Radiofrequency Treatment in Simple Snoring: Tolerance, Safety and Results

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Abstract

Objective: Snoring is a non-pathologic social problem. In the search for non-aggressive efficacious treatment, we introduce our experience in using temperature-controlled radiofrequency treatment for snoring.

Methods: A 6-month follow-up revision of 37 patients who received a mean of 1.1 radiofrequency treatment sessions at turbinates, soft palate, tonsils and/or tongue-base.

Results: Mean sample age was 39.6 ± 9 years; mean BMI was 29.5 ± 4. Good tolerance was presented by 78% of our patients, 78% had no postoperative pain complaints and 68.3% no postoperative symptoms a week after procedure. Minor complications (mainly mucosal breakdown) were presented by 14.6% of the patients. The snoring score went from a mean of 8.6 to 5.6 on the visual analogue scale; 86.5% of the patients improved their clinical snoring and 37.8% were cured of it. Epworth daytime somnolence test results went from mean 9.3 to 6.1.

Conclusions: Radiofrequency is a procedure that is safe, well tolerated and fairly painless postoperatively, effective in improving clinical snoring in simple snorers. Radiofrequency is an effective primary treatment for snoring whose cause is accessible to radiofrequency.

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PALABRAS CLAVE
Trastornos respiratorios del sueño; Roncopatía; Radiofrecuencia con temperatura controlada

Tratamiento de la roncopatía simple con radiofrecuencia: tolerancia, seguridad y resultados

Resumen

Introducción y objetivos: El ronquido simple es un problema social no patológico. En busca de un tratamiento eficaz y poco agresivo, presentamos nuestra experiencia en el uso de radiofrecuencia con temperatura controlada en el tratamiento de la roncopatía simple.

Métodos: Revisión a 6 meses de una muestra de 37 pacientes intervenidos con una media de 1,1 tratamientos con radiofrecuencia en cornetes, paladar blando, amígdalas y/o base de la lengua.

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Introduction

Simple snoring is defined as a sleeping disease in which there is increased resistance to airflow in the upper airways of nose breather tube. It is characterised by turbulent airflow, vibration of the walls and a characteristic respiratory noise, which can become highly intense and be very annoying. Simple snoring is different from obstructive sleep apnoea-hypopnoea syndrome (OSAHS) because there are no respiratory arrests of at least 10s duration at a minimum rate of 5 per hour.

Simple snoring can be associated with the syndrome of increased upper airway resistance, a pathological entity defined by Guilleminault that reproduces, on a smaller scale, the typical symptoms of obstructive sleep apnoea syndrome (OSAS), such as daytime sleepiness or asphyxiating awakenings. The decrease in volume flow without oxyhaemoglobin desaturation, associated to an increased respiratory effort, produces an arousal after a peak of maximum negative inspiratory oesophageal pressure. Simple snoring generally causes only a social problem, one that can seriously interfere in the patient’s married life.

Surgery on the upper airway is one of the most commonly used treatments for simple snoring. For over a decade, temperature-controlled radiofrequency (TCR) has been found in the therapeutic arsenal for the treatment of sleep-disordered breathing (SDB). It is particularly suitable for simple snoring, sometimes known as somnoplasty. Bipolar diathermy radiofrequency is based on the production of high temperatures (of up to 80 ◦C) in the submucosal tissue by 2 close electrodes attached to a terminal. These electrodes emit low-frequency radio waves. The temperature rise causes a local and controlled destruction of tissue bonds, whose subsequent scarring decreases tissue thickness and increases its rigidity. This reduces vibration of the soft tissues of the upper airways (UA) and possible secondary respiratory obstruction.

In the last decade, several trials with this technique have proven its ability to decrease the intensity of snoring and improve daytime sleepiness. However, some studies have shown that the effect of radiofrequency decreases with time, and that a variable percentage of patients (29%-40%) suffer a troublesome clinical relapse of snoring some 12-20 months after surgery. The literature review conducted by Bäck et al. in 2009 confirmed the good tolerance of the procedure and the decrease of the effects of surgery in the long term.

