

A COMPARATIVE STUDY OF DISSECTION SNARE, RADIOFREQUENCY, AND LASER TECHNIQUES IN PEDIATRIC TONSILLECTOMY: EVALUATING OPERATIVE OUTCOMES AND POSTOPERATIVE MORBIDITY

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Received : 18/10/2024
 Received in revised form : 08/12/2024
 Accepted : 23/12/2024

Keywords:

Pediatric tonsillectomy, dissection and snare, radio frequency, CO2 laser, postoperative pain, intraoperative blood loss, surgical techniques.

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DOI: 10.47009/jamp.2024.6.6.138

Source of Support: Nil,
 Conflict of Interest: None declared

Int J Acad Med Pharm
 2024; 6 (6); 733-737

**Abstract**

Background: To compare the advantages and disadvantages of pediatric tonsillectomy techniques, including dissection and snare, unipolar radio frequency, bipolar radio frequency, and CO2 laser methods, focusing on operative time, intraoperative blood loss, postoperative pain, and complications. **Materials and Methods:** A prospective, randomized clinical study was conducted on 58 pediatric patients (34 boys, 24 girls; aged 7–14 years) with recurrent acute tonsillitis. Patients were divided into four groups: Group I (n=24): Dissection and snare. Group II (n=12): Unipolar radio frequency. Group III (n=12) Bipolar radio frequency. Group IV (n=10): CO2 laser. Outcome measures included operative time, intraoperative blood loss, postoperative pain (measured using a visual analog scale), and complications. Statistical analysis was performed using SPSS (Version 25.0), with significance set at $p < 0.05$. **Result:** Shortest in CO2 laser and bipolar RF groups (mean 16.4 and 16.3 minutes, respectively), longest in dissection and snare (mean 18.87 minutes; $p < 0.05$). Significantly lower in CO2 laser (mean 12.8 ml) and bipolar RF (mean 16.25 ml) compared to dissection and snare (mean 105.4 ml; $p < 0.05$). CO2 laser group had the lowest pain scores in the first week, but by the second week, pain was higher than in radiofrequency groups. Pain scores were comparable across all groups by the fourth postoperative week. No reactionary hemorrhage was recorded. One case of secondary hemorrhage occurred in the unipolar RF group, managed conservatively. **Conclusion:** CO2 laser and bipolar RF techniques demonstrated advantages in reducing operative time and intraoperative blood loss compared to the dissection and snare method. However, pain outcomes varied, with CO2 laser showing better immediate postoperative pain relief but increased discomfort in the second postoperative week. All techniques had minimal complications, underscoring their safety and efficacy in pediatric tonsillectomy.

INTRODUCTION

Palatine tonsils play an important role in the development of immune system, complete development of the tonsils is achieved after birth under the influence of antigens. Their protective mechanism sometimes fails and become a seat of infection rendering sore throat, fever and other complications. This requires removal of diseased tonsil.^[1]

For children under 10 years of age most common indication for surgery is recurrent episodes of tonsillitis. But many children also have sleep disordered breathing. In young adults recurrent infections constitute the main indication for surgery and the indication is rarely based solely on tonsillar hypertrophy with obstructive symptoms, infections

causing repeated absences from school and academic studies may put a young person's future at risk by impeding academic results in high school, college and accomplishment in work and social life.^[2,3]

Although a long practice procedure tonsillectomy is still a common operation and considered one of the most common major surgical procedure performed in children and young adults. This procedure still surrounded by controversy, especially regarding indications for surgery and details of surgical techniques.^[4]

Sharp instrumentation and guillotine tonsillectomy techniques are still used. More recently however, dissections using various electro cautery devices have become popular. First clinical experience with laser reported in 1972 but it is only recently that the use of laser has been widespread.^[5] During last 20

years significant number of investigations of tonsil surgery have focused on decreasing the duration of surgery, collateral tissue damage, intraoperative blood loss, peri and post-operative pain and recovery time, and post-operative complications.^[6]

Tonsillectomy is a common operation in both children and adults performed by variety of techniques; none has been proved to be superior to another. These techniques have evolved over years aiming to make the procedure safe and decrease the post-operative morbidity and complication, despite the developments in techniques and technology tonsillectomy still carries a relatively high risk of morbidity. This present study was designed to compare the effects of various techniques of tonsillectomies. The following four techniques were compared:

- Dissection and Snare.
- Unipolar radio frequency
- Bipolar radio frequency
- CO₂ laser.

