Clinical and histopathological findings of sialoliths

Abstract
The aim of the present study was to describe the clinical and histopathological findings of 53 cases of sialoliths retrieved from the Oral Pathology Service, School of Dentistry of Piracicaba, State University of Campinas, São Paulo. They were most frequently found in females and adult patients with mean age of 45 years. Submandibular gland was the more affected, followed by minor salivary and parotid glands. The sialoliths were most frequently described as a single (93.3%), nodule (92.3%) and hard consistency (65.2%). Microscopically, the sialoliths showed lamellated pattern of calcification in 84.9% of cases. Dilated pericalcular ducts were observed in 11 cases and squamous metaplasia was noted in 10 of them (90.9%). Areas of periductal chronic inflammation were observed in 81.8% of the cases. In 10 out of 53 cases salivary glands were available for analysis and the more common finding was mild chronic inflammation associated with acinar atrophy.

Key Words:
sialolith, salivary gland, histopathology
Introduction
Sialolithiasis is a common disease of the salivary glands occurring more frequently in middle-aged patients. It is characterized by organic and mineralized matter, in varying ratios, and may be localized within the duct or in the parenchyma gland. Major salivary glands are more affected, particularly submandibular gland, followed by parotid, sublingual and minor salivary glands. The patients frequently complain of a painful swelling of the gland that is more pronounced before, during and after meals. Compression of the involved gland might produce less saliva and purulent discharge. The severity of symptoms and signs depends on the size and location of the sialoliths. However, eventually some patients may not present symptoms and the sialolith be detected accidentally in a routine radiographic exam.

Radiographic exams are used to identify the sialoliths, which show normally radiopacity. The degree of radiopacity varies from 56% to 98% and depends on its mineral composition. The majority of the sialoliths is round to oval in shape and shows normally radiopacity. The degree of radiopacity varies from 56% to 98% and depends on its mineral composition. Other treatment options are sialendoscopy and lithotripsy. Occasionally, spontaneous exfoliation of the sialolith by ductal orifice or through the skin might occur.

Management of sialoliths particularly depends on the duration of the symptoms, size and localization. Small and peripherally located sialoliths may be removed with manipulation of the gland. However, most of the cases require surgical excision of the sialolith. Eventually, when the sialolith is large and/or deeply located, surgical excision of the gland may be necessary. Other treatment options are sialendoscopy and lithotripsy. Occasionally, spontaneous exfoliation of the sialolith by ductal orifice or through the skin might occur.

Microscopical analysis of the sialoliths frequently reveals a central portion composed by homogeneous substances, which is surrounded by concentric layers with variety thickness and fingerprint-like appearance or by globular structures uniformly arranged. The purpose of this study was to describe the clinical and histopathological findings of sialoliths retrieved from the Oral Pathology Service, School of Dentistry of Piracicaba, State University of Campinas, São Paulo.

Material and Methods
The files of the Oral Pathology Service were reviewed and all cases diagnosed as sialolith or sialolithiasis were retrieved for a retrospective clinical and histopathological analysis. The archives were checked for clinical information and gross description and all cases were reexamined microscopically for diagnosis confirmation. The lesions were classified according to the location, duration, signs and symptoms. Morphological features were also analyzed according to the pattern of calcification, presence of inflammation, ductal metaplasia, atrophy and fibrosis of the associated soft tissue.

Results
Clinical Findings
Sialolith occurred in 53 patients: 32 (61.5%) female and 20 (38.5%) male. The gender of one patient was not specified. The age ranged from 10 to 82 years, with a mean of 45 years. The majority of cases occurred in the third (10/53; 18.9%), fifth (11/53; 20.8%), sixth (8/53; 15.1%), and seventh (7/53; 13.2%) decades. In 3 patients, the age was not available.

Information about radiographs was available in 25 cases (25/53; 47%). In 23 cases the occlusal radiographs were taken for submandibular sialolith diagnosis. In the other 2 cases, a periapical film was used in the upper lip and in the buccal mucosa for diagnosis of minor salivary sialolith and Stensen’s duct sialolith, respectively. The radiographic images were described as single in 22 (22/25; 88%) and multiple in 3 (3/25; 12%). The lesions were described as radiopaque in 24 patients (24/25; 96%), and as mixed appearance in 1 patient (1/25; 4%).

