



## Management of Cerebrospinal Fluid Leak after Anterior Cervical Discectomy and Arthroplasty

Paul Lavantès and Thierry Dufour\*

Department of Neurosurgery, Institut Parisien du Dos, Geoffroy Saint Hilaire Clinic, France

### Abstract

**Introduction:** Anterior dural tears complicated by Cerebrospinal Fluid (CSF) leakage with anterior meningocele are extremely rare. Indeed, in the literature, cases are described in anterior arthrodesis, but no case of post-cervical arthroplasty is described. The management of this type of complication is poorly described and not consensual. Surgeons are rarely confronted with this type of complication, especially since the working space is very limited and does not allow direct suturing.

**Case Report:** We present the case of a patient who underwent cervical arthroplasty complicated by a post-dural tear meningocele. The revision surgery consisted of a combination of closure of the breach with a fatty patch covered by a TachoSil patch, followed by reinsertion of a cervical prosthesis.

**Conclusion:** At the last follow-up, the patient did not present any residual effects of the complication, and the mobility of the disc prosthesis was not altered by it. The use of TachoSil appears to be a satisfactory surgical option for the management of these complications.

**Keywords:** Cerebrospinal Fluid (CSF) leaked; Dural tear; Anterior cervical discectomy; TachoSil; Dural repair; Cervical arthroplasty

### Case Presentation

We present the case of a 48-year-old patient who underwent cervical disc hybrid surgery, arthroplasty and fusion, complicated by a compressive anterior meningocele following a peroperative dural breach. This patient presented a multilevel cervical spondylosis leading to myelopathy (C5-C6, C6-C7 and C7-T1); benefited from a hybrid surgery, arthroplasties of the C5-C6 and C6-C7 levels (MOBI-C, Zimmer Biomet) and an arthrodesis of the C7-T1 level (ROI-C, Zimmer Biomet). The initial procedure was performed with the patient in the dorsal position under C-arm fluoroscopy and microscope. During the C5-C6 discectomy, it was noted that a small portion of the posterior longitudinal ligament was adherent to the dura on the right foramina. A lateralized punctiform dural tear is then visualized under the microscope with minimal flow. The placement of a 5 mm TachoSil sponge at the level of the tear allows drying up the flow immediately. The rest of the surgery was carried out without any complication. Initial post-operative course was simple. The patient was discharged from the department on the first day after surgery, with no postoperative headache and no cervical abnormality, no dysphonia. The patient was seen in consultation at fifteen-day post op because of the persistence of a "clear water" flow through a punctiform orifice, laterally to the skin incision without any clinical or biological signs. He was seen again on 26<sup>th</sup> day with persistent clinical discharge. A Magnetic Resonance Imaging (MRI) was performed and a 10 cm × 7 cm × 4 cm pre-vertebral fluid collections was identified, with leftward discharge of the esophageal tract without any abnormality of the medullary cord. No dysphagia or dysphonia was observed but the leakage was evident. Despite neurological post op improvement from myelopathy signs, it was decided rehospitalization urgently for 2D surgery with evacuation of the collection, bacteriological sampling and closure of the dural tear at the origin of the meningocele fistulizing to the skin (Figure 1).

### Diagnostic Imaging

The diagnosis was therefore made on a cervical MRI with a 10 cm × 7 cm × 4 cm image of prevertebral fluid collection, without cord abnormality, with a suspicious hypersignal opposite the right foraminal C5-C6 consistent with the intraoperative tear. Material-related artifacts did not allow accurate visualization of the dural disruption (Figure 2, 3).

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#### \*Correspondence:

Thierry Dufour, Department of Neurosurgery, Institut Parisien du Dos, Geoffroy Saint Hilaire Clinic, France, E-mail: [thierry.dufour@ramsaysante.fr](mailto:thierry.dufour@ramsaysante.fr)

Received Date: 01 Apr 2022

Accepted Date: 06 May 2022

Published Date: 23 May 2022

#### Citation:

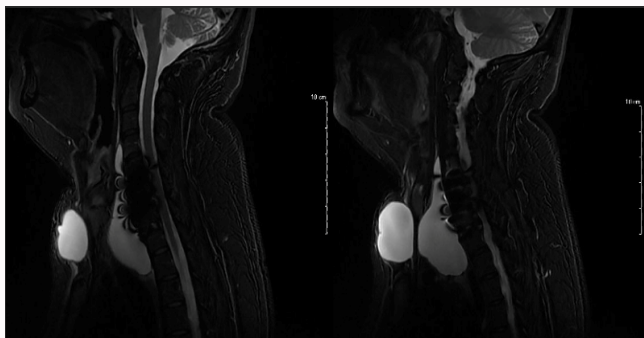
Lavantès P, Dufour T. Management of Cerebrospinal Fluid Leak after Anterior Cervical Discectomy and Arthroplasty. *Ann Clin Case Rep.* 2022; 7: 2200.

ISSN: 2474-1655

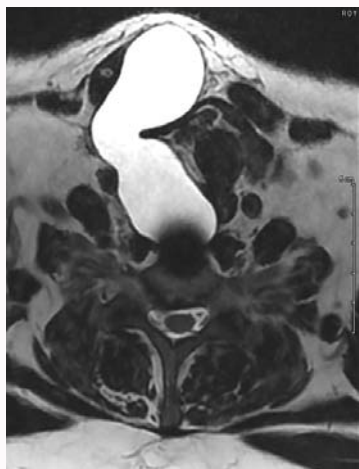
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**Figure 1:** Anterior (A) and lateral (B) illustrations (the upper part of the image is the chin) showing a clinical defect at the left part of the scar (white arrow) (A) and a significant compressive curvature (B) in a short neck patient.



