Clinical and health economic benefits of out-patient lumbar microdiscectomies in Australia.

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Abstract

Introduction: This study reports on the clinical, nursing and health outcomes on the out-patient lumbar microdiscectomy program at a single institution. A multi-disciplinary team approach to the pre- and post-operative planning and education is key to the success of this program.

Methods: A retrospective review of prospectively collected data for two patient groups (out-patient microdiscectomy and in-patient microdiscectomy) over a two-year period in a single institution was performed. Clinical, demographical, surgical and economic measures were collected including a 10-point visual analogue pain scale (VAS), patient satisfaction, direct and indirect costs of treatment. Patients included had a single level lumbar disc prolapse with persistent disabling sciatica of more than 8 weeks consistent with failure of conservative measures.

Results: Twenty-one out-patient and forty-one in-patient microdiscectomy patients were treated over this period. Post operatively pain levels showed a significant improvement in VAS levels from 5.2 ±2.9 to 1.6 ±0.8 and 0.7 ± 0.8 at day 1 and 7 post-operatively respectively. This was not different across both groups. Patient satisfaction was high in both surgical groups. There was a significant cost savings in out-patient lumbar micro-discectomy with the majority of savings coming from costs associated with staff (nursing, allied health and medical) funding. There was successful discharge 100% of out-patient microdiscectomy patients without readmission.

Conclusion: Outpatient lumbar microdiscectomy is a viable option in Australia. It demonstrates no difference in patient outcomes as compared to in-patient lumbar microdiscectomies and has high patient satisfaction outcomes. There are significant benefits in terms of health economics and nursing care in establishing an out-patient lumbar microdiscetomy program.

Keywords: *Microdiscectomy, outpatient, economic*

Introduction

Lumbar microdiscectomies are the gold standard in the surgical treatment of patients with prolonged sciatica secondary to a compressive lumbar disc prolapse. Surgery is indicated following failure of conservative management inclusive of rest, physical therapies and percutaneous therapeutic interventions such as epidural or foraminal cortisone injections (Kreiner, Hwang, Ease, Resnick, Baisden, Bess, Cho, DePalma, Dougherty, Fernand. Ghiselli, Hanna, Lamer, Lisi, Mazanec, Meagher, Nucci, Sembrano, Sharma, Summers, Taleghani, Tontz & Toton, 2014). Successful relief of sciatica occurs in over 90% of surgical candidates and recovery classically entails an overnight stay (1-2 nights) admission to hospital and gentle mobilization in the ensuing 4-6 weeks (Aichmair, DU, Shue, Evange, Sama, Hughes, Isbl, Burket, Cammisa & Giradi, 2014; Koebbe, Maroon, Abla, El-Kadi & Bost 2002. Soliman, Harvey, Howes, Seibly, Dossey & Nardone, 2014).

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The advent of the operative microscope has allowed micro-surgical techniques to be performed for surgical lumbar disc disease with studies showing early mobilization, no sitting restriction and activity as beneficial in the recovery phase post-lumbar discectomy (Danielsen, Johsen, Kibsgaard & Hellevik 2000; Dolan, Greenfield, Nelson & Nelson, 2000). This has led to the concept of out-patient lumbar microdiscectomies which have now been performed internationally with excellent clinical outcomes (Gonzalez-Castro, Shetty, Nagender & Greenough, 2002; Abou-

Zeid, Palmer & Gnanalingham, 2014; Singhal & Bernstein, 2002). Within Australia, lumbar microdiscectomy surgery is invariably performed in an in-patient model, despite the potential health economic benefits of out-patient lumbar microdiscectomies. This paper reports on the clinical and health economic outcomes following the establishment of an out-patient lumbar microdiscectomy program at a single institution.

Methods

A retrospective review of prospective collected data including clinical, radiological and surgical details, was undertaken on consecutive patients undergoing out-patient lumbar microdiscectomies between July 2011 and December 2013. All surgeries were performed by the senior spinal trainee or spinal neurosurgeon in a single institution with indication for surgery being persistent disabling sciatica (duration more than eight weeks) secondary to a radiologically confirmed lumbar disc prolapse. Inclusion criteria for this study included all adult patients aged above 18 years (no upper age limit) with single level lower lumbar disc prolapse (L3/4 L4/5 or L5/S1). Exclusion criteria included non-elective surgery, a history of chronic pain (prolonged opioid use >12 months), substance abuse, previous spinal infection, or geographically distant patients living more than 200kms from the institution. Data was similarly collected for a control group of consecutive patients undergoing in-patient lumbar microdiscectomies at the same institution over the same time period.

