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A Review of Anterior Instability of the Shoulder

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A REVIEW OF ANTERIOR INSTABILITY
OF THEShoulder

by

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Bachelor of Science in Physical Therapy
University of North Dakota, 1966

An Independent Study
Submitted to the Graduate Faculty of the
Department of Physical Therapy
School of Medicine
in partial fulfillment of the requirements
for the degree of
Master of Physical Therapy

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1997
This Independent Study, submitted by Ross Argent in partial fulfillment of the requirements for the Degree of Master of Physical Therapy from the University of North Dakota, has been read by the Faculty Preceptor, Advisor, and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

(Signatures)

(Faculty Preceptor)
(Graduate School Advisor)
(Chairperson, Physical Therapy)
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Title          A Review of Anterior Instability of the Shoulder

Department    Physical Therapy

Degree        Master of Physical Therapy

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ABSTRACT

Shoulder dislocations are increasingly being recognized among physical therapists as a common disabling condition in the health care setting. Surgeons are constantly attempting to improve and develop new surgical techniques to help patients who present with anterior instability. The purpose of this paper is to address the issue of anterior instability and its clinical importance to physical therapy.

The shoulder complex demonstrates an important balance between stability and mobility. As the name implies, it is an extremely complicated joint with various components contributing to its strength. The shoulder joint is dislocated more often than any other major joint in the body. Approximately 95% of these shoulder dislocations are anterior in nature.

This literature review will cover the pertinent anatomy of the shoulder, the biomechanics, the etiology, the rehabilitation, and the conservative versus surgical management. It will provide updated information which will be valuable to physical therapists treating patients with a diagnosis of anterior instability.
CHAPTER I
INTRODUCTION

The shoulder complex demonstrates an important balance between stability and mobility. As the name implies, it is an extremely complicated anatomic region and one that can be easily dislocated. The glenohumeral joint is prone to dislocation due to the great amount of motion available with approximately 95% of all shoulder dislocations being anterior in nature.\(^1\)

A complete and thorough understanding of the anatomic relationships of the structures of the shoulder complex is essential for the proper identification of pathology and the establishment of treatment options for the patient. The biomechanics of the glenohumeral joint and the factors affecting stability are also very important to consider in designing sound physiological movement patterns. Several dynamic and static mechanisms work together to provide an intricate balance between shoulder stability and the extreme range of motion available at this joint.\(^2\)

The etiology of instability at the glenohumeral joint involves many factors which are responsible for anterior dislocations.\(^3\) The factors include the size and tilt of the glenoid fossa, the humeral head retroversion angle, the condition of the capsule and labrum, and the function of the muscles that control the
anterosuperior position of the humeral head. Each will be discussed in detail in a following chapter.

In recent years, there has been an influx of information regarding the evaluation and treatment of the unstable shoulder joint. The treatment options range from the conservative nonoperative method to the more aggressive surgical approach. The conservative management is often the first treatment choice of physicians in solving the problems of instability. The patients undergo an intensive rehabilitation program designed to provide stability to the shoulder joint by strengthening the surrounding muscles.

Hippocrates was the first to note the core problem of instability and felt that cautery followed by immobilization would build up scar tissue to serve as a shoulder stabilizer. Many physicians have since developed numerous surgical techniques which attempt to provide stability to an unstable joint. Some of the procedures currently being used include the Bankart, the Bristow, and the Putti-Platt.

Many different opinions have surrounded the surgical management over the years. Some surgeons favor a delayed rehabilitation process to allow adequate tightening of the muscles and scar tissue. The more aggressive surgeon's approach involves protected motion in the early stages of rehabilitation to decrease loss of neuromuscular control and prevent muscular atrophy.

The purpose of this paper is to review the pertinent anatomy of the shoulder, the biomechanics, the factors related to instability, and discuss the conservative versus the surgical management of anterior instability. This
Literature review will provide updated information which will be valuable to physical therapists treating patients with anterior instability as their chief complaint.
CHAPTER II

ANATOMY OF THE SHOULDER COMPLEX

The shoulder complex is a very mobile and minimally constrained ball and socket joint allowing a large arc of motion while sacrificing stability.\textsuperscript{7,8} Because of its freedom of movement, this joint is dislocated more often than all other joints combined in the adult population.\textsuperscript{9} The shoulder girdle is comprised of 3 bones, 4 joints, 12 ligaments, and numerous muscles which must interact in a highly coordinated and complex manner in order to elevate the arm.

The three bones of the shoulder joint complex consist of the clavicle, the humerus, and the scapula.\textsuperscript{7} The clavicle is located at the thoracocervical junction in the root of the neck. It extends laterally from the manubrium of the sternum to the acromion of the scapula, forming the acromioclavicular joint. This joint can be palpated 2 to 3 cm medial to the lateral border of the acromion. The function of the clavicle is to act as a strut to hold the shoulder joint outward so the pull of the muscles is mechanically improved and the range of motion of the upper extremity is increased. This bony brace also offers mechanical support to the anterosuperior thorax and cervical spine.\textsuperscript{10}

The humerus is the largest bone in the upper body.\textsuperscript{11} Its proximal end consists of a head, neck (anatomical and surgical), and shaft. The spheroidal humeral head, articulating with the shallow glenoid cavity of the scapula faces
medically, posteriorly, and superiorly in regard to the shaft of the humerus. Close to the head are the lesser and greater tubercles which are the location for the insertion of muscles surrounding the shoulder joint. Lying between the two tuberosities is a deep groove which holds the tendon of the long head of the biceps brachii muscle.

The scapula is a flat, trianually shaped bone that lies on the posterolateral aspect of the thorax. It continues laterally into a flattened process termed the acromion which articulates with the clavicle. The glenoid cavity is situated directly below the acromion and mainly serves as the articulating cavity for the reception of the humeral head. The scapula’s design allows it to function as a base for humeral motion while moving independently of arm motion. It is attached to the thorax only by muscles and fascia forming the scapulothoracic joint.

The four articulations mainly associated with the shoulder complex are the sternoclavicular (SC) joint, the acromioclavicular (AC) joint, the scapulothoracic joint, and the glenohumeral joint. It is essential that normal range of motion takes place in all four of these articulations to provide a smooth, coordinated movement pattern. Each joint will be discussed in regard to its anatomy, available motions, ligamentous support, and dynamic stability. The glenohumeral joint will be given the greatest attention due to the fact that it is the primary joint associated with anterior instability.
Sternoclavicular Joint

The sternoclavicular articulation is a saddle type of synovial joint. The joint is formed by the medial end of the clavicle and the posterolateral aspect of the manubrium. It is the only bony articulation connecting the upper limb to the axial skeleton. Movement of the SC joint results in changes in the areas of contact between the joint surfaces. Motions which occur at this joint are elevation, depression, and rotation of the clavicle.

