

UCUENCA

Universidad de Cuenca

Facultad de Odontología

Carrera de Odontología

Intraoperative dental aspiration e ingest, systematic review and algorithm proposal

Trabajo de titulación previo a la obtención del título de Odontólogo


Autores:

Dennis Patricio Sigüenza García

Yajaira Valeria Vázquez Sánchez

Director:

Pablo Andrés Crespo Reinoso

ORCID:  0000-0002-1405-5198

Cuenca, Ecuador

2023-11-21

Resumen

La aspiración e ingesta de dientes durante su extracción es un accidente poco común, por lo que no existe suficiente información sobre los casos reportados. El objetivo de este estudio es realizar una revisión sistemática, analizar los artículos sobre aspiración e ingesta dental intraoperatoria y proponer un algoritmo para el manejo de esta complicación. Se realizó una revisión sistemática siguiendo los criterios PRISMA en la base de datos PubMed en enero de 2023 con las limitaciones: estudios realizados en humanos; Idioma inglés; informes de aspiración y deglución de dientes durante la extracción dental, la edad no estaba limitada. Criterios de exclusión: estudios de aspiración e ingestión de cuerpos extraños que no involucren dientes. Se obtuvieron un total de 5 artículos con 5 casos reportados de aspiración. No hubo informes asociados con ingesta de dientes. El sexo de mayor prevalencia fue el masculino, siendo todos los casos reportados en hombres, la edad promedio fue de 24,4 años. Los estudios de imagen de elección fueron la radiografía de tórax y la tomografía computarizada. El bronquio derecho fue el sitio de localización prevalente. El tratamiento de primera línea fue la broncoscopia, seguida de traqueotomía y toracotomía. La extracción dentaria es un procedimiento quirúrgico común, por lo que es fundamental tener cuidado ante posibles complicaciones como aspiración o ingesta dentaria intraoperatoria. La aspiración de dientes puede ser una complicación potencialmente mortal, por lo que es importante un tratamiento oportuno. El algoritmo propuesto permite un manejo adecuado para la aspiración e ingesta de dientes.

Palabras clave: extracción dental, aspiración, diente, complicaciones postoperatorias, árbol bronquial



El contenido de esta obra corresponde al derecho de expresión de los autores y no compromete el pensamiento institucional de la Universidad de Cuenca ni desata su responsabilidad frente a terceros. Los autores asumen la responsabilidad por la propiedad intelectual y los derechos de autor.

Repositorio Institucional: <https://dspace.ucuenca.edu.ec/>

Abstract

Aspiration and ingestion of teeth during extraction is a rare accident, so there is not enough information on reported cases. The objective of this study is to conduct a systematic review, analyze the articles on aspiration and intraoperative dental ingestion and propose an algorithm for the management of this complication. A systematic review was performed following the PRISMA criteria in the PubMed database in January 2023 with the limitations: studies conducted in humans; English language; reports of tooth aspiration and swallowing during tooth extraction, age was not limited. Exclusion criteria: foreign body aspiration and ingestion studies that do not involve teeth. A total of 5 articles were obtained with 5 reported cases of aspiration. There were no reports associated with tooth ingestion. The most prevalent sex was male, with all cases reported in men, the average age was 24.4 years. The imaging studies of choice were chest x-ray and computed tomography. The right bronchus was the prevalent site of location. The first-line treatment was bronchoscopy, followed by tracheostomy and thoracotomy. Tooth extraction is a common surgical procedure, so it is essential to be careful about possible complications such as aspiration or intraoperative tooth ingestion. Tooth aspiration can be a life-threatening complication, so prompt treatment is important. The proposed algorithm allows adequate management for tooth aspiration and ingestion.

Keywords: dental extraction, aspiration, tooth, postoperative complications, bronchial tree



The content of this work corresponds to the right of expression of the authors and does not compromise the institutional thinking of the University of Cuenca, nor does it release its responsibility before third parties. The authors assume responsibility for the intellectual property and copyrights.

