

Surgically Treated Fracture of the C7 Vertebra with Hangman's Fracture Morphology in a 59-Year-Old Patient — Case Report

Złamanie kręgu C7 o morfologii złamania wisielczego, leczone operacyjnie u 59-letniego chorego — opis przypadku

Zygmunt Siedlecki¹, Kajetan Hadzik¹, Jakub Woźniak¹,
Emilia Główczeńska-Siedlecka², Maciej Śniegocki¹

¹ Department of Neurosurgery, Neurotraumatology and Pediatric Neurosurgery,
The Ludwik Rydygier Collegium Medicum in Bydgoszcz, The Nicolaus Copernicus University in Toruń, Poland

² Department of Geriatrics, The Ludwik Rydygier Collegium Medicum in Bydgoszcz,
The Nicolaus Copernicus University in Toruń, Poland

Abstract

Introduction. Hangman's fractures are a rare type of cervical spine injury, usually involving the C2 vertebra. However, in exceptional cases, they can affect other cervical vertebrae, including C7.

Aim. In this paper, we present a case of an atypical fracture of the C7 vertebra with hangman's fracture morphology and describe its surgical treatment.

Case Report. We present the case of a 59-year-old male with a fracture of the C7 vertebra with a morphology resembling that of a hangman's fracture, which typically occurs at the C2 vertebra. Hangman's fractures most often result from hyperextension injuries, whereas, in this case, the fracture occurred due to a fall. The fracture was successfully treated surgically. Stabilisation of C6-C7-Th1 was performed via an anterior approach.

Discussion. The instability mechanism in the fracture described in this case involves the separation of the C7 vertebral body from the rest of the vertebra and its apparent subluxation relative to Th1. Thus, the only surgical treatment that ensures the stabilisation of such a fracture is the fusion of C6-C7-Th1, so that the fractured vertebra is fused to both the vertebra above and below.

Conclusions. Although C7 fractures can resemble hangman's fractures in terms of injury mechanism, there are significant anatomical and biomechanical differences. The stabilisation must involve the fractured vertebra and fuse it with the vertebra above and below. (JNNN 2025;14(1):43–46)

Key Words: hangman's fracture, surgically treated, vertebral fracture

Streszczenie

Wstęp. Złamania wisielcze są rzadkim typem urazów kręgosłupa szyjnego, zwykle obejmującym kręgi C2. Jednak w wyjątkowych przypadkach mogą dotyczyć innych kręgów szyjnych, w tym C7.

Cel. W niniejszym artykule przedstawiamy przypadek nietypowego złamania kręgu C7 o morfologii złamania wisielczego oraz opisujemy jego leczenie operacyjne.

Opis przypadku. Przedstawiamy przypadek 59-letniego mężczyzny ze złamaniem kręgu C7 o morfologii przypominającej złamanie wisielcze, które typowo występuje w kręgu C2. Złamania wisielcze występują także najczęściej na skutek urazów przygięciowych, zaś w przypadku opisanego chorego, do złamania doszło w wyniku upadku. Złamanie zostało ono skutecznie leczone operacyjnie. Z dostępu przedniego wykonano stabilizację C6-C7-Th1.

Dyskusja. Mechanizm niestabilności w opisanym w tej pracy złamaniu polega na oderwaniu się trzonu C7 od reszty kręgu i jego pozornym podwichnięciu się względem Th1. Dlatego jedynym leczeniem operacyjnym zapewniającym stabilizację takiego złamania jest zespolenie C6-C7-Th1, tak aby złamany kręg był zespolony zarówno z kręgiem powyższym, jak i poniższym.

