In-hospital outcome of patients discharged from the ICU with tracheostomies

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Objective. To document the outcome of patients discharged from the intensive care unit (ICU) with tracheostomies.

Design and setting. This was a retrospective study conducted in the ICU of Dr George Mukhari Hospital, Pretoria.

Patients. All patients discharged from the ICU with tracheostomies over a period of 1 year from 1 January to 31 December 2003.

Interventions. None.

Measurements. The main variables studied were post-ICU mortality and length of hospital stay, the Glasgow Coma Scale (GCS) at discharge from ICU and the multiple organ dysfunction score on the day of discharge from the ICU.

Main results. Forty-seven patients were discharged with tracheostomies during the study period. The post-ICU mortality was 57%. The mortality of patients discharged with a GCS below 8 was statistically higher than that of patients discharged with a GCS above 8 (79% v. 22%, $p = 0.0002$). Survivors had significantly longer duration of hospitalisation (26.95 ± 21.47 days v. 13.48 ± 14.24 days, $p = 0.021$) than non-survivors. The mortality rate was higher if the tracheostomy was performed for a low GCS than when it was performed for reasons other than a low GCS ($p = 0.0001$). The 20 surviving patients were decanulated before discharge from hospital.

Conclusion. The outcome of patients discharged from the ICU with tracheostomies is, on the whole, unfavourable compared with predicted mortality. A GCS of less than 8 is a good predictor of poor outcome.

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Tracheostomies are performed on intensive care unit (ICU) patients to facilitate airway management. Most of the patients already have an artificial translaryngeal airway in place. While there is general agreement that patients who need an artificial airway over weeks should undergo tracheostomy, there is considerable controversy about the appropriate timing.[1,2]

There have been many claims regarding the advantages of tracheostomy over long-term intubation, such as better patient comfort, facilitation of nursing care and early oral feeding, less laryngeal damage and better resource utilisation in the ICU.[3-6]

The most common indications for tracheostomy are long-term mechanical ventilation, airway protection in the comatose, facilitation of bronchial toilet and permanent relief of upper airway obstruction.[3]

The procedure itself can be performed safely at the bedside in the ICU.[7-9] The short-term complications include bleeding and barotrauma as a result of injury inflicted by the surgical incision on the surrounding structures.[10] The long-term complications include tracheal stenosis, erosion into the brachiocephalic artery and accidental extubation.[11] Death from tracheostomy can occur as a consequence of uncontrolled bleeding, unrecognised barotrauma, blockage of the tracheostomy tube or accidental extubation with failure to re-establish the airway.[12]

There is a paucity of clinical data describing the association between tracheostomies performed in ICUs and patient outcomes, especially hospital mortality.

Materials and methods

Study location and patients

This study was conducted at a university-affiliated urban teaching hospital, Dr George Mukhari Hospital (1 700 beds), over a 1-year period. All patients discharged from the hospital's multidisciplinary ICU with a tracheostomy were eligible for the study. The Research, Ethics, and Publications Committee of the Medical University of Southern Africa approved the study.

Study design and data collection

The study was a review of the hospital records of eligible patients. All the files for the year 1 January - 31 December 2003 were retrieved. The following characteristics were recorded for all study patients: age, gender, diagnosis at admission, indication for tracheostomy, length of stay in hospital following

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discharge from ICU, Glasgow Coma Scale at discharge from ICU, multiple organ dysfunction score (MODS) at discharge from ICU, and outcome. We calculated the MODS using clinical and laboratory data available for the last 24 hours in ICU.

Data analysis

Quantitative data were expressed as means ± standard deviation (SD). All comparisons were unpaired, and all tests of significance were two-tailed. The characteristics of the survivors and non-survivors were compared using Student's *t*-test for continuous variables and Fisher's exact test for categorical variables.

Results

A total of 47 patients were discharged from the ICU to the general wards with tracheostomies during the study period. Fifteen (31.9%) were females and thirty-two (68.08%) were males. The mean age of the group was 36.9 years (SD 16.7, range 1 - 74 years). The discharge GCS for the group was a mean of 8 (SD 4.5).

Bedside tracheostomies were performed in 75% of the reviewed cases. Conventional surgical tracheostomies were performed in 95.7% of the patients and percutaneous procedures in 4.3%. None of the patients developed procedure-related complications.

The indications for tracheostomy are summarised in Table I.

Table I. Indications for tracheostomy

Indications	No. of cases (%)
Prolonged ventilation (> 3 weeks)	5 (10.42)
Low GCS (< 8)	35 (75)
Upper airway obstruction	7 (14.58)

GSC = Glasgow Coma Scale.

