Endoscopic Gluteus Medius Repair With an ITB-Sparing Versus ITB-Splitting Approach

A Systematic Review and Meta-analysis

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Background: During hip endoscopy, the iliotibial band (ITB) can be split or preserved to access the peritrochanteric workspace. To our knowledge, no comparative studies have been performed to analyze patient-reported outcomes (PROs) and surgical failure rates (gluteus medius retear and/or revision surgery rates) for ITB-sparing versus ITB-splitting approaches in endoscopic gluteus medius repairs.

Purpose: To perform a systematic review and meta-analysis of the literature to evaluate PROs and failure rates of patients undergoing ITB-sparing versus ITB-splitting repairs of the gluteus medius.

Study Design: Systematic review; Level of evidence, 4.

Methods: A systematic review was performed by following PRISMA (Preferred Reporting Items for Systematic Meta-Analyses) guidelines and using the PubMed, Cochrane CENTRAL, and Embase databases. The quality of evidence was evaluated using the modified Coleman Methodology Score. Level 1-4 studies were evaluated for endoscopic abductor repair techniques on all types of gluteus medius tears. Given the small number of studies and varying population sizes, all quantitative data were adjusted for study population size.

Results: A total of 13 studies met our inclusion criteria, while more granular data, including ITB approach, were available for 8 studies. Because of the paucity of literature on the subject, all included studies were of lower quality per the modified Coleman Methodology Score. The visual analog scale for pain, the modified Harris Hip Score (mHHS), and the surgical failure rates were compared between approaches. Patients who underwent ITB splitting had a significantly greater change in mHHS (45.5 ± 4.6 vs 27.3 ± 6.5; P < .001) and lower surgical failure rates (3.67 ± 2.33 vs 4.75 ± 2.54; P = .04). There was no significant difference in change in visual analog scale for splitting versus sparing (4.26 ± 0.41 vs 4.39 ± 0.14; P = .96). The results may have been biased by between-group differences, such as patients who undergo ITB sparing being significantly younger.

Conclusion: Endoscopic gluteus medius repair is a reliable procedure to improve pain and function in appropriately selected patients. This study highlighted the lack of high-quality literature available regarding ITB approach. However, the evidence to date has suggested that ITB approach may influence hip-specific PROs. Splitting the ITB during abductor repair may be associated with a greater improvement in mHHS and lower surgical failure rates. Further prospective comparative studies are warranted to evaluate the effect of ITB approach.

Keywords: gluteus medius; endoscopic; arthroscopic; ITB; iliotibial band; repair; greater trochanteric pain syndrome; postoperative; surgical failure; PRO; patient-reported outcome

Greater trochanteric pain syndrome (GTPS) is a prevalent but loosely defined set of symptoms, diagnosed in approximately 1.8 per 1000 patients.8 These patients report persistent pain in the lateral hip and may demonstrate weak or painful hip abduction.10,14,19 Full- and partial-thickness tears of the gluteus medius are increasingly being reported as an underdiagnosed cause of this recalcitrant hip pain.10,13,14,19 If left untreated, these tears can progressively worsen, cause chronic hip pain and weakness, and affect the gait of the patient.9 Patients with gluteus medius tears and 6 months of unsuccessful conservative therapy may be considered candidates for surgical repair.7,19

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These patients are more likely to have gait deviation and decreased power on resisted abduction testing.1 In a systematic review, Alpaugh et al1 found that abductor repairs consistently improve functional status and patient-reported pain.

Literature has demonstrated that open and endoscopic approaches for gluteus medius repairs have similar patient-reported outcomes (PROs), functional improvements, and pain reductions.1,6,16 Lower complication rates have been detailed for the endoscopic approach, with systematic reviews by Alpaugh et al1 and Chandrasekaran et al15 and a study by McCormick et al15 yielding a 0% complication rate.

During endoscopy, the iliotibial band (ITB) overlying the deep gluteal musculature affects the amount of space available for viewing and correcting peritrochanteric pathology.15 With the ITB-splitting surgical approach, the ITB is incised or windowed to allow access to the deeper bursal tissue and muscle fibers.9,10 The ITB-sparing surgical approach utilizes portals anterior and posterior to the ITB, thus “sparing” the tissue to access the peritrochanteric workspace.3 The complication rate of open repairs in the comparison studies was documented to be as high as 17%.1,6,15

This systematic review and meta-analysis compared the postoperative outcomes of patients who underwent ITB-sparing versus ITB-splitting endoscopic gluteus medius repairs. We assessed postoperative outcomes via PROs and surgical failure rates (gluteus medius retear and/or revision surgery). We hypothesized that (1) the ITB-splitting approach would have postoperative PROs equivalent to those of the ITB-sparing approach and that (2) the ITB-splitting approach would have a lower surgical failure rate.

