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Endoscopic antrostomy in the nasal fontanelle

C. T. Buiter and N. J. A. Straatman
Groningen, the Netherlands

SUMMARY

One of the causes of recurrent maxillary sinusitis may be a too narrow natural ostium, which becomes blocked easily. As the mucus transport inside the sinus is directed towards the ostium, i.e. towards the middle nasal meatus, the most suitable place for an artificial extra ostium is in the middle meatus. In the posterior fontanelle such an ostium can be made comparatively easily under endoscopic control. For this purpose a special coagulating perforating instrument has been designed.

There have always been various ways of surgical treatment of maxillary sinusitis. One of the earliest methods was to pull out a molar and make an oroantral fistula via its socket with the aid of a drill. Through this fistula the diseased sinus could be rinsed and drained. In the process of healing granulation tissue was allowed to develop in order to obtain closure of the fistula. The surgical opening was meant to be temporary.

An operation still widely in use is that after Caldwell (1893) and Luc (1897) in which procedure a wide surgical access is obtained via the canine fossa. This method was developed when it was thought necessary to remove all of the diseased mucosal lining. At the end of the operation a drainage opening is made towards the inferior meatus, which is meant to be permanent. The accurate removal of all of the mucous membrane requires a large opening in the canine fossa; neuralgia of the infraorbital nerve and hypaesthesia of the cheek are well-known complications of this technique.

There is an increasing tendency to keep the tissue injuries limited. A radical removal of all of the mucosal lining of the affected maxillary sinus is no longer considered necessary. Smaller openings in the anterior wall are made and only the severely diseased mucous membrane, such as polyps and cysts, are removed.

In recent years the surgical opening in the canine fossa has been abandoned by many, and a sufficiently wide opening to the maxillary sinus is made in the inferior meatus only, via a nasal approach under microscopic control. Through this antrostomy polypoid swellings and cysts can be removed when they seem to im-

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pair a proper drainage and aeration of the sinus. The removal can be checked with the aid of endoscopes (Wigand, 1977). Postoperatively the maxillary sinus can easily be rinsed via this opening. Any formation of granulations in the antrostomy-opening, which could cause its closure by scar tissue, can be dealt with during nasendoscopic check-ups. In this way a permanent opening can be ensured. This method can be regarded as an ultimate refinement of the surgical treatment as described by Claoué (1912). For some years now we have used it in cases of chronic maxillary sinusitis (see Figure 1).

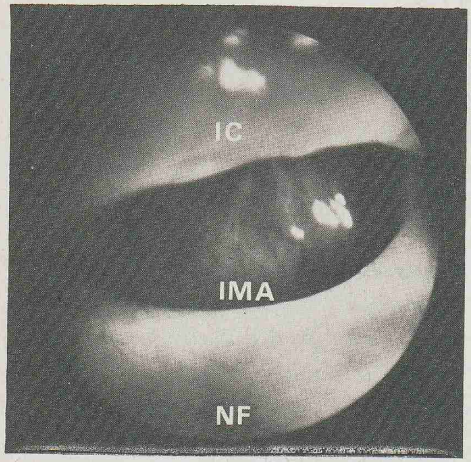

Figure 1. Endoscopic view in a right inferior meatus. A healthy maxillary sinus after inferior meatus antrostomy (IMA). IC = inferior concha, NF = nasal floor

In the case of recurrent sinusitis there is no need to remove any tissue from the sinus. By "recurrent sinusitis" we mean repeated inflammations alternated with complaint - free periods, when the mucous membrane shows no abnormalities and the ciliary function is unimpaired.

Recurrent sinusitis may be caused by a too narrow maxillary ostium, or by a relatively small ostium combined with an increasing tendency of the nasal mucosa to become swollen, as in cases of allergy. In this situation the drainage and aeration of the maxillary sinus becomes inadequate whenever there is any neighbouring infection in the upper airways (rhinitis, ethmoiditis, infundibulitis), as the ostium becomes blocked so easily.

In these cases, when the mucous membrane shows only minor reversible changes, and the ciliary movement is not impaired at all or only for a short period, an extra ostium providing good aeration and drainage is sufficient to prevent further recurrencies of maxillary sinusitis.

Already in 1893 Zuckerkandl preferred the nasal fontanelle, in the middle meatus, for making an accessory maxillary ostium.

