Original Research Article

A comparative study of coblation assisted adenotonsillectomy and cold dissection adenotonsillectomy in children

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ABSTRACT

Background: The aim of the present study was to compare intraoperative blood loss, operative duration and postoperative pain between coblation-assisted adenotonsillectomy and cold dissection adenotonsillectomy in children. **Methods:** A prospective, randomized, single-blind trial of pediatric patients aged 7 to 13 years undergoing adenotonsillectomy was conducted. Patients were randomized to undergo either cold dissection or coblation-assisted adenotonsillectomy. Measured intraoperative parameters included surgical duration and intraoperative blood loss. Measured postoperative parameters included a daily pain rating using the visual analog scale on the postoperative evening, postoperative day 1 and day 7. Intraoperative and postoperative measures were statistically compared between the two groups.

Results: Sixty children were randomized and included in the study. 30 patients underwent cold dissection adenotonsillectomy and 30 coblation-assisted adenotonsillectomy. Mean age was 8.7 years in the coblation group and 9.1 years in the cold dissection group. Intraoperative blood loss was lower for the coblation assisted adenotonsillectomy group versus the cold dissection adenotonsillectomy group which was proved statistically (mean bleeding was 16.67 in coblation group and 58.67 in cold dissection group and p value <0.0001). There was statistically no significant difference in the mean pain scores in the 2 groups in the postoperative evening and on postoperative day 1. The mean pain scores on postoperative day 7 were found to be 3.4 in the coblation group and 2.47 in the cold dissection group with a significant p value of 0.0087. The average duration of surgery in the coblation group was 55.6 minutes as against 34.1 minutes in the cold dissection group. The p-value was found to be less than 0.0001 which makes the difference statistically significant.

Conclusions: This study found that the intraoperative blood loss was significantly less in Coblation adenotonsillectomy than in cold dissection adenotonsillectomy. The duration of surgery in Coblation assisted adenotonsillectomy is significantly greater than the duration of surgery in cold dissection adenotonsillectomy. While the postoperative pain scores are similar with coblation and cold dissection adenotonsillectomy in the early postoperative period, it is significantly more with coblation in the late postoperative period.

Keywords: Adenotonsillectomy, Coblation

INTRODUCTION

Tonsillectomy in children is one of the most frequently performed operations in the developed world. Since the

first tonsil removal was performed by Celsus in 30 BC, multiple surgical techniques for removal of the tonsils including cold dissection, electrocauterization, laser dissection, cryosurgery, bipolar dissection scissors,

coblation-assisted tonsillectomy, and ultrasonic scalpel tonsillectomy.¹ The cold dissection procedure was the standard approach which was followed for centuries. Coblation-assisted tonsillectomy is a new technique involves passing radiofrequency energy through a conductive medium (such as isotonic sodium chloride) and producing a plasma field. This technique can be utilized for completion tonsillectomy, or for intracapsular tonsillectomy or tonsillotomy where the tonsil is debulked, leaving a small amount of lymphoid tissue to cover the inferior constrictor muscle. Coblation assisted tonsillectomy is gaining popularity based on the reduced intraoperative blood loss and decreased postoperative pain.²

The aim of this study was to compare intraoperative bleeding, duration of surgery and postoperative pain in coblation assisted adenotonsillectomy and cold dissection adenotonsillectomy in paediatric age group.

METHODS

Study design & population

A prospective randomized experimental study was conducted among 60 patients attending a tertiary care hospital for a period of two years from August 2012- July 2014. The study included paediatric patients in the age group 7 to 13 years fulfilling the SIGN guidelines for adenotonsillectomy.

We used simple random sampling method and included 30 patients each for coblation assisted adenotonsillectomy and control group cold steel adenotonsillectomy. To ensure comparable age distribution in the two groups, the patients were divided into 2 age groups, one from 7 to 9 years and the other, 10 years and above.

Selection criteria

The study included paediatric patients in the age group 7 to 13 years fulfilling the sign guidelines for adenotonsillectomy with sore throats due to tonsillitis, five or more episodes of sore throat per year, symptoms persisting for atleast a year and episodes of disabling sore throat which prevent normal functioning.

