Papillary stenosis of the submandibular gland caused by dental prostheses

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Objectives. The aim of this study was to assess diagnosis and treatment of submandibular duct stenosis caused by dental prostheses.
Study Design. This retrospective study included 9 patients with papillary stenosis caused by physical irritation of the Wharton duct ostium by a mandibular dental prosthesis. Diagnostics included physical examination, as well as transcutaneous and transoral ultrasound examinations. Treatment consisted of duct incision, papillotomy, and subsequent sialendoscopy. After surgery, patients were advised to have the dental prosthesis altered by the dentist and to have regular gland massage. Follow-up data were obtained via telephone interviews. The most important outcome parameter was a symptom-free state.
Results. In all 9 patients, the insertion of the sialendoscope was initially impossible because of the stenosis. After duct incision, sialendoscopy ruled out other obstructive causes and inflammatory states, leaving the dental prosthesis as the only underlying cause of the obstruction. Seven of the 9 treated patients were interviewed after a follow-up period of 28.1 (± 25.4) months. The procedures had resulted in all patients being symptom-free, without any reported complications.
Conclusions. Mandibular prostheses can cause stenosis of the papillary region with subsequent submandibular duct obstruction. Surgical therapy is easy to perform and results in excellent long-term outcomes. (Oral Surg Oral Med Oral Pathol Oral Radiol 2020;130:e24−e28)

Patients typically describe salivary obstructive symptoms as a more or less painful recurrent swelling of the affected gland, occurring after eating or when salivation is stimulated. The submandibular gland (SMG) is more often affected compared with the parotid gland, with sialolithiasis being the most frequently observed reason for obstructive diseases, followed by stenosis.[1] The latter represents 5% to 10% of all obstructive causes in the submandibular gland.[2-5] Of the imaging modalities used, such as computed tomography (CT) or magnetic resonance imaging (MRI) (± sialography), and ultrasonography, ultrasonography has become increasingly accepted as a diagnostic method for detecting ductal congestions.[6-10] In particular, transoral ultrasonography can provide precise insights to differentiate between sialolithiasis and stenosis, especially in the distal duct sections, as reported previously by our group.[11] A subsequent sialendoscopy, if available, can often establish a definitive diagnosis or exclude other obstructive causes through direct visualization.[3,12,13]

In the SMG, greater than 80% of the stenoses are associated with cicatricial tissue, and more than two-thirds are located at the papilla or in the distal duct.[12] However, the reasons for these stenoses at the papilla sometimes remain unclear. In our experience, mandibular prostheses display one of various causes of papillary stenosis, but so far, this finding has not been described in detail in the literature.

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This article describes the diagnostic findings in patients presenting with fibrous papillary Wharton duct stenosis resulting from mechanical irritation by mandibular dental prostheses, illustrates treatment options, and analyzes the results and follow-up data after transoral duct surgery.

MATERIALS AND METHODS

This retrospective study was conducted at a tertiary referral center for salivary gland diseases (FAU Medical School, University of Erlangen-Nuremberg, Department of Otolaryngology, Head and Neck Surgery, Erlangen, Germany) and included patients treated between February 2009 and February 2019.

Patient selection and study cohort

From February 2009 and February 2019, 6847 sialendoscopies were performed at our department. The records and operation reports of all patients diagnosed as having stenosis of the Wharton duct papilla within that period were reviewed. Patients with other obvious causes of obstruction (stenoses not associated with the use of a dental prosthesis, stenosis caused by sialolithiasis or a history of sialolithiasis, stenoses of the duct not located at the papilla, inflammatory stenoses, or stenoses caused by any other space-occupying lesions

Statement of Clinical Relevance

Fibrous submandibular salivary duct stenoses can be caused by dental prostheses as a result of irritation of the papillary region. Treatment consists of transoral surgery with posterior rerouting of the duct under local anesthesia.

of the floor of the mouth) and patients who had had prior surgery to the floor of the mouth were excluded. Only patients with a mandibular prosthesis (partial or full, being worn for at least 1 year, and previous symptom-free state of the patient) as the only cause of the obstruction were selected. Finally, 9 patients who presented to the department with obstructive symptoms of the SMG and who fulfilled these criteria were included in the study (N = 9; 8 females, 1 male; mean age at presentation 72.3 ± 10 years).

