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Sports Participation After Shoulder Replacement Surgery

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Background: Return to sports after total hip or knee replacement surgery has been extensively described. However, the return to general sporting activities after shoulder replacement surgery has not been well documented. With improved implant survivorship, patient expectation of function is high.

Purpose: The purpose of this study was to assess the outcome and ability of patients returning to sports after shoulder replacement surgery.

Study Design: Case series; Level of evidence, 4.

Methods: Seventy-five patients (86 shoulder replacements) who participated in sports or recreational activities before surgery were followed for a minimum of 2 years. Their preoperative and postoperative sports participation and level of competition were assessed. The frequency of their activity, modifications in activity, and length of time it took to resume sports participation after the operation were all reviewed.

Results: The mean age at follow-up was 65.5 years (range, 24-88). The average follow-up was 3.7 years (range, 2-9.4). Sixty-four percent of the patients stated that one of the reasons they had the surgery performed was participation in sports. Thirty-four of 48 of these patients (71%) demonstrated an improvement in their ability to play their sport and 50% increased their frequency of participation postoperatively. Softball athletes demonstrated the least favorable return; only 2 of 10 patients returned. Swimming, tennis, and golf were the most popular sports; participants in these sports showed the most favorable improvement and actual return. The mean time to partial return to sports was 3.6 months, and 5.8 months to full participation.

Conclusion: Patients are able to successfully return to sports after shoulder arthroplasty. Many returned with improved performance and increased frequency in participation in a timely manner.

Keywords: sports participation; shoulder; joint replacement; activity

Total joint arthroplasty is becoming increasingly more common, especially as the population ages and techniques and joint implant survivorship improve. The goal with a joint replacement is to relieve pain and restore mobility to a joint. A growing proportion of the aging population that undergoes joint replacement surgery is interested in sports and physical activity. Their participation in sporting activities may be curtailed by the condition that necessitates the joint

arthroplasty. Past studies have demonstrated a return to sports after various joint arthroplasties.^{2,4,6,8,9,11,12,14,15,20} A majority of these have focused on sports participation after hip or knee replacement. To our knowledge, there is only 1 published study that has specifically investigated the issue of patient sports involvement after shoulder replacement surgery.⁹ In a study limited to 24 patients, Jensen and Rockwood⁹ demonstrated that 96% of these patients were able to return to golf and most were able to play with an improved game.

Although golf is a popular game, particularly in the elderly population, patients undergoing a shoulder replacement often participate in a variety of other sports and activities. The active patient is often curious and seeks to understand the ability (or inability) to return to a specific activity. Often, questions arise from patients regarding return to activity when they undergo counseling for a

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shoulder replacement. The purpose of this study was to (1) establish the types of sports to which patients are able to return, (2) assess the average time needed to return to sports, and (3) determine the rate of return and ability level of patients undergoing shoulder replacement surgery.

PATIENTS AND METHODS

A retrospective review of the records was done on all patients who underwent a biomodular (Biomet, Warsaw, Indiana) total shoulder arthroplasty or hemiarthroplasty as an elective procedure by one of the senior authors (D.A. and R.F.W.) from 1988 to 1997. The procedure was done for various conditions of the shoulder, including osteoarthritis, inflammatory arthritis, posttraumatic arthritis, and osteonecrosis. Patients who had the procedure done as a revision or as treatment for a tumor or acute fracture were excluded. Any patient with less than a 2-year follow-up was also excluded.

A comprehensive review of the records of these patients was undertaken. Data regarding the patients were compiled with particular attention to the preoperative diagnosis, preoperative sports participation, the reason for the surgery (eg, pain, sports participation, work), age at time of surgery, hand dominance, prior procedures on the shoulder, comorbid conditions, type of procedure, and follow-up clinical notes.

A questionnaire was sent to patients who met inclusion criteria (see online Appendix for this article at <http://ajsm.sagepub.com/supplemental>). Information regarding current coexisting medical conditions, subsequent procedures on the shoulder, past and present sports and activity participation, and medication use was obtained.

