

Preliminary Outcomes with Dual Mobility Cups in Patients Older Than 65 With Hip Fractures. A Retrospective Analysis of 102 Patients

Germán Garabano, Manuel I. Alonso, Leonel Pérez Alamino, Adrián Jaime, Matías L. Cullari, César Á. Pesciallo
Orthopedics and Traumatology Service, Hospital Británico, Autonomous City of Buenos Aires, Argentina.

ABSTRACT

Objective: This retrospective study aimed to assess the functional outcomes and dislocation rate in the treatment with dual mobility prostheses in patients older than 65 with hip fractures. **Materials and Methods:** We analyzed all patients treated between 2017 and 2021 for hip fractures in our service. We included patients older than 65 years, treated with dual mobility cups, and a minimum follow-up of 24 months. We analyzed demographic data, comorbidities, functional outcomes (Parker score and Harris Hip Score, HHS), complications (infection, dislocation, loosening), reoperations, and revisions. **Results:** We included 102 hip fractures (75 medial and 27 intertrochanteric) in 102 patients. Seventy-four (72.5%) were women, the mean age was 80.59 ± 6.92 years, the mean Charlson index was 4.71 (range 3-10), and ASA was 2.47 (1-4). 93.1% started walking on the second postoperative day. 94.1% presented excellent or very good outcomes according to the HHS, the postoperative Parker index did not show significant differences in comparison to the preoperative one ($p < 0.05$). The average follow-up was 30 months (range 24-60). There were 8 (7.84%) complications: 2 (1.9%) deep vein thrombosis, 4 (3.9%) pulmonary thromboembolism, 3 infections (2.9%), and 1 (0.9%) dislocation. The reoperation rate was 2.9%. **Conclusions:** We obtained acceptable functional outcomes using dual mobility cups with a relatively low dislocation rate (0.9%). This suggests that these implants are an option to consider in treating these lesions.

Keywords: Elderly patients; hip fracture; double mobility prosthesis; dislocation; reoperation.

Level of Evidence: IV

Resultados iniciales del uso de cotilos de doble movilidad en pacientes >65 años con fractura de cadera. Análisis retrospectivo de 102 casos

RESUMEN

Objetivo: El objetivo de este estudio retrospectivo fue evaluar los resultados funcionales y la tasa de luxación en pacientes <65 años con fractura de cadera operados con prótesis de doble movilidad. **Materiales y Métodos:** Se analizó a los pacientes tratados por una fractura de cadera entre 2017 y 2021. Se incluyó a pacientes >65 años, tratados con copas de doble movilidad y un seguimiento mínimo de 24 meses. Se analizaron los datos demográficos, las comorbilidades, los resultados funcionales (Parker y puntaje de Harris), las complicaciones (infección, luxación, aflojamiento), las reoperaciones y revisiones. **Resultados:** Se trataron 102 fracturas de cadera (75 mediales y 27 intertrocantericas) en 102 pacientes. El 72,5% eran mujeres (media de la edad 80.59 ± 6.92 años), el Índice de Comorbilidad de Charlson promedio fue de 4,71 y el puntaje ASA, 2,47. El 93,1% comenzó a caminar al segundo día de la cirugía. Según el puntaje de Harris, los resultados fueron excelentes o muy buenos en el 94,1%; los puntajes de Parker preoperatorio y posoperatorio no difirieron significativamente ($p < 0,05$). El seguimiento promedio fue de 30 meses. Hubo 8 (7,84%) complicaciones: 2 (1,9%) casos de trombosis venosa profunda, 4 (3,9%) de tromboembolismo pulmonar, tres infecciones (2,9%) y una (0,9%) luxación. La tasa de reoperaciones fue del 2,9%. **Conclusiones:** Con el empleo de copas de doble movilidad se obtuvieron resultados funcionales aceptables y una tasa de luxación relativamente baja (0,9%). Esto sugiere que estos implantes representan una opción en el tratamiento de estas lesiones.

