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AMBISPECTIVE INCIDENCE, IMPACT, AND RISK FACTORS OF UNINTENDED DUROTOMY

Medicine

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ABSTRACT

OBJECTIVES: Current study aims to use a retrospectively collected data registry of the surgically treated cases of the degenerative spine disease to clarify the relative frequencies of durotomy incidence in our setup over a period of 5-years. Special emphasis devoted to analyze the incidence, impact, and risk factors of adverse events in such cases.

METHODS: A retrospective data from a cohort of patients who underwent surgical intervention in a single center over a five-year period from January 2013 to January 2018 examined. The clinical diagnosis was confirmed by radiological studies (CT scan, MRI…) in all patients. The surgical cases included in our series were for degenerative disc disease.

RESULTS: The overall incidence of the unintended durotomy in the scrutinized group was 10.42%. In the subgroups it varied depending on the specifics of the surgical procedures performed. The biggest number of unintended durotomies was in the subgroup of re-operations– 31(16.93%) cases. Some serious complications have been encountered; 13-cases of pseudo-meningocele, 8-cases had epidural abscess, 2-cases developed meningitis, and one case diagnosed to have arachnoiditis.

CONCLUSION: This review conducted demonstrates that revision surgery, age, degenerative disease, and elevated surgical invasiveness are significant risk factors. Knowing about the mechanisms and predisposing factors for that serious complication is a matter of utmost importance when planning and performing spinal surgical procedures. Primary repair of durotomies, once recognised, should always be done to prevent complications.

KEYWORDS

Unintended durotomy; pseudomeningocele; infection; Primary repair; surgical invasiveness.

INTRODUCTION

Unintended durotomy is a somewhat common intra-operative complication of degenerative spine disease surgery. Prevalence ranges from 3 to 5% in primary and 7 to 17% in revision procedures [1, 2]. While most durotomies have no long-term sequelae and are easily water tightly closed intra-operatively using sutures and/or patching substances such as fibrin glue, still, a diversity of immediate or delayed complications can occur. These include severe headache, persistent leak (duro-cutaneous fistula), pseudomeningocele formation, meningitis, and arachnoiditis [3-6]. Several risk factors for incidental durotomy have been acknowledged, encompassing prior lumbar surgery, older age, female gender, and history of spinal trauma [7-11].

Contemplation and anticipating these risk factors and conceivably decreasing the risk of unintentional durotomies is perilous because these complications can have a substantial impact on cost and health resource utilization.

The purpose of the current study was to, use a prospectively collected data registry of the surgically treated cases of the degenerative spine disease to clarify the relative frequencies of durotomy incidence in our setup over a period of 5-years at King Hussein Medical Center. Special emphasis devoted to analyze the incidence, impact, and risk factors of adverse events in such cases.

METHODS

We analyzed retrospective data from a cohort of patients undergoing spinal surgery over a five-year period from January 20013 to January 2018. The study group comprised of 1324 consecutive patients who underwent surgical intervention in a single referral center for degenerative disc disease of lumbar spine. The clinical diagnosis was confirmed by radiological studies (CT scan, MRI…) in all patients. The surgical cases included in our series were for degenerative disc disease. Dural tears secondary to trauma, or cases with intradural pathology were not included in this analysis as they did not fit into the definition of "unintended dural opening".

Patients were classified into four age groups as shown in Table I.

Table I: Age wise patients groups.

Age group	Number	percentage
30<	187	14.12 %
30- 40	483	36.48 %
40-60	360	27.19 %
> 60	294	22.20 %

Table II: Indications for operative procedure

Pathology	Number	percentage
Degenerative spinal disease	438/1324	33.1 %
Disc herniation	486 /1324	36.71 %
Instrumented spinal procedures	217/1324	16.38 %
Re-operations	183 /1324	13.82 %

RESULTS

The overall incidence of the unintended durotomy in the scrutinized group was 10.42%. In the subgroups it varied depending on the specifics of the surgical procedures performed. The biggest number of Unintended durotomy was in the subgroup of re-operations– 31(16.93%) cases, followed by the group of the patients with degenerative spinal disease – 58 (13.24%), and finally - disc herniations - 36(7.40%). Unintended durotomy was found in 13(5.99 %) in patients with instrumented spinal procedures (Tabl. 2). Some serious complications have been encountered; 13-cases of pseudo-meningocele, 8-cases had epidural abscess, 2-cases developed meningitis, and one case diagnosed to have arachnoiditis.