Muscles contribute very little to the support of the joint's stability; therefore, it depends on the articular disk, the surrounding ligaments, and the articular capsule for stability. The articular surfaces are separated by a fibrocartilaginous disk which functions as a shock absorber against medial forces. The disk actually divides the joint into two separate cavities and acts as a pivot point during the SC motion. The disk also provides an important stabilizing function by increasing joint congruences and absorbing forces that may be transmitted along the clavicle from its lateral end.

The SC joint is reinforced by a fairly strong capsule but is dependent on three ligaments for the majority of its stability. The anterior and posterior SC ligaments reinforce the capsule, serving primarily to check anterior and posterior movements of the clavicle. The costoclavicular ligament is a very strong ligament which checks elevation, superior glide, and depression of the clavicle. It is located between the first rib and the inferior margin of the medial end of the clavicle.
Acromioclavicular Joint

The acromioclavicular articulation is essentially a plane type of synovial joint. It is formed by the outer end of the clavicle and the acromion of the scapula. The acromial surface faces upward and medially, whereas the clavicular surface faces downward and laterally. The articular facets of the AC joint are small and afford minimal motion. The primary function of this joint is to maintain the relationship between the clavicle and scapula in the early stages of elevation of the upper limb. The AC joint also allows additional range of rotation of the scapula on the thorax in the later stages of limb elevation.

The ends of the bones are surrounded by a weak, relaxed fibrous capsule, which is reinforced by the acromioclavicular and coracoclavicular ligaments. The acromioclavicular ligament strengthens the capsule superiorly, helping to prevent posterior displacement of the clavicle on the acromion. The superior and inferior portions of the AC ligament assist in controlling horizontal joint stability. The coracoclavicular ligament is a very strong ligament which anchors the lateral end of the clavicle to the coracoid process of the scapula. It is divided into a lateral potion, the trapezoid ligament, and a medial portion, the conoid ligament. Both portions of the coracoclavicular ligament work together to limit rotation of the scapula. The most important role of this ligament is to produce the longitudinal rotation of the clavicle necessary to achieve full range of motion in elevation of the upper extremity. Without the action of the clavicle due to this mechanism, abduction of the arm would be restricted.
Scapulothoracic Joint

The scapulothoracic joint is a bone-muscle-bone articulation between the scapula and the thoracic wall. It is not a true anatomic joint, but rather an important physiological joint which contributes significantly to the motion of the shoulder complex. Normally, the scapula is said to lie over the posterior thorax between the second through seventh ribs. The plane of the scapula lies approximately at a 90° angle to the plane of the glenoid. At rest, it lies obliquely 30° to 45° anterior to the coronal plane.

The motions available at this joint are often described as if they could occur independently of each other; however, this pure motion is prevented by the attachment of the scapula to both the AC and SC joints. In describing scapular motions, it must be noted that movement of the scapula on the thorax is associated with the related motions of the AC and the SC joints. The related motions require sliding of the scapula on the thorax. A considerable amount of soft-tissue flexibility is needed to allow the scapula to participate in all upper extremity motions. The motions of the scapula include: elevation, depression, protraction, retraction, and upward and downward rotation.

The scapula does not have any bony or ligamentous connections to the thorax other than through its attachments at the acromioclavicular joint and by means of the coracoclavicular ligament. The scapula is primarily stabilized by axioscapular muscles which include the trapezius, latissimus dorsi, rhomboid major and minor, serratus anterior, and levator scapulae.
Glenohumeral Joint

The glenohumeral joint is located inferior to the AC joint and is designed for mobility at the sacrifice of stability.\textsuperscript{1,13} It is an enarthrodial joint with a synovial articulation between the head of the humerus and the glenoid fossa of the scapula.\textsuperscript{12} The humeral head is ovoid and forms one-third of a sphere.\textsuperscript{1,9} The glenoid fossa is pear-shaped and very shallow, contributing to the decreased

stability.\textsuperscript{13}

The glenoid cavity is deepened slightly by a rim of fibrocartilage called the glenoid labrum.\textsuperscript{1,9} The glenoid labrum helps to increase stability in the articulation by contributing approximately 50% of the total depth of the glenoid cavity.\textsuperscript{11} The superior portion of the labrum adheres to the tendon of the long head of the biceps brachii muscle.

The articulation is surrounded by a thin and loose fibrous capsule, thus allowing a large range of movement.\textsuperscript{9} The capsule is attached medially to the glenoid labrum, superiorly to the root of the coracoid process, and laterally to the anatomical neck of the humerus. The capsule encloses the attachment of the long head of the biceps muscle. In the resting position with the arm at the side, the capsule is taut superiorly and slack anteriorly and inferiorly.\textsuperscript{14} The reinforcement the capsule provides is weakest inferiorly, but this weakness is most evident anteriorly, since the forces acting on the humerus are more likely to thrust the humeral head anteriorly than inferiorly.

The glenohumeral joint is also reinforced by several ligamentous constraints which add significant stability.\textsuperscript{4} The anterior part of the capsule is
reinforced by the superior, inferior, and middle glenohumeral ligaments. The superior glenohumeral ligament passes from the upper part of the glenoid labrum to the superior glenoid tubercle, inserting at the base of the lesser tuberosity and on the anatomic neck of the humerus. Its primary function is to prevent inferior displacement of the humeral head when the arm is in the adducted, dependent position.

The inferior glenohumeral ligament attaches to the anatomical and surgical neck of the humerus laterally and to the anterior, inferior, and posterior margins of the glenoid labrum medially. Turkel et al described a thin broad inferior portion of the inferior glenohumeral ligament called the axillary pouch and a thickened superior portion named the superior band. They work together in the upper ranges of arm elevation beyond 90° to prevent anterior subluxation and dislocation in this part of the range. O'Brien et al identified a posterior band in addition to the axillary pouch and superior band that acts to prevent posterior subluxation of the humeral head during abduction and internal rotation.

The middle glenohumeral ligament runs from the anterior aspect of the anatomical neck medial to the lesser tuberosity on the humerus and proximally to the anterior margin of the glenoid fossa. This ligament inserts on the lesser tuberosity and blends with the subscapularis tendon. It may be thin or absent leading to anterior instability, particularly in the range of 60° to 90° of elevation.

The coracohumeral ligament is also a primary stabilizer of the glenohumeral joint. It is located on the superior aspect of the glenohumeral joint, originating on the base of the coracoid and running laterally to insert into
the greater and lesser tubercles. It acts as a check against upward and lateral displacement of the humeral head.\textsuperscript{13}

Stability of the glenohumeral joint is also provided by the muscles of the shoulder girdle which can be discussed in terms of two layers.\textsuperscript{22} The muscles of the most superficial layer are the deltoid and the pectoralis major (clavicular head).\textsuperscript{4} The deeper muscular layer consists of the four rotator cuff muscles: supraspinatus, infraspinatus, teres minor, and subscapularis. Although the biceps brachii is not listed in either muscular layer, it along with the rotator cuff and deltoid comprise the prime components of the dynamic stabilization about the glenohumeral joint. The following chapter will discuss the contribution that these muscles provide in producing smooth motion about the shoulder.
CHAPTER III

BIOMECHANICS

Biomechanics is defined as the study of mechanics in the human body. It describes the motion taking place at various body segments and the forces which act on these body parts during normal daily activities. For the establishment of rational treatment programs applied to the shoulder, an understanding of the interrelationship of force and motion is necessary. Harmful effects may be produced during activity if the forces about the shoulder rise to abnormally high levels. This chapter will discuss surface joint motion, scapulohumeral rhythm, and force couples responsible for providing the integrated motion needed for full, smooth range of motion.

