A PERUSAL of annual medical reports will reveal the all too common occurrence of remarks such as "cases of chronic suppurative otitis media are still too prevalent."

This article is the result of an attempt to discover the grounds for the above statement, to investigate the methods of treatment employed, and if possible to improve such treatment; with the ultimate objects of reducing the number of working hours lost by subjects of this condition, and of economizing the expenditure of public money incurred by hospitalization of the said subjects.

The first thing which impressed the author was the fact that almost all cases sent to him for consultation as Otological Specialist, first in the Southern Command and then in the Northern Command, India, have been accompanied by entries in the case notes such as "the usual treatment has been employed," "Peroxide of hydrogen followed by boric and spirit drops have proved unsuccessful," "treated by syringing," &c., ad nauseam; while, where such remarks were absent, cross-questioning of the patients has almost invariably shown that treatment along similar lines had been carried out.

With a view to demonstrating the faulty principles underlying the above therapeutic methods it is necessary to recall certain anatomical facts regarding the middle ear cleft and to survey briefly the pathology of chronic suppuration in it. First, however, we should endeavour to define the term "established otorrhoea"; and since no hard and fast definition is really possible, it will be as well to regard as "established" every case of otorrhoea which has persisted in spite of careful and efficient conservative treatment for over six weeks.

FIG. 1.—The middle ear cleft.
ANATOMY.

It is not necessary for the purposes of this article to discuss the anatomy of the middle ear cleft in detail, but the following points have a direct bearing on the question and call for comment.

The middle ear cleft is lined with mucous membrane directly continuous with that of the nasopharynx. In the Eustachian tube the mucous membrane is covered with ciliated columnar epithelium, and in the cartilaginous portion of the tube contains numerous mucous glands and lymphoid tissue (tubal tonsil). In the tympanic cavity the epithelial cells tend to flatten out, but are still ciliated, and mucous glands are absent. In the aditus there are again mucous glands present and the mucosa is thin. Lastly, in the antrum and mastoid air cells the mucosa is very thin, and practically only consists of a single layer of flattened cells on a basement membrane, while mucous glands are absent.
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The mucous membrane clothes the ossicles, tympanic muscles, and chorda tympani nerve, so forming an anatomical shelf which projects horizontally inwards from the outer wall a little above the narrowest transverse width of the tympanic cavity, and producing above the shelf certain folds which enclose the pouches of Tröltzsch and Prussak’s space, and form the so-called ligaments of the ossicles.

The mucous membrane covering the horizontal process of the incus and lining the aditus converts the latter into a somewhat horseshoe-shaped chink, which is narrower in the adult than in the child.

Lastly, it should be pointed out that the mucous membrane of the middle ear cleft has a very generous blood supply except in the antrum and mastoid air cells, where the supply is distinctly poor.

The consideration of the above anatomical facts will show the reader that there are four points where the lumen of the middle ear cleft is narrowed, and where there is accordingly distinct risk of obstruction to drainage occurring. These are: (1) In the Eustachian tube, particularly in the region of the isthmus. (2) At the tympanic “shelf.” (3) In the aditus. (4) At the points where the mastoid air cells open into the antrum. It should moreover be borne in mind that oedematous swelling of the mucosal folds above the anatomical “shelf” may result in the encystment of inflammatory products in the pouches of Tröltzsch and in Prussak’s space.

PATHOLOGY.

Chronic suppurative otitis media results from an attack or attacks of acute suppurative otitis media, the treatment of which has been inefficient or inadequate; it is, however, especially liable to follow on an acute inflammation in cases of scarlatina, measles or diphtheria.

In reviewing its pathology it is necessary to consider the middle ear cleft as a whole, and to trace the stages leading up to the development of chronic suppuration in it.

When acute inflammation occurs, the cleft fills with fluid, at first serous, then seropurulent, and finally frankly purulent; coincidentally oedema of the mucosa develops and obstruction to drainage results.