The scientific literature in Spanish contains few publications on the outcomes of this technique. This article presents our experience with the use of TCR at different UA levels for the treatment of simple snoring, used during a 40-month period between September 2007 and December 2010. We analysed patient tolerance to the method, type, intensity and duration of postoperative symptoms and its safety as affected by the presence of complications or sequelae. We also studied the effectiveness of the procedure, both from the point of view of decreasing intensity of snoring as measured by a spouse, and of daytime sleepiness, establishing a comparison with similar studies published previously.

Material and Methods

We present a retrospective study of clinical cases with a sample of 37 patients suffering from simple snoring, diagnosed by an overnight polysomnography test (PSG) with an apnoea-hypopnoea index (AHI) less than 10. These patients underwent TCR for reduction of soft tissue in one or more of the following locations: inferior turbinates, palate, tonsils or tongue base. The interventions were conducted between September 2007 and December 2010 at our snoring unit. We used the following clinical examination parameters to determine the UA soft tissue area that would be treated: anterior and posterior rhinoscopy, Friedman scale corrected for the assessment of lingual occlusion, tonsil size, Müller test in supine position with nasofibroscopy in suspension to assess levels of pharyngeal collapse (retropalatal, retrolingual, epiglottic) according to Sher’s degree of closure and direction of collapse (posteroanterior, lateral or circular), as well as clinical cephalometry (cervical diameter and mandibular plane to hyoid distance) (Table 1). In 2 doubtful cases, after clinical examination we also carried out video-fiberscope somnoscopy under sedation in the operating room, for surgical indications. All examinations and surgeries were performed by the same specialist.

The criteria to intervene each area were: for treatment on soft palate, we assessed a degree of posteroanterior retropalatal closure of 2 or more in the Müller test (>50%), associated to elongated soft palate or uvula; for treatment of tonsils, we assessed a grade III or IV size, or else a participation of Sher’s degree 2 or more in pharyngeal occlusion

Resultados: La edad media de la muestra fue de 39,6 ± 9 años y el IMC medio de 29,5 ± 4. El 78% de los pacientes toleró bien el procedimiento, el 78% no sufrió dolor post-operatorio, y el 68,3% tuvo síntomas que duraron menos de una semana. El 14,6% de los pacientes presentó secuelas leves (principalmente úlceras en el punto de inserción). El ronquido medio pasó de 8,6 a 5,6 en la escala visual analógica, el 86,5% de los pacientes mejoraron de su ronquido clínico y el 37,8% se curaron. La somnolencia medida con el test de Epworth pasó de 9,3 a 6,1 de media.

Conclusiones: La radiofrecuencia es un procedimiento bien tolerado, seguro y con post-operatorio poco doloroso. Resulta efectivo para mejorar el ronquido clínico en la roncopatía simple. Es un buen tratamiento de inicio para ronquedores simples cuya causa es accesible a la radiofrecuencia.

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in the Müller test; for treatment on the tongue base, we assessed a grade III or IV on the corrected Friedman scale, associated to tongue base collapse of Sher’s grade 2 or more in the Müller test; for turbinate treatment, we assessed turbinate hypertrophy observed by rhinoscopy, associated to nasal obstruction symptoms, which improved after 1 month of treatment with topical corticosteroids in standard doses for the treatment of rhinitis.

The procedure was performed with the CelonLab ENT™ radiofrequency device, using the hand pieces provided by this company, Celon ProBreath for turbinate surgery and Celon ProSleep for the various pharyngeal and tongue base treatments. On the palate, we performed 2–3 insertions in the midline (9–10 V) and 1–3 on each tonsillar side-pillar (10–11 V), depending on size. In each tonsil, we performed 2 or 3 insertions (7–8 V), depending on size. At the tongue base, we performed 2–3 insertions in the midline and 2 on each side (6–7 V). In the turbinate, we used an anterior insertion, with 15–18 V according to age and size. Surgery was performed on an outpatient basis, using preoperative sedation with diazepam 5 mg, 15 min before surgery. As local anaesthesia, we used topical lidocaine spray on the pharynx and submucosal infiltration of lidocaine (in the pharynx, associated to adrenaline).

