

CHARLES W. GROSS, MD
JANIEL G. BECKER, MD, GUEST EDITORS

Q
70T55
30
3
1997

THE OTOLARYNGOLOGIC CLINICS OF NORTH AMERICA

Advances in Sinus and Nasal Surgery

J	U	N	E
1	9	9	7

Neurent 1107
Neurent v. Foundry
IPR2024-00280

THE OTOLARYNGOLOGIC CLINICS OF NORTH AMERICA

Advances in Sinus
and Nasal Surgery

CHARLES W. GROSS, MD, AND
DANIEL G. BECKER, MD, GUEST EDITORS

VOLUME 30 • NUMBER 3 • JUNE 1997

W.B. SAUNDERS COMPANY

A Division of Harcourt Brace & Company

PHILADELPHIA LONDON TORONTO MONTREAL SYDNEY TOKYO

W.B. SAUNDERS COMPANY
A Division of Harcourt Brace & Company

The Curtis Center • Independence Square West • Philadelphia, PA 19106-3399

**THE OTOLARYNGOLOGIC CLINICS
OF NORTH AMERICA**
June 1997

Editor: Theresa Monturano

Volume 30, Number 3
ISSN 0030-6665

Production Editor: Patience A. Rathbun

Copyright © 1997 by W.B. Saunders Company. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information retrieval system, without written permission from the Publisher.

The ideas and opinions expressed in *The Otolaryngologic Clinics of North America* do not necessarily reflect those of the Publisher. The Publisher does not assume any responsibility for any injury and/or damage to persons or property arising out of or related to any use of the material contained in this periodical. The reader is advised to check the appropriate medical literature and the product information currently provided by the manufacturer of each drug to be administered to verify the dosage, the method and duration of administration, or contraindications. It is the responsibility of the treating physician or other health care professional, relying on independent experience and knowledge of the patient, to determine drug dosages and the best treatment for the patient. Mention of any product in this issue should not be construed as endorsement by the contributors, editors, or the Publisher of the product or manufacturers' claims.

Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by W. B. Saunders Company provided that the base fee of \$0.00 per copy, plus \$0.20 per page, is paid directly to Copyright Clearance Center (CCC), Transactional Reporting Service, 222 Rosewood Drive, Danvers, MA 01923. Identify this publication by including with your payment the fee code 0030-6665/97 \$0.00 + \$0.20. For those organizations that have been granted a photocopy license by CCC, a separate system of payment has been arranged. All fees are subject to change without notice.

The Otolaryngologic Clinics of North America (ISSN 0030-6665) is published bimonthly by W. B. Saunders Company. Corporate and Editorial Offices: The Curtis Center, Independence Square West, Philadelphia, PA 19106-3399. Accounting and Circulation Offices: 6277 Sea Harbor Drive, Orlando, FL 32887-4800. Periodicals postage paid at Orlando, FL 32862, and additional mailing offices. Subscription price is \$126.00 per year (US individuals), \$176.00 per year (US institutions), \$180.00 per year (Canadian individuals), \$216.00 per year (Canadian institutions), \$188.00 per year (international individuals), and \$216.00 per year (international institutions). Foreign air speed delivery for all *Clinics* is \$6.00 per issue. All prices are subject to change without notice. POSTMASTER: Send address changes to *The Otolaryngologic Clinics of North America*, W. B. Saunders Company, Periodicals Fulfillment, Orlando, FL 32887-4800. **Customer Service: 1-800-654-2452 (US). From outside the US, call 407-345-4000.**

The Otolaryngologic Clinics of North America is also published in Spanish by McGraw-Hill Interamericana Editores S.A., P.O. Box 5-237, 06500 Mexico D.F., Mexico.

The Otolaryngologic Clinics of North America is covered in *Index Medicus*, *Current Contents/Clinical Medicine*, *Excerpta Medica*, *BIOSIS*, *Science Citation Index*, and *ISI/BIOMED*.

