

Clinical management of sinusitis

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SUMMARY

In the clinical management of sinusitis, consideration should be given to the etiology of the disease, which today can be classified as infection, allergy and vasomotor conditions and local and general immunity deficiency. It is important to mention that infection can be present with an allergy, as well as with immunity deficiency. Knowledge of this differentiation is necessary for providing more effective and longer lasting conservative treatment. Surgical interventions are kept at a minimum and used only for aeration and drainage of sinuses, while preserving the mucosa.

PARANASAL sinuses, when compared with the nasal cavity, have an essentially subordinate function. They are only a by-product of the evolutionary transformation of the human viscerocranium, neurocranium and upper jaw. Since they communicate with the nasal cavity (where pneumatization begins), the nasal mucosa continues on into these cavities towards the lateral walls, ethmoidal labyrinth and frontal sinuses. This mucous membrane is thinner with less epithelium and has a looser subepithelial layer with fewer cellular and glandular elements.

ETIOLOGY OF SINUSITIS

Proetz (1932), Flottes (1960) and Drettner (1965) made important contributions to the understanding of the normal physiology and pathophysiology of paranasal cavities. Proetz noted the permeability of the sinusal ostium from where the physiological cycle originates in normal conditions, or in the case of occlusion of the ostium, a whole range of pathological phenomena in the mucosa of the sinuses occurs. We are of the opinion that it is essential to be aware of the pathological processes which cause a closure of the ostia and variation in the pressure level, since these fundamental changes may lead to pathological processes in the mucosa of the paranasal sinuses. Thus when the etiology and treatment of sinusitis are reviewed, three factors should be considered: infection, allergy and a deficient general or local immunity of the mucous membrane in the upper respiratory tract. In all cases, the nasal passage way and pathology of the lateral nasal walls (hypertrophic rhinitis, nasal polyposis) have an immediate effect on the development of the pathological process in the sinuses.

INFECTION

Normally there is no bacterial flora in the sinuses, contrary to the nose, which is directly exposed to outside factors that can be removed mechanically, biochemically or cyto-immunologically. Virus infections play an important role, particularly in children (60%), and in adults somewhat less. However, whether the sinuses are closed or there is edema of the mucous membrane and a disturbed mechanical defense (which is favorable for infection), the bacterial infection in these cases is considered secondary. According to Axelsson and Pollak (1972), the most frequent bacterial flora in sinusitis are pneumococcus, streptococcus, staphylococcus and *H. influenza*. Van Cauwenberge, Kluyskens and van Renterghem (1975) found anaerobes in 33% of their cases; 12% of the cultures were pure anaerobic and 21% were mixed aerobic-anaerobic. The most frequent anaerobe observed was the Pepto-streptococcus. Pure anaerobic cultures were most often found in unilateral cases of paranasal sinusitis.

Sixty-eight of our patients with maxillary sinusitis underwent three examinations: nasal swabs, lavage with glucose bouillon and lavage with saline solution. There were 35 sterile samples from the 68 nasal swabs and 34 from the lavage with glucose bouillon. The samples with potential pathogenic flora were also almost equal in number (16 : 14). Of the 68 samples taken by saline lavage, 52 were sterile; potential pathogenic flora was found in only four samples and saprophytic flora in 13. When the results of samples obtained by nasal swabs and sinus lavage with sterile bouillon were compared, we noted that the same causative agents were not always isolated. That is to say, while the influenza was isolated from nasal swabs in four cases and staphylococcus pyogenes aureus in 24 cases, the samples obtained by lavage with sterile bouillon quite often contained the coli-form group of *E. coli* and proteus. Thus we believe that both of these methods should be employed in the bacteriological examination of the sinus. If the puncture proves to be positive, than only the specimen itself is necessary for analysis, but if negative, lavage with sterile bouillon should also be carried out. The lavage with bouillon must always be followed by lavage with saline in order to remove an adequate medium for bacteria from the sinus. Only the specimen from lavage with bouillon should be used in the bacteriological examinations of sinus infection, for if lavage with saline is used, the picture of infection with *H. influenza* can easily be dissimulated. The bacteriological findings in the nasal mucosa cannot be the bacteriological indicator of the type of infection in the paranasal sinuses. Axelsson and Brorson (1973) examined the concentration of various antibiotics given perorally for sinus secretion during acute inflammation. Generally penicillin and ampicillin had low antibiotic concentrations in sinus secretion when compared with tetracyclines and spiramycin. The concentration in irrigated secretion was 34% for cephradine, 48% for ampicillin and 76% for erythromycine. No correlations were observed between the concentration of antibiotics and various clinical parameters, such as duration of therapy, intervals between doses, radiological healing, ostium resistance and irrigations findings which were negative for aspirated secretions. In the case of acute maxillary sinusitis, the particular anatomi-

