World Journal of Orthopedics

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World J Orthop 2026 February 18; 17(2): 113367

DOI: 10.5312/wjo.v17.i2.113367

ISSN 2218-5836 (online)

MINIREVIEWS

Early dislocation in primary total hip arthroplasty: Evaluation of treatment options following closed reduction

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Specialty type: Orthopedics

Provenance and peer review: Invited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's classification

Scientific Quality: Grade A, Grade B, Grade B, Grade B

Novelty: Grade A, Grade A, Grade B, Grade B

Creativity or Innovation: Grade A, Grade A, Grade B, Grade C

Scientific Significance: Grade A, Grade B, Grade B, Grade C

P-Reviewer: Ali Shah F, Associate Professor, Pakistan; Yadav HS, Researcher, Nepal

Received: August 25, 2025

Revised: September 9, 2025

Accepted: November 25, 2025

Published online: February 18, 2026

Processing time: 165 Days and 18 Hours

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Abstract

Although total hip arthroplasty (THA) is a very successful orthopedic operation with high long-term survival rates, some failures may occur and considerably influence the final outcome. Early dislocation following primary THA is a rare but challenging complication, which may affect functional recovery and patient satisfaction, especially in case of recurrence. Moreover, it is one of the most common reasons for revision, and is associated with substantial social, health, and economic costs. The aim is to critically review the current evidence on the management of early dislocation after primary THA, with particular focus on post-reduction treatment strategies and the role of immobilization techniques. Particular attention was given to the evidence base supporting various clinical approaches. The review highlights a lack of consensus regarding optimal post-reduction management. Several methods have been proposed, but most are supported by limited data and small case series. Comparative studies are scarce, and clinical outcomes are inconsistent. Based on current findings, the recommended post-reduction management practice remains controversial, but the effectiveness of immobilization in preventing recurrence is not supported by clinical evidence, and therefore should be avoided. Further high-quality studies are needed to establish standardized, evidence-based protocols that can improve patient outcomes and reduce the risk of recurrence.

Key Words: Dislocation; Total hip arthroplasty; Closed reduction; Brace; Immobilization; Revision surgery; Risk factors

Core Tip: Dislocation is a challenging complication of primary total hip arthroplasty, as it is a leading cause of early revision, and the management following closed reduction is still controversial. This review presents the outcome of the proposed methods of treatment (bed rest, bracing, and early rehabilitation), which are unfortunately supported by limited data and small case series. Although our investigation failed to provide reliable guidelines for the post-reduction treatment strategies, immobilization should be avoided, as its effectiveness in preventing recurrence is not confirmed by clinical evidence. Further comparative studies including larger cohorts are required to establish best practices.

Citation: Regis D, Borgese R, Bagnis F, Magnan B, Samaila EM. Early dislocation in primary total hip arthroplasty: Evaluation of treatment options following closed reduction. *World J Orthop* 2026; 17(2): 113367
URL: https://www.wjgnet.com/2218-5836/full/v17/i2/113367.htm
DOI: https://dx.doi.org/10.5312/wjo.v17.i2.113367

INTRODUCTION

Total hip arthroplasty (THA) is one of the most successful orthopedic procedures, and it was defined in 2007 "the operation of the century"[1], as significant pain relief and increased limb mobility may usually be obtained, providing improved patient's quality of life[2]. Despite its remarkable success rate, THA complications and failures still occur, and instability is the major cause of early reoperation. According to data from national registries, the incidence of early dislocation after primary THA ranges between 0.3% and 3%. Recent data from the Italian Regional Register of Prosthetic Orthopaedic Implantology reported a dislocation rate of approximately 1.2% in 2021[3], whereas the Australian Orthopedic Association National Joint Replacement Registry showed a rate of 2.2% as early as 2004[4]. These figures reflect both the improvements over time in surgical technique and implant design, as well as ongoing variability among different healthcare systems. Currently, dislocation rate accounted for 28% in revision surgery, involving thousands of patients per year[5].

Consequently, dislocation is still a cause for concern as it may considerably affect the functional result of the surgical procedure and the patient satisfaction, especially in case of recurrence, and can be extremely traumatic, as patients lose confidence in their artificial joint and outcome of the operation. Additionally, the economic impact should be considered, as further hospitalization and potential revision surgery may be required[6]. The clinical and economic burden was retrospectively evaluated in England using data from the United Kingdom clinical practice research datalink database. Patients who dislocated showed two-year median direct medical costs of 15333 pound higher than uncomplicated population. Moreover, they had greater healthcare resource use and less improvement in EuroQol five-dimension index [7].