Siebenmann claimed to be able to perforate the fontanelle with his little finger, and even to judge the condition of the antral mucosa by palpation via the perfora-

tion. This "digital approach" could not of course be used often, and various instruments have been developed to make a fontanelle ostium, such as a trocar, by Onodi (1903) and a sharp spoon, by Siebenmann. Kubo (1912) observed that surgical ostia in the middle meatus showed less stenoses than those in the inferior meatus. After these first publications on surgery of the nasal fontanelle the method fell into oblivion, apart from an occasional revival. This impopularity of the fontanelle surgery is probably due to the rather high frequency of complications, such as lesions of the orbital floor and profuse haemorrhages from the sphenopalatine artery. These complications were probably caused by the fact that the operation had to be carried out largely blindly, and rather tangentially at the back of the nose.

In 1971 Lavelle and Spencer Harrison once more drew the attention to the middle meatus, when they described how they made surgical ostia in the middle meatus with the aid of a Killian speculum with very good results. Messerklinger (1972) and Buiter (1976) also suggested the possibilities of the nasal fontanelle.

The bony medial wall of the maxillary sinus shows a defect: the maxillary hiatus, which is situated posteriorly in the middle meatus of the nose. Here the wall between the nose and the maxillary sinus consists of a double mucous membrane only. The maxillary hiatus is divided into an anterior and posterior fontanelle by the ethmoidal process of the anterior concha and the dorsocaudal part of the uncinate process (see Figures 2 and 3). The posterior fontanelle is fairly constant in size, and larger than the anterior fontanelle, which is quite often so small as to seem to be absent. The absence of bone in the (posterior) fontanelle can sometimes be demonstrated dramatically by nasendoscopy during an acute maxillary sinusitis. When the maxillary ostium is blocked, the pressure of the secretions inside the sinus can cause a bulging of the fontanelle into the middle nasal meatus, which in severe cases can completely fill the middle nasal meatus (see Figure 4). In the case of recurrents sinusitis we prefer to make an extra ostium towards the maxillary sinus in the posterior fontanelle for the following reasons:

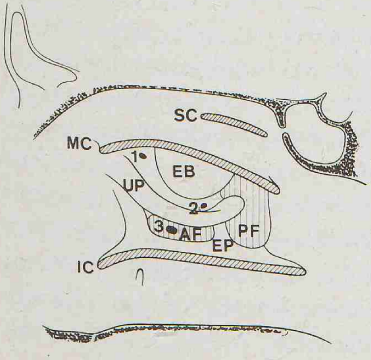

Figure 2. Lateral wall of the nose (schematic).
SC = superior concha (resected); MC = middle concha (id); IC = inferior concha (id); EB = ethmoid bulla; UP = uncinate process; EP = ethmoidal process of inferior concha; AF = anterior fontanelle; PF = posterior fontanelle; 1 = ostium of nasofrontal duct; 2 = small maxillary oatium; 3 = large accessory maxillary ostium in anterior fontanelle

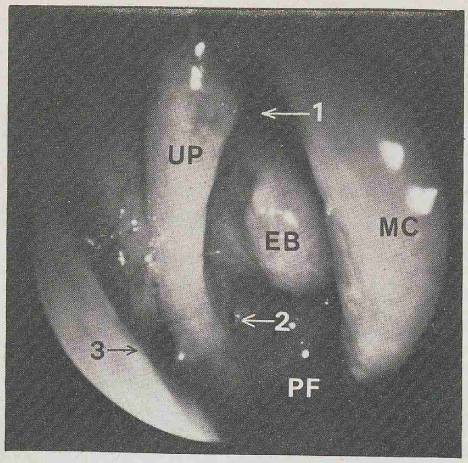

Figure 3. Endoscopic view of a right middle meatus for legends: see Figure 2

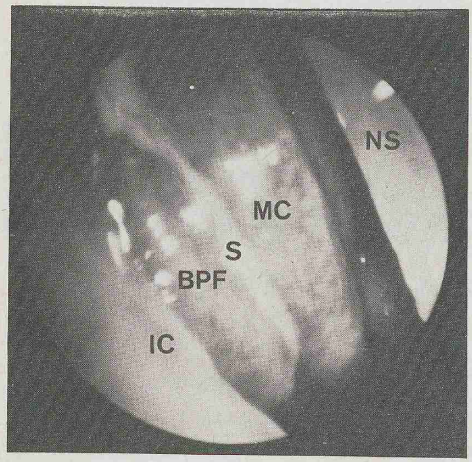

Figure 4. Endoscopic view of a right middle meatus.
A bulging posterior fontanelle (BFP), in a case of acute maxillary sinusitis with a blocked maxillary ostium.
NS = nasal septum; MC = middle concha; S = secretion; IC = inferior concha

