GIANT SIALOLITHS: LITERATURE REVIEW AND REPORT OF ONE CASE WITH MOUTH FLOOR PERFORATION

PRISCILLA FLORES **SILVA**[1], CAIO DE ANDRADE **HAGE**[2], FLÁVIA SIROTHEAU CORRÊA **PONTES**[3], FÁBIO LUIZ NEVES **GONÇALVES**[4], ANELISE PINHEIRO DE **QUEIROZ**[5]

1. Bucomaxilofacial Surgeon, University Hospital Oswaldo Cruz (UPE); Residency Staff of Maxillofacial Surgery and Traumatology, University Hospital João de Barros Barreto (UFPA); **2.** Dental Surgeon, Federal University of Pará (UFPA); Resident in Maxillofacial Surgery and Traumatology, University Hospital João de Barros Barreto (UFPA); **3.** Dental Surgeon, Federal University of Pará (UFPA); Specialist in Periodontics, USP-Bauru; Specialist in Oral Pathology, USP; MsD in Stomatology, Federal University of Minas Gerais; PhD in Oral Pathology, USP; Adjunct Professor of UFPA; Coordinator of the Residency Program in Oncology of University Hospital João de Barros Barreto (UFPA); **4.** Bucomaxilofacial Surgeon, Hospital Restoration (SES/PE); Residency Staff of Maxillofacial Surgery and Traumatology, University Hospital João de Barros Barreto (UFPA); **5.** Dental Surgeon, Federal University of Pará (UFPA).

* Tv Nove de Janeiro, 590, Apto 601, Fátima; Belém, Pará, Brazil. CEP: 66060-370, priscilla.fsilva@yahoo.com.br

Received: 04/25/2015. **Accepted:** 05/06/2015

ABSTRACT

Sialolithiasis is the most common non-neoplasic disease of the salivary glands, characterizes by obstruction of the salivary secretion due to appearance of sialoliths. The symptoms are swelling, pain, and inflammation of the affected gland. Ussualy measure less than 10mm those beyond 15 mm are considered giants and rare. It is believed that sialoliths grow 1–1.5 mm per year on average, which would mean 10 years of growth for the sialolith to become giant. Sialolithiasis occurs 80% to 95% in the submandibular gland, 5% to 20% in the parotid gland, and 1% to 2% in the sublingual and smaller glands.The treatment consists in excision of the sialolith being necessary or not the gland´s resection. Were found in the literature 90 cases of giant sialoliths and of these only 24 cases pierced the mouth floor. After the analysis of 90 cases in the literature, the authors concluded that giant sialoliths affected more the fifth to seventh decade of life unlike the normal sialoliths, which affect the third to sixth decade of life.

KEYWORDS: Giant sialolith, megalith, large salivary stone.

1. INTRODUCTION

Sialolithiasis is the most common non neoplasic disease of the salivary glands, characterized by obstruction of salivary secretion due to the appearance ofcalculus, also called sialoliths[1–6]. It is estimated to affect 12 in 1.000 of the adult population[7]. The sialoliths usually measure less than 10 mm, those beyond 15 mm are considered giants and rare[2,5,8,12]. Perforation of the mouth floor by a giant sialolith is extremely rare (24 cases/ Figure 1). It occurs more often during the third to sixth decade of life, thus considered rare in children[13]. The classic symptoms are swelling, pain during meal, infection/inflammation of the affected gland, secondary to obstruction of the salivary ducts, but it is commonly asymptomatic. This disease affects twice as many men than women[14].

Several authors have reported that sialolithiasis occurs in 80% to 95% in the submandibular gland, 5% to 20% in the parotid gland, and 1% to 2% in the sublingual and smaller glands[3,7,13-15]. One-quarter of the symptomatic cases that affect the submandibular gland promote hypofunction or nonfunction of the gland[15]. According to Emir *et al.* (2010) [14] and Yildirim (2004)[15] 70% to 80% of all cases are solitary sialoliths, 3% are multiples bilateral/unilateral, and three or more sialoliths match with 5% of all cases.

