The Golfer's Shoulder

David H. Kim MD, Peter J. Millett MD, MSc, and Jon J.P. Warner, MD
Harvard Shoulder Service, Massachusetts General Hospital, Brigham and Women's Hospital, Boston, MA

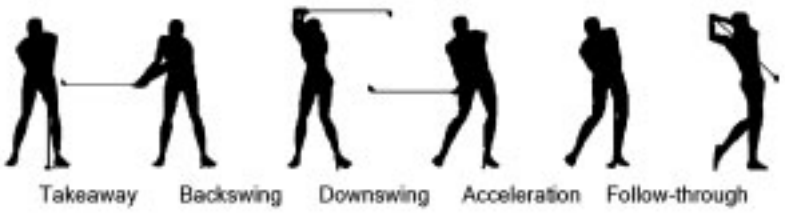
INTRODUCTION

Golf has become increasingly popular, , with an estimated 37 million participants and 518 million rounds played in 2001 in the United States alone.[2] With improved golf equipment, the abundance of golf courses, and expanded media coverage—what other sport has its own dedicated 24 hour cable network?—golf is more accessible to the general public than ever before.

Because of this growing population, we can expect to see more patients present with golf-related injuries. The purpose of this article is to review the current literature pertaining to shoulder conditions affecting golfers and to provide a foundation for evaluating and treating shoulder problems in this particular patient population.

BACKGROUND

The shoulder represents the third most commonly injured area for professional golfers, behind the lumbar spine and the wrist/hand.[17] For amateur golfers, the shoulder is the fourth most commonly affected site, trailing the lumbar spine, the elbow, and the wrist/hand.[17] The majority of the time, the lead or non-dominant, arm is involved. Professional or elite-level golfers often sustain overuse injuries as a result of repeated swings during frequent practice sessions,[16] sometimes up to 2000 or more swings per week.[13] In contrast, amateur golfers usually injure themselves because of poor swing mechanics.[23]



Phases of the golf swing

Dr. Kim is a Clinical Fellow, Harvard Shoulder Service, Massachusetts General Hospital, Boston, MA

Dr. Millett is an Instructor in Orthopaedic Surgery, Harvard Medical School, and Attending Physician, Brigham and Women's Hospital, Boston, MA

Dr. Warner is Chief of the Harvard Shoulder Service, Massachusetts General Hospital, Boston, MA

Address correspondence to:

David H. Kim, MD
Department of Orthopaedics
Massachusetts General Hospital
275 Cambridge Street POB 403
Boston, MA 02114

BIOMECHANICS/EMG STUDIES

To effectively understand the shoulder problems which afflict golfers, one must understand the biomechanics of the normal golf swing and the dynamic forces created by the shoulder girdle. The golf swing is traditionally divided into five segments: 1. Takeaway(from address until club is horizontal to ground), 2. Backswing (horizontal club to top of backswing), 3. Downswing (from top of back swing until club is horizontal), 4. Acceleration (from horizontal club to impact), 5. Follow-through (from ball contact until end of swing).[21] Golfers may give a history of symptoms which occur only during a specific part of the swing.

In the classic studies by Jobe et al.[12] and later by Pink et al.,[21] the relative activity of the rotator cuff muscles during the golf swing of professional golfers using electromyography (EMG) and high-speed photography was examined. They found that the supraspinatus and infraspinatus demonstrated relatively low, synchronized activity throughout the swing, specifically during takeaway and late follow-through, and concluded that these muscles act as abductors and external rotators to primarily help to stabilize the glenohumeral joint. The subscapularis was the most active of the rotator cuff muscles, showing activity during most of the swing, but especially during the acceleration phase of the swing. The latissimus dorsi and the pectoralis major are the major contributors to the golf swing, with the latissimus dorsi acting maximally earlier in the swing and the pectoralis major responding later in the swing. Finally, the deltoid is conspicuously quiet, except for the anterior deltoid which is most active during the follow-through phases of the swing, acting as a flexor of the arm.

