



# A Rare Case of Type II Odontoid Fracture With Bilateral Vertebral Arteries Occlusion Without Neurological Deficits

Morteza Sanei Taheri<sup>1</sup>, Hamidreza Haghighatkah<sup>1</sup>, Arash Azhideh<sup>1\*</sup>, Mehran Arab Ahmadi<sup>2</sup>

<sup>1</sup>Department of Radiology, Shohada-e-Tajrish Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

<sup>2</sup>The advanced diagnostic and interventional radiology research center, Tehran University of Medical Sciences, Tehran, Iran.

## Abstract

Cervical spine fractures are common fractures due to spine trauma. Odontoid fracture is responsible for 20% of cervical spine fractures. Vertebral artery injuries (VAIs) had widely focused in this setting due to its occurrence with upper cervical fractures. In our case of study, a 42-year-old female presented in the hospital's emergency department with a history of cervical spine injury without neurological deficits. In further investigations, cervical spine X-ray, magnetic resonance imaging (MRI), and angiography were done to evaluate the possible injuries to the bone, spinal cord, and vascular structures surrounding the spine that eventuated in the accidental diagnosis of bilateral vertebral artery occlusion. This case of the study demonstrated the importance of diagnostic investigations that can evaluate in an emergency department and bilateral vertebral artery occlusion without neurological symptoms due to collateral arteries establishment.

**Keywords:** Odontoid process; Neurologic deficits; Fracture.

## \*Correspondence to

Arash Azhideh,  
Department of Radiology,  
Shohada-e-Tajrish Hospital,  
Shahid Beheshti University of  
Medical Sciences, Tehran, Iran.  
Tel:+989121596311,  
Email:arashazhide@gmail.com

**Published online** December  
30, 2020

**Citation:** Sanei Taheri M, Haghighatkah H, Azhideh A, Arab Ahmadi M, A Rare Case of Type II Odontoid Fracture With Bilateral Vertebral Arteries Occlusion Without Neurological Deficits Clin Neurosci J. 2021;8(1):48-49. doi:10.34172/icnj.2021.10.



## Introduction

About twenty percent of all cervical spine fractures consist of odontoid fractures.<sup>1,2</sup> The most common odontoid fracture is type II fractures occurring in 65%–74% of cases.<sup>3</sup> According to Anderson and Alonzo, odontoid fractures type II are caused by major trauma or osteoporotic bone quality.<sup>4</sup>

In this setting, vertebral artery injury (VAI) had extensively received attention.<sup>5</sup> Cervical subluxations, transverse foramen fractures, and upper cervical spine fractures are also associated with VAI.<sup>6,7</sup> VAI can occur in various situations such as facial hemorrhage, lateralizing neurological dysfunction, as well as cervical hyperextension – rotation or hyperflexion process, closed head injury with diffuse axonal damage, near hanging, and seat belt damage to the back.<sup>7</sup> According to the literature, the prevalence of vertebral artery damage associated with a cervical spinal injury is between 11 and 80%.<sup>8</sup> These vascular injuries cause a wide range of neurological problems for patients. To the best of our knowledge, this is the first report of bilateral vertebral arteries occlusion in type II odontoid fracture, which is founded accidentally in the routine evaluation of patients after a car accident eventuates in fracture without any neurological deficits.

## Case Presentation

This case report had conducted in an academic tertiary hospital and a consent form obtained from our patient.

A 42-year-old female presented to our hospital with a history of car rollover four days before presentation. In another hospital, a type II odontoid fracture diagnosis with anterior angulations made, and she has referred to our hospital. She had no significant past medical and surgical history. On admission, she had a stiff collar, and she just complained of neck pain. Her vital signs were blood pressure of 90/60 mm Hg, respiratory rate of 19/min, heart rate of 80/min, and temperature of 37°C. Her physical examinations revealed no abnormal findings. Also, in neurological examinations, she was awake and oriented to time, place, and person. All cranial nerve examinations were normal. Motor and sensory examinations were all normal, and she had no sensory level and paraesthesia. Deep tendon reflexes were 2+. Also, her gait and cerebellar examinations were normal.

Laboratory examinations revealed these findings. Normochrome normocytic anemia with hemoglobin: 10.9 (normal range 11-16 g/dL) with mean corpuscular volume (MCV): 88.3 (Normal Range 80-100 fl) and MCH 29.13 (Normal Range 27-35 pg). The hematocrit ratio was 34.1 %, and the platelet count was 271 (10<sup>3</sup>/mm<sup>3</sup>).

The serum sodium and potassium levels were 139 mEq/L and 3.8 mEq/L, respectively as well as, the erythrocyte sedimentation rate (ESR) was 45. Other laboratory studies were all in normal limits.

