MINITRACHEOSTOMY IN VENTILATORY INSUFFICIENCY

Lt Col AK MEHTA *, Surg Cmde VK SINGH VSM †

ABSTRACT

Sputum retention is a very common problem in comatose and postoperative patients. The biochemical changes of hypoxia and hypercarbia associated with it ultimately lead to respiratory failure. Tracheobronchial toilet can be achieved by various methods all of which have their disadvantages. Minitracheostomy has been suggested as the best available method for tracheobronchial toilet. Nineteen patients in our series underwent minitracheostomy for tracheobronchial toilet. Fifteen patients showed full recovery. The oxygen saturation improved from 85.47% to 98.53%. There were very few complications and the procedure was comfortable and acceptable to patients.

MJAFI 1999; 55 : 217-219

KEYWORDS: Minitracheostomy; Tracheobronchial toilet.

Introduction

Ventilatory insufficiency can result from retention of tracheobronchial secretions. Sputum retention occurs whenever a patient is incapable of adequately clearing his own tracheobronchial secretions. Diagnosis of this condition is essentially clinical and is based on evidence of respiratory distress with rapid shallow respiration leading to hypoxia with a reduced level of consciousness and further exacerbation of the condition.

Traditionally there are four ways of achieving tracheobronchial toilet- tracheal suction, endotracheal intubation, bronchoscopy and tracheostomy. All these methods have their drawbacks. Minitracheostomy has been suggested by some authors as an elective method in the treatment of sputum retention [1]. A minitracheostomy is a small cannula placed through the cricothyroid membrane that allows permanent access to the tracheal lumen and can be used for evacuation of bronchial secretions while avoiding the disadvantages of other methods of tracheobronchial toilet [2].

A study was undertaken by us with an aim to:-

- (a) Evaluate the utility of minitracheostomy in ventilatory insufficiency.
- (b) To objectively assess the efficacy of minitracheostomy in improving arterial oxygen saturation.
- (c) To study the incidence of complications that result from minitracheostomy.

Material and Methods

The study was carried out in a teaching hospital. Nineteen patients with features of ventilatory insufficiency were included in the study. Cases below 12 yrs

of age and those with obscure laryngeal anatomy were excluded from the study. These patients were subjected to detailed clinical examination. This included:-

- (a) Detailed history and a thorough general examination especially to look for cyanosis, stridor, respiratory and pulse rate.
- (b) Complete ENT examination.
- (c) Routine haematological and radiological investigation like X-ray neck/X-ray chest.
- (d) Specific investigations depending upon the cause.
- (e) Minitracheostomy was done using Minitrach-II Kit (Standard) (Fig-1) or Seldinger Minitrach II kit.
- (f) Oxygen saturation levels were recorded both before and after minitracheostomy.
- (g) Patients not improving with minitracheostomy were subjected to tracheostomy.
- (h) Patients were followed up by regular review in immediate postoperative period and subsequent hospital stay well as after 3 months to assess for any delayed complications.

Observations and Results

Nineteen patients suffering from ventilatory insufficiency secondary to systemic diseases or trauma underwent minitracheostomy. The following observations were made:

- (a) *Age and Sex Distribution* : The mean age was 56.6 yrs ranging from 41 to 70 yrs. 85% were males (n-16) and 16% were females (n-3) (Table 1).
- (b) *Diagnosis*: The patients who underwent minitracheostomy were suffering from various pathologies depicted in Table 2.
- (c) *Arterial Oxygen Saturation Levels* : The arterial oxygen saturation levels in pre and post minitracheostomy period were as shown in Table 3. The mean SaO₂ before minitracheostomy was 85.47% and after performing minitracheostomy was 98.53%.
- (d) *Duration of Cannulation* : The duration for which minitracheostomy was retained is depicted in Table 4. The mean duration was 13.9 days with range of 8-26 days.
- (e) *Conversion to Tracheostomy* : Three of the nineteen patients

* Classified Specialist (ENT) & President SMB, C/O Military Hospital, Bhopal, † Consultant Professor & Head, Department of ENT, Armed Forces Medical College, Pune 411 040.

