SALIVARY FISTULÆ.*

BY L. DIEULAFÉ.

In the surgery of civil life the clinical history of salivary fistulæ is altogether limited to that of the parotid gland and of Stenon's duct; the submaxillary gland by reason of its situation in the floor of the buccal cavity escapes traumatism, and in the case of fistulæ consequent upon inflammations of the submaxillary gland or calculi in Wharton's duct, the opening is made inside of the buccal cavity and offers no functional inconvenience.

In war surgery, with all the complex lesions of the maxillary glands and the floor of the buccal cavity and the extensive condition involving the bones and the soft parts, I have never seen a fistula of the submaxillary gland which indicated a special operation. Indeed, according to my previous studies and my observations in war surgery, I need describe only two varieties of salivary fistulæ:

- (a) Parenchymatous fistula of the parotid gland;
- (b) Fistula of Stenon's duct.

The masseteric region and the retromaxillary space, increased by the extension movements of the head, afford the parotid gland such a large surface in which to spread itself that there should be no surprise at the frequency of traumatic lesions of this gland; in addition to this, accidental traumatisms, surgical incisions, foreign bodies within the small ducts, calculi or abscesses may be the cause of fistulous lesions. In war surgery it may be implicated by wounds from various projectiles (bullets, fragments of shells); these fragments of shells of different caliber, sometimes more than one on the same gland, frequently cause lesions of the parenchyma of the gland.

A clean cut section of the parenchyma, especially if it remain aseptic, is restored spontaneously; but the contusion conse-

*Translation made in the office of the Surgeon-General of the Army from the original which was published in *La Restauration Maxillo-faciale*.

quent upon wounds by projectiles or suppuration breaks open the multiple lobules, attacks the intraglandular canals of appreciable caliber and the saliva pours out through a wound in the skin. In our men wounded in war attention to this flow is sometimes neglected at the beginning, because the phenomena of inflammation which result in the production of pus call for the use of dressings, under the protection of which the pathologic feature of the saliva discharge passes unnoticed. It is the same in cases of intraglandular collections; Daniel Mollière has shown that in these cases the fistulæ are preceded by a salivary tumor of slow development, with its volume varying from day to day, the skin covering of which becomes attenuated and reddened and ends in spontaneous ulceration, unless the surgeon may have been induced to make an opening.

When a parotid fistula becomes established after the retrogression of inflammatory phenomena or after the healing of the entry wounds made by projectiles or by operative wounds made to remove them, there may be noticed on the masseteric surface or in the sternomaxillary region a small reddish spot, depressed or acuminate, from the center of which a discharge of a clear viscid liquid appears, its flow limited to a few drops when the jaws are in a state of repose, but greatly increased during the movements of mastication. This is the real secretion mechanism of the parotid saliva.

It is only in cases where the fistula formation is of little importance or possibly where the suppuration of the parotid wounds is still more marked that there need be hesitation as to the diagnosis. In these cases, if the observation of the product of the secretion is not sufficient, the function of the gland may be stimulated by touching the lingual mucous membrane with a little vinegar or possibly by having the patient masticate. I have him chew a piece of hard bread for a moment. The characteristic limpid fluid is then seen flowing abundantly in real rushes through the fistulous place.

Sooner or later the diagnosis is always established; it may even thrust itself upon our notice, for when the other pathologic phenomena have all ceased this abnormal flow alone will remain. In this condition the patient himself makes the diagnosis, for the flow is produced only at the time of meals, and then he notes that his cheek is wet and even in certain cases

actually flooded by the liquid that streams even over his clothes.

In our wounded men who require attention on account of projectile wounds, it is only after the cure of the wound that the fistula offers any inconvenience; at the time when all dressings should be omitted the abnormal flow attracts attention and presents a new therapeutic indication. A few have been referred to us for salivary fistula, but in others who have been evacuated into the special services for facial or maxillofacial lesions, the salivary fistula was first discovered at our examination. Variations in the abundance of saliva flowing through the fistula depend upon the anatomic varieties of lesion; they may result from small lobules or from quite extended portions of the parenchyma with opening of important intraglandular canals.

