

The importance of the anaerobic bacteria in paranasal sinusitis

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SUMMARY

The anaerobic examination of the material, obtained by 100 antral punctures, in 66 patients with paranasal sinusitis, showed the importance of the anaerobic bacteria. In 33% we found anaerobes: 12% of the cultures were pure anaerobic, 21% were mixed aerobic-anaerobic. The most frequent anaerobe is the Peptostreptococcus. Anaerobic cultures are more frequently found in the unilateral cases of paranasal sinusitis. The presence of anaerobes does not seem to be dependent on the patient's age, the duration of the sinusitis and the previous administration of antibiotics during the last 3 days. In 76% the anaerobes disappeared after the initial antral puncture and washing.

ANAEROBIC bacteria are responsible for severe infections, such as tetanus, gas-gangrene, botulism and actinomycosis. This was already known in the 19th. century.

Recently, other anaerobes have come into attention; these micro-organisms, which belong to the normal flora in humans and animals, can become pathogenic in certain conditions; they are found in various abscesses of the lower respiratory tract and the genital organs.

Because in the paranasal sinusitis, there exist many favourable conditions for the development of anaerobes, we studied the frequency of these bacteria; also, we searched for different parameters, that may point at an anaerobic sinusitis.

METHODS AND MATERIAL

During the period from July '74 till June '75, we collected all pus and mucus, obtained by antral puncture, and cultured both aerobically and anaerobically.

The material comes from 66 outpatients of the E.N.T.-Clinic of the Academical Hospital, University of Ghent, Belgium. (Director: Prof. Dr. P. Kluyskens).

In all we got 100 positive punctures.

The pus or mucus, directly sucked in a sterile syringe, is stripped of the air-bubbles and transported immediately to the Laboratory of Microbiology, at the same University Hospital. (Director: Prof. Dr. E. Nihoul).

Each sample is divided into two portions; we use the first one for direct micro-

scopical examination and aerobic cultures; the second portion serves for anaerobic examination.

For the aerobic culture we use: bloodplate (T.S.A. oxoïd + 5% human blood), M.S.A. (for the isolation of Staphylococci), E.M.B. (for the isolation of Enterobacteria), A.B.Y (for the isolation of yeasts), Chocolate agar + penicilline (isolation of *Hemophilus influenzae*) and Thioglycolate.

The anaerobic media are: V.L.S., bloodplate with neomycin (for the inhibition of the facultative anaerobic Enterobacteria), and Rosenow-medium; for the incubation we use the Gas Pak system, during 48 hours at 37° C.

The control of facultative or strictly anaerobes, the micro-aerophiles and the strictly aerobes is performed with the deep V.L.-tube.

RESULTS

Of the 66 patients, 26 or 38% had at least at one occasion, anaerobes in their cultures. The distribution of aerobic, mixed, anaerobic and sterile cultures is given in table 1.

Pure aerobic culture	50
Mixed aerobic-anaerobic	21
Pure anaerobic culture	12
No growth	17
	100

Table 1: The results of the bacteriological examination of the material, obtained by 100 antral punctures.

Of the 33 cultures, in which we found anaerobes, 12 were pure anaerobic; in 13 cases the anaerobe was accompanied by an apathogenic aerobe (alpha- and gamma- hemolytic streptococcus, or staphylococcus epidermidis); in the remaining 8 cases the anaerobe was accompanied by a pathogenic aerobic bacteria. This means that we can consider the anaerobes as the probably only pathogenes in 25% of the cultures.

The number of the different anaerobes is given in table 2.

Peptostreptococcus	15
Peptococcus	7
Veillonella	7
Propionibacterium	7
Bacteroides Sp.	5
<i>B. oralis</i>	3
<i>B. Melaninogenicus</i>	2
Gram-neg. Rods	2
Fusobacterium	1
Bifidobacterium	1

Table 2: The distribution of the different anaerobes in 33 cases of anaerobic sinusitis.

Of the 33 cultures containing anaerobes, 23 had only 1 species of anaerobes, 8 cultures contained 2 species, and there were 2 cultures with 3 different species of anaerobes.

The distribution of the different aerobes is given in table 3; we compared the presence of the different aerobes in the pure aerobic with that in the mixed anaerobic-aerobic cultures.

	Aerobic cult.	Mixed cult.	Total
	(50)	(21)	(71)
<i>Hemophilus influenzae</i>	12	5	17
<i>Staphylococcus epidermidis</i>	11	5	16
<i>Streptococcus α hemolyticus</i>	8	5	13
<i>Diplococcus pneumoniae</i>	9	1	10
<i>Streptococcus faecalis</i>	6	2	8
<i>Staphylococcus aureus</i>	6	2	8
<i>Klebsiella species</i>	5	0	5
<i>Corynebacterium pseudo-diphthericum</i>	3	0	3
<i>Proteus species</i>	2	1	3
Other bacteria	3	1	4

Table 3: The distribution of the different aerobes in 71 cases of sinusitis, presenting aerobes.

