Arthroplasty of the shoulder

Essay

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M.SC. Degree in Orthopaedics

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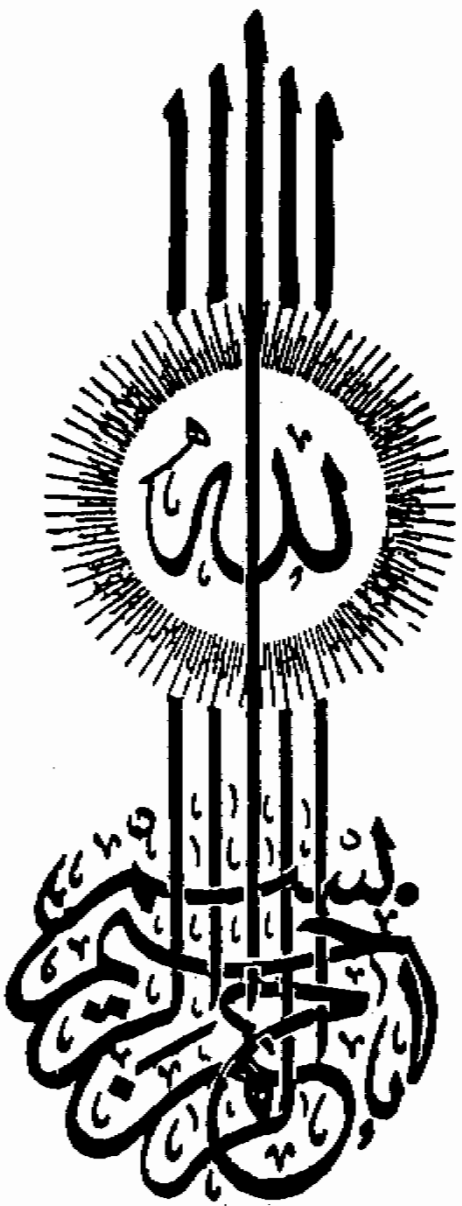
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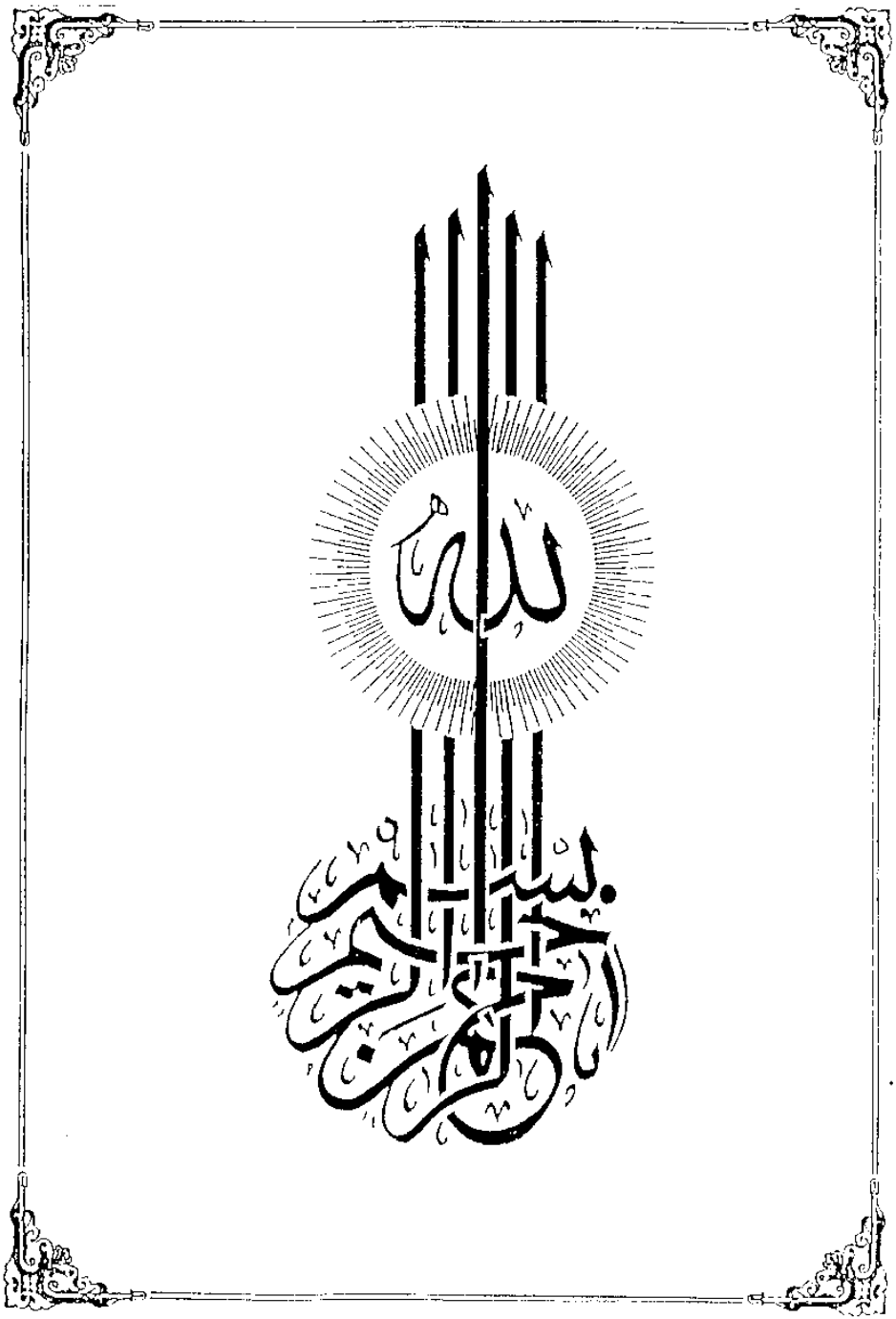