The fistulous points may be multiple, but my own cases have been single, except in one case in which they were double. The site of the lesion necessarily varies greatly, since all of the region occupied by the parotid gland may be affected by a traumatism or may become abscessed on account of an intraglandular collection. In the latter regard, on account of the burrowing of the pus, the outlet of the pus may be external to the parotid region.

Parenchymatous fistulæ have a tendency to disappear spontaneously, and as in the surgery of civil life they hold only a small place as a clinical entity, but in war surgery the fistula may persist in view of the long periods of observation often necessary for the care required for the accompanying lesions.

I should point out that when the flow from the fistula ceases on account of spontaneous cicatrization the results are as good whether the lower jaw is allowed to be free and movable or fixed by means of an appliance for a fracture; and when the fistula persists after a long period it is found quite as frequently in patients with lockjaw or in those whose mouth has been kept closed for a long period for the fracture to grow firm as in those who have kept up the movement of mastication during the entire period.

It is not a very serious condition, but it is embarrassing, however slight the flow may be.

To what method of treatment must recourse be had?

Pressure. Excision of the Tract.—First of all, I call attention to the two procedures which have been shown to be inadequate and which consequently need not occupy our attention: Pressure, recommended by Jobert, and excision of the fistulous region, followed by suture.

Cauterization.—Cauterizations with nitrate of silver and with the thermocautery have given good results. For small fistulæ, with a slight flow, and consequently limited to small acinous groups, cauterization with delicate thermocautery points has given me good results. I make these cauterizations in two ways:

1. I cauterize the accessible parts of the parenchyma right through the tract of the fistulæ; if this procedure is to be effective two or three cauterizations at intervals of three or four days should result in the cure.

2. But these cauterizations may be inadequate and yet the lesions may be too insignificant to justify a surgical operation; the fistulous point can scarcely be noticed, for in the intervals between meals there is no flow, and it is only at the time of mastication that the clear drops rise to the surface and trickle down. In these cases I enlarge the orifice under local anesthesia and make an incision above and below the fistula (always in the direction of the fibers of the facial nerve at this place) and through this little opening I sear with the cautery all the surface laid open, curette or excise the cutaneous tract, and unite the cut surfaces with horsehair or silk.

In the slight cases my advice is always to begin with one or the other of these methods; they are recommended most particularly for small fistulæ consequent upon intraglandular suppurations.

Injections of Oil.—Taking as his basis the atrophies of the pancreas obtained in the experiments of Claude Bernard by injecting fatty substance into its interior, Daniel Mollière undertook to cure parotid fistulæ by injecting aseptic oil into the injured lobule.

In two cases I tried injections of gomenol oil into the fistulous tract after failure with actual cautery, there was a very perceptible diminution in the secretion of the saliva through the orifice of the fistula, but this result was temporary. The secretion reappeared in a few days. These re-

sults do not justify any judgment as to the method, for it is not likely that the oil penetrated as far as the secreting acini.

Creation of an Intrabuccal Opening by Transfixion.—Fano and Duplay made an artificial passage within the mouth.

I have myself made an intrabuccal opening, in three cases where the fistula was situated over parts of the parenchyma upon the external surface of the masseter and adjacent to the anterior border of this muscle. I only followed the procedure which I used in fistulæ of Stenon's duct when this duct had a lesion in its posterior extremity, or when it was very tightly involved in hard cicatricial tissues or in tissue infiltrated with neoplastic formation.

This is the procedure that I advise :

A probe blunt at the end is inserted into the cutaneous opening, introduced through the tract without effort. The skin is cut in a lineal direction anterior and posterior to the probe. The end of the probe must not be displaced and must always mark the base of the fistula ; this is the place where the collections of acini occur or where the small channels abnormally open, and this is the place which should become the center of the transfixion. Without leaving the mark the probe is directed obliquely forwards anterior to the mucous membrane in the chin portion, and pierces through the lesion in the parenchyma. With a fine bistoury, guided by the probe in order to open all of the tissues which separate the gland from the buccal cavity, we slide over the anterior border of the masseter, for if the muscle is pierced the new tract would be quickly closed by the muscular contractions. This forms a very oblique course across the gland, the genial aponeurosis, the bulb of Bichat and the mucous membrane. We press back anteriorly all the tissues that cover the masseter in order to avoid cutting the facial vessels. A drain is introduced into this tract, choosing one of from six to eight millimeters ; in order to put it in place a Péan's forceps is introduced through the mouth and the opening made in the mucous membrane ; the forceps are pushed to the opening in the skin, giving them free play ; and the drain introduced and drawn toward the mouth. This drain is left for a considerable time in the vestibule of the mouth, and it is fastened by means of a thread which goes through it to the neck of a tooth, most often one

