

Original Article

Getting back in the game after humeral head resurfacing

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ABSTRACT

Background: Aim of this investigation was to analyze whether patients undergoing humeral head resurfacing (HHR) surgery are able to successfully return to their sports and occupation afterwards.

Materials and methods: Fifty patients treated with CUP (HHR) arthroplasty were included. Two groups were built: Patients who have participated in sports less than 5 years prior surgery (Group 1: n = 42 (84%)) and patients who have never participated in sports (Group 2: n = 8 (16%)). Evaluation was based on a questionnaire asking for types of sports, frequency, time to return to sports and work as well as limitations in work life.

Results: Mean age at the time of surgery was 58.6 (36–84) years in Group 1 and 65 (56–75) years in Group 2. Mean time follow-up was 5.5 years (2.5–12) years. Twenty-seven (64%) patients in Group 1 participated in sports right before surgery. Twenty-one patients (50%) returned to sports after surgery. The returning rate was 78%. Seven (17%) patients in Group 1 stated that the reason they underwent shoulder replacement surgery was to continue to participate in sports. Swimming and skiing were two of the most favorable sports. Two (4%) patients had to change their profession due to surgery. Most of the patients were retired at follow-up.

Conclusion: Most of the active patients undergoing HHR surgery are successfully able to return to their sports activities after surgery. Patients employed were able to return to their occupation after surgery. Many patients were already retired at the time of follow up.

1. Introduction

Shoulder arthroplasty has evolved over recent decades into a reliable procedure with satisfactory long-term outcome.^{1,2} Advances in implant design and techniques have led to good implant survival.

The balance between implant stability and survival on one hand and bone preservation and less invasive procedures on the other remain a major challenge for surgeons. New implant designs have helped to address these concerns.

The first humeral head resurfacing system was inaugurated in Sweden in the 1980s. It was used mainly in young patients with rheumatoid arthritis, preserving most of the proximal humeral bone stock.³ The breakthrough for the cup prosthesis came with Copeland's work in the 1990s in the UK. Both primary arthritis of the shoulder and rheumatoid arthritis were treated, preserving bone for possible revision surgery, especially in younger patients. Zimmer's Durom cup brought the technique to Germany, treating mainly younger patients suffering from primary arthritis, rheumatoid arthritis, or humeral head necrosis. Good medium- and long-term results were reported.^{4,5} The principal

disadvantages of humeral head resurfacing are the difficult exposure of the glenoid and the neurological complications reported after glenoid replacement.

However, humeral head resurfacing can be an attractive treatment option in young patients with rheumatoid arthritis or primary arthritis, especially when the glenoid is still intact, yielding more options in the event of revision surgery. Young patients are particularly likely to ask whether they will be able to participate in the same activities as before surgery and what kinds of sports they will be able to play after the operation. Studies on this topic are rare.

The aim of this investigation was therefore to ascertain to what extent patients who had undergone humeral head resurfacing surgery successfully returned to their sports activities and working life thereafter.

2. Materials and methods

Seventy humeral head resurfacing operations in 70 patients performed at a single shoulder center between 2003 and 2011 were

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included in this retrospective study. All patient records were reviewed. All of the operations were performed by the same senior surgeon or under his supervision.

The inclusion criteria for this investigation were: (1) patients humeral head resurfacing without replacement of the glenoid and (2) minimum follow-up of 2 years. Various diagnoses leading to hemi shoulder replacement surgery were included. Patients were treated with either the Copeland resurfacing system (Biomet®, Indiana, USA) or the Epoca resurfacing system (Synthes®, Pennsylvania, USA).

A questionnaire was developed and sent to all patients who had undergone hemi shoulder arthroplasty surgery (see [Appendix A](#)). Information was sought on sports activities, frequency of participation in sports, time to return to the same level of activity as before shoulder replacement surgery, level of sports, time to get back to work, and limitations in work or sports due to shoulder replacement surgery.

The study was reviewed and accepted by the ethic committee. The IRB Approval number is S-305/2007.

