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Direct anterior approach *vs* posterolateral approach for total hip arthroplasty: our early experience

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Summary

Objective. The direct anterior approach (DAA) for total hip arthroplasty (THA) is a surgical procedure gaining increasing popularity among hip surgeons in the last decade, even for surgeons previously accustomed to other surgical approaches. This study aimed to analyze the first cases of direct anterior approach THAs in a single institution, performed by skilled surgeons accustomed to the postero-lateral approach.
Methods. We retrospectively reviewed 40 THA (38 patients) performed in our institution for primary arthritis, between December 1st 2019, and December 1st 2020. Patients were matched for age, gender, BMI and comorbidities. A matched pair analysis was performed.
Results. The two groups had no statistically significant differences in hospitalization time, six-month patient-reported outcomes measures (PROMs), and radiographic measurements. However, a significant difference was observed regarding surgical timing.
Conclusions. The direct anterior approach (DAA) for total hip arthroplasty is a safe and feasible technique even in the early experiences.

Key words: direct anterior approach, posterolateral approach, total hip arthroplasty, patient-reported outcomes measures

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Introduction

The direct anterior approach (DAA) is a growing total hip arthroplasty (THA) approach that offers several benefits during and after surgery. Literature reports better tissue preservation regarding the abductor complex and the external rotator muscles, lower blood loss, reduced risk of dislocation, quicker recovery and less surgery-related pain [1-4]. This approach is often used in pediatric surgery for developmental hip dysplasia, treatment of hip infection, femoroacetabular impingement and hip resurfacing [2,5]. Despite its advantages, DAA is a challenging technique even for experienced surgeons; this leads to longer operating times, a long learning curve and a higher complication rate, especially during the early learning phase.
As described by de Steiger et al., the learning curve for DAA is estimated in more than 50 surgeries to reduce the revision rate [6]. Furthermore, the possible complications described are intra-operative femoral fracture and lateral femoral cutaneous nerve (LFCN) injury [5]. For these reasons, the best approach for THA is still a matter of debate. Several parameters can be used to evaluate outcomes after surgery: questionnaires based on patient satisfaction such as the Forgotten Joint Score-12

and the Harris Hip Score, selected for our study, and radiographic measures such as global off-set and abductor lever arm [7-9]. Our hip surgery team at A.O. Ordine Mauriziano in Turin started to perform THA with DAA in the last two years. We conducted a first experience study analyzing the first 20 DAA THAs performed in our department and comparing them to 20 PLA THAs matched for diagnosis, age, body mass index (BMI) and gender. The study aimed to determine whether it is feasible and safe to switch from the posterolateral hip to the direct anterior approach.

Materials and methods

We conducted a retrospective matched case-control study analyzing THAs performed from December 1st, 2019, to December 1st, 2020, at A.O. Ordine Mauriziano, Turin, Italy.

All patients provided informed consent to participate in the study, and all procedures were in accordance with 2013 WMA Helsinki declaration.

Data were obtained through analysis of departmental databases, follow-up visits, and telephone interviews.

Ninety-two patients aged 33 to 85 years underwent THA, 18 received direct anterior access (DAA) and 74 posterolateral access (PLA).

Patients diagnosed with a proximal femoral fracture, congenital hip dysplasia, femoral head osteonecrosis, or oncologic disease as an indication for THA were excluded. None of the patients who underwent DAA was excluded. Among the 18 patients operated through DAA, two bilateral THAs were implanted for a total of 20 total hip replacements via DAA.

Each DAA patient was matched to a PLA control patient according to the following parameters: diagnosis of primary hip arthritis as an indication for surgery, age ± 5 years, same BMI range, gender and comorbidities.

Thus, we selected 18 patients undergoing DAA and 20 patients undergoing PLA for a total of 40 THAs (n = 20 DAA and n = 20 PLA) that differed only in the type of surgical approach. All patients operated were evaluated clinically at two months, clinically and radiographically at 3 and 6 months and followed for a minimum of 1-year.

Patients were divided into two groups: DAA (n = 20 THA) (group A) and PLA (n = 20 THA) (group B). The two groups were assessed for surgical procedure-related parameters, pre- and post-operative radiographic comparison, and patient-reported outcome measures (PROMs), especially Harris Hip Score (HHS) and Forgotten Joint Score-12 (FJS-12).

