Case report

A complex fracture of the hyoid bone and the larynx after a bicycle accident – Case report and review of literature

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A B S T R A C T

Introduction and importance: Reports about laryngeal trauma and fractures of the hyoid bone are rare in the literature. Most cases are forensic cases and the results of postmortem analysis. Traumatic larynx and hyoid bone fractures represent a rare but important differential diagnosis of the common symptom hoarseness.

Case presentation: A 60-year-old female patient presented with unclear dysphonia and globus sensation following intubation for a surgical treatment for a lower leg fracture after a bicycle accident two months ago. Endoscopy and the computed tomography (CT) of the neck revealed a fixed and immobile fractured piece of the larynx, a hyoid bone fracture and a pseudarthrosis between the greater horn of the hyoid bone and the upper edge of the thyroid cartilage. The hyoid bone fracture led to a distortion of the supraglottis. After surgical removal of the fractured part of the hyoid bone and the pseudarthrosis separation, the supraglottis appeared symmetrical again. Four weeks after surgery the patient was symptom-free.

Clinical discussion: Though combined hyoid bone and larynx fractures after traumatic injuries are rare, they represent an important differential diagnosis in trauma patients with dysphagia or dysphonia. The clinical symptoms can vary and occur immediately or within a latent period taking weeks or months until the proper diagnosis. Depending on the symptoms, surgical management can be effective.

Conclusion: An isolated partial resection of the hyoid bone with separation of the pseudarthrosis is a reasonable therapeutic option and can lead to completely resolving symptom. Preoperatively, a CT provides further valuable information.

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1. Introduction

Laryngeal trauma and fractures of the hyoid bone is are: In the literature, the frequency is given as 0.002% of all fractures [1–3]. Hyoid bone fractures can arise after direct trauma, as a result of suicidal or criminal acts as indirect, so-called muscular fractures. Furthermore, they can also occur after hyperextension of the cervical spine and iatrogenic, e.g. after hyperextension during surgical resection of a median branchial cyst [2,4]. In general, hyoid bone fractures are commonly combined with accompanying injuries, e.g. mandibular fractures, extensive LeFort fractures and laryngeal injuries. Most reported cases are forensic cases and the results of postmortem analysis [5,6]. Most publications revolve around the changes of the hyoid bone and the larynx after hanging [2,4–6].

Here, we present a rare case from an academic tertiary referral center that shows the successful therapy of a complex fracture of the larynx and the hyoid bone after a bicycle accident. The work has been reported in line with the SCARE criteria [7].

2. Case presentation

A 60-year-old woman was referred to our University Hospital Erlangen, Department of Otorhinolaryngology, Head and Neck Surgery with dysphonia and a globus sensation after being intubated for a surgical treatment of a lower leg fracture after a bicycle accident two months ago.

Her previous medical history showed no further traumas and a well-controlled arterial hypertension. There was no pertinent drug, family or psychosocial history regarding this patient. Endoscopy showed a massive bulging base of the tongue base and the vallecula on the left side with consecutive tilting of the epiglottis (Fig. 1A+B). Immediately performed computed tomography (CT) of the neck revealed a partial larynx and hyoid bone fracture and a pseudarthrosis/neo-joint between the greater horn of the hyoid bone and the upper edge of the thyroid cartilage (Fig. 2A–D). In addition, a fracture of the thyroid cartilage could be detected (Fig. 2C).

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Intraoperatively, the preparation of the hyoid bone showed a broken and caudal distorted bone fragment posteriorly pushing into the pharynx. Furthermore, a fractured part of the greater horn of the hyoid bone was displaced caudo-anteriorly and formed a pseudarthrosis with the upper edge of the thyroid cartilage. There were also two small fracture-lines in the anterior thyroid cartilage, but they were already fixed and immobile. The thyroid cartilage was not dislocated.

In general anesthesia a partial resection of the hyoid bone and the separation of the pseudarthrosis was performed through an open surgical approach (Fig. 3A–C), by a team of experienced head and neck surgeons. The extent of the hyoid bone resection was discussed intraoperatively.

Fig. 1. Preoperative endoscopy and 3D volume rendering of the preoperative CT scan. A) Preoperative, endoscopic image taken with a 70° endoscope, showing the protrusion of the supraglottis (arrow). B) 3D volume rendering of the fracture of the hyoid bone (*) and the pseudarthrosis of the thyroid cartilage and the hyoid bone (arrow).

Fig. 2. Preoperative CT imaging. A–C) Preoperative axial CT scans showing the deformed left thyroid cartilage and the fracture of the hyoid bone with a neo-joint between an extension of the left greater horn of the hyoid bone and the upper left edge of the thyroid cartilage (arrow). D) 3D volume rendering of the hyoid bone and the thyroid cartilage (posterior anterior view) illustrating the fracture of the hyoid bone and the neo-joint between the thyroid cartilage (arrow).
Only the left greater horn of the hyoid bone and a small part of the left-sided body of the hyoid bone was resected (Fig. 3C). The rest of the hyoid bone remained in order to maintain swallowing function.

The pseudoarthrosis was separated using the scissors with a cut at the upper edge of the thyroid cartilage. Therefore, no resection of the cartilage was needed and no tissue was needed for interposition purposes. The muscle disruption was re-sutured.

Following operative resection, a direct laryngoscopy was intraoperatively performed and confirmed symmetric anatomy of the epiglottis without remaining impression due to bony fractures. Post-operatively, except a slight postoperative laryngeal edema, there was no complication or adverse events. The swallowing function was evaluated and despite the asymmetric hyoid bone, the patient regained maximal swallowing function.

