



Challenge of Spine Surgery Procedure in an Unusual Hangman's Fracture During Corona Virus Disease 2019 Pandemic in Severe Cluster Region

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Abstract

Introduction: Hangman's fractures are one of the most frequent types of high cervical spine injury. It usually have no neurological deficit in clinical presentation, but in our cases we found a neurological deficit that is caused by complex mechanism of injury. This unusual clinical presentation and also COVID-19 pandemic made this interesting case to discuss and challenging to choose the best spine surgery procedure.

Clinical case: A 19 years-old man was referred to our emergency department with the history of road accident. Patient was performed physical examination and radiology findings. There was instability on the C2 cervical spine with neurological deficit and sign of the spinal shock. All the caregiver that involved wearing full protective equipment because of patient with high risk COVID-19.

Conclusion: During the COVID-19 pandemic, it is possible to maintain spine surgical activity which is considering all of the healthcare protective parameter. Surgical procedure must be discussed and organized with all the caregivers who are involved. Indications for surgery procedure must be in line with the scientific guidelines.

Keywords

Hangman's fracture, Spinal shock; COVID-19; Spine surgery procedure

Introduction

The term hangman's fracture was first used in 1965 to define a similar fracture of the C2 neural arch without damage to the odontoid process and with or without forward listhesis of the C2 vertebral body upon the C3 vertebral body [1]. Hangman's fractures are one of the most frequent types of high cervical spine injury, accounting for 20 to 22% of all axis fractures [2,3]. Blunt trauma is the leading mechanism of this fracture, most of cases because of motor vehicle accidents and falls [4]. Hangman's fracture usually has no neurological deficit in clinical presentation, [5] but in our cases we found a neurological deficit which is can be explained by its mechanism. The unusual clinical presentation made this interesting case to discuss and to plan the best management of the patient.

The corona virus disease 2019 (COVID-19) pandemic becoming special attention to manage spine surgery procedure in our department. Our country Surabaya, Indonesia, include in black zone of the COVID-19 pandemic. According to the guideline from our health authorities, [6] elective surgery were cancelled and urgent surgeries were performed. When performing surgical procedure a lot of preparation must be made to ensure the safety of the medical staff and patients. In some of our cases within this preparation sometimes had worsened the patient's condition.

This clinical study was presented to share our experience as the impact of the COVID-19 pandemic on spine surgical activities in our department and its associated organization in a severe COVID-19 cluster region.

Clinical case

A 19 years-old man was referred to our emergency department following a road accident between a motor-bike and a car. Patient was riding motor-bike and crash into the front of a car. There was no witness in the location. The exact mechanism of injury was unknown. History of loss of consciousness was found when the accident. Patient came with difficult of breathing and unable to move all of the extremities.

Within the examination in our emergency department, patient came with fully awareness and difficulty of breathing. There were no strength in motoric with motoric score

Article Information

DOI: 10.31021/jnn.20203149
Article Type: Case report
Journal Type: Open Access
Volume: 3 **Issue:** 3
Manuscript ID: JNN-3-149
Publisher: Boffin Access Limited
Received Date: 09 July 2020
Accepted Date: 14 August 2020
Published Date: 16 August 2020

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Citation: Permana GI, Faris M, Subagio EA, Bajamal AH. Challenge of Spine Surgery Procedure in an Unusual Hangman's Fracture during Corona Virus Disease 2019 Pandemic in Severe Cluster Region. J Neurosci Neurosurg. 2020 Aug;3(2);149.

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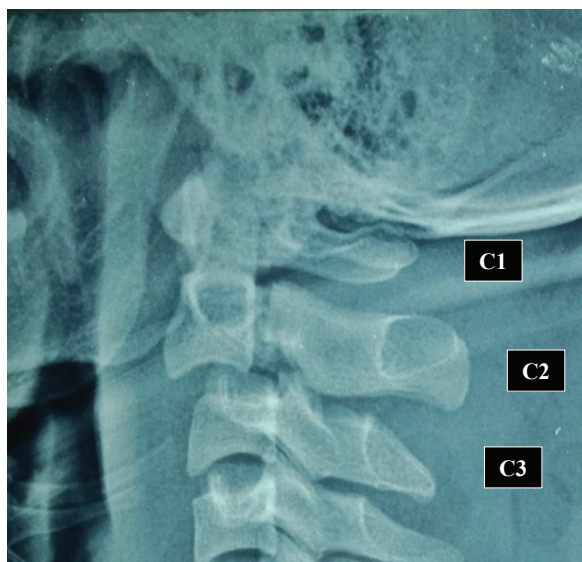


Figure 1: Lateral X-ray showing C2 vertebral body displaced anteriorly to C3 vertebral body.

