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Postoperative paraplegia secondary to the use of oxidized cellulose (Surgicel)

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Abstract Iatrogenic paraplegia after thoracic surgery is a devastating complication. In this report, the authors present a case of paraplegia in a toddler after the resection of a mediastinal neuroblastoma. In this case, the paraplegia was caused by spinal cord compression after migration of oxidized cellulose into the spinal canal.

Iatrogenic paraplegia after thoracic surgery is a rare but devastating event. There have been reports of paraplegia in adults after surgery on the thoracic and abdominal aorta as well as after pulmonary surgery. Generally, these types of injuries are caused by ischemia owing to vascular damage to the intercostal arteries. In a few instances, epidural hematomas have been found to cause a compressive paraplegia [1,2]. In this report, we present a case of paraplegia caused by spinal compression by Surgicel after a resection of a thoracic neuroblastoma.

1. Case report

An 18-month-old girl underwent a right thoracotomy for resection of an asymptomatic posterior mediastinal mass (Fig. 1). The patient underwent complete resection of an apparent neurogenic tumor. The lesion emanated from the sixth, seventh, and eighth intervertebral foramina. After excising the tumor at the level of the seventh foramina, we encountered venous bleeding. Initially, pressure was applied with a laparotomy pad. This controlled the bleeding but when the pack was removed 10 minutes later, the bleeding persisted. Electrocautery was not effective in stopping the bleeding. Hemostasis was achieved, by packing a 1 × 1-cm square of Surgicel in the seventh foramina. The foramina was observed for 10 minutes without further bleeding. The initial postoperative course was unremarkable.

A thoracostomy tube was removed on postoperative day 2 having observed no bloody drainage. That evening (55 hours after the procedure) the patient acutely developed motor and sensory loss below the level of T7. A magnetic resonance image was obtained which demonstrated an intramedullary mass compressing the thoracic spinal cord (Fig. 2). A decompressive laminectomy was performed and the Surgicel was found to be compressing the spinal cord. Postoperatively, the patient exhibited no signs of motor or sensory function below the lesion. Two

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Fig. 1 Computed tomography scan of mediastinal mass.

months later, she has regained partial sensation and motor function.

2. Discussion

This case describes the potential risk of iatrogenic spinal cord injury using a compressive hemostatic agent near or in the spinal foramina. We hypothesize that in our case the oxidized cellulose entered the spinal canal postoperatively either by expansion or migration through the spinal foramen. The magnetic resonance image and the findings at exploration show the mass of oxidized cellulose within the canal, although it was not placed there at the time of operation.

To our knowledge, this is the first reported case of spinal cord injury via this mechanism after resection of a posterior mediastinal tumor and the first reported case in a child. There are 14 published cases of postthoracotomy paraplegia owing to the compressive effects of oxidized cellulose in adult patients undergoing thoracotomy for pulmonary pathology [1-7]. In these reports, oxidized cellulose was used for hemostasis after electrocautery had been inadequate to control difficult bleeding on the posterior thoracic wall. The oxidized cellulose had been left in the thoracotomy wound at the end of the case and found in the spinal canal at reexploration. Some authors speculated that pressure differences on closure of the thoracic cavity caused the oxidized cellulose to migrate into the spinal canal through the foramen [2,3,5,6]. Although there is not normally a connection between the pleural cavity and the epidural space, disruption of the parietal pleura during surgery may create such a connection [2].

These previously reported cases cite the end of the posterior rib of a thoracotomy incision as the troublesome sites of bleeding requiring application of oxidized cellulose [1,5,6]. The more posterior the incision was toward the vertebrae, the presumed greater chance there was for injury of the spinal cord [1]. In all of these cases, venous bleeding was controlled with oxidized cellulose after attempts at pressure and electrocautery [1-7].

