Use of a Flexible CO₂ Laser Fiber Delivery System in Otolaryngology Head and Neck Surgery: Multi-institutional Experience

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ABSTRACT

Objective: To examine the current applications of the flexible CO₂ laser waveguide in otolaryngology-head and neck surgery.

Design: Retrospective review of case data from three institutions.

Methods: Flexible CO₂ laser fibers were used in 264 otolaryngic cases between 11/2006 and 04/2009. Intraoperative data including surgical site, fiber type, power setting, and laser mode was analyzed. Surgeon opinions were assessed regarding the fibers’ cutting, ablating, and coagulating capacities as well as their safety and efficacy when compared with alternative modalities. After each case, the surgeon was asked whether operative time was shortened by using the flexible CO₂ laser waveguide when compared with the appropriate alternative.

Results: Flexible CO₂ laser fibers were used in 44 head and neck, 142 otology, 47 laryngology/airway, 29 pediatric and 2 rhinology cases. The majority of surgeons agreed that the waveguide offered superior cutting and ablation to traditional modalities (cold steel, electrocautery, coblator, microdebrider, Argon/KTP laser, and drill) and better flexibility and access than the CO₂ laser micromanipulator. Improved pathologic margins were obtainable with the fiber because of its precision, safety for use near vulnerable structures and greater access to non-line of site locations. These advantages resulted in shorter operative times in most applications, as listed in Table 2. Complications in our series included six fiber failures; however none compromised the safety of patients or staff.

Conclusion: The flexible CO₂ laser waveguide is a safe, versatile and effective tool with applications in all otolaryngic subspecialties.

INTRODUCTION

CO₂ laser energy has long been regarded as a valuable surgical tool due to its high water absorption and resulting ideal tissue interaction. The laser’s long wavelength of 10.6 microns is also absorbed by all materials, and its uses had previously been limited to line of sight applications by delivery through an articulated arm or a micromanipulator. BeamPath™ technology permits the transfer of CO₂ laser light through a flexible, handheld fiber which can be used as a surgical cutting, ablating and coagulating tool. The Ommiguided™ BeamPath™ fiber was introduced for clinical use in May 2005, and since then it has been employed in thousands of surgical cases and minimally invasive procedures across many specialties.

Within the field of otolaryngology-head and neck surgery, flexible CO₂ laser fibers are now utilized in all subspecialties including head and neck oncology, otology/neurotology, laryngology/airway, pediatric otolaryngology and rhinology. The fibers are available in different diameters ranging from 0.55 mm to 2.0 mm. Larger diameter fibers are useful in procedures requiring ablation and power, whereas the smaller diameter fibers are more useful for precision and control. Table 1 provides a brief summary of fiber types.

METHODS AND MATERIALS

Flexible CO₂ laser fibers were used in 264 otolaryngic cases between 11/2006 and 04/2009. Intraoperative data including surgical site, fiber type, power setting, and laser mode was analyzed. Surgeon opinions were assessed regarding the fibers’ cutting, ablating, and coagulating capacities as well as their safety and efficacy when compared with alternative modalities. After each case, the surgeon was asked whether operative time was shortened by using the flexible CO₂ laser waveguide when compared with the appropriate alternative.

Previous Product Name | Current Product Name | Outer diameter (mm) | Spot size (microns) | Ave time saved (min)
--- | --- | --- | --- | ---
BeamPath-A | Discontinued | 2.0 | 500 | -
BeamPath-L | ENT-L | 1.21 | 320 | -
BeamPath-S | OTO-S | 0.55 | 250 | -
BeamPath-M | OTO-M | 1.21 | 320 | -

Table 1. Flexible CO₂ Fiber Summary. This table compares previous and current fiber products by outer diameter and working spot size.

Results

Flexible CO₂ laser fibers were used in 44 head and neck, 142 otology, 47 laryngology/airway, 29 pediatric and 2 rhinology cases. The majority of surgeons agreed that the waveguide offered superior cutting and ablation to traditional modalities (cold steel, electrocautery, coblator, microdebrider, Argon/KTP laser, and drill) and better flexibility and access than the CO₂ laser micromanipulator. Improved pathologic margins were obtainable with the fiber because of its precision, safety for use near vulnerable structures and greater access to non-line of site locations. These advantages resulted in shorter operative times in most applications, as listed in Table 2. Complications in our series included six fiber failures; however none compromised the safety of patients or staff.

Table 2. Flexible CO₂ Laser Fiber Usage. This table compares fiber usage by sub-specialty, power settings, laser mode & average time saved.

CONCLUSION

The flexible CO₂ laser fiber delivery system is a safe, versatile and effective tool with applications in all otolaryngic subspecialties.

REFERENCES