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ORTHOPAEDIC SURGERY

Does previous hip arthroscopy negatively influence the short term clinical result of total hip replacement?

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Abstract
Introduction The risk that hip preserving surgery may negatively influence the performance and outcome of subsequent total hip replacement (THR) remains a concern. The aim of this study was to identify any negative impact of previous hip arthroscopy on THR.
Methods Out of 1271 consecutive patients who underwent primary THR between 2005 and 2009, 18 had previously undergone ipsilateral hip arthroscopy. This study group (STG) was compared with two control groups (CG, same approach, identical implants; MCG, paired group matched for age, BMI and Charnley categories). Operative time, blood loss, evidence of heterotopic bone and implant loosening at follow-up were compared between the STG and the MCG. Follow-up WOMAC were compared between the three groups.
Results Blood loss was not found to be significantly different between the STG and MCG. The operative time was significantly less ($p < 0.001$) in the STG. There was no significant difference in follow-up WOMAC between the groups. No implant related complications were noted in follow-up radiographs. Two minor complications were documented for the STG and three for the MCG.
Conclusion We have found no evidence that previous hip arthroscopy negatively influences the performance or short-term clinical outcome of THR.

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Introduction

Femoroacetabular impingement (FAI) is a well recognized intra-articular pathology causing hip pain and secondary osteoarthritis among young adults [1–7]. Advances in surgical techniques such as surgical dislocation of the hip, hip arthroscopy, reverse periacetabular osteotomy and proximal femoral osteotomy, provide the surgeon with effective and safe tools to correct some of the underlying anatomical issues [8–17]. Over the past decade, hip arthroscopy surgery (HAS) has gained widespread popularity and its results are claimed to be comparable with other conservative hip procedures [18, 19]. Due to its minimally invasive nature, and as indications have broadened, HAS has become more frequently employed as a palliative surgical option. While there is fair evidence in the literature for the use of arthroscopy for FAI, there is also conflicting evidence regarding hip arthroscopy for the treatment of mild and moderate osteoarthritis [20]. Despite palliative hip arthroscopy, progression of the degenerative process may still result in end-stage arthritis, and as every surgical approach to the hip traumatizes the musculoligamentous complex, concern remains as to whether previous hip joint-preserving surgery hinders future total hip replacement (THR) and whether the long-term outcome of THR may be impaired. Periacetabular osteotomy, for instance, seems not to compromise the results of THR and may even improve its outcome in dysplastic hips [21, 22]. Conversely, there is evidence that the implantation of a total hip arthroplasty may be more difficult after a previous corrective femoral osteotomy, though the long term results published provide

conflicting data[23–28]. There are no data available regarding the outcomes of THR after surgical hip dislocation or hip arthroscopy. Therefore, the purpose of this study was to identify any negative impact of previous hip arthroscopy on the performance and clinical result of THR.

Patients and methods

Study group

All consecutive patients, who underwent primary THR between January 2005 and December 2009, were identified from our computerized institutional database. All data in this database are entered prospectively. Out of these 1271 patients, 21 had previously undergone ipsilateral hip arthroscopy. Three patients were excluded because of earlier ipsilateral open hip surgery prior to hip arthroscopy. The remaining 18 patients were included and represented the study group (STG) comprising five men and thirteen women with an average age of 46 years (range 36–74). In three patients, the hip arthroscopy was not performed in our institute. In all the cases, the indication for hip arthroscopy was FAI In two of the 13 cases, FAI was secondary to Perthes disease and partial osteonecrosis of the femoral head, respectively.

The arthroscopic procedure consisted of combined femoral osteochondroplasty and acetabular trimming in nine cases. In three cases, a femoral osteochondroplasty and in six cases, an acetabular trimming alone was performed.

Reasons for arthroscopic failure and conversion to THR were progression of pre-existing degenerative changes already seen on X-rays prior to arthroscopy. In five cases, no degeneration of the hip joint was present before arthroscopy. All five of these patients had a postoperative arthro-MRI because of persisting pain. In two patients, oedema of the femoral head was identified and considered a complication of arthroscopy and responsible for residual pain. In one case, there were new degenerative changes of the cartilage in the weight bearing zone, which was also considered a complication of arthroscopy. In two patients, repeat arthroscopy was performed because of residual impingement and tendinitis of the iliopsoas tendon, respectively. However, the post-operative follow-up was unfavourable in both cases. These five patients who continued to suffer significant hip pain and remained dissatisfied were finally offered THR after an average time of 16 months (range 8–21) following the index procedure.

Oedema of the femoral head was identified in two patients. Other complications such as fracture of the femoral neck, heterotopic ossification, neuropathy of the pudendal or lateral femoral cutaneous nerve were not encountered in this series.

