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Systematic Review

Comparative analysis of total hip arthroplasty versus hemiarthroplasty for femoral neck fractures: a systematic review

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ABSTRACT

Displaced femoral neck fractures (FNFs) are among the most common and debilitating injuries in elderly. The optimal surgical management-total hip arthroplasty (THA) or hemiarthroplasty (HA), remains a subject of debate. This study aimed to compare clinical outcomes reported in literature of patients with a femoral neck fracture treated with either hemiarthroplasty or total hip arthroplasty (THA).This review incorporates findings from landmark randomized controlled trials (RCTs), meta-analyses, and major guidelines, including NICE (2023), Falotico et al (2025) , the HEALTH trial (2019) , Ekhtiari et al (2020), Tang et al (2020) , Lewis et al (2019) , and large registry analyses Edelstein et al 2023 which included population based retrospective studies of elderly >65 years of age with neck of femur fracture. Across over 60,000 patients, mortality rates were similar between THA and HA. THA demonstrated modest improvements in medium-term function and quality of life, particularly in cognitively intact, independent patients. However, THA carried a higher dislocation risk and required longer operative time and greater blood loss. Revision and reoperation rates were comparable. Cost-effectiveness analyses favoured THA in healthy, active individuals but not in frail or dependent patients. Our study concludes that THA offers small functional advantages but with higher dislocation risk. Procedure choice should be individualized based on patient health, functional status, and life expectancy. HA remains appropriate for frail or low-demand patients.

Keywords: Femoral neck fracture, Total hip arthroplasty, Hemiarthroplasty, Hip fracture management, Comparative outcomes

INTRODUCTION

Femoral neck fractures (FNFs) represent a major cause of morbidity and mortality in older adults. Globally, the incidence of hip fractures is expected to exceed 7 million annually by 2050, reflecting aging populations and rising life expectancy.[1] Displaced intracapsular fractures are commonly treated with arthroplasty, and the main decision lies between THA and hemiarthroplasty (HA).

THA replaces both the femoral head and the acetabulum, restoring hip biomechanics and potentially providing better long-term function. HA, which replaces only the femoral head, is less invasive and widely used due to shorter operative times, reduced dislocation risk, and lower initial costs.[2] Despite decades of research, the optimal choice remains uncertain.

Evidence suggests that THA may offer advantages over hemiarthroplasty in well-selected, healthier patients with displaced femoral neck fractures. Reported benefits include lower reoperation rates, less pain, and better mobility and function. However, most supporting studies are randomized controlled trials (RCTs) with methodological limitations and limited generalizability.

A recent multicentre RCT found no significant difference in reoperation rates and only minimal functional or quality-of-life benefits with THA.[3] Similarly, results from meta-analyses and population-based studies remain inconsistent. Given these mixed findings, further high-quality, population-level evidence is warranted.

The present study therefore aimed to compare clinical outcomes between patients aged ≥60 years who underwent THA or hemiarthroplasty for femoral neck fractures, hypothesizing that THA may carry a higher risk of short-term complications.

Recent high-quality RCTs, including the HEALTH trial (NEJM 2019) and meta-analyses by Falotico et al. (2025) and Tang et al have added important insights.[3,5,6] This review consolidates these findings to clarify comparative effectiveness. The objective of this study was to review and analyse current high-quality evidence comparing the outcomes of THA and HA for displaced femoral neck fractures, focusing on mortality, complications, functional results, quality of life, and cost-effectiveness.

METHODS

A total of 50 articles were screened from PubMed, ResearchGate and Google Scholar for abstracts. Literature published between 2018 and 2025 was reviewed. A narrative synthesis was performed from these published RCTs, systematic reviews, and guidelines between 2018 and 2025. Key databases included PubMed, Cochrane, and Embase as reported in each source. The focus outcomes included: mortality (early and long-term); revision/reoperation rates; functional and quality-of-life measures (Harris Hip Score, WOMAC, EQ-5D); complications (dislocation, infection, periprosthetic fracture); operative factors (surgical time, blood loss, length of stay); cost-effectiveness.

