Chapter 9: Nasal polyps

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Nasal polyps are an easily recognizable clinical entity. They result from the prolapsed lining of the ethmoid sinuses and block the nose to a variable degree depending on the size. On examination polyps appear as pale bags which arise most commonly from the middle meatus and are relatively insensitive when probed. This helps to differentiate polyps from mucosa of the middle turbinate which may be polypoid. The pale colour is a result of the poor blood supply but, in the presence of repeated trauma and inflammation, they may become reddened. They are usually bilateral and, when unilateral, transitional cell papilloma (Ringert's tumour, inverted papilloma) or malignancy need to be excluded. Antrochoanal polyps are similar in colour to ethmoidal ones, but are a different disease affecting the maxillary sinus, where the lining prolapses by way of the ostium into the nasal fossa and postnasal space.

Simple polyps may arise at any time after the age of 2 years, and if suspected before this they are likely to be meningocoeles or encephalocoeles and the floor of the anterior cranial fossa should be examined radiographically. However, it is unusual for simple nasal nasal polyps to arise before the age of 10 years and if found may be the presenting complaint of cystic fibrosis (Schwachman et al, 1962). It follows that any child with nasal polyps should have cystic fibrosis excluded by sweat tests. It is much more common for polyps to arise in established cases (Schwachman et al, 1962; Drake-Lee and Pitcher-Willmott, 1982).

Although polyps are a disease of the ethmoid sinuses, the mucosal changes frequently extend further into the nose and into the other paranasal sinuses. The maxillary sinuses are affected more commonly than the frontal and sphenoid sinuses. The extent of these changes may be seen radiographically. The mucosal changes may not be limited to the nose since patients may have coexisting asthma.

There are three factors which may be involved in the pathogenesis of nasal polyps; the mucosal reactions at the cellular level; the relatively poorly developed blood supply of the ethmoid sinuses; and the complex anatomy of the ethmoid labyrinth.

Treatment is a combination of surgery to the polyps and medical therapy with topical corticosteroids. Whatever therapeutic regimen is used, nasal polyps are a chronic condition which is prone to recurrence, in some cases with surprising frequency.

Historical background

The condition was first recognized in India and by 1000 BC curettes had been devised to remove them (Vancil, 1969). Hippocrates (460-370 BC) recognized them as well and devised a method to remove them using a piece of string which was passed through the nose into the nasopharynx. Sponge was attached to the postnasal end and the sponge was then pulled through the nose removing all before it! The word polyp comes from the Greek, although it was subsequently latinized and means many-footed (poly-pous). Snares and forceps similar to those used today were developed in the middle ages. All polypoidal conditions were initially grouped together until histological classification helped to

differentiate them from the neoplastic conditions (Berdal, 1954). Billroth, who described their histological characteristics in the middle of the nineteenth century, still considered them neoplastic. Zuckerkandl understood that they were an inflammatory condition. He also demonstrated that the histological changes in the sinuses were the same as those in polyps.

The first advance in treatment was the introduction of cocaine for local anaesthesia. In addition to the anaesthetic properties, it is also a vasoconstrictor. It is still widely used today, sometimes in combination with a general anaesthetic. More extensive surgery is better performed under general anesthesia. Better illumination has aided surgery. With a more controlled technique of anaesthesia, removal with the aid of a microscope and by endoscopy may be favoured.

Aetiology

There has been a number of different theories put forward for the pathogenesis of nasal polyps. Although a single aetiology would be attractive, this may not be the case, but it appears that patients may be divided clinically into several groups. There are five main theories of pathogenesis: the Bernoulli phenomenon, polysaccharide changes, vasomotor imbalance, infection and allergy. All may contribute to polyp formation, but none can be universally incriminated.

Bernoulli phenomenon

The Bernoulli phenomenon results in a pressure drop next to a constriction. This sucks the mucosa of the ethmoids into the nose. If this were true then the mucosa nearest the nasal valve would always be polypoidal in the normal nose.