Institutional Repository: <https://dspace.ucuenca.edu.ec/>

Index of Contents

Resumen	2
Abstract	3
Introduction	7
Materials and Methods	7
Results	9
Discussion	11
Conclusion	15
References	16

Index of figures

Figure 1. Flowchart of included articles.	8
Figure 2. Algorithm for intraoperative tooth aspiration management.....	12
Figure 3. Algorithm for intraoperative tooth intake.	14

Index of tables

Table 1. This table summarizes the findings of age, sex, cause, imaging study, and tooth involved.....	9
Table 2. This table summarizes the findings of location, symptoms, and treatment.	10

Introduction

The extraction of third molars is one of the most performed procedures by surgeons maxillofacials.[1] Various complications have been reported that can occur intraoperatively including iatrogenic displacement of the third molars towards the air and digestive tracts [1] [2]. Aspiration is defined as the inhalation of an organic or inorganic foreign body in the respiratory tract, [3] when this happens, the organism responds immediately with the cough reflex trying to expel it, if it is not possible to expel it, it can lodge in any region of the airway from the larynx to the bronchi.[4]

A tooth acts as a foreign body if it is not diagnosed immediately it can cause serious complications such as pneumonia, wheezing, bronchiectasis or atelectasis or even death. [5] [6]

The ingestion of foreign bodies is common in children, the same ones that, depending on their shape, texture, may or may not cause complications. There are cases, in which during dental procedures, foreign bodies have been ingested, the same ones that must be reported and radiographically analyzed to know their location. Foreign bodies that are 2.5 cm in diameter generally make it through the gastrointestinal tract without problem; however, those that are not evacuated can be removed with endoscopic techniques. [7]

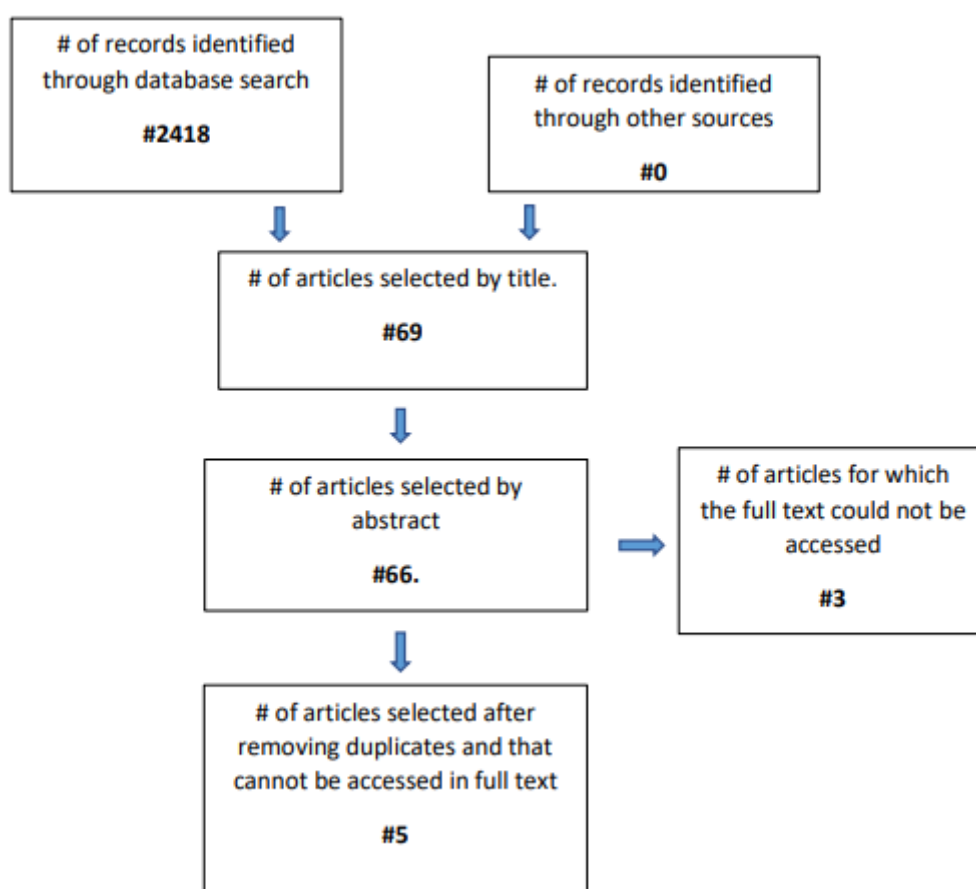
The objective of this study was to carry out a systematic review of intraoperative tooth aspiration and intake, analyzing possible causal factors and treatment, as well as proposing an algorithm for the management of these complications.