Primary sources were Lewis et al, the HEALTH Trial, Ekhtiari et al, Falotico et al, Tang et al, NICE Evidence Review B, and Edelstein et al.[2-8]

Inclusion criteria

The study included randomized controlled trials, systematic reviews, meta-analyses, or large registry studies; studies with adult patients having displaced femoral neck fractures; studies with direct comparison between total hip arthroplasty and hemiarthroplasty; reported at least one major outcome (mortality, revision, complications, functional outcomes, or quality of life); and published in English between 2018-2025.

Exclusion criteria

The study excluded any included undisplaced fractures or internal fixation comparisons*;* case reports, narrative opinions, or non-comparative studies*;* involved pediatric populations and lacked extractable outcome data.

RESULTS

Mortality

Across nearly all major systematic reviews and randomized controlled trials (RCTs), there is no statistically significant difference in mortality between patients treated with THA and those treated with HA. The landmark HEALTH trial (n=1,495) demonstrated mortality rates of 14.3% in the THA group versus 13.1% in the HA group (p=0.48), showing no meaningful difference between the two procedures.[3] Similar findings were reported in the NICE Evidence Review (2023) which confirmed parity in early, one-year, and long-term mortality outcomes between both interventions.[7] A large meta-analysis by Falotico et al (2025) which pooled data from nearly 30,000 patients, also concluded that THA and HA have comparable survival outcomes, regardless of follow-up duration.[5] Collectively, these results indicate that the choice of arthroplasty type does not influence overall mortality, and that the decision should instead focus on functional recovery, quality of life, and complication profiles.

Revision and reoperation rates

Revision and reoperation rates are critical indicators of surgical durability and long-term success. The HEALTH trial reported no significant difference in the rate of secondary procedures within 24 months after surgery, with reoperation rates of 7.9% in THA versus 8.3% in HA (HR 0.95, 95% CI 0.64-1.40).[3] Similarly, the large-scale review by Falotico et al (2025) found a lower relative risk of revision following THA (RR 0.67, 95% CI 0.48-0.93), suggesting improved implant longevity.[5] However, Ekhtiari et al (2020) observed moderate heterogeneity across included studies, though results still slightly favoured THA.[4] On the other hand, a major Medicare database analysis by Edelstein et al (2023) reported no significant difference in 12-month revision rates (2.4% for THA vs. 2.5% for HA), indicating that the advantage of THA may only emerge in the long term.[8] These findings suggest that THA may reduce late revision risk, particularly by preventing acetabular erosion, while short-term reoperation rates remain comparable between the two surgical approaches.

Functional outcomes and quality of life

Functional recovery and health-related quality of life are key determinants of treatment success. Most comparative studies have shown superior functional outcomes and quality-of-life scores with THA, though the differences are generally modest. In their comprehensive overview, Falotico et al (2025) reported that THA provided significantly better early functional recovery (SMD 0.59, 95% CI 0.04-1.08) and improved EQ-5D quality-of-life scores (MD 0.05, 95% CI 0.03-0.08) compared to HA.[5] Similarly, Tang et al (2020) found that patients undergoing THA achieved higher Harris Hip Scores (HHS) during the

first five postoperative years, indicating better medium-term function.[6] Lewis et al (2019) also demonstrated enhanced HHS and SF-36 scores in the THA group, concluding that THA should be preferred in younger, more active patients (<80 years old) or those with an expected lifespan of more than four years.[2] However, it is important to note that the HEALTH trial, the largest RCT to date, reported only small, clinically insignificant improvements in functional outcomes, suggesting that while THA may offer measurable advantages, these gains may not always translate into meaningful everyday benefits for all patient populations.

Table 1. Key comparative outcomes across major studies.

