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Original Research Article

Can we improve clinical results of tonsillectomy using lasers?



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ABSTRACT

Current medicine uses a variety of high-tech devices to obtain maximum results with minimally invasive procedures. Our goal was to determine the benefits of laser medicine in tonsillectomy in comparison with traditional tonsillectomy, harmonic scalpel and radio frequency scalpel. Forty adult patients with chronic tonsillitis, scheduled for bilateral tonsillectomy, were divided into four groups in a prospective study. The left side tonsillectomy was performed using a traditional technique. The right side tonsillectomy was performed using four different methods: Ho:YAG laser, Er,Cr:YSGG laser, radiofrequency scalpel and harmonic scalpel. Peroperative bleeding and operation time were evaluated by the surgeon, development of pain during the healing period was evaluated by the patients and also histological examination of the resectates was performed. The results showed a significant increase of postoperative pain after the Ho:YAG and Er,Cr:YSGG laser procedure in comparison to traditional tonsillectomy. No significant differences in postoperative pain were found after the use of radiofrequency scalpel and harmonic scalpel. Average operation time and peroperative bleeding differed partially in all methods. In conclusion, all the tested methods offer a safe, uncomplicated alternative to traditional tonsillectomy; however, they do not bring any substantial benefit for the patient in reduction of pain during the postoperative period.

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Introduction

The first primitive method for performing tonsillectomy was described in the “Corpus Hippocraticum”. Since then, the method had evolved and the traditional cold-steel method has been performed since about 1910, when the ligature to stop post-operative bleeding was introduced. Former methods to stop bleeding included gargling cold water and compressions, however, these methods were unsatisfactory and sometimes ended up with fatal consequences. In the twentieth century, newly developed devices were used in tonsillectomy. In 1935 McLaughlin published his experience with tonsillectomy using diathermoelectrocoagulation (McLaughlin, 1935). Then, in the second half of the 20th century, works by Leach et al. (1993) and Tay (1995) describing the use of a traditional electroknife were published. Later, first attempts to use cryotherapy and lasers were made. Around 1980, CO₂ laser was used (Grossenbacher, 1979), followed by KTP (Oas and Bartels, 1990; Auf et al., 1997; Saito et al., 1999), Nd:YAG (Maloney, 1991) and, later, diode lasers (Havel et al., 2012). At the beginning of the 21st century, there was a significant development of advanced technologies. During a ten-year period, the following tonsillectomy methods were tested: argon plasma (Bergler et al., 2000; Ferri and Armato, 2011), coblation (Toft et al., 2009; Alexiou et al., 2011), radiofrequency thermoablation (Maddern, 2002; Aksoy et al., 2010), harmonic scalpel (Lachanas et al., 2007; Alexiou et al., 2011), thermal welding (Chimona et al., 2008; Sezen et al., 2008) and other types of lasers. So far, however, none of the modern methods has been proven to have significant advantages over the traditional tonsillectomy that is still considered as “the golden standard”.

With present-day technical advancements, medical instruments and techniques are becoming more accurate and less invasive. In this study, we wanted to determine whether the tested modern devices can be beneficial in improving tonsillectomy, since their application in tonsillectomy is still controversial. They can be used, but can they really bring benefit to the patient?

In our work, we focused on two relatively new types of lasers (Ho:YAG and Er,Cr:YSGG). The Ho:YAG laser (Gilling and Fraundorfer, 1998) is widely used for soft tissue operations in urology such as prostatectomies. The Er,Cr:YSGG laser (Boj et al., 2011) is a device with patented tissue cooling spray of air and water, intended primarily for dentistry where its use does not require local anesthesia. Both these lasers are market leaders in their primary indications. In the literature, we found no examples of these methods being used in tonsillectomy except for a study by Slouka et al. (2015) where ten types of

lasers (Ho:YAG, KTP, NdYVO₄, Th:DPFL, Er,Cr:YSGG, CO₂ and diode lasers of 980, 940, 810 nm) were compared regarding peroperative bleeding, time of the procedure, orientation in the tissue and thermal damage depth. The Ho:YAG laser was evaluated there as the best-performing among the tested laser types in peroperative bleeding and operation time while the Er, Cr:YSGG laser had the smallest depth of the thermal damage, which are the reasons for the inclusion of these devices in our study.

Besides the two laser tools, harmonic scalpel (HS) and radiofrequency scalpel (RFITT) were included in the study as well. Considering their wide use in various fields of surgery, HS and RFITT need no introduction.

Materials and methods

Material

The study took place in the period from 1/2009 until 5/2013 at the ENT Clinic of the University Hospital in Pilsen. It was a prospective, partially blinded study that included patients with a diagnosis of chronic tonsillitis indicated for surgical treatment. The examined group included 40 patients who met the inclusion criteria (specified below). These were 32 women (80%) and 8 men (20%). Their average age at the time of surgery was 32.5 ± 11.6 (mean ± SD) (Table 1).

Patients were divided into 4 groups of 10 probands. For their left side tonsillectomy, traditional instruments were used. The right side tonsillectomy was performed using a fiber-guided Ho:YAG laser (Auriga, StarMedTec, Germany) in Group A; an Er, Cr:YSGG laser with patented tissue cooling water and air spray (Waterlase iPlus, Biolase, USA) in Group B; a radiofrequency scalpel (CelonLab ENT, Olympus, Japan) in Group C and a harmonic scalpel (SonoSurg, Olympus, Japan) in Group D (Table 2).

At the time of the surgery and one month after the surgery, each patient reported data to the questionnaire without the knowledge of the method performed on either side.

Inclusion criteria: Age over 18 years, diagnosis of chronic tonsillitis.

Exclusion criteria: Chronic diseases of pharynx (excluding tonsillitis), previous surgery or injury of pharynx, peritonsillar abscess, coagulation disorder or other hematologic disease, cleft palate or past history of surgery of pharynx, general contraindications for general anesthesia, pregnancy, lactation.

Table 1 – Characteristics of the study group.

	Group A	Group B	Group C	Group D	p-Value	Significance test
Operation technique	Ho:YAG	Er,Cr:YSGG	RFITT	Harm. scalpel	–	–
Sample size (N)	10	10	10	10	–	–
Gender (male/female)	1/9	2/8	2/8	3/7	0.95	Exact
Mean ± SD	32.2 ± 11.1	36.3 ± 13.7	32.8 ± 11.4	28.8 ± 10.4		
Age					0.57	One-way ANOVA
Min/Max	19/48	19/59	18/55	19/46		

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