Recent Trends in Fixation of Proximal Humerus Fractures

An Essay

Submitted for Fulfillment of Master Degree
In ***Orthopedic surgery***

By:

Ebrahim Salah Eldin Zaky Hantera
(MB, B.ch.)

Under supervision of:

Prof. Dr.: Ahmed Amin Galal
Professor of orthopedic Surgery
Faculty of Medicine,
Cairo University.

Dr.: Mostafa Mahmoud
Lecturer of orthopedic Surgery
Faculty of Medicine,
Cairo University.

Faculty of Medicine
Cairo University
2010

Abstract

Proximal humeral fractures account for approximately 4– 5% of all fractures. The incidence of proximal humeral fractures increases exponentially after 50 years of age ,regarding treatment of proximal humeral fractures; much controversy and confusion still exist, and no single treatment protocol or algorithm has been proved to be universally effective, Recently, some new trends have been described for fixation of proximal humerus fractures as PHILOS (Proximal Humeral Internal Locking System) plate, percutaneous cannulated screws[1], Intramedullary pinning with tension band wiring.transosseous sutures.

Key words :

Proximal humeral Fractures .

Contents

List of Figures

Introduction

The proximal humerus is uniquely adapted to allow for the large range of motion of the shoulder joint [1]. Neer described the proximal humerus as having four parts: 1) humeral head, 2) greater tuberosity, 3) lesser tuberosity, and 4) humeral shaft [2]. The diaphysis expands into the surgical neck, which is just below the greater and lesser tuberosities of the metaphyseal flare [1].

Proximal humeral fractures account for approximately 4–5% of all fractures. The incidence of proximal humeral fractures increases exponentially after 50 years of age, with approximately 80% of such fractures occurring in women. In the elderly population, most fractures of the proximal humerus are related to osteoporosis [2].

Regarding treatment of proximal humeral fractures; much controversy and confusion still exist, and no single treatment protocol or algorithm has been proved to be universally effective. Areas still in question include radiographic diagnosis, operative or nonoperative treatment, consideration of patient age in treatment decision making, surgical approach, fracture fixation and type of internal fixation [3]. Several operative treatment modalities have been developed over the years, including fixation

with wires and loops with minimal soft tissue dissection, different plate designs, nails, as well as percutaneous techniques [4].

In spite of the development of new techniques and implants, undesirable early and late sequelae may occur after both nonoperative and operative treatment of fractures of the proximal humerus such as shoulder stiffness, heterotopic ossification (HO), avascular necrosis (AVN), malunion, nonunion and post-traumatic arthritis [5].

There is a clear trend towards surgical treatment. The main advantage is the possibility of mobilizing the joint at an early stage. Conventional plate fixation has stood the test of time for many years. Besides a possible impairment of perfusion leading to humeral head necrosis, the main problem is the anchoring of the screws in osteoporotic bone. A typical resulting complication is the loosening of the implant. Systems with a locked screw plate interface (internal fixators) have been available since 1997 and have reduced the complication rate due to a higher stability [6].

Recently, some new trends have been described for fixation of proximal humerus fractures as PHILOS (Proximal Humeral Internal Locking System) plate [7], percutaneous cannulated screws [8], Intramedullary pinning with tension band wiring [2].

Aim of the work

Fractures of proximal humerus still a problem which faces surgeons with no satisfactory results up till despite different methods of fixation. The aim of this work is to review the recent trends of fixation in treatment of fractures of proximal humerus; which helps to achieve the proper way of fixation of the proximal humeral fractures.

