

# A study of pattern and prevalence of vertebral artery injury in patients with cervical spine fracture

Kiran Choldas Patil<sup>1\*</sup>, Anil Baliram Bonde<sup>2</sup>

<sup>1</sup>Professor, <sup>2</sup>Associate Professor, Department of Radiology, Dr Ulhas Patil Medical College, Jalgaon, Maharashtra, INDIA.

Email: [pramod.bhirud@yahoo.com](mailto:pramod.bhirud@yahoo.com)

## Abstract

**Introduction:** Vertebral artery injuries are rare, with an incidence of 0.1 - 1.0%, if all patients admitted with blunt head trauma are considered. It is not unusual for vertebral artery injury to occur when there are fractures through the transverse foramina of the first to the sixth vertebrae. Woodring *et al.* **Aims and Objectives:** To Study Pattern and Prevalence of Vertebral Artery Injury in Patients with Cervical Spine Fracture. **Methodology:** This was a Cross-sectional study at the Radiology Department of a tertiary health care center in patients with Cervical Spine Fracture during the one year period from January 2015 to January 2016. Total 158 patients were referred to Radiology department the study period. The demographic information and detailed radiological features were recorded. CTA was performed on a Philips multi-detector CT scanner (Brilliance 15, Netherlands; Serial Number 7636). Routine CTA protocols of the neck are titled 'CT neck angiogram', 'CT cervical spine angiogram' and 'CT carotid angiogram'. The CT scan database was searched according to these protocol titles. The CT database also has a list of all patients who have been scanned, as well as the type. **Result:** In our study we found The majority of the patients were from the age group of 30-40-26.58% followed by 20-30-24.05%;40-50-18.35%;50-60-13.92%; 10-20-9.49%; >60 -7.59%.The majority of the Patients were Male i.e. 51.90% as compared to Females 48.10%. The most common mechanism of Injury was Motor vehicle accident-41.13%;Pedestrian/vehicle accident-17.08%;Fell off a bicycle-13.92%;Fell From Tree -12.65%;Assault-7.59%;Fell from Building -7.59% The most common radiological findings with Vertebral artery spasm and level of Vertebral artery injury was -level From origin to C2-Complete occlusion from C3 to C6 ; From origin to C7-Eccentric thrombus compressing the lumen ;From origin to C3-Complete occlusion from C2 to C3 ;From origin to C1-No vessel injury From C2 to C7 Complete occlusion at C2. **Conclusion:** CTA is very important to early identification and exclusion vertebral artery injury in the Cervical Spine Fracture.

**Key words:** Vertebral Artery Injury, Cervical Spine Fracture, Vertebral artery thrombosis (VAT).

## \*Address for Correspondence:

Dr. Kiran Choldas Patil, Professor, Department of Radiology, Dr Ulhas Patil Medical College, Jalgaon, Maharashtra, INDIA.

Email: [pramod.bhirud@yahoo.com](mailto:pramod.bhirud@yahoo.com)

Received Date: 16/09/2014 Revised Date: 11/10/2014 Accepted Date: 04/11/2014

## Access this article online

Quick Response Code:	Website: <a href="http://www.medpulse.in">www.medpulse.in</a>
	DOI: 06 November 2014

## INTRODUCTION

Vertebral artery injuries are rare, with an incidence of 0.1 - 1.0%, if all patients admitted with blunt head trauma are considered.<sup>1</sup> It is not unusual for vertebral artery injury to

occur when there are fractures through the transverse foraminae of the first to the sixth vertebrae. Woodring *et al.*<sup>2</sup> found the incidence of vertebral artery injury to be 78% in patients who had fractures through the transverse foraminae. Other important risk factors for vertebral artery injury include facet joint dislocations and fractures of the first to the third cervical vertebrae.<sup>3,4</sup> Injury to the vertebral arteries can result in permanent brain injury via ischaemia to the posterior circulation territory of the brain. Vertebral-basilar insufficiency may occur if either both vertebral arteries or the dominant vertebral artery is injured. Other sequelae include downstream embolisation of a thrombus, anterior spinal artery compromise causing spinal cord ischaemia, and occlusion of blood flow to the posterior inferior cerebellar artery (PICA), causing lateral medullary syndrome.<sup>5</sup> Vertebral artery thrombosis (VAT)

