

The American Journal of Sports Medicine

<http://ajs.sagepub.com/>

Do Patients Return to Sports and Work After Total Shoulder Replacement Surgery?

Matthias Bülhoff, Peter Sattler, Thomas Bruckner, Markus Loew, Felix Zeifang and Patric Raiss

Am J Sports Med 2015 43: 423 originally published online November 18, 2014

DOI: 10.1177/0363546514557940

The online version of this article can be found at:

<http://ajs.sagepub.com/content/43/2/423>

Published by:



<http://www.sagepublications.com>

On behalf of:

American Orthopaedic Society for Sports Medicine



Additional services and information for *The American Journal of Sports Medicine* can be found at:

Email Alerts: <http://ajs.sagepub.com/cgi/alerts>

Subscriptions: <http://ajs.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

>> [Version of Record](#) - Jan 29, 2015

[OnlineFirst Version of Record](#) - Nov 18, 2014

[What is This?](#)

Do Patients Return to Sports and Work After Total Shoulder Replacement Surgery?

Matthias Bülhoff,* MD, Peter Sattler,* MD, Thomas Bruckner,[†] PhD,
Markus Loew,[‡] MD, Felix Zeifang,* MD, and Patric Raiss,*[§] MD

*Investigation performed at the Center for Orthopaedics and Trauma Surgery,
University of Heidelberg, Heidelberg, Germany*

Background: Studies evaluating the return to sports and work after shoulder arthroplasty are rare, and there are no studies evaluating return to work after total shoulder arthroplasty (TSA).

Hypothesis: Patients undergoing TSA will be able to return to their preoperative sports levels and occupations.

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

Methods: A total of 154 patients with 170 TSAs for primary glenohumeral arthritis were included. Two subgroups were formed: patients who had participated in sports during the 5 years before surgery (group 1; n = 105 [68%]) and patients who had never participated in sports (group 2; n = 49 [32%]). The return-to-work rate in patients who had not retired after surgery were also analyzed, as were responses to a survey.

Results: The mean age at the time of surgery was 71 years (range, 33-88 years) in group 1 and 76 years (range, 54-88 years) in group 2. Mean follow-up time was 6.2 years (range, 2.5-12.6 years). Fifty-seven patients (54%) in group 1 participated in sports right up to the time of surgery. All 57 (100%) returned to sports after surgery. A further 3 patients (3%) from group 1 resumed sporting activity after surgery; swimming was the most popular sport. No patient in group 2 started sports activity after shoulder replacement surgery. Many of the patients, 14% of the entire group, had retired by final follow-up because of TSA. Fourteen percent of patients in group 1 and group 2 were pursuing their work at the time of most recent follow-up. Thirty patients of the entire cohort (19.5%) had to change their occupations because of surgery.

Conclusion: Patients who participated in sports before TSA were successfully able to return to sports activities after surgery. Patients who did not participate in sports just before surgery were unlikely to start sports after surgery. Fourteen percent of the entire cohort was able to return to work after surgery.

Keywords: sports participation; total shoulder arthroplasty; activity; glenohumeral arthritis

Total shoulder arthroplasty (TSA) is a well-established treatment option for degenerative pathologic abnormalities of the shoulder joint and has shown satisfactory long-term functional outcomes.^{1,3,4,6,7,14,18} New implants and surgical techniques have been developed, and good implant survival without frequent need for revision surgery can be expected.^{4,14}

As life expectancy increases and shoulder replacement surgery is routinely performed in young and active patients with degenerative conditions as well as in the elderly population, new goals of shoulder joint replacement are becoming more important, such as the ability to resume sports and return to work. Patients often ask before shoulder replacement surgery whether they will be able to participate in their favorite sports or return to work thereafter.

Various studies have shown a good rate of return to sports after hip and knee replacement.^{2,8,11} However, studies on this topic in the field of shoulder arthroplasty are rare.^{12,15} Some of the available studies are heterogeneous with regard to implant concept and diagnosis, making the results difficult to interpret.

