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# Post thoracotomy spinal cord compression in a child. A word of caution

Meletios A. Kanakis*, Andrew Chatzis, Elias Papadopoulos, Constantinos Contrafouris, Prodromos Azariades, Andreas Karabinis, Fotios Mitropoulos

*Department of Pediatric and Congenital Heart Surgery, Onassis Cardiac Surgery Center, Athens, Greece*

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ABSTRACT

*INTRODUCTION:* Oxidised regenerated cellulose is a commonly used haemostatic agent in surgery which, in rare cases, has been held responsible for severe complications.
*PRESENTATION OF CASE:* A 6-year-old girl developed flaccid paraplegia following the excision of a large thoracic ganglioneuroblastoma. Magnetic resonance imaging revealed spinal cord compression at the T10–11 level and the patient underwent emergency decompression via the previous thoracotomy. At operation the causative factor was found to be a mass consisted of cellulose used at the original procedure to control local bleeding in the vicinity of the intervertebral foramen.
*DISCUSSION:* The accessibility of the spinal canal from the thoracic cavity through the opening of the intervertebral foramen may allow migration of material and in this case oxidized regenerated cellulose, commonly used during cardiothoracic procedures, can cause rare but severe complications such as compression of the spinal cord.
*CONCLUSION:* The value of hemostatic gauze is well established in cardiothoracic surgery. However, surgeon should be cautious with the application of material in the proximity of the intervertebral foramen, especially if this is to leave behind after the completion of the procedure.


## 1. Introduction

Oxidised regenerated cellulose (Surgicel®) is a commonly used hemostatic agent in thoracic surgery and its role is well established both from literature and surgical experience. However, in rare cases, it could be responsible for devastating complications such as paraplegia.[1–8] We present the case of a young girl who underwent surgical excision of a large posterior mediastinal tumor and she developed delayed paraplegia after thoracotomy due to migration and swelling of oxidised regenerated cellulose into the spinal canal.

## 2. Case

A 6-year-old girl was admitted to our department for surgical treatment of a posterior mediastinal tumor. The tumor was 8 cm in diameter located in front of the spinal column. At operation, resection of the tumor resulted in a continuously bleeding point in the proximity of the intervertebral foramen and local application of oxidized regenerated cellulose was used to control it. The procedure was completed without further inadvertent effects and the patient was extubated on the operating table. Chest tubes were removed the following day. Histology showed ganglioneuroblastoma and the operative margins were found clear from tumor infiltration.

On the 2nd postoperative day, the patient complained of pain in her lower extremities, which was remitted after a period of an hour with the use of common analgesics. There were no signs of sensory or motor impairment. On the postoperative day 3, she complained of numbness and inability to move her legs. This time neurological examination revealed severe sensory and motor impairment of her lower extremities. Emergency magnetic resonance imaging (MRI) of the spinal cord showed the presence of a mass compressing the spinal cord at T10 level (Fig. 1). The patient underwent emergency redo thoracotomy through the old incision for decompression of the spinal cord. At the time of the procedure, the superior and inferior pedicles (T10 and T11) were partially removed, in order to safely access and remove the cellulose mass. The latter consisted of cellulose, apparently originating from the hemostatic material placed at the time of the original surgery at the entrance of the intervertebral foramen in order to control the aforementioned local bleeding source, which after the rib approximation migrated into the canal and later swelled causing spinal cord compression.

The patient was soon after extubated in ICU and underwent the next day repeat MRI, which confirmed total relief of all spinal cord compression and absence of any relevant mass (Fig. 2). During her stay in the ICU, blood pressure was maintained at high levels for optimal spinal perfusion. Four days later, the patient was

* Corresponding author at: Department of Pediatric and Congenital Heart Surgery, Onassis Cardiac Surgery Center, 356 Syngrou Avenue, 17674 Kallithea, Greece. Tel.: +30 2109493000.
*E-mail address:* meletis_kanakis@yahoo.gr (M.A. Kanakis).

