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**Functional Laser Surgery in ENT Practice**

For almost 10 years, I have been operating a surgical ENT practice between Potsdam and Berlin, and have been based at the "Ärztehaus am Rathausmarkt" medical center in Kleinmachnow for approximately one year. We frequently host laser workshops here for fellow ENT specialists interested in this subject, most of whom are eager to expand their surgical expertise by learning what can be achieved with diode lasers. At these workshops, I always use a diode laser manufactured by Biolitec AG in Jena for the purpose of demonstration.

For approximately three years, I have been making regular and extensive use of this laser to enhance the range of surgical procedures I offer in my practice. I previously spent some considerable time testing virtually all of the leading laser systems on the market that are of relevance for out-patient ENT surgical treatment.

While working in a clinical setting, I had the privilege of learning from the considerable expertise of Herr Dr. med. Gundlach. While most of the expert instruction I received during this period related to the use of CO₂ lasers in the surgical treatment of tumors in the ENT field, I later chose to procure a diode laser with a wavelength of 980 nm for my own practice. Based on its impressive absorption behavior in tissue, I decided that this laser system was both the most pragmatic and the most economical solution for most ENT interventions, taking all of its properties into account, and, in particular, because it offered a good compromise between cutting and coagulation.

Given the small number of legitimate "individual healthcare services" (or IGel, i.e. services paid for by patients themselves) that can be offered in ENT medicine, the acquisition of the diode laser undoubtedly represented a business optimization for the practice.

New surgical treatment options enabled extrabudgetary inputs in many cases. Since January 2002, I have performed 672 laser conchotomies, 152 functional septum correction procedures (ridges, spurs, deviations, synechias), 56 laser hemostases on the front septum (unilateral in all cases), 33 LAUPs, 146 laser tonsillotomies, 37 treatments of benign neoplasia, and 638 laser paracenteses, in other words, a total of 1,734 laser surgical procedures.

Overall, the results can be classed as positive, in the sense that many treatment objectives can now be achieved using much less invasive procedures from a patient perspective. The vast majority of the procedures, in particular among adults, were carried out under local anesthetic, which allowed us, as surgeons, to work with relative ease without the assistance of an anesthetist.

Patient compliance can be rated as extremely high. In the case of selected applications, in particular tonsillotomies on children, we managed to establish grounds for charging fair, extrabudgetary fees as part of an agreement on integrated healthcare management with individual public health insurance organizations.

This treatment option is valued by parents and pediatricians in particular.

To date, I have never experienced hemorrhage or other complications.
All children recovered very well from the procedure, which I performed exclusively on an out-patient basis and in conjunction with an adenotomy in each case. Note that 90% of referrals come from pediatricians.

Naturally, this type of pediatric surgery is performed using endotracheal anesthesia. However, I also administer two to three bilateral peritonsillar depot injections of 1 – 2 mL of ultracain 1% and suprarenin, which effectively minimize post-operative pain. The only indication for this procedure is tonsillar hyperplasia.

For other conditions, by contrast, I have had to remove 50% to 70% of the tonsil tissue with an alligator forceps using gentle luxation. With the laser set to continuous mode, I use a suction handpiece to apply a carbonized fiber tip onto or into the tonsil tissue directly at a wavelength setting of 15 – 17 W. The tissue is trimmed along a line parallel to the front palatal arch without any loss of blood. I have also found that covering the surrounding tissue with damp gauze pads prevents any thermal damage to that tissue. I regularly prescribe antibiotics and anti-inflammatory drugs for five to seven days after surgery.

I have also found this to be an effective treatment that has caused no problems. For some time now, I have considered this procedure to be one concrete way in which we can collaborate creatively at an interdisciplinary level with a large number of pediatricians, at whose instigation the procedure is performed in many cases. Thanks to this system, we, as active practitioners of out-patient laser surgery, have succeeded in replacing an operation that was previously performed on a strictly in-patient basis (i.e., tonsillectomy) with an out-patient surgical service, at least in the case of hyperplasia. To sum up, the use of this diode laser has clearly had a long-term positive impact on the surgical service offered by my practice, first and foremost in terms of increased patient comfort and the qualification of many indications for highly invasive surgical procedures.

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Use of the D15 Diode Laser in ENT Practice

Dr. med. G. Maak, Dr. G. Strehlow, Erlangen, Germany

Summary

The Ceralas D 15 diode laser was used to successfully treat more than 1,000 patients presenting with hyperplasia of the nasal turbinates within a period of approximately six months. When applied systematically, a laser output of 12 – 14 W at a wavelength of 980 nm is sufficient to achieve a defined ablation of the mucosal tissue. The procedure is painless and normally involves no loss of blood.

