The Journal of Laryngology and Otology
July 1998, Vol. **112,** pp. 657–659

The management of massive pneumocephalus and cerebrospinal fluid rhinorrhoea as a consequence of biopsy in a patient with inverted papilloma

U. S. KALE, F.R.C.S., D.N.B., M.S., D.L.O., S. G. RAJE, M.S., R. G. WIGHT, F.R.C.S.

Abstract

Nasal polypectomy is a common ENT operation. Cerebrospinal fluid (CSF) rhinorrhoea and pneumocephalus are rare complications. We present a patient who developed both these complications after biopsy of nasal polyps which subsequently proved to be an inverted papilloma. He had a defect in the ethmoid roof, which was repaired.

Whilst endoscopic repair of CSF leak is increasing in popularity, in this patient because of his pathology and difficulty of access a more traditional lateral rhinotomy approach was made with a successful outcome. An overview of the management of these complications is presented.

Key words: Nasal polyps; Cerebrospinal fluid; Pneumocephalus

Introduction

Nasal polypectomy is a frequently performed operation in ENT departments throughout the United Kingdom. The principal complications of polypectomy are per-operative or post-operative bleeding and orbital trauma.

The polyps arise from the ethmoid air cells and bulge into the nasal cavity from beneath the middle turbinate and hence their upper aspect is in close approximation to the skull base. However, the development of intracranial complications is rare. Intranasal ethmoidectomy is associated with a 0.2 per cent incidence of intracranial complications (Freedman and Kern, 1979).

Traditionally polyps have been removed by avulsion, snaring, under endoscopic control and more recently by powered instrumentation and are then sent for histopathological examination. The finding of an inverted papilloma is relatively uncommon, but typically appears as a more irregular, bleeding friable polyp at removal. The disease has a propensity to recur if the polyp is not completely removed. There is a potential association with malignancy.

We present a case where, following initial biopsy, massive pneumocephalus and a CSF leak developed and where medial maxillectomy and lateral rhinotomy had to be performed to excise the inverted papilloma and repair a dural defect.

Case report

The patient in his late 60's underwent a left nasal polypectomy in another hospital and had his nasal cavity packed at the end of the procedure. The polyps were noted to be friable and suspicious of inverted papilloma. The nasal pack was removed the following morning when a clear discharge was noted from the left nasal cavity which tested positive for glucose. The nasal cavity was repacked with bismuth iodoform paraffin paste coated ribbon gauze. The suspicion of CSF rhinorrhoea led to neuro-observation and the starting of sulphadiazine and penicillin. Skull X-ray on the second post-operative day showed pneumocephalus. On transfer the patient had a lumbar drain put in and his antibiotics were changed to intravenous cefuroxime (750 mg eight hourly), metronidazole (500 mg eight hourly) and flucloxacillin (500 mg six hourly). The nasal pack was removed and his nose examined. A few blood clots, small left middle turbinate and friable polypoidal mucosa were found. There was no obvious CSF rhinor-

FIG. 1
Coronal CT scan showing defect in the roof of ethmoid (small arrow) and pneumocephalus (large arrow).

From the Department of Otolaryngology, North Riding Infirmary, Middlesbrough, UK.
Accepted for publication: 27 April 1998.

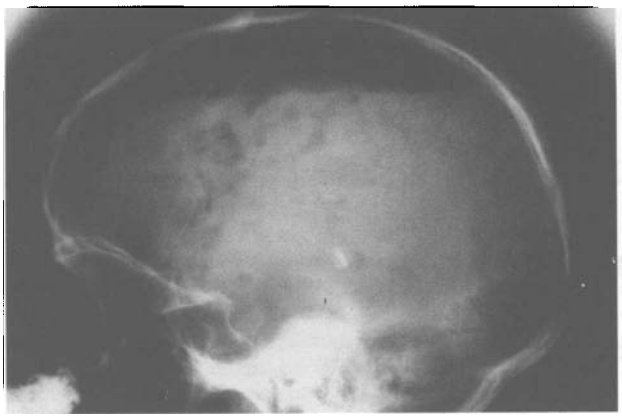

FIG. 2
X-ray, skull lateral view showing massive pneumocephalus.

rhoea or bleeding. His neuro-observations were normal. He proceeded to have a high definition CT scan of his head, which demonstrated a 1 cm breach in the roof of the ethmoids (Figure 1) anterior to the sphenoid. It also showed massive pneumocephalus (Figure 2).

