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COMPARISON BETWEEN CARBONDIOXIDE LASER AND COLD INSTRUMENTS IN TREATMENT OF VOCAL NODULE

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ABSTRACT

Background: Vocal cord nodules are one of the most frequent disorders in both children and adults who use their voice excessively. Main symptom with which patient presents is hoarseness of voice. The treatment in early stages is voice therapy. Various methods are used for its treatment e.g. surgical removal with cold instruments and carbon dioxide LASER ablation. Response to the treatment is measured by improvement in voice quality.

Objective: To compare the results of Carbon dioxide laser and cold instruments in the treatment of vocal nodule.

Study Design: Quasi-experimental study.

Place and Duration of Study: This study was conducted at Otolaryngology Department Combined Military Hospital Rawalpindi.

Patients and Methods: In this study 50 patients undergoing treatment of vocal cord nodule were included, 25 patients were treated by surgical removal with cold instruments and 25 patients were treated with carbon dioxide laser ablation. The main comparative outcomes were measured by patients' perception of voice quality (worse, same, improved) one week post operatively.

Results: Improvement in voice quality with carbon dioxide laser was found to be clinically superior. Voice quality was significantly improved as compared to cold surgical instruments.

Conclusion: Carbon dioxide laser causes early improvement in quality of voice as compared to cold instruments in the treatment of vocal nodules.

Keywords: Carbon Dioxide Laser, Cold Instruments, Quality of Voice.

INTRODUCTION

Vocal cord nodules are spindle-shaped thickenings of the edges of the vocal cords. They constitute localized thickenings, varying from small points to nodules typically at the junction of anterior and middle thirds of the vocal cords and always symmetrically on both sides. Vocal nodules originate from a combination of overtaxing and incorrect use of the voice (habitual dysphonia)[1]. Vocal cord nodules are a frequent disorder in both children and adults who use their voice excessively. The degree of hoarseness corresponds to size of nodule. If the offending factors persists it can lead to nodules becoming permanent, and rarely progress to squamous cell carcinoma[2,3].

The treatment in early stages is re-education of the voice by a suitable training programme that motivates the patient to practice at his home and work envoirment. Nodules not responding to voice rest have to be removed surgically.

Surgical options include removal of the nodule with cold instruments, use of CO2 LASER to ablate the nodule or Endoscopic injection of steroids into the nodule and Phonosurgery type[14,5].

So far there is no consensus on the best method neither is there good quality data to determine the optimal management in Pakistan. The two surgical options available in our setup are cold instruments and CO_2 LASER. This study was planned to determine the better method of treatment of vocal nodule as regards to post operative voice quality in our settings.

Operational Definitions

1. CARBONDIOXIDE LASER: CO_2 LASER is invisible laser with wavelength of 10600 nm.

2. COLD INSTRUMENTS: Laryngeal surgical instruments including foreceps, sickle knife and scissors.

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3. OUTCOME Quality of voice (worse, same, improved) 1 week post operatively.

MATERIALS AND METHODS

The study was quasi experimental study conducted at ENT department Combined Military Hospital Rawalpindi. The study was completed in one year time. A total of 50 patients with vocal nodule were divided into two different groups with 25 cases in each group. Group A was treated with CO_2 LASER ablation and Group B with surgical excision with cold instruments. Patients were assigned to different groups by Non Probability Convenience Sampling.

Inclusion criteria was clinically diagnosed cases of vocal nodule. Those patients were excluded from the study who were having bleeding diathesis or previous history of laryngeal surgery. Permission from concerned authorities and 'Hospital Ethics Committee' was obtained and study commenced. After obtaining informed consent fifty patients undergoing vocal nodule surgery at Combined Military Hospital Rawalpindi during the study period fitting the inclusion criteria were selected. Hospital registration numbers of all patients included in the study was recorded. History of present illness was recorded in terms of hoarseness. Non probability convenience sampling technique was used. Patients were divided into two groups 'A & B' by random allocation. The patients of group A were managed by surgical excision of vocal nodule and group B was managed by Laser ablation. Post operatively both groups were given

a. Tablet Mefgesic 500 mg three times a day.
b. Injection Dexamethasone 2 mg Intravenous three times a day for 24 hours.

