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Comparison of Diode Laser Tonsillectomy and Bipolar Cauterization Tonsillectomy

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ABSTRACT

Objectives: To compare the outcomes of diode laser tonsillectomy and bipolar cauterization tonsillectomy in terms of intraoperative efficiency, postoperative recovery, and complications.

Methodology: This prospective comparative study carried out at Rawal Institute of Health Sciences (RIHS), Islamabad from January 2023 to December 2023. A total of 100 patients were randomly selected for the diode laser tonsillectomy procedure and bipolar cauterization tonsillectomy. Various details such as intraoperative parameters, postoperative pain, time to start a normal diet, and the complication/s that ensued were documented and compared.

Results: The mean age of the patients was 26.5±5.2 years, with gender distribution was 50% male and 50% females. Diode laser tonsillectomy resulted in shorter operating time (25.0±5.0 min), decreased blood loss (5.0±2.0 ml), reduced pain score at day 7 (1.5±0.5 points) and faster postoperative recovery than bipolar cauterization ($p < 0.001$). The frequency of secondary haemorrhage in the diode laser patients (2%) was also noticeably less.

Conclusion: Diode laser tonsillectomy is characterized by fewer post-operative complications, shorter time of treatment, and faster healing compared to classical methods of tonsillectomy due to high cost it is not popular.

Keywords: Cautery; Complications; Lasers, Semiconductor; Postoperative care; Tonsillectomy.

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Introduction

Tonsillectomy, a routine operation, is applied for recurrent tonsillitis, obstructive sleep apnoea and tonsillar hypertrophy.[1] However, diode laser tonsillectomy has the feature of precision, can perform cutting and coagulation at the same time, and has less effect on the tissues around the discovery. However, cauterization, which is commonly applied in bipolar surgery, utilizes diathermy both for coagulation and tissue division and thus has its benefits.[2] Lasers have been recently applied to conduct a few operations like tonsillectomy, and research data derived from here are much more positive.[3] Research also shows that more blood loss is reduced by means of laser tonsillectomy than the traditional methods, which are important in countering the incidents of post-surgery complications like secondary haemorrhage.[4,5] The same high level of accuracy provided by the diode laser also minimizes harm to the tissues, thus lowering instances of post-surgery redness, soreness or swelling.[6]

However, bipolar tonsillectomy has been deemed normal in different operations for the past few years now.[7] Furthermore, bipolar cauterization is cheaper that is why it is effective in providing the necessary services for the regions which have a lack of finances.[8] Comparative research looking at the two methods has demonstrated that diode laser tonsillectomy yields lower measures of intraoperative blood loss, operating time and postoperative

pain.[9] The above-mentioned advantages lead to early intergroup recovery and shortened hospitalization periods that would be relevant in a resource-limited setting.[10] Furthermore, wound healing and scarring after the operation are less satisfactory with a diode laser than with a non-diode laser because of the latter's high degree of accuracy.[11] While, the higher cost of laser equipment is still out of reach in some healthcare centres, the general advantage of not only speedy recovery but also low complications risks see laser as a better option.[12]

Bipolar cauterization, on the other hand, is preferred more as it is readily available and has relatively low operation costs.[13] Bipolar cauterization is cost-effective, especially in developing countries like Pakistan, where tonsillectomy and other healthcare modalities have huge discrepancies.[14] The opportunity to use laser technology and the consciousness of receiving its advantages can shift the picture of tonsillectomy in Pakistan.[15]

The rationale of the present study is to assess the diode laser tonsillectomy and bipolar cauterization tonsillectomy in view of intraoperative effectiveness, postoperative healing and morbidities. This study objective was to compare the outcomes of diode laser tonsillectomy and bipolar cauterization tonsillectomy in terms of intraoperative efficiency, postoperative recovery, and complications.

Methodology

This prospective comparative study was carried out at Rawal Institute of Health Sciences (RIHS), Islamabad from January 2023 to December 2023. The study samples included 100 patients in the age range of 10 to 40 years old with recurrent tonsillitis, obstructive sleep apnea, or tonsillectomy for which tonsillectomy was necessary. Respectively, participants read the study information and gave their informed consent, none had prior tonsillectomy or severe comorbidity. Patients who had coagulopathy were active infectious cases or had a contraindication to surgery, and those who had received a previous tonsillectomy were excluded from the study. Moreover, any participant with other comorbid systemic diseases like diabetes or cardiovascular diseases which would affect recovery would also be excluded.

A non-probability consecutive sampling was done. Fifty (50) patients received diode laser tonsillectomy, and 50 patients received bipolar cauterization tonsillectomy. Both surgical interventions were done under general anaesthesia by senior otolaryngologists. The diode laser patients used a cutting and coagulation diode laser to remove the tonsils, whereby little bleeding was observed, and faster healing was expected as compared to the bipolar tonsillectomy patients. In the bipolar cauterization patients, bipolar diathermy was used for dissection and coagulation of tissue by adjusting the temperature set and maintained by the surgeon. The amount of time taken to perform the surgery and any blood loss during the surgery were also noted as intraoperative variables. The patient's recovery was evaluated based on the Visual Analog Scale (VAS) on days 1, 3, and 7 postoperative, the time the patient took to resume a normal diet. During the period of follow-up, there were complications such as secondary haemorrhage and infections that were observed.

The data was entered and analyzed by SPSS v 23. The mean and SD were employed for continuous variables. Independent sample t test was employed for comparison of diode laser tonsillectomy and bipolar cauterization tonsillectomy patients. A p value ≤ 0.05 was considered significant.

