Journal of Orthopaedic Surgery and Research

REVIEW

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Use of soft tissue repair as a hip dislocation preventive strategy following a total hip arthroplasty by posterior and posterolateral approach in patients with osteoarthritis: a systematic scoping review

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Abstract

Introduction Total hip arthroplasty (THA) is a procedure primarily performed for hip osteoarthritis. Dislocation rates after primary THA range from 0.7 to 2%, remaining a key concern. Variability in surgical approaches, especially regarding posterior soft tissue repair, underscores the need for evidence specific to osteoarthritis. This review evaluates the impact of soft tissue repair on reducing dislocation rates in THA via posterior and posterolateral approach.

Methods An exploratory systematic review was conducted to evaluate the effect of soft tissue repair on dislocation rates following THA for osteoarthritis. Studies in English and Spanish were included, focusing on posterior approach repairs. Searches were done in PubMed, Scopus, and Google Scholar. Three reviewers independently assessed study quality and extracted relevant data, using tools like APPRAISE-AI and PROBAST.

Results Out of 478 initially identified publications, 13 studies met the inclusion criteria. The studies focused on the impact of soft tissue management on hip dislocation following THA in patients with osteoarthritis. Results consistently showed that preserving or repairing the external rotator muscles reduced dislocation rates, with tendon-to-bone repair proving most effective among the existing techniques for soft tissue and external rotator repair.

Conclusion Soft tissue repair using the tendon-to-bone technique enhances hip stability and reduces the risk of dislocation in total hip arthroplasty for osteoarthritis. Preventive strategies should be tailored to individual risk factors, as personalized approaches are essential for optimizing outcomes in osteoarthritis patients with a high comorbidity burden.

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Keywords Total Hip Arthroplasty (THA), Hip dislocation, Soft tissue repair, External rotator muscles, Posterior approach, Posterolateral approach, Osteoarthritis, Tendon-to-bone repair, Hip stability, Systematic scoping review

Introduction

Total hip arthroplasty (THA) is a common surgical procedure aimed at reducing pain and improving joint function, resulting in improving patient's quality of life. One of the most common indications for this procedure is osteoarthritis, with 595 million cases reported worldwide in 2020, and a projected 95.1% increase in hip osteoarthritis by 2025 [1]. The choice of surgical approach depends on the surgeon's experience and comfort. There are three types of approaches: anterior, lateral, and posterior. The anterior and lateral approaches do not significantly compromise the short external rotator muscles of the hip [2], while the posterior approach typically involves their detachment, which has been proposed to increase the risk of prosthetic dislocation. Worldwide, a dislocation rate of 0.7–2% after primary THA has been estimated, and it continues to be a major concern for both surgeons and patients [3]. Dislocations have been shown to lead to a deterioration in the patients' quality of life and an increased burden on the healthcare system [2].

Current literature reveals considerable variation in the management of rotator muscles during the posterior approach, often based on surgical technique and surgeon preference. Three primary approaches are noted: some surgeons choose to preserve the rotator muscles, others to repair them and some deliberately decide against repair [3]. Evidence demonstrates that soft tissue repair significantly reduces dislocation rates, with meta-analyses indicating a protective effect [4]. However, none of these studies have specifically analyzed its use on dislocations after a hip arthroplasty performed for osteoarthritis, making it difficult to generalize findings to this group. Demographic and risk factors inosteoarthritis patients differ significantly compared to younger patients undergoing hip arthroplasty due to trauma or other causes and thus may influence the risk magnitude of dislocation [5]. Robust studies are still needed to definitively assess the effectiveness of these interventions in preventing complications such as prosthetic dislocation in patients undergoing THA for osteoarthritis.

The aim of this review is to synthesize the evidence on the impact of the soft tissue repair during a THA secondary to osteoarthritis in reducing the rate of prosthetic dislocation and improving hip joint stability through a systematic and exploratory review intended to address the gap in current knowledge on this complication for this specific population.

Methods

An exploratory systematic review was conducted following the methodology outlined by Arksey and O'Malley [6] and further refined by Levac et al. [7]. The study adhered to this framework, beginning with the formulation of a research question. This question emerged from the need to identify effective methods for preventing hip dislocation or instability following THA in adult patients with osteoarthritis. Due to the nature of this review, all the personal information that may be included in this study is anonymized, therefore, the requirement for informed consent and ethical approval was waived by the Ethics Committee of Universidad de La Sabana (2024-08-0, Med-519).

Eligibility criteria

We searched for relevant empirical studies from the last 20 years (2004–2024), both experimental and observational, published in English or Spanish, that provided data on the use of soft tissue repair during a posterior approach in THA and its impact on instability or dislocation as a complication from the procedure. It is important to note that theoretical publications, such as literature reviews, other systematic reviews or meta-analyses, position papers including consensus statements, expert opinions, and guideline recommendations, clinical management guidelines, letters to the editor without case reports, and finally those documents lacking access to an abstract or full text, were excluded from the review Fig. 1.

Search strategy

Search strategies were developed using Boolean operators, focusing on the population undergoing hip arthroplasty for osteoarthritis. Key terms were tailored specifically for PubMed, Scopus, and Google Scholar to ensure comprehensive coverage of relevant studies (Supplementary Material 1). Additionally, references cited in the selected documents that met the inclusion criteria, but were not identified in the initial search, were also included.

