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ORIGINAL ARTICLE

Factors Related to Post-tonsillectomy Pain in Adults☆

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Tonsillectomy;
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Abstract
Objective: Assessment of factors related to pharyngeal anatomy and surgical technique as possible causes of post-tonsillectomy pain.
Materials and methods: This was a prospective observational study that included 42 patients undergoing tonsillectomy with cold and monopolar electric device dissection. We recorded duration of the entire operation, duration of electrocautery use, tonsil size and postoperative pain and discomfort assessed using a visual analogue scale (VS) and a 40-item questionnaire (QoR-40, Quality of Recovery), along with sequelae on returning to normal diet, weight loss and hospital stay. Correlations among quantitative variables were obtained by mean of lineal regression coefficients.
Results: Duration of surgery was 22.66±7.07 min, removing tonsils with a volume of 6046.07±3866.20 mm^3 and an electrocautery use time of 66.14±37.77 s, applying 1984.24±1133.32 joules per patient. The most frequently observed Mallampati classification and tonsil size scores were stages II and III. The VS score increased and QoR-40 decreased at 24 h and 7 days, but differences were statistically non-significant. Joule amount used for electrocautery was the parameter that correlated the best with discomfort status as measured via assessment scores, analgesic and corticosteroid requirements, weight loss and hospital stay. Pain was higher in subjects submitted to peritonsillar surgical aggression.
Conclusions: Improved use of electrodissection techniques, limiting and focusing the application of its energy, and preservation of peritonsillar mucosa are factors that may lower post-tonsillectomy pain levels.

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PALABRAS CLAVE
Amigdalectomía;
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Dolor postoperatorio

Factores relacionados al dolor postamigdalectomía en adultos

Resumen
Objetivo: Valoración de factores relativos a la anatomía faríngea y a la técnica quirúrgica como posible causa de dolor postamigdalectomía.
Material y métodos: Estudio longitudinal prospectivo sobre 42 pacientes amigdalectomizados mediante disección con bisturí frío y monopolar, cuantificando los tiempos quirúrgicos y de empleo de electrobisturí, tamaño amigdalar, el dolor postoperatorio mediante escala analógica visual (EAV) y test de 40 ítems (QoR-40) y sus secuelas en la tolerancia oral, pérdida de peso y la estancia hospitalaria. Las correlaciones entre variables cuantitativas se establecieron mediante coeficientes de regresión lineal.
Resultados: La amigdalectomía duró 22,66 ± 7,07 minutos, retirando amígdalas con un volumen medio de 6.046,07 ± 3.866,20 mm^3 y empleando electrocauterio 66,14 ± 37,77 segundos para aplicar 1.984,24 ± 1.133,32 julios por paciente. El Mallampatti más frecuente se estadió en los estadios 2 y 3, y el tamaño amigdalar fue mayoritariamente entre 2-3. La EAV se elevó y el índice QoR-40 descendió a las 24 horas y a los 7 días de forma estadísticamente no significativa. La cantidad de julios administrados fue la variable que mejor se correlacionó con el malestar medido en las escalas, los requerimientos de analgesia y corticoides, la pérdida de peso y la estancia hospitalaria. El dolor fue más acusado entre sujetos en los que existió manipulación quirúrgica de tejido periamigdalino.
Conclusiones: La mejoría en el empleo de las técnicas de electrodisección con aplicaciones más limitadas y focalizadas de energía y la preservación de la mucosa periamigdalar son factores que podrían aliviar el nivel de dolor postamigdalectomía.

Introduction

Tonsillectomy is probably the most common surgical procedure in the speciality. Its range of indications and its accessibility make it a technique that has been performed extensively for almost a century. Although with variations, the dissection of the capsule that surrounds the tonsils to remove them is the only conditioning factor that characterises optimum posterior benefits.

Performing tonsillectomies is normal even from the earliest stages of physician training. In addition, despite advances in anaesthetic procedures that avoid painful manipulation, the main side effects are still haemorrhage and pain.

Many technical variations have been offered for the control of haemorrhage secondary to tonsillectomy, most focused on using electrocoagulation systems. The excellent postoperative results achieved with this technique have led to the fact that it can be included in outpatient surgery protocols, even under general anaesthesia general.

However, depending on the extension of focal burns in the tonsillar bed from electrocoagulation, has increased the other side effect of the operation: pain. This, along with an entire context of social attitudes and responses that generate pain intensity in the patient receiving the operation, moves the concept proposed by Kelley[1] in 2006 of the painless tonsillectomy further away from reality.

