

Results and limitations of outpatient and overnight stay laminectomies for lumbar spinal stenosis

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Background: At our centre, laminectomies have been traditionally performed as inpatient surgery. A gradual change in practice occurred between 2010 and 2013 to try to do these procedures as outpatient or overnight stay surgery.

Methods: We conducted a retrospective cohort study of consecutive patients having laminectomies over 2 18-month periods: before the change in practice and after full implementation of the outpatient/overnight stay protocol. We collected information on patient characteristics (age, sex, American Society of Anesthesiologists [ASA] classification, home address, number of laminectomy levels, estimated blood loss) and patient outcome (complications, hospital length of stay, 30-day readmissions).

Results: We found no significant difference in age, sex, ASA classification, number of laminectomy levels, or estimated blood loss between the 2 cohorts. There was a change in the number of outpatient (from 0 to 25) and overnight stay laminectomies (from 0 to 13). There was an increase in total (inpatient, overnight stay and outpatient) laminectomies from 41 to 82, and an increase in patients from out of our region from 15% to 32%. There was 1 readmission within 30 days that occurred in the first cohort.

Conclusion: We found that outpatient and overnight stay laminectomies can be done safely, with no patients requiring postoperative admission to hospital or readmissions within 30 days. They can be done in patients from out of town who need to travel home postoperatively. It is possible to safely reduce the level of resources used for spine surgery by carrying out laminectomies as outpatient or overnight stay surgery in select patients.

Contexte : Par le passé, les laminectomies effectuées dans notre centre nécessitaient l'hospitalisation des patients. Un changement graduel de la pratique a toutefois eu lieu entre 2010 et 2013, et les laminectomies constituent maintenant, dans la mesure du possible, une chirurgie d'un jour, ou une chirurgie dont la durée de séjour se limite à une seule nuit.

Méthodes : Nous avons mené une étude de cohorte rétrospective sur des patients ayant subi consécutivement une laminectomie au cours d'une des 2 périodes de 18 mois suivantes : avant le changement de pratique ou après celui-ci, c'est-à-dire après la mise en œuvre du protocole de chirurgie d'un jour ou de chirurgie exigeant un séjour d'une nuit. Nous avons recueilli des données sur les caractéristiques des patients (âge, sexe, classification selon l'American Society of Anesthesiologists [ASA], adresse du domicile, nombre de vertèbres touchées par la laminectomie, perte sanguine estimée) et sur les résultats des patients (complications, durée du séjour à l'hôpital, réadmission dans les 30 jours).

Résultats : Aucune différence significative n'a été observée entre les 2 cohortes du point de vue de l'âge, du sexe, de la classification de l'ASA, du nombre de vertèbres touchées par la laminectomie et de la perte sanguine estimée. Il y a toutefois eu une augmentation du nombre de patients se présentant pour une chirurgie d'un jour (de 0 à 25) ou pour une chirurgie exigeant un séjour d'une nuit (de 0 à 13). Le nombre total de laminectomies (patients hospitalisés, chirurgie d'un jour et chirurgie exigeant un séjour d'une nuit) a également augmenté (de 41 à 82), tout comme la proportion de patients venant de l'extérieur de notre région (de 15 % à 32 %). Il n'y a eu qu'une seule réadmission dans les 30 jours suivant une laminectomie, survenue dans la première cohorte.

Conclusion : Nous avons constaté que les laminectomies effectuées comme chirurgie d'un jour ou comme chirurgie exigeant un séjour d'une nuit peuvent être réalisées de façon sûre, sans que les patients aient besoin d'être hospitalisés en période postopératoire ou d'être réadmis dans les 30 jours suivant l'intervention. Les patients demeurant à l'extérieur de la ville et devant rentrer à la maison en période postopératoire peuvent subir une laminectomie. Il est donc possible de réduire de façon sûre les ressources utilisées pour réaliser des laminectomies en effectuant ces interventions comme chirurgie d'un jour ou comme chirurgie exigeant un séjour d'une nuit chez certains patients.

