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Original article
High-level judo practice after hip resurfacing

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Abstract

Background and hypothesis:

The ability to participate in sports after hip arthroplasty is increasingly being requested by patients. The possibilities of participating in sports such as judo after hip arthroplasty have not been explored sufficiently even though these sports are associated with a high risk of loosening, dislocation or revision. The aim of this study was to evaluate the return to judo after hip resurfacing arthroplasty (HRA) in terms of time and level of practice in an expert population and to determine the surgical complication rate.

Materials and Methods:

This was a retrospective observational study of all licensed judo practitioners at an expert level (\geq black belt 3rd Dan) who underwent HRA. Patients filled out a sport-specific questionnaire that captured their level of judo practice (international, national, regional, recreational), type of practice (teaching, technical recreational, competitive recreational), dan grade, weekly volume of practice and time elapsed after surgery before resuming judo. The features of the return to judo were analyzed (technical, ground, combat).

Results:

Sixty-seven HRA were implanted in 60 patients: 11 were international judokas, 3 were national, 8 were regional and 38 were recreational. The case series consisted of 18 patients who were 3rd Dan, 18 were 4th Dan, 7 were 5th Dan, 5 were 6th Dan and 12 were 7th Dan. The average follow-up was 65.3 months (range 9.9–11.9). All the clinical scores pointed to clinically and statistically significant improvement. Of the 60 patients, 53 had resumed judo at the final assessment (90%) after a mean of 4 months (2-7) for technical judo, 6 months (3-10) for ground judo and 7 months (3-12) for combat judo. Of those who did not resume their judo practice, 3 patients voluntarily changed sports, 2 had psychological apprehension and 2 had residual groin pain. The weekly volume of practice preoperatively was 0.9 hours (0–5) and postoperatively it reached 5 hours (2–18) ($p < 0.001$).

Conclusion:

HRA in a population of high-level judokas allows for return to sport practice without short-term complications such as fracture, dislocation or loosening.

Level of evidence: III

Keywords: hip resurfacing arthroplasty, judo, return to sport

INTRODUCTION

The primary goal of total hip arthroplasty (THA) is to restore function and eliminate pain [1,2]. Currently, the functional demands of patients have been increasing with greater desire to participate in physical activities and/or sports [1,3]. The progress in surgical technique and perioperative care along with the introduction of innovative implants have helped to satisfy this demand [4-6]. Use of large-diameter heads, optimization of tribological properties and head–neck ratio along with the availability of short stems are some of the technological improvements that have contributed to reducing the dislocation rate, implant wear, and prosthetic impingement and to preserving the bone stock [7]. Hip resurfacing arthroplasty (HRA) is an alternative to conventional THA that falls within the scope of these objectives: negligible risk of instability, preservation of the hip's proprioception and three-dimensional anatomy [7]. This surgical technique is aimed at a specific population of younger patients who suffer from disabling primary hip osteoarthritis [2,7-11].

Judo is a pivot-contact combat sport. The goal is to throw the opponent during the standing combat phase or to immobilize, strangle or place the athlete in an arm lock during the ground combat phase. This requires considerable hip functional capacity in a joint that is flexible, stable and powerful [12]. Hip osteoarthritis in judokas can be treated by THA while keeping in mind that certain projection techniques could increase the risk of periprosthetic fracture or dislocation [12,13]. We have also wondered about the implant's survival in the context of intensive judo practice [14]. HRA appears to meet the patient's functional objectives; however, the implant survival in judokas and return to sport have never been described in the literature.

The main goal of this study was to evaluate the return to judo after HRA in terms of time and level of practice in an expert population (minimum black belt 3rd Dan). The secondary goal was to determine the surgical revision rate. We hypothesized that HRA would allow return to judo practice at a comparable level to the one prior to the disabling osteoarthritis phase.

MATERIALS AND METHODS

Patients:

This was a single-center retrospective observational study of all licensed judo practitioners who practiced at an expert level (\geq black belt, 3rd Dan) and who underwent an HRA

procedure by a single surgeon (JG) between March 2009 and April 2018. During the inclusion period, this surgeon did 2257 HRA procedures, 67 of which met the inclusion criteria. The included patients' data was exported to a study-specific registry where the sport practiced was always recorded. The indication for HRA was made based on well-known and validated criteria (less than 65 years of age, no osteoporosis, more than 2/3 viable femoral head volume, no leg length discrepancy [8-9]).

The resurfacing implants used were the Conserve® Plus Resurfacing Hip System (Wright Medical Technology, Arlington, TN, USA) or the BIRMINGHAM HIP™ Resurfacing System (BHR™) (Smith & Nephew, Hull, UK) with hybrid fixation (cemented femoral implant and cementless cup). The surgical technique consisted of a posterolateral approach without circumferential capsulotomy with reattachment of the external rotators and preservation of the neck proprioceptors [15].

