

Airway obstruction with stridor due to nasal secretions

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Abstract

Two cases of non-fatal airway obstruction by nasal secretions are described. The diagnosis was made after laryngoscopy and the features which suggested this previously undescribed aetiology were: depression of conscious level; poor oral hygiene; and irregular friable mass with mucoid areas obstructing the airway. The diagnosis was confirmed by histological examination of the obstructing material which was composed of laminated fragments of squamous epithelium, keratin debris and mucus. It is suggested that these masses form in the post-nasal space and then become dislodged descending into the larynx, where they cause partial laryngeal obstruction and stridor.

In patients whose conscious level is depressed and who have poor oral hygiene, nasal secretions should be considered as a cause of sudden unexplained airway obstruction and stridor.

Key words: Larynx; Laryngoscopy; Respiratory sounds; Nasal mucosa; Oral hygiene

Introduction

Laryngeal stridor occurs when there is partial obstruction of the larynx due to acute swelling in allergic or inflammatory reactions, laryngeal tumour, laryngeal spasm, bilateral vocal fold paralysis and inhalation of a foreign body. The nature of the obstruction is established by laryngoscopy and the airway can be cleared of foreign

material. Stridor due to impacted secretions has only been reported once before where the diagnosis was made at postmortem (Leadbeater and Douglas-Jones, 1989). We describe two further cases of this phenomenon.

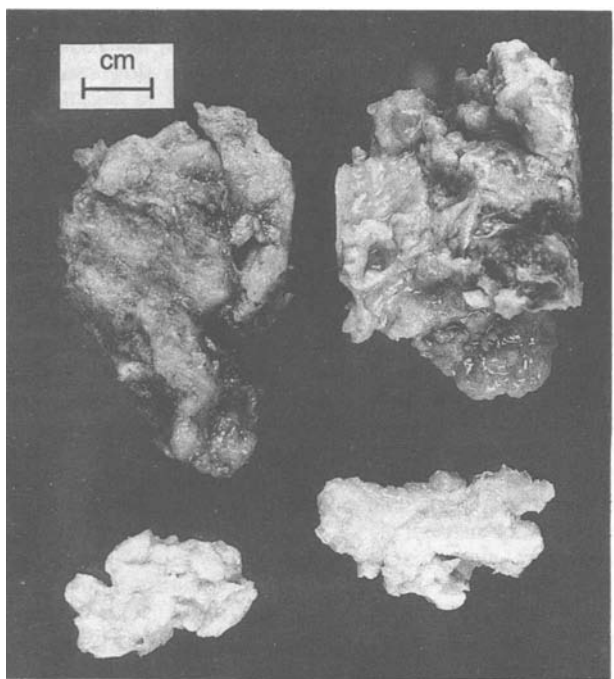


FIG. 1.

Gross appearance of the pieces of material removed from the larynx of *Case 1*. The surfaces are rough and irregular. Pieces of material readily became detached indicating the friable nature.

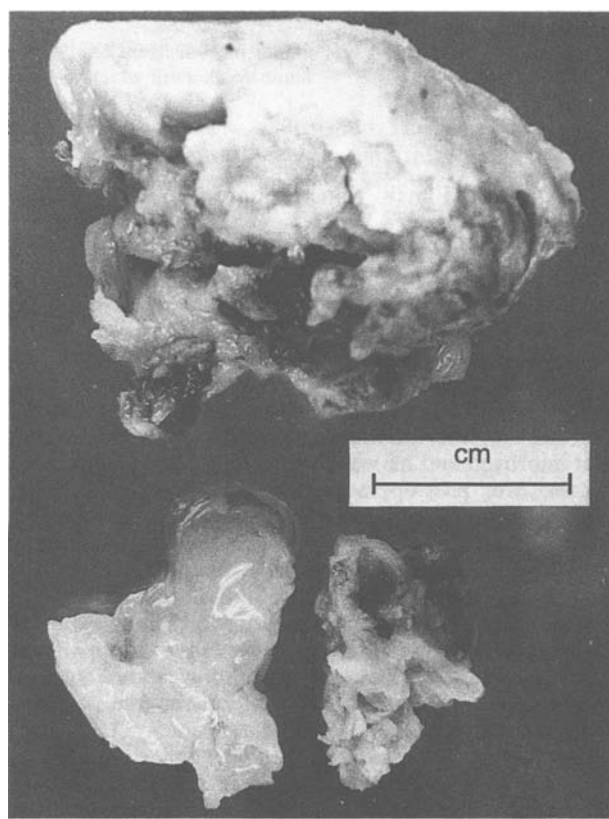


FIG. 2.