In an attempt to control pain in the best possible way, many tonsillar resection systems have been evaluated, intra- and postoperative analgesic protocols have been designed and hygienic and nutritional activities have been recommended to avoid a factor that is at the same time eminently natural: inflammation of the tissue invaded.

The purpose of this article is not to establish a new system of carrying out techniques of electrodissection and of analgesic chemotherapy. We have attempted to focus on investigating what the main factors that cause discomfort in the patient submitted to the intervention are. With this knowledge, it would be possible to act in a more targeted and less empirical manner with respect to this classic sequela from the surgery.

Materials and Methods

The data from 42 individuals that underwent a tonsillectomy in the last 3 years were gathered in a prospective longitudinal study. The surgical procedure was the conventional one under general anaesthesia with endotracheal intubation, placement of a Davies gag and tonsillar dissection with cold steel scalpel and unipolar electrocautery system (Fig. 1). However, the diversity among anaesthesia specialists and otorhinolaryngologists intervening in the operation made it recording the following variables recommendable: duration of the preoperative induction procedure, the surgery and awakening, the need for heat energy and dressings used in the haemostatic technique, and the characteristics of the faucial isthmus and pharyngeal airway (American Society of Anesthesiology [ASA] classification, Mallampati classification and tonsil size). In the surgical procedure, we recorded

Figure 1 Tonsillectomy using cold steel dissection (left) and unipolar dissection (right). The arrows indicate the plane of dissection.

circumstances that might be involved in greater tissue damage, such as the need to remove the palatoglossus and/or palatopharyngeus muscles partially or to on the glosstonsillar sulcus to be able to individualise the lower pole of the tonsil appropriately.

Heat energy in joules was quantified by timing the period of unipolar electrode activation in seconds, at a previously determined power setting that ranged from 20 to 35 W. The energy produced was calculated considering its relation with the electrode power according to the formula:

Power (W) = Energy (J)/Time (s)

During the operation, patients were administered 2 g i.v. of amoxicillin–clavulanate or cefazolin, paracetamol, ranitidine and methylprednisolone at the rate of 1 mg/kg of patient weight when there were no contraindications.

The tonsils removed were measured immediately after the surgery, after drying the samples on porous paper for 5 min and then introducing them in glasses of precipitates with a known volume of distilled water.

Although there were 84 surgical samples obtained, the sample volume was adjusted to the number of patients that were operated. The values reported for each patient's tonsils were the result of the arithmetic mean of both tonsils for each individual.

The circumstances as to postoperative clinical status and its evolution were established by a 0–10 visual analogue scale (VAS)—with 0 representing the lack of any pain and 10, the greatest pain imaginable—as well as the Postoperative Quality of Recovery Scale test or the 40-item Quality of Recovery Score (QoR-40 test) from Myles et al. (MYL). The QoR-40 assigns 5 points for each item evaluated, with 0 being the maximum lack of recovery and 5, the complete restitution of the parameter measured (Table 1). These evaluations were carried out in the days and weeks afterwards.

The variable of postoperative pain was associated with the clinical circumstances quantified as the beginning of oral tolerance, need for analgesia (with paracetamol if there were no contraindications) and oral cortisone therapy (in equivalents of prednisone if there were no contraindications) and any possible weight loss associated with dysphagia.

All the patients were duly informed about the intention and objectives of the study. They gave their written informed consent for both the anaesthetic and surgical procedure, as well as for inclusion in the follow-up for monitoring signs and symptoms.

The criteria for exclusion from the study were as follows:

1. The lack of any of the previously-mentioned written informed consents.
2. Age less than 18 years (older individuals were chosen to facilitate a more direct patient-researcher relationship).
3. Any physical or psychological impediment that would prevent the subject from understanding the study correctly or appropriately communicating the information requested.
4. The lack of any of the data requested in the developmental follow-up of the cases.

Table 1 Items Considered in the Postoperative Quality of Recovery (QoR-40) Test.

