Review / Derleme

Radiofrequency treatment for inferior turbinate hypertrophy

Alt konka hipertrofisinde radyofrekans tedavisi

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Radiofrequency ablation (RFA) is a technique which causes a reduction in tissue amount using ablation by high-frequency current. Beside other surgical tools, RFA has become quite popular over the past decade. Hypertrophy of the inferior turbinate is a common cause of chronic nasal obstruction. There is no agreement on how to deal with this problem. An ideal procedure for turbinate reduction should be performed with minimal discomfort or adverse reactions and should preserve the physiologic function of the turbinate, such as regulation of humidification and temperature of inspired air. All the current techniques have potential short and long-term complications such as bleeding and atrophic rhinitis. No technique is perfect, and the main goal of turbinate surgery should be the preservation of mucosal surfaces with reduction of submucosal tissue. The variety of surgical techniques available indicates the lack of consensus on the optimal technique. Radiofrequency tissue reduction is a surgical procedure that uses radiofrequency heating to induce submucosal tissue destruction, leading to the reduction of tissue volume. This energy induces ion agitation within the tissue, which increases the local temperature and causes a thermal lesion that should occur in the deep mucosa without damaging the surface. The healing process secondarily induces fibrosis with wound contraction, leading to tissue volume reduction. Radiofrequency ablation is an efficient, easily applicable technique, which does not lead to serious complications in the treatment of the nasal obstruction caused by inferior turbinate hypertrophy.

Key Words: Complications; inferior turbinate; patient recovery; radiofrequency ablation; radiofrequency.

Radyofrekans ablasyon (RFA), yüksek frekanslı akım ile ablasyon kullanarak doku miktarında azalmaya neden olan bir tekniktir. Diğer cerrahi yöntemlerin yanı sıra RFA geçtiğimiz 10 yıl içinde oldukça popüler hale gelmiştir. Kronik burun tıkanıklığının yaygın olan nedenlerinden biri alt konka hipertrofisidir. Bu sorunla nasıl başa çıkılacağı, konusunda herhangi bir uzlaşma yoktur. Konka redüksiyonuna yönelik, ideal bir işlem minimal rahatsızlık veya ters etki oluşturacak şekilde uygulanmalı ve konkanın, örneğin, solunan havadaki nemlenme ve sıcaklığın regülasyonu gibi fizyolojik işlevini muhafaza etmesi gerekir. Şu anda kullanılan teknikler kanama ve atrofik rinit gibi, potansiyel kısa ve uzun süreli komplikasyonlar içermektedir. Konka cerrahisinde mükemmel teknik yoktur fakat cerrahinin başlıca amacı, submukozal dokunun azaltımı yoluyla mukozal yüzeyin korunması olmalıdır. Uygulanabilir cerrahi tekniklerin çeşitliliği, optimal teknik üzerinde konsensüs olmayışının göstergesidir. Radyofrekans doku azaltımı, doku hacminin azalmasına neden olmak üzere submukozal doku hasarını indüklemek için radyofrekans kullanılan cerrahi bir işlemdir. Bu enerji doku içinde iyon uyarımını indükler ve lokal sıcaklığı artırır ve yüzeye zarar vermeden derin mukozada oluşması beklenen termal lezyona neden olur. İyileşme süreci ikincil olarak yara kontraksiyonu ile fibrozisi indükler, bu da doku hacminin azalmasına neden olur. Radyofrekans ablasyon, alt konka hipertrofisi nedeniyle oluşan burun tıkanıklığı tedavisinde ciddi komplikasyonlara yol açmayan, etkin, kolay ve uygulanabilir bir tekniktir.

Anahtar Sözcükler: Komplikasyon; alt konka; hasta iyileşmesi; radyofrekans ablasyon; radyofrekans.

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Several surgical techniques have been used to reduce pathologically enlarged tissues in the human body. Surgical methods basically consist of removal of the pathologic tissue and reconstruction. However difficulties in performing these techniques, some problems, complications and duration of the postoperative course led to investigation of different techniques.

Radiofrequency (RF) is one of these techniques and has been used in different medical disciplines, especially in cardiology, urology, plastic surgery, oncology, neurosurgery and in otorhinolaryngology over the past decade. Radiofrequency ablation (RFA) is a technique which causes reduction in submucosal tissue amount without any damage to superficial epithelium.[1] With the transmission of controlled RF energy to submucosal tissue, intracellular and extracellular ions such as sodium (Na), chloride (Cl), calcium (Ca) gain mobility and contact surrounding ions producing heat and subsequent coagulation necrosis. This necrotic tissue heals according to healing principles and scar formation and tissue retraction occur, giving rise to volume reduction and stiffness.[2] The lack of requirement for incision, excision and reconstruction, and low morbidity popularized this technique over the past decade. The first generation tools used manually controlled RF generators without accurate energy control, but currently used generators provide accurate energy control either with bipolar or monopolar probes in a 100-4000 Hz frequency spectrum. Low tissue heat (<100°) produced by low power and voltage causes coagulation necrosis and finally cell death. The lesion magnitude in tissues is directly related to probe, current magnitude and duration.[2]

