MAXILLARY SINUSITIS : A STATISTICAL INVESTIGATION*

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THE purpose of this paper is to give an account of the cause, symptomatology, diagnosis, treatment, and results in all cases of maxillary sinusitis treated by Dr. J. S. Fraser in his wards and out-patient department at the Edinburgh Royal Infirmary during the years 1921 to 1930 inclusive. The paper may be regarded as a companion to that on Frontal Sinusitis by J. P. Stewart and J. S. Fraser which appeared in the *Journal of Laryngology and Otology* in June, 1931.

Although we recognize the difference between catarrhal and suppurative disease, i.e. that on proof puncture the secretion in catarrhal cases is washed out in one or two coherent masses, whereas in suppurative cases the exudate resembles thin pea soup, we have dealt with them together since, from the clinical point of view, they are closely allied.

It is difficult to give an account of maxillary sinusitis alone, as it is so often associated with a similar affection of the other paranasal sinuses. We have, therefore, thought it advisable, in certain parts of the investigation, to differentiate the uncomplicated cases, i.e. cases in which the maxillary sinus alone was affected, from the complicated cases, i.e. cases in which there was adequate evidence of disease also affecting one or more of the other paranasal sinuses. Since cases of antro-naso-choanal polypus are quite distinct from maxillary sinusitis, these cases are omitted from this investigation.

The cases are grouped for analysis in various ways. Firstly, as explained above, as complicated and uncomplicated. Secondly, as acute and chronic, the acute cases being those up to three months' duration, and the chronic cases those of

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over three months' duration. Lastly, from the point of view of treatment, they have been subdivided as follows:

Group A. Treated by conservative methods.
Group B. Treated by intranasal operation.
Group C. Treated by radical operation.

Having excluded those cases which did not report for treatment after their first attendance, the total number of cases of maxillary sinusitis in the period under discussion was 508. Table I shows how these were made up.

TABLE I.

	Complicated.	*Uncomplicated.*	*Total.*
Acute Cases ..	55 (30%)	125 (70%)	180 (35·5%)
Chronic Cases ..	143 (43·6%)	185 (56·4%)	328 (64·5%)

Sex. From Table II, it will be seen that there is a more frequent incidence of males than of females among the acute cases, and of females than of males among the chronic cases.

TABLE II.

	Males.	*Females.*
Acute Cases	100 (55%)	80 (45%)
Chronic Cases	155 (47%)	173 (53%)
Total	255 (51%)	253 (49%)

Side. From Table III it will be seen that, in this series, the left maxillary sinus was slightly more often affected than the right. The chronic cases were three times more commonly bilateral than the acute cases.

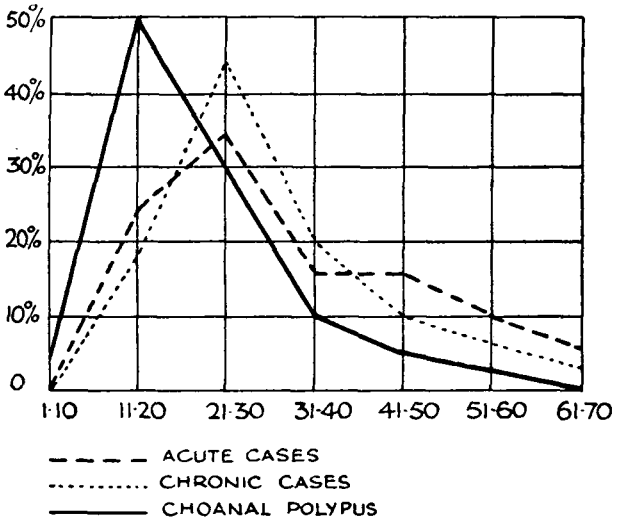
TABLE III.

	Right Side.	*Left Side.*	*Bilateral.*
Acute Cases ..	75	87	18 (10%)
Chronic Cases ..	110	115	103 (31·4%)
Total	185	202	121

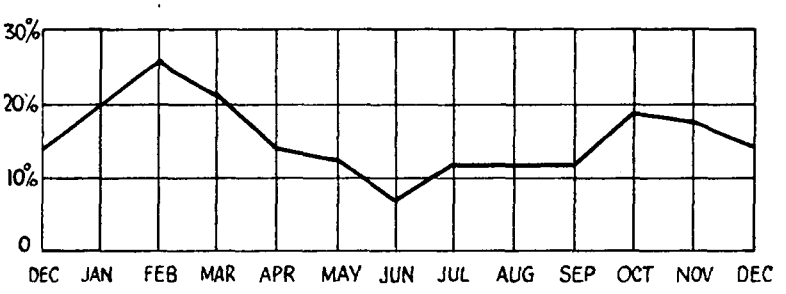
Age. Graph I is an Age Distribution Graph for acute and chronic cases. The number of cases in each ten years age period is expressed as a percentage of the total acute or chronic cases during the years 1921 to 1930 inclusive. The graph for cases of choanal polypi is included for comparison, and shows the high incidence of this condition under the age of twenty, viz. 53%. The acute and chronic cases have most commonly come for treatment in the third decade, but the acute cases are fairly evenly distributed over each decade.