METHODS

Literature Search

Search strategies were developed with the assistance of an orthopaedic health sciences librarian with expertise in searching for systematic reviews. Searches were developed by the authors and the librarian using an iterative process of gathering and evaluating terms. Searches were finalized in June 2019. Comprehensive strategies, including index and keyword terms, were devised for the following databases: PubMed (including MEDLINE), Embase (Elsevier platform), and Cochrane CENTRAL (Wiley). To maximize sensitivity, pre-established database filters other than the English-language filter were not used. The full PubMed search strategy was adapted for use with the other electronic databases. Complete search strategies are available upon request. Supplementary approaches for searching included reviewing reference lists and citing articles of relevant studies via SCOPUS searches for the included studies.

In the PubMed Search strategy, the MeSH terms and text words used to identify hip injuries (search 1) included the following:

("Hip Injuries"[Mesh] OR "Buttocks"[Mesh] OR "Femur"[Mesh]) AND ("Lacerations"[Mesh] OR "Tendon Injuries"[Mesh] OR "Tendons/injuries"[Mesh] OR "Pain"[Mesh]) OR (gluteus medius tear[Text Word] OR gluteus medius injur*[Text Word] OR gluteal tear*[Text Word] OR gluteal injur*[Text Word] OR gluteal tendinopath*[Text Word] OR hip abductor tear*[Text Word] OR hip abductor lesion*[Text Word] OR gluteus medius defect*[Text Word] OR trochanteric pain syndrome*[Text Word] OR greater trochanter* pain[Text Word]).

The MeSH terms and text words used to identify endoscopic repair and ITB approach (search 2) were as follows:

("Endoscopy"[Mesh] OR "Minimally Invasive Surgical Procedures"[Mesh] OR "Suture Anchors"[Mesh]) OR (endoscopic*[Text Word] OR arthroscopic*[Text Word] OR repair*[Text Word] OR minimally invasive*[Text Word] OR minimal surgical*[Text Word] OR IT band*[Text Word] OR iliobibial band*[Text Word] OR ITB*[Text Word] OR peritrochanteric approach*[Text Word] OR minimal access*[Text Word]).

We then combined these 2 searches, limited results to English language, and found a total of 467 articles on this database. Duplicates were removed by using an approach to ensure accuracy and prevent accidental loss of records. This process was facilitated by citation management software and supplemented by manual review of records.

Our initial search yielded 1799 results that were evaluated according to our inclusion and exclusion criteria (Table 1). We reviewed 38 full-text articles and found 8 studies that fully met our inclusion criteria and were assessed qualitatively and quantitatively (Figure 1). The target intervention of the included studies was endoscopic gluteus medius repair, and studies needed to specify whether an ITB-splitting or ITB-sparing operative approach was utilized.5,5,10,16,18,20 If these data were not available in the text, the corresponding authors were
contacted to verify the ITB approach employed during surgery. If the corresponding authors did not respond, these studies were excluded per our criterion requiring specification of operative approach. The studies also needed to have quantifiable postoperative PROs or surgical failure rates available for analysis.3-5,10,16-18,20

### Table 1

| Inclusion                                                                 | Exclusion                                                                 |
|--------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Adults only                                                               | Non–English language studies                                               |
| Levels 1-4, conference papers                                            | Animal studies                                                            |
| All publication dates                                                    | Studies of minors                                                          |
| Acute and degenerative gluteus medius tears                              | Studies of patients with rheumatic conditions                              |
| Avulsion-related gluteus medius tears                                     | Level 5 studies                                                            |
| Patient-reported outcomes and/or reoperation rates reported               | Systematic reviews                                                         |
| Minimum follow-up approximately 2 y                                       | Meta-analyses                                                             |
| May include patients with prior hip arthroscopy, prior gluteus medius repair (open or endoscopic), prior trochanteric bursectomy, prior iliotibial band procedures, prior hip arthroplasty | Commentaries                                                              |
| May have concomitant extra-articular procedures, hip arthroscopy         | Technique descriptions                                                     |

**Figure 1.** PRISMA (Preferred Reporting Items for Systematic Meta-Analyses) flow diagram of included and excluded studies of endoscopic gluteus medius repair, with iliotibial band approach specified.
Statistical Analysis

Given the relatively small number of included studies and the large differences in study population size, all quantitative results comparing ITB splitting versus ITB sparing were adjusted for population size. Additionally, there was no data overlap in the 3 studies with ITB-splitting and ITB-sparing repairs because separate quantitative variables were not given for the different populations. Therefore, adjusting the data by population size was performed to reduce inaccuracies due to overlap.

