Implant failure within 3 days after plating of fracture shaft humerus

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Fracture shaft of humerus is a relatively common long bone fracture accounting for 10 percent of long bone fractures. But unlike other long bone fractures, the uniqueness of this fracture is that most fractures are managed conservatively rather than operatively. Excellent functional outcomes and high rates of bony union have been reported by numerous studies for conservatively managed fractures. Nevertheless, in the subset of fractures that require open reduction and internal fixation, plating is the gold standard among surgeries with 92 to 96 percent success rate. Implant backing out after plating is rare and causes can be mechanical, biological, poor surgical technique, excessive/insufficient construct stiffness etc. But backing out of a plate usually appears after repeated cycles of mechanical loading and is a gradual process. Presented here is a rare case in which the plate backed out within 3 days after surgery and a discussion regarding the causes of this drastic complication.

Keywords: implant failure, fracture humerus

INTRODUCTION

Presented here is a rare case in which compression plating was done in a closed mid-shaft humerus fracture and the plate backed out within 3 days after surgery. We are presenting this case because implant failure within 3 days of surgery is rare and unheard of. Although a case of plate failure secondary to fissure fracture has been reported, it was after 11 days of surgery and secondary to post-operative mobilisation of the operated limb (Derek et al., 2010). To the best of our knowledge, no case of implant failure within 3 days of surgery has been reported so far in the current orthopaedic literature.

Case report

A 36 year old man presented to our emergency unit after an alleged history of assault with a blunt weapon (sloth hammer) to his left arm. He complained of severe pain in mid arm region and inability to lift weights. On physical examination, skin was intact but there was marked deformity of left arm with tenderness, crepitus and abnormal mobility. Distal neurovascular function was not impaired.

Plain antero-posterior and lateral radiographs of the arm demonstrated a fracture of midshaft of left humerus (AO TYPE 12-A3). (figure 1 and 2)

Closed reduction and immobilisation in a U slab was attempted but the reduction was unstable and there was failure to maintain alignment in the coaptation splint. Thereafter patient was shifted to the operating room for open reduction and internal fixation. Patient was positioned in the right lateral decubitus position and the fracture was exposed using a posterior triceps splitting approach. The radial nerve was identified and protected all the way during the course of the surgery. Compression plating was done using a 9 hole, small fragment, narrow LCDC non locking plate (AO; SYNTHES). Immediate post operative x-rays showed excellent anatomic reduction of the fracture. Arm was immobilised in an above elbow posterior slab and patient was shifted to the ward. Figure 3 and 4.

3 days after surgery, patient complained of worsening of pain at the fracture site. He was immediately shifted for x rays which showed that the screws had walked out secondary to a longitudinal fracture in the proximal fragment leading to loosening of the LCDC plate and failure of fracture reduction. Figure 5.

Patient was counselled and advised to undergo a
**Figure 1, Figure 2.** Pre-op x-rays depicting transverse fracture of midshaft humerus (left)

**Figure 3 and Figure 4.** Immediate post-operative x-rays showing anatomic reduction of fracture with LCDC plate (note opening up of the near cortex due to over pre-bending of the plate; also note the faint outline of the above elbow pop slab)
revision surgery but he refused citing financial and personal reasons. As the next best option, arm was immobilised in a coaptation splint and advised to follow up regularly in the opd.

When the patient reported back to opd 3 months later, the fracture had united reasonably well. He had full range of motion in his shoulder and elbow. There were no signs of infection and his radial nerve function was normal. The patient who is a mason by occupation, is to this day, able to carry out all his routine daily activities with ease. Figure 6.
DISCUSSION

So what went wrong in the management of this case that lead to such a catastrophic complication? Let us discuss briefly.

Humerus fractures account for 10% of long bone fractures and diaphyseal fractures account for 30% of humerus fractures (Ward et al., 1998). One must keep in mind that the mainstay of treatment in these fractures is pre dominantly non operative i.e. closed reduction and arm brace, as it is associated with high rates of union and excellent functional outcomes (Ward et al., 1998). In fact, functional bracing is a time tested method and now considered as the gold standard for management of humeral diaphyseal fractures. (Sarmiento et al., 2000; Rutgers and Ring 2006; Sarmiento et al., 1977; Sharma et al., 1991; Zagorski et al., 1988)

Operative management as such is indicated only in open fractures, polytrauma patients, segmental fractures, vascular injury, intra-articular fractures, pathologic fractures, ipsilateral humeral shaft and forearm fractures, and also in cases in which there is a failure to tolerate or maintain alignment in a functional brace. (Browner et al., 1998; Epps and Grant, 1991; Sarmiento et al., 2002

Although many surgical techniques have been described for fixing these fractures like plating, nailing, external fixators etc, plating still remains the gold standard operative procedure with union rates in the 92% to 96% range, time to union averaging around 12 weeks, and complication rates ranging from 5% to 25%. (Chiu et al., 1997; Hee et al., 1998; Heim et al., 1993; Modabber and Jupiter 1998; Niall et al., 2004)

The reasons for failure of fracture plate fixation are multifactorial and in most cases the exact reason(s) for failure remains unclear. Extensive review of literature about the biomechanics of implant failure failed to show a clear cut or a widely accepted classification summarising all the possible reasons for failure of implant.

According to Gardner et al, failure of fracture plate fixation can be due to biological causes (traumatic soft tissue injury/atrophic fracture site) or mechanical causes (malreduction/inadequate plate strength or length/excessive or insufficient construct stiffness) or due to poor surgical technique/judgement or lack of patient's compliance (Gardner et al., 2009). According to Asif et al, imperfect fixation due to surgeon error is the commonest cause for implant failure. (Naileyer et al., 2000)

In this case, biological reasons can be ruled out as they cause late failure and not early failure of implants. Lack of patient compliance also cannot be the cause as the arm was immobilised in a slab and the patient didn’t indulge in any load bearing activities in the post operative period.

Coming to mechanical causes, malreduction, may be due to improper technique, that is, not a parallel, but a staggered or diverging technique to each fragment which is due to a combination of excessive prebending of the plate leading to opening up of the near cortex as shown in figure 2, and hence the possibility of longitudinal fissuring is decreased. Narrow plates should be used only if dictated anatomically.

If the x rays are carefully examined you can see that there is a longitudinal fissure fracture in the proximal fragment which is due to a combination of excessive construct stiffness and the fact that screws were placed parallel (rather than a staggered or diverging) to each other in a narrow rather than a broad plate. Also the excessive prebending of the plate leading to opening up of the near cortex as shown in figure 2 would have increased the stress thereby contributing to the excessive construct stiffness.

REFERENCES


