Abstract

Aim of the study: To assess the morbidity and efficacy of bipolar radiofrequency thermal ablation tonsillectomy and compare it with traditional cold dissection tonsillectomy in children.

Materials and Methods: 100 patients between the age of 3-10 years admitted for elective tonsillectomy with recurrent or chronic tonsillitis or obstructive tonsillar hypertrophy. Half of them had traditional cold dissection tonsillectomy and the other half had tonsillectomy by bipolar radiofrequency thermal ablation, there is no intergroup difference in age, sex and weight.

Results: The mean operative time is longer in the coblation group, and the estimated blood loss is little more in the coblation group than the traditional. The post operative pharyngeal or ear pain score is much less in the coblation group and there was no higher risk of bleeding in the coblation tonsillectomy than the traditional tonsillectomy.

Conclusions: Coblation tonsillectomy has the advantage of less post operative pain and there is no higher risk of post operative bleeding between the two groups.

Introduction

Coblation Tonsillectomy Versus Traditional Tonsillectomy in Children

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Tonsillectomy is one the most common procedures in Ear Nose and Throat surgery. Standard or extracapsular tonsillectomy, which is typically performed under general anesthesia, involves surgically removing the palatine tonsil and capsule, and then sealing blood vessels (hemostasis) with ligatures (ties), sutures, or heat (diathermy) [1].

Tonsillectomy is usually performed as day surgery. The most common side effects are pain and bleeding (hemorrhage), but patients may also experience difficulty in swallowing, nausea, vomiting, throat and ear pain, weight loss, dehydration, fever and airway obstruction [2-6].

The incidence of primary hemorrhage (bleeding within the first 24 hours) is approximately 1% and the rate of secondary hemorrhage (occurring between 24 hours and 10 days) is between 1% and 7% [1]. Transfusion or further surgery, particularly in children, may be required after primary hemorrhage. One in every 40,000 patients dies from bleeding after secondary hemorrhage. Pain is the result of disruption of mucosa and glossopharyngeal and / or vagal nerve fibres followed by inflammation and spasm of pharyngeal muscles that lead to ischemia and a protracted cycle of pain. It does not completely subside until the muscle become covered with mucosa i.e 14-21 days after surgery.

Coblation is a new method for removing and / or reducing the volume of the soft tissue enabling rapid and precise tissue removal with little or no damage to the surrounding tissue. This may be associated with a number of surgical and clinical advantages, including:

1. better operative results.
2. reduced surgical time.
3. less postoperative pain

Monopolar radiofrequency thermal ablation of soft tissue has been studied extensively by specialist in cardiology [9], neurosurgery[10], urology [11], and oncology[12]. It has demonstrated acceptable efficacy, safety, and reproducibility of treatment results. A precise controllable lesion characterizes the radiofrequency thermal ablation method. The coagulation necrosis effect of monopolar radiofrequency energy is also effective, safe, and associated with low morbidity in treatment of the soft palate [13], nasal turbinate [14], and the tongue base [15].

Coblation tonsillectomy is a variation of bipolar electrosurgery that generates lower temperatures (40-70 °C), with the aim of minimizing thermal damage to the surrounding tissues[3]. A series of electrodes on the tip of the coblation probe are bathed in a conductive saline solution that flows continuously through an irrigation sheath. Radiofrequency energy ionizes the saline to form a localized plasma layer of sodium ions. The heat generated by these ions cuts tissue and seals small blood vessels [9,10,11,12].

The bipolar ENTec Coblator Plasma Surgery System (Arthrocare Cooperative, Sunnyvale, CA) functions with a voltage range of 96 - 312 voltage root mean – square value (vrms) at 1000 kHz.

