DOI: https://doi.org/10.54393/pbmj.v5i6.510

PAKISTAN BIOMEDICAL JOURNAL

https://www.pakistanbmj.com/journal/index.php/pbmj/index

Volume 5, Issue 6 (June 2022)

Original Article

Incidental Dural Tears in Lumbar Decompressive Surgery: Incidence, Causes, Treatment, Results

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ARTICLE INFO

Key Words:

Spinal Surgery, Dural Tear, Cerebrospinal Fluid Seepage, Durotomy, Herniation

How to Cite:

Haq , N. U. . . . ., Shah, I., & Khan, M. (2022). Incidental Dural Tears in Lumbar Decompressive Surgery: Incidence, Causes, Treatment, Results: Incidental Dural Tears in Lumbar Decompressive Surgery. Pakistan BioMedical Journal, 5(6). https://doi.org/10.54393/pbmj.v5i6.510

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Received Date: 27th May, 2022

Published Date: 20th June, 2022

Acceptance Date: 30th June, 2022

ABSTRACT

Durotomy (Incidental dural tears or ID) is a very rarely occurring disorder when decompressive surgery (spinal surgery) of the patients takes place. This disorder has severe effects on patients. During different surgeries of the spinal cord, the chances of this durotomy vary greatly. **Objective:** The main objective of this research work is to evaluate the main reasons for the incidence of this durotomy disease. During different surgeries of the spinal cord surgeries (decompressive and compressive) within the different regions, many factors play their role in the initiation of this durotomy disease. It is the target of this work to find the initiation factors of the disease so that effective methods of treatment can also find out. **Methods:** It was a retrospective study with a statistical approach. This study was conducted in Neurosurgery unit, Mardan medical complex / Bacha khan medical college, Mardan for the Duration of one year August 2020 to July 2021. To proceed with this study, 30 patients were selected with posterolateral and posterior compressive and decompressive surgeries within the different regions of the spinal cord. The patients were randomly selected from December 2020 to December 2021. **Results:** The incidence of this durotomy disease was investigated within all groups and the probability of this disease was only 12.65%. The occurrence of this disease also depends upon the type of surgery. Patients suffering from spinal trauma, stenosis of the spinal, different tumors, and vertebral disc herniation had exaggerating role in the incidence of durotomy in patients having some spinal surgery. **Conclusion:** The durotomy disease should be considered a serious issue with a number of other complications. For the treatment of this disease, prevention is the best method and to know about the complications is important because all of the factors involved in the incidence of durotomy should be considered while performing any kind of surgery.

INTRODUCTION

An unexpected tear of the dura mater during surgery or other invasive extradural operations such as epidural injections is known as an incidental durotomy. There may be some dura flaws that do not repair the following myelography. Durotomies are unfavorable yet reasonably common in spine surgery, whether they are pre-existing or arise after surgery [1]. The prevalence of inadvertent durotomy varies depending on the series examined and the type of surgical treatment performed. Different factors during spinal surgery play their role in the incidence of this durotomy disease. In this durotomy, multiple complications arise that may prove seriously problematic [2]. The occurrence of an inadvertent durotomy during spinal decompression surgery is a rather uncommon complication that can have serious consequences. The rate of incidental durotomies varies greatly between writers (1-16 %) and is dependent on the nature and critical of the vertebral column surgeries in general. The majority of writers link a higher rate of dural tears to an increased rate of retreatments respectively with fibrosis of epidural and progressive spinal degrading alterations with a pale ligament in older patients having surgery. In recent decades, the frequency and complexity of spinal surgeries have increased, resulting in a higher occurrence of dural

