Low-temperature plasma ablation of inferior turbinate for the treatment of perennial allergic rhinitis

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[Abstract] Objective: To observe the role of low-temperature ablation plasma surgery system in the treatment of perennial allergic rhinitis. **Method:** After surface anesthesia of the nasal cavity and submucosal infiltration anesthesia of the inferior turbinate, 35 patients with perennial allergic rhinitis were treated with endoscopic ablation of the inferior turbinate. **Results:** The patients were followed up with for more than 6 months, and the total effective rate was 94.3% (33/35), and the excellent rate was 85.75% (30/35). **Conclusion:** With a good short-term effect, low-temperature plasma ablation of the inferior turbinate in the treatment of perennial allergic rhinitis is simple in operation, and safe and reliable, and has high clinical application values.

[Keywords] Rhinitis, allergic, perennial; Ablation

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Clinical observation on radiofrequency ablation treatment in perennial allergic rhinitis

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Abstract Objective: To study the effect of radiofrequency ablation on perennial allergic rhinitis. **Method:**Thirty-five cases of perennial allergic rhinitis underwent the treatment in radiofrequency ablation were studied. **Result:**All patients were followed up for more than 6 months, the total effective rate was 94.3% (33/35). Among the total, and the excellence rate was 85.7% (30/35). **Conclusion:**The radiofrequency ablation is a simple and safe instrument to treat perennial allergic rhinitis.

Key words Rhinitis, allergic, perennial; Radiofrequency

From March 2003 to April 2004, low-temperature ablation plasma surgical system under nasal endoscopy was used in our department to treat 35 cases of perennial allergic rhinitis using inferior turbinate perforation and achieving satisfactory results. Now, the technique is reported as follows.

1 Data and Methods

1.1 Clinical data

Among the 35 patients, there were 15 males and 20 females aged from 16 to 50 years at an average age of 34 years. The course of the disease was 6 months to 10 years. All the patients had symptoms such as paroxysmal nasal itching, persistent sneezing, clear nasal discharge, and nasal congestion. Examination showed pale and swollen mucosa of the inferior turbinate, with clear, water-like secretion in the nasal cavity, which complied with the diagnostic criteria for allergic rhinitis (Haikou, 1997). All the patients received systemic treatments such as decongestants, oral antihistamines, or topical corticosteroids for more than 3 months, with no significant improvement in the symptoms.

1.2 Surgical methods

Surface anesthesia was carried out with 1% tetracaine spray in the nasal cavity, and infiltration anesthesia was carried out with 5 ml of 1% lidocaine under the bilateral inferior turbinate mucosa. One 0° nasal endoscope (TongluJianduanTiansong brand) with an outer diameter of 4 mm and a Hummingbird or ReFlex 45 RF electrode of ENTec plasma surgical system (Jesse Company, USA) was selected, the host energy was set to grade 6, and the RF electrode was immersed in the physiological saline before making each hole to ensure the formation of a plasma-thin layer during tissue ablation. The location for making the holes was selected at the lower or medial edge of the inferior turbinate. According to the size of the inferior turbinate, the inferior turbinate was divided into two parts, i.e., the anterior and posterior part, or three parts, i.e., the anterior, middle, and posterior part, with 1-2 holes made in each part. The RF electrode was inserted into the inferior turbinate and pushed along the longitudinal direction to an appropriate depth (approximately 1.5-2.0 cm) under the mucosa; after making the hole to the required depth, the RF electrode remained stationary, and the cutting pedal was pressed and held continually for about 10 seconds, then, the RF electrode was deactivated, and the electrode was slowly removed. After the surgery, nasal tamponade was not needed. The access site could be appropriately covered with gelatin sponge, and oral antibiotics and nasal drops of decongestant were given for one week.

2 Results

The surgery for all the patients was completed within 10-15 minutes, and the blood loss was approximately 5-10 ml. On the first day after the surgery, there was pseudomembranous formation at the surgical site, swelling of the inferior turbinate, poor nasal ventilation, and sticky secretions in the nasal cavity. One week later, the nasal cavity was cleared, and pseudomembrane was no longer formed, the swelling was gradually relieved, the secretion was decreased, and the symptoms of sneezing and watery discharge were improved. In 5 patients, a small number of scabs were formed at the hole site within one week to one month. The patients were followed up with once every 1 week, 4 weeks, 3 months, and 6 months after the surgery. According to the evaluation criteria for the efficacy of allergic rhinitis (Haikou, 1997), 30 patients showed significant improvement, 3 patients showed improvement, and 2 patients showed no significant effect after 6 months. The total effective rate was 94.3%. No surgical complications or other discomfort were observed.

