

ORIGINAL RESEARCH

## Total hip replacement using the direct anterior approach. Experience in a hospital of Bogotá D.C., Colombia

Reemplazo total de cadera mediante abordaje anterior directo. Experiencia en un hospital de Bogotá D.C., Colombia

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### Abstract

**Introduction:** Total hip arthroplasty is the definitive treatment for osteoarthritis and intracapsular fractures of the hip in patients over 65 years of age. In recent years, direct anterior approach (DAA), also known as minimally invasive anterolateral approach (MIAA), has been reintroduced as an alternative to conventional procedures. However, there are few studies describing the outcomes of its application. **Objective:** To describe the clinical and transoperative results and outcomes in patients who underwent total hip replacement using DAA.

**Methodology:** Retrospective cohort study conducted in 36 patients with osteoarthritis or intracapsular fractures of the hip who underwent hip arthroplasty using DAA in a tertiary care hospital in Bogotá D.C. between 2017 and 2020 and were followed up for at least 6 months.

**Results:** The mean age was 68.8 years (SD: 15.1), 58% of the participants were women. Primary osteoarthritis was the main reason for indicating surgery (47.2%). In addition, the average hospital stay was 3 days (SD: 1.62), the median bleeding was 200cc (IQR: 200-300), and two intraoperative femur fractures occurred. Finally, there were no cases of postoperative prosthesis dislocation and all patients recovered functionality.

**Conclusion:** DAA demonstrated outstanding effectiveness for the functional recovery of patients, decreased operative time, and a low incidence of complications.

**Keywords:** Arthroplasty, Replacement, Hip; Minimally invasive surgical procedures; Orthopedics; Hip Prosthesis; Osteoarthritis (MeSH).

### Resumen

**Introducción.** La artroplastia total de cadera es el manejo definitivo de la artrosis y fracturas intracapsulares de la cadera en personas mayores de 65 años. El abordaje anterior directo (AAD), también conocido como cirugía mínimamente invasiva anterior (AMIS), es una técnica quirúrgica que se ha retomado en los últimos años como alternativa a los procedimientos convencionales; sin embargo, hay pocos estudios que describan los resultados de su utilización.

**Objetivo.** Describir los resultados clínicos y transoperatorios, así como los desenlaces en pacientes en los que se realizó reemplazo total de cadera mediante AAD.

**Metodología.** Estudio de cohorte retrospectivo realizado en 36 pacientes con artrosis de cadera o fracturas intracapsulares de dicha articulación que fueron sometidos a artroplastia de cadera mediante ADD en un hospital de tercer nivel de atención de Bogotá D.C. entre 2017 y 2020, y tuvieron seguimiento durante mínimo 6 meses.

**Resultados.** La edad promedio fue 68,8 años (DE: 15,1), el 58% de los participantes eran mujeres. La osteoartritis primaria fue el principal motivo de indicación quirúrgica (47,2%). Además, el promedio de hospitalización fue 3 días (DE: 1,62), la mediana de sangrado fue de 200cc (RIQ: 200-300) y se presentaron dos fracturas de fémur intraquirúrgicas. Finalmente, no hubo casos de luxación de la prótesis en el postoperatorio y todos los pacientes recuperaron la funcionalidad.

**Conclusión.** El AAD tuvo una buena efectividad para la recuperación funcional de los pacientes, un tiempo operatorio reducido y una baja frecuencia de complicaciones.

**Palabras clave:** Artroplastia de reemplazo de cadera; Procedimientos quirúrgicos mínimamente invasivos; Ortopedia; Prótesis de cadera; Osteoartritis de la cadera (DeCS).

## Introduction

Total hip arthroplasty is a surgical technique that has shown good results for the management of osteoarthritis and intracapsular fracture of this joint in older adults, since it reduces pain and improves the functionality and quality of life of these patients.<sup>1</sup> However, a significant frequency of complications between 16% and 19% has been reported in patients who underwent such surgery through posterior and anterior approaches, respectively.<sup>2</sup> Therefore, in recent years, new surgical techniques have been suggested, offering a lower complication rate and shorter recovery time, such as the direct anterior approach (DAA),<sup>2</sup> also known as minimally invasive anterolateral approach (MIAA).

The DAA is a minimally invasive technique in which the muscular plane is preserved by making an incision in the internervous and intermuscular planes, thus reducing the risk of dislocation and promoting early recovery by minimizing surgical injury to the soft tissues and, consequently, pain.<sup>3</sup> Since its inception, the DAA has been used to treat dysplasia, hip fractures and femoroacetabular impingement.<sup>4</sup> In 1947, Robert Judet reported its use in a total hip replacement (THR) procedure, in which the patient was positioned on a Judet table, thus allowing for direct access to the joint; however, this procedure was discontinued because the prosthetic components used at the time were bulky and, therefore, difficult to insert.<sup>4</sup>

At the beginning of the 21<sup>st</sup> century, minimally invasive surgery (MIS) was developed, bringing with it some variations of the known surgical approaches; however, patients who underwent surgery with these new techniques continued to experience the same type of complications. Thus, the DAA was reinstituted by implementing new MIS technological development, and significant advantages were achieved with the use of this technique. Currently, about 10% of THRs are performed using the DAA worldwide. In 2016, more than 100 surgeons around the world were experts in this technique and more than 200 000 hip replacements had been performed involving the MIAA.<sup>4,5</sup>

Given that the DAA is a relatively new surgical technique, its use in hip arthroplasty in Colombia is unknown. In view of the above, the objective of this study was to describe clinical and transoperative results, as well as the outcomes in patients who underwent THR with DAA.

