Orthopedics and Rheumatology
Open Access Journal
ISSN: 2471-6804

Research Article
Volume 25 issue 2- December 2025
DOI: 10.19080/OROAJ.2025.25.556165

Ortho & Rheum Open Access J

Minimally Invasive Approach to Intertrochanteric Hip Fractures

Lázaro Martínez Aparicio[1], Lázaro Martín Martínez Estupiñan[2], Leonardo Martínez Aparicio[2], Claribel Plain Pazos[3]* and Yadira Pardillo Niebla[4]

[1]*Specialist in Orthopedics and Traumatology, Instructor Professor, University General Hospital Mártires del 9 de Abril. Villa Clara. Cuba*

[2]*Doctor in Medical Sciences, II Degree Specialist in Orthopedics and Traumatology, Full Professor, University General Hospital Mártires del 9 de Abril. Villa Clara. Cuba*

[3]*I and II Degree Specialist in Comprehensive General Medicine, Faculty of Medical Sciences of Sagua la Grande, Cuba*

[4]*Bachelor of Nursing, Instructor Professor, Faculty of Medical Sciences of Sagua la Grande, Cuba*

Submission: November 26, 2025; **Published**: December 19, 2025

***Corresponding author:** Claribel Plain Pazos, Faculty of Medical Sciences of Sagua la Grande, Villa Clara, Cuba

Abstract

Introduction: Minimally invasive surgical techniques have gained interest among orthopedic surgery specialists in the last decade. Hip fractures in the elderly represent a huge social and health problem as they are a major cause of morbidity, functional loss, and mortality in the elderly.

Objective: To conduct a study of the minimally invasive approach to hip fractures.

Methods: A prospective, multicenter study involving two orthopedic services in different countries, with the same primary surgeon, was conducted. Eighty-one patients were studied with a minimally invasive approach and internal fixation using DHS 81 at the Mártires del 9 de Abril Provincial Hospital in Cuba, and 30 patients underwent surgery using the minimally invasive technique to place the internal fixation using the Endovis system. Between January 1, 2020, and June 30, 2025, the mean age of the cases was 77.4 years. The female sex predominated, as did the right hip. There was no need for intraoperative blood draw. The approaches averaged between 2 and 4 cm, and the outcome was excellent in most patients.

Conclusion: The use of minimally invasive techniques allows for the best outcome in cases of hip fractures treated surgically.

Keywords: Hip fractures; Minimally invasive surgery; Dynamic Hip Screw; Osteoporosis; Radiological

Abbreviations: DHS: Dynamic Hip Screw

Introduction

Minimally invasive surgical techniques have gained interest among orthopedic surgery specialists in the last decade. Hip fractures in the elderly currently represent a huge social and healthcare problem as they are a significant cause of morbidity, functional loss, and mortality in the elderly. These commonly occur in old age, with intertrochanteric fractures being the most common. The ENDOVIS intramedullary system is widely popular in Europe and provides stable fixation with a minimally invasive procedure. The Dynamic Hip Screw (DHS) plate/nail is a highly recommended fixation system for patients with osteoporosis and is relatively easy to use and offers secure fixation.

There is controversy regarding the use of fixation materials; for stable hip fractures, fixation with a sliding plate/screw is considered the "gold standard" of treatment [1]. A wide-threaded lag screw is used, capable of sliding in the fracture plane and supported by a lateral plate. To achieve proper fixation of the system, a series of fundamental rules must be followed. In the surgical treatment of hip fractures, regardless of the type of fracture and the technique used, the experience of orthopedic surgery specialists has proven to be a fundamental factor in the outcome. Orthopedic procedures are associated with substantial blood loss, which can result in increased morbidity and mortality, hospital stays, and costs. The demand for this type of surgery has increased secondary to the rising prevalence of obesity and the aging population, forcing specialists to seek ways to minimize the associated risks. In these cases, minimally invasive approaches to the injury are preferred [2].