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Duration. Information as to duration was available in 93% of the acute and in 70% of the chronic cases. 68% of the acute cases were under one month's duration; the remaining 32% were of one to three months' duration. Of the chronic cases 51·3% were under three years, and the remaining 48·7% were over three years' duration.



GRAPH I.



GRAPH II.

Seasonal Incidence. The curve of seasonal incidence in acute cases (Graph II) shows that the incidence of acute maxillary sinusitis is greater in the winter than in the summer months, reaching its height in February.

Cause. Information as to cause was available in 57% of the acute, but only in 13% of the chronic cases. It is set out for

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what it is worth in Table IV. The figures for the dental origin of maxillary sinusitis—8% acute and 6% chronic—are quite reliable and noteworthy since, formerly, most cases of antral suppuration were regarded as being of dental origin and treated by the dental route. It should be noted in addition that eighty-nine (27%) of the chronic cases had nasal polypi, a possible cause of the maxillary sinusitis.

TABLE IV.

	Acute Cases.	*Chronic Cases.*
Coryza or Influenza ..	77 (42·7%)	8 (2·4%)
Dental Origin	14 (8%)	20 (6%)
Injury	3 (1·7%)	10 (3%)
Scarlet Fever	2 (1%)	2 (0·6%)
Tonsillitis	7 (4%)	—
Other Causes	—	3 (1%)

Symptomatology. The percentage frequency with which various symptoms occurred in this series is expressed for acute and chronic cases in Table V. Notes of the symptoms were usually taken by a secretary before the patient was seen by the surgeon. The less striking symptoms, e.g. post-nasal discharge, are perhaps understated but, on the whole, the notes from which the figures are drawn were fairly full.

TABLE V.

	Complicated.		*Uncomplicated.*		*Total.*	
	Acute.	*Chronic.*	*Acute.*	*Chronic.*	*Acute.*	*Chronic.*
Total Cases ..	55	143	125	185	180	328
Nasal Discharge	50%	57%	56%	58%	55%	58%
Post-nasal Discharge	5%	10%	5%	13·5%	5%	12%
Nasal Obstruction	22%	65%	32%	45%	29%	54%
Headache or Pain	91%	45%	66%	40%	74%	42%
Pain over Antrum	15%	1·4%	24%	5%	21%	3%
Swollen Cheek ..	2%	—	6%	—	5%	—
Bad Odour or Taste	7%	19%	10%	23%	9%	21%
Frequent Colds	—	8·4%	—	11%	—	10%
Anosmia	—	7%	—	1·6%	—	4%
No Nasal Symptoms	2%	8%	14%	15%	12%	12%

Headache or pain was the most frequent symptom in the acute cases, occurring in 91% of the complicated and in 66% of the uncomplicated cases. Of these cases only 21% had pain over the antrum itself, and only 5% visible swelling of the cheek;

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some of the latter were of dental origin. Of the chronic cases nasal discharge occurred in 58%, nasal obstruction in 54%; headache or pain was complained of in 42% and a bad odour or taste in 21%.

Examination of the Nose. On anterior rhinoscopy pus was seen in the middle meatus in 40% of the acute and in 32% of the chronic cases; pus was seen elsewhere in the nose, usually on the floor or in the olfactory cleft, in 24% of the acute and in 33% of the chronic cases; no pus was seen in 24% of the acute and in 18% of the chronic cases. The notes as to swelling or congestion of the mucous membrane were scanty (14% acute and 8% chronic); the mucosa was noted as being atrophied in 4% of the chronic cases. The middle turbinate was polypoid in 5% of the acute and in 11% of the chronic cases; polypi were present in 27% of the chronic cases.

The septum was seen to be deflected or irregular in forty-six acute cases (25·5%), and in 123 chronic cases (37·5%). Of the acute cases twenty-one had the septum deflected to the affected side, fourteen to the healthy side, and in eleven cases the septum was irregular. In forty-four of the chronic cases the septum was deflected to the diseased side, in thirty-nine to the healthy side, in eighteen the septum was irregular, and in twenty-two cases the septum was deflected but both maxillary sinuses were diseased. These figures do not seem to indicate any particular rôle to a deflection of the septum in determining the chronicity of a maxillary sinusitis.

Although posterior rhinoscopy was not always successful, pus was observed in this way in 31% of the acute, and in 28% of the chronic cases. The location of the pus was frequently of help in diagnosis. Pus was observed only in this way in 11% of the acute and in 8% of the chronic cases, serving to stress the value of this method of examination.