To my parents, wife and son

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INTRODUCTION & AIM OF WORK

INTRODUCTION AND AIM OF THE WORK

The modern era of prosthetic arthroplasty in the shoulder began in the late 1940s or early 1950s. Some custom- made shoulder prostheses were developed before that time, but it was not until the implant developed by Neer (**Neer I**) became available in the early 1950s that a prosthesis became readily available for patient care. ***(Neer, 1964 & Cofield, 1991)***

This proximal humeral articular surface replacement made out of a chrome- cobalt- molybdenum alloy was initially used in the care patients with complex fractures. It was then applied to the care of the patients with a variety of arthritides, and Neer's reports of his experiences in 1971 and 1974 Stimulated renewed Consideration of the Use of proximal humeral prosthetic replacement for the care of patients with Shoulder arthritis ***(Neer, 1971 & 1974)*** . In the Late 1960s and early 1970s. a number of total shoulder arthroplasty designs were introduced stimulated by the technical advaces and results associated with total hip arthroplasty . ***(Coughlin , 1979 &lettin , 1982)*** .

When these designs were construced there was scant information available on the characteristics of shoulder arthritis in patients who might require prosthetic arthroplasty .

Many prosthetic designers assumed that the rotator cuff and capsule would be extensively involved by the arthritic process and that the arthroplaplasty would require a great deal of constraint built into the implant system . Many constrained designs were developed based on this idea .

The result of these early designs were not encouraging, and as the pathology associated with shoulder arthritis was better understood, most surgeons turned toward the use of the relatively unconstrained type of total shoulder arthoplasty, such as the system designed by Neer *(Cofield , 1991)* . In the early 1970s . Neer revised his proximal humeral prosthesis and developed a polyethelene glenoid component . Since then , his system has been expanded and modified (Near II) *(Neer , 1982)* .

Also , a number of other surgeons have designed prostheses with various features throught to be advantageous, but really differing little from the concepts incorporated in the Neer system *(Gristna , 1987 & Amstutz , 1988)* .