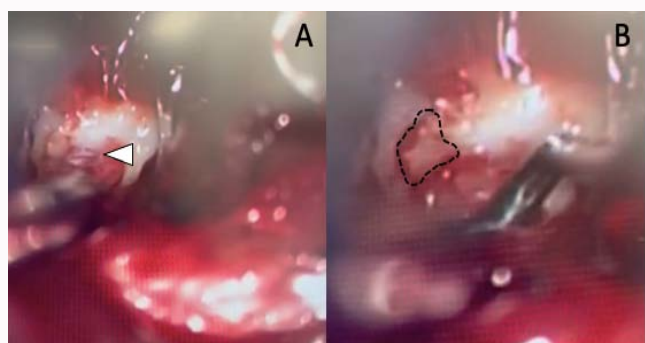
**Figure 2:** MRI in sagittal T2 section showing the anterior meningocele.



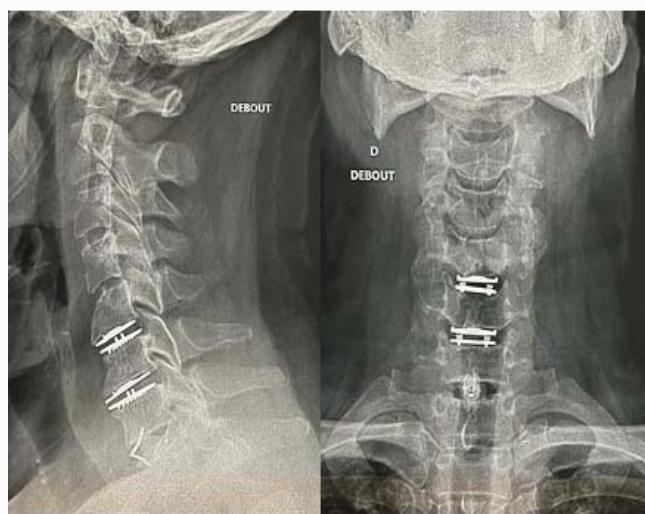
**Figure 3:** Axial T2-weighted MRI showing anterior meningocele with left-displaced esophageal structures and skin fistula.

## Historical Review, Diagnosis and Management

In the literature, the incidence of cerebrospinal fluid leakage following anterior cervical spinal decompression surgery is in the range of 0.5% to 3% [1]. In the literature, male gender, revision surgery, and surgery for ossification of the posterior longitudinal ligament are risk factors for accidental durotomy [2-4]. Most surgeons have very limited experience in the management of these anterior cervical spinal tears, because its rarity. In the cervical spine, the pressure of the CSF is low and one surgical option is to do anything to close these leaks except simply complete the operation and avoid using drainage. In our case, the prosthesis allows communication between the



**Figure 4:** Intraoperative microscopic photograph of the dural tear with steady pulsed flow of cerebrospinal fluid (A), and with placement of a fat patch in the breach prior to placement of the TachoSil (B).



**Figure 5:** Lateral (left) and frontal (right) X-ray of cervical spine showing the implants at 4 months.

neurological elements and the esophageal and tracheal prevertebral structures. No article in the literature describes the management of an anterior meningocele in the context of cervical arthroplasty. Over time many techniques have been used to treat anterior dural tears; gelatin foam, fibrin glue, fascia, fat, muscle graft and sometimes postoperative placement of lumbar shunt (drain) [1,5-10]. In 2019 the team of Gazzeri presented a study of 8 cases treated with a TachoSil patch with very good efficacy [5]. TachoSil is a tissue sealant patch containing two layers, namely one collagenous layer, and a layer containing fibrinogen and human thrombin [11,12]. The sponge is manufactured from horse tendons. TachoSil reacts upon contact with blood, other body fluids or saline to form a clot that glues it to the tissue surface. Sealing is reached in a few minutes, and the sponge is absorbed by the body within several weeks [12]. The use of TachoSil was a very satisfactory option for us, allowing us to avoid enlarging the bone window to perform a direct suture.

## Procedure

The patient was reoperated on 27<sup>th</sup> day of his initial surgery, under general anesthesia, in strict dorsal decubitus position, under C-arm fluoroscopy and high magnification microscope. First, we made a skin opening opposite the incision of the first surgery. Sampling of liquid with a "clear water" appearance (200 ml) for systematic bacteriological analysis as usual. The sternocleidomastoid approach



**Figure 6:** Lateral (left) and frontal (right) dynamic X-ray of cervical spine that shows good mobility at 4 months.

is taken from the anterior aspect of the cervical spine between the aero-digestive axis and the jugulo-carotid bundle, following the plane of the meningocele. The C5-C6 prosthesis is approached with an opposite leak. Placement of a Caspar and TSI retractor to obtain the best possible exposure. Easy removal of the C5-C6 prosthesis without bony complications. Under the microscope, we observe a dural breach lateralized on the right side of the dura mater. No more TachoSil seen at that place. A regular flow of CSF was observed through a tiny hole of a few millimeters. It was therefore decided to place fatty tissue at the level of the breach and then apply a new TachoSil patch to close the breach, which was difficult to suture given the limited space available (Figure 4). We waited for four minutes (minimum duration of effectiveness) and then performed Valsalva maneuvers which did not reveal leak anymore. Given the absence of leakage, it was decided to install a new total disc prosthesis (identical to the previous one). Closure without the use of a suction drain, as usual.

### Outcome, Follow-Up

The patient was evaluated clinically and radiologically at 2 and 6 months postoperatively and had no documented complications suggesting persistent leakage. In addition, tear and meningocele has not caused any complications of mechanical failure to the prosthesis for the moment (Figure 5, 6).

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