There are several known techniques that contribute to blood conservation and are frequently used in the specialty of Orthopedics and Traumatology: pneumatic cuff, spinal anesthesia,

induced hypotension, normovolemic hemodilution, intraoperative and postoperative blood salvage, the use of drugs that stimulate coagulation and inhibit fibrinolysis, the use of erythropoietin in the preoperative and postoperative periods, and minimally invasive surgery [3] Elderly patients should not be confined to bed, so the current trend is surgical treatment, mobilization, and early weight-bearing, a condition that can be effectively achieved with DHS and Endovis. Both osteosynthesis methods are widely used; other systems have been designed to overcome this problem, with very mixed results. To reduce morbidity and improve the results achieved with this technique, several authors have proposed minimally invasive surgery [4,5].

Method

A prospective, descriptive, cross-sectional, multicenter study was conducted involving two orthopedic services in different countries, with the same primary surgeon. Eighty-one patients were studied with minimally invasive approach and internal fixation using DHS 81 at the Mártires del 9 de Abril Provincial Hospital in Cuba, and 30 patients who underwent surgery using the minimally invasive technique to place the internal fixation using the Endovis system. The study took place between January 1, 2020, and June 30, 2025. The protocol for the services involved was followed. Patients were selected using inclusion and exclusion criteria, with 31A1, 31A2, and 31A3 intertrochanteric fractures (Figure 1), operated on by the same surgical team leader. The minimally invasive technique was used as the approach to place the internal fixation, which was performed with a DHS plate nail (Figure 2) and with Endovis (Figure 3).

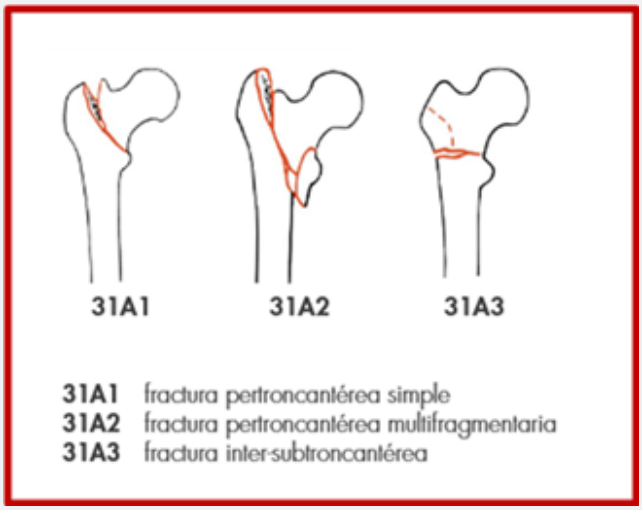

Figure 1: AO classification for intertrochanteric fractures treated with a minimally invasive approach.