Materials and Methods

A systematic review was conducted following the PRISMA criteria (preferred reporting items for systematic reviews and meta-analyses) [8], in which the PubMed database was searched in January 2023 with the following limitations: studies conducted in humans; English language; reports of aspiration and swallowing of teeth during dental extraction, age was not limited. Exclusion criteria: studies of aspiration and ingestion of foreign bodies that do not involve teeth. The search words were: tooth in the airway, molar in the airway, tooth in stomach, tooth aspiration, tooth in esophagus, tooth in lung, tooth in lung aspiration, tooth swallowing, obtaining a total of 2418 articles. When reading the titles, a total of 69 articles were obtained,

while reading the abstracts we obtained a total of 66 articles. A complete reading of each article was carried out, obtaining ten, of which, when performing the elimination of duplicates, five were obtained. The selection criteria include: two operators carried out the search separately, then jointly it was verified if we carried out the same search and if the same results were obtained, additionally a third author was in charge that this review coincided.

Figure 1. Flowchart of included articles.



Results

In the systematic review, no reports associated with the ingestion of a tooth during a dental extraction surgical procedure were found; there are case reports of teeth aspirated during said procedures.

A total of 5 articles were found in the systematic review of five cases [9] [10][11][12] [13] reported that met the inclusion and exclusion criteria. The average age of the reported patients is 24.4, with the oldest being 77 [10] and the youngest 6 [11]; all the patients were found to be healthy. The predominant sex was masculine; being five men and zero women. The cause of tooth aspiration was only reported in one case [9]. In addition, in all reported cases a radiographic examination (chest X-ray) was requested for diagnosis [10][11][12][13]; additionally, only one article complements the radiographic examination using computed tomography[9]. Three of the five were diagnosed immediately[9][10][11], while one case was diagnosed after one week [12] and the other after 12 days [13]. In relation to the tooth involved, the lower left third molar represents 20% of prevalence [9]; while 60% is in deciduous teeth [11][12][13] and 20% does not report [10].

Table 1. This table summarizes the findings of age, sex, cause, imaging study, and tooth involved.

Articles	Age	Sex	Cause	Imaging study	Find time	Tooth involved
<i>R. F. Elgazzar, A. I. Abdelhady, A. A. Sadakah.</i> [9]	23	Male	Gag reflex due to suction tip	Use of chest x-ray plus tomography	Immediate	Lower left third molar
<i>Albert Lu, and Paul Aronowitz.</i> [10]	77	Male	Does not report	Use of chest x-ray	Immediate	Does not report
<i>Birrer RB, Garven BA.</i> [11]	6	Male	Does not report	Use of chest x-ray	Immediate	Deciduous molar

Ulkü R, Başkan Z, Yavuz.[12]	8	Male	Does not report	Use of chest x-ray	A week later	Deciduous tooth
Ospina JC, Ludemann JP.[13]	8	Male	Does not report	Use of chest x-ray	After 12 days	Deciduous tooth

The location of the tooth in four cases was in the right bronchus [9] [10][12] [13] and only one presented in the cricoid cartilage, obstructing the upper airway[11]. The most frequent symptoms were: coughing attack (60%)[9] [10][13], fever [12][13] and shortness of breath [11][12](40%), wheezing [11], tachycardia [12], tachypnea [12], pleuric pain [13], crackles [13] (20%). Finally, the treatment of choice was bronchoscopy representing 60% of the cases [9] [10] [13], tracheotomy 20% [11]; however, one of the reports was not resolved with bronchoscopy, so a thoracotomy was performed, representing 20%[12].