Written informed consent for the use of information regarding all diagnostic procedures, therapeutic measures, and scientific data processing was obtained from each patient, according to the university's general contract conditions and the tenets of the Declaration of Helsinki.

Clinical and ultrasound examinations

In all of the 9 patients, clinical examination showed that the plastic part of the prosthesis was in contact with the anterior floor of the mouth and also covered the Wharton duct papilla, which was swollen, was domed, and could be palpated as an indurated nodule. All patients received transcutaneous ultrasound examinations (N = 9), and all patients who presented to the department as of 2016 (n = 4) received additional transoral ultrasound examinations (Acuson S3000, equipped with the 9 L4 and 14 L5 SP transducer, both Siemens Healthineers, Erlangen, Germany). All of these examinations were conducted after the administration of ascorbic acid (Apoday Vitamin C powder, WEPA Apothekenbedarf GmbH & Co KG, Hillscheid, Germany) by 2 certified and experienced ultrasound instructors (Figures 1A and 1B).

Treatment

First, the dental prosthesis was removed, and lidocaine spray (2%, Aspen GmbH, Germany) was applied to the anterior floor of the mouth. A metal conical dilator (Karl Storz SE & Co. KG, Tuttlingen, Germany) was used to attempt to widen the indurated papilla. This was not successful in any case because of complete stenosis and did not result in sufficient salivary flow or a sufficient opening for inserting a sialendoscope (minimum diameter 0.8 mm, Karl Storz, Tuttlingen, Germany) (Figures 2A and 2B). Then, 1 to 3 mL of 4% articaine hydrochloride with 1:200,000 epinephrine was injected around the papilla and next to the anterior third of the Wharton duct. A retropapillary incision posterior to the papilla, 3 to 5 mm in length, was performed to open the mucosa. The distal duct was dissected to about 1 cm and opened with a small incision to insert the sialendoscope. All sialendoscopies were performed by highly experienced investigators, and other obstructive causes and inflammation close to the papilla or elsewhere in the duct were excluded (Figure 1C).

The duct was then further opened posteriorly, resulting in a maximum incision length of 5– to 10 mm, and also anteriorly with a back-cut to open the fibrotic papilla in a retrograde manner, taking care not to damage the excretory duct of the sublingual gland, and to exclude any other cause of fibrosis (e.g., a small sialolith, an inflammatory state, or any other foreign body). Finally, the opened duct was marsupialized with the mucosa by using absorbable sutures (4-0 or 5-0 Vicryl; Ethicon, Johnson & Johnson Medical GmbH, Norderstedt, Germany) (Figure 2C), and an additional control sialendoscopy was performed to ensure an unimpeded drainage of the neo-ostium.

Postoperative treatment

On the first postoperative day, all patients received ultrasound control examinations, and the persistence of the ductal obstruction was excluded, as indicated by a collapse of the duct, which was no longer detectable in the absence of an obstructive cause, even after administration of ascorbic acid.

