

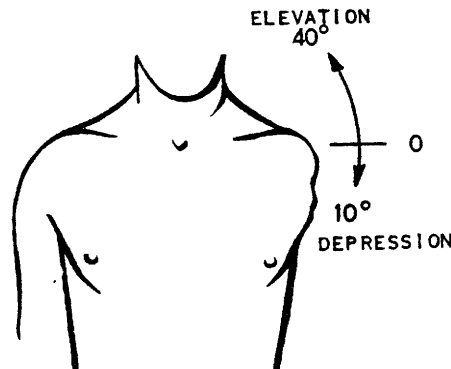
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## II. Anatomical Movements Related to Upper Extremity Prosthetics

A. **Shoulder Girdle Movements** - Movements involving the scapula (shoulder blade) and/or clavicle (collar bone).

1. Elevation of the Shoulder Girdle - a movement where the scapula moves in a superior or upward direction occurring at the sterno clavicular joints.

2. Depression of the Shoulder Girdle - A movement opposite to elevation. The scapula moves downward or in an inferior direction. Shrugging the shoulder illustrates elevation and depression of the shoulder girdles. The normal ranges of motion of these movements are  $40^\circ$  of elevation and  $10^\circ$  depression.

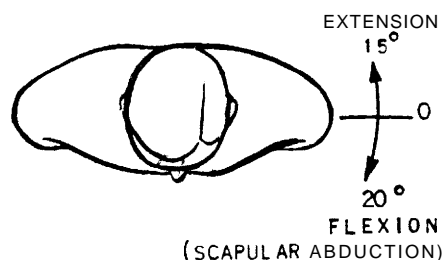


3. Scapular Abduction - Also called scapular flexion or protraction. A movement where the scapula moves laterally away from the spinal column.

4. Scapular Adduction - Also called scapular extension or retraction. It is a movement the opposite of abduction. Throwing the shoulder back and pinching the shoulder blades together illustrates adduction of the shoulder girdles.

The normal ranges of motion for these movements are  $20^\circ$  scapular abduction and  $15^\circ$  scapular adduction.

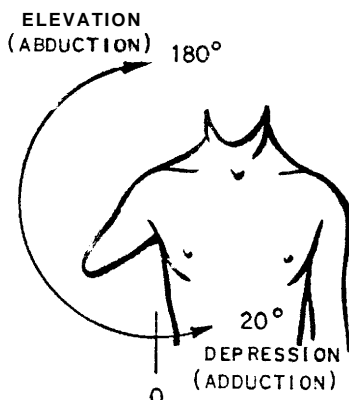
(SCAPULAR ADDUCTION)



B. Glenohumeral Joint Motions

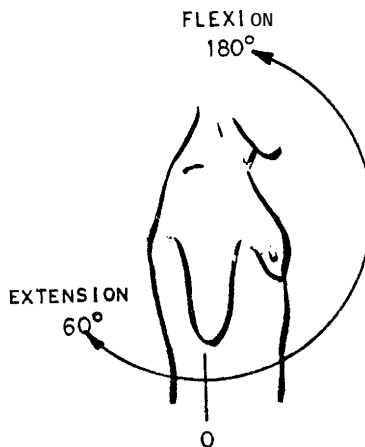
1. Glenohumeral Abduction- A movement of the arm away from the midsagittal plane of the trunk. This movement involves both glenohumeral joint motion and movement of the shoulder girdle. The first 30° of abduction of the glenohumeral joint occurs solely in the shoulder joint. From 30° abduction to 180° with each 15° of abduction of the arm, 10° of motion is at the glenohumeral joint and the other 5° of motion is due to rotation of the scapula on the thorax.

2. Glenohumeral Adduction - A movement of the arm toward the midsagittal plane of the trunk.



3. Glenohumeral Forward Flexion - The anterior movement of the humerus or upper arm at the glenohumeral joint.

4. Glenohumeral Extension - A posterior movement of the humerus at the glenohumeral joint. Extension beyond the vertical "arm at side" position is sometimes called hyperextension. The ranges of motion of these movements are 180° glenohumeral forward flexion and 60° glenohumeral extension.

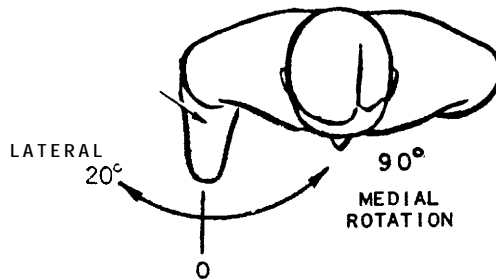


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5. Glenohumeral External Rotation - (Also called lateral or outward rotation). A movement around the long axis of the humerus at the glenohumeral joint. When the elbow joint is flexed to  $90^\circ$  external rotation would cause the hand to move laterally or away from the midsagittal plane of the body.

