Scripta Scientifica Medicinae Dentalis, 2024;10(1):7-13
DOI: 10.14748/ssmd.v9i2.9347

ISSN 2367-7236 (Print)
ISSN 2367-7244 (Online)

REVIEWS

ACUTE SIALOADENITIS OF THE SUBMANDIBULAR SALIVARY GLANDS AND ACUTE INFLAMMATION OF THE SUBMANDIBULAR LYMPH NODES. A REVIEW ARTICLE

Yanko Yankov

Department of General and Operative Surgery, Faculty of Medicine, Medical University of Varna, Bulgaria
Clinic of Maxillofacial Surgery, St. Marina University Hospital, Medical University of Varna, Bulgaria

ABSTRACT

INTRODUCTION: Acute inflammation of the submandibular salivary glands and submandibular lymph nodes in humans are common diseases. Their clinical manifestation largely overlaps, but there are also a number of significant differences between them.

MATERIALS AND METHODS: This is a review article whose aim is to provide clear and understandable information on the diagnosis, treatment and prognosis of acute inflammation of the submandibular salivary glands and submandibular lymph nodes in humans. It was written after analyzing information on the topic from 57 full-text articles from peer-reviewed medical journals.

RESULTS AND DISCUSSION: The causes of sialoadenitis of the submandibular glands are mainly the anatomical features of the submandibular duct, the high viscosity of the saliva produced by them, and previous sialolithiasis of the duct or of the parenchyma of the gland. In children, acute lymphadenitis of the submandibular lymph nodes is most often due to infections of the upper respiratory tract, and in adults it has an odontogenic origin. The treatment of both diseases includes the mandatory intake of antibacterial drugs, and in the presence of purulent exudate, surgical treatment is carried out in the form of incision, lavage and drainage.

CONCLUSION: With early diagnosis and treatment, the prognosis of these diseases is good, but with high virulence of the bacterial causative agents and/or congenital and acquired diseases of the patient's immune system, the treatment may be prolonged.

Keywords: *acute lymphadenitis, acute sialoadenitis, antibacterial therapy, incision, submandibular glands, submandibular lymph nodes*

Address for correspondence:
Yanko Yankov
Clinic of Maxillofacial Surgery
St. Marina University Hospital
1 Hristo Smirnenski Blvd
9010 Varna
e-mail: yanko_1989@abv.bg

Received: January 3, 2024
Accepted: February 16, 2024

INTRODUCTION

The submandibular space is a small paired space located in the upper anterior cervical region (1). Despite its small size, it houses important anatomical structures, the functioning of which is extremely important for the proper functioning of the human organism (1,2). The main organ, occupying almost the entire submandibular space, is the submandibular salivary gland (1–3). This is the gland

© The Author(s) 2024. This is an open access article distributed under the Creative Commons Attribution License (CC BY), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

that produces the main amount of saliva in humans (2). Its anatomical structure is such that it predisposes it to frequent inflammatory diseases (2,4). Around it, and also in its capsule itself, there are several submandibular lymph nodes which are the main lymphatic collector of lymph from the head and the reason for the aforementioned predisposition (2,3,5).

MATERIALS AND METHODS

This is a review article that after carefully reading and analyzing the information about inflammatory diseases of the submandibular salivary gland and submandibular lymph nodes from 57 full-text articles (55 in English and 2 in Bulgarian), which have been published in prestigious medical journals, provides readers with the most important clinical manifestations, diagnoses, treatment, and the prognosis of these two types of pathology.

RESULTS AND DISCUSSION

Although they are not the largest salivary glands (the parotid glands are the largest), the submandibular glands produce about 70% of the saliva in humans (6,7). This makes their function extremely important for the proper function of digestion, the maintenance of the homeostasis, and the correct hygiene of the oral cavity (2,4,6,7). From the submandibular salivary glands, saliva is secreted into the oral cavity through their ducts (3–5). The course of the latter along the posterior edge of the mylohyoid muscles has an almost right angle, which leads to the retention of saliva in them (8,9). This, together with the fact that the saliva they produce both a serous and a mucinous component, causes the slower elimination of microorganisms that have entered the ducts from the oral cavity, which is a prerequisite for the occurrence of inflammatory diseases of the submandibular glands, called sialoadenitis (4,5,8,9).

