

CO₂ laser tonsillectomy: A comparison with conventional technique

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Abstract

Objective: To define the advantages and disadvantages of CO₂ laser tonsillectomy compared with conventional method.

Study design: Retrospective review.

Setting: Department of Otolaryngology & Head and Neck Surgery, Apollo Hospitals Dhaka.

Materials and Methods: This study included fifty two patients with tonsillectomies from October 2007 to May 2008. The patients were diagnosed with history and clinical examination. Preoperative investigations have been done for general anaesthesia. Patients were intubated with laser reinforced endotracheal tube and fire precautions were taken. Laser tonsillectomy has been avoided below 10 years in our centre. 52 patients aged 10-35 years underwent tonsillectomy in a period of 10 months. Out of them 12 patients underwent laser tonsillectomies. The data of each patient included intra-operative blood loss, operation time, postoperative pain and postoperative healing.

Results: All Patients were admitted for 24 hours. Intra operative blood loss was dramatically less with the use of CO₂ laser than that of conventional method (5ml vs. 18ml). Profuse bleeding did not prolong this time especially in laser technique. The incidence of postoperative reactionary hemorrhage were not significantly different between two techniques. 2 patients suffered with secondary haemorrhage in conventional technique and in laser technique one patient had secondary haemorrhage. There was statistically significant difference in duration of operating time (15 vs. 40 min). Both methods of surgery had non-identical effect on post operative pain. Postoperative pain was less in laser technique than that of conventional technique in 7 days postoperative follow up. Leukocytic membrane formation and separation and final healing were earlier in laser technique than in conventional technique.

Conclusion: CO₂ laser is a safe and acceptable method for tonsillectomy. CO₂ laser tonsillectomy reduces operation time and intraoperative blood loss. Postoperative pain is less than conventional technique and healing is also earlier in laser technique.

Key Words: CO₂ laser, tonsillectomy, ventilation.

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Introduction:

Tonsillectomy is a surgical procedure to remove the tonsils. The tonsils are part of the lymphatic system, which is responsible for fighting infection. Aulus Cornelius Celsus, a Roman physician and writer, was the first to describe a surgical removal of the tonsils.

The indications, methods and complications of tonsillectomy are various.^{1,2,3}

The tonsils were removed in the past using this *Guillotine* method. This method has been abandoned because of the risks of bleeding. In this method a guillotine is used to simply chop off the tonsil.

Dissection method (Conventional technique) is the commonly used method to perform tonsillectomy

today. The advantage of this method is that the procedure is safe, bleeding is less and the tonsil can be removed in toto without any remnants. The patient is put in Rose position. This position owes its name to a staff nurse by name Rose who suggested this position to the surgeon. The mouth gag is held in position by a M shaped stand called as Draffins bipod. During surgery the mouth gag must be frequently released and reapplied. The mouth gag applies intense pressure to posterior 1/3 of the tongue causing certain amount of disruption to its blood supply thus leading to intense tongue pain post operatively. Frequent release of the mouth gag during surgery reduces to some extent this type of pain. Recently dissection using bipolar electrocautery devices have become popular.

Cryo-tonsillectomy can also be performed using a cryo probe. Cryo-surgery is a process in which very cold instrument or substance is applied to tonsil and it is removed by the process of repeated freezing. The major advantage of this procedure is minimal bleeding. The major disadvantage of this procedure is the operating time involved. This procedure is used only in patients with known bleeding diathesis.

In Intracapsular tonsillectomy method tonsil is removed from its capsule. Micro -debrider with a 45 degree hand piece is used for this surgery. The major advantage of this procedure is that it causes fewer traumas to the pillars and mucosa of the oro-pharynx uvula and soft palate. In some centres radio-frequency coagulation has been used for tonsillectomy.

In Harmonic scalpel tonsillectomy, Harmonic scalpel -an ultra sound coagulator and dissector that uses ultra-sonic vibrations to cut and coagulate tissues. The cutting operation is made possible by a sharp knife with a vibratory frequency of 55.5 KHz. The major disadvantage is the expense of the equipment and the increased duration of surgery.

Coblation tonsillectomy is also other wise known as cold ablation. This technique utilizes a field of plasma or ionized sodium molecules, to ablate tissues. The heat generated varies from 40 - 80 degrees centigrade, much lower than that of electrocautery. The major advantage of this procedure is reduced bleeding and reduced post operative pain.

Laser tonsillectomy is performed using laser. A carbon dioxide laser or a KTP laser can be used. Major advantage of laser surgery is reduced bleeding. Laser seals all bleeders efficiently.²

Laser Tonsillectomy under General Anesthesia-this technique is performed with the patient asleep, under general anesthesia. Special laser protective endotracheal tubes are used by the anaesthetist. These tubes are expensive. Carbon dioxide laser in scanned mode is used to vaporize away tonsil tissue right down to the level of the capsule of the gland⁴. This allows total removal of tonsil tissue. Its advantages lie in the fact that we are not completely exposing the nerves as in a traditional tonsillectomy, pain levels will be less⁵. Also, because the space between the tonsil and the muscle of the swallowing is not entered, the risk of severe bleeding either during or after the operation is minimal, since the major blood vessels lie in this area. A further advantage lies in the fact that this is a no-touch technique. Therefore the risk of transmission of infected particles (e.g. HIV, Hepatitis) is in theory significantly reduced when compared with conventional tonsillectomy⁶. It is suggested that the effect of the laser for tonsillectomy is associated with reduction of immediate post operative pain, and less intra operative blood loss. The purpose of this study was to further define the advantages and disadvantages of CO₂ laser tonsillectomy compared with the conventional method.