Gross appearance of the pieces of material removed from the larynx of *Case 2*. One of the pieces is frankly mucoid.

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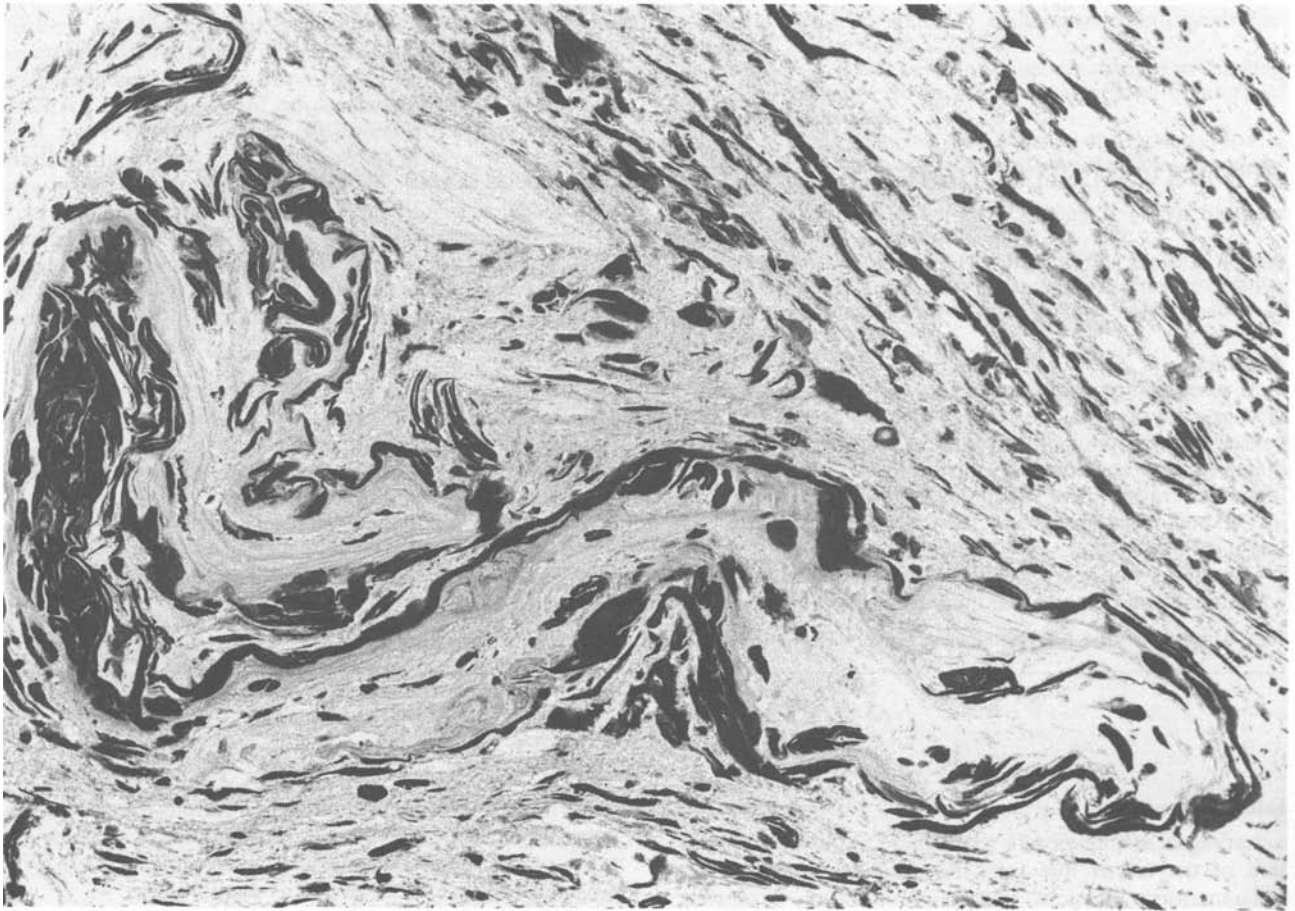


FIG. 3.

