would permit of its being attacked at a stage when a permanent cure might be obtained.

With regard to treatment, some little experience has convinced me that there is only one method capable of giving access to the naso-pharynx adequate for the free removal of these tumours, and that is osteoplastic resection of the upper jaw. The classical operation in which the bone flap includes only the maxilla does not, however, give so satisfactory a view of the parts concerned as a modification which I use. This is to include in the bone flap the malar bone with the upper jaw. No one who has practised or seen the two operations could have any doubt as to the great gain obtained from this extension of the flap. The operation, although formidable in appearance, is easy to carry out, is not dangerous in itself, and leaves no deformity.

In conclusion, I would refer once more to the extreme clearness of the clinical type presented by these cases of infiltrating endotheliomata of the naso-pharynx, to the exact anatomical distribution of the symptoms, and to the frequent absence of any of the symptoms usually regarded as those of naso-pharyngeal tumours.

DEVIATIONS OF THE NASAL SEPTUM AND THE SUBMUCOUS RESECTION OPERATION.

RECORDS OF ONE HUNDRED CASES.

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DEVIATIONS of the septum to one or other side are extremely common. A strictly vertical septum is rare. Morell Mackenzie examined 2,000 skulls, and found asymmetry of the septum in 77 per cent. of skulls examined. Many other observers who have studied the nasal septum have also noted this asymmetry, and their figures bearing on this subject vary from 96 to 53 per cent.¹ In the lower races of mankind a deviated septum is the exception, being only found in 20 per cent. A vertical septum is the rule in the lower animals, deviation being almost unknown. In the Anglo-Saxon race the deviation is more often to the left side than to the right. This has been explained by the fact that most of us use the right hand in blowing the nose, and that, unconsciously, the tip of the nose is bent to the right, throwing the cartilage over to the left side. This statement is open to the objection that in the skull of the Gibraltar man (of the early Neanderthal type) found at Gibraltar in 1843 there was a marked deviation of the bony septum to the right. Also the skull of a short Cist man found in Aberdeenshire showed a very marked bony deflection with a compensatory enlargement of the middle turbinal bone of the opposite side. These two skulls take us back several thousand years, when I doubt very much if pocket-handkerchiefs were in use. I think it is more probable in both cases that the deviations were traumatic. In the last-mentioned skull I am quite sure that its possessor suffered from marked nasal obstruction.

In the adult a certain number of deviations are due to traumatism, as falls, blows on the nose while boxing, etc., but by far the largest number of deflections are due to faulty development of the upper jaw and bony palate in early childhood, a result of mouth-breathing consequent upon the presence of adenoids in the naso-pharynx. A certain small number of septal deviations may be wholly congenital.

In attempting to classify deviations, apart from their origin, I have divided them into two main groups:

from above down or from behind forwards (see Fig. 1). B. Deviations of the simple type (above) associated with overgrowth of certain parts, hyperostosis, hyperchond-

rosis (spurs, crests, and projections). Overgrowth of this kind are usually found where bone and cartilage or bone and bone meet (see Fig. 2). Apparently they

Fig. 2.—Nasal septum. Shaded area shows parts usually removed by a submucous resection. A, Site of vomerine crest. B, Maxillary crest.

are due to the separation of periosteum or perichondrium by accumulated blood at the time of the accident, and subsequent inflammation and irritation resulting in overgrowth. Certainly these forms are more frequently met in cases with a history of trauma than in those without. The observation and study of a large number of nasal septa at all ages has led me to form the opinion that the slow, gradual, but constant, upward pressure of the developing jaw is more likely to produce a bending or dislocation of the component parts of the nasal septum than to fracture them. It is reasonable to suppose that sudden external violence would in all probability cause fracture of some part (other than the cartilage) rather than a bending or deviation of an elastic, resilient structure, such as the triangular cartilage. Unless the cartilage be partially ossified, as sometimes it is observed to be, it is difficult to imagine how fracture could take place. Fractures of the vomer are rare, but fracture of the thin, papery-like perpendicular plate of the ethmoid is frequently seen. Dislocations are very common. Both are the origin of a hyperplastic periostitis, resulting in the formation of a crest or spur or thickened septum, hence nasal obstruction.