Total shoulder arthroplasty has shown better clinical outcomes and higher patient satisfaction than hemiarthroplasty in several studies, and there seems to be a trend toward total shoulder replacement.^{5,9,16,17} A common question that a patient asks a shoulder surgeon is "Will I be able to participate in sports after surgery and when?" Therefore, it is of clinical interest to know the rate of return to sports and work in patients treated with TSA.

[§]Address correspondence to Patric Raiss, MD, Center for Orthopaedics and Trauma Surgery, University of Heidelberg, Schlierbacher Landstrasse 200a, 69118 Heidelberg, Germany (e-mail: patric.raiss@med.uni-heidelberg.de).

*Center for Orthopaedics and Trauma Surgery, University of Heidelberg, Heidelberg, Germany.

[†]Institute of Medical Biometry and Informatics, University of Heidelberg, Heidelberg, Germany.

[‡]Department of Shoulder and Elbow Surgery, ATOS Clinic Heidelberg, Heidelberg, Germany.

One or more of the authors has declared the following potential conflict of interest or source of funding: This study was supported by the non-commercial research foundation Deutsche Arthrose-Hilfe eV.

The purpose of this study was therefore to analyze the rate of sports and work activities before surgery and their postoperative rates of return in a homogeneous cohort of patients with primary glenohumeral osteoarthritis treated with the same third-generation anatomic shoulder implant.

MATERIALS AND METHODS

Demographics

Between May 1997 and July 2007, a total of 250 total shoulder arthroplasties were performed at our clinic. The inclusion criteria for this study were as follows: (1) primary glenohumeral osteoarthritis, (2) treatment with the same anatomic third-generation total shoulder implant, (3) treatment by or under the supervision of the same surgeon, (4) absence of rotator cuff tears in the affected shoulders, and (5) minimum follow-up of 2 years.

A questionnaire was sent to all 195 patients fitting the inclusion criteria, and 154 patients (79.5%) returned it. These patients' records were systematically reviewed.

Questionnaire

All patients who met the inclusion criteria were sent a questionnaire (see the Appendix, available online at <http://ajsm.sagepub.com/supplemental>). At the beginning of the questionnaire, patients were asked whether they had ever participated in sports or work activities (group 1) or not (group 2).

The first part of the form included questions about the affected side, hand dominance, and previous surgery, followed by information about work status (before surgery and currently), whether the patient had had to change his or her work because of the surgery, and comorbidities possibly affecting current ability to participate in sports.

The next part focused on the specific sports activities in which the patients participated, with the time that they needed to resume full activities and the frequency of sports.

Surgical Technique and Implants

The same cemented unconstrained third-generation anatomic implant (Aequalis Total Shoulder) was used in all cases. Patients were placed in the beach-chair position. The deltopectoral approach was used.¹³ The joint was exposed after tenotomy and release of the subscapularis tendon. The biceps tendon was released, and tenodesis in the bicipital groove was performed. The humeral head was exposed and resected at the anatomic line. The humeral intramedullary canal was then prepared. Next, the glenoid was reamed via reamers of increasing size. In patients with biconcave glenoids, the version was slightly corrected with reaming. After jet lavage and drying of the glenoid surface, cement was applied, and a keeled glenoid was implanted. High-viscosity cement (Biomet) was used for both the humeral stem and the glenoid component. Continuous

pressure was put on the glenoid during cement curing. The third-generation cementing technique was used for implanting the stem with a distal plug, performing jet lavage, conducting retrograde filling, and applying continuous pressure. After component placement and repositioning, the subscapularis tendon was reattached with up to 5 non-absorbable sutures. A drain was placed and subsequently removed 1 day after operation. Postoperatively, the arm was placed in an abduction pillow (20°) and internal rotation (20°) for 4 weeks. Actively assisted exercise was performed daily with a physiotherapist starting at day 1 for the first 6 weeks after surgery. Active and free range of motion was allowed thereafter.

The study was reviewed and accepted by the ethics committee of the University of Heidelberg.

RESULTS

Demographic Findings

There were 119 women (77%) and 35 men (23%). The patients' mean age at the time of surgery was 72 years (range, 33-88 years). The dominant arm was treated in 103 cases (67%). The mean duration of follow-up was 6.2 years (range, 2.5-12.6 years). There were 16 patients (10%) with bilateral total shoulder arthroplasties.