Surface Joint Motion

The glenohumeral joint displays the surface motion typical of a ball and socket joint in which three types of motion may take place in any given plane; these are rotation, rolling, and translation. It is important to know which motion occurs at various arm positions when determining the mechanism responsible for dysfunction of the shoulder joint.

In rotation, the contact point of the glenoid fossa remains constant while the contact point of the humeral head changes. This is analogous to the rear tire of a car stuck in snow where the tire rotates while maintaining a constant...
position. Rolling occurs when the contact point of the head of the humerus changes as it rotates in the glenoid fossa. This is analogous to a car tire rolling along in perfect traction where each point on the tire comes into contact with a different part of the road surface. In translation, the contact point of the humeral head remains the same while the socket’s contact point changes. This is analogous to the tire of an automobile with locked brakes skidding on ice where the same portion of the tire remains in contact with different parts of the icy road surface.

The glenohumeral socket has a relatively planar bony glenoid fossa which allows for rotation, a small amount of translation, and rolling where the center of rotation of the humerus may displace with respect to the glenoid fossa. Poppen and Walker found that, from 0° to 30° of elevation and often from 30° to 60° of elevation, the humeral head moves upward with respect to the glenoid fossa. Rolling and/or translation takes place with rotation in the first 60° of motion. However, in further elevation, the surface joint motion is almost pure rotation.

As the arm moves into maximum elevation, the glenoid fossa shifts medially, tilts upward, and finally moves upward. During the first 30° of elevation, the scapula rotates about its center. From 60° elevation onward, the center of rotation moves toward the glenoid fossa, resulting in a lateral shift of the inferior tip of the scapula. The scapula attempts to maintain an optimal position of articulation with the head of the humerus throughout the entire range of motion.
Scapulohumeral Rhythm

It is also essential for the shoulder complex's various components to move together rhythmically to perform all movements.1 In order for the smoothest and greatest range of motion possible, each joint moves in a coordinated fashion. Codman termed this synchronous action of the scapula and humeral components of the shoulder motion the scapulohumeral rhythm.25

The purpose of the scapulohumeral rhythm involves three objectives.16 The first is to distribute the motion between two joints, permitting a large range of motion with less compromised stability than would occur if the same range occurred at only one joint. The second objective involves maintenance of the glenoid fossa in optimal position to receive the head of the humerus, increasing joint congruency while decreasing shear forces. The third objective of a smooth scapulohumeral rhythm is to provide an optimal length-tension relationship of the glenohumeral muscles, thereby minimizing or preventing active insufficiency of the muscles.

During the initial 30° of abduction or the initial 60° of flexion of the humerus, an inconsistent amount and type of scapular motion takes place relative to glenohumeral motion.16 During this early period termed the setting phase, the scapula moves to a position of stability in relation to the humerus. Motion occurs primarily at the glenohumeral joint at approximately a 4:1 ratio, although stressing the arm may increase the scapula's contribution in this phase.16,26
With increasing range, from approximately $30^\circ$ to $180^\circ$, the scapula increases its contribution, approaching a 1:1 ratio with glenohumeral movement. However, in the latter part of the range, the glenohumeral joint again increases its contribution. Poppen and Walker found the overall glenohumeral to scapulothoracic ratio to be 5:4 between $24^\circ$ and $180^\circ$ indicating that the glenohumeral joint did in fact increase its motion in the latter part of the range.

It is generally accepted that during the entire $180^\circ$ of scapulohumeral movement, $120^\circ$ are attributed to the glenohumeral joint and $60^\circ$ accomplished by the scapulothoracic joint. While the ratio of scapulohumeral rhythm varies among subjects, one can conceptualize the concerted movement of the humerus and scapula as being $2^\circ$ of glenohumeral motion for every $1^\circ$ of scapulothoracic motion.

**Force Couples**

The final biomechanical component to be discussed is the muscular force couple present at the glenohumeral joint. Application of this information is imperative for successful rehabilitation of an unstable shoulder. A force couple can be defined as two equal but opposite forces not acting along the same line. The rotator cuff musculature along with the deltoid muscle comprise the force couple mechanism which will be discussed in detail.

The supraspinatus is one of the key elements of the force couple. The tendon of the supraspinatus inserts into the uppermost facet of the greater tuberosity on the top of the humerus and controls the action of the superior
portion of the cuff. The muscle has two functions. Its primary role is to establish a fulcrum, allowing the deltoid to elevate the arm. On contraction, the supraspinatus' short tendon depresses the head of the humerus, producing the essential fulcrum. The supraspinatus also functions as an initiator of abduction of the arm. Its activity increases progressively throughout the entire range with maximal activity at 100° of abduction.25

The subscapularis, together with the supraspinatus and infraspinatus, pulls the head of the humerus downward.24 It contains the humeral head in the glenoid fossa and opposes any force causing a potential displacement of the head anteriorly or inferiorly out of the fossa. The capacity of the subscapularis to act as a dynamic and powerful barrier in front of the humeral head is another important function.

The infraspinatus, together with the teres minor, forms the posterior portion of the cuff.24 They initiate external rotation of the humerus. Also, along with the subscapularis and the supraspinatus, the infraspinatus functions in depressing and stabilizing the head of the humerus in the glenoid fossa.

The muscular force opposing the rotator cuff is generated by the overlying deltoid musculature.28 The deltoid has a low angular pull and reduced leverage, causing a shear force. This force tends to displace the humerus vertically upward and is greatest in the first 90° of abduction, especially when unopposed by the simultaneous rotator cuff function of joint compression. By far the most integral mechanism for abduction of the arm is the deltoid muscle along with the associated rotator cuff.25
In simple terms, rotation occurs through two forces acting in opposite directions on opposite sides of the center of rotation. The upper force, acting above the center of rotation, is the rotator cuff while the lower force, acting below the center of rotation and in the opposite direction, is the deltoid. The upward pull of the deltoid and the downward pull of the rotator cuff combine to have no net force allowing for free rotation when the two sets of muscles act through the force couple mechanism.

It is important to remember that proper timing and contraction of the muscles are essential in providing smooth movement that is free of pain. Disruption of any of these components may lead to anterior instability or other problems associated with the shoulder joint. In the clinic, physical therapists must determine which component is lacking and design the rehabilitation accordingly. The following chapter will discuss the factors related to anterior instability.
CHAPTER IV

FACTORS RELATED TO ANTERIOR INSTABILITY

Several etiological factors contribute to the development of anterior instability of the shoulder. This chapter will discuss the classification of shoulder instability, the related predisposing factors, the associated complications, and the diagnostic criteria for anterior instability.

