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ORIGINAL ARTICLE

Hip arthroscopy versus total hip arthroplasty in patients above 40 differences: outcome and residual complain

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Abstract

This study aimed to compare patient outcomes and residual complains after hip arthroscopy (HAS) and total hip arthroplasty (THA) to improve patient counseling. It includes 140 hips/129 HAS-patients and 77 hips/62 THA-patients aged 40 to 55 years with a BMI under 30. All patients underwent primary HAS or primary THA in our hospital from 2007 until 2014. Exclusion criteria were a history of prior hip surgery or suffering sequels of childhood's hip disease, systemic inflammatory disease or avascular hip osteonecrosis. Outcome measures were WOMAC, subjective hip value, residual complains, the need of infiltrations and the complication and conversion rate. Patient data and scores were collected pre-operative, after one year and at the last follow-up. Scores indicated significant patient benefits in both groups ($p < 0.0001$). Variability of outcome was significantly higher and less predictable in the HAS group (HAS: 1.9 vs. THA: 0.9). While THA showed significant improvement mainly after one year, HAS showed significant improvements after one year and the latest follow-up. Residual complains were more frequent after HAS ($p = 0.026$). Groin pain was the main complain after HAS, limping and disturbing leg length discrepancy after THA. THA more predictably improves patient's outcome with shorter recovery time. Limping and leg length discrepancy are predominant after THA.

Keywords Hip arthroscopy · Total hip arthroplasty · Quality of life · WOMAC

Introduction

A main goal of any hip intervention is to relieve pain and to restore or improve function. With total hip arthroplasty, damaged joint surfaces are removed and replaced with prosthetic components. This intervention drastically improves the mobility and quality of life of patients with hip disorders [1, 2].

Alternatively, hip arthroscopy preserves joint by improving its biomechanics and repairing damaged parts. Although hip arthroscopy was firstly reported in 1931 [3], arthroscopy was mainly performed in the knees and shoulders until the late 1980s. Until then, hip arthroscopy has only been performed by a limited group of orthopedic specialists and has been regarded as an indication seeking procedure [4]. With the further development of surgical equipment and techniques [5], hip arthroscopy has established itself as a method for a variety of hip pathologies.

Initially, hip arthroscopy was mainly performed on younger patients and athletes with limited cartilage damage. In recent years, the indications for hip arthroscopy in older patients have expanded and numerous age-related studies have been published [6, 7]. Frank et al. [6] examined one hundred and fifty patients of different ages who underwent hip arthroscopy caused by a femoroacetabular impingement (FAI) and found significant improvements in all outcome parameters. Patients older than 45 years performed worse than younger patients. Female patients older than 45 years had the lowest outcome scores. Sing et al. [8] found that arthroscopy procedures, which were most commonly performed in the 40-to-49-year-old group, tend to fail with age, as 17% of the patients in the over 50-year-old group had conversions to THA within 2 years after hip arthroscopy. In a retrospective study with 1,140 patients aged 60 years and older who underwent an arthroscopic labral revision, Redmond et al. [7] found that age, poor preoperative PROM and pain scores, borderline dysplasia and severe chondral

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damage are associated with poor outcomes. A general conclusion from previous studies is that the benefits of arthroscopy decrease with age.

Over the last decade, the author's institution performed HAS in patients aged up to 55 years of age, depending on symptoms, osteoarthritis degree [9] and expectations. In the meantime, THA has been performed frequently in patients under 55 years of age. It is evident that THA was more often indicated in advanced osteoarthritis than HAS regardless of the patient's age. Despite of this apparent bias, we wondered about short-term benefit of patients aged 40–55 who had either HAS or THA. In order to improve patient counseling when discussing THA compared to HAS in this age group, we aimed to compare the benefits quantitatively but also qualitatively in terms of residual complains and recovery time.

Methods

HAS group

Between January 2007 and December 2013, a total of 938 hip arthroscopies were performed by three experienced surgeons. Patients aged < 40 years or > 55 years, a BMI > 30, a history of hip surgery, or sequels of childhood's hip disease, systemic inflammatory disease, or avascular osteonecrosis of the hip were excluded. This led to a HAS group of 129 patients with 140 hip arthroscopies (Fig. 1).