Discectomy and laminectomy are common surgical procedures for degenerative lumbar spine conditions.¹ Discectomy is used to treat disc herniation/extrusion/sequestration, and laminectomy is used for spinal stenosis. Traditionally, patients undergoing these operations have been admitted to hospital after surgery. Discectomy is now being performed at many centres as an outpatient procedure.²⁻⁴ Compared with postoperative in-hospital stays, outpatient discectomy is safe,^{3,5,6} favoured by the vast majority of patients,⁷ and associated with decreased complications.^{3,4} Cost is also decreased.^{5,6,8}

There is growing interest in offering spine surgery in an ambulatory setting, with reports on anterior cervical discectomy and fusion, cervical disc replacement, transforaminal lumbar interbody fusion, and laminectomies performed as outpatient procedures,⁹ although it is uncommon for laminectomies to be done this way.¹ Palmer and colleagues¹⁰ reported successful outpatient laminectomies in 7 out of 8 patients. Best and Sasso¹¹ reported that outpatient laminectomies and discectomies can be done safely and successfully in patients 65 years of age or older, with only a 3.8% conversion rate to inpatients; however, it is not stated how many of their 233 outpatients had laminectomies.

In our academic centre we have followed the lead of others and perform discectomies as outpatient procedures. We wondered if we could apply our discectomy protocol to laminectomies because of the technical similarities between the 2 procedures. However, we recognize that the patient population is different, with those having laminectomies tending to be older and have more comorbidities. Therefore, a gradual change in practice was instituted between 2010 and 2013 to try to perform laminectomies as outpatient and overnight stay surgery in select patients. The purpose of this study was to determine the effect of our change in practice on hospital inpatient days and patient outcomes.

METHODS

Study population

We retrospectively reviewed a single surgeon's practice (D.Y.) comparing consecutive patients in 2 18-month periods: one before the change in practice (April 2009 to October 2010) and the other after full implementation of the outpatient/overnight stay protocol (July 2013 to January 2015). The logistics of the protocol were worked out, and gradual implementation took place in the 32 months between the study periods. We reviewed the hospital medical record for patient factors, including age, sex, American Society of Anesthesiologists (ASA) classification of physical health to grade preoperative health of the patients, home address, number of laminectomy levels, and estimated blood loss (EBL), and patient outcomes,

including complications, hospital length of stay (LOS) and readmission within 30 days. We routinely gave patients in both cohorts a 6-week postsurgical follow-up appointment during which we obtained a history, asking them whether they had to seek medical attention or admission to hospital elsewhere for postoperative complications, and performed a physical examination to determine if they had recovered from their surgery. We categorized patients' homes as being located in our city, outside the city but in our region, or out of our region. Our province divides health care into regions (local health integration networks); each roughly correspond to a major urban centre, its county, and those bordering its county. The Queen's University Health Sciences Research Ethics Board approved our study.

Surgical procedure

The surgical procedure was the same for patients in both cohorts. A CMAX-T (Steris, Mentor) operating room table was used. It is a general-purpose OR table found in all of the rooms in both the ambulatory care centre and the in-patient hospital involved in this study. The patients were positioned prone, supported on 2 cylindrical gel bolsters. The laminectomies were bilateral posterior decompressions from a unilateral approach using an open technique. No microscope or tubular retractor systems were used. No preoperative analgesia was given. We infiltrated 20 mL of 0.25% bupivacaine hydrochloride without epinephrine into the paravertebral muscles and subcutaneous tissue at the start of the procedure and another 20 mL at the end of the procedure.

Discharge protocol

The outpatient/overnight stay protocol for spine surgery consisted of the anesthesiologist limiting the long-acting narcotics and intravenous fluids given during surgery. Patients were given a handout with instructions for after surgery care upon discharge from hospital, and a nurse telephoned patients on the first day after surgery to check on their condition and answer any questions.

