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Review Article

A systematic review of preoperative predictors for postoperative clinical outcomes following lumbar discectomy

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Abstract

BACKGROUND CONTEXT: Sciatica is often caused by a herniated lumbar intervertebral disc. When conservative treatment fails, a lumbar discectomy can be performed. Surgical treatment via lumbar discectomy is not always successful and may depend on a variety of preoperative factors. It remains unclear which, if any, preoperative factors can predict postsurgical clinical outcomes.

PURPOSE: This review aimed to determine preoperative predictors that are associated with post-surgical clinical outcomes in patients undergoing lumbar discectomy.

STUDY DESIGN: This is a systematic review.

METHODS: This systematic review of the scientific literature followed the Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines. MEDLINE and PubMed were systematically searched through June 2014. Results were screened for relevance independently, and full-text studies were assessed for eligibility. Reporting quality was assessed using a modified Newcastle-Ottawa Scale. Quality of evidence was assessed using a modified version of Sackett's Criteria of Evidence Support. No financial support was provided for this study. No potential conflict of interest-associated biases were present from any of the authors.

RESULTS: The search strategy yielded 1,147 studies, of which a total of 40 high-quality studies were included. There were 17 positive predictors, 20 negative predictors, 43 non-significant predictors, and 15 conflicting predictors determined. Preoperative predictors associated with positive postoperative outcomes included more severe leg pain, better mental health status, shorter duration of symptoms, and younger age. Preoperative predictors associated with negative postoperative outcomes included intact annulus fibrosus, longer duration of sick leave, worker's compensation, and greater severity of baseline symptoms. Several preoperative factors including motor deficit, side and level of herniation, presence of type 1 Modic changes and degeneration, age, and gender had non-significant associations with postoperative clinical outcomes.

CONCLUSIONS: It may be possible for certain preoperative factors to be targeted for clinical evaluation by spine surgeons to assess the suitability of patients for lumbar discectomy surgery, the hope being to thereby improve postoperative clinical outcomes. Prospective cohort studies are required to increase the level of evidence with regard to significant predictive factors.

Keywords: Lumbar disc herniation; Lumbar discectomy; Outcome; Predictor; Sciatica; Surgery

FDA device/drug status: Not applicable.

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Introduction

Sciatica secondary to lumbar disc herniation is characterized by radiating leg pain often associated with a loss of sensory or motor function along the distribution of the affected nerve [1]. With about 2% of the adult North American population affected by lumbar disc herniations [2], surgical management is common for those who do not improve with conservative treatment. Lumbar discectomy is one of the most common procedures performed by spine surgeons in the United States [3,4].

The cost for a primary lumbar discectomy can be upwards of $25,000 per patient [5–7]. Given the substantial financial outlay, a concern for patients and surgeons alike is the fact that surgical success rates vary from 74% to 98%, thus leaving many patients without a satisfactory outcome [2,8]. Persistent pain or disability after lumbar spine surgery is experienced by between one in four and in one in eight patients, respectively [9]. "Failed back surgery syndrome" contributes significantly to the overall financial burden of patients via ongoing medical treatment, lost earning power, and disability payments. Hence, there is an incentive to try and improve the outcomes of lumbar discectomy surgery.

To date, much of the literature revolving around improved surgical outcomes has focused on patient selection. Numerous prospective trials have investigated sociodemographic, clinical, radiographic, work-related, and psychological variables [10–15]. However, there is still no clear agreement as to the appropriate indications for spine surgery. Recent studies have found that many predictive factors play a role in postsurgical outcomes, including preoperative depression and somatic awareness [16], psychosocial issues [17], axial joint pain [17], nerve root decompression [17], pain drawing score [17], cognitive-behavioral factors [18], size and type of herniation [19], duration of disabling illness [19], revision cases [20], and extruded cases and protruded or sequestrated cases [20].

An up-to-date identification of reliable predictors for postoperative clinical outcomes following lumbar discectomy would be invaluable to surgeons when deciding whether surgery is the appropriate course of treatment. The purpose of the present systematic review was to define which, if any, preoperative factors predict clinical outcomes after lumbar discectomy for treatment of sciatica and lumbar disc herniation.

Materials and methods

A systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines [21].

Search strategy

MEDLINE and PubMed were searched from January 1, 2000 to June 1, 2014 using medical subject headings and free text terms relating to sciatica, lumbar disc herniation, and discectomy (Supplementary Material Appendix S1). Additionally, a hand search of the reference lists from relevant studies was also conducted to uncover additional studies.

Screening

Search results were screened independently by two reviewers (CAW and DMR). Disagreements were resolved by discussion until consensus was met. If consensus was not met, a third independent reviewer (EKW) would address the article in question and pursue further discussion with reviewers to reach consensus. Duplicate articles were removed before level 1 screening. Level 1 screening involved the evaluation of each study by title, abstract, and key words. Level 2 screening included the full-text evaluation of studies deemed eligible after level 1 screening or those that had insufficient information for eligibility during level 1 screening (eg, no abstract available).

Eligibility criteria

Studies meeting the following criteria were included:

1. Patients with confirmed sciatica or radiculopathy symptoms resulting from lumbar disc herniation
2. Surgeon(s) performed a lumbar discectomy surgical procedure
3. Study published after 2000
4. Randomized controlled trial, controlled trial, or prospective cohort study
5. Study must have included clinical outcome measures postoperatively (ie, validated questionnaires: Oswestry Disability Index [ODI], visual analog scale [VAS], Short-Form 36 health survey [SF-36], EuroQol-5D [EQ-5D], etc)
6. At least 12-month postoperative follow-up
7. A minimum of 40 patients included at follow-up

Studies were excluded if they met any of the following criteria:

1. Percutaneous surgical procedure
2. Inclusion of a spinal fusion
3. Retrospective study
4. Literature review
5. Studies not published in English

Methodological quality assessment

Two reviewers (CAW and DMR) independently assessed the quality of each study using a modified version of the Newcastle-Ottawa Scale for observational studies (eg, case-control and cohort studies) [22]. Studies were deemed satisfactory when a study achieved five or more stars (out of a possible total of nine stars). Disagreements were discussed by reviewers until consensus was met. When consensus was not met, a third reviewer (EKW) was available to help facilitate the discussion.