The majority of dislocation cases, typically over 67% according to registry and clinical data, can be managed successfully with conservative treatment, while a smaller number requires surgical intervention[8]. The aim of this paper was to review the potential treatment options following closed reduction in order to evaluate the most effective therapeutic strategy for restoring proper prosthetic function.

CLASSIFICATION

Early dislocation of a THA occurs within the first 3 months following surgery (or up to 6 months according to some authors)[9]. It is the most common type (50%-70%) and may be related to surgical technique, inadequate soft tissue tensioning or poor patient adherence to postoperative instructions. Intermediate dislocations occur later, between 3 months (or 6 months) and up to 5 years following surgery (15%-20% of cases), after normal activities have been resumed and prosthetic range of motion increases, and component malpositioning should be suspected[10]. When this complication is observed beyond 5 years after operation, it has to be considered late, and is frequently linked to polyethylene wear.

In 2012, Wera *et al*[11] developed a classification based on causal factors assessing 75 revision cases for instability. This system identifies the dislocation mechanism in order to propose the most appropriate treatment, and includes six types: Types I and II result from acetabular and femoral components malpositioning, respectively. Types III, IV, and V are related to abductor musculature insufficiency, components impingement and wear, respectively. Type VI includes unidentified cause of the dislocation, and type VII is associated with spinopelvic imbalance (Table 1).

PATIENT-RELATED RISK FACTORS

Although not always easy, identification of the prosthetic dislocation mechanism is crucial for implementing the most appropriate treatment (Table 2). In their analysis of 40 dual mobility prostheses implanted for instability, Lange *et al*[12] reported that 57% were classified as Wera VI (unknown etiology).

Table 1 Classification of instability after total hip arthroplasty according to Wera *et al*[11] (modified)

Type	Etiology	Diagnosis	Treatment
I	Acetabular component malposition	Anteroposterior pelvic radiograph: Calculate acetabular version by arcsin (1); pelvic CT: Calculate version	Revision of the acetabular component
II	Femoral component malposition	Pelvic and knee CT performed in same sequence: Measure version	Revision of the femoral component
III	Abductor insufficiency	MARS-MRI: Evaluate abductor soft tissue; gait test: Evaluate for Trendelenburg limp	Constrained liner; some authors have had success with dual mobility components
IV	Impingement	Intraoperative detection: Evaluate for subtle signs of wear on the femoral neck and acetabular metal rim; when performing a full range of motion, check for impingement in all degrees of motion	Remove offending impingement structures
V	Late wear	Anteroposterior pelvic radiograph: Migration of the femoral head superiorly and laterally	Liner exchange; curettage and bone-grafting of the osteolysis for contained defects
VI	Unknown etiology	Unable to be determined based on plain radiograph and advanced imaging	Constrained liner
VII	Spinopelvic imbalance	Sitting and standing lateral radiographs: Evaluate sacral tilt; determine pelvic motion as normal, hypermobile or stiff; and then evaluate cup position and determine anteversion and inclination	Anterversion and inclination of the cup varies based on the position of the acetabular component

CT: Computed tomography; MARS-MRI: Magnetic resonance angiography with susceptibility weighting.

Table 2 Current role of patient-related risk factors for predisposing to dislocation after primary total hip arthroplasty

Risk factor	Confirmed
Weight	Not
Height	Not
Sex	Not
Age	Not definitively
Femoral neck fracture	Not definitively
Parkinson disease	Not definitively
Cerebral palsy and muscular dystrophy	Yes
Dementia and psychosis	Yes
Previous hip surgery	Yes
Alcohol abuse	Yes
Patient compliance	Yes
Lumbar spine stiffness	Yes

LITERATURE REVIEW

We performed a narrative review of the papers on conservative management of early dislocation following primary THA. A comprehensive search was conducted in PubMed, Cochrane Library, and Scopus databases between December 2023 and January 2025. The search strategy included combinations of the following keywords: "total hip arthroplasty", "dislocation", "brace", "immobilization", "nonoperative treatment", and "conservative management".

Inclusion criteria comprised peer-reviewed articles published in English up to 2024 that addressed clinical outcomes following post-reduction management of early dislocation in primary THA. Both prospective and retrospective studies were considered, regardless of sample size, provided they reported specific treatment strategies (*e.g.*, bracing, bed rest, early mobilization). Exclusion criteria included case reports, surgical technique papers unrelated to post-reduction care, and studies focusing solely on revision surgery or non-primary THA.

