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MODERN SURGICAL TREATMENT OF TUMORS OF THE LARGE SALIVARY GLANDS

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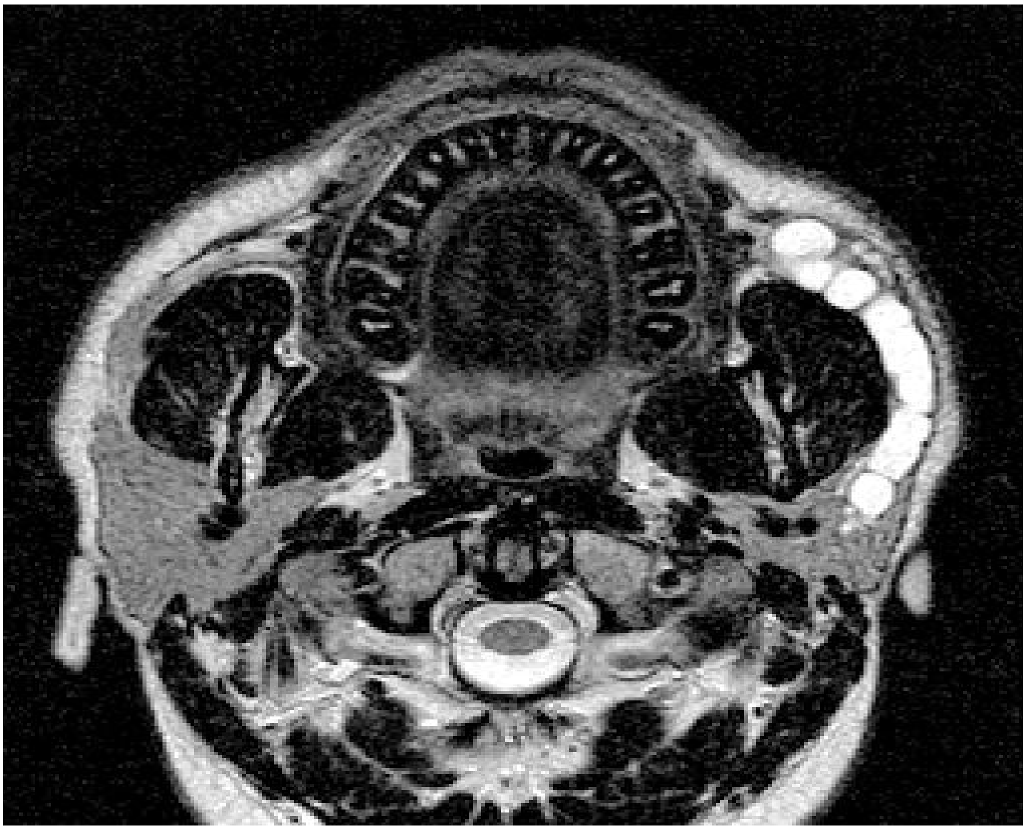
Abstract: Over the past fifteen years, increasing public demand for minimally invasive surgery and recent technological advances have led to the development of a number of conservative therapeutic treatments for obstructive salivary gland diseases such as stones and duct stenosis. These include extracorporeal shock wave lithotripsy, sialendoscopy, laser intracorporeal lithotripsy, interventional radiology, video-assisted conservative surgical removal of parotid and submandibular stones, and botulinum toxin therapy. Each of these methods can be used as a stand-alone therapeutic method or in combination with one or more of the above options, usually on a day or overnight basis under local or general anesthesia. The multimodal approach is completely successful in approximately 80% of patients and reduces the need for gland removal by 3%, justifying the combination, albeit labor-intensive and relatively expensive, as part of a modern and functional treatment of salivary gland stones. Regarding the treatment of salivary duct anomalies such as strictures and kinks, interventional radiology with fluoroscopically guided balloon ductoplasty appears to be the most appropriate method despite the use of radiation. Operative sialendoscopy alone is the best therapeutic option for all mobile intraluminal causes of obstruction such as microliths, mucus plugs or foreign bodies, or for the local treatment of inflammatory conditions such as recurrent chronic mumps or autoimmune diseases of the salivary glands. Finally, if one of the above methods fails and regardless of the cause of obstruction, botulinum toxin injection into the salivary gland parenchyma using color Doppler ultrasound monitoring should be considered before deciding on surgical removal of the gland.