THA group

Between January 2007 and December 2013, a total of 2923 primary total hip arthroplasties were performed by six experienced surgeons. Patients aged < 40 years or > 55 years with a BMI > 30, a history of hip surgery or sequels of childhood's hip disease, systemic inflammatory disease or avascular osteonecrosis of the hip were excluded. This resulted in a THA group of 62 patients with a total of 77 hip arthroplasties (Fig. 1).

Evaluation

The patient's demographic data, indications to surgery, complications and re-interventions were extracted from medical reports. A WOMAC (Western Ontario und McMaster Universities Arthritis Index) [10] and the SHV (subjective hip value) were used prospectively to document the subjective hip status of all patients before surgery, 12 months after surgery and at the last follow-up. The SHV is defined as a patient's subjective hip assessment, expressed as a percentage of a completely normal

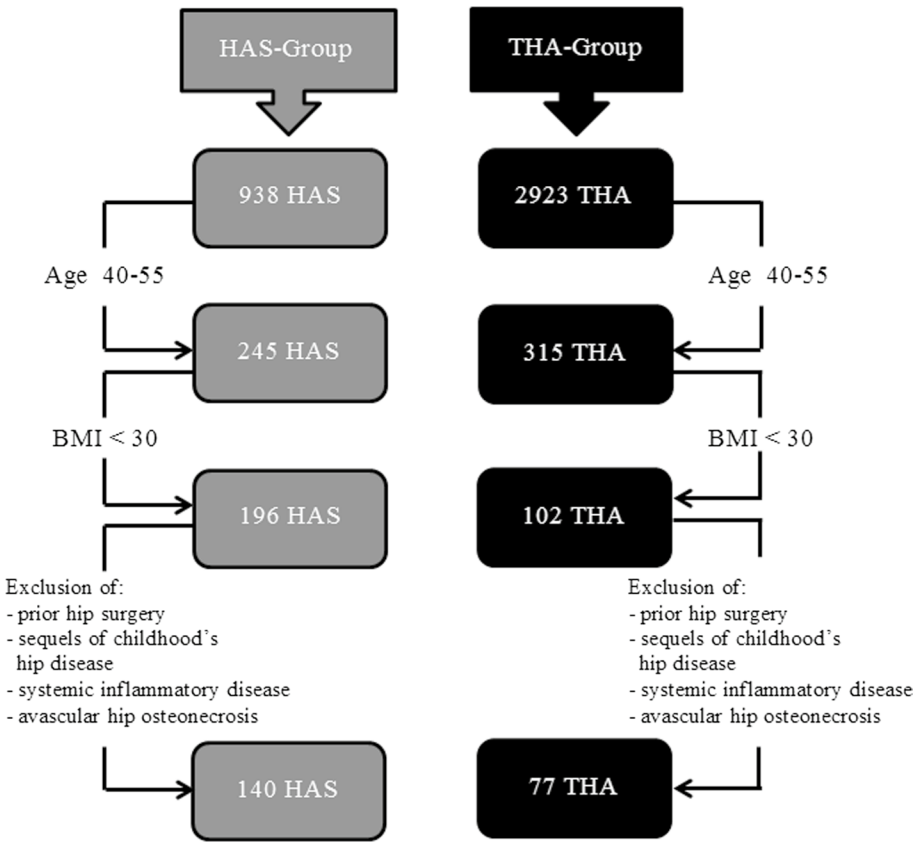

Fig. 1 Reproducible description of the patient selection process with and 140 hips for the HAS group and 77 hips qualifying for the THA group

hip that would reach 100% (analogous to the "subjective shoulder value" by Gerber and Gilbert [11]). Finally, residual complaints, the use of therapeutic joint infiltrations, reoperations and complications were recorded.

Statistical methods

A two-tailed Kolmogorov–Smirnov test was used to analyze data distribution. Nonparametric continuous data are presented by median and range and analyzed by using the Mann–Whitney *U*-test. The parametric data are presented by mean ± standard deviation and analyzed with the Student *T*-test. Categorical data were compared with a chi-square test and a Kruskal–Wallis test. The results were considered significant when $p < 0.05$. The data were analyzed using IBM SPSS® Statistics for Windows software (version 22.0; IBM Corp., Armonk, NY, USA).

