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REVIEW ARTICLE

# Tonsillectomy with thermal welding technology using the TLS<sup>2</sup> thermal ligating shear

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**KEYWORDS**

Disposable instruments;  
Thermal welding technology;  
Tonsillectomy

**Summary**

**Objective:** To introduce and assess a new method of tonsillectomy with thermal welding technology (TWT) using the thermal ligating shear (TLS<sup>2</sup>), in pediatric population.

**Method:** TWT provides a new surgical instrument that combines heat and pressure to simultaneously coagulate and divide tissue. Among the handpieces available for the TWT generator, the TLS<sup>2</sup> handpiece was selected. A prospective study was conducted in our Department, on 60 children who underwent tonsillectomy with the use of TWT. Inclusion criteria were obstructive sleep apnea syndrome, peritonsillar abscess history and chronic tonsillitis. Patients undergoing adenoidectomy, or any other procedure together with tonsillectomy were excluded from this study. All patients' data, including intraoperative blood loss, operation time and complication rates were recorded in a database.

**Results:** Our series consisted of 60 patients (39 male and 21 female). There was no measurable bleeding during surgery in any of the cases. The mean operative time was 20 min. Only one case of postoperative hemorrhage occurred. Mild uvula edema was noticed in 25 patients.

**Conclusion:** TWT is a safe method for tonsillectomy. Among the several handpieces available for the TWT generator, the TLS<sup>2</sup> is very effective and easy to use in tonsillectomy procedures, providing sufficient hemostasis and diminished operative time.

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## 1. Introduction

Tonsillectomy is one of the most common procedures performed by otolaryngologists. Several different techniques are used to perform this operation, including blunt dissection, guillotine excision, electrocautery, cryosurgery, coblation, ultrasonic removal, laser removal, as well as monopolar and bipolar dissection [1]. The resulting morbidity includes intraoperative blood loss, primary and secondary hemorrhage and postoperative pain.

Thermal welding technology (TWT) (Starion Instruments, Corp., Saratoga, CA) is a new hemostatic electro-surgical device that combines heat and pressure to simultaneously coagulate and divide tissue. It consists of an electro-surgical generator and a handpiece (Fig. 1). The thermal ligating shear (TLS<sup>2</sup>) can be used to simultaneously seal and divide, as well as to grasp and dissect soft tissue. TWT using the TLS<sup>2</sup> handpiece has been widely used in laparoscopic surgery, and it has proved to be quite efficacious and safe.

No studies regarding the use of the TLS<sup>2</sup> in tonsillectomy procedures have been reported so far. In this report we introduce a new method of tonsillectomy with the use of TWT and the TLS<sup>2</sup>.

## 2. Material and method

From January 2006 to August 2006, a prospective study was conducted in our Department, on children who underwent tonsillectomy with TWT using the

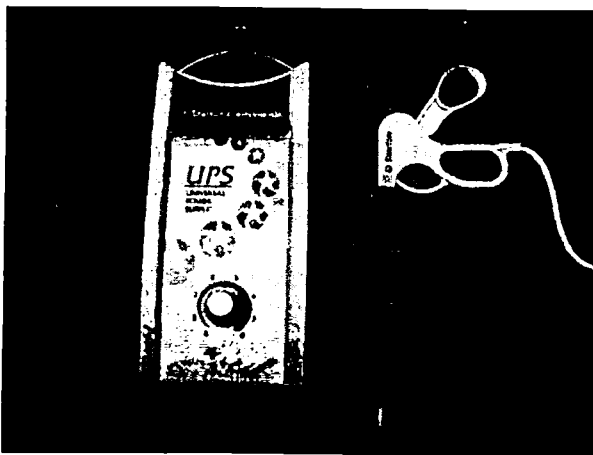


Fig. 1 The electro-surgical generator and handpiece.