Often, sialoliths are radiographic findings. The location and size of sialoliths are important factors in deciding which surgical procedure will be performed, espe-

cially in giant sialoliths[8].

The treatment consists in excision of sialolith, being necessary or not, the gland´s resection, and duct reconstruction, depending on the degree of involvement of the same [13]. The purpose of this paper is to present a literature review on giant sialoliths (Table 1).

Figure 1. Intraoral view showing a giant sialolith in the left region that drilled the mouth floor.

2. MATERIAL AND METHODS

We conducted a review of literature, based on dental newspapers and magazines and also in specialized sites in search of scientific articles as Pubmed Central and Science Direct, about giant sialoliths from 1942 to 2014 using the key words: giant sialolith, megalith and large salivary stone. We found 90 cases of giant sialoliths with information about age, gender, affected gland, site affected, larger diameter and treatment. This information formed the basis for developing the Table 1.

Table 1. Systematic Review of Patients with Giant Sialoliths (1942-2014).

Case	Author/Year	Gender/ Age	Gland	Site	Size (mm)	Gland Status
1	Meyers/1942*	M/50	SMG	Gland	50	Preserved
2	Mustard/1945	M/52	SMG	Duct	55	-
3	Guernsey/1953*	F/65	-	Gland	33	-
4	Allen/1956	M/49	SMG	Duct	35	Preserved
5	Caar/1965	F/46	SMG	Duct	25	Preserved
6	Rust/1969	M/66	Parotid	Duct	51	-
7	Rust/1969	M/58	SMG	Gland	35	-
8	Brusati/1973	M/55	SMG	Gland	31	Preserved
9	Zakaria/1981	M/70	SMG	Gland	33	Resected
10	Deeb/1981*	M/30	SMG	Duct	16	Preserved
11	Koshal/1981	M/40	SMG	Duct	50	Preserved
12	Isacsson/1982	M/48	SMG	Duct	36	Preserved
13	Naraynsigh/1985	M/28	SMG	Gland	60	Resected
14	Frame/1986	M/50	SMG	Gland	25	Resected
15	Frame/1986	M/67	SMG	Gland	30	Resected
16	Kaltman/1987	M/53	SMG	Gland	45	Resected
17	Lakhoo/1989*	M/37	SMG	Duct	65	Resected
18	Bamgbelu/1989	M/55	SMG	Duct	35	Resected
19	Lakhoo/1989*	M/37	SMG	Duct	65	Resected
20	Asfar/1989	M/75	SMG	Gland	28	Resected
21	Asfar/1989*	M/55	SMG	Gland	38	Resected
22	Asfar/1989	M/43	SMG	Gland	20	Resected
23	Tinsley/1989*	M/48	SMG	Gland	50	Preserved
24	Hubar/1990*	M/65	-	-	52	-
25	Akin/1991	M/45	SMG	Gland	45	Resected
26	Iqbal/1992	F/48	Parotid	Duct	30	-
27	Paul/1995*	M/45	SMG	Gland	45	Preserved
28	Kesse/1998	M/64	Parotid	Gland	50	-
29	Cotter/1998*	F/63	SMG	Duct	20	Preserved
30	Bodner/1999	M/81	Parotid	Duct	25	Preserved
31	Siddiqui/2002	F/52	SMG	Duct	30	Preserved
32	Bodner/2002	M/50	SMG	Duct	50	Preserved
33	Bodner/2002	M/46	SMG	Duct	32	Preserved
34	Bodner/2002	M/25	SMG	Duct	32	Preserved
35	Bodner/2002	M/45	SMG	Duct	30	Preserved
36	Bodner/2002	M/61	Parotid	Duct	20	Preserved
37	Bodner/2002	M/61	SMG	Duct	16	Preserved
38	Gonçalves/2002	F/52	SMG	Duct	22	Preserved
39	Sutay/2003*	F/22	SMG	Gland	37	Preserved
40	Raveuthiran/2004	F/10	SMG	Duct	35	Preserved
41	Yildirim/2004	M/56	SMG	Gland	30	Resected
42	Chan/2006	M/27	SMG	Duct	35	-