One notable feature of the equipment used was a safety system with an automatic stop and audible alarm once the wattage required for the programmed intensity was reached. This increased safety and relieved the surgeon of the need to calculate the amount of released energy necessary or the impedance curve.7

After surgery, the patient remained lying down for 5–10 min and was then discharged from the hospital, with an analgesic treatment of paracetamol 500 on demand, according to pain intensity.

Postoperative evaluation was performed 6 months later. Discharge and repetition of surgery with TCR or an alternative treatment were decided at this point, based on evolution and the patient’s informed decision.

We used various parameters to evaluate the results. For the intensity of snoring, an international visual analogue scale (VAS) for snoring intensity, as assessed by the spouse of improvement in snoring.

Differences between results were verified by parametric tests of statistical significance, using the hypothesis test of the Student t test for independent variables when comparing 2 variables.

Results

The study group consisted of 37 subjects, with an age range between 19 and 57 years (mean of 39.6 ± 9.25 years). We included 25 males (67.6%) and 12 females (32.4%). The mean body mass index (BMI) was 25.9 ± 3.7 and did not vary significantly in the postoperative review.

We performed 41 interventions: 33 patients (89.2%) underwent a single intervention with TCR, while 4 patients (10.8%) underwent 2, with a mean 1.1 interventions per patient. As for the technique, we carried out almost 40 reductions of the soft palate, 15 reductions of the turbinates, 8 reductions of the tonsils and 2 reductions of the tongue base. These were combined as follows: 24 isolated palate reductions, 8 reductions of palate and turbinates, 6 reductions of palate and tonsils, 2 reductions of soft palate, tonsils and tongue base and one isolated reduction of the turbinates. The total was 65 procedures.

Tolerance to the intervention was assessed by patients as good (without discomfort) in 32 cases (78%), as regular (discomfort such as nausea or pain that did not prevent the scheduled procedure) in 8 cases (19.5%), and as bad (vasovagal symptoms or severe pain that interfered with the procedure) in one case (2.5%). Among the different types of locations, reduction of the inferior turbinates showed excellent tolerance, whereas the association to reduction of tonsils and/or tongue base was less well tolerated (Table 2).

The postoperative symptoms were described as 0 in 5 cases (12.2%), as discomfort in 27 cases (65.8%), and as mild pain, (controlled by treatment with paracetamol 500 scheduled by protocol), in 9 cases (22%). The pain was more common when treatment included the tongue base and tonsils, especially when it included the turbinates (Table 3).

The duration of symptoms (pain or discomfort) was less than 3 days in 41.5% of cases, between 3 and 7 days in 26.8% and longer than 7 days in 31.7%. The procedure on the tonsils increased the duration of postoperative symptoms more notably than the rest, whereas the procedure on the inferior turbinates had the least influence (Table 4).

There were 6 postoperative sequelae (14.6% of procedures), all mild and transient: 2 uvula oedemas (associated with treatment of soft palate), 3 soft palate ulcers due to burn at the electrode insertion point (one in an isolated palatoplasty and another in a palatoplasty associated to tonsilloplasty) and one oral thrush (in an intervention
of the palate and tonsils). There were no voice changes, velopalatal insufficiency or swallowing problems.

The results were followed up at 6 months. Regarding functional outcomes, the degree of preoperative snoring measured with a spouse-scored VAS decreased from a mean of 8.56 ± 0.88 (range, 7-10) preoperatively to 5.63 ± 1.3 (range, 2-8) postoperatively. In total, 32 out of 37 patients (86.48%) improved their snoring, but only 14 reached the criterion of cure (37.84%).