Histologically, the material was similar in both cases. It is seen to consist of mucus, inflammatory cells, degenerate squamous cells and laminated keratin which is stained black. (Phloxine tartrazine; $\times 250$).

Case reports

Case 1

A 37-year-old man with a nonfunctioning pituitary adenoma underwent a transsphenoidal hypophysectomy. The surgery was uneventful but post-operatively the patient was found to have a dilated and unreactive pupil on one side. Subsequent CT scanning revealed a subarachnoid haemorrhage with blood in all the ventricles. An angiogram was performed which showed no vascular abnormality. The patient was breathing spontaneously and was nursed in a high dependency unit. Over the course of the next four days the patient's conscious level improved and he was able to respond to commands. On the fifth post-operative day his breathing became laboured and an inspiratory stridor was audible. Oxygen saturation levels measured by pulse oximetry fell to below 80 but could be maintained in the low 90s with a high percentage of oxygen. Examination of the oral cavity revealed very poor oral hygiene with a thick coating on the tongue, teeth and gums. Indirect laryngoscopy was impossible due to limited cooperation and fiberoptic nasendoscopy thought to be imprudent due to the previous trans-sphenoidal surgery.

The decision was made to examine the larynx under a general anaesthetic and to protect the airway. The patient was induced by gaseous agents and the larynx was examined prior to intubation. It was found to be anatomically normal but lying in the hypopharynx were several pieces of solid rubbery material which were removed by suction. The patient was intubated for some days following the procedure during which time more

pieces of similar material were removed by bronchial suction. The patient continued to make a slow recovery following his original surgery.

Case 2

A diabetic man in his 70s was admitted with a chest infection. His conscious level deteriorated and he became semi-comatose. As his conscious level improved with treatment his breathing became more laboured and an audible respiratory stridor was noted. On examination the oral hygiene of the patient was noted to be very poor and on depression of the tongue a mass of material was visible arising in the hypopharynx. The patient's condition was not felt to be good enough to undergo a general anaesthetic and the secretions were removed in one large piece after loosening them by nebulization with normal saline. There was immediate relief of the stridor and respiratory distress.

Pathology

The material removed from the larynx at indirect laryngoscopy from both cases was fixed in 10 per cent buffered formalin. In both cases there were multiple pieces of irregular firm friable material. The external appearance of the material was similar with an irregular rough surface (Figures 1 and 2). Both specimens were composed of multiple fragments reflecting the friable nature of the material. One of the pieces from Case 2 was frankly mucoid (Figure 2). In both cases the cut surface showed

