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Controversies and Evidence in Surgical Decision-Making for Unstable Intertrochanteric Fractures in Older Adults: Total Hip Arthroplasty Versus Cephalomedullary Nailing and a Four-Domain Stratified Algorithm

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Abstract: ***Background:*** *Unstable intertrochanteric fracture (ITF) in older adults is associated with substantial disability and mortality. Cephalomedullary nailing (CMN) is widely regarded as first-line treatment for unstable ITF [1]. However, severe comminution and osteoporosis may increase fixation-failure risk, whereas primary arthroplasty—particularly total hip arthroplasty (THA)—has been proposed for selected patients to enable immediate stability and early full weight bearing, leading to ongoing controversy.* ***Objective:*** *To synthesize guideline recommendations and comparative evidence for THA versus CMN in older adults with unstable ITF, and to propose a pragmatic four-domain stratified decision algorithm (Figure 1).* ***Methods:*** *A narrative evidence synthesis focused on high-yield sources, including international guidelines and pivotal clinical evidence: randomized-trial–based systematic reviews/meta-analyses and representative observational/database studies [2–5,12]. Outcomes included perioperative metrics, early mobilization and rehabilitation, functional scores, complication profiles, reoperation, and mortality, as well as the burden of conversion THA after failed fixation [9,10].* ***Results:*** *Available evidence suggests arthroplasty may facilitate earlier mobilization and better short-term function [3–5], while longer-term functional superiority is inconsistent and overall complication, reoperation, and mortality differences are often not significant [3–5,12]. Fixation failure after CMN is influenced by modifiable technical factors (e.g., implant position, reduction quality, lateral wall/medial support) [6–8]. THA introduces procedure-specific risks (dislocation, periprosthetic fracture); stability strategies such as dual-mobility constructs may reduce dislocation in high-risk populations [11].* ***Conclusion:*** *CMN remains the default strategy for most older adults with unstable ITF [1]. Primary THA should be reserved for carefully selected patients at very high fixation-failure risk and high failure cost, considering pre-fracture function, concomitant symptomatic hip disease, and system readiness within an experienced arthroplasty pathway (Figure 1).*

Keywords: Intertrochanteric fracture, Unstable fracture, Cephalomedullary nailing, Total hip arthroplasty, Lateral femoral wall, Osteoporosis, Conversion arthroplasty, Decision algorithm.

1. Introduction

Intertrochanteric fractures in older adults are strongly associated with functional decline, long-term disability, institutionalization, and increased mortality. Surgical treatment aims to restore structural stability that permits early mobilization, reduces immobilization-related complications, and maximizes recovery to pre-injury function.

For unstable ITF, CMN offers intramedullary load sharing and a shorter lever arm, making it the preferred choice in many centers and strongly supported by guideline recommendations [1]. Nevertheless, in severely comminuted patterns, profound osteoporosis, or cases where reduction is difficult to maintain, fixation failure and the complexity of salvage procedures have fueled the debate about primary arthroplasty, including THA, in selected patients [3–5].

2. Guideline Landscape and the Source of Controversy

The AAOS guideline provides a strong recommendation for treating unstable intertrochanteric fractures with a cephalomedullary device (CMN) [1].

NICE guidance emphasizes fracture subtype distinctions and recommends extramedullary implants for most trochanteric fractures above and including the lesser trochanter, except for reverse obliquity; subtrochanteric fractures favor intramedullary nails [2].

3. Defining Instability: Classification and Structural Predictors

Instability is commonly defined using AO/OTA patterns (often 31-A2 and 31-A3) and disruption of key load-bearing structures. Lateral femoral wall integrity is linked to mechanical stability and reoperation risk [7,8].

4. Cephalomedullary Nailing: Rationale and Failure Mechanisms

4.1 Why CMN is the Default for Unstable ITF

CMN provides intramedullary load sharing and improved leverage against varus collapse and rotational instability, supporting its first-line role [1].

4.2 Failure Patterns and Modifiable Risk Factors

Key modifiable contributors include implant position/depth (TAD principle) [6] and reduction quality with preservation/ reconstruction of lateral wall and medial support [7,8].

5. Total Hip Arthroplasty: Rationale, Trade-offs, and Risk Mitigation

5.1 Immediate Stability and Early Full Weight Bearing

THA may facilitate immediate stability and early full weight bearing in selected high-risk patients. RCT-based syntheses often report better early mobilization and short-term function for arthroplasty compared with internal fixation [3–5].

5.2 Procedure-Specific Risks

THA introduces procedure-specific risks such as dislocation and periprosthetic fracture, particularly when trochanteric/abductor integrity is compromised.

5.3 Dual Mobility and Stability Strategies

Dual-mobility constructs may reduce dislocation risk in high-risk arthroplasty settings [11].

