Shoulder Resurfacing

fulfillment of MSc. Degree in orthopedic surgery

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ABSTRACT

Shoulder resurfacing is a viable alternative to conventional shoulder arthroplasty, as shown by multiple short and mid-term follow-up studies.

Resurfacing is a type of shoulder arthroplasty that involves replacing the humeral joint surface with a metal covering, or cap, thus preserving the bone of the proximal part of the humerus. If the glenoid is also replaced, a current conventional polyethylene glenoid replacement prosthesis or an interposed soft-tissue graft is used.

Key words: Shoulder - Resurfacing

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Introduction

Shoulder arthroplasty is a reliable procedure for relief of pain and improved function in well-selected patients early attempts at shoulder arthroplasty in Europe involved constrained prostheses in order to deal with the considerable loss of bone and soft tissues secondary to infection and tumour[1]. In the USA, Neer developed a stemmed unconstrained humeral prosthesis specifically for the treatment of four-part fractures. His design was successful in providing a scaffold around which the proximal humerus could be rebuilt [2]. Later, this was used for arthritis and a glenoid component developed .[3]

Neither of these prostheses was specifically designed for use in arthritis of the shoulder. In the early 1980s came the idea of developing an arthroplasty using a surface replacement for use in the degenerative shoulder which was less worn [4].

Neer had shown that the prosthetic shoulder joint did not need to be mechanically constrained. This was certainly true in the presence of an intact rotator cuff and arguably so even if it was damaged. The design of Neer's stemmed humeral component was very similar to that widely used for hip replacement. However, it seemed unnecessary to use a stem if the tuberosities were intact [2].

Resurfacing is a type of shoulder arthoplasty that involves replacing the humeral joint surface with a metal covering,or,cap,thus preserving the bone of the proximal part of the humerus.if the glenoid is also replaced,a current conventional polyethylene glenoid replacement prothesis or interposed soft-tissue graft is used.(5)

Surface replacement of the shoulder has been proven to be at least as successful as stemmed implants with certain advantages for treatment in young people. The hydroxyapatite coating has been a major advance in reducing lucent lines and loosening. If complications do occur, then they can be more easily treated, and the results of surface hemiarthroplasty appear to be better than stemmed hemiarthroplasty. (6)

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Anatomy

I. Bony anatomy of the proximal humerus and glenoid

A. The proximal end: consists of a large rounded head joined to the body by a constricted portion called the neck, and two eminences, the greater and lesser tubercles into a body and two extremities.(Fig.1)[8]

-The Head (*caput humeri*): The head, nearly hemispherical in shape , directed upward, medialward, and a little backward, a articulates with the glenoid cavity of the scapula. The circumference of its articular surface is slightly constricted and is termed the anatomical neck**,** in contradistinction to a constriction below the tubercles called the surgical neck.[8]

-The Anatomical Neck (***collum anatomicum***): is obliquely directed, forming an obtuse angle with the body. It is best marked in the lower half of its circumference; in the upper half it is represented by a narrow groove separating the head from the tubercles. It affords attachment to the articular capsule of the shoulder joint, and is perforated by numerous vascular foramina.[8]

-The Greater Tubercle (*tuberculum majus; greater tuberosity*): The greater tubercle is situated lateral to the head and lesser tubercle. Its upper surface is rounded and marked by three flat impressions: the highest of these gives insertion to the Supraspinatus; the middle to the Infraspinatus; the lowest one, and the body of the bone for about 2.5 cm. below it, to the Teres minor. The lateral surface of the greater tubercle is convex, rough, and continuous with the lateral surface of the body.[8]

