

# Treatment of acute maxillary sinusitis

Erythromycin base and Phenoxyethyl-penicillin (penicillin V)

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## SUMMARY

*One hundred patients with acute maxillary sinusitis have been studied. The diagnosis was made clinically and confirmed radiologically, using a roentgenological 6-point score for mucous membrane thickening and secretion. Fifty patients in each group were treated with either erythromycin base or phenoxyethyl-penicillin (penicillin V). The roentgenological state of each sinus was classified on the 1st, 5th, 10th, and 15th day, giving an objective evaluation of the treatment effect.*

*There was no significant difference between the two treatment modes as to therapeutic outcome, and the results are compared with those of a larger material of 1220 patients with acute maxillary sinusitis studied in the same way at Lundby Hospital since 1970 (25 different treatment modes).*

## INTRODUCTION

At Lundby Hospital, Gothenburg, 25 different modes of therapy for acute maxillary sinusitis have been studied since 1970: irrigation alone, nasal decongestant alone and different antibiotics (alone or in combination with irrigation or a nasal decongestant) (Axelsson et al., 1970b; 1971; 1973; 1975; 1981; von Sydow, 1981). Drainage therapy alone showed the same good results as most antibiotics, but nasal decongestants alone gave less favourable results than average. Also, the treatment combination of phenoxyethyl-penicillin acid 1.2 g TID + nasal decongestant seemed to be slightly less beneficial than average. In the present investigation we compare phenoxyethyl-penicillin potassium salt tablets 1.6 g BID and erythromycin base capsules 500 mg BID.

In spite of its wide-spread use, only sparse information is found in the literature concerning the treatment effect of penicillin V in acute maxillary sinusitis. Nylén (1972) reported no differences in therapeutic effect between penicillin V and azidocillin. Carenfelt (1975) compared penicillin V with azidocillin, tetracycline and doxycycline but found no difference in antibacterial efficacy. The difficulty in achieving high concentrations of penicillin V in the sinus secretion has been emphasized in this and other studies (Lundberg and Malmborg, 1973; Eneroth and Lundberg, 1976). Contrarily, Ekedahl (1978, 1981) found that the concentration of penicillin V was lower in inflamed mucosa than in healthy tissue, but that

concentrations were "considerably higher than the MIC for most sinusitis bacteria including most *Haemophilus influenzae* strains". In 27 out of 32 patients treated with oral penicillin "the acute signs and symptoms disappeared completely within a period of  $7.4 \pm 2.02$  days" and "sufficient concentration" in sinus secretion was reported by Gschnait (1977).

In earlier studies we have used the acid penicillin V (Axelsson et al., 1970b; 1971). The treatment outcome differed between the four penicillin groups from slightly more to statistically less efficient than average.

Erythromycin estolate has been shown to give a good clinical and roentgenological effect (Axelsson et al., 1975). Erythromycin stearate was studied by Kalm (1975). After 500 mg BID or TID, 81% and 94%, respectively, of the patients were classified as clinically improved or recovered. In different studies of erythromycin penetration into the maxillary sinus, low concentrations have been reported (Axelsson and Brorson, 1974; Paavolainen et al., 1977; Abramson et al., 1978).

#### MATERIAL AND METHOD

One hundred patients without known allergic or vasomotor rhinitis, having suffered from fever and purulent nasal discharge and/or other symptoms of acute maxillary sinusitis for not more than four weeks, were accepted in the study. After a clinical examination (with the observation of pus in the nasal cavity and other signs of maxillary sinus infection), the diagnosis was confirmed radiologically as described by Axelsson and Jensen (1974). The roentgenological state of each maxillary sinus was classified on the 1st, 5th, 10th and 15th day, using a 6-point scale (Axelsson et al., 1970a).

Mucous membrane thickening $\leq 6$ mm	1 point
Mucous membrane thickening $> 6$ mm	2 points
Secretion	2 points
Mucous membrane thickening $\leq 6$ mm + secretion	3 points
Mucous membrane thickening $> 6$ mm + secretion	4 points
Complete opacity	6 points

Completely opaque sinuses were aspirated for the demonstration of pus. As the bacteriology of acute maxillary sinusitis is well known from other recent investigations (Carenfelt et al., 1978; Hamory et al., 1979), samples for bacteriological examination were taken only from these aspiration specimens.

The study was performed double-blind, and the patients were allocated at random to either of two treatment groups:

- Erythromycin base (Ery-Max<sup>®</sup>, Astra) 500 mg BID.
- Phenoxymethyl-penicillin potassium salt (Kåvepenin<sup>®</sup>, Astra) 1.6 g BID.

All patients were given a nasal decongestant as well (Nezeril<sup>®</sup>, Draco).

The subjective clinical effect was judged at the follow-up as "Recovered" (no clin-

ical symptoms, normalized nasal mucous membranes), "Improved" (negligible clinical symptoms and/or catarrhal mucous membranes without purulent discharge) or "Failure" (clinical symptoms of infection and/or purulent discharge), as a complement to the objective radiological status.

