



## Gold Laser Resection of the Concha Bullosa: Description of a New Technique

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### Abstract

**Introduction:** Concha bullosa is the most common anatomic abnormality of the lateral nasal wall, and inflammation or infection of the concha bullosa can result in headaches and nasal obstruction. Functional endoscopic sinus surgery is the treatment of choice for refractory or recurrent symptoms despite medical management, and can present a challenge to the otolaryngologist due to the vascularity of the concha bullosa, as well as propensity for scarring postoperatively, which may lead to recurrence. Presented here is a safe, novel technique for surgical management of the concha bullosa.

**Methods:** The Gold Laser (Medical Energy, Pensacola, FL) is a 980 nm laser containing gallium, indium and arsenide phosphate. The delivery system incorporates a suction hand piece with the laser fiber, allowing simultaneous cutting/coagulation and smoke/blood evacuation. The chisel-tip of the fiber allows cutting and ablation of soft tissue and thin bone in contact mode, and coagulation of bleeding tissue in non-contact mode.

**Results:** Long-term follow-up data on 33 patients treated with the Gold Laser are presented. All patients reported improved symptoms postoperatively, with decreased nasal obstruction and headaches, and fewer episodes of rhinosinusitis. There were no postoperative complications such as scarring or significant bleeding.

**Conclusions:** The Gold Laser is a safe, facile means of treating concha bullosa. The excellent hemostasis afforded allows for excellent visualization and safe surgery, and the symptomatic improvements are maintained for years postoperatively.

**Keywords:** Concha bullosa; Lasers; Endoscopic sinus surgery

### Introduction

The concha bullosa, wherein the middle turbinate is pneumatized, represents the most common anatomic abnormality of the lateral nasal wall [1]. This congenital anomaly often results in an oversized middle turbinate which can predispose the patient to sinusitis. Subsequent results may include obstruction of normal sinus outflow tracts, polyposis within the turbinate, headaches from increased pressure within the pneumatized cavity of the turbinate, contact between mucosal surfaces, and pyocele of the middle turbinate secondary to retained secretions within the cavity [1-4].

Numerous methods have been described to surgically address concha bullosa, from crushing with endoscopic instruments, resection *via* marsupialization using combinations of blunt and sharp dissection or powered microdebriders, to laser treatment [5-7]. When considering Functional Endoscopic Sinus Surgery (FESS), the very small working space dictates that visibility and hemostasis are paramount, and this is also true of surgical management of concha bullosa. Other endoscopic methods may be effective in long-term disease control, but the ideal method will be both efficacious and facile for the surgeon, eliminating unnecessary intraoperative bleeding.

The use of lasers in endoscopic sinus surgery is not new; multiple lasers have been utilized with varying degrees of success. CO<sub>2</sub>, KTP-532, argon laser, and pulsed diode laser have all been described in FESS for a variety of nasal complaints, each with its own limitations and successes [8-11]. The ideal laser for endoscopic sinus surgery is one that is able to ablate thin, vascular tissue of the nasal mucosa for hemostasis and polyp destruction, as well as relatively hypovascular bony tissue such as the concha bullosa or anterior ethmoid bulla. While a perfect laser for these applications remains elusive, the Lightforce Gold Laser (Medical Energy, Pensacola, Florida, USA) provides these features

and, in our experience, is a facile tool for endoscopic sinus surgery and concha bullosa resection.

### Methods

Retrospective chart review was undertaken of all patients having undergone Gold Laser resection of a concha bullosa by the senior author (N.K.W.) from 2007 – 2011. Indications for procedure, any concurrent surgical procedures, intraoperative and postoperative complications, and postoperative recurrent ipsilateral rhinosinusitis or headache symptoms were recorded.