The information about localization was available in 51 cases. Major salivary glands were affected in 42 cases (42/51; 82.4%). The submandibular gland was involved in 39 (39/42; 92.9%), and the parotid gland in 3 (3/42; 7.1%) patients. Sialolith in minor salivary glands occurred in 9 (9/51; 17.6%) patients. The upper lip was involved in 4 (4/49; 44.5%) patients, buccal mucosa in 3 (3/9; 33.3%), and lower lip in 2 (2/9; 22.2%) patients. The duration of the lesion in 41 cases in which this information was given varied from 5 days to 6 years. Information about the size of the sialolith was available in 45 cases and varied from 0.2 to 2.5 cm in maximum diameter. Regarding the number, sialoliths were described as single in 42 of 45 (93.3%) cases. They were characterized as nodule in 36 out of 39 cases described (92.3%).

The information about consistency was given in 45 cases, and in 28 (65.2%) were described as hard, and in 11 cases (24.4%) as fibrous. In 45 cases, where reference to color was recorded, were described as white, yellow and normal in 12 cases each (26.7%), and red in 9 cases (20%). Purulent drainage was noted in 7 patients (13.2%). Statement regarding pain was made in 46 subjects and the lesion was painful in 23 (50%).

In 42 cases information about management was available. Surgical excision of the sialolith was performed in 39 cases (39/42; 92.8%). Removal by manipulation occurred in 2 (2/42; 4.8%), and spontaneous exfoliation in only 1 case (1/42; 2.4%).

Histopathological findings
In all 53 cases sialoliths were analyzed microscopically. They were single in 42 cases (79.2%). Their shape was classified as oval in 23 (43.4%), round in 20 (37.7%) and irregular in 10 cases (18.9%). Lamellated appearance with alternating eosinophilic and basophilic zones disposed concentrically or in shape of globular calcified areas was predominant being noted in 45 cases (84.9%). This pattern was associated with a
homogeneous mass in 10 cases (22.2%) and with heterogeneous in 35 cases (77.8%) (Figure 1). In 7 cases (13.2%), the main part of the sialolith had a heterogeneous and 1 case (1.9%) had a homogeneous morphology. In 1 case, foreign body, probably of vegetal origin, was observed, associated with the central portion of sialolith (Figure 2). Pericalcular ducts were present in 11 cases (20.8%), and in all of them were dilated. In the lumen of these ducts was observed polymorphonuclear neutrophills in 4 cases (36.4%). In 10 cases (90.9%), ductal squamous metaplasia was found. Moreover, were noted some areas of the mucous metaplasia in 4 (36.4%), and respiratory epithelium in 3 cases (27.3%). A periductal inflammatory infiltrate was observed in all 11 cases and was judged to be mild in 6 (54.5%), moderate in 4 (36.4%) and severe in 1 case (9.1%). Inflammatory infiltrate only of chronic nature was noted in 9 (81.8%), and associated with polymorphonuclear neutrophills in 2 cases (18.2%).

Salivary glands adjacent to the sialolith were available for histopathological examination in 10 cases. Mucous glands were observed in all of them. Inflammatory chronic reaction was observed in the parenchyma of the all salivary glands. It was mild in 7 (70%), moderate in 2 (20%), and severe in 1 case (10%). In 9 cases (90%) parenchyma atrophy was found, and in 2 (20%) was observed fibrosis (Figure 3).

Discussion
A male predominance has been frequently reported in the literature. However, in other studies a similar gender distribution and a female predominance also has been described. In our study, we found a slight female predominance with a ratio male:female of 1.6. The mean age varies from 42 to 58.4 years, and almost even incidence in the 3rd to 8th decades. Children are rarely affected but a review of the literature reveals 100 cases of submandibular sialolith in children aged 3 weeks to 15 years old. In our study, the mean age was 45 years and the majority of cases occurred in the 3rd to 7th decades. The radiographic aspect of the sialoliths depends on its mineral composition, and localization. In some cases, the sialoliths may be not identified radiographically because the low grade of calcification or by superimposition of other hard tissue. The occlusal radiography is the most reliable method for visualization of submandibular sialolith located in the anterior portion of the salivary duct. The employ of a periapical film and a reduced exposition time is useful for identification of minor salivary glands sialoliths located in areas of soft tissue. In our series, 23 occlusal radiographs and 2 periapical radiographs were taken for sialolith diagnosis. The radiographic images were described as radiopaque in 96% of these cases. The submandibular gland is more frequently affected.
probably occur due to the viscous consistency and mineral content of its saliva, which has high calcium concentration and mucin content, as well as high pH. Moreover, its duct has a long and irregular length, antigravity flow, and has a small opening that facilitates stasis of the saliva\textsuperscript{3,5,7,9,14,20}. In this study, the submandibular gland was also more frequently affected, followed by minor salivary and parotid glands. Considering only minor salivary glands, the most common sites were upper lip, followed by buccal mucosa and lower lip. The more involvement of the minor salivary glands in areas in close proximity to the teeth may be implicated by trauma in the region, which can lead to inflammatory changes. The resultant inflammation alters the composition and properties of the salivary gland or duct, and may predispose sialolith formation\textsuperscript{1,4-5,17}. However, multiples sialoliths particularly in submandibular and sublingual glands has been found as well\textsuperscript{8,20,22}. In our study, the clinical lesions were described as single in 93.3\% of cases, and the microscopical exam revealed the presence of single sialolith in 79.2\% of cases. The sialoliths show large variety of size and duration. The size may vary from one millimeter to several centimeters\textsuperscript{5,7}. We found lesions from 0.2 to 2.5 cm and with duration from 5 days to 6 years. Normally these lesions, which reach large size and have a long time, are probably asymptomatic\textsuperscript{3,20}. Swelling and pain are often associated with sialolith. They occur in meals time due to elevated intraglandular pressure resulting from an increased salivary secretion in the obstructed gland and duct. They might be also a feature if the lesions become traumatized or secondary infected\textsuperscript{2-3,5-9,17}. In this study the lesions were described as painful in 50\% of cases.