43	Grazianni/2006	M/61	SMG	Duct	22	-
44	Krishnappa/2008	M/42	SMG	Duct	20	Preserved
45	Soares/2009	F/54	SMG	Duct	25	Preserved
46	Sahin/2009	M/46	SMG	Gland	26	Resected
47	Rai/2009	M/60	SMG	Duct	72	Preserved
48	Krishinan/2009*	M/41	SMG	Duct	34	Preserved
49	Krishnan/2009*	F/32	SMG	Duct	25	Preserved
50	Shetty/2010*	M/50	SMG	-	27	Preserved
51	Gungormus/2010	M/59	Sub-lingual	Gland	32	Resected
52	Wallace/2010	M/69	Parotid	Gland	23	Preserved
53	Wallace/2010	M/69	Parotid	Gland	23	Preserved
54	Wallace/2010	F/46	SMG	Duct	15	Preserved
55	Wallace/2010	M/55	SMG	Gland	15	Resected
56	Wallace/2010	M/33	SMG	Gland	25	Preserved
57	Wallace/2010	F/15	SMG	Gland	17	Preserved
58	Wallace/2010	F/50	SMG	Gland	15	Preserved
59	Cited by Wallace et al/ 2010	F/52	SMG	Duct	20	Preserved
60	Cited by Wallace et al/ 2010	M/42	SMG	Duct	56	-
61	Cited by Wallace et al/ 2010	M/55	SMG	Gland	38	Resected
62	Cited by Wallace et al /2010	M/52	SMG	Gland	45	-
63	Cited by Wallace et al/ 2010	M/34	SMG	Duct	26	-
64	Cited by Wallace et al/ 2010	M/61	SMG	Gland	22	Preserved
65	Cited by Wallace et al/ 2010	F/46	SMG	Duct	25	Preserved
66	Cited by Wallace et al/ 2010	M/70	SMG	Gland	20	Resected
67	Bofano/2010	M/48	SMG	Duct	22	Preserved
68	Emir/2010*	M/57	SMG	Gland	35	Resected
69	Gehani/2010*	M/41	SMG	-	35	Preserved
70	Gehani/2010*	F/32	SMG	Duct	25	Preserved
71	Ramesh/2010	M/55	SMG	Duct	43	Preserved
72	Cottrell/2011	M/75	SMG	Duct	28	Preserved
73	Rivera-Serrano/2011	M/69	SMG	Duct	23	Preserved
74	Oteri/2011	F/40	SMG	Duct	20	Preserved
75	Oteri/2011	F/51	SMG	Duct	15	Preserved
76	Babu/2011	M/50	SMG	Duct	62	Preserved
77	Igbal/2012*	M/55	SMG	Duct	35	Preserved
78	Rauso/2012*	M/56	SMG	Gland	56	Resected
79	Santos/2012	M/44	SMG	Duct	25	Preserved
80	Santos/2012	M/56	SMG	Duct	25	Preserved
81	Singhal/2012*	M/51	SMG	-	15	Preserved
82	Singhal/2012*	M/40	SMG	-	18	Preserved
83	Fowell/2012	M/58	SMG	Gland	41	Resected
84	Pandarakalam/2013	M/68	SMG	Gland	40	Resected
85	Gupta/2013*	M/48	SMG	Duct	28	Preserved
86	Gupta/2013	F/45	SMG	Duct	19	Preserved
87	Dalal/2013	F/40	SMG	Duct	18	Preserved
88	Singh/2013*	M/55	SMG	Duct	37	Preserved
89	Rodrigues/2014*	F/48	SMG	-	45	Preserved
90	This case*	F/25	SMG	Soft tissue	42	Preserved

Legend:***= Perforation of the mouth Floor;*** SMG**= Submandibular Gland;** M**=Male;** F**=Female.**

3. DISCUSSION

There are three requirements for sialolith formation: a nest, saliva stagnation, and minerals' precipitation. Physical trauma, infection, and inflammation of the gland predispose the appearance of the sialolith by promoting the precipitation of salts[13]. According to Rauso *et al.* (2012)[16] the use of drugs predisposes a reduction of salivary flow, alteration in electrolyte concentration, an impairment of glycoprotein synthesis and a structural deterioration of the cell membranes of the salivary glands.

