RHINOLITHS

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Rhinoliths, or nasal calculi, are comparatively uncommon. An exhaustive review some years ago (Polson, 1943) noted that something over 500 reports has appeared in the literature since the condition was first mentioned by Mathias di Gardi in 1502.

Details of further rhinoliths have been published more recently (Lord, 1944; Walker, 1950; McNab Jones, 1952; Jarvis, 1966, etc.) and attention drawn to other previously recorded instances (Cunningham et al. 1945).

In view of the relative rarity of rhinolithiasis it was considered that a review of 10 cases seen by the author might merit some attention.

The late Sir William Milligan (1896), one of the most illustrious predecessors of the University to which I am attached, describing a case, summed up the essential features as follows "Rhinoliths may occur with various foreign bodies as their nucleus, or they may even collect round such things as small blood-clots. Usually they consist of carbonate or phosphate of lime".

At that time a distinction was usually made between true rhinoliths, in which no central nucleus was discovered, and false stones within the substance of which a foreign body was embedded (Cozzolino, 1893).

Today, a more acceptable definition is into exogenous, where the centre consists of a previously inserted foreign body, and endogenous, in which the centre is derived from autogenous body elements such as inspissated mucus, blood clot, bone or a misplaced tooth (Polson, 1943; Thomson and Negus, 1948).

Concentric layers of various inorganic salts are gradually deposited around the nucleus. Calcium, magnesium and sodium carbonate; calcium and magnesium phosphate; calcium, magnesium and iron oxide, and phosphorous pentoxide, have all been reported. Oxalic acid has been found, particularly in rhinoliths containing cherry stones. This has been a commonly observed nucleus, itself containing oxalic acid, the obvious source, therefore, of this substance.

Mucin, protein, and sodium chloride may be present. They are derived from,

1. Mucus-secreting glands in the nasal mucous membrane,
2. Tears produced by the lachrymal glands, entering the nasal cavity by way of the naso-lachrymal duct, and
3. Inflammatory exudates induced by the irritation of the calculus itself.

In appearance the stones are usually rounded, often with a rather gritty surface. The colouration varies from white through pale grey, lemon yellow, light or dark brown to a dull red haematinic or even blackish appearance, parti-

cularly when blood elements have been assimilated as a result of bleeding from surrounding tissue damage.

Projections extending into the recesses of the inferior and middle meatus and into the post-nasal space may result in stones having an appearance somewhat reminiscent of the staghorn calculi of renal origin.

One such rhinolith, its surface black and craggy, was encountered in the left nasal passage of a hypertensive lady, 65 years old. After preparing the nose with a local surface anaesthetic containing equal quantities of 10% cocaine hydrochloride and 1 in 1.000 adrenaline solution, this was removed by morcellement, using a pair of Luc's forceps, as an out-patient procedure. No foreign body was found in the fragments and it was considered probable that the stone had formed around blood clots resulting from repeated epistaxis secondary to her hypertension. Incidentally, haemorrhage has been said to be the main operative hazard during removal and may sometimes be severe (Gorman, 1930).

This lady presented with the symptoms commonly seen in this condition. Although bilateral rhinoliths have on rare occasions been reported (Nitsche, 1891; Hopmann, 1900; Birman-Bera, 1931; McNab Jones, 1952), the presentation is almost always one-sided.

The symptoms may be slight, vague, and similar to those produced by any nasal foreign body, usually with unilateral obstruction, discharge which may be excessive, mucoid or purulent, sometimes with an extremely offensive odour, and possible accompanied by epistaxis.

On occasion, however, a rhinolith may only come to light because of secondary symptoms originating from it. Accompanying sinusitis, otitis media, nasal deformity, and even signs suggestive of malignancy have all been described.