Printed in the United States of America.

LASERS IN ENDONASAL SURGERY

Howard L. Levine, MD

The laser has a valuable primary and adjunctive role in the management of various sinus and nasal disorders.³ This article discusses the safety of the laser unique to intranasal use, instrumentation for intranasal use, the type of pathology that can be treated, the energy dosage for that pathology, and the results that might be expected.

LASER SAFETY

In any use of the laser for the management of otolaryngologic pathology, several safety precautions must be utilized. Both the surgeon and the laser operator must be familiar with the laser. Issues such as safety, energy dosage, fiber management, and instrumentation must be understood. Many of the general principles governing safe use of the laser endonasally are the same as those applying to laser utilization elsewhere in the body.

The surgeon and laser operator must communicate consistently and frequently about whether the laser is "on" or "off" and in regard to the wattage and exposure. The surgeon should clearly and succinctly state, "Laser on" (or "standby"), and the wattage and exposure time. The laser operator should repeat the instruction.

Proper signage outside of the laser suite must include a warning that the laser is being used, the wavelength, and the type of eye protection needed. Many surgeons and staff wear eye protection when the laser is being used in an open wound but opt not to wear eye protection when working in a closed cavity such as the nose, sinus, or oral cavity. Patient

From the The Mt. Sinai Nasal Sinus Center, Cleveland Ear, Nose & Throat Center, Inc.,
Cleveland, Ohio

OTOLARYNGOLOGIC CLINICS OF NORTH AMERICA

protection should include eye protection with goggles for procedures performed under local anesthesia or monitored sedation and moistened eye pads for procedures performed under general anesthesia.

When the laser is coupled with nasal endoscopes for use within the nose and sinuses, a proper eye safety filter is used and inserted between the endoscope and beam splitter or camera.

ENDONASAL LASER INSTRUMENTATION

Many intranasal procedures with the laser can be performed with a headlight, laser safety glasses, a nasal speculum, and a laser fiber with appropriate hand piece. This is especially true for anterior nasal pathology and much of the surgery on the inferior and anterior middle turbinate. For most other intranasal and endonasal procedures, the nasal endoscope provides visualization for the surgeon. One of several laser hand pieces (Fig. 1) is used depending on the area to be operated on.

ENERGY DOSAGE

Energy dosage is determined as in any other laser procedure. Spot size, wattage, and exposure time are all important.

Cutting requires high-energy density achieved with a small spot size, high wattage, and variable exposure, calculated by the following equation:

$$\text{Energy Density} = \text{Power} \times \text{Time} / \text{Area (watts/sec/cm}^2\text{)}$$

Coagulation requires a low-energy density achieved with a large (defocused) spot size, low-to-intermediate wattage, and variable exposure. Vaporization requires high-energy density achieved with an intermediate spot size, high energy, and variable exposure.

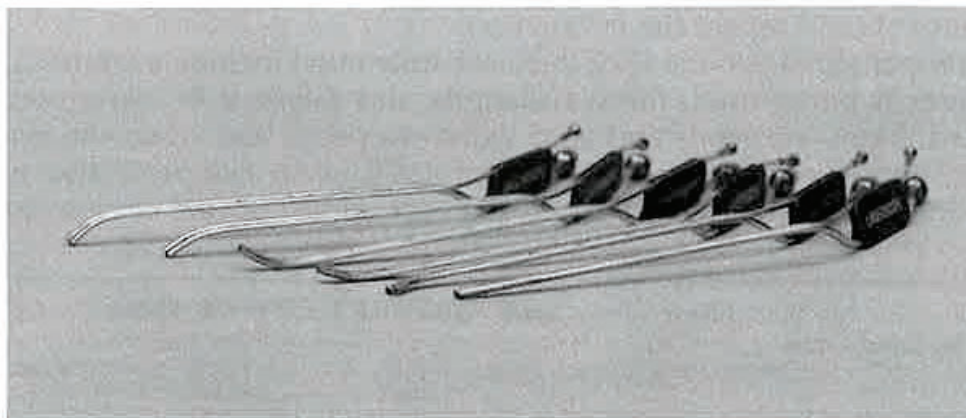


Figure 1. Various laser handpieces of differing angles allow the laser to be used within the recesses of the nose and sinuses.