Excel (v 1808; Microsoft Inc) was utilized to perform basic comparisons of patient characteristics and all Student t tests. Student t tests were performed to compare descriptive data between patients undergoing ITB splitting and those undergoing ITB sparing; mean age, mean percentage of female patients, and mean follow-up were analyzed. Additionally, Student t tests were used to assess quantifiable study outcome variables, such as preoperative visual analog scale (VAS) for pain, postoperative VAS, decrease in post- versus preoperative VAS, preoperative modified Harris Hip Score (mHHS) for hip function, postoperative mHHS, difference in post- versus preoperative mHHS (ΔmHHS), and surgical failure rates for ITB splitting versus ITB sparing. To evaluate qualitative operative variables, SPSS (v 25; IBM) was utilized; these results were not adjusted for patient population size. Given the amount of variation in concomitant and prior hip procedures performed, these variables were standardized to evaluate their presence or absence in the patients of the study, with 1 = yes and 0 = no. Pearson chi-square tests were performed to compare the presence or absence of concomitant extra-articular procedures and/or concomitant intra-articular procedures and/or prior ipsilateral hip procedures in patients undergoing ITB splitting versus those undergoing ITB sparing. Fisher exact tests were performed if the numerical inputs were not large enough to support performing a Pearson chi-square analysis. In the 3 studies of ITB-splitting and ITB-sparing repairs, there was no data overlap for the qualitative variables, so data overlap did not affect these results.

Outcome Variables

The primary outcome variable of this study was the surgical outcomes of patients undergoing endoscopic gluteus medius repair with an ITB-sparing versus ITB-splitting approach. Surgical outcomes were evaluated using postoperative PROs, overall rate of surgical failure (gluteus medius retear or revision surgery), and individual numbers of confirmed retears or revision surgery cases.

The extent of postoperative PRO score improvement after endoscopic gluteus medius repair was examined among patients who underwent ITB splitting versus sparing. All 8 studies collected pre- and postoperative PRO data from their patients but differed widely in which specific PROs were collected and whether the numerical PRO scores were reported in the study. The most data points were available to compare ITB splitting versus ITB sparing for mHHS and VAS. Postoperative PRO score improvement was defined as a significant increase in mHHS and a significant decrease in VAS. Therefore, we analyzed the ΔmHHS (the difference between post- and preoperative mHHS) as well as the ΔVAS (the difference between pre- and postoperative VAS).

Surgical failure was also examined and could be defined as a radiographically confirmed gluteus medius retear or as gluteus medius revision surgery; the number of cases of confirmed retears and revision surgery were assessed individually in addition to composite surgical failure rates. Seven studies reported surgical failure rates, and 4 of the 8 included studies having cases of failure occur. Two studies defined surgical failure as a gluteus medius retear confirmed using magnetic resonance imaging (MRI) scan, and 2 studies defined surgical failure as a documented revision repair of the gluteus medius.

Study Quality

The mean modified Coleman Methodology Score (Appendix Tables A1 and A2) was assessed by 2 independent reviewers (E.A.P., A.M.M.). For the 8 evaluated studies, the median score was 32 (range, 18-39). Scores were similar among studies using the ITB-splitting approach versus the ITB-sparing approach versus both approaches. All study scores were <55, which is considered "poor quality," owing to small study size, lower-quality study type, and multiple interventions per group. These scores were expected because of the relatively new nature of the surgical intervention in question and the paucity of literature available.

RESULTS

In the group of 8 evaluated studies, the median sample size was 19 patients, with a range of 7 to 43. Of these 8 studies, 2 used the ITB-splitting approach, and 3 used the ITB-sparing approach, and the remaining 3 utilized both approaches. In total, 141 ITB-sparing and 33 ITB-splitting repairs were available for analysis (Tables 2 and 3). The mean ± SD age of the ITB-splitting group was 58.43 ± 4.26 years, which differed from the mean age of the ITB-splitting group (64.11 ± 3.84 years; P < .01). The mean percentage of female patients was different between patients undergoing ITB sparing and those undergoing ITB splitting, at 92.38% ± 4.98% versus 86.40% ± 3.64% (P < .01), respectively. The mean follow-up was 29.72 ± 5.08 months for ITB sparing and 28.33 ± 4.88 months for ITB splitting, which was not significantly different (P = .16).

Operative variables were assessed between the ITB-splitting and ITB-sparing populations. There was a large amount of variance in the concomitant and prior hip procedures allowed for the included studies, so the analysis was standardized to evaluate for the presence or absence of concomitant extra-articular ipsilateral procedures and/or concomitant intra-articular ipsilateral procedures and/or prior ipsilateral hip procedures. Nawabi et al did not provide data on concomitant intra- or extra-articular procedures performed, and Bogunovic et al did not provide data on
The percentage of studies including patients with concomitant extra-articular procedures did not differ significantly between the ITB-sparing (75.61% ± 43.12%) and ITB-splitting (87.88% ± 33.14%) literature ($P < .01$). However, studies with ITB sparing were significantly more likely to include patients with concomitant intra-articular procedures (65.04% ± 47.88% vs 18.18% ± 39.17%, $P < .01$). Studies with ITB sparing also had a significantly greater inclusion of patients with prior procedures on the operative hip (65.18% ± 47.85% vs 0.00% ± 0.00%; $P < .01$).