Polysaccharide changes

An alteration in the polysaccharides of ground substances has been postulated by Jackson and Arihood (1971), but analysis of polyps has shown them to be oedematous (Taylor, 1963) with little alteration in the collagen. The collagen appears normal on analysis, although it tends to be recently formed.

Vasomotor imbalance

Vasomotor imbalance is implied because the majority of cases are not atopic and no obvious allergen can be found. Patients frequently have a prodromal period of rhinitis prior to occurrence of polyps. Polyps themselves often have a very poor nerve supply and they may be palpated freely and insensitively. Blood vessels are encountered in polyps but they are infrequent and usually comprise capillaries. Larger polyps have little smooth muscle within them. Vasomotor problems may cause polyps but this is conjecture alone.

Infection

The literature of the 1930s and 1940s proposed the concept that there were two types of maxillary sinusitis - purulent and hyperplastic - however, it became increasingly clear that the terms have been used interchangeably. Purulent sinusitis results from infection, usually

by bacteria. The inflammatory changes may extend into the ethmoids and cause the mucosa to become polypoidal. It is encountered today as unilateral disease. Hyperplastic sinusitis is associated with mucus hypersecretion in which organisms may be found and cultured. Infection may, like chronic bronchitis, exacerbate the condition, but it does not cause it. Inappropriate surgery on the maxillary sinus leaves an intranasal antrostomy through which the new mucosa undergoes the same changes and subsequently prolapses through the artificial ostium. Polyps now appear from both the middle and inferior meatus.

The cause of inflammatory reactions is uncertain. There are mucosal changes in the maxillary sinus in the majority; these are labelled sinusitis and it is frequently inferred that the sinuses are 'infected'. Indeed, mucus is washed out and when cultured a significant proportion grow an organism. The commonest organism is the non-capsulated *Haemophilus influenzae* (Majumdar and Bull, 1982). This bacterium is a common commensal in the nose and oropharynx and is frequently cultured from the sputum of patients with chronic bronchitis. In the latter case it exacerbates the condition and it may do so for cases with nasal polyps. Unfortunately, it is difficult to implicate any further relationship because antibiotics have little effect on the course or recurrence of the disease and merely modify the infectivity of the mucus. The actions of corticosteroids allow no place for infection as a primary cause. Corticosteroids improve the condition in over one-half of the cases and, where they do not improve, they certainly do not exacerbate it as expected if infection plays an important role. It may be possible that patients are allergic to bacteria, but no evidence has been found nor any mechanism shown.

Allergy

Allergy has been implicated because of three factors: the histological picture where 90% or more of nasal polyps have an eosinophilia; the association with asthma, and the nasal findings which may mimic allergic symptoms and signs. Unfortunately allergy is an imprecise term which is used in a variety of ways. It was originally used by von Pirquet in 1906 to describe the altered host reactivity to an antigen which, in today's terms, is any immune response. It is now used more commonly to mean hypersensitivity. The immune reactions involved cause tissue damage and are mainly mediated by the immunoglobulin IgE which is attached to the mast cell. Degranulation of the mast cell is a rapid event and is complete within 30 minutes.

It is now clear that mast cells may be triggered by other reactions including IgG4, complement activation, some drugs, chemicals and non-specific factors. The resulting degranulation produces similar symptoms whatever the trigger. The mast cell releases preformed elements, histamine, heparin and other vasoactive and chemotactic factors and generates the metabolites of arachidonic acid, the prostaglandins and leukotrienes, the latter including slow reacting substance of anaphylaxis (SRS-A).

Clinically it is easy to consider symptoms such as attacks of anterior rhinorrhea, sneezing and blockage as allergic when no obvious cause is found and the patients have one or more positive skin tests.

