

Treatment of Herniated Lumbar Disk by Sequestrectomy or Conventional Discectomy

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Key words

- Herniation
- Nucleus pulposus
- Recurrence
- Recurrent disk
- Sciatica



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INTRODUCTION

Intervertebral disk herniation causes radiculopathy by both mechanical deformation of the associated nerve root and local inflammation. A variable degree of pain, neurologic deficit, and functional disability result. Removal of herniated disk material provides relief of back leg and back pain, and high degrees of patient satisfaction are achievable with minimal risk (15, 16). Although surgical indications are well defined, the optimal surgical approach is less clear. Sequestrectomy involves decompression of the nerve root by removal of only the herniated disk fragments, generally avoiding surgical penetration of the annulus. The technique is believed to offer advantages of minimizing perioperative pain, preserving disk architecture, and protecting against progressive degeneration (4, 5). In addition to removing herniated fragments outside of the annulus, conventional discectomy requires formal annulotomy, endplate curettage, and removal of accessible disk fragments from within the disk space. It is performed in the hope of reducing the incidence of recurrent herniation and need for revision surgery (17). Despite the intuitive nature of

■ **BACKGROUND:** The optimal surgical technique to treat disk herniation radiculopathy is uncertain. Advocates of sequestrectomy cite less perioperative pain and preserved disk architecture, whereas advocates of conventional discectomy cite less frequent recurrent herniation.

■ **METHODS:** Consecutive patients were evaluated retrospectively from 2 independent practices, one in which sequestrectomy was performed and one in which conventional discectomy was performed. Demographic, radiographic, and outcomes data were analyzed to assess clinical results and incidence of recurrent herniation requiring further operation. Patients requiring further surgery were identified from a government-run provincial database independent of the surgeon performing the second procedure.

■ **RESULTS:** Among 172 patients (98 conventional discectomy procedures, 74 sequestrectomy procedures), there were no significant differences in age, gender, smoking status, or level of disk herniation. Conventional discectomy was not associated with greater blood loss, longer surgery, or longer length of stay compared with sequestrectomy. At 3-month follow-up, approximately 85% of patients improved clinically regardless of the procedure performed. However, recurrent herniation over 6 years median follow-up requiring further surgery was lower among patients receiving conventional discectomy (10% overall, 6% same-level, 4% adjacent-level) compared with sequestrectomy (19% overall, 15% same-level, 4% adjacent-level).

■ **CONCLUSIONS:** No clinical advantage was found to performing a limited sequestrectomy instead of conventional microdiscectomy for the treatment of radiculopathy owing to lumbar disk herniation. Conversely, the incidence of recurrent disk herniation requiring revision surgery was lower in patients treated by more aggressive disk removal.

arguments supporting each technique, the supporting evidence is not only sparse but also difficult to interpret by virtue of small sample sizes and incomplete data sets. Observations pertaining to recurrence and revision surgery are universally limited in length of follow-up, critical to understanding the natural history of a pathology that can take months and years to manifest and remedy.

We undertook a retrospective review to evaluate patient outcome and need for additional surgery at a single institution within the independent practices of 2 surgeons, one who performs sequestrectomy and one who performs conventional discectomy for the treatment of radiculopathy secondary to lumbar disk

herniation. The purpose of this study was to provide best available evidence to establish the comparative success of each procedure.

METHODS

Over a 10-year period, consecutive patients undergoing lumbar microdiscectomy performed by 1 of 2 surgeons at the Foothills Hospital and Medical Centre were studied. The indication for surgery was radiculopathy secondary to lumbar disk herniation, refractory to at least 3 months of medical care. Inclusion criteria required patients to be >18 years old; have no previous spine operations; possess proof of disk herniation on magnetic resonance imaging

Table 1. Demographic Characteristics of Study Population

	Conventional Diskectomy	Sequestrectomy	P Value
Number	98	74	
Age (years)	44.1 ± 1.7	44.4 ± 1.4	0.90
Gender (% male)	63%	64%	0.86
Body mass index	28.0 ± 0.9	28.8 ± 0.7	0.44
Smoking status	34%	20%	0.04
Operative level (number)			
L2-3	0	1	0.64
L3-4	4	7	
L4-5	35	41	
L5-S1	35	49	

corresponding to clinical presentation; and be free from history of trauma, neoplasm, or spinal infection.