Transillumination, Radiography, and Proof Puncture. These methods of investigation were carried out respectively in 92%, 55% and 78% of the acute, and in 89%, 68% and 86% of the chronic cases. Taking a positive proof puncture as evidence of a diseased maxillary sinus, and a negative proof puncture as evidence of a healthy sinus, we find that the value, separately and/or combined, of transillumination, and X-ray examination, may be expressed briefly as in Table VI. With regard to the diagnostic value of proof puncture certain fallacies must be recognized. (1) In a certain number of cases proof puncture

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was done on one side only although transillumination showed both sides to be dull. (2) In certain cases, e.g. those with polypi, a proof puncture was not considered advisable or necessary. (3) The result of proof puncture is not an infallible guide to the state of health or disease of the maxillary sinus. (Francis P. Emerson, Oskar Hirsch.)

TABLE VI.

	Acute Cases.			*Chronic Cases.*		
	Accurate.	*Divergent.*	*% Error.*	*Accurate.*	*Divergent.*	*% Error.*
Transillumination	126	34	21·2%	195	46	19%
X-ray Examination	65	18	21·6%	138	21	13%
Transillumination plus X-ray	53	3	5·4%	103	8	7·3%

The greater accuracy of the X-ray findings in the chronic than in the acute cases is as one would expect. The high percentage error in the X-ray findings may not be acceptable to some, but an exactly similar error was found in thirty cases subjected to the radical operation on the strength of an X-ray diagnosis of maxillary sinusitis, but in whom no proof puncture was done. The error arose for the most part in cases which had obstruction to the ostium of the sinus, e.g. by polypi, without any pathological content or change in the mucous membrane.

One would also stress the value of employing both transillumination and radiology in investigating these cases, since some seem to show up by the one and not by the other method.

Co-affection of the other Paranasal Sinuses. X-ray evidence of disease in the other paranasal sinuses was available in forty-seven out of fifty-five acute complicated cases, and in 123 out of 125 chronic complicated cases. It is therefore simpler to analyse the X-ray findings alone. This is done in Table VII.

TABLE VII.

	Acute Cases.	*Chronic Cases.*
Ethmoid Labyrinth	36 (20%)	105 (32%)
Frontal Sinus	26 (14·4%)	66 (20%)
Sphenoid Sinus	—	23 (7%)
Ethmoid alone	21 (11·7%)	50 (15%)
Frontal alone	11 (6%)	18 (5·5%)
Ethmoid, Frontal, and/or Sphenoid	15 (8·3%)	53 (16%)

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Co-affection of the Ears. There were inflammatory changes, acute or chronic, in the middle ear in twenty-nine of the acute cases (16%), and in seventy-eight of the chronic cases (23·7%). Of the acute cases, twenty-seven had acute otitis media, suppurative in twenty-three and catarrhal in four. The acute otitis media occurred on the side of the acute maxillary sinusitis in eighteen cases (10%), and on the opposite side in seven cases (4%); in two cases both ears were affected.

Of the chronic cases only sixteen (4·8%) had acute otitis media. In thirty-six cases (11%) there was chronic middle-ear catarrh, mainly Eustachian obstruction; in seventeen (5%) chronic suppurative otitis media, and in nine (2·7%) a healed chronic suppurative otitis media. There was no special affection of the ear on the same side as the maxillary sinusitis, but usually both ears were affected, especially in cases of chronic middle-ear catarrh.

Co-affection of the Pharynx. Acute tonsillitis was noted only in four acute cases (2·2%), but the tonsils were enlarged or diseased in ten (5·5%). Of the chronic cases, thirty (10%) had enlarged tonsils, and twenty-eight (8·5%) some remains of adenoids. Pharyngitis was noted in eleven (3·3%), and laryngitis in seven cases (2%).

Treatment and Results

Table VIII gives the number of acute and chronic cases treated (*a*) conservatively, (*b*) by intranasal operation, (*c*) by the radical (Caldwell-Luc) operation. It also gives, in brackets, the number and percentage in each group who reported later for examination, or who replied to a questionnaire.

TABLE VIII.

	Acute Cases.		*Chronic Cases.*	
	Complicated.	*Uncomplicated.*	*Complicated.*	*Uncomplicated.*
Conservative	32 (15–47%)	88 (39–44%)	7 (3–43%)	69 (34–49%)
Intranasal ..	21 (15–71%)	27 (13–48%)	69 (51–74%)	78 (54–69%)
Radical ..	2 (2–100%)	10 (7–70%)	67 (53–77%)	38 (28–74%)
Conservative (Modified)	45 (21–47%)	113 (50–44%)	49 (21–43%)	124 (61–49%)

Since 43% of the cases treated by intranasal and radical operation had previously been treated conservatively without

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success, and were really failures to conservative treatment, the figures for the latter have been modified. These cases have been added as failures in proportion to the number of conservative cases who reported. It is, of course, understood that in this way, we get only a rough idea of the relative value of conservative treatment, since many of the worse cases were not considered at all for such treatment, and so are not included in these figures.