All patients having laminectomies were either discharged home from the recovery room and classified as having outpatient surgery, kept overnight (< 24 h stay) in an extended postanesthetic care unit (EPACU) in our ambulatory care centre, or admitted to a ward in our in-patient hospital and classified as having inpatient surgery. The EPACU has a capacity for 10 patients and is shared by multiple surgical services. It is staffed by an anaesthesiologist and 2 nurses, with the rest of the ambulatory care centre closed from 8 pm to 8 am. Imaging and laboratory services are available during the day, but not overnight. Any patients having intraoperative or postoperative complications in our ambulatory care centre are immediately transferred to our in-patient hospital located less than 1 mile away.

The surgeon assigned patients to 1 of these 3 treatment paths when they were put on the waiting list for surgery based on their general health and home support system. An ASA of 3 or less and availability of someone to do the homemaking duties was required for the outpatient or overnight stay EPACU streams. Patients were assigned to the overnight stay EPACU instead of outpatient surgery if the surgeon felt their age and comorbidities required overnight monitoring.

Statistical analysis

Statistical analysis was carried out using a series of *t* tests for equality of means to compare the 2 groups for age, ASA, EBL and number of laminectomy levels. We used Pearson χ^2 tests to assess readmissions, sex and percentage of patients from out of our region. We conducted an analysis of variance (ANOVA) with post hoc Tukey tests to compare the ASA and age for the outpatient, overnight stay EPACU and inpatient groups within the second cohort. We considered results to be significant at $p < 0.05$.

RESULTS

In comparing the 2 18-month periods, one before the change in practice and the other after full implementation of the outpatient protocol, we found no significant differences in age, sex, ASA class, number of laminectomy levels, or EBL (Table 1). We did find a change in the number of outpatient laminectomies (from 0 to 25) and overnight stay EPACU laminectomies (from 0 to 13; Fig. 1). Therefore, by implementation of outpatient surgery and overnight stays in the EPACU, we reduced the average LOS from 2.0 ± 1.7 days in the first cohort to 0.7 ± 0.8 days in the second ($p < 0.001$), and we reduced resource utilization by 25 inpatient days (Fig. 1).

From the medical record and direct questioning of the patients during the 6-week postoperative follow-up visit, in the first cohort we identified the following complications. One patient had a postoperative acute myocardial infarction. One patient visited the emergency department (ED) on postoperative day 7 for leg pain, which was managed with reassurance. Three patients with no wound problems

at the 6-week follow-up reported being prescribed an oral antibiotic by their family doctors: 1 for wound blisters, 1 for wound redness, and 1 for an unknown reason. One patient had a urinary tract infection, 1 patient had urinary retention requiring transient home care catheterization, and 2 patients had nausea delaying discharge for 1 day.

In the second cohort we identified the following complications. One patient experienced transient confusion in the recovery room, and 1 patient had hypertension on awakening from the anesthetic that resolved in the recovery room. One patient visited the ED twice postoperatively owing to narcotic withdrawal symptoms. Two patients had dural tears repaired intraoperatively, 3 patients had transient urinary retention while still in hospital, and 1 patient had a urinary tract infection. One patient had epigastric and back pain, slowing mobilization by physiotherapy for discharge, and 1 patient had hypotension treated by holding their preoperative antihypertension medications during their hospitalization.

No patients switched from planned outpatient laminectomy to overnight stay in the EPACU or to inpatient admission. No patients switched from planned overnight stay in the EPACU to inpatient admission. The 2 patients with dural tears repaired intraoperatively were allowed to mobilize immediately postoperatively and were scheduled as inpatients preoperatively. Similarly, the 3 patients with transient urinary retention, the patient with a postoperative urinary tract infection, the patient with epigastric and back pain slowing mobilization by physiotherapy for discharge, and the patient with hypotension treated by holding their preoperative antihypertension medications during their hospitalization were all scheduled as inpatients.

