RHINOLITHIASIS

By J. MORGAN (Glasgow)

MORE than 400 cases of rhinolithiasis, occurring during the past four and a half centuries, have been referred to or recorded in the literature, and probably many more cases have been treated without publication, but still the ætiology of rhinolithiasis remains essentially unknown.

Rhinoliths are diagnosed usually in adults. This fact, when considered along with the assumption that children are more liable than adults to insert into the nose, the foreign material, which often comprises the adventitious nucleus of the rhinolith; suggests that their formation requires considerable time, probably several years. In some instances the time interval from inserting the foreign substance till its recovery from the centre of a rhinolith, was believed to be known, and was usually a few years (Polson, 1943).

Various statistics have shown a preponderance of rhinolithiasis in the female. Polson (1943) in an exhaustive review of the subject estimated 56·8 per cent. female. The explanation may be, that women blow their noses less frequently and more gently than men (Seeligmann, 1892), or that women in general have a more passive attitude to physical discomforts (Jones, 1952). The natural trend of the population is important and shows a majority of females of 52·7 per cent. (Census, 1931).

Rhinoliths are usually unilateral, suggesting a non-constitutional basis, and also are probably rather more common in the right nasal cavity. The latter impression may be explained by most people being right-handed and it is probably more convenient for them and a simpler manœuvre to introduce a small foreign body into the nearer right nostril. For these reasons, intranasal foreign bodies are known to be more frequent on the right, and examination of the case-reports of one hundred consecutive patients with intranasal foreign bodies showed sixty-six were stated to be on the right side.

Proper nose-blowing by occluding each nostril in turn, is probably important in preventing rhinolithiasis, but it may be that a rhinolith has formed before a child has learned this. A child of two years, should be able to co-operate in effective nose-blowing, but much older children are frequently seen unable to do so. Where necessary, the short time taken to instruct the parent on this commonplace subject is well spent.

Rhinoliths are usually found in the lower half of the nasal cavity, midway between the anterior and posterior nares. The site may be due to the effect of gravity on the foreign body and the secretions, or to wideness

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of the nasal cavity due to deviated nasal septum, which favours stagnation of the secretions. It may be associated with the entry of the lachrymal fluid.

The source of the calcium salts in a rhinolith is believed to be mainly the inflammatory exudates (StClair Thomson and Negus, 1948). Polson (1943) states, that the principal source of calcium is pus, and that suppuration is necessary for rhinolithiasis. These opinions are probably based on the relatively high calcium content of pus and inflammatory exudates as compared with normal nasal secretions. It is suggested that owing to the probable slow formation of a rhinolith, minor variations in the mineral salt content of the various types of nasal secretions are of little ætiological importance. It is doubtful if normal lachrymal fluid contains any calcium. Ridley (1930) did not detect any, but Polson (1943) quotes Demarquay (1845) as having reported traces of calcium in the lachrymal fluid. The composition of the lachrymal fluid will, of course, vary according to the method and site of its collection, and with the state of the lachrymal apparatus.

Controversy exists as to the pH of the normal nasal secretions, while nasal pus is acid and lachrymal fluid is alkaline. The pH of the secretions in the nasal cavity will probably determine the chemical composition of a rhinolith; oxalates tend to be deposited in an acid medium producing a hard calculus, and phosphates in an alkaline medium, their amorphous variety being friable. Changes in the pH may cause actual precipitation of crystalloids held in a super-saturated solution, as might happen when a little concentrated acid nasal pus comes into contact with alkaline lachrymal fluid, resulting in a precipitation of earthy phosphates.

Predisposing factors in rhinolithiasis are excessive nasal secretion and suppuration, as a source of mineral salts, and hypertrophic rhinitis, septal spurs and crests, deviated septum and narrowed nostrils (Brown, 1859) which favour stagnation and drying of the secretions, with concentration of their chemical constituents. It may be impossible to decide if a deviated nasal septum is a cause or effect of rhinolithiasis. The rarity of rhinolithiasis in atrophic rhinitis, where crusts afford potential endogenous nuclei, may be due to diminished secretions; there are, however, enough secretions to form the crusts. Polson (1943) stated that no rhinolith had been shown to have a crust as a nucleus. Such proof is difficult, as with the passage of time and decomposition, crusts are unlikely to be recognized.

