

SWELLINGS OF THE SUBMAXILLARY REGION *

BY ROBERT H. IVY, M.D., D.D.S.
OF PHILADELPHIA, PA.

IMMEDIATELY beneath the lower border of the mandible lies a region peculiarly related to the structures of the mouth in that it is frequently the seat of secondary manifestations of disease arising within the mouth and lower jaw. The boundaries of the submaxillary triangle are: Above, the lower border of the mandible and a line drawn from the angle of the mandible to the tip of the mastoid process; below, the anterior and posterior bellies of the digastric muscle. The coverings of the triangle are: The skin and the superficial cervical fascia, the platysma myoides and the deep cervical fascia. The superficial fascia and the platysma myoides form an inseparable layer attached above to the lower border of the mandible and blending imperceptibly into the superficial fascia and muscles of expression of the lower lip and chin. Beneath the platysma lie the submaxillary and submental lymph-nodes, which receive the lymphatics draining from the lower gums, floor of the mouth and tongue. Posterior to these and somewhat deeper, just beneath the angle of the jaw is the deep cervical node receiving drainage from the fauces and tonsil. Beneath the deep fascia is the submaxillary salivary gland. The floor of the submaxillary triangle is formed by the hyoglossus and mylohyoid muscles, the latter separating it from the mouth. The duct of Wharton leaves the under surface of the submaxillary gland, passes around the posterior edge of the mylohyoid muscle, then runs forward on the upper surface of this muscle beneath the mucous membrane of the floor of the mouth, and has its outlet in a papilla at the side of the frenum of the tongue. Other important structures lying within the submaxillary triangle are, the facial (external maxillary) and lingual arteries, the facial (anterior facial) vein, the branches of the facial nerve to the platysma and muscles of the lower lip, the hypoglossal and glossopharyngeal nerves. The facial artery is given off from the external carotid and passes upward and forward through the submaxillary gland to the facial notch which is a depression that can be felt in the border of the mandible about 2 cm. in front of the angle. Two branches of this artery, the submaxillary and submental, are given off in the submaxillary gland. The facial vein is also intimately connected with the submaxillary gland. The facial nerve branches to the platysma and muscles of the lower lip lie in the superficial fascia. The hypoglossal and glossopharyngeal nerves lie deeper and are not concerned in this paper.

There appears to be misapprehension about several conditions manifested by swelling in the submaxillary region. Sébilleau called attention to this confusion in an admirable paper in the *Presse Médicale*, March 16, 1921. He

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points out the common error of regarding the acute inflammatory swelling in the submaxillary region following dental abscess as a lymphadenitis instead of a cellulitis by direct extension from the periosteum of the mandible. The course of an acute dental abscess beginning in the lower jaw depends entirely upon the place at which the pus perforates the bone. (The quotations following are from Sébilleau's article.) "The abscess is at first intra-alveolar, then intraosseous; it then becomes subperiosteal, and finally extraperiosteal, provoking around it a more or less extensive cellulitis, which resembles lymphadenitis. If the perforation takes place at the level of the alveolar process of the jaw, there is formed a swelling in the vestibule of the mouth with a buccal opening or an opening on the skin of the face; if, on the contrary, the perforation occurs at the level of the body of the bone, a true submaxillary phlegmon is formed." The location of the swelling differs somewhat according to whether the outer plate, the inner plate, or the lower border of the mandible is perforated. That this process is one of osteoperiostitis and not lymphadenitis is shown by several facts: (1) The submaxillary swelling communicates with the alveolus. This can be demonstrated by pressure over the swelling causing pus to be discharged from the socket of the tooth. (2) If the submaxillary swelling is incised through the skin, with a probe a more or less extensive surface of denuded bone can always be felt. (3) All cases, and more especially those involving the posterior part of the mandible are accompanied by trismus or limited opening of the jaws. "The early onset and extent of the trismus bear a close relation to the nearness of the lesion to the wisdom tooth and the angle of the jaw. It would be an error to believe that trismus is entirely and constantly absent in lymphadenitis of the submaxillary and retroangular region, but here it is never so intense." The trismus is due to a fusion of the jaw bone with the inflammatory mass, and is the most important sign in diagnosis of osteoperiostitis. "Except for a few cases of diffuse osteomyelitis in children (and even this is open to discussion), mandibular osteomyelitis should practically always be regarded as of dental origin, either the consequence of dental caries, pericementitis, maleruption of the third molar, or retained teeth." Even those cases following fracture or other trauma are nearly always due to dental disturbances. Consequently, in every case manifesting an inflammatory swelling of the submaxillary region, accompanied by trismus, dental pathology should be suspected. Owing to the trismus, proper clinical examination of the inside of the mouth may be impossible, and much dependence must be placed on the X-ray. It is not denied that acute submaxillary lymphadenitis can exist, but very seldom as a complication of acute dento-alveolar infection. Lymphadenitis in this region is nearly always due to ulcerations of the oral soft tissues, the gums, vestibule and floor of the mouth and tongue. In tonsillitis and inflammations about the fauces the lymph-node beneath the angle of the jaw is involved. These lymphatic swellings are almost never accompanied by trismus. They are generally more circumscribed in the beginning than the osteoperiostitis cases. The submaxillary phlegmon complicating osteoperiostitis of dental origin usually