### PRO Measures

The study by Nawabi et al$^{16}$ did not provide numerical data on postoperative PROs. Six studies included pre- and

| Author | No. of Patients (M:F) | Mean (Range) Age, y | Follow-up, mo | ITB Splitting or Sparing | Postoperative PROs Obtained | Scores | Failure Rate, No. (%) | Summary |
|--------|-----------------------|---------------------|---------------|--------------------------|-----------------------------|--------|---------------------|---------|
| Byrd$^4$ | 12 (0:12) | 56 (39-77) | 24 | 12 sparing | mHHS, iHOT-12 | mHHS, 85; iHOT-12, 73 | 0 (0) | Endoscopic ITB-sparing GM repair improves hip outcome scores with no incidence of complications |
| Nawabi$^{16}$ | 18 (1:17) | 51.6 | 38.1 (24-87) | 18 sparing | mHHS, HOS-ADL, HOS-SS | Significant increase in mHHS, HOS-ADL, HOS-SS | 2 (11.1) | Open and endoscopic GM repairs result in clinical improvement |
| Voos$^{20}$ | 10 (2:8) | 50.4 (33-66) | 25 (19-38) | 9 sparing, 1 splitting | mHHS, HOS | mHHS, 94 (84-100); HOS, 93 (85-100) | 0 (0) | All patients had complete pain relief; improved mHHS, HOS, and strength; and no complications |
| Chandrasekaran$^5$ | 34 (2:32) | 57 (20-79) | 24, minimum | 30 sparing, 4 splitting | mHHS, NAHS, HOOS-ADL, HOOS-Sports, VAS | VAS, 2.4 | Not obtained | Endoscopic GM surgical repair is effective with suture bridge or transtendinous technique |
| Bogunovic$^3$ | 30 (3:27) | 62.2 (36.7-88.5) | 34.68 | 29 sparing, 1 splitting | HOS-ADL, HOS-SS, mHHS, VAS | HOS-ADL, 83.3; HOS-SS, 75.0; mHHS, 81.1; VAS, 1.68 | 2 (6.67) | The degree of muscle fatty atrophy negatively affects postoperative PRO scores and reoperation rates |
| Saltzman$^{17}$ | 43$^b$ | 62.1 | 29.31 | 43 sparing | HOS-ADL, HOS-SS, HHS, mHHS, SF12-PF, iHOT-12, VAS | HOS-ADL, 82.79 (53-100); HOS-SS, 72.31 (11.1-98.5); mHHS, 78.72 (41.8-100); VAS, 1.92 | 4$^c$ | PRFM had no effect on pain or retear rates and may improve hip physical function |
| Drummond$^{10}$ | 7$^b$ | 65 (26.7-88.6) | 20.7 (5.3-41.2) | 7 splitting | VAS, Oxford, iHOT-33 | VAS, 2.8; Oxford, 37.3; iHOT-33, 70.2 | 0 (0) | ITB release, bursectomy, and GM repair are safe and effective for greater trochanteric pain |
| Thaunat$^{18}$ | 20 (3:17) | 66 (45-82) | 31.7 (24-47) | 20 splitting | mHHS, NAHS, VAS | mHHS, 80.2; NAHS, 76.8 ± 14.5; VAS, 3.2 | 1 (5) | Endoscopic GM surgical repair is effective in the short term, but fatty degeneration can affect clinical outcomes |

$^a$ADL, activities of daily living; F, female; GM, gluteus medius; HOOS, Hip disability and Osteoarthritis Outcome Score; HOS, Hip Outcome Score; iHOT, International Hip Outcome Tool; ITB, iliotibial band; M, male; mHHS, modified Harris Hip Score; NAHS, Nonarthritic Hip Score; PRFM, platelet-rich fibrin matrix; PRO, patient-reported outcome; SF-12-PF, 12-Item Short Form Health Survey–Physical Functioning; SS, Sport Specific; VAS, visual analog scale for pain.

$^b$No sex data available.

$^c$No delineation between open and endoscopic.