Table 2. This table summarizes the findings of location, symptoms, and treatment.

Articles	Location	Symptoms	Treatment
<i>R. F. Elgazzar, A. I. Abdelhady, A. A. Sadakah.</i> [9]	Right lung	Cough	Bronchoscopy
<i>Albert Lu, and Paul Aronowitz.</i> [10]	Right lung	Cough	Bronchoscopy
Birrer RB, Garven BA.[11]	Cricoid cartilage	Shortness of breath, wheezing	Tracheotomy

Ulkü R, Başkan Z, Yavuz.[12]	Right lung	Shortness of breath, low fever, tachypnea, tachycardia.	Bronchoscopy plus thoracotomy
Ospina JC, Ludemann JP.[13]	Right lung	Paroxysmal cough, fever, right pleuritic pain, crackles.	Bronchoscopy

There were no deaths in any case, as well as complications after having carried out the treatment, additionally, only one article mentions that the patient is summoned for subsequent medical reviews.

Discussion

In this systematic review, a total of 5 cases reported by 5 articles were analyzed. It was reported that all the cases were men with a stable state of health, with an average age of 24.4 years, the deciduous teeth were the most prevalent, the initial radiographic examination was a chest X-ray, the exact location was given in the right bronchus and the most frequent symptoms: coughing attack, fever and difficulty breathing, in addition the treatment of choice was bronchoscopy. In no case were there deaths and there were no complications after extracting the tooth.

There are no reported cases of tooth ingestion after dental extraction, however it is mentioned that foreign bodies such as dental materials have been ingested, being located mainly in the esophagus where the extraction is carried out by endoscopy. Six hours after accidental ingestion, the foreign body tends to pass from the stomach to the intestine, allowing it to be expelled rectally.[14] There are cases in which foreign bodies cannot be evacuated, making endoscopic extraction difficult. [15]

Tooth aspiration is a rare accident during dental extraction surgical procedures [15], so there is not enough information collected, despite this, this accident occurs in people of different ages, being more likely in the elderly due to the decrease in motor capacity, [14] also in children due to hyperactive behavior and finally it is probable that these accidents occur due to inappropriate maneuvers. Therefore, it is suggested to preserve the safety of the patient

and establish precautionary measures to avoid possible accidents of ingestion or aspiration of dental pieces.[15]

When it is not possible to find a tooth during the time of extraction, a history of suffocation accompanied by respiratory symptoms provide clues to reach a presumptive diagnosis, on the other hand, simple chest x-rays are complementary to locate the aspirated object, additionally, in some cases, to reach a definitive diagnosis a Computed Tomography examination is required and with it reflect a well-defined image of the dental piece and its exact location. It is worth mentioning that due to the immediate need for care, the chest radiographic examination is the first choice due to its availability and the time it takes. In addition, tomography is not highly recommended due to the radiation involved and the decreased profitability in this type of event.[16]

In the cases of aspiration, the foreign bodies were commonly located in the right bronchus-right lung, this is due to the less marked angle between the communication of the trachea and the right bronchus; Furthermore, the right bronchus has a larger diameter than the left. [15]

From the review it is suggested that once aspiration is confirmed, immediate treatment should be carried out to avoid major complications.[15] In our review, the treatment of choice is bronchoscopy, since four cases were resolved from this treatment. Additionally, other treatments are mentioned, such as tracheostomy and thoracotomy, the latter being used to solve said event because other treatments did not work.

Figure 2. Algorithm for intraoperative tooth aspiration management.