There were 105 patients (68%) who stated that they had participated in sports activities during their lives (group 1); 49 patients (32%) had never participated in sports (group 2). The mean age at surgery was 70.6 years (range, 33-88 years) in group 1 and 75.9 years (range, 54-88 years) in group 2. There were 78 women (74%) and 27 men (26%) in group 1 and 41 women (84%) and 8 men (16%) in group 2.

In group 1, the dominant side was treated 71 times (68%) and the nondominant side, 34 times (32%). In group 2, the dominant side was treated 32 times (65%) and the nondominant side, 17 times (35%). There were 11 patients (10%) in group 1 and 5 patients (10%) in group 2 with bilateral TSA.

Sports Activities Before Surgery

In group 1, 62 of the 105 patients (59%) had participated in sports ≤ 5 years before total shoulder replacement, whereas 43 patients (41%) had not. Of the 62 patients who had participated in sports within 5 years of surgery, 57 (54%) had participated right before (within 3 months) surgery. Twenty-one of the remaining 48 patients (20%) had to stop sports activity specifically because of shoulder problems, and 27 patients (26%) stopped sports activity mainly because of other comorbidities.

Sports Activities at Final Follow-up

Sixty patients (39%) of the entire cohort were participating in sports activities at the time of follow-up. All 60 patients belonged to group 1 (57%).

All 57 patients in group 1 who had participated in sports until just before surgery returned to sports after arthroplasty

TABLE 1
Patients Participating in Sports at Follow-up (n = 60)^a

Sport/Exercise	No. of Patients (%)
Swimming	60 (57)
Sports including the lower extremities	42 (27)
Skiing	31 (30)
Gardening	29 (28)
Bowling/skittles	18 (17)
Tennis	15 (14)
Handball	6 (4)
Athletics	4 (3)
Volleyball	3 (2)
Golf	2 (1)
Other	26 (25)

^aAll patients belonged to group 1 (n = 105).

TABLE 2
Frequency of Participation in Sports
Preoperatively (Group 1)

Times per Week	No. of Patients (%)
4-7	2 (2)
2-3	6 (6)
1-2	15 (14)
1	34 (32)

(100%). A further 3 patients from group 1 (3%) also resumed participation in sports after surgery; these 3 patients had participated in sports ≤ 5 years before surgery. Fourteen patients (13%) changed their sports after surgery, and the remaining patients in group 1 returned to their prior sports.

In 8 of the 45 patients (17.8%) in group 1 who were not participating in sports activities at the most recent follow-up, the stated reason was shoulder problems; 23 (51.1%) gave other reasons. The other 14 patients (31.1%) were no longer interested in participating in sports.

Seventeen patients (16%) of group 1 stated that one reason why they underwent total shoulder replacement was to continue sports. Additional reasons for undergoing surgery included pain relief (n = 146 [95%]), improvement of mobility (n = 120 [78%]), desire to continue working (n = 20 [13%]), and other (n = 9 [6%]).

The types of activities of the 60 patients currently participating in sports are listed in Table 1.

Frequency of Sports Activities

Fifty-six patients in group 1 (53%) were participating in 1 or 2 types of sports activities at the time of most recent follow-up, and 4 patients (4%) were involved with more than 2 activities. The frequency in sports participation preoperatively and at most recent follow-up is demonstrated in Tables 2 and 3.

Compared with the highest level of activity ever attained, 53 patients in group 1 (51%) had to lower their intensity of sports activities after shoulder replacement surgery. Twenty-four (23%) had to reduce the frequency of sports; 9

TABLE 3
Frequency of Participating in Sports
at Most Recent Follow-up (Group 1)

Times per Week	No. of Patients (%)
4-7	8 (8)
2-3	18 (17)
1-2	12 (11)
1	22 (21)

TABLE 4
Time to Return Fully to Sports (Group 1)

Time	No. of Patients (%)
<3 mo	6 (6)
3-6 mo	14 (13)
7-12 mo	7 (7)
1-2 y	6 (6)
>2 y	27 (26)

(9%) had to reduce the level of sports; and 19 (18%) had to cease sports activities altogether because of surgery.

