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Original Article

Coblation versus Diode Laser Tonsillectomy in Children: A Randomized Controlled Trial

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Abstract:

Objective: *This study aimed to compare the efficacy of diode laser and coblation tonsillectomy in paediatric patients in relation to operative time, amount of blood loss, post operative pain, healing of tonsillar fossa and returns to normal diet.*

Methods: *A total of 200 patients ,100 for coblaton and 100 for diode laser, aged 3-12 years with recurrent tonsillitis with or without snoring and sleep apnoea were recruited. Participants were prospectively randomised to diode laser and coblation tonsillectomy. Operative time and blood loss were recorded. Pain was recorded by VAS or assessed by using analgesic*

Results: *The operative time were recorded 07-15 minutes,mean 10 minutes in coblation group and 12-20 minutes ,mean 14 minutes in laser group., Blood loss was recorded 0-15 ml mean 8 ml in coblation group and 10-25 ml mean 13.5 ml in diode laser group . However, at post-operative day seven, the diode laser tonsillectomy group had significantly higher pain scores compared with coblationtonsillectomy groups.Coblation group started normal soft diet on day 5 whereas diode laser started on day 8*

Conclusion: *Coblation tonsillectomy is associated with less operative time and blood loss, early returns to normal diet and less pain score in comparison to Diode laser tonsillectomy*

Keywords: Coblation, Laser, Pediatrics, Tonsillectomy;

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Introduction:

Tonsillectomy is one of the most common surgical procedure performed world wide by the ENT Surgeons.[1] Various methods of tonsillectomy have been practiced over the century aimed at reducing or eliminating intraoperative and postoperative morbidity.[2] Since the first tonsil removal performed by Celsus in 30 BC.[3] Multiple surgical techniques have been described anddiverse instruments have been evolved for this purpose.[4] It is recommended in patients with chronic tonsillitis, recurrent attack of acute tonsillitis, peritonsillar abscess, sleep apnoea syndrome and unilateral tonsillar hypertrophy

with suspicion of malignancy, TB or any other growth.[5, 6] At the beginning of the 21st century dissection tonsillectomy is more often used than tonsillotomy,[7,8] In the 1960s and1970s, one to 2 million tonsillectomies, adeno-idectomies or combined procedures were performed annually in the United States.[9,10,11] The most important complications of tonsillectomy are the operative and post operative haemorrhage and severe post operative pain resulting in odynophagia.[9] Described methods of tonsillectomy include blunt dissection, guillotine excision, cryosurgery, monopolar and bipolar diathermy dissection, ultrasonic scalpel, laser and recently introduced coblation assisted tonsillectomy.[8,12] However, the dissection technique has remained the standard procedure for tonsillectomy for many years till now. The surgical technique of coblation tonsillectomy is based on dissection of tonsil in the relatively bloodless tonsillar muscular plane, using an Arthrocare Evac XP plasma wand.[8] The operating principle of coblation is similar to bipolar diathermy or electrosurgery. In both methods, an alternative current passing between the active electrodes at the tip of the device produces destruction of the target tissue adjacent to the electrodes. In bipolar diathermy, direct contact between electrodes and tissue produces local temperature of 400 degree C to 600 degree C resulting in heating of intracellular contents and subsequent vaporization of the cell.[13] In contrast coblation must fill the physical space between the electrodes with a medium rich in sodium (eg, isotonic saline or saline gel) By coblation the medium is dissociated into the free sodium ions which are responsible for the destruction of intrcellular bonds, resulting in tissue destruction. The reaction is achived at temperatures between 60 degree c to 70 degree C with minimal collateral thermal tissue damage. Also the presence of cool irrigating isotonic saline helps to limit the amount of heat delivered to the surrounding structures.[8,14,15]

Methods:

This is a prospective randomized study to compare the result of coblation assisted tonsillectomy with diode laser tonsillectomy with regards to the operative time, intra-operative blood loss, degree of post operative pain, healing of tonsillar fossa, day of return to normal diet and any post operative complications. This prospective randomized study was done at Maleka Nursing Home and Matin Specialized Hospital at Bogra and CDM Hospital in Rajshahi, Bangladesh from 1st January 2011 to 31 December 2016. 200 patients were divided into two groups of equal number. In one group, the tonsillectomy performed by Coblation using Coblator II and in the other group the tonsillectomy performed by Diode laser.The patients were randomized to either the coblation or Diode laser group of equal number. All operations were done under general anaesthesia. All patients were kept one day at hospital. In coblation Evac XP plasma wand was used for dissection and haemostasis and power was set at 7;3. In Diode laser group, laser probe was used for dissection and bipolar diathermy was used for haemostasis if needed . Surgical time was measured from the start of operation to the final haemostasis. Intraoperative blood loss was measured by weighing the tonsil swab before and after tonsillectomy and by measuring the amount in the suction bottle. All patients were given perioperative antibiotic (cephradine) and post operative analgesics (paracetamol and diclofenac if needed) Postoperatively, pain scores were charted from day one to day 8 using standardized visual analogue scale 1-10, mild (0-3),

moderate (4-6), severe (7- 10) . The parents were also asked to keep records of any complications. Patients were reviewed in the clinic on 8th post operative day.