6. Glenohumeral Internal Rotation - (Also called medial or inward rotation). A movement around the long axis of the humerus causing the hand, with the elbow flexed to  $90^\circ$  to move toward the midsagittal plane of the body.

The normal ranges of motion of these movements are  $20^\circ$  glenohumeral external rotation and  $90^\circ$  glenohumeral internal rotation.

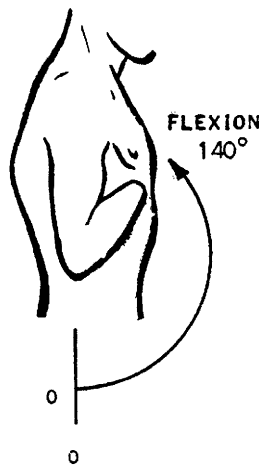


### C. Elbow Joint Motions

1. Elbow Flexion - The movement of bending the elbow causing the anterior surfaces of the arm and forearm to move toward each other.

2. Elbow Extension - The bending movement of the elbow causing the anterior surfaces of the arm and forearm to move away from each other; straightening the arm and forearm.

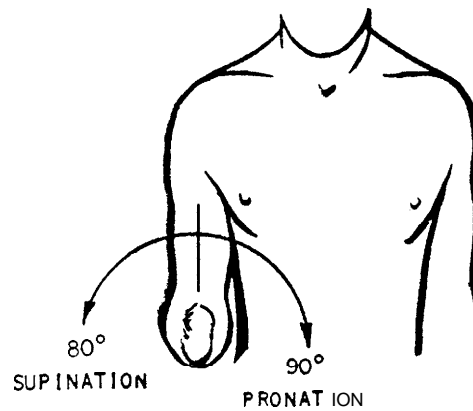
The normal ranges of motion of these movements are  $140^\circ$  elbow flexion and  $0^\circ$  elbow extension.



D. Radio-ulnar Joint Motion

1. Pronation of the Forearm - This movement involves turning the forearm and palm from a palm forward to a palm backward or downward position.
2. Supination of the Forearm- A movement of turning the forearm and palm from a palm backward to a palm forward or upward position.

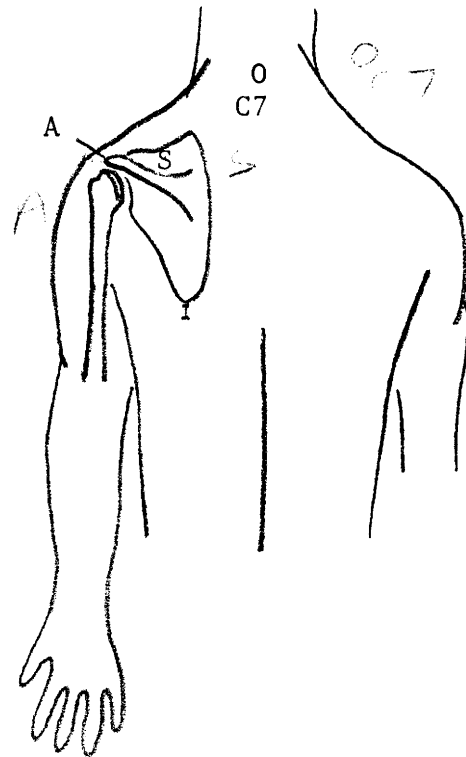
Pronation and supination movements of the forearm occur primarily between the proximal articulation of the radius and ulna. The normal ranges of motion of these movements are 80° supination and 90° pronation.



## Body Landmarks

The body surface landmarks used by the prosthetist in measurement and evaluation of the upper extremity are described.

**Spine of the Scapula.** This large transverse ridge on the scapula can usually be seen, except in very fleshy or muscular people. Locate the spine of the scapula by palpating the shoulder blade. The spine can be found in the upper 1/3 region of the scapula in a horizontal plane.

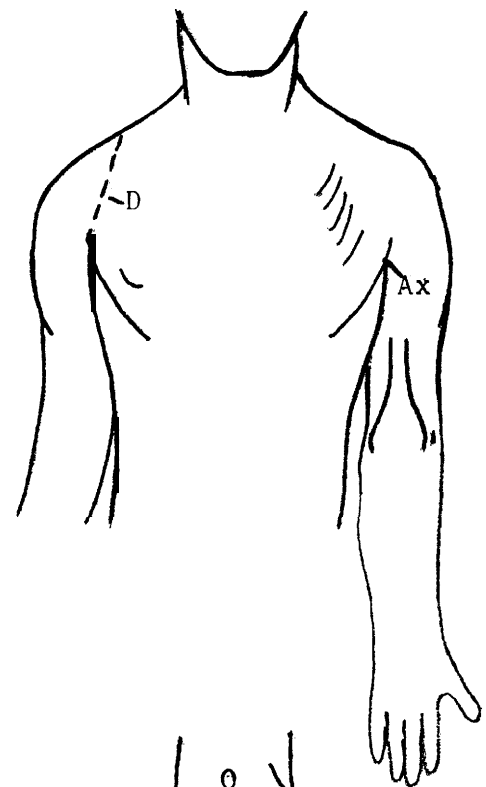


**Acromion.** The acromion process is the lateral extension of the spine of scapula. It can be identified by running the finger laterally along the spine of the scapula. The extreme lateral edge of the acromion is the point used for prosthetic measurements. The arm should be slightly abducted and supported at the elbow to relax the shoulder muscles and make palpation of the acromion easier.