Rhinolithiasis is a condition associated with the formation of rhinoliths, and it is probably unfortunate that this term should be so little used, as it undoubtedly creates a broad mental concept of a condition, in which the established rhinolith could be regarded almost as a complication, or at any rate as a late, but not necessarily the last stage of the pathology. On the other hand, simple removal of the rhinolith is usually curative, so that the tendency to regard a rhinolith as an entity is justified therapeutically.

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Rhinolithiasis

Rhinoliths are now classified exogenous and endogenous according to the nucleus found. A third group, of unknown origin, is probably necessary for those rhinoliths in which no identifiable nucleus is found and which cannot be classified as endogenous merely because no exogenous nucleus is discovered, however intensive the microscopic examination. The nucleus is usually exogenous. Children excepted, inserting and allowing a foreign body to remain in the nose, suggests a poor mentality, amounting usually to a personal carelessness, rather than a psychical abnormality. Perhaps extroversion, which is generally associated with a lower intelligence than introversion, explains the lack, or disregard of symptoms. Acknowledged symptomless rhinoliths are reported (Cowie *et al.*, 1954).

In general, the first stage in rhinolithiasis is the reaction of the nasal mucosa to the foreign body. This varies from a slight rhinitis to ulceration and hæmorrhage (StClair Thomson and Negus, 1948). A large nasal foreign body is likely to cause commanding symptoms by obstruction, or by trapping nasal secretions which become infected. An object with irregular surfaces or which is absorbent, retains secretions, and the resulting symptoms of infected stagnant secretions are likely to lead to an early correct diagnosis. A small smooth foreign body may cause little or no symptoms, and is thus apt to be associated with rhinolithiasis. Mild infection probably supervenes in most cases. The role of infection in the incrustation is unknown, but it may be that the micro-organisms affect the proteins in the secretions and alter their buffer action, or their colloidal action which is keeping the crystalloids in solution. Bacterial action may further alter the pH by splitting ammonia and carbon dioxide from the urea of the lachrymal fluid. The physical-chemical explanation of how the surface of a foreign body induces salt deposit from a saturated solution is not fully known, but in the nose the foreign body probably affords the most stable surface for calcium salt deposit, the nasal mucosa continually changing. Occasionally concentric layers of calcification are seen in a rhinolith (Brown, 1859), but apart from denoting periods of varying calcifying activity, relationship to infection is not clear.

Complications of rhinolithiasis, apart from sinusitis, are rare. Price-Brown (1900) referred to facial paralysis and perforation of the palate, while Polson (1943) listed "rhinitis caseosa", middle-ear disease, septal abscess and septal perforation. The only fatal case recorded was complicated by orbital abscess and meningitis (Key Åberg, 1921).

Rhinoliths are uncommon but not rare, and of the four I have encountered in the last three years, one was associated with perforation of the palate.

Case Report

A quiet-spoken housewife, aged 54 years, apparently of average intelligence and incidentally right-handed, complained of a recent profuse

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epistaxis from the right nostril. There had been very slight epistaxes many times in the past five years, always from the right nostril and often brought on by nose-blowing. Epistaxis was her sole complaint, she denied having faceache, headache, anosmia, cacosmia, nasal discharge or obstruction, bouts of sneezing or susceptibility to "colds", epiphora or conjunctivitis or any aural symptoms. She denied also having inserted anything into the nose, even to stop the bleeding. Her daughter had noticed a slight nasal fœtor occasionally during the last two months.

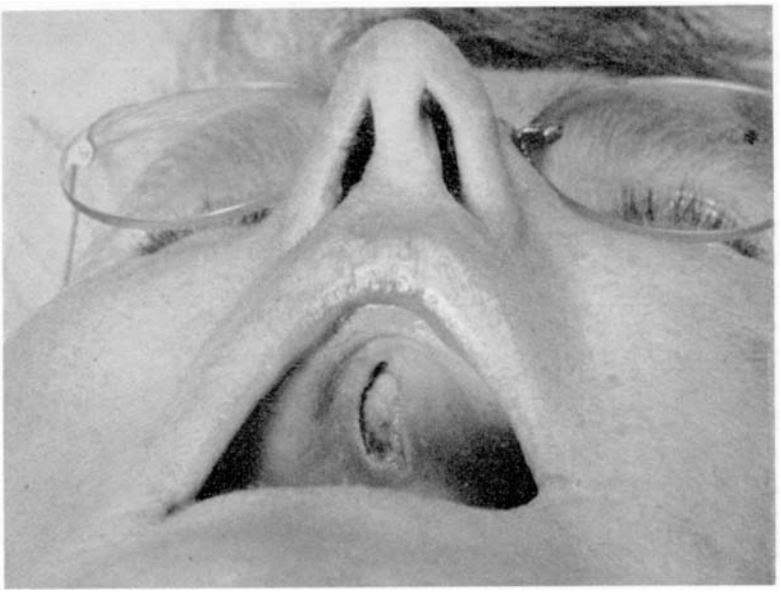


FIG. 1.
Perforation of the palate with rhinolith *in situ*.