Classification of Shoulder Instability

Instability is often classified according to the degree of instability (subluxation, dislocation), the timing (acute, recurrent), the direction of instability (anterior, posterior, multidirectional), and the etiology (traumatic, atraumatic, overuse). It is important to note that not all patients presenting with shoulder instability will have the same etiology and symptoms. Therefore, an accurate classification is essential in determining the treatment plan necessary for successful rehabilitation.

Shoulder dislocation is the complete separation of the articular surfaces without spontaneous relocation. Whereas shoulder subluxation refers to a transient displacement of the head of the humerus with respect to the glenoid fossa with spontaneous relocation.

A glenohumeral joint that has been unstable on multiple occasions demonstrates recurrent instability. Recurrent dislocations occur very
frequently, especially in patients who are very active. In fact, recurrent anterior dislocations of the glenohumeral joint account for more than 80% of all dislocations in the upper extremity. Several factors have been reviewed extensively to predict the chance of recurrence. They include age, gender, arm dominance, severity of initial trauma, and length of immobilization.

The most consistent factor influencing the recurrence of anterior shoulder dislocation is age at the time of the primary dislocation. In patients over the age of 40, the recurrence rate is very low, whereas the incidence of recurrence in patients less than the age of 20 has been reported to be as high as 90%. Males are more commonly affected; however, arm dominance did not affect the incidence of recurrence.

Rowe has shown that the greater the severity of trauma causing the primary dislocation, the lower the incidence of recurrence. In the past, it was believed that a long period of immobilization was important in preventing future dislocations. However, recent studies suggest that the incidence of recurrence is not affected by the length or type of immobilization.

Patients who have congenital laxity of the shoulder joint have compromised stability. Therefore, they can sustain recurrent dislocations with minimal trauma. These patients often do not respond well to conservative management and often require surgical intervention. These two treatment approaches for anterior instability will be discussed in detail in the following chapters.
The acronyms TUBS and AMBRI have also been used for classification purposes and to guide in the treatment decisions.\textsuperscript{37} Most patients seen with shoulder instability will fall somewhere within the continuum of these two classifications. The TUBS classification is used to describe patients who experienced a Traumatic Unidirectional injury with a Bankart lesion which often requires Surgery. The Bankart lesion is defined as the detachment of the capsulolabral complex from the anterior glenoid rim. The patients who fit into the AMBRI classification often present with Atraumatic, Multidirectional, Bilateral instability and often respond best to Rehabilitation; however, they often end up requiring an Inferior capsular shift procedure to reinforce stability of the shoulder.

When evaluating a patient with a lesion in the TUBS classification, it is important to determine whether the dislocation was anterior, posterior, or inferior in nature. Zarins, McMahon, and Rowe\textsuperscript{8} state that the most common mechanism that forces the humeral head out of the glenoid fossa in an anterior direction is excessive external rotation along with abduction of the arm greater than 90°. As the arm is driven posteriorly, the humeral head is levered anteriorly, avulsing the anterior capsule, glenoid labrum, and possibly fracturing the anterior rim of the glenoid fossa. This mechanism may produce a traumatic anterior shoulder dislocation, resulting in a Bankart lesion of the anterior glenoid labrum. A Hill-Sachs lesion, which is defined as a compression fracture of the posterior aspect of the humeral head, may also accompany the Bankart lesion.\textsuperscript{37} It is produced by the recoil of the humeral head against the anterior glenoid rim.
Posterior dislocations of the glenohumeral joint make up less than 5% of all shoulder dislocations. In fact, the diagnosis is often missed due to the relative infrequency of this condition. The mechanism of injury usually involves a severe blow to the front of the shoulder or a fall on the outstretched hand with the elbow extended and the humerus internally rotated.

When considering surgical repair of recurrent posterior dislocations, it is important to ascertain whether the initial dislocation was traumatic or atraumatic. Conservative management is indicated initially for patients who are not traumatically induced. They are often best managed with progressive external rotation exercises rather than with surgery. Several surgical procedures have been described for the management of posterior glenohumeral instability, such as the reverse Bankart or the reverse Putti-Platt. However, none of them has had overwhelming success.

The patients placed in the AMBRI classification are more difficult for therapists to treat due to the gradual onset of their symptoms in an atraumatic fashion. Shoulders with multidirectional instability are frequently observed in athletic patients who have experienced repetitive microtrauma. Conservative treatment involves a prolonged course of rehabilitation placing emphasis on strengthening the deltoid and rotator cuff muscles along with strengthening the axioscapular muscles.

These patients have symptomatic glenohumeral instability in more than one direction making surgery very difficult. The standard unidirectional procedures may not be successful because they do not correct all directions of
the multidirectional instability. Excessive tightness on one side of the joint may cause a fixed subluxation in the opposite direction. However, the inferior capsular shift is designed to reduce the capsular volume on all sides by thickening and overlapping the capsule on the side of greatest instability while putting tension on the inferior and opposite sides of the capsule making it the procedure chosen most often.

Predisposing Factors to Anterior Instability

There are several factors which contribute to anterior instability of the glenohumeral joint. These include an inadequately sized glenoid fossa, a reduced humeral head retroversion angle, an anteriorly tilted glenoid fossa, a stretched capsule and/or detached tilted glenoid labrum, and a weakened or deficient rotator cuff. Pathology of the shoulder may result if any one of these factors exist. Saha found that if the longitudinal diameter of the glenoid fossa was less than 75% and the transverse diameter was less than 57% of the humeral head’s diameter, the glenohumeral joint was more likely to be unstable.

Another important factor contributing to glenohumeral instability is a reduced humeral head retroversion angle. The reduced angle inherently contributes to increased vulnerability of the shoulder joint to anterior dislocation. In a study by Kronberg et al., 66 patients were operated on for recurrent shoulder dislocations. It was shown that the retroversion angle in 64% of the patients was smaller than that seen in the normal population. Based on the results of this study, the authors proposed that a small humeral head
retroversion angle is an important factor in determining anterior glenohumeral joint instability.

Anterior tilt of the glenoid fossa also influences anterior stability of the shoulder. Saha found evidence of an anteriorly tilted glenoid fossa in 80% of 21 unstable shoulders. The incidence of the anterior tilt in 50 normal shoulders was only 27% indicating that this may be a predisposing factor to anterior shoulder instability.

An intact capsule and glenoid labrum is also a very important factor in determining the stability of the shoulder joint. Reeves found that the younger population with anterior instability is likely to have a detached labrum, while older patients with the same condition are likely to have a stretched capsule.

Clinically, shoulders with weakened or deficient rotator cuff mechanisms are likely to have compromised stability from lack of concavity compression. Concavity compression refers to the stability gained by compressing the humeral head into the concave glenoid fossa. Increasing the magnitude of the compressive load provided by the dynamic muscle contraction increases the concavity compression stabilization. Tears in the rotator cuff often lead to superior migration of the humeral head. In this situation, the deficient rotator cuff may not provide a sufficient amount of concavity compression to the humeral head to withstand the powerful upward force of the deltoid muscle.