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requires drainage by incision beneath the lower border of the jaw. By planning the incision according to the point at which the pus approaches the skin either in front of or behind the facial artery, annoying hemorrhage from cutting this artery will be avoided. The tooth or teeth from which the trouble originates should be removed at the time the external incision is made or soon after, otherwise a sinus may persist or the condition will recur, or the trismus may develop into ankylosis. Even though a considerable portion of the surface of the mandible be denuded of periosteum, prompt incision and drainage with removal of the cause may result in healing without necrosis.

A not uncommon condition is that of an acute or subacute swelling in the submaxillary region, fairly well circumscribed and quite tender to pressure. In the acute cases the pain may be severe. The patient will often state that this painful enlargement comes and goes every time he catches cold. There is no limitation in opening of the mouth. This condition also is usually diagnosed as an inflammatory enlargement of the submaxillary lymph-nodes, and attributed to drainage from infected teeth or tonsils. As mentioned above, it is quite the rule for a tonsillar infection to be accompanied by a lymph-node enlargement, the tonsillar node being situated rather at the angle of the mandible than in the submaxillary triangle itself. Acute inflammation of the gums and other soft tissues of the mouth, as in Vincent's gingivitis, are also characterized by lymph-node enlargement, this time in the submaxillary and submental region. But it has been shown that an entirely different picture characterizes the swelling from infection arising in the teeth and mandible itself. Here we have direct extension of the inflammation to the submaxillary soft tissues from a periostitis, with marked trismus. In the absence of an inflamed tonsil or acute stomatitis, what other conditions may cause the symptoms mentioned, *viz.*, acute or subacute circumscribed tender swelling in the submaxillary region? We must not overlook the presence in this region of the submaxillary salivary gland and the possibility of its enlargement from obstruction of Wharton's duct by a salivary calculus or by inflammation without calculus. It is this condition that is most commonly mistaken for a lymphadenitis due to infection from teeth or tonsils. In most of the cases that have come to our notice the patients have been told that the trouble was due to infection from the teeth, and have had one or more teeth extracted without relief. In typical acute inflammatory obstruction of the duct of Wharton by a calculus no difficulty should be encountered in diagnosis, yet even here the mistaken diagnosis of dental abscess is often made. The patient will generally give a history of several previous attacks, with increase of pain and swelling especially during meals (salivary colic). In addition to the tender circumscribed swelling in the submaxillary region, there will be painful oedematous swelling under the tongue and difficulty in swallowing. The outlet of the duct behind the incisor teeth may be reddened and pus may be expressed from it. An extremely tender nodule—the calculus—may be felt somewhere along the course of the duct in the floor of the mouth by combined intraoral and extra-oral palpation. Occasionally, these symptoms and signs will exist from acute