The search retrieved 16 articles from PubMed, 11 from Scopus, and 1 from the Cochrane Library. After removal of duplicates and initial screening, full-text analysis was conducted on selected studies. References within included articles were also examined to identify additional relevant publications. Given the heterogeneity of study designs and outcomes, a formal meta-analysis was not feasible; instead, the results are presented in a descriptive and thematic synthesis in the following section.

DISCUSSION

Despite a relatively low incidence (0.2%-3.6%), hip prosthesis dislocation is a serious complication, representing one of the leading causes of early revision surgeries based on national registry data[13,14]. Dislocation requires a specialized approach, beginning in the emergency department with imaging and manual reduction, followed by an in-depth investigation to identify the underlying cause, which often remains unknown.

Ten studies that detailed post-reduction treatments and recurrence rates were considered and briefly discussed (Table 3). In 1976, Ritter[15] reported 7/502 dislocations: 5 were treated with manual reduction and abduction brace for an unspecified time, observing 2 cases of recurrence. The effects of immobilization using a pelvifemoral cast following reduction (either closed or open) were evaluated in 16 mixed patients by Williams *et al*[16]. This immobilization, similar to a modern abduction brace limiting the prosthesis range of motion, resulted in only one recurrence. However, the inclusion of open reductions, with possible correction of component malposition, is a strong limitation of this study.

Thirty-nine cases of dislocation were classified by Dorr *et al*[17] into three types: I (well-positioned components), II (soft tissue imbalance), and III (prosthetic malposition), which underwent different post-reduction treatments, involving 6 weeks of brace immobilization alone, the same protocol with revision performed in case of recurrence, and immediate revision surgery, respectively. The overall recurrence rate was 59%. The results of immobilization after closed reduction using a brace locked between 70°and 80° of flexion and neutral abduction for 6-9 months were reported by Clayton and Thirupathi[18] in 9 patients with well-positioned components following recurrent dislocation, and only 1 experienced further complication. Undoubtedly, the main limitation of this effective management option was the extremely long duration of bracing.

Dorr *et al*[19] highlighted the benefit of braces, as dislocation weakens the gluteus medius muscle and immobilization helps to resolve hematomas and support scar tissue repair. Although the failure rate is high, this treatment may avoid revision surgery in some cases. The prognosis of 161 (59 early) dislocations (0.4% of THAs) observed at Wrightington Hospital was assessed at an average follow-up of 8 years. They were considered early (within 5 weeks) or late, with recurrence rates of 25% and 11%, respectively. After closed reduction (156 cases), treatments varied from bed rest and traction to bracing and casting. Closed reduction with no further complication was obtained in 84% of patients, while 26 required revision, which was successful in 73%[20].

Yuan and Shih[21] followed for up to 5.3 years 62/97 dislocations (3.6% of total), identifying three causes: Soft tissue imbalance, prosthetic malposition, and postural instability. Most dislocations (58%) occurred within 3 months postoperatively, and were managed by bed rest and traction, with braces used for recurrent dislocations. Reoperation was required in 15% of cases, all involving malposition or soft tissue imbalance. In 2004, DeWal *et al*[22] conducted the first large-scale study documenting the effects of immobilization after reduction. They retrospectively evaluated 149 dislocations, categorized by first episode (91) or recurrence (58). Patients with successful closed reduction and no radiographic malposition according to Lewinnek's criteria were included. The choice of immobilization *vs* immediate rehabilitation was left to the surgeon. The recurrence rate following first dislocation was 61% and 64% in braced and immediately mobilized patients, respectively. Prosthetic instability was managed in 72% of cases with an abduction brace, and recurrence occurred in 55% and 56% of braced and non-braced patients, respectively. This study, which analyzed homogeneous cohorts excluding component malposition and irreducible cases, found no significant difference in recurrence rates between the two treatment methods[22].

