

## Case Report

# Oxidised regenerated cellulose as a cause of paraplegia after thoracotomy: case report and review of the literature

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**Study design:** Case report.

**Objective:** To report an unusual case of paraplegia.

**Setting:** University Hospital Bursa, Turkey.

**Case report:** A 22-year-old woman presented with paraplegia following a left-sided thoracotomy. Magnetic resonance imaging showed a dorsal epidural mass at the level of T6. The patient underwent an emergency T6/7 laminectomy and removal of a tuft of oxidised regenerated cellulose, which had migrated through the intervertebral foramen causing spinal cord compression.

**Conclusion:** In cases of neurological deficits after surgery at the posterolateral edge of a thoracotomy, the clinician should be aware of the above possibility. Urgent radiological diagnosis and decompressive laminectomy is the treatment of choice.

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**Keywords:** oxidised regenerated cellulose; paraplegia; spinal cord compression; thoracotomy

## Introduction

Paraplegia following nonspinal surgery is a rare complication that has been reported after surgery of the thoracic or abdominal aorta,<sup>1–3</sup> pulmonary surgery,<sup>4</sup> and epidural catheterisation.<sup>5</sup> Oxidised regenerated cellulose (ORC) is a commonly used haemostatic agent in various surgical disciplines that gradually increases in volume following saturation with blood.<sup>6,7</sup> We report a case of paraplegia following thoracic surgery during which ORC had been placed in the posterior angle of thoracotomy incision for controlling haemorrhage. We also discuss 13 reports found in the literature of post-thoracotomy paraplegia due to ORC.

## Case report

### *History and examination*

A 22-year-old woman presented with a history of paraplegia 36 h following a left-sided thoracotomy at another institution. On admission, neurological examination indicated that she was able to move her right leg when gravity was eliminated but had a left leg flaccid monoplegia with loss of the deep tendon reflexes, urinary incontinence and an extensor plantar response. There was hypoesthesia below the level of T4. Magnetic resonance imaging (MRI) of the thoracic spine revealed

a dorsal epidural mass lesion at the level of the T6 vertebrae. The lesion was dumbbell shaped and was located both inside and outside the spinal canal (Figure 1a and b); it appeared isointense to slightly hyperintense and markedly hypointense on T1- and T2-weighted images, respectively, and did not enhance after contrast administration. The signal characteristics were consistent with early acute–subacute haemorrhage.

### *Operation*

An emergency laminectomy of T6 and T7 vertebrae revealed an epidural compressing mass lesion that was found to have migrated through the intervertebral foramen. The mass, which turned out to be a hard tuft of ORC (Surgicel<sup>®</sup>, Ethicon, Switzerland), was removed and the spinal cord decompressed. The dural sac then expanded and pulsated normally.

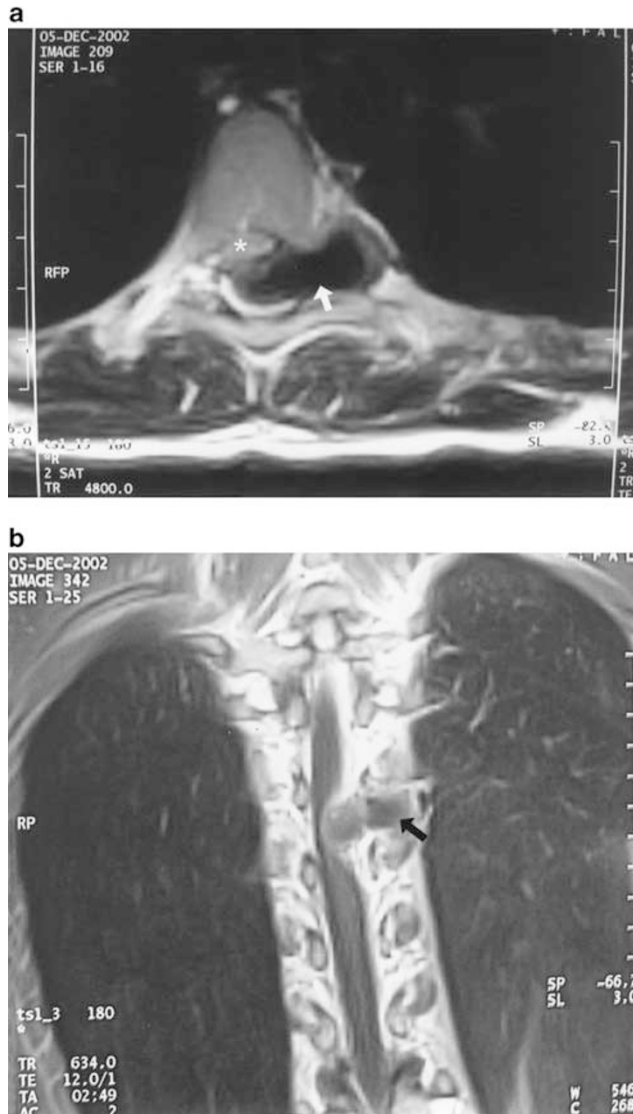
### *Postoperative course*

By the sixth postoperative month, the patient had experienced a gradual return of power of the right leg against gravity, unfortunately the left leg remained paralysed.