-The Lesser Tubercle (*tuberculum minus; lesser tuberosity*): The lesser tubercle, although smaller, is more prominent than the greater: it is situated in front, and is directed medialward and forward. Above and in front it presents an impression for the insertion of the tendon of the Subscapularis The tubercles are separated from each other by a deep groove, the intertubercular groove (*bicipital groove*), which lodges the long tendon of the Biceps brachii and transmits a branch of the anterior humeral circumflex artery to the shoulder-joint. In the fresh state its upper part is covered with a thin layer of cartilage, lined by a prolongation of the synovial membrane of the shoulder-joint; its lower portion gives insertion to the tendon of the Latissimus dorsi. It is deep and narrow above, and becomes shallow and a little broader as it descends. Its lips are called, respectively, the crests of the greater and lesser tubercles (*bicipital ridges*), and form the upper parts of the anterior and medial borders of the body of the bone. [8]

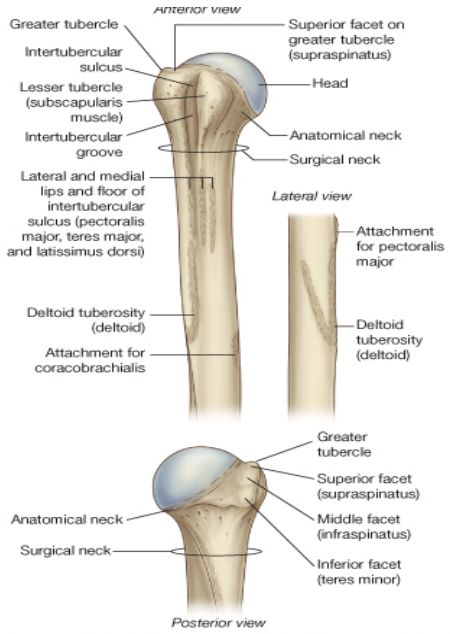

Figure (1): proximal end of right humerus[13]

B. the glenoid cavity:

Which is directed lateralward and forward and articulates with the head of the humerus; it is broader below than above and its vertical diameter is the longest (Fig.2). The surface is covered with cartilage in the fresh state; and its margins, slightly raised, give attachment to a fibrocartilaginous structure, the glenoid labrum**,** which deepens the cavity. At its apex is a slight elevation, the supra glenoid tuberosity, to which the long head of the Biceps brachii is attached. The neck of the scapula is the slightly constricted portion which surrounds the head; it is more distinct below and behind than above and in front [(9)](Fig.3).

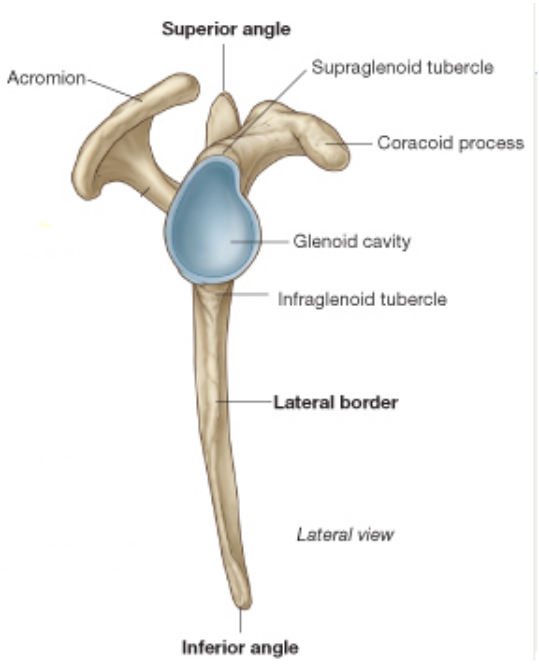

Figure (2): lateral view of the scapula[(11)]