The case series consisted of 60 patients (3 women, 57 men) who underwent 67 HRA procedures (37 with the Conserve Plus and 30 with the BHR, Table 1) at a mean age of 45 years (17-65). The right hip was operated 40 times and the left hip 27 times. None of the patients were lost to follow-up. The hip osteoarthritis was primary in most cases (44 HRA, 66%) and was secondary to femoroacetabular impingement (11 HRA, 16%), dysplasia (6 HRA), osteonecrosis (3 HRA), osteochondritis (2 HRA) or osteochondromatosis (1 HRA) in the other patients. The mean diameter of the femoral implant was 54 mm (46-60).

Fourteen patients were national or international judokas, 8 were national or regional and 38 were recreational. In terms of ranking, 43 patients were 5th Dan or less, while 17 were higher (5 were 6th Dan and 12 were 7th Dan). At the time of surgery, 48 patients had stopped doing judo because of hip pain. The other 19 patients had reduced their practice and made adjustments.

The average follow-up was 65.3 months (range 9.9–11.9). Full weight bearing was allowed immediately after the HRA procedure. Postoperative thromboprophylaxis was prescribed for 6 weeks along with 15 rehabilitation sessions to prevent muscle atrophy in these athletic patients. Return to sport was allowed in the 2nd month after the clinical follow-up visit that confirmed good muscular and joint conditions.

During the standard annual follow-up visit, all patients were reviewed in person and filled out a sport-specific questionnaire (Appendix 1) capturing their level of judo practice before the surgery (international, national, regional, recreational), type of practice before surgery (teaching, technical recreational, competitive recreational), ranking (dan grade), number of

hours of judo practice per week and the time elapsed after HRA before judo activities were resumed. The features of the return to sport were analyzed (technical, ground, combat).

The clinical outcomes were based on the Merle Postel d'Aubigné score [16], the Harris Hip Score [17] and the Oxford-12 HIP score [18], along with the satisfaction level reported at the last follow-up visit. The joint range of motion was evaluated clinically.

Statistics

The quantitative parameters were summarized by their mean and standard deviation values or the median and interquartile intervals. Normal distribution of the data was verified graphically and with the Shapiro Wilk test. The qualitative parameters were summarized by counts and percentages. The preoperative parameters were compared to the follow-up parameters by the Chi² test or Fisher test for the qualitative variables and Student's *t* test or Mann-Whitney test for the quantitative variables. Significance threshold was set at 5%. The statistical analysis was done using SPSS software (Version 22.0, IBM Corp, Armonk, NY, USA).

RESULTS

All the functional outcomes showed a clinically and statistically significant improvement (Table 2). The mean flexion at the review was 135° (110-150°). Of the 60 patients, 53 had resumed judo at the final assessment (90%) after a mean of 4 months (2-7) for technical judo, 6 months (3-10) for ground judo and 7 months (3-12) for combat judo. Of those who did not resume their judo practice, 3 patients voluntarily changed sports, 2 had psychological apprehension and 2 had residual groin pain. No mechanical or implant-related issue was found for the residual pain in these latter 2 patients. In terms of satisfaction, 54 patients were very satisfied with the surgery, 2 were satisfied, 2 were somewhat satisfied and 2 were dissatisfied. The two patients who were dissatisfied were the same ones who had not resumed their judo practice because of residual pain.

The weekly volume of practice increased from 0.9 hours (0-5) preoperatively to 5 hours (2-18) ($p < 0.001$) postoperatively. We could not compare the outcomes between patients of different rankings (5th dan or higher versus lower ranks) because of the limited number of patients.

Only one patient required an early revision to drain a hematoma. At the final review (mean 5.4 years' follow-up), there were no implant dislocations or revisions.

DISCUSSION

Return to sport after THA is increasingly being requested by younger patients, especially for impact or contact-pivot sports [19]. Resuming judo practice in patients operated because of end-stage hip osteoarthritis is a challenging goal. In fact, this requires an implant that drastically reduces the risk of dislocation and periprosthetic fracture that could occur during a fall. This case series confirms our hypothesis that HRA allow return to judo in 90% of high-grade judokas after a mean of 6.7 years.

Some studies have been done on return to sport after HRA in other sports. Girard et al. [10] reported on 48 patients who did long-distance triathlons at 4.7 years of follow-up. With 94% returning to sport and 28 patients having competed in an Ironman (longest triathlon distance), the authors confirm the possibility of returning to high-impact sports in a young population (44.8 years). In that study, the time before resuming a non-weight bearing activity was significantly shorter (6.2 weeks for swimming and 5.4 weeks for cycling) than a weightbearing activity (16.1 weeks for running). In another prospective study [9], return to weight bearing sports after HRA was possible in 94% of patients after a mean of 4 months. Sandiford et al. [20] concluded that 3 months after HRA was sufficient to return to the same level of practice as before the surgery, with no significant difference in the revision rate relative to the sedentary population.

