

A Review on Clinical Significance of Hyoid Bone

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Abstract

The hyoid bone is a horseshoe-shaped bone situated in the anterior midline of the neck between the chin and the thyroid cartilage. At rest, it lies at the level of the base of the mandible in the front and the third cervical vertebra (C3) behind. The hyoid bone is a unique structure in the human body for many reasons. The hyoid bone is the only bone in humans that does not articulate with any other bone, but only has muscular, ligamentous, and cartilaginous attachments. Together with its attached muscles, the hyoid bone has number of physiological functions, including breathing, swallowing and speech and other two important functions: it holds up the tongue, which sits above it, and it holds up the larynx, which hangs below it by bracing these structures alongside each other in order to produce variation. Typically, a broken hyoid result from forced strangulation (i.e. choking). The position of the hyoid bone one of the important considerations for obstructive sleep apnoea because it anchors the musculature of the tongue in keeping the airway patent. A few other clinical considerations such as Hyoid bone insertion tendinitis, hyoid bone syndrome, Eagle's syndromes are discussed in this article.

Keywords: *Hyoid bone, greater cornua, syndromes*

Introduction

The hyoid bone is a U-shaped bone that is held in place by muscles from the anterior triangle of the neck, the larynx, pharynx, tongue, and the floor of the mouth. The name hyoid derives from the Greek word "hyodeides," which means "shaped like the letter Upsilon(υ)." It is classified as a sesamoid bone which means it is a freely floating bone and unlike other bones the hyoid does not feature any points of articulation (joints) with other bones. It is anatomically positioned in the midline of the neck, anteriorly at the base of the mandible, posteriorly at the fourth cervical vertebra and just superior to the thyroid cartilage. The hyoid bone can be divided into three component parts (Fig 1): (a) the body of the hyoid, (b) the lesser cornua, and (c) the greater cornua. The body of the hyoid is centrally located, while the cornua are on both sides. The body is laterally stretched and quadrilateral in shape. It forms the convexity of its classical U-shape (Fig 2), with its outer (anterior) border forming the convexity and the inner (posterior) border forming the concavity. There is a vertical

median ridge located in the midline of the body. The lesser cornua are small conical projections oriented upwards. The greater cornua extends backwards from the body of the hyoid. This bone also provides a place of attachment for many muscles such as suprahyoid muscles namely digastric, stylohyoid (skull), mylohyoid (mandible) and geniohyoid (genial tubercle) and the infrahyoid muscles namely sternohyoid (sternum), sternothyroid (sternum), omohyoid (medial border of scapulae notch), and thyrohyoid (thyroid cartilage), associated with the mouth's floor (hyoglossus), as well as the larynx, pharynx (middle pharyngeal constrictor muscle), and epiglottis [1]. The second pharyngeal arch forms the lesser horn (cornua) and the upper body of the hyoid, while the greater horn (cornua) and the lower portion of the body derive from the third pharyngeal arch (Fig 3).