of the upper premolars. On the skin side the drain is cut off level with the parenchyma; the incision in the skin is sutured above after incision of the fistulous tract. The skin wound and the buccal cavity are kept very clean, irrigation through the drain, and after a few days the skin wound closes up. The drain is left in place as long as possible, ten, twelve or fifteen days, in order to obtain a well formed tract through the tissues.

After removal of the drain, it is still necessary to maintain the new opening through the vestibule of the mouth; thus an accessory excretory canal is created. In one of my operations, this canal did not remain permeable and the fistula returned.

Removal of the Auriculotemporal Nerve.—It has seemed rational to deal directly with the secretory nerves of the parotid gland. Before the war, Leriche had tried the removal of the auriculotemporal nerve in order to do away with the parotid secretion in a case of a fistula and also in a case of long standing hypersalivation in connection with a serious case of aerophagy. One of his pupils (Aigrot, *Lyon chir.*, 1914, p. 242) was very enthusiastic about this therapeutic procedure. The experiments of Claude Bernard have, in fact, assigned to this auriculotemporal nerve the excretory part in the function of the parotid gland, and experimenters who have followed have confirmed this fact, although they have shown definitely that the secretory filaments from this nerve do not originate from the inferior maxillary nor from the facial, but from the glossopharyngeal through the intermediate nerve of Jacobson which supplies the small deep petrosal nerve at the otic ganglion. The proof is demonstrated by the following experiments: The excitation of the glossopharyngeal nerve in the cranium or of the nerve of Jacobson provokes secretion; on the contrary, intracranial section of the glossopharyngeal or of the small petrosal, or the extirpation of the otic ganglion suppresses the action of the reflex stimulants of the secretion. Similar experiments show that the inferior maxillary nerve and the facial nerve do not play any part in excretion.

The cervical sympathetic nerve also plays a part in the parotid secretion by the action of the external carotid plexus.

In spite of these scientific facts, in spite of the results ob-

tained by Leriche, I was persuaded a priori that the nerve mechanism of the parotid secretion was more complex, for within the parenchyma of the parotid gland the auriculotemporal nerve receives an anastomotic branch from the facial nerve. It seems to me that, if the auriculotemporal nerve had the preponderating rôle shown by Claude Bernard, it should not be the only one to act; it is indeed admitted that the sympathetic nerve has a rôle, and I believe that the facial must have one also.

I was quite prepared for failure to obtain an absolute drying up of the parotid secretion by the cutting of the auriculotemporal nerve alone; nevertheless the observations of Leriche were encouraging and all other means of healing were without result.

Through some investigations made upon the cadaver I ascribed a certain importance to a filament of the facial nerve which ran posterior to the condyle and was united with the auriculotemporal. There was no possibility of getting to the sympathetic plexus of the carotids without destruction of important tissue. It was therefore necessary to resort to the operation of Leriche.

It is advisable to make quite an extensive resection to avoid the deep plane of the carotid.

The technic is very simple. The operation can be made either under general or local anesthesia; local anesthesia must be reserved for cases where there is no inflammatory cicatricial tissue in the region of the nerve, and general anesthesia is preferable in the other cases.

