

**Post-traumatic spinal hygroma causing cord compression in type III odontoid  
fracturewith vertical atlanto-axial instability.**

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## **Study Design:** Case-Report

**Objective:** To report the first case in the literature of a traumatic cervical spine subdural cerebrospinal fluid (CSF) collection (hygroma) under tension causing cord compression. We suggest etio-pathogenesis and modality of treatment.

**Summary of Background Data:** Hygromas are subdural cranial CSF collection. A literature review showed no previous published case of post-traumatic spinal hygroma. This was a potential life threatening sequelae of a high cervical injury that warranted early diagnosis and emergency treatment.

**Method:** We present a case of a young adult who sustained a traumatic vertical atlanto-axial dislocation associated with a type III odontoid fracture. He was initially scored C6 ASIA D. MRI demonstrated cord contusion at the crano-cervical junction and a small fluid collection anterior to the cervical cord. On day 5 following his injury he developed complete paraplegia and priapism. An urgent MRI of his spine revealed expansion of the intraspinal fluid collection with distortion of the cord. He was treated with an emergency surgical decompression. The cervical fluid collection was found to be subdural extra-arachnoidal CSF. A subdural-pleural shunt was inserted. The atlanto-axial injury was reduced and fixed with posterior instrumentation.

**Results:** At one year from the injury the patient was independent and fully ambulant. MRI and CT images of his spine demonstrated complete resolution of the cervical hygroma, appropriate placement of the cervical-pleural shunt and stability of the atlanto-axial injury.

**Conclusion:** We describe a unique case of post-traumatic spinal hygroma causing cord compression in a patient with an unstable crano-cervical injury. The early recognition and correction of this dangerous complication is of paramount importance to savage cord function.

**Key-words:** Hygroma; atlanto-axial dislocation; spinal injury; odontoid fracture; Atlanto-occipital dissociation; acute traumatic myelopathy; cervical cord compression; C1-C2 posterior fixation; C2 translaminar screws; cervical-pleural shunt

**Level of Evidence:** 5

ACCEPTED

## **Introduction:**

Hygroma refers to cerebrospinal fluid accumulation in the subdural extra-arachnoidal space.

Hygromas can be under tension and produce pressure related symptoms that often require surgical drainage [1].

Cranial hygromas can be diagnosed in association with a variety of conditions including brain atrophy, intracranial hypotension[2], paediatric trauma[3], foramen magnum decompression[4].

To our knowledge a post-traumatic CSF collection of the cervical spine causing acute cord compression has not been previously reported.

Here we discuss a case of a young adult that sustained a vertically unstable type III odontoid fracture. This type of injury is extremely rare[5-6-7]. The clinical course of our patient was complicated by clinical and radiological evidence of cord compression distal to the initial crano-cervical junction trauma. This was found to be a hygroma in the cervical spine.

In this report we want draw attention to this dangerous and potentially life-threatening emergency complication of crano-cervical injury. We postulate the mechanism of formation of a post-traumatic spinal hygroma. Finally we propose a surgical treatment to address this problem.

## **Case Report:**

A 22 year old man was hit by a car while riding his bike. He was found dyspnoic and unconscious (GCS 4/15) by paramedics. A trauma CT revealed a type III odontoid fracture with longitudinal atlanto-axial dislocation. There was an 8 mm vertical distraction of the peg

with kyphotic angulation(fig.1). His other injuries included cerebral contusions, a right haemopneumothorax and a pelvic fracture. CT-Angiography confirmed a left vertebral artery dissection.

He was transferred to the neurosurgical intensive care. An intracranial pressure probe was inserted and revealed raised intracranial pressure.An MRI of the spine demonstrated severe ligamentous injury of the crano-cervical junction, signal changes within the high cervical cord at C2 to C5 and a small fluid collection anterior to the cord.He was able to move all his limbs against gravity. His spinal neurology was classified as C6 ASIA D.

On day 5 while still ventilated, he was found unable to move his legs with priapism suggesting a new cord injury distal to the initial crano-cervical trauma. An urgent MRI of his spine demonstrated an expanding collection iso-intense to CSF signal and anterior to the cord from C4 to T1. This collection was causing severe distortion and flattening of the cord at C6(fig 2a,b). During surgical exploration, the collection was found to be subdural and extra-arachnoidal CSF under tension. Because hygromas have the tendency to re-accumulate, we decided to permanently implant a catheter in order to prevent this issue. A silicone tube 2.5mm in diameter was inserted under direct visualization. The shunt tube was then tunnelled subcutaneously through a separate skin incision and passed into the chest cavity via an intercostal space of the posterior chest wall.During the second stage of the procedure, the odontoid fracture was reduced and stabilised. For the posterior instrumentation and fusion we favoured C1 lateral mass screws and C2 lamina screws. The patient had a left vertebral artery dissection and this was considered a contra-indication to cannulating the C2 pedicles.