MATERIALS AND METHODS

This clinical study was conducted between Nov-2008 - June 2010 on the patients in the Govt. ENT Hospital Koti, Hyderabad. This is a prospective randomized clinical study to compare between conventional, bipolar radio frequency, mono polar radio frequency and laser tonsillectomy.

All patients included in the study and their parents were informed about the nature of the tonsillectomy operation, but not about the method of tonsil removal (dissection & snare, radio frequency or laser).

58 patients were included in this study 34 boys and 24 girls aged between 7 and 14 years. All had suffered recurrent attacks of acute tonsillitis and showed symptoms and signs of chronic tonsillitis. All patients underwent full ENT history taking a thorough clinical examination and full pre-operative laboratory investigations

All the operating surgeons had the same surgical qualifications and were almost at the same level of surgical training.

The patients, history of illness recorded and thorough clinical examination was made. After making clinical diagnosis the following investigations were carried out.

- Complete blood picture
- Complete Urine examination
- HIV 1&2, Hbs Ag
- Random blood sugar
- Blood urea
- Serum creatinine

Having confirmed the diagnosis and after adequate preoperative preparations all the patients were operated and the following findings at the time of operation and post-operative period were recorded.

- Duration of the surgery
- Intraoperative blood loss
- Post operative pain and complication.

All patients were discharged after 24 hrs of post-operative period and followed regularly after 1st wk, 2nd wk and 4th wk. Statistical records of all tonsillectomy cases at Govt ENT Hospital, Hyderabad were studied. Finally findings of this study of 58 cases have been discussed.

Exclusion criteria: Patients with bleeding rehabilitations diseases (or) combined surgeries (adenotonsillectomy are not included in this study.

Methods: Children were prospectively randomised into 4 groups.

Group I	Sample size 24 Operative method - dissection and snare
Group II	Sample size 12 Operative method - unipolar radio frequency
Group III	Sample size 12 Operative method - bipolar radio frequency
Group IV	Sample size 10

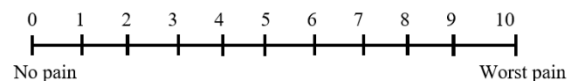
Operative method: CO₂ laser

Total number of patients: 58

Outcome measures observed: Operative time: Calculated from application of Boyles Davis mouth gag to removal of it after completion of surgery was noted in each case.

Intraoperative Blood loss: Estimation in our study was purely a subjective assessment by the surgeon.

Post-operative pain: Patient were asked to record their pain on a 10 cm. Standard visual and analogue scale from zero (No pain) to 10 (Sever pain) post-operative complications were also recorded & managed.



1-10 numeric pain intensity scale.

Post-operative complications:

- Reactionary haemorrhage
- Secondary haemorrhage

In laser group CO₂ laser was used, the laser was set to 10 watt continuous. The laser beam delivered via a 0.6 mm endostat fibre. During laser use all appropriate precautions were taken to protect the safety of theatre personals.

In radio frequency group a 3.8 M. Hz. Ellmen Surgitran was used. In bipolar group cutting and coagulation mode with intensity of 40 was used for tonsillar dissection. While bleeding points were controlled using the coagulation mode.

In unipolar group cutting mode with intensity of 60 was used for tonsillar dissection. While bleeding points were controlled using the coagulation mode.

Statistical analysis: SPSS (Version 25.0) was used for analysis and test of significance was performed using ANOVA test AP value of less than 0.05 was considered statistically significant.

RESULTS

As per [Table 1 and Figure 1] the mean age group for procedure of dissection and snare was 11.2 years,

Unipolar RF was 10.4 years, Bipolar RF was 10.6 years.