Like most inflammatory diseases, sialoadenitis goes through several successive stages if not promptly treated (10). During the first stage of inflammation, when the latter is only serous, the affected submandibular gland is swollen, its size is increased, and it is very painful, especially during palpation (11,12). During this stage of inflammation, there is a change in the composition of the saliva secreted through the duct of the gland, and there is almost never a deterioration in the general condition of the body (11,13). If it is not treated, serous inflammation passes into the next stage of its development–purulent inflammation. During the purulent stage of inflammation, the affected submandibular salivary gland is even more enlarged, the skin above it is swollen, smooth and red, and saliva mixed with pus, or only pus, flows through the duct of the gland (14,15). The general condition of the body has worsened, and the submandibular region is very painful–both during palpation and when touched very lightly and even at rest (13,15).

With extremely high virulence of the pathogens and/or with a problem in the immune system of the macroorganism, it is possible for the capsule of the inflamed submandibular salivary gland to lyse and for pus to pour out of it into the submandibular space–a condition known as a submandibular abscess (14,16). In it, the clinical manifestation does not differ significantly from the purulent stage of sialoadenitis, except that usually the symptoms are more pronounced and the general condition is more severe. Although rare, trismus can also be observed (13,15,16).

Retrograde retention of saliva along the ducts of the submandibular glands, as well as in their parenchyma itself, is often determined by the presence of sialoliths in them, and in this case the sialoadenitis is perceived as a complication of sialolithiasis (17,18).

Submandibular lymph nodes vary in number, between 5 and 12 on each side (1,19). Some of them are located in the capsule of the submandibular salivary gland and are called intraglandular, and others are outside it and are called extraglandular (1,20). All lymph nodes of the submandibular space are interconnected, including intra- and extraglandular ones (19,20). In the submandibular lymph nodes, the lymph from the lymph nodes of the head drains, which is why they are called the main lymph collector of the head, and of the lymph from almost all tissues and organs adjacent to them–premolar and molar teeth, lower and upper jaw, submental and submandibular salivary glands, the upper lip, the lateral parts of the lower lip, the maxillary sinuses, the body of the tongue, the lateral and posterior parts of the floor of the oral cavity, the medial parts of the cheeks, part of the soft palate, the medial part of the eyelids, carunculae lacrimales, the external nose in-

cluding the tip of the nose, the anterior parts of the nasal cavity and the skin of the neck in the submandibular areas (5,20,21). The submandibular lymph nodes on one side of the body connect with the ipsilateral submental lymph nodes (1,22,23). The lymph from them drains into the upper and lower deep lymph nodes of the neck (5,6,23,24).

The large area of lymphoedema, which is associated with the normal functioning of the submandibular lymph nodes, determines their vulnerability to inflammatory diseases, called lymphadenitis. The most common cause of the latter in adults is an infection from a diseased tooth (odontogenic origin of lymphadenitis), and in children, lymph node infections are mainly due to inflammatory diseases of the upper respiratory tract (rhinogenic origin of lymphadenitis) (22,25). Consecutively, the inflammation of the submandibular lymph nodes passes through a serous stage, a purulent stage and a lymphadenophlegmon stage (14,26). In serous lymphadenitis, the affected lymph node is painful and soft, the overlying skin and surrounding soft tissues are unchanged or may be slightly swollen (25,27). The shape of the lymph node is not changed (28). During this period of inflammation of the lymph nodes, the general condition is not impaired, and laboratory markers almost always remain unchanged (25,27). If the infection is not treated, the inflammation passes into the next stage of development–purulent infection. In his case, the lymph node increases in size and is very painful during palpation: the soft tissues around it and the overlying skin are highly swollen, which makes physical examination difficult, the general condition of the macroorganism may have deteriorated, the laboratory markers may also have changed, which is characteristic of inflammatory reactions (22). If the infection is not treated, or when the body's immune defenses are weakened and/or when the bacteria that cause the inflammation are highly virulent, the capsule of the lymph node lyses and the pus from it pours into the submandibular space–a condition known as lymphadenophlegmon of the submandibular space (24,29,30). With it, the clinical manifestation is very pronounced– on palpation and even with a light touch, the place is very painful, the submandibular area is swollen, the skin above it is smooth, stretched and red, trismus can be observed (24,25). The general condition is worsened, and the laboratory inflammatory markers are increased (26,28).

