

Diagnosis, Management and Repair of Tracheal Stenosis

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ABSTRACT

Background: Tracheal stenosis is the obstruction of airway and need a proper diagnosis, management and treatment approach.

Objective: To diagnose manage and repair tracheal stenosis.

Study Design: Comparative analytical study

Place and Duration of Study: Department of Thoracic Surgery, Sandeman Provincial Hospital Quetta from 1st July 2020 to 30th June 2021.

Methodology: Forty seven patients were divided into two groups for management and repair of tracheal stenosis. After informed consent patients were underwent various procedure depending upon their diagnosis and comorbidity presentation. Their demography and other related information were entered in well-structured questionnaire. Data was analyzed by SPSS tool using t test and chi square.

Results: The mean age of patients was 49.5±2.99 years. There were 57.4% of males in the study. Twenty five cases under went bronchoscopic procedure while surgical repair was conducted on 22 cases. The success rate of surgical procedure was far more evident than bronchoscopic.

Conclusion: Multidisciplinary approach is required in management and repair of tracheal stenosis related to clinical history and diagnosis.

Key words: Tracheal stenosis, bronchoscopy, tracheal repair

INTRODUCTION

Tracheal stenosis is a critical condition of trachea causing obstruction of the air way pipe. The incidence of tracheal stenosis has decreased with modern knowledge about its aetiology and modified management design and techniques. However it is still the most commonly indicated problem associated with requirement of tracheal surgery.¹ The larynx anatomy and guidance of oxygen through trachea involves single lumen being opened into two separate bronchial system having bronchioles branching ending into alveoli. The injury or occlusion to trachea progresses into asphyxia within minutes enforcing the surgeon to treat this condition immediately.²

There is a high need of urgent clinical diagnosis of tracheal stenosis through computer topographic (CT) scanning, bronchoscope diagnosis which have ascended significance in proper evaluation before treatment.³ Tracheal stenosis can be caused by various diseases or agents such as tuberculosis, viral infections, tumours or carcinoma. The management and treatment plan wholly depend on the condition which initiated its formation. Initial management involves bronchoscope dilation or stenting, fiberoptic-assisted balloon dilatation, argon plasma coagulation, percutaneous dilatation and laser therapy without or in addition to stenting.⁴ In few emergent scenarios immediate tracheostomy is a strategy for patient's management in critical hypoxic situation. Poor management can lead into subsequent complication during the procedure. In severe cases surgical approaches as prime resection, anastomosis as well as other procedures like of tracheoplasty should be opted for better outcomes.⁵⁻⁶

In case of children and infants the management of tracheal stenosis involves more difficult treatment due to high risk of life-threatening anomalies and cardiopathy.⁷ Rib cartilage tracheoplasty, resection and end-to-end

anastomosis, pericardial patch anterior tracheoplasty, tracheal homograft in addition to autograft of free-tracheal are some of the techniques applies post diagnosis in infants.⁸⁻¹⁰

The present study was designed to compare the outcomes and analyze the treatment plans needed for tracheal stenosis repair.

MATERIALS AND METHODS

It was a comparative analytical study conducted at Department of Thoracic Surgery, Sandeman Provincial Hospital Quetta from 1st July 2020 to 30th June 2021. The demographic information, concomitant/associated diseases, feature of stenosis sight, related complications and medical/clinical history were included. A total of 47 cases were enrolled after taking informed consent. They were divided into two groups. Group 1 was bronchoscopic group while Group 2 was surgical group. Diagnosis was made either through CT scan which was conducted in non-emergent cases or through flexible bronchoscopy (FB) as well as rigid bronchoscopy (RB) examined under general anesthesia. Localization data, length of stenosis and type/degree (cotton Myer 4-degree classification) were documented. Four grades classification system of Cotton-Myer. Rigid bronchoscopy dilated the stenotic area with sectioning of mucosa at 11 and 1 O'clock levels using a diode laser with 4–25 W pulse and wavelength of 980nm, cryotherapy using rigid or else-wise flexible probes was performed. Those patients requiring stenting went under silicon or self-expanding metallic covering stents. Stenosis features examined under bronchoscopy included presence of segment of stenosis greater than 1cm or not, cartilage involvement and inflammation defining the complexity of TS. Post diagnosis treatment was planned into 4 categories. (A) simple stenosis by dilation through

bronchoscopy. (B) Surgical repair in complex healthy cases with >1cm segment. (C) Poor health, malaise, segment < 1cm and non-complex underwent bronchoscopy followed by stenting. (D) Complex TS and >1-2 cm, without malaise, complete achievement of airway was dilated with bronchoscopy and did not undergo stent placement. During surgical procedure if there was a tracheotomy stoma present then it was excised including stenosis segment. After distal airway ventilation and traction sutures; the patient was intubated as per requirement. Flexion manoeuvres were performed, as well as cervical flexion in addition to anterior cervical mediastinal enlistment was conducted in all patients. Tracheal membranous surface was continuously sutured. Statistical analyses were conducted by SPSS version 24.0 using t test and chi square test was applied. P<0.05 was considered significant.