An incision four centimeters long is made in front of the tragus, passing a little in front of the ear and down to the posterior border of the maxillary, a little below the neck of the condyle. Below the skin in front of the tragus, the temporal artery is carefully made out, its beats serving as a guide. Close behind the artery is found the vein in the conjoint sheath of the vessels, more difficult to find because it is not prominent like the artery which is pulsating. The nerve is found, separated from its surroundings, held with a pair of smooth forceps and its peripheral end divided. The nerve is always isolated by going down across the gland, and it must be disengaged very far down. In some dissections I have seen very clearly

the anastomotic branch of the facial nerve and have divided it separately. When the nerve is disengaged very far down outside of the gland, the forceps are given a twist and the nerve is coiled around them. The coiling is always done very gently while the nerve is stretched out, the parts farther down are disengaged and it is separated quite entirely by this motion of pulling out.

Looking for this nerve is made very difficult by hemorrhage. When local anesthesia is used a little adrenalin is put into the solution of stovain or cocain.

If an operation is done in a cicatricial mass, as I have done twice, it is very tedious, and the search for the nerve is difficult. It is necessary to invade the healthy tissue, find a branch of the nerve and follow it down to the trunk, and then isolate this carefully without dividing it too soon. The operation will be useless if all the gland filaments of the nerve are not resected, for the filaments returning to the gland as well as the anastomotic branch of the facial nerve would be spared.

What proves that the parotid secretion is, like the submaxillary secretion, a complex nerve phenomenon is the fact that this secretion does not stop instantly in those upon whom the operation has been performed.

I have tried the resection of the auriculotemporal nerve for fistula of the parotid gland variously situated, three times in healthy tissue, twice in cicatricial tissue. In every instance the secretion was continued after the operation and then disappeared.

In two cases it was necessary to complete the cure of the fistula by cauterizing, which had previously been without value. After the operation there still remains in the gland nerve connections which keep up the secretion and which are gradually checked by reason of the absence of stimuli from the auriculotemporal nerve.

But, on the whole, this operation led to the therapeutic success which was sought.

B.—FISTULÆ OF STENON'S DUCT.

The war has enriched the practice of surgery in the matter of fistulæ of Stenon's duct. In my volume on the surgical conditions of the buccal cavity (Vol. 8, *Traité de Stomatologie*), I

wrote: Wounds of the cheek assume quite a special character when they affect Stenon's duct, resulting, indeed, in a salivary fistula. These fistula appear as a complication of traumatic wounds, and may also originate in the course of surgical treatment, as, for instance, opening an abscess, removing a neoplasm or excising flaps for an autoplasty. They may also follow in the wake of inflammatory lesions or ulcerations due to salivary calculi. In 1911, I had one of my pupils (E. Lafont, Thèse de Toulouse) publish a comprehensive study of fistulæ of Stenon's duct, and he reported one of my cases in which the fistula was consecutive to an epithelioma of the cheek.

The present circumstances afford an opportunity for renewed study of the traumatic variety of these fistulæ. Among those that I have examined in men wounded in war, I have been able to establish various pathogenic conditions: (1) Very limited traumatism of the cheek from a fragment of a shell injuring the duct of Stenon directly and forming the fistula as the result of a lateral section of this canal; (2) extensive laceration of the tissues of the cheek by fragments of shells, followed by cicatricial contractions drawing together the duct of Stenon, obliterating its normal orifice and leaving the wound of the canal open upon the skin; (3) a traumatism, always from fragments of shells, which are of all projectiles most likely to produce serious wounds, after injuring the bones and soft parts and giving rise to inflammatory phenomena which open into and form abscesses and fistulæ in the duct of Stenon. The second class is the most frequent; of each of the others I have observed only a single case.

By reason of the frequency of facial lesions in the present war, their seriousness and the extensive destruction which they produce, I have the impression that the fistula in the duct of Stenon is a rare complication of them. These lesions are indeed followed by tough, cicatricial reparative tissue which often obliterates the wound in Stenon's duct; the cicatricial pressure, in this case, is converted into a spontaneous ligature of the canal and dries up the fistula by sclerotic transformation. There is from this fact a suppression of the excretory salivary canal, and secondarily, an arrest of the secretory function and an atrophy of the gland.

All the surgeons who have operated in the centers for

maxillofacial surgery have reported the sclerotic tendency of all cicatricial tissues, including the superficial skin lesions as well as the soft parts adjacent. I have often performed esthetic operations for cicatrices extending over a large portion of the face, which obliterated and stenosed into a sclerotic mass a wound which had injured irreparably the duct of Stenon, as it had cut off all the soft parts in this region. In the course of the dissection I did not even find a trace of this duct.