Diagnosis of acute sialoadenitis and lymphadenitis is usually not difficult, especially for experienced maxillofacial surgeons (31–34). Ultrasound examination of the neck in most cases is absolutely sufficient to confirm the diagnosis of these inflammatory diseases, but sometimes nuclear magnetic resonance or computed tomography, with or without intravenous contrast material, are also prescribed (35,36). During their serous inflammation, blood markers of inflammation are rarely elevated, but during the purulent stages and submandibular abscess stages, they are almost always elevated. Such reliable blood indicators are the concentrations of leukocytes and neutrophils, and the plasma level of C-reactive protein (37,38). In recent years, in the diagnosis of inflammatory diseases of the head and neck, the calculation of the delta neutrophil index, as well as the measurement of the plasma concentration of procalcitonin, have increasingly been applied (39,40). They can also be used in the diagnosis of acute sialoadenitis of the submandibular salivary glands and acute lymphadenitis of the submandibular lymph nodes.

The differential diagnosis between them is made mainly by examining the saliva that is released from the sublingual caruncle–in sialoadenitis it is mixed with pus, and in lymphadenitis it is unchanged (41,42). Differential diagnosis with other diseases includes exacerbated lateral and skin cysts, tumor processes, lymphomas, lymph node metastases, sialolithiasis, and epidemic sialoadenitis (14,42–44).

The treatment of the two acute inflammatory diseases during their serous stages includes only the application of antibacterial drugs, and in the case of sialoadenitis, also salivary drugs (44–46). An example of such a medication is potassium iodide–it is prepared extemporally in a concentration of 2.5% for adults and 1.5% for children (47,48). It should be stored in the dark to prevent it from oxidation and the recommended dose is one tablespoon orally 3–4 times a day (47). Antibacterial medications that are prescribed must necessarily cover the gram-positive spectrum of action of bacteria, because the inflammations of these diseases are mainly caused by gram-positive bacteria, but it is appropriate to prescribe antibiotics that also cover the gram-negative

spectrum (35,42). The therapy remains the same in the purulent stage of sialoadenitis with the difference that sometimes it does not lead to healing and an incision has to be made. In case of sialoadenitis, in order to stimulate the gland to produce more saliva and, through its excretion in the oral cavity, to separate the purulent exudate collected in its parenchyma, the observance of a specific nutritional regimen is needed–intake of more liquids and the consumption of acidic and dry foods (13,49).

Incision is mandatory for purulent inflammation of the lymph nodes (50,51). With it, through an incision in the skin and subcutaneous tissue in the area of the most pronounced fluctuation, the pus-engaged lymph node is reached, its capsule is incised or pierced with a blunt instrument, and the available pus is drained (50). A lavage is performed with physiological serum, 1% hydrogen peroxide, an antibiotic (most often metronidazole) or a solution of Braunol or Hibiscus, after which a drain (most often silicone) is placed.

In the presence of sialolith in the duct of the submandibular gland, an incision is made on the latter and the sialolith is removed. For a sialolith in the parenchyma of the gland, one usually waits until the acute inflammatory condition is controlled and then the entire gland is removed (total sialadenectomy) together with the sialolith in it (18,52).

The presence of pus in the submandibular space (submandibular abscess) requires its immediate evacuation, which is carried out surgically (53,54). The operative process goes through three successive stages–incision, lavage, and drainage. The incision is made under general anesthesia and after preliminary antiseptic treatment of the operative field. The incision is made at least 2 cm below the lower edge of the mandible to avoid cutting the marginal branch of the facial nerve passing there, a condition that can lead to the inability to close the mouth due to loss of muscle innervation to the orbicularis oculi muscle on the losing side (50,51). The skin, subcutaneous tissue, platysma, enveloped on both sides with the superficial fascia of the body are successively cut, and the submandibular space is bluntly reached, from which the available pus is evacuated. A lavage is performed with the means listed above and a silicone drain (most often corrugated) is placed and fixed.

During each of the stages of sialoadenitis and lymphadenitis, oral or parenteral antibacterial therapy is mandatory (10,25,55).

In case of lymphadenitis of odontogenic origin during the incision or after, it is mandatory to eliminate the disease of the tooth, which is the entrance door of the infection. If it cannot be cured, it is extracted (56,57).

CONCLUSION

Sialoadenitis of the submandibular salivary glands and lymphadenitis of the submandibular lymph nodes are common pathologies in both the pediatric population and adults. Their diagnosis is usually not difficult. It is mandatory for their treatment to include oral or parenteral administration of antibacterial drugs, and in the case of sialoadenitis, salivary drugs and a special diet are used. Their prognosis is good, except when the bacterial agents are not extremely virulent and/or the macroorganism has acquired or congenital immune deficiencies.