Exclusion criteria were patients with known bleeding disorders, immune-compromised status and unwilling for surgery.

Preoperative assessment

All patients underwent clinical examination. Hematological investigations included Haemoglobin and PT-INR. An X- ray lateral view of nasopharynx was done for evidence of adenoid hypertrophy.

Informed written consent for adenotonsillectomy and consent for inclusion into the study was obtained from the parents of the patients. The study protocol was approved by the hospital ethical committee.

Coblation assisted adenotonsillectomy

All surgeries were performed under general anaesthesia. The patient is placed in Rose's position. The technique involves the use of microscopic visualization of the oral cavity. The tonsils were held using tonsil holding forceps and excised using Evac Extra HP Coblation wand. The power setting for ablation was 7 and coagulation was 3. The dissection could be from superior to inferior or from inferior to superior; as per the comfort of the surgeon. The tonsil capsule is dissected from anterior to posterior known as open book method. The bleeding vessels are coagulated as and when they are encountered. Infant feeding tube is inserted through both the nostrils and delivered through oral cavity and tied for better visualization of the nasopharynx to address adenoids. The adenoids were coblated using the same wand bent suitably with transnasalendoscopic visualization.

Cold steel tonsillectomy was done by standard dissection and snare technique.

The following outcomes were measured.

- Bleeding
- Duration of surgery
- Pain scores on visual analog scale

Estimation of blood loss during the procedure was calculated taking into account gauze pieces and suction. All patients were followed up on the postoperative evening and on days 01, 07 days after the intervention to assess post-operative morbidity.

Postoperatively a diclofenac sodium suppository is kept per rectally before extubation and syrup Paracetamol/ tablet Paracetamol for analgesia according to body weight. For patients having a pain score more than 4, injection Tramadol was given. Injection Augmentin was given as per body weight 12 hourly for 1 day followed by syrup augmentin for 4 days. Patients were generally discharged 24 hours after the surgery.

Duration of surgery

The duration of surgery is calculated in minutes from the time of positioning of patient under anaesthesia to the time of handing over the patient to anaesthesiologist after hemostasis.

Estimation of pain

Pain was scored using Wong Baker visual analog scale (0-no pain and 10- worst pain). Pain was scored after 6

hours of surgery, on first postoperative day and 7th postoperative day.

Statistical analysis

Analysis was based on the comparison of results obtained intraoperatively and post operatively. The parameters compared included blood loss in ml, duration of surgery and pain score on visual analog scale was compared by independent t test. Amount of bleeding in the two groups was compared using independent t-test.

RESULTS

The mean age of patients in the coblation group was 8.8 years and the mean age of patients in the cold dissection group was 9.1 years. The range was 7 -13 years in coblation group and 7 -12 years in cold dissection group.

Figure 1: Age distribution.

Gender

In the coblation group, 48 percent were males and 52 percent were females whereas in the cold dissection group, 40 percent were males 60 percent were females.

Figure 2: Gender distribution.

Haematology

The mean hemoglobin level in the coblation group was 11.9 gm/dl and in the cold dissection group was 12.2 gm/dl. All children had normal coagulation profile and INR.

Bleeding

The intraoperative blood loss was compared in the two groups. The amount of blood loss ranged from 10-25 ml

in the coblation cases and 40 ml -100 ml in the cold dissection cases. The mean blood loss was 16.67 ml in the coblation group and 58.67 ml in the cold dissection group. The difference was proven to be statistically significant using the independent t-test.

Postoperative hemorrhage was seen in 2 cases (7%); both were in the cold dissection group. Both the patients were taken to the operation theatre and bleeding was controlled by bipolar diathermy under general anaesthesia.

Duration

The average duration of surgery was longer in the coblation group was 55.6 minutes as against 34.1 minutes in the cold dissection group. The p- value was found to be less than 0.0001 which makes the difference statistically significant.

Postoperative pain scores

The mean postoperative pain scores were noted on visual analog scale on the postoperative evening, postoperative day 1 and postoperative day 7.

Table 1: Comparison of postoperative pain scores.