2.1. Surgical procedure

For surgery the patient was placed in the beach chair position. A delto-pectoral approach was used in all cases. After exposure of the proximal humerus with its anatomic neck, the humeral head was prepared for resurfacing. In the presence of good cancellous bone a cup arthroplasty was implanted. Next, the glenoid was exposed. Humeral head resurfacing was performed only in patients with A1 or A2 glenoid morphology according to Walch.⁶ Final reduction and closure of the wound followed after insertion of a drain. An abductor splint was put on in the operating room ([Figs. 1 and 2](#)).

3. Results

3.1. Demographic findings

Of the 70 patients that met the inclusion criteria, 50 (71%) could be recruited. The remaining 20 patients had either died (13; 19%), could not be contacted after moving to a new address (4; 6%), or declined to participate in the study (3; 4%). All 50 patients recruited completed the questionnaire in full.

The mean duration of follow-up was 5.5 (2.5–12) years.

The collective was divided into two groups: patients that had participated in sports activities no more than 5 years prior to shoulder replacement surgery (group 1: 42, 84%) and patients that had participated in sports activities (group 2: 8, 16%).

The Patients' overall mean age at the time of shoulder replacement surgery was 59.7 (36–84) years. The mean age in group 1 was 58.6

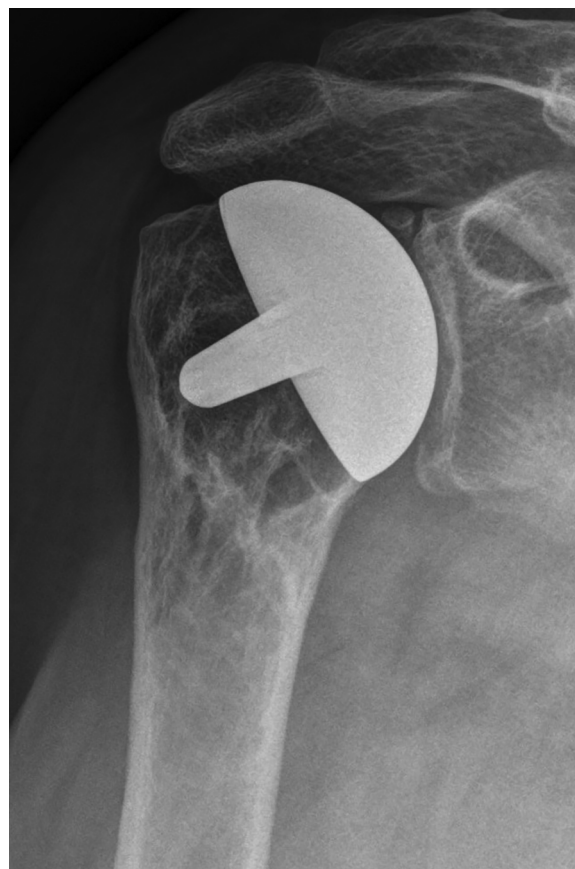


Fig. 2. The x-ray 12 years after surgery.

years (36–84) and in group 2 65 years (56–75). There was no significant difference between the two groups in this respect ($p = .1632$).

The collective consisted of 32 women (64%) and 18 men (36%), Group 1 comprised 26 women (62%) and 16 men (38%).

The diagnoses leading to cup hemi arthroplasty were posttraumatic osteoarthritis ($n = 14$; 28%), primary osteoarthritis ($n = 31$; 62%) and humeral head necrosis ($n = 5$; 10%). None of the patients had undergone previous surgery on the affected shoulder.

Eighteen (36%) left shoulders and 32 (64%) right shoulders were treated. In group 1 the left shoulder was treated in 15 patients (36%) and the right shoulder in 27 patients (64%). In 31 cases (62%) the dominant side was affected, in 19 cases (38%) the non-dominant side. In group 1 the dominant arm was affected in 26 patients (62%) and the non-dominant arm in 16 patients (38%).

3.2. Intraoperative complications

There was 1 (2%) intraoperative complication, namely a humeral stem fissure. It needed no further treatment and was followed up clinically and radiographically.