The normal route for such drainage is from the mastoid air cells via the antrum and aditus into the attic, then down between the anatomical shelf and the inner tympanic wall into the lower part of the tympanic cavity, and finally down the Eustachian tube into the nasopharynx; but when obstructive oedema has developed very varying results ensue according to the precise point at which such obstruction is most marked.

(1) Eustachian obstruction causes, as it were, distension of the middle ear cleft with fluid, and the resultant rise of pressure, which may be considerable, produces a varying degree of pain.

If this pressure is relieved by an early perforation of the lower part of the tympanic membrane or by judicious myringotomy before oedema of the “shelf” has resulted in obstruction there, the fluid from the more distant
parts of the cleft escapes, the mucosal oedema subsides, the Eustachian tube again becomes patent, the perforation may heal, and the case recovers without loss of hearing.

(2) If, however, obstruction at the "shelf" has developed, the condition is more serious, perforation may occur in the region of Shrapnell's membrane, but it is usually inadequate owing to the narrow tortuous channel which the fluid has to traverse before it can escape, the fall in pressure in more distant parts of the middle-ear cleft is not rapid enough; accordingly there is interference with the mucosal blood supply, and a tendency to the deposition of inflammatory cells in the mucous membrane itself, resulting in permanent clogging of the movements of the ossicles and some loss of hearing after recovery.

Early and adequate myringotomy may avoid these unfortunate consequences; but if there be delay, damage already done in parts beyond the "shelf" cannot be undone, though the Eustachian tube may, it is true, again become patent and the lower part of the tympanic cavity recover.

(3) If the aditus has become obstructed, perforation will obviously not relieve the pressure in parts beyond the obstruction, and the case is one of acute mastoiditis necessitating early mastoidectomy; myringotomy is bound to be unsuccessful. Moreover, while the tympanic cavity may recover as the result of such perforation or myringotomy, some permanent loss of hearing very often persists.

(4) Lastly, if oedema has obstructed the mouths of the mastoid air cells the encysted purulent contents may perforate:—

(a) Into the peri-sinus space—with resultant peri-sinus abscess, sinus thrombosis, etc.

(b) Through the mastoid tip into the cervical tissues, producing Bezold's mastoiditis, gravitation abscess, etc.

(c) Through under the periosteum—causing a subperiosteal abscess.

Finally, infection of the cancellous bone of the mastoid process may take place, resulting in osteomyelitis.

It should also be borne in mind that there is a possibility of contained bacteria permeating the blood in the sinus, giving rise to aural bacteriæmia.

In all the cases cited under this paragraph there is a varying degree of toxæmia, and early mastoidectomy is obviously essential.

What must be stressed here is the fact that when acute infection of the middle-ear cleft has occurred, unless very early relief of pressure is secured by whatsoever means, bony infection and destruction commence almost at once in the aditus, antrum or mastoid air cells because their mucosal blood supply is so poor and the actual mucosa itself is so thin that it is very rapidly destroyed, exposing the bone beneath to the infective process.

In the case of the ossicles, the incus is very poorly supplied with blood, and is therefore attacked very early on in the process.

The stages in the establishment of chronic suppurative otitis media following an acute attack may be summarized in brief as follows:—
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(1) The stage of inefficient drainage—"transitional stage."
(2) The stage of desquamation. The products of such desquamation showing a tendency to be retained, especially in attic suppuration.
(3) The stage of fibrosis.
(4) The stage of bony necrosis.

When, owing to the mucosal destruction, the bone has become infected and actual bony destruction has commenced, the condition has passed into the chronic state, and otorrhoea will be found to persist in spite of treatment, or at least to recur after temporary cessation. Conversely, in cases of "established otorrhoea" there is invariably a degree of mastoiditis present, which serves as a focus for a fresh "light up."