For all THPs in the study group, a minimally invasive anterior approach [29] was performed and cementless implants {Medacta®: Versafit cup, Quadra stem (10 cases); Zimmer®: Fitmore cup, Fitmore stem (6 cases); Stryker®: Trident cup, Accolade stem (1 case)} were used for all but one patient who received a hybrid replacement {Zimmer®: Fitmore cup, Exafit stem Palacos G}.

Control groups

In order to evaluate the results of the study group, two control groups were identified from our database for comparison. First, out of the total pool of 1,271 patients, who underwent primary THR, all the patients in whom a minimally invasive anterior approach was performed were identified (1,269 cases) and 489 chosen as control group (CG) because they had already been enrolled in a prospective follow up study. In all of them, the same implant (Medacta®; Versafit cup; Quadra stem) was used. Second, a paired matched (age, BMI, and Charnley categories [30]) control group (MCG; $n = 36$) was formed.

Evaluation

As indicators of THR performance and complexity, operation time, intraoperative blood loss, intra- and early postoperative complications were evaluated and compared between the study and the matched control groups. Additionally, standard anteroposterior and cross table lateral views one year after surgery were used to grade eventual heterotopic ossifications according to Brooker [31] and report implant complications. To determine subjective patient outcome, the WOMAC [32], recorded at least 1 year post operatively, were assessed for all groups and compared.

Statistical analyses were performed by a statistical consultant. The paired Wilcoxon signed-rank test was used to compare preoperative values with those at the time of follow-up. The Mann–Whitney U test and Chi-Square test were performed to compare the three groups. The level of significance was set at $p < 0.05$.

Results

Demographics of the STG and MCG were statistically equivalent and summarized in Table 1

Recorded blood loss was not different between the STG (625 ml ± 372, range 100–150) and the MCG (693 ml ± 287, range 250–1600; Fig. 1). The operative time in the MCG (166 ± 39 min, range 110–265) was significantly higher ($p > 0.001$) than in the STG (118 ± 31 min, range 60–170; Fig. 2).

Table 1 Demographics of study and matched control group

Demographics	STG	MCG	*p*-value
Number	18	36	na
Age	46.3	50.4	0.087
BMI	23.9	24.7	0.196
Charnley Classification (A:B:C)	11:6:1	17:16:3	0.744

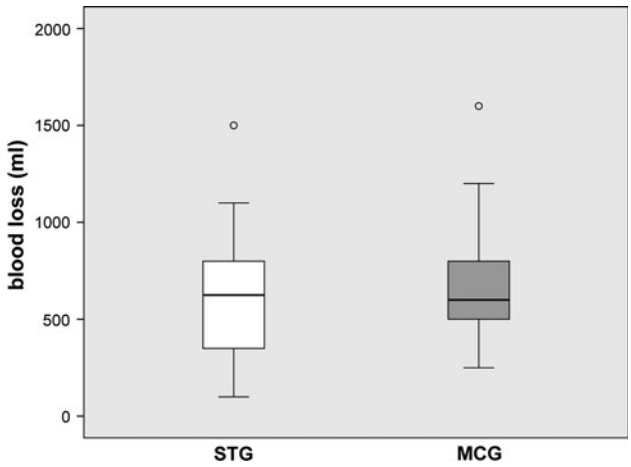

Fig. 1 Boxplot of intraoperative blood loss of study group and matched control group

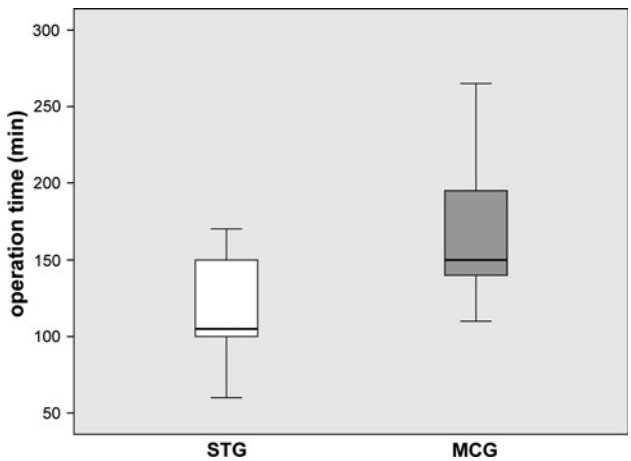

Fig. 2 Boxplot of operative time of study group and matched control group

Two minor complications were in encountered in the STG. One patient had a superficial wound infection due to a suture granuloma that resolved with antibiotic therapy. The post-operative X-ray of the second patient showed that one of the cup screws was unduly long and had penetrated the inner table of the ilium. Revision surgery was undertaken the same day to replace the screw. Three minor complications were observed in the MCG. In one patient, a small perforation of the quadrilateral plate was needed to be augmented with bone taken from the removed femoral head during the same surgery. An intraoperative fracture of the greater trochanter occurred in the second patient and was treated with touch weight bearing for 6 weeks and healed uneventfully. In the third patient, an early anterior dislocation was reduced under general anaesthesia without recurrence.

