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Case Report

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Blunt Cerebrovascular Injury with Severe Head Injury

Tamajyoti Ghosh[1], Sudip Kumar Sengupta[2] and Subir Dey[3*]

[1]*Senior Resident, Armed Forces Medical College, Pune, India*

[2]*Professor, Armed forces Medical College, Pune India*

[3]*Associate Prof, Armed Forces Medical College, Pune India*

[*]Corresponding author

Subir Dey,Associate Prof,armed Forces Medical college,Pune India

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Abstract

Blunt Cerebrovascular Injury (BCVI) are rare and comprises of less than 1% of total head injury in our tertiary neurocenter. This leads to significant morbidity and mortality of patient. This case report is to focus on the BCVI with head injury. Because of rarity of this disease, there's no treatment guidelines. However whatever the treatment we have is based on the experience of the surgeons/physician our case came to our Emergency Room with alleged history of lying along the road side in pool of blood .He was evaluated in peripheral hospital and he was later transferred to our center. Patient on evaluation was found to have transaction of Right ICA just distal to right Common carotid artery bifurcation. There was associated fracture of spinous process C5, C6. Probable mechanism of injury was sudden hyperextension of neck. Patient presented with delayed stroke following BCVI. He was managed with Right Decompressive hemicraniectomy and anticoagulation therapy was started for Right ICA injury. Thus early diagnosis and treatment of Blunt Cerebrovascular injury is essential in traumatic brain injury patients with risk factors for BCVI for definitive treatment of vascular injury with either stenting or surgery and thereby limiting morbidity and mortality of the patient.

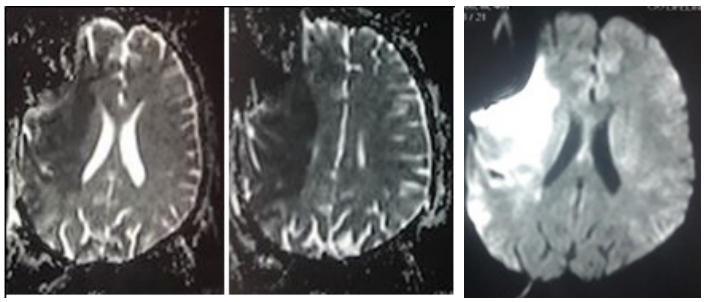
Keywords: Traumatic Brain Injury, Blunt Cerebrovascular Injury, Traumatic Infarct

Introduction

Lesions involving carotid artery and vertebral artery secondary to direct trauma is called blunt cerebrovascular injuries and are relatively rare with incidence rate of around 0.39–1.11% [1-4]. Cerebral Infarct resulting from blunt cerebrovascular Injury carries high mortality and morbidity ranging from 23 to 28% and 48-58% of survivors have significant neurological complications [5, 6]. Blunt traumatic Carotid Injury ranges from 0.08 to 0.27%. Most common cause being motor vehicle Injury [7-10]. Cerebral infarct occurs in 10-20% patients of BCVI [11].

Case Report

Here we present the case of a 38 year male with no known co morbidities who presented with alleged history of motor vehicular accident while riding a two wheeler he was found along the road side in pool of blood. He was comatose and brought to peripheral health care. His GCS at presentation was E1V2M4, pupils B/L 2 mm reacting. Multiple lacerated wound over scalp and neck. Patient had weakness in left side of body. After stabilizing and primary care, he was transferred to tertiary hospital. He was evaluated with CT Scan, MRI Brain which was suggestive of right MCA territory infarct. Patient was evaluated with CT Angiogram Brain and neck vessels which was suggestive of thrombus in proximal ICA in right side of neck. There was associated fracture of spinous process of C5-C6. Further he was evaluated with carotid Doppler study of neck vessels. This showed decreased flow in Right ICA with thrombus formation. Patient underwent Right Frontotemporoparietal decompressive Craniectomy and augmentative duraplasty. Post operatively patients GCS was E2V2M5 pupils B/L 2 mm reacting with left sided hemiplegia. Post operatively patient was stated on therapeutic dose of low molecular weight heparin in consultation with neurologist.