Fifty-six dislocations in 5205 THAs (1.1%) occurring 6 months before (early, 43%) or after (late, 57%) operation, showed an overall recurrence rate of 39% (46% in early). Closed reduction was followed by conservative treatment, such as derotational casting or Hohmann bandage, and was successful in 86% of cases, while the remaining underwent revision surgery[23]. The most numerous case series was reported in 2022 by Ogonda *et al*[24], who analyzed data from 8606 THAs carried out through a posterior approach in 7818 patients between 1998 and 2017. A total of 218 hips (2.5%) experienced at least one dislocation, with significantly decreasing rates from 6.2% between 1998 and 2002 to 1.5% between 2003 and 2017. Revision surgery was performed in 92 cases (1.06%), but only 5 (0.06%) involved both components, while the remaining 87 required intervention only on the acetabular side. The Authors concluded that in patients experiencing a second dislocation within 3 months of primary operation, the use of a spica or long leg cylinder cast to minimize the need for revision is recommended. Consequently, an algorithm for managing instability with less aggressive operative treatment, particularly for elderly patients, to reduce physiological stress and healthcare costs, is suggested[24].

Patient-related and procedure-related factors significantly influence the frequency of dislocation and subsequent management strategies. Cemented, uncemented, hybrid, and dual mobility implants demonstrate differing rates of early instability, with dual mobility designs generally associated with lower dislocation risk. Bilateral arthroplasty may alter biomechanics and slightly increase the risk of instability compared to unilateral procedures. Advanced age, frailty, and comorbidities can compromise soft tissue integrity, predisposing to dislocation and influencing the choice and duration of conservative treatment. Furthermore, traumatic dislocations, such as those caused by falls, may require distinct post-reduction strategies compared to non-traumatic dislocations, given the differing underlying soft tissue and prosthetic factors. These considerations should guide individualized management decisions, particularly regarding the use of braces, immobilization, or early mobilization.

Therefore, the management of early dislocation following primary THA remains a matter of debate. Although several treatment strategies, such as closed reduction followed by immobilization, bracing, or early mobilization, have been proposed, evidence remains heterogeneous. Moreover, despite the presence of such high-quality studies, most of them consist of smaller series with limited patient numbers, retrospective designs, and lack of direct comparisons between treatment options. These limitations hinder the development of universally accepted, evidence-based post-dislocation protocols.

Table 3 Data obtained from papers concerning total hip arthroplasty dislocation, including methods of treatment and related outcome, *n* (%)

Ref.	Year	Total hip arthroplasty	Early dislocations	Treatment	Recurrence (%)	Follow-up
Ritter[15]	1976	502	7	ABD brace	2 (28.6)	NA
Williams *et al* [16]	1982	1030	13 (non-surgical); 19 (surgical)	16 cast for 6 weeks	1 (6.25)	32 months
Dorr *et al*[17]	1983	NA	39; type I; type II; type III	ABD brace for 4-6 weeks; ABD brace + revision if needed; revision	23 (59)	NA
Clayton and Thirupathi[18]	1983	289	9	Brace for 6-9 months in case of recurrence	1 (11)	NA
Dorr *et al*[19]	1998	NA	37; type I (11); type II (12); type III (14)	ABD brace for 4-6 weeks; ABD brace + revision if needed; revision	(45); (82); (NA)	5 years
Joshi *et al*[20]	1998	NA	59 (161)	52% rest in bed for 10 days; 28% skin traction applied to the lower limb; 9% ABD brace; 6% cast; 5% trans-tibial tuberosity traction	15 (25)	8 years
Yuan and Shih [21]	1999	2728	62 (total 97); posterior instability (39%); soft tissue imbalance (13%); component malposition (48%)	1-2 weeks of skin traction applied to the lower limb for all cases. In case of recurrence: 4-6 weeks ABD brace; 3 months ABD brace; NA	(44)	5.3 years
DeWal *et al*[22]	2004	NA	91	45 no brace; 46 ABD brace	(64); (61)	4 years
Leichtle *et al* [23]	2013	5205	24 (total 56)	25% anti-rotational cast; 18% Hohmann bandage; 46% anti-rotational cast + bandage; 11% no treatment	11 (45.8)	NA
Ogonda *et al* [24]	2022	8606	218	Spica or long leg cylinder cast in case of recurrence + revision if needed	(45.6)	20 years

NA: Not available.

The apparent contradiction between the presence of large-scale reviews and the assertion that data is limited can be reconciled by acknowledging that the few large studies available provide guidance in specific settings, but do not comprehensively address the comparative effectiveness of different conservative and surgical strategies across diverse patient populations. This highlights the need for multicentric, prospective trials with standardized outcome measures.