Relying on this spontaneous tendency to heal, I consider as absolute only such fistulæ as have resisted the test of time, and during the period of observation (most often depending on the treatment of other lesions) I stimulate the cicatricial process by hot cauterizations over the fistulous area as is done in fistulæ of the parenchyma.

But if the fistula is obstinate, all the symptoms of this lesion are present; most often a clear liquid is seen to exude along a fungus growth in the region of the masseter or the buccinator. This liquid is slight in quantity in the intervals between meals, but increases and becomes very abundant during mastication. An opening more or less visible leads to the passageway of Stenon's duct. The patient sometimes experiences a dryness in the mouth on the side where the fistula is located, but no trouble in nutrition results from it. Sometimes there is a kind of cystic sac at the level of the fistula which is easily emptied by pressure, causing the salivary liquid to flow out. This sac is due to the accumulation of the liquid between the wound in the duct and the opening in the skin. Its existence, in cases where intervention is necessary, is a valuable landmark in the formation of a new collecting channel.

The flow of the saliva through the abnormal channel is more abundant than in parenchymatous fistulæ, since the fistula carries by the principal collecting channel the entire amount of the parotid saliva. The quantity of saliva varies: A patient of Duphœnix discharged 70 grams in a quarter of an hour; one of Jobert lost several teacupsful in twenty-four hours; Mischerlich had a fistula which discharged only 60 to 95 grams in twenty-four hours; Beaunis states that the average discharge is 80 to 100 grams per day, while Hirschfeld reports a

quarter of a liter discharged at a single meal. Besides this, the quantity depends on whether the buccal end of the canal is still discharging or is completely cut away. The discharge occurs at the time of mastication, and it is by the action of mastication that it is brought into notice. Sometimes the saliva is accompanied by purulent secretions proceeding from an area of inflammation with which the fistula is connected; at other times the flow of saliva is the only symptom. The loss of a large quantity of a liquid which results from the recrementitious secretion and which contains mineral salts, especially chlorides and phosphates, entails in the long run a weakening of the organism; besides, the abundance of the flow constitutes a real infirmity.

In order to treat the fistulæ of Stenon's duct, several procedures have been put into practice, as in the case of the parenchymatous variety:

Compression of the gland (Désault) or of the canal (Maisonneuve).

Injections producing atrophy (Daniel Mollière, Tussau, Cocchini).

The absolute immobility of the jaws (Moure, Piétri).

Cauterization of the Fistulous Tract.—Galen obtained a speedy cure by the application of a plaster; Ambrose Paré cured a soldier by means of aqua fortis and vitriol; Louis obtained a successful result by cauterizations with nitrate of silver, as also Dupuytren, Hergott, Lombard, Ravenel. There is every evidence that in order to obtain the cure of the fistula by simple cauterizations of the surface the fistula must be the result of a lateral wound of the duct, and this latter must remain permeable in its peripheral portion. It is thus that I explain a cure that I obtained upon a soldier whose wound, limited strictly to the buccinator region, led directly over the duct.

Simple Occlusion of the Fistula.—This treatment has given good results in recent fistulæ with permeability of the buccal segment of the duct. Malgaigne completely obliterated the orifice by means of thin goldleaf pasted on the skin with pitch; Rodolphi, Michalski, Champouillon, Tornley and Stokay have used collodium for this purpose.

The Suture of the Fistula.—The reuniting of the edges of the fistula after scraping them afresh may only be successful in the case of recent fistulæ with slight discharge; Morand, Sr., used it with success in one case.

The suture of the two ends of the duct (Nicoladoni, Dollinger) of its restoration by autoplasty (Bérard, Badiali), exceptional procedures which can be recommended only in cases where the divided ends of the duct are not retracted and where the surrounding tissues have remained free from sclerotic transformation.

The Reestablishment of the Permeability of the Anterior End.—This has in view dilation of the anterior segment so as to make sure of an easier flow of the saliva towards the mouth. The treatment with the seton may be mentioned (Louis, Morand) and that with the canula (Bérard).