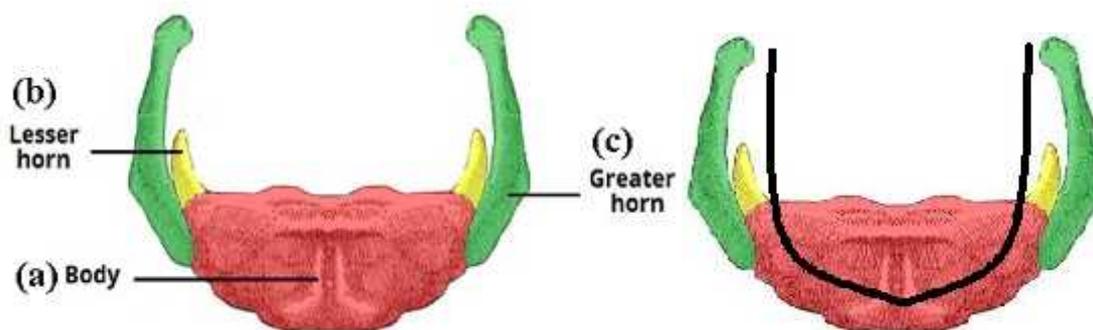


Figure 1- Parts of the Hyoid Bone Figure 2- Hyoid Bone-"U" shape

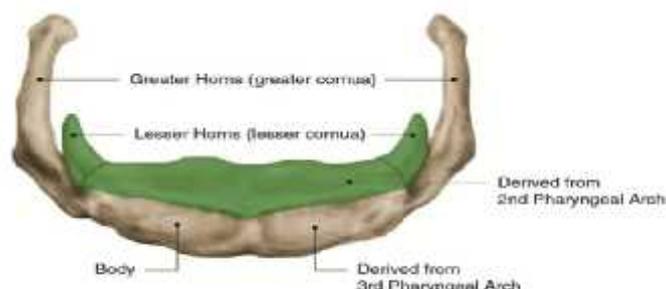


Figure 3-development of hyoid bone

Clinical consideration

In general consideration of cervicofacial skeleton, the hyoid bone tends to be overlooked or is given scant attention. However, it is associated with several important functions of the human body such as deglutition, phonation, and respiration. [1]

1. Obstructive Sleep Apnea Syndrome

Hyoid bone plays an important role in keeping the airway patent. Upper airway structures tend to collapse in the supine position. The compensatory reflexes acting on pharyngeal dilators holding the hyoid bone forward help in preventing pharyngeal narrowing during the life span (Farhana, et al., 2010). The position of the hyoid bone may be important consideration for obstructive sleep apnoea because it anchors the musculature of the tongue, (Lyberg, et al., 1989). When this bone is low, the tongue positioned further back, reducing airway potency. It has also been shown that, in OSA patients' hyoid bone is located in a lower position, in relation to different skeletal structures when compared with controls, (Lyberg, et al., 1989). Since it forms the anterior boundary of airway, (Bibby and Preston, 1981), any change in its position can adversely affect the dimensions of airway. [1]

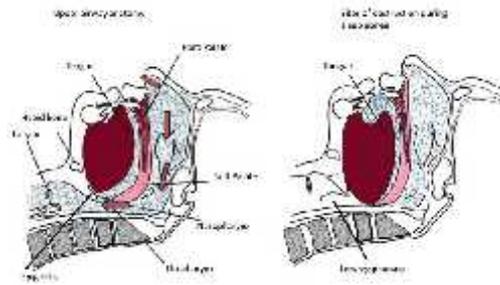


Figure 4-Obstructive Sleep Apnea

2. Hyoid Bone Insertion Tendinitis

Microscopically, degenerative changes in the striated muscle tissue, which are characterized by myocyte necrosis, atrophy along with fibrosis and calcification in some foci, were observed. Hyoid bone insertion tendinitis is a complex of symptoms comprising tenderness on greater cornu of hyoid on palpation, pain in the neck and throat while swallowing and neck movement. Sharp or dull pain spreading to temporal region, sternocleidomastoid muscle, posterior pharyngeal wall, ear or supraclavicular region is the main symptom. Swallowing or head movement can trigger or increase the pain.^[2] Hyoid bone syndrome was first described by Brown in 1954. Later, Steinmann reported that hyoid bone syndrome was a form of insertion tendinitis. Ernest III also showed the histopathologic evidence that hyoid bone syndrome is a form of insertion tendinitis.^[2,3]

(a) Hyoid bone syndrome

The greater cornu of the hyoid bone on both sides was found to be long upon neck CT, in addition to approaching the transverse process of the fourth cervical vertebra. The excessively long greater cornu of the hyoid bone was observed on both sides of neck on CT imaging, with the greater cornu of the hyoid bone approaching the transverse process of the third cervical vertebra.^[4]

3. Eagle Syndrome

Eagle's syndrome (ES) consists of craniofacial and neck pain due to elongation of the styloid process and/or calcification of the stylohyoid ligament (Fig 5 and 6). The normal length of the styloid process ranges from 2 to 3 cm and it is hardly palpable. ES is usually an asymptomatic disease that mostly affects women aged 30 to 50 years.^[5]

There are two types of Eagle syndrome.