The aim of the work is to provide a survey of the types , indications, operative techniques results and complications of shoulder arthoplasty . Special interest has been given to the prosthetic replacement (hemi and total arthoplasty) .

ANATOMY & BIOMECHANICS OF THE **SHOULDER JOINT**

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Successful prosthetic arthroplasty of the shoulder requires a through knowledge of the shoulder girdle's detailed anatomy and biomechanics.
The shoulder differs from other joints at least in one important respect, its functional efficiency depends on interrelated synchronous action at five sites:
(1) Glenohumeral (2) The sterno-clavicular joint
(3) The acromio clavicular joint. (4) The sub-acromial joint and
(5) The movement of the scapula across the thoracic cage. (Fig 1-1).
The inter dependent articulations involving the humerus, scapula and clavicle, in addition to a complex network of supporting muscles, capsule and ligaments, make shoulder reconstruction a formidable task. this Complex system function synchronously to produce smooth,rhythmic and co-ordinated movements of the upper limb (*De Palama, 1983*).

* The articular surface and orientation of the glenohumeral joint:

- The articular surface of the humerus constitutes approximately one - third of the surface of a sphere with an arc of about 150 degrees. This articular surface is oriented with an upward tilt of approximately 45 degrees and is retroverted 30 to 40 degrees referable to the condylar line of the distal humerus. (Fig 1-2)
- In the coronal plane, the articular surface of the glenoid comprises an arc of approximately 75º, while in the transverse plane, the arc of curvature of the glenoid is only about 50º. The glenoid has a slight