**Materials and Methods**

This study is prospective, randomized, clinical study conducted at the department of otolaryngology in Al diwaniya Private Hospital, from the period of January 2010 until December 2010. Two groups of patients (each group composed of 50 patients) between the age of 3-10 years
were subjected to tonsillectomy by one of two methods (coblation tonsillectomy and traditional tonsillectomy). The indications for tonsillectomy were recurrent infection, chronic infection, airway obstruction. Exclusion criteria included patients with bleeding disorders and any significant chronic illness that would interfere with expected recovery. Each patient was randomly assigned to either traditional or coblation tonsillectomy group by the surgeon. None of the nursing staff taking care of the patient was aware of the group in which the patients was randomized, and the patient's family does not informed about the type of procedure until two weeks after the operation. All of the operations were done by the author under general anesthesia. A standardized anesthetic technique was used in all patients. The patients were prepared in accordance with our standered guidelines for tonsillectomy in both groups. Traditional tonsillectomy was initiated by an incision overlaying the superior pole of the tonsil, the dissection proceeded along the tonsillar fossa in the peritonsillar plane keeping as close to the tonsil capsule as possible. Hemostasis was achieved by the application of pressure with packs, and persistent bleeding was controlled with either silk ligation or a bipolar diathermy coagulation of vessels. In the coblation group the bipolar ENTec Coblator Plasma Surgery System and ENTec Plasma Scalpel Wand (Arthro Care Corporation) were used in this group. The wand comprises of 5 active electrodes located at the distal end of the tip with the exposed portion of the shaft acting as the return electrode just proximal to the active electrodes. Cooled saline was connected to the wand and set to a flow rate of 1-3 drops per second through the saline delivery channel. A different suction line was used. The power was set levels 5-7 (192-260 rms) during the ablation and in case of bleeding the coagulation mode was applied. The coblation tonsillectomy proceeded slowly from the lower pole upward to the upper pole along the capsular plane. If there was more bleeding or if the wand did not seal the vessel within 5 seconds, the point diathermy coagulation was applied. The time taken to perform each operation was measured from the the first incision to the removal of the mouth gag. The intra operative blood loss was measured by volume of suction aspirate. The patients stayed in the hospital for few hours postoperatively (day case). All of them received amoxicillin syrup 250 mg three times a day except in cases of hypersensitivity where erythromycin 250mg four times a day for 7 days were prescribed. They also received paracetol syrup as needed to mitigate postoperative pain. One of the patients parents were asked to score the severity of the pharyngeal or ear pain. The pain score was recorded as a score from 0-4:

0 = no pain
1 = slight pain
2 = moderate pain
3 = severe pain
4 = intractable pain

Postoperative bleeding divided into three grades:

Grade 1 : report of bleeding.

Grade 2 : office or emergency room cautery.

Grade 3 : return to operating room.

**Results**

100 patients between the age of 3-10 years (mean age 6.5 years) were entered the present study. They are divided into two
groups (50 patients in each group), random selection of patients for traditional or coblation tonsillectomy. They were 64 male and 36 female. The two groups were similar for the demographic and clinical parameters of interest. No intergroup difference was noted in age, sex, weight, and indications of tonsillectomy. The mean operation time was 13 minute for the traditional tonsillectomy and 17 minutes for the coblation group.

Estimated blood loss during surgery was 36 ml for the traditional tonsillectomy and 42 ml for the coblation group.

The pain score of each patient were recorded completely by one of the patient parents, the postoperative pharyngeal or ear pain were recorded and the results were shown in table 1.

Table 1 pain score

<table>
<thead>
<tr>
<th>Pain score</th>
<th>traditional tonsillectomy</th>
<th>coblation tonsillectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>1</td>
<td>19</td>
<td>26</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Postoperative bleeding observed carefully by the nursing staff during hospitalization and by the patient’s family at home and reported. There were mild bleeding in 3 patients in each group as shown in table 2.

Table 2 bleeding reports

<table>
<thead>
<tr>
<th>Type of procedure</th>
<th>Bleeding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Coblation</td>
<td>2</td>
</tr>
<tr>
<td>Traditional</td>
<td>1</td>
</tr>
</tbody>
</table>
Discussion