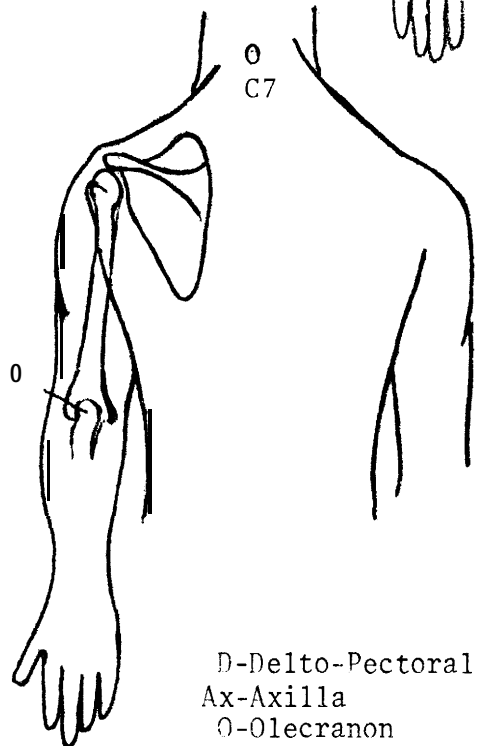
**Inferior Angle of the Scapula.** The inferior angle of the scapula is the lowest tip of the bone. It is found by placing a finger on the border of the scapula closest to the spine and tracing downward. The inferior angle is the point at which the border turns outward and upward.

A-Acromion  
S-Spine of the scapula  
C7-7th Cervical Vertebra

Axilla. This is otherwise known as the armpit. While not as precise as a bony point, it is important in prosthetic measurement. To locate it, have the amputee sit or stand with arm hanging at side. Slide a flat hand, index finger side up, into the armpit using gentle pressure upward. The upper edge of the index finger defines the axilla.



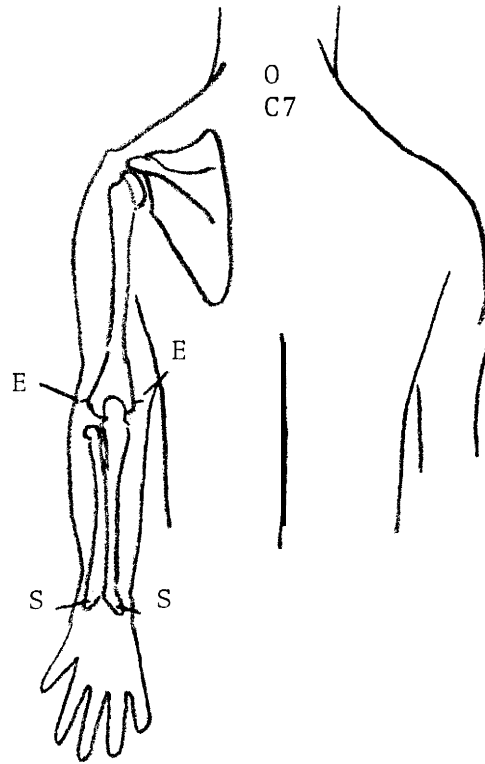
Deltopectoral Line. This is the line of shoulder flexion. To locate it, place the fingertips lightly on the front of the shoulder just inside the bulge of the shoulder. As the subject flexes the shoulder back and forth, gently slide the fingertips in toward the chest just far enough to touch flesh that is not moving. The line of shoulder flexion is located when the outside of the finger touches moving flesh and the inside edge of the finger rests on flesh that is not moving.



Olecranon Process. This part of the ulna is the prominent bony projection at the posterior angle of the elbow. To identify this point, have the subject flex the elbow to 90 degrees. The lower back portion of the elbow, which is easily seen and felt, is the olecranon.

D-Delto-Pectoral Line  
 Ax-Axilla  
 O-Olecranon  
 C7-7th Cervical Vertebra

**Epicondyles.** Located at the condyles of the humerus, there is a rather large prominence on the side of the medial condyle and a smaller projection on the side of the lateral condyle. These projections are called epicondyles.



**Styloids of the Radius and the ulna.** The styloid of the radius and the ulna are small projections found at the distal tips of these bones at the wrist. The radial styloid is located at the wrist on the thumb side of the hand. The ulnar styloid is located at the wrist on the little finger side of the hand.

C7-7th Cervical Vertebra  
 E-Humeral epicondyles  
 S-Styloids of the Radius