

# ORIGINAL ARTICLES

## Outcome Using a Conservative Tracheostomy Strategy in Intensive Care

R Khanna, JA Beynon, DS Ure

Department of Anaesthesia and Critical Care, Stobhill Hospital, Balornock Rd, Glasgow G21 3UW, UK

### Correspondence to:

Dr David S Ure, Department of Anaesthesia and Critical Care, Stobhill Hospital, Balornock Road, Glasgow, G21 3UW  
Email: davidure@ntlworld.com. Fax: 0141 201 4167

### ABSTRACT

#### Background and aims

We have a conservative approach to tracheostomy in intensive care, in that every patient considered for tracheostomy in our unit is discussed at a clinical meeting to evaluate potential benefit and harm from the procedure. This study examined tracheostomy numbers, complications and outcome of patients who had tracheostomy in comparison to our general intensive care population and to Scottish national data.

#### Methods

We collected prospective data on all patients having a tracheostomy over a three year period. Data included included time to tracheostomy, type of procedure (open or percutaneous), ventilator settings immediately before tracheostomy, peri- and post-operative complications and mortality.

#### Results

The number of tracheostomies was low (27 of 692 patients, 4%) and time to tracheostomy high (mean, 18 days) in comparison to published data. Patients who had a tracheostomy had a hospital mortality that was greater than predicted by the APACHE II scoring system (55% actual mortality vs. 44% predicted). Standardised mortality ratio (SMR) was 1.29 for tracheostomy patients and 0.89 for patients who did not have a tracheostomy. Length of stay and mortality were similar to national figures. One patient in the tracheostomy group developed tracheal stenosis that needed surgical intervention. There were no cases of symptomatic tracheal stenosis in the much larger group managed with orotracheal intubation alone.

#### Conclusions

We found that a conservative approach to performing tracheostomy reduced the number of procedures performed without affecting overall unit outcomes.

### Introduction

Tracheostomy is a common procedure in intensive care. There is no clear evidence for optimal timing of the procedure.<sup>1</sup> Performing tracheostomy reduces length of intensive care stay in neurosurgical patients,<sup>2,3</sup> but this has not been shown in a general intensive care population. Important risks associated with the procedure include bleeding, infection and tracheal stenosis.<sup>4</sup> Tracheostomy has not been shown to improve survival in a general intensive care population.<sup>5</sup> Given the above, we adopted a conservative approach to performing tracheostomies in intensive care. All patients considered for tracheostomy are discussed at a unit meeting to consider the potential for benefit and harm to the individual concerned. We prospectively recorded data on all patients having a tracheostomy over a 3 year period to define the subset of

patients who had tracheostomies, to monitor complications related to the procedure and compare outcome between this population and the intensive care unit (ICU) population as a whole. We also compared our results with national data produced by the Scottish Intensive Care Society (SICS).

### Methods

We collected data prospectively on every patient who had a tracheostomy between May 2000 and May 2003. Patients were followed up until hospital discharge or death.

Data on the entire ICU population was gathered from our admissions database. Data recorded included time to tracheostomy, reason for insertion, type of procedure (open or percutaneous), ventilator settings immediately before tracheostomy, peri- and post-operative complications and mortality. Statistical analysis was performed with SPSS (SPSS Inc., Chicago, Illinois, USA). Chi-squared analysis was used to compare mortality between the two groups.

**Table I Descriptive Data on Patients Having Tracheostomies (n=27).**

	Sex	Age	Diagnoses	Indication	Day of procedure
1	F	62	Pneumonia, COPD, IHD, Chronic renal failure	1	13
2	M	56	Pneumonia/ARDS, CVA, alcohol excess	2	8
3	F	30	Pneumonia, IVDA, myopathy	1	14
4	F	69	Aspiration pneumonia, pancreatitis	1	10
5	M	51	Perinephric abscess, sepsis	1	16
6	F	79	Pneumonia, CVA, ICU myopathy	1, 3	33
7	M	57	Pneumonia, myopathy, IHD	1	21
8	F	38	Post AVR + root dissection, cerebral infarct, post-op MI	4, 7	25
9	F	67	Pneumonia, pneumonectomy, COPD	1	29
10	M	46	Pneumonia, muscular dystrophy	1	28
11	F	58	Upper airway obstruction	5	1
12	M	67	Pneumonia, IHD, Chronic renal failure	1	37
13	F	20	Sepsis, Panproctocolectomy	6	36
14	M	56	Oral CA, pneumonia	5	2
15	M	66	Haematemesis, laparotomy, aspiration pneumonia	1, 5	15
16	M	73	Perforated DU, IHD, LVF, pneumoilet	1, 4	20
17	M	47	Pancreatitis, Acute renal failure	1	14
18	F	67	Perforated colon, sepsis	6	16
19	M	59	Pancreatitis, aspiration pneumonia	1	23
20	F	53	Pneumonia, COPD	6	29
21	M	49	Pneumonia, cardiac failure	1	18
22	M		Pneumonia, malnutrition	1	17
23	M	52	Perforated duodenal ulcer, sepsis	4	27
24	M	72	Pneumonia, COPD	4	16
25	M	48	Oesophagectomy, sepsis	4	50
26	M	28	Diffuse brain injury	7	7
27	M	70	Pneumonia, sepsis	1	8

