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ORIGINAL ARTICLE

Outcome of management of subglottic stenosis Grade I, II (Cotton-myer Grading System) using radiofrequency coblation.

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ABSTRACT… Objective: To find the outcome of management of subglottic stenosis Grade I and II (Cotton-Mayer grading system) using radiofrequency coblation. **Study Design:** Descriptive Case study. **Setting:** Lahore General Hospital, Lahore. **Period:** 08-02-25 to 07-05-25. **Methods:** Over three months we assessed the outcomes of radiofrequency coblation in managing Grade I and II subglottic stenosis (SGS). A total of 189 patients aged 20–60 years were selected. Inclusion was based on CT and endoscopic confirmation of Grade I (0–50%) or Grade II (51–70%) SGS. Patients with prior SGS surgery, pregnancy, or significant comorbidities were excluded. Voice outcomes were assessed using the Voice Handicap Index (VHI-30), and swallowing function was evaluated using the Eating Assessment Tool (EAT-10). **Results:** Of 189 patients 53.4% were aged 41–60 years, and females made up 58.2% of the sample; Grade I stenosis was slightly more common than Grade II. Regarding treatment outcomes, only 10.6% required retreatment. The mean age was 40.22 years, with average VHI and EAT-10 scores of 19.10 and 5.12, respectively. **Conclusion:** Radiofrequency coblation is a safe and effective modality for managing Grade I and II subglottic stenosis. Radiofrequency coblation showed acceptable outcomes on voice and swallowing related quality of life. The lack of significant association between age, gender, or stenosis grade suggests consistent efficacy across patient subgroups.

Key words: Coblation, EAT-10 Score, Subglottic Stenosis, Voice Handicap Index.

INTRODUCTION

Subglottic stenosis refers to the abnormal narrowing of the airway below the glottis and is infrequently encountered in clinical practice.[1-2] The etiology of subglottic stenosis includes congenital origins, acquired conditions, and cases where no clear cause is identified, referred to as idiopathic.[3] Managing subglottic stenosis remains a surgical challenge, with the primary goal being to enlarge the airway enough to permit normal breathing. The necessity for tracheostomy and the risk of restenosis post-treatment can greatly impair a patient's quality of life.[4]

SGS can be treated surgically through endoscopic or open procedures. While endoscopic methods are often adequate for Grade I and II stenosis, higher-grade stenoses (III and IV) usually demand open surgical intervention.[5] Endoscopic treatment often includes excision of subglottic scar tissue using a carbon dioxide (CO_2) laser, though other modalities such as KTP laser, Nd:YAG laser, electrocautery, microdebrider, or radiofrequency coblation may also be employed. This is typically followed by mechanical airway dilation using bougies, endotracheal tubes, or radial-expansion balloon catheters.[2,6-7]

In endoscopic procedures for subglottic stenosis, the CO_2 laser is advantageous because it produces controlled radial incisions with minimal collateral heat damage, helping maintain viable tissue that supports re-epithelialization.[8] The challenge of managing iatrogenic subglottic stenosis with minimally invasive techniques was highlighted in a study by Cevizci and coworkers (2017).

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Their investigation focused on flexible fiber CO_2 laser surgery in a cohort where all 14 cases of stenosis were attributed to complications from intubation or tracheostomy. The severity of the cases was notable, with a majority (11/14) being classified as Myer-Cotton Grade III. Despite this, the intervention proved effective, leading to a successful decannulation rate of 71.4% over a mean follow-up of 5.2 months. These findings led the researchers to advocate for flexible fiber CO_2 laser surgery as a safe and effective primary therapeutic modality, provided that patient selection is performed judiciously.[9] CO_2 laser has been the most commonly used modality. However, there are several disadvantages of CO_2 laser including the significant procedural time to remove a large lesion, risk of airway fire, and distal seeding of the tumor.[10] Coblation represents an alternative adjuvant endoscopic technique that utilizes plasma-based radiofrequency energy. This method is characterized as a fast, safe, and minimally invasive procedure with significant hemostatic properties. Its unique ablative mechanism is suggested to have the potential to reduce disease recurrence. This technology was originally developed and first utilized within the field of orthopedics before being adapted for other surgical applications.[11] The radiofrequency coblation is now used for the treatment of a variety of otolaryngologic conditions.[10]

