A NOTE ON THE INCIDENCE OF SINUSITIS IN CHILDREN

BY

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Much interest has recently been shown in the prevalence of infections of the accessory nasal air spaces in children, and several reports of otitis media and sinusitis have appeared in the medical literature. During a study of the examination of the middle ear in a series of consecutive necropsies (Ebbs, 1937) a similar effort was made to determine the incidence of sinusitis. Clinical reports of the incidence of this disease in children are confined almost entirely to infection of the maxillary antra, and a complete clinical and bacteriological study of maxillary sinusitis has recently been recorded by Crooks and Signy (1936). It is hoped that the present report on the incidence of sinusitis as found post mortem will emphasize its prevalence and provide further statistics for comparison with other districts.

Method of Investigation

The observations have been made in children of all ages from birth to 14 years who have died from a great variety of medical and surgical conditions. The children have all lived in or near the city of Birmingham, and are representative of the child population in that district. The method used to expose the different sinuses was that described by Pickworth (1935), with minor modifications to suit the age and individual variation in each patient. The frontal sinus was not examined unless specifically indicated, and therefore finds no place in this survey. Information as to the presence or absence of the tonsils, and their infection or otherwise, was not sufficiently complete to be included with the examination of the sinuses. Infection was recorded as present only when definite pus or muco-pus was found in the sinus; sinuses that contained thin watery fluid or clear mucus were considered normal. Histological examinations of the mucous membrane lining these sinuses have not been completed in sufficient numbers to be included in this report. Direct smear examination and culture were carried out in the majority of cases in order to confirm the presence of definite purulent material and bacteria.

The Numbers and Age Groups

Table I records the number of children examined in each age and also the number who had purulent infection in one or more sinuses. Of 496 children 152 were found

TABLE I.—*The Incidence of Infection in One or More of Sinuses Examined*

Age in years	1	2	3	4	5	6	7	8	9	10	11	12	13	Totals
Number examined ..	331	60	23	9	13	20	10	9	4	6	2	6	3	496
Normal ..	223	40	19	8	10	16	6	6	2	3	2	6	3	344
Pus present	108	20	4	1	3	4	4	3	2	3	0	0	0	152
" " %	32.6	33.3	17.4	11.1	23	20	40	33.3	50	50	0	0	0	30.6

to have such an infection. In other words, 30.6 per cent. of the children of all ages who have died in a large children's hospital showed evidence of sinusitis at necropsy.

The number of infants under 1 year old was extremely large in this series, and indicates the age group in which the majority of the deaths in a children's hospital occur. It was found that 32.6 per cent. of 331 infants under 12 months of age and 33.3 per cent. of sixty children in the second year of life had infected sinuses. A further analysis of the first year is shown in Table II. The

* TABLE II.—*The Incidence of Sinusitis in Infants*

Age in months	1	2	3	4	5	6	7	8	9	10	11	12	Totals
Number examined	43	60	55	24	18	29	21	17	18	18	12	16	331
Normal ..	33	47	36	16	12	19	15	9	10	9	7	10	223
Pus present	10	13	19	8	6	10	6	8	8	9	5	6	108
" " %	23.2	21.6	34.5	33.3	33.3	34.4	28.5	47	44.4	50	41.6	37.5	32.6

incidence rises from 23.2 per cent. in the first month up to 50 per cent. at 10 months. Of the ten infants 1 month or under who had pus in the antra two were only 2 weeks old at death. Infection of the antrum is recorded in an infant only 3 days old (Holt and McIntosh, 1933).

Incidence of Infection

The incidence of infection in the different sinuses is shown in Table III. In two cases the maxillary antra were

TABLE III.—*The Incidence of Infection in the Different Sinuses*

	Maxillary Antrum	Ethmoid Cells	Sphenoid Sinus	Middle Ears
Number examined ..	494	444	305	496
Normal ..	350	383	258	216
Pus present ..	144	61	47	280
" " per cent.	29.15	13.74	15.4	56.4

not definitely found and therefore the presence or absence of pus could not be recorded. In a few patients only a slight depression was seen, but in the majority there was an easily recognizable cavity, which in some cases was surprisingly large, especially in small infants. The same was true of the ethmoid cells and sphenoid sinuses, although these were found less often. Of 494 infants and children in whom the maxillary antra were examined 144, or 29.15 per cent., were infected. The ethmoid cells were recorded in 444 children, and these showed infection in sixty-one (13.74 per cent.). The sphenoid sinus was examined in 305 patients and infection was present in 15.4 per cent. These figures support the view, held by most observers, that infection of the maxillary antrum is much more frequent than in either the ethmoid cells or the sphenoid sinuses.

Table III also records the incidence of associated otitis media. The examination of the sinuses was carried out at the same time as an examination of the middle ear and mastoid antrum in these 496 children. Only thirty-three had infected sinuses without an associated otitis media, while 280, or 56.4 per cent., were found to have pus in the ears. Of 152 cases with sinusitis 78.2 per cent. had an associated otitis media.