Recent work

Mast cells

Mast cells are a heterogenous collection of cells and have been divided in animals into two main groups: mucosal and connective tissue types; in addition, circulating basophils may also enter the tissue. Ultrastructural analysis showed that mast cells were degranulated (Cauna et al, 1972) and this has been confirmed, but further comment on the granule morphology and cell structure suggests that the features may not be consistent with those described in the allergic nose (Drake-Lee, Barker and Thurley, 1984). The mast cells are also degranulated on the inferior turbinate of over one-half of the patients. It suggests that mast cell reactions within the nose as a whole may be important in the development of polyps in these cases. Mast cell reactions occurring within the polyps would lead to oedema once the condition has started.

Nasal polyps oedema

Histological examination has demonstrated that polyps are mainly oedematous (Taylor, 1963). The extracellular oedema is easy to extract and has been analysed in many studies (Berdal, 1954; Donovan et al, 1970; Drake-Lee and McLaughlan, 1982). Following removal, the polyps may be coarsely minced and centrifuged and the resulting sera collected and analysed. Matched serum may be taken at the same time. Berdal injected polyp fluid subcutaneously and repeated skin tests. Those patients who had a positive skin test had greater reactions when tested again at the site of injection. Donovan et al showed that the level of IgE was raised in polyp fluid irrespective of the results of skin tests.

Immunoglobulins

Nasal polyp tissue continues to behave as normal respiratory mucosa in some respects and it is able to produce immunoglobulins from the plasma cells present. All immunoglobulins are found in polyp oedema, both IgA and IgE levels tending to be higher in polyp fluids than in sera. The levels of IgG, IgA and IgM are variable and elevated levels probably represent a recent upper respiratory tract infection. IgA is a dimeric immunoglobulin which has a junctional chain and secretory piece which makes it stable in mucus. It is the surface immunoglobulin of the respiratory and gastrointestinal tract. The levels are higher in polyp fluid and so it could be argued that this causes polyps in a manner similar to that advocated for IgE.

Allergen-specific IgE

IgE was discovered as the main immunoglobulin in immediate hypersensitivity (Ishizaka and Ishizaka, 1967) and soon afterwards the radioallergosorbent test (RAST) was developed to detect allergen specific IgE in serum (Wide, Bennich and Johansson, 1967). Mixed grass pollens and house-dust mite are the commonest allergens to cause allergic rhinitis. Only 25% of patients with nasal polyps have positive skin tests to these allergens (Drake-Lee et al, 1984). Since these are the two most commonly positive skin tests in patients with nasal polyps it would seem logical to expect these to be the commonest raised levels of allergen specific IgE. RAST levels in polyp fluid and sera however are raised only

infrequently (John and Merret, 1979). This would suggest that allergic reactions may occur but are infrequently encountered in patients with nasal polyps.

Free histamine in polyp fluid

When mast cells degranulate a variety of products is produced of which histamine is the easiest to measure and has been measured in polyp oedema (Drake-Lee and McLaughan, 1982). Levels which are between 100 and 1000 times the serum level are encountered. This would suggest that when mast cells degranulate, local homeostatic mechanisms may be overcome. This occurs most easily in the ethmoid sinuses, partly because of the anatomy which allows the mucosa to prolapse into the nose, and partly because the blood supply is less well developed here and is therefore less able to remove vasoactive compounds. This is a dynamic state so that polyps will vary in size.

Asthma and nasal polyps

The association of nasal polyps and asthma has long been accepted and has recently been reviewed (Maloney and Collins, 1977). Around 20-40% of patients with polyps have coexisting asthma and it appears that a similar proportion of adults with asthma have nasal polyps. Unfortunately earlier work suggested that polypectomy caused asthma, but studies were anecdotal and could not be confirmed.

It is the late onset asthma which is associated with nasal polyps rather than the childhood asthma. The incidence of childhood asthma is about 5% of the population and it was 3.5% in a recent study of cases with nasal polyps (Drake-Lee et al, 1984). Asthma usually commenced around the onset of nasal polyps with over one-half of patients developing either polyps or asthma within 5 years of each other. Surgery has little effect on asthma; some patients noticed a subjective improvement in their asthma (Maloney, 1977). It has been suggested that patients with asthma may be a distinct subgroup within the disease because the sex incidence of patients with asthma and polyps is equal whereas polyps usually occur more frequently in males.