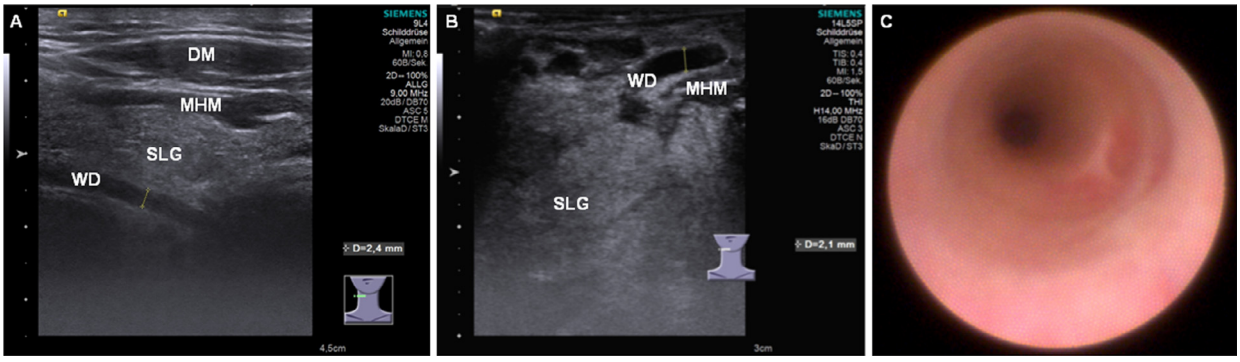

Fig. 1. Ultrasound images of the right Wharton duct after application of ascorbic acid onto the floor of the mouth and sialendoscopic view. **A,** Transcutaneous ultrasonography, revealing duct congestion (2.4 mm); the cause of the obstruction is not visible. The papillary region usually cannot be imaged because of the dorsal sound extinction caused by the mandible. **B,** Transoral ultrasonography scan of the same patient, which depicts the congestion (2.1 mm) as well as the stenotic papilla, without any signs of a concrement. **C,** A sialolith, an inflammatory state, and other obstructive causes were excluded by using sialendoscopy after the surgical treatment. *DM,* digastric muscle; *MHM,* mylohyoid muscle; *SLG,* sublingual gland; *WD,* Wharton duct.

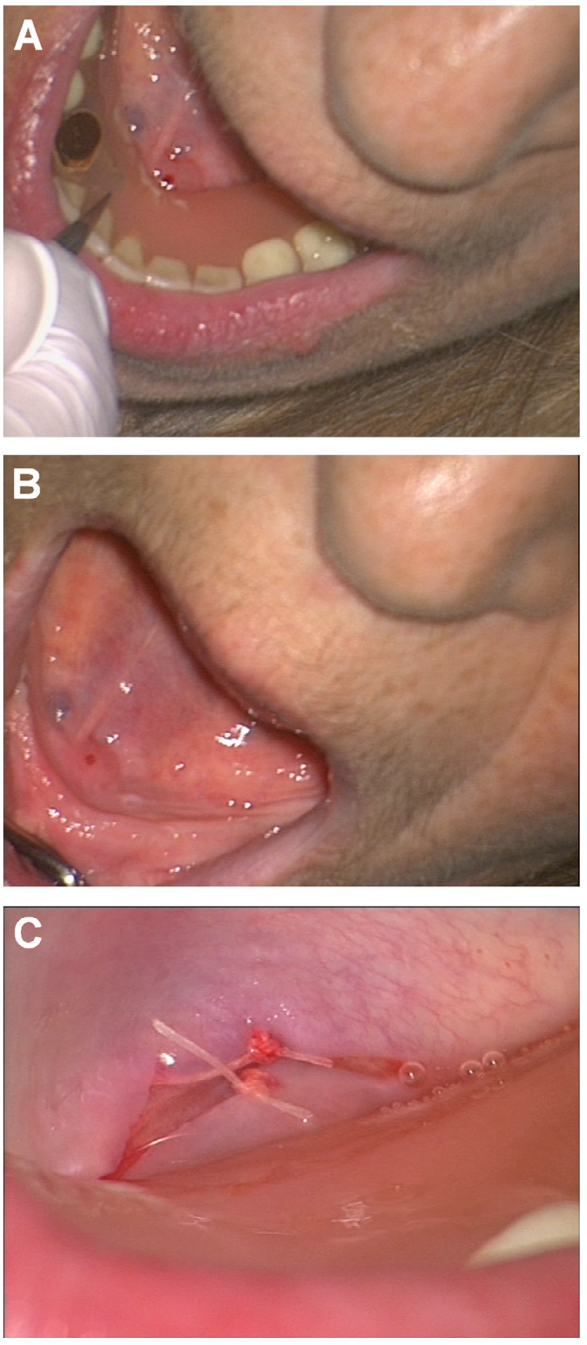

Fig. 2. Fibrous papillary stenosis of the excretion duct of the left submandibular gland. **A,** The plastic part of the slightly mobile dental prosthesis, which was moved anteriorly with the dilator to show the region of interest, partially covers and irritates the left Wharton duct papilla. **B,** The left papilla of the same patient without the dental prosthesis. The red spots identify the ostium after an unsuccessful attempt of dilation caused by complete stenosis. No salivary flow can be observed, not even when gland massage is performed. The papilla can be palpated as an indurated nodule and is slightly domed, demarcating the fibrotic remodeling zone. **C,** Sufficient saliva drainage after papillotomy, anterior opening, and marsupialization of the left Wharton duct. The neo-ostium is located more posteriorly, preventing occlusion and irritation caused by the dental prosthesis.