One patient required hospital readmission within 30 days in the first cohort, and none required readmission in the second cohort. Two of 41 patients (5%) in the first cohort and 4 of 82 patients (5%) in the second cohort were not seen at their scheduled 6-week follow-up appointment.

There was an increase in total (inpatient, overnight stay EPACU, and outpatient) laminectomies from 41 to 82 in the second cohort (Fig. 1). There was also an increase in the percentage of patients coming from out of our region from 15% to 32% ($p = 0.042$; Fig. 2).

Table 1. Demographic and clinical characteristics of the study sample

Characteristic	Group; mean \pm SD (range)*		<i>p</i> value
	April 2009–October 2010 (<i>n</i> = 41)	July 2013–January 2015 (<i>n</i> = 82)	
Age, yr	68.6 \pm 12.3 (37–88)	66.8 \pm 7.6 (49–84)	0.32
Sex, male:female, %	51.2:48.8	59.8:40.2	0.37
ASA classification	2.61 \pm 0.49 (2–3)	2.66 \pm 0.53 (2–4)	0.56
Estimated blood loss, mL	240 \pm 231 (50–1400)	187 \pm 167 (20–1250)	0.14
No. of laminectomy levels	2.27 \pm 0.87 (1–6)	2.35 \pm 0.76 (1–5)	0.58

ASA = American Society of Anesthesiologists; SD = standard deviation.
*Unless indicated otherwise.

Within the second cohort, there was a significant difference in ASA classification between the outpatients and inpatients ($p = 0.001$) and between the outpatients and overnight stay EPACU patients ($p = 0.046$; Table 2 and Table 3). Similarly, there was a significant differ-

ence in age between the outpatients and inpatients ($p = 0.014$) and between the outpatients and overnight stay EPACU patients ($p = 0.001$; Table 4 and Table 5). However, there was no difference between the EPACU and inpatient groups for ASA ($p = 0.90$) or age ($p = 0.17$).

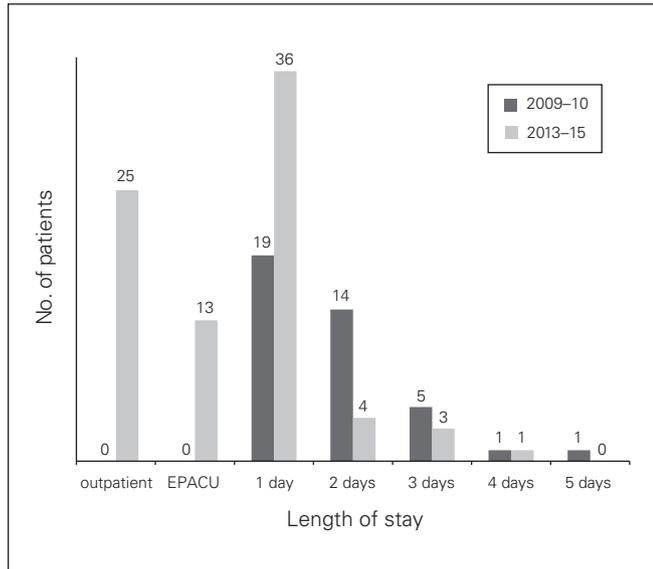


Fig. 1. Length of stay. One patient in 2009-10 had an 11-day length of stay (not shown). EPACU = extended postanesthetic care unit.