Aspirin hypersensitivity

Patients with aspirin hypersensitivity, asthma and nasal polyps are a well-recognized subgroup (Samter and Beers, 1968) which occurs in up to 8% of patients with nasal polyps. The mechanism for both aspirin hypersensitivity and asthma is unclear, but it is not an allergic reaction and there is some suggestion that there is an alteration in prostaglandin synthesis (Sczeklik, Gryglewski, Czerniawska-Mysik, 1975).

Recurrence

Recurrence of nasal polyps is one of the problems facing every otolaryngologist in the management of these cases. The rate of recurrence is variable. A 2-year study showed that 5% of patients had had five or more previous polypectomies (Drake-Lee et al, 1984). It is difficult to study those factors which are associated with recurrence, but several appear to be important. As might be expected those patients developing polyps at a younger age and associated with a long history of nasal complaints tend to have more severe recurrence.

Patients with severe nasal disease often have more extensive surgery, but this has not been shown to decrease the recurrence rate. Perhaps the single most easily detectable aetiological factor is the association with asthma. Patients with asthma suffer more severe recurrence in general and, if they have aspirin hypersensitivity, then this is increased even more. It is noteworthy that hay fever, childhood asthma, penicillin allergy and multiple positive skin tests, all manifestations of allergic diatheses, are not associated with severe recurrence.

Age

Nasal polyps are a disease of adults, although children with cystic fibrosis and occasionally teenagers develop them. The incidence every 10 years is equal between the ages of 30 and 60 years following which the prevalence decreases. Patients who are atopic and asthmatic do not develop polyps any earlier.

Incidence

The true incidence is difficult to assess, but it may be inferred from the incidence of asthma since the frequency of nasal polyps in late onset asthmatics is the same as that of late onset asthma in patients with nasal polyps. The incidence of asthma is about 5% with over one-half of the patients developing asthma during childhood. It would be expected that between 1 and 20 per 1000 of the adult population would have nasal polyps one or more time in their life. This would fit with the general prevalence of nasal disease in the UK where about 10% of the population suffers from seasonal allergic rhinitis (hay fever), about 5% suffer from perennial allergic or vasomotor rhinitis and of these only a proportion would develop nasal polyps.

Sex

There is a strong male predominance in patients who have polyps; figures range between 2:1 and 4:1 depending on the study. The male predominance is also present in children with cystic fibrosis (even though more males have cystic fibrosis). The sex incidence of patients with asthma and nasal polyps is equal which suggests a different clinical subgroup.

Racial groups

Nasal polyps have been reported in all major racial groups although the comparative incidence has not been documented.

Animals

The only other animal to have nasal polyps is the chimpanzee and polyps occur infrequently. Although cattle may develop polypoid lesions of the nasal septum and cats suffer with eustachian tube polyps, they are different lesions so it would appear that this disease is virtually confined to man.

Macroscopical features

Polypoidal lesions may arise from the nasal mucosa particularly the middle and inferior turbinate and also from any respiratory mucosa in the nose. The classic and commonest situation for their development is the ethmoid sinuses; they arise from beneath the middle turbinate anteriorly and above the middle turbinate posteriorly. Polyps may occur in the other sinuses, particularly the maxillary antrum and following inappropriate surgery in the antrum, they prolapse through the antrostomy. The colour of nasal polyps varies but it is usually a translucent white bag that blocks the nose to a variable degree. Polyps may become red with repeated trauma and nasal infection and, in the most florid cases, prolapse through the anterior nares. The degree of development varies from side to side and without therapy the size may also vary considerably; up to one-quarter will regress spontaneously without treatment. Polyps are usually multiple.