Associated Complications of Anterior Instability

Complications that occur with anterior shoulder dislocations primarily involve bony structures, nerves, vascular structures, and/or rotator cuff
muscles. A fracture of the greater tuberosity is a relatively frequent complication occurring in approximately 25% to 30% of primary anterior dislocations. In some cases, the tuberosity is displaced under the acromion requiring surgical intervention. The tuberosity must be restored to its proper anatomical position to ensure a good, functional result. Fractures of the glenoid rim may also occur with primary dislocation at an incidence of about 11%.

The axillary nerve, which supplies the deltoid and teres minor muscles, may be bruised, stretched, or torn during an anterior dislocation, with the function of these muscles temporarily or permanently lost. Fortunately, in many instances, the axillary nerve recovers over time, allowing for full return of deltoid and teres minor functions.

Trauma to the axillary vessels may also occur at the time of dislocation. Following the vascular injury, the patient's radial nerve pulse may be absent and the limb may be cold, cyanotic, and numb. The patient may exhibit shock and hypotension. An arteriogram should be done immediately following an injury of this type. Regardless of the management of this injury, the prognosis is poor with very few patients retaining a useful upper extremity.

Rotator cuff tears occur more often than expected with anterior shoulder dislocations. They occur most frequently in adult patients over the age of 45. If the rotator cuff is ruptured, it should be repaired in order to gain pain free, normal shoulder function.
Physical Therapy Diagnosis

An accurate diagnosis is essential for the successful treatment of anterior instability of the shoulder. A detailed history along with a physical examination are the primary tools that physical therapists use to achieve this goal. The use of special tests such as the apprehension test are used to confirm anterior instability while ruling out other possible diagnoses. Other tests such as an arthrogram, a computed tomography (CT) scan, magnetic resonance imaging (MRI), and bone scans are often necessary to confirm the diagnosis of instability.

When taking a patient's history, the physical therapist should get a broad overview of the patient's instability complaints. The physical complaints of the patient should fit into one of the classification systems (TUBS, AMBRI) alluded to earlier in the chapter.

The physical examination should begin with both shoulders exposed for comparison. Muscle atrophy, lost range of motion, bone deformity, and shoulder asymmetry are observed. A key physical finding in a patient who has dislocated anteriorly is the inability to internally rotate the arm. Strength testing should also be assessed to determine whether or not a deficient rotator cuff is contributing to the anterior instability.

The use of special tests should be a routine part of all shoulder instability examinations. The patient's reaction to placing the arm in certain positions while stressing the shoulder should be carefully noted. The apprehension (crank) test involves the therapist abducting and externally rotating the patient's shoulder slowly while in the supine position. The test is positive for anterior
instability if the patient demonstrates a look or feeling of apprehension and resists further motion. The fulcrum test, the clunk test, and the anterior drawer test along with several others are used to confirm the diagnosis of anterior instability.

Additional tests can be used to differentiate among diagnoses that may exist or to determine other factors that may contribute to anterior instability. The differential diagnoses include a rotator cuff tear, impingement, and tendinitis. The drop arm test is used to indicate a rotator cuff tear while the empty can test specifically targets the supraspinatus muscle of the rotator cuff. The impingement test is indicative of an overuse injury to the supraspinatus muscle and sometimes to the biceps tendon. Bicipital tendinitis is indicated by the Speeds and Lippman tests. Once an accurate diagnosis has been determined, a rehabilitation program is initiated.
CHAPTER V

CONSERVATIVE MANAGEMENT

A proper rehabilitation program is essential for successful conservative and postsurgical management of anterior shoulder instability. This chapter will focus primarily on the conservative management for patients with first time anterior dislocation. The treatment after any dislocation should include relieving the acute symptoms, regaining normal range of motion, strengthening the dynamic stabilizers, diminishing of symptomatic apprehension, and finally, exercises geared toward facilitating return to functional activity.

The success of the rehabilitation program is dependent on the ability to correct or control the anatomic factors responsible for the glenohumeral instability. Therefore, initial protection of provocative motion along with dynamic muscle strengthening exercises are a critical part of the program. Ultimately, the goal of conservative treatment is to resume the previous level of activity with normal strength and range of motion without any signs of apprehension.

Dines and Levinson have devised a six-phase progressive rehabilitation framework for the conservative treatment of anterior instability. It can be adapted for both acute dislocation and chronic instabilities. It is important to remember that each patient’s rate of progress will differ. The role of the physical
therapist is to individualize the rehabilitation treatment program according to subjective complaints and objective findings. Any rehabilitation program for shoulder instability should be comprehensive, safe, and specifically adapted to meet the needs of the patient. The following is a detailed outline of each phase with a summary table of the goals (Table 1) located at the end of the chapter.

Phase I

After the reduction of the dislocation, the shoulder will be immobilized anywhere from one to four weeks depending on the physician.\textsuperscript{1,32,48} It is generally accepted that younger patients should be immobilized for a longer period of time due to the fact that a high percentage sustain a glenoid labral detachment. The position of immobilization is internal rotation and adduction of the humerus. The purpose of the immobilization is to protect the injured soft tissues during initiation of the healing process.\textsuperscript{37}

Modalities, ice, and anti-inflammatory drugs are used for management of pain and inflammation.\textsuperscript{13,32}\textsuperscript{13,32} It is important to educate the patient on the importance of using pain and inflammation as guidelines when going through the rehabilitation program. For example, an increase in either one of these may indicate a need to slow the progression of the program by decreasing the intensity.

Active, active assistive, or passive range of motion of the elbow, wrist, and fingers should be performed several times each day while the shoulder is immobilized to maintain the integrity and function of these joints.\textsuperscript{14} Manual
scapular stabilization exercises for protraction/retraction and elevation/depression are also initiated in this early phase of treatment.

Phase II

In phase II, gentle shoulder range of motion exercises are performed.\(^{32,37}\) The mobility exercises should include Codman’s pendulum exercises.\(^ {14}\) These exercises are self-mobilization techniques that use the effects of gravity to distract the humerus from the glenoid cavity. They help to relieve pain through gentle traction and oscillating movements while providing early motion of the shoulder joint structures.

Range of motion exercises should also be initiated concentrating on restoring forward flexion.\(^ {32}\) It is extremely important to regain motion before dynamic strengthening exercises are initiated to prevent a dyskinetic chain of events that may lead to clinical symptoms or functional loss.\(^ {23}\) Motion loss of the shoulder caused by scarring and fibrosis can generally be prevented through aggressive stretching along with grades I and II joint mobilization.

The use of an upper body ergometer (UBE), an exercise bike in which only the arms move in a circular pattern, can be used to increase range of motion of the shoulder.\(^ {32,37}\) The UBE is also useful for aerobic exercise to increase the blood supply and circulation, which is important in the early phases of rehabilitation.