He did not have any headache or any signs of meningeal irritation. He was treated conservatively for the next two days whilst histology of the polyp removed during the original operation was obtained.

Histology showed extensive inverted papilloma but no evidence of malignancy. His general condition deteriorated with development of mild confusion and it was decided to proceed to close the dural defect. We considered the anterior cranial fossa approach but as extensive polypoidal disease was found in the nasal cavity and maxillary antrum, we opted to excise it through a frontoethmoidectomy and to attempt dural closure from below. Lateral rhinotomy revealed extensive disease in the antrum, ethmoids and nasal cavity. A medial maxillectomy was performed to ensure complete removal of the papilloma. The breach in the roof of the ethmoid was identified after finding the anterior skull base and following this posteriorly to the region of the breach. A puncture in the bone and dura of 0.8 cm was evident, and free leakage of CSF seen. The repair was undertaken with a fascia lata graft placed to the defect and glued with Tisseel to its undersurface. Surgicel was then placed beneath this covered by sterispon. The patient's nose was packed with ribbon gauze, which was removed 10 days later under general anaesthesia. His intravenous antibiotics were continued for two weeks followed by oral flucloxacilin (500 mg qds) for the next two weeks. On subsequent removal of the pack the patient did not show any signs of CSF leakage and he was discharged three days later well. He has been followed up for a further nine months and remains well with no recurrent papilloma evident.

Discussion

Inverted papilloma, though a benign nasal tumour, has a locally aggressive nature. In the majority of cases it arises from the lateral nasal wall and goes on to involve paranasal sinuses and other adjacent regions. It usually presents as a unilateral nasal polyp, but bilateral inverted papillomas have been reported. Complete surgical resection is the treatment of choice in inverted papillomas. Its irregularity, friability, multicentricity, propensity to recur and malignant potential increase the difficulty of surgically treating it.

Nasal polypectomy and intranasal ethmoidectomy can be associated with complications including pre-operative or post-operative haemorrhage and orbital injury. Intracranial complications due to these surgical procedures are rare. A review of 1,000 intranasal ethmoidectomies reported only two intracranial complications of meningitis in one case and CSF leak in the other (Freedman and Kern, 1979), but no cases of pneumocephalus occurred. Our patient was suspected to have an inverted papilloma per-operatively and hence only underwent a biopsy at that stage. Subsequently he developed both the complications of pneumocephalus and CSF rhinorrhoea.

Pneumocephalus is a collection of air or gas within the skull. The air can be epidural, subdural, subarachnoid, intraventricular or intracerebral. Most of the cases of pneumocephalus are due to trauma. Intranasal surgical procedures do not commonly lead to pneumocephalus. It can be either of the simple type or a tension pneumocephalus. The simple type is usually accompanied by CSF rhinorrhoea. Tension pneumocephalus is due to a one-way valve mechanism where air is driven intracranially through the defect in the skull base and its exit is prevented by the dura and the brain tissue. Succussion splash audible to the patient and examiner on shaking the patient's head may be present in cases of pneumocephalus. Tension pneumocephalus leads to increased intracranial pressure with severe headache and papilloedema. Symptoms including headache, mental confusion, convulsions, ataxia, or hemiparesis following nasal polypectomy should raise a suspicion of pneumocephalus. Tension pneumocephalus as a rare complication of nasal polypectomy has been described (Misra and Harris, 1987).