Items	Score
Emotional state	
Sensation of comfort	*Yes→5 No→0*
Show a sensation and general expression of well-being	*Yes→5 No→0*
Impression of self-control	*Yes→5 No→0*
Uncomfortable or disagreeable dreams	*Yes→0 No→5*
Sensation of anxiety	*Yes→0 No→5*
Sensation of anger	*Yes→0 No→5*
Depressive manifestation of mood	*Yes→0 No→5*
Feeling on loneliness	*Yes→0 No→5*
Difficulty falling asleep	*Yes→0 No→5*
Physical well-being	
Easy pulmonary ventilation	*Yes→5 No→0*
Develop a state of coherent somnolence	*Yes→5 No→0*
Ability to enjoy food	*Yes→5 No→0*
Sensation of a good night's sleep	*Yes→5 No→0*
Nauseas	*Yes→0 No→5*
Vomiting	*Yes→0 No→5*
Retching	*Yes→0 No→5*
Sensation of lack of rest	*Yes→0 No→5*
Agitation or muscle contractions	*Yes→0 No→5*
Shivering	*Yes→0 No→5*
Sensation of excessive cold	*Yes→0 No→5*
Sensation of dizziness	*Yes→0 No→5*
Psychological support	
Ability to communicate with hospital staff	*Yes→5 No→0*
Ability to communicate with relatives or friends	*Yes→5 No→0*
Receive physician support during admission	*Yes→5 No→0*
Receive nursing support during admission	*Yes→5 No→0*
Receive support from relatives or friends	*Yes→5 No→0*
Ability to understand instructions or advice	*Yes→5 No→0*
Sensation of confusion	*Yes→ No→5*
Physical independence	
Ability to return to social-work	*Yes→5 No→0*
Ability to write	*Yes→5 No→0*
Maintaining conversations	*Yes→5 No→0*
Ability to take care of personal grooming	*Yes→5 No→0*
Ability to take charge of general appearance	*Yes→5 No→0*
Pain	
Several moderate pains	*Yes→0 No→5*
Several severe pains	*Yes→0 No→5*
Headache	*Yes→0 No→5*
Myalgias	*Yes→0 No→5*
Back pain	*Yes→0 No→5*
Throat pain	*Yes→0 No→5*
Oral cavity pain	*Yes→0 No→5*
Total	Extremely bad→0 Optimum→200

The indication for the tonsillectomy or non-pharyngeal circumstances (comorbidity, substance abuse, allergies or medication intolerance and maxillofacial anatomical variations) did not constitute a reason for exclusion from the study.

The Student—Fisher *t*-test was performed to study the change in the response before and after the subjects underwent a level of exposure, by comparing the means and standard deviations. In small samples, such as when the study population volume was subdivided into categories, had to comply with the assumption of normality of the difference in the population variable; in these cases, the Kolmogorov—Smirnov test was applied, based on comparing the accumulated distribution of the values of the sample

Table 2 Variables Related to the Anatomical and Technical Characteristics of the Intervention.

Variables	x±standard deviation	Range
Duration of the operative act (anaesthesia and surgery)	*40.33±8.81 min*	*21–59*
Duration of the surgical procedure	*22.66±7.07 min*	*13–42*
Duration of electrocoagulation use	*66.14±37.77 s*	*21–173*
Energy used	*1984.24±1.133.32*	*630–5.190*
Patient's ASA	*2.04±0.76*	*ASA 1 (n=11)*
		ASA 2 (n=18)
		ASA 3 (n=13)
Mallampati classification	*2.40±1.01*	*Mall 1 (n=9)*
		Mall 2 (n=14)
		Mall 3 (n=12)
		Mall 4 (n=7)
No. of tonsillitis episodes in the preceding 2 years	*5.21±4.45 episodes*	*0–18*
Tonsil size	*2.31±0.99*	*TS I (n=10)*
		TS II (n=15)
		TS III (n=11)
		TS IV (n=6)
Tonsil volume	*6046.07±3866.20 mm^3*	*1120–17 280*
Craniocaudal diameter	*25.54±5.08 mm*	*14–36*
Transverse diameter	*15.40±3.15 mm*	*11–22*
Anteroposterior diameter	*13.73±4.30 mm*	*6–24*
No. of Davies gags	*3.00±0.58*	*2 (n=7)*
		3 (n=28)
		4 (n=7)
Notch of the gag used	*8.00±1.10*	*6–12*
No. of dressings used	*7.04±3.72*	*2–15*
Extra-tonsillar involvement with scalpel	*31/42 (73.8%)*	*PG n=20/42 (47.6%)*
		PPF n=7/42 (16.6%)
		PGF n=14/42 (33.3%)

PG: palatoglossal muscle; PGF: palatoglossal fold; PPF: palatopharyngeal fold.

that would be obtained on the assumption that it exactly followed a normal law for known mean and variance. The *t*-test calculation for $n-1$ degrees of liberty in normal volumes of distribution was verified by applying SPSS system Scatter Plot procedure.