- The first type (Fig 5) is the classic Eagle syndrome or the classic styloid syndrome, usually seen after tonsillectomy as pharyngodynia found in the tonsillar fossa, occasionally associated with odynophagia, dysphagia, foreign body sensation, hypersalivation, and seldom, temporary voice changes. All these symptoms appear when the tightened tonsillectomy scar tissue moves along the tip of an elongated styloid process through functional movements.
- The second type (Fig 6) is called the stylo-carotid syndrome and it develops following the compression of the internal and/or external carotid arteries and their perivascular sympathetic fibres, which leads to constant pain that radiates to the carotid region, such as chronic neck pain, headache, pain when moving the head and pain that radiates to the eye. Other symptoms include vertigo and ear pain. Therefore, patients with these symptoms may present to the ENT, dental, neurosurgery, or ophthalmology clinics with a variety of complaints. Additionally, as described above, this syndrome may be the result of calcification of the stylohyoid ligament.^[6]

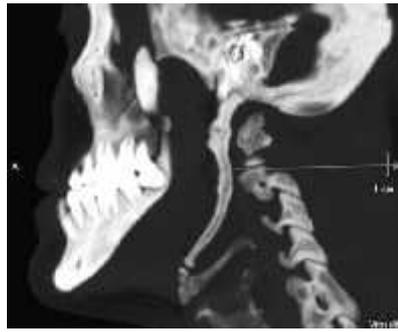


Figure 5- Eagle Syndrome –



Figure 6 - Eagle Syndrome –

elongated styloid process(type 1)calcification of stylohyoid ligament (type 2)

4. Hyoid Fracture

Hyoid bone fracture is usually the result of direct trauma to the neck because of manual strangulation, hanging, blunt trauma or projectiles. However, fracture of the hyoid bone is rare because it is protected by the mandible. This injury can cause rapid deterioration of a patient's condition and can quickly become life-threatening. In most cases, a missed or delayed diagnosis can result in morbidity and death.^[6, 7]

Hyoid bone fractures are classified into three different types:^[8]

- Inward compression fractures with outside periosteal tears (Fig 7)
- Antero-posterior compression fractures with inside periosteal tears
- Avulsion fractures

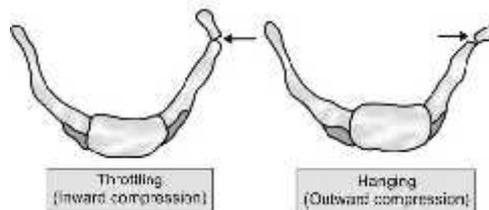


Figure 6- Compression fracture inward and outward

5. Absence of the hyoid bone

The absence of the hyoid bone has been reported as well in a male neonate who was also a teratoma case, had a mandibular cleft, and suffered from respiratory distress. These anomalies correlate to some clinical conditions such as micrognathia, Pierre Robin sequence, and cleft lip and palate. Symptoms caused by these anomalies include dysphagia, neck movement limitations and foreign body sensation in the throat.^[6]