inflammatory obstruction of the duct without calculus. The diagnosis is easy also when the stone is seen to be spontaneously extruded from the orifice of the duct. It is in the milder or subacute recurrent cases that there is more excuse for overlooking the true condition present. Here, the only symptoms may be more or less mild recurrent attacks of circumscribed tender swelling in the submaxillary region, with no particular complaint in the floor of the mouth. The likelihood of a stone should, however, always be thought of under these circumstances and careful palpation of the floor of the mouth will frequently reveal a point of tenderness or a hard nodule. The diagnosis will be confirmed by X-ray examination. A No. 2 film ($2\frac{1}{2} \times 3\frac{1}{4}$ in.) is placed horizontally between the upper and lower teeth as far back in the mouth as possible with the sensitized side down, and the rays directed from beneath the chin. A calculus in the anterior three-fourths of Wharton's duct will cast a clear shadow on the lingual side of the teeth and jaw. If the stone is farther back, near the beginning of the duct, a lateral extraoral film may be required to show it. The extraoral method of examination for a small calculus in the anterior part of Wharton's duct is often unsatisfactory, as the stone shadow may be covered by that of the mandible.

The treatment of obstructive enlargement of the submaxillary gland by calculus in Wharton's duct is primarily removal of the calculus. If the calculus is in the anterior two-thirds of the duct this can be accomplished by an incision through the mucous membrane of the floor of the mouth under local anæsthesia. The cases vary greatly in difficulty. No doubt most of us have picked out with forceps a calculus impacted in the orifice of the duct. Where an incision becomes necessary, anæsthesia is best attained by injecting the lingual nerve as in the mandibular injection for extraction of teeth. A fine lacrymal probe passed into Wharton's duct often proves a valuable guide. The mucous membrane is incised in the direction of the duct, and in case of a large calculus the latter can then be readily felt with the finger, the duct incised and the stone liberated. In case of a small stone with little or no surrounding inflammatory reaction, the duct can be first isolated with the probe as a guide, and an incision made in it over the stone. In non-suppurative cases, the mucous membrane incision can be closed without drainage. If much acute inflammatory reaction or suppuration be present, a small wick of gauze or strip of rubber dam should be left in the incision. There is usually considerable reaction following the trauma of this operation, lasting for a few days, which may be partially controlled by hot mouth washes and the application of ice externally. Pain may call for a sedative. If the calculus lies near the point at which Wharton's duct is given off from the gland, removal by external incision is indicated. In cases of long standing, the gland undergoes degenerative changes from chronic inflammation, and even removal of the stone does not effect a return to normal. Here, it is advisable to remove the gland as well as the stone. In this operation, the usual skin incision runs about an inch below and parallel with the lower border of the mandible from just behind the symphysis to the angle. The platysma is divided along the same line and turned up as a separate

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layer. In dissecting out the gland the facial artery and vein are divided and tied. In completing the operation the platysma and skin are sutured in separate layers. A small rubber dam drain is usually inserted for twenty-four to forty-eight hours. Very frequently some of the cervical branches of the facial nerve are cut during the operation, causing a characteristic inability to depress the corner of the mouth due to paralysis of the *triangularis menti* muscle. Improvement may occur with time. This accident is difficult to avoid, but there is less chance of its occurrence if the incision be made well below the border of the jaw.

CASE I.—J. D., male, aged forty, reported that two years previously he began to have attacks of soreness in the floor of the mouth and difficulty in swallowing associated with inflammatory swelling in the right submaxillary region. The pain and swelling increased at meal times. The attacks occurred every two or three months, would be very severe for a few days and then gradually subside. On two occasions during attacks he had supposedly abscessed teeth in the right lower jaw extracted, without preventing recurrence. When seen on February 10, 1924, patient had been suffering from severe pain in the right submaxillary region and back part of the floor of the mouth, and had been unable to swallow anything but liquids for several days. There was a large, tender deep-seated swelling in the right submaxillary region about the size of a small hen's egg, surrounded by redness and œdema. The right side of the floor of the mouth was red, tender and swollen, the orifice of Wharton's duct being distinctly inflamed. No definite nodule could be felt in the floor of the mouth on bimanual palpation. There was practically no limitation of opening the mouth. An intraoral X-ray film showed no calculus in the anterior two-thirds of Wharton's duct. A lateral extraoral film, however, showed a large calculus between the posterior part of the lower border of the mandible and the hyoid bone. February 12, 1924, under ether, through an incision one inch and parallel to the right lower border of the mandible, the submaxillary gland and the calculus were removed. In order to get at the stone, which was embedded in a dilatation of Wharton's duct beneath the gland, it was necessary to dissect the latter entirely free. The wound was closed in two layers, interrupted catgut for the platysma and fascia and dermal suture for the skin. A small rubber dam drain was left in place for forty-eight hours. There was considerable purulent discharge for four or five days, but the patient recovered completely in two weeks. Pathological examination revealed chronic inflammatory changes in the gland.

