Systematic review and meta-analysis of outcomes following laparoscopic nerve decompression surgery in neuropathic sciatic pain due to endometriosis of the sacral plexus and/or sciatic nerve

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Abstract

Abstract

This systematic review and meta-analysis protocol aims to evaluate clinical outcomes following laparoscopic nerve decompression surgery in patients with neuropathic sciatic pain due to endometriosis involving the sacral plexus and/or sciatic nerve. The review will include studies published between 2000 and 2025 reporting pre- and postoperative data on pain frequency and intensity, quality of life, diagnostic delay, and surgical complications.

We expect this review to provide the first quantitative synthesis of outcomes associated with this severe and underdiagnosed condition, helping clarify the effectiveness and safety of nerve-sparing surgical approaches. The results may inform future clinical guidelines and highlight gaps in current evidence

Guidelines

This systematic review and meta-analysis protocol strictly follows internationally recognized methodological guidelines to ensure transparency, reproducibility, and scientific rigor.

The protocol is reported in accordance with the **PRISMA-P 2015** (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) guidelines.
The full review will follow the **PRISMA 2020** statement to ensure clear and complete reporting of the systematic review process.
Risk of bias in individual studies will be assessed using the **Joanna Briggs Institute (JBI) Critical Appraisal Tools**, adapted to each study design.
The certainty of evidence will be evaluated using the **GRADE (Grading of Recommendations, Assessment, Development, and Evaluation)** approach, when applicable.
Statistical analysis will be conducted in line with recommendations from the **Cochrane Handbook for Systematic Reviews of Interventions**, including use of the restricted maximum likelihood (REML) estimator and the Hartung-Knapp-Sidik-Jonkman (HKSJ) method for random-effects models.
The protocol will be registered in **PROSPERO** and adheres to its standards for prospective protocol registration of systematic reviews.

This protocol will be registered in **PROSPERO** and complies with its standards for the prospective registration of systematic review protocols.

In addition, the review protocol has undergone **external peer review** by independent experts in pain medicine and gynecology to ensure its clinical relevance, methodological soundness, and clarity of objectives prior to PROSPERO registration. The final results of the review will also be submitted for **peer-reviewed publication** in a scientific journal.

Before start

- Familiarize the team with PRISMA-P and PRISMA 2020 guidelines.
- Ensure access to all required databases (PubMed, Embase, Scopus, etc.).
- Assign at least one reviewer with statistical software skills (R, Jamovi).

Population

1 Exclude patients with one or more of the following criteria :
- Patients younger than 18 or older than 60 years of age;
- Male patients;
- Patients presenting with neuropathic pelvic pain without definitive diagnostic confirmation of sciatic nerve and/or sacral plexus involvement;
- Patients with a history of traumatic neuropathic pelvic or sciatic pain prior to diagnosis or surgical intervention;
- Patients presenting with non-neuropathic pelvic or lower limb pain;
- Patients without final diagnostic confirmation of the neuropathic origin through pelvic assessment (including pelvic ultrasound, pelvic MRI, neurography MRI, and/or pelvic electromyography), intraoperative findings, or histological analysis;
- Patients diagnosed with endometriosis without associated neurological symptoms (i.e., no clinical signs suggestive of sciatic nerve or sacral plexus involvement);
- Patients who previously underwent pelvic nerve surgery for unrelated indications (e.g., trauma, oncological procedures);
- Patients who have not undergone laparoscopic nerve decompression surgery, with or without nerve-sparing techniques (including conventional laparoscopic surgery, LANN technique, or robotic-assisted approaches).

2 Include women meeting all of the following criteria :
- Aged 18 to 60 years;
- Presenting with neuropathic sciatic pain in a clinical context suggestive of endometriosis involving the sciatic nerve and/or sacral plexus;
- Underwent laparoscopic nerve decompression surgery, with or without nerve-sparing techniques (including conventional laparoscopic surgery, LANN technique, or robotic-assisted approaches);
- Final diagnosis confirmed by pelvic assessment (including pelvic ultrasound, pelvic MRI, neurography MRI, or pelvic electromyography), intraoperative findings, or histological confirmation.