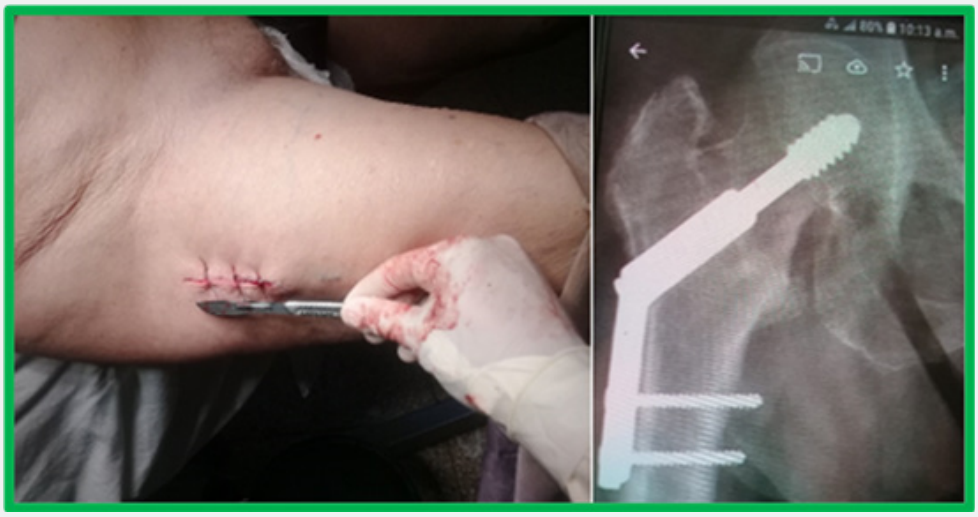

Figure 2: Minimal approach for osteosynthesis in hip fracture with DHS plate nail.

How to cite this article: Lázaro Martínez A, Lázaro Martín Martínez E, Leonardo Martínez A, Claribel Plain P, Yadira Pardillo N, et al. Minimally Invasive Approach to Intertrochanteric Hip Fractures. Ortho & Rheum Open Access J. 2025; 25(2): 556165. DOI: 10.19080/OROAJ.2025.25.556165

Figure 3: Minimal approach for internal fixation of hip fractures with the Endovis intramedullary nail.

Inclusion Criteria:

- Provide consent to participate in the study.
- Present a hip fracture type 31A1, 31A2, or 31A3 according to the AO Group Classification.

Exit Criteria:

- Discontinue follow-up by the service or be referred to another institution for reasons other than the hip fracture.

A survey form was created (name and surname, age, sex, home address, telephone number, municipality of origin, date and time of the fracture, type of fracture, affected limb, lag screw size, number of holes in the blade, surgical time, and intraoperative and postoperative bleeding) and completed as the cases were treated. Clinical and radiological outcome was another study variable and was divided into three categories:

- **Excellent:** radiological signs of consolidation within the appropriate time frame without complications.
- **Fair:** delayed consolidation, without complications.
- **Poor:** non-union, pseudoarthrosis, or serious complications.

Descriptive statistics with absolute and relative frequency distributions and measures of central tendency such as mean, standard deviation, mode, ratio, and percentage analysis were used for data processing and analysis, supported by Excel software from the Office 2010 suite for Windows. Ethical considerations were taken into account in the research, and the commitment to use the data obtained strictly for the proposed objectives was respected, while maintaining the anonymity of the participants' personal data.

Results

Surgical approaches do not exceed 4.5 cm in most cases. Two- or three-hole blades with an 80 cm lag screw were used in more than half of the cases. In patients treated with Endovis, the medium-sized nail with an 85 cm lag screw was used, slightly larger than the DHS, where the size 80 lag screw predominates. Transoperative and postoperative bleeding was very minimal, so no transfusion was necessary during surgery. Surgical time was less than 35 minutes for both procedures (Table 1).

Discussion

Over the past three decades, there has been a significant increase in the incidence of hip fractures. This trend is expected to begin due to the increase in the number of elderly people, a consequence of longer life expectancy and the impact of existing risk factors in society on individuals over 65 years of age. In 1990, approximately 1.3 million hip fractures occurred worldwide. Current studies estimate that this figure will double by the end of 2025 and increase to 6.3 million fractures annually by 2050 [6]. If a hypothetical hierarchical order of surgical treatment objectives for elderly patients with hip fractures were established, the primary objective would be to save lives, which is achieved in approximately 70% of cases.

The second most important objective would be to minimize morbidity; recovery of functional status would therefore occupy a tertiary position, although essential to minimize the psychological impact of the fracture. However, only 50% of these patients achieve a functional level comparable to that prior to the fracture, and loss of functional status after surgery is the most important predictor of depression after a hip fracture. Rapid recovery of functional status is essential in the management of these patients. Regarding surgical treatment, achieving this objective inevitably

How to cite this article: Lázaro Martínez A, Lázaro Martín Martínez E, Leonardo Martínez A, Claribel Plain P, Yadira Pardillo N, et al. Minimally Invasive Approach to Intertrochanteric Hip Fractures. Ortho & Rheum Open Access J. 2025; 25(2): 556165. DOI: 10.19080/OROAJ.2025.25.556165

requires the application of techniques that provide sufficient stability to the fracture and allow for early weight-bearing [3,7]. Currently, the DHS plate nail is the standard of care for stable hip fractures (AO 31.A1); However, it is also used for fractures with greater complexity in the fracture line (AO 31.A2).