RESULTS

The age of patients was between 19-65 years with mean age was 49.5±2.99 years. The gender distribution showed 57.4% of total cases to be males. Out of the total TS cases bronchoscopic management was performed in 53.2% while surgical treatment was given to 46.8% of the cases (Table 1).

Majority were suffering from hypertension with 34.04% such cases followed by 27.7% diabetics and 17.02% of those patients suffering from ischemia. On basis of diagnosis and clinical presentation of co-morbidities, those patients who were suffering from hypertension, chronic obstructive pulmonary disease, malignancy, heart failure or renal insufficiency were preferred for bronchoscope management treatment (Table 2).

In addition to the treatment given within two defined groups the obstruction ratio was noticed to be presented insignificantly. The flexible and rigid bronchoscopy number was significantly varied between the two groups (Table 3).

The rate of failure with bronchoscopic technique was significantly higher than surgical treatment with 20% to 4.5% ratio respectively. The success of surgical procedure was also 90.9% which was much higher than bronchoscopic procedure (Fig. 1).

Table 1: Demographic representation within tracheal stenosis groups (n=47)

Variable	Bronchoscope (n=25)	Surgical (n=22)	P value
Age (years)	55.86±3.6	41.05±14.6	0.02
Male	14 (51.8%)	13 (48.1%)	0.49
Presentation time (days)	93.95±19.8	55±12.51	0.79

Table 2: Clinical characteristics of TS patients

Variable	Bronchoscope (n=25)	Surgical (n=22)	P value
Diabetes mellitus (n=13)	10	3	0.002
Hypertension (n=16)	12	4	0.01
Chronic obstructive pulmonary disease (n=7)	6	1	0.02
Chronic heart failure (n=5)	5	-	0.039
Ischemic heart disease (n=8)	6	2	0.10
Renal insufficiency (n=6)	6	-	0.04
Cerebrovascular disease (n=5)	3	2	0.58
Steroid use (n=4)	2	2	0.89
Malignancy history (n=6)	5	1	0.04

Table 3: Distribution of procedural factors with treatment groups

Variable	Bronchoscope (n = 25)	Surgical (n = 22)	p value
FB number	3±9.5	1±5.5	0.022
RB number	3±6.6	2±6.1	0.031
Obstruction ratio	79±3.0	80±9.1	0.432
Segmental length	2.1±0.32	1.99±0.79	0.561
Malaise (%)	7(28)	2 (9.09)	0.04
Distance to vocal cords	2.80±0.32 (1–6.5)	3.61±1.95 (2–9)	0.13
Cryotherapy (%)	8 (32)	2 (9.09) [†]	0.06
Diode laser (%)	1 (4)	1 (4.5)	0.891
Dilatation number	2.1±0.36	1.59±0.22	0.432

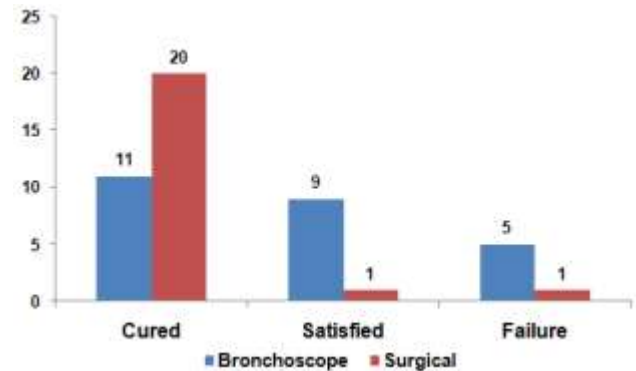


Fig 1: Cure versus failure rate between two groups

DISCUSSION

Tracheal stenosis is a critical, life threatening condition presented in infants, children and adults of all ages.¹¹ The mean age of admitted patients in current study was 49.5±2.99 years. A nine year retrospective research elaborated that majority of the TS patients were between age less than 65 years.¹² This age seems to be more prevalent to traumatic or idiopathic cause of tracheal stenosis.¹³

More men are prevalent for tracheal stenosis than females in adult ages.¹⁴⁻¹⁵ among the gold standard considered procedure for TS surgical repair is considered the primary resection procedure. However it could not be performed on patients suffering from cardiovascular, ischemic or diabetic conditions.¹⁶ The present study reported majority of patients with co morbidities leaving them best opted choice as bronchoscope treatment. In treating TS multidisciplinary approach is very important for better outcomes and management.^{17,18}

Complications related to stent have a high ratio. The frequency of progression of granulation tissue is around 33% in all stented cases with 30-43% of patients which develops mucostasis.¹⁹⁻²⁰

CONCLUSION

A multidisciplinary approach for treatment of tracheal stenosis is required with surgical procedure being significantly more successful.

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