

# Pathophysiology of Spinal Subdural Hematomas: The Role of Venous Congestion

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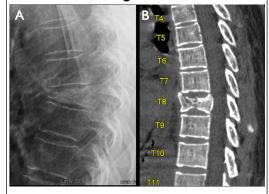
### Introduction

Spinal subdural hematomas are rare conditions which usually progress with severe neurological deficits. Although there have been several case reports in the literature of spontaneous spinal subdural hematomas in the setting of anticoagulation, anti-platelet therapy or coagulation disorders, the exact pathophysiology of such phenomena remains obscure.

### **Methods**

The authors review a case of a subdural hematoma after percutaneous vertebroplasty for treatment of a T9 compression fracture (Figure 1) in the absence of cement extravasation to the spinal canal. With basis on the post-operative CT-scan (Figure 2) and MRi findings (Figure 3), the authors propose a new pathophysiological scheme, emphasizing the role of venous congestion leading to rupture of the fragile valveless radiculomedullary veins into the subdural space as the main etiological factor responsible for such occurrence.

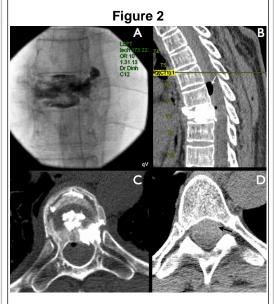




Lateral plain x-ray of the thoracic spine demonstrating an acute comminutive T8 compression fracture B: Sagittal CT-scan performed three months later demonstrating the same fracture which affected mainly the mid-portion of the vertebral body, with preservation of the posterior cortex.

#### Results

This is the first report of a spine subdural hematoma after percutaneous vertebroplasty. The occurrence of such complication in a level different from the one where the intervention was performed and in the absence of cement extravasation into the spinal canal (as well as the presence of pneumorrachis) strongly suggest a venous congestive mechanism as the most plausible etiological explanation.



Intra-operative fluoroscopy demonstrating small extravasation of the cement to the posterior epidural veins in the most superior region of the vertebral body. B: Immediate post-procedure CT-scan (B: sagittal and C: axial) demonstrating absence of cement leakage into the spinal canal, as well as the presence of a spinal subdural hematoma extending from 2 levels above the vertebroplasty (D) up to the lower cervical spine. Note also the presence of pneumorrachis (white arrow).

## Figure 3



Sagittal post-operative MRi of the thoracic spine demonstrating the subdural collection anterior to the spinal cord extending up to the cervical spine. The acute spinal subdural hematoma is seen as hypertense in both T1 (A) and T2 (C) sequences. The axial images demonstrate no residual compression either at the laminectomy level (C) or in the levels above (D), as evidenced by the presence of CSF posterior to the spinal cord.

#### Conclusions

The proposed pathophysiological scheme suggest that venous congestion plays a pivotal role in the etiology of spinal subdural hematomas. Further anatomical and histological studies designed to investigate the response of the radiculomedullary veins to congestive venous hypertension may share further light into the still obscure pathophysiology of spontaneous spinal subdural hematomas.

### **Learning Objectives**

- To understand the proposed pathophysiological hypothesis for the occurence spinal subdural hematomas;
- To appreciate how the radiological findings of the presented case (such as the absence of cement extravasation, the presence of pneumorrachis and the occurence of a subdural hematoma far from the cement injection level) strongly support the role of venous congestion as an important etiological factor involved in the occurence of spinal subdural hematomas.

### References

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