Palabras clave: Pacientes añosos; fractura de cadera; prótesis de doble movilidad; luxación; reoperación.

Nivel de Evidencia: IV

Received on May 8th, 2023. Accepted after evaluation on July 4th, 2023 • Dr. LEONEL PÉREZ ALAMINO • leonelp95@gmail.com  <https://orcid.org/0000-0002-1563-6947>

How to cite this article: Garabano G, Alonso MI, Pérez Alamino L, Jaime A, Cullari ML, Pesciallo CA. Preliminary Outcomes with Dual Mobility Cups in Patients Older Than 65 With Hip Fractures. A Retrospective Analysis of 102 Patients. *Rev Asoc Argent Ortop Traumatol* 2023;88(5):520-526. <https://doi.org/10.15417/issn.1852-7434.2023.88.5.1757>

INTRODUCTION

The effectiveness of total hip arthroplasty (THA) in elderly adults with hip fracture has been demonstrated, making it a widely accepted therapeutic modality.^{1,2}

Despite the excellent functional outcomes achieved with this treatment, dislocation of the prosthesis is a relatively frequent complication.³ In older adults undergoing THA for hip fracture, the rate of dislocation is as high as 10%, which is five times higher than when performed for hip osteoarthritis.⁴

In recent years, the use of dual-mobility cups to treat these injuries has increased,⁵ as it combines Charnley's⁶ principle of a low-friction head with McKee and Watson-Farrar's⁷ principle of using a larger femoral head to prevent dislocation. Different authors have reported relatively low dislocation rates with these implants in hip fracture patients.^{8,9} These cups consist of a head that moves within a larger secondary acetabular cup that, in turn, has mobility over the cup. By breaking down motion, this design allows for a wider range of motion without compromising intraprosthetic stability.^{10,11}

Very few reports have been published on the use of these implants in hip fractures in our country.^{11,12}

The aim of this retrospective study was to evaluate the functional outcomes and dislocation rate of dual mobility prosthesis treatment in patients >65 years of age with hip fracture.

MATERIALS AND METHODS

We retrospectively analyzed all patients treated consecutively for hip fracture in our Service between January 2017 and June 2021. Inclusion criteria were: hip fracture, treatment with a dual mobility prosthesis, age >65 years and a minimum follow-up of 24 months. Patients treated with another type of arthroplasty (hemiarthroplasty or THA without dual mobility cup), history of surgery on the affected hip, pathological fractures and those treated for inveterate fractures (>90 days) were excluded.

Treatment with dual-mobility prosthesis was recommended for older patients (>65 years old) with poor bone quality evaluated on fracture radiography using the Dorr index, who were able to walk outside the home for at least 100 m, or had symptoms of hip osteoarthritis > Tönnis grade 2.

The national prostheses used were made of a metallic cup (Polygram), a mirror polished stem (Cyclon), and a 28 mm diameter modular metallic head attached to a dual-mobility polyethylene cup (Fico, Ortopedia Alemana, Argentina) (Figure). Depending on the cervico-diaphyseal angle, a standard offset or lateralized stem was used according to the preoperative planning. Prosthesis fixation on both prosthetic components was cemented in all cases.