Deflections of the septum are seen at all periods of life and in both sexes. Statistics obtained from my own cases show the average age when advice is sought to be 30.5 years. Deviations are rarely seen in children under 7 years of age, and these deformities appear to reach their maximum development between the fourteenth and twenty-fifth years. Sex apparently has some slight influence, for in the 100 cases which I am now considering 62 were males and 38 females. No doubt the male nose is more likely to suffer injury than the female.

When should a deviation be corrected? Only when symptoms arise which can be traced to the deviation as a likely cause. These symptoms include headaches, obstruction, deafness, and laryngeal troubles.

1. *Nasal obstruction* may be of two kinds—inspiratory and expiratory obstruction. Of the two forms, the inspiratory is apparently the one most frequently complained of. While both forms are usually found to be present on the same side, it may happen that one form is present on one side, the other being present on the opposite. This may be understood readily by considering the site of the obstruction. Obstruction to inspiration may be due to (a) blockage low down close to the vestibule (septal), (b) blockage high up above the level of the inferior turbinate, or opposite the middle turbinate (septal). In this form the associated symptoms are obstruction and headache, but the symptoms special to this form of obstruction are all related to the larynx and its surroundings. Obstruction to expiration is caused by some blockage of the inferior meatus of the nose (the chief channel of the expiratory air current). This form is not so frequently a source of complaint, although it is more often associated with disease of the ear. It may be accompanied with headache.

Patients do not usually themselves differentiate between these two forms of obstruction; the fact is more often elicited by the rhinologist while conducting his examination. At the same time, I have found the complaint of "stuffiness" to be more likely due to expiratory obstruction.

tion, while the complaint of, "I cannot breathe through the nose," seems to be due to inspiratory obstruction.

CASE.—Male, aged 32. Complains of obstruction and attacks of sneezing and watery discharge from the nose. Duration three years. No cause known. Nose: Septum deviated to left below, expiratory obstruction; septum deviated to right above, inspiratory obstruction. "S"-shaped septum. Compensatory enlargement right inferior turbinate. Right middle turbinate cannot be seen (see Fig. 3).

In considering the symptoms of these 100 cases, obstruction alone was complained of in 19 cases. It was more or less complete. Fifteen cases had headache in addition; 8 cases obstruction and unilateral deafness, the deaf ear always on the same side as the obstructed nostril. Two of these 5 cases were suffering from chronic otitis media, which could be traced to deficient drainage of the middle ear. In 6 cases laryngeal symptoms were a marked accompaniment of the obstruction.

2. *Headaches*.—Deviations of the septum are responsible for quite a considerable number of cases of intractable headache,² and the physician, therefore, would be wise to always make an examination of the nasal cavities before ascribing such headaches to neurasthenia or other similar disorder. The position of the headache is variable; usually, however, it is referred to the same side of the head as the obstructed nostril. Should the deviation exert pressure upon either middle or inferior turbinate, orbital or nasal pain may be an additional source of complaint. In the 100 cases under consideration headache was the symptom in 22 cases; alone in 11 cases; in conjunction with laryngeal symptoms in 8 cases, and aural ones in 3 cases.

CASES.—Male, aged 24. Complains of inability to breathe through the nose. Duration twelve months; accident ten years ago. Inspiratory obstruction, left side; headaches referred to the left side of the head. Nose: Septum deviated to left, slight spur posteriorly right (see Fig. 4). Female, aged 56. Complains of stuffiness in nose preventing breathing. Duration three years. Pain over right side of nose; frontal headache; impaired sense of smell, inspiratory obstruction (intermittent). Nose: Thickening of the septum (bilateral), worse on the right side; septum and middle turbinates in contact (see Fig. 5).

3. *Laryngeal troubles* were a common source of complaint. Such symptoms as loss of voice, hoarseness, inability to produce certain notes, "nasal voice," always catching cold in the throat, were complained of in 16 cases. Their meaning is quite clear when the respiratory function of the nasal cavities is considered. These patients had been breathing air which was inadequately warmed, moistened, and filtered; as a result, the delicate mucous membrane lining of the larynx and trachea had suffered; attacks of inflammation of these parts, with hoarseness and loss of voice, were frequent. One patient, a well-known actor now in Australia, who was particularly prone to catching cold and attacks of hoarseness, had a most marked deviation. This was corrected by means of the Killian operation. Several months later he wrote to me from Brisbane:

My throat is splendid; you have made a new man of me.