Associated with and resulting from the chronic suppuration we may get cholesteatoma in cases where the perforation is in the region of the membrana flaccida of Shrapnell; either, according to some otologists, due to excessive desquamation of the attic mucosa, or as the result of the ingrowth of squamous epithelium from the external auditory meatus through the perforation into the attic where it proliferates. The Edinburgh view is, however, that it is the result of metaplasia of the mucosal epithelium of the attic under the influence of the chronic irritation induced by prolonged contact with pus, which can escape but slowly through the small perforation occurring in this region. This explanation would appear to be the most probable one.

Other views as to the aetiology of this interesting condition are also held, but need not be discussed here.

Granulations and polypi also tend to develop from the pathological mucous membrane in chronic suppurative cases, and help to obstruct the drainage even further.

TREATMENT.

The treatment of chronic suppurative otitis media should not be routine either as regards operative or non-operative procedure. Each case should be carefully considered and treated according to indications: the fact being constantly borne in mind that the condition constitutes a potential menace to life as well as endangering the hearing.

The principles governing treatment are:

(1) Removal of the disposing cause, nasopharyngeal toilet and treatment of mastoiditis if present.
(2) Employment of a strictly aseptic technique.
(3) Establishment of free drainage.

If any form of operative treatment is contemplated it is essential in every case to carry out first the following tests:

(a) Test the hearing.
(b) Carry out the caloric test.
(c) Test for "fistula" sign.

To omit the last two tests is to run the risk of suppurative labyrinthitis and possibly of suppurative meningitis by spread from the labyrinth.
METHODS OF TREATMENT FORMERLY IN VOGUE.

PALLIATIVE.

Two systems of treatment were popular, the "wet" and the "dry."

(A) The "Wet" System.—(1) After a careful nasopharyngeal toilet the ear was syringed with warm (100° F.) sterile saline, saturated boric lotion or weak soda bicarbonate solution.

(2) Peroxide of hydrogen (10 vol) was instilled, the ear then dried out and boric and spirit drops were introduced.

Both of these were found to be contra-indicated under the following conditions:

(a) In febrile cases.—Here there is incarcerated pus and therefore risk of an intracranial complication. The indication is for myringotomy, mastoidectomy, or exploration of the lateral sinus.

(b) In a case of acute suppurative otitis media supervening on the chronic condition.—Because the high bactericidal power of the purulent secretion is removed by its dilution.

(c) In incipient mastoiditis.—Because there is often a patch of carious bone in contact with the dura mater and hydrogen peroxide in particular may pass beneath this, spreading infection to healthy parts. The indication is for mastoidectomy.

(d) If there be any sign of incipient intracranial complication: Mastoidectomy is obviously essential.

When syringing or the use of peroxide of hydrogen was judged to be inadvisable, the following methods were employed:

After mopping out the purulent discharge, instillation was made of the following substances:

(1) Liquid paraffin.—This being non-irritating and tending to prevent dermatitis was on the whole good.

(2) Menthol in paraffin.—This being a powerful antiseptic was found to be good in certain cases.

(3) 1:10,000 flavine in saline.—This was occasionally found to be of value where the progress of the condition was rapid, but it is very messy to use.

(4) Rectified spirit.—This was definitely of use, but it is painful for the subject and is therefore ill-tolerated.

(5) Carbolic in glycerine.—This is both antiseptic and analgesic. It was very generally recommended, especially when the stage of recovery had been reached and alcohol had become painful.

(6) Sodium chloride solution.—This proved to be of use in cases with large perforations and pallid mucosa showing very little reaction.

(7) Sodium bicarbonate and glycerine.—This was of use to dissolve thick pus.

(8) Citric or boric acid and glycerine.—Experience went to show that this might produce cure in obstinate alkaline cases.

(9) Calamine and glycerine or paraffin.—This was found to be very
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valuable where maintenance of the otorrhoea was due to inflammation of the external auditory meatus.

(10) Mercurochrome in 2 per cent solution.—This was of definite value in obstinate cases, but should not be used for more than a fortnight as it is a definite tissue poison and frequently seems to delay healing.

