To Fix or Replace? A Systematic Review and Meta-Analysis on Surgical Management of Acetabular Fractures in the Elderly

Tyler Todd Brady, Shaylan Bera, Andrew Adamczyk

INTRODUCTION: Acetabular fractures amongst the elderly have become increasingly common and are associated with high morbidity and mortality. While open reduction and internal fixation (ORIF) has been the mainstay of treatment, outcomes in the elderly have been less consistent, with high rates of post-traumatic arthritis and secondary procedures. Acute total hip arthroplasty (THA), with or without fixation (combined hip procedure, CHP), has emerged as an alternative approach that may facilitate earlier mobilization and reduce early reoperation rates. This study is a systematic review and meta-analysis comparing outcomes of ORIF versus acute THA/CHP for acetabular fractures, specifically in patients aged 60 and older.

METHODS: A systematic review was performed per PRISMA guidelines. PubMed, Embase, Scopus, and Web of Science were searched from 2000 to present. Comparative studies reporting outcomes for both ORIF and THA/CHP in patients aged ≥60 were included. Two reviewers independently screened and extracted data on demographics, interventions, complications, reoperation, mortality, functional outcomes, and patient-reported outcomes measures (PROM). Pooled incidence rates, risk ratios (RRs), and mean differences were calculated using random-effects models. PROSPERO registration: CRD420251042369.

RESULTS:

Thirteen studies comprising 949 patients (ORIF: 620; THA/CHP: 329) were included. Overall, males represented the majority of patients (64%, $\chi^2 = 74.0$, $p < 0.0001$), and were significantly more likely to be treated with ORIF than with arthroplasty (RR 1.24, 95% CI: 1.07–1.44, p=0.0047). Patients undergoing THA/CHP were significantly older (77.4 vs. 72.9 years; MD −4.14, p<0.01) and had higher ASA scores (p=0.018). Reoperation was significantly more common following ORIF (RR 2.60, 95% CI: 1.42–4.75, p=0.0019), with 84% of ORIF reoperations due to conversion to THA, most commonly for post-traumatic osteoarthritis (PTOA), which occurred in 34% of ORIF patients. The median time to conversion was 14.7 months. Postoperative dislocation occurred in 8% of THA/CHP patients. One-year mortality did not differ significantly between groups (RR: 0.60, 95% CI: 0.30–1.19, p = 0.14), but two-year mortality favored the ORIF group (RR: 0.52, 95% CI: 0.27–0.99, p = 0.047). Infection risk was similar between groups (RR 0.87, 95% CI: 0.45–1.68, p = 0.68). Functional outcomes assessed by Harris Hip Score were significantly higher in the arthroplasty group (MD −6.11, 95% CI −9.90 to −2.31, p<0.01). THA/CHP patients experienced earlier weight-bearing (43.1 vs. 68.4 days) and fewer postoperative weight-bearing restrictions (35.0% vs. 97.7%, p<0.0001). Patient-reported outcome measures (SF-12/36) modestly favored THA/CHP, though data limitations precluded meta-analysis.

DISCUSSION AND CONCLUSION:

This is the largest meta-analysis to date comparing ORIF versus THA/CHP for acetabular fractures in patients aged 60 and older. Acute arthroplasty is associated with significantly lower rates of reoperation and improved functional outcomes at follow-up. While the risks associated with delayed conversion to arthroplasty remain incompletely defined, the physiologic toll on frail elderly patients and the economic burden of unplanned reoperations underscore the importance of optimizing initial treatment strategy.

Given that patients in the arthroplasty group were, on average, older and demonstrated greater baseline medical complexity, it is not unexpected that the 2-year mortality rate was significantly higher in this cohort. Additionally, 1-year mortality rates did not differ significantly between groups, and arthroplasty patients exhibited superior functional outcomes as measured by the Harris Hip Score. Therefore, the difference observed in longer-term mortality is more likely attributable to patient selection and comorbid burden rather than the surgical intervention itself. Considering these findings, further research using matched cohorts is warranted to better isolate the impact of treatment modality on outcomes.

An important consideration not quantified by this analysis is the technical complexity of arthroplasty in the setting of acute trauma. The feasibility of widespread adoption of acute arthroplasty may be constrained by a steep procedural learning curve and limited familiarity among general orthopaedic surgeons, particularly outside high-volume trauma centers.

This study is not without limitations. The majority of included studies were retrospective, introducing potential selection bias and unmeasured confounders. Additionally, heterogeneity in the reporting of metrics across studies limited our ability to perform subgroup analyses.

In conclusion, acute arthroplasty appears to offer meaningful advantages over ORIF in terms of reducing reoperation and improving early function among elderly patients with acetabular fractures. Future prospective studies and randomized trials are warranted to refine treatment algorithms and better define patient selection criteria.

