

# Severe visual disturbance after exposure of the optic canal during intranasal ethmosphenoidectomy

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## SUMMARY

*The cause of disturbed visual acuity associated with intranasal ethmosphenoidectomy is, on the one hand, a direct injury to the optic nerve. In this case, the disturbance in visual acuity develops immediately after the operation, and severe visual complications with a poor prognosis are found. On the other hand, in the two cases presented in this paper, the disturbed visual acuity develops postoperatively. In this case, it is necessary to take various possibilities into consideration, such as indirect effects of intraorbital bleeding, and damage to the lamina papyracea due to indirect and direct injury. Moreover, effects on the peri-optic nerve area and small blood vessels within the osseous optic canal should be considered. After thorough consideration and observation of the response to conservative therapy, such complications should be treated by investigating whether or not decompression of the optic nerve is effective.*

## INTRODUCTION

Severe visual complications associated with intranasal ethmosphenoidectomy have been attributed to disturbances of the optic nerves due to injury to the optic canal or the lamina papyracea in the posterior paranasal sinuses.

Recently, we experienced two cases in which severe visual disturbances developed after intranasal sinusectomy despite the absence of injury to the optic canal. Therefore, we investigated the etiology of severe visual complications associated with intranasal sinusectomy. We studied mainly the clinical anatomy of the optic canal, the optic nerve and the paranasal sinuses.

### Case 1

The patient was a 36-year-old male. In February 1983 he underwent intranasal sinusectomy because of severe paranasal sinusitis associated with nasal polyps. The lesion was severe on both sides. In the ethmoidal sinus, the mucosa looked

like nasal polyps, with a soft and thin cellular lamina. Right intranasal sinus-ectomy was completed as usual, except that the operation was temporarily interrupted because of the need to tend to massive bleeding in another patient. To prevent hemorrhaging, the cavity was packed with gauze impregnated with bos-min and 4% lidocaine for the one hour that the operation was suspended. Immediately after the operation, the patient complained of a narrowed visual field of the right eye, which was not associated with any abnormality in visual acuity. When he awoke the next morning, he complained of blindness, and the light reflex disappeared in the afternoon. Injury to the optic canal was suspected, and therefore the lamina papyracea and the optic canal were examined in collaboration with an ophthalmologist. Fiberscopic examination detected no injury to the 2/3 tube-shaped optic nerve in the sphenoidal sinus or to the lamina papyracea (Figure 1). However, since we could imagine no cause for the blindness other than injury to the optic nerve, the osseous wall was removed and the optic nerve sheath was exposed. Promptly after decompression of the optic canal, light perception (LP) became positive and the light reflex reappeared. From the third postoperative day onward, hand movements (HM) were perceived. Subsequently, the clinical course progressed as shown in Figure 2, and on the 63rd postoperative day the patient had recovered with restoration of the visual acuity to 1.2, although a slight defect in the visual field remained.

### Case 2

The patient was a 57-year-old male. He had mild diabetes mellitus from about

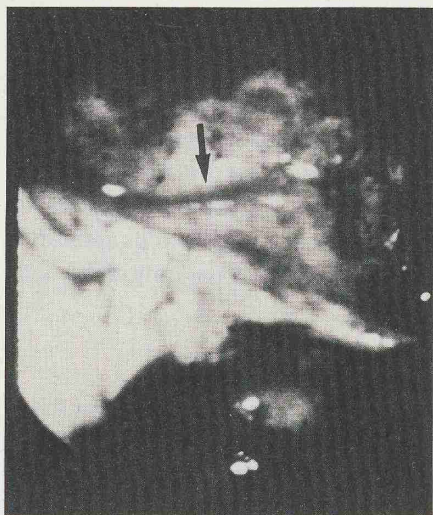


Figure 1. Fiberscopic findings of the right optic nerve canal.

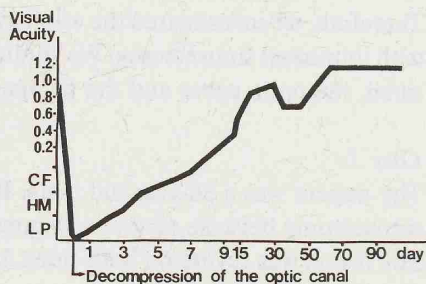


Figure 2. Changes in visual acuity of the right eye (Case 1).



one year before. In July 1983 sinusitis was diagnosed, and a right intranasal sinus-ectomy was performed. During the operation, the orbital fat tissue was exposed due to partial injury to the lamina papyracea. However, the operation was completed as usual by opening the sphenoidal sinus. No abnormality of the visual acuity was noticed immediately after the operation. However, the patient noticed a slight abnormality in visual acuity on the first postoperative day and complained of pronounced reduction in visual acuity down to 0.04, associated with a narrowed visual field, on the second postoperative day. Therefore, the intranasal tamponade was removed, and the cavity which had been operated on was examined with a fiberscope. However, the 2/3 tube-shaped eminentia optica did not show any sign of injury. The fatty tissue of the lamina papyracea exposed during the operation had already disappeared.