Study	Year	Design	Sample (n)	Function / QoL (THA – HA)	Revision / Reoperation	Dislocation	Mortality
NICE Review	2023	Evidence synthesis (20 RCTs)	~4,000	HHS ↑ 4–7 points; EQ-5D ↑ 0.03–0.05	No significant difference	THA ~3.0% vs HA ~1.5%	Similar (1-yr 13–15%)
Falotico et al[5]	2025	Overview of 20 SRs	29,980	Early function: SMD 0.59; EQ-5D ↑ 0.05	THA ↓ revision: RR 0.67	No significant pooled difference (range 1–5%)	No difference
HEALTH trial	2019	RCT	1,495	WOMAC ↑ 2–4 (clinically small); EQ-5D ↑ 0.02	THA 7.9% vs HA 8.3%	THA 4.7% vs HA 2.4%	THA 14.3% vs HA 13.1%
Ekhtiari et al[4]	2020	Meta-analysis	~4,000	HHS ↑ 6–8 points	THA ↓ revision: RR 0.74	THA ~4% vs HA ~2%	No difference
Tang et al[6]	2020	25 RCTs	3,223	HHS ↑ 5.4 points	↓ acetabular erosion: WMD 0.030	THA 5% vs HA 2.5%	No difference
Lewis et al[2]	2019	Meta-analysis	1,364	HHS ↑ 4–5 points; SF-36 PF ↑ 4–6	THA ↓ revision by ~30%	THA 4–6% vs HA 1–3%	No difference
Edelstein et al[8]	2023	Registry (Medicare)	61,695	Not assessed	THA 2.4% vs HA 2.5% (12-mo)	THA 2.9% vs HA 1.9%	THA 5.6% vs HA 6.0%

HHS: Harris Hip Score; EQ-5D: EuroQol 5-Dimension; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index.

Table 2. Advantages and disadvantages summary.

Parameters	THA	HA	Quantitative difference (effect size/p value)	References
Functional outcome (HHS)	HHS ↑ +4–8 points	—	MD +5.4 (THA>HA), p<0.01	Tang 2020; Lewis 2019; Ekhtiari 2020
Quality of Life (EQ-5D)	↑ 0.03–0.05	—	MD +0.05, p<0.01	Falotico 2025; NICE 2023
Early WOMAC function	↑ 2–4 points	—	HEALTH: MD +2.2, p=0.09 (NS)	HEALTH Trial 2019
Dislocation rate	4.7–5%	1.9–2.5%	RR ~2.0; HEALTH: HR 2.00, p ≈ 0.06	HEALTH 2019; Edelstein 2023; Tang 2020
Operative time	+20 min longer	—	MD +18–25 min, p<0.01	Tang 2020
Blood loss	+60–80 ml	—	MD +70 mL, p < 0.01	Tang 2020
Mortality (1 year)	14–15%	13–15%	No significant difference (p>0.40)	HEALTH 2019; NICE 2023
Revision rate (early 12–24 mo)	7.9%	8.3%	HR 0.95, p=0.81	HEALTH 2019

Continued.

Parameters	THA	HA	Quantitative difference (effect size/p value)	References
Revision (long-term)	↓ revisions: RR 0.67	↑ acetabular erosion → ↑ late revisions	RR 0.67, p<0.01	Falotico 2025; Lewis 2019
Acetabular erosion	Rare	Common	Tang: WMD 0.030, p=0.001	Tang 2020
Cost-effectiveness	Cost-effective only in fit, independent patients	Preferred in frail patients	Incremental QALY gain small; model favours THA only in low-risk groups	NICE 2023
Length of hospital stay	Slightly longer	Shorter	MD 0.3–0.6 days, p<0.05 (varies)	NICE 2023; Tang 2020

Dislocation and mechanical complications

One of the most recognized disadvantages of THA is the higher risk of postoperative dislocation compared to HA. The HEALTH trial observed dislocation rates of 4.7% with THA versus 2.4% with HA (HR 2.00; 99% CI 0.97-4.09), suggesting approximately double the risk.[3] Similarly, Edelstein et al (2023) analysed a large Medicare cohort and reported a 12-month dislocation rate of 2.9% in THA versus 1.9% in HA (p 0.001).[8] Tang et al (2020) corroborated these findings, noting that THA nearly doubled the risk of dislocation (WMD 1.897; p=0.002).[6] Interestingly, Falotico et al (2025) found no statistically significant difference when pooling results across multiple systematic reviews, which may reflect variations in surgical approach, prosthesis design, and surgeon experience.[5] Despite the increased dislocation risk, the absolute difference remains small (approximately 2-3%) and can often be managed non-operatively through closed reduction. Nevertheless, this factor remains critical in determining the most appropriate procedure, particularly in frail or cognitively impaired patients where stability is prioritized over maximal function.