Critical evaluation and data extraction

The study selection process was carried out independently by three investigators across all databases after the findings from each search was downloaded and subsequently uploaded to Rayyan, ensuring consistent results based on the inclusion criteria. Afterward, the selections were compared to verify accuracy and agreement. Initial data analysis was conducted by all three investigators. (JOG), with expertise in statistical analysis, evaluated

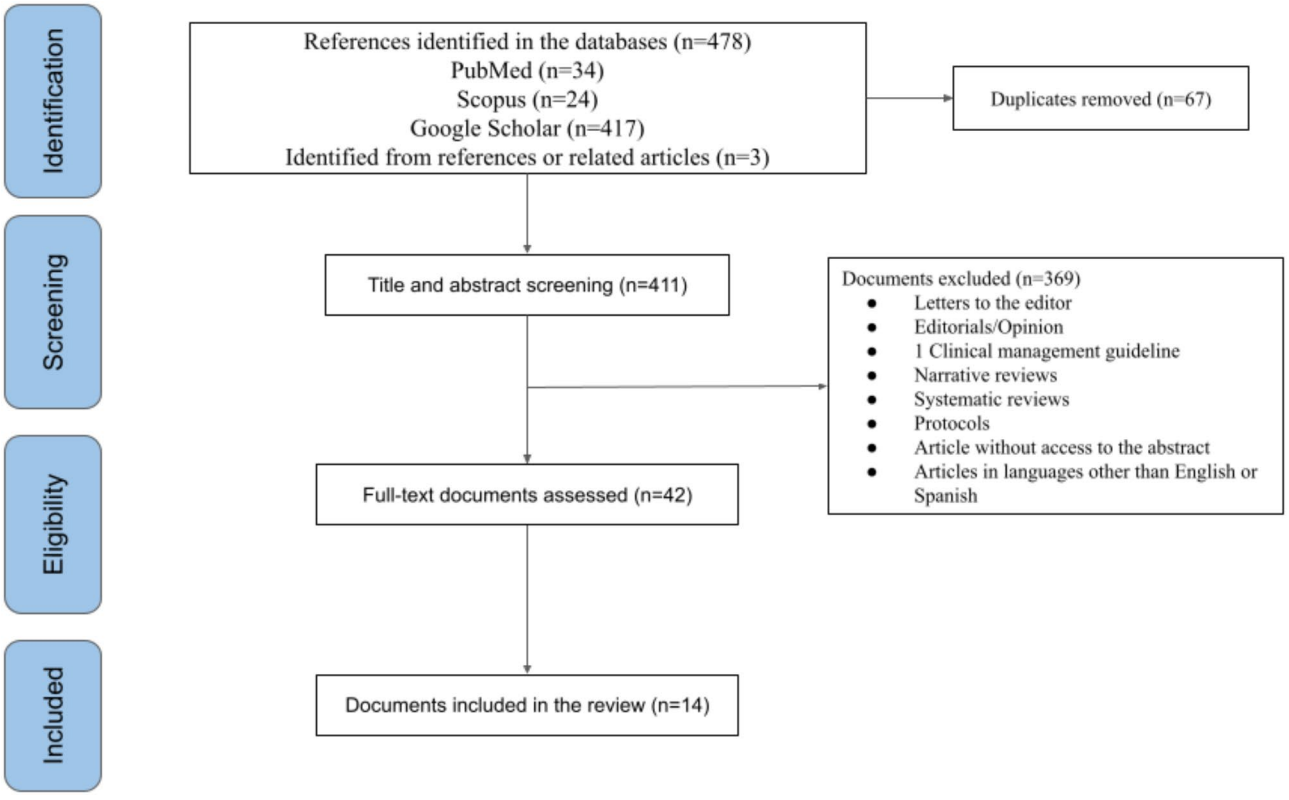

Fig. 1 PRISMA Flowchart

the quality and methodology of the studies to ensure robust data that would allow reliable conclusions to be drawn from the reported results using the APPRAISE-AI Tool, which was released on JAMA Network Open in 2023 [8], and the Prediction model Risk Of Bias Assessment Tool (PROBAST) [9]. Experts in orthopedics (SDP, CAJ), assessed the thematic consistency of the results, scrutinizing the methodology and ensuring the studies adequately addressed the research question. This ensured that only appropriate studies were included. Differences or uncertainty during the screening process were untied by a third referee (JGOM). Furthermore, a comprehensive summary and report of the results was completed Fig. 1. The review followed the guidelines for reporting systematic reviews as outlined in PRISMA-ScR Supplementary material 2 [10].

Finally, the articles included were reviewed in full text by all the authors, and the following information was extracted in a table: authors, country, year of publication, type of study, sample characteristics and size, objective, journal, and main findings. Subsequently, a narrative synthesis of the most representative publications included in our review was carried out and summarized.