Time to Return to Sports

The time that patients needed to fully return to their sports activities is shown in Table 4.

Work

In group 1, 91 patients (87%) had worked at some time in their lives, whereas 14 (13%) had not. In group 2, there were 35 patients (71%) who had worked and 14 (29%) who had not.

Thirty-six patients (34%) in group 1 stated that they had pursued working ≤ 5 years before shoulder replacement surgery, while 69 (66%) had not. In group 2, there were 21 patients (43%) who had worked ≤ 5 years preceding surgery, whereas 28 (57%) had not.

Fifteen patients (14%) in group 1 and 7 patients (14%) in group 2 were pursuing their work at the time of most recent follow-up. Most patients who were not working at final follow-up had retired from work. Twenty-one patients (14%) of the entire group were retired because of TSA.

Three patients (3%) in group 1 and 3 patients (6%) in group 2 were not pursuing their work at the time of most recent follow-up because of shoulder problems. Thirty-eight patients (25%) had to give up their work because of shoulder surgery: 32 (31%) in group 1 and 6 (12%) in group 2.

Thirty patients (20%) of the entire cohort had to change their occupations, and 6 (4%) had to reduce their hours of work owing to shoulder arthroplasty.

DISCUSSION

This study demonstrates a good rate of successful return to sports in patients undergoing TSA with primary

glenohumeral arthritis. Overall, 57% of patients who had ever participated in sports in their lives were doing so at final follow-up. All patients that participated in sports right before surgery were successfully able to return. Improvements in implants and the higher expectations of the elderly with regard to shoulder replacement surgery make it a major issue to give patients good advice preoperatively and during postoperative rehabilitation.

The 3 most popular activities involving the upper extremities were swimming (57%), skiing (30%), and tennis (14%). The majority (63%) of the patients who participated in sports did so more than once a week.

One reason why swimming was so popular among our patients may be the fact that we recommend swimming when patients ask about sports activities after shoulder replacement surgery. We always place limitations on contact and collision sports, such as handball and soccer, although our patients do not commonly play these kinds of sports, most likely because of their advanced age.

The frequency and intensity in sports activities were much greater after TSA than before surgery. This raises the possibility that surgery may restore the ability to participate in sports activities. Less pain, more confidence in the affected joint, and an improved range of motion are also possible reasons.

The studies of sports participation after joint replacement surgery mostly concern hip and knee replacement. Huch et al⁸ reported sports activities 5 years after total hip or knee arthroplasty. Although most patients with hip (97%) and knee (94%) osteoarthritis had participated in sports during their lives, only 36% (hip) and 42% (knee) had maintained sports activities up to the time of surgery. Five years postoperatively, 52% of the hip patients but only 34% of the knee patients were participating in their sports activities. The study included 809 patients (hip, $n = 420$; knee, $n = 389$).

In a study of 83 golfers, Mallon et al¹¹ found a good ability to play golf after total knee arthroplasty. Of 83 golfers undergoing total knee arthroplasty, their mean handicap rise after surgery was 4.6 strokes.

Bradbury et al² also found a good return-to-sports rate after total knee arthroplasty in 160 patients with a mean age of 68 years and a mean follow-up of 5 years. Seventy-nine patients (49%) participated in sports at least once a week. Patients were more likely to return to low-impact sports (eg, bowling; 91%) than high-impact sports (eg, tennis; 20%). Of the patients participating in sports 1 year before surgery, 77% resumed activity.

The above-mentioned rate of return-to-sports rate after hip replacement surgery seems comparable with the findings in our investigation. Compared with the return to sports after knee arthroplasty, the rate in our study is higher, even at a mean follow-up of 6.2 years.

Studies regarding sports activities after shoulder arthroplasty are limited. McCarty et al¹² followed 75 patients (86 shoulder replacements) participating in recreational sports for a minimum of 2 years. This cohort included patients treated with TSA or hemiarthroplasty for different diseases

(osteoarthritis, inflammatory arthritis, posttraumatic arthritis, osteonecrosis). Of the patients, 64% stated that one of the reasons for undergoing shoulder replacement was to enable continuation of sports activities; 71% reported improved sporting ability after surgery; and 50% increased their frequency. The mean time to return to sports was 3.6 months for partial activity and 5.8 months for full participation. In their study, 19% did not resume sports after shoulder surgery, not only because of shoulder problems, but also owing to other medical conditions.

