Journal of Clinical Neuroscience 23 (2016) 44–50

Contents lists available at ScienceDirect

Journal of Clinical Neuroscience

journal homepage: www.elsevier.com/locate/jocn

Review

Surgical management of recurrent lumbar disc herniation and the role of fusion

Ashraf Dower [a,b,*], Robindro Chatterji [b], Alexander Swart [b,c], Mark J. Winder [c]

[a] Department of Medical Administration, Liverpool Hospital, Locked Bag 7103, Liverpool, NSW 2170, Australia
[b] Department of Medicine, University of New South Wales, Kensington, NSW, Australia
[c] Department of Neurosurgery, Saint Vincent's Hospital, Darlinghurst, NSW, Australia

ARTICLE INFO

Article history:
Received 9 April 2015
Accepted 18 April 2015

Keywords:
Discectomy
Lumbar disc herniation
Recurrence
Spinal fusion

ABSTRACT

This systematic review was performed to evaluate the various operative management strategies for recurrent lumbar disc herniation (RLDH), including the efficacy of instrumented spinal fusion (ISF) at repeat discectomy, and whether the operative approach for repeat discectomy, minimally invasive (MID) or conventional open discectomy (CD), affected the outcomes. RLDH is one of the most common complications of lumbar discectomies. Whilst repeat discectomy is the standard procedure performed, the routine addition of ISF has been advocated to improve outcomes and prevent reherniation. A comprehensive search of the MEDLINE, EMBASE, CINAHL and Cochrane databases was performed. The measured outcomes included the rate of satisfactory clinical outcome, improvement in leg and back pain, Japanese Orthopaedic Association (JOA) recovery score, and complication rates. In total, 37 studies met our inclusion criteria, with 1483 patients. The rate of satisfactory outcomes was found to be statistically similar between the patients undergoing a discectomy with or without fusion (77.8% with ISF *versus* 79.5% without ISF; $p = 0.665$). Back pain and JOA scores showed greater improvements in the patients undergoing discectomy and fusion, compared to discectomy alone. The rate of satisfactory outcomes was marginally higher in the patients undergoing MID compared to CD (MID 81.2% *versus* CD 77.5%; $p = 0.248$). However, the leg pain improvement was similar. The postoperative back pain improvement was greater in the MID group (52.5% MID *versus* 36.3% CD), but with lower complication rates, specifically durotomies (MID 5.2% *versus* CD 15.3%; $p < 0.001$). There is no evidence to recommend the routine addition of ISF in the management of RLDH. The data suggest that MID has lower complication rates than CD in the setting of RLDH, yet unequivocal evidence is lacking.

1. Introduction

Recurrent lumbar disc herniation (RLDH) is defined as a recurrence of disc herniation at the same site of a previous discectomy, after an initial period of symptomatic improvement. This represents a significant cause of surgical failure, occurring in approximately 5–11% of discectomies [1–4].

Despite the strict definition of RLDH, allowing for both ipsi- and contralateral herniations, many have argued that only ipsilateral herniations should be included, as the site of the previous surgery makes ipsilateral reherniations a clinically unique subset [3,5]. The minimum length of the postoperative pain-free interval is also debateable, ranging from any interval of pain resolution postoperatively to 6 months [4,6].

RLDH has been associated with various patient-related factors including obesity, young age, male sex, manual labour employment and smoking status [5]. The effect of surgical factors upon recurrence has also been examined, with data suggesting an increased rate of disc herniation associated with limited discectomies compared to aggressive discectomies [7].

However, the surgical management of RLDH herniation is controversial due to an absence of high level evidence to guide management. A repeat discectomy (RD) remains the principal procedure performed for RLDH, with clinical outcomes being only slightly worse than seen for primary discectomies [8]. However, a review of RLDH data suggests that multifactorial causes exist, which may predispose to an increased likelihood of failure of the RD and further recurrence. Therefore, many surgeons advocate the routine use of instrumented spinal fusion (ISF) in addition to RD, regardless of whether there is objective evidence of spinal instability [5,9].

* Corresponding author. Tel.: +61 413485128; fax: +61 2 8738 6318.
E-mail address: Ashrafdower@gmail.com (A. Dower).

http://dx.doi.org/10.1016/j.jocn.2015.04.024
0967-5868/

We aimed to compare the various surgical approaches to RLDH and assess the evidence for the efficacy of ISF in addition to a RD. Furthermore, we performed subgroup analyses to determine whether a minimally invasive discectomy (MID) differed in outcome to a conventional open discectomy (CD).

2. Methods

2.1. Search strategy

A literature search was performed to assess the effectiveness of RD alone *versus* ISF and RD for the management of RLDH. This was performed using a preferred reporting items for systematic reviews and meta-analyses (PRISMA)-compliant method, involving a search of the MEDLINE, EMBASE, Cochrane, Google Scholar and CINAHL databases.

