This paper assesses the effectiveness of our laser surgical technique for chronic paranasal sinusitis retrospectively. Forty-one adult patients with chronic paranasal sinusitis and bilateral nasal polyposis underwent laser surgery. After local anesthesia was administered, nasal polyps were resected and the diseased mucous membrane of the middle meatus and middle turbinate were vaporized with a CO₂ laser, without opening the paranasal sinuses. Relief or improvement of symptoms was achieved in patients with nasal obstruction (100%), amount of nasal discharge (97.4%), and anosmia (85.8%). The degree of opacity of the maxillary and ethmoid sinuses on x-ray films improved in 95% and 93.8% of sinuses, respectively. The laser surgical technique that we have developed for chronic paranasal sinusitis is noninvasive and appears to be a good alternative to the Caldwell-Luc operation or endoscopic sinus surgery.

Key words: chronic paranasal sinusitis, CO₂ laser, endoscope

Introduction

Recently functional endoscopic sinus surgery (FESS) was developed¹⁻³ as a result of the endoscopic finding⁴⁻⁵ that the pathogenic origin of paranasal sinusitis is in the middle meatus-anterior ethmoid complex (osteomeatal complex). And it was demonstrated that during postoperative recuperation of paranasal sinuses after FESS, once aeration of the sinuses was restored, even severe mucosal disease—which was assumed to be irreversible—returned to normal¹⁰.

FESS is aimed at the fenestration of anterior ethmoidal cells to widen the osteomeatal complex and improve ventilation of paranasal sinuses. Therefore, if opening the osteomeatal complex resulted in improvement of aeration of paranasal sinuses, it seemed that a less invasive procedure to keep the middle meatus open might be adopted to improve the ventilation of paranasal sinuses.

Materials and Methods

Surgical Procedure

Surgery was performed under local anesthesia. The nasal cavities were packed with 4% Xylocaine®- and epinephrine-soaked gauze preoperatively, and during the operation 0.5% Xylocaine® with 1 : 100,000 epinephrine was also applied.

Nasal polyps were transected with a nasal polyp snare and/or a grasping forceps. The polypoid mucous membranes of the middle turbinate, ethmoid bulla and semilunar hiatus were also removed as much as possible using a grasping and/or cutting forceps without fenestrating the ethmoidal sinuses (Figure 1). The architecture of the osteomeatal complex and orifices of paranasal sinuses were left untouched. Next, all residual polypoid mucous membranes of the
middle meatus and the middle turbinate were vaporized with CO₂ LASER (MEDILASER 30-S, Mochida®, Tokyo, Japan; 1-3W, continuous delivery). All procedures were performed under a rigid sinus endoscope (Olympus®, Tokyo, Japan; optical axis of 0° and 30°).

Patients and Method

Forty-one adult patients (24 men and 17 women, age 12~76 years (47.6±17.0 years), eleven of them with allergic rhinitis) with severe paranasal sinusitis and bilateral nasal polyposis resistant to medication underwent the laser surgery. Concurrent septoplasties were not performed in any of the subjects. All the patients had been treated preoperatively for 3 months or longer with medication consisting of roxithromycin (RXM) (150 mg per day) and lysozyme chloride, and with beclometasone dipropionate aqueous nasal spray 200 micrograms bid or fluticasone propionate aqueous nasal spray 200 micrograms bid in our center, but showed no improvement. The duration of symptoms before the operation ranged from 6 months to 40 years (9.7±10.4 years).

Low-dose macrolide antibiotics (roxithromycin, 150 mg per day) and tranilast (300 mg per day) were administered postoperatively. Beclometasone dipropionate (200 micrograms bid) or fluticasone propionate (200 micrograms bid) was also applied intranasally in an aqueous spray for several months until the mucous membrane of the middle meatus became normal.

Before and three months after surgery, the patients were asked to rate their nasal symptoms: 1) obstruction, 2) rhinorrhea, 3) anosmia, on a 4-point scale (0: asymptomatic; 1: slight; 2: moderate; 3: severe). The scores were compared between the two occasions to evaluate the effectiveness of the treatment. The effectiveness was also determined radiologically by comparing the opacity of maxillary and ethmoidal sinuses on x-ray and/or CT films between before and one year after surgery.