The most common aetiology of CSF rhinorrhoea is non-surgical trauma, although a series reports around 53 per cent of cases to have an iatrogenic cause (Hughes *et al.*, 1997). Clear nasal discharge following intranasal surgery should raise the suspicion of CSF rhinorrhoea and further relevant investigations must be carried out. The fluid should be tested for sugar and with immunofixation assay of beta-transferrin confirm the fluid to be CSF wherever the facility is available. After diagnosing CSF rhinorrhoea it is important to localize the site of the leak. This is usually achieved by CT scan. Hughes *et al.* (1997) used intrathecal fluorescein in cases where CT scan did not localize the defect. CSF rhinorrhoea has the potential of causing meningitis and intravenous antibiotics are indicated in traumatic groups, more so in the presence of pneumocephalus. CT scan in our patient localized the defect of 1 cm in the roof of the ethmoid and he was put on intravenous antibiotics.

Further management of such patients is very important. Whether to operate or not and if yes, when to operate are two major questions. Vrankovic and Glavina (1993), studied 52 consecutive surgically-treated cases of frontal fossa fractures regarding the indications and time for surgical treatment. The patients involved also had one or more sequelae-CSF rhinorrhoea, pneumocephalus and/or meningitis. The study states that the appropriate time for operation in urgent cases is immediately, in cases with an absolute indication is five to six days after the injury, 10 days after the onset in long-standing CSF rhinorrhoea and in pneumocephalus as soon as the signs occur. Tension pneumocephalus is an indication for urgent surgery.

In our patient two aspects of surgical treatment were involved. The first aspect was closure of the dural defect and the other being complete resection of the inverted papilloma. We managed our patient conservatively to start with for two reasons – he had no neurological abnormality and secondly we were awaiting histopathological report of the initial nasal biopsy. A lumbar drain was placed for

continuous drainage of cerebrospinal fluid. Shapiro and Scully (1992), have mentioned about the success of closed continuous drainage of CSF via a lumbar subarachnoid catheter for various conditions including intra-operative augmentation of tenuous dural closure.

Anterior cranial fossa approach for the repair of anterior fossa dural defects involves increased morbidity and mortality, has a potential for post-operative convulsions and loss of the sense of smell. Hughes *et al.* (1997), reports a high success rate in treating such cases endoscopically. In our case neither of the above approaches was ideal because we also had an extensive inverted papilloma to remove. For better exposure and for complete excision of the inverted papilloma, a more open approach was needed and therefore we chose the classical lateral rhinotomy approach.

Nasal polypectomy and intranasal ethmoidectomy are common procedures in ENT surgery but unfortunately, that does not make one immune from getting serious intracranial complications although fortunately that is rare. It is extremely important to be aware of these possibilities and one has to be aware of symptoms and signs of intracranial complications not only for early diagnosis of the problems but also to decide promptly about their further management.

References

Freedman, H. M., Kern, E. B. (1979) Complications of intranasal ethmoidectomy: a review of 1,000 consecutive operations. *Laryngoscope* **89:** 421–434.

Hughes, R. G. M., Jones, N. S., Robertson, I. J. A. (1997) The endoscopic treatment of cerebrospinal fluid rhinorrhoea: the Nottingham experience. *Journal of Laryngology and Otology* **111:** 125–128.

Misra, B. K., Harris, P. (1987) Tension pneumocephalus following nasal polypectomy. *Surgical Neurology* **28:** 307–310.

Shapiro, S. A., Scully, T. (1992) Closed continuous drainage of cerebrospinal fluid via a lumbar subarachnoid catheter for treatment or prevention of cranial/spinal cerebrospinal fluid fistula. *Neurosurgery* **30(2):** 241–245.

Vrankovic, D., Glavina, K. (1993) Classification of frontal fossa fractures associated with cerebrospinal fluid rhinorrhoea, pneumocephalus or meningitis, indications and time for surgical treatment. *Neurochirurgia* **36(2):** 44–50.

Address for correspondence:
Mr Richard G. Wight, F.R.C.S.,
Department of Otolaryngology,
North Riding Infirmary,
Newport Road,
Middlesbrough TS1 5JE.