The daytime sleepiness survey as measured by the Epworth test went from a score of 9.28 ± 3.71 preoperatively (range, 4-16) to 6.14 ± 3.8 postoperatively (range, 0-12), representing a 34% improvement in the sample mean. All differences in preoperative and postoperative results were statistically significant (P<.05).

### Discussion

Temperature-controlled radiofrequency has been used for SDB treatment since 1998, driven by the group of Guilleminault. Both its ease of use (under local anesthesia and on an outpatient basis without the need for admission) and the good patient tolerance of the procedure and of the postoperative period have led it to become one of the primary therapeutic weapons in SDB. Various studies have demonstrated the low incidence and general lightness of sequelae found with TCR, highlighting ulcers at the point of insertion of the electrodes as the most frequent. Other complications reported, although very rare, were abscess of the tongue base or tonsils, uvular oedema, oedema of the mouth bottom, palatal neuropathies, dysphagia and, as the only serious complication, one reported case of haemorrhage from pseudoaneurysm of the lingual artery, attributed to a prior TCR intervention. Several studies have confirmed that neither the velopalatal function nor word phonation or articulation suffer permanent alterations with this surgical intervention. In our study, the rate of postoperative sequelae was 14.6%, which is in the upper limit of the range of complication rates (1.5%-15.5%) described in the studies consulted. Our sequelae presented the same distribution as in those studies in terms of prominence of mucosal ulcerations, and lightness and transience of them all.

In our experience, TCR surgery with local anaesthesia was well tolerated in 78% of cases and only 2.4% reported symptoms of poor tolerance (nausea or vasovagal syndrome that required the treatment to be modified or discontinued) of the procedure (Table 2). The postoperative symptoms were described as pain (mild and controllable with prescribed

<table>
<thead>
<tr>
<th>Duration of Postoperative Symptoms</th>
<th>&lt;3 days</th>
<th>3-7 days</th>
<th>&gt;7 days</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palate</td>
<td>10</td>
<td>41.7%</td>
<td>7</td>
<td>29.2%</td>
</tr>
<tr>
<td>Palate and turbinates</td>
<td>3</td>
<td>37.5%</td>
<td>4</td>
<td>50%</td>
</tr>
<tr>
<td>Palate and tonsils</td>
<td>3</td>
<td>50%</td>
<td>4</td>
<td>50%</td>
</tr>
<tr>
<td>Palate, tonsils and tongue base</td>
<td>2</td>
<td>100%</td>
<td>2</td>
<td>100%</td>
</tr>
<tr>
<td>Isolated inferior turbinates</td>
<td>1</td>
<td>100%</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>41.5%</td>
<td>11</td>
<td>26.8%</td>
</tr>
</tbody>
</table>
Table 5: Review of Studies on Treatment of Simple Snoring With Controlled-Temperature Radiofrequency and Comparison With Our Own.