Indication for tracheostomy is coded from 1 to 7.

1. Sputum retention/inadequate cough,
2. Loss of airway reflexes
3. Psychological benefit,
4. Tube intolerance,
5. Upper airway obstruction,
6. Critical care neuropathy
7. Neurological injury

**Table II Ventilator Settings on Day of Tracheostomy.**

All patients were on pressure support ventilation with positive end expiratory pressure (PEEP). Data are given as mean (SD).

(PEEP). Data are given as mean (SD).	
Inspired oxygen concentration (%)	48 (12)
Pressure support (cmH <sub>2</sub> O)	8.5 (5)
PEEP (cmH <sub>2</sub> O)	6.2 (3.8)
Duration of ventilation (days)	19.7 (11.4)

**Table III Illness Severity and Outcome in Patients with Tracheostomy Compared to Whole Intensive Care Population.**  
Data are median (range) for length of stay, mean (range) for APACHE II scores and mean for other variables.

	Tracheostomy group (n = 27)	ICU population (n = 665)
APACHE II score	23.5 (9 - 70)	22 (3 - 53)
APACHE II predicted mortality	43.8%	44.1%
ICU mortality	33.3%	32.5%
Hospital mortality	55.5%	39.3%
Severity adjusted mortality	1.27	0.89
Length of ICU stay	26 (1 - 67)	2.2 (0.1 - 84.9)

**Table IV Comparison of Unit Tracheostomy Rate, Time to Tracheostomy and Length of Stay with Scottish National Data.**  
Data are mean (range)

	Unit	Scotland
Tracheostomy rate	3.6% (n/a)	8.2% (2.5%- 18%) <sup>6</sup>
Time to tracheostomy (days)	19.7 (1-50)	10.6 (7-17) <sup>6</sup>
Length of stay (days)	5.0 (0.1-85)	5.9 (0-395) <sup>7</sup>

## Results

Over the three-year study period 692 patients were admitted to the intensive care unit. Twenty-seven patients (4%) had a tracheostomy during their admission. Descriptive data on the patients are shown in Table I. Twenty-one (78%) tracheostomies were performed percutaneously and six (22%) as an open procedure. Ventilator settings at the time of tracheostomy are shown in Table II.

Patients who had tracheostomies had similar APACHE II scores to those who did not (23.5 tracheostomy group, 22 orotracheal intubation alone group). Intensive care mortality was 33% in the tracheostomy group and 32.5% in those who did not have a tracheostomy. Hospital mortality was higher in the tracheostomy group (55%) than in the rest of the ICU population (39%). This was not statistically significant ( $p < 0.1$ ). If the two patients who had early tracheostomy for acute upper airway obstruction are excluded from analysis, mortality is even greater in the tracheostomy group (60%) and the

difference between the two groups becomes statistically significant ( $p < 0.05$ ). Mortality in the tracheostomy group (55%) was higher than predicted by APACHE II scoring (44% predicted mortality, SMR 1.29). Severity of illness and mortality data are summarised in Table III. One patient in the tracheostomy group developed tracheal stenosis. He went on to receive laser treatment and a tracheal stent. No patients managed with an endotracheal tube alone developed symptomatic tracheal stenosis. One tracheostomy patient who survived intensive care had a fatal cardiorespiratory arrest on a general ward that was highly suggestive of tracheostomy tube obstruction.