## Discussion

Paraplegia after thoracic aortic surgery is a relatively frequent complication that is generally considered to

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**Figure 1** (a) Axial T2-weighted MR image of the thoracic spine showing a dumbbell-shaped compressive mass lesion that has hypointense appearance (arrow), displacing the cord anteriolaterally (asterisk). (b) Coronal T1-weighted contrast-enhanced MR image which shows a hypointense unenhancing lesion causing marked compression of the spinal cord (arrow)

be the result of compromise of spinal cord blood flow during aortic crossclamping or after ligation of the posterior intercostal arteries.<sup>6,8</sup> On the other hand, paraplegia after thoracotomy is an extremely uncommon complication, with an estimated incidence of 0.08%.<sup>6</sup> The common denominator of paraplegia complicating thoracotomy is a posterolateral thoracotomy incision. The more posterior the incision is toward the vertebrae, the greater the chance of injury of the spinal cord.<sup>6</sup> Bleeding at the costovertebral angle is another common feature of these cases. Manoeuvres aimed at haemostasis at the posterior edge of a posterolateral thoracotomy such as packing the

wound with haemostatic agents or electrocauterisation could create a pleural epidural or even a pleural subarachnoid communication through the intervertebral foramen.<sup>4,9</sup> In the presence of an intact pleura, the epidural space has no communication with the pleural cavity. The distance that separates the pleural cavity posteriorly from the spinal canal and the dura through the intervertebral foramina is very short and the intervertebral foramina do not form a strong barrier protecting the spinal cord.<sup>10,11</sup>

Use of ORC as a haemostatic agent is common in neurosurgery, orthopaedic surgery and thoracic surgery. Following saturation with blood, it gradually increases in volume and forms a gelatinous mass that aids in the formation of clot. Pushed or packed through a pleuro-epidural communication, ORC may enter the vertebral canal and directly compress the spinal cord. Also, packed ORC left in place preventing the drainage of active bleeding in the pleural cavity, may swell and promote haematoma formation inside the vertebral canal, with consequent spinal cord compression. In 13 previous reports paraplegia due to ORC after pulmonary surgery as in our case have been described; in one case it occurred after aortic surgery<sup>1</sup> (Table 1).

Furthermore, there are reported cases of progressive worsening of paraplegia despite normal neurological status in the early postoperative period. This type of late neurological worsening is thought to result from the migration of ORC through the intervertebral foramen due to a relative pressure gradient between the intervertebral foramen and the spinal canal. Such a pressure gradient on the other hand, could be produced either by closure of the thoracotomy with rib approximation or by respiratory movements.<sup>7,12</sup>

MRI is the best investigation in such cases MRI delineates the location of lesion and the degree of cord compression. Hyperacute haematomas appear hypointense or slightly hyperintense on T1-weighted images and have mixed signal intensity on T2-weighted images. Acute haematomas are also isointense on T1-weighted images, but more hypointense on T2-weighted images; chronic haematomas are hyperintense on all sequences.<sup>13</sup> In their study on the MRI characteristics of ORC, Oto *et al*,<sup>14</sup> reported that ORC has a short relaxation time on T2-weighted images, leading to marked hypointensity in the early postoperative period, and also noted that T2-weighted images were the most useful in detection of ORC. In our case, there was a marked hypointensity on T2-weighted images which was consistent with acute haematoma.

In conclusion, in cases of neurological deficits after extensive surgery at the posterolateral edge of a thoracotomy, the clinician should be aware of the above possibilities including a compressive tuft of ORC. Urgent radiological diagnosis and decompressive laminectomy is required.

**Table 1** Summary of reported cases of post-thoracotomy paraplegia due to ORC

<i>Authors</i>	<i>Patient age (years)</i>	<i>Operation</i>	<i>Neurologic level</i>	<i>Outcome</i>
Perez-Guera and Hotland <sup>9</sup>	59	Left pneumonectomy	T5	Paraplegia; no improvement
Tashiro <i>et al</i> <sup>10</sup>	56	Right upper pulmonary lobectomy	T5	Brown–Squard Syndrome improvement
Short <sup>15</sup>	49	Right upper pulmonary lobectomy	T5–6	Left leg improved, right monoplegia
Short <sup>15</sup>	59	Right lower lobectomy	T5–6	Paraplegia
Short <sup>15</sup>	72	Right upper and middle lobectomy	T5–6	Paraplegia
Wada <i>et al</i> <sup>12</sup>	37	Right upper lobectomy	T5	Improved
Wada <i>et al</i> <sup>12</sup>	69	Right upper lobectomy	T5	Improved
Iwabuchi <sup>16</sup>	46	Right lower lobectomy	T5	Paraparesis
Lovstad <i>et al</i> <sup>17</sup>	56	Left lower lobectomy	T8	Paraplegia
Brodbelt <i>et al</i> <sup>7</sup>	15	Ventriculoseptal defect and pulmonary artery stenosis	T5–6	Paraparesis
Brodbelt <i>et al</i> <sup>7</sup>	37	Lower lobectomy	T5	Died
Brodbelt <i>et al</i> <sup>7</sup>	50	Thoracic crush injury	NR	Right leg monoparesis
Biglioli <i>et al</i> <sup>1</sup>	38	Thoracic aortic aneurysm	T6	Paraplegia
Present case	22	Left thoracotomy	T6	Right leg partially improved, left monoplegia

NR: no record

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