All his symptoms were due to faulty nasal respiration. Two other cases are worth mentioning:

1. A gentleman who had had several attacks of laryngitis and had physical signs of phthisis in his chest. From an examination of the larynx, it was decided that the laryngitis was probably not tuberculous, but due to chronic rhinitis and nasal obstruction from a markedly deviated septum. The deviation was corrected, the laryngitis improved, and, after a course of treatment for his chest trouble, he made an excellent recovery.

2. A young girl who had some hoarseness and occasional loss of voice. There was a chronic laryngitis with a large inter-arytenoid pachydermia. She also had an obstructed nostril from a septal deviation. The Killian submucous operation was performed and the laryngitis treated, unfortunately with no great success. The chest was examined on several occasions, with negative results. A von Pirquet and Calmette's reaction were tried, also with negative results. Iodides and mercury had no effect. Eventually I removed the pachydermia by the indirect method, and it was submitted to microscopic examination. The pathologist's (Dr. Wyatt Wingrave) report was as follows: "The tissue consists almost entirely of tuberculous elements—namely, infiltration by epithelioid and lymphoid cells with a few giant cells. It is of the chronic type, as shown by the presence of plasma cells."

Eventually some slight physical signs of phthisis were noted in the chest. She is now under treatment at a well-known sanatorium in the South, and is making rapid progress towards recovery.

I do not cite this case as an illustration of the beneficial effects of a submucous resection. The opinion which I have formed regarding the case is that at first the laryngitis was of a simple catarrhal nature, directly due to breathing unprepared air, but that ultimately the tubercle bacilli (for there must have been lung disease, although undiscovered) found a suitable nidus, and the laryngitis became tuberculous.

Typical cases of laryngitis due to nasal obstruction are illustrated by the two following cases (see Figs. 6 and 7),

both of whom improved greatly as a result of the nasal operation:

CASE.—Male, aged 27. Complains of hoarseness and nasal obstruction. Duration twelve months. No accident. Nose: Septum deviated to right (above). Compensatory enlargement of left middle turbinate. Inspiratory obstruction. Chronic laryngitis and pharyngitis.

CASE.—Male, aged 50. Complains of stuffiness in nose, hoarseness, and "nasal voice." Duration three months, increasing. No accident. Nose: Septum deviated to right (below, slight); septum deviated to left (above, and large spur projecting into inferior turbinate). Intermittent obstruction, worst at night. Chronic laryngitis.

4. *Deafness*.—The association of deafness and nasal obstruction has long been recognized.³ How are they related? There are three types: (a) A blockage within the nose usually means Eustachian catarrh and intermittent obstruction. The air within the tympanum becomes absorbed, leading to retraction of the drum on the outside and on the inside, pulling the stapes and Scarpa's membrane out of their respective windows. A lowering of labyrinthine pressure results, and hence deafness. (b) Negative intratympanic pressure results in an increase of secretion from the mucous membrane of the middle ear, and this favours the growth of micro-organisms. (c) A blocked nasal passage means an increased expiratory effort, causing a portion of the contained air in the blocked side to be forced up the Eustachian tube under pressure, tending to stretch the ligaments of the ossicles and the drum itself. At the same time the stapes and the membrane of the oval window are forcibly driven in, raising labyrinthine pressure to excess and giving rise to tinnitus with deafness. This form is typically met in the "pocket-handkerchief deafness," to which Mr. Chas. Heath has recently drawn the attention of otologists.

Aural symptoms were evidenced in 25 of my cases—alone in 14, in conjunction with nasal obstruction in 8, and headaches in 3. The results of the operation have been most satisfactory, for if the operation did not cure the deafness it at least prevented it from becoming worse. The following case exemplifies this type of deafness with obstruction:

CASE.—Male, aged 25. Complains of deafness in left ear: duration, six to eight months. Cannot breathe through left nostril; duration, two years. Accident four years ago. Nose:

Septum deviated to left; no view obtainable of either middle or inferior turbinates on left side. Compensatory enlargement of right middle and inferior turbinates. At operation cartilage split, one small piece on right side lying along septal cartilage and partly over overgrowth of vomer. Hyperostosis of osseocartilaginous junction (vomer) (see Fig. 8). Ear: Chronic catarrh, membrane indrawn and partly fixed.

