

Management of Different Post-Operative Outcomes Due to Incidental Durotomy During Lumbar Spine Surgery, Single Institute Experience: Case Series

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Abstract

Background: Unintended incidental dural tear is an underrated and unpleasant event during spine procedures. Many outcomes of improperly managed dural tears have been noted. A retrospective study was carried on about 1217 consecutive patients who had lumbar spine surgery done in a single institute from February 2016 to February 2021. We excluded patients with emergency lumbar spine pathologies and lumbar spine surgeries performed in the pediatric age group.

Aim of Study: The main aim of this study was to detect the incidence, management of post-operative complications due to incidental dural tear during lumbar surgery and results after 6 months follow-up clinically.

Patients and Methods: A retrospective review was conducted on about 1217 consecutive patients who underwent lumbar spine surgery performed in one institute from February 2016 to February 2021. We excluded patients treated for emergency lumbar spine cases and lumbar spine surgeries performed in the pediatric age group.

Results: 1217 patients underwent lumbar spine surgery in 5 years. Of those, we identified 180 patients with unintended dural injury. All incidental durotomies were recognized either intra-operatively or during the post-operative period and managed accordingly by either water-tight closure using primary sutures, muscle grafts, fat grafts or lumbar drain in some cases after failure of conservative measures. We never used tissue glue in our study.

Conclusions: Incidental durotomy is a frequent and not uncommon drawback of lumbar spinal surgery. Primary dural closure with water-tight running sutures is the method of choice in cases with intra-operative incidental durotomy. The combination of this method with fat grafts or muscle grafts would secure the closure even better with great cautious when using subfacial drains, as the use of drains beneath fascia in such cases would facilitate cerebrospinal fluid (CSF) leak. Invasive measures such as lumbar drains and/or surgical revision should always be kept in mind and planned after failure of conservative measures.

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Key Words: Lumbar spine surgery – Incidental durotomy – Pseudomeningocele – Cerebrospinal fluid leak.

Introduction

INCIDENTAL unintended durotomy during lumbar spine surgery is a relatively not uncommon drawback that could cause many unpleasant complications if not managed properly. The incidence of incidental dural injury differs widely between observers (1-17%) and mainly depends on the type and difficulty of the surgery [1]. Several consequences of inadequately treated dural tears have been reported [2]. In the vast majority of cases, dural tears are witnessed intra-operatively and immediate primary repair with the different surgical maneuvers is necessary. Not all dural tears can be detected and managed intra-operatively leading to many consequences after surgery [3]. Cerebrospinal fluid leakage after dural injuries can lead to many dangerous complications such as CSF fistula, pseudomeningocele and/or infection [4].

This study is aiming at assessing the incidence, management of post-operative complications due to incidental dural tear during lumbar surgery and results of 6 months clinical follow-up.

Patients and Methods

Between February 2016 and February 2021, we evaluated 180 patients with incidental durotomy from a total number of 1217 consecutive patients who performed lumbar spine surgery in a single institute. We excluded patients treated for emergency lumbar spine cases, patients with tumors in the lumbar region and lumbar spine surgeries performed in the pediatric age group.

List of Abbreviations:

CSF : Cerebrospinal fluid.
OPLL: Ossified posterior longitudinal ligament.

Patients collected data were demographic characteristics, pre-operative clinical data at time of presentation, methods of management of the post-operative complication whether conservative or surgical, post-operative clinical findings and outcome and complications if present. All the gathered data were evaluated. Clinical follow-up of the patients was done for the first 2 days in the ward before discharge and in the outpatient clinic 14 days, 1 month, 3 months and 6 months after discharge.

Surgical technique: All operations were done under general anesthesia in the prone position with great care given to secure pressure points as the orbit, the anterior iliac crest, the genitalia and the abdomen to reduce pressure in the epidural venous system and bleeding during surgery. All patients should receive standard peri-operative antibiotics. C-arm fluoroscopy is utilized for accurate level localization. Posterior midline approach with subperiosteal muscle separation either unilaterally or bilaterally was the standard approach utilized in all our cases.

Results

About 1217 patients had lumbar spine surgery in 5 years. Of these, we identified 180 cases with incidental durotomy. All incidental durotomies were recognized either intra-operatively or during the post-operative period and managed accordingly by either water-tight closure using primary sutures, muscle grafts, fat grafts or lumbar drain in some cases after failure of conservative measures. We never used tissue glue in our study.