The sialoliths are composed of calcium phosphate and carbonate in the form of hydroxyapatite, with a lower amount of magnesium, potassium and ammonia. Submandibular calculus are composed of 82% inorganic and 18% organic material, whereas parotid calculus are composed of 49% inorganic and 51% organic material[3]. Commonly, the inorganic substances predominate in the periphery of the stone, while the center is substantially organic substances. The pathogenesis remains unclear, but it is believed that the sialolith begins with the deposition of minerals around an organic core consisting of modified salivary mucin, desquamated epithelial cells and bacteria[17]. Ledesma-Montes *et al.* (2007)[18] studied the microscopic characteristics of a giant sialolith by a scanning electron microscope and were not able to find

structures that suggested the presence of mineralized bacteria. Their hypothesis is that the bacteria may have undergone morphological changes during the mineralization process, thus losing their shape.

Sialoliths can arise in any salivary gland, the submandibular gland being the most affected (80% to 95%). There are some factors that influence this incidence: saliva from the submandibular gland is mucinous, unlike that produced by the parotid gland, which is serous, having more calcium and phosphate; the pH of saliva rich in mucin is more alkaline, the Wharton duct is longer and more tortuous than the Stensen duct, and finally, gravity acts against salivary secretion in the case of the submandibular gland[19].

It is believed that sialoliths grow 1–1.5 mm on average per year, which would mean 10 years of growth for the sialolith to become giant[20]. The ability of calculus growth to become a giant sialolith depends on two factors. The first is related to the ability of adjacent sialolith ducts to dilate, allowing almost normal salivary flow, causing an asymptomatic disease. The second relates to the inertia of the patient to notice the swelling of his face and seek care only years later[3], as in the case reported here, wherein the patient waited three years to seek care.

Salivary stones are classified as ductal (85%) or intraglandular (15%)[5]. Submandibular sialoliths are mostly found in ducts (75% to 85%)[20]. Sialograms have been reported to be 100% effective in detecting ductal and intraglandular stones[15]. Transillumination from the sialendoscope allows location and extraction of the calculus with limited dissection and gland preservation, beyond the identification of lingual and facial nerves, avoiding paresthesia[8]. Scintigraphy is able to determine how functional the gland is. Ultrasonography detects ecodenses spots in 90% of cases when the sialolith measures more than 2 mm. A computed tomography scan is also very effective in diagnosing sialoliths, however, this test is not accessible to the poor population because of high cost, therefore, panoramic, occlusal, and poster anterior radiographs are cheaper tests and assist in the diagnosis and treatment plan[15] (Figure 2).

There are three main ways to treat patients with salivary calculi: resection of the gland, removal through the oral cavity (Figure 3), and salivary endoscopy[7]. Excision of the submandibular gland is indicated in the presence of small sialoliths in the vertical portion of the Wharton duct or a giant stone inside the gland, performing the intraoral approach not being possible[13]. The resection of submandibular gland has a 0% to 8% risk of causing permanent or temporary palsy due to marginal mandibular nerve injury[20]. Damage to the lingual and hypoglossal nerves is also possible. Excision of the parotid gland is also indicated when conservative treatment fails, but there is a possibility of injuring the facial nerve[8]. However, according to Wallace *et al.* (2010)[8] histopathological studies of excised glands due to sialolithiasis showed normal architecture, moreover, patients undergoing endoscopic removal of a sialolith with preservation of the gland after one year had the return of its function. The great advantage of salivary endoscopy is the fact that it has access to sialoliths located in the hilar or glandular region without the need for removal of the gland, thus preserving the salivary flow; however, this technique has only been used for small stones[8,16].

