Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: www.elsevier.com/locate/ijporl





Arun Garg^a, Yeeshu Singh^{b,*}, Pankaj Singh^a, Gaurav Goel^c, Susant Bhuyan^a

^a Department of Neurosciences. Medanta—The Medicity. Gurgaon. Harvana. India

^b Paediatric Neurology, Department of Neurosciences, Medanta—The Medicity, Gurgaon, Haryana, India

^c Interventional Neuroradiology, Department of Neurosciences, Medanta-The Medicity, Gurgaon, Haryana, India

ARTICLE INFO

Article history: Received 8 July 2015 Received in revised form 21 December 2015 Accepted 24 December 2015 Available online 16 January 2016

Keywords: Internal carotid artery Carotid artery dissection Adenoidectomy

What is known

The internal carotid artery may bulge medially in coronary plane directly behind the posterior pharyngeal wall where it can be injured during the process of adenoidectomy.

What is new

We have demonstrated the loop in contralateral right internal carotid artery. Since such abnormalities are usually bilateral, it is presumed that adenoidectomy on the left side possibly injured the extended loop and caused dissection of ipsilateral internal carotid artery.

1. Case report

A previously healthy 7 year old girl, with normal developmental milestones, developed right hemiplegia with global aphasia following adenoidectomy at a local hospital. As per referring surgeon, she was taken for adenoidectomy for persistent bilateral otitis media with effusion not responding to medical therapy and adenoid hypertrophy causing nasal obstruction. Her surgical note stated that while removing tissue torus tubarius, sudden bleeding

* Corresponding author. Tel.: +91 9717203390.

E-mail addresses: gargarungarg@hotmail.com (A. Garg),

Yeeshu.singh@medanta.org, yeeshusudan@gmail.com (Y. Singh),

pankaj.singh@medanta.org (P. Singh), gaurav.goel@medanta.org (G. Goel), sushant.bhuyan@medanta.org (S. Bhuyan).

ABSTRACT

Carotid dissection and cerebral infarction are extremely rare complications of adenoidectomy. We describe the case of seven year old girl, who suffered from left internal carotid artery dissection following adenoidectomy, leading to right hemiplegia with global aphasia. A CT angiogram confirmed a loop in contralateral right internal carotid artery. It is presumed that a similar loop also existed in left internal carotid artery, which possibly extended medially close to posterior pharyngeal wall and was injured during the course of surgery.

© 2015 Elsevier Ireland Ltd. All rights reserved.

started. Gauze packs put into the cavity failed to control the bleeding. The surgeon initially tried to clip the vascular pedicle but could not get a secure hold on the vessel. He then used a vessel sealing system (ERBE vessel sealing system–BICLAMP) to seal the vessel. This system uses bipolar current to seal vessels and generates heat with a limited lateral thermal spread. There was no further bleeding after that. When she was recovering from the effect of anaesthesia, weakness of right half of the face was noted. This was associated with a persistent left lateral gaze deviation and inability to follow verbal commands. MRI of brain (Fig. 1) confirmed water shed infarcts in left internal carotid artery (ICA) territory. Next day patient was referred to us for further management. At the time of admission, patient was conscious, globally aphasic with right facial paresis, 0/5 power on right side and left horner's syndrome. CT angiogram (CTA) revealed complete occlusion of left ICA one centimetre beyond the origin which wasflame shaped in contour (Fig. 2). The right ICA had a loop extending medially close to posterior pharyngeal wall (Fig. 3a and b). All other extra and intra cranial vessels were normal, which ruled out possibility of vasculitis or fibromuscular dysplasia. The history of adenoidectomy with profuse bleeding during the procedure, a loop in contralateral ICA (which is usually seen bilaterally) and flame shaped contour of occluded vessel suggested the possibility of injury to ICA leading to carotid artery dissection (CAD). However, another possibility of formation of major thrombus occluding ICA could not be ruled out. Rest of the investigations including prothrombotic workup and connective tissue serology were within normal limits. Patient was started on antiplatelet (aspirin) and physiotherapy. With intense physiotherapy and speech therapy, she has made



Case report



CrossMark



Fig. 1. MRI showing left ICA watershed infarct.

almost complete recovery by the end of three months. The only residual deficit is the left sided horner's syndrome.

