



**ORIGINAL RESEARCH PAPER**

**Otorhinolaryngology**

**ANALYSIS OF STRIDOR IN PATIENTS AND IMPACT OF EMERGENCY TRACHEOSTOMY**

**KEY WORDS:** Arterial Blood Gas, Tracheostomy, Stridor

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**ABSTRACT**

**Aim:** To analyze the various indications of emergency tracheostomy in patients presenting with Stridor. Detection of Acid-Base disorders using Arterial Blood Gas (ABG) in patients with upper airway obstruction. Its Relevance to morbidity and mortality. Impact of tracheostomy on improvement in Acid-Base Status and ventilatory status of the patient. **Materials And Methods:** This study was designed as a prospective cohort study of 50 patients who attended the OPD and casualty at the Department of Otorhinolaryngology in a tertiary care hospital. Thorough History, clinical examination, and relevant investigations were carried out. Arterial Blood gases were collected before tracheostomy, 12 hours, and 24 hours post-procedure. Stridor was graded as mild, moderate, and severe based on the clinical grading of stridor given by Davis and Gartner. **Results:** In the present study, stridor was found to be more common in males when compared to females, age groups commonly affected were the 6th and 7th decade. Most of the patients presented with malignancy 44 (88%), whereas only a small proportion of patients presented with non-malignant causes 6(12%). Tobacco use, alcohol abuse, and pan use were the risk factors present in the patients in this study. The commonest Acid-base disturbance in this study group was an acute primary, uncompensated Respiratory acidosis of mild to moderate severity. Based on the clinical grading of Stridor, 10(20%) patients had mild Stridor, 11(22%) had moderate Stridor, and 29(58%) had severe Stridor. Based on ABG categorization, 44(88%) patients were in respiratory failure at the time of presentation in our institute, 4(8%) were in impending failure, and 1(2%) patient showed no evidence of failure. **Conclusion:** Clinical assessment of Stridor can be occasionally misleading and can lead to a delay in the timing of tracheostomy or intubation. Respiratory failure, if allowed to progress will eventually lead to circulatory failure. Thus, the ABG analysis used in this study provided valuable information about the acid-base imbalance and respiratory status of the patient helping in the intervention.

**INTRODUCTION:**

Stridor is an audible respiratory noise derived from turbulent airflow due to narrowing or obstruction of the airway in the larynx, trachea, or bronchi. It is classically a harsh sound, which can vary in quality from a squeak to a whistling noise. Stridor may be characteristic of a particular pathology but is never diagnostic[1].

Stridor is an alarming symptom that is worrisome for the patient as well as the patient's relatives. It is life-threatening most of the time unless timely intervention is available.

Rapid onset Acute airway obstruction is commonly encountered in children as well as adults.

The history and examination, whilst suggestive, are rarely sufficient for a firm diagnosis. In such cases, Analysis of blood gases in these patients would thus be a valuable objective parameter for deciding the line of management. Thus pH, PO<sub>2</sub>, and PCO<sub>2</sub> values were analysed. In our series, we attempted to study the significance of ABG estimation in patients presenting with stridor and undergoing emergency tracheostomy.

**MATERIALS AND METHODS**

This study was designed as a prospective cohort study of 50 patients presenting with stridor including children as well as adults in the Department of ENT at our institute. After approval from ethical committee and informed consent from the patient, all patients attending the ENT outpatient department and casualty with Stridor due to upper airway obstruction and Emergency tracheostomy was deemed to be the treatment of choice were drafted in the study. Patients with uncorrectable bleeding disorders, insufficient collaterals in palmar arch, chronic obstructive airway disease, asthma, interstitial lung disease, Systemic conditions causing acidosis like renal failure, diabetic ketoacidosis, starvation ketosis, and patients on diuretic therapy were excluded. Patients whose pre-operative ABG when analyzed revealed a mixed type of acid-base disorder indicating the additional presence of

metabolic component were excluded.

All the patients had acute airway obstruction with significant respiratory distress, therefore the history, examination, and initial resuscitation took place simultaneously. All the necessary clinical, laboratory, and radiographic investigations were done. All patient data were recorded. The stridor was categorized based on the classification given by Davis and Gartner into mild, moderate, and severe. [2] Table 1

The patient's management was based on the etiology of stridor. Tracheostomy and medical care were the treatment modalities instituted. The decision to do a tracheostomy was based on clinical assessment and ABG values. When there was a discrepancy in blood gas values, pH was used for assessing respiratory status.

The potential etiology of obstruction was categorized as Oncological and Non- oncological Associated co-morbidities were noticed and recorded. Analysis was done in all cases at the time of presentation and after treatment.