MATERIALS AND METHODS

Patients

Patients with previous turbinate surgery, septal deformities, nasal polyps or tumors, radiotherapy over the nose or recurrent sinusitis were excluded. Additional exclusion criteria included diabetes mellitus, oral steroid use, coagulation disorder, cardiac pacemaker, and uncontrolled hypertension. Examination included anterior rhinoscopy and nasal endoscopy in all patients. Patients had been treated previously with topical corticosteroids, antihistamines, decongestants, and topical anticholinergic agents.

The basic indication for inferior turbinate RFA was nasal obstruction solely related to inferior turbinate hypertrophy. We performed RFA on this group of patients under general anesthesia. Additionally we performed RFA solely on the inferior turbinates for some patients with septal deviation who refused septal surgery, or some patients who had contraindications to general anesthesia. We also performed inferior turbinate RFA on patients undergoing septorhinoplasty in order to avoid any possible nasal obstruction potentially due to postoperative narrowing of the nasal cavity even in patients without inferior turbinate hypertrophy. Besides RFA, for patients undergoing septorhinoplasty under general anesthesia who had severe inferior turbinate hypertrophy, inferior turbinoplasty or partial turbinate resection might be preferable in order to prevent recurrences and further surgical interventions.

Technique

The inferior turbinates are composed of osseous and mucosal parts. Although inferior turbinate hypertrophy is generally due to mucosal hypertrophy, osseous hypertrophy is also encountered in some patients. Topical vasoconstrictive agent application on the inferior turbinate prior to intervention allowed differentiation between pure osseous hypertrophy and mucosal hypertrophy. As RFA would be of no benefit in patients with pure osseous part hypertrophy, this distinction was significant.

To obtain a painless procedure, we introduced 2% pantocaine-soaked cotton in both nasal cavities and subsequently infiltrated lidocaine HCL 20 mg/dl and waited at least 10-15 minutes. No vasoconstrictive agent was used topically or by injection, to avoid turbinate shrinkage, which is thought to increase the risk of potential mucosal injury and postoperative complications. Previously used submucosal probes have been lately replaced by bipolar probes, which have rendered the procedure easier. For the application using submucosal electrodes, the electrodes were inserted submucosally under endoscopic guidance, and the energy was delivered to three different sites of each turbinate in the anterior, middle, and posterior portions. In relatively small turbinates, two applications were accomplished in the anterior and posterior parts. In addition, energy delivery was stopped once whitening was noted over the applied area of mucosa during the procedure; the power was kept

constant while the duration was decreased. On the other hand, as bipolar electrodes are longer, they were inserted submucosally in an anterior to posterior direction, and were withdrawn during the procedure. Application to more than three areas using submucosal probes or using devices without energy control may lead to mucosal or even osseous necrosis. No packing was used in patients postoperatively.

To reduce the risk of necrosis after the application, postoperative antibiotic treatment of five days was given. No severe pain was encountered in the postoperative period; but patients were given acetaminophen in the first postoperative day for analgesia.

Patient recovery

Excessive congestion was encountered during the first 3-4 postoperative days due to trauma to the inferior turbinates, and patients were given topical decongestants during this period. Inferior turbinate reduction commences generally after 10 days and is accomplished within 3-4 weeks. After correct application, except for minor crusting around the probe entrance areas, no severe crusting is seen.

Follow-up

In our 11-years of experience with RFA, we have seen that except for patients with allergic rhinitis, the majority of our patients benefited from the procedure for at least 3-4 years. In case of recurrent hypertrophy, we perform a second or third RFA. However the patients undergoing a third procedure are not numerous.

If patients have recurrent hypertrophy in the short term, they are considered for turbinoplasty or partial turbinate resection, and if they refuse the recommended intervention, another RFA is performed.

Complications

The complications of RFA are rare. The most common complications are pain due to insufficient application of local anesthetics, excessive edema in the inferior turbinates in the first postoperative week, and crusting around the probe entrance area. Besides these complications, postoperative bleeding might be encountered due to lack of vasoconstrictor use during local anesthesia. However this complication can be controlled easily in most of cases. Late postoperative bleeding might be seen secondary to incorrect application. Particularly, if excessive energy is delivered to the posterior part of the inferior turbinate, necrosis might occur and severe bleeding from a posterior lateral nasal branch of the sphenopalatine artery might be seen. In this case, the bleeding focus may be cauterized or nasal packing used. Inappropriate application or excessive energy use may lead to late mucosal or osseous necrosis. In such patients, a meticulous follow-up and nasal irrigation may be helpful. The healing process might take weeks or even months, and may result in a partial or total loss of the inferior turbinate.

