Case Report / Olgu Sunumu

Tortuosity of the internal carotid artery detected during tonsillectomy: two case reports

Tonsillektomi esnasında saptanan internal karotis arter aşırı kıvrımı: İki olgu sunumu

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Tonsillectomy is one of the most common performed surgical procedures in childhood. Tortuosity of the internal carotid artery (ICA) is an anatomical variation of the course of the ICA, and can be seen at any levels along the course of the artery, even in lateral oropharyngeal wall. In this article, we present two cases in which ICA tortuosity detected as a pulsating mass in the lateral oropharyngeal wall in an eight-year and a five-year-old girls, during tonsillectomy.

Key Words: Adenoidectomy; internal carotid artery; pharynx; tonsillectomy; tortuosity.

Tonsillektomi, çocukluk çağında yapılan en yaygın cerrahi işlemlerden biridir. İnternal karotis arter (İKA) aşırı kıvrımı İKA'nın anatomik bir varyasyonudur ve arterin seyri boyunca herhangi bir bölgede, hatta orofarengeal yan duvarda görülebilir. Bu yazıda, sekiz ve beş yaşlarında iki kız çocuğunda tonsillektomi esnasında saptanan ve yan orofarengeal fossada pulsatif kitle olarak görünen İKA aşırı kıvrımı olgusu sunuldu.

Anahtar Sözcükler: Adenoidektomi; İnternal karotis arter; farenks; tonsillektomi; aşırı kıvrım.

Even in the simplest routine surgeries in the practice of otolaryngology, it is very important to evaluate the anatomic structures of the head and neck region before planning the operation.[1] Because this area is proximate to vital vascular structures like the carotid artery, if an anatomical variation is not recognized before surgery, serious problems may occur during and after surgery.[1-3] The surgeon has to be careful due to the possible existence of an anatomical variation.

Here, we present cases of an eight-year-old and five-year-old girl where anomalies of the internal carotid artery (ICA) were encountered during tonsillectomy to highlight the possible anatomical variations of the ICA in the oropharynx and help avoid disastrous complications in oropharyngeal surgeries.

CASE REPORT

Case 1– A tonsillectomy was planned in an eight-year-old girl with grade 4 tonsils for excessive

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snoring, mouth breathing and sleep disturbances. The preoperative examination did not show any abnormal or pulsating mass in the pharyngeal wall. Under general anesthesia, the neck was extended and the mouse opener was inserted. After elevating the right tonsil, a pulsating mass was observed in the right pharyngeal wall, lying about 1 cm medially to the inferior pole of the tonsil. The oropharynx and nasopharynx were re-examined by palpation because of the possibility of a vascular anomaly. Postponing tonsillectomy was discussed, but when the distance was estimated to be 1 cm between the pulsation and the inferior pole of tonsil, a decision was made to continue the operation. Without using any cauterization and starting from the superior pole, dissection of the tonsil was carefully carried out with cold knife. The postoperative period was uneventful except for serious pain that the patient suffered the first day after surgery. Although the pain could be relieved by acetaminophen and ibuprofen, it lasted for two weeks. The vascular anomaly was confirmed with computed tomography (CT) angiography, which revealed tortuosity of the right ICA in the lateral pharyngeal wall (Figure 1, 2).

Case 2– An adenotonsillectomy was recommended for a five-year-old girl with adenotonsillar hypertrophy. Aside from grade 4 kissing tonsils, the preoperative oropharyngeal examination was normal. When the right tonsil was elevated during the operation, a pulsation was detected in the posterolateral pharyngeal wall. The grade 4 tonsils had hidden the pulsation. Suspecting a great vessel anomaly, tonsillectomy was performed carefully with a cold knife. After the operation, CT angiography showed a tortuous ICA on the right lateral pharyngeal wall (Figure 3, 4).