Samples collected from the radial artery and analyzed. Informed consent was obtained from patients and family members before procedure.

The various indications of emergency tracheostomy in patients presenting with Stridor, the impact of the disease process on the patient's ABG values, and the effect of tracheostomy on ABG changes were documented and statistically analyzed. t value, p values were derived, and the statistical significance of data was interpreted

**RESULTS:**

The patients included 50 adults with a mean age of 54.2 years at the time of diagnosis. 45 out of the 50 were males, and the remaining 5 were females.

	MILD	MODERATE	SEVERE

COLOR	Normal	Normal	Pale/ dusky/ cyanotic
CHEST RETRACTIONS	Absent/mild	Moderate	Severe using accessory muscles
AIR ENTRY	Mild decrease	Moderate decrease	Severe decrease
STATE OF CONSCIOUSNESS	Normal	Anxious, restless	Lethargic, depressed

Based on the clinical grading of Stridor, 10(20%) patients had mild Stridor, 11(22%) had moderate Stridor, and 29(58%) had severe Stridor.

The pH, PO<sub>2</sub>, and PCO<sub>2</sub> values at the time of presentation and after intervention in the study are given in Table 2. Based on ABC categorization, 44(88%) patients were in respiratory failure at the time of presentation in our institute, 4(8%) were in impending failure, and 1(2%) patient showed no evidence of failure. Malignancy accounted for 44 cases (88%) of upper airway obstruction leading to the need for an awake tracheostomy. The remaining 6 cases (12%) had non-malignant etiologies. The most common type of malignancy was squamous cell carcinoma (n=44). The most common site of malignancy was the hypopharynx(n=23,46%) followed by supraglottis (n=11,22%), Glottis (n=7,14%), and subglottis (n=2,2%).

**TABLE 2**

PH	PRE-OP	IMMEDIATE POST-OP	12HRS POST-OP	24 HOURS POST OP
SEVERE ACIDOSIS<7.30	14(28%)	2(4%)	0	0
MILD ACIDOSIS 7.31 TO 7.35	31(62%)	15(30%)	0	0
NORMAL ABG 7.36 TO 7.45	5(10%)	33(66%)	50(100%)	50(100%)
STATISTICAL SIGNIFICANCE	-	Highly significant	Highly significant	Highly significant
PO <sub>2</sub>	PRE-OP	IMMEDIATE POST-OP	12HRS POST-OP	24 HOURS POST-OP
MODERATE HYPOXAEMIA <80MM HG	50(100%)	20(40%)	2(4%)	0
MILD HYPOXAEMIA 80 - 90MM HG	0	30(60%)	16(32%)	5(10%)
NORMOXIA >90MM HG	0	0	32(64%)	45(90%)
STATISTICAL SIGNIFICANCE	-	Highly significant	Highly significant	Highly significant
PCO <sub>2</sub>	PRE-OP	IMMEDIATE POST-OP	12HRS POST-OP	24 HOURS POST-OP
HYPOCARBIA <35MM HG	0	0	2(4%)	2(4%)
NORMOCARBIA 36-44 MM HG	0	11(22%)	36(72%)	46(92%)
HYPERCARBIA ≥45MM HG	50(100%)	39(78%)	12(24%)	2(4%)
STATISTICAL SIGNIFICANCE	-	Highly significant	Highly significant	Highly significant

The period of follow-up was two years. Overall, of the malignant disease, no patients were decannulated of their tracheostomy tubes at the end of 2 years. Five patients had poor follow-up in our clinic, so their final disposition could not be ascertained, and two died of the disease in hospice.

**Table 3: ETIOLOGY OF STRIDOR**

S.No	DIAGNOSIS	No of Cases	%
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1	Glottic growth	7	14%
2	Supraglottic Growth	11	22%
3	Sub Glottic Growth	2	4%
4	Hypopharyngeal Growth	24	48%
5	Others		
	BILATERAL ABDUCTOR PALSY	2	4%
	FRACTURE MANDIBLE	1	2%
	JUVENILE LARYNGEAL PAPPILLOMATOSIS	2	4%
	LEFT AE FOLD CYST	1	2%
	Total	6	12%

The remaining 37 patients with malignancy had ongoing tracheostomy requirements because of post-radiation edema, the need for secretion management, or failure to tolerate capping.

Of the patients with the non-malignant disease, 2 of 6 (33.33%) patients were successfully decannulated of their tracheostomy tube. The remaining patients (n=4, 66.66%) had ongoing use of their tracheostomy tubes at 6-month follow-up.