is a complication of cervical spine injury with potentially fatal complications. VAT is a subset of vertebral artery injuries (VAI), which also include dissection and transection (rare). The incidence of VAIs overall following cervical spinal injury varies considerably in the published trauma literature, with incident rates ranging from 3% to 88%<sup>6-10</sup>. Possible explanations for the variable incident rates include patient selection biases, small patient cohorts (usually 20 patients with VAT), variation in imaging technique, type of injury, and inconsistencies in patient evaluation. Posttraumatic VAT is often asymptomatic, and the impact of VAT on neurologic outcome is unknown. Moreover, unless this complication is screened for at the time of injury, it may remain undetected.

### METHODOLOGY

This was a Cross-sectional study at the Radiology Department of a tertiary health care center in patients with Cervical Spine Fracture during the one year period from January 2015 to January 2016. Total 158 patients were referred to Radiology department the study period. The demographic information and detailed radiological features were recorded. CTA was performed on a Philips multi-detector CT scanner (Brilliance 15, Netherlands; Serial Number 7636). Routine CTA protocols of the neck are titled ‘CT neck angiogram’, ‘CT cervical spine angiogram’ and ‘CT carotid angiogram’. The CT scan database was searched according to these protocol titles. The CT database also has a list of all patients who have been scanned, as well as the type.

### RESULT

**Table 1:** Age wise distribution of the Patients

Age	No.	Percentage (%)
10-20	15	9.49%
20-30	38	24.05%
30-40	42	26.58%
40-50	29	18.35%
50-60	22	13.92%
>60	12	7.59%
<b>Total</b>	<b>158</b>	<b>100.00%</b>

The majority of the patients were from the age group of 30-40-26.58% followed by 20-30-24.05%;40-50-18.35%;50-60-13.92%; 10-20-9.49%; >60 -7.59%.

**Table 2:** Gender wise distribution of the Patients

Sex	No.	Percentage (%)
Male	82	51.90%
Female	76	48.10%
<b>Total</b>	<b>158</b>	<b>100.00%</b>

The majority of the Patients were Male i.e. 51.90% as compared to Females 48.10%.

**Table 3:** Distribution of Patients as per the Mechanism of injury

Motor vehicle accident	65	41.13%
Assault	12	7.59%
Pedestrian/vehicle accident	27	17.08%
Fell off a bicycle	22	13.92%
Fell From Tree	20	12.65%
Fell from Building	12	7.59%
<b>Total</b>	<b>158</b>	<b>100%</b>

The most common mechanism of Injury was Motor vehicle accident-41.13%;Pedestrian/vehicle accident-17.08%;Fell off a bicycle-13.92%;Fell From Tree -12.65%;Assault-7.59%;Fell from Building -7.59%.

**Table 4:** Distribution of the Patients as per the vertebral artery spasm level vertebral artery injury

Vertebral artery spasm level	Vertebral artery injury level
From origin to C2	Complete occlusion from C3 to C6
From origin to C7	Eccentric thrombus compressing the lumen
From origin to C3	Complete occlusion from C2 to C3
From origin to C1	No vessel injury From C2 to C7 Complete occlusion at C2

The most common radiological findings with Vertebral artery spasm and level of Vertebral artery injury was - level From origin to C2-Complete occlusion from C3 to C6 ; From origin to C7-Eccentric thrombus compressing the lumen ;From origin to C3-Complete occlusion from C2 to C3 ;From origin to C1-No vessel injury From C2 to C7 Complete occlusion at C2.

### DISCUSSION

Many published studies on vascular injury to the neck collectively refer to traumatic blunt injury to either the carotid or vertebral arteries (BCVI, or blunt carotid and vertebral injury). Multicenter trauma reviews report an incidence of blunt carotid injury ranging from 0.08% to 1.1% and isolated vertebral artery injury as less frequent (7–11). Blunt injuries to the vertebral arteries have the potential to present with devastating strokes. Miller *et al* (15) reported a stroke rate of 54% for untreated blunt vertebral artery injury (BVAI), whereas Biffel *et al*<sup>7</sup> In our study we found The majority of the patients were from the age group of 30-40-26.58% followed by 20-30-24.05%;40-50-18.35%;50-60-13.92%; 10-20-9.49%; >60 -7.59%. The majority of the Patients were Male i.e. 51.90% as compared to Females 48.10%.