Chapter 1:

Anatomy of proximal humerus

Proximal end of humerus

The proximal end of the humerus consists of the head, anatomical neck and the greater and lesser tubercles. It joins the shaft at an ill-defined 'surgical neck, which is closely related on its medial side to the axillary nerve and posterior humeral circumflex artery. [9]

Head

The head of the humerus forms rather less than half a spheroid; in sectional profile it is spheroidal) its smooth articular surface is covered with hyaline cartilage, which is thicker centrally. When the arm is at rest by the side, it is directed medially, backwards and upwards to articulate with the glenoid cavity of the scapula. [9]

Anatomical neck

The anatomical neck of the humerus immediately adjoins the margin of the head and forms a slight constriction; it indicates the line of capsular attachment of the shoulder joint other than at the intertuberous sulcus, where the long tendon of biceps emerges. Medially, the capsular attachment diverges from the anatomical neck and descends 1 cm or more onto the shaft. [9]

Lesser tubercle

The lesser tubercle is anterior to and just beyond the anatomical neck. It has a smooth, muscular impression on its upper part palpable through the thickness of deltoid 3 cm below the acromial apex. The bony prominence slips away from the examining finger when the humerus is rotated. The lateral edge of the lesser

tubercle is sharp and forms the medial border of the intertuberous sulcus. Subscapularis is attached to the lesser tubercle, and the transverse ligament of the shoulder joint is attached to the lateral margin. [9]

Greater tubercle

The greater tubercle is the most lateral part of the proximal end of the humerus. It projects beyond the lateral border of the acromion. its posterosuperior aspect, near the anatomical neck, bears three smooth flattened impressions for the attachment of supraspinatus (uppermost), infraspinatus (middle) and teres minor (lowest and placed on the posterior surface of the tubercle) . [9]

The intertuberous sulcus (bicipital groove) lies between the tubercles. It contains the long tendon of biceps, its synovial sheath, and an ascending branch from the anterior circumflex humeral artery. the rough lateral lip of the groove is marked by the bilaminar tendon of pectoralis major, its floor by the tendon of latissimusdorsi and its medial lip by the tendon of teres major.fig(1) [9]

Fig(1) **Part A: 1.** Head. **2.** Anatomical neck. **3.** Surgical neck. **4.** Greater tubercle. **5.** Lesser tubercle. **6.** Intertuberous sulcus. **7.** Shaft.
Part B: 1. Greater tubercle. **2.** Surgical neck. **3.** Shaft. **4.** Radial groove. **5.** Head. **6.** Anatomical neck.

Vascular Anatomy

The rich vascular anatomy of the proximal humerus is important to explain osteonecrosis of the humeral head. The anterior lateral branch of the anterior humeral circumflex artery is the primary blood supply to the proximal humerus. the anterior humeral circumflex artery arises from the lateral side of the third division of the axillary artery approximately 1 cm distal to the inferior border of the pectoralis minor muscle (just above the teres major muscle) and courses laterally behind the coracobrachialis to reach the surgical neck of the humerus at the lower border of the subscapularis. **[10]**

The anterolateral branch sends twigs to the lesser tuberosity, crosses under the biceps tendon, and then arches superiorly adjacent to the lateral side of the intertubercular groove. The vessel then penetrates bone at the cephalic portion of the transition from greater tuberosity to intertubercular groove, staying distal to the position of the old epiphyseal plate. The intraosseous portion of this artery has been named the arcuate artery by Laing because of its posteromedial course after entering the humeral head. Multiple branches radiate to supply the subchondral bone of the humeral head.fig (2) **10]**

The importance of both the extra- and intraosseous arterial anastomoses has recently been described. The abundant extraosseous anastomoses between the anterior humeral circumflex artery and posterior humeral circumflex arteries, as well as with the thoracoacromial, subscapular, suprascapular, and profundabrachii arteries. The anterior and posterior circumflex vessels connect with the profundabrachii artery through ascending deltoid vessels. Anastomosis of the profundabrachii artery occurs with the radial (anterior) and medial (posterior) collaterals. This rich collateral circulation about the shoulder can provide adequate circulation to maintain viability of the extremity despite axillary artery disruption. **10]**

The importance of the intraosseous anastomoses and, that the humeral head could be completely profused after ligation of the anterior humeral circumflex artery at its entry site into the humeral head. They found large metaphyseal arteries that passed through the fused growth plate to anastomose with the arcuate artery. **10]**

Knowledge of the vascular anatomy may help predict osteonecrosis of the humeral head. As in a case report of a shoulder dislocation with both circumflex arteries interrupted and the extraosseous network compromised. Osteonecrosis did