Surgical procedure-related parameters were: operative time, length of hospital stay, need for transfusion, and post-operative complications. A radiographic study examined the post-operative change in global off-sets and abductor lever arm. All patients were also regularly evaluated after surgery and tested on the HHS and FJS-12 at six-month follow-up, providing information on short-term outcomes.

Statistical analysis was performed using the Statistical Software Medcalc® (MedCalc Software, Ostend, Belgium).

All demographic data were analyzed with descriptive statistics. Means and standard deviations were obtained for all continuous variables. In addition, categorical variables were analyzed in terms of frequency and incidence. The Student's t-test was used to compare normally distributed continuous variables.

Microsoft Excel spreadsheets (Version 2016; Microsoft, Redmond, WA) were used to collect the data. The obtained results were considered statistically significant with a p-value < 0.05.

Results

Table I shows the characteristics of the two groups.

Table I. Patient demographics.

	Group A (DAA)	Group B (PLA)	P-value
Number of patients	18	20	
Number of hips	20	20	
Age at surgery, years (± SD)	62.65 ± 15.58	62.70 ± 14.44	0.992
Sex, male/female	10/8	12/8	
BMI Kg/m^2, (± SD)	25.74 ± 3.22	25.88 ± 3.20	0.895
HHS, mean (± SD)	93.65 ± 8.11	93.50 ± 6.70	0.948
FJS -12, mean (± SD)	76.35 ± 22.76	66.97 ± 28.10	0.254
Surgical time, min, men (± SD)	79.85 ± 19.83	55.65 ± 15.03	0.0001
Hospital stay, days (± SD)	10.05 ± 6.74	11.15 ± 8.21	0.646

SD: standard deviation; BMI: body mass index; HHS: Harris hip score; FJS-12: forgotten joint score score-12; DAA: direct anterior approach; PLA: postero-lateral approach

Demographic data analysis

There was no statistically significant difference in mean age (group A = 62.65 ± 15.58; group B = 62.70 ± 14.44; p = 0.992), BMI (group A = 25.74 ± 3.22; group B = 25.88 ± 3.20; p = 0.895) or gender (group A = 8 Females, 10 Males; group B = 8 Females, 12 Males) between group A and group B.

Patient-reported outcome measures

There were no statistically significant differences in the 6-month PROMs between group A and group B (Harris Hip Score group A = 93.65 ± 8.11; group B = 93.50 ± 6.70; p = 0.948; and Forgotten Joint Score-12 group A = 76.35 ± 22.76; group B = 66.97 ± 28.10; p = 0.254).

Clinical data analysis

Operative time was statistically significant higher for group A than group B (group A = 79.85 ± 19.83; group B = 55.65 ± 15.03 p = 0.0001). Difference in hospital stay was not significant between the two groups (group A = 10.05 ± 6.74; group B = 11.15 ± 8.21; p = 0.646).

Bleedings were not assessed directly, but the need for transfusions was evaluated between the groups as higher in group A (5 patients required transfusion, 2 of whom were bilateral THAs) than group B (1 patient required transfusion).

Radiographic data analysis

No statistically significant difference was observed between group A and group B in global offset and abductor lever arm changes after surgery (Global Offset: group A preop = 79.28 ± 10.49; group A post-op = 76.18 ± 10.32; p = 0.3529; group B preop = 76.73 ± 9.15; group B post-op = 74.25 ± 11.04; p = 0.4440) (Abductor Lever Arm: group A pre-op = 58.22 ± 9.17; group A post-op = 58.63 ± 10.50; p = 0.8961; group B preop = 57.06 ± 9.22; group B post-op = 56.68 ± 11.17; p = 0.9084).

Complications

One case of lateral thigh hypoesthesia for suspected lateral femoral cutaneous nerve injury was reported in group A. One NSTEMI during hospitalization was reported in group B. A case of total external popliteal sciatic nerve deficit was recorded in group B. No other complication was reported after surgery in the two groups.

No deaths, early prosthetic joint infections, intra-operative fractures, or dislocations were reported at final follow up for any of the 38 patients (40 THAs) studied.

Discussion

No significant differences in age at intervention, BMI, sex or comorbidities were observed by demographic analysis between the groups. Thus, thanks to matching, differences in the parameters analyzed depend only on the approach used.

The study's primary outcome was the 6-month PROMs comparison between DAA and PLA. We used the Harris Hip Score (HHS), a widely applied score for THAs outcome evaluation, which combines specific questions with a physical examination, including Range Of Motion, residual limp and deformity [9].