All patients were asked about any discomfort in relation to the therapy, and all side effects reported by the patients were registered.

## RESULTS

There was a domination of female patients in both groups, but no significant difference in age distribution (Table 1) or in the relation between completely and not completely opaque sinuses. In the penicillin group the number of patients with both sinuses affected was somewhat greater than in the erythromycin group which may indicate slightly more severe infections in the penicillin group. The radiological state according to the point scale suggests the same difference initially (Table 2; Figure 1). However, the healing course for the two groups run parallel

Table 1. Acute maxillary sinusitis: Present material showing number of patients and diseased sinuses.

	erythromycin	penicillin
women	32	39
men	18	11
total	50	50
mean age, years	33	36
sinuses analysed:		
- initially	76	81
- after 5 days	68	81
- after 10 days	66	74
- after 15 days	74	79
one sinus affected	26	17
both sinuses affected	25	32
frontal sinus also affected	5	11
not completely opaque sinuses	55	53
completely opaque sinuses	21	28

Table 2. Acute maxillary sinusitis. Radiological gradation\* of all sinuses before and during treatment.

antibiotic	N	mean number of points/sinus				mean healing
		before	5 days	10 days	15 days	
erythromycin	76	3.94	2.89	1.77	0.97	2.97
penicillin	81	4.15	3.14	1.86	1.25	2.90

\* The point scale adopted is given in the text on page 248.



to each other, giving average healing points of 2.97 for the erythromycin group and 2.90 for the penicillin group. The subjective clinical effect was equally good in both groups: 46/47 (98%) in the erythromycin group and 40/44 (91%) in the penicillin group being judged as clinically "Recovered" or "Improved".

One patient in each group had to discontinue the therapy because of side effects: one in the erythromycin group because of epigastric pain and vomiting, and one in the penicillin group because of urticaria (Table 3). The gastro-intestinal disturbances dominated in the erythromycin group. Epigastric pain was in some cases relieved if the erythromycin capsules were taken together with food instead of one hour before meals as recommended, but no difference was noticed between taking the 250 mg capsules 1 × 4 compared 2 × 2.

Table 3. Acute maxillary sinusitis. Side effects. Figures within brackets indicate "drop-outs", i.e. patients who did not complete therapy because of side effects.

side effects/complaints	erythromycin (N = 50)	penicillin (N = 50)
urticaria	-	1 (1)
swollen eye-lids	-	1
itching	1	-
fatigue	3	1
epigastric pain	6	1
epigastric pain + vomiting	1 (1)	1
nausea	3	-
loose stool/diarrhoea	5	6
total number of complaints	19	10

## DISCUSSION

Following the series of earlier investigations of 25 different treatment modes for acute maxillary sinusitis, the present study of penicillin V and erythromycin base was considered to be of a special interest. Penicillin V is (at least in Sweden) the antibiotic most commonly used in the treatment of acute maxillary sinusitis, and erythromycin - with an (anaerobic) antimicrobial spectrum very much like that of the penicillin V - is the first antibiotic alternative in penicillin allergy. Even if concentration studies suggest that neither penicillin V nor erythromycin is fully effective against *Haemophilus influenzae* in the maxillary sinus secretion (Carenfelt and Lundberg, 1976; Kalm et al., 1975), the clinical effect seems to be fully acceptable. *Branhamella catarrhalis*, previously regarded as non-pathogenic, is now thought to be a causative agent in acute maxillary sinusitis (Brorson et al., 1976). Among isolates of *Branhamella catarrhalis* from upper respiratory tract specimens, 15-17% have been reported as  $\beta$ -lactamase-producing (Kamme, 1980). In these infections erythromycin and trime topri/sulphamethoxazol seem to be the preferred drugs. The effect of the present two antibiotics has been

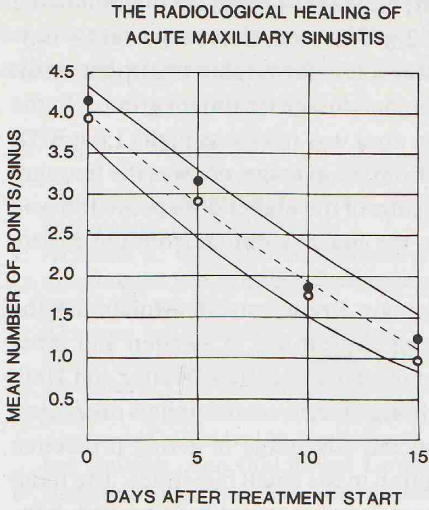


Figure 1.  
The radiological healing for the two different groups.  
○ = erythromycin base  
● = penicillin V  
The radiological point scale is given in the text on page 248.

