Review Article

Vajira Med J
Journal of Urban Medicine

Outcomes Comparison in the Management of Displaced Femoral Neck Fractures among Elderly Patients: Total Hip Arthroplasty versus Bipolar Hemiarthroplasty

Somchai Taosuwan MD[1], Varah Yuenyongviwat MD[1]

[1] *Department of Orthopedics, Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkhla 90110, Thailand*

ABSTRACT

Treating femoral neck fractures in the elderly demands careful strategies for optimal results. This review explores into the roles of total hip arthroplasty (THA) and bipolar hemiarthroplasty (BHA) in addressing these fractures, considering their distinct advantages. THA, catering to active elderly patients, delivers excellent pain relief, enhanced mobility, and sustained functionality. In contrast, BHA presents a more conservative option suitable for less mobile patients. Factors like surgery time and dislocation risks play a crucial role in selecting between the two options, while postoperative complications, including infections and joint issues, significantly impact recovery. Adequate post-surgical care and advancements in techniques are pivotal for overcoming these challenges. Continuous research and enhancements in diagnostic methods and post-surgical care are critical for refining strategies, ultimately improving the recovery and quality of life for elderly patients.

KEYWORDS: bipolar hemiarthroplasty, femoral neck fractures, total hip arthroplasty

INTRODUCTION

Femoral neck fractures are common among the elderly, with projections indicating that the worldwide annual incidence of hip fractures will reach 6.26 million by 2050[1]. Surgical intervention remains the primary treatment choice. Surgical options range from hip arthroplasty, typically used for displaced femoral neck fractures in elderly patients, to various fixation techniques such as multiple screw fixation, sliding hip screw, and intramedullary nail, usually used in younger patients[2]. Total hip arthroplasty (THA) involves replacing the entire hip joint, while bipolar hemiarthroplasty (BHA) replaces only the femoral head—these advanced procedures contribute significantly to the treatment landscape by aiming to improve mobility and reduce pain. This article reviews the roles of THA and BHA in the treatment of femoral neck fractures in elderly patients, to improve their quality of life by reducing pain and enhancing mobility.

DIAGNOSIS AND TREATMENT OPTIONS

Femoral neck fractures in the elderly are usually classified into high-energy and low-energy types. Patients typically present with a history of falls, hip pain, and mobility issues. Diagnosis primarily relies on X-ray imaging, although 2-10% of cases might not reveal distinct fracture lines, especially with

Corresponding author: Varah Yuenyongviwat, varahortho@gmail.com
Received: 20 November 2023
Revised: 22 January 2024
Accepted: 5 February 2024
Vajira Med J 2024;68(1):e266094
http://dx.doi.org/10.62691/vmj.2024.266094

non-displaced fractures[3]. In such instances, magnetic resonance imaging is indispensable, with a diagnostic sensitivity of 100% and specificity between 93% and 100%[4].

Treatments for femoral neck fractures are surgical and non-surgical depending upon fracture severity, type, and mobility. Extracapsular fractures require surgical fixation, with considerations including bone quality, fracture pattern complexity, and fracture configuration[5]. The management of intracapsular fractures may involve open reduction and internal fixation (ORIF), closed reduction and internal fixation (CRIF), or arthroplasty. Comparative studies evaluating fixation versus arthroplasty outcomes have consistently favored the latter[6-7]. Studies, such as those by Chammout et al.[8], comparing parameters such as the Harris Hip Score and complication rates, have established arthroplasty's long-term superiority. Rogmark et al.[9], demonstrated that arthroplasty patients aged over 70 had reduced rates of falls, reduced pain, and enhanced mobility within two years of surgery.

CLASSIFICATION OF FEMORAL NECK FRACTURES

Femoral neck fractures are typically classified using the Pauwels classification, which delineates the angle of the fracture in the horizontal plane[10], and the Garden Classification, based on X-ray images[11]. The Garden Classification is widely favored for its detailed differentiation between complete, incomplete fractures and level of displacement (figure 1), and plays a pivotal role in choosing between ORIF, CRIF, and arthroplasty.