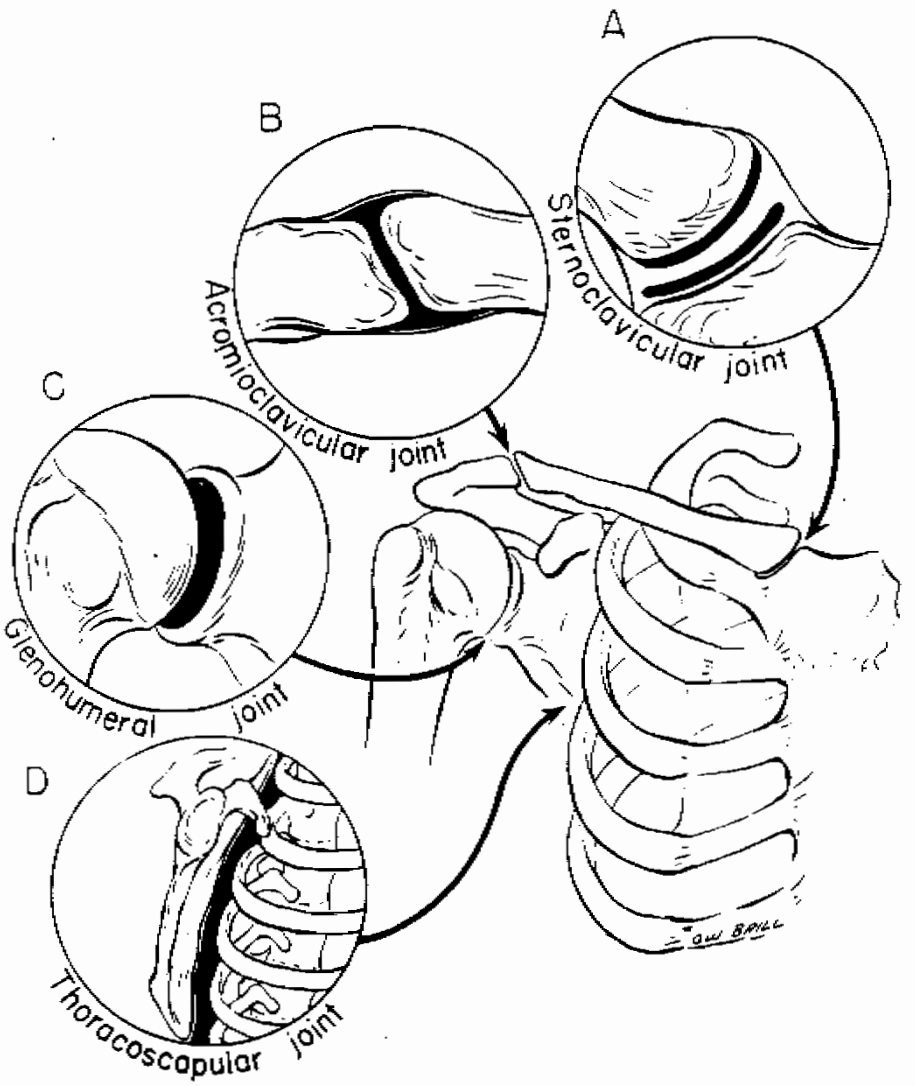

Fig 1-1 The functional components of the shoulder joint (from De Palma, 1983).

upward tilt of about 5 degrees referable to the medial border of the scapula and is retroverted a mean of approximately 7 degrees. (Fig 1-3)

* The resting position of the scapula in relation to the trunk

It is anteriorly rotated about 30 degrees with respect to the frontal plane as viewed from above. (Fig 1-4)

The scapula is also rotated upward about 3º in relation to the transverse plane as viewed from the back. (Fig1-5)

It is tilted forwards (anteflexed) about 20 degrees with respect to the sagittal plane.

[The 30 degree retroversion of the articular orientation is complemented by the 30-degree anterior rotation of the scapula on the trunk. With the arm at the side, this relationship is referred to as the *Zero position* (*Saha, 1983*).]

Fibrous capsule and rotator cuff (*Clemente, 1987*)

The glenohumeral capsule is a thin - walled capacious structure with several outpouchings. It is attached medially to the circumference of the glenoid cavity, beyond the glenoidal labrum. Above, it encroaches on the origin of the long head of biceps, laterally, it is attached to the anatomical neck of the humerus except on the medial side where it descends for more than 1 cm on the shaft.

- With the arm hanging loosely at the side of the body, the upper portion of the capsule is taut and the inferior portion is redundant and pleated. With the arm fully extended overhead, the opposite exists.

(Fig 1-6) (*Cailliet, 1991*)

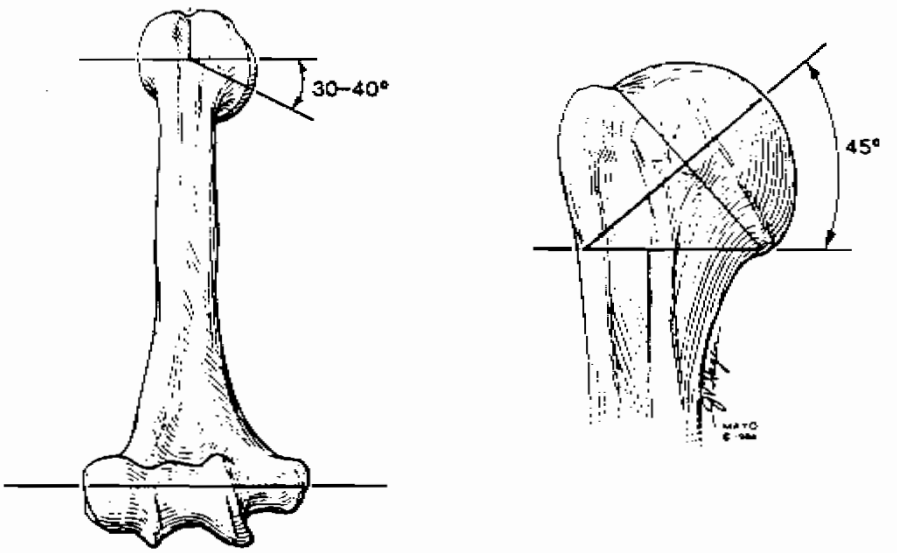

Fig 1-2 The two-dimentional orientation of the articular surface of the humerus with respect to the bicondylar axis (from Rockwood, 1990).