Histology

Tissue removed from the maxillary sinuses, nasal polyps and the bronchi (from patient from status asthmaticus) are similar. Nasal polyps usually have a respiratory epithelium with ciliated columnar epithelium with goblet cells. If there has been repeated trauma, squamous metaplasia occurs. The gross oedema will give rise to artefacts when polyps are processed for scanning electron microscopy since this process involves the dehydration of material. As the polyp shrinks the surface epithelium is lost to a variable extent and this has been described as 'cobblestones'. There is apparent thickening of the basement membrane which will vary from area to area and polyp to polyp. The submucosal tissue is grossly oedematous and contains few blood vessels, which are mainly capillaries, and the occasional nerve fibre. The cellular infiltrate is mainly plasma cells, small lymphocytes, macrophages, and the most striking feature, an eosinophilia. The eosinophilia may be very variable not only from patient to patient but also between polyps in the same patient. Eosinophils are found in 90% of polyps, the remaining cells being neutrophils. Occasionally, some of the stromal cells may show marked atypia (Friedman and Osbourne, 1982).

Clinical features

Nasal obstruction

Almost without exception all patients suffer from nasal blockage. This is constant, although it will vary with the size and position of polyps. The mildest form of complaint is congestion. Patients will often complain they feel as though they have a cold at times and this may be socially embarrassing. Usually there is some nasal breathing. It may be that, following surgery with the improvement of nasal function with adequate warming and humidification of the air, those patients with asthma notice an improvement in their chest symptoms.

Rhinorrhoea and sneezing

About one-half of patients suffer from attacks of either rhinorrhoea and/or sneezing and this may be helped by surgery when large areas of oedematous mucosa are removed. Patients who suffer with these symptoms will often say that they have hay fever. This is

because the symptoms are the same, but they are perennial and even if intermittent have no obvious triggers.

Sense of smell

Partial loss of sense of smell and alterations in taste are common complaints. These do not usually recover following treatment except in some cases treated by corticosteroids, particularly when taken orally when there may be a general improvement in respiratory function.

Pain

Although not frequent, pain does occur in patients with polyps and is usually over the bridge of the nose, the forehead and cheeks. It is worse when the nose is congested or when the postnasal drip changes in colour.

Postnasal drip

Most patients will complain of some postnasal drip. It is usually white, but may become green or yellow, particularly with maxillary pains or following exacerbation of nasal symptoms. Alteration of the mucus and its hypersecretion is a consequence of inflammation irrespective of cause; since nasal polyps are an inflammatory condition then mucus hypersecretion occurs. A severe eosinophilia may change the colour of the mucus from white to yellow or a yellow/green colour and was called allergic pus in the 1930s. The postnasal drip may improve following surgery or, if the mucus changes to green, may become normal following antibiotic therapy.

Epistaxis

This is infrequent and follows extensive clearing of the nose; if it does occur as a major symptom then it indicates a more sinister pathology underlying the nasal lesion.

Signs

Patients have a distinctive hyponasal voice and when the blockage is so severe then polyps may be seen externally. The obstructed nasal breathing may produce mouth breathing and occasionally flaring of the alar cartilages. This later sign is usually produced by the polyps themselves. If polyps develop before the nasal and facial bones fuse, hypertelorism will develop in more florid cases: it is seen in children with cystic fibrosis. This may also occur in adults if polyps remain untreated. The intranasal signs have been discussed previously.

Investigations

There are no specific haematological, biochemical and immunological investigations that are required apart from those involved in the general examination of cases prior to surgery. Skin tests have been widely used to investigate nasal cases but the incidence of positive skin tests is no greater than expected in the general population (Pepys and Duveen,

1951; Settipane and Chafee, 1977; Drake-Lee et al, 1984). Those patients with positive skin tests do not present any earlier nor have more severe occurrence. Cases with hay fever and dust mite allergy should have these treated in their own right. Sweat tests should be performed in children.