Wnioski. Chociaż złamania C7 mogą przypominać złamania wisielcze pod względem mechanizmu urazu, różnice anatomiczne i biomechaniczne są znaczące. Stabilizacja musi obejmować złamany kręgi i zespalać go z kręgiem powyższym i poniższym. (PNN 2025;14(1):43–46)

Słowa kluczowe: złamanie wisielcze, leczenie operacyjne, złamanie kręgu

Introduction

Hangman's fractures, also known as traumatic spondylolisthesis of the axis, are a specific type of cervical spine injury, most commonly occurring as a result of hanging [1,2]. These fractures not only present an interesting topic from the standpoint of anatomy and injury mechanics but are also significant in the context of forensic medicine and emergency medical services. The mechanism of this injury is related to a sudden and forceful hyperextension of the head relative to the neck, leading to damage to the bony and ligamentous structures of the cervical spine. The first descriptions of hangman's fractures come from forensic medicine, where they were observed in individuals who died as a result of hanging. The biomechanical essence of a hangman's fracture is the instability of the spine and dislocation of the C2 vertebral body relative to C3, which gives the impression of a C2-C3 subluxation. However, this is not actually a subluxation because there is no damage to the C2-C3 joints [2,3]. Modern research on this type of injury has led to a better understanding of its mechanisms and treatment options. Forensic medicine uses knowledge of hangman's fractures to determine the circumstances of death, which is particularly important for forensic examinations. Although hangman's fractures are rare in everyday medical practice, their recognition and treatment are crucial for preventing neurological complications. Modern imaging techniques, including computed tomography and magnetic resonance imaging, play a key role in assessing the extent of the injury and planning surgical or conservative treatment [4].

In our manuscript, we present a case of an atypical fracture of the C7 vertebra with hangman's fracture morphology and describe its surgical treatment.

Case Report

We present a case of a 59-year-old male who was brought to the emergency department after falling from a height of approximately 3 metres. The patient reported severe neck pain and limited head mobility. Neurological examination revealed subtle muscle weakness distally in the right upper limb and paresthesia in the same area. A CT scan of the cervical spine revealed a fracture of both pedicles of the C7 vertebra, resembling a hangman's fracture, with anterior displacement of the C7 vertebral

body (Figure 1). Magnetic resonance imaging (MRI) confirmed compression of the spinal cord by the posterior portion of the C7-Th1 disc and an abnormal signal from this disc, indicating damage. The patient was qualified for



Figure 1. C7 fracture with a “hangman's fracture” morphology, showing the fracture line through the pedicle and displacement of the C7 vertebral body relative to Th1

surgical treatment. An anterior approach was utilised for C6-C7 and C7-Th1 discectomy, decompression of the spinal canal, insertion of PEEK cages, followed by anterior stabilisation with a C6-C7-Th1 titanium plate (Figure 2).

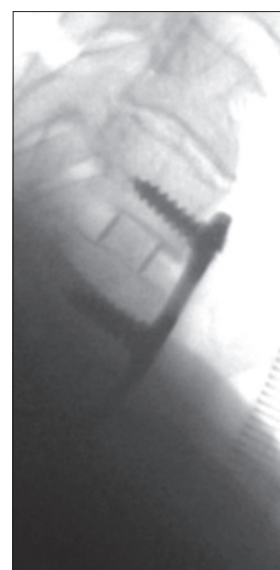


Figure 2. Intraoperative X-ray image, highlighting the difficult visualisation of the Th1 vertebra, with the anterior plate and PEEK cage at C6-C7 visible

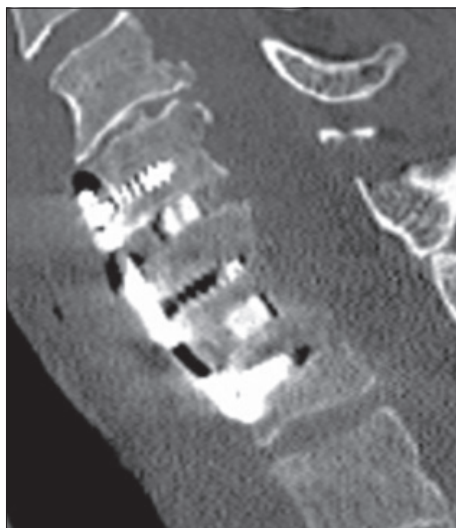


Figure 3. Postoperative CT scan showing the state after C6-C7-Th1 stabilisation

This achieved stabilisation of the fractured C7 both superiorly and inferiorly (Figure 3). In the first few days after surgery, the patient reported improvement in muscle strength in the right upper limb. Gradual motor rehabilitation was introduced, and the paresthesia resolved. Hoarseness developed immediately after the operation, which resolved spontaneously after 3 days. It was most likely due to irritation of the right recurrent laryngeal nerve from the surgical approach.