Contrary to earlier studies, Ogonda *et al*[24] have recently provided data analysis from over 8000 THAs and proposed an algorithm recommending the use of spica or long-leg casts in selected cases to avoid revision surgery. While these findings are valuable, the study lacks a direct comparison between different conservative treatment strategies and does not evaluate their relative effectiveness in preventing recurrence. This reinforces the need for systematic reviews that not only summarize existing data but also highlight areas where evidence remains inconclusive or unsupported by comparative trials.

Preventing dislocation involves addressing modifiable risk factors, as many patient-related factors (*e.g.*, age, sex, femoral neck fractures, dementia, psychiatric disorders) are largely unchangeable. Spinopelvic imbalance, particularly in patients with vertebral fusion or stiffness, significantly increases the risk of dislocation due to abnormal pelvic kinematics, leading to impingement and posterior dislocation[25].

Technical improvements, especially posterior capsule repair, have minimized differences between surgical approaches, and correct positioning of the acetabular component according to Lewinnek's "safe zone" remains critical, as well as reconstruction of physiological offset of the femur and leg length and the use of a stem with high head-to-neck ratio. Undoubtedly, surgeon experience is essential in achieving these goals. Recently, Díaz-Ponte *et al*[26] performed a systematic scoping review of the impact of soft tissue repair on reducing the incidence of dislocation in THA, particularly in osteoarthritis patients. Their findings consistently showed that preserving or repairing external rotator muscles, with tendon-to-bone repair being most effective, significantly reduced dislocation rates.

Several studies have demonstrated a strong correlation between femoral head diameter and the risk of dislocation after THA. Smaller head sizes (*e.g.*, 28 mm or less) are associated with a higher incidence of instability, primarily due to reduced jump distance and impingement tolerance. Conversely, larger heads (32 mm and above) provide increased stability, though they may raise concerns about wear in certain bearing couples[6,27,28]. While 67% of dislocations can be managed successfully with closed reduction, the following treatment varies widely among the few published case series, including immobilization methods (*e.g.*, casts, braces, or limb traction), bed rest, and early rehabilitation, often used in combination.

Earlier clinical studies included a relatively low number of cases, and focused on the rate of recurrence, which suggested the use of abduction braces[21]. Moreover, early and late dislocations were not always clearly differentiated, and the results of various treatment systems were not compared[17,18].

The rationale for immobilization is to prevent recurrence through promoting repair of damaged soft tissues. Consequently, Dorr *et al*[19] recommended the use of an abduction brace to reduce the range of motion when evident malpositioning of the prosthesis can be excluded. However, no evidence supported this treatment, and no alternative solutions were presented. DeWal *et al*[22] were the first to perform a retrospective study, including 149 dislocations, to assess the effects of immobilization after reduction. The management involved articulated brace or immediate rehabilitation, which was selected by the surgeon. No significant difference in recurrence rates between the two treatment methods was found, questioning the efficacy of immobilization.

Finally, analyzing data from a single-institution experience, a significant, over time reduction in the dislocation rate [overall, 218/8606 (2.5%)] of THAs performed through a posterior approach was recently reported. As revision was required in 1.06% of patients, the use of a spica or long leg cylinder cast to reduce the risk of a new operation was empirically recommended only in case of recurrence within 3 months of primary surgery[24].

Unfortunately, our investigation failed to establish reliable guidelines for the advisable post-reduction treatment strategies, as the available studies are outdated, include very limited and incomplete case series, and are no longer actual due to advances in surgical techniques and prosthesis designs. According to Díaz-Ponte *et al*[26], preventive strategies should be tailored to individual risk factors, and personalized approaches are necessary for optimizing outcomes in patients with a severe comorbidity burden. However, based on current findings, post-reduction immobilization should be avoided, as no clinical evidence support its benefits.

CONCLUSION

Although prognosis is generally favorable, dislocation of a THA remains a serious cause for concern for both surgeons and patients. A thorough preoperative assessment is essential to identify risk factors and apply the most effective preventive measures. The brevity of this review documents the lack of data on optimal post-reduction treatment, highlighting the need for more comprehensive studies. Current evidence suggests that immobilization may not provide any clear benefit, and future studies should compare different treatment approaches, including immediate rehabilitation and short-term bracing, to establish best practices.

FOOTNOTES

Author contributions: Regis D and Bagnis F designed the study and wrote the article; Borgese R created the artwork and conducted the literature review; Magnan B and Samaila EM made critical revisions. All authors approved the submitted version.

Conflict-of-interest statement: All the authors report no relevant conflicts of interest for this article.

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S-Editor: Zuo Q
L-Editor: A
P-Editor: Wang CH

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