The mean age of patients at the time of surgery was 52 years old (range: 15 to 77 years old) and mean follow-up time was 30 months (range: 1 to 51 months). Fourteen patients were female and 19 were male. Indications for concha bullosa resection, as well as any concurrent rhinologic pathologies, are given in Table 1. The most common indications were chronic ipsilateral maxillary sinusitis (31/33 patients) and nasal obstruction (29/33 patients), while other indications included recurrent ipsilateral acute sinusitis, headache, nasal polyposis, nasal mass, allergic fungal sinusitis and mucocele. Multiple indications were present in 22/33 patients. The most common concurrent non-

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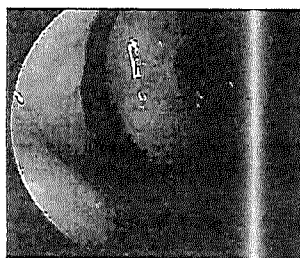


Figure 2: 8 month postoperative results. Note the well-healed middle turbinate, with no exposed bone or synichiae, and near-normal appearance after resection of the concha bullosa. The medial maxillary anastomy is widely patent and easily visible in this patient as well.

and nasal polyposis, and had an endoscopic frontal sinus mucocele resection at the time of concha bullosa treatment. With reinstatement of topical nasal steroids and oral antihistamines, the patient is doing well one year after his revision FESS for contralateral disease.

In all patients there were no instances of cerebrospinal fluid leakage, ocular or orbital injury, anosmia, synechia, exposed bone intranasally, lateralization of the middle turbinate, persistent ipsilateral headaches or nasal obstruction postoperatively.

## Discussion

There have been many technological advances in recent years in the field of FESS. Among these are the development of smaller, lighter endoscopes and cameras, the advent of high-definition cameras and monitors, and a remarkable variety of endoscopic surgical instruments. Concha bullosa resection, which is frequently performed in conjunction with other endoscopic surgical procedures, has undoubtedly benefited from some of these advances as well. Paramount to successful and safe endoscopic sinus surgery is visibility, which is achieved partly through the use of cameras and monitors capable of delivering high-quality images, but also through surgical technique and surgical instruments capable of maintaining hemostasis.

Preoperative and intraoperative use of topical and injected vasoconstrictive agents has long been the backbone of hemostatic maintenance in FESS, and remains an integral tool. In addition, minimizing trauma, both intentional surgical trauma as well as inadvertent trauma incurred *via* repetitive withdrawal and reinsertion of multiple surgical instruments, is necessary to achieve this aim. While some authors have described novel methods of handling multiple instruments simultaneously within the nose [12], another technique used to reduce such inadvertent mucosal trauma is to utilize a single instrument capable of performing multiple tasks.

The Lightforce Gold Laser hand piece incorporates a suction tip, as well as the flexible quartz laser fiber, thus allowing this single instrument to cut soft tissue and thin bone, coagulate bleeding vessels, and evacuate smoke, blood, secretions, or irrigation fluid from the operative field without changing instruments. The 980 nm wavelength of the Indium-Gallium-Arsenide Phosphate III laser contained within the Lightforce Gold unit has a reported burn depth of 0.3 mm [13], and can be used in two ways. Placing the tip of the laser fiber in contact with tissue allows precise cutting of vascular nasal mucosal surfaces whilst coagulating the small vessels within the tissue as it cuts, avoiding bleeding. The chisel shape of the fiber tip allows the surgeon, by gently increasing applied pressure with the instrument, to puncture thin bone

lamina, such as concha bullosa or ethmoidal cells, while maintaining the same hemostatic ability. The requirement of a subtle, but conscious, increase in force by the operating surgeon makes it very difficult to unintentionally puncture even thin bone. Withdrawal of the tip of the laser fiber 1-2 mm away from the tissue surface defocuses the beam to an area of approximately 2 mm, producing a superficial coagulating effect to control any unexpected bleeding. The shallow depth of burn injury of the Lightforce Gold Laser and precision handling by the operative surgeon both obviate the thick, fibrinous exudate formation in the postoperative healing period reported by Kennedy, and other authors [14,15].

The ability to maintain a virtually bloodless field not only increases the safety and decreases the technical difficulty of the procedure, but increases patient comfort postoperatively as well. Only a small amount of absorbable packing material is left in the nasal cavity, and postoperative nausea is less likely as there is almost no blood to be inadvertently swallowed intraoperatively by the patient.

The use of the Lightforce Gold Laser in concha bullosa resection provides a simple, facile method to achieve long-term successful results (Figure 2), and is a further addition to the rhinologic surgeon's armamentarium.

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