BRITISH MEDICAL JOURNAL

LONDON: SATURDAY, DECEMBER 14th, 1935

TREATMENT OF MAXILLARY SINUS SUPPURATION*

BY

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If the ideal aim of treatment is the restoration of function, then this should be best achieved by removing all the factors which we believe to be concerned in causing its impairment or loss. In my opinion there are certain principles peculiarly its own which underlie the health of a sinus, its maintenance in this condition, its spontaneous return to normal from temporary inflammatory involvement, and the attainment of this return to function even in the face of gross disease.

I am deliberately departing from the more usual method followed in discussions of this kind, because I propose to present the subject more or less as we encounter cases clinically. In doing this, I will attempt to answer certain fundamental questions on which the prospect of successful treatment depends, in the hope that such a plan will prove to be the most profitable. The questions are: (1) What precedes sinus suppuration? (2) Why is not maxillary sinus suppuration more universal? (3) Why does it occur? (4) How can it be got rid of? (5) What factors can we count on to promote a cure?

The views advanced here are largely based upon conclusions drawn from a long period of personal investigation in a series of various types of maxillary sinus infections, in which the influence of air current pressure phases or the ventilation dynamics of the nose and sinuses were studied and graphically demonstrated in health and disease. Nasal accessory sinuses function under the physical laws which govern air movements generally in nature, and should always be thought of in terms of "ventilation" rather than in terms of "fluid gravity drainage," whether these cavities may contain excessive secretion for the time being or not. It should be remembered that, in contrast to what obtains in an abscess of a solid organ, the purulent fluid, though unable to escape from the air space, is still outside the body tissues.

My aim, therefore, in this discussion will be to concentrate attention chiefly on this fundamental aspect of our subject, and apply its lesson to the surgical methods of treatment which should follow as a natural corollary.

Mechanism of Sinus Function

The logical discussion of these questions and their bearing upon the treatment of antral suppuration calls for a brief preliminary review of our present knowledge of how the health of this air space is maintained, and of the factors concerned with disease and recovery.

Apart from the action of glandular secretions the physical side of the physiological function of an antrum depends upon two main factors of paramount importance, which are concerned with the preparation and purification

of the inspired air and the transport of debris from the sinuses and the nose. These are: (1) ciliary activity; and (2) air pressure variation currents, which synchronize in phase with those of the nasal passages in each respiratory cycle. These variation currents will later be termed "ventilation." Both are independent of gravity, but in my opinion they are interdependent, as air currents provide the stimuli and need for ciliary activity. Both are capable of increased activity to meet special needs, but air pressure variation currents are the more mobile and expansive. By virtue of the force they can exert when, in disturbed conditions of ventilation, increased respiratory effort is made against resistance, air pressure variation currents constitute a potent factor in causing the peculiar oedematous changes of the soft tissues associated with inflammatory processes in the nose and sinuses—changes which, so far as I can see, are not explicable by any other line of reasoning.

In the absence of infection, and so long as ciliary activity and ventilation are efficiently maintained, the sinus remains healthy because it is provided with the same defensive air preparation and purification mechanism as the nose, though it is perhaps of a less robust type. It remains healthy indefinitely in those persons who never get a head cold, and they are many.

Capacity for Recovery

During quiet breathing in health, negative and positive ventilation air pressures equal the very small force of 6 and 4 mm. of water respectively, but during forced respiration they may reach 800 mm. or more, and this can be exerted to overcome increased resistance to nasal and sinus air currents produced by inflammatory engorgement. If this effort succeeds in restoring both pressure phases, alternating regularly in each respiratory cycle, the sinus becomes normal on the subsidence of the vascular engorgement. If it fails to do so, sinus suppuration ensues and remains until ventilation is re-established.

The possibility of regeneration of ciliated epithelium was demonstrated fifty years ago by Schäfer on the trachea of a rabbit, and many recent research workers, notably McGregor, Knowlton, Proetz, Coates, Gorham, and others have proved that what is true of the characteristics of cilia in animals is also true for man. An acute inflammation may destroy the epithelium and cause its exfoliation as pus, to be followed by regeneration, which takes about four weeks. This happens more or less in any acute inflammatory coryza.