prior ipsilateral hip procedures. The percentage of studies including patients with concomitant extra-articular procedures did not differ significantly between the ITB-sparing (75.61% ± 43.12%) and ITB-splitting (87.88% ± 33.14%) literature ($P < .01$). However, studies with ITB sparing were significantly more likely to include patients with concomitant intra-articular procedures (65.04% ± 47.88% vs 18.18% ± 39.17%, $P < .01$). Studies with ITB sparing also had a significantly greater inclusion of patients with prior procedures on the operative hip (65.18% ± 47.85% vs 0.00% ± 0.00%; $P < .01$).
postoperative VAS score data (Table 4)\(^3,5,10,17,18\) Four studies\(^3,4,17,18\) included pre- and postoperative mHHS score data, while Voos et al\(^20\) provided only postoperative mHHS data. ITB splitting patients had higher pre- and postoperative VAS scores as compared with ITB sparing patients (preoperative, \(7.22 \pm 0.41\) vs \(6.48 \pm 0.28\) \(P < .01\); postoperative, \(2.97 \pm 0.37\) vs \(2.09 \pm 0.28\) \(P < .01\)). However, there was not a significant difference in postoperative VAS improvement (\(\Delta\)VAS) between ITB splitting patients and ITB sparing patients (\(4.26 \pm 0.41\) vs \(4.39 \pm 0.14\); \(P = .96\)). For the mHHS, ITB splitting patients had lower preoperative scores (\(34.75 \pm 4.78\) vs \(52.85 \pm 4.51\); \(P < .01\)) but not significantly different postoperative scores (\(80.87 \pm 2.94\) vs \(81.49 \pm 4.75\); \(P = .25\)). There was a significantly greater degree of improvement in mHHS scores among ITB splitting patients (\(45.5 \pm 4.6\) vs \(27.3 \pm 6.5\); \(P < .001\)).

**Surgical Failure Rates**

Of the 8 studies reviewed, only the study by Chandrasekaran et al\(^5\) did not provide surgical failure data. Three studies documented zero cases of surgical failure within the 2-year follow-up period.\(^4,10,20\) Of the remaining 4 studies, Bogunovic et al\(^3\) and Nawabi et al\(^16\) documented cases of revision procedures, while Saltzman et al\(^17\) and Thaunat et al\(^18\) documented retears confirmed using MRI on (Table 5). Saltzman et al had 4 cases of clinical retears confirmed using MRI on, but only 2 could be definitively attributed to endoscopic gluteus medius repairs, as this study also included open repairs. For this reason, the minimum retear rate (2 of 43, 4.65%) from the Saltzman et al study was included in the between-groups failure rate calculations, but the study data were not included in the Pearson chi-square calculations because the number of nontear cases could not be confirmed. The ITB-splitting group had 4 retears and 4 reoperations documented and 63 cases with no retear and no revision surgery confirmed. The ITB-splitting group had zero retears and 1 reoperation documented, 19 cases with no retear confirmed, and 28 cases with no reoperation confirmed. The Pearson chi-square results for retears and reoperations between the ITB-splitting and ITB-splitting groups were not significant. The mean surgical failure rate (retears and reoperations) was 4.75% ± 2.54% for ITB splitting versus 3.67% ± 2.33% for ITB splitting (\(P = .04\)).

**DISCUSSION**

This systematic review and meta-analysis evaluated the surgical outcomes of patients who underwent endoscopic gluteus medius repair via the ITB-splitting versus ITB-splitting approach. Overall, patients see substantial clinical benefits from gluteus medius repair regardless of surgical approach. The results from the limited pool of current literature suggested a small but statistically significant advantage with the ITB-splitting approach. ITB splitting resulted in a lower overall surgical failure rate while achieving the same functional outcomes according to the mHHS, despite the patient population having a significantly lower mHHS before surgery. This was demonstrated by the significantly higher \(\Delta\)mHHS among ITB splitting patients. Patients undergoing ITB splitting had higher pre- and postoperative pain scores, but the improvement in pre- to postoperative VAS was not significantly different between ITB splitting and ITB sparing approaches. Demographically, patients undergoing the ITB-splitting approach were younger, with a greater percentage of female patients. They also more often underwent concomitant intra-articular hip procedures and were more likely to have had prior procedures on their operative hip, making reliable statistical comparisons of ITB splitting versus ITB sparing outcomes difficult.

The benefits of endoscopic gluteus medius repair regardless of ITB approach were detailed consistently in our review of the literature. In all 8 of our included studies, patients had significant improvements in pain, strength, and function after surgery.\(^3,5,10,16-18,20\) Nawabi et al\(^16\) were the only authors to compare open and endoscopic surgery, and they found similar improvements among all patients in mHHS, Hip Outcome Score—Activities of Daily Living, and Hip Outcome Score—Sports Specific subscale up to 3 years postoperatively. These results concur with findings by Alpaugh et al\(^1\) and Chandrasekaran et al\(^5\), both of whom found that endoscopic gluteus medius repairs improve patient outcomes to the same extent as open repairs, with a lower incidence of complications.