In considering the results of treatment the cases have been classified as (1) Cured, (2) Improved, (3) *In statu quo* (I.S.Q.). Since the result in 57% was obtained by questionnaire we have had to be guided largely by the subjective statement of the patient as to the cure, relief, or persistence, of the nasal or postnasal discharge, nasal obstruction, headaches, etc. We cannot very well assess the "personal factor", or the varying reaction of different individuals to a minor degree of discomfort or disability; nor can we tell whether the post-operative treatment was properly carried out by the patient.

The criterion of "Cure" is therefore the disappearance of all nasal symptoms previously complained of, or their persistence in such slight degree as to constitute, by comparison with the patient's previous state, a trifling disability. As "Improved" we group those cases in which there was cure of all but one or two of the nasal symptoms or in which there was recurrence only after a period of years. As "I.S.Q." we group those cases in which symptoms persisted as much as before treatment or in which relief was only of short duration. These various standards of result were corroborated wherever possible by a careful examination of the patient, details of which are given later.

Group A—Conservative Treatment

Conservative methods of treatment usually consisted of menthol-steam inhalations, headlight baths, proof puncture and, occasionally in chronic cases, a saline "nose wash", or an autogenous or stock vaccine. Where pain was complained of, headlight baths were given, usually with considerable benefit; in addition menthol inhalations usually gave relief. Some cases cleared up with these methods of treatment alone. In the greater proportion of the acute, and in almost all the chronic cases, puncture through the lateral wall of the inferior meatus and lavage was carried out. Some cases cleared up after one or two irrigations, but the results of repeated puncture, on

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alternate days in acute cases and on alternate weeks in chronic cases, showed that if a case did not clear up after four irrigations on an average, further treatment of an operative nature was necessary.

In the four acute and in six chronic cases, classified as treated conservatively, although no operation was carried out on the maxillary sinus, the septum or enlarged turbinates were resected or the ethmoid labyrinth was opened up.

The figures (modified) of the results of conservative treatment are set out in Table IX. This shows a recovery rate of over 50% in acute cases, and of over 30% in chronic uncomplicated cases. The presence of complications affecting the other paranasal sinuses has had little effect on the recovery rate of the acute cases, but for chronic cases, with a recovery rate of under 10%, conservative treatment is hardly worth while.

TABLE IX.

RESULTS OF CONSERVATIVE TREATMENT.

	Cured.	*Improved.*	*I.S.Q.*
Acute Complicated Cases ..	12 (57%)	1 (4·7%)	8 (38%)
Acute Uncomplicated Cases ..	27 (54%)	10 (20%)	13 (26%)
Chronic Complicated Cases ..	2 (9·4%)	1 (4·7%)	18 (86%)
Chronic Uncomplicated Cases ..	21 (34%)	7 (11·4%)	33 (54%)

One case died, a mortality rate of 0·48%. This was an acute case who developed purulent meningitis secondary to acute middle-ear and mastoid disease. The latter condition was present before treatment for the maxillary sinusitis was instituted.

Group B—Intranasal Operation

The intranasal operation on the maxillary sinus was carried out in forty-eight acute, and in 147 chronic cases; it is now more often tried in chronic cases than formerly. Local anæsthesia alone was employed in thirty-five acute cases (73%), and in 105 chronic cases (71·5%). In the remainder combined local and general anæsthesia was used.

The method of carrying out the operation was more or less standardized. In practically every case the anterior end of the inferior turbinate was removed; the medial wall of the antrum was opened with Tilley's burrs, and the opening thus made was enlarged, and fragments of bone removed with Ostrom's and Grünwald's forceps. The opening into the maxillary sinus, or

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the nasal cavity itself, was not packed except in cases in which there was considerable hæmorrhage. Forty-eight hours after operation the maxillary sinus was washed out by means of a curved cannula to which a Higginson syringe was attached. No medicaments were introduced by means of the syringe. Lavage was repeated twice daily at first, but as the discharge lessened, was carried out less frequently. In cases with involvement of the frontal sinus and the ethmoidal cells, the anterior end and lower border of the middle turbinate was removed, the anterior ethmoidal cells opened up, and the naso-frontal duct enlarged, this in addition to the operation on the maxillary antrum.

Complications

(*a*) *Acute Cases.* Eczema of the upper lip and cheek—one case; erysipelas—two cases (4%); further operation on the ethmoid or frontal sinus—three cases (6%); one of the cases of erysipelas died, a mortality rate of 2%.

Fatal Case.—Mrs. J.H., aet. 58, suffered from diabetes and acute left maxillary sinusitis. Conservative treatment for the sinusitis and medical treatment for the diabetes was carried out for three weeks but, as this was unsuccessful, an intranasal antrotomy was performed. Erysipelas of gangrenous type set in three days later, and she died on the eleventh day after operation.

(*b*) *Chronic Cases.* Secondary hæmorrhage—two cases (1·4%); swelling of the cheek or lower eyelid—three cases (2%); tonsillitis—three cases (2%); acute suppurative otitis media—three cases (2%), one case required a mastoid operation; pyrexia—six cases (4%), and one case each of anosmia, facial erysipelas, pleurisy, and erythema nodosum. There were two fatal cases, which are described below, a mortality rate of 1·4%.