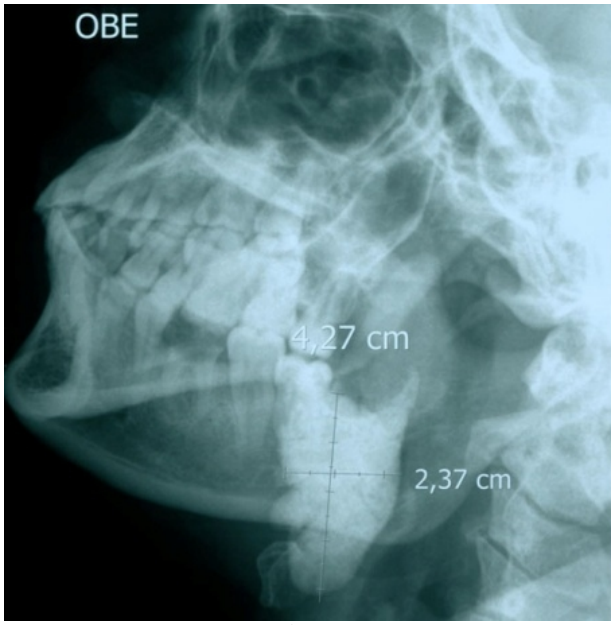

Figure 2. Oblique radiograph of jaw showing a radiopaque, conical, mineralized sialolith measuring 42 mm in its largest diameter.

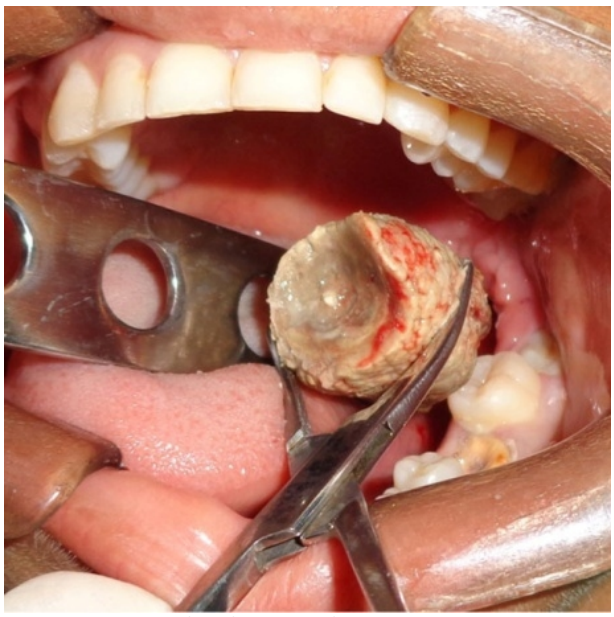

Figure 3. Removal of the first piece of sialolith.

Giant sialoliths were found in 90 cases (Table 1). We concluded that giant sialoliths affected more the fifth to seventh decade of life, representing a total of 77% of all

cases, unlike the normal sialoliths, which affect the third to sixth decade of life[19]; men were affected in 76% of cases. This means they were 3.2 times more affected compared with women; the submandibular gland was affected in 88% of cases being followed by parotid (7%) and sublingual (1%); the duct (55%) was more affected than the gland (38%); the gland was preserved in 61% of cases. In the literature, there were only 24 cases (26%) drilled the mouth floor.

4. CONCLUSION

Giant sialoliths represent a major challenge to oral surgeons in the choice of surgical approach to prevent excision of the gland and likelihood of hypoesthesia, dry mouth, or salivary fistulae. The surgical approach for removal of sialoliths should be minimized to prevent gland morbidity, preferring the intraoral approach. The purpose of this treatment is to restore normal salivary flow. Salivary obstruction for long periods can cause fibrosis and atrophy of the affected gland. Giant sialoliths should be removed even when asymptomatic to prevent complications.

ACKNOWLEDGMENTS

The authors thank the University Hospital João de Barros Barreto and the Training Program for Oral and Maxillofacial Surgery.

REFERENCES

[1]. Naraynsingh V. Giant submandibular gland calculi. J Oral Maxillofac Surg. 1985 May; 43(5):384-5.