3.3. Postoperative complications

There were three superficial wound infections after operation. All of them were successfully treated with oral antibiotics and were followed up clinically. No further treatment was necessary.

3.4. Sports activities

Twenty-seven (64%) of the 42 patients in group 1 took part in their sports activities up to the time of surgery. Of the 15 patients (36%) that were no longer participating in sports at the time of surgery, eight



Fig. 1. The preoperative x-ray.

(19%) had to stop due to problems of the affected shoulder, one (2%) was not interested in sports any more, four (10%) suffered from comorbidities, and two (5%) stated other reasons.

At the time of final follow-up, 21 patients in the group 1 (50%) were taking part in their previous sports activities. The rate of return to sports activities was therefore 21/27 (78%).

Of the six (14%) patients who were active in sports prior to surgery but not thereafter, two (5%) stated shoulder problems as the main reason, two (5%) stopped due to comorbidities, and two (5%) named other reasons.

Seven (17%) of the 15 patients (36%) that were still not participating in sports at final follow-up stated shoulder problems as the main reason, 4 (10%) suffered from comorbidities, and 4 (10%) gave other reasons. None of the patients that were not participating in sports activities before surgery took up sports thereafter.

Nineteen patients (45%) had to reduce the frequency and 7 (17%) patients the level of sports activities after shoulder replacement surgery.

3.5. Reasons for undergoing cup surgery

The reasons for undergoing cup arthroplasty surgery varied. Table 1 gives an overview.

The shows that most of the patients chose to undergo cup arthroplasty surgery because they wanted to reduce their pain or stay mobile. At 17%, the proportion of patients whose reason was continuation of their sports activities was low. However, reduced pain and enhanced mobility also increase the ability to participate in sports.

3.6. Time to return to sport

Table 2 shows how long it took before patients participating in sports at the time of final follow-up (n = 21) needed to return to their previous level of activity.

Most (n = 18; 86%) of the patients who were active at final follow-up needed up to 12 months for full return to sports at the same level as before shoulder replacement surgery. Only two patients (10%) needed more than 2 years. Both of these patients were of advanced age (75 and 84 years).

3.7. Type of sports activities

The sports activities that the active group (Group 1) was executing at time of final follow-up are shown in Table 3.

Sports activities involving the lower extremities (“leg sport”) as well as swimming were executed by all of the active patients and were the most favored sports activities. However, gardening and skiing were also popular among this group. Three patients were even playing handball or volleyball at the time of final follow-up.

Nineteen patients (45%) of the active group were participating in one or two sports activities at final follow-up, two patients (5%) in three or more sports.

Table 1
Reasons undergoing cup shoulder arthroplasty surgery.

Reason	Group 1 (n = 42)	Group 2 (n = 8)
Desire to continue sports	7 (17%)	–
Reduction of pain	39 (93%)	7 (88%)
Maintenance of mobility	35 (83%)	6 (75%)
Desire to continue working	13 (31%)	0
Other	1 (2%)	0

Table 2

Time to return to sports (Group A; n = 21).

	< 3 months	3–6 months	7–12 months	1–2 years	> 2 years
Partial return	8	8	5	0	0
Full return	1	4	13	1	2

Table 3

sports activities at final follow up.

Sports activity	Group 1 at final follow-up (n = 21)
Leg sport	21 (100%)
Swimming	21 (100%)
Gardening	19 (90%)
Skiing	10 (48%)
Tennis	9 (43%)
Bowling/skittles	8 (38%)
Volleyball	3 (14%)
Handball	3 (14%)
Athletics	2 (10%)
Golfing	0
Other	19 (90%)

Table 4

Frequency in participating in sports activities.

Frequency	Before surgery (n = 27)	At 1 year after surgery (n = 21)	At final follow-up (n = 21)
4–7 × /week	0	4 (19%)	6 (29%)
2–3 × /week	1 (4%)	4 (19%)	7 (33%)
1–2 × /week	3 (11%)	7 (33%)	5 (24%)
1 × /week	0	3 (14%)	1 (5%)
Less	23 (85%)	3 (14%)	2 (5%)

3.8. Frequency of sports activities

Table 4 shows the frequency of sports activities in group 1.