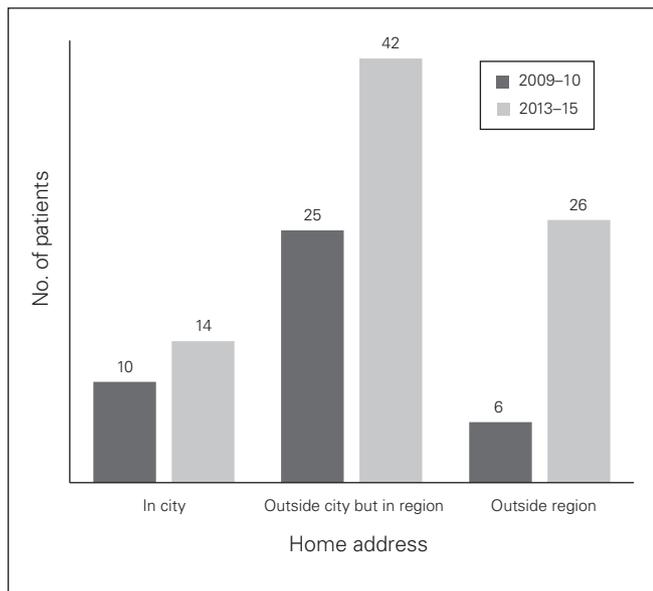


Fig. 2. Patient home location.

DISCUSSION

There was no significant difference in age, sex, ASA classification, number of laminectomy levels, or EBL between the laminectomy patients in the 2 periods studied. We included in our study all patients of a single surgeon who had been in practice for 17 years by the time of the first cohort without any changes in practice pattern. Therefore, we believe that the change in process rather than a difference in our patient population or surgeon's proficiency resulted in the increase in the number of outpatient laminectomies from 0 of 41 (0%) to 25 of 82 (30%) and an increase in the number of overnight stay EPACU laminectomies from 0 of 41 (0%) to 13 of 82 (16%). Reviewing the surgeon's practice, we noted that there was more overall surgical volume during the 18 months of the second cohort. Therefore, we believe that the mechanism allowing the increase in total (inpatient, overnight stay EPACU, and outpatient) laminectomies from 41 to 82 was more OR time due to the change in process.

Some studies on outpatient discectomy restricted their patients to those who resided close to hospital owing to concerns about their ability to travel any distance immediately after having surgery.^{5,6} However, Bednar¹² reported that travel distance was never an issue in failure of outpatient discectomy in his series. We found that it is possible to carry out outpatient and overnight stay laminectomies even with 51% of our patients living out of town and 32% out of our region.

We did not actively recruit patients and are not aware of any changes in accessibility to spine surgery outside of our region between the 2 study periods. However, there was an increase in total (inpatient, overnight stay EPACU, and outpatient) laminectomies from 41 to 82 and in patients from outside of our region from 15% to 32%. Therefore, we believe that the change in practice did not deter referrals.

We found that outpatient and overnight stay EPACU laminectomies are safe, with no patients requiring admission to hospital. They were also safe in terms of readmissions within 30 days, with none identified from the hospital record or at 6-week postoperative follow-up visits.

Table 2. American Society of Anesthesiologists classification for July 2013–January 2015 cohort groups

Characteristic	Group; mean ± SD (range)		
	Outpatient (n = 25)	EPACU overnight stay (n = 13)	Inpatient (n = 44)
ASA classification	2.33 ± 0.482 (2–3)	2.75 ± 0.452 (2–3)	2.82 ± 0.495 (2–4)

ASA = American Society of Anesthesiologists; EPACU = extended postanesthetic care unit; SD = standard deviation.

We were able to reduce the level of resources used for spine surgery by performing 30% of our laminectomies as outpatient procedures. We were further able to avoid admitting patients to hospital with use of an EPACU for an additional 16% of laminectomies. Therefore, in comparing the April 2009–October 2010 and the July 2013–January 2015 periods, we reduced the average hospital stay from 2.0 to 0.7 days and hospital resources by 25 inpatient days while increasing the total number of patients having laminectomies by 41 (Fig. 1). These changes freed up inpatient beds for other patients while still providing spine surgery at our centre. However, we believe that significant medical comorbidities and lack of home support in some of our laminectomy patients limited our ability to offer outpatient surgery to more of them for safety reasons and risk of readmission to hospital.