Heterotopic ossification Class 1, according to Brooker [31] was present in one patient (6%) in the study group and in eight patients (22%) in the MCG. The heterotopic ossification was asymptomatic and clinically irrelevant in all patients. No cases of implant loosening or failure were identified.

The mean follow-up of the STG, MCG and CG was 24.4 months (SD ± 15.1; range 12–54), 18.7 months (SD ± 13.2; range 12–54) and 14.2 months (SD ± 8.1; range 12–54), respectively. Although the difference in follow-up time between the STG and the MCG was not significant ($p = 0.094$), follow-time of the CG was significantly shorter ($p < 0.001$) The WOMAC scores showed no significant difference ($p = 0.875$) between the STG (1.5 ± 2.3, range 0–7.7) and the CG (1.2 ± 1.5, range 0–7.7), nor between the STG and the MCG (1.3 ± 1.6, range 0–6.1; $p = 0.667$; Fig. 3).

Discussion

Due to its minimally invasive nature, indications for HAS have broadened over time, and it has become more frequently employed as a palliative surgical option. In the setting of pre-existent degenerative joint disease and when the goal of the HAS is palliative, the benefit-to-risk ratio

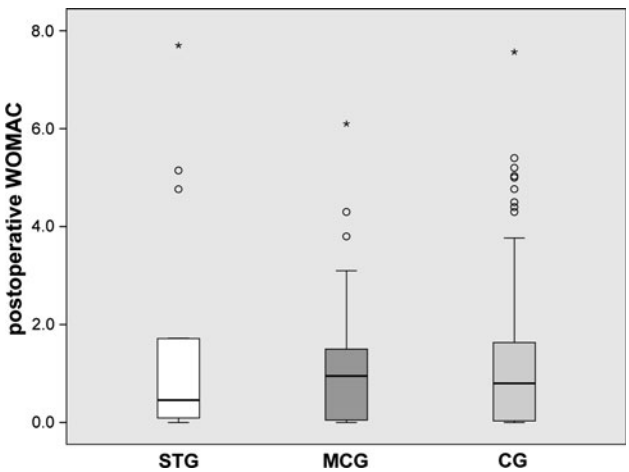

Fig. 3 Boxplot of 14 months follow-up WOMAC of study group, matched control group and control group

must be carefully weighed and discussed in detail with each individual patient in order to keep the rate of early conversion to THR as low as possible.

In addition the possible impact of previous HAS on the technical aspects and outcome of THR should be considered. From a morphological point of view, one might not expect HAS making THR more difficult, but potential scarring and persistent postoperative inflammation could theoretically have some influence. Such a negative influence on the performance and outcome of total hip replacement could potentially be important in clarifying the indications for arthroscopic hip surgery, particularly palliative indications. This study aimed to evaluate this concern and to our knowledge is the first of its kind.

In the present investigation, intraoperative blood loss, surgical time, intra-and post-operative complications, occurrence of heterotopic ossifications and short term implant failures were used as measures of potential complexity of THR after previous hip arthroscopy. With respect to these parameters, previous HAS was not associated with any negative impact when compared to a group of primary THR without previous surgery, or a matched control group.

The WOMAC was used as a measure of subjective outcome and did not reveal an inferior outcome for THR performed after previous hip arthroscopy.

This study has some limitations. First, the size of the study group appears small. Nevertheless, for an equivalent difference of 2.5 in the WOMAC and 300 ml for Intraoperative blood loss, power analysis resulted in 97 and 89% power, respectively, when a significance level of 0.05 was assumed.

Second, only a short-term outcome is reported in our study. However, numerous published studies show that [33–35] quality of life and outcome scores after THR reach a plateau after 12–18 months and it is therefore unlikely that the average WOMAC scores would change in any clinically significant manner after a mean follow-up of 14 months.

Third, when compared to the MCG, we were surprised to find a shorter operative time was recorded for THR in the STG. Though perhaps not the complete explanation, we feel this is likely because the senior surgeon was concerned about the failed HAS and was focussed on a precise and efficient THR surgery at the expense of time spent teaching the residents. It is however recognized that while the duration of hip arthroplasty is significantly higher for orthopaedic trainees than senior surgeons, there are no significant differences in outcome and complication rates. [36, 37] and hence we do not expect this limitation to relevantly bias our results.

We therefore conclude that, previous ipsilateral hip arthroscopy surgery does not appear to negatively influence the performance or outcome of subsequent THR.

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

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