Hydrotherapy is indicated for patients who do not respond well to traditional stretching activities.\(^ {49}\) The major benefit of therapy in water is the buoyancy that the water provides to the upper extremity. The water exercises
cause little discomfort which enhances the patient's confidence in using the shoulder. An easy and safe transition is usually made to active dry-land therapeutics.

Closed chain scapular stabilization activities are initiated during the early phases of rehabilitation. They should comprise a large portion of the treatment throughout the entire rehabilitation program. The closed chain exercises are described as exercises performed with the distal end of the extremity fixed. By fixing the distal end of the limb, an axial load is created providing a compressive force to the joint. Thus, the joint stability is enhanced and the tensile stresses to the capsule are decreased. A co-contraction of the scapular muscles is also created further enhancing the joint's stability. Furthermore, the mechanoreceptors facilitating proprioception are stimulated with the closed-chain activities.

Rotator cuff and deltoid muscle isometric strengthening exercises are initiated in the plane of the scapula which is believed to be a position of optimal length-tension relationships for these muscles. The lengthened position enhances muscle force, and the supraspinatus and deltoid have a more direct line of pull in this plane, avoiding subacromial impingement upon abduction of the arm.

Latissimus dorsi strengthening exercises from 90° forward flexion to a neutral position are also initiated in this phase. Basset et al have shown that the latissimus dorsi plays a significant role in the deceleration of the shoulder during overhead activities. One must be careful not to exacerbate the instability
of the shoulder while restoring strength of the latissimus dorsi. The exercise may be performed by using a dumbbell in a prone position, theraband, or a cable system.

Phase III

In the third phase of anterior instability rehabilitation, external rotation range of motion exercises at 30° to 45° of abduction are initiated. The scapular muscles should continue to be strengthened with a focus on restoring normal scapulothoracic motion. Any scapular muscle deficits may enhance the chances of an over-use injury due to the additional stress on the rotator cuff.

Moseley et al performed an EMG analysis to determine which exercises most effectively use the scapular muscles. They were able to establish a core of scapular strengthening exercises consisting of rowing, scaption, pushups with a plus, and pressups that target specific axioscapular muscles. Rowing emphasizes the rhomboids and middle trapezius. Scaption, which is elevation of the arm in the scapular plane with the humerus externally rotated, emphasizes the upper and lower trapezius along with the levator scapulae. Pushups with a plus emphasize the serratus anterior and pressups emphasize the pectoralis minor and latissimus dorsi. Shrugging exercises are also useful to strengthen the upper trapezius and levator scapulae. Resistance must be controlled during scapular strengthening exercises to avoid excessive long axis distraction to the glenohumeral joint which may produce instability. In this phase, the exercises should concentrate on the concentric component in which the extended muscle contracts and is shortened.
Rotator cuff isotonic strengthening exercises should be started in the plane of the scapula after scapular strength and stability have been restored.\textsuperscript{32} Any deficiency in the rotator cuff's strength may prevent proper centering of the humeral head, leading to greater stresses on the static restraints of the shoulder. A weak rotator cuff may contribute to injury of the ligamentous structures responsible in providing stability to the shoulder.

Initially, the exercises should be performed in a comfortable position of abduction progressing to a more stressful position, such as the overhead position in later phases of rehabilitation.\textsuperscript{32} Theraband or tubing can be used to perform internal and external rotation exercises. A free weight can also be used to strengthen the external rotators with the patient lying on his/her uninvolved side. The weight is placed in the hand of the involved arm and external rotation is initiated from a position of internal rotation and lifted to a neutral position.

It is important to incorporate the biceps brachii into the strengthening program to restore dynamic stability of the glenohumeral joint.\textsuperscript{52} The biceps brachii has been shown to demonstrate an anterior stabilizing function, particularly in the abducted, externally rotated position.\textsuperscript{32} The muscle should be trained for endurance with high repetitions and low weights. The exercises should be monitored to avoid inflammation to the tendon. Deltoid strengthening may also be initiated in the plane of the scapula to 90° elevation, if there is adequate scapular and humeral head control.
Scapular strengthening exercises are also continued incorporating the eccentric component in which the tensed muscle lengthens. It is important to train the scapular muscles for endurance because fatigue will result in abnormal scapulohumeral rhythm, which will lead to compensatory impingement and loss of energy. These muscles should be trained to react in a coordinated, synchronous manner. The rotator cuff exercises should also be advanced, stressing the eccentric component at this time. Any deficit in the eccentric strength provided by the posterior rotator cuff during the deceleration phase of movement may contribute to the development of chronic instability.

Latissimus dorsi strengthening may be advanced to above 90° elevation if the previous exercises were pain free with adequate proximal stability and humeral head control. The overhead pull-down machine may be used with the exercises performed anterior to the frontal plane to avoid stretching the anterior capsule. It is important to maintain flexibility of the latissimus dorsi as the strengthening program continues, as a loss of its flexibility may compromise the mechanics of many activities. Deltoid and biceps brachii strengthening exercises are also continued.

Proprioceptive training of the upper extremity is initiated to help restore the dynamic stability of the shoulder. The dynamic stability is dependent on the proprioceptors to signal the rotator cuff muscles to contract preventing excessive translation of the humeral head. Timing and sequence of muscle contractions are vital components to the dynamic stability of the shoulder. Proprioceptive
neuromuscular facilitation (PNF) techniques are useful in re-establishing the functional movement patterns.\textsuperscript{37,53} An example of a PNF technique is rhythmic stabilization, a stability enhancing co-contraction of the dynamic stabilizers surrounding the joint.

**Phase V**

An athlete or heavy laborer who may want to return to strenuous activity would continue to progress to the latter phases of rehabilitation. However, not all patients need to progress into this phase if their lifestyle is sedentary.

Aggressive scapular strengthening continues to be emphasized in this phase of the rehabilitation program.\textsuperscript{32} The rotator cuff strengthening exercises should be progressed to the overhead position, stressing the eccentric component, especially for the overhead athlete. The patient must be asymptomatic, show no apprehension, and demonstrate good proximal stability and strength before progressing to a position of greater elevation. The entire upper body should be involved in a strengthening program at this time.

Neuromuscular training using the PNF concepts and specific activity patterns should be continued.

Speed training of muscles must be included in the rehabilitation program, especially for athletes.\textsuperscript{32} Isokinetic exercise machines are used to achieve a solid baseline of strength to be converted to functional strength and endurance in the next phase.\textsuperscript{37} The isokinetic exercises are initially performed with the patient standing with the elbow at the side at speeds no greater than 180° per second.\textsuperscript{48}

When not attending physical therapy sessions, the patient should use surgical
tubing or theraband in a home exercise program. The home exercise program will continue when therapy is discontinued.

