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Ethmoidal nerve and artery block in endonasal sinusectomy

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INTRODUCTION

Chronic sinusitis in adults often follows intranasal disease acquired in childhood. This has been shown by Takahashi (1971) in a long-term study, begun just after the second world war, of over 1,200 school children. Disorders such as chronic rhinitis were common and were found to be partially related to a poor diet; and improvement in nutrition, particularly through an increased intake of dairy and meat products, was followed by a lower incidence of chronic sinusitis as the children grew up. Improvement in diet is thus one of the factors which has led to a decrease in severity of chronic sinusitis in adults in recent years in Japan. As a result, the operation of Caldwell-Luc is performed less often, and endonasal ethmosphenoidectomy – with correction of associated abnormalities such as deviation of the septum and hypertrophy of the turbinates – is now a more frequently performed surgical procedure.

For smooth conduct of endonasal sinusectomy, control of pain and bleeding is essential.

In this paper we describe our technique of ethmoidal nerve and artery block, which, in our experience, produces effective local anesthesia and good control of bleeding during the operation.

ANATOMY

The anterior and posterior ethmoidal nerves are branches of the nasociliary nerve which is a branch of the first division of the Trigeminal nerve. The anterior ethmoidal nerve passes along the anterior ethmoidal canal and is distributed to the mucosa of the upper nasal cavity. The posterior ethmoidal nerve passes through the posterior ethmoidal foramen in the medial wall of the bony orbit and is distributed to the mucosa of the ethmoid and sphenoid sinuses. Ethmoidal nerve block produces anesthesia of the ethmoid and sphenoid sinuses and upper part of the nasal cavity.

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The anterior and posterior ethmoidal arteries are branches of the ophthalmic artery. They accompany the corresponding nerves and supply the ethmoid sinus and partially supply the sphenoid sinus. Injection of a vasoconstrictor in the region where these arteries emerge with the nerves at the anterior and posterior ethmoidal foramina will reduce blood flow to the sinuses by means of both vasoconstriction and mechanical compression of the arteries.

TECHNIQUE OF INJECTION

A 23 gauge needle 4.0 cm long is inserted through the previously anesthetized skin just below the supraorbital incisure. While exerting gentle pressure on the eyeball infero-laterally with the other hand, the needle is directed upward and backward until it is just clear of the eye. The needle is then directed medially and slightly downward until the tip is felt to meet the medial bony wall of the orbit. Next, the needle is advanced to a depth of 3 cm in females and 3.5 cm in males underneath the periostium, with the bevel facing medially, toward the optic foramen.

The average distance between the supraorbital incisure and the optic foramen is 46.6 mm in men and 43.6 mm in women in our measurement of 100 skulls (Ashikawa, 1980). When a 5 mm thickness is allowed for the preorbital soft tissue, we would have about 2 cm from the tip of the needle to the optic nerve when the needle is inserted to the above depths.

After trial aspiration, 3–4 ml of 1% lidocaine with epinephrine 1:100.000 are injected slowly in the region of the anterior and posterior ethmoidal foramina. The directions of the needle insertion are shown in Figure 1.

SUBJECTS, METHOD AND RESULTS

In order to assess the efficacy of ethmoidal nerve and artery block in controlling pain and bleeding in endonasal ethmosphenoidectomy, 22 consecutive patients who underwent the procedure were studied. There were 14 men and 8 women, and 35 procedures were performed. The indications for operations were chronic sinusitis in 19 patients, an ethmoidal cyst in 2 patients and retrobulbar neuritis in 1 patient.

For a control study another 18 consecutive cases of endonasal sinusectomy were studied for the level of pain and amount of blood loss during the operation without executing ethmoidal nerve and artery block.

The control group consisted of twelve male and six female, all with chronic sinusitis, whose ages ranged from 18 to 64 with an average age of 37.4 years.