Comparing various means was carried out by analysing the relationship between an independent variable with more than 2 categories and another dependent quantitative variable, applying analysis of variance with observation of the increase in the independent variable and evaluating if the set of the means obtained presented certainty relationships or only some type of tendency. This could be calculated applying the *t*-test group procedure and Oneway in the SPSS system.

Any difference was considered statistically significant for results of $P<.01$.

To test the hypothesis of independence between quantitative variables, the correlation coefficient of the population was calculated as an indicator of the degree of association between the 2 variables, with the calculation of equations of lineal association lines in point-cloud environment, adjusting it with the least squares criterion. From these, the *R* coefficient association (which is accessible in Excel in any version of Microsoft-Office for Windows) was calculated.

Results

A total of 42 subjects were included in the study, 24 males and 18 females, with ages falling between 19 and 45 years (30.04±6.54). The indications for surgery were recurrent pharyngotonsillitis in 20 cases, tonsillar hypertrophy in 13, peritonsillar disease in 7, and the need to rule out neoplasia in another 2.

The tonsillectomies, not including pre- and postoperative time, ranged between 13 and 42 min (22.66±7.07). Electrocautery was used to ensure hemostasis through unipolar scalpel; the heat energy applied ranged between 630 and 5190 J (1984.28±1133.32), depending on the time of electrode application in the surgical bed at a power that varied upon otorhinolaryngologist request.

Management of intraoperative times and airway characteristics during the operations are shown in Table 2.

Clinical recovery following the intervention was established by the scores recorded in the VAS and the QoR-40, which are reflected in Table 3. This table also includes quantitative variables about the beginning or oral tolerance, coadjuvant medical treatment and weight loss secondary to the surgery. Based on the 2 tests for assessing general clinical status, its measurement at 7 days after the intervention showed the greatest values of clinical compromise.

Table 3 Variables Related to Postoperative (p.o.) Pain.

Variables	x±standard deviation	Range
VAS at 24 h p.o.	*4.09 ± 2.18*	*2–9*
VAS at 7 days p.o.	*6.28 ± 1.11*	*4–8*
VAS at 14 days p.o.	*3.90 ± 1.22*	*2–7*
Preoperative QoR-40	*181.19 ± 9.59*	*163→195*
QoR-40 at 24 h p.o.	*152.42 ± 7.83*	*132→166*
% deterioration	*−15.71 ± 5.21%*	*−27.46→0*
QoR-40 at 7 days p.o.	*155.50 ± 20.70*	*137→172*
% deterioration	*−18.47 ± 9.28%*	*−23.83→−6.06*
QoR-40 at 14 days p.o.	*175.61 ± 7.65*	*162→189*
% deterioration	*−2.96 ± 3.58%*	*−10.36→4.04*
Commencement of oral tolerance	*12.52 ± 6.84 h*	*6–34*
Need for analgesics p.o.	*9.43 ± 2.55 g paracetamol*	*6–17.2*
Need for corticoids p.o.	*59.52 ± 34.06 mg prednisone*	*15–150*
Weight loss at 7 days	*2.86 ± 0.90 kr*	*1.1–4.2*
Weight loss at 14 days	*1.50 ± 0.63 kg*	*0.8–2.7*
Hospital stay	*20.09 ± 8.79 h*	*10–42*

QoR-40: 40-item Quality of Recovery test; VAS: visual analogue scale.

However, in the general volume studied, no statistical significance was seen.

When correlations were performed between quantitative variables related to the circumstances of the intervention and parameters on patient side effects, there was statistically significant correlation in the amount of analgesia administered and the VAS score 24 h after the tonsillectomy with surgical time. Likewise, there was statistically significant correlation in the amount of paracetamol required for pain control with the time of unipolar scalpel use and the amount of prednisone for anti-inflammatory reasons with the amount of heat energy applied. The other correlations were not significant or simply revealed inconclusive tendencies (Table 4). The intraoperative factor that yielded the most tendencies among the correlations tested was the amount of heat energy used, ahead of the duration of operation, of the duration of the entire procedure combined with anaesthesia induction and awakening, of time of use of the unipolar electronic scalpel, and of the number of dressings used for maintaining hemostasis.