By the time of shoulder replacement surgery most of the patients were taking part in their sports less than once per week. At the time of follow-up, however, most patients (n = 19; 90%) were participating in sports activities at least once per week, 13 of them (62%) at least two times per week.

3.8.1. Occupation

At the time right before surgery 30 patients (60%) of the whole collective were working. Most of the patients who were no longer working prior to shoulder replacement surgery were retired: n = 12 (24%). Two (4%) patients suffered from comorbidities and six (12%) patients stated other reasons for not working.

At the time of follow-up 19 patients (38%) were active in their occupation. The overall rate of return to work of the patients who were working at the time of follow-up was therefore 19/30 (63%).

Most of the patients were retired at final follow-up (n = 26; 52%). One patient (2%) had to stop working due to comorbidities, and four (8%) patients stated other reasons for discontinuing their occupation.

In the cohort as a whole, four patients (8%) had to retire and two (4%) had to change their occupation due to shoulder replacement surgery.

4. Discussion

This investigation shows that patients undergoing humeral head resurfacing surgery who were active prior to surgery have a good chance of returning to their chosen sports afterwards. Of those that were not retired at the time of final follow-up, most had been able to return to their occupation after surgery. The overall rate of return to

sports activities after surgery was high (78%).

In our outpatient clinic we do not recommend sports activities such as volleyball or handball after shoulder replacement surgery. Because the cohort was comparatively young, that seemed to have no influence in our findings.

We know of no study with a larger cohort that has evaluated the ability to participate in sports and return to work after humeral head resurfacing.

Studies have shown satisfactory to good clinical results after humeral head resurfacing.^{5,7} Even radiographic signs of loosening seem to have no correlation with clinical findings in the medium term.⁸ Young and active patients seem to have especially good results.⁹ Leaving the meta- and diaphyseal part of the proximal humerus untouched ensures a good bone stock and facing variety of options if revision surgery is required. Copeland stated this as one of the main advantages when inaugurating the cup prosthesis. Good clinical results may also enhance ability to take part in sports activities.

Several studies have dealt with the ability to return to sports activities after hip and knee arthroplasty.

Seyler et al., for example, reviewed on the ability to perform sports after hip and knee arthroplasty. Especially swimmers and golfers showed no problems in returning to their sports activities after joint replacement surgery.¹⁰ However, restrictions and limitations concerning high-impact sports were also mentioned. Overall, there seems to be a good chance of returning to sports after hip and knee arthroplasty.^{11–13}

Jackson et al. reported a full return to golf after total knee arthroplasty at a mean of 6 months after surgery for the majority (57%) of their patients.¹⁴

There are also studies dealing with the ability to return to work after joint replacement surgery. Shah et al. reported an evaluation of 80 hips with ceramic-on-ceramic bearings. Eighty-eight percent of the patients continued working in the same or a similar occupation after surgery.¹⁵ Other investigations show the ability to continue the occupation that was performed prior to surgery; however, the rate of return to the same occupation varies widely.^{16–18}

Considering that a high number of our patients were already retired at the time of final follow-up, we found a high rate of return rate to the job performed prior to shoulder surgery (63%). However, 8% of the collective (all in group 2) stated that they had retired due to shoulder replacement surgery.