Preoperatively, gauze soaked in 4% lidocaine was applied to the mucosa of the nasal cavity. Ethmoidal nerve and artery block was then instituted as described above. The agger nasi, anterior part of the middle turbinate and fontanelle

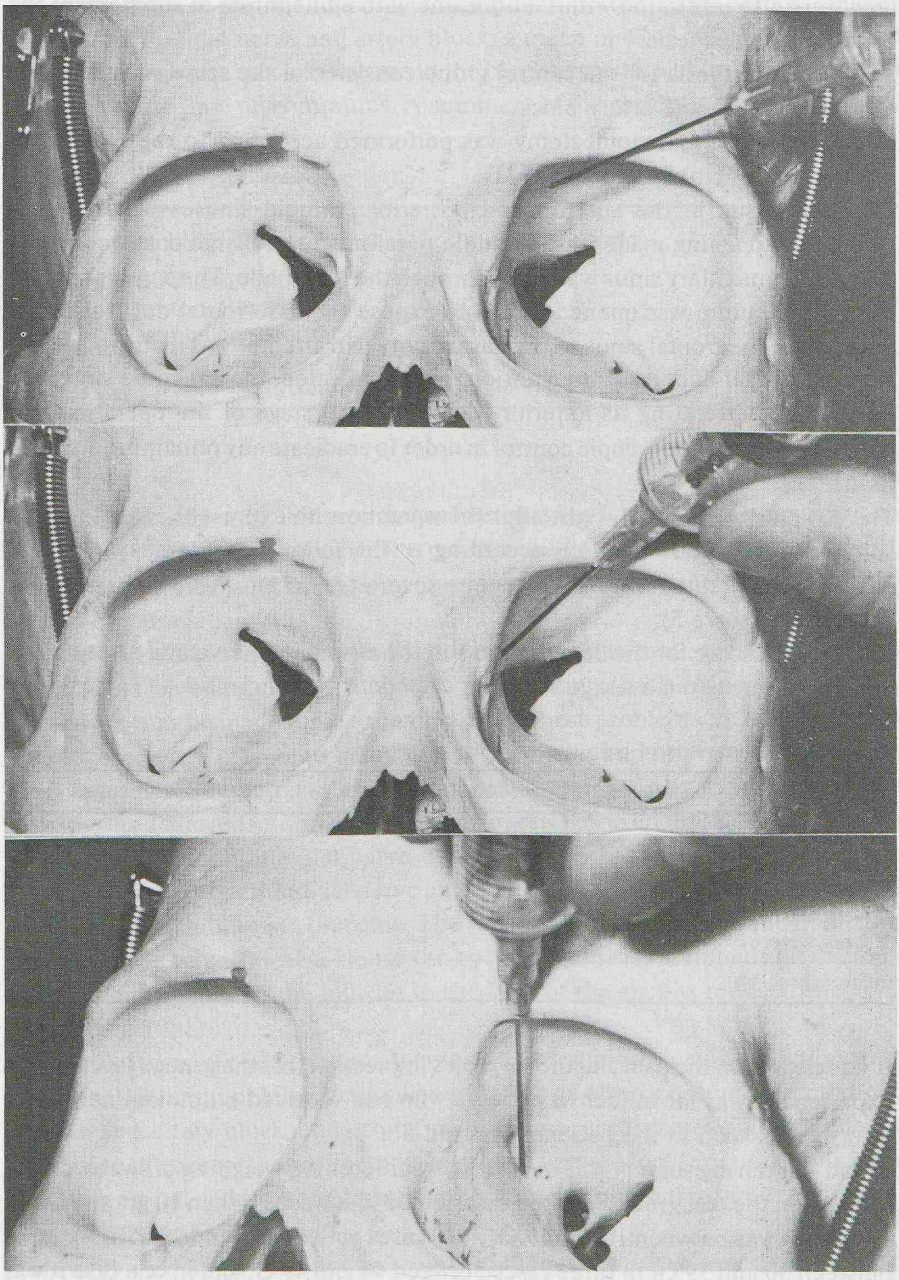

Figure 1. Three step injection for ethmoidal nerve and artery block.

area were also infiltrated with 1% lidocaine with epinephrine to supplement the conduction anesthesia.

The local anesthesia for the control group consisted of the same except for the ethmoidal nerve and artery block.

Endonasal ethmosphenoidectomy was performed according to the method of Takahashi (1971 b) (Ashikawa 1981).