A research study was performed by (Shriwastav, Mariati A. et al., 2023) to analyze the benefits and results of the coblation method in airway surgeries. The study was conducted in India, where 15 patients were taken for research who had obstructed airway and breathing issues and had their voices changed. After the procedure, the issue of breathlessness was observed in eleven patients. However, the stridor issue was observed in ten and diminished oxygen level issue in eight. Moreover, approximately forty percent of the patients had grade II while twenty-seven percent had grade III subglottic stenosis. After a stay of one month in the hospital, seventy-three percent of the patients suffering from subglottic stenosis showed improvement. Considering this, it can be concluded that the coblation method is beneficial as it causes minimum blood loss, speedy healing process, and minimum chances of collateral damage. However, the only issue is regarding the cost of the procedure.[11]

Another study performed by (Gelbard, Anderson et al., 2020)[17], compared different surgical procedures on subglottic stenosis. A prospective cohort study was performed in which 810 patients were categorized into three groups and each group underwent a different surgical procedure. The surgical procedures included in this study were: endoscopic dilation, endoscopic resection with adjuvant medical therapy, and cricotracheal resection. The outcomes of the research study were analyzed using chronic obstructive pulmonary disease, voice handicap index, questionnaire, Eating Assessment Tool-10 (EAT-10), the 12-Item Short-Form Version 2 (SF-12v2), and postoperative complications. Out of 810 patients, 603 underwent endoscopic procedure, 121 underwent endoscopic resection with adjuvant medical therapy and 86 underwent cricotracheal resection. 360 days following admission, individuals receiving treatment for CTR had the highest perioperative risk in addition to most favorable results on the CCQ (0.75 points), SF-12v2 (54 points), and VHI-10 (13 points). The results reveal that endoscopic dilation procedure is the most hyped surgical procedure for the treatment of subglottic stenosis. However, it has a high recurrence rate. Moreover, cricotracheal resection procedure has less recurrence rate but has significant risk on perioperative and long-term voice outcome. Combined with medication therapy, endoscopic resection was linked to improved disease management compared to endoscopic dilation and showed little correlation with vocal functioning.[12-14]

Another study was undertaken by (Eggerstedt et al., 2021) to determine the correlation between the spirometry data and quality of life of patients with respect to voice in patients suffering from subglottic stenosis. The mean total voice-related quality of life (V-RQOL) scores was 78.41 with standard deviation of 16.45. Furthermore, the mean total of voice handicap index (VHI-10) scores was 7.51 with standard deviation of 9.11. The peak inspiratory flow (PIF) and peak

expiratory flow (PEF) were observed in relation to voice handicap index and V-RQOL surveys. The correlation of PIF was significant with V-RQOL. However, the PEF had no such link with V-RQOL and VHI. Similarly, queries associated with breathlessness were more pronounced in spirometric data. Patients with subglottic stenosis see predictable effects on their voice-related quality of life.[15]

A study was conducted by (Arslan, Demir, Krhng, & Karaduman, 2017) to determine the aspiration of neurological disorder patients using Eating Assessment Tool-10 (EAT-10). 259 patients with neurogenic issues were included who complained about difficulty in swallowing. Using EAT-10 tool and studying the video fluoroscopic swallowing, oropharyngeal dysphagia was observed. The degree of penetration and aspiration was recorded using a scale called the Penetration-Aspiration Scale (PAS). The results revealed that between patients with aspiration (PAS >5) and those without (PAS <6), the mean T-EAT-10 was 25.91 ± 10.31 (min = 1, max = 40) and 15.70 ± 10.54 (min = 0, max = 40), respectively ($P < 0.001$). Patients with EAT-10 score of more than 15 were prone to aspirate 2.4 times more than others. The sensitivity in detecting aspiration in these patients was 81% and its specificity was 58%. It can be concluded that Eating Assessment Tool-10 can be used to detect dysphagic patients.[16]

The literature on management of subglottic stenosis is limited. Therefore, current study is carried out to find out the outcome of management of subglottic stenosis using radiofrequency coblation.

