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Article

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Analysis of 30-day unplanned readmissions after degenerative spinal disease surgery

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Abstract: *Background*: Degenerative spinal disease surgery is frequently performed in most neurosurgical departments. Unplanned 30-day readmissions represent a significant economic burden and have been used in several studies as a tool to evaluate quality of patient care. *Objective*: To review 30-day unplanned readmission rates after degenerative spinal disease surgery in our department, in order to identify their causes and determine strategies aimed at decreasing their frequency. *Methods*: A retrospective analysis was performed on all patients operated in our department for spinal stenosis or disc herniation over a 3 year period (January 2014 – December 2016), evaluating the rate and causes of unplanned readmission in the first month after discharge. Complications were divided in medical and surgical. *Results*: Out of the 1106 patients included, 33 (2,98%) presented a 30-day unplanned readmission. The percentage was higher after disc herniation surgery (3,40%), compared to spinal stenosis (1,92%). Pain management was the most common medical cause for readmission (45,45%), while in the surgical group, CSF leaks were the most frequent complication (18,18%). *Conclusions*: The rate of 30-day readmissions was low in our series but, even so, they associate significant costs. They could be avoided by applying correct and aseptic surgical technique, proper availability of dural sealing agents and superior patient medical education.

Key words: degenerative spine disorders, 30-day readmission

Introduction

Surgery for degenerative spinal disease is frequently performed in most neurosurgical departments, usually as an elective intervention. Several of these patients develop long-term postoperative complications, the so-called failed back surgery syndrome. Others are readmitted in the first postoperative month for early complications, either medical or surgical.

These unplanned and undesirable readmissions are grounds for patient-doctor conflict and represent a significant economic burden. In the US, a 2008 report showed an 18% rate of 30-day readmissions that

amounted to over 15 billion dollars in costs (1).

There is a difference of opinion regarding 30-day unplanned readmissions. On one hand, the official opinion is depicted as suboptimal patient care. Consequently, hospitals with high readmission rates are exposed to financial penalties. On the other hand, from the doctors' point of view, these readmissions can be explained as a consequence of reduced mortality due to a high quality of care for patients with severe conditions.

Postoperative complications for patients with spinal stenosis and disc herniation have been extensively studied.

The goal of this study is to review 30-day readmissions after spinal stenosis and disc herniation surgery, performed over a 3-year period in our neurosurgical department, in order to identify their causes and develop means to reduce their incidence rate.

Material and methods

Patient records were analyzed for all disc herniation and spinal stenosis surgical interventions that were performed in our department, between January 2014 and December 2016. Patient characteristics, such as age, sex and comorbidities were evaluated, as well as early medical and surgical postoperative complications that determined readmission in the first 30 days after discharge.

Lumbar disc herniation surgery was performed using the interlamar approach. Regarding spinal canal stenosis, laminectomy was used for decompression, while foraminal spinal stenosis was treated with ipsilateral fenestration and foraminotomy for unilateral symptoms and bilateral for bilateral symptoms. In both cases, the hypertrophic ligamentum flavum was removed and the nerve root was decompressed in the foramen by using partial facetectomy.

Postoperatively, patients were treated with antibiotics for the first 24 hours, anti-inflammatory medication for 3 days and pain medication.

Patients who resided in the same city were discharged 3 days postoperatively, while the ones that did not were discharged 7 days after surgery. Patients were advised to use a lumbar waistband for 1 month. In addition, they received instructions regarding local hygiene.

Complications that determined readmission in the first 30 days were divided into medical and surgical. The persistence of back pain or radiculopathy was noted, as well as the development of new symptoms, local surgical wound complications (dehiscence, infection, CSF leak) or surgical reintervention.

Results

A number of 1106 surgeries for degenerative spine disease were performed in the Neurosurgical Department of "Saint Pantelimon" Clinical Emergency Hospital, Bucharest, between January 2014 and December 2016. Among these patients, 33 were readmitted within 30 days of discharge, resulting in a 30-day readmission rate of 2,98%. Only patients that were operated for degenerative spinal disease were taken into account, excluding the ones that were diagnosed and planned for surgery in the nearest future, or did not have surgical indication.