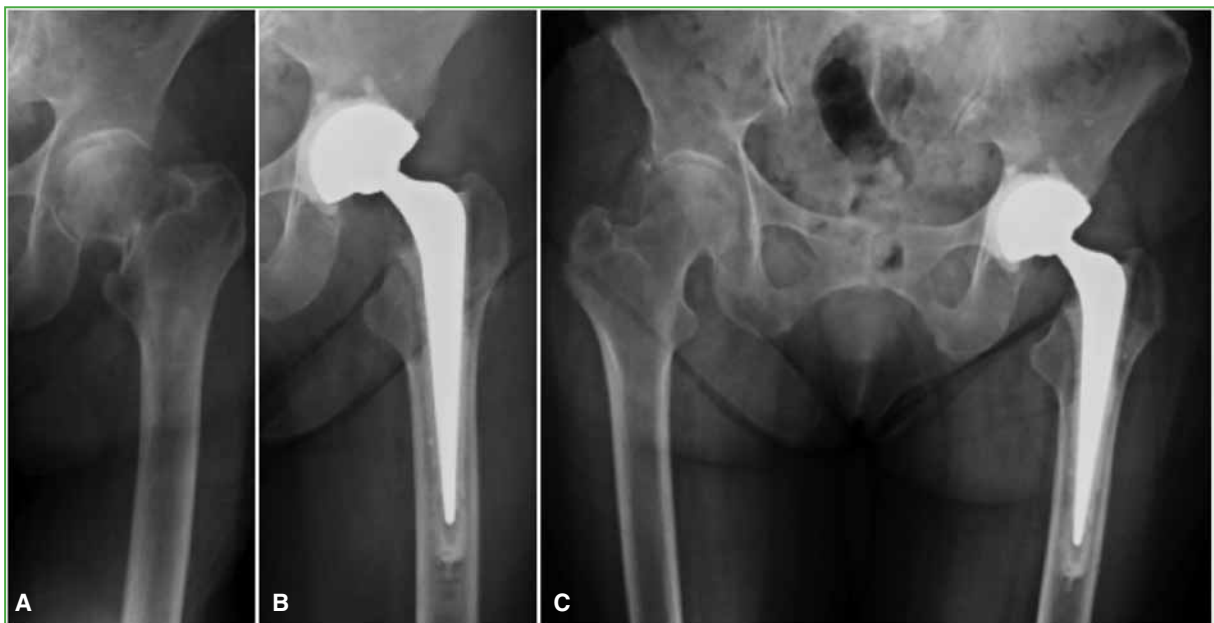


Figure. Anteroposterior radiograph of the left hip. **A.** An alteration of the shape compatible with medial fracture is observed. **B.** Reconstruction with total cemented prosthesis, with a dual mobility cup. **C.** Evolution at 12 months.

Surgical technique

The same surgical team operated on all patients in a laminar flow operating room, utilizing a Bauer approach in dorsal decubitus. Hypotensive spinal anesthesia was administered, except when general anesthesia was administered due to anesthetic or cardiologic indications.

To pressurize the cement, a distal plug was placed, and cementing was done retrogradely with a gun. In all cases, a continuous suture of the abductor mechanism was performed. Antithrombotic prophylaxis consisted of subcutaneous enoxaparin and bandages on both lower limbs for four weeks. As infectious prophylaxis, 1 g of cefazolin was administered intravenously (one dose before surgery and two doses after, every 8 h).

Rehabilitation was the same for all patients and consisted of isometric exercises and bed sitting on the first day after surgery. From the second day on, standing and walking with a walker without weight-bearing restrictions were permitted, depending on pain tolerance. Postoperative clinical-radiological controls were performed after 3 and 6 weeks, after 3, 6 and 12 months, and then annually.

At the time of closing the study, patients who had not attended the control in the previous year or who had not finished the follow-up were summoned for control or phoned to inquire if they were able to walk and if they did so with assistance, and a radiographic control was requested.

Variables analyzed

Gender, age, fracture type (medial or lateral), comorbidities (Charlson Comorbidity Index¹³ and American Society of Anesthesiologists (ASA) classification), and previous walking abilities (Parker score)¹⁴ were the variables examined by analyzing hospital records.

The days from admission to surgery were also documented, because some patients required some form of clinical stabilization before surgery due to comorbidities, as well as the postoperative day they began walking.

Anteroposterior and lateral hip radiographs were analyzed for signs of demarcation or loosening of components according to the DeLee-Charnley and Gruen zones.¹⁵ Any complications inherent to the procedure and reoperations were also recorded.

The objective analysis of the results was performed according to the Harris hip score criteria,¹⁶ grouping them into excellent, good, fair and poor, and with the Parker score after surgery.