The early post-operative follow up MRI demonstrated complete resolution of the cervical hygroma. The MRI and CT at one year proved no recollection of the hygroma and good reduction and fusion of the C1 and C2 motion segments (Fig.3). In clinic at 1 year the patient was independent, ambulatory and had returned to full time work.

## **Discussion**

Our patient sustained a traumatic vertical atlanto-axial dislocation with an odontoid fracture. This is a highly unstable crano-cervical injury. It is an extremely rare injury with only 5 previously reported cases, each of which had either a fatal or poor outcome[5-6-7]. Our patient made a remarkable functional recovery at one year.

The management of our patient was complicated by the accumulation of CSF in the spinal canal causing cord compression. It is possible that at the time of the injury a small tear of the meninges at the crano-cervical junction allowed CSF to accumulate in the spinal canal through a one-way flow valve mechanism. The CSF could have been entrapped between the arachnoid and the dura of the cervical spine with increasing tension. This was suggested by serial MRI demonstrating expansion of the hygroma and clinical deterioration of the patient. A similar phenomenon has been described following iatrogenic inadvertent durotomy during lumbar surgery[8].

It is important to emphasise that the hypothesis of second cord injury distal to the initial crano-cervical trauma was based on clinical findings during the clinical examination of the patient. It highlights the importance of periodic and meticulous monitoring of the neurological function in the ventilated spine trauma patient.

During surgical exploration, we opted to implant a subdural catheter draining to the pleural space. This simple surgical strategy addressed the problem of hygromare-accumulation avoiding further surgical intervention.