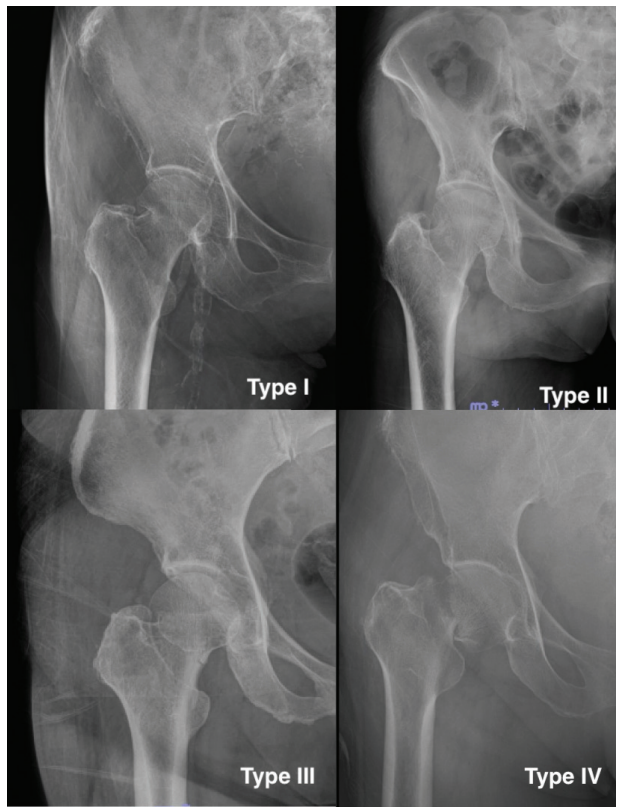

Figure 1 The images of femoral fractures categorized under the Garden classification.

Each surgical approach has distinct indications. The American Academy of Orthopedic Surgeons (AAOS) and the United Kingdom's National Institute for Health and Care Excellence (NICE) recommend THA for elderly patients who retain mobility, even in the presence of significant hip pain or osteoarthritis[12]. Conversely, BHA is suitable for elderly patients with limited activities of daily living, especially those with multiple comorbidities[13]. For patients with medical concerns that preclude prolonged surgery or blood loss, closed reduction with cannulated screw fixation is the optimal choice[14]. Hip arthroplasty has the best outcomes for Garden types 3–4 fractures, whereas patients with Garden types 1–2 with minimal displacement benefit from CRIF using cannulated screws[15].

TOTAL HIP ARTHROPLASTY VS. BIPOLAR HEMIARTHROPLASTY

Surgical interventions for displaced femoral neck fractures include THA and BHA (figure 2). Numerous studies have compared these procedures' outcomes[16-19]; however, conclusive evidence on the superior method remains elusive due to inherent patient-specific factors. According to the NICE guidelines, there is no substantial disparity in benefits and importance between THA and BHA, even in long-term follow-up regarding the necessity for revision surgery[16].

However, a prevailing trend in research favors THA over BHA, especially in elderly patients with displaced femoral neck fractures. THA consistently demonstrates superior results using metrics such as the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), encompassing pain scores, stiffness scores, and functional outcomes[17]. Research by Migliorini et al.[18], and Muslim et al.[19], corroborates THA's superiority in metrics, including gait, range of motion, and re-operation rates.

THA takes longer operation time[20], leading to increased risks from potential excessive bleeding in patients with underlying health conditions. Additionally, THA requires a longer anesthesia time, and post-surgery recovery may also be prolonged[21-22]. Therefore, THA is recommended for active patients with a longer life expectancy, normal cognitive function, and significant hip pain or osteoarthritis. However, BHA may be a better option for physiologically older patients with limited mobility, multiple comorbidities, and reduced daily activities. THA involves higher expenses due to extended hospital stays and increased medical and physiotherapy costs[21-22].

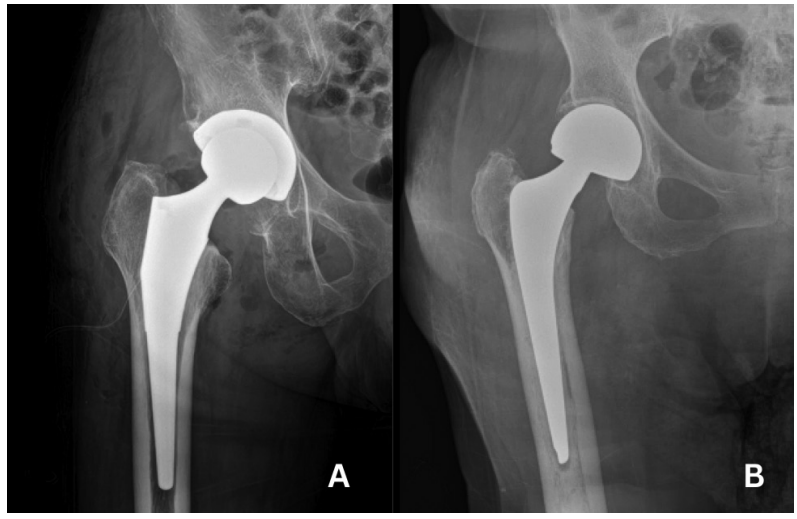

Figure 2 The postoperative images of right total hip arthroplasty (A) and hemi-hip arthroplasty (B)

PROGNOSIS AND COMPLICATIONS

Hip fractures cause significant patient morbidity and mortality, with nearly half of patients failing to regain normal functionality[23]. Surgery has its challenges; postoperative complications afflict up to 20% of hip fracture cases, particularly among the elderly, significantly impacting mortality rates within the first year after surgery. Several factors, including preoperative cognitive state, medical comorbidities, and mobility levels, contribute to these complications[24].