METHODS

This descriptive case study was conducted at the Department of ENT, Lahore General Hospital, Lahore, over a period of three months 08-02-25 to 07-05-25. The study aimed to assess the outcome of management of subglottic stenosis (SGS) Grade I and II, as classified by the Cotton-Myer grading system, using radiofrequency coblation. The study population included patients aged 20 to 60 years presenting with SGS. Both male and female patients were eligible. A total of 189 patients were selected through non-probability consecutive sampling. The sample size was calculated with 95% confidence level, absolute precision of 0.13, and based on a mean Voice Handicap Index (VHI) score of 7.51 ± 9.11 from previous literature. Inclusion criteria comprised patients with subglottic stenosis of Grade I (0–50% obstruction) and Grade II (51–70% obstruction) as confirmed by CT scan and endoscopic evaluation. Patients were excluded if they were pregnant, had previously undergone surgical intervention for SGS, or had other significant comorbidities that could influence airway management outcomes.

Prior to data collection, ethical approval was obtained from the hospital's institutional review board (AMC/PGMI/LGH/Article/Research no./2025/ERC/49-04/07/25), and informed consent was taken from each participant. All patient data were handled with confidentiality in accordance with the Declaration of Helsinki. Each patient underwent clinical assessment and radiologic evaluation to confirm the diagnosis and determine the severity of subglottic stenosis. Demographic information, duration of symptoms, and stenosis grade, were recorded using a structured proforma developed and pre-tested by the researcher. The primary outcome was assessed one month after the intervention using two validated tools: Voice Handicap Index (VHI-30) – A 30-item questionnaire assessing the physical, emotional, and functional impact of voice disorders. Each item was scored from 0 (never) to 4 (always), with higher scores indicating more severe voice handicap. Eating Assessment Tool (EAT-10) – A 10-item self-administered scale used to evaluate dysphagia symptoms. Each item was rated from 0 (no problem) to 4 (severe problem), with a total score ≥3 indicating significant swallowing difficulty. The collected data were analyzed for quantitative variables (VHI and EAT-10 scores), mean and standard deviation were calculated. For categorical variables (stenosis grade, gender, age group), frequencies and percentages were reported.

RESULTS

The study included a total of 189 participants, as outlined in Table-I. The age distribution showed

that 46.6% (n=88) of the patients were between 20 and 40 years old, while 53.4% (n=101) were between 41 and 60 years, indicating that the majority of participants belonged to the older age bracket. In terms of gender, females represented a larger proportion, with 58.2% (n=110), compared to 41.8% (n=79) males. Regarding clinical characteristics, slightly more than half of the patients (53.4%, n=101) had Grade I subglottic stenosis, while the remaining 46.6% (n=88) had Grade II stenosis.

The mean age of participants of this study was 40.22+12.27 years. The average duration of symptoms before treatment was 6.31 weeks (±3.59), suggesting a relatively short symptomatic period before seeking medical care. The mean Vocal Handicap Index (VHI) score was 19.10 (±9.99), which reflects a moderate degree of vocal impairment among the patients. Additionally, the mean EAT-10 score, which evaluates swallowing difficulty, was 5.12 (±3.64), indicating that patients had mild to moderate dysphagia symptoms on average.

Variable	Group	Count	Percent
Age	20–40 years	88	46.6%
	41–60 years	101	53.4%
Gender	Male	79	41.8%
	Female	110	58.2%
Stenosis Grade	Grade I	101	53.4%
	Grade II	88	46.6%

Table-I. Demographic & clinical characteristics (n=189)

Variable	Mean	Std. Deviation
Age (years)	40.22	12.269
Duration of Symptoms (weeks)	6.31	3.585
VHI Score	19.10	9.990
EAT-10 Score	5.12	3.636

Table-II. Descriptive statistics of continuous variables (n=189)

DISCUSSION

This study evaluated the treatment outcomes of patients with Grade I and II subglottic stenosis (SGS) managed with radiofrequency coblation. The findings demonstrate a high treatment success rate, and favorable functional outcomes as measured by VHI-30 (mean: 19.10 ± 9.99) and EAT-10 (mean: 5.12 ± 3.64). These results highlight the effectiveness of the intervention in improving both voice and swallowing functions in patients with lower-grade SGS.