DISCUSSION

Radiofrequency ablation is a surgical procedure that uses radiofrequency heating to induce submucosal tissue destruction, leading to the reduction of tissue volume. This energy induces ion agitation within the tissue, which increases the local temperature and causes a thermal lesion that should occur in the deep mucosa without damaging the surface. The healing process secondarily induces fibrosis with wound contraction, leading to tissue volume reduction.[3]

In the ear nose and throat (ENT) field, RFA is used to the soft palate, base of tongue and tonsils for snoring and apnea surgery, and the inferior turbinates for nasal obstruction. Powell et al.[4] first used RFA to the base of tongue in animals in 1997 and subsequently published the results of RFA for the inferior turbinate and soft palate (including histopathological findings) in two articles in 1998. Taking into account the studies published in the literature and our experience, we believe that best results are achieved in the group of patients with inferior turbinate hypertrophy.

Hypertrophy of the inferior turbinate is a common cause of chronic nasal obstruction. No agreement has been reached on how to deal with this problem. An ideal procedure for turbinate reduction would be associated with minimal discomfort or adverse reactions and should preserve the physiologic functions of the turbinate, such as regulation of the humidification and temperature of the inspired air.[5] The main goal of turbinate surgery should be the preservation of mucosal surfaces with reduction of submucosal tissue. All techniques have potential complications that fall into several categories.[6] No technique is perfect, and each is associated with known short- and long-term complications such as bleeding and

atrophic rhinitis. The variety of surgical techniques available indicates the lack of consensus on the optimal technique. Radiofrequency tissue reduction is a surgical procedure that uses radiofrequency heating to induce submucosal tissue destruction, leading to the reduction of tissue volume.[5] Histopathologically, collagen accumulation in tissues begins 12 days after the application, and volume reduction related to chronic inflammation, fibrosis and scar contracture occurs in three weeks.[5,7]

Therefore, radiofrequency could be useful for turbinate volume reduction without the disadvantages of the other techniques.[8,9] In studies on RFA applied to the turbinates, decrease in symptom severity and frequency of nasal obstruction were reported in 81% to 100% of cases.[5,10] To evaluate the results of inferior turbinate reduction some subjective methods such as visual analogue scale (VAS) and nasal endoscopy, and some objective methods such as rhinomanometry, acoustic rhinometry have been used. Additionally, we used magnetic resonance imaging (MRI) to evaluate inferior turbinate volumes, and have shown objectively an 8.7% reduction in inferior turbinate volume.[11]

This technique might also be used in children under general anesthesia with good cooperation. At least for children who have adenoid hypertrophy and concomitant allergic or non-allergic inferior turbinate hypertrophies, RFA might be used on the inferior turbinates during adenoidectomy. For other patients, this procedure may provide the possibility to wait comfortably until further surgical intervention in the future.

The most common side effects of RFA are pain during the procedure. Hytönen et al.[12] evaluated 35 studies and found that the most common complaint was peroperative or postoperative pain. Coste et al.[8] reported that three out of 14 patients had severe pain during the procedure and that the intervention was stopped in two patients. They mentioned that there was no postoperative pain, or the patients had minimal pain controlled with analgesics. In our experience, we had some problems due to insufficient local anesthesia, however we did not stop any operation nor did we use general anesthesia in any of these patients. We believe that cooperation with the patient and appropriate local anesthesia is sufficient to get a good result. Pain was not a concern for our patients in the postoperative course.

No major complication related to bleeding is encountered in the literature. Only in one study by Bhattacharyya[13] on 24 patients were two instances of epistaxis reported with nasal packing used in one of the patients. We had no patients with postoperative epistaxis. An important point is to avoid excessive energy delivery to the posterior part of the inferior turbinate. Additionally, in patients undergoing anticoagulant therapy, anticoagulants should be withheld 10 days prior to the intervention, and patients should not take these agents at least two weeks postoperatively.

If applied appropriately, no crusting is seen except around the entrance points of the probes, and no impairment of mucociliary function is found. In a study comparing mucociliary activity in patients undergoing CO_2 laser, RFA and partial turbinate resection, we have shown that mucociliary function is not impaired in patients who had RFA.[3] Similar results concerning the mucociliary activity has been shown in the literature.[8,9,14]

We have performed many RFA to the inferior turbinates since 1999, and both we and the patients were satisfied with the results. As a relatively easy office procedure with low cost and comfortable postoperative course, many patients have preferred this technique. We believe that excepting the need for repetitive applications in some patients, this technique has many advantages, and could be used by otolaryngologists in relevant indications.

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