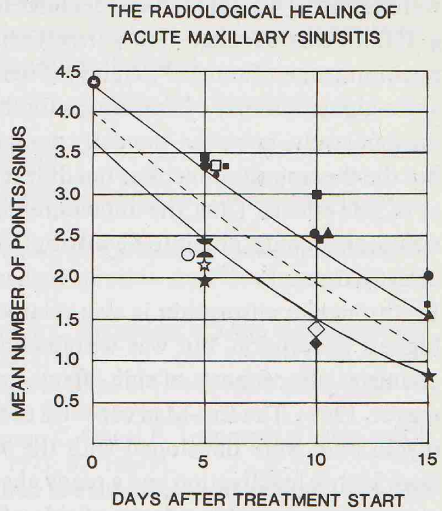


Figure 2.  
The radiological healing of 27 different treatment regimes in acute maxillary sinusitis.  
— = enclosing the P95 confidence limits  
- - - = mean healing for all different treatments  
Symbols above the upper solid line indicate statistically poorer radiological healing; symbols below the lower solid line indicate statistically better radiological healing.  
The radiological point scale is given in the text on page 248.

compared with that of the previously studied modes (Figure 1). The mean healing of erythromycin base and potassium penicillin V is related to the mean healing of 1320 patients (2039 maxillary sinuses), constituting the total material of the 27 treatment modes studied at Lundby Hospital since 1970 (Figure 2) (von Sydow et al., 1982). The results of both present groups are well within the P95 confidence limits of this large material.

During the last ten years, the recommended dose of penicillin V in upper respiratory infections – such as acute otitis media or acute maxillary sinusitis – has been raised from 0.2 g TID to 1.6–2.0 g BID or 25 mg/kg bodyweight BID (Ekedahl et al., 1980). In our first two investigations (Axelsson et al., 1970b; 1971), the penicillin tested was phenoxymethyl-penicillin acid with a relatively poor absorption, giving a 40% lower serum concentration than the potassium salt penicillins now commonly used (Peck and Griffith, 1958). The following doses and combinations



were tested: 0.4 g TID + nasal decongestant; 1.2 g TID + nasal decongestant; 1.2 g TID + nasal decongestant + irrigation; 1.2 g TID + nasal decongestant + oxyphenbutazone (Tanderil<sup>®</sup>, Geigy). There was a less favourable treatment result and a higher number of side effects for the higher dosage treatment groups. In the present study, however, the daily penicillin dose was nearly as high (1.6 g BID) but the therapeutic effect was not different from the average, nor was the frequency of side effects. Thus, the unfavourable results of the higher dose penicillin acid treatments could possibly be attributed to the low absorption from the gastrointestinal canal.

Erythromycin absorption is also relatively poor. Erythromycin estolate has the highest absorption, but was withdrawn from clinical use in Sweden and other countries after reports of side effects i.e. cholestatic hepatitis (Walter and Heilmeyer, 1969). The Ery-Max capsules containing enteric-coated pellets of erythromycin base were developed with the expected advantage of giving protection from gastric inactivation and a ready absorption in the small intestines. The treatment outcome and incidence of side effects of erythromycin base proved, however, not to be different from that of previous erythromycin studies.

#### CONCLUSION

In the treatment of acute maxillary sinusitis, penicillin V has proved as effective as most other more sophisticated and expensive antibiotics, giving no more side effects than average. Erythromycin base gave the same good treatment results but a slightly higher incidence of side effects. As we have noticed very little difference between various treatment modes as to therapeutic effect in acute maxillary sinusitis, consideration instead must be made to other factors than merely therapeutic ones, such as pharmacokinetics, forms of administration, dosage and cost, as well as type and frequency of side effects. Thus, our results are not in contradiction with the use of penicillin V as a primary antibiotic choice in acute maxillary sinusitis. Erythromycin base has proved to be a good alternative in cases of penicillin allergy.

#### ZUSAMMENFASSUNG

Einhundert Patienten mit akuter Kieferhöhlenentzündung wurden studiert. Die Diagnose wurde klinisch gestellt und röntgenologisch konfirmiert mit Hilfe einer 6-Punkte-Skala für Schleimhautschwellung und Sekret. In jeder Gruppe wurden 50 Patienten behandelt entweder mit Erythromycin Base oder Phenoxy-methyl-Penicillin (Penicillin V). Der röntgenologische Status von jedem Sinus wurde am 1., 5., 10. und 15. Tag abgelesen, um auf diese Weise den Behandlungserfolg zu objektivieren.

Betreffs des therapeutischen Resultates wurde keine signifikanter Unterschied gefunden zwischen den beiden Behandlungsgruppen. Die Resultate wurden ver-

glichen mit denen eines grösseren Materials von 1220 Patienten mit akuter Kieferhöhlenentzündung die auf dieselbe Weise seit 1970 am Lundby Krankenhaus untersucht wurden (25 verschiedene Behandlungsformen).

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