Results

Out of 478 investigations initially identified, 14 publications met the inclusion criteria conformed by 35%retrospective single cohorts ($n=5$), 21% prospective single cohorts ($n=3$), 21% randomized clinical trials (RCT) ($n=3$), 14% case control studies ($n=2$) and 7% case series ($n=1$). Out of the 14 publications, 21% were from South Korea ($n=3$), 14% from China ($n=2$), 14% from Japan ($n=2$), and 7% from each of the following: Spain ($n=1$), France ($n=1$), Germany ($n=1$), United Kingdom ($n=1$), Netherlands ($n=1$) and Australia ($n=1$) further information regarding the characteristics of these studies can be found synthesized in Table 1.

The overall aim of these studies was to determine the impact of preserving, repairing, or not repairing the short external rotator muscles after a THA on preventing hip dislocation or instability among other complications. The majority of these studies indicated that preserving or repairing the short external rotator muscles significantly contributed to improved hip joint stability and a reduction in dislocation rates.

Randomized clinical trials

Similarly, Moon et al. who also conducted a RCT, analyzed 167 THAs comparing tendon-to-tendon repair ($n=80$ hips) with tendon-to-bone repair ($n=87$ hips). Aside from the soft tissue repair, all other surgical

Table 1 Characteristics and description of the included studies

Authors, year	Type of study	Country	Demographics	Aim	Journal	Outcomes
Moon et at, 2018	RCT	South Korea	159 patients with reattached the short external rotator tendon with posterior capsule. 87 hips tendon-to-bone and 80 hips tendon-to-tendon)	To investigate the incidence of suture failure, dislocation, and time to failure for two repair techniques for posterior soft tissue repair during total hip arthroplasty.	International Orthopaedics	Suture failure rate was higher in tendon-to-tendon than tendon-to-bone 65% vs. 18.4% ($p < 0.001$). The relative risk for hip dislocation when posterior soft tissue repair failed was 6.44-fold greater than when the repair was successful (95% CI, 1.33 to 31.2). Hip dislocation was higher in tendon-to-tendon than in tendon-to-bone 1.1% vs. 7.5% ($p = 0.041$)
Greidanus et al., 2012	RCT	Canada	135 patients, MIS DL ($n = 40$), MIS PL ($n = 26$) and MIS AL ($n = 69$.	Determine superiority of the AL approach, judging by SF-36 and QoL measures, radiographic parameters, and complications, compared with limited incision MIS DL and PL approaches repairing the external rotators and posterior hip capsule.	Clinical Orthopaedics and related search	No differences in SF36 measures in both groups (p = > 0.5) according to satisfaction scores, MIS AL approach for total hip arthroplasty preserving the external rotators was not superior to other minimal invasive approaches DL and PL repairing the external rotators and posterior capsule, no cases of dislocation.
Kumar et al., 2014	PSC	United Kingdom	512 hips with capsular repair.	To determine the rate of dislocation in patients who received a 22 mm head on a 9/10 Morse taper through a posterior approach with capsular repair and using the transverse acetabular ligament as a guide for the alignment of the acetabular component.	The bone and joint Journal	THR with a 22 mm diameter head performed through a posterior approach with capsular repair and using the TAL as a guide for the alignment of the acetabular component was associated with a low rate of dislocation (0.78%)
Khan et al., 2006	PSC	Australia	100 THA reviewed, 56 patients selected, 100 patients from control group, 65 patients selected	Evaluate the single-incision less invasive posterior approach and validate its use in total hip arthroplasty, comparing it to the standard posterior approach	The Journal of Arthroplasty	No dislocations in the less invasive group, 4 dislocations in the standard group ($p = 0.045$)
Pringent, 2008	ACS	France	98 hips with MIS P approach with piriformis sparing and 98 hips with posterior approach cutting and reinserting the piriformis.	To compare incidence of hip dislocation of a posterior minimally invasive approach with suture of the capsular joint and the preservation of the piriformis muscle against posterior approach with posterior capsular resection and cutting of the piriformis reinserted on the trochanter.	European Journal of Orthopaedic Surgery and Traumatology	With the standard approach, the dislocation rate was 2.9% at 1 year. With the approach combining the preservation of the piriformis and capsular suture, there was no prosthetic dislocation in 12 months ($p < 0.02$)
Spaan et al., 2015	RSC	Netherlands	465 THA, TT ($n = 246$), TB ($n = 219$)	To determine difference in dislocation rate between transmuscular and transosseous repair of the posterior soft tissues with use of 36 mm heads.	Hip International	1.6% dislocation rate in TT group and 1.8% in TB group, with no statistically significant difference between them ($p = 0.57$).
Fujii et al., 2020	RSC	Japan	188 patients who underwent THA. Repair group ($n = 94$) and a non-repair group ($n = 94$).	To investigate whether external obturator repair played an important role in preventing the mechanism in dislocation following a total hip arthroplasty.	Arthroplasty	Specifically, the values in the repair group were lower than those in the non-repair group. During a 5-year period of postoperative follow-up, hip joint dislocation occurred in one patient of the non-repair group. No dislocation was observed in the repair group.