Our Institutional Ethics Committee has given approval for publication of this case and proper consent has been taken from the patient's father.

2. Discussion

Carotid artery dissection (CAD) is responsible for about 2% of stroke cases in general population but its incidence is significantly higher in younger patients [1]. The disorder can be spontaneous or traumatic in nature and can affect intracranial or extracranial carotid artery. Traumatic CADs can occur as a result of major penetrating or non-penetrating traumas [2]. Spontaneous CADs are mostly intracranial in location, while traumatic ones are more commonly extracranial [3]. Accidental trauma to internal carotid artery following adenoidectomy, causing dissection and infarction is a rare but potentially serious complication. Very few cases of CAD following tonsillectomy and adenoidectomy have been described in literature [4,5]. As per one meta-analysis, patients of younger age (<12 years) appear to be more prone to such injuries [6]. Sudden-onset Horner's syndrome, particularly if associated with headache or neck pain or with an ipsilateral ischemic stroke in the carotid territory, can be considered to be specific to carotid-artery dissection and should lead to urgent investigation of the cervical arteries [7]. Carotid artery injury can take the form of pseudoaneurysm formation, dissection, thrombosis and occlusion of the vessel. All these can result in serious neurological sequelae due to ischemia. Pathologically, CAD is associated with a haematoma in the wall of the carotid artery, secondary either to an intimal tear or to direct bleeding within the arterial wall caused by ruptured vasa vasorum. The intramural haematoma can expand towards the intima or the adventitia, resulting in stenosis or aneurysmal dilation of the artery producing



Fig. 2. (A and B) CT angiography reconstructed images demonstrating the "Flame shaped" occlusion of the left internal carotid artery 1 cm distal to its origin suggestive of dissection (arrows).



Fig. 3. (a) CT angiography demonstrating the loop of the right internal carotid artery (arrow). (b) MR angiography time of flight (TOF) images demonstrating the loop of the right internal carotid artery (small arrow, arrow head and thick arrow). Due to the loop the ICA is medial then the usual location (small arrow), close to midline (long arrow).

cerebral ischemia by two possible mechanisms: hemodynamic changes or embolism [8]. Radiologically, CAD can present as a long tapered stenosis or occlusion which appears flame shaped (as seen in this case), or a dissecting aneurysm. The double lumen is difficult to demonstrate, although it is considered to be a pathognomonic sign [9]. In MRI, intramural bleeding is seen as hyperintensity surrounding the narrowed lumen on T2—weighted transverse images of the neck.

The ICA may bulge medially in coronary plane directly behind the posterior pharyngeal wall where it can be injured [6]. Weibel and fields introduced a simplified classification of aberrant courses of ICA [10]. Paulssen et al. described various courses of ICA straight, kinking, coiling or curved [11]. Redundant ICA is also one of the risk factors in patients undergoing adenoidectomy, and is prone to dissection following surgical trauma. Prevalence of kinks and coils ranges from 4 to 66% in general population (3-5% in those undergoing carotid endarterectomy). In one study redundancy was found in 62% of the cases who suffered from carotid dissection [12]. Copious bleeding after adenoidectomy is extremely rare and likely to be caused by an injured aberrant artery and occurs immediately after curettage. Aberrant course of internal carotid artery can bring it close to the nasopharyngeal mucosa and thus increase chances of injury to either the main vessel or its branches in the nasopharynx. A medial bulge or kink of the internal carotid artery can bring it closer to the nasopharyngeal mucosa about 5 mm on average. Lien et al. found that the distance between the ICA and nasopharyngeal mucosa was significantly shortened in the presence of aberrant nasopharyngeal ICA, increasing the risk of injury to the vessel in common nasopharyngeal surgeries like adenoidectomy [13]. On CTA and MRA of our patient, a loop was seen in right ICA which was going medially, close to posterior pharyngeal wall (Fig. 3a and b). Since such vascular anomalies are usually bilateral, it was presumed that such an aberrant course also existed on left side, resulting in lethal injury to the artery. However, after injury to left ICA leading to its occlusion, no such aberrant artery or course could be demonstrated on CTA or MRA. It should be noted that the heat of laser-assisted instruments or electronic devices may also result in necrosis of vessel wall because of thermal damage. Careful pre and intra operative evaluation may reveal a bulge or pulsation of the artery in the nasopharynx submucosally. Though, unfortunately no such bulge or pulsation could be seen in this patient on nasopharyngeal examination prior to surgery, otherwise CTA prior to surgery could have given accurate information on the course of internal carotid artery. The role of doing a CT angiogram to evaluate an aberrant internal carotid artery in all cases of adenoids or other simple and routine nasopharyngeal surgery is controversial and is a subject to be debated. A non-invasive technique like carotid Doppler prior to surgery may also give vital information on vessel course. To avoid injury to vital structures around the nasopharynx, it may be safer to use a suction diathermy with piecemeal removal of tissue under constant visualisation than using a microdebrider..