Radiology

Plain radiographs of the paranasal sinuses taken by the conventional three views will show the extent of the disease in the nose and paranasal sinuses. Radiotranslucency in the nose, hypertrophy of the turbinates, and deviation of the bony septum may be seen. The ethmoid complex is almost always opaque on the side of the polyps. The maxillary sinus will have changes in most cases with mucosal thickening of a variable degree until the antrum may eventually become opaque. Fluid levels are encountered and may be due to retained secretion alone or purulent material, since blockage of the maxillary ostium by polyps will prevent the migration of mucus from the sinus. Expansion of the ethmoids will be encountered in those with polyps which developed before the bones fused. Bony erosion, although highly suggestive of malignancy, may be found in patients who have polyps and is the result of previous surgery. Previous surgery is generally implicated in the mucocoeles which may develop. They are most commonly frontal or ethmoidal with a rare primary sphenoid mucocoele (Lund and Lloyd, 1983). Plain radiographs of the sinuses should be taken on all patients who present with polyps to determine the extent of the disease, exclude any bone changes, and as a baseline for follow-up.

Treatment

Unfortunately much of the literature on the treatment of polyps is anecdotal and has not been subject to useful trials and scrutiny. It is the author's view that, unless any operation has been shown to be more effective than another, it is best to perform the simplest operation with the best view and with least risk of harm to the patient. Most surgeons today treat polyps surgically, but many polyps are sensitive to corticosteroids, and where polyps are not obstructing the nose completely a preoperative trial of corticosteroids is worthwhile.

Preoperative medical treatment

The proportion of patients sensitive to corticosteroids is uncertain but approximately one-half seem to have some response. It is not possible in most otolaryngological clinics to give the thorough medical examination required before commencing oral corticosteroids, so they should be avoided even though they are more effective than topical preparations.

Betamethasone nose drops, two drops twice daily each side, may be given for one month. The position of administration should be either in the recumbent head dependent posture, or the 'Mecca' position which is kneeling with the head well down and forwards. It allows drops to penetrate more easily into the ethmoid region (Charlton et al, 1985). Alternatively aqueous beclomethasone or flunisolide, two puffs, may be tried (Dingsor et al, 1985). Aqueous preparation are probably more effective than Freon sprays. If patients have congested and polypoidal turbinates this may be the more effective method of obtaining a general cover of the nasal mucosa. Polyps may disappear completely and treatment should be continued for at least 3 months.

Surgical treatment

Anatomical considerations

The anatomy of the nose and ethmoids has been considered elsewhere but there are several points which should be highlighted. The middle turbinate is the key to nasal surgery. If surgery is performed medially, then the cribriform plate may be breached and the anterior cranial fossa entered. If surgery is lateral then the ethmoid complex may be entered. Extensive intranasal operations on the ethmoids render the middle turbinate unstable, if it is lost or removed it makes subsequent orientation difficult. Since may operations are performed subsequently by junior surgeons the risk of complications is greater.

The eye is the lateral relation of the ethmoids and the lamina papyracea is very thin; it is easy to enter the orbit if ethmoid surgery is vigorous. The simplest complication is herniation of orbital fat, but more extensive surgery may injure the medial rectus anteriorly and the optic nerve posteriorly.

Preoperative preparation

The nose should be prepared adequately before surgery to cause vasoconstriction and shrinkage of the mucosa. Drier fields are obtained under local anaesthesia alone. Various methods are used to prepare the nose and each will give a good field if used well. The author prefers to perform nasal surgery under local anaesthesia if possible, but patients should be admitted and sedated with an adequate intramuscular premedication. Surgery should be performed in theatre where all facilities are available. Preparation with cocaine 10% spray is given on the ward 15 minutes before local anaesthesia. This allows a much more thorough local anaesthetic to be given. Cocaine paste 25% is used on wires and the mucosa is painted thoroughly. Nerve blockage is obtained with one wire far back under the middle turbinate to block the sphenopalatine ganglion. The anterior ethmoidal nerves are blocked by a wire between the nasal bones and septum. If the inferior meatus is to be entered a further probe is inserted here as well.