Radiographs of the cervical spine revealed that the axis at the base of the odontoid process had broken, defined as a type II fracture based on Anderson and D'Alonzo<sup>3</sup> (Figure 1).

MRI of the cervical spine was performed to evaluate the cervical spinal cord status and ligament integrity. There was no evidence of signal anomaly or any cord compression at the atlantoaxial dislocation level (Figure 2).

Two days before surgery for evaluating possible vascular damage during the procedure, the digital subtraction angiography brain and bilateral carotid angiography had done. Angiography revealed that bilateral vertebral arteries were completely occluded. On the left side, in V2-V3 junction, short segment dissection with 90% occlusion was seen. Cut off was evident in the V2 segment at the level of the C2 vertebra. The left posterior communicating artery's blood flow flows to the left anterior cerebral artery, which gives branches to the right vertebral basilar artery (Figure 3). By the third hospital day, she underwent surgery to fix the fracture, which was followed by post-surgery physiotherapy. The artery occlusion dissolved by anticoagulant therapy within seven days. Thus the patient is discharged from the hospital without any neurological consequences.

### Discussion:

Our patient was a 42-year-old female presented to our hospital with a history of car rollover four days before presentation, a diagnosis of type II odontoid fracture with anterior angulations made with the aid of a CT scan. In the cervical MRI study, no evidence of signal abnormality or any cord compression at the atlantoaxial dislocation level has seen. In brain and carotid angiography, complete occlusion of bilateral vertebral arteries was seen without any clinical symptoms revealed by anticoagulant therapy during hospitalization. Previously, vertebral artery damage after blunt cervical trauma was known to be rare; nevertheless, developments in imaging modalities dramatically expanded the incidence of VAI diagnoses. Patients of cervical injuries with cervical spine fractures and dislocations or transverse foramen fractures in emergency rooms should suspect of causing vertebral artery damage.

The screening of blunt cerebrovascular injury is recommended in upper C1 to C3 fractures, and the patient should undergo prompt screening.<sup>9</sup>

One of five individuals with cervical trauma has some involvement in the axis.<sup>10</sup> The most seen type of axis injury is an odontoid fracture at the body's junction and dense, which is called type II fracture. C1-C2 joint can have far



Figure 1. X-ray of Odontoid Fracture in the Emergency.



Figure 2. Odontoid Fracture Without Compression of the Cord.



Figure 3. Bilateral Basilar Vertebral Artery Occlusion.

more rotation from any other joint in the spine. However, tense transverse ligament limits the translational motion at the C1-C2 level.<sup>11</sup> Hyperflexion at the neck is the most common cause of dens fracture, leading to anterior displacement of C1-C2.

An investigation by L.R Caplan et al. demonstrated a

progressive neurological deficit in patients with bilateral artery occlusion.<sup>12</sup>

In 1998, Okuyama et al presented the first case of bilateral vertebral arteries occlusion associated with fracture of the cervical spine. This case had wide neurological symptoms,<sup>13</sup> however, in our case of study, despite the occlusion of bilateral vertebral arteries, the patient did not demonstrate any clinical neurological deficit.<sup>14</sup>

Posterior circulating disease (PCD) which includes vertebral artery occlusion is as important as an anterior circulating disease.<sup>15</sup>

Schoen et al in 2011, demonstrated a case of basilar artery occlusion that has altered mental status and ischemia site brain MRI due to delayed diagnosis which demonstrates the importance of diagnosis of arterial occlusion in the emergency department.<sup>16</sup>

Ausman et al. study demonstrated that PCDs existed in about 20- 40% of strokes. Despite the superiority of IA angiography in detecting PCDs, MR and CT angiography are convenient screening imaging tool to evaluate PCDs.<sup>17</sup>

Bilateral vertebral artery occlusion is common with neurological symptoms, though neurological symptoms did not exist in this case of study. In this case, the importance of clarifying acute vascular events due to spine trauma is the key to diagnosing this occlusion in an emergency department. This case of study can demonstrate the emphasis of how important can a diagnosis doubt in the emergency department can eventuate in the finding of asymptomatic disease. In this case of study, despite the vertebral artery's bilateral occlusion, neurological deficits were not present. This phenomenon is a rare condition that occurs due to the circulation of blood flow through communicating branches.

To conclude, this patient is a rare case of bilateral vertebral artery occlusion who did not demonstrate any neurological deficit, which was found accidentally. Vertebral arteries occlusion mostly accompanied by neurological deficits. This case demonstrates the importance of assessing arterial occlusion in cases with underlying disease or suspicious events, even without any neurological deficit.