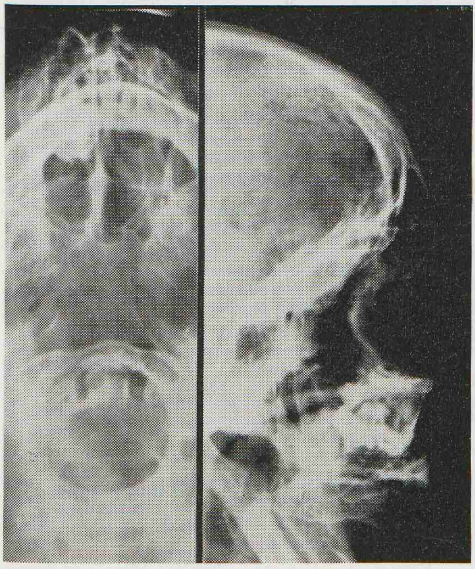


Figure 1. Which had a button as its nucleus.

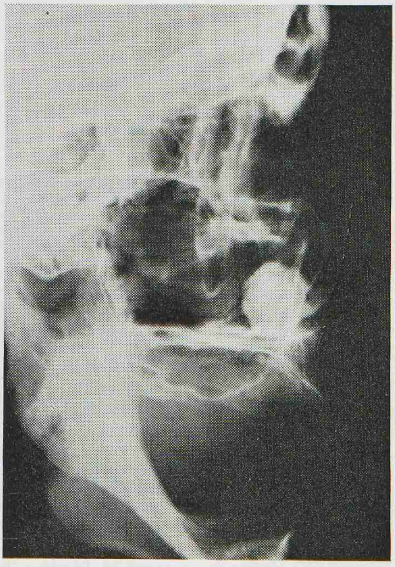


Figure 2. Radiograph of rhinolith. This had a bead in the centre.

A 66 year old housewife was referred because of vertigo of 3 months' duration. She had an active right chronic suppurative otitis media and a dry left central perforation but in this ear there was a marked sensori-neural deafness. A right sided nasal discharge of many years' duration proved to be associated with the presence of a large white impacted rhinolith (Figure 1), lying about half-way along the floor of the nasal cavity.

Removal under a general anaesthetic revealed a small button made of bone embedded in its posterior aspect.

Diagnosis is simple, a rock-like sound being obtained when the stone is tapped or scraped with a metal probe. X-rays are conclusive (Figure 1).

Although these cases frequently provide a little light relief from some of the more serious rhinological lesions, extraction of a rhinolith may on occasion require a considerable amount of ingenuity. The exhilaration of successful delivery should not however cause one to omit a careful search for any co-existing pathology which may also be present in the nose, sinuses, or ears.

The commonest aetiological factor in the eventual causation of a rhinolith is the insertion of a comparatively inert foreign body such as a button, bead, stone or small plastic toy into the nostril during early childhood. Trauma and the vomiting of foreign material into the posterior nares are rarer causes.

All too frequently infants experimentally push an assortment of miscellaneous objects into their various bodily orifices. Then, either because no apparent harm results, or in fear of possible parental wrath, no mention is made of the incident. It is often only many years later, when a calculus has formed, that the matter eventually comes to light.

The rate of growth varies enormously. Although sizeable rhinoliths have been removed from young children, enlargement to a size sufficient to result in symptoms may progress over several decades.

Another of my late predecessors, Lindley Sewell (1909), dealt with a rhinolith in which the nucleus was the metal ring of a shoe button. This had been placed in the nose 44 years previously.

I had always tended to suspect that in some way the parents must be at fault when a child secreted foreign objects within its nose.

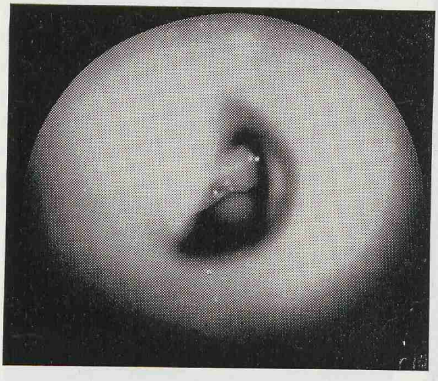


Figure 3. Partially extracted foreign body in left nostril.

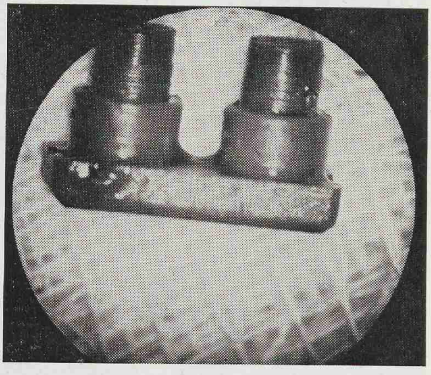


Figure 4. Building block after removal. This might well have formed the nucleus for a rhinolith if left.