Table 1 Overview and comparison of patient demographic data

Group	HAS	THA	*t* test
Hips	140	77	
Female	57%	26%	$p < 0.0001$
Male	43%	74%	
Age (years) (mean ± SD)	46.9 ± 4.38	48.1 ± 4.22	$p = 0.058$
BMI (kg/m^2) (mean ± SD)	24.35 ± 3.05	24.89 ± 3.01	$p = 0.210$

Results

Table 1 shows demographic data including gender, age and BMI. The HAS group consists of 80 female hips and 60 male hips (mean age 46.9 and mean BMI 24.35). The THA group consists of 20 female hips and 57 male hips (mean age 48.1 and mean BMI 24.89). Significantly more female patients underwent hip arthroscopy ($p < 0.001$). Both groups were comparable in terms of age ($p = 0.058$) and BMI ($p = 0.210$).

Symptomatic femoroacetabular impingement with osteoarthritis Tönnis grade on conventional X-ray < II was the indication for HAS. Osteochondroplasty was performed in 139 hips, acetabular rim trimming in 120 hips, 60 times with labral preservation. Osteoarthritis (Tönnis grade ≥ II on conventional X-ray) was the indication for THA (62 hips). All THAs were performed using a direct anterior approach with leg positioner.

The mean follow-up after HAS and THA was 26 months (median 13; SD ± 22) and 34 months (median 14; SD ± 29). The range was between 12 and 100 months.

A timeline of the preoperative and postoperative WOMAC development is summarized in Fig. 2. The 1-year improvement (preoperative to one year after surgery 3.65 versus 0.58, ($p < 0.0001$), and the total improvement (preoperative in comparison with the last follow-up 3.83 versus 1.53, $p < 0.0001$) was significantly higher in the THA group compared to the HAS group. Patients with HAS had a significantly better preoperative score than THA patients: 5.33 versus 3.53 ($p = < 0.000$). The THA group improved significantly overall after one year, the improvement in the

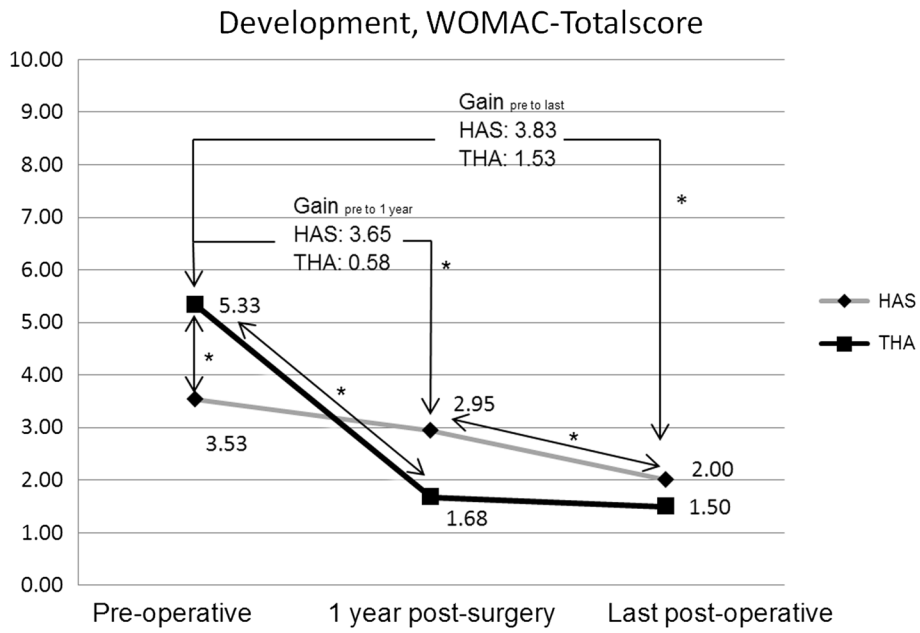

Fig. 2 Timeline: development and comparisons of the WOMAC-total score, HAS vs. THA. *Y*-axis describes the score (minimum 0; maximum 10 Points), *x*-axis the moment of data collection. Results were considered significant if $p < 0.05$ and marked by *

HAS group was not significant (HAS 2.95 ($p=0.198$); THA 1.68 ($p<0.0001$)). In the last follow-up examination, however, HAS patients showed a significantly better WOMAC compared to one-year data (2.00, $p=0.042$). The WOMAC values after one year and after the last follow-up did not differ significantly between the HAS and THA populations ($p=0.317$ and $p=0.271$).