(B) The "Dry" System.—Advocates of this recommended dry mopping of the discharge, followed by insufflation of boric powder or orthoform.

This method is open to the obvious criticism that powders should on no account be employed if there be any risk of poor drainage from whatsoever cause.

In combination with either "wet" or "dry" method it was sometimes judged advisable to instil astringents once a week, those most in favour being:

(1) Silver nitrate in 1 to 3 per cent solution (even 10 per cent could be used if the instillation was carried out by the surgeon himself).

(2) Argyrol in 10 per cent solution.

(3) Salicylic acid (2 to 5 grains in 1 fluid ounce of rectified spirit).

It is necessary to cocainize the patient first.

(4) Picric acid (1 per cent in 70 per cent spirit). Cocainization must be carried out in this case also.

(5) Zinc sulphate (4 grains in $\frac{1}{4}$ fluid ounce each of peroxide and spirit).

If there be no improvement after some weeks of the above lines of treatment, it has been recommended that zinc ionization be given a trial. It is, however, only suitable if the chronic suppurative process is confined to the lower part of the tympanic cavity and if the perforation is a large one.

If the otorrhoea be kept up by persistent Eustachian salpingitis, the introduction of 10 per cent argyrol by means of a Eustachian catheter has been recommended for trial.

If, in spite of all, profuse otorrhoea persisted for over two to four months, operative treatment was considered.

Surgical.

(a) Myringotomy.—This was tried for cases with small perforations above the folds of Tröltsch. A study of the pathology shows the inadequacy of this measure.

(b) Part of the tympanic membrane was removed together with the malleus, incus and perhaps the outer attic wall in cases where the suppurative process was judged to be in the attic. This procedure, needless to say, was disastrous to the hearing.

(c) Granulations were curetted away and polypi were snared off with a cold wire snare. As, however, these measures made no attempt to deal with the cause of the condition, the results were disappointing.

(d) Radical mastoidectomy was performed. As only some $33\frac{1}{3}$ per cent of the hearing is to be expected after this operation, it would appear to have been unnecessarily drastic in many cases.
Before turning to consider modern methods it will be as well to criticise the palliative methods outlined above.

A consideration of the pathology will show that the principal focus in a case of "established otorrhoea" is in the aditus, mastoid antrum, or in the mastoid air cells; the inflammatory tumefaction has either completely obstructed drainage at one or more of the narrow points of the middle ear cleft, or has left an extremely narrow channel still patent, while the anatomical pouches of the mucosa are deepened.

It is, therefore, impossible for fluids syringed into the external auditory meatus to travel farther than a fraction of the tortuous path from the perforation in the membrana tympani to the actual focus of suppuration; while, in the case of an acute "light up" supervening on a chronic suppuration, syringing actually tends to aggravate matters by reducing the bactericidal powers of the pus in such parts of the cleft as can be reached; moreover, with the exception of astringent solutions, fluids of any kind tend to increase the waterlogging of the mucosa, so still further obstructing drainage and actually contravening one of the principles governing treatment; lastly, peroxide of hydrogen is a definite mucosal irritant, and is, moreover, responsible for initiating many attacks of otitis externa.

The insufflation of powders is open to the criticism that there is an obvious risk of their "caking" and obstructing drainage still further.

**MODERN PALLIATIVE METHODS.**

These take the form of modifications and improvements in the technique of the use of powders.

Scott Stevenson [1], for instance, following the American lead, has recommended the use of iodoboric powder. He states that the essential for the success of this method is first to mop out or suck out the discharge, and then to blow in the powder; he claims that "nascent iodine apparently gets into the furthest corners of the affected middle ear."

In criticising this there are three points which strike one:

(a) How can purulent secretion be sucked out from the antrum and air cells when the drainage is obstructed?

(b) How can the powder reach parts other than the immediate neighbourhood of the perforation in the presence of generalised mucosal swelling?