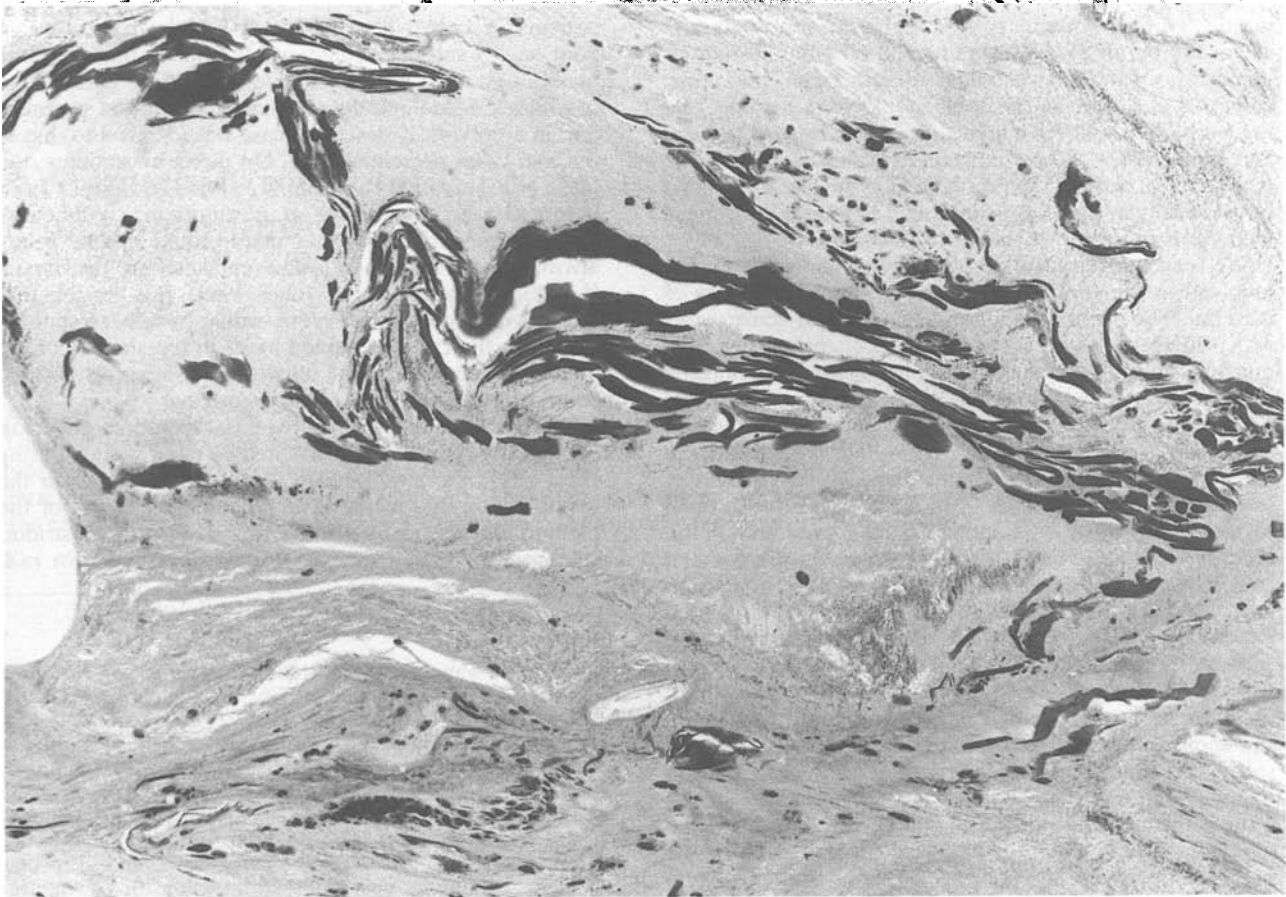


FIG. 4.

Histological appearance of crusted secretions from the nasal cavity of a normal person showing a laminated structure with keratin which is stained black. (Phloxine tartrazine; $\times 250$).

pale, cream, mucoid material with a faintly whorled appearance.

Samples of the material were selected and processed routinely in paraffin wax. Sections ($5\ \mu\text{m}$) were cut and stained with haematoxylin and eosin, periodic acid schiff (PAS), with and without, diastase for mucin and glycogen, with phosphotungstic acid haematoxylin (PTAH) for cross striations in muscle and with phloxine tartrazine for keratin. Immunocytochemistry was performed for keratin markers (Cam 5.2 – low molecular weight and AE1/AE2 – broad spectrum). Frozen sections were prepared from unfixed, unprocessed material and stained with oil red O (ORO) for fat.

The histological appearance in both cases was identical. Sections showed poorly cellular, irregular, laminated material, composed of keratin, keratinocytes, mucin, strips of stratified squamous epithelium, birefringent particulate matter (*Case 1* only) and occasional groups of neutrophil leucocytes and gram-positive cocci. Keratin laminations were conspicuous with phloxine tartrazine stain (Figure 3). Occasional groups of flattened cells showed positive immunocytochemistry for Cam 5.2 and AE1/AE3 confirming an epithelial origin. Although in some areas there was a laminated structure, the size and configuration of the structures was irregular and chaotic (Figure 3). The observation of PAS-positive diastase-resistant material confirmed the presence of mucin. The material contained no fat on ORO staining in either case. No structured foreign body masses were seen and no skeletal muscle (meat) or vegetable matter was identified. Other than small groups of flattened cells no viable histologically

recognizable tissue was identified. The appearance in the *Case 2* was identical, but no birefringent material was identified. The appearance was compared to the crusted nasal secretions obtained from the nasal cavity of a control subject (Figure 4). The histology of this material showed a pauci-cellular laminated structure containing similar constituents without the birefringent particles.