Excess ITB friction, with subsequent greater trochanteric bursitis, was identified in the past as the main culprit of GTPS.\(^10,11\) It is increasingly being recognized as only 1 of the multiple contributing factors for lateral hip pain, although it still plays an important biomechanical role in symptom resolution.\(^10,11\) In some patients with recalcitrant lateral hip pain, an ITB release with or without a trochanteric bursectomy is adequate to resolve their symptoms, such as the patients described by Jain et al\(^11\) and Zeman et al.\(^21\) In these cases, pain may be caused by the ITB rubbing along the underlying tissues, with the friction creating painful inflammation.\(^10\) However, addressing the ITB is only part of the problem for many patients with GTPS, as shown in a study by Coulomb et al,\(^8\) in which patients with GTPS and confirmed partial-thickness gluteus medius tears underwent surgery involving ITB release, bursectomy, and debridement of the fraying gluteus medius. Of the 17 patients, 6 were unsatisfied, and many had only a moderate improvement in PROs and functional results.\(^8\) Thus, releasing the ITB is an important component of addressing...
Sparing 6.48 ± D

ITB Preoperative Postoperative
prior hip surgery.
between-group difference in patients having undergone
detailed in the Limitations section, such as a significant
mately 1
difference in failure rate between approaches was approxi-
may be attributed to an enlarged workspace, facilitating
surgical failure rate for ITB splitting found in this review
opening a window in the ITB allows clear access to the bursa
Thaunat et al18 and Drummond et al10 both detailed how
opening the ITB before placing the hip in abduction allows
for superior access, and our included ITB-splitting studies by
abductor repair may be associated with greater improve-
ment in mHHS and lower surgical failure rates. Further
further comparative studies are warranted to evaluate
endoscopic gluteus medius repair. Additionally, the conclu-
sions drawn from this systematic review and meta-

acknowledged that ITB release is not a wholly benign proce-
dure, with one example being concerns about slowed return
to performance after ITB release in athletic populations.2

In addition to addressing any pain that may be generated
because of ITB friction, splitting the ITB during endoscopic
gluteus medius reconstruction allows for direct access to
deeper pathology and may provide an improved peritrochan-
teric workspace.12 When discussing surgical challenges dur-
ing gluteus medius reconstruction, Davies and Davies9
advised caution on both ends of the spectrum: with small
undersurface partial-thickness tears that are difficult to see
and may require additional maneuvering, and with large
tears that should be reinforced after the initial repair. A
technical note by Laskovski and Urchek12 discussed how
opening the ITB before placing the hip in abduction allows
for superior access, and our included ITB-splitting studies by
Thaunat et al18 and Drummond et al10 both detailed how
opening a window in the ITB allows clear access to the bursa
and then to the underlying gluteal musculature. The lower
surgical failure rate for ITB splitting found in this review
may be attributed to an enlarged workspace, facilitating
avoidance of the previously detailed pitfalls. However, the
difference in failure rate between approaches was approxi-
mately 1%, and we cannot exclude bias, owing to the factors
detailed in the Limitations section, such as a significant
between-group difference in patients having undergone

GTPS, but in patients with complex hip pathology, it does
not have a high likelihood of consistently resolving the hip
symptoms as an isolated procedure.8 It should also be
acknowledged that ITB release is not a wholly benign proce-
dure, with one example being concerns about slowed return
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detailed in the Limitations section, such as a significant
between-group difference in patients having undergone

case reports, being technique descriptions, or utilizing only
open repair techniques. The majority of our included studies
were case series with multiple interventions within the same
experimental group, which lowered the overall power of our
study. Additionally, there was quantitative variable data
overlap in our 3 studies with both ITB-splitting and ITB-
sparing repairs. Patients were older in the ITB-splitting
group and more commonly female in the ITB-sparing group;
these can be confounding factors that influence PROs and
reoperation rates.

We acknowledge that these limitations—lower-quality
source literature, quantitative variable data overlap,
potential within-group confounds—restrict the power of
conclusions drawn from this systematic review and meta-
analysis. However, this research does highlight the striking
paucity of data on the subject of advantages and disadvan-
tages to ITB-splitting versus ITB-sparing approaches for
endoscopic gluteus medius repair. Additionally, the conclu-
sions from this study can serve as a hypothesis-forming
"starting point" for future research regarding this topic.

CONCLUSION
Endoscopic gluteus medius repair is a reliable procedure to
improve pain and function in appropriately selected
patients. This study highlighted the lack of high-quality
literature available regarding ITB approach. However, the
evidence to date has suggested that ITB approach may
influence hip-specific PROs. Splitting the ITB during
abductor repair may be associated with greater improve-
ment in mHHS and lower surgical failure rates. Further
prospective comparative studies are warranted to evaluate
the effect of ITB approach.

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REFERENCES
1. Alpaugh K, Chilelli BJ, Xu S, Martin SD. Outcomes after primary open
or endoscopic abductor tendon repair in the hip: a systematic review
of the literature. Arthroscopy. 2015;31(3):530-540.

TABLE 4
Patient-Reported Outcome Measures for Patients Undergoing ITB-Sparing vs ITB-Splitting Repairsa

| ITB       | VAS      | mHHS   |
|-----------|----------|--------|
| Sparing   | Preoperative | 6.48 ± 0.28 | 52.85 ± 4.51 |
|           | Postoperative | 2.09 ± 0.28 | 81.49 ± 4.75 |
|           | Δ         | 4.39 ± 0.14 | 27.26 ± 6.50 |
| Splitting | Preoperative | 7.22 ± 0.41 | 34.75 ± 4.78 |
|           | Postoperative | 2.97 ± 0.37 | 80.87 ± 2.94 |
|           | Δ         | 4.26 ± 0.41 | 45.50 ± 4.58 |
| P value   | .01      | <.01   |

Values are presented as mean ± SD. ITB, iliotibial band; mHHS, modified Harris Hip Score; VAS, visual analog scale for pain.