Key words: Salivary glands, salivary stones, salivary duct stenosis, surgical treatment, extracorporeal lithotripsy, sialendoscopy, botulinum toxin therapy

Introducion: Diseases of the salivary glands are relatively common. The most common non-neoplastic disease of the salivary glands is obstructive sialadenitis, which can be caused by stones, fibromucinous plugs, duct stenosis, foreign bodies, anatomical changes or malformations of the duct system leading to mechanical obstruction associated with stasis. Patients with a history of obstructive sialadenitis have recurrent painful periprandial swelling of the affected gland, best known as "meal-time syndrome," which is often complicated by recurrent bacterial infections, with fever and purulent discharge from the papilla. Sialolithiasis is the main cause of obstructive diseases of the salivary glands, it occurs in 66% of cases and accounts for about 50% of the main diseases of the salivary glands. Postmortem studies have shown a prevalence of salivary gland stones in the general population of 1.2%, although Escudier and McGurk described the incidence of symptomatic salivary gland stones as approximately 59 cases per million per year with a clinical prevalence of 0.45% 9. Sialolithiasis is more common in male patients. The peak incidence is between the ages of 30 and 60 years, and it is rare in children, as only 3% of all cases of sialolithiasis occur in the pediatric population. Sialolithiasis affects the submandibular gland in 80-90% of cases, mostly unilaterally10 but without a preferred side; this finding is partly explained by recent postmortem morphometric studies that have shown symmetry between the right and left glands. In our experience, the average size of submandibular stones is about 7.3 mm, although giant sialoliths up to 7 cm have occasionally been described. Most stones are located in the distal third of the duct or at the hilum of the gland; pure intraparenchymal stones are rare. Five to 10% of cases occur in the parotid gland. The difference between parotid and submandibular stones is striking partly related to the ascending duct system of the submandibular gland and the type of secretion (mainly mucous). The sublingual and other small salivary glands are rarely affected (approximately 0-5% of cases). Traditional etiopathogenetic factors associated with stone formation include obstruction, decreased salivary flow rate, dehydration, altered salivary pH associated with oropharyngeal sepsis, and impaired crystalloid solubility3; physiologically, microliths may be detected after precipitation in supersaturated mucus plug solution3 or membrane phospholipids in excess secretory vesicles, which become symptomatic and may act as a nidus in which successive layers of inorganic and organic matter are deposited. In addition to these classical hypotheses, Marshall et al. 4 recently proposed a retrograde theory of lithogenesis, which posits that retrograde migration of food, bacteria, or foreign bodies from the oral cavity into duct system may lead to stone formation, which is facilitated by changes in the sphincter-like mechanism, which are reported in 90% of cases. This hypothesis was supported by Teymourtash et al., who used a poly polymerase chain reaction (PCR) to extract gene fragments belonging to oral bacteria from salivary stones, most of which are Streptococcus species (the same as those found in bacterial plaque on gums). The traditional diagnostic approach consists of standard radiography, which fails to detect radiolucent, intraglandular, or small stones in approximately 20% of cases, and computed tomography (CT), which is limited by the fact that the stone may be obscured by thick radiographic sections and that scanning does not provide accurate localization of the stone. sialolith in the duct system. Color Doppler is also considered useful in patients with sialolithiasis. Ultrasound examination is currently an excellent first-level diagnostic method, since in experienced hands it allows detection of ductal and highly mineralized stones with a diameter of at least 1.5 mm with an accuracy of up to 99%. Recent advances in optical technology have led to the development of sialendoscopy, a new diagnostic tool for direct visualization of intraductal stones, which has made it possible to bridge the diagnostic gap between clinical suspicion of salivary gland obstruction and the limitations of traditional radiology. Miniature instruments corresponding to the average diameters of the excretory ducts of the major salivary glands (0.5-1.4 mm for the Stensen duct and 0.5-1.5 mm for the Wharton duct, as suggested by histological studies) allow for a virtually complete examination of the duct system in most patients.