(c) How can one hope to get over the "cork into bottle" effect of blowing the powder through a narrow channel into a wider cul-de-sac beyond?

Watson Williams [2] pointed out that the narrow drainage channels are obstructed by engorged mucous membrane, while the spaces that are left are filled with exudate, purulent at first but rapidly becoming glairy and mucinous; "therefore," he said, "it is obvious that the scope of treatment via the meatus is strictly limited. The most we can do is to promote natural drainage. We must carefully avoid anything which may increase
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congestion or the risk of additional infection, or which may damage the
inflamed tissues, so that repair may be as rapid and complete as possible,
with a minimum of scarring and damage to hearing—that is essentially
damage about the oval and round windows.”

He accordingly recommends dry mopping till the meatus is thoroughly
cleansed; then half filling the meatus with powdered magnesium sulphate
crystals; followed later on by iodoboric powder when the discharge has
become minimal.

This would appear to be by far the best palliative method of treatment
to date.

Problems in Military Otolological Practice.

The military otologist, particularly in a country like India where the
distances are so huge and the British garrison so scattered, is confronted
with special problems.

In May, 1931, the Medical Directorate at Army Headquarters, Simla,
issued the following ruling: “In future, cases of otitis media and the
results thereof will not be invalided ipso facto. Only those cases definitely
unfit for military service by reason of deafness or other disability will be
invalided.”

The otologist’s objects, therefore, are:—

(1) To avoid by judicious intervention complications resulting from the
chronic suppurative process.
(2) To save patients from being boarded out of the Service.
(3) To conserve the hearing as much as possible.

Special factors which he has to bear in mind are:—

(a) That military patients with “established otorrhoea” are in many
cases apt to become “sick parade birds,” appearing at the Medical Inspection
Room with the utmost regularity whenever an unpleasant or uncongenial
job looms on the horizon, to fade away into obscurity again when the
danger period has passed.  (b) That any form of treatment which he may
recommend is very often carried out by individuals unskilled in aural mani-
pulations, or under conditions where the requisite instruments are not avail-
able.  (c) That there is a marked dearth of medical officers with sufficiently
expert otological knowledge to judge which cases are and which are not
suitable for any particular line of treatment.  He should, therefore, aim at
being radical as early as reasonably possible; thereby cutting short the
duration of treatment, as well as fulfilling the other desiderata given above
under (1), (2) and (3).

During the past year the treatment recommended by Watson Williams
has been given six months trial in the Northern Command, India: with
the safeguard that the following types of case must be referred directly to
the specialist:—

(1) Cases with small perforations, particularly if situated in the upper
quadranets of the tympanic membrane.
(2) Cases of “established otorrhoea” in adults with good hearing and
minimal inoffensive discharge.
Cases where the discharge continued offensive or frankly purulent in spite of six weeks' careful treatment by Watson Williams' method. The reports submitted by all stations on the efficacy or otherwise of this method have been distinctly encouraging. A large number of cases were treated, but only 134 were quoted in detail. Of these only fifteen had failed to respond satisfactorily and had to be referred to the Specialist.

**Aims and Objects of Modern Operative Treatment.**

1. To perform a thorough nasopharyngeal toilet where necessary, to avoid reinfection.
2. To remove all infected and damaged tissues, so producing cessation of the otorrhoea.
3. To improve drainage, so reducing the risk of a relapse.
4. To conserve hearing by avoiding permanent thickening of the mucosa and reducing the number of adhesions which will form if the chronic suppurative process is allowed to continue unchecked.

**Selection of Cases for Operation.**

The following types of cases should be regarded as being suitable for operative treatment:

(a) Cases which are still offensive or frankly purulent after six weeks' careful treatment by the method of Watson Williams.
(b) Cases with small attic perforations and thick offensive discharge.
(c) Cases shown by radiography to have extensive unilateral mastoid radio opacity on the affected side, and having also a thick offensive discharge.
(d) Cases with the peculiar offensive discharge containing cholesterin crystals indicating the presence of cholesteatoma.
(e) Cases with extensive attic granulations or polypi, or meatal fistula, and with radiographical evidence of mastoiditis.
(f) Cases with free "established otorrhoea" and marked loss of hearing.