The average age of patients was 48.2 years (range 27-75). 116 men and 64 women. Thirty two (17.8%) gave history of previous lumbar spine procedure. No previous dural tear happened in any of them. Incidental dural tears are commonly seen with decompression procedures for lumbar canal stenosis. The operation done and the incidence of dural tear in each type is shown in (Table 1).

Table (1): Incidence of incidental dural tears according to surgical procedure (out of 180 patients).

Operation (Lumbar Spine)	Patients	Percentage
Decompression and instrumentation	66	36.7
Decompression only	54	30
Microdiscectomy	40	22.2
Open discectomy	20	11.1

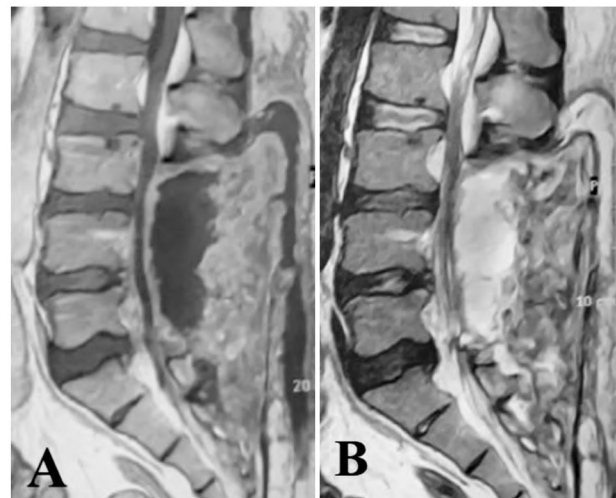


Fig. (1): Sagittal magnetic resonance images showing the pseudomeningocele; (A) Sequence T1 weighted image, (B) Sequence T2 weighted image.

Operative management: All cases with incidental durotomy were dealt with primarily once noticed intra-operatively. In the majority of cases, injury happened in the lower lumbar region with L5/S1 level being the most common involved site followed by L4/5 then L3/4. Fewer cases took place in the upper lumbar region. Most of the cases were managed by direct suturing of the tear with a continuous locked technique using non-absorbable sutures. That was sufficient only in 90 cases (50%) without use of any grafts especially in posteriorly located tears. Muscle grafts were used in 20 cases (11.1%). Fat grafts were used in 70 cases (38.9%). Both muscle and fat grafts were used mainly in cases with posterolateral or laterally directed tears that were difficult to suture primarily. Blood film was used as an add on step after putting either muscle or fat graft. Tissue glue was not used in our study. At the end of the repair we performed the Valsalva maneuver. Subcutaneous layers closure was carried out using Vicryl sutures and skin closure was carried out using simple interrupted sutures. Subfascial drains were applied for 136 patients (75.5%) and were left for 48 hours in all patients before removal.

Post-operative bed rest: The mean post-operative rest period was 2.68 days (range 0-10 days). The rest time needed differs according to the procedure, the size of dural tear, the tightness of primary sutures and post-operative manifestations.

Outcome and complications: Of 180 cases with incidental durotomy, 50 patients showed no sequelae. 40 patients developed cerebrospinal fluid leak (watery clear or blood tinged fluid) from the wound which ended after lumbar drain usage for about five days. 90 patients developed wound collection. In 66 patients the collection was lax and disap-

peared spontaneously within one year. In the remaining 24 patients the collection was tense and non-ballotable. Lumbar drain was inserted in 18 out of these 24 patients for about 5 days after which the collection totally resolved while lumbar drain failed in the remaining 6 patients and they need surgical repair. Surgical repair failed in one patient which developed cerebrospinal fluid leak and meningitis after the surgery. Later on, this patient developed hydrocephalic changes and a medium pressure ventriculoperitoneal shunt was inserted after complete resolution of the infection. 2 weeks after applying the shunt, the patient developed bilateral subdural hygroma and he underwent another surgery to evacuate the hygroma and to upgrade the shunt to a high pressure one.

Discussion

The incidence of dural tear and CSF leakage during lumbar spinal surgery has been reported in the range of 1.8-17.4% [5]. The incidence differs according to the type of surgery and age of the patient (less for younger people and for disc procedures). Procedures for spinal stenosis with old age have higher rates of dural tear [6]. Ishikura and colleagues studied the risk factors for incidental durotomy during posterior open spine surgery for degenerative diseases in adults especially in recurrent cases and when instrumentation is used [7]. However, the risk of incidental dural tear increases with the use of drills, cases with posterior longitudinal ligament ossification (OPLL) and lumbar spine re-do procedures [8]. Great care should be given while using high speed drills and different instruments. The most useful method to minimize the risk of cerebrospinal fluid leak after dural injury is prevention [9].