A protocol review detailing the inclusion criteria, outcome measures and data collection was published in advance. The registration number is CRD42015015982 and is available at http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42015015982.

The specific search strategy utilised for the MEDLINE and EMBASE databases is outlined in Supplementary Table 1. The following keywords were utilised in the search of the CINAHL, Google Scholar and Cochrane database: diskectomy, discectomy, disc herniation, and spinal fusion.

2.2. Eligibility

The search was limited to human studies published in the English language. Articles that included original data on patients undergoing surgical management of RLDH were considered. RLDH was defined as the recurrence of a disc prolapse in a patient with a previous discectomy and a period of postoperative symptomatic relief of undefined duration. The level of the prolapsed disc must have corresponded to the previous level of discectomy. Both ipsilateral and contralateral reherniations were included.

Studies were included if they had radiological confirmation of a disc prolapse preoperatively. Studies that included patients for whom the diagnosis of a prolapsed disc was made intraoperatively were not considered for the analysis. The exclusion criteria were as follows: patients who had previous fusion surgery, disc herniation not being the primary cause of spinal pathology, or if chronic back pain was the primary complaint rather than leg pain. Studies in which concurrent spinal instability was a requirement were excluded.

2.3. Data collection and extraction

Two authors (AD and RC) independently reviewed the MEDLINE and EMBASE search results, including a title and abstract examination to determine the eligibility for inclusion. The manuscripts of all selected abstracts were then reviewed in their entirety. Any disagreements were resolved by discussion between the two reviewers. The data were then extracted independently by two authors (AD, AS or RC).

The level of evidence of all included studies was analysed and classified as per the guidelines published by the Centre for Evidence Based Medicine, Oxford, UK [10].

2.4. Outcomes

The primary end-point included the rate of surgical success or failure, defined as a satisfactory or unsatisfactory result. The evaluation of a satisfactory result relied on the same or a similar scale to the modified McNab's criteria [6], where results were classed as excellent, good, fair or poor (Table 1). Only excellent and good were classified as a satisfactory result. Where the scales that were used to determine satisfactory clinical outcome varied (Prolo scale [11], Japanese Orthopaedic Association (JOA) score [9], 7 point Likert score [12], or other), we aimed to standardise the criteria by ensuring a minimum requirement for a satisfactory clinical outcome, regardless of scoring system. The scoring system had to define, at the very least, that the patients had complete to almost complete improvement in their preoperative pain for the designation of a satisfactory outcome. This method has been utilised in other systematic reviews to compare studies of outcome measures in spinal surgery [13].

Furthermore, we recorded the numerical scores that assessed factors including pain, disability and overall clinical recovery. The pain scores were separated for leg and back, as this remained clinically relevant. The Oswestry disability score (ODI), JOA score and the JOA recovery score [14], was also collected (Table 2) [1]. The JOA recovery score [9] is a derivative of the JOA score which represents the relative improvement in the preoperative to postoperative JOA score.

2.5. Data analyses

The rate of satisfactory clinical outcomes, including the scale utilised by each study, was recorded. The percentage of satisfactory outcomes was cumulated for each surgical group and then statistically compared using the Fisher's exact test (GraphPad Software, San Diego, CA, USA). Similarly, complication rates were cumulated and a pooled percentage was calculated for each surgical group. This was statistically analysed using the Fisher's exact test.

All numerical scores, including leg pain, back pain, ODI and JOA recovery scores were converted into a 100 point score for generalisation and extrapolation. The average change from the pre- to postoperative values was recorded, including the absolute change in 100 point scores and the percentage change. These values were pooled for each surgical group.

3. Results

The MEDLINE search yielded 1720 results (Fig. 1). Two authors independently reviewed all titles and abstracts to select 61 studies for a full text review. Thirty-three articles were excluded due to the various reasons outlined in Figure 1, and one study (five patients) was excluded due to the inability to obtain the full text. Finally, 27 studies from the MEDLINE database were included for the systematic review. The same search strategy was performed in the EMBASE database, however, only non-MEDLINE articles were reviewed. Six of these met the inclusion criteria. A keyword search of the Google Scholar, Cochrane and CINAHL databases further identified four articles for inclusion.

Table 1
Modified McNab's criteria

Clinical outcome assessment	
Excellent	No pain; no restriction of mobility; return to normal work and level of activity.
Good	Occasional non-radicular pain; relief of presenting symptoms; able to return to modified work.
Fair	Some improved functional capacity; still handicapped and/or unemployed.
Poor	Continued objective symptoms of root involvement; additional operative intervention needed at the index level irrespective of length of postoperative follow-up.