Studies dealing with the return to sports and work after shoulder arthroplasty are limited in number.¹⁹ In a recently published investigation, Garcia et al. evaluated the return to sports and work after shoulder hemiarthroplasty.²⁰ Seventy-nine percent of the patients were active prior to surgery and 49 percent thereafter. The time to full return to their chosen sports was 6 months. The implants in that study were not specified, while we used only one type of implant. The time to full return to sports in the study by Garcia and colleagues, seems fast compared with our findings. Bühlhoff et al. evaluated the return rate to

sports and work after total shoulder arthroplasty and reverse shoulder arthroplasty: patients with both implant designs showed a good rate of return to sports and work after shoulder replacement surgery.^{21,22} McCarty et al. analyzed 75 patients with a follow-up of 3.7 years. Sixty-four percent of the patients named the wish to continue pursuing sports activities as the main reason for undergoing shoulder arthroplasty. Seventy-one percent saw an improvement in their ability to perform their activities. A full recovery was attained at 5.8 months after surgery.²³ Swimming, tennis, and golf were the most popular sports activities. These results are comparable to our findings; however, there is no differentiation between total shoulder arthroplasty and hemi shoulder arthroplasty, and no rate of return to work is mentioned.

The ability to play golf after shoulder arthroplasty has been described.²⁴ Thirty-five golfers who underwent shoulder arthroplasty were analyzed by means of a questionnaire. At a mean 8 months after surgery their driving distance had improved by 12.5 yards with a decrease in pain and their handicap had fallen by a mean of 1.4 strokes. Especially in the elderly, swimming and golf seemed to be popular sports that patients treated with hemi shoulder arthroplasty were able to perform. That correlates with our findings. The literature supports our investigation in showing a good ability to returning to these sports after shoulder replacement surgery.

Schumann et al. evaluated 55 patients that had undergone shoulder arthroplasty, reporting the clinical outcome and findings after 2.8 years' follow-up.²⁵ Swimming, golf, and cycling were the most favored sports. The return rate was 89% and no patient had to stop sports due to surgery. The active group had a better clinical outcome than the non-active group. The main advantage of this study is the clinical evaluation, which did not form part of our investigation. However, we have a longer follow-up and more restrictive inclusion criteria, for we evaluated only patients that had undergone hemi humeral head resurfacing arthroplasty.

Our study has some limitations: we did not evaluate the clinical or radiographic outcome of the patients included, and this was a questionnaire-based investigation. However, the high rate of return, particularly the ability of the majority of patients to return to activities performed prior to surgery within 12 months, leads us to assume that the clinical outcome is satisfactory, especially considering that many of the sports activities include the upper extremity and the affected shoulder. Prospective trials with clinical and radiographic follow-up are needed to verify the findings of our study.

5. Conclusions

Active Patients undergoing Humeral Head Resurfacing surgery are able to return to their sports and activities afterwards.

Conflicts of interest

None.

Appendix A**Definitions:****Have you ever been active and/or participated in sports activities:**

1= yes, 0=no

Have you been active and/or participated in sports activities 5 years before shoulder replacement surgery:

1= yes, 0=no

If no, why:

2= shoulder problems

3=age

4=not interested

5=morbidity

6=trauma

7= others

Are you active and/or participate in sports activities nowadays:

1= yes, 0=no

If no why:

2= shoulder problems

3=age

4=not interested

5=morbidity

6=trauma

7= others

Have you ever executed a profession:

1= yes, 0=no

Have you executed a profession 5 years before shoulder replacement surgery

1= yes, 0=no

If no, why:
 2=shoulder problems
 3=retired
 4=morbidity
 5=others

Do you execute a profession nowadays:
 1= yes, 0=no

If no, why:
 2=shoulder problems
 3=retired
 4=morbidity
 5=others

Have you had a dislocation of the shoulder:
 1= yes, 0=no

Dislocation Side: 1=right, 0=left, 2=bilateral

Frequency of dislocation (right side):
 1=once, 2=twice, 3=more than twice

Frequency of dislocation (left side):
 1=once, 2=twice, 3=more than twice

Dominant Side:
 1=right, 0=left, 2=bilateral

Have you had other surgery of the effected shoulder:
 0=no
 1=rotator cuff
 2=Bankart-Procedure
 3=Impingement
 4=Revision Surgery of TSA
 5= others

Are you suffering from other illness:
 0=no; 1=yes

CHD:
 0=no; 1=yes

Asthma:
 0=no; 1=yes

Diabetes mellitus (Insulin-dependent):
 0= no; 1= yes

Obesity:
 0=no; 1=yes

Osteoarthritis of other joints:

0=no; 1=yes

Others:

0=no; 1=yes

Reason for surgery: 1=answered**Reason: To Continue Sports:**

0= no; 1= yes

Reason: Pain:

0=no; 1=yes

Reason: for Mobility:

0=no; 1=yes

Reason: To execute my profession:

0=no; 1=yes

Reason: Trauma of the shoulder:

0=no; 1=yes

Other Reason:

0=no; 1=yes

What kind of sports are you executing?**Leg Sport:** 0= no
1= yes**Volleyball:** 0= no
1= yes**Handball:** 0= no
1= yes**Tennis:** 0= no
1= yes**Skiing:** 0= no
1= yes**Bowling:** 0= no

1= yes

Swimming: 0= no
1= yes

Gardening: 0= no
1= yes

Exercise: 0= no
1= yes

Golf: 0= no
1= yes

Other Sport: 0= no
1= yes

What kind of profession are you executing:

1= desk work
2=light physical work
3=more intense physical work/ housewife
4=strong physical work
5=driver
6=others

How often did you participate in sports activities (general before shoulder replacement surgery):

0=>16-30x (4-7x/week)
1=9-12 (2-3x/ week)
2=>4-8 (1-2x/ week)
3=4x (1x/ week)
4=none

How often did you participate in sports activities right before shoulder replacement surgery:

0=>16-30x (4-7x/ week)
1=9-12 (2-3x/ week)
2=>4-8 (1-2x/ week)
3=4x (1x/ week)
4=none

How often did you participate in sports activities 1 year before shoulder replacement surgery:

0=>16-30x (4-7x/ week)
1=9-12 (2-3x/ week)
2=>4-8 (1-2x/ week)
3=4x (1x/ week)
4=none

How often do you participate in sports nowadays:

0=>16-30x (4-7x/ week)
1=9-12 (2-3x/ week)
2=>4-8 (1-2x/ week)
3=4x (1x/ week)
4=none

Did you have to change sport because of shoulder replacement surgery:

0=no; 1= yes

Did you have to reduce the frequency of sports because of shoulder replacement surgery:

0=no; 1= yes

Did you have to reduce the level of sports because of shoulder replacement surgery:

0=no; 1= yes

Did you have to swap sports because of shoulder replacement surgery:

0=no; 1= yes

Did you have to stop sports because of shoulder replacement surgery:

0=no; 1= yes

Did you have to change your profession because of shoulder replacement surgery:

0=no; 1= yes

Did you have to reduce your work-time because of shoulder replacement surgery:

0=no; 1= yes

Did you have to swap your work-place because of shoulder replacement surgery:

0=no; 1= yes

Did you have to swap your profession because of shoulder replacement surgery:

0=no; 1= yes

Did you have to get retired because of shoulder replacement surgery:

0=no; 1= yes

Did you have to stop your sports activities/ your profession because of shoulder replacement surgery:

0=no; 1= yes

Are you executing a profession nowadays:

0= no; 1= yes

How many sports are you participating in:

1to2: 0= no; 1= yes
 More than 2: 0= no; 1= yes

Do you work Overhead:

0= no; 1= yes

How long did it take you to get partially back to your sports level that you had before shoulder replacement surgery:

0=<3 months
 1= 3-6 months
 2=7-12 months
 3=1-2 years
 4=>2 years
 5=not at all

How long did it take you to get fully back to your sports level that you had before shoulder replacement surgery:

0=<3 months
 1= 3-6 months
 2=7-12 months
 3=1-2 years
 4=>2 years
 5=not at all

What kind of pain medication did you take before shoulder replacement surgery:

0=none
 1=NSAIDs
 2= NSAIDs (combination)
 3= NSAIDs+Opioid (weak) / Cortison
 4=strong opioid
 5=Opioid (combination)

What kind of pain medication did you take after shoulder replacement surgery:

0=none
 1= NSAIDs
 2= NSAIDs (combination)
 3=NSAR+Opioid (weak)
 4=strong opioid
 5=Opioid (combination)

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