Silver is used for the wires as it is malleable and bends if the patient were to have a vasovagal attack and fall forwards. These attacks are prevented by premedication and performing the local anaesthetic with the patient lying flat. Adequate time should be left for the anaesthetic to take effect. When general anaesthesia is used, an endotracheal tube and throat pack are required in addition as with all nasal surgery.

Surgery

There are different views on the type of surgery required for nasal polyps. Many patients will have infrequent recurrence and to advocate an extensive operation initially before the problem of recurrence is evident is illogical. Simple polypectomy is the treatment of choice. Polyps may be removed either by an avulsion or cutting snare or forceps such as Tilley Henckel's. Care must be taken when using forceps not to go either too medially or too far lateral. All polypoidal mucosa should be removed from the ethmoids, the lower border of the middle turbinate and the inferior turbinate.

Although intranasal ethmoidectomy is advocated by some authors, it is neither a complete nor safe operation. It is impossible to remove all the anterior and posterior ethmoid air cells without making the middle turbinate unstable. If this is lost, os is the main intranasal landmark.

External ethmoidectomy is performed through an incision medial to the inner canthus of the eye (Howarth's) or through an incision in the natural skin crease below the infraorbital margin (Patterson's). All the ethmoid cells may be removed once the orbit has been displaced laterally with the lacrimal apparatus and the anterior ethmoidal vessels divided. The anterior ethmoidal vessels provide a clue to the level of the cribriform plate. All the ethmoidal cells should be removed and the sphenoid sinus may be entered if desired. Care should be taken to open the ostium of the frontal sinus widely to prevent mucocoeles which are a late complication of surgery. There have been no trials to determine whether external ethmoidectomy prevents recurrence, although it has some advocates (Hughes, 1973).

The mucosal changes may extend into the maxillary sinus and some surgeons advise the Jansen-Horgan procedure. This is the combination of a Caldwell-Luc operation with a posterior ethmoidectomy through the antrum and an intranasal antrostomy and middle ethmoidectomy. It is rarely performed today.

The Caldwell-Luc operation may be undertaken alone for maxillary mucosal disease but, frequently, recurrent polypoidal mucosa prolapses through the antrostomy in the inferior meatus. This is exceptionally difficult to treat.

Complications of surgery

The main immediate complication is haemorrhage. This occurs at the time of surgery and is usually minimized if the operation is performed under local anaesthesia. It is often unnecessary to pack the nose when topical vasoconstrictors are used and the patient feels the immediate benefit of the improved airway. Packing will control the haemorrhage in virtually every case particularly when simple polypectomy alone is performed. Slight ooze and serosanguineous discharge occur from the raw areas for the next few postoperative days.

The other principal complications occur from damage to the cribriform plate and the orbit. The anterior cranial fossa may be entered and this may result in cerebrospinal fluid leakage only or, more importantly, meningitis and abscess formation. Complete anosmia is rare since in most cases the olfactory bulb will remain undamaged. The orbit may be entered through the lamina papyracea or through the posterior ethmoid air cells. Damage to the orbital periosteum may cause herniation of periorbital fat, medial rectus palsy, damage to the anterior and posterior ethmoidal arteries and division of the optic nerve.

Recurrence of nasal polyps is not a complication of surgery since it is a feature of the disease.

Postoperative medical care

There is no single approach to care. Some surgeons advocate a 10-day course of decongestants and steam inhalations for all patients who have undergone nasal surgery. The

role of long-term medical treatment with corticosteroid sprays has yet to be fully evaluated, but evidence suggests recurrence may be controlled (Mygind et al, 1975; Deuschl and Drettner, 1977). There are two main reasons to give corticosteroid sprays - to control this symptoms of rhinitis and to prevent recurrence.