The SHV shows that the preoperative gain up to one year postoperatively (16.38 versus 41.17 ($p=0.008$)) and preoperatively until the last follow-up (21.03 versus 44.20 ($p=<0.0001$)) was significantly higher for the THA group. The overall preoperative and postoperative SHV is summarized in Fig. 3. With regard to the preoperative values, the SHV did not differ significantly between the groups (49.00 vs. 36.33, $p=0.134$). The THA group improved significantly overall after one year, and the improvement in the HAS group was not significant after one-year (HAS 65.38 ($p=0.135$) THA 77.50 ($p<0.0001$)). There was no significant improvement from one year to the last follow-up. The SHV after one year did not differ significantly between the HAS and the THA population ($p=0.208$). At the last follow-up examination, the THA group showed significantly better values ($p=0.010$).

Ten reoperations were performed. Eight subsequent HAS, consisting of conversions in total hips after an average of 29 months (SD ± 24). After THA, two times revision surgery was performed. One for the superficial wound infection mentioned above and one for polyethylene wear after 84 months. Residual complains are summarized in Table 2.

Residual complaints occurred in 37% of the HAS group and 22% of the THA group ($p=0.026$). At the last follow-up examination, groin pain after HAS occurred significantly more frequently. Limping and leg length difference only occurred after THA. The infiltration rate was significantly higher after HAS ($p<0.0001$). Complication in the HAS group consisted of three non-displaced femoral neck

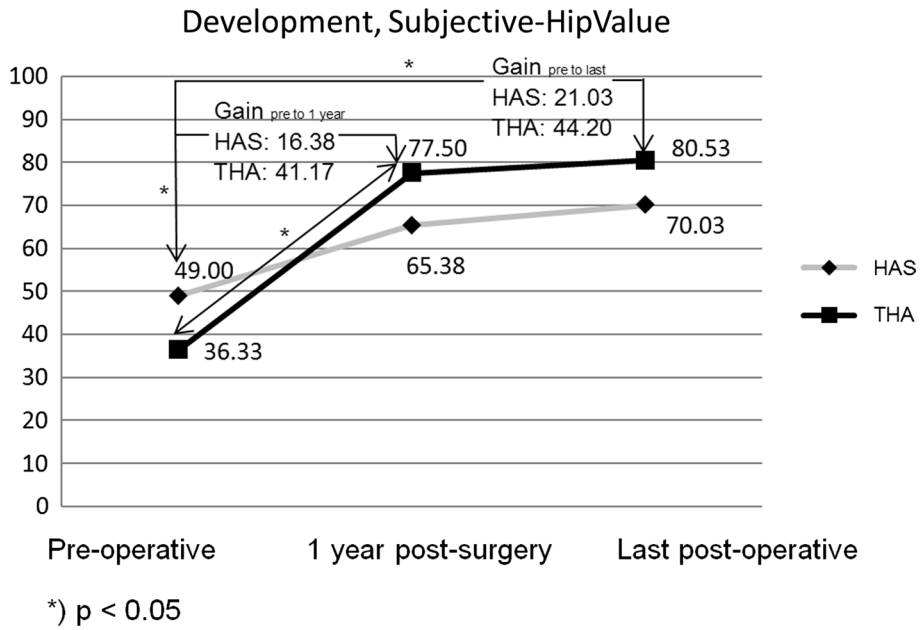

Fig. 3 Timeline: development and comparisons of the SHV, HAS versus THA. *Y*-axis describes the value (minimum 0%; maximum 100%), *x*-axis the moment of data collection. Results were considered significant if $p<0.05$ and marked by *

Table 2 Summary and statistical analysis of residual complains, HAS vs. THA

	HAS ($n=140$)	THA ($n=77$)	p value
Patients with residual complains	52 (37%)	17 (22%)	*0.026**
Residual groin pain	52	14	*0.004**
Indurated operation scar	1	–	0.457
Disturbing leg length differences	–	5	*0.002**
Limping	–	10	*<0.0001**
Iliopsoas impingement	–	2	0.055
Infiltration post-surgery	44	4	*<0.0001**
Conversion/ reoperation	8	2	0.295
Complications	9	2	0.218

Results were considered significant if $p<0.05$ and marked by *

fatigue fractures treated conservatively with prolonged partial weight bearing, 1 scrotal skin lesion, 3 neurapraxia of the lateral cutaneous nerve of the thigh, 1 of the pudendal nerve and 1 of the plexus lumbosacralis. All lesions but two neurapraxia of the lateral cutaneous nerve of the thigh resolved until last follow-up. Superficial wound infection that required reoperation was the only complication in the THA group.