Method :

This study included fifty two patients with tonsillectomies from October 2007 to May 2008. The patients were diagnosed with history and clinical examination. Preoperative investigations have been done for general anaesthesia. Patients were intubated with laser reinforced endotracheal tube and fire precautions were taken. Laser tonsillectomy has been avoided below 10 years in our centre. 52 patients aged 10-35 years underwent tonsillectomy in a period of 10 months. Out of them 12 patients underwent laser tonsillectomies.

The parameters monitored were intraoperative blood loss, operation time, postoperative pain and healing. Blood loss was estimated by calculating the number of soaked gauzes and measuring volume of suctioned blood.

Reactionary and secondary haemorrhages have been recorded. Total operation time for each case have been noted. Patients were asked on the first 24 hours after surgery about the nature of pain in the operation site and their responses were recorded. Same questions have been asked 7 days later at the OPD visit.

Healing was assessed at the 5-14 days postoperative OPD visit by noting the degree of erythema and character of leukocytic membrane formation and final healing.

Results :

All Patients were admitted for 24 hours. Intra operative blood loss was dramatically less with the use of CO_2 laser than that of conventional method (5ml vs. 18ml). In conventional technique intraoperative blood loss was 5 to 40ml (Av-18ml). In laser technique intraoperative blood loss was 2-15ml (Av-5ml). Vigorous bleeding did not prolong this time especially in laser technique.

The incidence of postoperative reactionary hemorrhage were not significantly different between two techniques. One patient with conventional technique had postoperative reactionary hemorrhage and no patients with laser technique had developed reactionary haemorrhage.

2 patients suffered with secondary haemorrhage in conventional technique and in laser technique one patient had secondary haemorrhage.

There was statistically significant difference in duration of operating time (15 vs. 40 min). In laser technique duration of operation time including haemostasis was from 10 to 25 minutes (Av-15 minutes). In conventional technique the time duration was 20 to 50 minutes (Av-40 minutes).

Both methods of surgery had non-identical effect on post operative pain. Postoperative pain was less in laser technique than that of conventional technique in 24 hours and 7 days postoperative follow up. All patients with conventional technique had post operative pain with 20 patients having equal bilateral pain at 7 days follow up. 5 patients had moderate to severe pain in one side. 4 patients were complaining of earache at 7 days follow up. In laser technique no patients had bilateral earaches in 7 days follow up. 2 patients had moderate to severe pain in one side. No patient was complaining of earache at 7 days follow up.

Leukocytic membrane formation and separation and final healing were earlier in laser technique (5-7 days) than in conventional technique (7-14 days).

Discussion :

The word laser is an acronym for light amplification by stimulated emission of radiation and laser technology is one consequence of Nobel Prize winning

in quantum mechanics, which is most important in 20th century physical sciences. The rapid advancement of this technology in ENT surgery has been accompanied by complications, making it imperative that anaesthesiologists as well as ENT surgeons understand the potential threat to their patients and themselves and be preparing to respond properly. The hazards associated with laser surgery can be due to atmospheric contamination, perforation of a vessel or structure, inappropriate energy transfer and many more⁷. Serious post operative complications secondary to surgery of the tonsils are primarily related to haemorrhage, air way obstruction, postoperative pulmonary edema and death⁸. Meticulous attention to surgical technique has significantly reduced the number of complications related to tonsillectomy. CO_2 laser produces light with a wave length of 10.6 μ m in infrared (invisible) range of the electro magnetic spectrum. The radiant energy produced by the CO_2 laser is strongly absorbed by pure, homogenous water and by biologic tissues high in water content⁹. The best advantage of CO_2 laser tonsillectomy is that operating time and blood loss are less than conventional dissection. It was reported that the post operative hemorrhage rate after conventional tonsillectomy was between 2-5%¹⁰. Post tonsillectomy hemorrhage can be intraoperative, immediate (first 24 hour after operation) and late hemorrhage. In our study intra operative blood loss was dramatically less with the use of CO_2 laser than conventional method (5ml vs. 18ml). The incidence of postoperative reactionary hemorrhage were not significantly different between two techniques. 2 patients suffered with secondary haemorrhage in conventional technique and in laser technique one patient had secondary haemorrhage. There was statistically significant difference in duration of operating time (15 vs. 40 min). Tonsillectomy by laser has shown that it improves the precision of tonsillectomy and provides a maximum protection for peritonsillar tissue and postoperative pain is less¹¹. In our study postoperative pain was less in laser technique than that of conventional technique in 7 days postoperative follow up. Because absorption of radiant energy produced by the CO_2 laser is independent of tissue color and because the thermal effect produced by this wave length on adjacent non target tissue are minimal, the CO_2 laser has because extremely versatile in tonsillectomy. Therefore post laser healing is always better¹¹. In the present study, leukocytic

membrane formation and separation and final healing were earlier in laser technique than in conventional technique.

Conclusion :

Lasers have some unique advantages in surgery. They allow precise cut. The ability to focus the beam on a tiny area concentrates the intensity enormously, producing heat at a rate of many thousands of degrees in some cases, allowing precise, rapid vaporization of tissue. Laser surgery is relatively dry, providing near instantaneous sealing of small vessels and lymphatics. There is also minimal damage to adjacent tissues resulting in less oedema, scarring and post operative pain. Laser tonsillectomy had lower intraoperative blood loss and shorter operation time. Postoperative pain is less and healing is good. Although CO₂ laser has a better coagulation property but there was no statistically significant effect on immediate and late post operative hemorrhage with its use.

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