TLS<sup>2</sup> handpiece. Inclusion criteria were obstructive sleep apnea syndrome, peritonsillar abscess history and chronic tonsillitis. Patients undergoing adenoidectomy, or any other procedure together with tonsillectomy, and patients with bleeding disorders were excluded. All operations were conducted under general anaesthesia with endotracheal intubation. According to our technique a Davis Tonsil Mouth Gag was typically placed into the patient's mouth. Each tonsil was grasped with an Allis clamp and was retracted towards the midline in order to expose the lateral extent of the tonsils. No mucosal incision was performed. Tissue bundles of the anterior pillar mucosa were gently grasped and coagulated with the TLS<sup>2</sup> using the "1" setting of the power supply unit, and divided afterwards with the same instrument, using the "8" setting of the power supply unit. Using the same settings the lateral tonsil capsule was separated from the surrounding tissue (Fig. 2). The inferior pole was coagulated, and the tonsil specimen was finally removed with the TLS<sup>2</sup> instrument. Visible blood vessels were grasped with the tips of the instrument and sealed with a power setting of "1". The same technique was performed on both sides. Intraoperative blood loss was estimated by measuring the amount in the suction bottle and by weighing the cottonoid pledgets before and after the procedure. Operative time, defined as the time for tonsils dissection and hemostasis when necessary, was recorded at the end of the operation.

All patients' data, including intraoperative blood loss, operation time and complication rates were recorded in a database. The research protocol was approved by the Ethics Committee of the University Hospital of Crete.

## 3. Result

Our series consisted of 60 children (39 male and 21 female). The patients' ages ranged from 5 to 13 years. There was no measurable bleeding during surgery in any of the cases, resulting in a bloodless surgical field.

The mean operative time was 20 min (range 17–26). Postoperative hemorrhage occurred only in one patient. Bleeding was managed conservatively. No other complications were noted. Mild uvula edema was noticed in 25 patients. The edema greatly improved within 2 days, without further treatment.

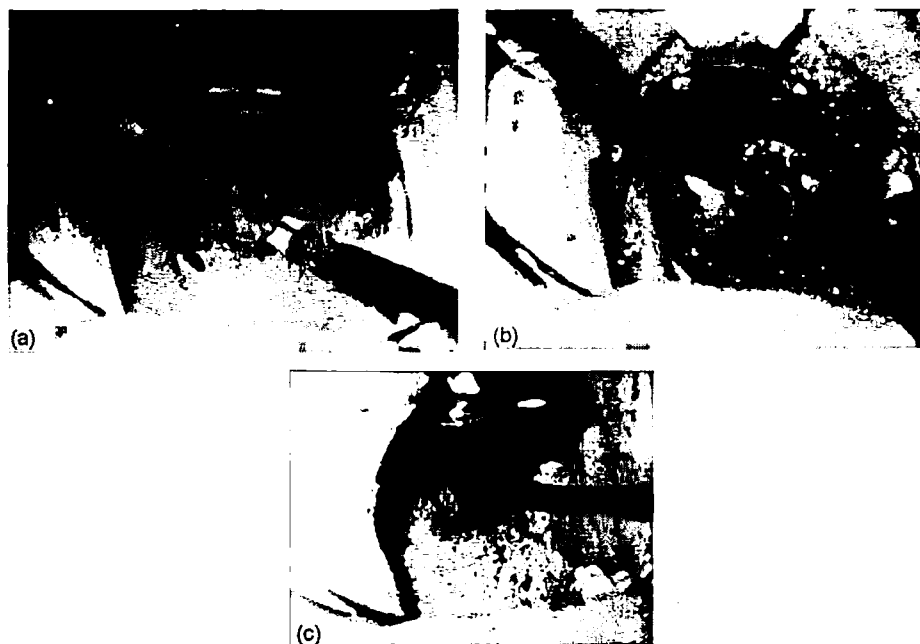


Fig. 2 Tonsillectomy procedure. (a) Tissue bundles of the anterior pillar mucosa were gently grasped and coagulated. (b) The inferior pole was coagulated. (c) Superior constrictor of the pharynx after tonsillectomy with TLS<sup>2</sup>.