#### Conflict of Interest

The authors declare that they have no conflict of interests.

#### Ethical Statement

This study was conducted under the permission of ethical committee of Shahid Beheshti University of Medical Sciences. Additionally, informed consent was obtained from the patient for publication of the report.

#### References

- Dunn ME, Seljeskog EL. Experience in the management of odontoid process injuries: an analysis of 128 cases. *Neurosurgery*. 1986;18(3):306-10. doi: 10.1227/00006123-198603000-00008.
- Vasudevan K, Grossberg JA, Spader HS, Torabi R, Oyelese AA. Age increases the risk of immediate postoperative dysphagia and pneumonia after odontoid screw fixation. *Clin Neurol Neurosurg*. 2014;126:185-9. doi: 10.1016/j.clineuro.2014.09.006.
- Anderson LD, D'Alonzo RT. Fractures of the odontoid process of the axis. *J Bone Joint Surg*. 2004;86(9):2081.
- Sullivan MP, McCormick JD, Arlet V. Vertebral artery injury and severely displaced odontoid fracture: the case for early reduction. *Eur Spine J*. 2013;22(10):2149-53. doi: 10.1007/s00586-013-2917-z.
- Pneumocephalus and Seizure in Patient after Epidural Lumbar Puncture: Case Report. *Arch Anesth & Crit Care*. 6(3):139-41.
- Fassett DR, Dailey AT, Vaccaro AR. Vertebral artery injuries associated with cervical spine injuries: a review of the literature. *J Spinal Disord Tech*. 2008;21(4):252-8. doi: 10.1097/BSD.0b013e3180cab162.
- Ismail F, Motsitsi S, Khan N, Fabris-Rotelli I. The pattern and prevalence of vertebral artery injury in patients with cervical spine fractures. *S Afr J Radiol*. 2013;17(2):52-5. doi: 10.7196/sajr.772.
- Friedman D, Flanders A, Thomas C, Millar W. Vertebral artery injury after acute cervical spine trauma: rate of occurrence as detected by MR angiography and assessment of clinical consequences. *AJR Am J Roentgenol*. 1995;164(2):443-7. doi: 10.2214/ajr.164.2.7839986.
- Moosaie F, Firouzabadi FD, Abouhamzeh K, Esteghamati S, Meysamie A, Rabizadeh S, et al. Lp(a) and Apo-lipoproteins as predictors for micro- and macrovascular complications of diabetes: a case-cohort study. *Nutr Metab Cardiovasc Dis*. 2020. doi: 10.1016/j.numecd.2020.05.011.
- Maleki Delarestaghi M, Ahmadi A, Dehghani Firouzabadi F, Roomiani M, Dehghani Firouzabadi M, Faham Z. Effect of low-pressure drainage suction on pharyngocutaneous fistula after total laryngectomy. *Ann Otol Rhinol Laryngol*. 2020;3489420934506. doi: 10.1177/0003489420934506.
- Cothren CC, Moore EE, Ray CE Jr, Johnson JL, Moore JB, Burch JM. Cervical spine fracture patterns mandating screening to rule out blunt cerebrovascular injury. *Surgery*. 2007;141(1):76-82. doi: 10.1016/j.surg.2006.04.005.
- Caplan LR. Bilateral distal vertebral artery occlusion. *Neurology*. 1983;33(5):552-8. doi: 10.1212/wnl.33.5.552.
- Okuyama T, Minamida Y, Sasaki T, Horikawa D, Izumiyama O, Mizuguchi M, et al. [Traumatic occlusion of the bilateral vertebral arteries associated with fracture of the cervical spine--a case report]. *No Shinkei Geka*. 1987;15(10):1141-5.
- Archer CR, Horenstein S. Basilar artery occlusion: clinical and radiological correlation. *Stroke*. 1977;8(3):383-90. doi: 10.1161/01.str.8.3.383.
- Fatic N, Jaffer U, Ivana S, Gordana GV, Markovic D, Kostic D, et al. Bilateral internal carotid artery occlusion, external carotid artery stenosis, and vertebral artery kinking: May it be asymptomatic? *Ann Vasc Surg*. 2017;44:416.e5-e8. doi: 10.1016/j.avsg.2017.04.038.
- Schoen JC, Boysen MM, Warren CR, Chakravarthy B, Lotfipour S. Vertebrobasilar artery occlusion. *West J Emerg Med*. 2011;12(2):233-9.
- Ausman JI, Liebeskind DS, Gonzalez N, Saver J, Martin N, Villablanca JP, et al. A review of the diagnosis and management of vertebral basilar (posterior) circulation disease. *Surg Neurol Int*. 2018;9:106. doi: 10.4103/sni.sni\_373\_17.