**DISCUSSION:**

The finding of 44 patients with respiratory failure and four patients going for impending failure sharply contrasts with the clinical findings. Of these 48 patients (44+4), 10 were classified as having mild Stridor. This shows that clinical assessment can be occasionally misleading and can lead to a delay in the timing of tracheostomy or intubation. Respiratory failure, if unattended may progress to circulatory collapse. Thus, the ABG analysis used in our study provided valuable information about the acid-base disorder and respiratory status of the patient helping in early intervention.

Pre-tracheostomy ABG shows 14 patients had severe respiratory acidosis. The majority of the patients (31/50) had mild uncompensated respiratory acidosis. Five patients had normal PH. Within 12 hours of tracheostomy, all patients had normalization in their pH value. The difference between pH before and after tracheostomy was statistically significant. In the study by Panduranga et al (2010)[3] before intervention 65% of patients(n=47) had pH in the range of 7.4 to 7.3 which after the intervention was 90.28% (n=65), 18.05% (n=13) patients had pH in the range of 7.3-7.2 which after the intervention was 2.78%(n=2) and 16.67%(n=12) had pH <7.2 Which after the intervention was 6.94% (n=5) which is comparable to the observation in this study.

Pre-tracheostomy ABG shows moderate to severe hypoxemia in all the patients. Acute airway obstruction produces severe hypoxemia, which can be life-threatening if not treated urgently. Tracheostomy provided relief from hypoxemia in 32(64%) of patients. Over 12 hours, immediate but limited improvement occurred in 30/50 (60%) immediately after tracheostomy. 45/50 (90%) achieved normoxia within 24 hours after the performance of tracheostomy. The changes among the postop values over preop values were statistically significant.

In the study by Panduranga et al (2010)[3] before intervention 8.33% of patients (n=6) had pO<sub>2</sub> in <60 mmHg which after the intervention was 5.55% (n=5), 33.33% (n=24) patients had pO<sub>2</sub> in the range of 60-70 mmHg which after the intervention was 4.17%(n=3) and 61.11% (n=44) had pO<sub>2</sub> >70 mm Hg Which after the intervention was 88.89% (n=64) which is similar to the observation in this study.

Pre-tracheostomy ABG shows hypercarbia in 100% of patients before tracheostomy. This is a type II respiratory failure. This leads to alveolar hypoventilation and retention of Carbon dioxide producing hypercarbia and acidosis. After tracheostomy, CO<sub>2</sub> values normalized within a period of 12 to 24 hours in the majority of the patients. 72% reached normocarbica within 12 hours, and 92% required 24 hours for

normalization of CO<sub>2</sub> values.

In the study by Panduranga et al (2010)[3] before the intervention, 8.33% of patients (n=6) had pCO<sub>2</sub> in >49 mmHg which after the intervention was 6.94% (n=5), 29.17% (n=5) patients had pCO<sub>2</sub> in the range of 45-49 mmHg which after the intervention was 6.94% (n=5) and 62.5% (n=45) had pCO<sub>2</sub> in the range of 40-45 mm Hg Which after the intervention was 86.11% (n=62) ) which is comparable to the observation in this study.

The patient showing normal serum bicarbonate denotes the initiation but not the completion of compensation. The compensation to primary respiratory acidosis by the renal mechanism which involves increased conservation and production of HCO<sup>3-</sup> ion. Analysis of bicarbonate values is critical for this study because it rules out acidosis due to metabolic disorders, where HCO<sub>3</sub> - values are grossly within the normal range. It also rules out acid-base disorders due to both respiratory and metabolic components that can co-exist in the patient., in most cases, the respiratory acidosis is acute, and hence no compensation has occurred. The presence of malignancy demonstrates a high risk for ongoing tracheostomy status compared with non-malignancy in this population These observations were similar to studies done by Altman et al. (2005)[5]., Fang et al. (2015)[4]., by Liliana Costa et al. (2016)[6]., and Yuen et al. (2007)[7]. Low pH, low PO<sub>2</sub>, and high PCO<sub>2</sub> were associated with a poor clinical outcome [3].

In this study population was divided into two groups comprised of patients with and without Head and Neck oncologic diseases (88% vs. 12% respectively). The latter group included a variety of indications: bilateral vocal cord paralysis, Trauma, Juvenile laryngeal papillomatosis, and AE fold cyst. The two groups differed significantly in patients' age, 58.45 ± 11.08 years for the oncologic patients and 23.33 ± 18.03 years for the nononcologic patients; p = 0. 013. The postoperative complications rate was not significantly different between the two groups.

**CONCLUSION:**

Arterial blood gas analysis if employed can detect underlying Acid-base disorders in patients presenting with stridor planned for tracheostomy. It prevents unnecessary delays in the management of patients. ABG along with clinical assessment may be carried out in all patients planned for emergency airway procedures.

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