6. Comparative Evidence: THA/Arthroplasty Versus CMN

Across meta-analyses, arthroplasty shows a more consistent advantage for early mobilization and short-term function [3–5]. Longer-term functional superiority is inconsistent, and pooled differences in complications, reoperation, and mortality are often not significant [3–5,12]. Complication spectra differ: CMN failures are closely linked to technique and structural support [6–8], whereas THA complications include dislocation and periprosthetic fracture [11].

7. Hidden Cost: Conversion THA After Failed Fixation

Conversion THA after failed fixation is technically demanding and carries notable complication burdens [9,10], representing an important downstream consideration.

8. Four-Domain Stratified Decision Algorithm (Figure 1)

We propose a four-domain stratification (Fracture–Bone–Patient–System) to guide individualized treatment selection (Figure 1). Default recommendation: CMN for most unstable ITF with meticulous technique [1,6–8]. Consider primary THA for carefully selected patients with very high mechanical and fixation-failure risk plus supportive patient/system factors [3–5,9,12].

9. Future Directions

Future studies should include fracture-subtype–stratified RCTs, separate evaluation of THA versus hemiarthroplasty, standardized reporting of weight-bearing/rehabilitation, and cost-effectiveness models that incorporate the downstream burden of conversion THA.

10. Conclusions

CMN remains the default first-line strategy for most older adults with unstable ITF [1]. Primary THA may offer early mobilization benefits in selected high-risk patients, but long-term superiority is inconsistent and procedure-specific risks must be considered [3–5]. A four-domain stratified approach can shift decision-making from implant preference to risk-profile matching (Figure 1).

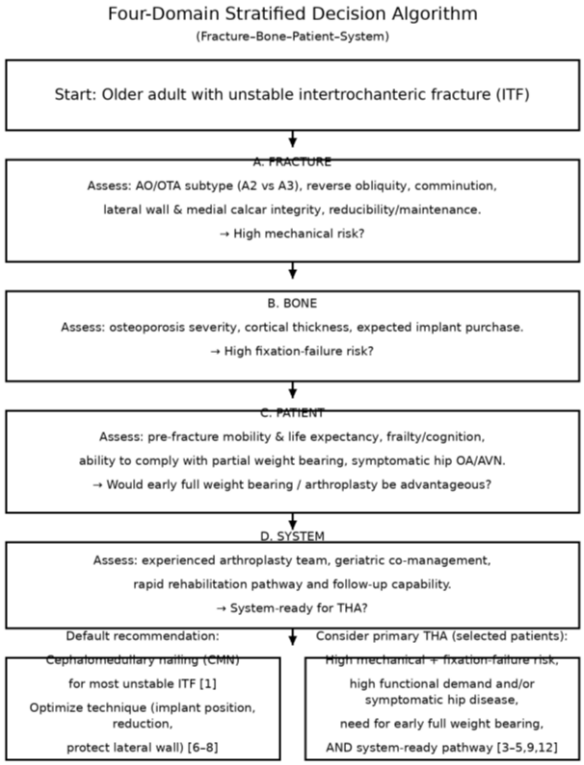

Figure 1: Four-domain stratified decision algorithm (black-and-white)

Table 1: THA versus CMN outcome comparison (evidence-informed)

Outcome domain	Typical direction (THA vs CMN)	Evidence summary	Key modifiers
Operative time	Often ↑ (longer)	Mixed across syntheses; center-dependent	Surgeon experience; case selection
Blood loss / transfusion	Often ↑	Arthroplasty may increase blood loss; pathway-dependent	TXA/ERAS; anesthesia
Time to full weight bearing / mobilization	Earlier	Most consistent early-phase advantage for arthroplasty [3–5]	Rehab capacity; protocol
Length of stay	Sometimes↓	System-dependent; reported in some RCT syntheses [4]	Discharge pathway
Early function (~3 months)	Often ↑	Higher early function reported in RCT syntheses [3–5]	Rehab intensity; complications
Later function (~12 months)	Often CMN ≥ THA	Longer-term superiority inconsistent; some favor CMN [3,4]	Abductor recovery; falls
Overall complications	Often similar	Frequently nonsignificant differences in pooled RCT analyses [3–5]	Baseline risk; bias
Complication spectrum	Different profiles	CMN: technique/support dependent [6–8]; THA: dislocation/periprosthetic fracture [11]	Fracture anatomy; implant choice
Reoperation	Mixed	Database suggests different early reop profiles [12]	Selection bias; small THA N
Downstream burden if fixation fails	Conversion THA is complex	Notable complication burden in conversion arthroplasty [9,10]	Failure cost; bone defects

Caption: Four-domain stratified decision algorithm (Fracture–Bone–Patient–System) for selecting CMN versus primary THA in older adults with unstable ITF.

Conflicts of Interest

The authors declare no conflicts of interest.

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