Evidence of regeneration of a complete antrum lining with all the functioning elements is now beyond question. When McGregor informed me of his momentous discovery in 1930 it seemed to me incomprehensible then, as it was to him previously, because we were both of the opinion

* Read in opening a discussion in the Section of Oto-Rhino-Laryngology at the Annual Meeting of the British Medical Association, Melbourne, 1935.

that the removed antral lining was replaced by simple scar tissue without glandular elements or ciliated epithelium. His later work, confirmed by that of several contemporary investigators, has finally established his earlier claims. This regeneration is usually complete in from six to nine months.

Proetz has made the valuable and noteworthy discovery of active cilia in a grossly diseased and suppurating sinus. Whether the cilia were destroyed by the primary acute inflammatory invasion and regenerated in the cold or chronic stage or not is immaterial, because the fact of importance is the proof of their presence under such conditions, still active and ready to function the moment that the sinus is placed in free air current continuity with the nose.

Nature of Infection

During the investigation referred to above I came to the conclusion, as the result of certain observations, that every invasion of the upper airway which produces symptoms capable of being diagnosed as an "acute cold in the head" shows simultaneous reactions in the nose and sinuses. All of these pass through the usual stages of vascular engorgement and secretory activity, such as are commonly described as being characteristic of acute catarrh or "inflammation" of a mucous membrane, and, further, either subsidence is usually coterminous. We have, in fact, with every acute coryza a sinusitis as truly as we have a rhinitis. During the active inflammatory process the ventilation of all the air spaces is impaired, but on the subsidence of the infective reactions it is again restored by ordinary respiratory effort. This knowledge supplies the answer to the second question on my list—"Why is not maxillary sinus suppuration more universal?"

Failure of the sinus to recover its ventilation simultaneously with that of the nose implies the presence at the ostium of a physical barrier—either vascular or structural, or both—which prevents the movements of air currents through it, and the same obstructive factor is also the chief one concerned in restraining ciliary output. With the subsidence of the general and pyrexial symptoms the nose clears up and ventilates, leaving the sinus as an "unresolved" portion of the infected airway. The inflammatory reactions have simultaneously subsided from their active peak in the sinus as well, and the condition has now become less acute, this being undoubtedly the commonest stage at which it comes under our observation for treatment.

The factors which influence the principles underlying treatment will obviously control procedure, which will range from management on constitutional or local lines up to a radical operation. Several questions have to be asked. Is the infection of dental or intranasal origin? Is it simple catarrhal or acute influenzal? Is the stage acute, chronic, or complicated by oedema, or polypi, or multiple sinusitis? (The latter will not be discussed, and is mentioned only for the purpose of emphasizing the importance of recognizing its presence, as failure to do so has frequently been responsible for disappointing results in otherwise well-planned and executed antral operations.) Suppuration entering from the upper nose may cause a persistent maxillary pyo-sinus, with apparent continuance of disease, although the surgical opening can be demonstrated as ventilating the cavity perfectly.

Dental Infections

These are usually definite and arresting in their onset. Suppuration appearing rapidly in the nose (say, inside twenty-four hours) following the extraction of a tooth has invariably for its source a root abscess which has burst into the sinus as a result of the manipulation.

Without antecedent intranasal symptoms no sinus will produce pus in such a short space of time, and its rapid appearance in the nose implies effective ventilation and ciliary activity. The temporary and isolated invasion of the previously healthy sinus is of no more gravity than the invasion of the nose by the same secretion, and such cases invariably clear up spontaneously. A single lavage, to remove all pus and establish the fact that there is a freely patent ostium, is a wise procedure from a prognostic point of view, but the alveolar fistula should be left severely alone, in the hope of its closing off rapidly from the mouth, the latter being a potential source of renewed and continuing reinfection.