A general idea of the incidence of infection in the upper respiratory tract in infants and children at necropsy is gained when it is realized that in this series 63.1 per cent. had pus in one or more of the sinuses or ears. These figures are supported by clinical and post-mortem

findings in other centres. Thus Crooks (1936) in a clinical study found that twenty-four of 100 children had evidence of infection of the maxillary antra. Skillern (1923) quotes various authors' post-mortem findings, which vary from 47 per cent. to 17 per cent., and give an average of 32.7 per cent.

The view that some patients develop a collection of fluid in the sinuses during the terminal period of a fatal illness, when resistance and normal ciliary action are poor, cannot be satisfactorily disproved in all cases, but the history and clinical course, in addition to the gross sepsis found at necropsy in the majority of these infants and children, is very strong evidence in favour of a pre-terminal infection. The incidence of the common cold and the frequency of respiratory infections in the patients who are brought to a children's hospital are high enough to support the view that a considerable number have an infection in the accessory nasal sinuses. The part which sinusitis has played as a cause of death in this group of children is difficult to assess, since it could have been the aetiological factor or an associated condition or the result of the condition which caused the death.

Summary

1. The incidence of sinusitis in 496 infants and children examined post mortem was 30.6 per cent.
2. The maxillary antra were observed to be more frequently involved than the ethmoid cells or the sphenoidal sinuses.
3. A high incidence of associated otitis media was found.
4. Infection of one or more of the sinuses or ears was present in 63.1 per cent. of these children.

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Clinical Memoranda

Tetanus supervening on Middle-ear Disease

The following case seems to be sufficiently interesting to be placed on record.

CASE REPORT

An Indian clerk aged 28 had a history of chronic purulent discharge from his right ear since childhood. Twenty days before admission to hospital he introduced some "samundar jahag" into the meatus. (Samundar jahag is a native "drug," and usually consists of powdered cuttlefish bone, but when this is not available dried scum from streams is substituted. These medicines are sold in the bazaar under filthy conditions, but have a local reputation among the less-educated classes for the treatment of suppurative lesions.)

Three days before admission he had difficulty in opening his mouth, stiffness in the back, a feeling of tightness in the chest, and pain in the right ear. All these symptoms gradually became more severe, so he went to hospital. On arrival he complained of the above-mentioned symptoms with

stiffness of the legs and tightness of the abdomen in addition. The temperature was 98° F., the pulse 72, and respirations 20.

Trismus and risus sardonicus were present, and the patient lay in bed on his left side, with some arching of the back and retraction of the head, and was moaning quietly. He could speak with difficulty, and complained of tightness of and pains in most of his muscles, and salivation. Spasms occurred on slight irritation. His eyes had a tendency to look to the right, with some internal strabismus, and also tended to roll about, particularly during examination. The fundi were normal and the pupils reacted normally to light and to accommodation. There was no nystagmus. The teeth could only be separated about a quarter of an inch with difficulty. Respiration was shallow, but an examination of the heart and lungs revealed no abnormalities. The abdomen was rigid and felt almost like concrete. The limbs all showed a tendency to spasticity, but the tendon reflexes were normal and the plantar reflexes flexor. Knee and ankle clonus was present on both sides. The right external auditory meatus discharged yellowish offensive pus, and examination showed a reddened meatal canal with a mass of granulation tissue obscuring the drum. The left drum was indrawn; the handle of the malleus was pink, but was otherwise normal. Lumbar puncture resulted in 10 c.cm. of clear fluid being withdrawn under slightly increased pressure; there was no globulin. A few red blood cells were probably adventitious.

There were 9,375 leucocytes per c.mm. of blood; 75 per cent. of these were polymorphs. The red cells were normal and showed no sign of malarial parasites. Examination of the aural discharge showed staphylococci and pneumococci.

The patient was given large doses of tetanus antitoxin intravenously, intramuscularly, and subcutaneously, with liberal sedatives. The ear was dressed with hydrogen peroxide. Though the pains and spasms were brought under control the temperature steadily rose, reaching 101.2° F. on the thirteenth day and coming down by lysis, while the pulse varied from 102 to 136. The symptoms rapidly improved from the fourteenth day. Most of the antitoxin was given by the intravenous route, and altogether 299,000 American units (598,000 I.U.) were injected.

The patient was discharged on the forty-eighth day of admission in good health though rather psychoneurotic. The granulations in the ear had retrogressed, revealing a moderate-sized perforation in the lower part of the drum, and there was very little discharge.

COMMENTARY

This case is, I think, most unusual; I can find no similar instance in the literature at my disposal. The clinical features and recovery after antitoxin leave little doubt as to the diagnosis, though the pathologist failed to find *B. tetani* in the fourteen successive daily specimens of the discharge. All showed staphylococci, and many of them pneumococci as well. Tetanus toxin is said to travel along the sheaths of the motor nerves, and in this situation only the small nerves which supply the tensor tympani and stapedius muscles and the chorda tympani, and tympanic plexus, in which there are probably some motor fibres, could easily be involved. There were no obvious signs of interference with the right facial nerve, nor was there evidence of any inflammatory process in the pinna.

The pronounced tetanic symptoms, with comparatively little rise of temperature or pulse rate and practically no leucocytosis, may be due to the fact that while the tetanus toxin reached the central nervous system via the motor nerves, very little of the other products of the inflammatory process were absorbed by the surrounding comparatively avascular bony tissues.

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