(I)—A.C., male, aet. 49, was seen on 8.2.22 complaining of nasal obstruction and frequent colds of four months' duration. The nasal septum was deflected to the left side, and there was disease of the left maxillary sinus, from which mucopus was washed out on proof puncture. Conservative treatment was tried for two weeks. On 22.2.22, under local anæsthesia, a submucous resection of the septum was done and an intranasal opening made into the left maxillary sinus, which was packed with iodoform gauze. On 24.2.22, the packing was removed; temperature 102·4° F. On 25.2.22, the temperature was 102·4° F.; the maxillary sinus was

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washed out; there was a patch of consolidation in the right lung. On 26.2.22 the patient died, probably of an acute streptococcal blood infection.

(II)—G.W., male, aet. 49, was seen on 29.11.26, complaining of neuralgia of the malar branch of the fifth nerve and foul smelling nasal discharge. The septum was deflected to the right side and there was disease of the right maxillary sinus, from which foul pus was washed out on proof puncture. On 7.12.26, under local anæsthesia, a submucous resection of the septum was done and an intranasal opening made into the right maxillary sinus, evacuating foul pus. The right side of the nose was packed with iodoform gauze. On 9.12.26, the packing was removed; temperature 103° F. On 10.12.26, the antrum was washed out and found to be moderately infected; the temperature was 102·6° F.

On 11.12.26, the right wrist was swollen; temperature 102° F.

On 12.12.26, the patient was delirious; temperature 104° F.; on washing out the maxillary sinus, it was quite clean. Mercurochrome in 1% watery solution was given intravenously, but the patient died. At autopsy, early pericarditis and peritonitis was found with fatty degeneration of the liver and heart. Blood culture from the heart yielded a streptococcus.

The results of treatment by intranasal antrotomy are given in Table X.

TABLE X.

RESULTS OF INTRANASAL OPERATION.

	Cured.	*Improved.*	*I.S.Q.*
Acute Complicated Cases ..	8 (53·3%)	5 (33·3%)	2 (13·3%)
Acute Uncomplicated Cases ..	10 (77%)	3 (23%)	—
Chronic Complicated Cases ..	17 (33·3%)	19 (37%)	15 (29·4%)
Chronic Uncomplicated Cases ..	18 (34·5%)	17 (32·7%)	17 (32·7%)

The results in the acute cases leave no doubt that this is the operation of choice. In chronic cases the cure of one-third, and the improvement in another third, also makes the operation well worth while. The fact that as many chronic complicated as uncomplicated cases were benefited by the operation may appear strange, but one should remember that only the less severe complicated cases were dealt with by this method, and that in practically every case the ethmoid, frontal, and/or sphenoidal sinuses were operated on at the same time as the maxillary sinus.

The time for cure varied between two weeks and two years, but 50% of the chronic, and 74% of the acute cases were free from discharge or other symptoms in less than two months.

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Group C—Radical Operation

This method was for the most part reserved for cases which the surgeon felt could not adequately be dealt with by conservative methods or by the intranasal operation. Here are some of the indications for preferring this operation. (1) The presence of recurring nasal polypi combined with evidence of disease of the maxillary sinus. (2) A polypoid mucous membrane lining the antrum, as shown by X-ray examination, or the difficulty or impossibility of proof puncture. (3) The probability that apical dental sepsis was the cause of the sinusitis. (4) Trauma, e.g. fracture of the maxilla. (5) Previous unsuccessful radical or intranasal operation. (6) Antro-buccal fistulae. (7) The presence in the antrum of caseous material or of a foreign body.

Method. Combined general and local anæsthesia was employed, and the nasopharynx was plugged with a sponge. The maxillary sinus was opened through the canine fossa, and polypoid mucous membrane, granulations, polypi, and pus were removed. The anterior end of the inferior turbinate was next divided with scissors and snared off. A large counter-opening was made through the lower part of the medial wall of the antrum, i.e. the lateral wall of the inferior meatus. The mucous membrane of the lateral wall was turned down as a flap into the antrum which, as a rule, was lightly packed with iodoform gauze ; the free end of this was brought out through the anterior naris. The mouth wound was closed with cat-gut stitches. The packing was removed forty-eight hours after the operation, and on the following day the antrum was washed out for the first time. Both maxillary sinuses were operated on at the same time, if necessary, and where there was involvement of other sinuses, or the formation of polypi, these were dealt with at the same time or, occasionally, a few days later.

The radical operation was carried out in twelve acute cases, two of which were complicated and ten uncomplicated, and in 105 chronic cases, sixty-seven of which were complicated and thirty-eight uncomplicated.

Cause. Of the acute cases, eight were caused by dental sepsis, two by trauma, and two by influenza. One of the traumatic cases also required an external operation on the frontal sinus, and the whole roof of the maxillary sinus was removed as a sequestrum.