DISCUSSION

According to our classical knowledge, the cervical part of the ICA has a straight course until the skull base[3] but anatomical variations of the ICA both in terms of structures and courses have been reported previously.[1-6] Variation of the course of the ICA was particularly described by Henle in 1868.[3] Based on both postmortem and angiographic investigations, the incidence of anatomical variations of ICA may be as high as 66%.[3] Weibel and Fields[7] in 1965 classified the course of the ICA as straight, S- or C-shaped elongation, kinking and coiling. Paulsen et al.[3] used the same classification in their postmortem investigation, but preferred the term curved instead of S- or C-shaped elongation. Herrschaft[8] investigated angiographies and showed that the course of the ICA was straight in 82.7%, C-

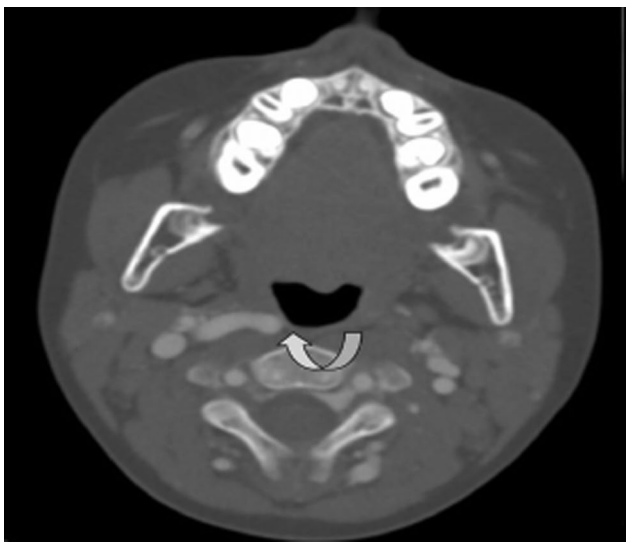

Figure 1. *Axial section of the cervical computed tomography angiography. Window level at the bone preset. The tortuosity of the internal carotid artery on the lateral pharyngeal wall is seen (curved arrow).*

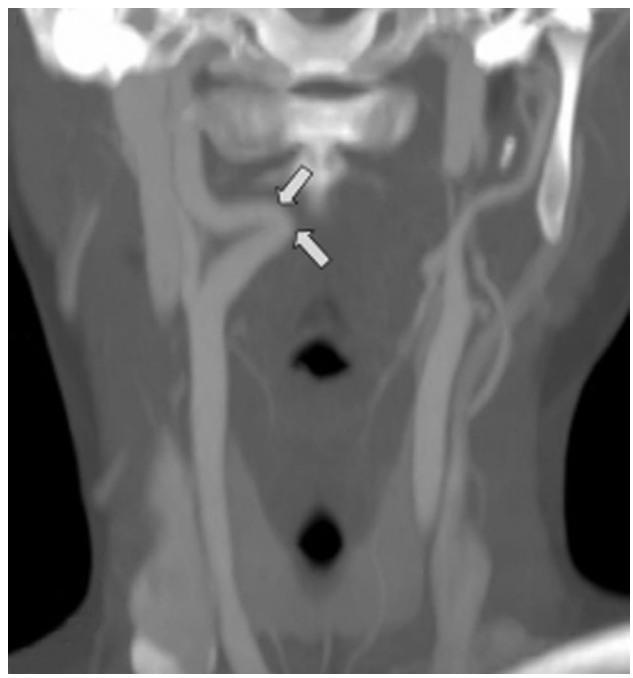

Figure 2. *Coronal thick section maximum intensity projection of the raw data obtained during cervical computed tomography angiography. The relationship between the internal carotid artery and pharyngeal wall (arrows).*

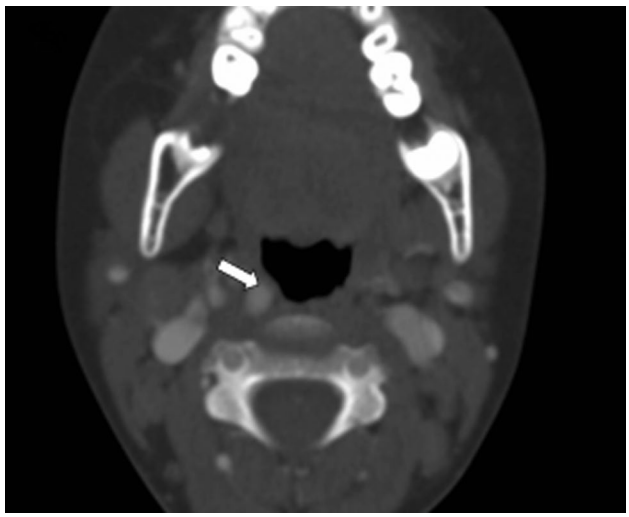

Figure 3. *Axial section of the cervical computed tomography angiography. Window level at the bone preset. Arrow depicting the aberrant right internal carotid artery running very close to the oropharyngeal mucosa (white arrow).*