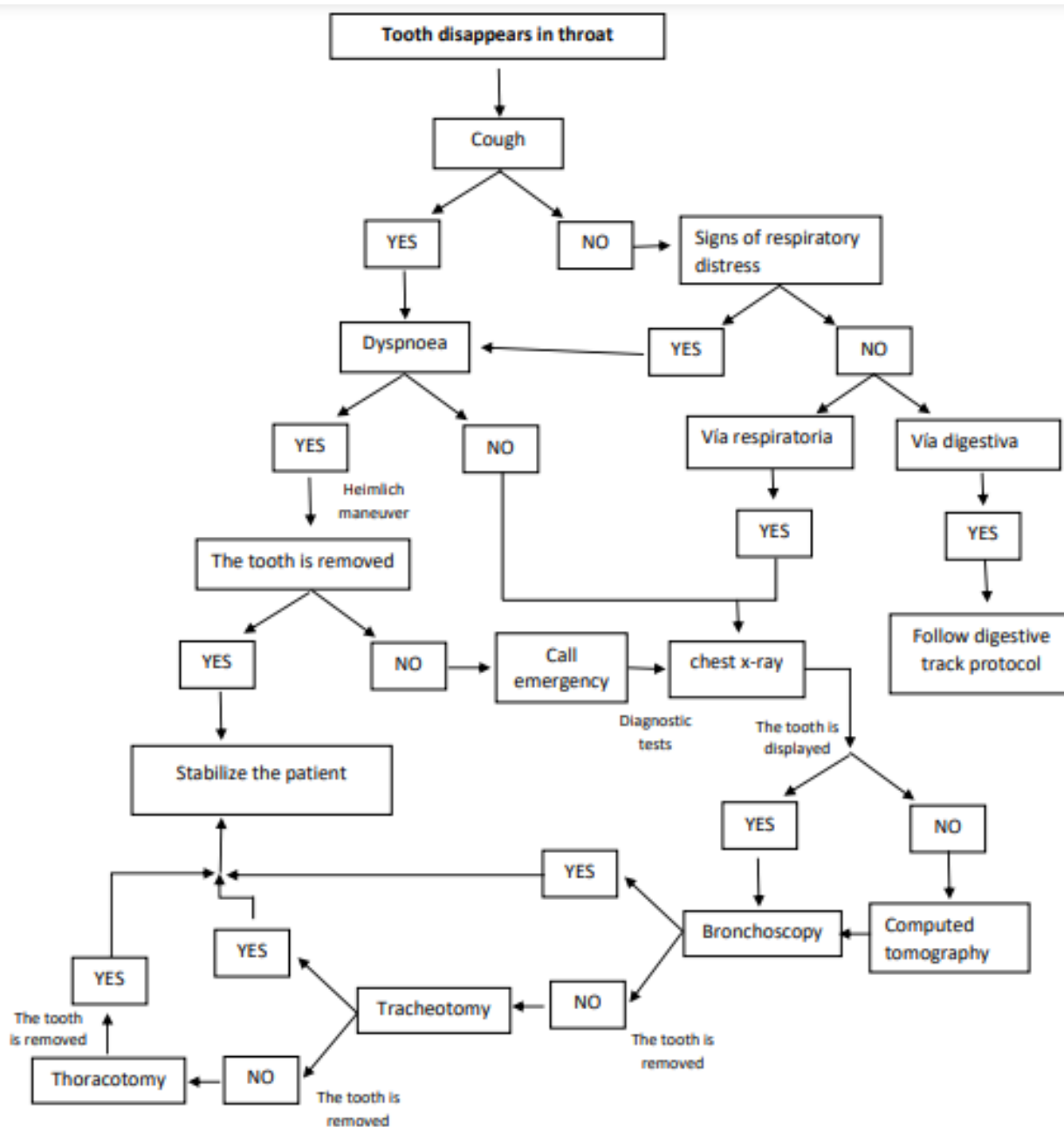
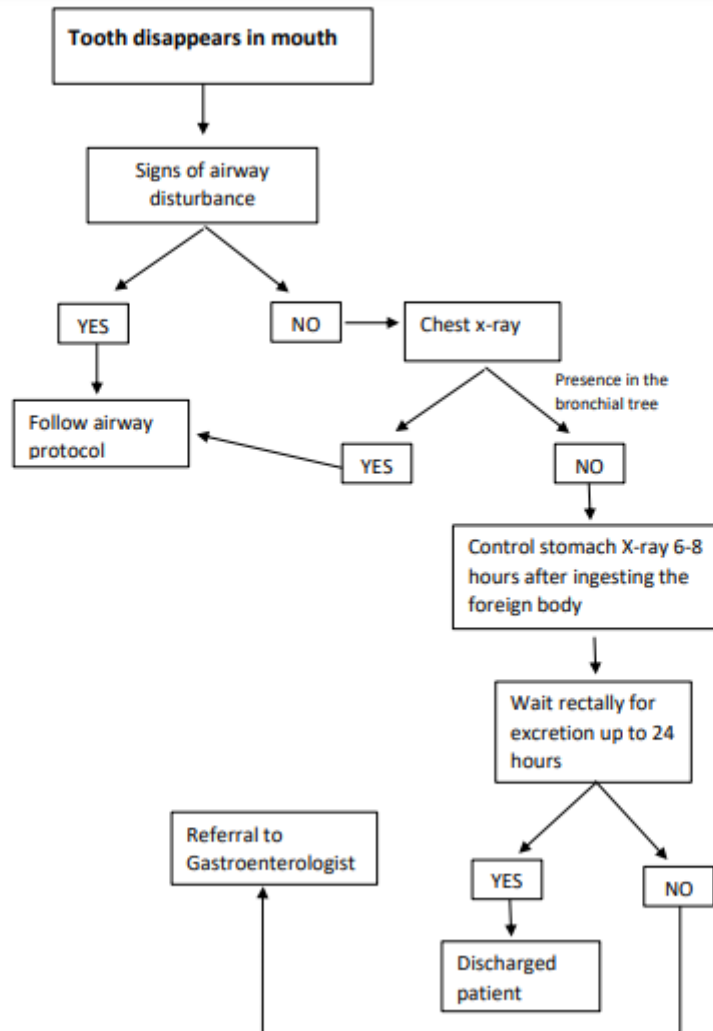