There are several techniques of tonsillectomy. The most commonly used technique at Al diwaniya Private Hospital and Al diwaniya Teaching Hospital are blunt dissection with ligation and blunt dissection with hemostasis by electrocautery, however, some surgeons believe that diathermy causes more postoperative pain than ligation. There were some studies that prove this belief [13-16]. Tay conducted a study that compared electrodisssection and cold techniques in the same patient undergoing tonsillectomy (different sides), no significant differences in postoperative pain between the two methods were observed in children [17]. The reduction of post tonsillectomy morbidity is important, not only for patient comfort, but also because reducing pain, improves oral intake, reducing the risk of dehydration, infection, and post surgery hemorrhage. Electrical instruments and lasers all achieve cutting and simultaneous hemostasis by sealing the blood vessels lumina by virtue of tissue heating. Several studies support the hypothesis that the extent of diathermy used in tonsillectomy has a direct influence on delayed post operative morbidity and healing of the mucosal wounds [18]. The degree of pain must be related to the degree of soft tissue damage. The post operative pharyngeal pain is caused from the disruption that occurs with the exposure of the underlying muscle fibres and nerve endings of the glossopharyngeal and the vagus nerves that supplies this region. Post operatively, exposed to the outside elements, these tissues become inflamed which can lead to spasm. Inflamed constrictor muscles are an intense source of pain because every swallow causes movement of these muscles. It would seem logical that any advancement in surgical technique would need to address the issue of damage and exposure of these structures. Radiofrequency current applied to surgical tools used to generate a plasma field to remove tissue volume without heat as the primary means. This technology (coblation) is fundamentally different from electrocautery and monopolar thermal radiofrequency ablation. Bipolar administration of radiofrequ-en-cy current results in less electricity being leaked to distant tissues, theoretically decreasing the morbidity following tonsillectomy. Radiofrequ-ency Is a surgical tool that was used to create an ionized vapor or plasma level resulting in cellular disintegration at a low temperature (60 °C to 100 °C) [19]. The technique of tonsil ablation or tonsillectomy leaves a cuff of tissue that may protect the underlying tissue from oral secretions and thereby decrease resultant inflammation. The average surgery time of coblation tonsillectomy was ranged from 15-24 minutes compared to 10-21 minutes for the traditional tonsillectomy. Estimated blood loss during surgery was not more than 42 ml for the coblation group and 36 ml for the traditional tonsillectomy. Stocker et al.(2004) reported that the mean estimated blood in the coblation group was 21.5 and 15 ml for the traditional surgery. The overall blood loss during coblation tonsillectomy was more than that during traditional surgery and this is in agreement with our findings . Table 1. show the pain score of the two groups. The coblation group show that the majority of patients had slight to moderate pharyngeal or ear pain 39 patients (78% ) compared to 27 patients ( 54% ) in the traditional group and there is no patient with intractable pain in the coblation group compared to 2 patients (4%) in the traditional tonsillectomy group. There was a study that compared the outcome of radiofrequency technique with regular blunt dissection tonsillectomies in children [20]. The recorded pain scores showed
significantly less pain in the tonsillotomy group. The concept of subtotal intracapsular tonsil reduction that avoids injury to the constrictor muscles as opposed to more classic methods of tonsillectomy and the advantages that include early elimination of pain and early resumption of normal diet and normal activity levels were also shown in the study of Friedman et al [21].

Post operative tonsillar bleeding are divided into primary (within the first twenty four hours) and secondary (delayed after discharge). Reported rates are felt in the literatures to vary by the operative technique used but the comparison between different techniques is difficult due to subtleties in the technique between surgeons and the different methods of defining post operative bleeding [22]. One of the first reports of an increased incidence of posttonsillar hemorrhage with coblation was from Noon and Hargreaves (2003). The reported bleeding rate of 22.2% was very high and led to discontinuation of the technique by the authors. This study only dealt with adults patients and had a very low number of subjects. However, Windfuhr, et al. reported similar findings in adult patients [23].

A report in the Lancet [24] reviewed 11,796 patients and concluded that compared to cold steel tonsillectomy without cautery, the relative risk of post operative bleeding was 3-4 times higher with coblation, 3.1 times higher with bipolar cautery and 2.2 times higher with cold steel removal with cautery only for hemostasis.

In the present study the post operative bleeding reported in 6% of patients in each group and this is in agreement with Glade et al [25] who reported that coblation tonsillectomy had similar rates of hemorrhage when compared to electrocautery and cold steel tonsillectomy.

The cost of the disposable hand piece for coblation is 120 usd and this is one of the factors that limit the use of this technique in general hospitals because the high cost.

**Conclusions**

Tonsillectomy performed by coblation has the advantage of less post operative pain compared to traditional tonsillectomy and there is no higher risk of post operative bleeding between the two groups.
References