Turbinate surgery

One of the most frequent diagnoses made by doctors in ENT practice is hyperplasia of the nasal turbinates, which may have many different causes, i.e.:

1. Anatomical irritants (mucosal contact due to septal deviation, nasal polyps)
2. Physical/chemical irritants (heat, cold, smoke, damp)
3. Allergic reactions (seasonal allergy, perennial allergy, occupation-related allergy, food allergy)
4. Endocrine responses (pregnancy, hyperthyroidism, acromegaly, contraceptives)
5. A neurological response ("skier's nose" (cold-induced rhinorrhea), reaction to spices, "old man's drip" (watery rhinorrhea caused by a testosterone deficiency in elderly males))
6. Toxic irritants (drug overdoses)
7. Post-infection occurrences (after a viral or bacterial infection)
8. Idiopathic (an unknown pathological mechanism with a trigger that cannot be identified)
9. Undetermined cause (cause of illness not determined, NARES syndrome, nasal mastocytosis)
10. Environmental factors (indoor and outdoor pollutants)

These various causes result in a thickening of the mucous membrane, which obstructs first nasal breathing and then oral breathing, in particular at night. This dries out the mucosal lining of the pharynxes, larynxes and tracheobronchial tree, resulting in constant throat-clearing and a dry cough due to swelling of the secreting mucosa.

Pharyngitis also causes a globus sensation (the feeling of having a lump in one's throat), which projects deep into the gullet. Snoring frequently occurs if the nose becomes blocked at night, in particular when this is caused by a thickening of the nasal turbinates. Decongestant, cortisone nasal sprays may offer temporary relief, but do not reduce the mucosal edema. Since the long-term use of these nasal sprays damages the mucosa, surgical intervention is the most suitable approach to treating hyperplasia of the nasal concha in both sides of the nasal cavity.

Several methods are available:

1. Conchotomy (turbinotomy) with a special nasal scissors: This involves a significant loss of blood, and postoperative nasal tampons are required to stop the bleeding.
2. Monopolar needle coagulation with an electrode
3. Bipolar coagulation with bayonet-shaped forceps
4. Shrinkage of the mucosal tissue with radiosurgery.
5. Bilateral laser conchotomy

Having previously used the bipolar method for 16 years to operate on some 36,000 patients suffering from problems of the nasal turbinates, I have been using a special diode laser (the Ceralas D15 by CeramOptec) since December 1996. I performed laser conchotomies on 1,172 patients up to the end of July 1997. The indications for using this procedure are described above.

Method:

After reducing nasal swelling with a pantocaine solution, a cocaine solution is applied to the nasal turbinates as an additional further anesthetic. A laser conchotomy in both sides of the nasal cavity can be performed after just 10 seconds. The laser is applied to the swollen areas of the mucosa, starting at the head of the turbinate and systematically progressing sagittally towards the dorsal end. Laser energy is applied to the end of the turbinate for a longer period because this area requires particular attention.

It is advisable to use a second application of laser energy in parallel to the first, working from the back to the front, in order to achieve satisfactory necrosis of the tissue (at a setting of approximately 12 – 14 watts in continuous mode).

The procedure is painless and normally involves no loss of blood. It only requires that the patient be in a lying position, and it can be administered on an out-patient basis. With the correct post-operative care, the mucosal wound will heal in approximately three weeks. In contrast to bipolar conchotomy, no separation of dead bone tissue has been observed. On one occasion, a patient experienced a late secondary hemorrhage after a period of two and a half weeks.

The results of using this laser are excellent, in particular because the versatile hand grip and the extremely light laser fiber allow for easy manipulation within the nasal cavity.

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After testing various types of lasers in my practice, I determined that this diode laser was best suited to this kind of procedure involving mucosal tissue. It allows for a minimally invasive treatment of patients, who are able to breathe freely and enjoy a new lease of life after just a few weeks.

I can also report additional indications for use of this diode laser (removal of nasal polyps, isolated ethmoidectomy, obliteration of epistaxis, uvula reduction, etc.).

After one week: a scab forms

Lower concha left, two minutes after treatment (14 W)

Two weeks after treatment: scab falls away

24 hour later: fibrin phase

Three weeks after treatment: wound has healed

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Method for treating snoring and sleep apnea syndrome:

Snoring is attributable to many different causes:

Obesity, the consumption of large quantities of alcohol in the evening, smoking habits, ingestion of food before bed, to name just a few…. In most cases, however, snoring is associated with obstructed nasal breathing at night and with the problem of the soft palate having an excessively long uvula.
Based on our experience, snorers fall into one of the following three categories:

1. Those whose snoring is caused by obstructed nasal breathing
2. Those whose snoring is due to a slack soft palate with an excessively long uvula, combined with obstructed nasal breathing at night
3. Those we refer to as "gullet snorers", where the snoring is caused by problems with the hypopharynx (thickening of the base of the tongue, narrow anatomical proportions)

Based on this classification, we treat snoring and sleep apnea syndrome as follows:

1. Clearing of the upper air passages, with correction of the septum and laser conchotomy in both nasal cavities (or possibly isolated laser conchotomy only in both nasal cavities), procedures on the paranasal sinus in the case of polyposis nasi et sinuum (polyps affecting the nose and sinuses) in both nasal cavities or in the case of ostial closure of the paranasal sinus with chronically infected sinusitis.