The population of patients operated was divided into categorical variables according to the characteristics of the upper aero-digestive tract (ASA index, Mallampati classification and tonsil size) and the surgical aggression on adjacent structures (tonsillar pillars or palatoglossus fold). Statistically significant results were found when these were correlated with the surgery side effects measured with quantitative variables. Patients having Mallampati classification 3 and 4 offered a QoR-40 indicator of general status at 24 h significantly better, less weight loss at 7 and 14 days, and lower paracetamol requirement. Among the subjects with tonsil size 1 and 2, the QoR-40 indicator at 24 h was likewise significantly greater, with less need of analgesia and shorter time of hospital stay. The ASA index did not affect local side effects from the intervention (Table 5). It was especially noteworthy that surgical action on the palatoglossal fold caused a rise in VAS at 7 and 14 days, a worsening of QoR-40 at 24 h and 7 days, greater weight loss at 7 and 14 days, an increase in the need for analgesia and for corticoids and a longer hospital stay. All of these differences were statistically significant. Partial removal of the palatopharyngeal muscle or posterior pillar caused greater clinical compromise than that of the palatoglossal or anterior pillar.

Discussion

The indication for tonsillectomy keeps on increasing even though the intervention involves an inevitable period of discomfort after it. It is almost paradoxical that a painful procedure not lacking in haemorrhagic complications is included in hospital strategies that consider it minor surgery and often an outpatient procedure. Painless tonsillectomy is still a challenge that is as desirable as it is utopia-like; and, in the search for it, changes in criteria and technique have been going on, particularly over the last 2 decades.

There are 2 main stumbling blocks that researchers of this problem find almost systematically. On the one hand, the offer of procedures aimed at removing the palatine tonsils has increased significantly. Conventional cold-steel surgery has been complemented or even replaced by electrodissection techniques or reductive procedures. The doubt arises as to which attitude combines efficacy in achieving the objective with appropriate tolerance: reducing surgical times and anaesthesia risks, reorganisation of the remaining lymph tissue, reappearance of symptoms that caused the indication, reducing postoperative haemorrhagic events, and, above all, eliminating local pain and general breakdown.

On the other hand, the lack of a commonly-accepted system for measuring pain and/or postoperative quality of life is the second obstacle. Each school designs scales for scoring and quantification of symptoms and evaluates their equivalence to the classic numeric assessment of the pain or discomfort. Equivalences are valid for internal studies, but they lose reliability in inter-trial reviews. Our group has used the Myles QoR-40, from 2000, based on an adequate

Table 4 *R* Coefficients for the Lineal Regression Line Equations and Tendencies of the Correlations Between Quantitative Variables Related to Surgical Factors (Columns) and a State Associated With Postoperative Pain (Rows).

	Operating time (s)	Surgical time (s)	Unipolar use time (s)	Energy used (J)	Tonsil length (mm)	Tonsil width (mm)	Tonsil depth (mm)	Tonsil volume (mm)	Pole opening (n)	Dressings applied (n)
VAS 24 h	0.7585	0.8232	–	0.7585	–	–	–	–	–	0.6647
VAS 7 d	0.5454	–	–	0.5454	–	–	–	–	–	–
VAS 24 d	–	–	–	–	–	–	–	–	–	–
Prior QoR-40	–	–	–	–	–	–	–	–	–	–
QoR-40 24 h	–	–	–	–	–	–	–	–	–	–
QoR-40 7 d	–	–	–	0.4702	–	–	–	–	–	–
QoR-40 14 d	–	–	–	–	–	–	–	–	–	–
Commencement tolerance	0.7107	0.7871	0.7773	–	–	–	–	–	–	0.6290
Analgesia amount	0.7311	0.9675*	0.8725	0.773	–	0.5779	–	0.5315	–	0.8263
Corticoid amount	–	0.7690	0.6676	0.8725	–	–	–	–	–	0.6907
↓W 7 d	–	–	–	0.6676	–	–	–	–	–	–
↓W 14 d	–	–	–	–	–	–	–	–	–	–
Hospital stay	0.5709	0.7583	0.7575	0.7715	–	–	–	–	–	0.6838

QoR-40: 40-item Quality of Recovery test; VAS: visual analogue scale; ↓W: weight loss.