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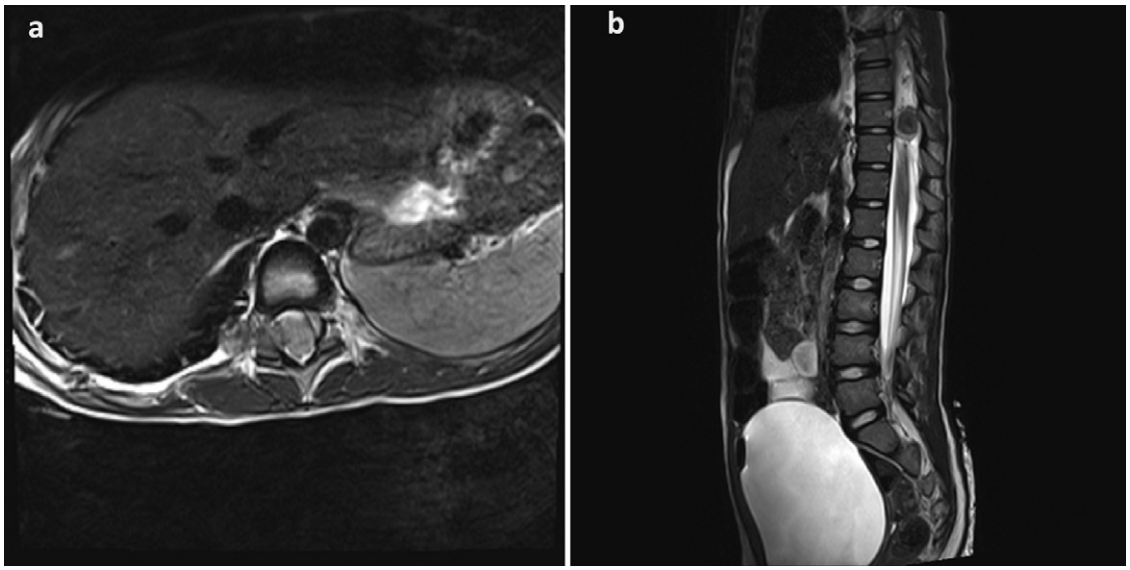


**Fig. 1.** Axial (a) and sagittal (b). MRI depicting severe compression of the spinal cord at the T10–11 level. Note the severe compression of the spinal cord that pushed to the left side of the central canal (b).

transferred to the ward. During her postoperative course, she was fully supported by specialists in pediatric neurology, urology, physical and rehabilitation medicine. Twenty days after spinal cord decompression, she could walk with a stick with a spastic gait. She had significant sensory improvement and her parents have been trained in bladder catheterizations. The patient was thereafter transferred to a special rehabilitation center for treatment of neurological disorders in children and her condition is continuing to improve.

## 3. Discussion

Post-thoracotomy paraplegia due to intraspinal migration of oxidized regenerated cellulose, widely used as an effective hemostatic agent, has been described before (Table 1).[1–8] The spinal canal is adjacent to the intrathoracic opening of the intervertebral foramen and migration is possible due to the lack of a strong musculoosseous barrier. Parietal pleural removal may further enhance this kind of migration. In addition, rib approximation during closure of a thoracotomy wound creates compressive force, which in combination with the established negative intervertebral subdural space pressure, may facilitate material migration. This is further supported by the fact that in the post mortem examination of one of the patients at least minimal positive force was required to advance a portion of cellulose gauze into the spinal canal via the intervertebral foramen.[5] The fact that of all only 3 cases involved children can be partially explained by the smaller anatomic opening.[5,7,8]