Postoperative complications include myocardial infarction or heart failure (35%–42%), anemia (24%–44%), and urinary retention or infection (12%–61%). Delirium affects 13.5%–33% of cases, deep venous thrombosis occurs in 27%, acute kidney injury in 11%, and skin pressure damage in 7%–9%. Pneumonia occurs in 7%, and pulmonary embolism in 1.4%–7.5% of cases[10].

Hip arthroplasty has specific complications that may require revision surgery. Both THA and BHA have a revision rate of more than 5.2%[25]. Dislocation is a hip arthroplasty complication, influenced by factors such as the surgeon's experience, treatment procedures, and the use of inappropriate equipment[26]. Dislocation incidents often lead to revision surgery. Patients undergoing THA face a dislocation rate of 2–20%[27], while BHA has a lower short-term (3-year) and long-term (5-year) rate[28].

Hip prosthesis loosening, which is influenced by factors such as gender and physical activity levels, decreases with age and correlates with daily activity levels. Patients with a body mass index (BMI) below 25 kg/m^2 maintain better joint implant integrity, with the loosening risk increasing by 3% for higher BMI individuals[29]. Loosening is also linked to cardiovascular events, including myocardial infarction, heart failure, and cerebral infarctions, which are observed in up to 30% of cases[30].

Post-surgical infections are primarily associated with pre-existing patient conditions. Infections occurring within 3 months include urinary tract infections (UTIs) and pneumonia. Studies indicate that postoperative pneumonia occurs in 9% of cases, UTIs in 4%, wound infections in 1.1%, and deep infections in 1%[31].

CONCLUSION

Managing femoral neck fractures in the elderly is a complex task. Choosing the right procedure involves considering age, activity level, and overall health. Despite its longer surgery time and higher complication risk, THA suits active patients, while BHA is safer for older, less mobile patients. Post-surgery complications like infections and joint problems underscore the need for careful care. Further research and improved surgical techniques are crucial for enhancing outcomes in elderly patients recovering from femoral neck fractures.

ACKNOWLEDGEMENT

None

REFERENCES

1. Kannus P, Parkkari J, Sievänen H, Heinonen A, Vuori I, Järvinen M. Epidemiology of hip fractures. Bone 1996;18(1 Suppl):57S-63S.
2. National Institute for Health and Care Excellence. Hip fracture: management. NICE clinical guidelines [internet]. 2023 [cited 2023 Oct 26]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK553768/
3. Deleanu B, Prejbeanu R, Tsiridis E, Vermesan D, Crisan D, Haragus H, et al. Occult fractures of the proximal femur: imaging diagnosis and management of 82 cases in a regional trauma center. World J Emerg Surg 2015;10:55.
4. Foex BA, Russell A. BET 2: CT versus MRI for occult hip fractures. Emerg Med J 2018; 35(10):645-7.
5. Lewis SR, Macey R, Lewis J, Stokes J, Gill JR, Cook JA, et al. Surgical interventions for treating extracapsular hip fractures in older adults: a network meta-analysis. Cochrane Database Syst Rev 2022;2(2):CD013405.