a. drainage pattern

In a healthy normal maxillary sinus the mucus transport is directed towards the middle meatus. In 1965 Messerklinger demonstrated that the mucus transport in the maxillary sinus diverges star-like from the bottom, and converges again towards the ostium. The latter usually is not star-like, but spiral-like (Buiter, 1976). By studies of secretions transport as performed by Buiter (1976) we have found that after the operation only a small part of the drainage of the maxillary sinus takes place via a surgical antrostomy in the inferior meatus, and that the mucus is usually transported towards the natural ostium, i.e. towards the middle meatus. As the direction of the spiral-like convergeance towards the ostium is dorsal-cranial-ventral, the ideal site for an accessory maxillary ostium is close to the

natural ostium, dorsally of it, which is the posterior fontanelle ostium. A larger part of the antral mucosa will be drained via a fontanelle ostium than via an inferior meatus antrostomy (see Figure 5).

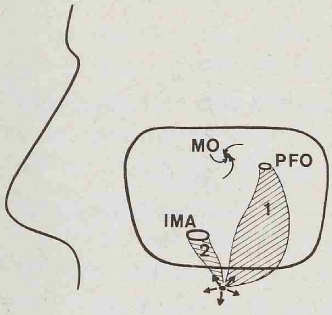

Figure 5. Mucus drainage pattern in left maxillary sinus, schematic, lateral view.
MO = maxillary ostium, in the centre of the spiral-like convergeance
1 = area, drained via a posterior fontanelle ostium (PFO)
2 = area, drained via a inferior meatus antrostomy (IMA)

b. structure of the lateral nasal wall

As the lateral nasal wall here consists of a double mucous membrane only, it can easily be perforated.

c. nasendoscopic control

When the procedure is carried out under nasendoscopic control, those complications, which are due to operations done largely blindly (see above) can be avoided. We had no complications during the endoscopic surgery. Endoscopic photodocumentation proved to be very helpful for the follow-up (Buiter, 1974).

SURGICAL TECHNIQUE

The operation is performed under general anesthesia. Decongestion of the nasal mucosa is obtained by means of strips of cotton-woll soaked in xylometazolini HCl 1/1000. Decongestion of the nasal mucosa gives a better visual and surgical access to the area concerned. We designed a unipolarly coagulating cutting sucker, which consists of a metal suction tube with a diameter of 3 mm, insulated but for the tip to restrict the coagulation effect to the tip only. The tip is sharpened to be able to perforate with it. We use unipolar coagulation. The operation takes place under visual control with the aid of an oval Hopkins 70° nasendoscope (see Figure 6). For the above-mentioned anatomical and physiological reasons we prefer the posterior fontanelle for surgery.

First the mucosa in the area where the new ostium has to be made is coagulated to prevent haemorrhage, then the fontanelle is perforated with the same instrument, and the tissue to be removed is pushed medially with the tip of the instru-

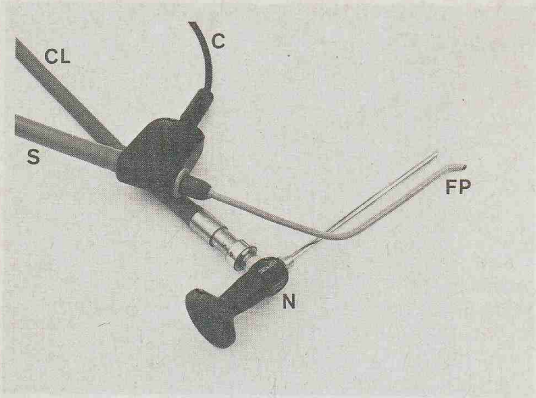

Figure 6. Instruments (I).
N = nasendoscope
C = coagulation
S = suction
FP = fontanelle perforator
CL = cold light

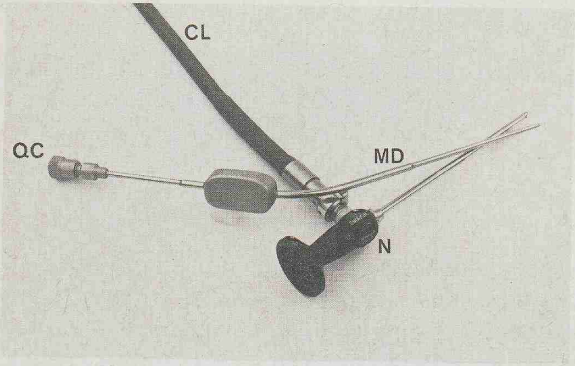

Figure 7. Instruments (II).
N = nasendoscope
CL = cold light
MD = manoevring device
QC = quartz-cable

ment and is further coagulated, resulting in a larger opening. After the opening is thus made sufficiently wide, any loose remnants at the edge of the new ostium are removed with a small forceps.

