

Complications of emergency and elective tracheostomy: a retrospective study of 150 consecutive cases

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The complications associated with 150 consecutive tracheostomies in adults were reviewed. A standard technique was used in all but five operations. The number and type of complications were compared between emergency and elective cases and between local and general anaesthetic cases. Only minor complications were observed. No deaths occurred attributable to the tracheostomy and there were no cases of symptomatic tracheal stenosis. Persistent tracheocutaneous fistulae occurred in five cases, of which four had been *in situ* for over 6 months, three had a previous tracheostomy and one had received radiotherapy to the region. Two unsightly scars required revision. The authors recommend the use of a simple standard technique with the insertion of a 'rescue' suture. Close postoperative supervision by nursing staff specially trained in the care of tracheostomies is of paramount importance in avoiding hypoxic complications secondary to displacement of the tracheostomy tube. Recent moves away from tracheostomy should only continue if the alternatives prove to have an even lower complication rate.

There are several indications for performing tracheostomy: to relieve upper airway obstruction, to facilitate prolonged intubation, to allow staged extubation by reducing the anatomical dead space, and to protect and

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give access to the tracheobronchial tree (1). Orotracheal or nasotracheal intubation and cricothyrotomy may be alternatives to or precede tracheostomy (2). It has been argued that these alternative procedures may be associated with fewer complications than a standard tracheostomy (3). There are few comparisons of the mortality and morbidity in adults of tracheostomy performed in the elective and emergency situation. We have studied the complications in 150 consecutive tracheostomies performed in one unit over a 7-year period. Particular attention is given to the frequency and type of complication, to the indications for tracheostomy, to the type of anaesthesia, and to the surgical technique involved.

Patients and methods

A series of 150 consecutive patients who had tracheostomy performed were identified from operating theatre record books. All operations were performed by members of St Mary's Hospital ENT unit. No tracheostomies were performed at the bedside. Only patients aged 16 years and over at the time of surgery were included in the study group. Complications were identified from the medical and nursing records. Sixty-two patients were traced and reviewed in an outpatient clinic for the purposes of this study. The minimum follow-up period was 6 months.

The tracheostomies were performed using a standard technique, with occasional minor modifications (any modifications in technique were noted and results were

compared separately with the standard group). They were performed through a transverse skin crease incision. The strap muscles were separated in the midline. The thyroid isthmus was always divided between clamps and suture-ligated if it lay below the second tracheal ring. A small tracheal window was excised at the level of the third or fourth tracheal ring. A stout silk suture was placed through the tracheal ring forming the inferior margin of the tracheostomy, or around it if calcified, and this was then taped to the anterior chest wall. Gentle traction on this 'rescue' suture was used to facilitate the first tube change by stabilising the opening in the trachea. A cuffed Portex® tracheostomy tube was used in all cases; latterly these were all of the low pressure Profile type. The tracheostomy tube flanges were held in place using silk sutures and retained also by tapes passed around the neck. Apart from those requiring ventilatory support or the protection of the lower airways from an incompetent larynx, the tracheostomy tube was changed on the 3rd postoperative day to a silver Negus pattern tube.

All patients received constant humidification of their inspired air and regular tracheobronchial suction using a fine sterile catheter during the early postoperative period. This care was administered by ward nursing staff trained in tracheostomy care. Patients were only managed on an intensive care unit postoperatively if the patient's general condition required it or if ventilatory support was necessary.

When the tracheostomy was no longer required, the tube was occluded for 24 h to confirm the adequacy of the laryngeal airway. The tube was then removed and an airtight dressing applied. Operative closure was only used in the case of persistent tracheocutaneous fistula.

Results

Of the 150 tracheostomies, 112 (74.7%) were elective and 38 (25.3%) were emergencies. A breakdown of the indications is given in Table I. General endotracheal anaesthesia was used in 97 (88.3%) of the elective cases and 18 (48%) of the emergencies. The tracheal window was fashioned at the level of the third or fourth tracheal ring in 146 (97.3%) of cases. In the other four cases (2.6%) a vertical slit was made in the trachea; of these, three were emergencies.