This opinion was changed radically, however, when at the tender age of two years my own son picked up a button, examined it quizzically for a few moments and then, before my very eyes, slipped it into his nostril.

I have wondered since whether perhaps I was not a little too precipitate in extracting it there and then. It might have proved an interesting study to observe the natural history of developing rhinolithiasis in vivo during the next few years.

Many types of foreign body can form the nucleus of a calculus. For photographic purposes this picture (Figure 3) was taken after partial extraction under a general anaesthetic. The child's parents did not know what the object was. On removal it was seen to be quite a sizeable plastic building block (Figure 4).

Had this not been removed it might well have culminated in the formation of a rhinolith, similar to one found in a 35 year old woman (Figure 5). Rather appropriately, her somewhat unusual occupation was that of a female stonemason.

In this respect it is interesting to speculate whether the dust from her chosen calling may have accelerated the rate of growth of her rhinolith. Indeed, rhinoliths have been considered to be an industrial hazard. In cement workers an incidence of nasal calculi as high as 10% has been stated to occur (Betz, 1893). It has, however, been pointed out (Polson, 1943) that only one such case has actually been recorded (Smith, 1922). Symptoms in one case in

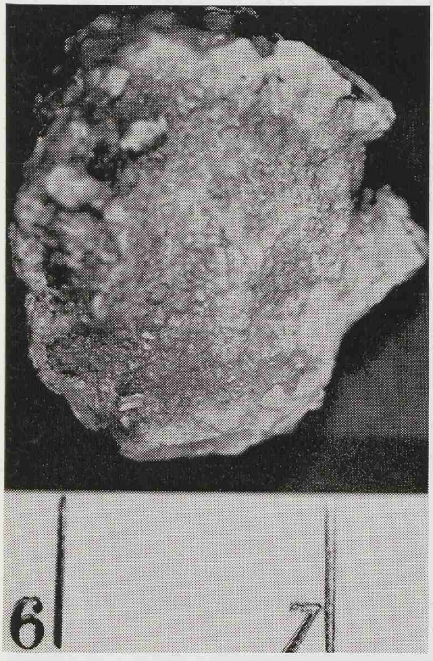


Figure 5. Nasal calculus removed from a 35 year old female.

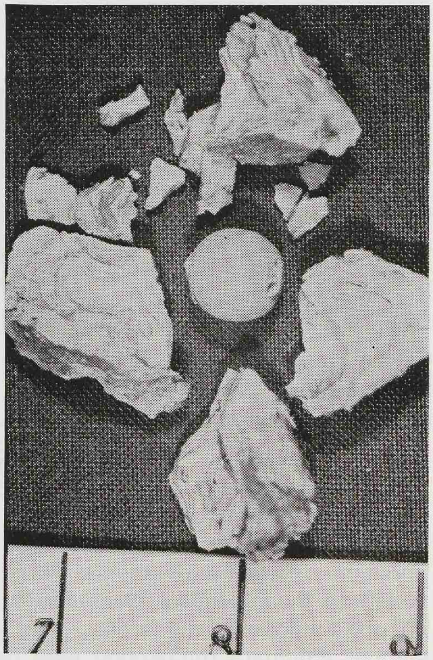


Figure 6. Rhinolith in Figure 5. After being split open. Note the concentric layers deposited around the bead which formed the nucleus.

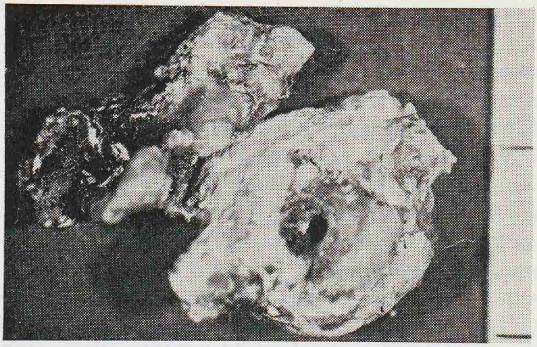


Figure 7. Irregular 'staghorn' calculus. Dark surface deposits from altered blood. The black circle was the bead around which formation had occurred.