In our investigation, 20 of the 60 patients (33%) in group 1 who were involved in sports at the time of most recent follow-up needed up to 6 months to fully resume their sporting activities. This is longer than that shown by McCarty et al.¹² The higher age of our cohort could be one reason for this finding.

Schumann et al¹⁵ followed 100 patients for a mean 2.8 years after TSA. The diagnoses that led to shoulder replacement surgery were not mentioned. Of the 55 patients doing sports before surgery, 49 returned. Of the 17 patients who had given up sports before surgery, 11 returned thereafter. Strength, range of motion, Short Form-36 physical component summary and Constant score were all significantly higher in the sports group (physical component, 46; Constant score, 77) than in the nonsports group (physical component, 41; Constant score, 71).

In a study by Neer et al,¹³ all 23 golfers and tennis players were able to get back to their sports. Jensen and Rockwood¹⁰ demonstrated the ability to play golf at a recreational level after shoulder replacement. Twenty-six shoulders of 24 golfers were treated: 20 total shoulder arthroplasties and 6 hemiarthroplasties. The patients' mean age was 52 years. Twenty-three were able to play golf after shoulder arthroplasty at a mean follow-up of 53 months. The average time between surgery and the first whole round of golf was 4.5 months. No increased loosening rate of the components was noted in the golfers when compared with a group of 76 patients not participating in sports.

In contrast to some other investigations, our study included multiple kinds of sports. It is still unknown whether level and type of sporting activity have an influence on implant survival owing to differing stress moments acting on the artificial joint. As we did not perform a radiographic analysis in this study, we have no data that might show the effect of sports participation on component loosening. Especially for high-impact sports such as tennis, it would be interesting to analyze the influence of sports on implant survival in future studies.

Zarkadas et al¹⁹ published patient-reported activities after shoulder replacement, comparing TSA and hemiarthroplasty. A total of 99 patients were included in their survey, with a mean follow-up of 8.7 years. Again, patients with different diagnoses were included (osteoarthritis, rheumatoid arthritis, posttraumatic arthritis, acute fracture, osteonecrosis). The most commonly reported activities were categorized by demand: low (eg, cooking), medium (eg, gardening, bowling, golf), and high (eg,

snow shoveling). No significant differences were found between the 2 groups at any level of activity.

The rate of return to sports after TSA in the present study seems to be in line with the above-mentioned investigations. The age of our patients at the time of most recent follow-up was relatively high. However, a high number of patients were able to return to sports despite their high age.

Information about the ability to return to work after shoulder replacement surgery is limited. As expected, most of our patients were retired at the time of follow-up. However, 30 patients (20%) had to change their work because of shoulder replacement surgery. Six patients (3.9%) of the entire cohort were not pursuing their work at the time of recent follow-up because of problems with the affected shoulders. However, it can be assumed that 61% of our patients did not retire or stop their work because of TSA.

This study has limitations. Besides the retrospective and questionnaire-based design, we have no detailed information about the level and ability of sports performance for each patient. Furthermore, as mentioned above, there is a lack of clinical parameters, such as the Constant score or American Shoulder and Elbow Surgeons score, and our data are unable to show whether sports activity may lead to increased radiographic signs of loosening of the implant components. It is also possible that there was a recall bias based on the questionnaire design. It could be that some patients are not able to read or write and therefore did not participate in this study.

As in nearly all clinical studies, some patients are lost for follow-up. In this investigation, we had a response rate of nearly 80%. Higher response rates are preferable for future studies. However, this study has among the largest and most homogeneous patient collective in the literature. We included exclusively patients with primary glenohumeral arthritis who had an intact rotator cuff, and all were treated with the same third-generation TSA. The duration of follow-up in our series was also one of the longest available.

CONCLUSION

Patients with active sports participation before TSA are successfully able to return to sports activities after surgery. Patients who are not participating in sports just before surgery are unlikely to resume sports after surgery. In our study, 14% of patients in groups 1 and 2 were able to return to work after surgery.