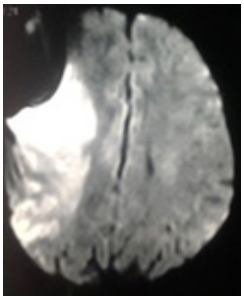


Figure 1: DWI & ADC showing Right MCA territory diffusion restriction

Figure 2: Carotid Doppler of neck vessels showing no flow in ICA maintained flow in Common carotis, and External carotid artery.

Figure 3: CT Angiogram neck vessels showing no flow in right ICA visible flow seen in contralateral.

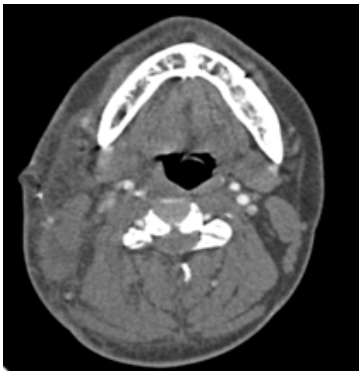


Figure 4: Axial CT Angiogram showing luminal narrowing of Right ICA.

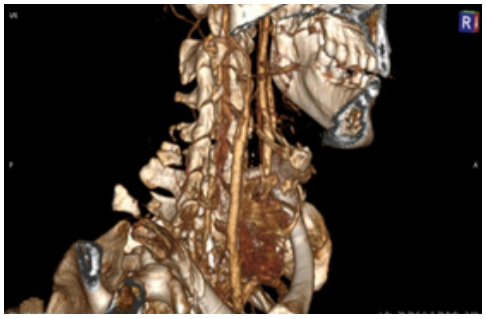


Figure 5: 3D reconstruction of CT Angiogram showing no distal flow to Right ICA. Associated fracture of spinous process C5, C6 can be seen.

Figure 6: Intraoperative picture of Right Frontotemporoparietal Decompressive Hemicraniectomy.

Discussion

Blunt trauma injury to neck may cause dissection with resultant occlusion, stenosis, aneurysm, or a combination of all three [12]. Main mechanism of injury include hyperextension and contralateral neck rotation of head where the ICA gets stretched across lateral process of cervical vertebra [13-17]. Other mechanism include direct pressure over neck. Disruption of intima causes luminal narrowing and occlusion of vessel. Subendothelial layer exposed initiates platelet aggregation leading to thrombus formation [18]. Transection of carotid artery may also lead to pseudoaneurysm formation [19].Main risk factor of a trauma patient for BCVI are low Glasgow coma scale, petrous fractures, and diffuse axonal injury and LeFort II and III fractures [20]. Although DSA is the investigation of choice but in emergency setup in our case it was the basis of diagnosis [21-24]. Colour Doppler is another modality to diagnose BCVI in emergency setup [25]. BCVI can be divided into five subtypes: 1. Luminal irregularity or dissection with <25% stenosis; 2. Dissection or intramural haematoma with ≥25% stenosis; 3. Traumatic aneurysm; 4. Occlusion; 5. Transection [26]. Our case is of category 5. Antithrombotic therapy is the basis of treatment of BCVI [27], but therapy in our case was delayed to 24 hours post surgery to avoid intracranial bleed. Patients with BCVI may develop stroke after 12-75 hours after injury which may even be delayed from several hours to week [27-30]. In our case had the patient been referred earlier following development of left sided

weakness within the window period of 4.5 hours. Stenting and repair of ICA could have been performed [32-34].

Conclusion

Post Traumatic Cerebral infarct is a potentially life threatening causing serious morbidity. CT angiogram of Brain and neck vessels should be routinely done in high risk patient as they are more likely to develop delayed infarct. Colour Doppler can also be used as bed side investigation to exclude BCVI. Patients presenting in window period following development of infarct can be salvaged by stenting and repair. Antithrombolytics are useful and may help in luminal recanalisation in BCVI cases.