In the first follow-up examination four weeks after completion of treatment, the dysphagia had completely resolved and the patient was symptom-free.

3. Discussion

Although combined hyoid bone and larynx fractures are rare, but they represent an important differential diagnosis in trauma patients with dysphagia, dysphonia or dyspnea [6,8–10]. Our case demonstrates that the clinic and the symptoms can vary, from having no symptoms to dysphagia, dysphonia or dyspnea. Furthermore, symptoms can occur immediately or within a latent period taking weeks or months until the proper diagnosis is made [1,10]. If the clinic is appropriate, injury to the hyoid bone and the larynx should be considered by the ENT. A CT scan provides further valuable information about the extent of the injury [1,6]. Postmortem analysis shows, that the most common fractures affect the superior horn of the thyroid cartilage followed by fractures of the greater horn of the hyoid bone. Joints between the greater horn and body are frequently present, but dislocations of these joints are rare [2,6]. In this context, hyoid bone fractures secondary to blunt trauma other than strangulation are scarce. There are only a few cases reported in the literature [3,10].

To the best of our knowledge, this is the first reported case of a complex, traumatic fracture of the larynx and the hyoid bone. In addition, the present case illustrates several factors to be considered aiming for the best therapy decision and optimal patient outcome, such as the patient's clinical symptoms, the preoperative endoscopic findings and CT imaging as well as the intraoperative findings.

Although there were fracture-lines in the thyroid cartilage, as shown in the CT, the intraoperative exploration revealed no dislocation and a stable cartilage. Consequently, no surgical reconstruction was needed. In our case, an isolated partial resection of the hyoid bone represented a crucial therapeutic option and led to a symptom-free patient [1,10,11].

4. Conclusion

Despite hyoid bone and larynx fractures being rare fractures, they should be considered as differential diagnoses in patients with persisting dysphagia or dyspnea after traumatic incidents. A computed tomography provides further valuable information about the extent of the injury. In the present case, reconstructive surgery resulted in an acceptable functional outcome. Thus, an isolated partial resection of the hyoid bone represented an important therapeutic option.

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Ethical approval

The study is in accordance with the Code of Ethics of the World Medical Association (Helsinki Declaration). The authors have obtained written informed consent from the patient to publish a case report. The patient's anonymity is preserved. Therefore, ethical approval from the ethics committee is not needed.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Research registration number

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CRediT authorship contribution statement

Lava Taha: Conception and design of the study acquisition, literature research, analysis and interpretation of data, writing the article, review and editing of the manuscript, final approval of the version to be submitted.

Matti Sievert: Conception and design of the study, interpretation of data, revising the manuscript critically for important intellectual content, final approval of the version to be submitted.

Felix Eisenhut: Conception and design of the study, interpretation of data, revising the manuscript critically for important intellectual content, final approval of the version to be submitted.

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Sarina K. Müller: Administrating the project, conception and design of the study, design of the methodology, validation and supervision, acquisition, analysis and interpretation of data, revising the manuscript critically for important intellectual content, final approval of the version to be submitted.

Declaration of competing interest

Lava Taha, Matti Sievert, Felix Eisenhut, Heinrich Iro, Maximilian Traxdorf, Sarina K. Müller declare that they have no competing conflict of interest.

References

[1] M.Kahle, A.D., Die isolierte Zungenbeinfraktur. Unfallchirurgie - Springer Verlag, 2000.
[2] P. Betz, W. Eisenmenger, Frequency of throat-skeleton fractures in hanging, Am J Forensic Med Pathol 17 (3) (1996) 191–193.
[3] M.K. Chainchel Singh, S.F. Siew, P.S. Lai, Isolated hyoid bone fracture in a child due to a fall, Int. J. Pediatr. Otorhinolaryngol. 139 (2020) 110443.
[4] V.D. Khokhlov, Injuries to the hyoid bone and laryngeal cartilages: effectiveness of different methods of medico-legal investigation, Forensic Sci. Int. 88 (3) (1997) 173–183.
[5] H. Es, M.F. Sahin, E. Ozdemir, Laryngohyoid fractures in fatal nonhomicidal falls from a height, Am J Forensic Med Pathol 38 (4) (2017) 289–293.
[6] H.M. de Baakker, et al., Fracture pattern of the hyoid-larynx complex after fatal trauma on the neck: retrospective radiological postmortem analysis of 284 cases, Int. J. Legal Med. 134 (4) (2020) 1465–1473.
[7] R.A. Agha, et al., The SCARE 2020 guideline: updating Consensus Surgical CAse REport (SCARE) guidelines, Int. J. Surg. 84 (2020) 226–230.
[8] V. Pino Rivero, et al., External severe laryngeal trauma with multiple fractures and airway compromise, An. Otorrinolaringol. Ibero Am. 32 (3) (2005) 239–244.
[9] W. Reimann, Fractures of the hyoid bone and thyroid cartilage in traffic accidents, Dtsch. Z. Gesamte. Gerichtl. Med. 52 (1961) 70–75.
[10] W. Wang, et al., Fracture of the hyoid bone associated with atlantoaxial subluxation: a case report and review of the literature, Am J Forensic Med Pathol 28 (4) (2007) 345–347.
[11] R.B. Bell, D.S. Verschueren, E.J. Dierks, Management of laryngeal trauma, Oral Maxillofac. Surg. Clin. North Am. 20 (3) (2008) 415–430.