Intervention

3 Include studies that meet all of the following criteria :
- Laparoscopic surgical approach, excluding primary open laparotomy or transgluteal approaches ;
- Targeted decompression of the sciatic nerve and/or the sacral plexus;
- Surgery performed in the context of suspected or confirmed sciatic endometriosis, based on clinical symptoms and/or diagnostic confirmation through pelvic assessment (including pelvic ultrasound, pelvic MRI, neurography MRI, or electromyography).

4 Additional specifications :

- Techniques reviewed include conventional laparoscopy, nerve-sparing procedures such as the Laparoscopic Neuronavigation (LANN) technique, and robotic-assisted approaches.
- Concomitant surgical procedures (such as hysterectomy or excision of other pelvic lesions) do not constitute exclusion criteria, provided that decompression of the sciatic nerve and/or the sacral plexus was part of the surgical intervention.
- Partial excision of the affected nerve segment, when required due to endometriotic infiltration, is considered an integral part of the procedure and does not lead to exclusion.
- Additional decompression of other pelvic nerves, such as the pudendal nerve, is also permitted as long as decompression of the sciatic nerve and/or the sacral plexus was performed during the same intervention.

5 Exclude studies if one or more of the following conditions apply :

- Primary non-laparoscopic surgical approaches (e.g. initial open laparotomy or transgluteal access) ;
- Surgical procedures not involving decompression of the sciatic nerve, the sacral plexus, or their contributing roots (e.g., L4 to S3) ;
- Surgeries performed for non-neurological indications, such as endometriosis without neuropathic pain;
- Surgical interventions targeting only other pelvic nerves, without concomitant decompression of the sciatic nerve, the sacral plexus, or their contributing roots.

Type of study

6 Include original clinical studies reporting relevant outcomes related to the surgical decompression of the sciatic nerve and/or the sacral plexus in the context of endometriosis, published in French or in English.

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Consider the following designs for inclusion :

- Prospective cohort studies, including both observational and interventional designs ;
- Retrospective cohort studies and case series involving five or more patients, provided they report sufficient clinical and surgical details ;
- Randomized controlled trials (RCTs), if available ;
- Mixed-methods studies, if they include extractable clinical data relevant to the surgical intervention ;
- Include conference abstracts, provided that adequate data are available for extraction.

7 To be eligible, studies must report pre- and post-operative data on the frequency of neuropathic sciatic pain, as defined in the primary outcome. Only studies published between January 1, 2000, and July 1, 2025 will be considered for inclusion.

8 Exclude the following sources:

- Duplicate publications (e.g., multiple reports based on the same patient cohort) ;
- Single-case reports;

- Case series involving four or fewer patients;
- Editorials, expert opinions, and narrative or literature reviews;
- Theoretical or methodological papers that do not report original clinical data;
- Animal or preclinical studies; studies without extractable outcome data, even if the intervention is described (e.g., surgical technique videos without clinical results).

Search strategy

9 Conduct a comprehensive literature search across multiple electronic databases to identify relevant studies evaluating laparoscopic nerve decompression surgery in patients with sciatic endometriosis.

Databases to be searched: CENTRAL (Cochrane Central Register of Controlled Trials), The Cochrane Library (CLIB), Embase.com, MEDLINE, PubMed, Scopus.

Use a combination of controlled vocabulary (e.g., MeSH terms) and free-text terms in the search strategy. The following keywords will be used: "endometriosis", "sciatic nerve", "catamenial neuropathic pain", "sacral nerve", "sciatic pain", "sacral plexus", "neuropathic pain", "surgery", "laparoscopy", "decompression", "nerve decompression".