Table 1 (continued)

Authors, year	Type of study	Country	Demographics	Aim	Journal	Outcomes
Wu et al., 2019	RSC	China	87 THA, TB ($n=46$), TT ($n=41$)	Compare two posterior soft tissue repair techniques, TTBRT/TTRT and establish clinical evidence for orthopedists, due to the lack of consensus of the best technique for posterior soft tissue repair.	Journal of Investigative Surgery	Dislocation rate 1.1%, no dislocations in TBRT group, 1 dislocation in TTRT group (2.4%), discrepancy was not statistically significant in early dislocation rate ($p=0.471$)
Hernandez et al., 2018	RSC	Spain	1437 patients, 1891 hips with external rotator repair.	To determine the incidence of dislocation after primary total hip arthroplasty using a posterior approach with capsular repair and transosseous reattachment of external rotators.	Spanish Journal of Surgery, Traumatology and orthopedics.	Early dislocation (within 12 months) rate was 1.2%, the majority of which were atraumatic dislocations. 43.5% of dislocations required revision surgery.
Kim et al., 2008	RSC	South Korea	557 patients with a total of 670 hips. No repair ($n=118$), intervention ($n=243$). Rotators preserved ($n=196$).	Determine whether preserving the external rotator muscles will reduce the dislocation rate after primary THA compared to the conventional posterior approach with or without repairing the external rotator muscles.	Clinical Orthopaedics and related search	The ERP group had the lowest dislocation rate ($p=0.004$), no dislocations in the ERP group 0/220, in the repair group 11/282 hips (3.9%), in the no repair group 9/168 hips (5.3%).
Suh et al., 2004	CCS	South Korea	303 patients with a total of 346 hips, cases ($n=83$) and controls ($n=220$).	To evaluate whether the rate of dislocation is influenced by repairing the external rotators and posterior capsule or not through a case control review chart study.	Clinical Orthopaedics and related search	Overall dislocation incidence rate of 4.9% in the entire CCS, 16/250 hips in the no repair group (6.4%), 1/96 hips in the repair group (1%), with a statistically significant difference ($p=0.041$).
Dimentberg et al.,	CCS	Germany	2242 THA reviewed, 172 patients selected, cases ($n=26$) controls ($n=146$).	To identify risk factors and assess the rate of dislocation following a primary THA comparing tendon-to-tendon repair versus posterior capsule and short external rotator tendon repair in dislocated patients (cases) versus non-dislocated (controls).	Archives of Orthopaedic and Trauma Surgery	1.2% dislocations occurred in the entire THA cohort (26/2,242). The TT protocol had a dislocation rate of 1.62%, while the TB protocol had a rate of 0.98% ($p=0.2$). The OR for dislocation with the TT protocol was 1.54 (95% CI: 0.60–4.95) adjusted. Non-inferiority tests confirmed that the TB was non-inferior to TT ($p=0.02$).
Kanda et al., 2018	CS	Japan	87 patients all in which soft tissue was preserved.	To investigate if protecting the posterior soft tissue increases the joint stability in the early postoperative period and results in a lower dislocation rate.	European Journal of Orthopaedic Surgery & Traumatology	The width of the internal obturator muscle increased significantly from 15.1 ± 3.1 mm before surgery to 16.4 ± 2.8 mm 6 months after surgery. The JOA score improved significantly from 50.8 ± 15.1 points to 95.6 ± 7.6 points. No dislocations occurred in this study.

Abbreviations: **THA** (Total Hip Arthroplasty), **RCT** (Randomized Clinical Trial), **MIS DL** (Minimally invasive Surgery Direct Lateral), **MIS PL** (Minimally invasive Surgery Posterolateral), **MIS AL** (Minimally invasive Surgery Anterolateral), **SF36** (Health Questionnaire) **QoL** (Quality of Life), **RSC** (Retrospective Single Cohort), **ERP** (External rotator preservation), **PSC** (Prospective Single Cohort), ACS (Ambispective cohort study), **CCS** (Case Control Study), **OR** (odds ratio), **TT** (Tendon-to-Tendon repair with precautions), **TB** (Posterior Capsule and Short ExternalRotator Tendon repair without precautions), **HHS** (Harris Hip Score), **TBRT** (Through bone repair technique), **TTRT** (Through tendon repair technique), **MIS P** (Minimally invasive Surgery Posterior), **CS** (Case Series)

procedures were standardized. Dislocation occurred more frequently in the tendon-to-tendon repair group compared to the tendon-to-bone repair group (7.5% vs. 1.1%; $p=0.041$). The relative risk for hip dislocation when posterior soft tissue repair failed was (RR, 95% CI [6.44, 1.33–31.2]) than when the repair was successful. Despite the extended surgical time and potential for greater trochanter fracture in tendon-to-bone repair, the authors concluded that it provides superior stability and lower dislocation rates compared to tendon-to-tendon repair [11].

Furthermore, Greidanus et al. also conducted a RCT to identify the most effective minimally invasive total hip arthroplasty (MIS THA) technique by comparing three approaches. A total of 135 patients were analyzed: the MIS anterolateral (AL) approach with external

rotator preservation ($n = 69$), the MIS direct lateral (DL) approach ($n = 40$), and the MIS posterolateral (PL) approach ($n = 26$), with the latter two involving external rotator and posterior capsule repair. The primary objective was to assess whether the AL approach resulted in better SF-36 scores and fewer complications compared to the DL and PL approaches. No significant differences in SF-36 measures were found between groups ($p > 0.05$). The authors concluded that the MIS AL approach, despite preserving the external rotators, did not demonstrate superiority over the other approaches in terms of dislocation prevention or overall patient satisfaction [12].