3. Conclusion

CAD is a rare complication after adenoidectomy. Careful inspection of nasopharynx prior to surgery may reveal abnormal pulsation, which may warn surgeon about the aberrant course of the vessels. Surgery should be postponed if abnormal pulsations are visualised and CTA or MR angiography should be done to exclude aberrant course of the major vessels. Curettage in a piecemeal fashion under visual control may help in preventing injury to aberrant arteries running in submucosal layer.

Contributions

Contribution credit YS: Data collection, analysed, preparation of manuscript.: AG conceptualised and supervised the data: PS Collection of data. AG, GG: critically reviewed the literature. SB: Data collection and review of literature. Name of Department— Department of Neurosciences, Name of Institution—Medanta-The Medicity, Gurgaon, Haryana, India

References

- J. Bogousslavsky, P.A. Despland, F. Regli, Spontaneous carotid dissection with acute stroke, Arch. Neurol. 44 (1987) 137–140.
- [2] W.L. Biffl, C.E. Ray Jr, E.E. Moore, R.J. Franciose, S. Aly, M.G. Heyrosa, et al., Treatment-related outcomes from blunt cerebrovascular injuries: importance of routine follow-up arteriography, Ann. Surg. 235 (2002) 699–706.
- [3] H.J. Fullerton, S.C. Johnston, W.S. Smith, Arterial dissection and stroke in children, Neurology 57 (2001) 1155–1160.

- [4] K.S. Carvalho, M. Edwards-Brown, M.R. Golomb, Carotid dissection and stroke after tonsillectomy and adenoidectomy, Pediatr. Neurol. 37 (2007) 127–129.
- [5] E. Wraige, V. Ganesan, K.R. Pohl, Arterial dissection complicating tonsillectomy, Dev. Med. Child. Neurol. 45 (2003) 638–639.
- [6] J.P. Windfuhr, G. Schloendorff, A.M. Sesterhenn, A. Prescher, B. Kremer, Adevastating outcome after adenoidectomy and tonsillectomy: ideas for improved prevention and management, Otolaryngol. Head. Neck. Surg. 140 (2009) 191– 196.
- [7] S. Debette, D. Leys, Cervical-artery dissections: predisposing factors, diagnosis, and outcome, Lancet Neurol. 8 (2009) 668–678.
- [8] W.I. Schievink, Spontaneous dissection of the carotid and vertebral arteries, N. Engl. J. Med. 344 (2001) 898–906.
- [9] J.M. Provenzale, MRI and MRA for evaluation of dissection of craniocerebral arteries: lessons from the medical literature, Emerg. Radiol. 16 (2009) 185–193.
- [10] J. Weibel, W. Fields, Tortuosity, coiling and kinking of the internal carotid artery, Neurology 15 (1965) 7–18.
- [11] F. Paulsen, B. Tillmann, C. Christofides, W. Richter, J. Koebke, Curving and looping of the internal carotid artery in relation to the pharynx: frequency, embryology and clinical implications, J. Anat. 197 (2000) 373–381.
- [12] P.J. Barbour, J.E. Castaldo, A.D. Rae-Grant, W. Gee, J.F. Reed 3rd, D. Jenny, et al., Internal carotid artery redundancy is significantly associated with dissection, Stroke 25 (1994) 1201–1206.
- [13] C.F. Lien, H.H. Weng, B.S. Lin, C.F. Liu, T.C. Wu, Y.S. Lin, Effect of carotid artery aberrancy on the distance between the vessel and nasopharyngeal subsites, J. Chin. Med. Assoc. 77 (2014) 253–257.