## Methodology

### Study type, population, and sample

Retrospective cohort study conducted in a tertiary care hospital in Bogotá, Colombia, in which the DAA surgical technique has been used to perform hip arthroplasty since 2017. Patients over 18 years of age who consulted the emergency department or attended the outpatient clinic due to osteoarthritis of the hip or intracapsular hip fractures (regardless of anatomic involvement or previous functional status), who underwent total hip arthroplasty using the DAA between January 2017 and December 2020 and were followed up for a minimum of 6 months, were included. Subjects who had incomplete information in their medical records were excluded (n=3), so the final sample consisted of 36 patients.

## Variables

Data on the following variables were collected: age, sex, laterality of the operated hip, reason for surgery (defined as the diagnosis that led the patient to surgery), surgical

time, blood loss during the procedure, intraoperative and postoperative complications, postoperative hospitalization time, mobilization with a walker on the first postoperative day, radiological changes 30 days after the procedure, presence of motor or sensory nerve damage 3 months after the procedure, pre- and postoperative femoral offset, pre- and postoperative lateralization, and prosthesis revision requirements.

All data obtained from the medical records were reviewed by two of the authors and double-checked.

### Statistical analysis

Data were entered into an Excel spreadsheet for subsequent analysis in the Epiinfo statistical software and are described using absolute and relative frequencies for qualitative variables and means and standard deviations (SD), or medians and inter-quartile ranges (IQR) for quantitative variables based on the distribution of the data (Poisson distribution).

### Ethical considerations

This research followed the ethical principles for conducting biomedical studies involving human subjects established in the Declaration of Helsinki<sup>6</sup> and the scientific, technical and administrative standards for health research set forth in Resolution 8430 of 1993 issued by the Colombian Ministry of Health.<sup>7</sup> Furthermore, the study was approved by the Research Ethics Committee of the institution where the data were obtained, as recorded in the minutes issued on August 11, 2021. Data confidentiality was guaranteed and, since this is a historical review research, no informed consent was requested in accordance with principle number 8 of the Declaration of Helsinki.<sup>6</sup>

### Results

Women accounted for 58% of the patients, the mean age was 68.8 years (SD: 15.1 years), and the main reason for surgery was primary osteoarthritis. Table 1 presents the general characteristics of the participants.

**Table 1.** General characteristics of the patients included in the study (n=36).

Variable	n	%
Age in years (mean; SD)	68.8	15.1
Sex		
Female	21	58.3
Male	15	41.7
Right laterality	18	50
Reason for surgery		
Fracture of proximal femur	16	44.4
Primary osteoarthritis	17	47.2
Osteoarthritis secondary to dysplasia	3	8.3

SD: standard deviation.

Source: Own elaboration.

The average duration of the procedure was 73.6 minutes, and the median blood loss was 200cc (IQR: 200-300). The average length of hospital stay was 3 days; in addition, all patients started gait training with a walker on the first postoperative day. Table 2 shows the type of implant used and the perioperative characteristics.

**Table 2.** Characteristics of the surgical procedure.

Variable	n	%
Type of implant		
Cemented implant	4	1.1
Uncemented implant	32	88.9
Surgical time in minutes (mean; SD)	73.6	36.0
Blood loss in cubic centimeters (median; IQR)	200	200-300
Blood transfusion requirement	2	5.6
Length of hospital stay (mean; SD)	3.04	1.62
Mobilization with a walker on the first postoperative day	36	100

SD: standard deviation. IQR: interquartile range.

Source: Own elaboration.

Regarding complications, two cases of femur fractures occurred during the procedure, which were treated in the same surgical time without loosening of the femoral component of the hip prosthesis. On the other hand, four patients developed post-surgical complications, namely, one case of surgical wound dehiscence, one patient with pulmonary embolism despite venous thromboembolism prophylaxis, one individual with meralgia paresthetica, and one person with motor nerve injury without improvement after three months of follow-up. Finally, none of the patients required revision of the prosthesis or additional procedures (Table 3).

**Table 3.** Complications of the patients included in the study (n=36).

Variable	n	%
Intraoperative complications	2	5.6
Femur fracture	2	5.6
Postoperative complications	4	11.11
Surgical wound dehiscence	1	2.78
Postoperative infection	0	0
Prosthesis dislocation	0	0
Nerve injury	2	5.6
Cup loosening	0	0
Stem loosening	0	0
Prosthesis fracture	0	0
Deep vein thrombosis	0	0
Pulmonary embolism	1	2.78
Persistent sensory nerve injury for 3 months	1	2.78
Persistent motor nerve injury for 3 months	1	2.78
Requirement for prosthesis revision	0	0

Source: Own elaboration.