Prospective single cohort

Likewise, cohort studies provide consistent evidence on the impact of soft tissue repair in reducing dislocation rates. For instance, Kumar et al., using a retrospective analysis of collected data regarding 512 consecutive primary cemented unilateral THAs performed between 2004 and 2011 focused on evaluating post-operative outcomes such as pain, function, and dislocation rates. The mean follow-up period was 2.8 years, with no patients lost to follow-up and no deaths recorded. There were four anterior dislocations (0.78%), with no clear pattern regarding the timing. Three patients had medium femoral heads (+0), while one had a short head (-3 mm). All dislocations involved high-offset (HO) stems and none of the dislocations had undergone soft tissue repair [13].

Furthermore, Khan et al. undertook a prospective cohort that involved 200 patients who underwent THA: ($n = 100$) with a less invasive posterior approach preserving soft tissue starting in April 2002 and ($n = 100$) with the standard posterior approach prior to January 2002. The aim was to compare outcomes between these two techniques. The less invasive approach resulted in significantly less blood loss (mean 468 mL vs. 838 mL; $P < 0.0001$), a shorter median inpatient stay (5 days vs. 8 days; $P < 0.001$), and fewer dislocations (none vs. 4; $P = 0.045$). Overall, the less invasive approach led to reduced blood loss, shorter hospital stays, fewer dislocations, and better functional outcomes within the first year [14].

Ambispective cohort study

Between November 2003 and July 2004 Prigent et al. conducted an ambispective cohort including 98 patients who underwent THA using a posterior approach that preserved the piriformis tendon and repaired the joint capsule. This cohort was compared with 98 patients from a previous series where the standard posterior approach, involving resection and reinsertion of the piriformis, was used. Both groups received 28 mm prosthetic heads. The surgical time was longer in the piriformis preservation group (84 vs. 62 min). The dislocation rate was 2.9% in the standard approach group, while no dislocations occurred in the piriformis preservation group, with a statistically significant difference between groups ($p < 0.02$) [15].

Case control studies

Suh et al. conducted a study on 346 hips that underwent primary THA via the posterolateral approach by the same surgeon between January 1993 and December 1998. 250 hips from 220 patients without posterior soft tissue repair and 96 consecutive hips form 83 patients with posterior soft tissue repair. Both groups were compared in terms of dislocation rates, demographic, intervention characteristics, operative time, length of hospital stay, rehabilitation period, Harris Hip Score at 1 year postoperative, and internal rotation at 1 year postoperative. Aside from the soft tissue repair, all other surgical procedures were standardized. The overall dislocation rate was 4.9%, with 16 dislocations (6.4%) in the group without repair and 1 dislocation (1%) in the group with repair. This difference in dislocation rates was statistically significant ($P = 0.041$). The authors concluded that posterior soft tissue repair significantly reduces the risk of dislocation, shortens hospital stays and rehabilitation periods, and reduces medical costs due to earlier discharge and ambulation [2].

In the same way, Dimentberg et al. conducted a 10-year retrospective case–control study, extracting data from medical archives on all patients who experienced a dislocation following a THA via the posterior approach between December 2010 and December 2020 ($n = 2{,}242$). The study compared two distinct surgical protocols. The first protocol involved a tendon-to-tendon (TT) repair. The second protocol involved a transosseous tendon-to-bone (TB) repair. The study's primary outcome was the rate of hip dislocation. The results showed a total of 26 dislocations (1.2%), with the TT repair group experiencing a 1.62% dislocation rate compared to 0.98% in the TB repair group. Although the difference was not statistically significant ($p = 0.2$), the odds ratios (OR) indicated a trend favoring TB repair, with an unadjusted OR of 1.66 (95% CI: 0.62–4.26) and an adjusted OR of 1.54 (95% CI: 0.60–4.95). Additionally, secondary analyses revealed that older age ($p = 0.04$), higher ASA scores ($p = 0.03$), and larger acetabular cup sizes ($p < 0.001$) were significant risk factors for dislocation [16].

Retrospective cohort studies

Spaan et at. studied 465 THA by posterolateral approach to determine the difference in dislocation rate between transmuscular ($n = 246$) and transosseous ($n = 219$) repair of the posterior soft tissues with use of 36 mm heads. Female to male ratio was nearly 2:1 in both groups. Aside from the soft tissue repair, all other surgical procedures

were the same. Hip joint dislocation occurred in 1.6% and 1.8% in TT and TB groups, respectively. However, there was no statistically significant difference between the two groups ($p = 0.57$). Authors would regard both reconstruction techniques adequate and equally effective [17].

Fujii et al. conducted a retrospective cohort study on 188 hips that underwent THA by a posterior approach to determine the relevance of the external obturator repair in terms of functional outcomes, range of motion and complications such as instability and dislocation. Half of the sample, ($n = 94$) had piriformis and conjoined tendon repair, while the intervention group ($n = 94$) had piriformis, conjoined tendon and external obturator repair. Female to male ratio was approximately 4:1 in both groups. Aside from the soft tissue repair, all other surgical procedures were the same. Hip joint dislocation occurred in one patient of the control non-repair group. No dislocation was observed in the repair group. In the control non-repair group. The authors concluded that repairing the external obturator may decrease the risk of postoperative prosthetic joint dislocation by reinforcing the posterior soft tissues of the hip joint [18].