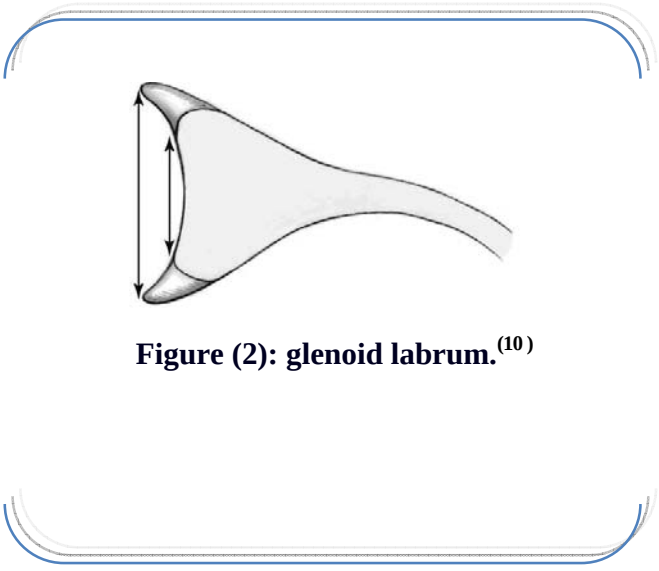

Figure (2): glenoid labrum.[(10)]

II. Anatomical relations and versions of glenoid and head of the humerus.

The glenoid surface is located on the lateral aspect of the scapula such that its surface has a slightly superior inclination relative to the vertical axis of the body. This inclination has been shown to play an important role in augmenting the inferior stability of the glenohumeral joint[12], In addition, the scapula is anteverted 30 to 40 degrees in respect to the coronal axis of the human body, while the glenoid surface is roughly orthogonal to the plane of the scapula, Therefore, the glenoid surface is also anteverted 30 to 40 degrees and faces anterolaterally with respect to the coronal axis of the human body(Fig.4), This glenoid anteversion, in turn, is matched by the retroversion of the humeral head. With the humerus in neutral rotation (i.e., the forearm pointing forward in respect to the human body), the humeral head faces posteromedially. In this fashion, the perpendicular axis of the humeral head corresponds to the perpendicular axis of the glenoid fossa (Fig. 5)[13]

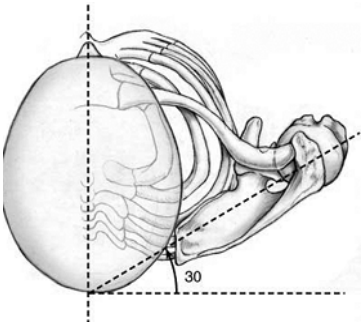

Figure (4): Antiversion of the scapula [14].

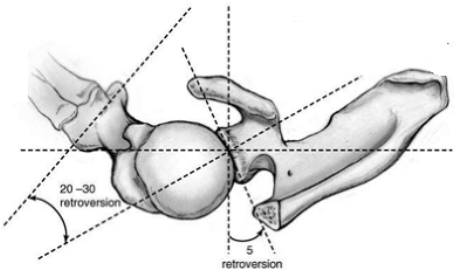

Figure (5): Retroversion of the glenoid and head of the humerus. [14] .

III. Muscle controlling shoulder joint

Anatomy of the Rotator Cuff:

Four muscles tendon units make up the rotator cuff: the supraspinatus, infraspinatus, subscapularis, and teres minor (SITS) (Fig.6). The four muscles that compose the rotator cuff take their origin from the body of the scapula and envelope the humeral head as they insert along the tuberosities of the proximal humerus.The musculotendinous cuff is firmly adherent to the underlying glenohumeral capsule and provides circumferential reinforcement except at the rotator interval and axillary recess. (15)

The supraspinatus originates from the supraspinous fossa to insert forward and laterally at the superior aspect of the greater tuberosity. The tendon blends into the joint capsule and infraspinatus tendon below. The supraspinatus stabilizes the glenohumeral joint and serves, along with the deltoid, to elevate the arm. Innervation is from the suprascapular nerve. (16)

The infraspinatus originates from the infraspinous fossa and extends laterally to its tendinous insertion on the middle facet of the greater tuberosity. The infraspinatus, along with the teres minor, provides the primary external rotation force and also stabilizes the glenohumeral joint against posterior subluxation. Innervation is from the suprascapular nerve.(17)