Variables		Re-treatment	
		Yes	No
Age	20–40 years	9 (45.0%)	79 (46.7%)
	41–60 years	11 (55.0%)	90 (53.3%)
Chi square test P value		0.882	
Gender	Male	8 (40.0%)	71 (42.0%)
	Female	12 (60.0%)	98 (58.0%)
Chi square test P value		0.863	
Stenosis Grade	Grade I	12 (60.0%)	89 (52.7%)
	Grade II	8 (40.0%)	80 (47.3%)
Chi square test P value		0.534	

Table-III. Treatment outcomes according to various effect modifiers (n=189)

Radiofrequency coblation in particular showed promising clinical outcomes. This aligns with the findings of Li et al. (2024)[20], who reported successful symptom relief without complications in 32 patients treated with bronchoscopy-guided coblation for benign central airway stenosis. Their observation of minimal intraoperative complications supports the safety profile we observed, and their molecular findings lend further biological plausibility to coblation's effectiveness.

The outcomes in our study are also consistent with those of Prgomet et al. (2023)[21], who reported an 84.8% decannulation rate and significant improvements in voice and swallowing scores post-treatment in SGS patients. Although they included higher stenosis grades and both endoscopic and open procedures, their use of VHI and EAT-10 scores validates our methodological approach. Our slightly higher VHI and EAT-10 scores could reflect more pronounced symptoms at presentation or anatomical differences in lesion characteristics.

Further support comes from Shriwastav et al. (2023)[18], who noted clinical improvement in 73% of patients treated with coblation, especially in

Grade II stenosis. Their emphasis on reduced thermal damage, minimal bleeding, and rapid recovery was echoed in our observational experience, especially when comparing coblation to CO_2 laser, which although precise, sometimes posed challenges in terms of operative time and tissue healing.

The large multicenter cohort by Gelbard et al. (2020)[17] emphasizes that while cricotracheal resection offers definitive disease control, it is often accompanied by higher perioperative risk. Their findings advocate for individualized treatment based on stenosis severity and patient factors. Our inclusion of only Grade I and II lesions supports this rationale, and the favorable outcomes with coblation suggest that minimally invasive techniques may be sufficient for managing lower-grade disease.

Patient-reported outcome measures such as the VHI and EAT-10 are increasingly being used in SGS studies. For instance, Eggerstedt et al. (2021) linked these scores to objective pulmonary function, reinforcing their relevance in assessing functional recovery. Although their mean VHI-10 score was lower than ours, this could be due to differences in baseline impairment. Similarly, Arslan et al. (2017)[16] validated the EAT-10 score's ability to detect aspiration risk, though our mean score of 5.12 suggests that most patients had only mild dysphagia, likely related to post-treatment edema or glottic proximity.

Demographically, our study population was predominantly female (58.2%) and in the 41–60 year age range (53.4%). These trends mirror those reported in earlier SGS literature, including studies by Prgomet et al[21] and Gelbard et al[17] which also observed female predominance in benign SGS. Importantly, age, gender, and stenosis grade were not significantly associated with retreatment rates in our analysis (p-values > 0.05 for all), suggesting that these demographic variables did not impact treatment efficacy within our cohort.

Moreover, coblation was noted to have advantages such as minimal bleeding, reduced collateral damage, and shorter operative times, especially in soft, less fibrotic stenosis. This is in line with findings by Shriwastav et al18 who favored coblation for its healing profile.

CONCLUSION

This study supports the use of radiofrequency coblation as a safe and effective modality for the treatment of Grade I and II subglottic stenosis. With favorable functional outcomes reflected by VHI and EAT-10 scores, coblation offers a promising minimally invasive alternative for selected patients. Demographic variables such as age, gender, and stenosis grade did not significantly influence the need for retreatment. Future randomized studies are needed to more precisely evaluate the relative benefits of coblation, particularly in more complex or higher-grade lesions.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Muhammad Salman Aslam:** Sampling, writing.
2	**Aamer Ayub Awan:** Help in writing.
3	**Tahir Rashid:** Help in writing.
4	**Maqsood Ahmed:** Data collection.
5	**Waseem Amin:** Proof reading.
6	**Izza Tariq:** Analysis