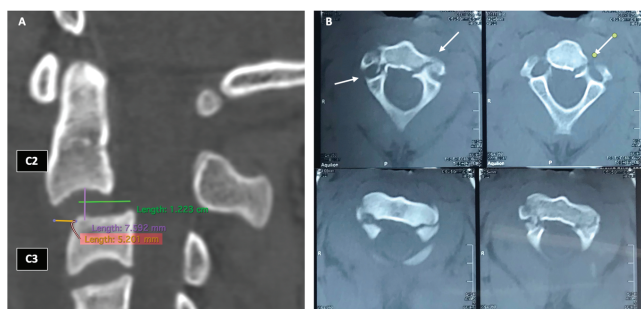


Figure 2: Cervical CT Scan. Anterior dislocation of the vertebral body C2 to the vertebral body C3 with the length more than 5 mm (A); Axial CT scan showing bilateral pedicle fracture of the C2 (arrow) without disturbance of the foramen transversarium of the C2.

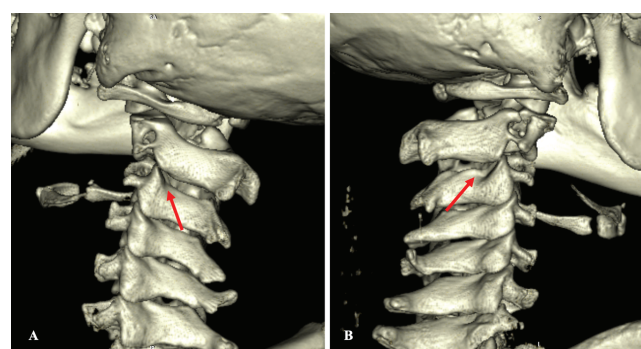


Figure 3: Cervical CT Scan 3D-reconstruction. Bilateral facet joints dislocation between C2 and C3 (arrow) left side (A) and right side (B).

is 0 and general loss of sensation in C3 level. The bulbocavernosus reflex and anal reflex were negative. There is an anterior dislocation of C2 to C3 and sign of fracture in the both of the pedicle of C2 in the lateral X-ray (Figure 1). Cervical CT Scan was performed as can be seen in Figure 2, there were anterior dislocation between vertebral body C2 and C3 more than 5 mm and bilateral pedicle fracture of the C2. Anterior dislocation was found in the 3D-reconstruction between the facet joint of the C2 to the C3 (Figure 3).

There was a sign of neurological abnormality, the cervical spine was immobilized with hard cervical collar and patient was performed intubation and mechanical ventilation because of the difficult of breathing and abdominal pattern of breathing. The saturation of patient was always below to 60% with non-rebreathing masks. We examined patient with spinal shock because there was a hypotension and bradycardia. In the thorax X-ray as seen in Figure 4, we found a bilateral infiltration of the lung, also in the thorax CT-Scan there was a “ground glass opacity” sign. Patient also diagnosed with the COVID-19.

The patient was planned to perform anterior stabilization, corpectomy, discectomy, and fusion. Unfortunately patient was passed away while waiting for spine surgery procedure. We are still unable to understand which is the cause of the death, whether caused by respiratory failure due to COVID-19 or spinal shock.

Discussion

The cervical spine is divided into the upper cervical spine (occiput to C2) and the lower cervical spine (C3 to C7). Fracture of the cervical spine may be present in polytraumatized patients and should be suspected in patient complaining of neck pain or neurological deficit. Fracture in the upper cervical spine include fractures of the occipital condyle and the atlas, atlanto-axial dislocations, fractures of the odontoid process, and hangman's fractures in the C2 segment [7]. These fracture are characterized based on specific classification.

Hangman's fracture or traumatic spondylolisthesis of the axis is the typical fracture resulting from hyperextension-distraction in which there is a bilateral fracture of the pedicle of C2 with dislocation of the body of vertebra C2 to C3. This fracture, despite the major dislocation of C2 on C3 that often occurs, rarely leads to spinal cord injury because it causes the canal to widen rather than narrow [8]. But there was difference result of our cases, which is make it unusual, we found a neurological deficit caused by spinal cord injury in our patient. Even the measurement of the Torg-Pavlov Ratio, [9] ratio of the sagittal diameter between the spinal canal to vertebral body, more than 1 that indicate there is no canal stenosis (Figure 5).