Statistical Analysis

Qualitative variables are expressed as frequency and percentages, and numerical variables as mean and standard deviation or median and interquartile ranges, according to their distribution. The comparative analysis of the categorical variables was performed with the chi-squared test (or Fisher's exact method), while the numerical variables were analyzed with Student's t-test. A p-value <0.05 was considered statistically significant.

All data were entered into an Excel® spreadsheet (Redmond, USA) and the GraphPad Prism® 9.0 program (LaJoya, CA, USA) was used for statistical calculations.

RESULTS

In the period analyzed, 257 patients with hip fractures were treated, 155 were excluded (98 treated with hemiarthroplasty; 27, with THA without a dual mobility cup; 11 pathological fractures, 11 cases lost to follow-up, 6 with a history of surgery on the fractured hip and 2 inveterate hip fractures).

The final series consisted of 102 patients with 102 hip fractures (75 medial [73.5%] and 27 lateral [26.5%]). The characteristics of the patients analyzed are detailed in the [Table](#).

The average number of days from hospitalization to surgery was 2.12 (range 1-16). Seventy-three patients (71.5%) were operated on before 72 h of admission and a subgroup of 29 patients required stabilization of some clinical parameter to face surgery. The average time from admission to surgery for this group was 5.8 days (range 4-16).

Gait and need for assistance after surgery

Regarding walking, 95 (93.1%) patients started walking on the second day after surgery; five (4.9%), from the third day; one (0.9%), from the fourth day and another (0.9%) did not walk. At the last control, 47% needed assistance, 98 patients (96.1%) walked outside the home and three (2.9%) walked inside the home; one did not walk again.

Table. Summary of the characteristics of the patients included in the series.

Variable	
Female sex, n (%)	74 (72.5%)
Age (years), mean, standard deviation	80.59 ± 6.92
CCI, Median (range)	4.71 (3-10%)
ASA score, median (range)	2.47 (1-4%)
Preoperative Parker score, median (range)	6.36 (3-9%)
Ability to walk before fracture, n (%)	
Outside the home	102 (100)
With assistance	44 (43.1%)
Days from admission to THA, median (range)	2.12 (1-16%)
Type of fracture, n (%)	
Medial	75 (73.5%)
Lateral	27 (26.5%)
Follow-up (months), median (range)	30 (12-60)

CCI = Charlson Comorbidity Index; ASA = American Society of Anesthesiologists; THA = total hip arthroplasty.

The median Harris hip score at the end of follow-up was 85.9 (range 62-93), with excellent outcomes in 64 (62.7%) cases, good in 32 (31.4%), fair in four (3.92%) and poor in two (1.9%).

The mean postoperative Parker index was 6.17 (range 0-9), with no significant differences ($p = 0.43$) in comparison to preoperative values.

Complications, dislocation and reoperations

There were eight complications (7.84%): two (1.9%) cases of deep vein thrombosis that evolved favorably with medical treatment; four (3.9%) patients with pulmonary thromboembolism (two were cured with medical treatment and two were hospitalized in intensive care for three days; in one of them, it was also necessary to place a filter in the vein and antiplatelet therapy; their evolution was favorable). Three patients (2.9%) suffered acute infections: one superficial infection resolved with antibiotic treatment; and two deep infections were treated with surgical debridement plus intravenous antibiotics. One patient evolved favorably and the other died one month after the debridement. Finally, one (0.9%) suffered an intraoperative greater trochanter fracture requiring wiring.

Only one case of dislocation (0.9%) was detected up to the close of the study. Eight months after arthroplasty, the patient sustained a periprosthetic fracture of the greater trochanter as a result of a fall from his own height, had three episodes of dislocation, underwent trochanter osteosynthesis with a cable plate, and no episodes of dislocation recurred.

The reoperation rate was 2.9% ($n = 3$); two (1.9%) cases for infection and one (0.9%) for trochanter fracture and dislocation.