The clinical diagnoses are summarised in Table II.

Table II. Clinical diagnosis

Diagnosis	No. of cases (%)
Traumatic brain injury	27 (57.3)
Non-traumatic neurological disorders	10 (21.3)
Cerebrovascular accident	3
Metabolic coma	3
Meningitis	2
Guillain-Barré syndrome	2
Sepsis	3 (6.4)
Upper airway obstruction	7 (15)
Traumatic	4
Benign strictures	2
LTB	1

The mean MODS at discharge from ICU was 3.2 (SD = 2.3). The predicted mortality based on this score was less than 5%.

The post-ICU mortality of the group was 57% (27 patients). Fifty per cent of patients under 20 years of age died, 55% of those between 20 and 50 years, and 77% of those over 50 years.

Twenty-three deaths out of 29 (79%) occurred in the group discharged with a GCS of less than 8 compared with 4 deaths out of 18 (22%) in the patients discharged with a GCS of 8 or more. This difference was found to be statistically significant ($p = 0.0002$). Further analysis of the mortality rate within the subgroup with a GCS below 8 revealed no statistically significant differences between traumatic and non-traumatic neurological disorders (30.4% v. 62.5%, $p = 0.206$).

In total, 25 of the 35 patients in the group that had a tracheostomy for low GCS died compared with 2 of the 12 who had tracheostomy for reasons other than a low GCS. This difference was statistically significant ($p = 0.0001$).

The mean length of stay in hospital after ICU discharge was 18.8 days (SD 18.5). Survivors had significantly longer duration of hospitalisation (26.95 days (SD 21.47) v. 13.48 days (SD 14.24), $p = 0.021$) than non-survivors.

The exact cause of death of the 27 patients could not be ascertained from the hospital files.

The 20 surviving patients were all decanulated before discharge from hospital.

Discussion

Tracheostomies are performed in this unit at a rate of approximately 4 per month. Patients with neurological insults, in particular traumatic brain injury, formed a large proportion of the study population (79%). This probably explains why a low GCS appears to be the commonest indication for tracheostomies (75% of the cases).

A GCS of less than 8 at discharge from the ICU is associated with increased mortality. This is especially true for patients with a discharge GCS of less than 4, among whom there was a mortality rate of 92%.

The mortality rate of the group was greater than would have been predicted by the MODS. The MODS was developed as an objective scale to measure outcome in critical illness. The score correlates with the ICU mortality rate, both when applied on the first day of ICU admission as a prognostic indicator and when calculated over the ICU stay as an outcome measure.[14] We performed the score on the day of discharge from ICU to determine if the study population was discharged with multiple and/or significant organ dysfunction. Applied at this stage the score appears to perform poorly in predicting the post-ICU outcome of this group of patients.

The study confirms the established safety of bedside tracheostomies. Bedside tracheostomies eliminate the hazards

of transporting critically ill patients, are economical and afford better time efficiency.[15,16]

The available data suggest that our post-ICU (in-hospital) mortality of 57% is far in excess of published values (± 14%).[13] The explanation for this high mortality rate may be twofold. Firstly the unit may be perfoming tracheostomies on patients who have an overall poor prognosis, and secondly the care of tracheostomies in the general wards may be inadequate.

The study also raises important moral and ethical questions, in particular the issue of fair use of resources. Should the ICU be used as a rehabilitation facility now that we appreciate the high mortality rate among these patients outside of the ICU environment? We are not convinced that the findings of this study justify the use of the ICU as a rehabilitation facility for a number of reasons. Firstly, we cannot conclude from this study that the ICU would have performed better in terms of the overall mortality of this group of patients. Secondly, the unit is often inundated with requests for beds for acutely ill patients. We believe that it is not fair to deny these patients access on the basis that beds are occupied by patients requiring rehabilitation and tracheostomy care. Rehabilitation is usually a long-term process and the cost in terms of ICU expenses prohibitive. There are also risks associated with prolonged stay in the ICU, one of the most important being ICU-acquired sepsis, which has a high mortality rate.

Conclusion

The era of escalating medical costs and limited resources mandates that more cost-effective strategies associated with equal or better patient outcomes be developed and implemented within the practice of critical care medicine. Many issues related to tracheostomies in the ICU remain unresolved. Patients receiving tracheostomies represent an important group for future study. Such studies should attempt to identify the subgroups of mechanically ventilated patients who benefit most from this procedure. The discharge GCS appears to be a good predictor of post-ICU outcome for this subgroup of patients and provides us with better prognostic information to tell the families. The urgent need for step-down facilities with adequately trained staff cannot be over-emphasised.

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