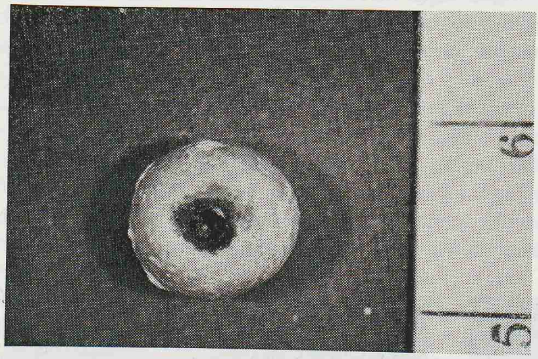


Figure 8. Bead which was the nucleus of the stone shown in Figure 7.

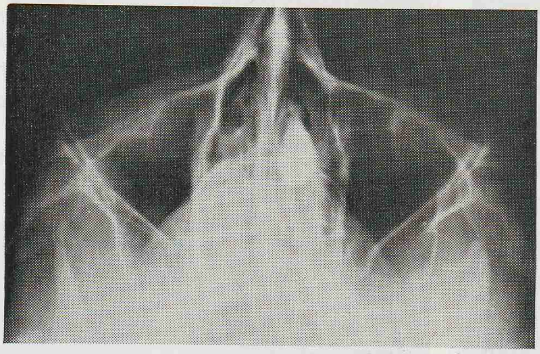


Figure 9. Radiograph which led to the discovery of rhinolith shown in Figures 7 and 8.

the present series, to which reference will be made later, originated at a time when the patient was working in cement dust.

Returning, however, to the lady stone-cutter, she attended with the all-too-common self-made diagnosis of "catarrh". This was in fact a persistent unilateral mucoid nasal discharge of many years duration. As unfortunately so often happens, numerous nasal drops and sprays had been prescribed without adequate rhinoscopy ever having been performed.

Once the left nasal airway had been carefully mopped out, the most striking feature was the presence of a rounded, slimy yellowish-grey object. This produced the characteristic solid sound when probed.

Extraction under local surface anaesthesia was accomplished through the anterior naris by hooking the curved tip of an eustachian catheter over its upper surface. Gentle pressure applied to the posterior surface then enabled it to be dragged forwards along the floor of the nasal chamber and levered out through the nostril intact. Occasionally it may be preferable to push a stone backwards into the post-nasal space, removing it then through the mouth. In rare instances with rhinoliths of great size, extraction through a Rouge's approach has been necessary (Botey, 1960). More rarely still a Moure's lateral rhinotomy may be indicated, as may a Caldwell-Luc operation for a stone within the antrum.

Although it is said that rhinoliths are often friable and tend to crumble easily, this has not usually been my own experience.

This particular stone was remarkably solid. The surface had the mammilated, pumice-stone like appearance so frequently described.

A deft blow with a mastoid mallet revealed the cause of origin (Figure 6). The layers of successively deposited mineral salts, reminding one of the geological strata seen in sedimentary rock formations, are well seen.

When shown the bright orange bead in the centre, the patient's face lit up with recognition. She then suddenly recalled pushing the bead up her nostril when she was 6 years old. Her mother looked in her nose and said it had gone, and from that day onwards she had never given it another thought.

By a remarkable coincidence, a similar left-sided rhinolith presented shortly afterwards. The patient was a more elderly woman, 60 years of age, and the calculus (Figure 7) of the irregular staghorn variety, of a darker hue in parts, due to the incorporation of haemosiderin deposits.

The black-looking pupil of the somewhat ominous cycloptic eye peering out of the stone, was the foreign body nucleus. When its rock-like surroundings were chipped away, this proved to be an almost identical, but not quite so elegant, orange bead (Figure 8).

The patient vehemently denied all knowledge of any such object ever having been inserted in her nose. Her presenting symptom had been a secondary frontal sinus infection and the presence of a stone was first brought to light when she was X-rayed on account of her headache (Figure 9). She was most aggrieved that these pains were almost instantly relieved by the extraction of her rhinolith under local anaesthesia. Her symptoms had been the basis of a medicolegal claim. When confronted with the bead, the real cause of her

Figure 10. Rhinolith from a 38 year old female.