* $P<.001$.

convergence with the VAS indicators and on the fact that the author applied it in patients operated in the otorhinolaryngological area with an adequate convergence with the VAS indicators.[2]

Working with non-specific postoperative quality score scales for an intervention involves an evident risk of bias. This is a reason why the review offered evaluated specific details of the procedure used in our centre (electrocoagulation, location of key points in the surgical bed and anatomical characteristics of the upper airway) and normal side effects (dysphagia, general exhaustion, need for drug support). Other scales consulted that are used in postoperative evaluation of general patient status do not consider items implicated in upper airway involvement, refer to chronic pain or emphasise fatigue or general deterioration.[3–6]

Healing of a wound requires a first substratum or inflammatory stage, with breakdown of the submucosa and vascular endothelium. This exposition brings about the extravasation of blood components with an initial objective of haemostasis. After vasospasm and activation of the extrinsic coagulation cascade pathway, platelet activation follows minutes later with the release of chemotactic and vasoactive mediators. A process of endothelial distension and vascular dilatation takes place, increasing vascular permeability vascular and favouring cell response to inflammation; this process develops for 3 or 4 more days, with greater attraction of neutrophils, macrophages and fibroblasts. In this time, the platelet α granules continue secreting growth factors from themselves and from fibroblasts, for cell transformation. However, they also secrete histamine and heparin, all substrates released without considering the quality of the trigger signal (that is, the wound), but with a marked irritating effect on nerve fibres and sensory terminations. From the point of view of inflammation, tonsillectomy dissection and electrocoagulation are 2 inflammatory manoeuvres that accumulate intensity of cell response and of substrate release. The pain grows in magnitude and extension, given that wide areas of sensory innervation are involved, as well as proximity to the muscles involved in the oral swallowing phase, and considerable systemic vascularisation scant millimetres away.[7,8]

Consequently, evaluating markers of general discomfort is justifiable.

The energy source used in our tonsillectomies for haemostatic section and dissection of tissues supporting cold scalpel use was electrocoagulation. In this process, tissue resistance to current flow, originating at electrode level, generates heat. This current flow through human tissue causes cell lysis, muscle and nerve cell stimulation and local hyperthermia. Specifically, the high frequency electricity cuts and coagulates tissue at frequencies above 300 hHz. Transmitted in the form of continuous waves, it produces a cutting effect by the rapid rise in tissue temperature and consequent explosive rupture of the cells, resulting in a burn of up to 0.1 mm in depth. As discontinuous waves, it generates coagulation by causing a gradual rise in tissue temperature that evaporates cell fluid and reduces the tissue; however, the lesion is deeper and haemostasis of vessels of up to 2 mm in diameter occurs through the reduction in size.

Table 5 Variations in the Visual Analogue Scale (VAS) Pain Test and in the 40-item Postoperative Quality of Recovery (QoR) Score at 24 h, 7 Days and 14 Days, Weight Loss (↓W) at 7 and 14 Days, Commencement of Oral Tolerance (COM TOL), Need for Analgesic (AMOUNT ANALG) (Grams of Paracetamol) or Corticoids (mg of Prednisone) and Hospital Stay, in Relation to Population Staging by ASA Level, Mallampati Classification, Tonsil Size (TS), Effect of Palatoglossal Muscle (PG), Palatopharyngeal Fold (*PPF*) and Palatoglossal Fold (*PGF*).