Examination showed a rhinolith in the lower right nasal cavity, but no fœtor, discharge, polypus or macroscopic evidence of cholesteatosis was detected. On removing the dentures a perforation was seen in the hard palate to the right of the midline. The perforation was oval in shape with smooth edges and no scarring, and measured approximately 2·5 cm. by 1 cm. A rhinolith was filling the perforation and was easily rocked by probing in the nose, but it could not be displaced upwards, probably because of its wedge shape and prolongations below the turbinates.

A full general history and examination threw no light on the nasal pathology and the blood Wassermann and Kahn tests were repeatedly negative.

Figs. 1, 2, and 3, show the case pre-operatively.

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Treatment

Under general anæsthesia with endo-tracheal intubation, plus topical cocaine and adrenalin solution, the concretion was partly crushed, during which slight fœtor was noted, and removed *viâ* the anterior naris. There was moderate bleeding which soon stopped. No erosion of lateral nasal wall or septum was found, but the latter was deflected to the opposite side.

Mucosal biopsy from inferior and middle turbinates showed chronic inflammatory tissue with iron-containing macrophages. The parts of the

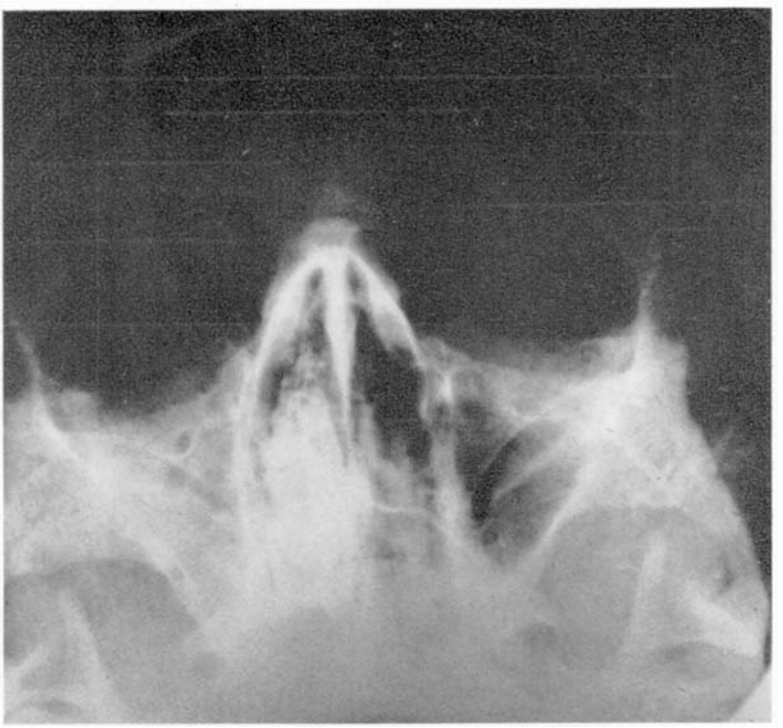


FIG. 2.

Rhinolith in lower part of right nasal cavity with opacity of neighbouring maxillary antrum.

rhinolith were examined carefully but no definite nucleus found. The dry weight, obtained by heating at 100° C. in an electric oven to a constant weight (for approximately two hours), was 7·2 gm. Emerson and Grohowski (1949) estimated the water content of a rhinolith at 4·4 per cent., so that allowing for loss of weight by dehydration, the fresh weight of this specimen would not have exceeded 8 gm. The rhinolith in Abu-Jaudeh's case (1951), weighed 116 gm., required removal by lateral rhinotomy and was associated with much destruction of the septum and lateral nasal wall, but there was no perforation of the palate. It is obvious.

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that size alone does not determine whether perforation of the palate will occur.