<table>
<thead>
<tr>
<th>Year</th>
<th>Study</th>
<th>N</th>
<th>No. Improvement</th>
<th>Cure</th>
<th>Epworth</th>
<th>VAS²</th>
<th>Preoperative and postoperative VAS and percentage of improvement.</th>
<th>Postoperative pain and percentage of improvement.</th>
<th>Daytime sleepiness</th>
<th>Postoperative pain and percentage of improvement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>Powell et al.</td>
<td>22</td>
<td>3</td>
<td>6</td>
<td>8.3</td>
<td>5.2</td>
<td>77%</td>
<td>29%</td>
<td>7.7</td>
<td>4%</td>
</tr>
<tr>
<td>2000</td>
<td>Hukins et al.</td>
<td>20</td>
<td>6</td>
<td>14</td>
<td>7.5</td>
<td>4.6</td>
<td>4.6</td>
<td>80%</td>
<td>7.5</td>
<td>15%</td>
</tr>
<tr>
<td>2000</td>
<td>Coleman et al.</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td>8.3</td>
<td>4.1</td>
<td>75%</td>
<td>25%</td>
<td>7.6</td>
<td>7%</td>
</tr>
<tr>
<td>2000</td>
<td>Boudewyns et al.</td>
<td>45</td>
<td>35</td>
<td>10</td>
<td>7.6</td>
<td>4.1</td>
<td>46%</td>
<td>54%</td>
<td>8.2</td>
<td>29%</td>
</tr>
<tr>
<td>2001</td>
<td>Sher et al.</td>
<td>113</td>
<td>31</td>
<td>82</td>
<td>8.3</td>
<td>5.2</td>
<td>75%</td>
<td>25%</td>
<td>8.1</td>
<td>7%</td>
</tr>
<tr>
<td>2002</td>
<td>Haraldsson et al.</td>
<td>16</td>
<td>12</td>
<td>4</td>
<td>8.3</td>
<td>5.2</td>
<td>55%</td>
<td>45%</td>
<td>8.1</td>
<td>7%</td>
</tr>
<tr>
<td>2003</td>
<td>Tatla et al.</td>
<td>18</td>
<td>15</td>
<td>3</td>
<td>9.4</td>
<td>6.5</td>
<td>80%</td>
<td>20%</td>
<td>9.4</td>
<td>4%</td>
</tr>
<tr>
<td>2003</td>
<td>Galindo Campillo et al.</td>
<td>45</td>
<td>35</td>
<td>10</td>
<td>9.4</td>
<td>6.5</td>
<td>80%</td>
<td>20%</td>
<td>9.4</td>
<td>4%</td>
</tr>
<tr>
<td>2005</td>
<td>Stuck et al.</td>
<td>12</td>
<td>12</td>
<td>0</td>
<td>8.3</td>
<td>5.2</td>
<td>55%</td>
<td>45%</td>
<td>8.1</td>
<td>7%</td>
</tr>
<tr>
<td>2006</td>
<td>Hofmann et al.</td>
<td>79</td>
<td>67</td>
<td>12</td>
<td>8.1</td>
<td>5.2</td>
<td>55%</td>
<td>45%</td>
<td>8.1</td>
<td>7%</td>
</tr>
</tbody>
</table>

N: number of cases; No.: number of interventions per patient.

With regard to the results, 86.48% of the patients presented spouse-rated social improvement in snoring on the VAS scale, and 37.84% reported its cure (intermittent snoring that was not annoying). These results fall within the range presented in previous studies using this surgical technique (47%-90% improvement and 28%-55% cure), thus representing a high degree of patient satisfaction with the social outcome of the surgery. The mean VAS index went from 8.6 to 5.6, representing a mean improvement of 37%, at the lower limit of the range of improvement in other studies (36%-77%) that used the same scale. With regard to daytime sleepiness, the mean Epworth test score dropped from 9.3 to 6.1, representing a mean improvement of 34% of its value with the intervention. This improvement is in the range of previous studies (23%-39%) (Table 5).

Conclusions

Temperature-controlled radiofrequency is a well-tolerated surgical procedure, with mild, short-lasting postoperative pain and scarce iatrogeny. It is excellently tolerated in the turbinates, and moderately tolerated when applied in the tonsils and tongue base. Selecting the location of the treatment through clinical and dynamic examination, it is possible to obtain a clinical improvement of snoring in 86.5% of patients and a cure of symptoms in 37.8%, within 6 months. Mean snoring also improves by 37% and mean daytime sleepiness by 34%. From our experience, we can confirm that the TCR procedure is well tolerated, has no serious complications, and offers good performance in improving symptoms in patients with simple snoring. Given its safety, we recommend it as initial therapy for patients whose snoring has aetiology accessible to nasopharyngeal treatment with local anaesthesia.

Conflict of Interests

The author of the study declares no conflict of interests.

This investigation did not receive any institutional or private financial resources for its implementation.

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