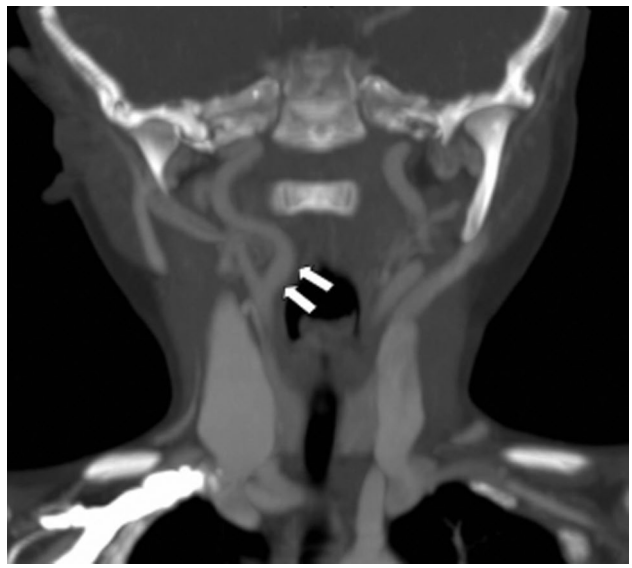

Figure 4. *Coronal thick section maximum intensity projection of the raw data obtained during cervical computed tomography angiography. Arrows clearly depict the aberrant course of the right internal carotid artery (double arrows).*

or S- shaped in 12.2% and "extremely sigmoid, siphon or circular ansa" in 5.1%. In another study of 509 CT scans, Jun et al.[9] found that the tortuous ICA was the most common type (51.4%). In 191 postmortem investigations, Paulsen et al.[3] reported a straight course in 67.7%, curved course in 26.2%, kinking in 4.3% and coiling in 1.8%. In addition, they found six cases of kinking and two of coiling with a close relationship to the tonsillar fossa.

Although the etiology of anatomical variations of the ICA is not known exactly, two causes are suggested: congenital deformity and acquired causes such as atherosclerosis.[3,6,7,10,11] In embryological life, the ICA originates from the third aortic arch and the proximal part of the dorsal aorta. During the first fetal month, these two components join and a loop occurs. In the second month of fetal life, normally, displacement of the heart and great vessels into the mediastinum results the straightening and elongation of the artery.[3,6,11] As a consequence of incomplete development or accelerated linear growth of the artery, a loop may persist.[3] Also, both tortuosity and coiling occur in many vessels such as the vertebral artery and the facial artery.[3,6] Ovchinnikov et al.[6] claimed that these forms of arteries may provide moving ability, even for the cervical part of the ICA. According to Schenk et al.[10] kinking of the ICA is due to old age, but curvature and coiling are congenital. Their reason is that kinking of the ICA arises with cerebrovascular signs, while tortuosity and coiling are usually asymptomatic.[1,3,6,10] In our cases, the right ICA had tortuosity in the lateral pharyngeal wall, while the left ICA had a straight course. When we consider the fact that our patients were children, we can easily argue that this was not caused by atherosclerosis and must therefore be congenital deformities.

Tortuosity of the ICA may be seen as a pulsating mass during oropharyngeal operations as we observed in our cases. Tortuosity of the artery may be in the tonsillar fossa,[1,3] inferior to the palatine tonsil,[2] and in the nasopharynx[12] where the ICA courses submucosally. A tortuous common carotid artery may also be seen together with tortuosity of the ICA.[13] If an abnormal ICA exists in the oropharynx, massive bleeding may occur during or after surgical procedures such as adenoidectomy, tonsillectomy, uvulopalatoplasty, and incision or drainage of peritonsillar abscess.[1-3] Deaths have been reported during adenoidectomy because of massive hemorrhage.[3,12] In our cases, tortuosity of the ICA could not be seen initially because of tonsillar hypertrophy and when the palatine tonsils were elevated, we met an unexpected mass. Therefore, because of the possibility of such a situation where there are no symptoms before surgery, the surgeon

should be careful during the operation, and any abnormality in the oropharynx and nasopharynx should be palpated. The risk of life-threating bleeding increases during oropharyngeal surgeries for patients with tortuosity of the ICA if instrumentation is directly performed on the unexpected pulsating mass.