6. Stirton JB, Maier JC, Nandi S. Total hip arthroplasty for the management of hip fracture: a review of the literature. J Orthop 2019;16(2):141-4.
7. Frihagen F, Nordsletten L, Madsen JE. Hemiarthroplasty or internal fixation for intracapsular displaced femoral neck fractures: randomised controlled trial. BMJ 2007;335(7632):1251-4.
8. Chammout GK, Mukka SS, Carlsson T, Neander GF, Stark AW, Skoldenberg OG. Total hip replacement versus open reduction and internal fixation of displaced femoral neck fractures: a randomized long-term follow-up study. J Bone Joint Surg Am 2012;94(21):1921-8.
9. Rogmark C, Carlsson A, Johnell O, Sernbo I. A prospective randomised trial of internal fixation versus arthroplasty for displaced fractures of the neck of the femur. Functional outcome for 450 patients at two years. J Bone Joint Surg Br 2002;84(2):183-8.
10. Schuetze K, Burkhardt J, Pankratz C, Eickhoff A, Boehringer A, Degenhart C, et al. Is new always better: comparison of the femoral neck system and the dynamic hip screw in the treatment of femoral neck fractures. Arch Orthop Trauma Surg 2023; 143(6):3155-61.
11. Kazley JM, Banerjee S, Abousayed MM, Rosenbaum AJ. Classifications in brief: garden classification of femoral neck fractures. Clin Orthop Relat Res 2018;476(2): 441-5.
12. Emmerson BR, Varacallo M, Inman D. Hip Fracture Overview [internet]. 2023 [updated 2023 Aug; cited 2023 Oct 26]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK557514/
13. Florschutz AV, Langford JR, Haidukewych GJ, Koval KJ. Femoral neck fractures: current management. J Orthop Trauma 2015;29(3): 121-9.
14. Zhang LZ, Gao J, Zhang ZC, Wang XW, Zhang JZ, Sun TS. Comparison of clinical effects of total artificial hip replacement and cannulated screw fixation for the treatment of displaced femoral neck fractures in elderly patients. Zhongguo Gu Shang 2018; 31(2):103-10.
15. Lutnick E, Kang J, Freccero DM. Surgical treatment of femoral neck fractures: a brief review. Geriatrics (Basel) 2020;5(2):22.
16. Choudhary BM, Ram GG. Bipolar hemiarthroplasty versus total hip replacement in displaced femoral neck fracture in elderly. Surg Rev: Int J Surg, Trauma Orthop 2020; 6(2):105-9.
17. Bhandari M, Einhorn TA, Guyatt G, Schemitsch EH, Zura RD, Sprague S, et al. Total hip arthroplasty or hemiarthroplasty for hip fracture. N Engl J Med 2019;381(23): 2199-208.
18. Migliorini F, Maffulli N, Trivellas M, Eschweiler J, Hildebrand F, Betsch M. Total hip arthroplasty compared to bipolar and unipolar hemiarthroplasty for displaced hip fractures in the elderly: a Bayesian network meta-analysis. Eur J Trauma Emerg Surg 2022;48(4):2655-66.
19. Muslim SM, Lingayat MB, Bansode P, Kesharwani A. Comparative outcome assessment of total hip arthroplasty versus bipolar hemiarthroplasty in intracapsular neck of femur fracture in old age. Int J Res Orthop 2023;9(5):956-61.
20. Rogmark C, Leonardsson O. Hip arthroplasty for the treatment of displaced fractures of the femoral neck in elderly patients. Bone Joint J 2016;98-B(3):291-7.
21. Lombardi B, Paci M, Nannetti L, Moretti S, Maritato M, Benelli G. Total hip arthroplasty after hip fracture or osteoarthritis: are there differences in characteristics and outcomes in the early rehabilitative stage? Orthop Nurs 2014;33(1):43-7.
22. Fusheng X, Rongjun K, Yongfu G, Wei Q. Bipolar hemiarthroplasty vs. total hip replacement in elderly. Int J Clin Exp Med 2017;10(5):7911-20.

23. Istianah U, Nurjannah I, Magetsari R. Post-discharge complications in postoperative patients with hip fracture. J Clin Orthop Trauma 2020;14:8-13.
24. Carpintero P, Caeiro JR, Carpintero R, Morales A, Silva S, Mesa M. Complications of hip fractures: a review. World J Orthop 2014;5(4): 402-11.
25. Farey JE, Cuthbert AR, Adie S, Harris IA. Bipolar hemiarthroplasty does not result in a higher risk of revision compared with total hip arthroplasty for displaced femoral neck fractures: an instrumental variable analysis of 36,118 procedures from the Australian Orthopaedic Association National Joint Replacement Registry. J Bone Joint Surg Am 2022;104(10):919-27.
26. Monzon DG, Iserson KV, Jauregui J, Musso C, Piccaluga F, Buttaro M. Total hip arthroplasty for hip fractures. Geriatr Orthop Surg Rehabil 2014;5(1):3–8.
27. Istianah U, Nurjannah I, Magetsari R. Post-discharge complications in postoperative patients with hip fracture. J Clin Orthop Trauma 2021;14:8–13.
28. Guyen O. Hemiarthroplasty or total hip arthroplasty in recent femoral neck fractures? Orthop Traumatol Surg Res 2019;105(1S): S95-101.
29. Melloh M, Eggli S, Busato A, Roder C. Predictors of early stem loosening after total hip arthroplasty: a case-control study. J Orthop Surg (Hong Kong) 2011;19(3):269-73.
30. Rysinska A, Sköldenberg O, Garland A, Rolfson O, Aspberg S, Eisler T, et al. Aseptic loosening after total hip arthroplasty and the risk of cardiovascular disease: a nested case-control study. PLoS One 2018;13(11): e0204391.
31. Roche JJ, Wenn RT, Sahota O, Moran CG. Effect of comorbidities and postoperative complications on mortality after hip fracture in elderly people: prospective observational cohort study. BMJ 2005;331(7529):1374.