The creation of an artificial passage towards the mouth. The following methods are used: Single puncture (Deroy), the seton (Monro, Larrey, Contavoz, Prompt, Jobert, Désault, J. L. Petit, Percy), the canula (Duphoenix, Atti, Higguet), the rubber drain (Pozzi, Kaufman, Reynier, Richelot, Décrétion, Rey), the double puncture, a method intended to avoid the continued use of a foreign body and to effect an extensive loss of substance from the mucous membrane (the method of Déguise, and also that used by Béchard, Croserio, Gosselin, Trélat, Malgaigne, Le Fort).

The creation of an artificial passageway by transfixion has seemed to me applicable in most cases both for wounds in Stenon's duct and in the masseteric lobes of the parotid gland. I had at first recommended in the thesis of Lafont (Toulouse, 1911) a procedure which made an opening in the mucous membrane opposite to the zone of the fistula, and abandoned this opening after having cauterized the whole tract with thermocautery and having sutured the skin after incision of the cutaneous fistula. Since the war the method by transfixion which I have practiced has been enforced upon me either by the receding position of the fistula, which did not permit the treatment of the posterior end of the duct or by the sclerotic condition of the chin tissues which stood in the way of the examination of the duct.

After an incision in the skin at the very level of the fistula

and excision of the fungous tract, there is a landmark to the probe at the point in Stenon's duct or in the sclerotic tissues that have replaced it and that correspond to the cloaca, everted or not, which serve as an intermediate channel between the normal duct and the tract in the skin. From this point in the mucous membrane the creation of a very extensive opening connecting with all of the tissues is made with a bistoury. Péan's forceps are introduced by the buccal passage through the incision in the mucous membrane, by means of which a free passage is made for a drain going from the fistulous cloaca to the buccal cavity. On the skin side the drain is shortened so as to leave its end buried under the skin; this is reestablished in its continuity by direct suture of the incisions surrounding the fistula; on the side of the mucous membrane the drain is fixed in place by the means of a catgut. This drain should remain in place as long as possible, from ten to fifteen days. By this procedure the passage of the flow of saliva towards the buccal cavity is reestablished; I have made use of it four times and each time with success.

Transplanting of Stenon's duct has been practiced by Langenbeck, Goris, Ribéri, Delore, Princeteau, Schartz, Bouglé, Poenaro-Caplesco. I had no success in one case in which I tried this transplanting after removing an epithelioma from the cheek (Lafont, Toulouse, Thesis, 1911), but in two men wounded in war where I was able to take off the posterior end of the duct and join it to a healthy part of the vestibular mucosa I was entirely successful. For the success of this procedure the tissues thus treated must not be the seat of cicatricial process; I recommend it for all cases where an appreciable segment of the posterior end can be found and joined to a healthy mucous membrane.

The creation of an artificial duct at the expense of the mucous membrane has been proposed by Braun and Nicoladoni. It would be applicable in cases in which the posterior end of the duct is too short to be transplanted and in which the tissues of the cheek have not been altered by inflammatory or cicatricial processes.

The transfixion method is always easier.

Suppression of the salivary secretion is a method especially applicable in cases of parenchymatous fistulæ, and I

have already explained how I obtained this result by the resection of the auriculotemporal nerve. I would hesitate to advise this for a fistula in Sténon's duct, for the fistula situated over the duct, in my opinion, should always be cured either by transplantation or by transfixion.

Certain authors have secured suppression of the parotid secretion by imitating a process which nature has brought into play in numerous individuals who were mutilated about the face. In fact, in many wounded in whom there is no salivary fistula, Stenon's duct has been the seat of a destructive wound and has consequently been enfolded in a cicatricial process which has dried up altogether. This is identical with the procedure of ligating Sténon's duct (Viborg, Gollisen, Velpeau, Borel, Pelschinsky). Quite recently Morestin, after resection of the cicatricial tissues surrounding the fistula, tried torsion and suture of the central portion, thus obtaining a cure, without noticing any phenomenon of retention or painful tension on the part of the gland.