	Pain score coblation arm	Pain score cold dissection arm
Post op evening	4.7	4.8
Post op day 1	3.89	3.6
Postop day 7	3.4	2.47

There was no statistical difference in the pain scores between the two arms on the postoperative evening and postoperative day 1. The standard deviation for pain scores on the postoperative day 7 was 1.4 and 1.25 in the coblation and cold dissection groups respectively and the p- value was 0.0087. The difference in pain scores on the postoperative day 7 was thus found to be statistically significant.

DISCUSSION

Coblation (controlled ablation) is a newly introduced technique of surgery. It is a controlled, non-heat driven process uses radiofrequency energy to excite the electrolytes in a conductive medium, such as saline solution, creating a precisely focused plasma field. The plasma's energized particles have sufficient energy to break molecular bond within tissue, causing tissue to dissolve at relatively low temperatures (typically 40°C to 70°C). The result is volumetric removal of target tissue with minimal damage to the surrounding tissue. Many coblation devices also are designed to stop blood (hemostasis) and coagulate or seal bleeding vessels. As the current does not pass directly through tissue during the coblation process, tissue heating is minimal. Most of

the heat is consumed in the plasma layer, or in other words, by the ionization process. These ions then cause molecular bonds to simply break apart dissolving the tissue. This vaporization theoretically results in effective dissection with less postoperative pain from thermal injury.^{2,3} Our study was done to evaluate the parameters of bleeding, duration of surgery and pain following use of coblation versus cold steel tonsillectomy.

Belloso in their study compared the benefits of coblation technique against traditional tonsillectomy techniques.⁴ In their study they found that coblation tonsillectomy was associated with a lesser incidence of delayed hemorrhage, significantly in the pediatric population. They found that secondary re-bleed rate with coblation was 2.25% versus 6.19% in the control group. Secondary haemorrhage rate in children following coblation was 0.95% versus 4.77% in the control group which was statistically significant. Secondary haemorrhage rate in adults following coblation showed evidence of a lower prevalence of secondary hemorrhage in the coblation group (4.40%) versus the control group (8.81%). They concluded that coblation for tonsil dissection offered significant advantages in the postoperative period compared with dissection tonsillectomy with bipolar diathermy hemostasis and was associated with less postoperative pain and early return to daily activities. Also there were fewer secondary infections of the tonsil bed and significantly lower rates of secondary hemorrhage with coblation.

Other authors such as Shah & Divi have found postoperative haemorrhage rates for coblation assisted surgery to be similar to cold steel surgery, whereas Magdy found significantly lesser blood loss in Coblation surgery.⁵⁻⁷ Some researchers however, have found a higher bleeding rate with the Coblator, and this issue remains a concern for some.^{8,9}

A prospective randomized study conducted by Sung-Moon et al compared intraoperative records and postoperative clinical outcomes in adolescents and adults following coblation and electrocautery tonsillectomies in 80 patients over 16 years of age.¹⁰ The study concluded the amount of blood loss was less in the coblation tonsillectomy group.

Mitic et al compared the intraoperative and postoperative outcomes of coblation tonsillectomy with dissection tonsillectomy with bipolar diathermy haemostasis in 40 patients.¹¹ The authors found that intra-operative bleeding was significantly less in the coblation group and patients undergoing coblation tonsillectomy reported less pain, quicker return to normal diet, quicker return to normal activity, and less use of analgesics over a 10-day period than patients undergoing dissection tonsillectomy.

Rakesh Singh et al in their study of 60 adult patients undergoing tonsillectomy compared one tonsil removed by subcapsular radiofrequency ablation method and the other by conventional dissection method.¹² It was found

that the duration of surgery was more using the coblation procedure (15 vs. 11 min) while the operative blood loss on the coblation side was less 11 ml vs 34 ml on the conventional side. 77% patients said that the coblation side was less painful for the overall 20-day recovery period. The healing however took longer on the coblation side.