Finally, the mortality rate within 24 months of surgery was 10.7% ($n = 11$), two patients died in the immediate postoperative period (within 4 weeks).

Radiographic analysis

At the end of the study, one patient developed demarcation signs (DeLee-Charnley zone 1 and Gruen zone 2-6) that were not clinically significant, therefore he continued with controls.

DISCUSSION

The main finding of this study was that the use of dual mobility cups in older adults with hip fractures achieves acceptable functional outcomes associated with a low dislocation rate.

In the prosthetic treatment of hip fractures in patients >65 years of age, current evidence has shown that THA achieves superior functional outcomes in comparison to other therapeutic options, such as hemiarthroplasty. Blomfeldt et al.¹⁷ and Hedbeck et al.¹⁸ reported higher Harris hip scores in patients treated with a THA. In our series, 94.1% obtained excellent or good functional outcomes, with a mean Harris score of 85.9 at 24 months follow-up.

Another important aspect of treatment in this group of patients is that THA allows for rapid mobilization. This would decrease complications caused by prolonged bed rest, such as urinary tract infections, pneumonia, thrombosis and bedsores.^{17,18} Pfeufer et al. demonstrated that with prompt mobilization and full weight bearing, operated patients obtained higher Parker scale scores, indicating improved postoperative ambulatory capacity.¹⁹ In our study, 93.1% of patients were capable of walking 48 hours after surgery, with an average Parker score of 6.17 and no statistically significant differences from their preoperative values.

Postoperative dislocation is still a concern in hip fracture patients treated with THA. Johansson et al.²⁰ reported a 22% rate of instability after THA for medial fracture in patients >70 years with the use of conventional cups, whereas, in a meta-analysis of 746 patients, Lu-Yao et al.²¹ obtained dislocation rates of 10.7%. Comparatively, some reports on the use of dual-mobility cups in hip fracture patients indicate lower rates than those mentioned.^{11,21} In a systematic review of 10,783 THAs with dual-mobility cups, Darrith et al.²² published a dislocation rate of 0.46% in hip fracture patients, and Adam et al.²³ reported a rate of 1.4% on 214 hip fractures. In our study, the dislocation rate was similar to that reported by these authors, with an incidence of 0.9%. We believe that this rate is attributable, in part, to the use of dual-mobility cups and the increased range of motion they provide, but it could also be influenced by the approach taken. The direct lateral approach resulted in lower dislocation rates than the posterolateral technique.²⁴ We believe it also has advantages in the treatment of fractures, such as facilitating access to the fracture and the removal of the head-neck fragment; on the other hand, the dorsal decubitus position facilitates both limb length measurement and anesthesiologist actions in this fragile group of patients.

Taking into account the condition treated, the mean age of the series (80 years) and the comorbidities (Charlson comorbidity index 4.71), we understand that the complication (9.6%) and reoperation (2.9%) rates in this study were acceptable. Comparatively, Rashed et al.²⁵ published a 16% complication rate in 31 patients with a mean age of 79 years, while Adam et al.²³ reported a reoperation rate of 3.4% (3 for infection and 5 for periprosthetic fracture) in 214 patients with a mean age of 83 years. The latter is similar to that found in this study, where reoperations were mostly related to infectious processes (2/3) and periprosthetic fracture (1/3).

The limitations of this research are those of a retrospective study, in which the patients analyzed had a substantial amount of clinical history, which, when merged or added together, could influence the outcomes regarding complications through biases. Another limitation, although it was not the objective of the study, is represented by the absence of a control group, which could give greater strength to our results.

The strengths are centered on the number of patients operated on in the same institution, by the same surgical team, with identical preoperative and postoperative evaluations, and treated with the same surgical technique and implant.

CONCLUSION

The results of this study suggest that dual-mobility cup THA is a therapeutic option to consider in older adults with hip fracture. The rate of good functional outcomes was 94% and the postoperative dislocation rate was low.

Conflict of interest: The authors declare no conflicts of interest.