Patients who have rhinitis and polyps do not, as a group, seem more prone to recurrence. Any trial that groups control of these symptoms together with recurrence is open to question. There is only one true test of control and that is the regimen which gives rise to fewer operations. There would seem to be no case for giving all patients who present with nasal polyps, for the first time, long-term steroids until the results of large clinical trials are available. In those patients with established disease, a one-year trial of medical treatment would seem to be appropriate. It is sometimes necessary to combine corticosteroid nose drops with an aqueous-based corticosteroid spray.

Antihistamines have virtually no place in the management of recurrence. The sedation caused by some products is unacceptable and, although non-sedating antihistamines are available, enzyme induction occurs in the liver after 6 weeks and so the effect of the antihistamine is reduced. A short course may be prescribed if the rhinitis is difficult to control.

Diets

There has been much enthusiasm recently for treating allergy to foods by exclusion diets. Tartrazine dyes are linked to aspirin pharmacologically and, since a group of patients has aspirin hypersensitivity, it would seem logical to exclude tartrazine dyes from their diet. No controlled trials have been performed, but patients frequently say that they feel better and have fewer nasal symptoms. The treatment does not harm the patient, has no side-effects and may help some of those who want to try to do something themselves to prevent recurrence.

Antrochoanal polyps

These polyps arise in the maxillary antrum and prolapse through the ostium of the sinus in the middle meatus. They hang either in the nose or, if larger, into the posterior choana. The choanal part of the polyp may be seen in the oropharynx where it pushes the soft palate downwards and forwards.

Antrochoanal polyps (Killian's polyps) are rare and probably occur in all racial groups. Like benign nasal polyps they are more common in males than females. The onset is usually before 40 years, although they may be found at all ages. The polyps tend to be dumb-bell in shape with a constriction where they pass through the ostium of the sinus. They occur usually either from the left or right maxillary sinus alone, but may rarely be bilateral. Attempts have been made to define from where in the maxillary antrum they arise. The floor and lateral wall are more common, although their site of origin cannot be determined frequently. The polyp is similar in colour to the simple types being pale white or translucent in appearance.

Histology shows a respiratory epithelium over a normal basement membrane. The ultrastructure is grossly oedematous and the cellular infiltrate is similar to ordinary polyps except that there is no eosinophilia. There have been no ultrastructural studies of the polyps.

The commonest symptom is unilateral nasal blockage, although when very large they may cause bilateral blockage. Other nasal symptoms are uncommon except for anterior nasal discharge which is usually mucoid. The polyp may not be visible on anterior rhinoscopy but is usually seen posteriorly, occasionally without the aid of the mirror.

Radiographs of the sinuses may show mucosal thickening or a completely opaque antrum. They are almost never normal on the affected side. The lateral view may show the polyp in the postnasal space.

Aetiology

Antrochoanal polyps are an entity of unknown aetiology. They are not associated with allergy, lower respiratory tract disease or sinusitis. Proetz suggested that they may be the result of a faulty development of the maxillary sinus ostium since it is always large. The ostium may be large because of expansion by the polyp but this is unlikely since there is no expansion of the posterior choana by large polyps nor is there any erosion or displacement of the middle turbinate medially.

Treatment

There is no medical treatment either preoperatively or postoperatively. Preoperative nasal preparation with a vasoconstrictor is essential. It is necessary to remove both parts of the polyp. There has been debate on the best method of removal. The approach is dictated by the age of the patient. Simple intranasal polypectomy alone will almost always be followed by recurrence. Many of the patients are young and the dentition is incomplete so that a Caldwell-Luc approach is not indicated. An antral wash out may produce straw-coloured fluid and should be performed since it may help in the dissection of the antral mucosa if simple polypectomy is performed. It is often impossible to remove the polyp through the nose, therefore it has to be delivered through the oropharynx. Larger polyps may be difficult to remove because they develop adhesions in the nose which have to be broken by blunt dissection.

A Caldwell-Luc antrostomy is the treatment of choice in adults since recurrence will be reduced. In children, once dentition is complete, simple polypectomy is replaced by the more radical procedure. All the lining of the sinus is removed together with the polyp. It is debatable whether an antrostomy into the inferior meatus is required.