Diseased tissue in the anterior and posterior ethmoid sinuses was removed through an opening made in the middle nasal meatus. A large communicating hole to the maxillary sinus was made through the fontanelle. The superior part of the infundibulum was opened widely to expose the nasofrontal duct for better drainage of the frontal sinus to the nasal cavity. No attempt was made to enlarge the nasofrontal duct itself. In addition, when indicated, the sphenoid sinus was opened by perforating its anterior wall. The final stage of the operation was performed under endoscopic control in order to eradicate any remaining diseased tissue.

The patients were asked, right after the operation, to express the level of pain suffered during the operation according to the following criteria; slight pain (score 1), moderate (score 2), moderate-severe (score 3), severe (score 4), and very severe (score 5).

The average score for the 35 patients with the ethmoidal nerve and artery block was 2.5, whereas the average score for the control group was 3.4 (Table 1).

Table 1. Comparison of pain scores.

pain score	control group	blocked group
1 (slight)	1	6
2 (moderate)	3	15
3 (moderate-severe)	4	8
4 (severe)	7	4
5 (very severe)	3	2
mean score	3.4	2.5

It was clear from the data and the surgeon's impression that the general level of pain experienced was far milder in patients who had received ethmoidal nerve and artery block than in the patients who did not.

Blood loss during surgery was measured by differential weighing of swabs. Of the 35 cases in the test group, in three cases blood loss was less than 10 grams (G), in 12 cases it was between 10 and 19 G, in 10 cases between 20 and 29G, in six cases between 30 and 39 G, in three cases between 40 and 49 G, and in one case it was 64 G; mean blood loss was 23 G (SD 13.6 G).

The average time of operation excluding that required for anesthesia was 35 minutes.

In comparison, in the 18 endonasal ethmosphenoidectomies for chronic sinusitis without ethmoidal nerve and artery block, a mean of 47 G (SD 17 G) of blood, which was twice as much as the one in the blocked group, was lost during an average operating time of 47 minutes. A summary of the results is shown in Table 2.

Table 2. Summary of results.

35 operations in 22 patients	14 males 8 female	(16–72 years old)
diagnosis: chronic sinusitis	19 patients	
postop. ethmoid cyst	2	
retrobulbar neuritis	1	
average blood loss	23 G (SD ± 13.6)(8 ~ 64 G)	
(control	47 G)(SD ± 16.9)(17 ~ 82 G)	

DISCUSSION

Endonasal ethmosphenoidectomy has been used in Japan since 1918 when it was proposed by Kenzo Takahashi. The method used today is that described by Ryo Takahashi in 1950, and this has become the surgical treatment of choise for many cases of chronic sinusitis.

Endonasal sinusectomy is usually performed under local anesthesia because much less bleeding occurs than with general anesthesia. Mucosal anesthesia however, may be inadequate to control pain. These problems we have found may be satisfactorily overcome using ethmoidal nerve and artery block within the orbital cavity. Similar results have been reported previously by Ashikawa (1979, 1980) who achieved minimal blood loss in a series of 58 endonasal ethmosphenoidectomies under ethmoidal nerve block.

The advantages of ethmoidal nerve and artery block are that it satisfactorily controls pain and minimises bleeding. The visualisation is improved and meticulous surgery may be performed. Hence the operating time is shortened and the risk of side effects including the injuries to the base of the skull is reduced effectively (Ohnishi, 1981).

Complications of the ethmoidal nerve and artery block include reaction to the anesthetics, and ophtalmic complications. Ptosis always occurs with ethmoidal nerve and artery block, and orbital pain, edema, ecchymoses and diplopia may occasionally occur; these effects are all short-lasting. More serious complications such as orbital cellulitis and ophthalmitis have not occured in our experiences of over 2,000 operations.

No oculocardiac reflex is known to us throughout our experiences, nor the visual disturbance.

It is our feeling that this procedure can be performed safely by experienced rhinologists with good knowledge of local anatomy after a course of training.

The incidence of reactions to the anesthetic can be minimised by giving test injections. We routinely inject a small volume of lidocaine into the forearm then subcutaneously in the area of the supraorbital incisure and finally at the anterior aspect of the middle turbinate, agger nasi and uncinate process area. The latter two injections are needed in any case if no untoward reactions occur and the nerve and artery block is proceeded with.

We have found the ethmoidal nerve and artery block most useful in endonasal sinusectomy under endoscopic control, where the control of bleeding within the sinuses is essential.

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