REFERENCES

1. Grewal JS, Jamal Z, Ryan J. Anatomy, Head and Neck, Submandibular Gland. 2022. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023.
2. Saitou M, Gaylord EA, Xu E, May AJ, Neznanova L, Nathan S, et al. Functional specialization of human salivary glands and origins of proteins intrinsic to human saliva. Cell Rep. 2020;33(7):108402. doi: 10.1016/j.celrep.2020.108402.
3. Patel S, Bhatt AA. Imaging of the sublingual and submandibular spaces. Insights Imaging. 2018;9(3):391-401. doi: 10.1007/s13244-018-0615-4.
4. Pachisia S, Mandal G, Sahu S, Ghosh S. Submandibular sialolithiasis: A series of three case reports with review of literature. Clin Pract. 2019;9(1):1119. doi: 10.4081/cp.2019.1119.
5. Bujoreanu I, Gupta V. Anatomy, Lymph Nodes. [Updated 2023 Jul 25]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK557717/
6. Casale J, Varacallo M. Anatomy, Head and Neck, Submandibular Triangle. 2023. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023.

7. Ghannam MG, Singh P. Anatomy, Head and neck, salivary glands. [Updated 2023 May 29]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK538325/

8. Rzymska-Grala I, Stopa Z, Grala B, Gołębiowski M, Wanyura H, Zuchowska A, et al. Salivary gland calculi - contemporary methods of imaging. Pol J Radiol. 2010;75(3):25-37.

9. Togni L, Mascitti M, Santarelli A, Contaldo M, Romano A, Serpico R, et al. Unusual Conditions impairing saliva secretion: developmental anomalies of salivary glands. Front Physiol. 2019;10:855. doi: 10.3389/fphys.2019.00855.

10. Wilson KF, Meier JD, Ward PD. Salivary gland disorders. Am Fam Physician. 2014;89(11):882-8.

11. Eleftheriadis I, Papadimitriou P, Tzelepi H. Hypognathies diogkoseis: prosegise ste diaphorike tous diagnose [Submandibular swelling and its differential diagnosis]. Hell Period Stomat Gnathopathoprosopike Cheir. 1990;5(2):59-68. Greek, Modern.

12. Adhikari R, Soni A. Submandibular sialadenitis and sialadenosis. [Updated 2022 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK562211/

13. Proctor GB, Shaalan AM. Disease-induced changes in salivary gland function and the composition of saliva. J Dent Res. 2021;100(11):1201-9. doi: 10.1177/00220345211004842.

14. Ugga L, Ravanelli M, Pallottino AA, Farina D, Maroldi R. Diagnostic work-up in obstructive and inflammatory salivary gland disorders. Acta Otorhinolaryngol Ital. 2017;37(2):83-93. doi: 10.14639/0392-100X-1597.

15. Chandak R, Degwekar S, Chandak M, Rawlani S. Acute submandibular sialadenitis-a case report. Case Rep Dent. 2012;2012:615375. doi: 10.1155/2012/615375.

16. Vestby LK, Grønseth T, Simm R, Nesse LL. Bacterial biofilm and its role in the pathogenesis of disease. Antibiotics (Basel). 2020;9(2):59. doi: 10.3390/antibiotics9020059.

17. Hammett JT, Walker C. Sialolithiasis. 2022. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023.

18. Badash I, Raskin J, Pei M, Soldatova L, Rassekh C. Contemporary review of submandibular gland sialolithiasis and surgical management options. Cureus. 2022;14(8):e28147. doi: 10.7759/cureus.28147.

19. Ganeshalingam S, Koh DM. Nodal staging. Cancer Imaging. 2009;9(1):104-11. doi: 10.1102/1470-7330.2009.0017.

20. Fives C, Feeley L, Sadadcharam M, O'Leary G, Sheahan P. Incidence of intraglandular lymph nodes within submandibular gland, and involvement by floor of mouth cancer. Eur Arch Otorhinolaryngol. 2017;274(1):461-466. doi: 10.1007/s00405-016-4205-0.

21. Koroulakis A, Jamal Z, Agarwal M. Anatomy, Head and Neck, Lymph Nodes. [Updated 2022 Dec 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK513317/

22. Maini R, Nagalli S. Lymphadenopathy. [Updated 2023 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK558918/

23. Schulte F, Zhang EP, Franke J, Ignatius R, Hoffmann F. Ipsilateral submandibular lymphadenectomy does not prolong orthotopic corneal graft survival in mice. Graefes Arch Clin Exp Ophthalmol. 2004;242(2):152-7. doi: 10.1007/s00417-003-0784-8.