Discussion

A review of the literature reveals only one other case in which aspiration of inspissated nasal secretion has been reported. In this case, postmortem revealed laryngeal obstruction by a mass of material and a pulmonary embolus (Leadbeatter and Douglas-Jones, 1989). In both this case and the two cases presented here the patient's general health was poor and their conscious level depressed. In addition, in both our cases the oral hygiene was noted to be very poor. Clinically, in these patients presenting with stridor, the differential diagnosis is of inhaled foreign material or acute laryngeal infection. In the first case, it was thought possible that fat used as packing in the nasal space after trans-sphenoidal hypophysectomy may have become dislodged and formed a foreign body which was then aspirated causing stridor. The absence of fat in the histological sections excludes this possibility. Although both patients were apyrexial, clinically the possibility of an acute laryngeal infection as the cause of stridor could only be excluded by laryngoscopy.

Pathologically, the appearance is identical to that of the so-called 'café coronary', where a bolus of inadequately

masticated food (often steak) is aspirated into the larynx classically by an elderly, edentulous, bibulous restaurant diner who suddenly becomes quiet, stops breathing, collapses and dies at the table. Onlookers assume that the patient has suffered a myocardial infarction (Mittleman and Wetli, 1982). A post-mortem examination reveals the true cause of death. Aspiration of food has been excluded histologically in both cases described here and the clinical scenario is quite unlike that of 'café coronary'.

We can only speculate as to the pathophysiology involved in the formation of these inspissated masses of material. They contain a number of different constituents with different physical and chemical properties, i.e. mucous, keratin, flattened epithelial cells and scattered inflammatory cells. In neither case were fungal elements detectable. When describing the pathophysiology of intravascular thrombosis, Virchow (1956) considered three elements to be important. These were: changes in the pattern of the blood flow; changes in the intimal surface of the vessel; and changes in the constituents of the blood (Virchow's triad). Thrombi are formed from red cells, fibrin and platelets which (in the arterial circulation) may be deposited in layers to produce a laminated structure macroscopically (lines of Zahn) and microscopically. Although the analogy cannot be carried too far, we need to ask if any of these possibilities could be relevant to the formation of laminated masses composed of keratin, squamous epithelium and mucous in the nasopharynx. It seems possible that in the patient who had had a hypophysectomy, there could have been changes in the airflow through the post-nasal space and damage to the nasal epithelium. There were desquamated cells in the mass histologically. The presence of abundant birefringent material indicated that this foreign matter may have played a role in increasing mucus secretion. The physical properties of mucus could be altered by a process of inspissation involving the desiccation of mucus by the flow of air over it leading to increased viscosity. Normally such material would be transported by the so-called 'ciliary escalator' and eventually expelled through the external nares or pass into the nasopharynx before reaching a clinically important size. Increased viscosity is likely to reduce the efficiency of the ciliary transport and the ciliated columnar epithelium of the pharynx may be replaced by squamous epithelium with advancing age (Bloom and Fawcett, 1986). Both

patients described here had poor oral hygiene, were in poor health and semi-conscious. It is likely that the large masses described here were able to build up under these conditions. Histologically the material found at postmortem in a previously described case was identical to that in the two cases presented here. On direct questioning, the nurse who attended the patient recalled laryngeal stridor before death. In addition, at postmortem a pulmonary embolus was found so that death could not be solely attributed to the mass found impacted in the larynx (Leadbeatter and Douglas-Jones, 1989). It is possible that the laryngeal obstruction alone would have been survivable (as in the cases presented here) in the absence of the pulmonary embolus if the inhaled mass of secretions had been promptly removed on laryngoscopy.

We postulate that inspissated nasal secretions collect in the nasopharynx and are loosened by nasal suction during chest physiotherapy. Inhaled, the material lodges in the hypopharynx due to the semi-recumbent position of the patients and acts as a ball valve causing inspiratory stridor.

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