Emerging Roles of Coblation in Rhinology and Skull Base Surgery

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KEYWORDS

• Coblation • Bipolar radiofrequency • Microdebrider • Endoscopic sinus surgery
• Skull base surgery • Blood loss • Complications • Outcomes

KEY POINTS

- Coblation is a type of bipolar radiofrequency ablation that works at relatively low temperatures by disrupting molecular bonds and allowing tissues to dissolve.
- Coblation may be associated with less postoperative pain following submucosal inferior turbinate reduction than other alternative techniques. Its duration of effect may be shorter than alternative surgical options.
- Additional applications in sinonasal and skull base surgery are actively being investigated (nasal polyposis, encephaloceles, juvenile nasal angiofibromas, skull base malignancies). Some studies have demonstrated a reduction in blood loss and improved endoscopic visualization.
- The cost of Coblation is often higher than that of traditional instruments. The benefits and costs of this technology must be carefully balanced.
- Longer-term outcomes studies for the various indications for Coblation are necessary to guide surgical decision making regarding Coblation therapies.

INTRODUCTION

Radiofrequency (RF) tissue ablation has been used safely and effectively for years in several surgical fields, including neurosurgery, urology, and gynecology. More recently, this technology has been applied to otolaryngologic procedures.[1] Within otolaryngology, this technique has been used most commonly for tonsil and adenoid surgery. Additional roles within the sinonasal cavity, however, are actively being investigated.

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Two distinct types of RF ablation exist, unipolar and bipolar. Most applications described here use bipolar RF technology. Coblation (Arthrocare ENT, Sunnyvale, CA; USA) is a specific type of bipolar RF ablation that works by creating a low-temperature sodium chloride RF plasma field between bipolar electrodes. This energy disrupts molecular bonds, allowing tissues to dissolve. This controlled ablation, or "Coblation," allows ablation of tissue to occur at relatively low temperatures (typically 60–70°C), which is thought to limit thermal damage to surrounding tissues with a depth of penetration of 2 to 4 mm.[2,3] On the other hand, unipolar RF devices deliver energy to the tip of the device, which is then dispersed into the surrounding tissue. Depth of penetration of unipolar RF is greater than bipolar RF and can be up to 20 mm.[3–5] Furthermore, unipolar RF requires that a grounding electrode be placed on the patient.

Coblation has been adapted for use within the sinonasal cavity, including treatment of adenoids, inferior turbinates, nasal polyps, encephaloceles, and skull base tumors. Although still under investigation, potential benefits of Coblation include reduced blood loss, improved visualization, and reduced thermal injury to surrounding tissue. The main limitations are cost, potential adverse effects on functional epithelium, and relative paucity of long-term outcomes.

COBLATION FOR INFERIOR TURBINATE SURGERY

Inferior turbinate (IT) hypertrophy is a leading cause of nasal airway obstruction and a frequent site of targeted surgical interventions. IT hypertrophy is associated with allergic rhinitis, vasomotor rhinitis, and nasal septum deviation (compensatory).[5] A variety of topical medications, including corticosteroid nasal sprays, may help to alleviate symptoms, but surgery is often indicated in refractory cases. Numerous techniques have been described, including turbinectomy, laser-assisted turbinoplasty, monopolar and bipolar cautery, and submucosal IT reduction. Submucosal reduction is often preferred because it is mucosal sparing and thus more likely to preserve the physiologic functions of the turbinate, including humidification and warming of inspired air. Overresection of the inferior turbinates may predispose the patient to dryness, crusting, atrophic rhinitis, or paradoxic nasal obstruction (empty nose syndrome).[5–7] Common methods used for submucosal IT reduction include microdebrider resection, monopolar RF ablation, and Coblation.

Coblation is thought to achieve volumetric reduction of the submucosal IT tissue via 2 mechanisms: tissue ablation as an immediate effect of applying RF energy and postoperative tissue contraction as a delayed effect of wound healing. Histologic changes after Coblation treatment of the IT tissue include decreased submucosal glands and decreased venous sinusoids. However, there may also be epithelial disruption and shedding.[8]

Clinical outcomes of Coblation submucosal IT reduction have been studied in several articles. Hegazy and colleagues[9] examined the outcomes of patients treated with endoscopic-assisted submucosal IT reduction with Coblation versus microdebrider in a prospective randomized trial. Forty patients were treated in the Coblation group (Coblator II System; Arthrocare), and 30 patients were treated in the microdebrider group (Medtronic, Jacksonville, FL, USA). Patients in the microdebrider group had increased pain postoperatively at 48 hours compared with the Coblation group ($P<.001$). No other outcome measures (postoperative adhesions, duration of surgery, or symptom improvement) reached statistical significance. Both groups maintained IT size reduction and symptom reduction at 6 months postoperatively ($P<.001$). However, a longer-term, randomized comparison of Coblation versus microdebrider IT reduction examined both subjective and objective outcomes. Subjective