24. Banjar FK, Wilson AM. Anatomy, head and neck, supraclavicular lymph node. [Updated 2023 Aug 28]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK544300/

25. Pecora F, Abate L, Scavone S, Petrucci I, Costa F, Caminiti C, Argentiero A, Esposito S. Management of Infectious Lymphadenitis in Children. Children (Basel). 2021;8(10):860. doi: 10.3390/children8100860.

26. Strabbing EM, de Visscher JG, van der Waal I. Een submandibulaire zwelling: de speekselklier? [A submandibular swelling: the salivary gland?]. Ned Tijdschr Geneeskd. 2004;148(51):2525-9. Dutch.

27. Qureshi FG, Newman KD. Lymph node disorders. Pediatr Surg. 2012:737–43. doi: 10.1016/B978-0-323-07255-7.00057-X.

28. Verhoef J, van Kessel K, Snippe H. Immune response in human pathology: infections caused by bacteria, viruses, fungi, and parasites. In: Parnham MJ, Nijkamp FP, Rossi AG, editors. Nijkamp and

Parnham's Principles of Immunopharmacology. 2019:165–78. doi: 10.1007/978-3-030-10811-3_10.

29. Klimpel GR. Immune defenses. In: Baron S, editor. Medical Microbiology. 4th edition. Galveston (TX): University of Texas Medical Branch at Galveston; 1996. Chapter 50. Available from: https://www.ncbi.nlm.nih.gov/books/NBK8423/

30. Carlson ER. Diagnosis and management of salivary gland infections. Oral Maxillofac Surg Clin North Am. 2009;21(3):293-312. doi: 10.1016/j.coms.2009.04.004.

31. Mandel L. Salivary gland disorders. Med Clin North Am. 2014;98(6):1407-49. doi: 10.1016/j.mcna.2014.08.008.

32. Nazarochkin IuV, Mazurin OE, Fernando DR, Proskurin AI. [Diagnostics of acute cervical lymphadenitis and adenophlegmona in patients with diabetes mellitus]. Vestn Otorinolaringol. 2010;(2):14-6. Russian.

33. Leung AK, Davies HD. Cervical lymphadenitis: etiology, diagnosis, and management. Curr Infect Dis Rep. 2009;11(3):183-9. doi: 10.1007/s11908-009-0028-0.

34. Zielnik-Jurkiewicz B, Pysz-Kuć M. Ostre zapalenie wezłów chłonnych szyi u dzieci [Acute lymphadenitis of the neck in children]. Otolaryngol Pol. 2005;59(2):209-14. Polish.

35. Iaremenko AI, Petrov NL, Matina VN, Kirillov AL. [Application of ultrasonography in diagnosis and treatment of acute inflammation of soft tissues in maxillofacial region and neck]. Stomatologiia (Mosk). 2011;90(4):41-4. Russian.

36. Kargaltseva NM, Kotcherovets VI, Mironov AY, Borisova OY, Burbello AT. [Inflammation markers and bloodstream infection (review of literature).]. Klin Lab Diagn. 2019;64(7):435-442. Russian. doi: 10.18821/0869-2084-2019-64-7-435-442.

37. Bishop GB, Born T, Kakar S, Jawa A. The diagnostic accuracy of inflammatory blood markers for purulent flexor tenosynovitis. J Hand Surg Am. 2013;38(11):2208-11. doi: 10.1016/j.jhsa.2013.08.094.

38. Cho J, Lee JH, Lee DH, Kim J, Uh Y. Performance comparison of procalcitonin, Delta Neutrophil Index, C-reactive protein, and serum amyloid A levels in patients with hematologic diseases. Diagnostics (Basel). 2023;13(7):1213. doi: 10.3390/diagnostics13071213.

39. Kim H, Kim Y, Lee HK, Kim KH, Yeo CD. Comparison of the delta neutrophil index with procalcitonin and C-reactive protein in sepsis. Clin Lab. 2014;60(12):2015-21. doi: 10.7754/clin.lab.2014.140528.

40. Molher J. Pathologies infectieuses des glandes salivaires ou sialadénites [Salivary gland infections or sialadenitis]. Rev Prat. 2023;73(7):744-746. French.