Plyometrics can also be incorporated to work on the speed component of the rehabilitation program.\textsuperscript{32} The plyometric exercises use the stretch reflex of the muscles to produce a powerful muscular contraction to ultimately prepare the patient for functional activities. The physical therapist must be satisfied with the patient's overall shoulder strength and symptoms before initiating the plyometric program. It should be specific to the patient with more emphasis placed on the quality of work rather than on the quantity. In this advanced phase of speed training, an arm deceleration training program is initiated. Failure of the decelerators to react at high speeds may result in excessive anterior translation leading to increased instability. Endurance and normal muscle flexibility should be monitored continuously.

Phase VI

Finally, in the last phase of shoulder rehabilitation all strength deficits should be eliminated.\textsuperscript{32} Simple strengthening of the shoulder musculature alone does not prepare the neuromuscular system for return to activity.\textsuperscript{37} Therefore, the functional progression phase is of particular importance in returning the patient back to a previous level of activity. The patient can return to normal activities in a controlled manner when there is no weakness or muscle imbalance and when the apprehension test result is negative.\textsuperscript{14}

The program discussed above is used as a framework for conservative treatment of anterior instability. Other programs exist with essentially the same
goals. Burkhead and Rockwood\textsuperscript{54} found a high percentage of good to excellent results in the conservative management of patients with atraumatic instability and poor success rate in those with traumatic recurrent shoulder instability. Therefore, these patients often require surgical intervention. The postsurgical rehabilitation program will vary depending on the surgical procedure chosen. Each program will be discussed in the following chapter.
Table 1.—Summary of Phase Goals for Conservative Management

Phase I Goals
- Protect and rest the shoulder
- Decrease pain and edema
- Prevent limitation of wrist and elbow motion
- Strengthen scapular muscles manually

Phase II Goals
- Increase pain-free motion of the shoulder
- Strengthen scapular muscles through closed-chain activities
- Strengthen rotator cuff and deltoid muscles isometrically in plane of scapula
- Strengthen latissimus dorsi from 90° forward flexion to neutral

Phase III Goals
- Increase shoulder external rotation range of motion
- Restore scapulohumeral rhythm
- Strengthen rotator cuff and deltoid muscles isotonically in plane of scapula
- Initiate biceps brachii strengthening

Phase IV Goals
- Restore full shoulder range of motion
- Continue to strengthen scapular and rotator cuff muscles, stressing eccentric component
- Incorporate upper extremity endurance training
- Initiate proprioceptive training

Phase V Goals
- Strengthen rotator cuff in overhead position
- Initiate an upper body strengthening program
- Initiate isokinetic strengthening exercises and plyometric exercises
- Monitor endurance and normal muscle flexibility

Phase VI Goals
- Eliminate any strength deficits
- Prepare for return to activity
CHAPTER VI  
SURGICAL MANAGEMENT  

In many cases, conservative management is sufficient to stabilize the glenohumeral joint.\textsuperscript{36} However, if the dislocation becomes chronic, surgical intervention is indicated. A wide variety of operative procedures have been successful in the treatment of recurrent instability.\textsuperscript{55} Ideally, the procedure should include the following criteria: (1) low recurrence rate, (2) low complication rate, (3) lower operation rate, (4) low chance of arthritis, (5) low level of difficulty, and (6) little loss of motion.\textsuperscript{56} It is obvious that no one operation fulfills all of these criteria in each patient. Therefore, the surgeon must choose the procedure that will best meet the needs of the patient.  

Apley and Solomon\textsuperscript{57} discuss the three most common surgical procedures used today: the Bankart procedure, the Bristow operation, and the Putti-Platt procedure. The Bankart procedure involves the repair of the torn glenoid labrum and capsule. The Bristow operation is used to reinforce the anterior capsule by redirecting other muscles across the front of the joint. The Putti-Platt operation entails shortening the anterior capsule and subscapularis by an overlapping repair. For these three surgical procedures what will be discussed are the indications, a brief overview of the operation, the post-operative rehabilitation programs, and the advantages and disadvantages of the procedures. A
summary table (Table 2) of the surgical procedures is located at the end of the chapter.

Prior to surgery, patients often undergo physical therapy. A detailed evaluation is conducted to determine which surgical procedure would be most beneficial for the patient based on the pathological condition present. A data base is also collected to be compared with postsurgical data. The data base contains an assessment of range of motion, strength, flexibility, joint play, and neuromuscular status. Preoperative patient education involves several exercises that will be used early in rehabilitation. The entire rehabilitation process is discussed with the patient.

Bankart Procedure

The Bankart operation is a commonly used capsular procedure which directly addresses the Bankart lesion by reattaching the glenoid labrum and anterior capsule to the glenoid rim. Thus, the Bankart procedure is indicated when the labrum and capsule are detached from the glenoid or if the capsule is thin. It is one of the more complex procedures that is used to restore anterior stability.

The surgical technique involves exposure of the anterior capsule of the glenohumeral joint with the subscapularis tendon being detached laterally. The capsule is initially cut transversely from lateral to medial exposing the glenoid rim. A longitudinal capsulotomy is made at the level of the glenoid labrum. Three straight holes are then drilled in the glenoid at the edge of the articular cartilage.
The drill holes are carefully angled away from the articular surface, and suture anchors are directed into the holes with arcs opposite the articular surface. Firm traction is then placed on the suture to seat the anchor and to test for possible pullout. It should be possible to achieve $30^\circ$ of external rotation in the operating room at this time. The capsule and subscapularis are then anatomically repaired.

Following the surgery, the patient is placed in a sling to limit external rotation.\textsuperscript{8,56,58} Within 24 to 48 hours, the sling is removed while pendulum exercises are initiated. At this time, the sling may still be used for comfort as needed, and the arm is used as tolerated avoiding external rotation past neutral until six weeks postoperatively. After the sixth week, increasingly aggressive strengthening and mobilization exercises into external rotation are begun within the limits of pain tolerance. By 12 weeks, 70% of shoulder motion should be available, with full motion regained at the end of six months. The patient should have regained full function of the shoulder and be allowed to return to contact sports or heavy labor at this time.

An advantage of this procedure is that it results in little loss of external rotation.\textsuperscript{8,37} This procedure also allows for correction of the labral defect and for capsule overlapping without the use of any metallic internal fixation devices.\textsuperscript{56} The major disadvantage of this technique is its technical difficulty. Because of the soft tissue nature of the construction, the rehabilitation course may be longer than with bony procedures.\textsuperscript{8}
Bristow Procedure

The Bristow surgical procedure is a method of treating anterior instability in which the coracoid process is transferred through the subscapularis tendon. This technique is indicated in patients with a fracture or chronic erosion of the glenoid rim or deficient anterior capsulomuscular support.

A standard anterior deltopectoral approach is commonly used. The coracoid process is identified with an osteotomy performed just distal to the insertion of the pectoralis minor tendon. Prior to the osteotomy, the insertion of the pectoralis minor muscle is reflected from the superior surface of the coracoid. The short head of the biceps and coracobrachialis muscles are also transferred and placed in a position to produce a strong dynamic buttress across the anterior and inferior aspects of the joint. The coracoid process is transferred to the anterior portion of the scapular neck through a slit in the subscapularis muscle. The muscles which were reflected are then replaced to their anatomic position and the subscapularis is repaired followed by closure of the subcutaneous layer and skin.