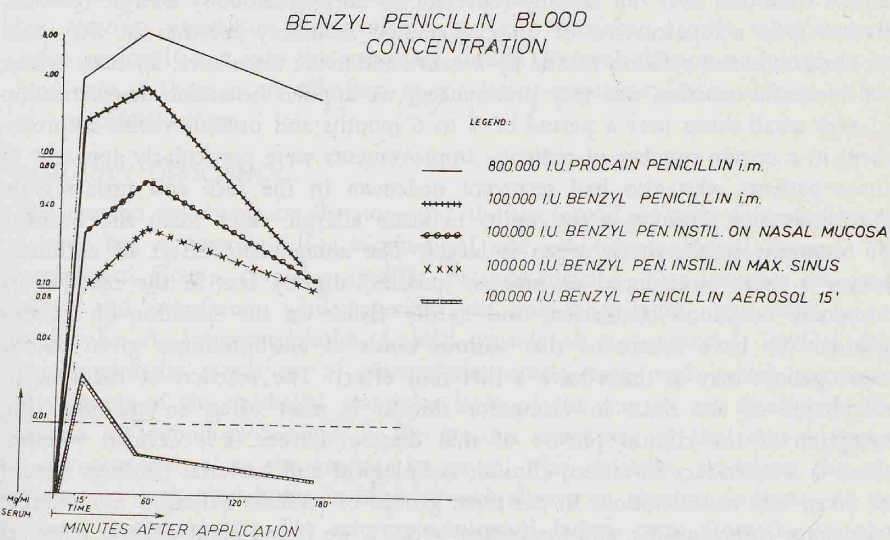
cal conditions, impaired drainage, mucous membrane thickening, frequent retention of secretion and the presumably poor vascularized area, apparently all are factors influencing the ability of different antibiotics to penetrate this area in random manner varying with the individual (Axelsson et al., 1973).

Our experience has shown that particularly in children, a profuse secretion from the nasal mucous membrane and sinuses can impair the effect of antibiotics. However if the patient undergoes aspiration daily, the antibiotics have a favorable effect. Hop and Garvey (1972) began using aerosol therapy in 1958 for decongestion of the nasal mucous membrane and reported good results in treating paranasal sinusitis with aerosol bacitracin.

By using vibrations of ultrasound aerosol, the amount of antibiotics in the maxillary cavity can be increased up to 25% (Kauf, 1972). Our experimental and clinical examinations have shown a small amount of antibiotics in the blood after the application of normal aerosol. (Figure 1). These aerosol fragments accumulate on the epithelium and only a small amount passes through the mucous membrane. This means that normal application of aerosol can not treat acute infections when general symptoms of the disease are present.

When there is a localized chronic infection of the maxillary sinuses, we believe that local application of antibiotics, cortizone and proteolytic enzymes can reduce the number of surgical interventions. Proteolytic enzymes decompose the secretion and enable a strong breakthrough of the antibiotics into the mucous membrane. Cortizone reduces depolymerisation of the tissue and establishes a balance between the cells and intercellular substance.