These important studies have not only helped us to appreciate the relative contributions of the muscles of the shoulder girdle but have also served as a guide to better understand the pathoanatomic mechanisms for golfing shoulder injuries. Moreover, this information has served as a basis for the training, swing mechanics improvement, and rehabilitation programs involving selective strengthening of the rotator cuff and scapular stabilizers.[12]

ROTATOR CUFF/SUBACROMIAL IMPINGEMENT/ ACROMIOCLAVICULAR JOINT

Although not strictly an overhead sport, golf still requires an element of humeral elevation and rotation to perform a mechanically sound swing. It is usually at the extremes of range of motion (such as at top of the backswing or the end of fol-

low-through) when patients experience symptoms. Moreover, patients with rotator cuff disease may be weak during initial takeaway and this could perpetuate poor swing mechanics.

In a review of 412 patients with golf-related injuries, 85 patients had shoulder symptoms and 79 patients (93%) demonstrated rotator cuff or subacromial disease.[12] A case report has described a professional golfer with anterior and posterior internal impingement occurring at the top of the backswing and the end of follow-though, associated with a partial rotator cuff tear.[13] This entity was treated with arthroscopic subacromial decompression and debridement of the rotator cuff and labrum, and the patient returned to competitive play.

Another recent study[24] examined 29 recreational golfers, average 60 years of age, with subacromial disease and rotator cuff tears. At average follow-up of 3 years following acromioplasty and rotator cuff repair, all but 3 patients returned to playing golf with no difference in handicaps or driving distance. The authors concluded that rotator cuff repair and acromioplasty predictably allow most recreational golfers to return to pain-free golf at a similar competitive level.

Another study[15] reviewed 35 professional or low-handicap golfers with shoulder pain and observed acromioclavicular joint disease (53%) to be the most common cause of the pain, followed by rotator cuff tendinitis and impingement (26%). The majority of golfers experienced symptoms at the top of the backswing, when the lead arm is placed in maximal cross-body adduction and when forces across the acromioclavicular joint are high.[3] All but one golfer were able to return to competitive golf after appropriate treatment, mostly consisting of physical therapy and swing modification.

INSTABILITY

To generate power during the swing, elite-level golfers will attempt to maximize their shoulder turn relative to their hip turn.[4,19] This maneuver often requires a great deal of shoulder flexibility, and some golfers may even demonstrate hyperlaxity. Due to overuse and repetitive microtrauma, capsular and labral structures often become injured or attenuated.[13]

Mallon et al.[15] described a 12% incidence of posterior instability in their series of 35 professional and competitive golfers with shoulder pain. In a recent retrospective review by Hovis et al.,[10] eight elite level golfers were noted to have posterior instability of the lead shoulder with associated secondary subacromial impingement. At an average of 4.5 years follow-up, all golfers returned to the same level of competitive play. Two patients were treated nonoperatively, and six patients underwent arthroscopic posterior thermal capsulorrhaphy and subacromial decompression when appropriate. The authors noted that the golfers described a sensation of pain and instability at the top of the backswing when the lead arm was fully adducted across the body. This correlated with physical examination findings of posterior instability during the "load-and-shift" test[9] and posterior apprehension with loading. They hypothesized that because EMG analysis has demonstrated a relative dominance of the subscapularis muscle compared to the other rotator cuff muscles during the swing,[12,21] the glenohumeral joint may be rendered susceptible to posteriorly directed forces with fatigue.

Anterior instability can also occur in the golfer. In theory, the leading arm would be vulnerable at the end of the follow-through phase of the swing, when the arm is in maximal abduction and external rotation. This has been described in a case report involving a professional golfer presenting with anterior shoulder pain and demonstrating primarily anterior instability on physical examination. After a failed trial of nonoperative management, an open anterior capsulolabral reconstruction was performed, and the patient resumed playing on the tour at one year postoperatively.[13] Anterior instability can be treated by arthroscopic methods,[6,8,14,18] but there have been no clinical studies in the golfing population to support this technique.