Mechanisms of injury of this trauma have an important role in the explanation of the neurological deficit that can be happened to this patient. There is extension-distraction mechanism to the patient that can cause spinal cord injury, as we seen in the Figure 6. There in a hematomyelia within spinal cord in the C2 and C3 level of the cervical CT Scan. As for the gold standard of this pathology must be diagnosed with MRI [10]. Patient was plan to do MRI to ensure the pathology within spinal cord, but the patient cannot make it. Hematome within the spinal cord can occur in the setting of the trauma, but it usually caused by underlying vascular lesion [11].

Many adaption in the healthcare structure are necessary in management patient with COVID +. The important things are perfect coordination between healthcare professional and wearing full personal protective equipment. The first step of management is related to screening for COVID-19 symptom and triage of the patient that would require a surgical procedure [12]. In our cases, we used

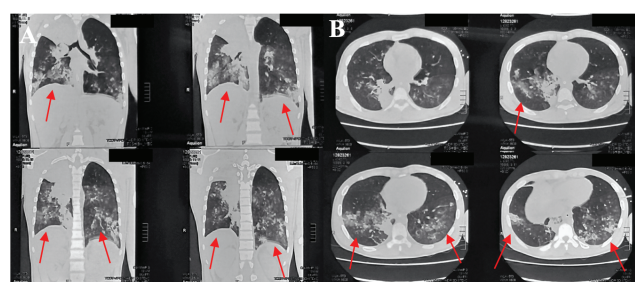


Figure 4: Thorax CT Scan showing bilateral “ground glass opacity” in the lung (arrow) in the coronal (A) and axial view (B).

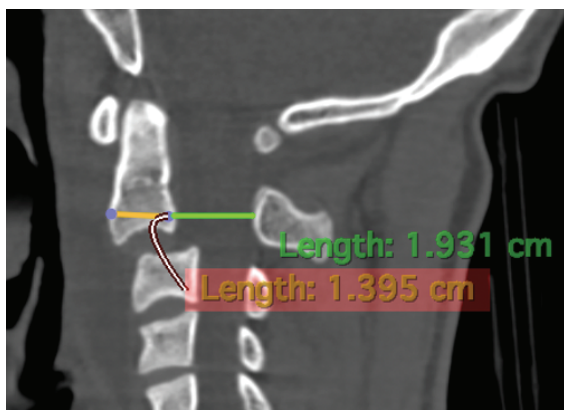


Figure 5: Measurement of the Torg-Pavlov Ratio or canal to body ratio of the C2 sagittal view in CT Scan showing the result is 1.38. If the score is <0.8 indication of cervical stenosis and the normal value is 1.0.

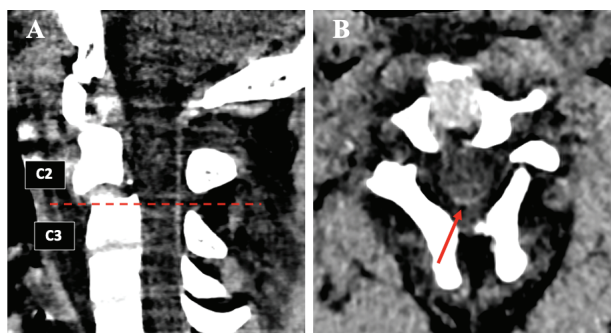


Figure 6: Cervical CT Scan sagittal view (A) and axial view (B) of the C2 and C3 cervical spine. There is hematomyelia in the level of C2 and C3 (arrow).

preoperative PCR testing and chest CT-scan for suspected cases. Full protective measures are necessary until results are available. When considering performing spine surgery procedure, indications must be limited to urgent cases only. Further, as in our experience, changing patient's condition happen because of it needs period of times to establish the diagnosis before perform the surgery? Some cases, the patient's condition getting worse and cannot make to the surgery, like this case. Our institution is located in high cluster region of COVID-19, we need perfect preparation before performing spine surgery procedure.

Conclusion

The present clinical case indicates that a complex mechanism of upper cervical spine extension-distraction and axial compression is

possible. Management was essentially aimed to restoring anatomic of normal cervical lordosis. During the COVID-19 pandemic, it is possible to maintain spine surgical activity which is considering all of the healthcare protective parameter. Each surgical procedure must be discussed and organized with all the caregivers who are involved, such as surgeons, anaesthetists, and infectious diseases physicians. Indications for surgery procedure must be in line with the scientific guidelines and should be adapted to each healthcare facility.

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