If the paraplegia results from the misplacement of oxidized cellulose through the spinal foramen at operation, symptoms would be expected to present rapidly in the postoperative period. However, several of the reported cases report delayed onset of symptoms as was observed in our case [1-7]. Perhaps this delay is caused by a continual gradual swelling of the oxidized cellulose, leading to some time elapse before compression on the spinal cord causes symptoms. Alternatively, another inciting event, such as a hypotensive episode in this watershed area of the spine, may exacerbate the compromise to the spinal cord. If the radicular artery is taken in this area, hypoxia could result, which could lead to spinal cord swelling and resulting symptoms.

The magnetic resonance imaging (MRI) findings in this case revealed a local area of hypointensity on T1- and T2-weighted images. These characteristics of the T2 MRI agree with other reported findings in similar cases [5,6,8,9]. These T2 images also emphasize the contrast on MRI between the appearance of retained Surgicel and epidural hematomas which generally are described as hyperintense on T2-weighted magnetic resonance images [5,8]. In addition, the focality of the lesion on MRI also differentiates it from an epidural hematoma, which would have appeared more spread out around the cord and not such a focal mass.

The onset of neurologic deficit associated with Surgicel mandates immediate diagnostic evaluation to salvage spinal cord function. Although epidural hematomas may, in some cases, be managed conservatively and allowed to resorb [1], masses of oxidized cellulose must be surgically removed if they are causing neurologic deficit. Thus, in the setting of neurological deficit after thoracotomy, the surgeon should

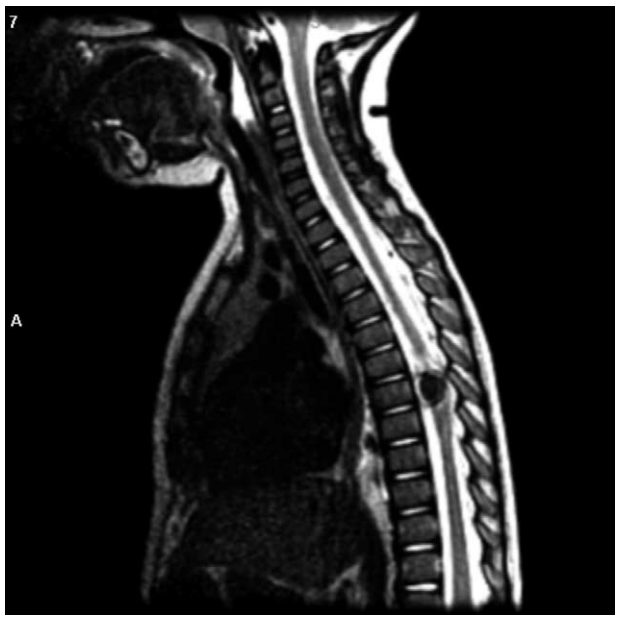

Fig. 2 Magnetic resonance imaging of compressive mass.

act rapidly and immediately to obtain both a neurosurgical consultation and magnetic resonance imaging.

Oxidized cellulose is used commonly in many surgical fields as a hemostatic agent. However, its tendency to swell once placed increases the risk of its use in closed or bone-walled spaces. Product information from the manufacturer describes "uncomfirmed reports" of migration of surgical into the spinal canal after "laminectomy" or "lobectomy" [10].

Surgeons operating in the thoracic cavity near the intervertebral foramen need to be aware of the risk of bleeding due to the multitude of small intervertebral blood vessels, the potential risk to this "watershed" area of the spinal cord, and the risk of using any hemostatic agent that could swell or migrate into the spinal canal. In addition, care should be taken with extensive dissection in the posterior angle of a posterolateral thoracotomy. A meticulous operation is crucial, with good visualization of all neurovascular structures. Gentle retraction of the ribs and use of a headlight may aid in visualization. If bleeding does occur, care should be taken with the use of electrocautery or ligation of intercostal vessels to avoid vascular injuries or thrombosis of the anterior spinal artery. If necessary for hemostasis, oxidized cellulose should be used judiciously, and when possible, these agents should be removed before closure of the thoracic cavity once hemostasis has been achieved.

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