Operative factors and hospital stay

When considering intraoperative and immediate postoperative factors, THA tends to be more demanding surgically than HA. Multiple studies, including Tang et al (2020) reported that THA required an average of 20 minutes longer operative time and resulted in approximately 70 ml greater blood loss compared to HA.[6] These differences, while not dramatic, can be significant in elderly or comorbid patients. Furthermore, HA is associated with a shorter hospital stay and faster early postoperative recovery, as highlighted in NICE (2023) and several comparative trials.[7] This makes HA a more suitable option for frail or medically compromised patients, where minimizing operative time and physiological stress takes precedence. Conversely, the slightly longer operation required for THA may be justified in healthier, independent patients who can tolerate a longer surgical procedure and potentially benefit from improved medium-term outcomes.

Other complications

Beyond dislocation, most reviews report no significant difference in other perioperative complications between the two procedures. Rates of infection, thromboembolism, and periprosthetic fracture are comparable across both groups, as confirmed in Tang et al (2020) and NICE (2023).[6,7] However, THA offers a distinct advantage in reducing acetabular erosion, a common long-term issue after HA. Tang et al. quantified this finding, reporting that THA significantly lowers the rate of acetabular erosion (WMD 0.030; p=0.001). This reduced erosion translates into fewer late conversions or revisions to THA, thereby improving prosthesis longevity. Overall, while the short-term safety profile of both procedures is similar, the long-term mechanical integrity appears to favour THA in appropriately selected patients.

Cost-effectiveness

Economic evaluations consistently demonstrate that THA is cost-effective only in specific patient groups. According to the NICE Evidence Review (2023) THA provides good value for money in medically fit, cognitively intact, and independently ambulant patients, due to the combination of better functional outcomes and lower revision rates over time.[7] However, for patients who are frail, dependent, or have multiple comorbidities, HA remains the more economical and clinically appropriate option, primarily because it involves shorter operative time, fewer perioperative risks, and reduced hospital stay. Several meta-analyses have concluded that while THA incurs higher upfront costs, these may be offset in the long term by reduced reoperation rates and improved quality-adjusted life years (QALYs). Ultimately, cost-effectiveness depends heavily on patient selection, life expectancy, and healthcare system resources.

DISCUSSION

Functional and quality-of-life gains

Evidence consistently indicates that THA provides measurable improvements in functional recovery and

health-related quality of life (QoL) when compared with HA in patients with displaced femoral neck fractures. Meta-analyses and systematic reviews, including those by Falotico et al, Tang et al and Lewis et al have all reported statistically significant gains in standardized outcome measures such as the Harris Hip Score (HHS) and EQ-5D among THA recipients.[2,5,6] Falotico et a observed a moderate standardized mean difference (SMD 0.59; 95% CI 0.04-1.08) in early functional outcomes and a mean difference (MD 0.05; 95% CI 0.03-0.08) in EQ-5D favouring THA, confirming modest yet measurable improvement in mobility and overall health perception.[5]

Similarly, Tang et al demonstrated superior HHS values for THA up to five years postoperatively, suggesting sustained functional benefit.[6] Lewis et al also reported improved Short Form-36 (SF-36) physical function and pain domains with THA, concluding that it should be considered particularly for patients younger than 80 years or with a life expectancy exceeding four years.[2] These findings collectively support THA as the functionally superior option in active, cognitively intact, and medically fit individuals.

However, the magnitude of benefit remains a point of debate. The landmark HEALTH trial the largest multicentre RCT to date, found that although THA patients scored slightly higher on WOMAC function and EQ-5D scales, these differences were deemed clinically unimportant.[3] This highlights that while THA may provide measurable statistical improvements, the practical impact on daily living and patient satisfaction may be minimal for frailer or less active populations. Therefore, the functional advantage of THA appears most meaningful in younger, ambulatory, and higher-functioning patients, while the same may not justify the increased surgical risk in older, low-demand individuals.