Results:

Out of 200 children recruited in this study, 100 patients were in the Coblation group and another 100 patients were in the Diode laser group. Male outnumbered female in both groups with the ratio of 58:42 and 64:36 in the coblation and Diode group respectively. (Table I) The mean age was 5.5 years (range, 3- 12 y) for coblation group and 7.2 years for laser group (range, 4-14 y) (Table II). The mean operative time for coblation group was 10 min. (range, 7-15 min.) and 14min. for laser group (range, 12-20 min) (Table III). Mean intraoperative bleeding for coblation group was 7.5mL (range, 0-10 mL) compared with 13.5mL for laser group (range, 10-25 mL). (Table IV) .The pain scores (VAS) and duration of pain in both groups were compared.(Table V) Patients experienced mild pain up to day 3 in both groups ,moderate pain in coblation group on day 4-and moderate to severe pain in laser group . Both groups showed mild pain on day 1 to day 3, day 4 showed moderate pain in coblation group but laser group showed severe pain from day 4 to day seven, where as day 4 being the most painful in thecoblation group, day 6 for the laser group and no pain on day 8 in coblation group whereas still there was moderate pain on day 8 in laser group. A noticeable difference was found in the day of return to normal diet -day 5 for coblation group compared with day 8 for laser group(Table VI) On 8th post operative day smooth tonsillar fossa with good healing and no granulation tissue observed in both group group (Table VII) There were one episode of secondary haemorrhage in coblation group where as one episode of reactionary haemorrhage and one episode of secondary haemorrhage experienced in laser group which were controlled by conservatively (Table VIII).

Table I

Distribution of patients according to sex (n=200)

Sex	Coblation group	Diode laser group
Male	58	64
Female	42	36
M;F ratio	1.4:1	1.8:1

Table II

Distribution of patients according to age (n=200)

Age	Coblation group	Diode laser group
Min	3	4
Max.	12	14
Mean	5.5	7.2

Table III

Operative time in minutes (n=200)

Time	Coblation group	Diode laser group
Minimum	7	12
Maximum	15	20
Mean	10	14

Table IV

Intraoperative blood loss in mL (n=200)

Amount	Coblation group	Diode laser group
Minimum	0	10
Maximum	10	25
Mean	7.5	13.5

Table V

Post operative pain (n=200)

Day	Coblation group	Diode laser group
Day 1-3	mild pain	mild pain
Day 4	moderate pain	moderate to severe pain
Day 5-7	mild	severe pain
Day 8	no pain	moderate pain

Table VI

Day of return to normal diet (n=200)

Group	Day
Coblation	Day 5
Diode laser	Day 8

Table VII

Tonsillar fossa on 8th POD (n=200)

Group	Tonsillar fossa
Coblation	Smooth healing, no granulation tissue
Diode laser	Smooth healing, no granulation tissue

Table VIII

Rate of complication (n=200)

Group	Complication
Coblation	1 secondary haemorrhage
Diode laser	1 reactionary haemorrhage & 1 secondary haemorrhage

Discussion:

Coblation tonsillectomy is a recently introduced dissecting technique with few reports in the literature[7,15,16]. In Bangladesh the author has been using this technique since 2005. Only three papers of coblation tonsillectomy was published in Bangladesh by the Author.[12, 20, 21] Blackburn and Ribble Valley Health Authority possess the largest series of coblation tonsillectomies in the United Kingdom and probably one of the largest in the world with nearly 850 operations.[1] Coblation is a new technique in the soft tissue surgery.[17] Recently the use of this new technique in the treatment of snoring, nasal congestion and sleep apnoea has received considerable research interest.[16, 17] As for the department of ENT, tonsillectomy is the most frequently operative procedure performed and conventional blunt dissection technique has been and continue to be considered a most common and standard method of tonsillectomy. There is no consensus on the optimum method of performing tonsillectomy. Various methods have been described which are frequently compared and discussed in otolaryngology literature18. In most studies, most of the new techniques used are usually compare to the standard blunt dissection technique. The value of a new technique must be judged by the results concerning intraoperative and postoperative morbidity and complications. The most common postoperative concerns following tonsillectomy are hemorrhage and pain. Postoperative pain is the most significant subjective symptoms as far as patient is concerned. In this study, operating time for tonsillectomy is determined by the duration, which the bleeding is secured. Thus, the time taken to control the bleeding will influence the operating time as well as the blood loss. In our study, the blood loss was significantly reduced and operative time was significantly shorter in the coblation group. Postoperative pain should be minimized not just for the patients comfort but also because it may impair swallowing with a risk of dehydration, infection and secondary haemorrhage. Hot electrosurgery and laser tonsillectomy has been reported to cause more severe postoperative pain than

conventional blunt dissection technique.[19, 20] In recent study of Elbaday et al shows significantly reduced operativetime and blood loss in coblation and laser group in comparative to cold dissection group but advocates coblation method than laser because of more post operative pain in laser group.[22] In our study, we found that children of coblation group experienced mild pain with maximum on day 4 and no pain on day 8 in comparison to laser group where children experienced moderate to severe pain with maximum pain on day 4 and mild to moderate pain on day8. Not only that blood loss and operative time was much less in coblation group than laser group, so we advocate coblation tonsillectomy the preferred method if patient can afford as it is the most expensive method ,one plasma XP Wand costs about 200 US dollar and to reduce the cost of operation we recommend re-use of plasma wand 3-4 times.

Conclusion:

This study was designed purely to assess new method coblation with classical dissection method regarding operative time, amount of blood loss, post operative pain, rate of healing of tonsillar fossa, return to normal diet and post operative complications. Very significant benefits have been observed in all of these respects when using this new method. This benefit justifies further evaluation of this method.

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