Results

Endoscopic observation of the nasal cavity

In every patient, a crust was observed soon after laser surgery in the middle meatus and/or on the middle turbinate, but the nasal cavity returned to normal about one month after surgery. No excessive proliferation of tissue was observed while the wound was healing, there was no synechia formation in the nasal cavity. Orifices of paranasal sinuses were

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Figure 1 Operative technique of the laser surgery. Endoscopic findings of the left nasal cavity are shown.
1. Nasal polyps were resected while preserving the turbinates and paranasal sinuses.
2. All morbid mucous membrane of the middle meatus and/or the middle turbinate was vaporized with CO₂ laser.
observed to be opened under endoscopic examination, and no recurrence of polyps was observed throughout the course of recovery. Figure 2-A shows a representative case; after surgery, blockage of the middle meatus and swelling of the middle turbinates completely disappeared.

Clinical Results

Table 1 shows symptomatic changes 3 months after laser surgery. Nasal obstruction disappeared in 85.4% of the patients and decreased in 14.6%, that is, all patients were relieved of this symptom. Nasal discharge disappeared in 66.7% of the patients and decreased in 30.7%. Concerning anosmia, 42.9% of patients recovered their full sense of smell, 42.9% regained it partially.

The degree of opacity of the maxillary and the ethmoidal sinuses on x-ray films improved in 95% and 93.8% of the sinuses, respectively (Table 2). Figure 2-B shows chronological changes in opacity observed on CT, in a representative case.

There were no complications peri-and postoperatively.
Discussion

During the past decade, several authors attempted to establish a clinical staging system for hyperplastic rhinosinusitis by findings on the radiographic studies, the presence or absence of nasal polyposis and/or the effectiveness of conservative medical therapies. According to these papers, surgical intervention is the rational way to handle the chronic rhinosinusitis concurring with nasal polyposis and being resistant to medication.

Cumulative endoscopic investigations have demonstrated that in most cases paranasal sinusitis originates in the nasal cavity. Obstruction of the infundibular area prevents mucus transport from the paranasal sinuses. FESS was developed by Messerklinger to correct that condition. Two techniques of improving infundibular obstruction are now in use. While, both of them fenestrate paranasal sinuses. Our laser surgical technique is a less invasive method for removing the pathologic mucous membrane and polyps from the nasal cavity without touching paranasal sinuses.

Nasal polyps are prone to recur after simple polypectomy with snare and/or forceps and the middle meatus is apt to be obstructed again, while laser irradiation inhibits excessive proliferation of tissue during the wound healing process and prevents regrowth of polyps. Therefore, vaporization of polypoid mucous membrane with laser in the middle meatus and middle turbinate can open the middle meatus for a long time, help to ventilate the osteomeatal complex and normalize nasal and paranasal aeration. In our series, neither regrowth of polyps, nor development of granulation has been observed during follow-up (maximum: for 4 years). The improvement of paranasal opacity detected by radiographical examination indicated that surgery was effective in opening not only the middle meatus but also the orifice of paranasal sinuses, restoring thereby normal ventila-

tion. One or two months after surgery, secretion and crust in the middle meatus disappeared, which suggested recovery of normal mucociliary function. Macrolide antibiotics, which are reported to normalize hypersecretion, might assist mucociliary clearance. Postoperatively, we also applied tranilast, which has been reported to suppress collagen synthesis by fibroblasts, expecting to inhibit excessive proliferation of tissue and thus keep the osteomeatal complex open.

In some patients, the procedure had to be performed twice to attain complete alleviation of symptoms.

Conclusion

Forty-one patients with chronic paranasal sinusitis underwent laser surgery dealing with only the diseased nasal mucosa to open the middle meatus. Most patients were cured or experienced improvement simply by removing middle meatal obstruction, which brought about better aeration and improved mucociliary transport of the osteomeatal complex. These results imply that it is not always necessary to open the paranasal sinuses to achieve physiological reversal of sinus disease and that this procedure can be a good alternative to the Caldwell–Luc operation or endoscopic sinus surgery.

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