Figure 1



ALLERGY

An allergic manifestation on the mucous membrane of the sinuses can be either Type I and IV according to Gell and Combs. In addition to the allergic reaction, it is important to differentiate other factors which can cause a vasomotor reaction on the mucosa of the nose and sinuses (endocrine, physical, toxic, psychosomatic and post-operative). A vasomotor reaction, whether allergic or non-allergic, rarely localizes only in the nasal mucous membrane, so that we use the term vasomotor rhinosinusitis. We are of the opinion that for proper treatment, every case of vasomotor rhinitis should be examined in detail, both clinically and in the laboratory. The examination should include an eosinophilic smear from the nose, X-ray of paranasal sinuses, allergic tests and depending on the case, other necessary clinical and laboratory tests. Based on our results with intradermal tests using inhalation allergens, and the treatment of allergic vasomotor rhinitis by desensitization, we have concluded the following:

1. A provocative nasal test can be very important in some cases where the cutane reaction and anamnestic data do not correlate.
2. The therapeutic results do not always depend on the strength of the cutane reaction.
3. Results are better in monovalent than in polyvalent sensitivity.
4. Our best results were obtained in the treatment of house dust and pollen allergies.
5. Objective findings from the nose do not always correspond to subjective changes. When there was an unchanged objective status, we observed normalization of subjective symptoms or even the opposite. Cutane tests need not change with the improvement of both subjective and objective signs.

A great problem in vasomotor rhinosinusitis is physical allergy. In our opinion, such a condition does not actually represent an antigen-antibody allergic reaction. Rather it is a repercussion of an exaggerated reflectory reaction in the sense of viscerovisceral reflexes caused by a neuro-endocrine imbalance. In cases where the histamine reaction was very pronounced, we applied histamine desensitization in very small doses over a period of 4 to 6 months and noticed visible improvement in a certain number of patients. Improvements were particularly apparent in those patients who also had recurrent oedemata in the face and nose region. Antihistamines produce better results in acute allergic cases when the quantity of histamine in the shock organ is larger. The antagonistic effect of antihistamines is most pronounced on smooth muscles, slightly less in the reaction of histamine on blood circulation, and hardly visible in the secretion of mucous glands. We have concluded that various kinds of antihistamines given to the same patient may at times have a different effect. The reaction of the mucous membrane of the sinus in vasomotor rhinitis is most often an accompanying symptom of the clinical picture of that disease. Before it is decided whether there is a secondary infection, clinical, radiological and bacterial findings should be taken into consideration. In our three groups of patients (allergic, non-allergic vasomotor rhinosinusitis, and the control group), we found eight positive bacterial

Figure 2.
Bacteriological findings of the nose and sinuses

Group	Allergic (55 subjects)						Non-allergic (44 subjects)						Control (24 subjects)					
	Nose			Sinuse			Nose			Sinuse			Nose			Sinuse		
Flora	St	Sp	Pt	St	Sp	Pt	St	Sp	Pt	St	Sp	Pt	St	Sp	Pt	St	Sp	Pt
Number	17	23	10	34	10	6	9	24	11	33	9	2	2	18	9	24	3	2

Legend St. = sterile Sp. = saprophyte Pt. = pathogen.

findings in the sinuses from 94 cases — 19 cases had saprophytes which can be a potential danger for a secondary bacterial allergy (Figure 2).

Since the pathogenic flora is quite mixed, it is important to do an antibiogram in order to determine the appropriate antibiotic. In a number of patients we obtained satisfactory results by locally applying antibiotics, cortisone and proteolytic enzymes on the mucosa of the sinuses. When the results were not satisfactory, conservative surgical treatment was performed. When allergic and hyperergic areas are treated surgically, there is the possibility that clinical symptoms will be distorted. For this reason, surgical procedures should be minimal and as atraumatic as possible. The removal of the mucosa of the sinuses should be avoided, yet favorable conditions for drainage and aeration of the sinuses should be made.

Due to recidivism, polyposis of the nose and paranasal sinuses are often a problem in therapeutic surgery and their most successful treatment is resection of the Vidian nerve. This removes the parasympathicomimetic reaction of the mucous membrane of the nose and sinuses in the relapse of polyposis and other results from obstinate vasomotor reactions of the mucosa.

For treating vasomotor rhinosinusitis, we give cortisone locally with a spray, drops or instillation into the maxillary sinuses. Peroral therapy or injections are used only if there is an affection in the lower respiratory tract such as asthma or bronchitic asthma.