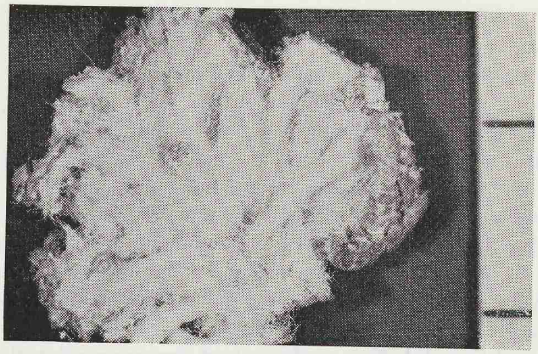


Figure 11. Woven blanket material around which the stone shown in Figure 10 had formed.

headaches, she realised with dismay that all hope of obtaining substantial compensation for her head pains, had disappeared.

The majority of published reports indicate a marked female preponderance where rhinoliths are concerned. In one large series (Key-Aborg, 1921), 73% occurred in women. This female predilection is borne out in the present review, 7 out of the 10 being found in women, 70%.

Various theories have been advanced as to why this should be. It has been suggested that women are endowed with a more passive outlook on physical discomforts (McNab Jones, 1953) or that they blow their noses less violently and less frequently than men (Seeligmann, 1892). Any rational explanation, however, seems obscure. Perhaps hormonal or vascular changes associated with the menses play some part. Possibly some curious Freudian urge is responsible. May it be that phallic symbolism is at the root of this desire for inserting innanimate objects within the comfortable enclosure of this particular body cavity?

This may well provide psychiatrists with food for thought, as may the next case, also female and 38 years old.

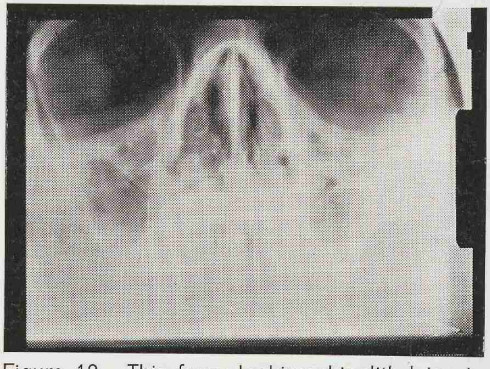


Figure 12. This fuzzy looking rhinolith lying in the right nasal passage contrained strands of wool in its interior.

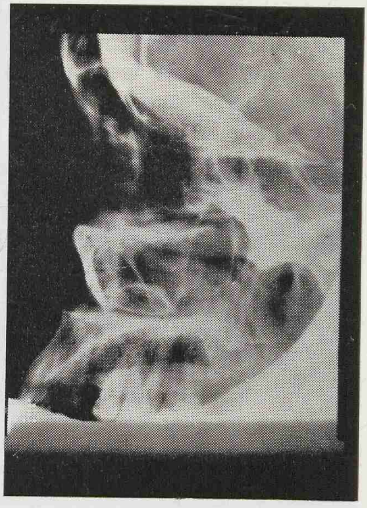
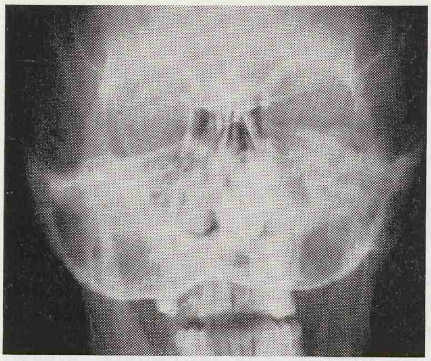


Figure 13. Lateral radiograph showing peripheral calcification around the woollen nucleus, producing a hollow appearance.