TABLE 5
Surgical Failure Rates for Patients Undergoing ITB-Sparing vs ITB-Splitting Repairsa

| ITB       | Failure, Mean ± SD, % |
|-----------|----------------------|
| Sparing   | 4.75 ± 2.54          |
| Splitting | 3.67 ± 2.33          |
| P value   | .04                  |

a ITB, iliotibial band.

Limitations
The predominant limitation of this study was the small pool
of literature on this relatively new technique. Of the 38 full-
text articles that were reviewed, 20 were excluded for being

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2. Beals C, Flanigan D. A review of treatments for iliotibial band syndrome in the athletic population. J Sports Med (Hindawi Publ Corp). 2013;2013:367169.
3. Bogunovic L, Lee SX, Haro MS, et al. Application of the Goutallier/Fuchs rotator cuff classification to the evaluation of hip abductor tendon tears and the clinical correlation with outcome after repair. Arthroscopy. 2015;31(11):2145-2151.
4. Byrd JWT, Jones KS. Endoscopic repair of hip abductor tears: outcomes with two-year follow-up. J Hip Preserv Surg. 2017;4(1):80-84.
5. Chandrasekaran S, Gui C, Hutchinson MR, et al. Outcomes of endoscopic gluteus medius repair: study of thirty-four patients with minimum two-year follow-up. J Bone Joint Surg Am. 2015;97(16):1340-1347.
6. Chandrasekaran S, Lodhia P, Gui C, et al. Outcomes of open versus endoscopic repair of abductor muscle tears of the hip: a systematic review. Arthroscopy. 2015;31(10):2057-2067.e2052.
7. Chandrasekaran S, Vemula S, Gui C, Suarez C, Lodhia P, Domb BG. Clinical features that predict the need for operative intervention in gluteus medius tears. Orthop J Sports Med. 2015;3(2):2325967115571079.
8. Coulomb R, Essig J, Mares O, et al. Clinical results of endoscopic treatment without repair for partial thickness gluteal tears. Orthop Traumatol Surg Res. 2016;102(3):391-395.
9. Davies JF, Davies DM. Surgical technique for the repair of tears to the gluteus medius and minimus tendons of the hip. JBJS Essent Surg Tech. 2014;4(2):e11.
10. Drummond J, Fany C, Tran P. The outcome of endoscopy for recalcitrant greater trochanteric pain syndrome. Arch Orthop Trauma Surg. 2016;136(11):1547-1554.
11. Jain S, Ghatahora A, Shah N, Grogan R. The surgical treatment of recurrent trochanteric bursitis and coxa saltans externa with Z-plasty lengthening of the iliotibial band. Hip Int. 2015;25:S110.
12. Laskovski J, Urchek R. Endoscopic gluteus medius and minimus repair with allograft augmentation using acellular human dermis. Arthroscopy Tech. 2018;7(3):e225-e230.
13. Lerebours FR, Cohn R, Youn T. Endoscopic treatment of gluteus medius tears: a review. Bull Hosp Jt Dis (2013). 2016;74(1):58-62.
14. Lindner D, Shohat N, Botser I, Agar G, Domb BG. Clinical presentation and imaging results of patients with symptomatic gluteus medius tears. J Hip Preserv Surg. 2015;2(3):310-315.
15. McCormick F, Alpaugh K, Nwachukwu BU, Yanke AB, Martin SD. Endoscopic repair of full-thickness abductor tendon tears: surgical technique and outcome at minimum of 1-year follow-up. Arthroscopy. 2013;29(12):1941-1947.
16. Nawabi DH, Wentzel C, Ranawat AS, Bedi A, Kelly BT. A comparison of open and endoscopic repair of full-thickness tears of the gluteus medius tendon at a minimum of 2 years follow-up. Orthop J Sports Med. 2015;3(7):2325967115S00088.
17. Saltzman BM, Ukwuani G, Makhni EC, Stephens JP, Nho SJ. The effect of platelet-rich fibrin matrix at the time of gluteus medius repair: a retrospective comparative study. Arthroscopy. 2018;34(3):832-841.
18. Thaunat M, Clowez G, Desseaux A, et al. Influence of muscle fatty degeneration on functional outcomes after endoscopic gluteus medius repair. Arthroscopy. 2018;34(6):1816-1824.
19. Thaunat M, Noël E, Nové-Josserand L, et al. Endoscopic management of gluteus medius tendon tears. Sports Med Arthrosc Rev. 2016;24(1):11-18.
20. Voos JE, Shindle MK, Pruett A, Asnis PD, Kelly BT. Endoscopic repair of gluteus medius tendon tears of the hip. Am J Sports Med. 2009;37(4):743-747.
21. Zeman P, Rati M, Skala P, et al. Clinical results of endoscopic treatment of greater trochanteric pain syndrome. Acta Chir Orthop Traumatol Cech. 2017;84(3):168-174.