The findings of funduscopy revealed papillary edema and dilatation of the veins. There was a light reflex, although weak. The CT scan showed a defect of the lamina papyracea and a bleeding source deep along the postocular nerve (Figure 3). Because retrobulbar bleeding or retrobulbar neuritis induced by loss of the lamina papyracea was suspected, the patient was treated conservatively using steroidal agents and vitamin preparations. The visual acuity improved to 0.1 on the fifth postoperative day and to 0.8 in about two months' time, although the visual field remained slightly narrow.

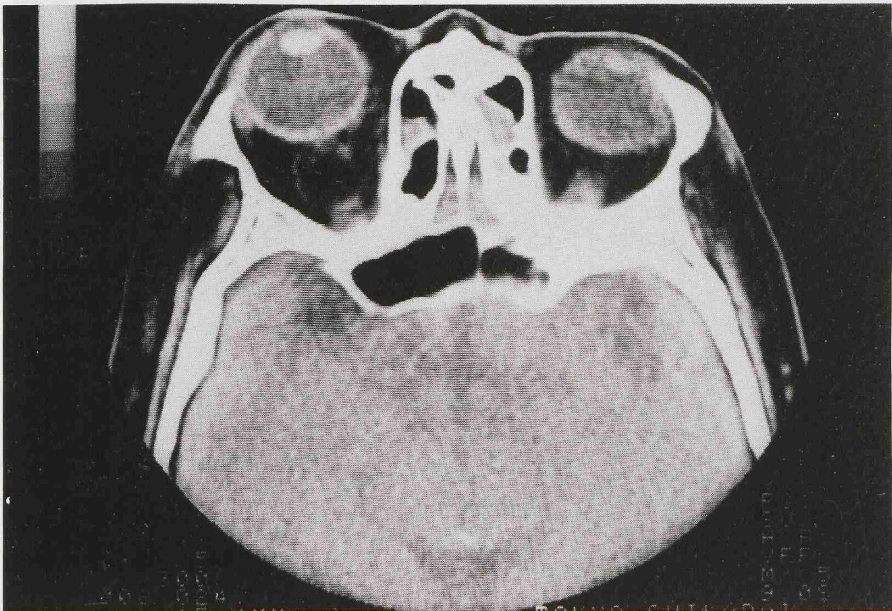


Figure 3. CT findings indicating retrobulbar bleeding (Case 2).



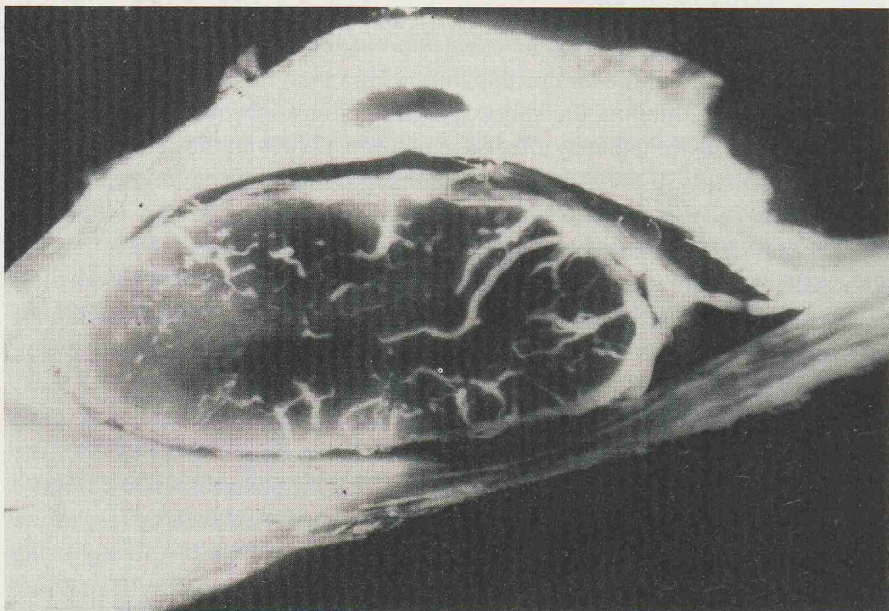


Figure 4. Angiographic findings of the peripheral blood vessels in the optic nerve canal. (Injected with barium sulfate).