Clinical outcomes

Visual analogue pain scores were obtained pre-operatively and post-operatively at six weeks with patient satisfaction scores obtained at the same post-operative review. Patient satisfaction was based on a four-point grading system with 1 being very satisfied, and 4 being very unsatisfied. All patients were contacted at a minimum of twelve months post-surgery for assessment of recurrent sciatica with recurrent disc prolapses identified following repeat magnetic resonance imaging (MRI) where clinically indicated.

Economic outcomes

Direct and indirect hospital costs were obtained using the PowerPerformance Manager system (Power Health Solutions, SA Australia) for each individual case inclusive of breakdown of costs for in-hospital services (ie theatre costs, nursing/allied health time, imaging etc) and out-patient services (ie pre- and post-operative assessments). Indirect hospital costs were measured for those departments that do not result in direct patient contact, but are a necessity for the hospital to function (ie payroll, finance, decision support units etc). Costs were calculated using the accounting methodology of 'Simultaneous Equation' based on using statistics within the costing system to allocate indirect costs to direct patient care areas.

Out-patient lumbar microdiscectomy protocol

A surgical treatment protocol was established as depicted in Figure 1. In short, all patients consented for out-patient lumbar microdiscectomies were subject to a pre-operative physiotherapy session encompassing education, physical assessment and implementation of pre-operative treatments. Patients were then scheduled for surgery with the proviso they reach the recovery room post-operatively by midday. A second physiotherapy contact was established following that with discharge from hospital completed within six hours post-operatively. For the first ten patients subjected to out-patient lumbar microdiscectomies, a follow-up phone assessment was made by the physiotherapist, however this was ceased due to the lack of any identifiable benefit from this process.

Each patient was then seen in the post-operative clinic at six to eight weeks by the physiotherapist running an out-patient clinic in parallel to the senior spinal trainee with any concerning clinical issues immediately referred on to the medical staff.

Statistics

Data was processed using commercially available statistical software (SPSS, Inc., Chicago, IL) with normally distributed parametric data compared using Student's t-test or ANOVA and post-hoc Bonferroni tests.

Results

Demographics and Pathology

Twenty-one patients underwent outpatient lumbar microdiscectomy during the study period. Mean ± SD age of the patients was 33.3 ± 9.4 years (Range: 26 – 66) with a slight male predominance (M:F = 12:9). Mean ± SD BMI of patients was 29.9 ± 6.5. All cases were single level with the majority being at L5/S1 (n=11) followed by L4/5 (n=9) and L3/4 (n=1). Two cases were redo-surgeries and there was no difference in the

side of disc prolapse (Right:Left = 12:9).

Forty-one patients underwent in-patient lumbar microdiscectomy during the study period. Mean ± SD age of the patients was 40.4 ± 13.5 years (Range: 18 – 65) with a slight female predominance (F:M = 23:18). Mean ± SD BMI was 28.5 ± 6.3. Similar to the day-case cohort, the majority of surgeries were at L5/S1 (n=25) followed by L4/5 (n=15) and L3/4 (n=1) without any side preponderance. Only one case was a redo-surgery. Average hospital length of stay was 1.7 ± 1.3 days (Range: 1 – 6) with the majority staying one night (n=23). Prolonged length of stay more than one day was due to increased post-operative back pain.

Surgical Data

A higher proportion of out-patient lumbar microdiscectomy patients underwent fragmentectomies as opposed to discectomies compared to overnight-stay lumbar microdiscectomies (52% vs 32%). Operative time was significantly longer for in-patient lumbar microdiscectomies (77.6 ± 22.3 mins) compared to day-stay lumbar microdiscectomies (56.4 ± 14.4 mins; $p<0.05$). There was one CSF leak in the entire study (in-patient cohort) and no intra-operative nerve injury or wound infection.

Clinical Outcomes

No patients failed discharge following out-patient lumbar microdiscectomy. All patients were discharged from clinics following the post-operative review. There was no early (within three months) recurrence of disc prolapse in either cohort. Patient satisfaction was high in both cohorts with only three patients (one out-patient, and two in-patient) being very unsatisfied with their outcome (Table 1).