Conclusion

For obstructive sleep apnoea, functional appliances such as twin blocks are used in developing Class II division 1 malocclusion not only to improve facial esthetics but also to increase the pharyngeal airway space along with a favourable hyoid bone position. This in turn may significantly reduce the chances of obstructive sleep apnoea in future.^[11] Hyoid bone insertion tendinitis is a degenerative muscle injury which involves the origin fibres of the middle pharyngeal constrictor muscle on the greater cornu of the hyoid bone. The microscopic evidence of injury to the middle pharyngeal constrictor muscle of the pharynx, as described, lends validity to other clinical reports of patients who suffer hyoid bone syndrome.^[9] In Eagle's syndrome, approximately 4% of the population has elongated styloid process, but only 4 to 10.3% of this group has its symptoms.^[5] It is important to note that an elongated styloid process does not necessarily signify Eagle's

syndrome, as the majority of individuals exhibiting this anatomical anomaly experience no symptoms. Also, it is noteworthy that the occurrence of the syndrome correlates with the length of the styloid process, its width and its angulation. Eagle's syndrome should be included in the differential diagnosis of cervicofacial and pharyngeal pain. The fact that it is often excluded in such cases results in underdiagnosis and, consequently, an underestimation of the incidence of this syndrome.^[9, 10] Hyoid bone fractures represent 0.002% of all fractures; they are rare because the hyoid bone is well-protected by its location in the neck behind the mandible and in front of the cervical spine.^[10]

Reference

1. Syeda S Yashmin, Ragni Tandon, Kamlesh Singh and Aftab Azam, Review Article Role Of Hyoid Bone In Obstructive Sleep Apnoea, International Journal of Current Research, April, 2018, Vol. 10, Issue, 04, pp.68063-68066.
2. Utku Aydil · Özgür Ekinci · Ahmet Köybaioflu | Hyoid bone insertion tendinitis: clinicopathologic correlation| Yusuf KizilEur Arch Otorhinolaryngol (2007) 264:557–560 DOI 10.1007/s00405-006-0220-x
3. Yoshimitsu Saito, Yasuhiro Miyamoto, Aibi Akashi, Masatoshi Akutsu, Satoko Fujita, Koushi Mikami, Shigeru Kasugai, Manabu Nakamura, Yoshihiro Akazawa, Yuichiro Yaguchi, Shoji Watanabe, Izumi Koizuka| Two Cases of Hyoid Bone Syndrome|J-STAGE: November 25, 2016 Volume 147 Pages 50-51
4. Ana Beatriz Soldati¹, Cláudia Miguelote¹, Carla Quero², Rita Pereira³, Roberto Santos⁴, Cristiane Soares⁵| Eagle's syndrome Síndrome de Eagle| Arq Neuropsiquiatr 2013;71(4):264-268.
5. Ghadeer H. AlJulaih¹; Ritesh G. Menezes²|Anatomy, Head and Neck, Hyoid Bone|Treasure Island (FL): StatPearls Publishing; 2020 Jan.
6. Yauh-Mirng Jehng a , Francis Tzen-Tak Lee a , Yung-Chia Pai a,b , Wai-Mau Choi a,b,|Case Report Hyoid bone fracture caused by blunt neck trauma| Journal of Acute Medicine| | September 2012| Volume 2| Issue 3| Pages 83-84.
7. Dalati, T. | "Isolated hyoid bone fracture"| *International Journal of Oral and Maxillofacial Surgery*| (2005) |34 (4): 449–452.
8. Ramchand, Tekchand; Choudhry, Osamah J.; Shukla, Pratik A.; Tomovic, Senja; Kuperan, Arjuna B.; Eloy, Jean Anderson (2005) |"Management of hyoid bone fractures: a systematic review"| *Otolaryngology–Head and Neck Surgery*| (2005) | 147 (2): 204–208.
9. MARIA PIAGKOU, * SOPHIA ANAGNOSTOPOULOU, KONSTANTINOS KOULADOUROS, AND GIANNOULIS PIAGKOS|Eagle's Syndrome: A Review of the Literature | (2009) | Clinical Anatomy 22:545–558.
10. Edwin A. Ernest, III, DMD, FAANaOS and E. George Salter, PhD |Hyoid Bone Syndrome|*first published in the Journal of Prosthetic Dentistry*¹ in 1991, this report of hyoid bone syndrome has been updated by the authors to reflect the latest information on the condition. 6(8); 45-9.