**The Role of the Radiogram.**

Good radiograms taken with a Potter-Buckey diaphragm in the true lateral position are of the utmost value as follows:

1. *As an aid to diagnosis.:* (a) By showing whether the mastoid area of the affected side is involved or not; (b) by occasionally revealing the presence of a sequestrum.

It should be remarked here that radiograms are considered to be of greater value as a diagnostic aid in chronic mastoiditis than in the acute condition.

It is essential that both mastoid areas should be radiographed for purposes of comparison.
Lastly, it should be borne in mind that radiography is a good servant, but a bad master; the otologist should avoid the error of making his diagnosis on radiograms alone.

(2) To aid at operation by showing: (a) The type of mastoid bone present, i.e., whether cellular, sclerotic, or mixed; (b) the whereabouts of the cell-groups; (c) which cell-groups are involved; (d) the whereabouts of the sinus groove; (e) whether the floor of the middle fossa is unduly low or not.

They should be available for inspection in the theatre throughout the operation.

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**Fig. 4.—Mrs. S.**

Right mastoid (healthy). Left mastoid (mastoid involved).

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**Fig. 5.—The mastoid cell groups.**
Of the cases where radiograms showed relative radio-opacity of one mastoid area, it was found in every case at operation that the aditus, antrum, or air cells contained either greatly thickened mucosa, pus, or débris, or that the mucosa was definitely polypoidal, or that more or less extensive osteitis was present; and, if anything, the radiograms led one to expect rather less than was actually found at operation.

**Types of Operation Available.**

In former times one was led to associate the subtotal mastoid operation with acute mastoiditis, and the radical operation with mastoiditis of a more chronic nature; but we have progressed far since then.

The late Charles Heath was the pioneer to point out that it is the duty of the aural surgeon when treating a case of chronic suppurative otitis media to arrest the otorrhoea *with conservation of the hearing.*

The radical operation inevitably destroyed about 70 per cent of the hearing; other operative techniques have now been elaborated and it is possible to select an adequate but far less destructive procedure for many a case which would formerly have had the otorrhoea arrested, but the hearing irreparably and permanently damaged.

The following indications govern the type of operation to be selected for each individual case:

*Schwartz's subtotal mastoidectomy.*

1. When there is a good hearing in the affected ear.
2. When there is moderate hearing in the affected ear, but the other ear is deaf.
3. If the mucosa of the middle-ear cleft is judged to be capable of recovery provided the discharge from the mastoid area is arrested.
4. As a preliminary stage to exposure of the lateral sinus, or the dura of the posterior fossa.
5. As a preliminary to dealing with an intracranial complication other than one due to a lesion of the attic roof.

The modern subtotal mastoidectomy is a very much more extensive operation than was that of its originator, Schwartz. It involves, for instance, a careful search being made for and the thorough clearing out of all the cell groups in the mastoid process, and not merely the drainage of the mastoid antrum as in the old operation. It is, accordingly, far more likely to be effectual.

Heath's cortical operation is not nowadays considered by the majority of otologists to be an effectual method of dealing with cases of "established otorrhoea," by reason of the fact that it leaves the vast majority of the air cells untouched, to act as potential foci for a fresh "light up" of the suppurative process.
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The Kuster-Heath operation.

This may be regarded as a modern Schwartzte operation with a modified approach via the bony external auditory meatus, and will be found to be of use in cases with a very superficial and forward lateral sinus and a low floor to the middle fossa, particularly if the antrum lies more or less deep to the lateral sinus.

The epi-tympanomastoid operation.