Another dental type shows an acute suppuration which is not the immediate sequence of active bilateral intranasal manifestations (the latter may be one-sided). This is suspiciously of dental origin if on lavage the ostium offers no resistance to the free flow of fluid. If there is pain in a tooth, spontaneously complained of by the patient or elicited by tapping on it with a metal instrument, or if this pain is manifested during lavage, the suspicion is still further increased.

On the other hand, a "silent infection" may result from a dead tooth, and this must be borne in mind. A careful radiographic examination of the sinus, teeth, and alveolus is now indicated, because if the latter is involved in a definite osteitis a portion of it may need to be removed during a radical operation. In my experience, however, this is relatively rare, occurring perhaps in not more than 1 per cent. of cases.

If one tooth or more than one is involved, immediate removal is indicated, followed by lavage through the inferior meatus, leaving the alveolar route untouched for fear of oral sepsis. Should the fluid flow freely through the ostium the re-establishment of ventilation and full ciliary activity is practically certain. We may always assume the possibility of a fairly patent ostium in these cases, because the sinus suppuration (if of short duration) is not consequent primarily on failure of ventilation through the nose, but on infection from one of its walls.

VACUUM PAIN

In the absence of any localized dental pain or tenderness the presence of pain or tenderness in the upper part of the cheek may mean "sinus vacuum pain" resulting from forced inspiratory efforts in clearing the nose. It always implies defective ventilation and a considerable ostial occlusion, which can be confirmed by resistance to lavage or by a testing tampon. In the older nomenclature such cases were referred to as "closed" or "manifest," words which unfortunately look like a contradiction in terms. The expression "manifest" is now passing into disuse.

If pus is escaping in any quantity through an ostium "vacuum pain" is unlikely, as any portal which permits the exit of pus will also allow the entrance of air up to the atmospheric level, causing restitution up to this pressure and abolition of the negative phase.

In active inflammation of sinuses the threshold of onset for pain is low, and should the ostium be much occluded aspiration of air (to cause a definite negative pressure in the cavity) by even a 10 c.cm. Record syringe may induce "sinus vacuum pain," which disappears quickly on release of the suction and re-entrance of air through the cannula. If no pain occurs on aspiration the ostium is relatively patent or the inflammation is rather chronic.

Oscillograph tests show that the merest chink will permit suction of air from the antrum by a large inspiration (such as sniffing) but its return by even a forced expiration, such as blowing the nose, is not possible, so that a negative phase with "vacuum pain" may persist for some time. When air re-enters it does so by gradual restitution up to atmospheric level only, but never to the positive phase, until free ventilation is restored. The "partial vacuum" is caused by an active force (inspiration), the "restitution" by a passive one (atmospheric pressure).

This seems to explain why pain is such a variable symptom in cases of antral suppuration, and why its presence does not denote an osteitis, which is sometimes assumed. Its presence does not imply that the pus is under pressure, which is often asserted, because the pain disappears on lavage. The correction of a "negative pressure" when ventilation is restored, either through the cannula or the ostium, would remove this source of pain, and is the more likely explanation. In further support of this view is the observation that no "positive pressure" has ever been met with in oscillograph tests in these cases.

Many cases accompanied by severe pain frequently yield very little pus on lavage, which, under the excessive purulent pressure or tension theory so often advanced to explain it, is contrary to expectation.

In the absence of intranasal factors likely to cause obstruction, the block to ventilation in these acute dental infection cases is invariably a vascular engorgement and part of the inflammatory reaction caused in the sinus, which rapidly subsides on removal of the infected tooth and lavage of the antrum, yielding some of our most brilliant results.

Chronic post-dental suppuration is usually the sequence of two causes. There may have been slow invasion of the sinus leading to oedematous inflammatory reaction with gradual occlusion of the ostium; or it may arise in persons in whom intranasal obstructive factors are already present. Removal of the infected tooth or teeth, with lavage, will scarcely suffice now, as conditions are similar to those discussed later, under the heading of chronicity of intranasal infective origin.