References

1. Zoltán Bajkó , Smaranda Maier , Anca Moţăţăianu, Rodica Bălaşa and Smaranda Vasiu , et al.(2018) Stroke Secondary to Traumatic Carotid Artery Injury – A Case Report, J Crit Care Med (Targu Mures) 4: 23-28.
2. PR Miller, Timothy CF, Martin AC, Catherine C and JS Williams, et, al. (2002). Prospective screening for blunt cerebrovascular injuries: analysis of diagnostic modalities, and outcomes," Annals of Surgery. 236: 386-395.
3. Walter LB, CC Cothren, EE Moore, Rosemary K and Christine C, et al. (2009). Western Trauma Association critical decisions in trauma: screening for, and treatment of blunt cerebrovascular injuries. Journal of Trauma. 67: 1150-1153.
4. Walter LB, Charles ER, Ernest EM, Reginald JF, and Somer Aly, et al. (2002). Treatment-related outcomes from blunt cerebrovascular injuries importance of routine follow-up arteriography. Annals of Surgery. 235: 699-707.
5. Biffl WL, Moore EE, Offner PJ, Brega KE and Franciose RJ, et al. (1999). Blunt carotid arterial injuries: implication of a new grading scale. J Trauma. 47: 845-853.
6. Zoltán B, Rodica B, Anca M, Laura B and Adina S, Nicoleta S, et al. (2016). Malignant Middle Cerebral Artery Infarction Secondary to Traumatic Bilateral Internal Carotid Artery Dissection. A Case Report. J Crit Care Med. 2:135-141.
7. JW Davis, TL Holbrook, DB Hoyt, RC Mackersie and TO Field, et al. (1990). Blunt carotid artery dissection: incidence, associated injuries, screening, and treatment. J Trauma. 30: 1514-1517.
8. AA Parikh, FA Luchette, JF Valente, RC Johnson and GLanderson, et al. (1997). Blunt carotid artery injuries, J Am Coll Surg, 185: 80-86.
9. RR Kraus, JM Bergstein and JR DeBord (1999). Diagnosis, treatment and outcome of blunt carotid arterial injuries Am Surg, 178: 190-193.
10. JJ Colella and DL Diamond (1996). Blunt carotid injury: reassessing the role of anticoagulation, Am Surg 62: 212-217.
11. TC Fabian (2013) Blunt cerebrovascular injuries: Anatomic, and pathologic heterogeneity create management enigmas. Journal of the American College of Surgeons, 216: 873-885.
12. Friedman WA, Day AL, Quisling RG, Sypert GWand Rhoton AL (1980). Cervical carotid dissecting aneurysms. Neurosurgery. 7: 207-214.
13. Boldrey E, Maass L and Miller E (1956). The role of atlantoid compression in the etiology of internal carotid thrombosis. J Neurosurg. 13: 127-139.
14. Hughes JT and Brown ell B (1968). Traumatic thrombosis of the internal carotid artery in the neck. J Neurol Neurosurg Psychiatry. 31: 307-314.
15. New PJ and Momose KJ (1969). Traumatic dissection of the internal carotid artery at the atlantoaxial level secondary to nonpenetrating injury. Radiology. 93: 41-49.
16. Batzdorf U. Bentson JR and Machleder HI (1979). Blunt trauma to the high cervical carotid artery. Neurosurgery. 5: 195-201.
17. Burrows PE and Tubman DE (1981). Multiple extracranial arterial lesions following closed craniocervical trauma. J Trauma. 21:497-498.
18. ParkMS, Martini WZ, Dubick MA, Salinas J and Butenas S (2009). Thromboelastgraphy as a better indicator of hypercoagulable state after injury than prothrombin time or activated partial thromboplastin time. J Trauma. 67: 266-275.