Although anatomical variations of the course of the ICA have been known for a long time,[1] most are detected coincidentally.[1-4] Tortuosity of the ICA is usually asymptomatic but occasionally may cause dysphagia, pharyngodynia, globus sensation, dyspnea and tinnitus depending on the location of the abnormality.[1,2,4] However, these signs are frequently encountered in ear nose and throat practice, and mostly due to other reasons.

Magnetic resonance (MR) imaging[1] and MR angiography[1,2,5] are useful when there is a suspicion of anatomical variation of the ICA. Angiography confirms the diagnosis[2,5] but MR angiography is preferred it is a noninvasive procedure.[5] In anatomical variations where the ICA courses on the skull base or the temporal bone, CT and CT angiography might be more efficient for diagnosis.[1,14] We confirmed our diagnosis with CTA. As an imaging procedure, CTA has been preferred over MR angiography due to high spatial resolution and lack of soft tissue-air interface artefacts.[15]

In conclusion, an anatomical variation of the course of the ICA may be seen anywhere along its course. A surgeon who performs oropharyngeal surgery should remember this possibility both before and during surgery. Otherwise, massive bleeding, and worst of all, death of the patients may occur.

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REFERENCES

1. Galletti B, Bucolo S, Abbate G, Calabrese G, Romano G, Quattrocchi C, et al. Internal carotid artery transposition as risk factor in pharyngeal surgery. Laryngoscope 2002;112:1845-8.
2. Sichel JY, Chisin R. Tortuous internal carotid artery: a rare cause of oropharyngeal bulging diagnosed by magnetic resonance angiography. Ann Otol Rhinol Laryngol 1993;102:964-6.
3. Paulsen F, Tillmann B, Christofides C, Richter W, Koebke J. Curving and looping of the internal carotid artery in relation to the pharynx: frequency, embryology and clinical implications. J Anat 2000;197:373-81.
4. Maybody M, Uszynski M, Morton E, Vitek JJ. Absence of the common carotid artery: a rare vascular anomaly. AJNR Am J Neuroradiol 2003;24:711-3.
5. Okami K, Onuki J, Ishida K, Kido T, Takahashi M. Tortuosity of the internal carotid artery--report of three cases and MR-angiography imaging. Auris Nasus Larynx 2001;28:373-6.
6. Ovchinnikov NA, Rao RT, Rao SR. Unilateral congenital elongation of the cervical part of the internal carotid artery with kinking and looping: two case reports and review of the literature. Head Face Med 2007;3:29.
7. Weibel J, Fields WS. Tortuosity, coiling, and kinking of the internal carotid artery. I. Etiology and radiographic anatomy. Neurology 1965;15:7-18.
8. Herrschaft H. Abnormal tortuosity of the internal carotid artery and its clinical significance in surgery of the neck area. Z Laryngol Rhinol Otol 1969;48:85-98.
9. Jun BC, Jeon EJ, Kim DH, Kim BY, Lee JH, Jin SY, et al. Risk factors for decreased distance between internal carotid artery and pharyngeal wall. Auris Nasus Larynx 2012;39:615-9. doi: 10.1016/j.anl.2011.10.018.
10. Schenk P, Temmel A, Trattnig S, Kainberger F. Current aspects in diagnosis and therapy of carotid artery kinking. HNO 1996;44:178-85.
11. Wasserman JM, Sclafani SJ, Goldstein NA. Intraoperative evaluation of a pulsatile oropharyngeal mass during adenotonsillectomy. Int J Pediatr Otorhinolaryngol 2006;70:371-5.
12. Mc Kenzie W, Woolf CI. Carotid abnormalities and adenoid surgery. J Laryngol Otol 1959;73:596-602.
13. Yildiz S, Cece H, Karayol S, Ziylan Z. Concurrence of the tortuosity of bilateral common and left internal carotid arteries in a case with common origin of the innominate trunk and left common carotid artery. Surg Radiol Anat 2010;32:797-9. doi: 10.1007/s00276-010-0667-8.
14. Rojas R, Palacios E, D'Antonio M, Correa G. Aberrant internal carotid artery as a cause of pulsatile tinnitus and an intratympanic mass. Ear Nose Throat J 2003;82:173-4.
15. Prokop M, Waaijer A, Kreuzer S. CT angiography of the carotid arteries. JBR-BTR 2004;87:23-9.