[2]. Rivera-Serrano CM, Schaitkin BM. Bilateral giant submandibular sialoliths and the role for salivary endoscopy. Am J Otolaryngol. 2011 Jan-Feb; 32(1):85-7. doi: 10.1016/j.amjoto.2009.09.011.

[3]. Rai M, Burman R. Giant submandibular sialolith of remarkable size in the comma area of Wharton's duct: a case report. J Oral Maxillofac Surg. 2009 Jun; 67(6):1329-32. doi: 10.1016/j.joms.2008.11.014.

[4]. Pandarakalam C, Goebel WM, Seyer B. Chronic sclerosing sialadenitis or Kuttner's tumor associated with a giant sialolith: a case report. Oral Surg Oral Med Oral Pathol Ora Radiol. 2013 Apr; 115(4):e38-40. doi: 10.1016/j.oooo.2012.10.011.

[5]. Raveenthiran V, Rao H. Giant calculus in the submandibular salivary duct: report of the first prepubertal patient. Pediatr Surg Int. 2004 Feb; 20(2):163-4.

[6]. Boffano P, Gallesio C. Surgical Treatment of a giant sialolith of the Wharton duct. J Craniofac Surg 2010 Jan; 21(1):134-5. doi: 10.1097/SCS.0b013e3181c46bc4.

[7]. Igbal A, Gupta AK, Natu SS, et al. Unusually large sialolith of Wharton's duct. Ann Maxillofac Surg. 2012 Jan; 2(1):70-3. doi: 10.4103/2231-0746.95327.

[8]. Wallace E, Tauzin M, Hagan J, Schaitkin B, Walvekar RR. Management of giant sialoliths: review of the literature and preliminary experience with interventional Sialendoscopy. Laryngoscope. 2010 Oct; 120(10):1974-8. doi: 10.1002/lary.21082.

[9]. El Gehani R, Krishnan B, Shehoumi MIL. Submandibular giant sialoliths: Report of two cases and review of the literature. Ear Nose Throat J. 2010 Jun; 89(6):E1-4.

[10]. Oteri G, Procopio RM, Cicciu M. Giant salivary gland calculi(GSGC): report of two cases. Open Dent J. 2011; 5:90-5. doi: 10.2174/1874210601105010090.

[11]. Soares EC, Costa FW, Pessoa RM, Bezerra TP. Giant salivary calculus of the submandibular gland. Otolaryngol Head Neck Surg. 2009 Jan; 140(1):128-9. doi: 10.1016/j.otohns.2008.08.018.

[12]. Krishnan B, Gehani RE, Shehumi MI. Submandibular giant sialoliths- 2 cases reports and review of the literature. Indian J Otolaryngol Head Neck Surg. 2009 Jan; 61(Suppl 1):55-8. doi: 10.1007/s12070-009-0019-3.

[13]. Bodner L. Giant salivary gland calculi: diagnostic imaging and surgical management. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2002 Sep; 94(3):320-3.

[14]. Emir H, Kaptan ZK, Uzunkulaoglu H, Dogan S. A rare case of asymptomatic bilateral submandibular gland sialolithiasis: a giant, fistulizes calculus on the right and multiple calculi on the left. Ear Nose Throat J. 2010 Oct: 89(10):502-4.

[15]. Yildirim A. A case of giant sialolith of the submandibular salivary gland. Ear Nose Throat J. 2004 May; 83(5):360-1.

[16]. Rauso R, Gherardini G, Biondi P, Tartaro G, Colella G.. A case of a giant submandibular gland calculus perforating the floor of the mouth. Ear Nose Throat J. 2012 Jun; 91(6):E25-7.

[17]. Graziani F, Vano M, Cei S, Tartaro G, Mario G. Unusual asymptomatic giant sialolith of the submandibular gland: a clinical report. J Craniofac Surg. 2006 May; 17(3):549-52.

[18]. Ledesma-Montes C, Garcés-Ortís M, Reyes-Gasga J, Salcido-garcia JF, Hernandez-Flores F.Scanning electron micrographic features of a giant submandibular sialolith. Ultrastruct Pathol. 2007 Nov-Dec; 31(6):385-91.