ENDONASAL PATHOLOGY

Turbinate Dysfunction

Vasomotor and allergic rhinitis are common problems that can be challenging to manage. Medical management with antihistamines with or without decongestants and various nasal sprays is usually effective. Despite adequate medical management, nasal obstruction and congestion may persist. In these instances, laser photocoagulation is often an appropriate adjunctive or complete management option.

Fukatake¹ has described the use of the CO₂ laser for allergic rhinitis. The laser is used at 12 watts and 0.1 second at weekly intervals for 5 weeks to reduce the turbinate. In a group of 1000 patients, 46% had an excellent result, 34% a good result, and 20% no change.¹ In a previous report, Fukatake² described histologic studies which showed a layer of scar tissue forming beneath the submucosa. It is thought that the scar tissue prevents the turbinate from expanding when stimulated by external irritants. The laser probably decreases the number of goblet-secreting cells and the autonomic innervation of the turbinate.

The author has observed a series of 425 patients who underwent KTP/532 reduction of the turbinate for 2 to 4 years. Laser reduction was performed with the patient under local anesthesia. The power was set at 8 watts and continuous to cross-hatch the anterior two-thirds of the inferior turbinate. This allowed the nasal mucosa to regenerate, preserving a normal surface while creating a layer of scar tissue in the submucosa.⁴ Of the 425 patients, 71.1% were asymptomatic with no nasal medications, and 20.2% were asymptomatic but required occasional use of nasal medications. The remaining 8.7% were no better. None were worse.

The laser seems to provide adequate turbinate reduction without crusting or atrophy. Healing is rapid and morbidity low. The laser improves the airway and reduces secretions in most instances.

Vascular Disorders

Hereditary hemorrhagic telangiectasia is an autosomal dominant disorder affecting the smooth muscle of blood vessels. Bleeding frequently occurs from the nasal mucosa. The laser has been used to photocoagulate the telangiectatic vessels. It is not curative but, rather, controls the bleeding by either sealing bleeding vessels or creating a layer of scar over the vessels to toughen the surface and minimize trauma.

Both the Nd:YAG and KTP/532 laser have been used in treatment.^{3,6,7} Both lasers have controlled bleeding by lessening the frequency and severity of epistaxis. Most of the patients have undergone laser photocoagulation using the KTP/532 laser because of its more superficial depth of penetration in comparison with the Nd:YAG laser.

The laser is used at a low-energy density of 1.5 to 3 watts with a defocused spot size and intermittent mode of 0.1 second on and 0.1 second off. This allows the greatest degree of coagulation. Patients are operated

on under general anesthesia to avoid the need for topical or injectable local anesthesia with vasoconstriction. This allows blood vessels to be easily seen, and there is little worry about aspiration of blood. Blood vessels are photocoagulated beginning peripherally and working centrally. If bleeding occurs, suction cautery is used briefly to dry the field, and then laser photocoagulation is continued. Approximately 70% of patients report a reduced frequency and severity of epistaxis 12 months after laser photocoagulation.

Chronic epistaxis is not an entity usually managed by laser treatment. On occasion, individuals will present with frequent epistaxis secondary to aggregates of blood vessels on the mucosal surface of the nose. Traditional cautery in the office does not control the bleeding, and therefore laser treatment is an option. The laser is used in the same manner as in the management of hereditary hemorrhagic telangiectasia.