APPENDIX

TABLE A1
Coleman Methodology Score

| Part A | Coleman Methodology Score |
|-------|---------------------------|
| 1. Study size (10) |  |
| 2. Mean duration of follow-up (5) |  |
| 3. Number of surgical procedures (10) |  |
| 4. Type of study (15) |  |
| 5. Diagnostic certainty (5) |  |
| 6. Description of surgical procedure (5) |  |
| 7. Description of postoperative rehabilitation (10) |  |

| Part B | Coleman Methodology Score |
|-------|---------------------------|
| 1. Outcome measures (10) |  |
| 2. Outcome assessment (15) |  |
| 3. Selection process (15) |  |

Total: 100 possible
| Criteria                                                                 | Begunovic⁶ | Byrd⁴ | Nawahi¹⁶ | Saltzman¹⁷ | Drummond¹⁰ | Thaunat¹⁸ | Voos²⁰ | Chandrasekaran⁵ |
|--------------------------------------------------------------------------|------------|-------|----------|------------|------------|-----------|--------|----------------|
| **Part A**                                                               |            |       |          |            |            |           |        |                |
| 1. Study size—No. of patients                                            | 0 0 0 4    | 4     | 0 0 0    | 0           | 0           | 0         | 0      |                |
| 2. Mean follow-up                                                        | 0 0 3 0    | 3     | 0 0 0    | 0           | 0           | 0         | 0      |                |
| 3. Percentage of patients with follow-up (radiographic and clinical)     | 5 5 5 5    | 5     | 5 5 5    | 5           | 5           | 5         | 0      |                |
| 4. Number of interventions per group                                     | 0 0 0 0    | 0     | 0 0 0    | 0           | 0           | 0         | 0      |                |
| 5. Type of study                                                         | 0 0 0 0    | 0     | 0 0 0    | 0           | 0           | 0         | 0      |                |
| 6. Diagnostic certainty (diagnosis confirmed by defined PE findings or MRI) | 5 5 0 5    | 5     | 5 5 5    | 5           | 5           | 5         | 0      |                |
| 7. Description of surgical technique                                     | 5 3 3 5    | 5     | 5 5 3    | 5           | 3           | 3         | 3      |                |
| 8. Description of postoperative rehabilitation                           | 3 3 0 3    | 3     | 0 3 3    | 0           | 3           | 3         | 0      |                |
| **Part B**                                                               |            |       |          |            |            |           |        |                |
| 1. Outcome criteria                                                      |            |       |          |            |            |           |        |                |
| Outcome measures clearly defined                                         | 2 2 2 2    | 2     | 2 2 2    | 2           | 2           | 2         | 2      |                |
| Timing of outcome assessment clear                                       | 2 2 2 2    | 2     | 2 2 2    | 2           | 2           | 2         | 2      |                |
| Use of outcome criteria with reported good reliability                   | 3 0 0 0    | 0     | 0 0 0    | 0           | 0           | 0         | 0      |                |
| Use of outcome with good sensitivity                                     | 0 0 0 0    | 0     | 0 0 0    | 0           | 0           | 0         | 0      |                |
| 2. Procedure for reporting outcomes                                      |            |       |          |            |            |           |        |                |
| Subjects recruited                                                       | 0 0 0 5    | 0     | 0 0 0    | 5           | 0           | 0         | 0      |                |
| Independent investigator (radiographic, clinical)                         | 0 0 0 0    | 0     | 0 0 0    | 0           | 0           | 0         | 0      |                |
| Written assessment                                                       | 3 3 3 3    | 3     | 3 3 3    | 3           | 3           | 3         | 3      |                |
| Patient-centered data collected                                          | 3 3 3 3    | 3     | 3 3 3    | 3           | 3           | 3         | 3      |                |
| 3. Description of subject selection process                              |            |       |          |            |            |           |        |                |
| Selection criteria reported and unbiased                                  | 5 5 5 5    | 5     | 5 5 5    | 5           | 5           | 5         | 5      |                |
| Recruitment rate reported and ≥80%                                        | 0 0 0 0    | 0     | 0 0 0    | 0           | 0           | 0         | 0      |                |
| Eligible subjects not included in the study satisfactorily accounted for   | 0 0 0 5    | 0     | 0 0 0    | 5           | 0           | 0         | 0      |                |
| **Total score**                                                          | 36 31 26 37| 39    | 39 33 31 | 18          |            |           |        |                |

⁶MRI, magnetic resonance imaging; PE, physical examination.