Pre-operative strategy and careful surgical steps are mandatory to decrease the risk of dural tears. Non-operative management of dural injuries is unsuccessful and must be managed wisely. Therefore, adequate direct repair of dural tears should be achieved and shows success in most of the cases. Proper meticulous closure of dural tears detected during surgery was mandatory for all patients [10]. Also, closure of the fascia tightly is necessary to prevent cerebrospinal fluid leak from the wound and infection. The completeness of repair is achieved by using Valsalva maneuver to increase the pressure inside the thecal sac and to detect inadequately closed dural edges as evidenced by cerebrospinal fluid leaking through the sutured tear [6].

The use of subfascial drains is debateable. Eismont and colleagues did not recommend putting them because this may lead to development of a fistula between thecal sac and the skin [10]. Cammisa and colleagues advised their use according to many factors: Type of surgery, dural tear size, tissues condition and effectiveness of the repair [6]. Wang and colleagues used a drain in all his patients as they found that those drains did not lead to the formation of fistulas in any patient [7].

Tafazaland colleagues found that mandatory bed rest was not necessary for patients who had repair of a dural tear intraoperatively [10]. Cammisa and colleagues recommended bed rest for 3 to 5 days in all cases [6]. Many complications may occur from inadequately managed dural tears as: continuous cerebrospinal fluid leak, infection (meningitis, arachnoiditis), pseudomeningocele, chronic back pain and different neurological sequelae [6].

Dural tear is a commonly faced complication during lumbar spine surgery. The presence of a dural tear may carry poor prognosis [5]. Saxler and colleagues found that patients with an incidental dural tear after lumbar disc surgery had poorer prognosis when they compared a group of 41 patients with a similar control group at 10 years follow-up [11]. Some studies showed no hazardous effects associated with incidental durotomies if the patients were managed adequately [6]. However, Saxler and colleagues have a longer follow-up period than these studies [11].

Drawbacks of our study include the absence of a control group, the relatively short follow-up period and the absence of validated score for clinical assessment. However, this study included a large group of patients with incidental durotomies.

Conclusion:

Unintended dural injury is a well-known complication of lumbar spinal surgery. Many cases of dural tears are reported nowadays owing to increase in the number and complexity of spinal procedures and therefore, they should be managed properly. Primary dural closure with water-tight running sutures is the method of choice in cases with intraoperative incidental durotomy. The combination of this method with fat grafts or muscle grafts would secure the closure even better with great cautious when using subfascial drains, as the use of subfascial drains in such cases would precipitate CSF leakage. The drains, if used, should not be put on negative suction pressure even with proper dural closure. Invasive measures such as lumbar drains and/or surgical revision (after failure of

lumbar drains) should always be kept in mind and considered the main options in managing CSF leak or tense wound collection after failure of conservative measures with great success.

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كيفية التعامل مع النتائج المختلفة لحالات قطع الأم لجافية بعد إجراء جراحات العمود الفقري القطني تجرية مؤسسة واحدة سلسلة من الحالات

يعد تمزق الأم الجافية العرضي الغير المقصود حدثاً غير سار وغير مرغوب به أثناء إجراء جراحات العمود الفقري. يختلف معدل حدوث إصابة الأم الجافية العرضي بشكل كبير بين المراقبين (١-١٧٪) ويعتمد بشكل أساسي على نوع الجراحة ومدى صعوبتها. في الغالبية العظمى من الحالات يتم مشاهدة هذا التمزق أثناء الجراحة ومن الضروري إجراء إصلاح أولي فوري باستخدام الأساليب الجراحية المختلفة. لا يمكن الكشف عن جميع تمزقات الأم الجافية والتعامل معها أثناء الجراحة مما يؤدي إلى عواقب عديدة بعد الجراحة. يمكن أن يؤدي تسرب السائل النخاعي بعد إصابات الأم الجافية إلى العديد من المضاعفات الخطيرة مثل ناسور السائل النخاعي و/أو القيلة السحائية الكاذبة و/أو العدوى. تهدف هذه الدراسة إلى تقييم حدوث وإدارة مضاعفات ما بعد الجراحة الناتجة عن تمزق الأم الجافية العرضي أثناء جراحة الفقرات القطنية ونتائج المتابعة المستمرة لمدة ٦ أشهر بعد إجراء الجراحة.