We also used the Forgotten Joint Score-12 (FJS-12), taking the concept of "forgotten joint" and assessing the awareness of the joint after surgery to better differentiate between good and excellent scores [7,10].

No significant difference in the 6-month HHS and FJS-12 was observed between groups. Notably, both HHS and FJS-12 were higher in the DAA group despite not being statistically significant.

According to the literature, these results indicate a high general post-operative short-term satisfaction rate and comparable PROMs between the DAA and PLA groups [11,12]. Consequently, in our experience, PROMs do not differ by the approach used, and DAA is reliably comparable to PLA in terms of outcomes even from the first few interventions.

Restoring the global off-set and abductor lever arm is critical in determining higher post-operative hip function, range of movement, abductor strength, and reducing pain [8,13-15].

No significant difference was observed between the DAA and PLA groups in global off-set and abductor lever arm changes after surgery. Therefore, our surgeries restored global off-set and abductor lever arm without increasing or decreasing them. Furthermore, the management of these outcome-critical parameters is not affected by the approach used.

In accordance with the literature, operative time was statistically significant longer in the DAA group compared to PLA [16,17]. We believe this may be a consequence of our initial learning curve with this approach. However, the longer operative time did not lead to increased complications.

The need for transfusion was used as a parameter to assess operative bleeding. Although DAA is believed to reduce operative bleeding [2,12], a recent meta-analysis observed more significant blood loss than in PLA [17]. Similarly, in our experience, we found a higher need for red blood cells (RBC) transfusions in the group undergoing DAA compared to PLA (group A = 5 patients; group B = 1 patient). This could be due to the novelty of DAA in our surgical practice, compared to the well-known and more practised PLA. It should also be noted that two of the five transfused DAA patients received bilateral THA, which may have increased operative bleeding.

According to the literature, DAA is associated with shorter hospitalization time [17].

In our experience, mean hospitalization time was 10 days in group A and 11 days in group B, showing no statistical difference between groups. Thus, longer operative time and the need for transfusions in DAA patients did not result in a longer recovery time. The possible explanation why DAA did not result in shorter hospitalizations is that PLA is a well-established

technique in our institution, leading to a short hospital stay for patients undergoing THA with this approach.

Regarding operative complications, we observed only one lateral femoral cutaneous nerve (LFCN) injury reported as a "burning" sensation and dysesthesia in the DAA group. The patient was evaluated at follow-up visits and treated with pregabalin 75 mg for 40 days, reporting an improvement in symptoms at follow-up and providing high HHS and FJS-12 scores. These findings support studies affirming that LFCN injury improves with time after surgery and appears to be independent from hip function scores [18].

We also observed a total external sciatic nerve injury with a complete TA (Tibialis Anterior), EDL (Extensor Digitorum Longus), EHL (Extensor Hallucis Longus) deficit and dorsal foot hypoesthesia in the PLA group. We treated the patient with steroids, pregabalin and personalized rehabilitation, achieving almost complete muscle strength recovery with residual dorsal foot dysesthesia. At six months follow-up, the patient reported 90 points in HHS and 31 in FJS-12 underlying a good functional outcome with a residual high THA awareness probably related to external sciatic nerve injury.

In some studies, DAA leads to a higher rate of prosthetic joint and wound infections, particularly for obese and diabetic patients [19].

In our experience, in line with other studies [20,21], we found no wound or prosthetic joint infection in any patient at the last follow-up. In addition, we did not find an increased risk of dislocation or intra-operative femoral fractures in DAA patients, thus obtaining an excellent complication rate for our initial learning curve.

Conclusions

According to the data in our study, it can be stated that DAA for THA is a safe and reproducible procedure. It requires an initial effort due to the long learning curve and the possibility of extending the surgical timing during the initial period. The risk of complications was not as high as expected. Furthermore, the degree of satisfaction in patients undergoing THA, as measured by the FJS-12 and HHS, was comparable in the two control groups. Our study has a number of limitations. Firstly, it is a very limited case series and, furthermore this is a retrospective study. Further studies with a higher number of patients and with longer follow-up are needed to confirm this recommendation.

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

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Authors' contributions
All Authors collaborated equally to the work.

Ethical consideration
This study was approved by the Institutional Ethics Committee of AO Odine Mauriziano, Università degli Studi di Torino, Turin, Italy, under protocol number 0021880. The research was conducted ethically, with all study procedures being performed in accordance with the requirements of the World Medical Association's Declaration of Helsinki. Written informed consent was obtained from each patient for study participation and data publication.

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