Combine these terms using Boolean operators (AND/OR) to ensure comprehensive retrieval of relevant literature. Develop and adapt equivalent search strategies for each database according to its specific indexing system and search syntax.

Screening strategy

10 Import all records identified through electronic database searches into a screening platform, where duplicate entries will be automatically detected and removed. In cases of discordance or uncertainty during this automated process, a manual verification by a reviewer will be performed to ensure accurate duplicate removal.

Conduct title and abstract screening of unique records by two independent reviewers, based on the predefined inclusion and exclusion criteria.

Retrieve and assess full texts of potentially relevant studies in detail for eligibility. Resolve any discrepancies in study selection through discussion and consensus. If consensus cannot be reached, consult a third reviewer.

Document the entire selection process using a PRISMA flow diagram, and record and report reasons for exclusion at the full-text stage accordingly.

Data management

11 Extract data using a standardized data extraction form developed specifically for this review. Collect the following variables for each included study :

- mean age of patients,
- reported inclusion criteria,
- diagnostic modalities used to confirm sciatic endometriosis,
- number of patients with sciatic nerve involvement and/or sacral plexus involvement,
- type of surgery performed,
- preoperative and postoperative frequency of sciatic pain,
- preoperative and postoperative intensity of sciatic pain,
- length of hospital stay,
- preoperative and postoperative quality of life,
- length of postoperative follow-up,
- frequency of major complications.

12 If outcome data are missing, incomplete, or unclear, attempt to contact the corresponding authors of included studies to request additional information or clarification. Perform this systematically for all studies lacking essential data required for quantitative synthesis. If no response is received within two weeks after two contact attempts, consider the data unavailable.

13 If missing data concern the primary outcome (pre- and post-operative frequency of neuropathic sciatic pain), exclude the study from the review in accordance with predefined eligibility criteria.

14 For secondary outcomes, exclude studies that do not report the relevant data from the specific quantitative analysis concerned, but allow inclusion in other secondary outcome analyses if they provide extractable data for those endpoints. This ensures each analysis is based on complete and reliable data while maximizing inclusion of studies across the overall synthesis.

Outcomes

15 Primary Outcome :

- Change in the frequency of neuropathic sciatic pain following laparoscopic nerve decompression surgery in patients with endometriosis involving the sciatic nerve and/or sacral plexus.
- Measure: Reported frequency of pain episodes (pre- and post-operative).
- Metric: Risk difference, odds ratio, or pooled proportion.

15.1 Secondary Outcomes:

1) Intensity of neuropathic sciatic pain before and after surgery.

- Measure: Visual Analog Scale, Numeric Rating Scale, or equivalent.
- Metric: Mean difference (MD) or standardized mean difference (SMD), where available.

2) Variation in the primary outcome by surgical technique.

- Measure: Frequency and intensity of sciatic pain in surgical subgroups.

- Metric: MD or SMD within subgroups; p-value for interaction.

3) Diagnostic tools used to identify sciatic endometriosis.
- Measure: Frequency of use of each diagnostic modality.
- Analysis: Descriptive synthesis and frequency tables.

4) Diagnostic delay.
- Measure: Time from symptom onset to confirmed diagnosis.
- Metric: Median or mean delay (in months or years), where available.

5) Quality of life before and after surgery.
- Measure: Validated quality-of-life instruments.
- Metric: Mean difference or descriptive synthesis depending on available data.

6) Perioperative and postoperative complications.
- Measure: Frequency of severe complications.
- Metric: Pooled complication rate (proportion), with subgroup analysis if applicable.

7) Duration of postoperative follow-up.
- Measure: Reported duration of follow-up.
- Metric: Median or mean duration (in months or years).

8) Heterogeneity in clinical outcomes across studies.
- Measure: I^2 statistic and between-study variance (τ^2).
- Analysis: Used to guide interpretation and sensitivity analyses.