In another retrospective cohort, Hernandez et al. determined the incidence of dislocation after primary THA using the posterior approach with capsular repair and trans-osseous reinsertion of the external rotators. A total of 1,891 hip surgeries were included in 1,437 patients, who underwent scheduled surgery between January 2009 and December 2015. The surgical technique used included the disinsertion (as close as possible to its trochanteric insertion of the hip external rotator muscles), with subsequent capsular repair and repair of the rotator musculature by placing 2 trans-osseous stitches on the posterior border of the greater trochanter. There were 23 early dislocations (defined as occurring in the first 12 months postoperatively). Identifying an overall incidence of dislocation of 1.2% specially in patients without soft tissue repair where the highest probability of dislocation occurred in the first 120 days. Concluding that external rotator repair may reduce the incidence of dislocation in patients undergoing THA surgery via a posterior approach [19].

Kim et al. modified the conventional posterior approach by preserving the external rotator muscles to enhance joint stability after THA and named this surgical approach the external rotator preservation (ERP) procedure. They aimed to determine whether the ERP would reduce the dislocation rate after primary THA compared to the conventional posterior approach, with or without repairing external rotator muscles. A total of 670 hips ($n = 557$ patients) were included, who underwent primary THA performed by the same surgeon between August 1997 and May 2005. The no-repair group, in which the posterior capsule and short external rotator were excised and not repaired, had a total of 168 hips ($n = 118$ patients), the repair group, in which the detached short external rotators were reattached to the posterior border of the greater trochanter, had a total of 282 hips ($n = 243$ patients), a third group, the ERP group, had a total of 220 hips ($n = 196$ patients). This group had the lowest postoperative dislocation rate ($n = 0$) compared to the others ($p = 0.004$). There were 11 dislocations in the repair group and 9 in the no-repair group. The authors concluded that preserving the external rotators reduces the dislocation rate compared to sectioning and repairing the external rotators and capsule [3].

Finally, Wu et al. aimed to compare two posterolateral soft tissue repair techniques with a total of 87 patients studied, who underwent primary THA via a posterolateral between June 2015 and June 2018. They were divided into two groups in accordance with the soft tissue repair methods: through-bone repair cases as group TB ($n = 46$) and through-tendon repair cases as group TT ($n = 41$). Only one patient in group TT sustained a posterior hip dislocation, resulting in an overall dislocation rate of 1.1%. Early dislocation rate (6 months) was 0% in the TB group and 2.4% in the TT group ($p = 0.471$). The authors concluded that there was no statistically significant difference in the early dislocation rate between TB and TT techniques [20].

Case series

Kanda et al. conducted a study involving 87 patients who underwent THA with a preoperative diagnosis of osteoarthritis or avascular necrosis. The aim of the study was to assess whether protecting soft tissue during surgery improves joint stability and reduces the risk of early postoperative hip dislocations. Specifically, the study focused on the recovery of internal obturator muscle strength by measuring the maximum width of the muscle belly along with the conjoint tendon. The surgical technique preserved the internal obturator muscle and included full repair of the posterosuperior hip articular capsule following femur elevation, as well as anterior capsule repair after accessing the joint. Clinical outcomes were evaluated by measuring hip range of motion, hip function using the Japanese Orthopaedic Association (JOA) hip score, and the dislocation rate within six months postoperatively. The width of the internal obturator muscle increased significantly from 15.1 ± 3.1 mm before surgery to 16.4 ± 2.8 mm 6 months after surgery. The JOA score increased from 50.8 ± 15.1 points to 95.6 ± 7.6 points. No dislocations occurred in this study. Authors concluded that this treatment increases joint stability in the early postoperative period reducing dislocation rate [21].

Discussion

Our systematic scoping review scrutinizes the available evidence on the role of posterior soft tissue and external rotator preservation in reducing the risk of hip dislocations following total hip arthroplasty (THA) via posterior and posterolateral approach in patients with osteoarthritis. We identified three major approaches to soft tissue management: sparing the muscles, resecting and repairing them, or simply resecting without repair.

The debate between repair and preservation of soft tissue in THA has gained attention in recent literature. Traditionally, repair—particularly with tendon-to-bone fixation techniques—has been shown to be effective in reducing the risk of dislocation compared with no repair. However, studies by Prigent et al., Kim et al., Kanda et al. have proposed preservation of the capsule and external rotators as an alternative strategy, based on the hypothesis that maintaining the integrity of these native structures provides inherent stability without requiring surgical repair. Notably, the studies favoring preservation reported lower dislocation rates (0%) compared to those focusing solely on repair (2.9%), suggesting that preserving the external rotators may be superior to repairing them in reducing postoperative instability [15].