Table 1: Epidemiology, age, sex, fracture type, and blood requirement.

Characteristics	Variables	MOS type	
		DHS	Endovis
Data on total fractures	Variables	n=577	n=199
	31. A1.		
Fracture type (Total)	31. A2.		
	31. A3.		
Affected limb (Total)	Derecho	302/52,3	103/51,6
	Izquierdo	275/47,7	96/48,4
Sample data	Variables	n=81	n=30
Blood requirements in minimally invasive surgery	Pre operatorio	11/13,3	03-Oct
	Trans	-	-
	operatorio		
	Post operatorio	5/6,4	-
Surgical Incision Size (SID) (cm)	menos 2,5	20/26,4	-
	Entre 2,5 y 3	33/40,3	-
	Entre 3 y 4	17/20,8	30/100
	Mas de 4	11/13,3	-
	2	44/53,3	
Number of Blade Holes (SID)	3	33/40,3	
	4	4/6,4	
Lag Screw Size	70	5/6,4	
	75	11/13,3	5
	80	38/46,7	8
	85	17/20,8	12
	90	5/6,4	3
	95	5/6,4	2
Endovis Nail	Corto	-	
	Medio		30/100
	Largo	-	
Intraoperative bleeding	Muy poco	70/86,7	30/100
	Poco	11/13,3	-
	Moderado o grande	-	-
Surgical time	Menor de 35 minutos	72/88,9	30/100
	De 36 a 45 minutos	9/11,1	-
	Más de 45 minutos		

How to cite this article: Lázaro Martínez A, Lázaro Martín Martínez E, Leonardo Martínez A, Claribel Plain P, Yadira Pardillo N, et al. Minimally Invasive Approach to Intertrochanteric Hip Fractures. Ortho & Rheum Open Access J. 2025; 25(2): 556165. DOI: 10.19080/OROAJ.2025.25.556165

Table 2: Comparison of outcomes of cases operated on using the minimally invasive approach according to the MOS used.

Year of the study	Total number of fractured patients	Minimal approach with DHS	Minimal approach with Endovis standard half nail	Evolution		
				Excellent	Satisfactory	Not satisfactory
2020	107	15	-	15/100%	-	-
2021	112	16	-	15/93,7%	1/6,3%	-
2022	109	20	-	18/90,0%	1/5,0%	1/5,0%
2023	119	13	-	14/100%	-	-
2024	130	12	-	11/91,7%	1/8,3%	-
2025	199	5	-	5/100%	-	-
			30	30/100%		

The rates of minimally invasive osteosynthesis use with DHS were low compared to those using Endovis (Table 2). Clinical and radiographic outcomes in the office were good in most cases, with no complications associated with the technique or postoperative outcomes. No postoperative complications occurred in any of the cases included in the study, and loss of fixation, nonunion, delayed union, and surgical wound infection were ruled out. All were alive six months after surgery.

The use of the cephalomedullary nail (Endovis) demonstrates that better functional results lead to a lower complication rate [8]. Although the number of cases has increased compared to the previous year and the average age has decreased slightly, this fracture is very common in this setting and occurs primarily in elderly patients with some degree of physical deterioration [9]. Laffita et al. [10] found that 14.1% of their cases had dementia. Hence the importance of minimizing the need for transfusions due to the potential risks of erythrocyte and leukoplatelet alloimmunization and any immunological conflict in general, in addition to preventing possible viral or parasitic transmission from a potentially contaminated donor and due to religious conflicts regarding the use of blood [3].