The first part of the questionnaire was designed to confirm information on hand dominance and the side of shoulder replacement. Patients were asked if there were any coexisting diseases or medical conditions that may be affecting them at the time of the survey completion and whether this affected their current ability to participate in sporting or recreational activities. They were also asked whether any subsequent surgical procedures were done on the shoulder that underwent replacement.

The next part of the questionnaire focused on the sports and recreational activities that the patients participated in. They were queried as to all current sports participation and the number of years they participated in each activity. Patients were also asked to list any sports that they had participated in before shoulder replacement surgery but were no longer able to play. They were also asked about possible improvement in their performance, with respect to each activity they participated in, after shoulder replacement surgery. The prior and current level of participation was also determined (eg, recreational, competitive league, semiprofessional, professional). If applicable, prior and current rankings, ratings, or handicaps were given. Patients were asked if they had to modify their sports activity because of the surgery. Questions were included regarding the frequency of the participation in each activity at 4 different time points: (1) before original injury and onset of symptoms in the shoulder, (2) immediately before the shoulder replacement surgery, (3) 1 year after the surgery, and (4) current frequency of participation. Finally, patients

were queried as to the length of time it took to resume partial, full, and/or competitive participation in each activity.

The final part of the questionnaire addressed the types of pain medications—specifically nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and narcotics—that the patients needed to take to participate in sports both currently and before the surgery. The number and the frequency of the medications were listed.

Results from the questionnaire were tabulated with primary distributions and percentages of numbers listed. Statistical analysis of the ability to return to participation in sports based on type of shoulder replacement (hemiarthroplasty vs total) was done with the χ^2 test.

RESULTS

Demographics

One hundred ninety-eight patients were initially identified as meeting the initial inclusion criteria; 53 could not be contacted due to either an address change or death. Of the 145 patients who returned questionnaires, 75 were participants in sports or recreational activities before the surgery and were thus included. These 75 patients who were active in sports underwent 86 shoulder arthroplasties. Sixty-four of the patients had unilateral procedures, while 11 had bilateral replacements. Twenty-five joint replacements (21 patients) were hemiarthroplasties and 61 (54 patients) were total shoulder arthroplasties. The shoulder replacements were done in the dominant shoulder in 49 shoulders. At the time of the questionnaire, the average follow-up was 3.7 years (range, 2-9.4). The mean age at the time of the follow-up was 65.5 years (range, 24-88). There were 27 women (33 arthroplasties) (mean age, 66.1 years; range, 24-84) and 48 men (53 arthroplasties) (mean age, 63.5; range, 46-88). The primary condition of the shoulder necessitating the surgery was osteoarthritis in 60 patients (68 shoulders), osteonecrosis in 3 patients (4 shoulders), posttraumatic osteoarthritis in 5 patients (6 shoulders), inflammatory arthritis in 2 patients (3 shoulders), and nonunion or malunion of proximal humerus fracture in 5 patients. Four patients (5%) underwent subsequent surgery. Three of these procedures were arthroscopic debridements. One patient underwent removal of the glenoid component secondary to loosening.

Sports Participation

Forty-eight of 75 patients (64%) stated that one of the reasons they had the shoulder replacement was so they could continue to play sports. Other reasons included pain relief in 68 (91%), improvement of motion in 51 (68%), and ability to continue work in 22 (29%). Before the shoulder replacement, the patients participated in a wide variety of sports; swimming (43 patients) was the predominant sport, and golf (35 patients) was the second most common. Fifty-four patients participated in more than 1 sport or activity (Table 1). The average frequency of participation in sporting activities before problems or symptoms in the shoulder was 2.6 days/week. The average frequency of participation decreased to 0.7 days/week immediately before the

TABLE 1
Type of Activities and Number of Shoulder
Replacement Patients Participating

Activity/Sport	No. of Patients
Swimming	43
Golf	35
Tennis	28
Downhill skiing	16
Weight lifting	14
Fishing	13
Softball	10
Bowling	10
Cross-country skiing	9
Walking/hiking	4
Running/jogging	4
Waterskiing	3
Rowing	3
Basketball	3
Hunting	3
Ballroom dancing	3
Equestrian	2
Racquetball	2
Kayaking	2
Sailing	2
Squash	2
Aerobics	2
Bodybuilding	2
Snorkeling	1
Darts	1
Baseball	1
Wrestling	1
Sculpting	1
Cycling	1
Stairs	1
Handball	1

shoulder replacement surgery. Fifty-one of the 75 patients (68%) were not able to participate in any sports immediately before surgery secondary to reasons of pain and/or decreased function.