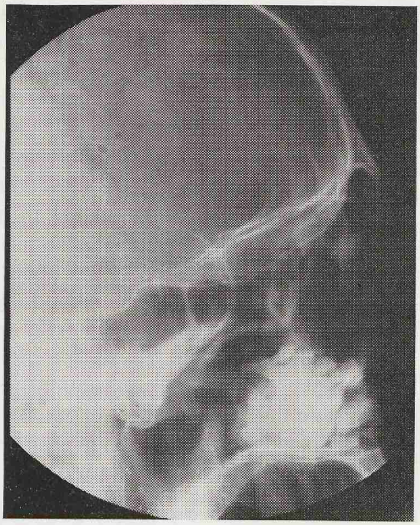


Figure 14. Left rhinolith associated with right mastoiditis.
Figure 15. Lateral radiogram same case as Figure 14.

No remembered foreign body history could be elicited concerning this calculus (Figure 10) which again was removed using a local anaesthetic spray from the right nasal airway. Its centre proved to be a portion of woven blanket material, dating presumably from childhood insertion more than 30 years previously (Figure 11). That a soft centre was present could be deduced from the X-rays. These showed a less dense stone than usual (Figures 12 and 13).

With regard to the male cases in the present series, one rhinolith was discovered quite by chance on routine clinical examination in a 40 year old man who had been referred for tonsillectomy. A greyish white calculus with a slightly roughened surface, about the size and shape of a haricot bean was observed lying beneath the middle of the inferior turbinate in the inferior meatus on the left hand side. Removal was simply effected by hooking it forwards with a curved blunt probe.

It had caused no symptoms, produced no local reaction within the nose, no history as to its presence could be elicited and on being pulverized no recognisable nucleus was discovered.

The second male was a 36 years old shoe worker. For 8 years he had noticed a foul-smelling, purulent, sometimes bloodstained discharge from the right nostril with nasal obstruction and increasing frontal headaches for the previous 3 yours.

The right nasal airway was almost completely blocked by a severely deviated septum. He was listed for submucous resection and, at operation, when the mucosa had been decongested with adrenaline a blackish foreign body was visible on the nasal floor posterior to the deviation. This was gritty when probed but only a small portion could be removed before the resection was performed. When this had been done the remainder of the rhinolith, which was the size of a small cherry, was seen lying in the posterior portion of the inferior meatus. It was removed, found to crumble easily, but there was no obvious nucleus, nor could any history be remembered that might have

accounted for its presence. Antral lavage was clear and on review one month later his nose was clean and he was completely symptom free.
A similar case of an unsuspected rhinolith being revealed during the performance of a submucous resection has been reported previously (Polson, 1943).
The septum may be perforated by a rhinolith or may be severely deviated as a result of pressure from its continued enlargement.
A 65 year old man presented with a right acute-on-chronic mastoiditis which required operative treatment.
The condition was found to be associated with a severe deviation of the nasal septum to the same side caused by a large rhinolith in the opposite nostril (Figure 14). This was a dark red evil-smelling stone with considerable surrounding hyperaemia. It was removed by fragmentation under general anaesthesia and the septum subsequently resected (Figure 15).
Nasal symptoms had been present for many years and had first been noticed at a time when he had been working in cement dust. Some previous nasal procedure had been performed, possibly antral lavage (Figure 16).

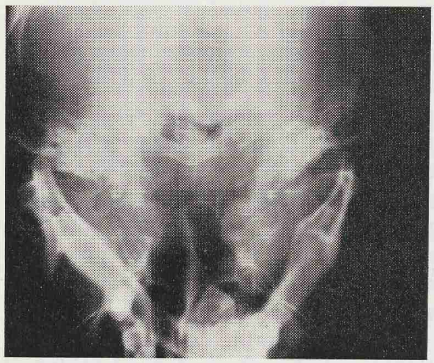


Figure 16. Basal X-ray showing position of rhinolith in anterior nasal fossa-same case as in Figures 14 and 15.