Currently, great importance is placed on the rational use of blood and its derivatives, and it is a widespread belief among medical and paramedical personnel who utilize its benefits that it is necessary to transfuse more effectively and, logically, to do so less. Hip surgery is considered a high-risk procedure for bleeding. It is important to maintain blood replacement, considering that losses are acute and occur in elderly patients with comorbidities. The mortality rate in patients with blood loss exceeding 500 ml is 38.5, and the risk is 2.5 times higher if blood loss exceeds 500 ml. Although bleeding is difficult to quantify in this operation, the influence of this variable on mortality is due to the complications caused by acute anemia [8]. Minimally invasive surgery for intertrochanteric hip fractures is one of the most up-to-date methods in modern traumatology and provides fracture stability [10].

This procedure is performed with a tiny direct incision, and patients tend to recover more quickly and with less discomfort than traditional stabilization techniques. Several authors have reported the advantages of the technique in their results Compared with the traditional procedure, it is an aesthetic procedure that involves minimal bleeding and less postoperative pain, and a shorter duration of surgery and hospital stay, without sacrificing the stability of the reduction or alignment [11-13]. The immediate postoperative period is less painful, mobility is resumed sooner, and rehabilitation is shorter [14]. The technique is performed using a small set without additional equipment.

The results obtained in this study are very similar to those reported by other Cuban authors [8,9,13] but the use of this type of minimal approach is exceptional. However, as reported in the present study, complications are few and surgical time is minimal. Longer surgical time is associated with increased bleeding; many studies [7,14-16] report this relationship and even establish that a one-minute increase in surgical time results in a 3.2 ml increase in blood loss. A 30-minute surgical time increases the risk of transfusion requirements by 1.8 times. Other studies show similar results and establish that maximizing operative time is not only associated with increased productivity but also with reduced blood loss and the risk of transfusion requirements [17-19]. Despite the limitations of this study, with its limited comparative design and limited study period, it is believed that it would contribute to the evaluation of expected benefits for orthopedic surgery specialists who treat fractures of the proximal femur.

Conclusion

Hip fracture is a common condition in the elderly, with a predominance in women. They generally have good cognitive and general health. Despite the low average preoperative hematocrit, the use of blood is limited due to the advantages of minimally invasive osteosynthesis and approaches less than 4 cm. The use of minimally invasive techniques allows for improved outcomes in patients surgically treated with hip fractures.

How to cite this article: Lázaro Martínez A, Lázaro Martín Martínez E, Leonardo Martínez A, Claribel Plain P, Yadira Pardillo N, et al. Minimally Invasive Approach to Intertrochanteric Hip Fractures. Ortho & Rheum Open Access J. 2025; 25(2): 556165. DOI: 10.19080/OROAJ.2025.25.556165