One year after the shoulder replacement procedure, the average frequency of participation in sports was 1.7 days/week. The average time it took patients to at least partially participate in their desired sport was 3.6 months. The average time to full return in sports activity was 5.8 months. Fishing had the highest percentage of return to participation after the procedure, with 12 of 13 patients (92%) returning, followed closely by swimming with 37 of 43 patients (86%). The least favorable rate of return after surgery was for softball, for which only 2 of 10 patients (20%) were able to return to play (Figure 1). The side of the surgery and hand dominance did not affect the ability to return to play.

Fourteen (19%) of the patients did not resume any type of activity/sports after the shoulder replacement. Of these patients, only 1 was participating in any type of activity before surgery when pain or symptoms limited their ability to play. Additionally, 8 of these patients had a coexisting medical condition that also affected their ability to participate in sports. These conditions included asthma, obesity, hypertension, knee osteoarthritis, heart disease, and diabetes.

There was no difference ($P = .96$) between patients with either a total shoulder arthroplasty (44 of 54 patients) versus a hemiarthroplasty (17 of 21 patients) in their ability to return to participation in their sport.

Before the procedure, 53 patients (71%) required some type of medication (NSAIDs, acetaminophen, narcotics) to continue with participation. Four of these patients also required the use of narcotics (hydrocodone/acetaminophen or acetaminophen/codeine). After the procedure, 29 patients (39%) continued some type of medication for participation.

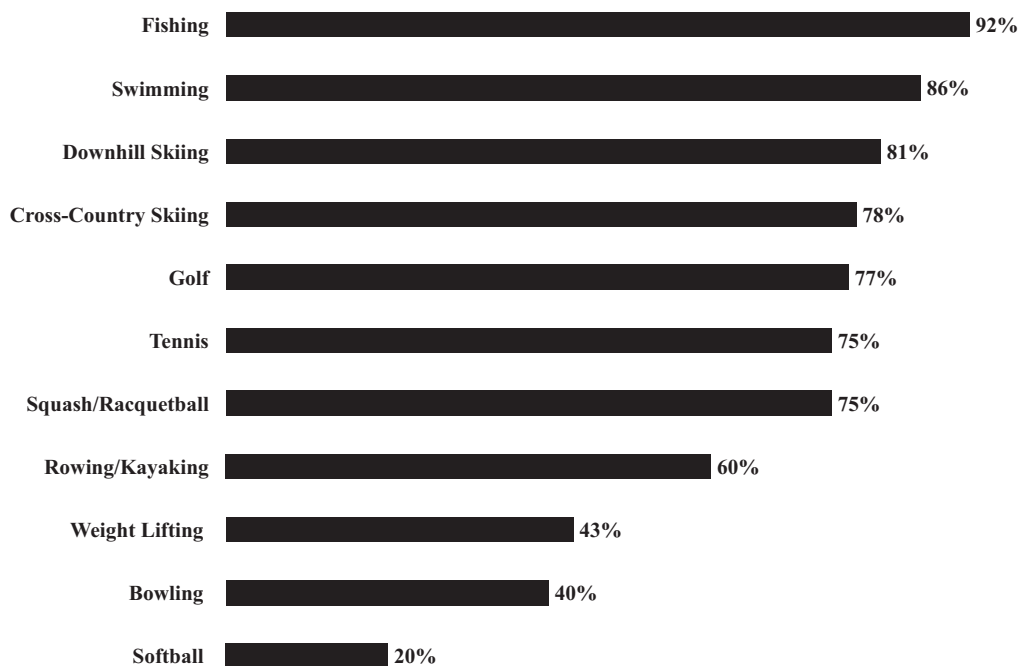


Figure 1. Rate of return to prior sports after shoulder replacement surgery.