All patients were treated postoperatively with oral ampicillin/sulbactam for 2 to 5 days, oral naproxen 500 mg twice daily for 3 to 5 days, and regular oral rinses (Salviathymol; MedaPharma Ltd., Bad Homburg, Germany). Regular daily gland massage with use of ascorbic acid or sialagogues was recommended.

Follow-up

Patients were contacted by telephone, and an interview was conducted to ask about the following parameters: absence of complaints after the surgical treatment, duration of freedom from symptoms, relapse of the obstructive symptoms on the treated side, necessity for additional therapeutic management on a long-term basis (e.g., interventional sialendoscopy, surgical revision, submandibulectomy), incidence of adverse effects, complications during the healing process, revision of the dental prosthesis, development of a ranula, sensory disorder of the tongue or the floor of the mouth on the intervention side (lingual nerve affection), performance of regular gland massages, and the patients' statements concerning their personal acceptance of the measures.

RESULTS

Diagnosis and treatment

In all nine cases, an attempt to dilate the fibrotic ostium with the use of a conical dilator was not successful because of complete stenosis of the ostium. The complete stenosis excluded other approaches, such as corticosteroid injections or primary revision of the prosthesis, as an appropriate therapeutic option.

Transcutaneous ultrasonography revealed duct congestions without any detectable signs of concrements, but ultrasound was limited in the anterior part of the duct as a result of the dorsal sound extinction of the mandible.[11-12] However, papillary stenosis as the obstructive cause can be directly depicted by using transoral ultrasonography[11] (see Figures 1A and 1B). Interestingly, in all cases, only 1 papilla or gland was symptomatically affected (5 on the left side and 4 on the right side).

All surgical procedures were carried out under local anesthesia and performed as described above. In every case, a subsequent sialendoscopic examination did not reveal any other obstructive cause or an inflammatory state close to the papilla (see Figure 1C). In all patients, the postoperative course was uneventful, and no complications resulting from the surgical or subsequent medical treatment were reported (Table I).

Follow-up

Mean follow-up period after the operation was 28.1 (± 25.4) months. Six of the 9 treated patients were contacted by telephone and an interview was conducted. Three of the 9 treated patients died as a result of other causes in the period between the operation and the interview. In 1

Table I. Results after surgical treatment of fibrous Wharton duct papillary stenosis caused by mandibular prostheses

Patients treated, total (N)	*9*
Age at operation (years, standard deviation [SD])	72.3 (± 10)
Follow-up possible (n)	7
Mean follow-up time (months, SD)	28.1 (± 25.4)
Freeness from obstructive symptoms (n, %)	7 (100%)
Revision of treatment necessary*(n, %)	0 (0%)
Revision of prosthesis (n, %)†	5/7 (71.4%)
Complications observed or reported‡(n, %)	0 (0%)
Would have decided in favor of the same treatment again (n, %)	7 (100%)

*Any kind of revision (sialendoscopy, dilation, surgical revision, removal of the gland).
†One of these 5 patients received a new prosthesis, thus avoiding the occurrence of papillary obstruction.
‡Any kind of complications (adverse effects of postoperative medical treatment, disturbed wound healing, chronic pain, development of a ranula, sensory deficits of the tongue or floor of the mouth on the treated side, relapse of symptoms).

of the deceased patients, sufficient follow-up information for the period until the patient's death could be obtained; in 2 other cases, follow-up data were insufficient. Thus, complete follow-up data could be obtained from 7 patients (77.8%). None of these patients needed or wished for a control examination because of freedom from symptoms. No further complaints were reported after the surgical treatment, and a revision procedure or surgical removal of the gland was not necessary in any patient. Four of 7 patients had had their prosthesis altered by their dentist, as recommended, to reduce pressure sores, particularly at the floor of the mouth, and 1 patient received a new prosthesis shortly after the operation.

Interestingly, the contralateral side was not symptomatically affected in any of the patients—neither at the first instance nor during the follow-up period and in patients who did not have their prosthesis altered. A closer inspection revealed slight asymmetries of the mucosal surface of the prostheses at the time when treatment was performed; however, the reason for the unilateral occurrence could not be elucidated further.

