Three Stitch technique for Humerus Nailing

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Abstract

Intramedullary nailing for humerus diaphyseal fractures is associated with a quite a number of complications like violation of rotator cuff, soft tissue injury around the shoulder and elbow. The purpose of this article is to describe a simple three stitch technique for intramedullary humerus nailing which aims at avoiding most of the common complications encountered during and after humerus nailing. One year follow up of all the patients have shown good to excellent results and favorable functional outcomes.

Keywords: humerus diaphyseal fractures, antegrade humerus nailing, three stitch technique

Introduction:

Approximately 5–10% of all long bone fractures occur in the humerus. And of them humeral diaphyseal fractures account for about 20% of all humeral fractures[1]. There are various modalities for internal fixation of humeral diaphyseal fractures, of which plate osteosynthesis and intramedullary nailing are the most common. Although plate osteosynthesis can afford a rigid fixation and good functional recovery, its disadvantages have been reported like plate fixation does require a wide surgical exposure and more time when compared with intramedullary fixation [2]. Intramedullary nailing being biomechanically better are subjected to smaller bending loads and are less likely to fail due to fatigue. They act as load sharing and stress shielding devices. The two most common are the antegrade humerus nailing and retrograde humerus nailing. Retrograde nail insertion is technically more demanding that antegrade insertion[3]. The nail enters the canal diagonally under a small angle, which may lead to a longitudinal fracture above the site of bone trepanation[4]. Proximal interlock with screws in retrograde nailing could damage the vulnerable soft tissues around the shoulder girdle, for example, the axillary nerve[5]. In young patients, a narrow medullary canal may be an obstacle for retrograde insertion. The prone position of the patient used for the retrograde technique may be associated with high anesthesia related risks [6]. Hence antegrade humerus nailing is a preferred choice for fixing diaphyseal humerus fractures. But they too have their own technical problems like violation of the rotator cuff, soft tissue injury around the shoulder and elbow while doing proximal and distal locking. So taking in to account all of the above considerations we have come up with a new three stitch technique for antegrade humerus nailing which aims at avoiding all the technical difficulties and complications encountered while using traditional method of antegrade humerus nailing.

Material and Methods:

This study was a prospective study, conducted at Department of Orthopaedics, Dr.D.Y. Patil Medical college and Hospital, Nerul over a period of 2 years (from May 2016 to May 2018). Study was initiated after approval from Institutional Ethical Committee. Informed consent from each patient was taken. 20 adult patients with traumatic fractures of diaphyseal humeral shaft were treated with closed antegrade intramedullary interlocking nailing using the three stitch technique. Skeletally immature patients, patients not fit for surgery, patients with associated fractures, head injury; pathological fractures or type II and type III compound fractures by Gustilo Anderson and those having associated radial nerve palsy were excluded from the study. All the cases were treated by closed intramedullary interlocking nailing in antegrade manner using the 3 stitch technique. Patients arm was kept in arm pouch post operatively. Early mobilization in the form of ROM exercises were started on the 3rd postoperative day. The patients were followed up on 2 weeks, 4 weeks and thereafter at every 1 month interval post operatively for a period of 1year. They were assessed with the objective to study the functional outcome after interlocking nail for diaphyseal fracture shaft of humerus using the 3stitch technique.

Surgical technique:

The patient was positioned in the “beach chair” position with the operative shoulder slightly over the edge of the operative table. The image intensifier was placed above the arm so that, with the arm abducted, a clear anteroposterior and lateral view of the fracture can be obtained. The shoulder and...