Quality of voice was assessed on patients perception of voice quality (worse, same and improved) 1 week post operatively . All this information was collected with the help of specially designed Performa. Data analysis was computer based with use of SPSS version 11. Mean and standard deviation were calculated for numerical data like age. Frequencies were calculated for categories like gender and voice quality. Chi square test was used as test of statistical significance to compare the two groups. p value of less than 0.05 was taken as significant.

RESULTS

A total of fifty patients were included in this study over a period of six months. The patients were divided into two groups A and B. Both groups underwent direct laryngoscopy for the treatment of vocal nodules with CO_2 Laser in group A and excision with cold microsurgical instruments in group B.

The study was conducted on 50 patients with vocal cord nodule. The age of patients in this study was from 13 to 45 with detail as shown in table 1.

Out of the fifty patients there were 32 males. The patient characteristics are shown in figure 1.

Group A comprised of 20(80%) males and 05(20%) females, while group B of 12(48%) males and 13(52%) females. In group A 20(80%) patients had improved voice quality while in group B 12(48%) patients had improved voice quality(p=0.004) Results show CO_2 laser to be better than cold steel surgery in terms of voice outcome for patients of vocal nodule.

All the patients in both the groups recovered from anaesthesia without any complications. Patients were kept on postoperative antibiotics and analgesics and discharged between second and third

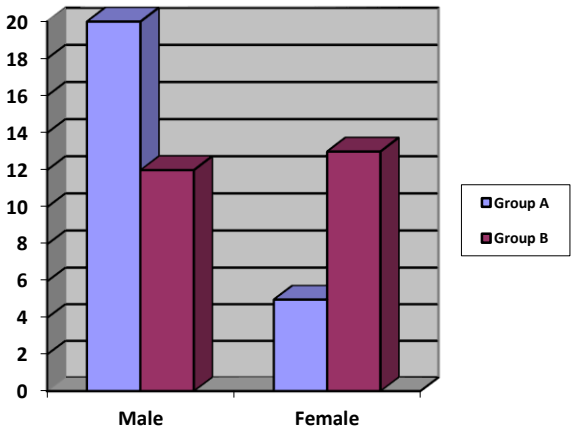

Fig-1: Comparison of gender distribution between treatment groups.

postoperative day. All patients were observed for any respiratory distress but none required emergency airway management.

DISCUSSION

Vocal cord nodule is one of the common benign lesions of vocal cords causing hoarseness of voice. It results mainly due to voice abuse rather than over use. It typically presents as bilateral small (less than 3 mm in diameter) swellings approximately at mid membranous portion of the vocal fold.

This study comprised of fifty patients divided into two groups with group A undergoing CO_2 LASER ablation and group B treated by removal with cold surgical instruments. Post operatively voice quality was judged as worse, same and improved by the patients. In group A, number of patient with voice quality worse than before was one as compared to five in group B. In 20 patients of Group A voice quality was improved as compared to 12 in group B. No change in voice quality was reported by 4 patients in Group A as compared to 8 patients in group B. Chi square test was applied to check the significance and *p* value. This *p* value came out to be less than 0.05 which showed that improvement in voice quality was statistically significant in CO_2 LASER group as compared to cold instruments.

There is no definite criteria for choice of the treatment of vocal cord nodules. As newer techniques are being developed for the treatment of vocal nodule in the world, in Pakistan surgical excision with cold instruments is practiced in nearly all centers. In my training centre LASER ablation is also been used for treatment of vocal nodule. Surgical excision with cold instruments has disadvantage of inadequate or excessive removal of the tissue and persistant poor quality of voice[6,7].

Voice quality is regarded as being determined primarily by four basic perceptual factors loudness, pitch intonation and timbre (tone quality). Perceptual evaluation of the voice refers to the process of assessing and grading the severity of these distinctive qualities in a speakers voice by an expert/trained listener[8]. It remains one of the most important widely used reliable and valid methods of voice evaluation in the clinical field. This is not only because the listeners ear may be the only tool available on a clinical setting as it requires no expensive equipment but it is in keeping with the patients complaints which are mainly based on their auditory perceptions.