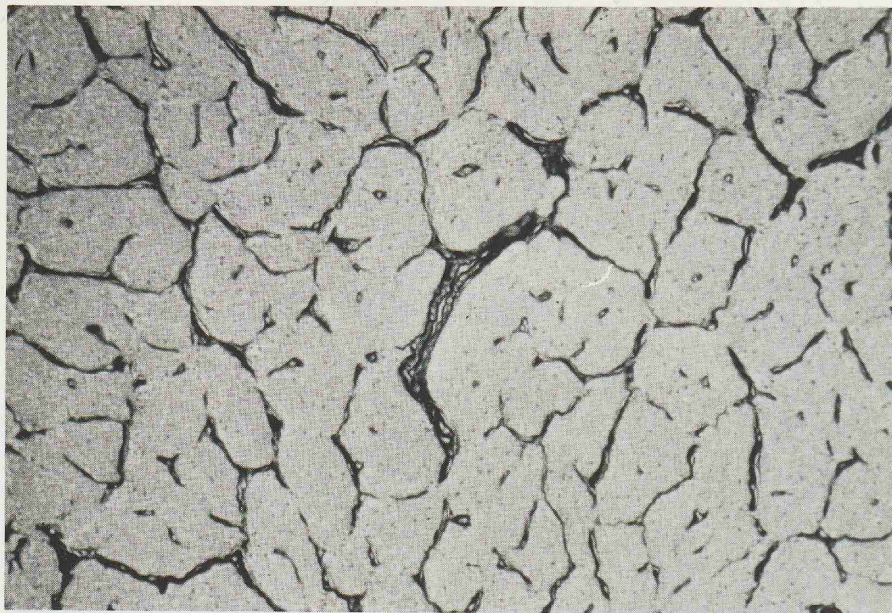


Figure 5. Histologic findings of the tissues in the optic nerve canal. (No central blood vessel is noted).



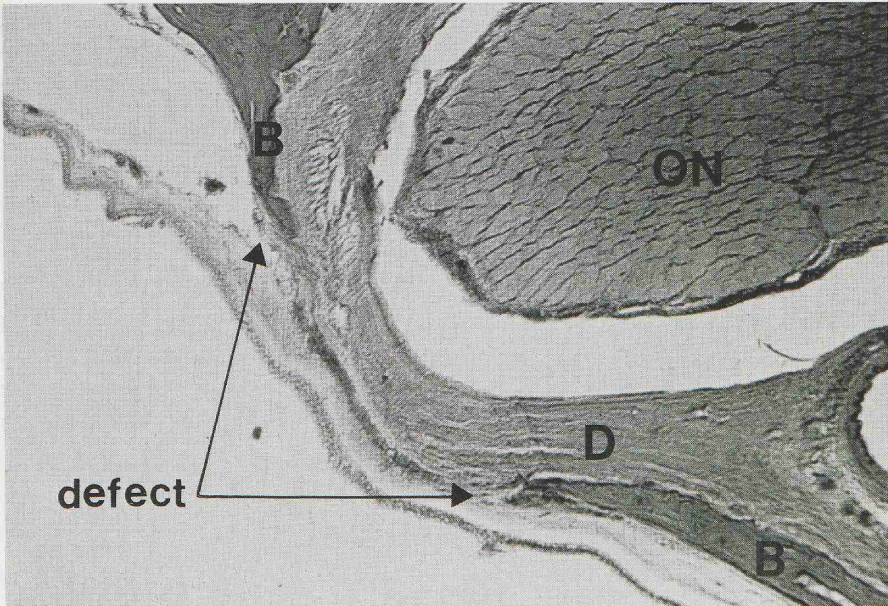


Figure 6. Dehiscens in wall of the Eminentia Optica.

ON: optic nerve.

B : Bony wall of the optic canal.

D : dura mater.

#### DISCUSSION

The pronounced eminentia optica is completely surrounded by bone, and within it the optic nerve sheaths, optic nerves and nutrient vessels are densely filled. When the blood flow is disturbed by, for instance, direct injury, the visual acuity is easily disturbed. The pathogenic mechanism is thought to involve disturbed blood flow of the nutrient vessels of the optic nerve and compression of the optic nerve or ophthalmic arteries due to edema or hemorrhage in the optic canal. Angiography was carried out on a preparation obtained by injecting barium sulfate added gelatin (Figure 4).