Dislocation and risk trade-off

The risk of postoperative dislocation is a well-documented trade-off when choosing THA over HA. Multiple studies, including the HEALTH trial and the Medicare-based registry study by Edelstein et al, demonstrate approximately double the risk of dislocation following THA.[3,8] The HEALTH trial reported dislocation rates of 4.7% in the THA group versus 2.4% in the HA group (HR 2.00; 99% CI 0.97–4.09), while the registry analysis showed rates of 2.9% and 1.9%, respectively.[3]

Tang et al quantified this association with a weighted mean difference (WMD) of 1.897 (p=0.002), again suggesting nearly a twofold increase in instability risk after THA.[6] Dislocation is multifactorial—associated not only with the type of arthroplasty but also with posterior surgical approach, smaller femoral head size, soft-tissue laxity, and inadequate component orientation. Despite these risks, Ekhtiar et al found no statistically significant difference in pooled dislocation rates across multiple systematic reviews, possibly reflecting variability in surgical technique and implant selection.[5]

Modern prosthetic designs with larger femoral heads, dual-mobility cups, and improved soft-tissue balancing have likely mitigated dislocation risk in recent years. Still, this complication remains clinically relevant, particularly in frail, cognitively impaired, or less compliant patients, for whom even a single dislocation episode can severely impact recovery and independence. Therefore, careful patient selection, meticulous surgical technique, and consideration of surgical approach are crucial to optimizing outcomes and minimizing this well-known complication of THA.

Long-term considerations

From a long-term perspective, acetabular erosion remains a major complication associated with HA. Over time, wear at the native acetabular surface leads to progressive pain, loss of function, and, in some cases, the need for conversion to THA. The systematic review and meta-analysis by Tang et al confirmed this finding, demonstrating a significantly lower rate of acetabular erosion in THA (WMD 0.030; p=0.001).[6] By replacing both the femoral and acetabular components, THA eliminates the risk of cartilage wear and offers greater joint longevity.

However, THA introduces its own long-term concerns, such as component loosening, polyethylene wear, and late instability. Despite these risks, the balance of long-term outcomes still favours THA in younger, active patients. Lewis et al noted that performing THA as a primary procedure in patients under 80 years or those with a reasonable life expectancy (>4 years) can prevent the need for secondary surgery and reduce cumulative morbidity.[2] Therefore, the long-term durability and reduced risk of acetabular wear justify THA for those who can tolerate a longer and technically more demanding operation.

Economic and clinical context

The cost-effectiveness of THA versus HA continues to be a subject of debate. The NICE (2023) evidence review concluded that THA is cost-effective only in specific patient populations, namely those who are medically fit, cognitively intact, and independent prior to injury.[7] In these patients, the improved functional outcomes, reduced long-term revision risk, and enhanced quality-adjusted life years (QALYs) justify the higher initial surgical costs.

Conversely, in frail or dependent patients, HA remains the more practical and economical option. The procedure requires shorter operative time, less blood loss, and fewer perioperative complications, translating to lower hospital costs and reduced postoperative morbidity. Several health-economic models have supported this stratified approach, emphasizing the importance of individualized surgical decision-making. Thus, in modern clinical practice, THA

should not be seen as universally superior, but rather as the preferred choice in fit, independent patients, while HA remains optimal for low-demand or high-risk individuals.

Despite the extensive body of literature, there remain several limitations in the current evidence base comparing THA and HA. Most RCTs, including large trials like HEALTH (2019) have follow-up durations of only one to two years, providing limited insight into long-term functional and implant survival outcomes.[3] Additionally, studies vary considerably in implant design, surgical technique, and rehabilitation protocols, introducing heterogeneity that complicates meta-analytic interpretation.

Outcome measures such as the HHS, WOMAC, and EQ-5D differ across studies in both timing and methodology, making direct comparison challenging. Moreover, many studies are conducted in high-income countries, and data from low- and middle-income regions remain sparse, limiting global generalizability. Registry-based studies, though large, are often constrained by coding inaccuracies and lack of granular clinical data

CONCLUSION

THA and HA both remain viable, evidence-based treatments for displaced femoral neck fractures. Current literature indicates that THA provides slightly better medium-term function and quality of life, lower acetabular erosion, and possibly fewer late revisions. HA offers shorter surgery, reduced dislocation risk, and similar survival and complication rates. Therefore, THA is recommended for medically fit, cognitively intact, independent patients with longer life expectancy. HA is preferable for frail, dependent, or cognitively impaired individuals.

Future research should focus on long-term prospective studies and registry linkages that incorporate patient-reported outcomes, cost-utility analyses, and subgroup stratification by age, comorbidities, and cognitive function. Only through high-quality, longitudinal data can clinicians develop truly evidence-based guidelines for the optimal management of displaced femoral neck fractures.

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