IMMUNITY DEFICIENCY

The mucous membrane of the nose and sinuses serves not only as a mechanical defense but is important for biochemical and cyto-immunological factors. The biochemical factors may be specific or non-specific. Non-specific are lysozymes and interferon, while specific are immunoglobulin, especially immunoglobulin A. Immunoglobulin A, still considered as secretorial, is, like other immunoglobulin, made up of plasmocytic protein parts with which secretorial components of the epithelial glandular layer of the mucosa are associated. The amount of immunoglobulin A in the mucous membrane of the sinus and nose is not proportional to the amount in serum. This indicates, therefore, that the amount of immunoglobulin in blood is not always an absolute indicator of the amount in the mucosa. The cyto-immunological factors come from the lympho-

cytes T and B and macrophages which play an important defense role in the mucosa. These biochemical and cyto-immunological factors reflect the various reactions of the normal mucous membrane of the nose and sinuses to all harmful outside agents.

It is still difficult to determine the amount of deficiency and which elements are lacking. According to Bruton: cit. Minet et Delire, (1973), agammaglobulinemia and dysgammaglobulinemia rarely occur and if or when they do, there is a total deficiency of gammaglobulin. However, there are a number of individual deficiencies of gammaglobulin. However, there are a number of individual deficiencies, which cause an overall change in local immunity, but they are difficult to determine. Local biopsy of the mucosa, histochemical tests and immunofluorescence will certainly provide more insight into the local immunity of the mucosa. Previous therapy with gammaglobulin did not always give satisfactory results. Gammaglobulin contains special IgG globulin which increases histamine in the plasma and increases blocking antibodies. However, our opinion is that its contents are not sufficient enough to stimulate immunological deficiency, particularly if it is present in the mucosa of the nose and sinus. Today we see more importance in the local immunity of the nasal and sinus mucosa and we are certainly on the way to differentiating this factor and its application in therapy in these deficient stages of immunity.

Conservative therapy reduced not only the severity of the clinical picture of sinusitis, its complications and the length of disease, but also the use of surgical treatment. Surgery of the maxillary sinuses, according to Denker has almost disappeared from the surgical protocol, and the Caldwell-Luc has been replaced by antrostomy. Eichel (1973) considers that the primary approach to treating inflammatory complications is the nasal antral window, the Caldwell-Luc, and the intranasal ethmoidectomy. The remaining two procedures, Fronto-ethmoid sinusotomy and the osteoplastic frontal flap, are advocated primarily for approaching space occupying lesions, excluding polyps, but can be used where attempts to manage the problem by the first three minor surgical interventions have been unsuccessful.

If respiration is essential for the nose and many other reflectory mechanisms to function, and maintains the physical and psychological integrity of the individual, then surgery of the nose and paranasal cavities should be kept at a minimum to preserve this function. Consequently, the general attitude towards surgery in this region should be changed in our opinion. It is not a question of whether methods described by various authors should be modified, but rather obtaining precise knowledge of pathological findings which indicate surgery. It is not enough today for the otorhinolaryngologist to be only an efficient surgeon from the technical point of view, but rather he must be acquainted with the entire pathophysiology of the given area. With this knowledge he will be able to provide the most modern, up-to-date clinical management of sinusitis.

ZUSAMMENFASSUNG

In der klinischen Behandlung von Sinuitiden, wird auf die Ethologie der Er-

krankung die man heute als Infektion, allergische und vasomotorische Bedingungen sowie auch lokale und allgemeine Immunitätsmängel klassifiziert, hingewiesen. Es ist wichtig zu betonen, dass die Infektion mit einer Allergie, wie auch mit einem Immunitätsmangel, vorkommen kann. Die Kenntniss über diese Differenzierung ist für eine wirkendere und länger dauernde konservative Therapie unentbehrlich. Chirurgische Eingriffe sollen auf den kleinsten Stand reduziert und nur für Aerisation und Drainage der Nasennebenhöhlen, während die Schleimhaut geschont werden soll, angewendet werden.

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