Airway anomalies

Structures and kinks are the second most common cause of obstructive sialadenitis and, unlike sialolithiasis, often affect the parotid duct system (75.3% 33) and predominantly affect women. Sialography findings indicate that salivary duct stenosis accounts for approximately 23-30% of recurrent parotid tumors and 3% of recurrent submandibular tumors. Other anatomical variations have been described in cases of salivary gland obstruction; these include accessory ducts, sphincter-like mechanisms located near the papilla in Wharton's duct or posteriorly in the Stensen duct, pelvic-like structures, which are pelvic-like structures at the hilum instead of the bifurcation or trifurcation, and intraductal deviations. Structures usually result from damage to the epithelial ducts following recurrent



infections or trauma caused by sialoliths or surgery, although congenital strictures have also been described. In this context, bilateral parotid duct sialoectasia in patients with parotid artery obstruction but without evidence of chronic mumps may be considered a congenital anomaly. Regarding the origin of the kinks, Nahliyeli et al described involvement of the acute bend of the Wharton duct over the lingual nerve and the mylohyoid muscle in an area known as the "knee region," in addition to herniation of surrounding tissue through the mylohyoid muscle or its weakening. The traditional diagnostic approach to ductal stenosis includes sialography, which is still considered the gold standard for diagnosis and also plays a therapeutic role by stretching the duct walls with contrast. Sialo-CT has also been proposed for the diagnosis of ductal system anomalies. However, these imaging techniques indirectly visualize the salivary duct system, expose patients to radiation, and may be complicated by infections or iatrogenic lesions of the duct wall. Magnetic resonance (MR) sialography has been introduced more recently as a new diagnostic tool for visualizing the duct system down to the tertiary branches and parenchymal tissue 45 46. Its advantages are that it does not require a contrast agent, there is no irradiation and no need for duct cannulation, it can also be performed in cases of acute glandular infection and, finally, the use of citric acid to stimulate the secretion of the salivary glandsm (dynamic sialo-MRI) allows the functional state of the affected gland to be assessed.

Sialo-MRI image of parotid duct stenosis of the distal third.

Recently, MRI sialographic 3D reconstruction and MRI virtual endoscopy of salivary gland ducts have been proposed based on the experience of using MRI virtual endoscopy in other systems such as the gastrointestinal tract, urinary tract, biliary tract, and vascular structures. This new diagnostic method was proposed as a non-invasive preoperative procedure in order to adapt conventional surgical endoscopy to the individual patient's anatomy based on the provided endoluminal images. Sialendoscopy is useful for identifying ductal abnormalities that may not be detected by traditional or newer imaging techniques. Other causes of obstruction Salivary duct obstruction may be caused by mucus plugs, foreign bodies, sialodochitis, compression of the ab estrinseco from neoplasm or reactive intraparenchymal parotid lymph nodes, intraductal polyps, or granulation tissue, sometimes associated with immunologic disorders such as Sjogren's syndrome. Obstructive symptoms may also result from dose- and time-dependent damage to the salivary glands following radioiodine therapy given to patients with thyroid cancer, since the salivary glands, and particularly the serous parotid cells, selectively concentrate iodine. Obstruction of the parotid salivary duct due to lack of neuromuscular coordination of movements has also been described, as has obstruction due to traumatic tooth eruption 34 or prosthesis-induced compression of the salivary duct opening. In most of these cases, where traditional and modern imaging techniques fail to visualize the cause of obstruction, sialendoscopy provides immediate and direct information. The traditional approach to treating obstructive salivary gland diseases involves duct dilation, incision and dissection for distal stones (sometimes followed by marsupialization, with the risk of postoperative stenosis) and sialadenectomy for proximal, iliac or intraparenchymal sialoliths. Sialolithiasis remains the main indication for sialadenectomy, although common postoperative complications include nerve injury, recurrent symptoms due to stones retained in the remaining duct, and unsatisfactory aesthetic results. For parotid stones, total conservative parotidectomy is considered better than superficial parotidectomy to avoid recurrence. The main complication reported after superficial parotidectomy for obstructive salivary gland diseases is facial nerve palsy (temporary nerve weakness in 16-38% of cases, permanent in up to 9% 58-60); Frey's syndrome is rare. After submandibular gland removal, there is a 1-8% risk of permanent marginal mandibular nerve palsy and a 1-5% risk of lingual nerve injury. Sialocele, salivary fistula or cyst formation, neuromas, infections, and hematomas are rare after sialoadectomy for obstructive diseases. In case of ductal anomalies, traditional treatment involves surgical removal of the salivary ducts or bypass with creation of a new excretory duct proximal to the stenosis, or ductal sialodochoplasty. Although sialolithiasis has been associated with a high incidence of chronic inflammation, suggesting that salivary duct obstruction resulted in irreversible parenchymal damage, recent scintigraphic and histopathologic studies have shown that that restoration of secretory function after stone removal is guaranteed in most cases. For example, based on a scintigraphic study, Yoshimura et al. estimated the functional restoration of 78% of salivary glands after sialolithotomy, and Marshall et al. found that at least half of his patients who underwent sialoadenectomy had normal histology. This paper presents a review of the major minimally invasive gland-preserving techniques currently used in the treatment of obstructive salivary gland diseases, including shock wave lithotripsy, sialendoscopy, interventional radiology, endoscopic video-assisted transoral and cervical stone removal, and botulinum toxin therapy.

