Clinical History:

A 54-year-old woman was admitted to the emergency department of our hospital with paraplegia, following a fall down the stairs. There were no previous injuries of the neck and further medical history was unremarkable.

Imaging Findings:

Computed tomography revealed a congenital block vertebra C6-C7, degenerative changes of the cervical spine (Fig. 1), and a frontal subgaleal haematoma. None of these findings could explain the extent of the neurological symptoms.

Therefore, subsequent MRI was performed for further evaluation of the cervical spine. In addition to the block vertebra C6-C7, MRI revealed a distinct injury of the myelum visualised as a hyperintense signal on T2-weighted images and particularly on fluid-sensitive sequences, most pronounced at C3-C4. There was no bone marrow oedema of the cervical spine (Fig. 2).

Discussion:

The term Spinal Cord Injury Without Radiographic Abnormality (SCIWORA) was introduced by Pang and Wilberger in 1982, based on radiological or Computed Tomographic (CT) criteria [1]. With the surge of Magnetic Resonance Imaging (MRI), the definition of SCIWORA was modified to stress the importance of MRI in the diagnosis of spinal cord injury. According to the new definition, SCIWORA is the presence of traumatic changes of the spinal cord on MRI, in the absence of structural abnormalities on plain radiography or computed tomography (CT) [2].

Isolated spinal cord injuries account for 6-19% and 9-14% of all spinal injuries in children and adults, respectively [3–5]. Greater elasticity of the osseous spine in children allows movements beyond the physiological range of motion, resulting in spinal cord injury without fractures. In adults, degenerative disc disease causing narrowing of the spinal canal may predispose to SCIWORA [6]. Intervertebral cervical fusion or congenital block vertebra may result in accelerated degeneration of the adjacent disc. In addition, a redistribution of biomechanical forces towards the adjacent vertebrae usually above the fused segment may cause an increased vulnerability to spinal cord injury [7].

In the setting of spinal trauma with a discrepancy between negative findings on CT and neurological findings, MRI is the imaging modality of choice. MRI findings include spinal cord oedema, intramedullary haemorrhage and anatomic
transection of the spinal cord. Oedema is hyperintense on T2-Weighted Images (WI) and is best seen on fluid-sensitive sequences [6]. The signal intensity of haemorrhage is complex and may vary along the stage being acute, subacute or chronic [8]. Cord transection is seen as a loss of continuity or a cavity filled with cerebrospinal fluid [6]. Cord concussion is associated with normal findings on standard MRI sequences, but is seen as hyperintense lesions on diffusion-weighted imaging (DWI) [9].

Several MRI findings have been correlated with prognosis. Intramedullary oedema and microhaemorrhages are associated with favourable prognosis. Conversely, anatomic transection of the spinal cord and frank haematomyelia are correlated with poorer prognosis [10]. However, it has been reported that the absence of these negative prognostic factors is not predictive of a good outcome [11].

In conclusion, spinal cord lesions can be missed on both plain radiography and CT. SCIWORA should be suspected in these cases of spinal injury presenting with neurological involvement.

**Differential Diagnosis List:** Traumatic myelopathy associated with adjacent vertebral fusion anomaly., Degenerative myelopathy, Multiple Sclerosis, Astrocytoma, Acute ischaemia, Transverse myelitis, Neuromyelitis optica, Acute disseminated encephalomyelitis, Vasculitis

**Final Diagnosis:** Traumatic myelopathy associated with adjacent vertebral fusion anomaly.

**References:**


Figure 1

Description: Sagittal reformatted image: Block vertebra C6-C7 with concavity of the anterior wall (red arrow) and partial osseous fusion (yellow star). Origin: © Vanhoenacker F, Department of Radiology, AZ Sint Maarten, Mechelen, Belgium.
**Description:** Coronal reformatted image: Block vertebra C6-C7 with partial osseous fusion (yellow star) with residual calcified disc remnant (yellow arrow). **Origin:** © Vanhoenacker F, Department of Radiology, AZ Sint Maarten, Mechelen, Belgium.
Description: Sagittal T1-WI: Fusion of C6-C7 with anterior concave delineation of the vertebral bodies C6 and C7 (red arrow). Origin: © Vanhoenacker F, Department of Radiology, AZ Sint Maarten, Mechelen, Belgium.
Description: Sagittal T2-WI: Fusion of C6-C7 with anterior concavity C6 and C7 (red arrow). Note swelling and hyperintense signal of the cervical myelum at C3-4 extending to C5-C6 (yellow arrow).  

Origin: © Vanhoenacker F, Department of Radiology, AZ Sint Maarten, Mechelen, Belgium.
Description: Sagittal left paramedian T2-WI: High signal in spinal cord at C3-C4 (yellow arrow). Note cord swelling causing loss of delineation of the anterior and posterior perimedullary liquor space on C3-C6 (red arrows). Origin: © Vanhoenacker F, Department of Radiology, AZ Sint Maarten, Mechelen, Belgium.
Description: Axial T2-WI: Intermediate to high signal in the spinal cord at C3-C4 (yellow arrow). Origin: © Vanhoenacker F, Department of Radiology, AZ Sint Maarten, Mechelen, Belgium.
Description: Sagittal TIR: Fusion of C6-C7 with anterior concavity C6 and C7 (red arrow). Note swelling and hyperintense signal of the cervical myelum at C3-4 extending to C5-C6 (yellow arrow). Origin: © Vanhoenacker F, Department of Radiology, AZ Sint Maarten, Mechelen, Belgium.