Infection by Intranasal Route: Antral Suppuration

"CATARRHAL TYPE"

I dislike the word "catarrh" because it is so vague and difficult to define with any degree of precision; but because it has a long tradition in our literature I am retaining it here. In the minds of patients it seems to cover every degree of nasal disturbance, from vasomotor or atrophic rhinitis to the most chronic form of sinus suppuration or even the grossest polypoid formation. Yet, in the absence of either of these conditions or any apparent evidence of the changes in the mucous membrane which we see associated with so-called "allergic manifestations," there are a large number of patients whom one may well describe as being "nose-conscious." Even between attacks of "colds in the head," they are sniffing and blowing the nose frequently, and complain of discomfort in breathing, or of "dropping" into the throat, or even of headaches.

The discharge is mostly mucus or muco-pus, rarely purulent. The condition is not one of "neurosis," though the patients are of a "nervous" type, and their mucous membranes appear to be hypersensitive to factors which others would ignore. Their apparently excessive secretory responses to the air stimuli of ordinary respiration may be likened to the peculiarity seen in certain individuals who perspire freely on the minimum of exertion.

In my opinion there is always a "ventilation imbalance" in these cases, for they frequently catch colds, and have passing attacks of a mild sinusitis, ending one day in a frank suppuration. Even between attacks, antral oscillograph tracings show irregularity of formation and outline, with at times loss of the "positive pressure phase," although little or no trace of muco-pus is obtainable by lavage, except sometimes at the residual end of a "head cold," and this may be found in any antrum if washed out at this stage.

The predominant recurrence of the "negative pressure phase" causes oedematous changes where its greatest force is usually exerted—namely, in the middle meatus and sinus, which now only awaits a fresh invasion of the

air spaces to end in suppuration of the antrum. Subsidence of the inflammatory engorgement may be followed again by ventilation, especially if aided by lavage, but the cases tend to relapse again with the next active infection, and then belong to the class discussed later under "chronicity."

ACUTE INFLAMMATORY TYPE

This does not differ essentially from that just described except in the intensity of the infection which has induced it, and in its more arresting symptoms and rapidity of onset. Although it occurs commonly in patients of the "catarrhal" type, it also affects many others who previously had a symptomless nose. In my experience, however, it practically never gets established in a well-ventilated upper airway.

Some intranasal factor, such as developmental abnormalities of structure or acquired oedematous or organized soft tissue changes, capable of causing quick obstruction to ventilation in the region of the ostium, can be found if carefully sought for. The acquired changes are the residual effect of previous inflammatory attacks, but air and ciliary function was still possible prior to the vascular engorgement which precipitated the present sinus suppuration. Spontaneous subsidence of the latter may still allow complete or partial restoration of function, to relapse again with the next active infection, and so on for a long period. The condition has possibly been shielded under the harmless-sounding diagnosis of "catarrh."

A see-saw of this kind, associated with serious impairment of ventilation and with long periods of recurring "negative pressure phases," ends in sustained chronicity, attended by soft tissue changes, and possible polypoid formation, which gravely complicates the suppurative process.

DISTINCTION BETWEEN ACUTE AND CHRONIC TYPES

When is a sinus suppuration acute and when chronic? Lack states that the late Professor Killian held the opinion that all cases of maxillary sinus suppuration were chronic, but does not give his reasons. There is much to be said for this point of view, because if there is no pain to attract early attention we usually encounter these cases when the active inflammation in the general airway has subsided (as it has also at this stage in the antrum), though the latter has failed to ventilate and get rid of its purulent secretion. This often takes us chronologically to the end of the three or four weeks required for the regeneration of any epithelium shed in the more active phase. For this reason it seems correct to me, pathologically speaking, to regard suppuration during this period as acute, but afterwards chronic. Thus when we meet most of the cases they practically coincide with Killian's view.