Patients with unintended durotomy, especially those re-operated and those with developed pseudomeningocele had worse postoperative

functional status if compared to the rest of the patients.

DISCUSSION

"Unintended durotomy" defined as an unintentional opening of the dura during the surgical procedure with CSF extravasation or bulging of the arachnoid layer. "CSF leak" defined as the egress of CSF from the skin incision requiring additional treatment.

Many previous studies have been conducted, inspecting various risk factors and treatment of unintended durotomy. They have suggested that these can occur irrespective of a surgeon's abilities or experience [12]. Conveyed risk factors have included among others: revision surgery, ossification of the PLL, surgeon's level of training and patient age, though these are inconsistently reported between studies. Revision surgery, is the most commonly reported risk factor based on literature review. Although there are several studies that attempt to examine the incidence and associated risk factors, they are limited by small numbers, retrospective data collection and lack of multivariate analysis. In our review factors associated with durotomy incidence were: revision cases, surgeon's level of experience, obesity, co-morbidities.

Understanding the mechanisms and predisposing factors for this serious complication is a matter of paramount importance when planning and performing spinal surgical procedures. Dural tear transpire while manipulating the thecal sack or nerve roots. Usually unintended durotomy followed by cerebrospinal fluid (CSF) leaks befall directly by the surgeon himself. Dural tears due to manipulations of the dura and nerve roots are tremendously dangerous among the patients with advanced degenerative spinal stenosis and in re-operated patients. As the area of the dural defect is exposed to the surgeon, the tear should be immediately repaired. Leaving behind small sharp bone specks during surgery is another mechanism that could contribute to small dural tears that could be left undetected during surgery, especially if the arachnoid membrane is intact and there are no CSF leaks. These small dural tears could be converted to open ones due to rapidly increased intradural pressure during the recovery from anesthesia, especially if it is very fast and violent. Large durotomies have to be sutured [3,4]. Our common practice is to attempt primary repair of durotomies, once documented, this should always be done to prevent the complications. Dural repair is made by suturing the dura, supplemented by applying fat. In other cases a good sealant agent was applied (tachosil). While cases were small punctiform durotomies encountered, fat graft, muscle graft can be effective. We advocate bed rest for 2-3 days in supine position, empirical antibiotics, also no drains were inserted.

Unintended durotomy could be detected during the initial surgery or during the postoperative period, based on clinical signs and symptoms suggestive of CSF leakage such as: postural headache, nausea, vomiting, pain or tightness in the neck or back, dizziness, diplopia due to VI cranial nerve paresis, or with MRI study (Fig. I). In our series we re-explored all cases presented with large pseudomeningocele, aiming to direct repair of durotomy [13,14]. Leakage of CSF following dural tears can pose potentially severe complications such as CSF fistula formation, pseudomeningocele, meningitis, arachnoiditis and epidural abscess. Though rarely, complicated CSF leaks could be lethal [15-18].

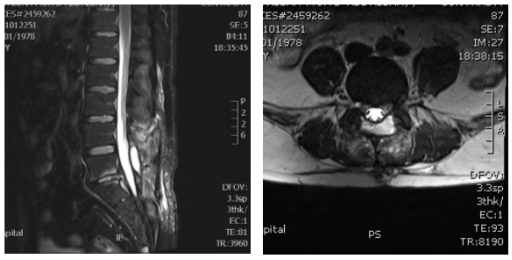

Figure. I: Post-operative MRI, Sagittal and axial cuts, demonstrating the presence of pseudomeningocele.

Inadvertent dural tears need to be readily recognized, and appropriately treated. The occurrence of durotomy demands an extended hospitalization. The development of CSF fistula or deep wound infection are serious dreaded complications of dural tear in spine surgery, which increase much more hospital stay and medical costs.

CONCLUSION

The present review conducted demonstrates that revision surgery, age, degenerative disease, and elevated surgical invasiveness are significant risk factors, with revision surgery being the strongest co-variate. Knowing about the mechanisms and predisposing factors for that serious complication is a matter of utmost importance when planning and performing spinal surgical procedures. Primary repair of durotomies, once recognised, should always be done to prevent complications.

Limitation: the major drawback of this study is that detailed information adjoining the genuine unintended durotomy are deficient. Operative reports were retrospectively revised. Detailed information surrounding the CSF leak; regarding timing of CSF leak (during decompression or instrumentation) or the type of instrument associated with the dural tear is lacking in this data registry. In addition, Academic training centres such as ours, have varying levels of surgical experiences. Naturally, the experience level of the surgeon seems likely to influence the rate of unintended durotomy.

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