# Evaluation of Treatment Modalities of Post Operative Cerebrospinal Fluid Leakage in Degenerative Lumbar Spine Surgery

*Thesis*

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بسم الله الرحمن الرحيم
اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ * خَلَقَ الْإِنسَانَ
مِنْ عَلَقٍ * اقْرَأْ وَرَبُّكَ الْأَكْرَمُ * الَّذِي
عَلَّمَ بِالْقَلَمِ * عَلَّمَ الْإِنسَانَ مَا لَمْ يَعْلَمْ *
صدق الله العظيم
سورة العلق (1-5)

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# Dedication

I dedicate this work to my Mother who is the gift of Allah for me, my kind Father who is without his kind help I can't continue in my life, and to all the members of my family for their continuous support and help …

Walid Elshamy
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# List of Abbreviations

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**CSF : Cerebro spinal fluid**

**CT : Computerized tomography.**

**MRI : Magnetic resonance imaging.**

**HCV : Hepatitis C virus.**

**OVLT : Organum vasculosum lamina terminalis.**

**DM : diabetes mellitus.**

**HTN : hypertension.**

**ESR : Erythrocyte Sedimentation Rate.**

**CRP : C Reactive Protein**.

# INTRODUCTION

Cerebrospinal fluid (CSF) leakage is a potential complication resulting from a dural violation during spinal surgery. Persistent CSF leakage leads to either pseudo-meningocele formation or a CSF fistula, which can result in poor wound healing, infection, and meningitis. Incidental durotomy and the resultant complications are increasingly important issues in spinal surgery because the number of indications for spine surgery is growing and the complexity of operations undertaken is increasing ***(Mustafa et al., 2003).***

Their incidence varies widely among different authors (1-17%) and in general depends on the type and complexity of the spinal procedures performed ***(Cammisa et al., 2000 and Deyo et al., 1992)***.

The majority of authors relate the increased rate of dural tears with the increase of reoperation rate and with the advanced spinal degenerative especially in elderly patients ***(Kalevski et al., 2010).***

Traditionally, the diagnosis of CSF leakage has been nearly exclusively the domain of clinical observation whether by direct Intraoperative recognition of durotomy, or by postoperative elicitation of characteristic symptom-matology, or by identification of advanced pathology such

as clinically significant Pseudomeningocele or wound dehiscence.

Although a broad array of treatments is available, definitive treatment by direct dural closure is both invasive and potentially technically difficult. The risk of unintended durotomy and CSF leaks can be reduced with increasing surgical experience. However, sometimes minor tear may become symptomatic only days or weeks after surgery. In severe spinal stenosis, which often presents with adhesions, dural tears occur even in the hands of experienced surgeons.

Appropriate management of an inadvertent durotomy depends on the time at which the dural breach is first identified. If the dural violation is recognized during surgery, immediate surgical repair with primary suture closure of the durotomy and/or dural sealant and graft placement is recommended. However, if the durotomy is not identified at the time of the initial procedure, or the surgical repair is unsuccessful with persistent CSF drainage, then several alternatives, less invasive measures are available. These include over sewing and reinforcing the skin incision, bed rest with a compression dressing, percutaneous epidural blood patch or fibrin glue, and closed subarachnoid drain placement. Ultimately, failure of any treatment options, whether conservative or surgical,

mandates re-exploration with definitive surgical repair ***(Goodkin et al., 1995).***

A midline dural tear is readily repaired by direct application of suture however; far-lateral or ventral dural tears are problematic. The defect can be covered with fascia, muscle, fat, or synthetic material such as Tissue-Dura ***(Perry Black, 2002).***

Postoperative management includes: bed rest, percutaneous injection of an epidural blood patch or a subarachnoid drain which can be placed as the initial treatment for a delayed CSF leak, or as an adjunctive measure to facilitate healing after surgical repair of a dural defect ***(Kitchel et al., 1989)***.

Traditional methods of spinal dural repair following incidental durotomy have a 5% to 10% failure rate ***(Narotam et al., 2004)***.

Ultimately, appropriate treatment of an incidental durotomy, CSF leak, or Pseudomeningocele depends on the time of diagnosis, size and location of the defect, and the patient's symptoms. Intraoperative identification of an incidental durotomy demands immediate and meticulous surgical repair. The modality of repair: whether primary suture repair, use of a graft, or both, depends on the size of the defect, accessibility, and the integrity of the dura. Dural defects that are diagnosed after surgery, if small and well-

contained, may spontaneously resolve with conservative management. CSF fistulas with minimal CSF drainage may be amenable to treatment with a percutaneous epidural patch, temporary closed subarachnoid drainage, or both. Profuse CSF drainage, large symptomatic pseudo-meningoceles, or a persistent CSF fistula despite prior treatment measures, however, warrants re-exploration with definitive surgical repair ***(Hoh and Lauryssen, 2010).***

# Aim of work

Faced with the multiplicity of treatment options described in literature for unintended durotomy. Therefore intend to assess different modalities used in the management of patients in our department so as to establish a treatment protocol best suited for our patients.

# CLINICAL ANATOMY

## MENINGES:

The spinal cord is covered by three meningeal coats; these are:

- The pia,
- arachnoid, and
- Dura mater.

### Histologically:

The meninges consist of fibroblasts and collagen fibrils. The amount of collagen varies in different meningeal layers. For example, the dura mater contains copious amounts of collagen fibrils, while the arachnoid mater has no collagen ***(Siegel et al., 2006).***

The dura is also called the **pachymeninges,** and the arachnoid and pia are called the **leptomeninges.**

### A- The Pia Mater

Composed of an inner membranous layer, (the intima pia): is intimately adherent to the surface of the spinal cord an outer superficial layer, (the epipia): carries blood vessels that supply and drain the spinal cord.

It is continuous above through the foramen magnum with the pia covering the brain; below it fuses with the filum terminale.

The pia mater is thickened on either side between the nerve roots to form *the ligamentum denticulatum*, which passes laterally to be attached to the dura. It is by this means that the spinal cord is suspended in the middle of the dural sheath. The pia mater extends along each nerve root and becomes continuous with the connective tissue surrounding each spinal nerve ***(Afifi et al., 2005).***

## B- The Arachnoid:

Is closely adherent to the dura mater. The space between the dura and arachnoid (subdural space) is a very narrow (potential) space visible with the aid of a microscope in histological preparations in normal conditions bridging veins course across this space. Rupture of these veins results in accumulation of blood and expansion of this space, a condition known as *subdural hematoma.* The space between the arachnoid and pia (subarachnoid space), in contrast, is wider and contains the cerebrospinal fluid.

## C- The Dura Mater:

Unlike the dura within the skull, is firmly attached to bone only at the margin of the foramen magnum.