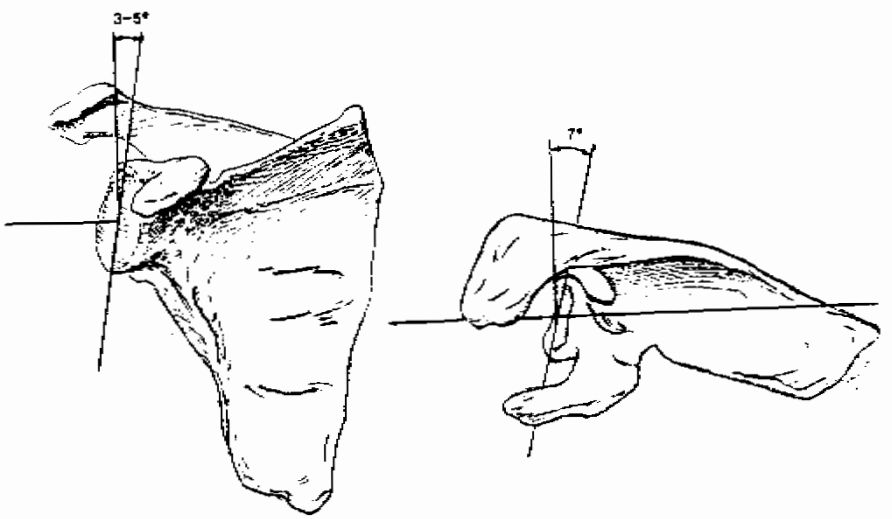

Fig 1-3 The glenoid faces slightly superior and posterior (retroverted) with respect to the body of the scapula (from Rockwood, 1990).

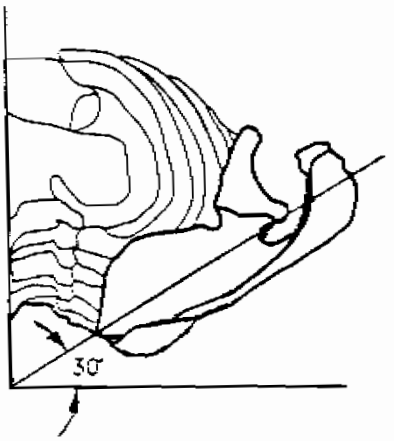

Fig 1-4 The resting position of the scapula is about 30 degrees forward with respect to the coronal plane as viewed in the transverse plane (from Rockwood, 1990).

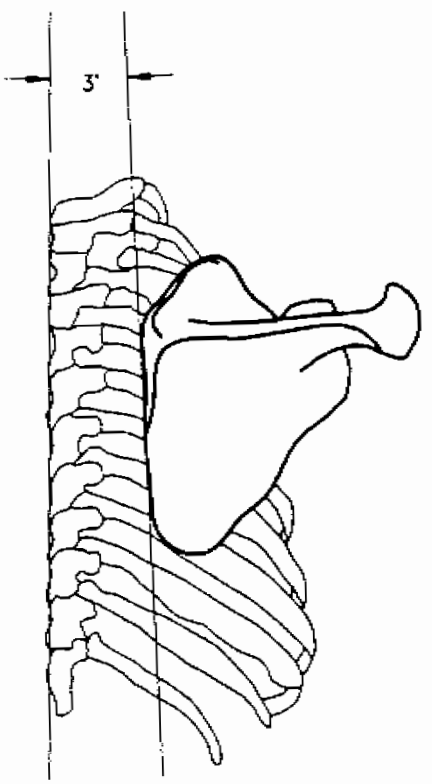

Fig 1-5 The resting position of the scapula is rotated about 3 degrees superior as viewed in the frontal plane (from Rockwood, 1990).