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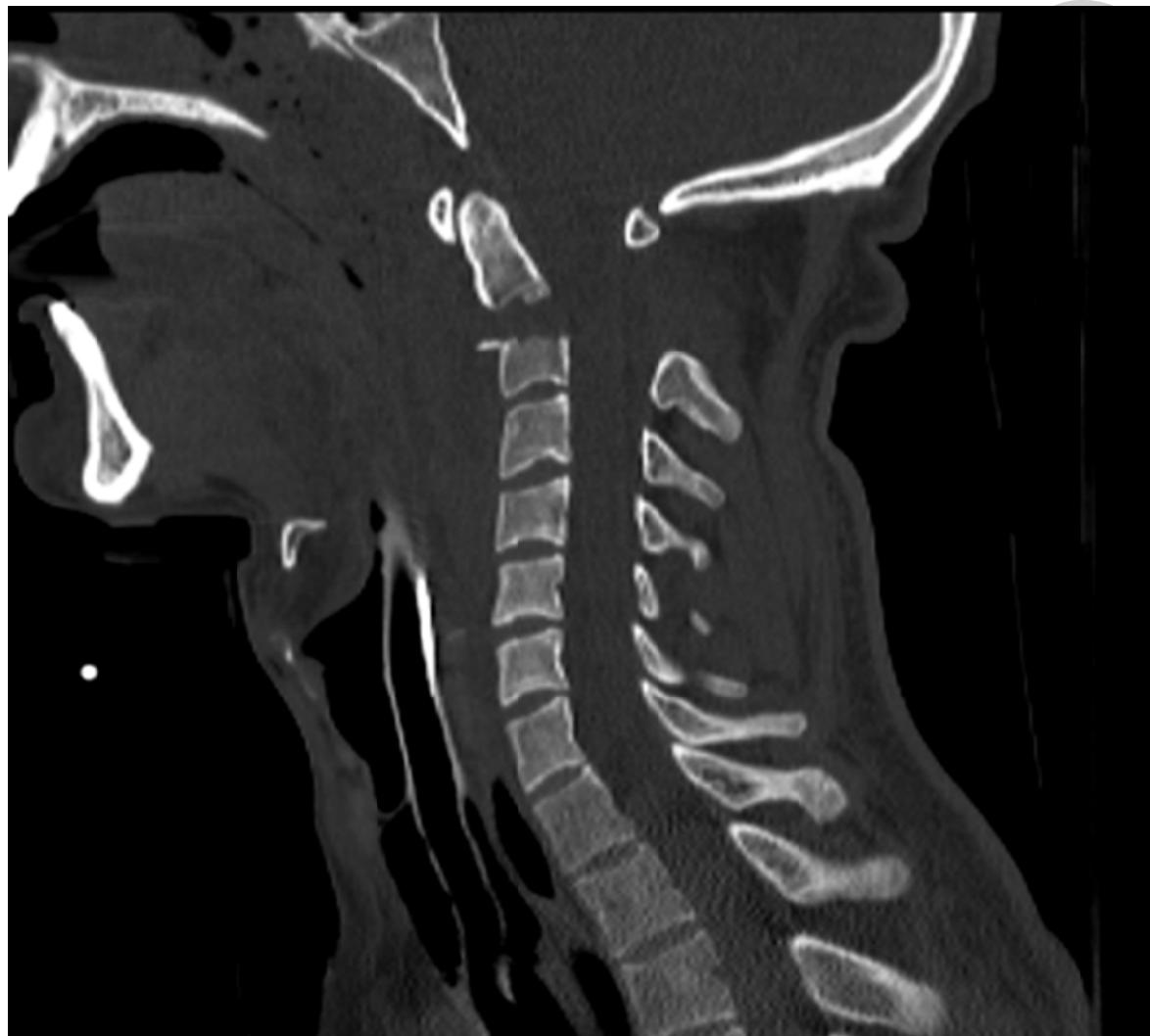
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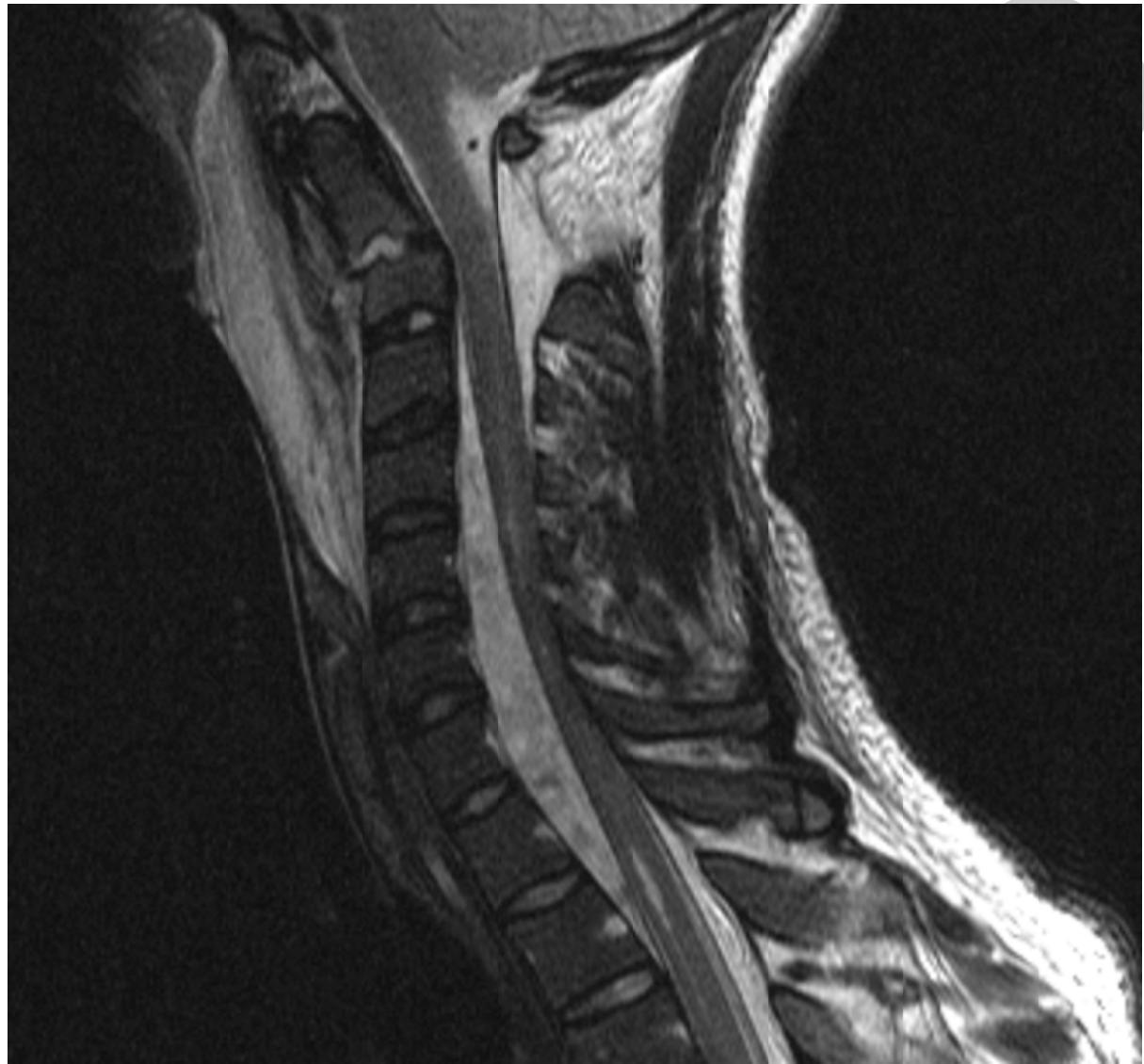
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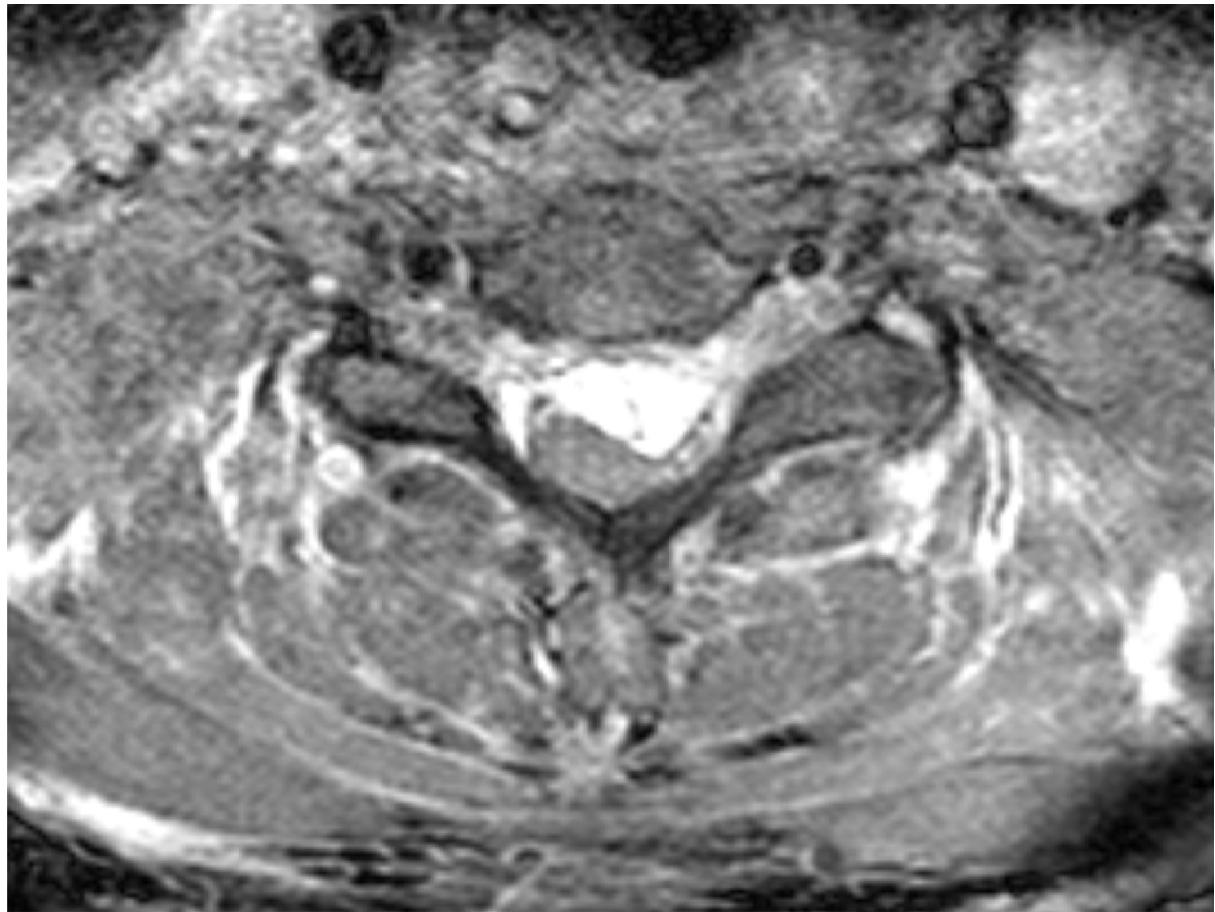
**Figure Legends:**

**Figure 1.** CT cervical spine, sagittal view showing unstable odontoid fracture with vertical atlanto-axial dislocation.



**Figure 2 (a.b).**Sagittal and axial MRI T2-weighted images demonstrating a large cervical fluid collection in the anterior spinal canal with spinal cord compression. Note the unstable injury of the cranio-cervical junction with vertical distraction and kyphoticangulation of the odontoid fracture.





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**Figure 3.** MRI T2 weighted Sagittalview at 3 months demonstrating reduction and fusion of the odontoid fracture and complete resolution of the hygroma. The spinal cord is re-expanded with a small residual syrinx.

