Rhinology, 19, 155-159, 1981

Comparative study of standard X-ray of the maxillary sinus and sinuscopy in children

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SUMMARY

Taking advantage of anesthesia for surgical procedures such as tonsillectomy or adenotomy, a sinuscopy of the maxillary sinus was performed in 45 children. A comparison was made between the results of this examination and sinus X-rays (Waters View), taken shortly before. In 66% of all cases the results of both examinations perfectly correlated. For the remaining cases only a slight discrepancy was found.

INTRODUCTION

Development of the maxillary sinus begins in the third month of fetal life. At the time of birth, it appears as a hollow cavity of ± 1 cm in length (Terrier, 1978). While it eventually develops in all directions, its growth is mostly mediolateral (Caffey, 1978).

A maxillary sinusitis can appear at any age. It is a very frequent disease (Axelsson et al., 1974). With children, its symptomatology is very polymorphic. The most frequent symptoms are: cough, purulent nasal discharge, and obstruction (Herz et al., 1977). Mostly, the maxillary sinus becomes infected together with the ethmoid sinus. Significant relationships are found between maxillary sinusitis on the hand, and otitis, adenoiditis, and tonsillitis on the other (Crooks et al., 1936). With children, sinubronchitis is very familiar as there is in those cases no distinct separation between infections of the upper and lower respiratory tract (Terrier, 1978; Behncke et al., 1980).

Besides rhinoscopy and transillumination, the standard X-rays of the paranasal sinuses (i.r. the four standard views) are routinely practised if sinusitis is suspected. The best evaluation of the maxillary sinus is obtained by the Waters View. Most of the pathological changes in the sinus appear in opacities that have water densities. That is why the density is of little diagnostic value (except for some foreign bodies); the shape of the opacity, however, is very important.

The following correspond to an accepted pattern:

1. A complete opacity of the sinus can correspond to an extreme thickening of the mucous membrane, severe polyposis or a sinus filled with secretion or neoplastic tissue.

Paper presented at the 8th Congress of the European Rhinologic Society and 2nd ISIAN, Bologna (Italy), October, 1980.

2. Thickening of mucosal lining corresponds to a total hyperplasia of the mucosa.
3. A lobulated image corresponds to a polyp or a cyst.
4. A local opacity corresponds to a definite mucosal hyperplasia.
5. A fluid level corresponds to the presence of secretions.

But this simplistic scheme has its imperfections, too. Agenesis and hypoplasia or a thickened bony wall (thallasemia) and a thickened superposed extrasinusal tissue (cellulitis), can also show a complete opacity of the sinus (Caffey, 1978). The presence of bone septa and an extreme limited development of the recessus zygomaticus or alveolaris can show an image of local opacity (Jonas et al., 1976). The impression of a reduced cavity can be caused by a pseudomucosal hyperplasia, by mistaking the sphenoidal fissure or the lateral expansion of the sphenoidal sinus with the antral cavity (Terrier, 1978).
In some rare cases, polyps can be missed on an X-ray, if the density is extremely low (Terrier, 1978). Many misinterpretations can be corrected by tomographic examination (Van den Eeckhout, 1978) and if needed by a C.T.-scan. This means, however, increased radiation exposure, especially if repeated examination is necessary.
With children, the interpretation of the standard X-ray is additionally hindered by the small size of the cavities. Very often, the edges of a normal antrum become fuzzy, due to the changing turgescence of the rhinosinusal mucous membrane, the presence of many spongiosa in the surrounding bone or to technical difficulties with some agitated patients (Terrier, 1978; Caffey, 1978).
With infants, the mucosa of the antrum is physiologically thickened. According to Terrier (1978) and Caffey (1978), maxillary sinuses can also show opacity during or after the child's crying.

Rhinoscopy as well as transillumination and X-rays of the sinuses, are a form of indirect examination. The advantage of antroscopy is that it allows direct local interpretation. There are many approaches via the processus alveolaris, the fossa canina or the nose (under the concha inferior) (Timm, 1965). Even the authors who use the fossa canina approach prefer the lower transmeatal approach in children.
The ostium area deserves special attention. Sometimes, it is possible to visualize the mucociliar activity and even the ostium function by observing the migration of secretions or blood to, and the evacuation through, the ostium. At the age of 6 year the endoscopic picture of the maxillary sinus is comparable to that of an adult.
A rhino-endoscopy and an antroscopy must always be performed at the same time.