Fig. 1 : Standard mini trach II kit

TABLE I
Age and sex distribution of cases

Age in years	Number of Males	Number of Females
41-50 yrs	04	—
51-60 yrs	10	02
61-70 yrs	02	01
Total	16	03

on minitracheostomy cannulation had to be converted to standard tracheostomy for mechanical ventilatory support.

- (f) **Complications** : Few complications like surgical emphysema, haemorrhage and displacement of cannula were encountered. All these complications occurred with portex minitrach II kit. No complication occurred with Seldinger technique for mini-

TABLE 2
Diagnosis

Diagnosis	Number of cases
Hypertension with intracranial haemorrhage	07
Vertebrobasilar Stroke	02
Intracranial space occupying lesion	02
Cor Pulmonale	02
COPD with Pneumonia	01
Postoperative sarcoma sternum	01
Postoperative carcinoma Gall bladder	01
Postoperative cervical Discectomy	01
Head injury	01
Accidental Chest Trauma	01

TABLE 3
Saturation of arterial oxygen

S. No.	SaO2% before Minitracheostomy	SaO2% After Minitracheostomy
X1	84	98
X2	85	98
X3	89	99
X4	89	99
X5	84	98
X6	80	98
X7	88	99
X8	87	99
X9	84	99
X10	85	99
X11	84	99
X12	84	99
X13	85	99
X14	83	99
X15	85	99
X16	85	99
X17	88	98
X18	87	98
X19	88	96

TABLE 4
Duration of cannulation

Duration in days	Number of cases
0-5	0
6-10	3
11-15	11
16-20	2
21-25	2
26-30	1

tracheostomy.

Discussion

The routine methods of tracheobronchial toilet are the following. All these methods suffer from numer-

ous disadvantages:-

(a) *Tracheal Suction* : This is a blind method and hence may be successful, evacuation of secretions may be incomplete and the procedure cannot be repeated frequently.

(b) *Endotracheal Intubation* : Provides ready access to the trachea but results in loss of voice and cough and is very uncomfortable in conscious patients.

(c) *Bronchoscopy* : Cannot be repeated at short intervals and sedation if required results in respiratory depression.

(d) *Tracheostomy* : Abolishes voice and cough and has a significant incidence of infection and tracheal injury.

In the present study nineteen patients suffering from diseases involving the central nervous system, cardiovascular system, trauma and post operative cases having acute or chronic respiratory insufficiency underwent minitracheostomy for tracheobronchial toilet. The mean age was 56.6 yrs. 84% were males and 16% were females.

Fifteen of the nineteen patient (63.2%) showed full recovery. Mechanical ventilatory support was required for 3 patients who suffered respiratory failure despite their minitracheostomy and had to be converted to standard tracheostomy. One of the patients died later because of septicaemia.

These results are in accordance with the findings of Mathews and Hopkins [1] who showed complete recovery in 14 of their 15 patients. Similar results were reported by Albertario and Mapelli [3] 68% of their patients benefited by minitracheostomy. The mean saturation of arterial oxygen before subjecting the patients to minitracheostomy was 85.47% and after minitracheostomy it improved significantly to 98.53%.

Similar findings were obtained by Pederson et al [4] who showed a significant increase in PaO₂ whereas PaCO₂ remained unchanged. Andriveti et al [5] showed an increase of saturation of arterial oxygen from 79.7% to 93.7% after three hours of starting intratracheal oxygen through minitracheostomy. The mean duration of cannulation was 13.9 days with a

range of 8 to 26 days. Similar results were noted by Balkan [6], however their maximum duration of cannulation was upto 42 days. Decannulation of minitracheostomy was simple and without complications and the small wound in the neck healed spontaneously in a few days.

Only three patients developed complications, one had surgical emphysema in immediate postoperative period which improved after two days. In another the cannula was misplaced in pretracheal space and had to be reinserted. The third patient who had haemorrhage while inserting the cannula required exploration of cricothyroid space to control bleeding. No complications occurred during the follow up period and no patient noticed any change in voice. Thus from this study it can be safely concluded that:-

(i) Minitracheostomy provides fast, atraumatic access to the airway.

(ii) It preserves the functions of the glottis. The patients can eat, speak, cough and humidify inspired air.

(iii) Minitracheostomy is effective in tracheo bronchial toilet and results in significant improvement in saturation of arterial oxygenation.

(iv) It has few complications during surgery and in postoperative period.

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