The specimen (Figure 17) was reported on and analysed by Dr. A. H. Gowenlock, Consultant Chemical Pathologist, United Manchester Hospitals.
The external surface was covered with dark material, smoothly irregular, forming a cast of the nasal cavity. This coating consisted of foul-smelling blood stained mucopus containing gram positive and gram negative cocci, and gram negative bacilli. Pneumococci had been cultured from the mastoid.
The total "dry" weight was 11.67 grammes. The average density of the largest fragment was 2.15 g/ml.
The fractured surfaces had a stratified appearance. The texture was moderately hard and fragments fractured with flaking on pressure.
The largest fragment was traversed by a number of fine dark channels, suggesting that a tangled piece of thread had acted as a primary focus, the material later decaying.
Calcium, magnesium, phosphate and carbonate were present on simple qualitative testing.
The approximate composition in grammes per 100 grammes of "dry" powdered rhinolith was as follows:

Table I

Water	3.35	Potassium	0.35
Organic matter	11.7	Iron	0.010
Inorganic matter	85.0	Phosphorus (as P)	14.6
Calcium	33.0	Carbonate	23.5
Magnesium	0.86	Oxalate less than	0.3
Sodium	0.88		

This corresponds with the following composition in equiv./kg.

Table II

Cations		Anions	
Ca^{++}	16.4	Co_3^{--}	7.83
Mg^{++}	0.71	HPO_4^{--}	9.45
Na^{+}	0.38	oxalate	0.07
K^{+}	0.01	other	0.15
Total	17.50	Total	17.50

The inorganic matter thus contains calcium carbonate and calcium phosphate as major constituents with much smaller amounts of magnesium and sodium salts. Iron and potassium occur as trace elements.

There is wide variation in the reported analytical figures for rhinoliths. The published constituents have been within the following limits (Polson, 1943):

Table III

Water	2.9 — 6.9 %
Organic matter	13.2 — 31.9 %
Calcium phosphate	44.7 — 79.5 %
Magnesium phosphate, traces	— 19.46%
Calcium carbonate, traces	— 20.69%

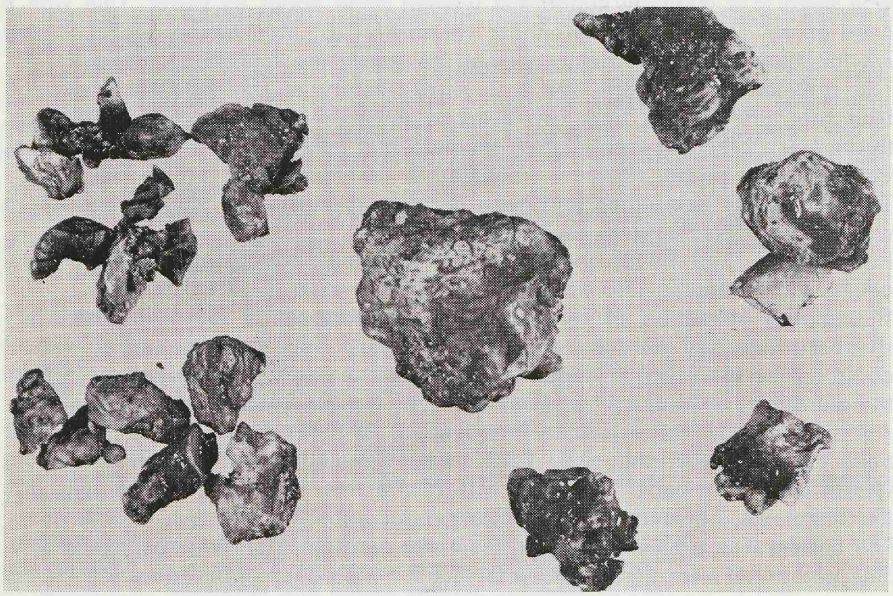


Figure 17. Rhinolith after removal by fragmentation. The large central stone contained a nucleus of decayed tangled threads.

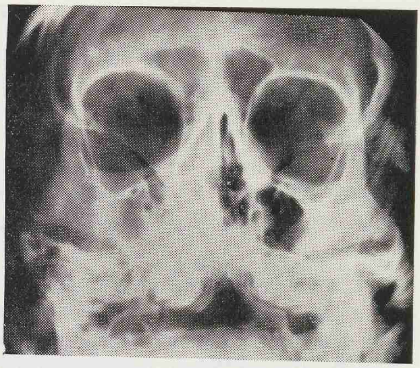


Figure 18. Lateral radiograph of rhinolith occupying right nasal cavity and extending into right antrum.
Figure 19. Radiograph of case shown in Figure 18 demonstrated involvement of maxillary antrum.