Treatment in the Acute Stage

During the acute pyrexial period of the airway infection treatment should be on general lines: bed; a constant room-temperature, to avoid exacerbations; a purgative; diaphoretics (Dover's powder); and vasodilators (aspirin and phenacetin). Active operative procedures are contraindicated in this stage of any sinus suppuration. This is a view now well established, gaining more and more support from the experience of reliable observers. If there is much nasal occlusion it seems wise to leave this alone to subside on general lines, as no ventilation is safer for the moment than an imperfect partial one, which only intensifies the vascular engorgement around the ostium by forced efforts of respiration, such as sniffing and blowing the nose, either of which is capable of creating a pressure action equivalent to

800 mm. of water or more. Grunwald deprecated blowing the nose in the acute stage, and I think wisely so.

There is no intranasal treatment I know of that is capable of rapidly aborting the inflammatory manifestations and which removes them permanently. Where it is possible, in the apyrexial stage, a change to the bracing air of the seaside may, however, provide the necessary ventilation stimulus to the still engorged mucous membrane, with restoration of vascular tone and sinus aeration. When ventilation is returning to the nose, inhalations of mentholized steam are comforting, and the wearing of a gauze mask indoors acts similarly, especially diminishing the tendency to sneezing attacks.

A solution containing ephedrine (alkaloid), sodium bicarbonate, and sodium chloride, 8 grains of each in 1 ounce of distilled water, is beneficial. One teaspoonful of this with one of hot water is sprayed freely, high in the nose, three or four times a day. It cleanses the area of the ostium, removing the accumulations of ciliary output, and diminishes the need for the patient to use frequent respiratory force for this purpose. If suppuration still persists attempts at restoring ventilation are now indicated.

Surgical Treatment for Subacute or Chronic Stage

Catheterization of the ostium is too uncertain a method, and, in my opinion, many of the cases reported as cured by it cleared up spontaneously because ventilation was restored by local vaso-constrictors used as anaesthetics preparatory to the passing of the catheter.

LOCAL VASO-CONSTRICTION AND LAVAGE BY PUNCTURE

Lavage enables us to assess the degree of obstruction relatively well. As the purpose of the solution used is chiefly mechanical—to remove the pus—a simple non-irritating preparation such as the three sodium salts (chloride, bicarbonate, and baborate) answers quite well.

The first lavage acts as a test of patency. After puncture, an attempt should be made to wash out the cavity, omitting the use of any cocaine or adrenaline under the middle turbinate. If the resistance to flow is marked and produces pain, the lavage should be stopped, and cocaine and adrenaline on a wool applicator placed in the region of the ostium for ten minutes, leaving the antral cannula still *in situ*. A further attempt to wash out should then be made. If the resistance is now much less, and increased patency is shown, the obstruction is mainly vascular engorgement, and the prognosis of treatment by this method is hopeful. The ephedrine and soda spray should be continued.

The second lavage should take place three days after the first, when the reactions of the previous manipulation have subsided. (I do not favour daily lavage for this reason.) As previously, the test for patency should be done, and the result noted before and after use of vaso-constrictors in the middle meatus. A small tambour "patency tester"¹ is quite helpful for this purpose, the prognosis being good if "positive and negative phases" are indicated by the lever, and if the excursion is enlarged by increased respiratory effort. The prospect of recovery is good up to the end of the fourth or fifth week from the estimated onset of the original airway symptoms of invasion (acute stage).

DEPLETION BY SCARIFICATION

This is a very promising method, although my personal experience of its use is only recent. My colleague Tilley and former teacher Lack have advocated it for years if there is much apparent inflammatory swelling beneath the middle turbinate, but it does not appear to have been generally practised.

Under local anaesthesia, and after antral lavage, I favour several punctures or short incisions below the ostium, in front of it (on the uncinat process), and above (along the inferior border of the middle turbinate and the region of the bulla ethmoidalis). This taps the whole area of vascular distribution around the ostium, and soon causes depletion of the engorgement. After ten minutes to allow arrest of haemorrhage, 20 per cent. silver nitrate should be applied to the bleeding area. This has a mild styptic and depleting action. After four or five days to allow the reactions of manipulation to subside, further lavage will reveal the effect on ventilation. If the results are favourable, puncturing or incising may be repeated, but if not a new opening into the airway must be established. Although the maxillary antrum is undoubtedly the commonest sinus to be infected, it is, by virtue of its size, accessibility, and general freedom from osteitis, also the earliest in which to restore air function.