References

1. Delgado Carro R, Martínez Aparicio L, Martínez Aparicio L, Ibañez Zamora E, et al. (2021) Population Aging and Hip Fracture. CMHRJ 1(2): 38-41.
2. Martínez Aparicio L, Martínez Aparicio L, Martínez Estupiñan LM, Plain Pasos C, et al. (2021) First Approach to Minimally Invasive Surgery for Hip Fracture - Short Communication. Ame J Surg Clin Case Rep 3(2):1-2.
3. Shah FA, Alam W, Ali MA (2017) Intertrochanteric fractures; Frequency of lag screw cut out fixed with dynamic hip screw. Professional Med J 24(11): 1740-1744.
4. Sizer SC, Cherian JJ, Elmallah R, Pierce TP, Beaver WB, et al. (2015) Predicting blood loss in total knee and hip arthroplasty. Orthop Clin N Am 46(4): 445-459.
5. Martínez Aparicio L, Martínez Estupiñán LM, Lugo Pijuan LA (2021) Cirugía mínimamente invasiva para la fractura de cadera. Informe de caso. Acta méd centro 15(2): 314-319.
6. Ramos-Maza E, Chávez-Covarrubias G, García-Estrada F, Buffo-Sequeira I, Domínguez-Barrios C, Meza-Reyes G (2016) Principio biomecánico del sostén. Acta Ortopédica Mexicana.
7. Gokulakrishnan PP, Manohara PK, Sakthivel A (2017) Use of Minimal Invasive Technique in Dynamic Hip Screw Fixation. J Minim Invas Orthop 4(1): e19.
8. Morales Piñeiro S, Morera Estévez L, Morales Morera T, Bretón Espinosa L, Mata Cuevas R, et al. (2019) Comorbilidad y mortalidad por fractura de cadera en la región noroeste de Villa Clara. Acta Méd Centro 13(3): 209-213.
9. Gómez Sarduy A, Morales Piñeiro S, López González MH, Mata Cuevas R (2018) Efectividad de acciones educativas dirigidas a prevenir fracturas de cadera por caídas en adultos mayores. Cuba Salud.
10. Laffita Zamora J, González Pedroso CD, García García E, Pérez Casanova M, Brown Pérez A, et al. (2017) Variables perioperatorias que influyen en la morbimortalidad de pacientes operados de fractura de cadera. Rev Cub Med Mil 46(4): 313-326.
11. Pountos I, Giannoudis PV (2016) The management of intertrochanteric hip fractures. Orthopaedics and Trauma 30(2): 103-107.
12. Méndez-Gil A, Fernández-Valencia Labordea JÁ, Estrada-Masllorensb JM, Plaza- García R, et al. (2014) Técnica DHS mínimamente invasiva: menor tiempo quirúrgico con similares resultados en el postoperatorio inmediato respecto al DHS convencional. Estudio retrospectivo de cohortes. Rev Esp Cir Ortop Traumatol 58(6): 351-356.
13. Morales Piñeiro S, Morera Estévez M, Martínez Aparicio L, Cedré González JC, Mata Cuevas R, et al. (2020) Caracterización epidemiológica de la fractura de cadera. Acta Méd Centro 14(2): 193-196.
14. Kumar J, Kumar D, Sahito B, Ali M (2015) Minimally Invasive Dynamic Hip Screw for Fixation of Stable Intertrochanteric Fractures of The Femur. JPOA 27(1): 3-9.
15. Sanjeev Reddy B, Sanjeevi Bharadwaj (2014) Stable Intertrochanteric Fractures of Femur Treated with Minimally Invasive Sliding Hip Screw Fixation – Outcomes, Pearls and Pitfalls. Journal of Evolution of Medical and Dental Sciences 46(3): 11242-11248.
16. Dhakad RKS, Kapoor A, Gupta S (2015) A comparative study of fixation of fracture Intertrochanteric femur with DHS by MIS versus Conventional muscle reflection surgical approach. OJMPC 21(2): 50-56.
17. Repantis T, Bouras T, Korovessis P (2015) Comparison of minimally invasive approach versus conventional anterolateral approach for total hip arthroplasty: a randomized controlled trial. Eur J Orthop Surg Traumatol 25(1): 111-116.
18. Suárez Monzón H, Yero Arniella LA, Rodríguez Fernández FR, Águila Tejeda G (2016) Resultados de la atención continuada en el tratamiento de la fractura. Medisur 14(2): 173-179.
19. Tabares Neyra H, Díaz Quesada JM, Tabares Sáez H, Tabares Sáez LI (2021) Actualización sobre prevención y tratamiento de la pérdida de sangre quirúrgica. Rev Cubana Ortop Traumatol 31(1): 92-109.

DOI: 10.19080/OROAJ.2025.25.556165

How to cite this article: Lázaro Martínez A, Lázaro Martín Martínez E, Leonardo Martínez A, Claribel Plain P, Yadira Pardillo N, et al. Minimally Invasive Approach to Intertrochanteric Hip Fractures. Ortho & Rheum Open Access J. 2025; 25(2): 556165. DOI: 10.19080/OROAJ.2025.25.556165