The most frequently found aerobe is the haemophilus influenzae, followed by the *Staphylococcus epidermidis* and the alpha-hemolytic *Streptococcus*. An important fact seems to be the very small number of *Diplococcus pneumoniae* as well as *Klebsiella*, in the mixed aerobic-anaerobic cultures, while we find these two organisms frequently in the pure aerobic cultures.

We also searched for several parameters that are different in the anaerobic and the non-anaerobic sinusitis (table 4).

	Anaerobic group	Non-anaerobic group
	(26 patients)	(40 patients)
The mean age	36 years	33 years
Females/Males	8/18	19/21
Uni-/Bilateral	21/5	23/17

Table 4

The mean age of the patients is nearly the same in both groups, the number of female patients is a little bit higher in the non-anaerobic group, but striking is the high number of unilateral sinusitis in the anaerobic group: there were only 5 bilateral cases out of a total of 26, in this group; for the non-aerobic sinusitis

the difference between the number of unilateral and bilateral cases is very small. The presence of anaerobes does not seem to be dependent on the duration of the sinusitis; in the anaerobic group 62% of the patients had a chronic sinusitis, during more than 3 months, 19% had a acute infection; in the non-anaerobic group these numbers are respectively 67% and 22%. The 3 cases of sinusitis of dental origin, were all anaerobic; of the 7 mucocoeles, only 2 contained anaerobic bacteria, while 5 gave sterile cultures.

We looked for the influence of previous administration of antibiotics, during the last three days before antral puncture, on the presence of anaerobes in the culture: it looks like there is no influence! The percentage of patients who received antibiotics, prior to the puncture, is nearly the same in the anaerobic group as in the non-anaerobic group (resp. 27% and 30%).

Most important for a physician is, of course, the influence of the presence of anaerobes on the evolution of the infection.

Therefore we studied the short-term evolution of the sinusitis (especially of the antral puncture) of the patients with an anaerobic sinusitis. We were able to follow the patients of 25 anaerobic cultures, where as 8 disappeared in the follow-up; of these 25 specimen, there are 19 by whom the anaerobes disappeared after the initial antral puncture and washing: 4 had a negative second puncture, 8 still had a positive puncture, but without anaerobes, 7 did not get a second puncture but they seemed to be cured as was proven by X-ray's, clinical examination and patient's interrogation. Of the six unsuccessful cases, 5 still presented anaerobes in the second puncture, and in 1 case anaerobes appeared after an initial pure aerobic culture.

DISCUSSION

Our strongest mechanism of defense against anaerobic infection is the positive oxidation-reduction potential of + 120 m Volt of our tissues; the anaerobes require a low oxidation-reduction potential and, of course, a reduced oxygen-tension.

These conditions are found in all kinds of necrotic tissues, and in areas with a reduced blood-flow. Therefore, it is not surprising to find anaerobes in infected paranasal sinuses; this mucosa has a reduced oxidation-reduction potential because of the decreased blood-flow. This ischemia can even grow worse by the use of nasal vasoconstrictors. At the same time the viscid secretions reduce the oxygen tension, and the previously present aerobes created ideal conditions for the growth of anaerobes.

The percentage of sinusitis in which we found anaerobes was 33%, and the most frequently found anaerobe is the peptostreptococcus, synonym of anaerobic streptococcus. It is very important to pay attention to the possibility of an anaerobic infection, because it is necessary to take several measures for keeping the material, obtained by antral puncture, suitable for anaerobic examination. One has to work very aseptically; all the air has to be eliminated and the material must be trans-

ported to the laboratory as quickly as possible, in an oxygen-free tube. (One can also use a transportmedium with a low oxydation-reduction potential, e.g. the Stuart-medium). If we pay attention to the possibility of an anaerobic infection, we will find it much more frequently.

RÉSUMÉ

L'examen anaerobique des sécrétions, obtenues par 100 ponctions sinusales chez 66 patients, qui présentaient une sinusite, nous a montré l'importance des germes anaerobies.

Nous avons trouvé des germes anaerobies en 33% des cas: en 12% il s'agissait d'une culture anaerobie pure, en 21% c'était une culture mixte.

Le germe le plus fréquent est le Peptostreptocoque.

On trouve plus sinusites anaerobiques dans les cas unilateraux. La présence, des germes anaerobies ne semble pas être influencée par l'âge des patients et la durée de la sinusite ni par l'administration précédente des antibiotiques pendant les trois derniers jours.

Les germes anaerobies disparaissaient après une seule ponction et lavage sinusale en 76% des cas.

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