In regard to the operation, a full description may be read in all modern textbooks of rhinology. It is unnecessary for me to enter

into these details here, although there are a few practical points which I would like to mention.

The Anaesthetic.

A general anaesthetic is unnecessary, except for extremely nervous patients or those in whom a considerable amount of bone chiselling has to be done. A submucous resection is a simple operation in experienced hands. It is usually undertaken to alleviate some minor discomfort. It is not an operation of necessity. It can be performed painlessly with local anaesthesia, and therefore for these reasons I consider it wrong to subject a patient to the dangers and discomforts of general anaesthesia. From the point of view of the surgeon a general anaesthetic merely adds another difficulty—that is, haemorrhage. Even plugging the nasal cavities with adrenalin for ten to fifteen minutes before the administration of the anaesthetic only mitigates to a very slight extent this troublesome complication.

The adoption of local anaesthesia has the following points in its favour: First, no danger; secondly, no pain; thirdly, no haemorrhage; fourthly, the surgeon has the intelligent co-operation of his patient; fifthly, the operation can be undertaken sitting up; sixthly, considerably less surgical shock.

The method of local anaesthesia giving the best results is associated with the name of Freer. A few crystals of cocaine hydrochlorate are picked up with a small cotton-wool mop saturated with adrenalin chloride (1 in 1,000) and gently rubbed into the mucous membrane of the septum on both sides. Three or four applications, extending over a period of about ten minutes, are usually sufficient to produce a perfect anaesthesia. Medical men frequently ask me if I never get cocaine poisoning by this method. I have never seen it. This cannot be said by those who still plug the nasal cavities with gauze strips or wool mops saturated with cocaine solution. At the same time the patient should be warned that should he feel the cocaine in his throat he must immediately cough it up. The advantages of this method are obvious; they are: (1) Simplicity of application; (2) knowledge of the exact amount of cocaine applied—being concentrated, less in bulk is required than in weaker solution, and hence risk of absorption is less; (3) action can be limited to the area to be operated upon; (4) freedom from danger, toxic effects are unknown; (5) no trouble with old and decomposed solutions.

While the operation is in progress, it is advisable to instruct your patient to breathe through the mouth, as nasal respiration causes the separated septal mucous membrane to flap about, and may thus impede the view of the operator.

The Operation.

The operation should be carried out with all aseptic precautions. Numerous experiments by many competent observers have shown that the mucous membrane of the nasal cavities is practically sterile. Even when non-pathogenic organisms are introduced (experimentally), they are found to rapidly disappear. To what is this sterility due? (a) The presence of vibrissae in the vestibule, which arrest many of the larger air-borne particles and organisms. (b) The cilia of the ciliated epithelium lining, continually waving in the one direction, tending to drive out any extraneous matter or organisms. (c) Bactericidal action of the mucus, killing or rendering inert pathogenic organisms, to be washed away later by the watery secretion from the glands of the olfactory region.