Patient Satisfaction Scale	Day-stay	Overnight
1	15	28
2	5	11
3	0	0
4	1	2

Table 1 (Above): *Patient satisfaction scores for each cohort (1: Highly satisfied; 2: Satisfied; 3: Unsatisfied; 4: Highly unsatisfied).*

Of these, the out-patient presented with increased L5 radiculopathy following an L5/S1 day-stay lumbar microdiscetcomy at two years post-operatively and underwent a lumbar fusion procedure. One in-patient suffered from persistent pain despite adequate neural decompression, whilst the last patient had persistent numbness in the L5 distribution with mild weakness in the same distribution (MRC 4+/5). There was no difference in outcomes when stratifying for level and position of disc prolapse, duration or type of surgery.

Post-operative pain levels demonstrated a significant progressive improvement in back VAS levels from 5.2 ± 2.9 to 1.6 ± 0.8 and 0.7 ± 0.8 at day 1 and 7 post-op respectively.

Economic Outcomes

There was a significant cost saving in undergoing out-patient lumbar microdiscectomy in our institution. Mean ± SD total cost for out-patients ($3545.69 ± $633.82) and in-patients ($6370.82 ± $1397.71) revealed a total saving per patient of $2825.14 ($p<0.0001$). The majority of savings came from costs associated with staff funding. In-patients were also more likely to undergo further investigations and treatment as shown by a significantly increased pathology and pharmaceutical cost (Table 2).

Discussion

Out-patient lumbar spinal surgery for radicular disc disease has been reported in North America as early as 1994 with successful discharge achieved in ninety percent (Bookwalter, Busch & Nicely, 1994). More recently, Abou-Zeid et al., (2014) reported on the initial United Kingdom experience of fifty patients with successful discharge occurring in thirty six patients. Our program was achieved successful discharge in one hundred percent of patients. Whilst the careful selection criteria is believed to have helped, we believe the intensive pre-operative multi-disciplinary team approach and education of patients was vital to achieving this.

Previous reports have suggested provision of adequate patient information and proper preparation of all clinical staff involved are key issues in successful application of out-patient lumbar microdiscectomies (Gonzalez-Castro, et al., 2002). In our study protocol, each patient was consented for surgery by the operating surgeon, and was individually assessed and educated by the neurosurgical physiotherapist in a separate 45 minute consultation. Key-points emphasized to the patients were the goal of same-day discharge, as well as goal of post-operative pain control rather than complete cessation of pain. Similarly

	Out-patient (AUD)	**In-patient (AUD)**		**p-value**
Total Cost	3545.69 ± 633.82	6370.82 ± 1397.71		
- direct	2970.53 ± 556.98	5216.10 ± 1157.00		
- indirect	575.16 ± 91.59	1154.72 ± 258.80		<0.0001
Theatre Cost				
- direct	2413.28 ± 452.19	3089.84 ± 786.31		
- indirect	322.80 ± 44.55	369.12 ± 98.83		0.003
Medical Cost (Surgical)				
- direct	546.76 ± 236.10	854.35 ± 379.08		
- indirect	129.34 ± 55.70	203.93 ± 88.55		0.005
Medical Cost (Non-surgical)				
- direct	72.48 ± 24.73	485.26 ± 265.20		
- indirect	39.80 ± 20.28	300.65 ± 165.38		<0.0001
Allied Health				
- direct	97.37 ± 38.50	131.270 ± 100.47		
- indirect	22.54 ± 9.06	29.60 ± 20.56		0.222
Nursing				
- direct	190.39 ± 68.60	1277.39 ± 512.85		
- indirect	40.14 ± 12.41	195.45 ±70.43		<0.0001
Radiology				
- direct	93.15 ± 2.37	207.70 ± 277.86		
- indirect	12.15 ± 0.17	26.42 ± 37.00		0.121
Pathology				
- direct	227.37 ± 38.50	90.79 ± 76.38		
- indirect	32.54 ± 9.06	14.72 ± 14.24		<0.0001
Pharmacy				
- direct	114.19 ± 34.38	212.18 ± 78.03		
- indirect	5.26 ± 5.88	7.95 ± 7.32		<0.0001

Table 2 (Above): *Costings (direct and indirect) of out-patient versus in-patient lumbar microdisectomies.*

education of the anaesthetics team and theatre nursing staff allowed for positive reinforcement to the patients at the immediate post-operative setting (Figure 1).