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arm are draped free for ease during intraoperative manipulation (Fig. 1). The site of entry was accessed through a small stab incision approximately 1 cm in length in front of the anterior rim of the acromion, remaining anterior enough to avoid the rotator cuff (Fig. 2). With careful soft tissue dissection bone is exposed. Soft tissue protection sleeve is passed through the incision over the bone and an entry point is made with the help of a guide wire lateral to the articular surface of humeral head under image intensifier guidance (Fig. 3). The entry point is widened taking care not to damage the surrounding soft tissue and a guidewire is inserted into the medullary cavity. Fracture reduction is achieved and guidewire is advanced in to the distal fragment. (Fig. 4) Serial reaming is done over the guide wire and a nail of appropriate size and length is inserted. Now the guidewire is removed and distal locking (antero posterior) is done with a free hand technique under image intensifier guidance. For this second stab skin incision is taken slightly lateral to the midline in order to avoid the neurovascular bundle (Fig. 5). Careful blunt soft tissue dissection with the help of blunt end of K wire is done till the bone surface is reached (Fig. 6). With the help of soft tissue protection sleeve passed over this K wire, hole is drilled through both cortices and distal locking is done with screw (Fig. 7,8). Now proximal locking sleeve is inserted through the zig. Third stab incision approximately 1 cm in length is made over the skin and blunt soft tissue dissection is carried out with the help of blunt end of K wire till the bone surface is reached (Fig. 9). Proximal locking sleeve is carefully advanced over this K wire till it reaches flush to the bone surface so as to avoid any damage to the soft tissue while drilling and insertion of the screw. Hole is drilled through the zig and proximal locking is done with a appropriate length screw. Simple mattress sutures are taken to close the stab incisions (Fig. 10).

**Results:**
All patients had good to excellent result following the three stitch technique for locked antegrade intramedullary humerus nailing at the end of 1 year. There were no complication and mean union time was 8 weeks with all fractures united by 10 weeks.

**Discussion:**
Conservative management of humeral shaft fractures, although giving high rates of union is losing popularity due to the need for prolonged immobilization to achieve solid union followed by vigorous rehabilitation to restore joint function and muscle strength [7]. Plate osteosynthesis, considered as the "gold standard" by its advocates has yielded good results but at the cost of infection, nerve palsies and need for additional surgeries to
salvage failures or for removal of the implant[8]. Antegrade Interlocking intramedullary nailing has yielded varying and often contrasting results with complications like Shoulder stiffness and impingement observed in many patients. However, there are cases where antegrade humeral nailing is irreplaceable, such as in the polytrauma patient who cannot be positioned prone to undergo retrograde nailing. In addition, the antegrade technique offers easier access to the humeral canal and easier handling of the image intensifier[9]. The technique, being less time consuming, is also preferred by anaesthesiologists. Violation of the rotator cuff during antegrade humeral nailing has been considered to be responsible for suboptimal clinical outcomes and discomfort in the shoulder joint[10]. To avoid this we make our portal slightly more anterior to avoid damage to the rotator cuff. Other problem encountered is the soft tissue injury around the shoulder. Vulnerable structures around the shoulder that could be injured during antegrade intramedullary nailing include the axillary nerve, the circumflex artery, the long head of biceps, and the deltoid. These structures are usually injured by the proximal locking bolts [11]. Some authors advocated the use of antegrade nails that do not use locking bolts for the proximal interlock to avoid these complications, but these nails could increase the risk of problems with the fracture union process due to reduced stability at the fracture site [9]. In our technique we carry out careful blunt soft tissue dissection with the help of blunt end of K wire to reach the bone surface and pass the proximal locking sleeve is over this K wire till it reaches flush to the bone surface so as to avoid entrapment and damage to the surrounding soft tissue. Distal interlocking of an antegrade humeral nail is considered difficult and time consuming as a lateral view of the humerus cannot be easily obtained with the image intensifier. Furthermore, the narrow locking holes of humeral nails and the ‘slippery’ bony surface at the distal humerus make distal interlocking even more challenging[12].

Insertion of a locking screw from lateral to medial, apart from being technically more difficult, bears the danger of injury to the radial and/or the lateral cutaneous nerves[13]. For this reason in our technique we do antero posterior distal locking. And to avoid the neurovascular structures present anteriorly we make our incision slightly lateral to the midline and carry out careful blunt soft tissue dissection with the help of blunt end of K wire to avoid damage while drilling and insertion of the screw.

**Conclusion:** Three stitch technique avoids the usual complications like violation of rotator cuff leading to shoulder stiffness, injury to neurovascular structures and impingement commonly encountered with the conventional nailing techniques leading to favourable outcomes following intramedullary nailing for diaphyseal humerus fractures and excellent functional outcomes.

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**References**


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