As would be expected with our selection process for postoperative pathways, there was a statistically significant difference in ASA classification and age between the outpatients and inpatients and between the outpatients and overnight stay EPACU patients. However,

there was no difference in the ASA classification and age between the EPACU and inpatient groups. Despite the statistics, in the EPACU group there was only 1 complication of a patient presenting to the ED twice after discharge owing to narcotic withdrawal, whereas in the inpatient group there were 8 patients with complications delaying their discharge home: 2 with dural tears, 3 with urinary retention, 1 with a urinary tract infection, 1 with epigastric and back pain, and 1 with hypotension. We believe this means that assigning patients to the postoperative pathway requires not only considering ASA classification and age, but also use of clinical judgment about the patient's independence and the nature and severity of their comorbidities.

Limitations

A weakness in our study was that we were conservative in directing patients to the inpatient stream, as evidenced by no outpatient laminectomy patients requiring postoperative admission to hospital unlike the 3.8% conversion rate reported by Best and Sasso,¹¹ no overnight stay EPACU laminectomy patients requiring postoperative admission to hospital, and no hospital readmissions within 30 days. Therefore, the number of outpatients and hence inpatient days saved potentially could have been higher, but with greater risk of patient complications. Another weakness is that we did not assess patient satisfaction with their pain control after discharge home or their satisfaction with their overall experience of having their laminectomy as an outpatient. However, although the patients tended to be older, we believe that owing to the similarities in surgical technique, our laminectomy patients would have had the same satisfactory experience reported by Hersht and colleagues⁷ for outpatient discectomy. Finally, we did not determine the cost savings of outpatient versus inpatient laminectomy. We have a universal coverage single-payer health care system; therefore, no bills for hospitalization are generated, and our focus is on efficient resource utilization to control our wait times for surgery. However, because our laminectomy patients receive standard postoperative care on a surgical ward while in hospital, we believe that the dollar cost savings from not admitting the patients should be similar to those reported for outpatient discectomy^{5,6,8} and outpatient procedures in general.¹⁰

CONCLUSION

Best and Sasso¹¹ reported that outpatient discectomies and laminectomies can be done safely and successfully, but with some patients needing to be converted to inpatients. Our study clarifies that outpatient and overnight stay laminectomies can also be performed safely without the need for conversion to inpatients if the

Table 3. ANOVA with post hoc Tukey test analysis of the ASA classification of patients in July 2013–January 2015 cohort groups*

Group	Comparison group	<i>p</i> value
Outpatient	EPACU	0.046
	Inpatient	0.001
EPACU	Outpatient	0.046
	Inpatient	0.90
Inpatient	Outpatient	0.001
	EPACU	0.90

ANOVA = analysis of variance; ASA = American Society of Anesthesiologists; EPACU = extended postanesthetic care unit.

*Overall 1-way ANOVA ($F = 7.98$, $p = 0.001$).

Table 4. Age of the July 2013 to January 2015 cohort groups

Characteristic	Group; mean \pm SD (range)		
	Outpatient (<i>n</i> = 25)	EPACU overnight stay (<i>n</i> = 13)	Inpatient (<i>n</i> = 44)
Age, yr	62.6 \pm 7.3 (49–81)	71.7 \pm 5.7 (59–84)	67.7 \pm 7.1 (49–81)

EPACU = extended postanesthetic care unit; SD = standard deviation.

Table 5. ANOVA with post hoc Tukey test analysis of age in the July 2013–January 2015 cohort groups*

Group	Comparison group	<i>p</i> value
Outpatient	EPACU	0.001
	Inpatient	0.014
EPACU	Outpatient	0.001
	Inpatient	0.17
Inpatient	Outpatient	0.014
	EPACU	0.17

ANOVA = analysis of variance; EPACU = extended postanesthetic care unit.

*Overall 1-way ANOVA ($F = 8.03$, $p = 0.001$).

candidates are selected carefully. We found significant inpatient bed savings by using a protocol for outpatient/overnight stay laminectomies and would encourage others to try this method of providing spine surgery.

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Contributors: Both authors designed the study, acquired and analyzed the data, wrote the article, and reviewed and approved the final version for publication.

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