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Of the sixty-seven chronic complicated cases, sixty-two (92·5%) were associated with nasal polypi. Of the thirty-eight uncomplicated cases, twelve (31·6%) were of dental origin, five had a polypus in the middle meatus, two were traumatic, one was said to follow an attack of influenza, and one case was associated with a cleft palate and malignant disease of the larynx; in the remaining thirteen cases (34%), no cause was ascertained. One of the cases of dental origin turned out to be a rhinitis caseosa, of which particulars are given.

G.B., male, aet. 42, was seen on 10.2.28 complaining of left-sided nasal discharge since his upper teeth were extracted six months previously. There was a sinus in the left upper molar region. The left maxillary sinus was dull on transillumination and on X-ray examination. The septum was very irregular, and there was pus in the left nostril. The left antrum was punctured on three occasions and foul pus was washed out. On 27.3.28 a submucous resection of the septum was done; on 1.5.28 a radical operation was carried out on the left maxillary sinus, which was found to be full of foul-smelling cheesy material. The mucosa was polypoid and was curetted, and a counter opening was made. He was free from discharge in six weeks, and has remained well to date.

Complications

Acute Cases (12). Two cases had troublesome swelling of the cheek; one case developed a scarlatiniform rash.

Chronic Cases (105). Early complications—twenty-six cases (25%) detailed as follows: Swelling of the cheek—fourteen; post-operative hæmorrhage—four; erysipelas—two; acute suppurative otitis media—two; tonsillitis—one; post-operative collapse—one; pyrexia—seven. Late complications—twenty-four cases (23%) as follows: recurrence of polypi—thirteen; further operation on the ethmoid labyrinth—six; facial neuralgia—two; adhesions in the nose—two; diphtheria—one. There were two fatal cases of which details are given below, a mortality rate of 1·9%.

Fatal Cases:

(I)—W.S., male, aet. 42. This patient had an external operation on the right frontal sinus four weeks before a radical operation on both maxillary sinuses. He developed meningitis and died. This

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case is fully described in the *Journal of Laryngology and Otology* of June, 1931, 379-80.

(II)—W.L., male, aet. 46, was seen on 17.3.29 complaining of intense frontal headaches, aphasic attacks, and epistaxis, of some years' duration. Several years previously he had nephritis and facial paralysis which had cleared up.

On anterior rhinoscopy a polypus and pus were seen in the left middle meatus, and pus on the right side : both inferior turbinates were atrophic. On transillumination both maxillary sinuses and both frontal sinuses were dull. The X-ray showed disease of both ethmoids, and of the left maxillary and sphenoid sinuses. On proof puncture, pus was washed out of both maxillary sinuses.

On 26.3.29, both ethmoids and the left sphenoid sinus were opened up ; a radical operation was carried out on both maxillary sinuses which contained pus ; the bony walls were very dense. The mucosa in both sinuses was polypoid and was curetted. Counter openings were made and the sinuses were packed. Bleeding was troublesome during and after the operation. He developed erysipelas with a high and swinging temperature, and died on the sixth day after operation.

The results of the radical operation are given in Table XI. The figures for the acute cases are excellent, but the cases are too few to give them much weight. The relatively poor result in the chronic complicated cases is due to the high incidence of polypi which are notoriously difficult to eradicate entirely. The good result in the chronic uncomplicated cases is gratifying, since most of them were not suitable for the intranasal operation.

TABLE XI.

RESULTS OF RADICAL OPERATION.

	Cured.	*Improved.*	*I.S.Q.*
Acute Complicated Cases ..	—	2 (100%)	—
Acute Uncomplicated Cases ..	7 (100%)	—	—
Chronic Complicated Cases ..	12 (23·5%)	24 (47%)	15 (29·5%)
Chronic Uncomplicated Cases	18 (64·3%)	7 (25%)	3 (10·7%)

In the acute cases the time for cure varied from four to eight weeks.

In the chronic cases, excluding two cases which took a year for the disappearance of symptoms, the average time for cure was two months ; over 50% of the cured cases felt their full relief in less than six weeks.

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Curetting of the Mucous Membrane Lining the Maxillary Sinus in Relation to the Result

Of the seven acute uncomplicated cured cases, in four, the mucous membrane was curetted, and in three it was left intact. The figures for chronic cases are expressed in Table XII.

TABLE XII.

	Cured.				*Improved.*				*I.S.Q.*			
	T.	C.	½C.	N.C.	T.	C.	½C.	N.C.	T.	C.	½C.	N.C.
Complicated Cases	12	4 33%	3 25%	25 42%	24	14 58%	2 8%	8 33%	15	7 54%	0 —	6 46%
Uncomplicated Cases	18	13 72%	1 6%	4 22%	7	4 57%	1 14%	2 29%	3	2 67%	1 33%	0 —
Total Cases	30	17 57%	4 13%	9 30%	31	18 58%	3 10%	10 32%	18	9 56%	1 6%	6 38%

KEY: T = Total Cases; C, ½C, N.C. = respectively wholly, partly, and not curetted.