Once the patient can breathe freely through the nose, we need to wait at least three months before assessing how this affects snoring. In most cases, no further intervention is necessary.

2. However, if this is not the case, we use a second laser surgical procedure to trim the uvula through laser pulse-controlled stiffening of the soft palate (see the illustration). In this case, laser energy is applied linearly to the soft-palate tissue and, in addition, lateral application of a pulsed laser beam (approximately 1 cm) induces scarring to stiffen the lax soft palate.

   Stiffening of the soft palate
   Additional option
   Periphery of uvular section
   1 cm

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The importance of the role played by obstructed nasal breathing in causing snoring is evidenced by the successful outcomes of adenoidectomies in children.

Snoring is dramatically reduced after this minor, out-patient procedure.

3. If nasal breathing is obstructed by bilateral hyperplasia of the nasal turbinates and by a soft palate with an extended uvula, we perform a laser conchotomy and plastic surgery to trim the uvula with stiffening of the soft palate. All of this can be done at the same time.

It takes approximately three weeks for the wound in the nose caused by the laser surgery to heal, and this process is accompanied by the usual fibrin exudation and formation of necrosis. It takes approximately two to three weeks for the tissue affected by the uvular trimming and soft palate stiffening to heal, and, in the first few days after the procedure, the wound causes a significant amount of pain. A combination of ibuprofen and tramal has proven very effective in the relief of this pain. A non-prescription anesthetic throat lozenge can also be used as a local anesthetic.

Since the nasal problems described above always occur in connection with soft palate stiffening and uvular trimming, we have not performed an isolated procedure on the soft palate and uvula to date.

According to patients' spouses, the procedures described here have had a significant positive effect on snoring and sleep apnea syndrome. The use of a night-time mask to deliver pressurized air is no longer necessary.

This leads us to conclude that patients suffering from sleep apnea syndrome and snoring should not be examined primarily in a sleep laboratory. Instead, they should first seek to pinpoint the exact cause of the problem with the help of an ENT specialist and receive a relevant diagnosis (based on endoscopy, sonography, if necessary X-rays of the paranasal sinus, rhinomanometry, allergy testing, nasal provocation testing, etc.). Based on this diagnosis,
their treatment should then consist of one of the surgical procedures described above. This conclusion is based on our experience of treating patients in our own practices.

Removal of septal spurs and ridges

Septal deviation and bilateral hyperplasia of the nasal turbinates are the most frequent causes of obstructed nasal breathing and its known effects. After achieving the best possible results using the Ceralas D15 diode laser for mucosal reduction over one year, we can now present the results of the surgical removal of septal deviations by laser. We were prompted to investigate this option when a patient with nasal haemorrhaging required emergency intervention. In this case, the bleeding originated in an artery in the septum located behind a dorsal septal spur. After applying nasal drops and pantocain to reduce the swelling, as well as a cocaine solution, the spur was sprayed with a local anaesthetic. Since the arterial hemorrhage could not be reached with bipolar forceps or with the curved guide tube of the diode laser, we separated the mucous membrane of the cartilaginous-osseous spur in its entirety. It could then be removed easily from the mucosal pocket with straight Blakesly ethmoid forceps. It was then a straightforward procedure to coagulate the bleeding using laser surgery. A soft nasal tamponade worn for one night allowed the mucous membrane to adapt and compressed the site of the bleeding.

Spurred on by the success of this procedure, we have since performed resectioning of septal ridges and spurs (in most cases dorsal) in many patients.

In six patients, the entire mucosa was lost in the region that was resected. This reepithelized within six weeks.

As part of postoperative care, the usual serofibrinous exudation of the mucous membrane necessitated repeated treatments to prevent the formation of adhesions.

Patient acceptance of this minor, non-invasive procedure was very high, with the result that most patients decided to be treated immediately on an out-patient basis during the consultation. The postoperative monitoring phase was conducted seamlessly by telephone.

In each case, a setting of 10 – 12 watts was used to treat the mucosal tissue. A higher setting of 14 watts was used to treat the septum. This allowed us to cut cleanly through the cartilaginous-osseous parts of the septum.

The results of pre-operative and post-operative rhinomanometric examinations revealed that the patients' nasal breathing was much freer after the procedure.

To the best of our knowledge, this is the first time this particular application of the Ceralas D15 diode laser has been reported.