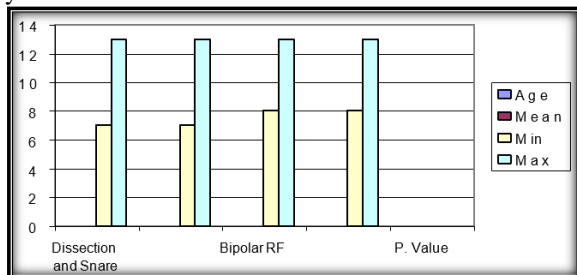


Figure 1: Distribution of patients according to Age

As per [Table 2] the operative time In dissection snare method ranges between 16-25. Mean operative time is 18.87 minutes, with standard deviation of 2.15 Operative time in CO2 laser and bipolar radio frequency methods 2 minutes less and one minute less with the unipolar radio frequency, when compare with the dissection and snare method.

As per [Table 3] in dissection snare method ranges between 60 to 140 ml. Mean blood loss in dissection snare method is 105.4 ml, with standard deviation of +- 24.31. Intra operative blood loss in CO2 laser and radio frequency methods minimal, when compare with the dissection and snare method.

As per [Table 4] in the first post operative day the visual analogue scale score for pain ranges from 6-8 in dissection and snare group. Mean 6.97 with SD. +- 0.7, in unipolar radio frequency group ranges from 6 and mean is 7.16 with standard deviation of 0.8. In bipolar radio frequency group VAS score for pain

ranges from 6-8 and mean is 7.3 standard deviation of 0.6. In laser group ranges from 6-8 with mean 6.9 standard deviation 0.7.

As per [Table 5] at the 1st post operative week follow-up visit the VSA pain score in dissection snare group is ranges from 2-4. Mean 3.16 with SD 0.7. In bipolar frequency group ranges from 3-6. Mean 4.08 SD 0.9. In laser group ranges from 2-5. Mean 2.1 SD 0.9.

As per [Table 6] at the 2nd post operative week follow-up visit the VSA pain score in dissection snare group is ranges from 0-2. Mean 1.25 with SD 0.5; In monopolar radio frequency group ranges from 2-3. Mean 2.3 with SD 0.4; In bipolar frequency group ranges from 1-3. Mean 2.25., SD 0.9; In CO2 laser group ranges from 3-6. Mean 4.5, SD 0.9.

At the 4th post-operative week follow-up visit the VSA pain score in dissection snare group is ranges from 0-1. Mean 0.08 with SD 0.8; In unipolar radio frequency group ranges from 0-1. Mean 0.16, SD 0.38; In bipolar frequency group ranges from 0-1. Mean 0.3 SD 0.4; In laser group ranges from 0-1, Mean 0.5, SD 0.5. There is no statistically significant difference between the four groups regarding post-operative emesis, Neck stiffness, there was no recorded reactionary haemorrhage. Only one case in unipolar radio frequency group developed secondary haemorrhage. This occurred 2 weeks post operatively, and was managed conservatively by broad spectrum antibiotics and povidone iodine mouthwash. This case did not represent a significant difference between the groups.

Table 1: Distribution of patients according to Age.

Age	Dissection and Snare	Unipolar RF	Bipolar RF	CO ₂ Laser
Mean	11.2	10.4	10.6	10.5
Min	7	7	8	8
Max	13	13	13	13

Table 2: Comparison of operative time

Groups	Sample size	Mean	Standard deviation	P Value
Group -I	24	18.87 min	2.15	
Group -II	12	17.83 min	2.2	<0.05
Group-III	12	16.30 min	1.77	
Group-IV	10	16.40 min	2.11	

Table 3: Comparison of Intraoperative blood loss

Groups	Sample size	Mean	Standard deviation	P Value
Group -I	24	105.4 ml	24.31	
Group -II	12	30 ml	6.3	
Group-III	12	16.25 ml	4.8	<0.05
Group-IV	10	12.8 ml	5.2	

Table 4: Comparison of postoperative pain within 24 hours

Groups	Sample size	Mean	Standard deviation	P Value
Group -I	24	6.9	0.7	
Group -II	12	7.1	0.8	>0.05
Group-III	12	7.3	0.6	
Group-IV	10	6.9	0.7	

Table 5: Comparison of postoperative pain 1 Week

Groups	Sample size	Mean	Standard deviation	P Value
Group -I	24	3.1	0.7	
Group -II	12	4.5	0.9	<0.05
Group-III	12	4	0.9	