Chemical analysis of the present rhinolith revealed calcium 27·9 per cent., phosphate 47·2 per cent., along with carbonate and oxalate and a little magnesium. Bacteriological investigation of the rhinolith by direct smear showed a heavy mixture of Borrelia and Fusiform bacilli of Vincent's type, and culture yielded a very scanty mixed flora of micrococci and streptococci. Vincent's organisms, which are difficult to culture,



FIG. 3.
Rhinolith with posterior prolongation resting in defect of bony palate.

are usually commensal, anaerobic or micro-aerophilic obligate parasites and are often detected in necrotic lesions, but their role in pathology in general is not clear. In rhinolithiasis the role of bacteria may be important, Watson Williams (1901) suggested the presence of micro-organisms might attract the lime salts of the nasal secretions.

Discussion

Perforation of the palate may be caused by syphilis, acute pyogenic infection and lupus (Syme, 1927). StClair Thomson and Negus (1948)

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referred to a case of "rhinitis caseosa" with perforation of the palate. In the present case there is no evidence that cholesteatosis was associated with the rhinolithiasis.

The upper denture which the patient has worn daily for 27 years was quite smooth on its palatal aspect. It is possible the denture prevented distension of the palate by exerting counter-pressure, especially during mastication, to the steady pressure of the enlarging rhinolith and thus accelerated the occurrence of perforation. Bovill (1886) describes a case of rhinolithiasis with displacement of the palate.

Rhinolithiasis has to be distinguished from syphilitic sequestration, calcified polypus, osteoma, necrotic bone, malignancy, chronic sinusitis and nasal cholesteatosis. The possibility of there being a double pathology should be borne in mind.

Conclusion

Perforation of the palate associated with rhinolithiasis may be of ætiological importance as in the case described by Walker (1950), where a cleft-palate repair was incomplete. In the present case, the site of the perforation, corresponding to the middle part of the floor of the nose, together with the absence of evidence of other pathology, suggests that perforation complicated the rhinolithiasis. Such a complication is rare and should become even more so, because of routine medical examinations at school, work or in the Armed Services, so that cases may be expected to be diagnosed earlier, before becoming complicated.

The patient was apparently symptom-free when last seen five months after the operation. The perforation is essentially unchanged and is completely covered by her upper denture. The right nasal cavity is roomy, but the mucosa is moist and there is no crusting. An unusual feature is the marked atrophy of the inferior turbinate. There is a narrow adhesion from the posterior end of the middle turbinate to the septum and a small perforation in the posterior part of the septum, both of which may have been caused during the operation. There is no sign of infection. Further X-ray shows the right nasal cavity to be free of opaque rhinolith fragments, but the opacity of the right maxillary antrum remains. Instruction has been given, always to wear her dentures while eating or drinking. Re-examination will be done at infrequent intervals and should her symptoms and signs warrant it, bearing in mind her unreadiness to complain, surgical closure will be advised.

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REFERENCES

ABU-JAUDEH, C. N. (1951) *Laryngoscope* (*St. Louis*), **61**, 271.
BOVILL, E. (1886) *Brit. med. J.*, **2**, 718.
BROWN, W. N. (1859) *Edinb. med. J.*, **5**, 501.
Census of England and Wales (1931) **1**, 68.
COWIE, H., HINCHCLIFFE, R., and WILLIAMS, D. P. C. (1954) *J. Laryng.*, **68**, 250.
DEMARQUAY (1845) *Arch. gen. Med.*, **8**, 174.
EMERSON, E. B. Jr., and GROHOWSKI, A. L. (1949) *Med. Radiogr. Photogr.*, **25**, 49.
JONES, R. F. M. (1952) *J. Laryng.*, **66**, 462.
KEY-ÅBERG, H. (1921-22) *Acta Oto-laryng.* (*Stockh.*), **3**, 449.
POLSON, C. J. (1943) *J. Laryng.*, **58**, 79.
PRICE-BROWN, J. (1900) Diseases of the nose and throat. New York, p. 110.
RIDLEY, F. (1930) *Brit. J. exp. Path.*, **11**, 217.
SEELIGMANN, M. (1892) Inaug. *Dissert. Heidelberg.*
SYME, W. S. (1927) Handbook of diseases of the nose, throat and ear, p. 146, Edinburgh.
STCLAIR THOMSON, and NEGUS, V. E. (1948) Diseases of nose and throat, 5th edit., p. 142 and p. 199. London.
WATSON-WILLIAMS, P. (1901) Diseases of the upper respiratory tract, p. 296. Bristol.
WALKER, A. S. (1950) *J. Laryng.*, **64**, 21.

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