19. Mitchell W Cox, David R Whittaker, Christopher Martinez, Charles J Fox and Irwin M Feuerstein, et al. (2007). Traumatic pseudoaneurysms of the head, and neck: Early endovascular intervention. Journal of Vascular Surgery. 46: 1227-1233.
20. Ajai K Malhotra, Marc Camacho, Rao R Ivatury, Ivan C Davis and Daniel J Komorowski, et al. (2007). Computed tomographic angiography for the diagnosis of blunt carotid/vertebral artery injury: a note of caution. Ann Surg. 246: 632-643.
21. Katrina P Emmett, Timothy C Fabian, Jennifer M DiCocco, Ben L Zarzaur, Martin A Croce (2011). Improving the screening criteria for blunt cerebrovascular injury: the appropriate role for computed tomography angiography. J Trauma.70: 1058-1063.
22. Charles P Shahan, Louis J Magnotti, Shaun M Stickley, Jordan A Weinberg, Leah E Hendrick, et al. (2016). A safe and effective management strategy for blunt cerebrovascular injury: avoiding unnecessary anticoagulation, and eliminating stroke. J Trauma Acute Care Surg. 80: 915-922.
23. Robert B Goodwin, Paul R Beery, Ronald J Dorbish, J Andrew Betz and Jayesh K Hari, et al. (2009). Computed tomographic angiography versus conventional angiography for the diagnosis of blunt cerebrovascular injury in trauma patients. J Trauma. 67: 1046-1050.
24. Fry WR, Dort JA, Smith RS, Sayers DV, Morabito DJ (1994). Duplex scanning replaces arteriography, and operative exploration in the diagnosis of potential cervical vascular injury. Am J Surg. 168: 693-695.
25. Biffl WL, Moore EE, Offner PJ, Brega KE and Franciose RJ, et al. (1999). Blunt carotid arterial injuries: implications of 25. a new grading scale.J Trauma. 47:845-853.
26. C Clay Cothren, Walter L Biffl, Ernest E Moore, Jeffry L Kashuk and Jeffrey L Johnson (2009). Treatment for Blunt Cerebrovascular Injuries Equivalence of Anticoagulation, and Antiplatelet Agents, Archives of surgery 144: 685-690.
27. Fabian TC, George SM, Croce MA, Mangiante EC and Voeller GR, et al. (1990)
28. Carotid artery trauma: management based on mechanism of injury.J Trauma. 30: 953-961.
29. Ahmad HA, Gerraty RP, Davis SM and Cameron PA (1999). Cervicocerebral artery dissections.J Accid Emerg Med. 16: 422-424.
30. Arulprakash N and Umaiorubahan M (2018). Causes of delayed arrival with acute ischemic stroke beyond the window period of thrombolysis, J Family Med Prim Care. 7: 1248-1252.
31. Krishna Amuluru, Fawaz Al-Mufti and Charles E Romero

(2018). Acute Ischemic Stroke due to Common Carotid Ostial Disease with Tandem Intracranial Occlusions Treated with Thrombectomy and Staged Retrograde Stenting and stenting. Interv Neurol. 7: 445-451.

32. Liu AY, Paulsen RD, Marcellus ML, Steinberg GK and Marks MP (1999). Long-term outcomes after carotid stent placement treatment of carotid artery dissection Neurosurgery. 45:1368-1373; discussion 1373-1374.
33. DM Coldwell, Z Novak, RK Ryu, K E Brega and WL Biffl, et al. (2000). Treatment of posttraumatic internal carotid arterial pseudoaneurysms with endovascular stents. J Trauma. 48: 470-472.
34. Yi AC, Palmer E, Luh GY, Jacobson JP and Smith DC (2008). Endovascular treatment of carotid, and vertebral pseudoaneurysms with covered stents. AJNR Am J Neuroradiol. 29: 983-987.
35. Reva VA, Pronchenko AA and Samokhvalov IM (2011). Operative management of penetrating carotid artery injuries. Eur J Vasc Endovasc Surg. 42:16-20.