Conclusions

Over the past fifteen years, the growing public demand for minimally invasive treatments, coupled with the rapid advances in medical technology, has led to the that various minimally invasive and conservative salivary gland-sparing treatments for obstructive salivary gland diseases have become available. The use of ultrasound-guided ESWL began in 1989, and the many years of experience gained since then in centers around the world show that that it has become the preferred minimally invasive treatment for all parotid stones and can also be used as a primary treatment for intraductal and intraparenchymal submandibular stones less than 7 mm in diameter. Since its introduction in 1990, significant advances have been made in diagnostic and operative sialendoscopy as a result of the development of improved optical systems and endoscopic devices. Flexible, rigid and semi-rigid endoscopes with outer diameters from 0.8 to 2.7 mm have been used, and the newest highly flexible semi-rigid sialendoscopes appear to be able to adapt to the anatomical landmarks of the salivary duct system. All of these sialendoscopes have a working channel that allows the introduction of microamplifiers, basket or balloon catheter for surgical removal of single or multiple stones; however, based on published results and personal experience, the main limitation of sialendoscopy alone is the difficulty in removing stones with a diameter > 4 mm, or located in a secondary branch of the ductal system, or after a sharp bend in the main duct. Future advances in endoscopic laser lithotripsy, such as the use of the Er:YAG laser, are likely to fill this therapeutic gap soon. Interventional radiology with fluoroscopically guided basket stone extraction is currently used (especially in the UK), and the overall success rate is 71.5%. Long-term experience accumulated in major European and Middle Eastern centers has shown that up to 30% of patients undergoing ESWL (especially with large chyloparenchymal stones) do not achieve successful results with this therapeutic approach, prompting clinicians to explore new conservative and iron-sparing surgical approaches. Recently proposed transoral removal of palpable subcutaneous stones by extended duct dissection or direct subcutaneous incision (possibly under endoscopic guidance) currently represents one of the main treatment options for subcutaneous stones. Finally, surgical removal of palpable and superficial parotid stones using video assistance. All these minimally invasive procedures are performed mainly under local anesthesia and general anesthesia in day surgery or same-day surgery, and it is likely that further improvements in this area will definitely move the treatment of salivary stones from the inpatient to the outpatient setting. A multimodal approach to salivary gland stone removal based on lithotripsy, sialendoscopy and gland-preserving surgical techniques (Tables I, I, II) II results in a high overall success rate (around 80%) in terms of stone removal, with only 3% of patients requiring gland removal; This justifies the combination of these labor-intensive and relatively expensive methods within the framework of modern and functional treatment of salivary gland stones.\

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