Statistical Methods

16 To synthesize outcomes across studies, a random-effects meta-analysis will be conducted to account for both clinical and methodological heterogeneity. All statistical analyses will be performed using R software (notably the *meta* and *metafor* packages) and Jamovi.

17 Estimate the between-study variance (τ^2) using the restricted maximum likelihood (REML) approach, in lin e with current recommendations from the Cochrane Statistical Methods Group.

18 Calculate confidence intervals for pooled effect estimates using the Hartung-Knapp-Sidik-Jonkman (HKSJ) method, which offers improved reliability in meta-analyses involving a small to moderate number of studies (≤ 20).

19 For continuous outcomes (e.g., pain intensity scores), summarize effect sizes as mean differences (MD) or standardized mean differences (SMD), each reported with their 95% confidence intervals (CIs). For dichotomous outcomes (e.g., recurrence or complications), express pooled effect estimates as risk ratios (RR), risk differences (RD), or pooled proportions, also with 95% CIs.

20 When essential summary statistics (e.g., standard deviations) are not reported, derive them from alternative data sources (e.g., p-values, confidence intervals, interquartile ranges) using standardized imputation methods. If such calculations are not feasible or would compromise the reliability of the result, exclude the study from the quantitative synthesis for the outcome concerned, but allow it to contribute to the narrative synthesis.

21 Assess statistical heterogeneity using the I^2 statistic and the between-study variance (τ^2), complemented by Cochran's Q test and visual inspection of forest plots. When at least 10 studies are included, calculate 95% prediction intervals to estimate the plausible range of true effects in future comparable populations.

22 In the presence of substantial heterogeneity ($I^2 > 50\%$), conduct sensitivity analyses to evaluate the robustness of the findings. Exclude studies judged at high risk of bias (as assessed using the JBI critical appraisal tools) and studies presenting significant methodological or clinical differences.

23 To explore potential sources of heterogeneity, perform subgroup analyses. Each study will contribute to only one subgroup per analysis.

Predefined subgroup comparisons include:

- type of endometriotic involvement (sacral plexus vs. sciatic nerve);
- surgical approach (LANN technique vs. standard laparoscopy vs. robotic surgery);
- follow-up duration (3c 6 months vs. ≥ 6 months).

24 If meta-analysis is not feasible (due to excessive heterogeneity, missing data, or incompatible outcome measures), conduct a systematic synthesis. This qualitative synthesis will aim to assess the direction, magnitude, and consistency of treatment effects across studies, while integrating both the clinical context and methodological characteristics of the included evidence.

Risk of Bias and Quality Assessment

25 Use the Joanna Briggs Institute (JBI) Critical Appraisal Tools to assess the methodological quality of included studies, selected according to the specific study design (e.g., case series, cohort studies, randomized controlled trials).

Two independent reviewers will perform the quality assessment. Resolve any disagreements through discussion or, if necessary, adjudication by a third reviewer.

26 Qualitatively assess risk of bias related to missing results, including potential publication bias and selective outcome reporting, based on the completeness of reporting and feedback obtained from study authors.

If ten or more studies are included in the meta-analysis, consider funnel plots and/or Egger's test to evaluate the presence of small-study effects and publication bias.

Certainty of Evidence

27 Use the GRADE (Grading of Recommendations Assessment, Development and Evaluation) approach to assess the certainty of evidence for each key outcome.

The following five domains will be considered:

- risk of bias,
- inconsistency of results across studies,
- indirectness of the evidence,
- imprecision of the estimates,
- publication bias.

Based on these criteria, rate the certainty of evidence as high, moderate, low, or very low. The assessment will be performed independently by two reviewers, with disagreements resolved through discussion or consultation with a third reviewer.

Support and Funding

28 This review is supported by DRAW YOUR FIGHT, a nonprofit organization dedicated to raising awareness of invisible disabilities and chronic pain, and to promoting research through collaboration between patients and medical experts.

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