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tears. Overburdened nerve root tension during the elimination of large disc extrusions and replacement of spinal insertions is one of the primary intraoperative mechanisms [3,4]. Whenever dural injury develops, it is usually discovered intraoperatively, and initial treatment with recognized surgical protocols/procedures is required. Unfortunately, not all dural rips can be properly identified and healed. Inadvertent pin-hole-type durotomies may go unnoticed during surgery, even by skilled surgeons [5,6]. If a defect is not recognized or closed adequately, the patient may develop a headache that includes vomiting, fever, nausea, sleeping disorder, laziness and diplopia due to VI cranial nerve paresis, photophobia, tinnitus, and other symptoms. Cerebrospinal liquid/fluid (CSF) leaking as a result of dural rips can result in Cerebrospinal fluid formation of fistula, pseudomeningocele, arachnoiditis, and meningitis, and abscess epidural, among other complications [7,8]. The goal of this study was to assess the initiation of pre durotomies during various types of spinal decompressive, compressive, and reconstructive surgical protocols/procedures, as well as to identify the most common causes of incidental dural tears (durotomies), treatment facilities, and their impact on early and late outcomes. Different research groups are trying to find the most appropriate method for the identification of the factors involved in the initiation of this disease [9,10].

METHODS

This study was conducted in Neurosurgery unit, Mardan medical complex / Bacha khan medical college, Mardan for the Duration of one year August 2020 to July 2021. In this statistical study, 30 patients were selected with different spinal surgeries of posterolateral and posterior surgeries (with compressive, decompressive, and reconstructive surgeries). All the patients had a single time or multiple time surgeries. Patients were selected from December 2020 to December 2021. Some patients were kept in the control group while another one was those who have vertebral column surgeries to observe the changes in the physiology of these patients and to identify the effects of surgeries at different durations. Patients were kept in different groups on the basis of different spinal cord surgeries done in their life. Some of the patients undergo surgeries again in a spinal reconstruction manner. In the cases diagnosed with the initiation of durotomy, efforts were made to identify the possible reason for their disease initiation. Cerebrospinal fluid seepage occurs within these organisms. Patients were diagnosed with different symptoms such as headache, irritation of meningeal, neurological defects, fluid secretion from the sub cuticle, and a number of many other complicated problems were also noted. When magnetic resonance imaging (MRI) of these patients was done after the symptom appearance, pseudo meningocele was identified. MRI was considered a method for the identification of this pseudo meningocele. In one patient CT myelography was diagnosed. In about 0.2 % of people having a spinal cord or vertebral column surgery, no observable scenes were identified. Among these some patients were retreated with surgery to prevent the seepage of CSF through wounded sites. To obtain the final results statistical methods were employed to calculate the probability value and to compare different patients, Student fisher test and t-test was used with average p-value less than 0.05 was considered significant.

RESULTS

The percentage incidence of IDs in the studied group is 13%. The incidences vary by varying surgical procedure. The higher incidence was seen in the group with cases of re-operation. It was observed to be 28%. The incidence of IDs in the cases of spinal traumatic injury was 20%. The incidence was seemed to be 11% in the patients with the degenerative spinal stenosis (Table 1). The patients with reconstructive spinal procedure has the 9% incidence of IDs. The postoperative functional status was observed to be worst in the patients experiencing re-operation.

Degenerative spine surgery indication	Total	Male	Female	Mean Age	Incidence
Patients with disc herniation	13	7	7	43.28	8%
Patients with degenerative spinal stenosis	8	3	4	51.3	11%
Spine trauma	4	3	1	41.3	20%
Reoperative surgery	3	1	2	48.7	28%
Tumor	2	1	1	67.6	10%
Total number	30	15	15	47	13%

Table 1: Percentage Incidence of IDs and Mean Age of the Patients

The higher VAS rates were observed in the patients with the IDs, the mean of those three patients who follow for one month was 4 while, the mean of the VAS-rates in the patients without the IDs was seemed to be 2. The results remain similar, even if the follow up increased to six or 24 months. The mean ODI of the patients was calculated for evaluation of the functional status. The 2 patients with ID were followed up for one year and the mean ODI calculated was 32%. The calculated ODI of the patients without ID was 25% (Table 2).