	VAS 24H	VAS 7D	VAS 14D	QoR 24H	QoR 7D	QoR 14D	↓W 7D	↓W 14D	COMM. TOL	AMOUNT ANALG	AMOUNT CORT	HOSPITAL STAY
ASA												
1(11)	*4.4 ± 2.8*	*6.1 ± 1.1*	*4.0 ± 1.5*	*153.4 ± 6.9*	*155.6 ± 17.5*	*177.3 ± 8.2*	*3.1 ± 1.3*	*1.6 ± 0.8*	*14.3 ± 6.7*	*9.4 ± 3.5*	*55.6 ± 38.5*	*19.4 ± 8.2*
2(18)	*4.1 ± 2.2*	*6.3 ± 1.6*	*3.8 ± 1.3*	*155.8 ± 8.2*	*156.8 ± 21.4*	*176.3 ± 9.3*	*2.7 ± 1.2*	*1.5 ± 0.6*	*12.4 ± 5.2*	*7.3 ± 4.2*	*58.8 ± 36.4*	*24.4 ± 7.5*
3(13)	*4.5 ± 2.7*	*6.3 ± 1.9*	*3.9 ± 1.2*	*151.3 ± 7.0*	*155.1 ± 18.3*	*1743 ± 5.7*	*2.5 ± 0.6*	*1.5 ± 0.4*	*13.5 ± 7.9*	*10.2 ± 4.4*	*64.1 ± 22.3*	*20.4 ± 9.2*
MALL												
1(10)	*4.5 ± 2.3*	*6.7 ± 1.2*	*3.8 ± 1.5*	*147.3 ± 8.3*	*1490 ± 14.5*	*1733 ± 8.4*	*3.2 ± 1.3*	*2.7 ± 1.4*	*14.3 ± 7.3*	*11.2 ± 3.6*	*72.1 ± 38.4*	*24.3 ± 6.8*
2(15)	*4.4 ± 2.0*	*6.6 ± 1.4*	*3.9 ± 0.7*	*151.3 ± 11.5*	*1552 ± 19.4*	*1744 ± 6.7*	*3.0 ± 1.1*	*2.1 ± 1.5*	*12.8 ± 5.6*	*10.4 ± 3.7*	*75.3 ± 27.8*	*20.4 ± 7.3*
3(11)	*4.0 ± 3.1*	*6.2 ± 0.6*	*3.6 ± 1.4*	*158.7 ± 6.3**	*1592 ± 22.3*	*1766 ± 4.8*	*1.4 ± 1.2**	*1.3 ± 1.1*	*12.6 ± 6.9*	*7.9 ± 2.7*	*60.4 ± 30.4*	*18.9 ± 9.4*
4(6)	*3.8 ± 1.5*	*5.7 ± 1.1*	*3.6 ± 1.2*	*157.9 ± 5.9**	*1633 ± 21.5*	*1769 ± 6.2*	*1.1 ± 0.8***	*1.0 ± 0.9**	*12.5 ± 6.4*	*6.7 ± 1.8***	*51.2 ± 36.2*	*21.4 ± 7.1*
TS												
1(9)	*3.5 ± 2.2*	*5.1 ± 1.6*	*3.7 ± 1.4*	*159.1 ± 6.4*	*162.4 ± 17.5*	*176.4 ± 8.5*	*1.8 ± 1.1*	*1.3 ± 0.6*	*10.4 ± 8.3*	*6.3 ± 2.7*	*46.3 ± 42.2*	*16.4 ± 6.8*
2(14)	*3.6 ± 2.5*	*5.7 ± 1.3*	*3.8 ± 1.2*	*153.4 ± 9.1*	*155.6 ± 14.9*	*174.5 ± 9.4*	*2.4 ± 1.5*	*1.6 ± 1.1*	*12.2 ± 5.1*	*8.3 ± 2.1*	*53.6 ± 32.7*	*17.3 ± 5.3*
3(12)	*4.0 ± 1.8*	*6.3 ± 0.4*	*3.9 ± 0.9*	*150.4 ± 12.4*	*147.4 ± 26.7*	*175.9 ± 5.6*	*2.7 ± 0.4*	*1.6 ± 1.0*	*14.7 ± 6.9*	*9.3 ± 3.2*	*63.5 ± 30.2*	*24.5 ± 9.1*
4(7)	*4.8 ± 2.3*	*6.6 ± 0.8*	*3.8 ± 1.1*	*142.3 ± 5.7***	*144.9 ± 21.4*	*173.3 ± 9.1*	*3.5 ± 1.8*	*2.5 ± 0.7*	*16.5 ± 10.1*	*13.1 ± 2.1***	*76.2 ± 25.3*	*28.4 ± 9.9**
PG+(20)	*4.2 ± 2.4*	*6.3 ± 1.1*	*4.2 ± 1.3*	*150.0 ± 8.3*	*152.7 ± 22.3*	*171.4 ± 12.4*	*2.7 ± 0.8*	*1.5 ± 0.8*	*12.8 ± 7.1*	*9.2 ± 2.5*	*54.6 ± 32.4*	*19.3 ± 8.3*
PG-(22)	*3.7 ± 2.0*	*6.0 ± 1.0*	*3.7 ± 1.1*	*154.5 ± 6.5*	*159.1 ± 17.7*	*181.3 ± 5.6***	*2.8 ± 1.2*	*1.4 ± 0.6*	*12.2 ± 6.6*	*9.6 ± 2.6*	*63.1 ± 35.9*	*21.8 ± 8.8*
PPF+(7)	*4.5 ± 2.6*	*6.6 ± 1.2*	*4.5 ± 1.1*	*147.3 ± 11.3*	*150.4 ± 25.3*	*165.2 ± 5.8*	*4.1 ± 1.9*	*2.3 ± 1.3*	*13.4 ± 4.2*	*13.2 ± 2.2*	*81.3 ± 42.2*	*25.5 ± 9.2*
PPF-(35)	*3.6 ± 1.8*	*5.6 ± 1.0*	*3.7 ± 2.0*	*161.2 ± 6.7**	*168.6 ± 18.3*	*178.3 ± 9.1***	*1.6 ± 0.6***	*1.2 ± 0.5*	*8.5 ± 7.1*	*6.7 ± 4.2***	*45.4 ± 21.5*	*18.1 ± 7.3*
PGF+(14)	*4.8 ± 2.8*	*8.2 ± 1.9*	*5.1 ± 1.4*	*145.7 ± 8.2*	*147.2 ± 19.9*	*174.3 ± 9.2*	*3.7 ± 0.8*	*2.2 ± 0.8*	*14.1 ± 8.1*	*14.2 ± 2.6*	*76.2 ± 16.3*	*24.1 ± 10.1*
PGF-(28)	*3.7 ± 1.7*	*4.9 ± 0.4***	*2.8 ± 1.1***	*159.8 ± 6.1***	*166.7 ± 21.3**	*177.8 ± 5.8*	*2.0 ± 1.0***	*1.3 ± 0.5***	*9.2 ± 5.2*	*6.1 ± 1.8***	*48.5 ± 42.2**	*16.3 ± 7.2**