Surgeon A (sequestrectomy) performed limited resection of disk material outside of the annulus fibrosus either contained or extruded from within the posterior longitudinal ligament. In the setting of disk protrusions (bulge) without frank herniation, an annulotomy was created, and disk material posterior to the vertebral body was removed. Surgeon B (conventional diskectomy) resected herniated fragments but in all cases also incised a rectangular window in the annulus, removed available disk material from within the disk space, undertook curettage of the superior and inferior endplates, and removed additional disk material. All surgeries by both surgeons were performed using microsurgical techniques under the operating microscope.

Outcome data were obtained from review of hospital and outpatient charts. Demographic information was collected including patient age, gender, smoking status, preoperative symptoms, and level of pathology. Intraoperative parameters collected included surgical time and blood

loss. Perioperative data were recorded including cardiovascular, respiratory, genitourinary, and thromboembolic complications as well as overall hospital length of stay. Clinical efficacy was extracted from outpatient charts at the 3-month follow-up visit. Outcomes are classified as “excellent” (resolution of symptoms), “good” (improvement in symptoms), “fair” (unchanged clinical status), and “poor” (worsened symptoms). Good and excellent outcomes are combined to “improvement,” fair outcome is “unchanged,” and poor outcome is “worsened.” Patients undergoing additional surgery were identified from the office-based charts cross-referenced to a search of the Southern Alberta Health Region database by patient identification numbers to capture revision surgery regardless of the performing surgeon. At the time of this study, the Foothills Hospital was the only neurosurgical center serving the southern half of the Province of Alberta and parts of Saskatchewan and British Columbia. In addition, it was the only facility for the same catchment area in which microdiskectomies were performed.

Table 2. Intraoperative Differences Among Study Population

	Conventional Diskectomy	Sequestrectomy	P Value
Blood loss (mL)	266 ± 29	261 ± 30	0.90
Surgical time (minutes)	120 ± 5	117 ± 4	0.67

Statistical Analysis

Categorical data were compared by χ^2 analysis, and continuous data were evaluated through analysis of variance. Intraoperative parameters were compared by Student t tests. In all cases, surgical technique was identified as the independent variable. Procedural efficacy, reoperation rate for any lumbar disk herniation, and reoperation rate for same-level recurrent herniation were compared by χ^2 analysis with surgical technique as factor, alongside obesity and smoking status as potential cofactors. Level of significance for all analyses was defined as $\alpha = 0.05$.

RESULTS

There were 172 patients identified as having undergone surgery by Surgeon A or B for symptomatic lumbar disk herniation; 98 were treated with conventional diskectomy, and 74 were treated with sequestrectomy. Demographic data for the 2 groups are summarized in **Table 1**. There were no differences noted with respect to age, gender, or level of operation between surgical techniques. However, a higher proportion of smokers was observed in the conventional diskectomy group (34%) compared with the sequestrectomy group (19%) ($P = 0.03$). The body mass index of patients in the conventional microdiskectomy group was 28.0 ± 0.9 , similar to 28.8 ± 0.7 in the sequestrectomy group.

The most frequent levels of operation were L4-5 and L5-S1 accounting for 94% of patients undergoing conventional diskectomy and 92% of patients undergoing sequestrectomy ($P = 0.64$). Intraoperative parameters were noted to be similar between the 2 groups (**Table 2**). Patients undergoing conventional diskectomy experienced an average of $266 \text{ mL} \pm 29$ of blood loss with mean duration of surgery of $120 \text{ minutes} \pm 5$. Patients undergoing sequestrectomy experienced on average $261 \text{ mL} \pm 30$ of blood loss ($P = 0.90$) with mean duration of surgery of $117 \text{ minutes} \pm 4$ ($P = 0.67$). There was no difference in median duration of hospitalization (median 1 day; $P = 0.48$).

Among patients undergoing conventional diskectomy, 84% reported improvement in symptoms, whereas 16% noted stable symptoms at 3-month follow-up (**Figure 1**). Patients undergoing sequestrectomy reported 88% improvement,

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