Regarding radiological outcomes (Table 4), it was identified that the positioning of the material was corroborated in all procedures using an intraoperative image intensifier. In addition, the inclination of the cup was measured in all the prostheses and had an average of 45.4° (SD: 5.3°), which is within the safe zone established by Lewinnek.<sup>5</sup> There was a difference of 2.4mm between the femoral offset before and after the procedure and 0.633mm between the average preoperative and postoperative lateralization.

**Table 4.** Radiological findings of the patients included in the study (n=36).

Variable	Mean	Standard deviation
Cup inclination angle	45.389	5.33
Pre-surgical offset		
Millimeters	49.858	8.26
Position (n; %)		
Neutral	19	52.78
Negative	7	19.44
Positive	10	27.78
Postoperative offset		
Millimeters	52.278	8.08
Position (n; %)		
Neutral	20	55.56
Negative	5	13.89
Positive	11	30.56
Difference between pre- and post-surgical offset	2.419	7.57
Laterality		
Presurgical	33.522	7.15
Postsurgical	32.889	5.64

Source: Own elaboration.

## Discussion

The present study found a low frequency of complications in patients who underwent total hip arthroplasty using the DAA, most of whom were older adults. In addition, it was identified that the main reason for requiring such surgery was osteoarthritis, the average operative time was less than two hours, and early assisted mobility was carried out in all patients.

The frequency of complications of the DAA in hip arthroplasty reported in the literature is 6%, so it is considered low compared to that of other surgical approaches.<sup>8</sup> However, the outcomes of neurological lesions described are varied; in this regard, a higher prevalence of meralgia paresthetica has been found in patients operated on using the DAA than in those in whom the replacement was performed using a posterior<sup>8</sup> or lateral approach.<sup>1</sup> This difference could be explained by factors such as the position of the patient during surgery, the dissection of the subcutaneous plane, as well as the position of the retractors and soft-tissue traction during the procedure.<sup>8</sup> However, it should be noted that the frequency of this complication decreases as the surgeon's experience improves and when the incision is made laterally.<sup>3</sup> It is worth mentioning that, in our study, only one patient presented femoral cutaneous nerve injury and recovered with rehabilitation.

Regarding the complications of THR surgery, it has been described that the frequency of femoral fracture and dislocation of the prosthesis in the immediate postoperative period is lower with the DAA (0.61%-0.96%)<sup>1</sup> than with other approaches such as the posterolateral approach (2.06-2.28%).<sup>4,9</sup> This may be related to the occurrence of muscle disinsertion in the lateral and posterior approaches, since the gluteus medius and gluteus minimus muscles are sectioned in the lateral approach, while posterior capsulotomy and section of the rotator muscles are performed in the posterior approach, generating greater instability and favoring prosthetic dislocation.<sup>1,3,9</sup> Meanwhile, with the DAA, the muscular plane is preserved, which favors the patient's recovery process since tissue damage and pain are reduced, allowing early mobilization and a quick resumption of daily activities.<sup>10</sup> In this study, none of the patients presented dislocation of the prosthesis and all were able to mobilize (walking with the aid of a walker) on the first postoperative day. Moreover, it has been reported that the use of this technique significantly decreases hospital stay (1.8 days,  $p=0.004$ ) and surgical times (8.8 minutes,  $p=0.048$ ).<sup>2</sup>

In the present study, the average operative time was 73 minutes, which is similar to that described in the literature, which has reported that the average operative time in THR surgery with the DAA is shorter compared to other approaches such as the lateral approach (78-81 minutes versus 85 minutes).<sup>1,5</sup> However, in a systematic review that included 18 studies published between 2012 and 2020, it was demonstrated that in 10 of these, the posterolateral approach had a shorter surgical time than the DAA, which may be associated with the surgeon's learning curve of the surgical technique, since it has been described that this technique should not be used by beginner surgeons, but by those with experience in hip arthroplasty.<sup>9</sup>

Some studies have identified osteoarthritis as one of the main causes of surgical indication for total hip replacement, followed by intracapsular femoral fractures and other less frequent conditions such as secondary osteoarthritis and avascular necrosis,<sup>2,5</sup> which is similar to what was found in this study.

Since this is a single-center study, extrapolation of results is limited; however, a significant number of subjects were included. On the other hand, an adequate DAA learning curve is essential to obtain good results, as they depend on the surgeon's expertise. Furthermore, this technique can be used in people with osteoarthritis of the hip or intracapsular fractures of the hip joint. Comparative studies on different surgical techniques are required in order to establish their advantages regarding the surgical procedure and their benefits for the patient in a more precise manner.

## Conclusion

Patients who underwent surgery using the DAA had a shorter operative time, little intraoperative bleeding and a low rate of intraoperative and postoperative complications, which allowed early recovery and, in turn, may have favored rapid incorporation into daily activities in these patients.

## Conflicts of interest

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