Study	Study Design	Mean Follow-Up, Months (range)	n	Total	Male	Female	Age, Mean ± SD (range)	ASA, Score (n)
Filloch et al., 2014	Single Center Retrospective Cohort	68 (18-120)		24	15	9	76.9 (65-93)	-
	ORIF			10	-	-	-	-
	CHP			14	-	-	-	-
Gary et al., 2015	Multi-Center Retrospective Cohort	12		210	136	74	-	-
	ORIF			174	116	58	70.3 ± 8.5 (43-76)	-
	THA			36	20	16	77.1 ± 8.2 (71-84)	-
Carlo et al., 2016	Multi-Center Retrospective Cohort	40 (3-96)		61	40	21	-	-
	ORIF			31	20	11	73.2 (65-93)	III (11)
	CHP			30	20	10	76.7 (65-86)	III (10)
Weaver et al., 2018	Multi-Center Retrospective Cohort	22 (6-89)		70	38	32	-	-
	ORIF			33	19	14	73 (65-88)	-
	CHP			37	19	18	79 (66-90)	-
Lannes et al., 2020	Single Center Retrospective Cohort	12 (1-96)		51	35	16	-	-
	ORIF			25	20	5	75 ± 8 (66-92)	I (1) II (12) III (12)
	CHP			26	15	11	78 ± 6 (66-88)	II (14) III (10) IV (2)
Novarro et al., 2020	Multi-Center Retrospective Cohort	24		80	61	19	-	-
	ORIF			72	-	-	68.9 ± 7.3 (60-89)	-
	THA			8	-	-	77 ± 9.35 (61-89)	-
Manasra et al., 2021	Single Center Prospective Clinical Trial (RCT + Observational Cohort)	12 (0-24)		47	32	15	-	-
	ORIF			22	14	8	70.7 ± 8.7	-
	CHP			25	18	7	72.8 ± 8.0	-
Riemenschneider et al., 2022	Single Center Retrospective Cohort	-		60	39	21	-	-
	ORIF			38	-	-	77.5 ± 7.4	-
	THA			22	-	-	84.1 ± 7.5	-
Smakaj et al., 2022	Multi-Center Retrospective Case-Control	≥ 24		45	13	32	-	-
	ORIF			24	8	16	69.5 ± 1.12	I (2) II (17) III (5)
	CHP			21	5	16	73.4 ± 1.84	I (1) II (19) III (1)
Kabbaleh et al., 2023	Single Center Retrospective Cohort	38		48	27	21	-	-
	ORIF			32	18	14	80 ± 4 (75-88)	I (1) II (18) III (13)
	CHP			16	9	7	83 ± 6 (75-92)	I (0) II (4) III (12)
Carruthers et al., 2024	Multi-Center Feasibility Trial RCT	9		40	24	16	-	-
	ORIF			19	13	4	*72.7 (63.5-88.5)	-
	CHP			21	9	12	*79.2 (65.92.4)	-
Rajillah et al., 2024	Single Center Retrospective Cohort	24		65	45	20	-	-
	ORIF			48	37	9	70.7 ± 9.4	I (6) II (23) III (16) IV (1)
	THA			19	8	11	78.4 ± 8.4	I (0) II (14) III (5) IV (0)
Ljungdahl et al., 2025	Single Center Retrospective Cohort	12 (24-144)		168	102	66	-	-
	ORIF			94	73	21	*76 (70-93)	I (9) II (30) III (52) IV (3)
	THA/CHP			54	29	25	THA *84 (71-92) CHP *81 (70-91)	I (1) II (16) III (35) IV (2)

Outcome Complications	ORIF	THA/CHP	p
PTOA	0.34 [0.22-0.48]	-	-
Heterotopic ossification	0.08 [0.03-0.19]	0.11 [0.06-0.20]	0.58
THA/CHP Dislocation	-	0.08 [0.05-0.1]	-
Nerve Palsy	0.03 [0.01-0.07]	0.01 [0.0 - 0.19]	0.69
Reoperation	0.27 [0.18-0.37]	0.08 [0.04-0.13]	**0.0004**
Infection	0.05 [0.02-0.09]	0.06 [0.04-0.10]	0.67
Mortality	0.06 [0.03-0.14]	0.12 [0.05-0.26]	0.32
In-patient †	0.13	0.07	0.66‡
1-year †	0.50	0.52	1.00‡
2-year †	0.58	0.62	1.00‡

†proportion calculated from the population of those who died; ‡Fisher's exact test;
PTOA: Posttraumatic Osteoarthritis, THA: Total Hip Arthroplasty,
CHP: Combined Hip Procedure; [95% CI], significance p < 0.05