The rate of 30-day readmission was higher for patients operated for disc herniation (3,40%) than for spinal stenosis (1,92%) (Table I). A possible explanation for this discrepancy between the two types of surgery may be the increased difficulty of hernia operation due to the supplementary surgical maneuvers of fragmentectomy and discectomy.

Readmitted patients presented a relatively equal distribution regarding decades of age (Table II).

Table I

30-day readmissions according to the type of surgery

	Number of patients	% of patients
Degenerative spinal disease surgeries	**1106**	
Disc herniation	793	71,70%
Spinal canal stenosis	313	28,30%
30-day readmissions	**33**	2,98%
After disc herniation surgery	27	3,40%
After spinal stenosis surgery	6	1,92%

Table II

Characteristics of patients with 30-day readmission

	Number of patients	% of patients
Sex		
Male	20	60,61%
Female	13	39,39%
Age		
Mean age	54,6	
20-29 yrs.	1	3,03%
30-39 yrs.	6	18,18%
40-49 yrs.	7	21,21%
50-59 yrs.	6	18,18%
60-69 yrs.	5	15,15%

70-79 yrs.	7	21,21%
80-89 yrs.	1	3,03%
Comorbidities		
Diabetes	9	27,27%
Hypertension	20	60,61%
Obesity	8	24,24%
Gastrointestinal disorders	7	21,21%
Cardiovascular disease	17	51,52%
Chronic obstructive pulmonary disease	6	18,18%
Depression	3	9,09%

Table III

Overall complications

	Number of patients	% of patients
Overall complications	**33**	
Medical	**15**	45,45%
Pain	14	42,42%
Transient ischemic attack	1	3,03%
Surgical	**18**	54,55%
Wound dehiscence	4	12,12%
Surgical site superficial infection	3	9,09%
CSF leak	6	18,18%
Disc herniations	5	15,15%

The most common medical cause for readmission was low back pain and/or leg pain. Low back pain was more frequently encountered in spinal stenosis surgery patients and was managed with medication. In this group, pain lasted for 2-3 weeks after surgery. Two patients were also diagnosed with coxarthrosis and presented pain exacerbation after discharge.

Another cause for readmission was cardiovascular disease. A patient presented a transitory loss of consciousness at home and drowsiness at readmission. She had interrupted blood thinners prescribed for her pre-existent atrial fibrillation. Cerebral CT scan and neurological examination were

normal and the diagnosis was established as transient ischemic attack. She received adequate medication for stroke prevention.

Among the surgical causes of readmission, CSF leaks were the most frequent. Five patients developed this complication after disc hernia surgery, two of them after recurrent herniation surgery and one after lumbar spinal stenosis surgery. After intraoperative acknowledgement of CSF leak, the dural sealing techniques consisted of muscle tissue, fat or Gelaspon placement that were used due to the lack of other agents' availability (Tisucol, Tachosil), proved to be insufficient. In three cases, surgical reintervention was necessary and Tachosil application was used. One patient was treated by injecting the surgical wound with autologous blood and another one with the use of closed, external drainage, with remission of leakage after 9 days. Patients with CSF leaks maintained bed rest for 3 days after initial surgery and received antibiotic treatment. However, two developed surgical wound infection, with Staphylococcus aureus and Escherichia coli respectively.

Another three patients presented superficial supraaponeurotic infection due to granuloma. After granuloma resection and wound debridement, per secundam suture was performed and surgical wound closure was achieved in all cases.

Five patients with foraminal spinal stenosis treated with fenestration and foraminotomy with persistent symptoms after surgery were also readmitted. In these cases, the foraminal stenosis was also caused by a disc protrusion for which no surgical maneuver was initially considered necessary. These patients were reoperated, discectomy was performed without fusion and presented a good postoperative outcome.

Surgical wound dehiscency occurred in four patients, three of which were operated for disc herniation and one for spinal stenosis. These patients were overweight, with associated diabetes mellitus. Wound resuture concluded with healing and good neurological outcome.

Discussion

First-month readmissions after operated spinal degenerative disorders (disc herniation, spinal stenosis) represent a reason of discontent for both the patient and doctor, and simultaneously determine an increase in medical care costs.