Table-1: Age analysis between the two groups

Variable	Treatment Group	
	Group A (n=25)	Group B (n=25)
Age (Years)	28-80 ±3.14	27.84 ±5.82

p=0.399

Table-2: Voice quality: one week post-op analysis between the two groups.

	Treatment group	
	Group A	Group B
Worse Cont % within Treatment group	01(4.0%)	05(20.0%)
Same Cont % within Treatment group	04(16.0%)	08(32.0%)
Improved Cont % within Treatment group	20(80.0%)	12(48.0%)
Total Cont	25	25

p- Value = 0.004. (Significant).

Treatment of vocal cord nodules is based on principles of removal of exudative mass and restoration of normal epithelium. When laser strikes tissue it scatters until all the laser energy is either absorbed or reflected. The absorption of laser energy heats tissue. The heat in the tissue produces a series of changes in the tissues as the temperature rises. The changes are denaturation, coagulation vaporizarion carbonization and incandescence[9]. Cutting with a laser is narrow controlled vaporization. The heat produced by the absorption of laser light produces a secondary thermal effect in surrounding tissue. The lateral thermal effect produces haemostasis by coagulation.

Laser versus microsurgical instrumentation ? The laser is not merely a precise surgical knife and the surgeon must have an understanding of the effects of the spot size, wattage and mode (pulsed or continuous), their soft tissue interaction and the important hazards linked to their use. Although some experimental studies initially described different healing rates, this has not been the case clinically. In a trained laryngologists hands, both are excellent tools in the management of phonosurgical disorders. In many ways, lasers and cold instruments should be considered as synergistic tools rather than in direct opposition.

Keilmenn et al[10] initially reported a study of 44 patients who were treated with CO_2 laser and conventional surgical instruments but no significant difference was found between two groups. Preoperatively, two days, one month, and four months postoperatively, the patients were queried about vocal problems and their subjective rating of their voice quality. Video laryngostrobos copy was performed, the maximal phonation time was determined, and a phonetogram of the speaking and of the singing voice was registered. A phonetically balanced text and sustained vowels were registered on a DAT recorder and used for subjective rating by experienced listeners and electroacoustic analysis. All parameters showed worsening immediately postoperatively and an improvement later compared to the preoperative value. There was no statistical difference between surgical treatment and CO_2 laser treatment.

Rogerson et al[11] gave description of use of vocal cord stripping and CO_2 laser in cats and found the postoperative voice results in laser group to be superior.

In 2000[12], Benninger also made comparison between microdissection and CO_2 laser. It was evident from the results that significant improvements were noted for perceptual analysis over time for the laser excision group as compared to microdissection group. This conclusion matched results of our study. There was no difference in duration of surgery or recovery period between laser excision and microdissection.

Sulica L[13], described opinions and practices in the treatment of benign mucosal lesions of the vocal folds. A lack of consensus was most evident in the choice of modality of treatment.

All the previous studies showed mixed type of results regarding the voice outcome after surgical removal and use of CO_2 laser. Some have used video stroboscopic examination, ultrasonography[14], voice handicap index and even histological examination of vocal cords (in a study involving cat model) for assessment of results of both therapeutic modalities.

In our study, we assessed voice quality one week postoperativelysed on patients perception of voice quality after the treatment. We have found better results for laser group. The most probable reason for this is that, the laser treated patients have minimal Reinke's space scarring and near-normal epithelial regeneration, and the surgically treated group showed marked subepithelial scarring, often involving the vocalis muscle[15].

These results demonstrate superior recovery of voice and healing in patients undergoing vocal cord epithelium removal with the CO_2 laser. As already elaborated in the introduction CO_2 laser is a much effective cutting and coagulation tool there by increasing the chances of mucosal preservation in operated cases which is essential for voice restoration. The loss of mucosa from vocalis muscle is one of the most important factor in voice rehabilitation post operatively[16].

Inferior outcomes seen in the surgically treated group may be related to difficulty in preserving Reinke's space during epithelium removal.

CONCLUSION

The research conducted has shown that CO_2 laser is a better treatment modality for vocal nodule in terms of voice quality both clinically and statistically as compared to cold surgical instruments.

There is still room for further research and multi center studies should be undertaken to validate these results.

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