[19]. Ledesma-Montes C, Garcés-Ortíz M, Salcido-García JF, Hernandez-Flores F, Hernandez-Guerrero JC. Giant sialolith: case report and review of the literature. J Oral Maxillofac Surg. 2007 Jan; 65(1):128-30.

[20]. Shetty BN, Sharma P. Unusual case of a projecting intraoral giant sialolith. Indian J Surg. 2010 Apr: 72(2):155-7.doi: 10.1007/s12262-010-0028-1.

[21]. Gungormus M, Yavuz MS, Yolcu U. Giant Sublingual Sialolith Leading to Dysphagia. J Emerg Med. 2010 Sep; 39(3):e129-30. doi: 10.1016/j.jemermed.2007.12.026.

[22]. Chan EK, Patel ND**.** Giant calculus of the submandibular salivary duct. Ear Nose Throat J. 2006 May; 85(5):306-8.

[23]. Gupta A, Rattan D, Gupta R. Giant sialoliths of submandibular gland duct: report of two cases with unusual shape. Contemp Clin Dent. 2013 Jan; 4(1):78-80. doi: 10.4103/0976-237X.111599.

[24]. Ramesh M, Ramesh K, Paul G. Sialolith- a rare case report. Journal Pierre Fauchard Academy. 2010 Sep; 24(3):99-101. doi: 10.1016/S0970-2199(10)43003-9.
[25]. Dalal S, Jain S, Agarwal S, Vyas N. Surgical management of an unusually large sialolith of the Wharton's duct: A case report. King Saud University Journal of Dental Sciences. 2013 Jan; 4(1):33-5. doi: 10.1016/j.ksujds.2012.11.006
[26]. de Santana Santos T, da Costa Araújo FA, Frota R, Caubi AF, de Oliveira E Silva ED. Intraoral Approach for Removal of Large Sialolith in Submandibular Gland. J Craniofac Surg. 2012 Nov; 23(6):1845-7. doi: 10.1097/SCS.0b013e3182653f42.
[27]. Babu L, Jain MK. Giant submandibular salolith: a case report and review of literature. Int J Head Neck Surg. 2011 Sep-Dec; 2(3):154-7.
[28]. 28.Singhal A, Singhal P, Ram R, Gupta R.Self-exfoliation of large submandibular stone-report of two cases. Contemp Clin Dent. 2012 Sep; 3(Suppl2):S185-7. doi: 10.4103/0976-237X.101087.
[29]. Rodrigues GHC, Carvalho VJG, Alves FA, Lemos Junior CA, Jaguar GC.Giant submandibular sialolith: case report. OOOOE 2014 Feb; 117(2):e159. doi: http://dx.doi.org/10.1016/j.oooo.2013.12.049.
[30]. Siddiqui SJ. Sialolithiasis: an unusually large submandibular salivary stone. Br Dent J. 2002 Jul; 27:193(2):89-91.
[31]. Frame JW, Smith AJ. Large calculi of the submandibular salivary glands. Int J Oral Maxillofac Surg. 1986 Dec; 15(6):769-71.
[32]. El Deeb M, Holte N, Gorlin RJ. Submandibular salivary gland sialoliths perforated through the oral floor. Oral Surg Oral Med Oral Pathol. 1981 Feb; 51(2):134-9.
[33]. Hoggins GS. Large calcified mass in the submaxillary gland. Oral Surg Oral Med Oral Pathol. 1968 May; 25(5):679-81.
[34]. Carr SJ. Sialolith of unusual size and configuration. Oral Surg Oral Med Oral Pathol. 1965 Dec; 20(6):709-12.
[35]. Guernsey LH. Giant sialolith. Oral Surg Oral Med Oral Pathol. 1953 Oct; 6(10):1230-2.
[36]. Hubar JS, Guggenheimer J, Evan M. Megalith. Oral Surg Oral Med Oral Pathol. 1990 Aug; 70(2):245.
[37]. Zakaria MAK. Giant calculi of the submandibular salivary gland. Br J Oral Surg. 1981 Sep; 19(3):230-2.