Cases of chronic inflammatory enlargement of the submaxillary gland with recurrent acute attacks are also met with in the absence of calculus. These are due to obstructive inflammation of the duct, and give rise to the same symptoms as those of obstruction due to calculus. If persistent these also demand excision of the gland. Case II is an example of this condition :

CASE II.—P. R., physician, aged fifty, presented a rather interesting history of obstruction of several ducts. Eight years ago he was operated upon for obstruction of the bile duct, and two days later for an abscess of the right parotid gland. About two years ago, while eating, he first noticed a soft swelling in the right submaxillary region, which disappeared after a few days. Since that time he has had many attacks, varying in severity, of painful swelling in the right submaxillary region, with inflammation beneath the tongue and difficulty in swallowing. When first seen early in September, 1924, there was a hard, tender swelling about the size of a walnut in the right submaxillary region. The floor of the mouth on the right side was red, tender and somewhat swollen. No nodule could be felt, and a lacrymal probe could be passed well back in Wharton's duct without encountering a stone. Intraoral and extraoral X-ray films were negative for

calculus. Within the next few days improvement occurred, but then the symptoms suddenly grew worse. September 13, 1924, the right submaxillary gland was removed. After a few days of muco-purulent discharge the wound healed. There is slight paralysis of the right corner of the mouth, which is gradually becoming less apparent. Examination of the gland after operation failed to reveal any calculi but showed chronic inflammatory changes.

Other Conditions Causing Swelling in the Submaxillary Region.—Carcinoma beginning in the mucous membrane of the cheek, gums, floor of the mouth or tongue is usually accompanied in its late stages by metastatic deposits in the submaxillary lymph-nodes. The diagnosis of submaxillary enlargement from this source generally presents no difficulties because of the presence of the primary lesion within the mouth. Rarely, a carcinomatous involvement of the lymph-nodes in this region occurs in which it is difficult to locate the primary source of the disease. Recently a patient was seen with metastatic carcinoma of the submaxillary lymph-nodes, in whom the primary lesion was in the ethmoid cells. The ethmoid disease was not discovered until several months after appearance of the submaxillary swelling.

There are several other important conditions which give rise to swelling in the submaxillary region, most of them involving the lymph-nodes, which will not be taken up in detail here. Among these are syphilis, tuberculosis, certain forms of leukemia, dermoid cysts and ranula. In conclusion, I wish to emphasize the differentiation between the three most common acute inflammatory swellings appearing beneath the border of the mandible:

(a) Infection from the teeth and alveolar process causes a periostitis with extraperiosteal cellulitis and submaxillary phlegmon, not through lymphatic channels but by direct extension into the soft tissues from the periosteum. It is characterized by marked trismus, or limited opening of the mouth, particularly when the molar teeth are implicated.

(b) Infection from the gums, mucous membrane of the floor of the mouth, tongue or tonsillar region, causes submaxillary lymphadenitis, the swelling here being unaccompanied by trismus of any consequence.

(c) Obstruction of Wharton's duct by calculus or by inflammation without calculus may cause acute inflammatory enlargement of the submaxillary salivary gland. There is nearly always evidence of inflammation beneath the tongue, swelling and pain increased on eating, X-ray may show stone, or the latter may be palpated. Trismus is not a prominent feature.