Discussion

In order to improve patient counseling when discussing THA compared to HAS in the age group of 40 to 55 years, we aimed to compare patient satisfaction, particularities of residual complains, complications and reoperation rates in respective groups. Both THA and HAS led to a significant improvement in the patient. This is in line with previous studies [1, 2, 4–7]. While the improvement in THA patients is almost complete after one year, hip arthroscopy patients still show improvements between one-year post surgery and the last follow-up. This longer recovery period is an important aspect when advising patients.

Overall, the gain in subjective hip value after THA is significantly higher in the short term.

While hips after arthroscopy may be expected to deteriorate over time due to the progression of osteoarthritis, it is known that the outcome after THA remains constant over the years (12). Patients should be aware of this important difference.

With regard to the WOMAC, the gain after THA was not significantly higher than after arthroscopy. Nevertheless, the range of score results after THA was much smaller compared to HAS (SD = 0.95; Range 1.15 to 9.27 versus SD = 1.9; Range 0.00 to 7.92).

However, we assume that the capacity of the subjective hip value to cover all aspects of a well-functioning hip is higher than a specific and limited questionnaire can offer.

Residual complaints differ according to THA compared to HAS. Residual complains are significant higher in the HAS-group ($p = 0.026$) and lead to more infiltrations in short-term ($p < 0.0001$). Typical complains after HAS are residual groin pain ($p = 0.004$), typical complains after THA are limping ($p < 0.0001$) and difference in leg length. In current literature, authors deal mainly with patient-related outcome scores [12–14]. A detailed analysis of residual complains in our special patient group is to our knowledge unique.

Reoperation rates are higher in the HAS group and consist mainly of conversion to primary THA. In the present series, 8 out of 140 hips (6%) were converted after 29 months. This is in line with current literature. In a systematic review of 92 studies that pooled more than 6000 patients, Harris et al. [12] indicated that the conversion to total hip arthroplasty is the most common reoperation after hip arthroscopy. Philippon et al. [13] found a 20% conversion rate in 153 patients over 50 years over a period of 3 years. In a series of 564 hip arthroscopies performed for osteoarthritis, Haviv et al. [15] reported that 90 hips (16%) were replaced over a seven-year period. A longer period between arthroscopy and total hip arthroplasty was specified for patients with younger age and milder arthritis. It is to mention that THA after HAS seems to lead to similar subjective and clinical results compared to primary THA without previous hip surgery [16].

Under consideration of actual studies, another point to discuss is conversion surgery in patients with osteoarthritis. A higher rate of complications [17] and significantly increased risk of THA Revision within 2 Years [18] was described. These findings underline a clear reluctant point of view regarding HAS in patients who present osteoarthritis. A delay of needing THA is here not to expect [19].

Griffin et al. describe in his review from 2017 [14] that outcome in HAS of older patients may be affected by type of treatment. Treatment for labral tears and FAI can be successful, but the absence of OA is essential. We agree with this with not clear worse results in HAS after setting indications with Tönnis grading < II.

Limitations of this study are the different patient cohorts in terms of OA grade and preoperative score with the wide range of the follow-up time ($M = 28.7$; Median 13.3; Range from 12.0 to 100.4) and the admittedly short-term follow-up.

Despite these limitations, we conclude that both HAS and THA significantly improve patient quality of live. However, the outcome after THA is more predictable. While THA shows faster improvement with plateauing after one year, HAS requires at least 2 years for a complete recovery. Residual complains after HAS are more frequent and different compared to THA. Groin pain is the main complain after HAS, while limping and/or disturbing leg length discrepancy are the typical complaint after THA. We think this findings should be considered in making the informed consent to generate clear expectations of patient`s HAS outcome. Additionally further studies with longer follow-ups are needed.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This research has been approved by the Ethical Commission Zürich.

Human and animal rights All procedures performed involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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