Often the accumulation of coagulated material around the tip of our coagulating suction tube caused a considerable lenghtening of the procedure, as it had to be cleansed repeatedly. In our workshop a manoeuvring device has been developed for the quartz-cable of the Nd-YAG laser ($\lambda = 1.06$ µm), which enabled the application of this type of surgery in the nose under endoscopic control. Surgery with this instrument is possible without any direct contact with the tissue concerned, so that the instrument stays clean and can be used continuously throughout the operation. The first results obtained with this instrument are quite satisfactory (see Figure 7).

Postoperatively the patients are given xylometazolini HC1 0.05%–dexamethason 0.01% nose drops during one week. Nasendoscopic check-ups take place one week, one month, three months and one year after the operation.

When the edges of the fontanelle ostia are made 'clean' there is only a minor tendency towards stenosis. As the tendency is not altogether absent, as we had first assumed to be on account of the early publications on fontanelle surgery, we now make larger ostia, to secure a sufficient opening (see Figures 8 and 9).
From a clinical point of view almost all patients showed a marked improvement or were entirely free of complaints. In patients with recurrent sinusitis a good mucus transport could be observed nasendoscopically during rhinitis, which no longer developed into a maxillary sinusitis. Patients suffering from headaches due to underpressure in the sinus, when the narrow maxillary ostium was blocked, remained free of complaints afterwards.
In cases of recurrent maxillary sinus disease due to a too narrow ostium endoscopic fontanelle surgery has turned out to be a good therapy. The location of the fontanelle ostia does not allow of any surgery inside the sinus, however. In cases where removal of severely affected parts of the mucous membrane is required, as in chronic maxillary sinusitis, the inferior meatus antrostomy is to be chosen, in spite of its inferior drainage capacity.

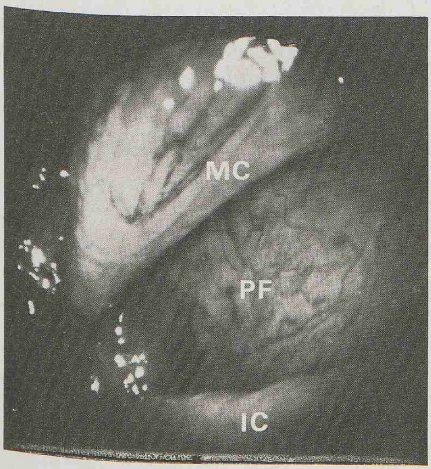

Figure 8. Endoscopic view of the left middle meatus. This patient suffered from recurrent maxillary sinusitis.
MC = middle concha
IC = inferior concha
PF = posterior fontanelle

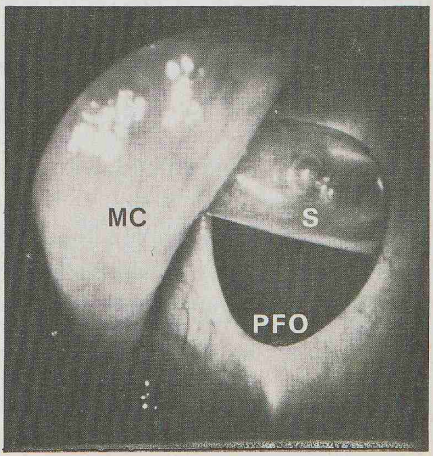

Figure 9. Endoscopic view of the left middle meatus. After endoscopic antrostomy of the nasal fontanelle the patient remained free of complaints. During rhinitus mucus transport could be observed.
MC = Middle concha; S = secretion;
PFO = posterior fontanelle ostium

ZUSAMMENFASSUNG

Eine der vielen Ursachen von rezidivierender Sinusitis maxillaris ist ein zu enges Ostium, das leicht insuffizient wird. Der Schleimtransport im Sinus maxillaris ist auf dem Ostium, d.h. auf dem mittleren Nasengang orientiert. Deshalb ist die ideale Stelle für ein operatives extra-Ostium in dem mittleren Nasengang. Mit Hilfe der Nasenendoskopie kann man relativ leicht ein solches Ostium anlegen in der hintere Nasenfontalle. Zu diesem Zweck ist ein spezielles Instrument entwickelt worden.

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C. T. Buiter
E.N.T. Department
University Hospital
Oostersingel 59
Postbox 30001
9700 RB Groningen
The Netherlands