In performing the operation, the position of the incision

is of more importance than its shape. It should be made well forward just within the muco-cutaneous junction on the convex side of the deviation, and should only include the mucous membrane of that side. If made too far in, a projecting piece of cartilage may be left which will effectually block the air current. In dealing with a prominent spine or crest greater accessibility is obtained if the incision be carried a short distance along the floor of the nose. There is present in some nostrils a web-like formation at the junction of the skin of the vestibule with the mucous membrane of the septum. This is congenital. If this web be incised and separated before making the primary incision, considerable trouble later will be saved. Separation of the mucous membrane is often most difficult, especially in the traumatic forms of deviation. In the first place, be sure you have cut through the muco-perichondrium; any attempt to separate the muco-perichondrium from the mucous membrane can only be attended by failure, but once *beneath* the muco-perichondrium, separation is quite easy. In several cases I have found that the mucous membrane has become adherent through being nipped in an injured cartilage. Button-holing is then almost inevitable, but, granting an intact mucous membrane on the opposite side, is of no consequence. In some cases the cartilage will be found to have undergone partial ossification. Its removal then with Ballenger's swivel-knife is attended by considerable difficulty. A much more efficient means of removal is provided in the septal punch forceps designed by Charles Heath. (This punch was really intended for the removal of the bony parts of the septum—the vomer and ethmoid.) Another difficulty associated with the cartilage arises when the deviation is situated high up, bordering on the bridge of the nose. Care has to be shown not to remove too much, for this would endanger the shape of the external organ, yet if a projecting piece is left, it has the effect of throwing the detached mucous membrane out, and preventing its proper apposition with that of the opposite side. Blood is liable to collect between these surfaces and the blockage remain unrelieved. A septal punch with up-turned blades (Heath) is useful in removing this area of cartilage, but *never remove more of the septum than is necessary to correct the deformity*. In the traumatic forms a splitting of the triangular cartilage is sometimes encountered. The force of the trauma has driven the cartilage upon the vomer, and has been split by it into two wing-like processes which project on either side. Great care is necessary in separating the mucous membrane in these cases, as often it is most adherent round the site of the split. When dealing with thickenings and spurs situated posteriorly, it is well to bear in mind the possibility that they may be accessory air cells—sphenovomerine bullae.

According to Parker and Freer,² if these bullae are met with and recognized as such, they are best left alone and should not be opened. If unintentionally they are opened, the possibility of sepsis spreading to the sphenoidal sinus should be remembered (see Fig. 2). The sphenovomerine bulla appears to be a prolongation forward of the sphenoidal sinus between the bony layers of the vomer at its junction with the sphenoid. In performing a submucous resection recently, and encountering one of these spurs causing considerable obstruction, I decided to remove it, knowing the possibility. In this case it did not communicate with the sphenoidal sinus. The size of the cavity was equal to a fair-sized pea.

The obstruction removed, the incision should be closed with a fine catgut suture. While deprecating the necessity for plugging, I think that it is advisable that the nasal cavities be plugged on both sides with a strip of ribbon gauze. A new form of ribbon gauze I have found most useful for this is that introduced by Parke, Davis and Co.; it is ordinary sterile ribbon gauze impregnated with adrenalin chloride. The plugs should be removed within twelve hours, when a pear-shaped plug of wool may be inserted on whichever side the surgeon thinks necessary with the object of maintaining the vertical position of the now only mucous membrane septum. All plugs may be dispensed with in the course of a day or two.

No after-treatment is called for. Watery lotions should be avoided, but, if crusts are troublesome, the instillation of a few drops of hydrogen peroxide renders their expulsion easy. A weak eucalyptus or menthol ointment keeps

the mucous membrane soft, and helps to prevent crust formation.

Complications.

This operation is not without certain minor dangers, most of which can be avoided by careful management. Operations within the nasal cavities usually do very well, septic troubles being almost unknown. The few complications which occurred in the 100 cases under consideration are briefly mentioned.

Haematoma of the Septum.—In this case the nose was plugged on one side only with gauze strips. A few hours after the completion of the operation the patient sneezed violently and a portion of the plug was blown out, the patient pulling out the rest of it as its purpose was unknown to him. When I saw him the following day both nostrils were completely blocked by a typical haematoma of the septum. It was not incised, and the ultimate result was not unsatisfactory.

Perforation of the mucous membrane occurred in a small number of cases. I have not found it to be detrimental, but if it be recognized that a small perforation has been made, *make it a big one*. Small perforations are troublesome; large ones never are.

Haemorrhage may complicate the operation if undertaken with general anaesthesia. It is rare with local anaesthesia.

Secondary haemorrhage after the operation may also occur. Frequently it can be arrested without plugging if the patient be instructed to sniff (forcible inspiration), which has the effect of emptying the veins of the head and nasal cavities.

Synechia may form if adjacent surfaces of turbinal and septum be injured, but this is rare.

"Toothache," involving the incisor teeth of the upper jaw, is sometimes complained of after operation. It is usually only temporary, and is due to injury of the branches of the large palatine nerve in removing the crest.

Acute otitis media occurred in one case where the plugging had been continued longer than usual. A plug in the nose, no matter how small it be, always gives rise to an acute rhinitis, and it is just as well to warn your patient beforehand that for a short time after the operation the obstruction may be greater than it was previously. Complications, such as acute otitis, are more due to this than to the operation. In this case paracentesis of the drum became necessary, and gave the requisite relief. Recovery was uneventful.

