Patient tolerance of the flexible CO₂ laser versus the 585-nm pulsed-dye laser for office-based laryngeal surgery

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Disclosure

OmniGuide, Inc., Cambridge, MA, supplied OmniGuide flexible CO₂ laser fibers for use in this study at no cost to the investigators or patients involved.
Outline

- Review office-based laryngeal surgery for benign laryngeal disease
- Describe lasers used
- Present results of pilot study comparing patient tolerance of flexible OmniGuide CO$_2$ laser versus PDL

Office-based laryngeal surgery

- OBLS
- Advantages over traditional laser therapy in OR under general anesthesia:
  - Decreased cost, recovery time, discomfort$^{1,2}$
  - Increased patient safety, satisfaction
Office-based laryngeal surgery

- Several benign glottal disorders well suited
- Recurrent glottal dysplasia and recurrent respiratory papillomatosis (RRP) traditionally followed clinically until:
  - Airway restriction
  - Voice deterioration
  - Worrisome appearance
- Multiple surgical treatments
- OBLS: treat more frequently at earlier stage

OBLS lasers

- Two categories
  - Photoangiolytic lasers
    - 585-nm pulsed-dye laser (PDL)
    - 532-nm potassium-titanyl-phosphate (KTP) laser
  - Water-targeting lasers
    - 10,600-nm carbon dioxide (CO₂) laser
    - 2013-nm thulium-YAG (“LISA”) laser
Photoangiolytic lasers (PDL/KTP)

- Fibers via flexible transnasal laryngoscope
- Wavelengths approximate absorbance of oxyhemoglobin for:
  - Small feeding vessels of dysplasia/papilloma
  - Vascular ectasias, varices, and hemorrhagic polyps\(^4,5\)
- Photoangiolytic lasers well tolerated and effective in treating benign laryngeal disorders\(^2-4\)

Water-targeting lasers (CO\(_2\)/thulium)

- CO\(_2\) laser allows direct tissue debulking
- Previously, use of CO\(_2\) laser limited to OR under rigid laryngoscopy with micromanipulator\(^8\)
- 2013-nm thulium flexible laser induces thermal damage\(^8-10\); reduced with cooling device\(^10\) but no clinically applicable tool
Photoangiolytic vs. water-targeting

- Photoangiolytic lasers limited in depth of penetration, applicability to bulky disease
- Photoangiolytic lasers result only in mildly blanched appearance
- Water-targeted lasers give immediate visible debulking of lesion

OmniGuide flexible CO\textsubscript{2} laser

- Photonic band-gap fiber assembly (PBFA)
- Fiber consists of hollow core surrounded by dielectric mirror and outer supportive cladding
- Hollow core delivers laser beam and nitrogen gas

Objective

- No studies compare tolerance of new flexible CO\(_2\) laser system with PDL in OBLS
- Purpose: to compare patient tolerance of benign laryngeal lesions treated with OmniGuide flexible CO\(_2\) laser vs. Cynosure flexible PDL

Methods

- Ten adult subjects: RRP, squamous dysplasia, granuloma, amyloid
- Bilateral superior laryngeal nerve blocks, nasal decongestant/anesthesia, topical lidocaine
- Within-subjects design: 50% of each lesion treated with CO\(_2\) laser and 50% treated with PDL
- Patients randomized and blinded to which laser used first, which side treated first
- Immediately after each laser, patients rated “pain” and “burning” on scales from 1 to 10 (1 no pain/burning, 10 intolerable)
Results – patient tolerance

- All completed intra- and post-operative questionnaires, follow-up at one month
- Mean intra-op pain:
  - CO₂ laser 2.0
  - PDL 3.0 (p=0.015)
- Mean intra-op burning:
  - CO₂ laser 2.3
  - PDL 3.0 (p=0.025)
- Three patients took single oral dose pain medication within first 24 hours; none required medications after 24 hours
Results - videostroboscopy

- No scar tissue or impaired mucosal waveform

Conclusion

- Unsedated OBLs with flexible CO₂ laser extremely well tolerated and efficacious
- Patients consistently rated pain and burning during treatment with CO₂ laser slightly lower than with PDL
- No scar tissue or impaired mucosal waveform
- Future studies to compare different laser power settings and disease outcomes
References