[38]. Sahin C, Yilmaz YF, Titiz A, Ocalan R, Ozca M. Giant Calculus of the submandibular. WAENT [Internet]. 2009; 2(1):2. http://www.waent.org/archives/2009/vol2-1/salivary-gland-stones/giant-salivary-gland-stone.htm [Accessibility verified April 19, 2014]
[39]. Bodner L. Parotid sialolithiasis. J Laryngol Otol. 1999 March: 113(3):266-7.
[40]. Kaltman S, Eichner M. Giant sialolithiasis appearing as odontogenic infection. J Am Dent Assoc. 1987 Sep; 115(3):425-6.
[41]. Lakhoo K, Mannell A. Giant submandibular calculus. S Afr Surg. 1989 Dec; 27(5):187-9.
[42]. Cottrell D, Courtney M, Bhatia I, Gallagher G, Sundararajan D. Intraoral removal of a giant submandibular sialolith obstructing Wharton's duct: a case report. J Mass Dent Soc. 2011; 60(2):14-6.
[43]. Brusati R, Fiamminghi L. Large calculus of the submandibular gland: report of case. J Oral Surg. 1973 Sep; 31(9):710-1.
[44]. Isacsson G, Persson NE. The gigantiform salivary calculus. Int J Oral Surg. 1982 Apr; 11(2):135-9.
[45]. Cotter J. Spontaneous passage of giant salivary calculus. Ir Med J. 1998 Jan-Feb; 91(1):28.
[46]. Meyers H. Large salivary calculus in submaxillary gland. Dent Dig. 1942; 48:420.
[47]. Akin I, Esmer N. A submandibular sialolith of unusual size: case report. J Otolaryngol. 1991 Apr; 20(2):123-5.
[48]. Kesse WK, Shehab ZP, Courteney-Harris R. A megalith of the parotid salivary gland. J Laryngol Otol. 1998 Aug; 112(8):784-5.
[49]. Tinsley G. An extraordinarily large asymptomatic submandibular salivary calculus. Br Dent J. 1989 Mar 25; 166(6):199.
[50]. Paul D, Chauhan SR. Salivary megalith with a sialo-cutaneous and a sialo-oral fistula: a case report. J Laryngol Otol. 1995 Aug; 109(8):767-9.
[51]. Koshal KD, Naik RS. Giant submaxillary sialolith. J Indian Med Assoc. 1981 Jul 1; 77(1):14-5.
[52]. Asfar SK, Steitiyeh MR, Abdul-Amir R. Giant salivary calculi: an orocervical fistula caused by a submandibular gland calculus. Can J Surg. 1989 Jul; 32(4)295-6.
[53]. Bamgbelu O. A giant submandibular sialolith: management and complications. Dent Update. 1989 Nov; 16(9):399-400.
[54]. Sutay S, Erdaq TK, Ikiz AO, Guneri EA.Large submandibular gland calculus with perforation of the floor of the mouth. Otolaryngol Head Neck Surg. 2003 Apr; 128(4):587-8.
[55]. Gonçalves M, Hochuli-Vieira E, Lugão CE, Monnazzi MS, Gonçalves A .Sialolith of unusual size and shape. Dentomaxillofac Radiol. 2002 May; 31(3):209-10.
[56]. Singh S, Singh S. Submandibular gland megalith eroding the floor of the mouth: a case report. Ear Nose Throat J. 2013 Dec; 92(12):E17-9.
[57]. Fowell C, MacBean A. Giant salivary calculi of the submandibular gland. J Surg Case Rep. 2012 Sep; (9):6. doi: 10.1093/jscr/2012.9.6.
[58]. Krishnappa BD. Multiple submandibular duct (Wharton's duct) calculi of unusual size and shape. Indian J Otolaryngol Head Neck Surg. 2008 Sep; 60(3):287-8. doi: 10.1007/s12070-008-0096-8.