ANTROSTOMY

The site of the surgical opening appears to be immaterial so far as the purposes of ventilation are concerned, provided that it fulfils certain conditions. From the point of view of operative accessibility, however, the inferior meatus is the route of election. The conditions are as follows. (1) The opening must be in communication with intranasal air currents and in pressure phase with them. (2) There must be permanent patency. (3) The opening must be sufficiently large to permit the escape of any inflammatory product likely to arise in subsequent infections. (4) There must be assured easy ventilation in the upper nose to protect the higher sinuses.

In order to fulfil this last condition, I do not hesitate, if the septum is deflected and the ostial area crowded, to resect the former and cut down the anterior end of the middle turbinate. I have removed the latter as a routine practice for over twenty years in all non-septic cases of marked inspiratory obstruction without any trace of crusting ever following as a result. The anterior ethmoidal cells should be carefully examined for diseased tissue and crumbling bone, as this invariably accompanies chronic antral suppuration, especially of intranasal origin. If found it should be freely removed to avoid antral pyo-sinus.

Very Chronic and Complicated Antral Suppuration

Owing to long periods of disturbed ventilation, extensive oedematous soft tissue changes (more or less organized) are always present in the nose or sinuses, or both. These changes can be seen in the nasal passage and often surmised by lavage in the antrum, but a radiograph with the excellent modern technique generally places this beyond doubt. Its thorough removal to re-establish full and free ventilation in both the nose and the antrum is the only guarantee of success, and if no foci of sepsis remain in the upper sinuses, this may be done with great freedom from any risk of subsequent crusting, *provided that the almost complete integrity of the inferior turbinate is rigorously respected*.

With our present knowledge of its power to regenerate in from six to nine months, we need not fear removal of the antral lining, so that for purposes of accessibility a canine fossa approach is the most effective. It is well, however, to remember that the opening thus made has no influence whatever on the subsequent ventilation principle underlying the function re-established by the intranasal window which accompanies it, as on the latter all hope of success depends.

Only the markedly oedematous portions should be removed, because they can never function again as mucous membrane. That not so affected should be left for the rapid regeneration of a new lining.

¹ Alfred Cox and Sons, 37, Duke Street, London, W.1.

The evolution of antral surgery shows clearly that openings made through the external sinus walls, away from intranasal ventilation, have proved a failure, and are now obsolete, because they are contrary to the principle which maintains air function in the sinuses and restores its loss when absent. The early Caldwell method or those of Cowper and Kuster have gone this way. The Caldwell-Luc operation, as now performed, still holds its place for cases complicated by gross oedematous changes in the lining, such as those just described, but in the absence of this complication, and for ordinary recent suppurative, the intranasal antrostomy—the really functioning portion of the Caldwell-Luc operation—must continue to be the method of choice.

I frequently make a second opening in the hiatus semilunaris by enlarging the anatomical ostium region, as recommended by Harmer and Gerber. This provides thorough ventilation of the cavity and the additional very important service of affording a continued portal of output for ciliary activity. Horgan carries his intranasal antrostomy opening high into the middle meatus, but this is for cases complicated by ethmoidal disease. It is excellent as a combined operation, and is planned on sound principles of ventilation.

PRESENT POSITION OF CAESAREAN SECTION IN OBSTETRIC PRACTICE *

BY

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When Numa Pompilius, Consul of Rome, promulgated the *Lex* he did so to the end that the opening of the uterus of the dead woman might save the child and so help in some measure to check the falling birth rate. When the operation was performed upon Henry VIII's consort, Jane Seymour, in 1537 it was done as a last resource in the struggle to produce a live heir to the throne. Later the very high mortality of the operation was faced as an alternative to the certain death of both mother and child: it was an attempt to avoid an inevitable catastrophe. In these days it would almost seem that Caesarean section is done because it is the easiest way in which the surgeon can deliver the woman of a child.