Figure 3. Algorithm for intraoperative tooth intake.



Conclusion

The extraction of molars is a common surgical procedure, so it is essential to be careful in the event of possible complications such as intraoperative aspiration or ingestion of teeth. In our systematic review, few cases of aspirated teeth have been reported, so in the event of this complication, an early and opportune diagnosis is recommended to avoid greater risks in the long term. The imaging tests of choice are chest X-ray and computed tomography, which allow us to give a correct diagnosis and have an exact location of the aspirated tooth, it is also important to carry out a correct treatment to preserve the patient's health.

The limited information reported on teeth aspirated during dental extractions has limited our systematic review study, because this postoperative complication is rare and there have been no deaths from them, in addition to the fact that aspirated teeth have been short-term diagnoses and therefore the treatments were successful.

References

[1] Bouloux GF, Steed MB, Perciaccante VJ. Complications of third molar surgery. *Oral Maxillofac Surg Clin North Am.* 2007 Feb;19(1):117-28, vii. doi: 10.1016/j.coms.2006.11.013. PMID: 18088870.

[2] Sayed N, Bakathir A, Pasha M, Al-Sudairy S. Complications of Third Molar Extraction: A retrospective study from a tertiary healthcare centre in Oman. *Sultan Qaboos Univ Med J.* 2019 Aug;19(3):e230-e235. doi: 10.18295/squmj.2019.19.03.009. Epub 2019 Nov 5. PMID: 31728221; PMCID: PMC6839670.

[3] Raghavendran K, Nemzek J, Napolitano LM, Knight PR. Aspiration-induced lung injury. *Crit Care Med.* 2011 Apr;39(4):818-26. doi: 10.1097/CCM.0b013e31820a856b. PMID: 21263315; PMCID: PMC3102154.

[4] Antón-Pacheco JL, Martín-Alelú R, López M, Morante R, Merino-Mateo L, Barrero S, Castilla R, Cano I, García A, Gómez A, Luna-Paredes MC. Foreign body aspiration in children: Treatment timing and related complications. *Int J Pediatr Otorhinolaryngol.* 2021 May;144:110690. doi: 10.1016/j.ijpor.2021.110690. Epub 2021 Mar 26. PMID: 33799103.