G. Garabano ORCID ID: <https://orcid.org/0000-0001-5936-0607>

M. I. Alonso ORCID ID: <https://orcid.org/0009-0007-2241-2152>

A. Jaime ORCID: <https://orcid.org/0009-0002-3175-6006>

M. L. Cullari ORCID ID: <https://orcid.org/0000-0002-6058-6686>

C. Á. Pesciallo ORCID ID: <https://orcid.org/0000-0002-4461-8465>

REFERENCES

1. National Clinical Guideline Centre (UK). The management of hip fracture in adults [Internet]. London: Royal College of Physicians (UK); 2011. PMID: 22420011
2. Parker MJ, Gurusamy KS, Azegami S. Arthroplasties (with and without bone cement) for proximal femoral fractures in adults. *Cochrane Database Syst Rev* 2010;6(6):CD001706. <https://doi.org/10.1002/14651858.CD001706.pub4>
3. Yu L, Wang Y, Chen J. Total hip arthroplasty versus hemiarthroplasty for displaced femoral neck fractures: meta-analysis of randomized trials. *Clin Orthop Relat Res* 2012;470(8):2235-43. <https://doi.org/10.1007/s11999-012-2293-8>
4. Gjertsen JE, Lie SA, Fevang JM, Havelin LI, Engesaeter LB, Vinje T, et al. Total hip replacement after femoral neck fractures in elderly patients: results of 8,577 fractures reported to the Norwegian Arthroplasty Register. *Acta Orthop* 2007;78(4):491-7. <https://doi.org/10.1080/1745367071001413>
5. Blomfeldt R, Törnkvist H, Ponzer S, Söderqvist A, Tidermark J. Comparison of internal fixation with total hip replacement for displaced femoral neck fractures. Randomized, controlled trial performed at four years. *J Bone Joint Surg Am* 2005;87(8):1680-8. <https://doi.org/10.2106/JBJS.D.02655>
6. Charnley J. The long-term results of low-friction arthroplasty of the hip performed as a primary intervention. *J Bone Joint Surg Br* 1972;54(1):61-76. PMID: 5011747
7. McKee GK, Watson-Farrar J. Replacement of arthritic hips by the McKee-Farrar prosthesis. *J Bone Joint Surg Br* 1966;48(2):245-59. PMID: 5937593
8. Tabori-Jensen S, Hansen TB, Stilling M. Low dislocation rate of Saturne®/Avantage® dual-mobility THA after displaced femoral neck fracture: a cohort study of 966 hips with a minimum 1.6-year follow-up. *Arch Orthop Trauma Surg* 2019;139(5):605-12. <https://doi.org/10.1007/s00402-018-3093-8>
9. De Martino I, Triantafyllopoulos GK, Sculco PK, Sculco TP. Dual mobility cups in total hip arthroplasty. *World J Orthop* 2014;5(3):180-7. <https://doi.org/10.5312/wjo.v5.i3.180>
10. Valdez S, Bertrand B. Cotilos con doble movilidad: principios, ventajas y resultados. *Rev Asoc Argent Ortop Traumatol* 2009;74(1):102-10. Available at: <http://www.scielo.org.ar/pdf/raot/v74n1/v74n1a16.pdf>
11. Philippot R, Farizon F, Camilleri JP, Boyer B, Derhi G, Bonnan J, et al. Survival of cementless dual mobility socket with a mean 17 years follow-up. *Rev Chir Orthop Reparatrice Appar Mot* 2008;94(8):e23-7. <https://doi.org/10.1016/j.rco.2007.10.013>
12. Peirano F. Artroplastia total de cadera con articulación de doble movilidad. Estudio retrospectivo en pacientes con riesgo de luxación. *Revista ACARO* 2019;5(1):16-24. Available at: https://acarorevista.org.ar/images/revistas/05_01/05_01_04_Peirano/05_01_04_Peirano.pdf
13. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis* 1987;40(5):373-83. [https://doi.org/10.1016/0021-9681\(87\)90171-8](https://doi.org/10.1016/0021-9681(87)90171-8)
14. Parker MJ, Palmer CR. A new mobility score for predicting mortality after hip fracture. *J Bone Joint Surg Br* 1993; 75(5):797-8. <https://doi.org/10.1302/0301-620X.75B5.8376443>
15. DeLee J, Charnley J. Radiological demarcation of cemented sockets in total hip replacement. *Clin Orthop* 1976; (121):20-32. PMID: 991504
16. Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fracture: treatment by mold arthroplasty. An end-result study using a new method of result evaluation. *J Bone Joint Surg Am* 1969;51(4):737-40. PMID: 5783851
17. Blomfeldt R, Törnkvist H, Eriksson K, Söderqvist A, Ponzer S, Tidermark J. A randomised controlled trial comparing bipolar hemiarthroplasty with total hip replacement for displaced intracapsular fractures of the femoral neck in elderly patients. *J Bone Joint Surg Br* 2007;89(2):160-5. <https://doi.org/10.1302/0301-620X.89B2.18576>
18. Hedbeck CJ, Enocson A, Lapidus G, Blomfeldt R, Törnkvist H, Ponzer S, et al. Comparison of bipolar hemiarthroplasty with total hip arthroplasty for displaced femoral neck fractures: a concise four-year follow-up of a randomized trial. *J Bone Joint Surg Am* 2011;93(5):445-50. <https://doi.org/10.2106/JBJS.J.00474>
19. Pfeufer D, Zeller A, Mehafey S, Böcker W, Kammerlander C, Neuerburg C. Weight-bearing restrictions reduce postoperative mobility in elderly hip fracture patients *Arch Orthop Trauma Surg* 2019;139(9):1253-9. <https://doi.org/10.1007/s00402-019-03193-9>