REFERENCES

- Berth A, Pap G, Lohmann C. Indikationsspezifische mittelfristige Ergebnisse der anatomischen Kurzschaft-Schulterprothese. *Obere Extremität*. 2012;2:83-90.
- Bradbury N, Borton D, Spoo G, Cross MJ. Participation in sports after total knee replacement. *Am J Sports Med*. 1998;26(4):530-535.
- Cheung E V, Sperling JW, Cofield RH. Polyethylene insert exchange for wear after total shoulder arthroplasty. *J Shoulder Elbow Surg*. 2007;16(5):574-578.
- Deshmukh AV, Koris M, Zurakowski D, Thornhill TS. Total shoulder arthroplasty: long-term survivorship, functional outcome, and quality of life. *J Shoulder Elbow Surg*. 1988;14(5):471-479.
- Edwards TB, Kadakia NR, Boulahia A, et al. A comparison of hemiarthroplasty and total shoulder arthroplasty in the treatment of primary glenohumeral osteoarthritis: results of a multicenter study. *J Shoulder Elbow Surg*. 2003;12(3):207-213.
- Fehring E V, Kopjar B, Boorman RS, Churchill RS, Smith KL, Matsen FA. Characterizing the functional improvement after total shoulder arthroplasty for osteoarthritis. *J Bone Joint Surg Am*. 2002;84(8):1349-1353.
- Haines JF, Trail IA, Nuttall D, Birch A, Barrow A. The results of arthroplasty in osteoarthritis of the shoulder. *J Bone Joint Surg Br*. 2006;88(4):496-501.
- Huch K, Müller KAC, Stürmer T, Brenner H, Puhl W, Günther K-P. Sports activities 5 years after total knee or hip arthroplasty: the Ulm Osteoarthritis Study. *Ann Rheum Dis*. 2005;64(12):1715-1720.
- Iannotti JP, Norris TR. Influence of preoperative factors on outcome of shoulder arthroplasty for glenohumeral osteoarthritis. *J Bone Joint Surg Am*. 2003;85(2):251-258.
- Jensen KL, Rockwood CA. Shoulder arthroplasty in recreational golfers. *J Shoulder Elbow Surg*. 1998;7(4):362-367.
- Mallon WJ, Liebelt RA, Mason JB. Total joint replacement and golf. *Clin Sports Med*. 1996;15(1):179-190.
- McCarty EC, Marx RG, Maerz D, Altchek D, Warren RF. Sports participation after shoulder replacement surgery. *Am J Sports Med*. 2008;36(8):1577-1581.
- Neer CS, Watson KC, Stanton FJ. Recent experience in total shoulder replacement. *J Bone Joint Surg Am*. 1982;64(3):319-337.
- Raiss P, Schmitt M, Bruckner T, et al. Results of cemented total shoulder replacement with a minimum follow-up of ten years. *J Bone Joint Surg Am*. 2012;94(23):e171.
- Schumann K, Flury MP, Schwyzler H-K, Simmen BR, Drerup S, Goldhahn J. Sports activity after anatomical total shoulder arthroplasty. *Am J Sports Med*. 2010;38(10):2097-2105.
- Sperling JW, Cofield RH, Schleck CD, Harmsen WS. Total shoulder arthroplasty versus hemiarthroplasty for rheumatoid arthritis of the shoulder: results of 303 consecutive cases. *J Shoulder Elbow Surg*. 2007;16(6):683-690.
- Van de Sande MAJ, Brand R, Rozing PM. Indications, complications, and results of shoulder arthroplasty. *Scand J Rheumatol*. 35(6):426-434.
- Young A, Walch G, Boileau P, et al. A multicentre study of the long-term results of using a flat-back polyethylene glenoid component in shoulder replacement for primary osteoarthritis. *J Bone Joint Surg Br*. 2011;93(2):210-216.
- Zarkadas PC, Throckmorton TQ, Dahm DL, Sperling J, Schleck CD, Cofield R. Patient reported activities after shoulder replacement: total and hemiarthroplasty. *J Shoulder Elbow Surg*. 2011;20(2):273-280.