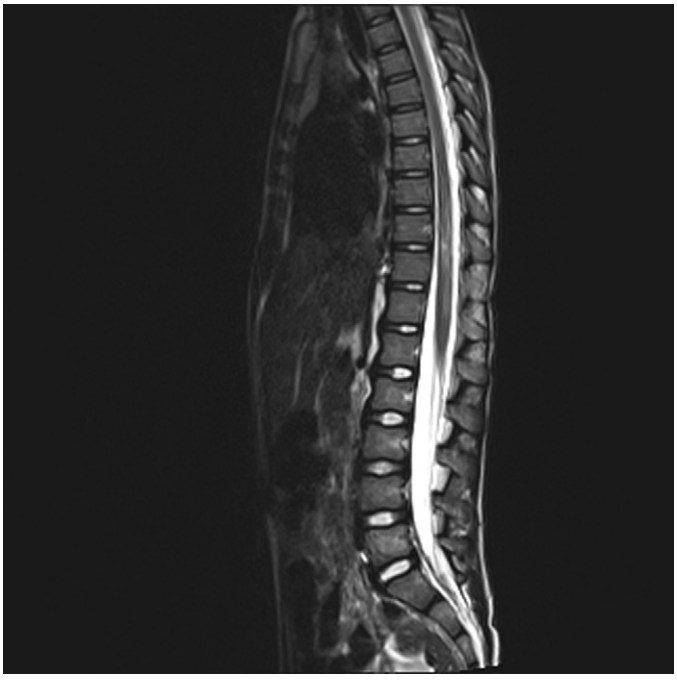

**Fig. 2.** Postoperative sagittal MRI depicting complete evacuation of the mass and signs of spinal cord edema.

Although epidural hematomas can be treated conservatively the progressive swelling associated with cellulose gauze mandates urgent decompression in order to preserve spinal cord function.[1–10] From previous reports the time elapsing from thoracotomy to the onset of symptoms and the establishment of paraplegia vary largely from immediate up to 50 h postoperatively.[1–9] In our patient symptoms occurred 48 h after surgery, while motor and sensory impairment appeared 72 h later. These data suggest that hemostatic material continues to swell after migration into the spinal canal.

MRI is the diagnostic test of choice and should be performed as quickly as possible. T2-weighted image is the most useful for differentiating hematoma from the aforementioned cellulose mass. In the majority of the reported cases spinal cord decompression was achieved by posterior approach and laminectomy.[1–8] In our case, the redo thoracotomy incision provided excellent spinal cord exposure and also allowed complete removal of all cellulose material both from outside and inside the spinal canal. This surgical approach has been described once before.[2]

Outcome varies in reported cases. In spite of prompt response, outcome seems overall dismal, with only 2 patients fully recovering and another 2 showing substantial improvement.[1–8] Nonetheless, the value of hemostatic gauze is well established in cardiothoracic surgery, especially in cases of bleeding where electrocautery is potentially hazardous. However, in cases with spinal proximity, one should be extremely cautious with the application of cellulose hemostatic material, the best action being removal of all of it before closure.

**Table 1**
Table depicting cases of paraplegia after thoracotomy described in literature. Adult & pediatric (grey).

| Author (year) | Patient | Age | Initial thoracic procedure | Presentation | Emergency procedure | Outcome |
|---|---|---|---|---|---|---|
| Short et al, 1990 | Female | 72 yr | Lobectomy (right upper+middle) | Paraplegia | Laminectomy | Modest motor improvement, essentially paraplegic |
| | Male | 49 yr | Lobectomy (right upper) | Paraplegia | Laminectomy | Right leg monoplegia |
| | Male | 59yr | Right thoracotomy (lung nodule resection) | Paraplegia | Laminectomy | Paraplegia (no improvement) |
| Wada et al, 1993 | Male | 69 yr | Lobectomy (right upper) | Paraplegia | Laminectomy | Fully ambulatory, minor sensory deficit |
| | Male | 37 yr | Lobectomy (right upper) | Paraplegia | Thoracotomy | Fully ambulatory |
| Iwabuchi et al, 1997 | Female | 46yr | Right lower lobectomy | Paraplegia | Laminectomy | Motor improvement |
| Lovstad et al, 1999 | Female | 56 yr | Left lower lobectomy | Paraplegia | Laminectomy | Paraplegia (no improvement) |
| Brodbelt et al, 2002 | Male | 15 mo | Blalock-Taussig shunt | Paraplegia | Laminectomy | Paraplegia |
| Brodbelt et al, 2002 | Female | 37 yr | Lobectomy | Paraplegia | Laminectomy | Early death |
| | Male | 50yr | Right thoracotomy | Monoplegia | Laminectomy | Motor improvement |
| Henry et al 2005 | Female | 18mo | Mediastinal neuroblastoma resection | Paraplegia | Laminectomy | Partial sensation and motor function |
| Dogan et al 2005 | Female | 22yr | Left thoracotomy | Paraplegia | Laminectomy | Monoplegia |
| Ryckman et al 2009 | Female | 10yr | Right chest wall resection + pulmonary wedge resection | Paraplegia | Laminectomy | Paraplegia (no improvement) |

## Conflict of interest

The authors declare no conflict of interest.

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None.

## Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of written consent is available for review by the Editor in Chief of this journal on request.

## Author contributions

MK performed the literature review and drafted the manuscript. AC performed the literature review and helped to draft the manuscript. EP helped to draft the manuscript and participated in the acquisition of data. CC helped in the acquisition of data. PA helped in analysis and interpretation of data. AK revised critically the manuscript for important intellectual content. FM conceived of the study, participated in its design and coordination, helped to draft and revised the manuscript, and he is the guarantor of the work.

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