20. Johansson T, Jacobsson SA, Ivarsson I, Knutsson A, Wahlström O. Internal fixation versus total hip arthroplasty in the treatment of displaced femoral neck fractures: a prospective randomized study of 100 hips. *Acta Orthop Scand* 2000;71(6):597-602. <https://doi.org/10.1080/000164700317362235>
21. Lu-Yao GL, Keller RB, Littenberg B, Wennberg JE. Outcomes after displaced fractures of the femoral neck. A meta-analysis of one hundred and six published reports. *J Bone Joint Surg Am* 1994;76(1):15-25. <https://doi.org/10.2106/00004623-199401000-00003>
22. Darrith B, Courtney PM, Della Valle CJ. Outcomes of dual mobility components in total hip arthroplasty: a systematic review of the literature. *Bone Joint J* 2018;100-B(1):11-9. <https://doi.org/10.1302/0301-620X.100B1.BJJ-2017-0462.R1>
23. Adam P, Philippe R, Ehlinger M, Roche O, Bonnomet F, Molé D, Fessy MH; French Society of Orthopaedic Surgery and Traumatology (SoFCOT). Dual mobility cups hip arthroplasty as a treatment for displaced fracture of the femoral neck in the elderly. A prospective, systematic, multicenter study with a specific focus on postoperative dislocation. *Orthop Traumatol Surg Res* 2012;98(3):296-300. <https://doi.org/10.1016/j.otsr.2012.01.005>
24. Guan J, Jinag FJ, Zhao H. [Correlation analysis of the influence of direct lateral approach and posterolateral approach on reoperation and dislocation in patients with femoral neck fracture]. *Zhongguo Gu Shang* 2020;33(1):43-6. [Chinese] <https://doi.org/10.3969/j.issn.1003-0034.2020.01.008>
25. Rashed RA, Sevenoaks H, Shabaan AM, Choudry QA, Hammad AS, Kasem MS, et al. Functional outcome and health related quality of life after dual mobility cup total hip replacement for displaced femoral neck fractures in middle-aged Egyptian patients. *Injury* 2018;49(3):667-72. <https://doi.org/10.1016/j.injury.2018.01.006>