able to do activities of daily living like buttoning/unbuttoning shirt, manoeuvring his machines of farming, ablution, eating (Figs. 4 and 5).

Patient was informed that data concerning the case would be submitted for publication, and he has agreed to this.

3. Discussion

The prevalence of humerus shaft non-union as a complication of both non-operative and operative treatment has been reported to range from 8% to 12%.¹ The common causes of non-union are infection, compounding of the fracture, comminution, inadequate immobilization of the fracture, distraction at fracture site, unstable fixation, wrong choice of implant,

Fig. 1 – (I) Anterior lacerated wound scar mark in a muscular arm and plate prominence on the posterolateral forearm (red line). (II) The inverted Y scar mark on arm (black arrows) and prominent plate end at mid forearm (red arrow). (III) Prominent plate end at mid forearm (black arrow).

Fig. 2 – Preoperative X-ray showing proximal humerus fragment with a cystic/lytic area pseudoarthrotic type distal end with a single 4.5 mm cortical screw in it (black arrow). The distal fragment was osteoporotic, irregular, pointed and angulated anteriorly (red arrow). The plate used for fixation of humerus had migrated from one body part to another that is from arm to forearm (yellow arrow).

iatrogenic devitalization of soft tissues, bone loss and osteoporosis.² In this case cause of non-union is conjectural as there were no previous records. It could probably be subclinical infection, reaction to implant; the union perse was also delayed as the patient was immobilized by the operating surgeon for 4 months. Heavy activities before the fracture healed completely probably did the final damage to the precariously uniting fracture as an audible click was heard by the patient. But the patient ignored surgeon's advice of reoperation as he had no problem performing his daily activities. Delayed union of humerus following fracture often leads to painful upper extremity with limited function & non-union leads to decreased function as the lever over which muscle acts is broken.^{3,4} Instead of these, he presented to us with pain and discomfort due to subcutaneous prominent plate.

In our case although patient had atrophic non-union, he had no problem in performing his daily and professional activities for 15 years and he approached to us only when plate became prominent at the elbow and started hurting and troubling him due to its subcutaneous location. This has been elucidated by other author's also.⁵ He was counselled about the treatment options their limitation, advantages and

disadvantages that is 1) implant removal, bone transport and osteosynthesis with ilizarov. This could be lengthy, tedious with implant infection wire cut-through, non-union/delayed union at proximal corticotomy site and still may fail. 2) Implant removal and reosteosynthesis with fibular autograft and plate. 3) Customized elbow replacement was not offered due to his hard farming professional activities. 4) Implant removal and acceptance of preoperative function. He opted for the last option that is removal of implant and return to preoperative function.

This is a unique case in which implant has failed in its mission and has migrated like a flying object from one anatomical part that is arm to forearm. The probable cause for this migration of anterior humeral plate is as follows: The implant in most likelihood started failing distally, with the distal screws failing in sequential manner; each screw pulling out of bone to a differential extent starting in ascending order from distal to proximal. The plate hence started to lift distally, with its distal part pointing towards anterior skin and subcutaneous tissue. This was much like the position of an aeroplane with its nose upwards. The daily heavy activities of farming like lifting etc also gradually caused the implant to fail

Fig. 3 – The activities he can do after implant removal. (I) Abduct his shoulder to 110° with elbow flexed to 80°, (II) abduct arm with elbow extended. (III) Flex his elbow to 80°.

proximally in a sequential manner and gradually the plate took off. It pierced the muscular tissue travelled or nibbled its way like a mouse underneath the deep fascia from arm to forearm into the subcutaneous tissue.

At the elbow, the deep fascia is attached to the epicondyles of the humerus and the olecranon of the ulna, and is continuous with the deep fascia of the forearm.⁶ So the plate after piercing the muscle had an unhindered travel to forearm from

arm. Plate's distal end finally even pierced the fascia at the proximal forearm into the subcutaneous tissue and glided through it to the middle of forearm as fat offers less gliding friction. It probably came to lie on lateral surface due to physiological cubitus valgus.

Migration of such a large blunt implant has not been reported in literature up till now from one part of limb to another part. Although migration of K wires,^{7,8} guide wires,⁹ screw, hip

Fig. 4 – Shows that he can lift weight after implant removal. (I) With elbow extended and arm by the side. (II) With shoulder abducted and elbow flexed. (III) The peculiarity/trick used by patient to do his daily activities became apparent while testing power of elbow flexors. The contracted biceps & triceps splinted the fracture site in flexion and extension & enabled him to bring the distal and contact.

Fig. 5 – Postoperative X-ray: (I) anteroposterior view. In the lateral view (II): flexing the elbow brings the distal and proximal fragment and also the proximal ulna into contact, the muscles splinted the bone; this allows the patient to do his work.

screws¹⁰ have been reported in different part of body but not of such a large plate. This is a lesson for patients not to ignore clicks in postosteosynthesis rehabilitation period as they may suggest a failing implant & expeditiously consult the operating surgeon. Had he followed the surgeon's advice of reoperating him 15 years back the result would have been better.

Conflicts of interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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