In our series they represented 2,98% of the entire number of patients operated for disc herniation and spinal stenosis with a higher rate for patients operated for disc herniation (3,40%) than for spinal stenosis (1,92%).

Literature data, as well as our results reveal that they are the result of a medical or surgical complication during patient care in which, in some cases, comorbidities may also be involved.

In a recent study which comprised a diverse neurosurgical pathology, that included a number of 163.743 cases, the general 30-day readmission rate was 8,63% (2), and in particular, 6,92% for lumbosacrat spinal decompression.

The readmission rate of neurosurgical patients with diverse neurosurgical pathology was recently reported varying between 6,9% and 11,8% (3, 4).

In other studies strictly regarding spinal pathology, 30-day readmission rate was reported between 3,84% and 9,1% (5–10).

Spinal operations are more frequent than other neurosurgical interventions, but although their readmissions rates are lower in comparison with other types of surgery, they occupy third place in Taylor's study (2).

This rate can be lowered by avoiding surgical complications. In our study, almost half of readmissions were related to pain management. Their high number could have been avoided if patients had respected discharge instructions and had addressed their general practitioner for evaluation and treatment.

Acute postoperative pain represented 0,5% of early readmissions according to Wang et al5. Back pain located at the level of the surgical intervention is usually caused by muscular compression and hypoxia, mainly in spinal stenosis patients when surgery is performed at multiple levels.

Another cause for readmission is surgical wound dehiscency caused by granulomas associated with superficial infection. We consider that this complication can be avoided by respecting the correct superficial layer suture technique and aseptic measures. The subcutaneous suture with a downward oriented knot avoids granuloma formation.

CSF leakage was the most frequent surgical complication in our series, representing 18,18% among reasons for readmission and 0,54% of the total number of reviewed interventions. When the durotomy was discovered intraoperatively, surgical repair consisting of muscle, fat and Gelaspon application was attempted and postoperatively, patients were instructed to maintain bed rest for the following 3 days. Although, after suture removal, the surgical wound appeared clean and dry, these patients returned after a few days presenting CSF leakage. There were several factors that determined fistula development: the impossibility of dural suture through mini-open approach, periduroradicular fibrosis encountered in patients who had previous surgery at the same level, obesity and diabetes. Lack of necessary products for immediate repair of dural tear imposed a second surgical intervention with higher costs compared to the value of the initially required products.

The low number of postoperative infections can be explained by the systematic epidural application of 1 gram of Vancomycin. Ever since we initiated this protocol, postoperative discitis practically disappeared. Infections associated with granuloma can be prevented by adopting the downward facing knot subcutaneous suture and enhanced sterile techniques.

In some studies, postoperative infections were the most common complication, especially when a device, implant or graft were used5.

Shah et al4 reported that surgical site infection accounted for 11,2% of readmissions. In McCormack's study (6), they represented 32% of 30-day readmissions after spine surgery.

There are literature reports of nosocomial infections such as urinary tract infections and pneumonia. If, in our series, these nosocomial infections had developed, such patients would

have been admitted in other cities or departments.

Among readmitted patients, five presented foraminal stenosis for which hypertrophic ligamentum flavum resection and partial facetectomy were performed by using interlamar approach. The intraoperative decision was against the removal of the protruding disc. Due to inadequate decompression by removal of hypertrophic ligament without removal of protruding disc, neurological symptoms remained nearly identical as in the preoperative period. The surgeons managing the respective cases decided to perform discectomy through the same interlamar approach.

Conclusions

Degenerative spinal disorders are frequent in neurosurgical practice and generally have good postoperative outcomes.

Readmissions at 30 days after discharge were rare in our series, but still associated significant costs. Some of these are avoidable by using correct and aseptic surgical techniques.

Cases of incidental durotomy could have been resolved during the first surgical intervention if the necessary sealing agents had been supplied, a measure that could prove to be superior, regarding overall cost effectiveness.

These measures associated with patient education regarding behavior in the early recovery period can mitigate rehospitalisation for lumbar decompression patients, reduce patient morbidity and medical costs.

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