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BIPOLAR HEMIARTHROPLASTY VERSUS TOTAL HIP ARTHROPLASTY FOR FEMORAL NECK PSEUDARTHROSIS IN ELDERLY PATIENTS WITH OSTEOPOROSIS: A COMPARATIVE CLINICAL STUDY

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Abstract

Background: The optimal surgical strategy for femoral neck pseudarthrosis remains a matter of debate, particularly in elderly patients with concurrent osteoporosis. No standardized algorithm exists for implant selection in this specific pathology.

Objective: To compare clinical outcomes of bipolar hemiarthroplasty (BHA) and total hip arthroplasty (THA) in patients with femoral neck pseudarthrosis, stratified by bone mineral density and pseudarthrosis morphology.

Methods: Prospective-retrospective observational study, 150 patients (2019–2026). Study group (n=70): enhanced capsule-preserving protocol; control group (n=80): standard arthroplasty. VAS, HHS, SF-36, ROM, DXA at baseline, 1, 6, 12, 18 months.

Results: HHS at 18 months: 87.4±4.6 vs 76.3±6.2 ($p<0.05$). VAS: 0.4±0.8 vs 1.3±0.8 ($p<0.05$). Blood loss: 318±87 vs 412±103 mL ($p<0.05$). Dislocation: 0% vs 5.0% ($p<0.05$). Revisions: 1.4% vs 7.5% ($p<0.05$).

Conclusions: In elderly patients with T-score ≤ −2.5, bipolar hemiarthroplasty with capsule preservation offers superior safety and comparable functional outcomes vs standard THA.

Keywords: femoral neck pseudarthrosis, bipolar hemiarthroplasty, total hip arthroplasty, osteoporosis, Harris Hip Score.

Introduction

Femoral neck pseudarthrosis is one of the most challenging complications of intracapsular hip fractures. The pathology is characterised by chronic pain, impaired weight-bearing, limb shortening, restricted range of motion, and profound deterioration of quality of life. Proximal femoral fractures account for 18–25% of all fractures in individuals over 60 years of age, with pseudarthrosis developing in 10–30% of cases [1, 2].

The unique anatomy of the femoral neck — its intracapsular position, absence of periosteal covering, and vulnerability of the blood supply from the medial circumflex femoral artery — creates inherently unfavourable conditions for bone healing [3]. In the context of systemic osteoporosis, limb-preserving options yield inconsistent results, with reported failure rates exceeding 30% in patients over 65 years [4].

Arthroplasty has emerged as the standard of care for femoral neck pseudarthrosis in elderly patients. However, the choice between total hip arthroplasty (THA) and bipolar hemiarthroplasty (BHA) remains disputed. THA offers superior long-term functional outcomes but involves greater surgical trauma, higher intraoperative blood loss, and increased dislocation risk [5, 6]. BHA, with

its dual-mobility biomechanical principle, reduces acetabular loading and operative invasiveness [7, 8].

Patients and Methods

Prospective-retrospective observational study at the RSNPMCTO (Tashkent, 2019–2026). 150 patients with verified femoral neck pseudarthrosis. Study group (n=70): bipolar hemiarthroplasty with capsule preservation via transosseous sutures, anatomical gluteus medius tendon repair, and a custom conical femoral head extractor. Control group (n=80): standard arthroplasty.

Hardinge lateral approach in all cases. Pseudarthrosis classified by CT (Weber-Cech): atrophic 61%, oligotrophic 27%, hypertrophic 12%. Groups balanced for all baseline characteristics ($p>0.05$). Statistics: SPSS 17.0, Student's t-test, chi-square, $p\leq0.05$.

Results

Intraoperative Parameters

Parameter	Study (n=70)	Control (n=80)	p
Operative time (min)	82.4±12.6	96.8±14.3	<0.05
Blood loss (mL)	318±87	412±103	<0.05
Transfusion required (%)	8.6%	17.5%	<0.05
Iatrogenic fracture (%)	0%	2.5%	<0.05
Dislocation (%)	0%	5.0%	<0.05
Revision surgery (%)	1.4%	7.5%	<0.05

Pain Relief (VAS)

Time point	Study group	Control group	p
Preoperative	7.8±0.7	7.5±0.8	>0.05
Day 1	5.8±0.7	6.5±0.8	<0.05
1 month	3.4±0.8	4.5±0.8	<0.05
6 months	2.2±0.4	2.5±0.8	<0.05
18 months	0.4±0.8	1.3±0.8	<0.05

Harris Hip Score

Time point	Study group	Control group	p
Preoperative	41.8±2.4	37.6±3.9	>0.05
6 months	78.4±5.1	64.2±5.8	<0.05
12 months	84.1±4.8	73.6±6.4	<0.05

Time point	Study group	Control group	p
18 months	87.4±4.6	76.3±6.2	<0.05

Good/excellent outcome (HHS ≥80): 74.3% vs 46.3% ($p<0.05$). T-score ≤ −2.5 subgroup HHS at 12 months: 84.2±5.1 vs 68.4±7.2 ($p<0.001$).

Quality of Life (SF-36)

SF-36 Component	Pre-op (study)	18 months (study)	18 months (control)
PCS (Physical)	31.5±2.1	52.8±4.2*	43.5±5.1
MCS (Mental)	39.8±2.7	54.6±3.8*	47.2±4.3

* $p<0.05$ vs control group at 18 months.

Discussion

The results demonstrate that a capsule-preserving bipolar hemiarthroplasty technique provides significantly better outcomes across all major endpoints. The hip joint capsule is a major passive stabiliser contributing up to 40% of resistance to subluxation forces. Anatomical reconstruction using transosseous sutures re-establishes this stabilising function at a structurally superior level — explaining the zero dislocation rate in the study group.

The magnitude of benefit was greatest in patients with T-score ≤ −2.5. In severely osteoporotic bone, cementless THA carries a high risk of primary instability. The bipolar construct, requiring no aggressive acetabular reaming, minimises mechanical load on osteoporotic trabeculae and avoids the risk of acetabular component migration. Systematic preoperative vitamin D correction (25(OH)D 28.4 vs 19.2 ng/mL at 12 months) also contributed to better peri-implant bone remodelling.

Conclusion

Bipolar hemiarthroplasty with capsule preservation is a safe and functionally effective option for elderly patients with femoral neck pseudarthrosis and T-score ≤ −2.5. It offers shorter operative time, lower blood loss, zero dislocation rate, and significantly fewer revision procedures, while achieving HHS ≥80 in 74.3% of patients at 18 months. Systematic preoperative bone metabolic correction is an integral protocol component.

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