Complications were divided into preoperative, early postoperative and late postoperative. There were no deaths due to airway obstruction or to the tracheostomy. A summary of the complications is given in Table II. Preoperative haemorrhage was a problem in three cases (one elective and two emergencies). This was controlled in each case by standard surgical techniques (4), without further incident. In one of these cases pre-existing superior vena caval obstruction was a contributory factor to the persistent venous bleeding. Pneumothorax was seen in one emergency case. The patient had suffered a respiratory arrest after failure of orotracheal intubation. A vertical midline incision was made through all

Table I. Frequency of indications for elective and emergency tracheostomies

<i>Elective (n = 112)</i>	
Head and neck surgery	72 (64.3%)
Prolonged ventilation	15 (13.3%)
Miscellaneous inflammatory conditions	11 (9.8%)
Laryngeal surgery for benign disease	8 (7.1%)
Neurological problem	6 (5.6%)
<i>Emergency (n = 38)</i>	
Airway obstruction due to:	
Tumour	23 (60.5%)
Trauma	5 (13.2%)
Epiglottitis	5 (13.2%)
Surgery	3 (7.9%)
Intubation problem	1 (2.6%)
Abscess	1 (2.6%)

layers, and the patient successfully resuscitated. The pneumothorax was partial, and resolved after 6 days.

In the early postoperative period there were four cases of bleeding, all of which were elective operations. In none of these was the blood loss significant. All were controlled on the ward by the application of local pressure. Five patients had infection of the tracheostomy site; this was defined as swelling and erythema in the skin around the tracheostomy site. Seven patients had postoperative chest infections. None of these infections was life-threatening, and all resolved with local toilet, systemic antibiotics and physiotherapy. Often in these cases there was clinical evidence of chest infection preoperatively. The tracheostomy tube became displaced from the trachea so as to require rapid replacement in four cases. Five patients required rapid tube change due to obstruction of the tube with secretions.

Salivary fistula occurred in one patient with airway occlusion due to a large hypopharyngeal carcinoma. The

Table II. Complications of elective and emergency tracheostomy

<i>Complications</i>	<i>Elective</i>	<i>Emergency</i>
<i>Per-operative</i>		
Haemorrhage	1	2
Pneumothorax	0	1
<i>Early postoperative</i>		
Chest infection	5	2
Bleeding	4	0
Infected tracheostomy	4	1
Obstructed tracheostomy	4	1
Displaced tracheostomy	4	0
<i>Late postoperative</i>		
Tracheocutaneous fistula	4	1
Scar requiring revision	1	1
Tracheal stenosis	0	0

tumour mass was entered as it lay anterior to the trachea. The resulting fistula closed spontaneously with conservative measures alone. Late postoperative complications in this series of patients were confined to persisting tracheocutaneous fistulae and unsightly scar formation. No symptomatic tracheal stenoses occurred. Persisting fistula occurred in five cases; four of these had the tracheostomy *in situ* for longer than 7 months and the tract was noted to have become epithelialised. Three had previous tracheostomies, and one had received radiotherapy to the region. Two patients had unsightly scars which required revision. No predisposing factors were apparent, and both had been performed via a transverse incision.

The overall complication rate was 38/150 (25.3%). This was subdivided by indications to give 27/112 (24.1%) of elective cases, and 11/38 (28.9%) of emergencies. Correlating with anaesthetic technique gives a complication rate of 28/115 (24.3%) of those performed under general anaesthesia, and 10/35 (28.6%) of those performed under local anaesthesia.

Discussion

Tracheostomy has been used to bypass upper airway obstruction for many centuries. Historically it was associated with a high risk of complications and a significant mortality (5). Several studies have shown that the complication rate is higher in children than in adults, particularly in neonates and infants (6). The reported complication rates in adults undergoing tracheostomy vary considerably (6). It is generally held that complications are more frequent after emergency tracheostomy for airway obstruction (6). There are, however, few studies available where a comparison is made between elective and emergency tracheostomies in adults. We have compared the complication rates in adults between these groups in one unit utilising a standard technique.

There were a significant number of minor (ie not life-threatening) complications in both groups of patients in this study. These included minor bleeding, infection of the tracheostomy site, chest infection and persisting tracheocutaneous fistula. No significant differences existed between the elective and emergency groups.

A total of nine patients, eight from the elective group and one from the emergency group, had problems with displacement of the tracheostomy tube within 72 h of operation. In all cases rapid replacement of the tube was possible, and none of the patients suffered a significant hypoxic episode. This was facilitated by the 'rescue' suture mentioned above. The problem of tracheostomy tube displacement highlights the need for close supervision of these patients by nurses trained in the care of tracheostomies. It also draws attention to the problem of securing the tracheostomy tube adequately.

In this study the complication rate was not increased in patients undergoing emergency tracheostomy, even though this group included patients with severe stridor and some who had suffered respiratory arrest. Long-term follow-up of these patients has revealed no serious morbidity and, in particular, no case of significant tracheal stenosis.

We suggest that if tracheostomy is performed in the standard manner described, then it remains a safe and reliable means of restoring the airway or of gaining access to the lower airways. Recent trends in adults towards the use of prolonged intubation, cricothyrotomy or mini-tracheostomy should only continue if these can be shown to have as low a complication rate as tracheostomy performed in this way.

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