#### 4. Discussion

Recently, there have been controversial suggestions of an estimated 1:5000 risk of acquiring the variant Creutzfeldt Jakob disease (v-CJD) as a result of tonsillectomy with reusable surgical instruments. The use of disposable instruments was implemented during the year 2000 in the United Kingdom [2]. On the other hand, there are many reports of increased postoperative hemorrhage in association with the use of disposable instruments [3,4].

TWT is a new type of surgical instrument that combines heat and pressure to simultaneously coagulate and divide soft tissue and blood vessels. This is not a bipolar instrument, since no electric current passes through the tissues grasped between the instrument's jaws. According to the theory of the TWT, the desired protein denaturing effects could be accomplished most efficiently by using direct thermal heating of the tissue instead of an intermediate form of energy such as electric, laser, radiofrequency, etc. The thermal energy producing elements consist of a simple resistant heating wire driven by low voltage direct current.

Among the several handpieces available for the TWT generator, we utilized the TLS<sup>2</sup>. This is a single-use instrument, 14 cm long, 360° rotational capability, with two speed hand control, designed for laparoscopic surgery, and its cost is approximately €400. The active part of the TLS<sup>2</sup> is comprised of nichrome heating element with a thermally insulating backing. This thermal insulating layer isolates

the heating effects of the nichrome wire from the rest of the instrument and prevents the underside of the jaw from becoming hot. Closing the instrument jaws passes the thermal elements against a conformable silicone boot, which is mounted on the other jaw of the device. The thermal profile consists of a narrow high temperature cut zone that is flanked on each side by a lower temperature coagulating zone. The bilateral and symmetric shape of the temperature profile allows the device to seal both ends on either side of the cut zone. Due to radiation of the heat from the nichrome elements, the width of the cut zone is somewhat greater than the actual physical diameter of the wire. In this region, the temperature is high enough to actually cut tissue by means of direct vaporization with very little charring. This temperature has been measured in the range of 300–400 °C. At distances greater than 500 μm from the center of the wire, the temperature falls down to below 100 °C, which is the ideal temperature range to coagulate and seal tissue by means of protein denaturation. The silicone boots pressure or crimp the vessel walls together in the lower temperature coagulation zone. This pressure effect along with the thermal denaturation of the tissue produces coagulation and sealing. The effect produced on a vessel by the instrument is to cut it clearly while producing a coagulated zone at the ends of the vessel on either side of the cut [5].

Even though Starion Company recommends the use of Bayonet UltraSlim Forceps (110-005D) for tonsillectomy procedures, we believe that TLS<sup>2</sup>

provides better visualization, finer tissue grasping and 360° rotational capabilities. Due to the constitution of two-speed hand control, the TLS<sup>2</sup> can be used to simultaneously seal and divide, as well as to grasp and dissect soft tissue.

TWT using the TLS<sup>2</sup> provided excellent intraoperative hemostasis. Mean operative time was 20 min, less than an average the cold knife procedure [6]. In our series only one case of postoperative hemorrhage was noted, in a patient. Bleeding was managed conservatively. Mild uvula edema was noticed in 25 patients. The edema greatly improved within 2 days following surgery without the need for any additional medications.

No significant changes were observed in our series regarding the pattern of postoperative diet compared to our previous experience with cold knife tonsillectomies. Patients typically remained on an all-liquid diet for the first 3 days, gradually moving to semi-solid foods and then to a normal diet by the 10th postoperative day. In addition, postoperative use of pain medications in this series remained at similar levels compared to cold knife procedures. It typically included oral administration of paracetamol (45 mg/kg/day) systematically for the first 2

days and then on an individualized basis according to each patient's needs.

In conclusion we found TWT with the TLS<sup>2</sup> to be quite effective in tonsillectomy procedures, providing sufficient hemostasis and safety against v-CJD transmission.

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