41. Knöbber D, Wilhelm HJ, Schätzle W. Differentialdiagnostische Betrachtungen zur akuten Sialadenitis [Differential diagnostic observations on acute sialadenitis]. Laryngorhinootologie. 1990 Jun;69(6):324-6. German. doi: 10.1055/s-2007-998201.

42. Afanas'ev VV, Starodubtsev VS. Differentsial'naia diagnostika limfogranulematoza (bolezn' Khodzhkina) i sialoadenita podnizhnecheliustnoĭ sliunnoĭ zhelezy [The differential diagnosis of lymphogranulomatosis (Hodgkin's disease) and sialoadenitis of the submandibular salivary gland]. Stomatologiia (Mosk). 1997;76(1):30-1. Russian.

43. Roccia P, Di Liberto C, Speciale R, La Torretta G, Lo Muzio L, Campisi G. Scialoadeniti ostruttive. Aggiornamento in tema di diagnosi e di terapia [Obstructive sialoadenitis: update of diagnosis and therapy issues]. Recenti Prog Med. 2006;97(5):272-9. Italian.

44. Miranda-Rius J, Brunet-Llobet L, Lahor-Soler E, Farré M. Salivary secretory disorders, inducing drugs, and clinical management. Int J Med Sci. 2015;12(10):811-24. doi: 10.7150/ijms.12912.

45. Vu M, Lopez Ortiz C, Sosa M, Peplinski B, Ganti L. Acute submandibular sialadenitis. Cureus. 2022;14(4):e24435. doi: 10.7759/cureus.24435.

46. de Dios Azorín Abraham J, Durán GT, Pabón NST, Peña-Fernández A, Fernández MÁP. Development of a formulation of potassium iodide tablets as an antidote against nuclear incidents. Saudi Pharm J. 2023;31(11):101814. doi: 10.1016/j.jsps.2023.101814.

47. Nidzović Z, Popović R, Bodiroga M, Odavić M. Izrada i ispitivanje preparata kalijum-jodida za zastitu stitaste zlezde posle kontaminacije radioaktivnim jodom (131I) [The preparation and study of potassium-iodide preparations for the protection of the thyroid gland after contamination with radioactive iodine (131I)]. Vojnosanit Pregl. 1989;46(5):330-3. Serbian.

48. Shchipskiĭ AV, Afanas'ev VV. Differentsial'naia diagnostika sialadenoza i khronicheskogo sialadenita [Differential diagnosis of sialadenosis and chronic sialadenitis]. Stomatologiia (Mosk). 2001;80(3):31-5. Russian.

49. Habermann TM, Steensma DP. Lymphadenopathy. Mayo Clin Proc. 2000;75(7):723-32. doi: 10.4065/75.7.723.

50. Prasad R, Arthur LG. Cervical Lymphadenopathy. Fundamentals of Pediatric Surgery. 2010:213–9. doi: 10.1007/978-1-4419-6643-8_28.

51. Karpf M. Lymphadenopathy. In: Walker HK, Hall WD, Hurst JW, editors. Clinical methods: the history, physical, and laboratory examinations. 3rd edition. Boston: Butterworths; 1990. Chapter 149. Available from: https://www.ncbi.nlm.nih.gov/books/NBK256/

52. Choi MG. Modified drainage of submasseteric space abscess. J Korean Assoc Oral Maxillofac Surg. 2017;43(3):197-203. doi: 10.5125/jkaoms.2017.43.3.197.

53. Maharaj SH. A review of the microbiology of submandibular space infections. J Maxillofac Oral Surg. 2019;18(4):584-8. doi: 10.1007/s12663-018-1159-3.

54. DiNardo LJ. Lymphatics of the submandibular space: an anatomic, clinical, and pathologic study with applications to floor-of-mouth carcinoma. Laryngoscope. 1998;108(2):206-14. doi: 10.1097/00005537-199802000-00009.

55. Yotsova R. Submandibular triangle - in normal conditions and in acute purulent inflammatory diseases. Varna Med Forum. 2023;12(2):180-5. doi: 10.14748/vmf.v12i2.9332

56. Jevon P, Abdelrahman A, Pigadas N. Management of odontogenic infections and sepsis: an update. Br Dent J. 2020;229(6):363-70. doi: 10.1038/s41415-020-2114-5.

57. Nikolaev NN, Yankov YG. Lymph Nodes of the Head and Neck: In Normal and Pathological Conditions. Varna Medical Forum. 2023, 12(1): 69-74. doi: 10.14748/vmf.v12i1.9034