AIM

The aim of this work was to evaluate how far the endoscopy of the maxillary sinus correlates with the interpretation of the standard X-ray of the maxillary sinus (Water View).

METHOD

In 45 children, the antroscopy was performed after the X-ray examination (in one case, the X-ray was not performed in our hospital).

The endoscopies, through the lower transmeatal approach, were performed under general anesthesia. But in order to avoid multiple narcosis on children the opportunity of another small intervention such as to tonsillectomy or adenotomy for instance, was taken to perform the sinuscopy at the same time.

The age of these children, 31 boys and 14 girls, ranged from 2 to 5 years, with a definite peak between 3 and 6. This last group represents 28 patients out of 45 (62%). This is to be expected for that kind of surgery.

The X-rays were divided into 3 types:

Type 1 – No pathology: the paranasal sinuses were considered normal.

Type 2 – Slight pathology: presence of a lobulated shadow or thickening of mucosal lining.

Type 3 – Severe pathology: complete opacity.

The antroscopy was divided into 4 types:

Type 0 – No sinuscopy possible (only 1 case).

Type 1 – No pathology: the mucous membrane has a normal aspect.

Type 2 – Slight pathology: thickening of the mucous membrane or local polyps or cysts.

Type 3 – Severe pathology: sinus completely filled with polyps or cysts and/or the presence of pus.

In the 45 children, a total of 67 antroscopies were performed (23 on both sides and 21 only on one side).

A total of 44 sinus X-rays were taken: on 65 sinuses an opinion was expressed (22 times both sinuses, and 21 times one maxillary sinus).

In 27 cases (61%) there was a one day interval or less between the roentgenograms and the sinuscopy (Table 1).

Table 1.

number of days between X-rays and sinuscopy	0	1	2	3	4	5	15	30 and more days
number of pictures	1	26	6	1	2	1	1	6

RESULTS

For 10 sinuses, the X-ray pictures were normal (type 1) although the endoscopies recorded 7 normal and 3 slightly pathological cases (type 2). For 13 endoscopies of type 1 (normal) the X-ray pictures showed 8 normal and 5 slightly pathological cases. For 22 cases, sinuscopy and X-ray showed some discrepancy with respect to type characterization. For 12 cases the X-ray was more pessimistic, and for 10 other cases the endoscopy was.

However, it is important to note that the difference in results between both examinations never was more than one step in the type scale.

CONCLUSION

We can conclude that standard X-ray in children gives a good insight into the condition of the maxillary sinuses. (In 66% of the cases, we found a concordance between antroscopy and standard pictures, in 33% of the cases a slight disconcordance, and in no case this discordance was greater than one step on the scale). Mostly with a normal standard view, one can say that there is no pathology in the sinus. In case of doubt, one should be guided by the clinical picture.

DISCUSSION

Based on the available literature, our conclusion as to the results of the various authors who made a comparitive study of sinuscopy and X-ray of the maxillary sinus would be that they are divergent. Most authors, however, studied adult populations (Table 2).

The time interval between the two examinations was kept as small as possible to guarantee an optimal concordance. In spite of our distinct correlation between X-ray and sinuscopy in children, the antroscopy remains a very useful examination since in addition to a direct view of the sinus mucosa, it also offers bacteriological, histological and therapeutical possibilities. It is true that the disadvantage of sinuscopy in children is that it can only be performed under general anesthesia.

Table 2.

Illum 1972	62% concordance
Herberhold 1973	64% concordance
Draf 1975	42% complete concordance
	36% moderate concordance
Buiter 1976	23% false−Rx
	30% false+Rx
Jeanneret 1977	92% concordance
Daele 1979	92% concordance
Behncke 1980 (sinuscopy in children)	major discrepancy
Our study 1980 (sinuscopy in children)	66% concordance
	33% slight disconcordance

It is by no means our purpose to advocate antroscopy when the smallest suspicion of maxillary sinusitis turns up. On the contrary, the first treatment in case of sinusitis should always be a conservative one.

RÉSUMÉ

Profitant d'une anesthesie générale nécessitée par une intervention chirurgicale comme par exemple une amygdalectomie, on a effectué sur 45 enfants une antroscopie.

Les résultats de cet examen ont été comparés aux radiographies des sinus (incidence selon Waters), qui avaient été prises peu de temps auparavant. Une corrélation parfaite est aparue pour 66% des cas. Pour les autres cas une discordance peu importante a été constatée.

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