Ten of these patients took fewer NSAIDs than previously. In the subgroup of patients for whom the reason for the shoulder replacement was to return to sports, 34 of 48 (71%) had improvement in their ability to play their sport as measured by level of participation and/or ranking/handicap. Thirteen of the 14 patients who did not have an improvement in their desired activity performance continued to participate in their desired activity or changed their sporting activity.

DISCUSSION

The majority of patients in this study demonstrated the ability to successfully return to sports and recreational athletic activities after shoulder replacement surgery. A high rate of return ($\geq 75\%$) was evident for the most popular pre-shoulder replacement sports: swimming (86%), golf (77%), and tennis (75%). A lower rate of return ($\leq 50\%$) was seen in sports such as weight lifting (43%), bowling (40%), and softball (20%). A higher frequency of participation was evident after surgery as well. Participants were active in their sports an average of just 0.7 days/week just before their surgery. One year after surgery, the average participation had more than doubled, to 1.7 days/week.

Although a return to athletics in this population was not the sole reason for undergoing a shoulder arthroplasty, it was cited by almost two-thirds of the patients (48 patients). An increase in range of motion was listed as a reason by 51 patients (68%) for having the surgery and was clearly an important reason in a population of active individuals participating in sports. Overall, pain was the predominant reason in this athletic population (68 patients [91%]). Pain is a common reason for the sedentary patient to undergo a total shoulder arthroplasty or arthroplasty of other joints in general.¹⁹ The fact that this series of patients placed such a high value on their motion and return to sports as reasons for having the surgery gives an indication of their motivation and the importance of athletics to them.

In recent years, there has been an increase in the number and proportion of the elderly population that remains active in sports. The sporting activities that many elderly patients enjoy include sports such as golf and tennis. We also found this to be the case, as the top 3 activities cited by our survey participants were swimming, golf, and tennis. However, there were many individuals who were relatively younger and were involved in a variety of other activities. In the group of patients under 60 years of age, the top 2 sports cited for activity participation were downhill skiing and swimming. Other activities included weight lifting, cross-country skiing, golf, and tennis.

Demands on the shoulder are greater in the shoulders of those arthroplasty patients participating in athletic endeavors involving the upper extremity compared with the more sedentary shoulder arthroplasty patients. Thus, one might expect more problems with the joint replacements necessitating further surgery and revisions. However, our population underwent only 4 procedures after the initial arthroplasty; and 3 of these were arthroscopic debridements, while only 1 glenoid was taken out. The arthroscopic procedures were performed for evaluation and

debridement of patients who had painful mechanical symptoms not responding to nonoperative management. Previously, arthroscopy has been used to assist in the diagnosis of loose glenoid components.^{1,7,21} The single patient in our study who underwent removal of the glenoid was still participating in his activity (golf), albeit with some limitations, just before the procedure. The fact that the patients in this study had not undergone a revision and for the most part were asymptomatic does not necessarily indicate that loosening of the shoulder replacement components did not occur. It is possible that a number of the components, glenoid and/or humeral, had undergone early loosening. Previously, the literature has indicated that patients with glenoid loosening have pain in the shoulder.^{3,10} However, it has also been demonstrated that a patient can remain asymptomatic even with radiographic signs of loosening.⁵

Past studies on joint replacements have demonstrated a successful return to participation in sporting activities.^{2,4,6,8,9,12-17,20,22} Naal et al¹⁶ investigated the ability to return after unicompartmental knee arthroplasty. They found that the majority of the patients (90.3%) had maintained or improved their ability to participate in sports or recreational activities after the surgery. However, those patients who participated in higher impact activities, such as downhill skiing, had a significant decrease in their ability to return. Bradbury et al² retrospectively examined patients who had undergone total knee replacement surgery by a single surgeon and found that 77% who had participated in regular exercise in the year before surgery returned to low-impact sports. Mallon and Callaghan¹² examined active golfers undergoing total knee arthroplasty. The golfers all returned to golf after the surgery, albeit with a significant rise in their handicap (mean, 4.6 strokes) and also a decrease in the length of their drives.