Furthermore, comparisons of specific repair techniques revealed a trend toward lower dislocation rates with tendon-to-bone (TB) repair compared to tendon-to-tendon (TT) repair identifying TB as the most efficient technique in this specific population. Additionally, minimally invasive approaches that aim to preserve certain muscles were associated with fewer dislocations.

Recent studies have compared which soft tissue repair technique was more efficient in reducing the incidence of dislocations and improved stability, in that regard, Sun et al. conducted a meta-analysis including 7 of these studies encompassing 1,417 patients (1481 hips) finding that the dislocation rate was lower in the transosseous group OR 95% CI (0.29; 95% CI: 0.14–0.59; $p = 0.0005$) [22]. These findings are supported by the findings of studies included in this systematic review by Dimentberg et al. and Moon et al. concluding that dislocation occurred more frequently in the TT repair group compared to the TB repair group in THA due to osteoarthritis. Our analysis extrapolates findings from previous studies to a specific THA population given the broader observation spectrum of more recent studies, in contrast to Sun's meta-analysis, which focused on a general population and older data.

A recent meta-analysis by Kunutsor et al., which included 125 studies and over 5 million patients, identified several key factors influencing the risk of dislocation following primary THA [5]. Patient-related factors such as age ≥ 70 years, BMI ≥ 30 kg/m², and neurological or psychiatric comorbidities were strongly associated with an increased risk of dislocation. Surgical and implant-related factors also played a significant role, with anterolateral, direct anterior, and lateral approaches demonstrating reduced risk, along with the use of dual mobility cups, larger femoral head diameters, and cemented fixations. Additionally, evidence from a pooled analysis of seven clinical trials using a posterior approach highlighted that soft tissue repair significantly lowered the dislocation risk. These findings align with the results of our systematic scoping review and emphasize the multifactorial nature of dislocation risk, which arises from a complex interplay between variables such as age, cup size, BMI, and other patient- or procedure-specific factors. Notably, the overall dislocation showed a pooled incidence of 2.10%, consistent with the range observed in our study. These results highlight the critical importance of adopting tailored surgical approaches to minimize the risk of dislocation, particularly in high-risk patients such as those undergoing THA for osteoarthritis with a particular focus on determining which soft tissue repair technique is most effective for this patient subgroup.

Finally, a previous meta-analysis by Zhou et al. from 2017 had explored the utility of soft tissue repair to prevent complications after a THA [4]. This study analyzed the data from 10 publications on this topic, including three RCTs and a total of 4816 hips, finding that soft tissue repair after posterior approach THA reduced early dislocation rates finding that capsular repair was more effective (RR = 0.12; 95% CI: 0.05–0.30) than rotator repair (RR = 0.73; 95% CI: 0.37–1.40). However, this effect was inconsistent when analyzing only RCTs, showing no statistically significant difference. Unlike Zhou's meta-analysis, our study exclusively focused on patients with osteoarthritis, analyzing a larger sample ($n = 6575$) and incorporating more recent studies that reflect current surgical techniques. This makes our findings more applicable to contemporary clinical practice and this specific population.

The studies included in this review exhibit significant variation in design, ranging from randomized clinical trials to case series, with a predominance of observational and retrospective studies, which may introduce information bias. Similarly, this study lacks analytical methods to draw significant conclusions, however, the consistency of findings across diverse methodologies supports the effectiveness of this prevention strategy for the specific intervention and outcome on the population studied. The inclusion of a wide range of studies enhances the overall patient pool, increasing the statistical power of the analysis. Geographic diversity, with research from South Korea, China, and Europe, offers a broad perspective and validates the impact of this intervention on dislocation rates despite variability arising from differences in healthcare systems, surgical practices, and patient demographics. Likewise, the small sample sizes in many previous

studies, particularly systematic reviews and meta-analyses, alongside their lack of subgroup analyses, limit the generalizability of their results, this study allows to validate previous findings of this intervention on a specific population prevalent worldwide. Moreover, the absence of large, statistically powered studies that precisely quantify the influence of different techniques of repair in the context of osteoarthritis poses a challenge, as this condition requires distinct preparation strategies that may significantly affect the risk of hip dislocation.

Our review highlights the effectiveness of soft tissue preservation and soft tissue repair using the tendon-to-bone technique in enhancing hip stability and reducing dislocation risk in patients undergoing THA for osteoarthritis. Even highlighting the importance and differential role that can bring the preservation of these tissues, rather than even their proper repair to reduce dislocation rates. Finally, older age, higher ASA scores, and larger acetabular cup sizes were identified as significant risk factors for dislocation, underscoring the need for individualized prevention strategies given the heterogeneity of complications following a THA. Given the higher comorbidity burden in this population, surgeons should consider either preserving native structures or tendon-to-bone soft tissue repair as a key preventive strategy, particularly for high-risk patients. While minimally invasive approaches offer benefits such as reduced hospital stays and blood loss, they do not inherently lower dislocation risk unless combined with muscle preservation or meticulous soft tissue repair. These findings reinforce the importance of integrating soft tissue repair into surgical planning to optimize outcomes and improve patient safety.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13018-025-05746-8.

Supplementary Material 1

Acknowledgements
We thank Juan Olivella-Gomez, Melissa Barros-Ortiz, and Christian Yothuel Perez, as well as Universidad de La Sabana for their support during the development of this study.