Group-IV	10	3.1	0.9	
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Table 6: Comparison of postoperative pain 2 Week

Groups	Sample size	Mean	Standard deviation	P Value
Group -I	24	1.2	0.5	
Group -II	12	2.3	0.4	<0.05
Group-III	12	2.2	0.9	
Group-IV	10	4.5	0.9	

Table 7: Comparison of postoperative pain 4 Week

Groups	Sample size	Mean	Standard deviation	P Value
Group -I	24	0.08	0.2	
Group -II	12	0.16	0.3	>0.05
Group-III	12	0.33	0.4	
Group-IV	10	0.5	0.5	

DISCUSSION

In this series patient's ages ranged from 7-14 years. This age group was selected in order to obtain as accurate an estimation as possible of patients' postoperative pain and discomfort, and of the changes in such pain over the follow-up period.

In this study, operative time was slightly longer in dissection and snare group (mean 18 min) compare with the radio frequency (unipolar mean 17 min, bipolar mean 16 min) and laser groups (mean 16 min). This could be attributed to the greater time required to haemostasis after the tonsil removal. The mean operative time recorded in previous trials of KTP Laser (Mean 12 min) and radio frequency (mean 8.5 min).

There was a significant decrease in intra operative blood loss in the CO2 Laser group (mean 12.8ml), and radio frequency group (unipolar - 16.2ml, bipolar-30ml), when compared with the dissection and snare group. (mean 105.4ml)

The CO2 Laser group reported slightly less postoperative pain and discomfort, using the visual analogue scale, from the first to the seventh postoperative day (mean 6.9); in the unipolar radio frequency group (mean 7.16), bipolar RF group (mean 7.3), in dissection snare group (mean 6.9).

However during the 1st post operative week mean score in dissection snare 3.1; unipolar RF group 4.5; bipolar RF group 4.0 and in CO2 laser group 3.1; in 2nd post-operative week the mean pain score for the Laser group was > that for radio frequency group. By forth post-operative week all groups pain scores had improved to a nearly equal level.

It is claimed that laser can reduced the immediate post operative pain because of its effect of desensitising the terminal nerve endings. Oas and Bartels.^[7] Along with others reported that this benefit is lost by the end of the first post operative week, and pain tends to last longer in a significant number of patients before disappearing completely later on. Kusalkar suggested that one of the causes of increased post operative pain may be surgical technique and recommended that the laser beam be directed to the tonsil tissue and not to the tonsillar fossa laterally, as this causes thermal damage to the

muscle bed and hence post-operative pain also by Ragab and Sood et al.^[8-11]

Strunk and Nichols in their KTP laser group observed a great amount of exudate on the first to second post-operative week follow-up visits.^[12] Auf et al. reported that wound healing was slower on their KTP laser side, with increased slough after two weeks and reduced rate of healing. The above statements could explain the higher pain scores reported by our patients in the second post-operative week.

The incidence of post-operative complications was minimal in our study. Reactionary haemorrhage was not recorded only in any group, while secondary haemorrhage occurred in only one patient, in unipolar radio frequency group. There was a no need for power analysis of the rates of postoperative bleeding, as subject numbers were too small to show a significant difference.

CONCLUSION

Compared to conventional dissection and snare method the blood loss is less with radio frequency knife and least with Co2 laser. The incidence of postoperative pain is more in the first week of post-operative period with radio frequency knife and during second week with Co2 laser. With carefully done conventional method the pain was most tolerable and acceptable. The incidence of intraoperative and postoperative complications are less in RaF and least with Co2 laser. The conventional method had slightly higher of intraoperative haemorrhage. The mean volume of blood loss is also higher by about (105.4) in dissection and snare method. But none of the patients in any group showed manifestations of blood loss. In terms of cost and feasibility to carryout in smaller and peripheral centres and postoperative pain, conventional method is still the method of choice. In well-equipped institutions where cost is not a significant factor and pain relief can be achieved by hospitalization and medication for a day or two, or more Laser Tonsillectomy is very effective. The incidence of complications is also the least by this method.

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