Keeping in mind the fact that only cases with marked polypoid changes of the mucous membrane were curetted, it would appear from these figures that the curetting *per se* has not been an adverse factor in determining the result.

General Review of the Cases which Reported

Age. The age of the patient is not a factor of any importance in relation to the result.

Sex. It will be noted from Table XIII that in both acute and chronic cases the results all over are better for males than for females.

TABLE XIII.

	Cured.		*Improved.*		*I.S.Q.*	
	Male.	*Female.*	*Male.*	*Female.*	*Male.*	*Female.*
Acute Cases	38 (76%)	26 (63%)	12 (24%)	9 (22%)	—	6 (15%)
Chronic Cases	43 (43%)	45 (38%)	38 (38%)	37 (31%)	19 (19%)	37 (31%)

Duration. Of all the cases which reported, information as to duration was available in eighty-one out of ninety-one acute cases (89%), and in 164 out of 223 chronic cases (73·5%). Remembering that cases of under three months' duration are classified as acute and cases of over three months' duration

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as chronic, the varying duration in cases cured, improved, and I.S.Q., is set out in Table XIV.

TABLE XIV.

	Duration.	*Cured.*	*Improved.*	*I.S.Q.*
Acute Cases	Under 1 month	45 (73·7%)	15 (24·6%)	1 (1·6%)
	1–3 months	12 (60%)	6 (30%)	2 (10%)
Chronic Cases	Under 3 years	38 (45%)	28 (33%)	18 (22%)
	Over 3 years	26 (32·5%)	36 (45%)	18 (22·5%)

The short duration in the acute cases is undoubtedly the most important single factor in determining a favourable result. In the chronic cases the influence of duration is less striking than one would have expected. Under three years' duration 45% were cured and 33% improved. Over three years' duration 32·5% were cured and 45% improved. Therefore while over 75% of the chronic cases were benefited by treatment, the longer duration of the disease has lessened the likelihood of permanent cure.

Patency of the Intranasal Opening

This was noted only in thirty-two cured cases; in thirty it was still patent, and in two it was closed. It was noted in thirty-four improved cases; in thirty it was still patent, and in four it was closed. It was noted in sixteen I.S.Q. cases; in twelve it was still patent, and in four it was closed.

Therefore, in seventy-six cases as against ten the opening made into the antrum remained patent. The importance of good drainage and æration of the maxillary sinus by the intranasal opening is most felt during the months immediately following operation. Our observations were for the most part made years after operation; still it is not without significance that in 6·2% of the cured, in 12% of the improved, and in 25% of the I.S.Q. cases the opening was closed.

The Maxillary Sinus and the Genesis of Nasal Polypi

In view of the contention of Oskar Hirsch (*Journal of Laryngology and Otology*, xlii., 39) that nearly all cases of nasal polypi recurring after removal are the result of chronic catarrh of the mucous membrane of an accessory sinus, *most commonly the maxillary sinus*, we have analysed our cases with nasal polypi or polypoid changes of the mucous membrane lining the maxillary sinus, which were subjected to the radical operation. There were twenty-one cases with recurrent polypi; of these fifteen (71·4%) showed marked polypoid

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changes in the maxillary sinus; in the remaining six cases the mucous membrane was not polypoid. Of the above fifteen cases, thirteen were followed up and eleven of them (84·6%) required further operation for the removal of polypi; ultimately eight cases were classed as improved, four as I.S.Q., and one as cured, the latter only after a double external operation on the ethmoids and frontal sinuses. Hirsch states that of fifteen cases of recurring polypi on whom he operated, removing polypi from the nose and polypoid mucosa from the antrum, he had recurrence of nasal polypi in only two cases (13%).

Considering this question now in the light of our findings at operation, there were ninety-five cases with nasal polypi and/or polypoid changes in the mucous membrane lining the maxillary sinus. Twenty-two of these cases had a polypoid condition of the mucosa lining the maxillary sinus, but there were no nasal polypi and there was no polypoid condition of the middle turbinate. In six cases the middle turbinate was polypoid; in five of these the antral mucosa was polypoid, possibly the primary condition, and in one case it appeared normal. The remaining sixty-seven cases had nasal polypi; in thirty-five of these the mucous membrane of the maxillary sinus showed polypoid changes sufficiently gross to suggest that the nasal polypi or the polypoid process affecting the nasal mucous membrane, might have originated here; in sixteen cases the mucous membrane of the maxillary sinus was not polypoid; in a further sixteen cases the polypoid changes were slight, apparently quite definitely secondary to disease of the ethmoid labyrinth.

Intranasal *v.* Radical Operation

It is interesting to note how, in the ten years 1921 to 1930 inclusive, the intranasal has gradually superseded the radical operation. This is well shown in Graph III, in which the number of cases treated by radical or intranasal operation, is expressed as a percentage of the total cases of maxillary sinusitis for each year.