Acute frontal sinusitis occurred twice, and was undoubtedly due to plugging. One case recovered by expectant treatment, rest in bed, warm fomentations, and strict attention to the nasal toilet, but in the other removal of the middle turbinal body was required with lavage of the affected sinus.

Tonsillitis was much more frequently observed, and this may also be traced to the plugging of the nose. It was usually mild in form, responding quickly to treatment.

A complication which is said to develop later is *atrophic rhinitis*. So far none of my cases have developed it, although, in a few, crusts which are difficult to expel continue to form.

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A CASE OF TONSILLAR CALCULUS.

BY

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THE patient in the following case, T. D., aged 30, a machinist, worked solely amongst metals. On January 7th, 1911, he consulted me at my house for inconvenience in the throat; he described it as "a tickling or roughness in the back of the mouth," which had troubled him for a month or more, but was increasingly troublesome during the last fortnight. He had worked all along until the day he called on me.

Previous History.—He had had only one illness, which occurred when he was a boy; it lasted about a month, and, from his account of the matter, it would seem to have been rheumatic fever.

State on Examination.—A swelling of the right tonsil was found, and between the pillars there was seen what looked like yellow membrane. Diphtheria being suspected, a swab was applied and the substance found to be very hard. Further examination with sinus forceps proved the substance to be something embedded between the pillars, but non-adherent to the wall.

Treatment.—On applying laryngeal forceps, they slipped twice. Fearing that if this occurred when extracting the body it might slip down the throat with disastrous consequences, one was forced to find a safer method of dealing with it. A pair of ovum forceps suggested themselves, and were applied. They held the body securely, and with steady traction it was brought through the opening, the parts being severely stretched, but there was no blood, nor any tearing of the tissue.

Result.—The body proved to be a calculus, of which the following is a report by the Clinical Research Association:

This specimen is about 2.5 cm. in greatest length, 2.5 cm. in greatest breadth, and about 1.5 cm. in depth, and weighs 4.635 grams (71.59 grains). It is but slightly nodular and has one surface very irregular and indented, but the others are roughly polished. Chemically it consists for the most part of calcium phosphate with a fair admixture of calcium carbonate and a trace of magnesium phosphate.

A part was decalcified and was found to be composed of necrotic calcareous debris, and no doubt represents a "plug" from a tonsillar crypt.

The urine, in consequence of this report, was subsequently examined, with the following result: Specific gravity 1020, slightly acid; neither albumen nor sugar; phosphates.

Microscope.—Numerous small crystals of oxalate of lime.

REMARKS.

Two features seemed to make this case worthy of a report:

1. The rare size for a tonsillar calculus.
2. The minimum of discomfort to the patient, he not losing from first to last an hour's work on account of it.

THE TREATMENT OF PULMONARY TUBERCULOSIS BY INDUCING AN ARTIFICIAL PNEUMOTHORAX.

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THE method of treatment of pulmonary tuberculosis by inducing an artificial pneumothorax is not new. It was first tried apparently by James Carson, who lived about 1840; recently Forlanini, Späth, and Murphy have improved the necessary technique, and reported many successful cases. Now Ludolf Brauer of Marburg, Lucius Spengler of Davos, and Saugman of Norway have carried out the treatment extensively, and, on the whole, very successfully.

The recent literature on the subject published in England seems to be limited to three articles in the *Lancet* of July 15th, 1911, advocating the method used by Saugman. I have learnt and practised Brauer's method, and from the cases I have studied and the literature I have read I think his method seems to offer a greater chance of success, and, on the whole, less danger to the patient.

The indications for this treatment are: (1) Pulmonary tuberculosis limited almost, if not entirely, to one lung. (2) Recurrent haemoptysis if at all severe. (3) Continued fever, cough, and general increase of disease on one side, while the other lung is healing, or only slightly affected. Slight inactive disease in the fairly sound lung is not a contraindication. The increase in the blood flow through this lung seems to influence the healing process favourably. In some cases it is impossible to produce a pneumothorax, owing to extensive pleural adhesions.

The operative procedures divide themselves into two distinct stages: the preliminary operation and the after-filling.