Results

The study included a total of 100 patients, of which 50 were placed in diode laser tonsillectomy and the other 50 in bipolar cauterization tonsillectomy. The mean age of the patients was 26.5±5.2 years, with gender distribution was 50% male and 50% females. The investigations of both groups found no significant differences in terms of age and gender.

The intraoperative parameters of the patients are provided in Table 1. Diode laser tonsillectomy was found to have a shorter operating time than bipolar cauterization ($p < 0.001$). The collected blood loss was also considerably lesser in diode laser patients as compared to bipolar cauterization patients ($p < 0.001$).

Table I: Comparison of operating time between patients. (n=100)

Parameters	Diode laser n=50	Bipolar cauterization n=50	p-value
Operating time (min)	25.0±5.0	35.0±7.0	.001
Blood loss (ml)	5.0±2.0	15.0±4.0	.001

The comparison of postoperative outcomes is summarized in Table II. The pain results of diode laser patients were substantially improved compared to bipolar cauterization patients through the VAS on postoperative day 1, 3, and 7 ($p < 0.001$). In terms of diet, diode laser patients resumed its normal diet earlier ($p < 0.001$).

Postoperative bleeding or secondary haemorrhage rate was also relatively low in diode laser patients. Only one patient, or 2%, suffered from postoperative bleeding, while three patients or 6%, in bipolar cauterization experienced postoperative bleeding ($p < 0.05$). The infection rate was also comparable in patients and was estimated to be 4%.

Table II: Comparison of VAS and diet between patients. (n=100)

Parameters	Diode laser n=50	Bipolar cauterization n=50	p-value
Postoperative pain day 1	3.2±1.0	5.0±1.5	.001
Postoperative pain day 3	2.0±0.8	3.2±1.0	.001
Postoperative pain day 7	1.5±0.5	2.8±1.0	.001
Return to normal diet (days)	4.5±1.2	6.5±1.5	.001

Table III: Summarized the complications observed in patients. (n=100)

Complications	Diode laser n=50	Bipolar cauterization n=50	p-value
Secondary hemorrhage (%)	1 (2%)	3 (6%)	.05
Infection (%)	2 (4%)	2 (4%)	1.00

Discussion

The many approaches developed in efforts to boost success in tonsillectomy are diode laser and bipolar cauterization. Comparisons of the intraoperative time, postoperative time, and complications pertaining to these two techniques were made in this study. The diode laser had an operating time of 25 minutes, while the bipolar cauterization had an operating time of 35 minutes. These findings are in concordance with other research and several earlier works indicating that diode laser-aided tonsillectomy lessens the amount of time spent in surgery.[1,2]

Another possible outcome of the conflict between the opposing views on the effectiveness of different sorts of tonsillectomy is postoperative haemorrhage. The findings of this study were substantiated by determining that the amounts of blood loss in some patients with the diode laser technique were lower than those of the bipolar cauterization. Laser cutting is less traumatic, and its ability to cause coagulation of blood should minimize post-operative bleeding, which is not uncommon after tonsillectomy.[3,4] The present result is also consistent with the earlier studies that show that diode laser tonsillectomy has been used as an effective approach to overcome the issue of blood loss and enhance patients' safety.

Patients who had diode laser tonsillectomy were found to have lower mean pain scores at day 1, 3 and 7 in this study. There was a statistical difference in pain level between the diode laser patients and bipolar cauterization patients ($p < 0.001$). This difference in pain levels corresponds with other studies that have indicated that this laser tonsillectomy causes less pain after the surgery than other techniques.[6,7] The diode laser patients also arrived at a normal diet much earlier than bipolar cauterization patient. This fact means that patients who have undergone diode laser tonsillectomy require a shorter period to heal and may return to their daily activities immediately.

The rates of complications found in this study also support the utilization of diode laser tonsillectomy. Secondary bleeding, a significant risk following tonsillectomy, was evident in 2% of the patients in the diode laser group, while 6% of the patients in the bipolar cauterization experienced it. This difference in hemorrhage rates according with other studies where laser techniques have been used with lower postoperative bleeding rates noted.[8,9] While, the rates of infection did not differ between the patients, the lower frequency of haemorrhage in the diode laser patients has a critical benefit since patients will not require re-surgery or hospital readmission because of bleeding issues.

It is also noteworthy that this method has definite limitations and certain difficulties in its implementation during tonsillectomy. Despite its benefits, diode laser tonsillectomy remains disadvantageous due to expensive laser equipment compared to bipolar cauterization equipment in the market.[1,10] However, bipolar cauterization still remains a popular method because it is relatively cheap and easily accessible to many people. Despite offering elevated operating times, higher blood loss, and proportional postoperative pain compared to laser mons, it still consults effective outcomes for most patients.[16]

In the present study, the theoretical and practical benefits of diode laser tonsillectomy compared to bipolar cauterization tonsillectomy with regard to operating time, blood loss, postoperative pain, recovery, and complication have been proved. Lastly, each technique shall be applied according to the patient's need, available resources, preference, and qualifications of the team involved.

Conclusion

Application of the diode laser technique was a faster and more effective procedure that saw the patients have reduced complications, especially secondary haemorrhage. The patient in the diode laser also returned to a normal diet sooner than the bipolar cauterization and also experienced a quicker healing process. However, the problem of the high costs of laser equipment and the requirement of the staff's specific training also persists, excluding Lasers from becoming more frequently applied to facilities with limited resources. However, as the studies comparing diode laser tonsillectomy with other conventional methods have shown superior postoperative outcomes, it can be stated that diode laser could be the option of choice in the systems where all of these resources are available.

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