The indications for preferring the radical to the intranasal operation (in Edinburgh at any rate) have already been discussed. Some of the advantages of the intranasal over the radical operation are:

(1) The operation can be performed under a local anæsthetic in most cases.

(2) There is much less bleeding during the operation.

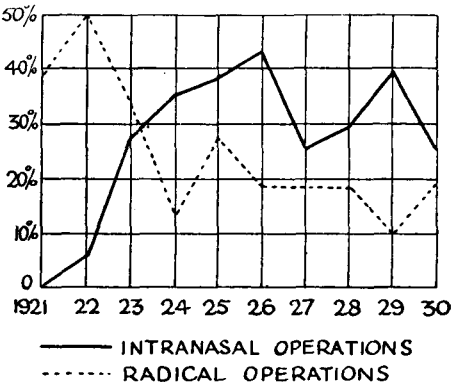
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(3) There is less discomfort to the patient.

(4) The length of stay in hospital is less—five days as against seven.

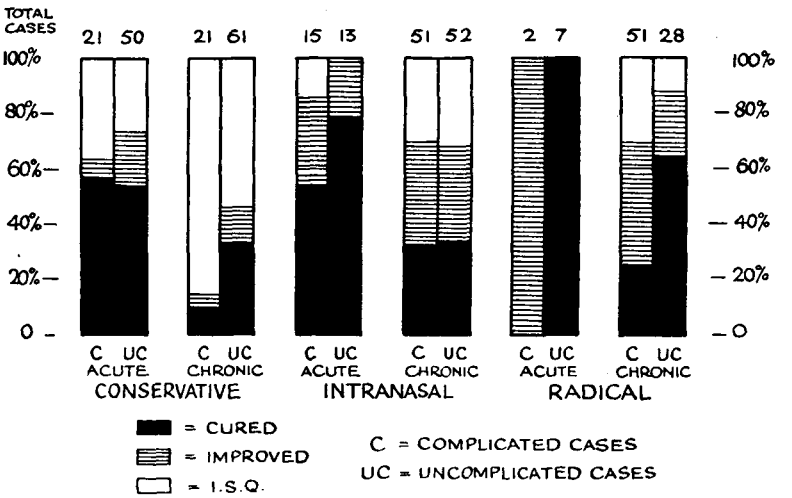
(5) There is not any risk of damaging the infra-orbital nerve, and only slight risk to the second division of the fifth nerve, which sometimes occurs in the radical operation, causing anæsthesia or intractable neuralgia.

(6) The risk of post-operative complications is less.



GRAPH III.

Graph showing the percentage number of Intranasal and Radical Operations for all cases, acute and chronic, of maxillary sinusitis in each year from 1921 to 1930.



GRAPH IV.

Summary of results of the different methods of treatment.

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Maxillary Sinusitis

Summary

(1) A series of 508 cases, 328 chronic and 180 acute, of maxillary sinusitis is reviewed. The results of treatment are summarized in the form of a block graph—Graph IV.

(2) Six cases died, a mortality rate of 1·18%; there was an operative mortality rate of 1·6%.

(3) In nearly all acute cases, and with certain exceptions in chronic cases, when conservative treatment fails, preference should be given in the first place to the intranasal rather than to the radical operation.

(4) The presence of nasal polypi adversely influences the chance of cure.

. . . .

Das Ziel dieser Arbeit bildet eine Uebersicht über Ursachen, Symptome, Diagnose, Behandlung und Erfolge aller Fälle von Kieferhöhleneiterung, die während der Jahre 1921-30 im Königlichen Krankenhaus in Edinburgh behandelt wurden. Die Arbeit umfasst 508 Fälle (328 chronische und 180 akute). Die Ergebnisse der Behandlung werden zusammengefasst. 6 Patienten starben. Nahezu in allen Fällen geben die Verfasser der intranasalen operativen Behandlung den Vorzung, wenn eine konservative Behandlung nicht zum Ziele führt. Dies gilt auch mit wenigen Ausnahmen für die chronischen Fälle. Die Verfasser glauben, dass das Vorhandensein von Nasenpolypen die Heilungsmöglichkeit ungünstig beeinflusst.

. . . .

L'objet de cet article est de donner un compte-rendu des causes, de la symptomatologie, du traitement et des résultats obtenus dans tous les cas de sinusité maxillaire traités à l'infirmerie Royale d'Edinbourg de 1921 à 1930. Cette étude porte sur 508 cas (328 chroniques et 180 aigus) et les auteurs résument les résultats du traitement. Six décés. Ces auteurs préfèrent le traitement opératoire intra-nasal dans presque tous les cas aigus lorsque le traitement conservateur a échoué. Ceci s'applique aussi avec quelques exceptions aux cas chroniques. Ils considèrent que la présence de polypes dans le nez influence défavorablement les chances de succès.

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