DISCUSSION

We have described here 9 cases where a submandibular prosthesis was identified as the only cause of a papillary submandibular duct stenosis after other causes other locations of stenosis had been ruled out. In all patients, the complaints had developed in later ages and after the prosthesis had been worn regularly. No obstructive symptoms had been previously present at any time in the patient's life. Patients reported recurrent, painful periprandial swelling of the affected gland, and purulent sialadenitis or abscess formation can be a consequence if the obstructive cause is left untreated.

Duct stenoses are responsible for about 10% of obstructive sialopathies in the submandibular gland and can have various causes.[4,12,14,16] Distal fibrotic duct stenoses account for about two-thirds of all stenoses in the SMG.[4,5,14,17] In our experience, papillary stenoses can be caused by the physical irritation of the papilla by a mandibular prosthesis. Although this diagnosis is rare, other obstructive causes may be more common, and the phenomenon described here has been rarely mentioned before[5,17]; to the best of our knowledge, to date, no systematic or similar findings have been reported in detail in the literature.

It should be noted that small salivary concrements can irritate the distal duct from the inside, resulting in scarring of the inner wall, gradually reducing the diameter of the duct. This is important for the differential diagnosis of a fibrous papillary stenosis. As it is difficult to differentiate between a distal stenosis and a small distal concrement in the Wharton duct, a sialendoscopic examination or transoral ultrasound examination may be required. Both pathologies are palpable as indurations and cannot be distinguished even when various other imaging methods are used.[3,6-9,15,18,19] Simultaneous occurrence of stenosis and sialolithiasis is possible.[14,17]

Transoral ultrasound examination with a suitable transducer is an additional helpful technique for differentiating between sialolithiasis and stenosis. Especially at the papillary region and after the additional application of ascorbic acid powder, this method can identify concrements and stenoses with very high sensitivity and specificity,[11] and this is of particular benefit if sialendoscopy is not available.

In cases of papillary stenosis, the insertion of a sialendoscope may not be possible at first. However, sialendoscopy should be recommended as a subsequent examination to exclude other causes of a ductal congestion. In all of the cases reported here, other reasons for the ductal obstruction were ruled out with postinterventional sialendoscopy, and thorough anamnesis and physical examination identified the prosthesis as the causative agent.

When duct surgery is performed, attention should be paid to localizing the rerouting of the duct to the more posterior floor of the mouth, where the neo-ostium is no longer covered by the plastic part of the prosthesis. Papillotomy and retropapillary duct incision or retropapillary duct incision with back-cut papillotomy and a subsequent sialendoscopy were performed in all of our study patients. In this way, any other obstructive causes could be excluded and recurrent stenosis avoided. As the papilla is incised but not resected with this technique, no tissue samples for a histopathologic examination were available. Resection of tissue in this area, however, poses the risk of ranula formation, particularly when the major or minor excretion ducts of the sublingual gland are involved. The

correlation between the visible and palpable induration at the papilla, which is typical for a fibrotic remodeling process, and the position of the dental prosthesis was obvious (see Figures 2A and 2B).

All surgical procedures were well tolerated under local anesthesia. The efficacy of this therapy is demonstrated by the fact that all of the patients were completely symptom-free after undergoing the reported treatment, even when the prosthesis was not altered, as recommended (4 of 7 patients); however, the explicit reasons why only one side was affected and why clearly more female patients were affected could not be elucidated in this retrospective study. Stenoses of this kind might be prevented if during the fitting process of a newly made mandibular prosthesis, care is taken to not irritate the papilla, thus avoiding stenotic remodeling.

The main limitation of our study is that the study patients may not be representative from an epidemiologic aspect, a circumstance that may be explained by a potential bias created by the referral of affected individuals to the endoscopy unit of our department. A controlled clinical study would be desirable; however, it may be difficult to perform because of ethical considerations (not diagnosing/treating symptomatic patients or diagnosing/treating asymptomatic patients) and the rarity of the described diagnosis.

CONCLUSIONS

Physical irritation caused by a mandibular prosthesis can cause fibrous papillary Wharton duct stenosis. Affected individuals can be treated under local anesthesia with transoral duct surgery, including retropapillary duct opening, back-cut papillotomy, and subsequent marsupialization. The reported technique was easy to perform, showed very good long-term results, and completely eliminated patients' complaints in all cases studied.

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