That all is not well nor has been for some years is shown in the written opinions of several authorities. The late Dr. Whitridge Williams, in the fifth edition of his *Obstetrics* (1921), says: "Many practitioners in urban districts have been led astray by the teaching of those who regard labour as a pathological rather than a physiological process, with the result that interference upon insufficient indications is frequently undertaken by those who do not fully appreciate the risk involved." He further quotes the conclusion of the Massachusetts State Medical Society in 1921, that next to puerperal infection Caesarean section was, in that State, the commonest cause of death after labour.

In the final report of the departmental committee of the Ministry of Health appears the polite but disturbing statement: "The committee's observations lead them to believe that in some cases there may be a tendency to resort to Caesarean section as a treatment for complications of labour, perhaps without due consideration of other methods of obstetrical treatment."

The New York Academy of Medicine Committee in its report upon maternal mortality in New York City (1933)

* Read in opening a discussion in the Section of Obstetrics and Gynaecology at the Annual Meeting of the British Medical Association, Melbourne, 1935.

concludes that "the data reveal an excessive use of the Caesarean section, and, as a result, a great increase in the mortality." The committee goes on to the most important conclusion "that a sharp reduction in the number of Caesarean sections performed is to be strongly recommended. Only by the definite narrowing of its use to the legitimate occasions demanding it, as well as by the provision of capable operators, can a decrease in these deaths be achieved." Holland animadvertes (*Lancet*, April 27th, 1935) upon "the increased opportunities given to local practitioners who may possess neither the requisite judgement nor skill of performing Caesarean section" and remarks that "the number of Caesarean sections has increased in an astonishing manner."

These statements suggest that the operation of Caesarean section occupies an unjustifiable position in obstetric practice to-day, that the incidence of the operation is far too high, that the indications for its use are at present too wide, and that it is attended by a mortality which makes it suspect among measures that should have for their aim the diminution of a maternal mortality which is at present too high.

Some Recent Figures of Caesarean Section

All these contentions are, I submit, abundantly borne out by a consideration of a series of cases, the result of which I present to you to-day. The series contains 3,486 cases of Caesarean section, 1,763 of which are taken from the reports of five large maternity hospitals in the British Isles during the years 1922-32, and 1,723 cases which occurred in the Borough of Brooklyn in the years 1921-26, and are analysed in the *American Journal of Obstetrics* (September, 1928). A study of these cases does, I fear, make it certain that the strictures upon the present place occupied by Caesarean section are not undeserved.

The enormous increase in the incidence of the operation will be obvious when we remember that in 1910 the late Dr. Amand Routh, in a monograph read at the Cinquième Congrès International d'Obstétrique et de Gynécologie at St. Petersburg, and published the next year in the *British Journal of Obstetrics*, had collected 1,282 cases as the complete experience of over 100 obstetricians practising in the British Isles who were living in 1910. Compare this number with 1,723 operations which were done in one American borough in five years, or with 609 operations in a single English maternity hospital of under 100 beds during a period of ten years.

Indications for the Operation

Turning to the indications for the operation we also see a very marked contrast between the conditions obtaining in 1910 and those in evidence to-day. Dr. Routh (loc. cit.) gives in a summary of the indications present in the cases the following:

Obstruction to Labour:

1. Contracted pelvis.
2. Fibromyomata.
3. Cancer of cervix or vagina.
4. Ovarian tumours.
5. Other pelvic tumours (osteomata, enchondromata, cancer of rectum, hydatid, bicornuate uterus).
6. Stenosis of vagina or cervix.
7. Miscellaneous (previous ventral fixation, tonic contraction, hour-glass contraction, prolonged gestation).

Uterine Haemorrhage:

1. Concealed accidental haemorrhage.
2. Placenta praevia.

Constitutional Crises:

1. Eclampsia.
2. Miscellaneous (chorea, advanced heart disease, obesity and anasarca, myasthenia gravis).

In all there are twenty-four different indications.