The coracoid transfer functions to hold the lower half of the subscapularis in position and not allow it to slip superiorly over the humeral head when the arm is abducted. Correct positioning of the transferred coracoid process is critical to the success of the procedure. It should be near the anterior glenoid rim but not over it. The transfer of the coracoid through the subscapularis tendon prevents further shoulder dislocations by creating a bone block effect.
A shoulder immobilizer is applied immediately after the surgery is completed and is worn for one week. The shoulder is then kept in a sling for approximately three to four additional weeks. At this time, pendulum exercises for the shoulder are initiated. Non-contact sports are allowed at three to four months with the return to full contact sports at six months.

An advantage of this technique is the early, more aggressive rehabilitation due to the inherent stability provided by the bony block. The procedure allows the earliest return to full activity and function. However, a disadvantage is the loss of 6° to 10° or more of external rotation which may be unacceptable for some patients such as throwing athletes. Other disadvantages may include possible musculocutaneous nerve injury, failure to correct any pre-existing labral or capsular pathological conditions, and loss of internal rotation power.

Putti-Platt Procedure

The Putti-Platt procedure involves shortening of the subscapularis muscle and anterior capsule by an overlapping repair. This surgical technique is indicated for patients who have a stretched anterior capsule and subscapularis muscle. The overlapping and shortening of the subscapularis tendon by suturing it to the lateral portion of the anterior glenoid lip provides increased stability. The procedure is rarely used when the anterior capsulolabral complex is of poor quality or if a large posterior humeral head defect requiring external rotation restriction exists.

The surgical approach is nearly the same as the one used for the Bankart repair. However, the subscapularis muscle and its underlying adherent capsule
are cut longitudinally from its insertion into the lesser tuberosity. If the muscle and capsule are adherent, no attempt to separate them is made. The joint is inspected for loose bodies after the subscapularis is retracted medially. Three or four sutures are then placed through the intact glenoid labrum. The suture ends are placed through the lateral subscapularis tendinous mass and capsule. The extremity is internally rotated and the sutures are tied tight. The medial portion of the subscapularis is placed over the attached lateral tendon and capsule.

Following the repair, an immobilizer is worn for three weeks with the arm internally rotated. The patient is then placed in a sling for one additional week and a program of pendulum exercises is initiated along with active-assisted elevation of the arm. At four weeks, the sling is removed and overhead pulley exercises are begun to institute active abduction and forward flexion exercises. At six weeks, an aggressive rehabilitation program with the use of light weights is begun. Return to heavy lifting is permitted at three months postoperatively and return to contact sports is not allowed for a minimum of five months.

The Putti-Platt procedure is not as technically demanding as the previously two mentioned operations, resulting in fewer complications in the operating room. The procedure greatly enhances anterior stability by tightening down the capsule at the cost of a significant decrease of external rotation. The operation is usually associated with the greatest restriction of external rotation due to overtightening of the subscapularis.

The majority of complications associated with these surgical procedures are observed in the postoperative period. They include restricted range of
motion, problems related to hardware, pain, osteoarthritis, infection, and inability to return to the same level of activity. It is imperative for the physical therapist to be aware of these complications when treating the patient.

Knowledge of the anatomic structures involved in the surgical procedure is also important in devising a specific rehabilitation program. In each of the procedures, after the immobilization period, the patient will enter phase II of the conservative management. The progression of activity is generally the same; however, the rehabilitation program after surgery should be careful not to stress the anatomic structures that were disrupted during the surgical procedure. The rehabilitation following surgical repair is generally more cautious, allowing more time to increase range of motion and strength to return the patient to the previous level of activity.
Table 2.—Summary of Surgical Procedures for Anterior Instability

<table>
<thead>
<tr>
<th>PROCEDURE</th>
<th>METHOD</th>
<th>INDICATION</th>
<th>ADVANTAGE</th>
<th>DISADVANTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bankart</td>
<td>Repair of Anterior Capsule</td>
<td>Detached labrum and capsule from the glenoid rim</td>
<td>Little loss of external rotation</td>
<td>Difficult procedure to perform</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Longer rehabilitation</td>
</tr>
<tr>
<td>Bristow</td>
<td>Coracoid Transfer</td>
<td>Fracture of chronic erosion of the glenoid rim</td>
<td>Early rehabilitation due to the stability provided by the bony block</td>
<td>Slight loss of external rotation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Loss of internal rotation power</td>
</tr>
<tr>
<td>Putti-Platt</td>
<td>Shorten the subscapularis muscle</td>
<td>Stretched anterior capsule and subscapularis muscle</td>
<td>Simple procedure to perform</td>
<td>Significant loss of external rotation</td>
</tr>
</tbody>
</table>
CHAPTER VII
CONCLUSION

The shoulder joint allows greater mobility than any other joint in the body. Because of this large freedom of movement, the shoulder joint is prone to instability and subsequent dislocation. The anatomy and biomechanics of the glenohumeral joint provide several static and dynamic mechanisms which produce sound physiological movement patterns. The muscles and ligaments that cross the shoulder joint assist in achieving the stability necessary to compensate for the great amount of mobility available. Therefore, a thorough understanding of the anatomic relationships of the shoulder complex is important for the establishment of treatment options for the shoulder.

The most common mechanism of injury to the shoulder resulting in an anterior dislocation is the forced abduction, external rotation position that forces the humeral head out of the glenoid cavity. The impact forces are usually so unexpected that the anterior muscles of the shoulder cannot provide adequate reinforcement. This mechanism often leads to two commonly seen defects known as the Bankart lesion and the Hill-Sachs lesion.

Recurrent dislocations commonly result from severe ligamentous and capsule laxity. Recurrent anterior dislocation can be managed with conservative or surgical treatment. The main objectives of conservative
management are the return of strength and range of motion.\textsuperscript{32} If the anterior dislocation continues on a regular basis and cannot be resolved or is resistant to conservative treatment, a surgical approach is indicated.\textsuperscript{14}

No surgical procedure fits all situations; thus, numerous techniques have been devised to treat recurrent anterior dislocation of the shoulder. This review described three of the most common surgeries and the rehabilitation protocols following each type of procedure.

It is necessary to implement the proper rehabilitation program for successful conservative and postsurgical management of anterior shoulder instability.\textsuperscript{32} This success is dependent on the ability to correct or control the anatomic factors responsible for the glenohumeral instability. The rehabilitation program should progress toward the ultimate goal of increased range of motion and strength without any signs of apprehension.

It is essential to remember that each patient’s rehabilitation and functional needs will differ.\textsuperscript{32} The key is to design a treatment program individualized according to the subjective complaints and the objective findings of the patient. Any treatment option for shoulder instability should be safe, comprehensive, and specifically designed to meet the needs of the patient.
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