If, on doing the Schwartzte operation and removing the outer wall of the aditus, the attic is found to be full of thick pus, débris, polypi, or fibrin fragments, the procedure should be extended to include removal of the bony outer wall of the attic, leaving intact the bony ring to which the tympanic membrane is attached.

Trans-antral atticotympanotomy.

This operation is of value when the greater part of the tympanic membrane remains intact and when the perforation, usually marginal, is in either the superior or attic area or in the posterior segment, when a chronic suppurative antral inflammation may be suspected. It involves extending the Schwartzte operation to include separation of the postero-superior segment of the tympanic membrane from the corresponding portion of the bony ring and the removal of the "bridge," with the object of allowing the separated membranous flap to fall inwards and become adherent to the inner tympanic wall, so shutting off the main tympanic cavity from the infected areas.

Radical Mastoidectomy.

(1) If there is necrosis of the outer attic wall or of the ossicles, with or without excessive scarring of the upper part of the tympanic membrane.
(2) If there is an intracranial complication due to a lesion of the attic roof.
(3) If there are multiple polypi, especially if recurrent, and if they are attached to the promontory or to the region of the oval window.
(4) If there be cholesteatoma.
(5) To deal with complications in the internal ear, viz: (a) Labyrinthine fistula, (b) suppurative labyrinthitis, (c) necrosis of the bony fallopian canal with facial palsy.
(6) If there are recurrent granulations.
(7) If the ossicles are bound down by adhesions to the inner wall of the tympanic cavity, with extreme deafness, diminished bone conduction and lowering of the upper tone limit (indicating an advanced stage of chronic membranous otitis media, with secondary involvement of the internal ear).
(8) If there be tubercular disease of the middle ear.
(9) If there be persistent rapid pulse after mastoidectomy, with or without pyrexia.
(10) As the first stage of Sourdille's operative procedure.
While many indications for the radical operation are given above, the tendency nowadays is to do a conservative operation whenever possible; indeed, even if there be cholesteatoma, the radical operation is not invariably called for, especially if the patient be a child.

Summary.

(1) The "wet system" of treatment as a whole is unsound in principle, as for anatomical reasons fluids are unable to reach the primary focus of the condition, moreover they tend to irritate and increase the "waterlogging" of the mucosa of the middle-ear cleft.

(2) The use of hydrogen peroxide is definitely dangerous.

(3) The "dry system" of treatment with insufflation of various powders is open to the objections that (a) powders cannot reach the primary focus, and (b) there is a tendency to "ball-up," with obstruction to drainage unless only the minimal quantity of powder is insufflated, which renders this method unsuitable for use by those unskilled in aural instrumentation and unequipped with apparatus capable of controlling the amount of powder insufflated.

(4) Dry mopping and the use of powdered magnesium sulphate, passing with improvement of the condition to iodoboric powder, as recommended by Watson Williams, is very satisfactory for prescribed types of cases.

(5) Surgical treatment should be selected for cases unsuitable for treatment by the method of Watson Williams, and for cases which have failed to respond to it after six weeks' careful trial. The results obtainable are on the whole satisfactory, and the number of cases requiring to be invalided out of the Service can be definitely reduced by its adoption.

(6) Conservative surgery is adequate for the vast majority of cases.

Some fifty-two cases of "established otorrhoea" were treated surgically, either because they were cases which had failed to respond to Watson Williams' treatment or were frankly unsuitable for it from the start.

It is considered that the results attained have been satisfactory on the whole: they may be summarized as follows:—

Of the series of 52 cases.

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<th>Type of Result</th>
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<td>Good results</td>
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<tr>
<td>Satisfactory</td>
<td>16</td>
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<td>Slight improvement</td>
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As yet it is admittedly too early to judge of the final results in many cases; there are nineteen having no more recent report than that given on discharge from hospital, but as in five the perforation was even then either healed or healing, while three had had the radical operation
performed, it does not seem unreasonable to hope that permanent benefit may have been secured in a very fair percentage of them.

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