3 Discussions

Nowadays, studies on the pathogenesis of allergic rhinitis have gone beyond the conventional category of Type I allergic reactions mediated by specific IgE, focusing on the levels of inflammatory transmitters, neurotransmitters, cytokines, and endocrine systems and thus providing a theoretical basis for new treatments for allergic rhinitis.[1]

The core of treating allergic rhinitis is to use immunotherapy or a combination of antihistamines, mast cell stabilizers, and steroid hormones, alternately, while avoiding contact with allergens as much as possible.[1] If the therapeutic effect is not satisfactory, surgical treatment can be used. The main principle is to reduce acetylcholine secretion and substance P release by removing some parasympathetic nerve fibers, the inferior turbinate microganglia, and the

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parasympathetic plexus, thereby reducing the sensory nerve sensitivity and the vascular permeability,reducing the glandular secretion, its sensitivity to external physical and chemical adverse stimuli, and the secretion of vasoactive peptides, inhibiting sneezing reflex, reducing nasal mucus, improving nasal ventilation, and achieving the objective of treating perennial allergic rhinitis.[2]Kazuhiro Yamamoto's study on the distribution of neuropeptides in the mucosa of the inferior turbinate showed that there are vegetative nerves passing through the anterior basal membrane of the inferior turbinate in patients with allergic rhinitis,[3] which is one of the bases for the surgical treatment of the inferior turbinate in allergic rhinitis.

The principle of low-temperature ablation is to use the energy generated by bipolar rf to convert the electrolyte between the rf electrode and the tissues into an ion vapor layer of the plasma.[4]The charged particles in the plasma cause the cells in the target tissues to gradually disintegrate on a molecular basis, causing protein coagulation and denaturation in the nasal mucosa and submucosal tissues, gland atrophy, and vascular closure, thereby reducing the degranulation process of mast cells (reducing the release of histamine), damaging the cholinergic microganglia and parasympathetic nerve fibers from the inferior turbinate, the unmyelinated sensory nerve fibers (SP energy nerves) and parasympathetic nerve endings from the pterygoid and anterior ethmoidal nerves in the nose, reducing the sensitivity of nerve endings, reducing gland secretion, and improving nasal ventilation. As this effect is limited to the surface layer of the target tissues and is achieved at relatively low temperatures, the thermal damage to the surrounding tissues is minimized, achieving a dual effect of both removing the target tissues and causing tissue shrinkage. Compared with lasers, microwaves, and shavers, this method has the advantages of minimal damage to the inferior turbinate, mild pain, fast postoperative recovery, and minimal postoperative care.

During anesthesia, the turbinate is not contracted as much as possible. The amount of liquid infiltration under the mucosa on each side of the inferior turbinate is 5 ml in order to make the mucosa have a certain thickness and form a good conductive layer locally. When punching, it is easy to insert and keep the plasma knife under the mucosa, reducing damage to the mucosa. But at the same time, the surgical field of view is also reduced, and the difficulty of surgery is increased, so the operators need to have a certain foundation in endoscopic surgery.

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Use of microwave in partial resection of inferior turbinate

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Since September 1997, 1,500 patients with chronic hypertrophic rhinitis were treated with partial resection of the inferior turbinate in our department and received microwave treatment of the wound surface, with good results achieved. Now, a report is given as follows.

1 Data and Methods

In the 1,500 patients, there were 788 males and 712 females, aged at 12 - 65 years, with the mean age being 25 years.

A small amount of adrenaline injection was added into 1% lidocaine injection (3 drops of 0.1% adrenaline added into every 10 ml of 1% lidocaine), and bilateral partial turbinectomy was performed after the local anesthesia took effect. During the surgery, no more than 1/3 of the lower part of the inferior turbinate was removed. After removing the bloody substances from the nasal cavity, microwave was used to cauterize the wound of the inferior turbinate, using a method of cauterization from the back of the wound to the front (if cauterized from the front to the back, the wound at the back might be neglected). After cauterization of the wound, black scabs were left locally, and the boundary with the unburned part was clear. The wound of the contralateral inferior turbinate was treated using the same method.

2 Results

Among the patients, 1,486 did not experience postoperative bleeding, and the wounds had primary healing. There was no significant difference in the wound healing time at 2 weeks after the surgery compared to conventional tamponade methods.After the surgery, 14 patients experienced nasal bleeding. At that time, the congestion in the nasal cavity was cleared, and 1% tetracaine and 1% ephedrine solution were sprayed onto the wound for anesthesia and hemostasis. The bleeding site was then treated with microwave again, and after treatment with microwave, 8 of the patients had gelatin sponge applied to the wound, which was then supported by cotton pads. The 14 patients ultimately achieved primary healing.

3 Discussions

The conventional nasal tamponade method brings severe pain to patients, manifested as an inability to ventilate on both sides of the nasal cavity during nasal tamponade, headache, toothache, overflow of tears, persistent breathing through the mouth, and decreased sleep quality. The cauterization of the wound surface using microwave eliminates nasal tamponade, allowing patients to breathe through the nose immediately after surgery, restoring the normal breathing channels, improving the sleep quality, avoiding the pain caused by gauze changes, and reducing the patient's economic burden.

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