The specimen just described was relatively large and contained more calcium carbonate than usual, probably because calcium salts are more readily deposited as a rhinolith enlarges. The small amounts of iron probably arose from altered blood incorporated in the surface layers accounting for the dark surface colouration.

Another case of mastoiditis associated with a deviated septum and a rhinolith, was seen in a mentally subnormal woman aged about 35 years. This was a case of my colleague, Mr. Kenneth Harrison. I assisted at the operation and am indebted to him for being allowed to record the following details.

The presenting complaint was a 2 years' history of foul-smelling discharge from the right nostril. There was a gross deviation of the septum to this side, the mucosa bleeding freely when touched and no clear view being obtained. Passage of a probe, however, revealed an obvious solid foreign body.

Three previous operations had been performed on the left mastoid and there was a freely discharging cavity.

Radiographs (Figure 18) showed a large rhinolith occupying the right nasal cavity and extending into the right maxillary antrum (Figure 19).

Submucous resection of the nasal septum exposed a large greyish-white rhinolith. This had partially eroded the septum and the naso-antral wall. It could not be extracted through the anterior naris and had to be delivered from the antrum by a Caldwell-Luc approach. The size was that of a ping-pong ball.

Antral rhinoliths are extremely uncommon. Only 8 cases are said to have been described (Wright, 1927; Lord, 1944; Cunningham et al., 1945). I would like to close this paper therefore with a brief record of one further antrolith, the diagnosis, however, being entirely radiological (Figure 20).

The patient was a 54 years old woman who worked in an engineering factory. She presented with vertico-occipital headaches of 2 months' duration. These were considered to be due to stress and associated with hypertension. Routine investigations included sinus X-rays, the result being as shown. Within

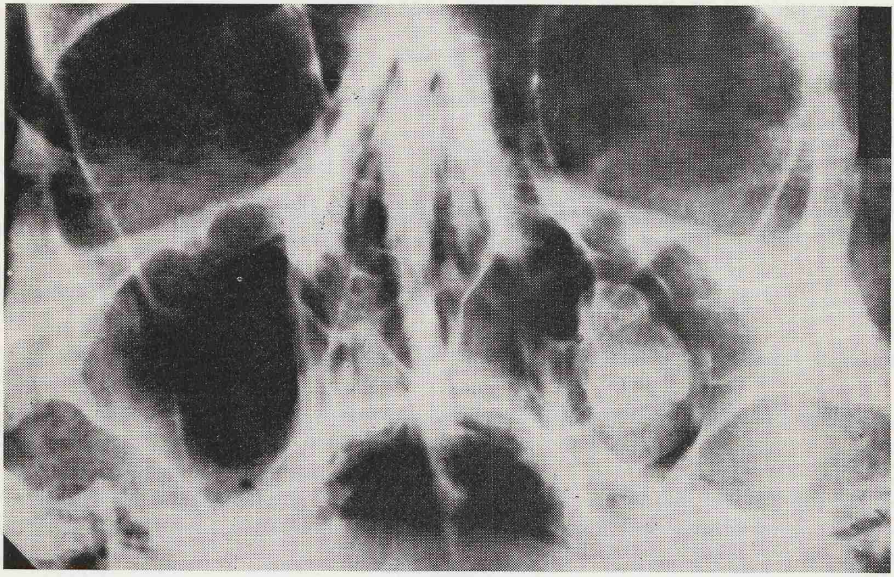


Figure 20. Left antrolith. Note destruction of the naso-antral wall.

the left maxillary antrum was a sharply defined opacity of irregular outline. A deficiency in the left naso-antral wall is evident.

Thirty three years previously she had fallen on the rim of a tub, injuring her left maxilla and subsequently she said she had undergone operative treatment for a "dental cyst".

At the time of her examination, the headaches had disappeared, there were no local symptoms referable to either antrum or nose, and the latter was clean and patent with no evidence of either rhinolith or foreign body within the nasal cavity. In view of her complete lack of symptoms, operative treatment was declined.

The X-ray appearances are however those such as one might expect to find where a rhinolith originating in the nose, erodes the lateral nasal wall and drops through into the antral cavity.

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