Nasal Polyposis with Eosinophilia

Nasal polyposis with eosinophilia is one of the most challenging problems facing the rhinologist. Patients frequently have asthma, aspirin sensitivity, or both associated with the nasal polyposis. The asthma is often more difficult to manage because of ongoing sinusitis, often secondary to the nasal polyposis.

Patients are treated with endoscopic sinus surgery followed by topical nasal corticosteroid spray. At the earliest sign of recurrence, systemic steroids are used. If systemic steroids are ineffective or must be used for a lengthy time, laser photocoagulation of the sinus cavity is undertaken.

The laser is used under nasal endoscopic control to photocoagulate the entire sinus cavity where polyposis appears. The power is set at 6 to 10 watts (depending on the depth of polypoid tissue) and the spot size slightly defocused and in an intermittent mode to cool the underlying tissue between laser bursts.

A total of 46 patients have been observed for 24 months (Table 1). Some of the patients have required medical management in addition to the laser photocoagulation. This medical management was often effective when it had previously failed.

Success was measured by determining the number of patients who either had no symptoms or improved symptoms either with or without

Table 1. KTP/532 LASER PHOTOCOAGULATION OF NASAL POLYPS WITH EOSINOPHILIA ($n = 46$)

Outcome	Follow-up = 24 Months	
	Medical Management	No Treatment
No symptoms	15	7
Improved	17	1
No better	4	0
Worse	2	0

medical management. A total of 40 of 46 patients (86.6%) were in this category. Although this number is encouraging, it may decrease with longer follow-up.

Intranasal Scarring

Nasal and sinus surgery can result in scar tissue formation which may or may not pose problems for the patient.⁵ Scar tissue might involve ostiomeatal complex narrowing with or without obstruction, intranasal synechiae, narrowing of various ethmoid sinus air cells, or maxillary or sphenoid sinus ostia.

The KTP/532 laser can be used in a vaporization or cutting mode (8 to 12 watts and either continuous or intermittent depending on the area used) to remove scar tissue. If necessary, a spacer of Silastic or Gelfilm may be needed to prevent recurrence of the scar.

POSTOPERATIVE MANAGEMENT

Most patients have some crusting and edema following nasal and sinus procedures with the laser. All patients are given saline nasal spray to be used at least six to seven times a day. Steroids and antibiotics have been used in the past but have not made a difference in the healing or postoperative discomfort. Patients are allowed to blow the nose gently about 1 week after surgery.

References

1. Fukatake T: CO₂ laser and turbinate dysfunction. Presented at the XII International Symposium on Infection and Allergy of the Nose (ISIAN), Seoul, Korea, October 8–11, 1993
2. Fukatake T, Yamashita T, Tomoda K, et al: Laser surgery for allergic rhinitis. *Arch Otolaryngol Head Neck Surg* 112:1280–1282, 1986
3. Levine HL: KTP/532 laser for nasal sinus disease. *Ann Otol Rhinol Laryngol* 98:46–51, 1989
4. Levine HL: The potassium-titanyl phosphate laser for treatment of turbinate dysfunction. *Otolaryngol Head Neck Surg* 104:247–251, 1991
5. May M, Levine HL, Mester SJ, et al: Complications of endoscopic sinus surgery: Analysis of 2108 patients—incidence and prevention. *Laryngoscope* 104:1080–1083, 1994
6. Mehta AC, Livingston DR, Levine HL: Fiberoptic bronchoscope and Nd:YAG laser in the treatment of severe epistaxis from nasal hereditary hemorrhagic telangiectasia and hemangioma. *Chest* 91:791, 1987
7. Parkin JL, Dixon JA: Laser photocoagulation in hereditary hemorrhagic telangiectasia. *Otolaryngol Head Neck Surg* 89:204–208, 1981

Address reprint requests to

Howard L. Levine, MD
The Mt. Sinai Nasal Sinus Center
Cleveland Ear, Nose & Throat Center, Inc.
26900 Cedar Road, Suite 22N
Cleveland, OH 44122