Procedures (surgical)	N	Percentage ID incidence
Decompression	19	11%
Decompression and fusion w/o instrumentation	2	9%
Decompression and fusion with instrumentation	6	9%
Reoperative spinal surgery	3	28%
Total number	30	13%

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Table 2: Incidence of ID in the respective Surgical Procedures

DISCUSSION

The one of the most common complication of spinal surgery is incidental durotomy (ID). It has high percentage incidence in the patients who underwent spine surgery. Many postoperative complication have seen in the patients with spinal surgery and these includes arachnoiditis and fistulas. The range of reported ID incidence vary from one to sixteen percent. The health care costs are raising because of the IDs. It is also associated with poor patient's outcome [11]. The spinal procedure and its type opt for the surgery generally control the incidence of dural tears in the patients. In a study conducted by Hisatoshi et al., the revision surgery and corrective verbal osteotomy were observed to be the independent risk factors for IDs. The revision surgery has the major contribution and strong association with the IDs. The study conducted by Hannallah showed that the highest risk of IDs are associated with the cases of ossification of posterior longitudinal ligament (OPLL)[12,13]. For repairing the suture are used for primary closure. For the healing purposes the ventriculo-peritoneal shunt procedure is used. The surgeon recommend the longer bed rest period for the patients with the ID. Postoperative complications are higher in the patients with the longer bed rest period [14]. In a study conducted by Khan et al., the ID was reported in the 10% who underwent spine surgery. Different risk factors are associated with the postoperative ID. The percentage contribution of such factors in causing ID can be accessed through multivariate analysis before the spine surgery. The invasive surgical methods and instruments have raised the number of IDs in the patients [15]. Wange et al., study depicted that 14% patients who underwent lumber spine surgery have the IDs complication. The research conducted by Godkin and Laska8 also showed that almost 16% patients have the complaint of post-operative IDs. Hence ID are proved to be highly associated with the spinal surgery [16]. These are highly observed in the old age patients as compared to the younger patients. The incidence of ID in the patient undergoing the microdiscectomy and cervical surgery procedures is low as compared to pateints with re-interventions. The results of the study conducted by Morghan-Hough represented that the percentage of IDs in the patients with the primary intervention was found to be 5% while it was 14% in the patients with the re-interventions. Out of the 30 patients included in the present study the incidence of IDs is 12% in the patients undergoing spinal surgery. The one patient was also observed with pseudo meningocele. The incidence of IDs is higher about 28% in the patients undergoing re-interventions. The patients undergoing microdiscectomy have the lowest incidence of IDs about 8% while, other with the spinal trauma has the incidence of 20% [17,18]. The cerebrospinal fluid CSF leakage symptoms are representative of the IDs in the patients. These can diagnosed while surgery or in the postoperative period (after surgery). The risk of ID development is higher in the cases where surgeons manipulate the dural sacs or nerve roots. These manipulations are proved to be highly dangerous in the patients with the spinal stenosis and re-interventions. The tear can be repaired when the dural defects region is exposed to the surgeon. Small dural tears can also produce after the defective surgery in which the sharp bone particles left behind by negligence of surgeon. While recovering from the anesthesia the intradural pressure can cause CSF leakage or opening of arachnoid membrane that eventually convert the small dural tears into open ones [19,20]. CSF leakage is most common in the patients with IDs. Different procedure such as fascial graft and suture are used to immediately seal the CSF leakage. In most of the cases of surgery the IDs remain hidden or unattended. These leakages if remained undetected can lead to headache, dizziness and nausea. The CSF fistula formation and meningitis are commonly observed in the patients with the dural tears. CSF leakage are seemed to be fatal in rare cases [21]. Different studies were conducted on the postoperative patients with IDs. The Saxler et al., conducted the study based on 10-years post-operative follow up and concluded that the worse clinical results were seemed in the patients with the IDs. IDs also increased the risk for re-operations. Our results are comparable with the above studies, though the follow-up time of our study is one year[22].

CONCLUSION

The most serious and prevalent condition in the patients undergoing spinal surgery is dural tears. These raised the multiple unwanted consequences in the post-operative patients. The best way to treat this complication is prevention. For the better management and proper planning of the spinal surgical procedures the in-depth understanding of the underlying mechanism that caused inadvertent dural tears is necessary. The percentage IDs in the present study was observed to be 13% in the patients undergoing spinal surgery.

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