LABRUM/BICEPS DISEASE

Although much more common in overhead throwing athletes,[1,5,7] superior labral lesions and biceps tendon disorders can occur in golfers. Anterior and posterior superior labrum (SLAP) fraying secondary to internal impingement has been described in a case report involving a professional golfer.[13] After failed nonoperative treatment, arthroscopic debridement and modification to a shorter backswing allowed this patient to return to competitive golf. Otherwise, there have been no studies in the literature reporting the incidence, treatment, or outcomes of SLAP lesions or biceps tendon disorders in golfers. Our personal experience confirms that these disorders do occur in both recreational and low-handicap golfers and can be treated successfully.

Patient with total shoulder arthroplasty enjoying a round of golf

ARTHRITIS

It is estimated that approximately 25% of the golfers in the United States are age 65 or older.[22] As our population ages, we can expect this number to increase. Degenerative joint disease is also prevalent in this age group, and many of these patients

are avid golfers. In the previously cited series of 35 professional and competitive golfers with shoulder pain, there was a 3% incidence of glenohumeral arthritis.[15]

In a retrospective review of 24 recreational golfers who underwent shoulder arthroplasty, 23 patients were able to resume playing golf at an average of 4.5 months postoperatively and eighteen of these patients improved their scores by almost five strokes at an average of 53 months follow-up.11 None of the patients reported significant pain or demonstrated evidence of component loosening. Interestingly, these same authors polled fifty members of the American Shoulder and Elbow Society, and most surgeons (91%) allow shoulder arthroplasty patients to resume playing golf at an average of 4.3 months postoperatively without observations of component loosening. Almost 60% of the surgeons polled felt that no limits should be placed on the patients and more than 70% believed that component wear would not be a problem in these patients.

A review of our shoulder arthroplasty golfers (unpublished data) reveals that most are able to return to playing and are very satisfied with their postoperative level of play. We have not noted any increased radiographic evidence of component loosening. While no published studies have examined the joint reactive forces on the glenohumeral joint in golfers, we have found that these patients appear to tolerate the golf swing quite well, especially if the resurfaced shoulder is the non-lead or trailing arm. We allow our shoulder arthroplasty patients to play golf without any limitations provided they do not have symptoms. Putting may start at 6-8 weeks postoperatively, chipping at 10-12 weeks, and hitting iron shots can begin at 3 months, provided range of motion and strength goals are met. Patients can then begin hitting long irons and woods at 4 months and begin playing a full round at 5 to 6 months if they are comfortable doing so.

REHABILITATION

The initial management of shoulder injuries in golfers always starts with a focused rehabilitation program. The tenets of the program are often based on the biomechanical and electromyographic studies previously described.[3,12,21] For example, golfers with posterior instability would concentrate on strengthening scapular stabilizers, especially the serratus anterior, as well as the supraspinatus and infraspinatus.[10] In contrast, those golfers with subacromial impingement and rotator cuff tendinitis would focus on posterior shoulder stretching and rotator cuff strengthening exercises as well as possibly including an anterior deltoid strengthening program.[21] Moreover, latissimus dorsi and pectoralis major muscle strengthening should be emphasized.

In addition, any swing flaws should be addressed. This may involve a coordinated effort with a teaching professional and retooling the mechanics of the entire swing, or by simply shortening the backswing or follow-through to diminish forces placed on the shoulder in these positions.[3,13]

A multidisciplinary approach employing the skills of a physiatrist, physical therapist, and teaching professional has been described[20] and reported to be highly effective in returning golfers to their previous level of play and in preventing future injury.

SUMMARY

Golf is a sport to be appreciated by all. With a good understanding of the mechanics and the basic science of the golf swing, we can diagnose and treat a majority of shoulder injuries sustained by both recreational and elite-level golfers. Whether treatment consists of a focused, team-approach rehabilitation program or a careful, diagnosis-specific surgical procedure, we can help these patients return to playing a sport they truly enjoy.

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