Author contributions
Author Contributions: Conceptualization: SDP, JGOM, GB; Data curation: SDP, MPE, CAJ; Formal analysis: SDP, JGOM, GB; Funding acquisition: JGOM; Investigation: SDP, JGOM, GB, MPE, CAJ; Project administration: JGOM; Software: SDP; Supervision: CAJ, JGOM; Validation: JGOM, GB; Visualization: SDP, MPE, CAJ; Roles/Writing – original draft: SDP, MPE, CAJ; and Writing – review & editing: SDP, JGOM, GB, MPE, CAJ.

Funding
None.

Data availability
No datasets were generated or analysed during the current study.

Declarations

Conflict of interest
The authors declare no conflicts of interest.

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Received: 13 February 2025 / Accepted: 21 March 2025
Published online: 14 July 2025

References

1. Collaborators GBDO. Global, regional, and National burden of osteoarthritis, 1990–2020 and projections to 2050: a systematic analysis for the global burden of disease study 2021. Lancet Rheumatol. 2023;5:e508–22.
2. Suh KT, Park BG, Choi YJ. A posterior approach to primary total hip arthroplasty with soft tissue repair. Clin Orthop Relat Res. 2004:162–7.
3. Kim YS, Kwon SY, Sun DH, et al. Modified posterior approach to total hip arthroplasty to enhance joint stability. Clin Orthop Relat Res. 2008;466:294–9.
4. Zhou Y, Cao S, Li L, et al. Is soft tissue repair a right choice to avoid early dislocation after THA in posterior approach? BMC Surg. 2017;17:60.
5. Kunutsor SK, Barrett MC, Beswick AD, et al. Risk factors for dislocation after primary total hip replacement: meta-analysis of 125 studies involving approximately five million hip replacements. Lancet Rheumatol. 2019;1:e111–21.
6. O'Malley HAL. Scoping studies: towards a methodological framework. Int J Soc Res Methodol 2005;8.
7. Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. Implement Sci. 2010;5:69.
8. Kwong JCC, Khondker A, Lajkosz K, et al. APPRAISE-AI tool for quantitative evaluation of AI studies for clinical decision support. JAMA Netw Open. 2023;6:e2335377.
9. Wolff RF, Moons KGM, Riley RD, et al. PROBAST: A tool to assess the risk of bias and applicability of prediction model studies. Ann Intern Med. 2019;170:51–8.
10. Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Ann Intern Med. 2018;169:467–73.
11. Moon JK, Kim Y, Hwang KT, et al. The incidence of hip dislocation and suture failure according to two different types of posterior soft tissue repair techniques in total hip arthroplasty: a prospective randomized controlled trial. Int Orthop. 2018;42:2049–56.
12. Greidanus NV, Chihab S, Garbuz DS, et al. Outcomes of minimally invasive anterolateral THA are not superior to those of minimally invasive direct lateral and posterolateral THA. Clin Orthop Relat Res. 2013;471:463–71.
13. Kumar V, et al. Total hip replacement through a posterior approach using a 22 mm diameter femoral head. Bone Joint J. 2014;96–B(9):1202–6. https://doi.org/10.1302/0301-620x.96b9.31831.
14. Khan RJ, Fick D, Khoo P, et al. Less invasive total hip arthroplasty: description of a new technique. J Arthroplasty. 2006;21:1038–46.
15. Prigent F. Incidence of capsular closure and piriformis preservation on the prevention of dislocation after total hip arthroplasty through the minimal posterior approach: comparative series of 196 patients. Eur J Orthop Surg Tr. 2008;18:333–7.
16. Dimentberg E, Barimani B, Alqahtani M, et al. The incidence of hip dislocation after posterior approach primary total hip arthroplasty: comparison of two different posterior repair techniques. Arch Orthop Trauma Surg. 2023;143:3605–12.
17. Spaans EA, Spaans AJ, van den Hout JA, et al. The result of transmuscular versus transosseous repair of the posterior capsule on early dislocations in primary hip arthroplasty. Hip Int. 2015;25:537–42.
18. Fujii H, Otani T, Kawaguchi Y, et al. Preventing postoperative prosthetic joint dislocation by repairing obturator externus in total hip arthroplasty performed via the posterior approach. Arthroplasty. 2020;2:33.
19. Hernandez A, Nunez JH, Mimendia I, et al. Early dislocation in primary total hip arthroplasty using a posterior approach with repair of capsule and external rotators. Rev Esp Cir Ortop Traumatol (Engl Ed). 2018;62:421–7.

20. Wu FM, Yin P, Yu X, et al. Comparison of two posterior soft tissue repair techniques to prevent dislocation after total hip arthroplasty via the posterolateral approach. J Invest Surg. 2021;34:513–21.
21. Kanda A, Kaneko K, Obayashi O, et al. Preservation of the articular capsule and short lateral rotator in direct anterior approach to total hip arthroplasty. Eur J Orthop Surg Traumatol. 2018;28:1111–6.
22. Sun C, Zhang X, Ma Q, et al. Transosseous versus transmuscular repair of the posterior soft tissue in primary hip arthroplasty: a meta-analysis. J Orthop Surg Res. 2020;15:547.

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