According to a study by Matsuzaki (1984) on the optic canal, the osseous optic canal is 4 to 5 mm in length and 5 to 6 mm in diameter in the average Japanese. The canal contains the ophthalmic arteries and their branches. These branches are distributed reversely after they depart from the ophthalmic arteries, differing from the pattern in which vessels are distributed to the optic nerves within the orbit. Moreover, after that branching the vessels undergo no further branching, and almost all of the branches enter the dura mater. Matsuzaki claims that the branches then undergo further branching in the dura mater and are distributed to

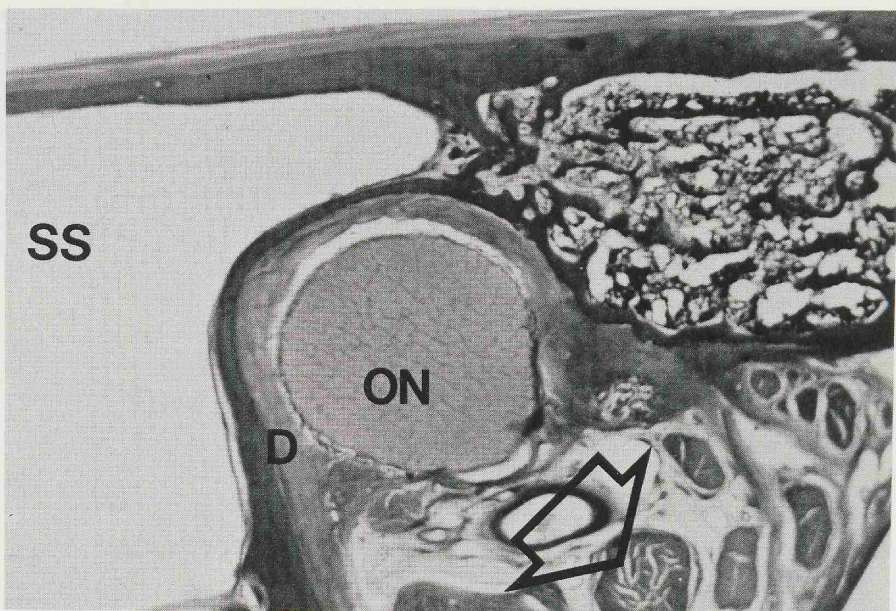


Figure 7. Optic nerve canal not surrounded by bone on the whole circumference.

ON: optic nerve.

SS : sphenoid sinus.

D : dura mater.

the intracanal optic nerves. The intracanal optic nerves have no central blood vessels and are dependent chiefly on the arteries of the pia mater or capillaries for nutrients. Compared with the blood flow of the intraorbital optic nerves, their branches are extremely small in number (Figure 5).

In Case 1, the course of development of the symptoms seemed to point toward a directly-affected optic nerve. The optic canal of the tube-shaped eminence probably had a partial bony defect which made it possible for a drug solution, such as bosmin, to penetrate from the packed gauze tamponade into the optic canal. This might have had an adverse effect on the nutrient blood vessels in the osseous optic canal (Figure 6). Subsequently, recovery of the blood flow was achieved after decompression of the optic canal.

In Case 2, edema and swelling due to bleeding from the posterior part of the orbit, induced by some injury to the anterior part of the lamina papyracea, involved the optic nerve canal. The optic canal was not completely surrounded by bone, thus leaving room for decompression towards the soft tissues (Figure 7). Therefore, some time was required before the symptoms were manifested, and the visual acuity recovered after disappearance of the edema. In addition, a bleeding tendency and weakening of the blood vessels due to the underlying disease of diabetes mellitus contributed to an increase in the intra-orbital bleeding.



## RÉSUMÉ

Pour ce qui est des causes d'une acuité visuelle perturbée associée à une ethmoïdo-sphénoïdectomie intranasale: lorsque la cause est une lésion directe, la perturbation de l'acuité visuelle se produit immédiatement après l'opération et l'on constate de graves complications avec des pronostics mauvais. D'autre part, comme dans les deux cas d'acuité visuelle perturbée postopératoire que nous présentons ici, il y a différentes possibilités dont il faut tenir compte telles que, influences indirectes provenant d'un saignement intra-orbital, lésions de la lamina papyracea dues à 2) et à 3), aussi bien qu'à 1). En outre, il faut examiner s'il y a des effets sur la région du nerf péri-optique et les petits vaisseaux sanguins dans le canal optique osseux. De telles complications doivent être traitées soigneusement; on déterminera si la décompression du nerf optique est effective ou non, en observant les réactions à la thérapie conservatoire.

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