The most common mechanism of Injury was Motor vehicle accident-41.13%;Pedestrian/vehicle accident-17.08%;Fell off a bicycle-13.92%;Fell From Tree -12.65%;Assault-7.59%;Fell from Building -7.59%

The most common radiological findings with Vertebral artery spasm and level of Vertebral artery injury was - level From origin to C2-Complete occlusion from C3 to C6 ; From origin to C7-Eccentric thrombus compressing the lumen ;From origin to C3-Complete occlusion from

C2 to C3 ;From origin to C1-No vessel injury From C2 to C7 Complete occlusion at C2.

## CONCLUSION

CTA is very important to early identification and exclusion vertebral artery injury in the Cervical Spine Fracture.

## REFERENCES

1. Hoit DA, Schirmer CM, Weller SJ, Lisbon A, Edlow JA, Malek AM. Angiographic detection of carotid and vertebral arterial injury in the high-energy blunt trauma patient. *J Spinal Disord Tech* 2008;21:259- 266. [<http://dx.doi.org/10.1097/BSD.0b013e318141fce8>]
2. Woodring JH, Lee C, Duncan V. Transverse process fractures of the cervical vertebrae: Are they insignificant? *J Trauma* 1993;34:797-802. [<http://dx.doi.org/10.1097/00005373-199306000-00008>]
3. Inamasu J, Guiot BH. Vertebral artery injury after blunt cervical trauma: An update. *SurgNeurol* 2006;65:238-246. [<http://dx.doi.org/10.1016/j.surneu.2005.06.043>]
4. Cothren CC, Moore EE, Biffl WL. Cervical spine fracture patterns predictive of blunt vertebral artery injury. *J Trauma* 2003;55:811-813. [<http://dx.doi.org/10.1097/01.TA.0000092700.92587.32>]
5. Fassett DR, Dailey AT, Vaccaro AR. Vertebral artery injuries associated with spinal injuries: A review of the literature. *J Spinal Disord Tech* 2008;21:252258.
6. Parbhoo AH, Govender S, Corr P. Vertebral artery injury in cervical spine trauma. *Injury Int J Care Injured* 2001;32:565–568.
7. Biffl WL, Moore EE, Elliott JP, *et al.* The devastating potential of blunt vertebral arterial injuries. *Annals Surgery* 2000;23:672–681.
8. Louw JA, Mafoyane NA, Small B, Nesor CP. Occlusion of the vertebral artery in cervical spine dislocations. *J Bone Joint Surg [Br]* 1990;72:679–681.
9. Weller SJ, Rosstich E, Malek AM. Detection of vertebral artery injury after cervical spine trauma using magnetic resonance angiography. *J Trauma* 1999;46:660–666.
10. Willis BK, Greiner F, Orrison WW, Benzel EC. The incidence of vertebral artery injury after midcervical spine fracture or subluxation. *Neurosurgery* 1994;34:435–442.
11. Biffl WL, Moore EE, Offner PJ, Burch JM. Blunt carotid and vertebral arterial injuries. *World J Surg* 2001;25:1036–1043.
12. Ramadan F, Rutledge R, Oller D, *et al.* Carotid artery trauma: a review of contemporary trauma center experiences. *J VascSurg* 1995;21:4655; discussion 55–56.
13. Cogbill T, Moore E, Meissner M, *et al.* The spectrum of blunt injury to the carotid artery: a multicenter perspective. *J Trauma* 1994;37:473–479.
14. Davis JW, Holbrook TL, Hoyt DB, *et al.* Blunt carotid artery dissection: incidence, associated injuries, screening and treatment. *J Trauma* 1990;30:1514–1517.
15. Eachempati SR, Vaslef SN, Sebastian MW, Reed RL. Blunt vascular injuries of the head and neck: is heparinization necessary? *J Trauma* 1998;45:997–1004.

Source of Support: None Declared  
Conflict of Interest: None Declared