In another study, Mallon and Callaghan¹¹ also found a successful return to golf after total hip arthroplasty, with a slight increase in handicap (mean, 1.1 strokes). At an average of 6.1 years after surgery, golf was being played 3.7 times a week. Ritter and Meding²⁰ examined patients after total hip arthroplasty and found a significant decrease in all forms of activity (except for cycling) after surgery; however, more returned to an active sport than did not. Mont et al¹⁵ sent questionnaires to United States Tennis Association members who had undergone a hip arthroplasty and found favorable results. One year after arthroplasty, players played both singles and doubles approximately 3 times/week. All tennis players were extremely satisfied with their hip arthroplasties and their increased ability to participate in their favorite sport. In a different study by Naal et al,¹⁷ patients who had undergone hip resurfacing arthroplasty were surveyed at a mean of 2 years after surgery. The authors found that patients returned to a high level of sports participation after surgery. More patients participated in sports after surgery (110 patients) than before (105). More than 50% of the patients returned to sports within 3 months after the surgery.

It might be expected that with sports activities there would be increased loosening of the component; however, this has not been documented. Dubs et al⁴ reviewed patients who underwent total hip arthroplasty and found

the incidence of replacement due to loosening is surprisingly higher among the group of patients with no sporting activity versus those who participated in intense sporting activity (14.3% to 1.6%). Gschwend et al⁶ followed 2 matched cohorts of 50 patients after total hip arthroplasty, 1 cohort active in Alpine and/or Nordic skiing and the other cohort inactive. At 5 years, no signs of loosening were demonstrated in the active group of patients while 5 hips demonstrated loosening in the inactive group. At 10 years, the wear rate was higher in the active group yet loosening continued to remain higher in the inactive group of patients.

Past studies regarding sports participation after shoulder arthroplasty have been limited. In a review of 273 shoulder replacement patients, Neer et al¹⁸ included a subset of 23 active golfers and tennis players who had returned to their respective sports. Jensen and Rockwood⁹ specifically studied patients returning to golf after a shoulder replacement. A retrospective review of 24 patients who had a shoulder arthroplasty revealed that 23 were able to resume playing golf. The average length of time from shoulder arthroplasty to playing an entire round of golf was 4.5 months. Eighteen patients were able to report their preoperative handicap and noted an average improvement after surgery of almost 5 strokes. Additionally, there was no increased radiographic evidence of component loosening when the golfers were compared with a control group of 76 shoulder replacement patients.

Overall, in our study, patients were able to return to most sports and activities that they had participated in before surgery. Sports that were more difficult to return to were those that put an excessive stress on the shoulder, such as weight lifting.

Although there was a successful return to sports in this series, it is not known if the activity may be precipitating loosening of the components. The risk of loosening is unknown. Demand on the shoulder varies with the different activities. It is higher in an activity such as weight lifting versus one like fishing. Further work is warranted to investigate the stresses that sports place on the components of a shoulder replacement.

Limitations of this study include the fact that it is retrospective. Ideally, a group of athletic patients could be followed prospectively for more than 10 years and followed for their activity level, symptoms, radiographic changes, etc. The study did not include clinical examination or radiographic follow-up. We did not attempt to obtain radiographs; rather, we used symptoms, activity level, and repeat surgeries as a guide to potential problems with the components. It is possible that a number of patients were able to successfully participate in their activities despite potential radiographic loosening that may go unrecognized due to their lack of symptoms. However, if such loosening was occurring, future symptoms could occur. Although motion and strength are important variables, restoration of function is of greater concern to these patients.

SUMMARY

Overall, the majority of the active shoulder replacement patients in this series demonstrated the ability to return to

sporting endeavors that involved their upper extremity. The demands of a large variety of sports were tolerated by these patients. Repetitive activities such as swimming did not appear to adversely affect the shoulder in the short term, as judged by the lack of revision surgery necessary and the current activity level of the patients. The information from this study may be helpful when counseling the active patient about return to sports after a shoulder replacement.

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