Untreated sialoliths might lead to infections. This occurs when pathogenic bacteria ascend from the mouth, reaching the affected gland or the saliva stagnating in the dilated ducts\textsuperscript{2,7,16}. It might cause damage of the parenchyma and produce a suppurative process, associated with a fistula and pus drainage via mucosa or skin\textsuperscript{12-13}. In our series, purulent discharge was clinically described in 13.2\% of cases. The treatment of sialolith depends on the duration of the symptoms, size and localization. Sialoliths of major salivary glands are normally removed by manipulation of the gland, surgical excision of the sialolith or with the associated gland, as well as sialoendoscopy and lithotripsy\textsuperscript{2,3,5-9,11}. When minor salivary glands are affected, the excision of the sialolith and the gland is indicated\textsuperscript{15,17}. In this study, surgical excision of sialolith was performed in 92.8\% of cases in which information about management was available. In 12 cases the surrounding soft tissue was removed as well. These cases, 8 were sialoliths of minor salivary glands, in 1 case the submandibular gland was removed due to the clinical diagnosis of sialadenitis. In 2 cases the sialoliths localized in the Wharton’s duct were removed together with its duct, and in 1 case the information about localization was unavailable. Removal by manipulation occurred in 2 of cases (4.8\%), and spontaneous exfoliation in only 1 case (2.4\%). The mechanisms of formation of sialolith might explicate the microscopical features more frequently found. The sialolith formation consists of the layered deposition of organic and inorganic matter around the nidus formed by organic matter, making a concentric pattern\textsuperscript{1-3,7,14,21-23,24}. Often, the organic substances predominate in the center of the stone while the periphery is essentially inorganic\textsuperscript{7}. However, in some cases the sialoliths may be composed only by mineral matter\textsuperscript{25}. We found lamellar pattern of calcification associated with a heterogeneous or homogeneous mass in 84.9\% of cases. With the methods used in the present study it was not possible to evaluate the degree of mineralization, although the presence of the basophilic and eosinophilic areas indicate more or less mineralized areas, respectively. The nidus may be formed by aliments, substances or bacteria, on which migrate from the oral cavity to salivary ducts. In other studies were also observed foreign body as hair\textsuperscript{21} and metal\textsuperscript{26} associated with the sialolith. We observed only one sialolith associated with a foreign body, probably of vegetal origin, which should be the cause of the sialolith formation\textsuperscript{21}. Morphological alterations in the duct and gland associated with sialolith are commons. It occurs due to the long-standing obstruction associated with inflammatory process, and with a possible bacterial infection\textsuperscript{1-5,7,16,18}. We observed squamous metaplasia in the majority of cases, and areas of mucous and respiratory metaplasia. The periductal inflammatory infiltrate was judged to be mild to moderate and of chronic nature. In 4 cases were observed polymorphonuclear cells in the ducal lumen. The alterations more commons in glands are inflammation, atrophy and fibrosis of parenchyma\textsuperscript{1-5,7,16}. In this study, we found mild inflammation, characterized by scattered chronic inflammatory cells. Parenchyma atrophy also was found in the majority of cases. Its through to occur by sialolith formation process, but might be associated with other factors as patient age\textsuperscript{16,18}.

In summary, the sialoliths observed in our series appeared as a single and hard nodule, and occurred more frequently in submandibular salivary glands. Females and middle-aged patients were more commonly affected. The surgical excision of sialolith was the treatment more frequently performed. Microscopically, the sialoliths showed predominantly lamellated pattern of calcification associated with a homogeneous or heterogeneous mass.

References