[5] Karakoç F, Karadağ B, Akbenlioğlu C, Ersu R, Yıldizeli B, Yüksel M, Dağlı E. Foreign body aspiration: what is the outcome? *Pediatr Pulmonol.* 2002 Jul;34(1):30-6. doi: 10.1002/ppul.10094. PMID: 12112794.

[6] Brkic F, Umihanic S, Altumbabic H, Ramas A, Salkic A, Umihanic S, Mujic M, Softic L, Zulcic S. Death as a Consequence of Foreign Body Aspiration in Children. *Med Arch.* 2018 Jun;72(3):220-223. doi: 10.5455/medarh.2018.72.220-223. PMID: 30061771; PMCID: PMC6021165.

[7] Shivakumar AM, Naik AS, Prashanth KB, Yogesh BS, Hongal GF. Foreign body in upper digestive tract. *Indian J Pediatr.* 2004 Aug;71(8):689-93. doi: 10.1007/BF02730655. PMID: 15345868.

[8] M.J. Page, J.E. McKenzie, P.M. Bossuyt, I. Boutron, T.C. Hoffmann, C.D. Mulrow, L. Shamseer, J.M. Tetzlaff, E.A. Akl, S.E. Brennan, R. Chou, J. Glanville, J.M. Grimshaw, A. Hróbjartsson, M.M. Lalu, T. Li, E.W. Loder, E. Mayo-Wilson, S. McDonald, L.A. McGuinness, D. Moher. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. DOI: 10.1016/j.recesp.2021.06.016

[9] R. F. Elgazzar, A. I. Abdelhady, A. A. Sadakah: Aspiration of an impacted lower third molar during its surgical removal under local anaesthesia. *Int. J. Oral Maxillofac. Surg.* 2007; 36: 362–364. # 2006 International Association of Oral and Maxillofacial surgeons. Published by Elsevier Ltd.

[10] Lu A, Aronowitz P. Better if left under pillow. *J Gen Intern Med.* 2010 Aug;25(8):873. doi: 10.1007/s11606-010-1353-6. Epub 2010 Apr 27. PMID: 20422303; PMCID: PMC2896586.

[11] Birrer RB, Garven BA. Tooth aspiration in a six-year-old boy. *Am J Emerg Med.* 2001 Nov;19(7):598-600. doi: 10.1053/ajem.2001.28332. PMID: 11699009.

[12] Ulkü R, Başkan Z, Yavuz I. Open surgical approach for a tooth aspirated during dental extraction: a case report. *Aust Dent J.* 2005 Mar;50(1):49-50. doi: 10.1111/j.1834-7819.2005.tb00085.x. PMID: 15881306.

[13] Ospina JC, Ludemann JP. Aspiration of an extracted molar: case report. *J Can Dent Assoc.* 2005 Sep;71(8):581-3. PMID: 16202198.

[14] Hayashi H, Abe A, Ota M, Momokita M, Ishihama T, Furuta H, Taniguchi T, Takeuchi K. Endoscopic removal of accidental aspirated and ingested dental foreign bodies: A cross-sectional study. *Medicine (Baltimore).* 2021 Nov 19;100(46):e27602. doi: 10.1097/MD.00000000000027602. PMID: 34797284; PMCID: PMC8601339.

[15]Hou R, Zhou H, Hu K, Ding Y, Yang X, Xu G, Xue P, Shan C, Jia S, Ma Y. Thorough documentation of the accidental aspiration and ingestion of foreign objects during dental procedure is necessary: review and analysis of 617 cases. *Head Face Med.* 2016 Jul 22;12(1):23. doi: 10.1186/s13005-016-0120-2. PMID: 27449659; PMCID: PMC4957346.

[16]Elgazzar RF, Abdelhady AI, Sadakah AA. Aspiration of an impacted lower third molar during its surgical removal under local anaesthesia. *Int J Oral Maxillofac Surg.* 2007 Apr;36(4):362-4. doi: 10.1016/j.ijom.2006.08.011. Epub 2006 Nov 15. PMID: 17110083.