Discussion

Although C7 fractures can resemble hangman's fractures in terms of injury mechanism, there are significant anatomical and biomechanical differences. The essence of a hangman's fracture involves a fracture through the pedicles, resulting in the detachment of the C2 vertebral body from the posterior structures of the vertebra and its displacement relative to C3, giving the impression of a C2-C3 subluxation. According to Schneider et al., the term "hangman's fracture" specifically refers to a fracture of the C2 vertebra [5]. Eghbal et al., when describing possible types of C7 fractures, do not use the term "hangman's fracture" [6]. The aim of this report is to demonstrate that bilateral fractures of the pedicles of the lower cervical vertebrae, including C7, morphologically and biomechanically resemble a hangman's fracture. The instability mechanism in the fracture described in this case involves the separation of the C7 vertebral body from the rest of the vertebra and its apparent subluxation relative to Th1. Therefore, the only surgical treatment that ensures the stabilisation of such a fracture is the fusion of C6-C7-Th1, so that the fractured vertebra is fused to both the vertebra above and below. This may be reminiscent of the fundamental

principle of stabilising long bone fractures, which involves the fusion of two adjacent bones.

Conclusions

Based on the described case, the authors point out that bilateral fractures of the lower cervical vertebral pedicles with dislocation of the fractured vertebral body are unstable fractures that require surgical treatment. The suggested surgical technique is anterior stabilisation with a plate, along with the removal of intervertebral discs. The stabilisation must involve the fractured vertebra and fuse it with the vertebra above and below.

Acknowledgments

The authors wish to thank the medical staff involved in the treatment of the patient: emergency physicians, radiologists, radiology technicians, nurses, surgical nurses, rehabilitation therapists.

References

- [1] Murphy H., Schroeder G.D., Shi W.J. et al. Management of Hangman's Fractures: A Systematic Review. *J Orthop Trauma*. 2017;31(4):S90–S95.
- [2] Poorman G.W., Segreto F.A., Beaubrun B.M. et al. Traumatic Fracture of the Pediatric Cervical Spine: Etiology, Epidemiology, Concurrent Injuries, and an Analysis of Perioperative Outcomes Using the Kids' Inpatient Database. *Int J Spine Surg*. 2019;13(1):68–78.
- [3] Penning L. Prevertebral hematoma in cervical spine injury: incidence and etiologic significance. *AJR Am J Roentgenol*. 1981;136(3):553–561.
- [4] Al-Mahfoudh R., Beagrie C., Woolley E. et al. Management of Typical and Atypical Hangman's Fractures. *Global Spine J*. 2016;6(3):248–256.
- [5] Schneider R.C., Livingston K.E., Cave A.J., Hamilton G. "Hangman's Fracture" of the Cervical Spine. *J Neurosurg*. 1965;22:141–154.
- [6] Eghbal K., Abdollahpour H.R., Ghaffarpasand F. Traumatic Chance Fracture of Cervical Spine: A Rare Fracture Type and Surgical Management. *Asian J Neurosurg*. 2018;13(3):906–909.

Corresponding Author:Zygmunt Siedlecki 

Department of Neurosurgery, Neurotraumatology
and Pediatric Neurosurgery,
The Ludwik Rydygier Collegium Medicum in Bydgoszcz,
The Nicolaus Copernicus University in Toruń, Poland
Curie-Skłodowskiej 9 street, 85-094 Bydgoszcz, Poland
e-mail: siedlecki@cm.umk.pl

Conflict of Interest: None**Funding:** None

Author Contributions: Zygmunt Siedlecki^{A–C, E, H},
Kajetan Hadzik^{C, G}, Jakub Woźniak^F,
Emilia Głowczewska-Siedlecka^{F, G}, Maciej Śniegocki^{F, G}

A — Concept and design of research, B — Collection and/or compilation of data,
C — Analysis and interpretation of data, E — Writing an article, F — Search of the
literature, G — Critical article analysis, H — Approval of the final version of the
article

Received: 8.04.2024**Accepted:** 24.04.2024