Post-operative pain control is the other factor that may adversely affect success of an out-patient lumbar microdiscectomy program. Pre-operative education of the goals of operative site pain control as opposed to complete pain relief is important in this setting. We routinely infiltrate 20-30mls of 0.25% Bupivacaine into the wound and paraspinal muscles upon wound closure. In addition, patients are pre-medicated with paracetamol upon induction and discharged with regular paracetamol (1g qid strict) and endone (5-10mg qid/prn) for one weeks duration. Using this analgesic regime, recovery room pain control was optimized resulting in decreased recovery room nursing requirements and earlier discharge. Similarly, no patients were readmitted following out-patient lumbar microdiscectomy and a five-fold decrease in back VAS was achieved by day 7 post-op.

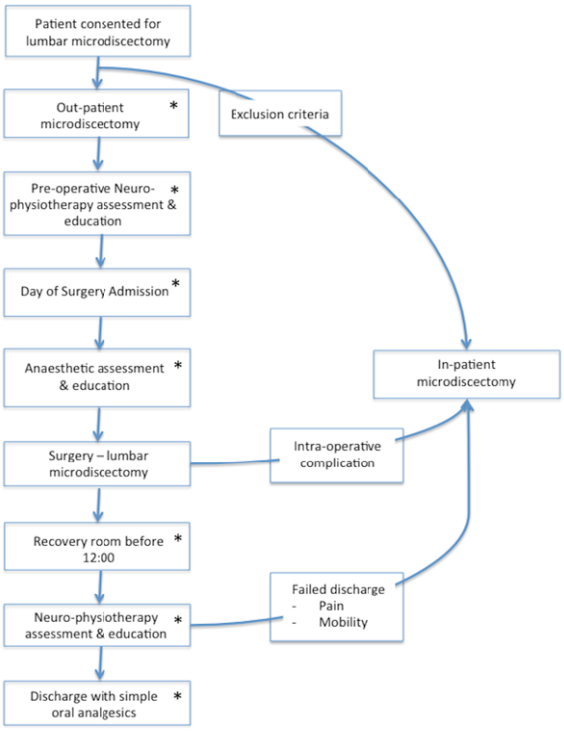

Figure 1 (Above): *Outpatient lumbar microdiscectomy protocol. * denotes patient contact where outpatient education and assessment occur via medical, nursing or allied health staff.*

During the post operatively period no sitting restrictions were prescribed for the patients and early mobilization was encouraged. There is no consensus in current literature with regards to post-operative mobilization and all patients in this study were encouraged to sit for as long as comfortable and gradually build up the walking over the four week period. The patients were each given exercises and education from the physiotherapist and nursing staff prior to discharge. It is believed that this reinforced education contributed significantly to the successful implementation of this out-patient program.

Detractors of an out-patient lumbar microdiscectomy program suggest poorer outcomes, increased complication rates or increased recurrence rates for disc prolapse. Pugely, Martin, Gao & Mendoza-Lattes (2013), reviewed 4310 lumbar discectomy cases (both day-stay and overnight) selected from the American College of Surgeons National Surgical Quality Improvement Program database. This review found a significantly higher complication rate for in-patient versus out-patient cases (6.5% vs 3.5%; odds ratio 1.521) (Pugel, et al., (2013). Abou-Zeid et al., (2014) reported excellent improvement of resolution of pre-operative symptoms in ninety-four percent. Whilst we acknowledge the relatively small number of patients in this study, we did not find any difference in complication rates in our cohort of patients. Clinical outcomes were also excellent with patient satisfaction high in both groups.

The advantages of implementing an out-patient lumbar microdiscectomy program are clear with regards to health economics. A demonstrable average saving of $2825.13 per patient is seen in our cohort of out-patients as opposed to in-patient lumbar microdiscectomies. The increased cost of in-patient treatment is mainly borne by increased medical and nursing care requirements with a lesser increase in pathology and pharmaceutical costs. The implementation of specialized pre- and post-operative neuro-physiotherapy clinics is cost neutral when offset against the in-patient physiotherapy requirements post-operatively (Table 2). Coupled with the improved hospital bed access by freeing up an in-patient bed, there are positive flow-on effects to health access in general.

Conclusion

Out-patient lumbar microdiscectomies are a viable option in Australia following appropriate multi-disciplinary protocols. It demonstrates no difference in patient outcomes as compared to in-patient lumbar microdiscectomies and has high patient satisfaction outcomes. Health economic and access improvements are also seen in this setting.

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