In our study the mean average blood loss during adenotonsillectomy ranged from 58.67 ml for cold steel surgery as against 16.67 ml for coblation surgery with a significant p value of <0.0001. The only two cases of post-operative haemorrhage occurred in the cold steel group. Coblation assisted surgery was not associated with any case of postoperative haemorrhage in our study. Our study suggests that coblation technology has significantly less bleeding when compared to cold steel adenotonsillectomy. These findings were in consonance with earlier studies by Belloso and Magdy.^{4,7}

Most of the studies involving coblation tonsillectomies have focused on adults and adolescents whose clinical data were not applicable for children. The present study sought to find the clinical advantages of coblation if any by assessing clinical outcomes of coblation tonsillectomy compared to cold dissection tonsillectomy especially in children

In our study, the morbidity of coblation assisted surgery was found to be similar to that of cold steel surgery as far as postoperative pain scores are concerned. On comparing the pain scores in the immediate postoperative evening after 06 hours of surgery there was no statistically difference in the pain scores between the two groups as shown in Table 1. These findings were in consonance with other authors such as Shah, Magdy & Parker D.^{5,7,13} In our study there was no statistical difference in the pain score on the first postoperative day between the 2 groups however on the 7th postoperative day the pain score was more for the coblation arm and it was statistically significant as in Table 1. In our study we found that the postoperative pain is equal on both sides in the early period whereas in the later postoperative period, cold steel provides better pain relief than coblation technique. This result can be reasoned out by the fact that coblation uses minimal but continuous thermal energy to ablate over the entire field, i.e. the tonsillar bed and results in more slough formation which can interfere with the wound healing process.

Burton in a cochrane review titled 'coblation versus other surgical techniques for tonsillectomy' to assess the effectiveness of coblation tonsillectomy compared with other surgical techniques in reducing morbidity.¹⁴ They selected randomised controlled trials of children and adults undergoing tonsillectomy by means of coblation compared with any other surgical technique for removal of the tonsils. They concluded that in terms of postoperative pain and speed and safety of recovery, there is inadequate evidence to determine whether

coblation tonsillectomy is better or worse than other methods of tonsillectomy.

Omraniet al in their study on 47 patients concluded that coblation tonsillectomy is associated with significantly less intraoperative or postoperative complications and morbidity in comparison with traditional method.¹⁵ Coblation was associated with less pain and quick return to normal diet and daily activity. They proposed that since coblation is operated in low temperature tonsillectomy with coblation involves less postoperative pain and allows accelerated healing of the tonsillar fossae compared with other methods involving heat driven processes

A study by Shapiro et al studied 47 children of which 24 underwent coblation assisted adenotonsillectomy and 23 underwent cold dissection adenotonsillectomy showed that there was no statistically significant difference between groups in daily pain scores.¹⁶ In our study we found that coblation does not reduce postoperative pain in immediate and late period.

Coblation assisted surgery took almost double the time of a cold steel surgery on the average. In our study, the average duration of surgery in the coblation group was 55.6 minutes as against 34.1 minutes in the cold dissection group. However authors such as Magdy & Shapiro have reported shorter operative times for coblation assisted surgery as compared to cold steel.^{7,16} Increased operative time implies more tissue handling, which may result in more postoperative pain..

CONCLUSION

In the context of a developing country like India, the cost of surgery is a matter that needs to be assessed against the benefits of the surgical technique. Coblation surgery is more expensive in terms of cost of the hardware and the disposable wands. Further, the increased duration of surgery adds to the cost. These parameters may be considered in assessing the overall efficacy of this tool. This study included adenoidectomy along with the tonsillectomy procedure where as many studies compared only tonsillectomy procedure. The present study is focused on paediatric population. It not only compared the blood loss and operative duration but also studied the pain score separately in the immediate and in the late postoperative period i.e. one week and compared it with the cold dissection method. This study found that the intraoperative blood loss was significantly less in coblation adenotonsillectomy than in the cold dissection adenotonsillectomy. The duration of surgery in coblation assisted adenotonsillectomy is significantly greater than the duration of surgery in cold dissection adenotonsillectomy. While the postoperative pain scores are similar with coblation and cold dissection adenotonsillectomy in the early postoperative period, it is significantly more with coblation in the late postoperative period.

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