* $P<.01$

** $P<.001$.

In the tonsillectomies in question, the high frequency current was applied using the unipolar system, establishing a circuit between the active electrode applied in the work area and a neutral electrode placed in the patient's body. The heat thus generated in the application area depends on current density, tissue conductivity, electrode shape and, above all, time of application. The electric current passes through the body without tissue lesion except at the entry and exit points. The advantage of the system is its efficacy in the hemostasis of small vessels, easy management, precision and low cost. However, it can produce lesions at the current exit spot or at a distance from the application point of the electrode through loss of the isolation layer of the instrument and contact with other metallic instruments or the phenomenon of capacitance. In addition, it produces smoke and is inoperable underwater.[9]

The direct relationship between the pain caused and the use of heat energy was the most evident correlation detected. Shin,[10] proposing the treatment of post-tonsillectomy pain with direct tonsillar bed washing of the area with saline solution at 4 °C, showed that the interventions that included electrosurgical devices determine greater pain duration and intensity. Magdalena[11] found less intense pain using only the cold scalpel, aside from using 2 different non-steroid anti-inflammatory protocols with prednisone or tramadol.

There is reasonable doubt as to the use of new electrosurgical alternatives in removing the palatine tonsils and obtaining a state of less intense discomfort. Using bipolar coagulation devices conditions heat energy action limited to the field between the 2 ends of the tweezers. Horii[12] detected a lower pain intensity reported via visual scale when patients underwent tonsillectomy with a system of these characteristics, comparing with the traditional cold dissection. Although hardly a worthless study, the electrosurgery-operated group associated this procedure with shock cooling therapy of the tonsillar bed; consequently, it is impossible to determine which of the 2 therapeutic options had the greater effect. In addition, with respect to managing bipolar systems on the tonsils, Soy[13] found that pharyngeal pain in the paediatric population normally intensified in a directly proportional way to the amount of heat energy transmitted. This was the only article found in our review that carried out correlations with the joules transmitted to the oral cavity in the form of heat. These results are very similar to the ones we obtained when we quantified the values of the energy to which the surgical field of our patients was exposed using the unipolar tweezer.

The integrity of the adjacent tissue during dissection of the tonsillar capsule is also worthy of being evaluated as a possible cause of postoperative damage. Tonsillar pillars and the palatoglossal folds are structures frequently damaged. Exposure of the submucosa brings about pain by irritating the sensory terminations exposed dependent on the lingual and glossopharyngeal nerves. Some authors believe that the generation of organic films on the injured area seems to be the basis for prescribing honey as an analgesic requirement.[14,15]

Opinions along the same lines are shared by the authors that propose covering the tonsillar fossa by overlaying with palatopharyngeal mucosa[16] or suturing the lower segments of the pillars.[17]

Based on the data gathered and studies revised, a direct relationship can be established between the increase in post-tonsillectomy pain and the management of electrosurgical instrumentation and the involvement of the adjoining mucosa. In the presence of postoperative analgesia coverage, we believe that optimising the surgical work with electrocautery instrumentation that is better defined for the tonsillar area and providing later local protection are highly modifiable factors that are involved in the pain caused. Intra-individual studies, such as comparing 2 different methods for the dissection of each tonsil, could provide more definitive results on the efficacy of one technique over others, given the acceptable subjective variability that pain causes in each individual.

Conflict of Interests

The authors have no conflicts of interest to declare.

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