We compared our data with the most recent figures from the Scottish Intensive Care Society (SICS)<sup>6,7</sup> (Table IV). The tracheostomy rate in our ICU was 4%. This was low in comparison with the Scottish average (8.2%). The mean time to tracheostomy (19.7 days) was higher than the Scottish average (10.6 days). Mean length of stay (5 days) was similar to the national figure (5.9 days).

## Discussion

Our approach to tracheostomy, based on individual patient assessment and discussion of individual risk and benefit by a group of experienced consultants, resulted in a low tracheostomy rate. In general, tracheostomies were performed only in patients who were clinically identified as being very frail and who had already had a lengthy weaning process. Patients were given more time than is generally allowed to wean from endotracheal intubation, to avoid the complications of tracheostomy in the absence of evidence of mortality benefit in the intensive care population.<sup>5</sup> We found that patients who had a tracheostomy were less likely to survive to hospital discharge than those who did not. While this was not surprising, in view of the above discussion, we had expected that the patients identified as needing a tracheostomy would have a higher predicted mortality using APACHE II severity of illness scoring than those who did not. This was not the case. We do not think it likely that tracheostomy itself contributed to excess mortality in the tracheostomy group. We feel it is more likely that the APACHE II system is not sufficiently sensitive to identify some high mortality patients, as most of the patients were perceived as high risk by individual clinicians. There was one case of symptomatic tracheal stenosis in the tracheostomy group but none in the much larger endotracheal intubation alone group. Fear of tracheal stenosis after prolonged endotracheal intubation seems unjustified as an indication for performing tracheostomy. The reverse appears to be true. A patient in

the tracheostomy group may have died from a tube obstruction on a medical ward some days after discharge from intensive care. Care of tracheostomies in non-critical care areas may not be optimal, due to reduction of personnel numbers in these areas of the hospital, and lack of training in tracheostomy care in those who are present. We think these are important complications of tracheostomy and should be considered when any discussion about performing tracheostomy is taking place. Our unit outcomes and length of stay were similar to Scottish national figures. In this study a conservative approach to tracheostomy resulted in a small number of procedures being performed with no evident influence on outcome or length of stay in intensive care. We feel that an individualised approach to tracheostomy should be used for patients rather than one that is protocol driven, in the absence of evidence of population benefit.

### Acknowledgements

We thank the Scottish Intensive Care Society Audit Group for the use of their data.

#### REFERENCES

1. Marsh HM, Gillespie DJ, Baumgartner AE. Timing of tracheostomy in the critically ill patient. *Chest* 1989; 96: 190–193
2. D'Amelio LF, Hammond JS, Spain DA et al. Tracheostomy and percutaneous endoscopic gastrostomy in the management of head injured trauma patients. *Am Surg* 1994; 60: 180–185
3. Koh WY, Lew TWK, Chin NM, et al. Tracheostomy in a neuro-intensive care setting: indications and timing. *Anaesth Intensive Care* 1997; 25: 365–368
4. Stauffer JL, Olson DE, Petty TL. Complications and consequences of endotracheal intubation and tracheotomy. A prospective study of 150 critically ill adult patients. *Am J Med* 1981; 70: 65–76
5. Berlauck JF. Prolonged endotracheal intubation vs. tracheostomy (Review). *Crit Care Med* 1986; 14: 742–5
6. Scottish Intensive Care Society Audit Group Annual Report 2002. Proportion of patients with tracheostomies (figure 26) and practice of performing tracheostomies (figure 29). Available at [http://www.scottishintensivecare.org.uk/SICSAG\\_AR2002.pdf](http://www.scottishintensivecare.org.uk/SICSAG_AR2002.pdf) (Accessed 30th August 2006)
7. Scottish Intensive Care Society Audit Group Annual Report 2003. Tabulated mean and median lengths of ICU stay (Table III). Available at [http://www.scottishintensivecare.org.uk/Annual\\_Report\\_2003.pdf](http://www.scottishintensivecare.org.uk/Annual_Report_2003.pdf) (accessed 30th August 2006)

# WE DON'T WANT SURGEONS

**So you've got your medical degree. You've fought your way through your higher specialist training. And your knowledge of surgery is impeccable. However, we know that's not all you are.**

**You see, we want someone who could improve the way surgeons actually operate in a developing country. Someone with the passion, the people skills and the adaptability to change lives forever. We want surgeons who can volunteer with VSO.**

**Go to [www.vso.org.uk/healthjobs](http://www.vso.org.uk/healthjobs) to find out how you can make a difference.**

CHARITY NUMBER 313757



**Sharing skills  
Changing lives**