In a prospective randomized study comparing return to sport after HRA and THA, Lavigne et al. [2] showed significantly better return to high- and medium-impact sports after HRA, with no difference in the revision rate between the two groups at 1 year of follow-up. This was confirmed in a study of 235 THA by Chatterji et al. [21] who reported that patients changed their sports activities to low-impact sports such as walking, swimming, and cycling. The practice of judo after THA was analyzed by Lefevre et al. [12] in 27 patients who were able to resume their practice after a mean of 4.1 months. This was an expert population (6th dan) with a mean age of 63 years at the time of surgery; 76% of them were able to resume judo after the surgery at a minimum of the demonstration level. No dislocation or periprosthetic fracture occurred. None of the patients had resumed competitive judo and 2 patients (7%) required revision after 6 and 9 years, respectively, due to implant loosening. This cast doubt on THA survival in this category of patients and the possibility of returning to competitive sports.

Patients who practice judo require a large movement amplitude and excellent proprioception. It is interesting to note that the motor function of the patients' lower limb after HRA can be superimposed to that of healthy patients (given the preservation of the proprioceptors in the femoral neck) [22]. Also, impact sports such as judo require restoring the hip's original 3D biomechanics, including preserving the femoral offset to recover the moment arm of the abductors and leg length. These two biomechanical parameters are automatically restored after HRA since the resected bone is replaced by the acetabular and femoral implants [23-25]. The bearing used in THA can tolerate impact sports without risk of head or liner fracture [26]. The metal-on-metal bearing generates metal debris, but only at very low levels during the practice of high-impact sports and has no clinical or biological consequences [9,10]. However, a longer-term follow-up of this series of cases is needed.

The current study has several limitations. This was a retrospective study with a relatively small population. However, its retrospective nature does not appear to be a limiting factor because these high-level judokas have extensive knowledge of their practice and are fully able to report their activity level. Also, our study included a unique population – judokas practicing at a minimum of 3rd dan preoperatively – with no patients lost to follow-up. The specific nature of this population would make it impossible to do a prospective study.

In our study, no revisions were needed, and no dislocations or fractures occurred. Our study confirms the possibility of sports participation after HRA as recently shown by the American Association of Hip and Knee Surgeons for return to sport after HRA [27]. This absence of complications despite doing a high-impact sport indicates that restoring optimal 3D biomechanics and using an appropriate surgical technique allow return to sports. However, the level of judo practice in this study is a selection bias that cannot be ignored. In fact, the technical mastery of this highly ranked population likely contributes to fewer falls or complications and to rapid resumption of judo practice.

Conclusion

This study confirms the possibility of returning to pivot sports such as judo in a population of high-level judokas with high technical mastery after HRA surgery without short-term complications such as fracture, dislocation or loosening. A long-term follow-up is needed to compare the survivorship in this population to a population practicing low-impact sports.

Conflict of interest:

J. Girard is a consultant for Corin, Mathys and Smith & Nephew

H. Migaud is a consultant for Corin, Zimmer and Serf

S. Putman is a consultant for Corin and Zimmer

H. Common and D. Rousseau have no conflict of interest to declare

Funding: none

Author contributions:

Harold Common: clinical review and writing

Henri Migaud: writing

Sophie Putman: statistical analysis

R Rousseau: clinical review

Julien Girard: corresponding author and writing

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Appendix 1: Sport-specific questionnaire

Last name

First name

Operated side

Procedure date

Preoperative:

Level of judo practice:

- International
- National
- Regional
- Recreational

Type of practice:

- Teaching
- Technical recreational
- Competitive recreational

Rank (Dan):

Mean hours of practice per week:

Time to return to judo after surgery (months):

Postoperative:

Level of judo practice:

- International
- National
- Regional
- Recreational

Type of practice:

- Teaching
- Technical recreational
- Competitive recreational

Mean hours of practice per week:

Table 1: Characteristics of study population (mean (min-max))

<u>Sex %</u>	
Male	57 (95%)
Female	3 (5%)
<u>Age</u>	
	45 years (17–65)
<u>Weight</u>	
	80 kg (60–128)
<u>Height</u>	
	1.76m (1.58–1.88)
<u>Cause of hip osteoarthritis (%)</u>	
Primary	44 (65.7%)
Femoroacetabular impingement	11 (16.4%)
Dysplasia	6 (9%)
Osteonecrosis	3 (4.5%)
Osteochondritis	2 (3%)
Osteochondromatosis	1 (1.4%)
<u>Level of practice (%)</u>	
International	11 (18.3%)
National	3 (5%)
Regional	8 (13.3%)
Recreational	38 (63.4%)
<u>Ranking (%)</u>	
3 rd Dan	18 (30%)
4 th Dan	18 (30%)
5 th Dan	7 (11.7%)
6 th Dan	5 (8.3%)
7 th Dan	12 (20%)

Table2: Comparison of preoperative to postoperative functional outcomes (mean (min–max))

	Preoperative	Follow-up	p
Overall MDP	11.8 (7-16)	17.3 (14-18)	<0.0001
<i>Mobility</i>	4.6 (3-6)	5.9 (4-6)	<0.0001
<i>Function</i>	4.1 (2-6)	5.8 (4-6)	<0.0001
<i>Pain</i>	3.1 (1-5)	5.9 (4-6)	<0.0001
Harris Hip Score	41.4 (27-58)	92.8 (71-100)	<0.0001
Oxford-12 Score	39.7 (29–46)	14.5 (12-28)	<0.0001