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Epidemiological profile of patients with tracheostomy in a referral public hospital intensive care unit in Belo Horizonte

Aspectos epidemiológicos de pacientes traqueostomizados em unidade de terapia intensiva adulto de um hospital de referência ao Sistema Único de Saúde em Belo Horizonte

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ABSTRACT

Objectives: Tracheostomy is a common procedure in intensive care unit to promote mechanical ventilation weaning. Despite tracheostomy is increasingly used there is no agreement of actual clinical practice of tracheostomy in different groups of patients in our environment. Objective of this study was to evaluate the epidemiological profile and outcomes of patients with tracheostomy at a clinical-surgical intensive care unit and compare this profile with the current literature.

Methods: Retrospective descriptive study through review of medical records and quality control database of “QuaTI” (Qualidade em Terapia Intensiva) of 87 patients with tracheostomy at Santa Casa de Belo Horizonte intensive care unit in 2007. We studied variables related to evolution aspects.

Results: The clinical and epidemiological analysis of the 87 patients showed: mean age 58 ± 17 years, mean Acute Physiology and Chronic Health Evaluation - APACHE II 18 ± 6 , mean time of orotracheal

intubation before tracheostomy of 11.17 ± 4.78 days. Intensive care unit mortality was 40.2% (35/87 patients), ward mortality was 36.5% (19/52) and overall hospital mortality 62.1% (54/87). Mean age of patients who died at intensive care unit (65 ± 17 years) was greater than who were discharged to ward (53 ± 16 years) $p = 0.003$. Mean age of who died in hospital (intensive care unit and ward) (62 ± 17 years) was also higher than survivors (52 ± 16 years) $p = 0.008$. Old age (≥ 65 years) was related to intensive care unit mortality (OR 2.874, CI 1.165 a 7.088 $p = 0.020$) and also related to the overall hospital mortality (OR 3.202, CI 1.188 a 8.628 $p = 0.019$). There were not others variables related to mortality in this sample.

Conclusions: The epidemiological profile of patients who underwent tracheostomy in the intensive care unit showed high mortality rate when compared to international series. Senility was related to worse outcome in these patients. Other issues were not related mortality in this group.

Keywords: Ventilator weaning; Respiration, artificial; Age; Tracheostomy

INTRODUCTION

Tracheostomy is a frequent surgical procedure for intensive care patients, and is increasingly being used earlier to support mechanical ventilation weaning.⁽¹⁾ Relative to prolonged trans-laryngeal intubation, potential advantages of tracheostomy include patient's comfort;⁽²⁾ safe airway access;⁽³⁾ reduced tube-related laryngo-tracheal injuries⁽⁴⁾ and mechanic ventilation time reduction.⁽⁵⁻⁷⁾ However, the tracheostomy benefits are not fully established.⁽⁸⁾ Tracheostomy practices varies substantively among different services⁽⁹⁻¹¹⁾ and data from clinical trials on its impact are lacking.⁽¹²⁾ Recent reviews recommend the use of percutaneous-bronchoscopy technique⁽¹³⁾ as a safe and with less wound infections, and early tracheostomy

in patients expected to have long term trans-laryngeal intubation.⁽¹³⁻¹⁷⁾ Other tracheostomy-related aspects in different patients groups remain unclear.

This work aimed to retrospectively evaluate the epidemiological aspects of patients undergoing tracheostomy while staying in the intensive care unit (ICU) of the Santa Casa de Belo Horizonte (SCBH), and to compare the results to the literature.

METHODS

Medical records and the "QuaTI" (Qualidade em Terapia Intensiva [Intensive Care Quality]) data bank were analyzed for 100 patients who underwent tracheostomy from January-December, 2007 in an intensive care unit encompassing a clinical ICU, a general post-operative ICU and a post-cardiovascular surgery ICU, totalizing 29 beds. The patients were included according to the SCBH's Chest Surgery team data. Thirteen patients with incomplete information were excluded. Tracheostomy was performed for mechanic ventilation weaning in all patients selected. In 87 patients the following variables were studied: age, gender, admission diagnosis, chronic pulmonary disease, ICU and hospital stay length after tracheostomy, early or late tracheostomy, ICU and hospital death rates. Early tracheostomy was defined as occurring within ≤ 7 days, based on previous studies.⁽¹³⁻¹⁵⁾

Statistical analysis

The quantitative variables were expressed as mean \pm standard deviation or median and interquartiles [25-75 percentiles] according to the samples distribution. The variables were compared using the t Student or Mann-Whitney tests according to the distribution normality. The sample's distribution was obtained with the Kolgomorov-Smirnov test. The categorical variables were expressed as numbers/totals and percentages, and the comparison used the Chi-square or the Fisher's tests. A $p < 0.05$ value was considered significant. This study was approved by the SCBH's Ethics Committee, according to the approval document 016/2008.

RESULTS

Sample's description

The 87 patient's clinical and epidemiological analysis showed a mean age of 58 ± 17 years, 55,2% were

male and with a mean Acute Physiological Chronic Health Evaluation (APACHE II) score of 18 ± 6 (Table 1). Clinical admissions mounted 59.7% (52 patients); among the causes: sepsis (19 [21.8%]); respiratory failure (18 [20.6%]); acute myocardial infarction (6 [6.8%]); acute renal failure (3 [3.4%]); congestive heart failure (2 [2.2%]); heart arrhythmia (1 [1.1%]); stroke (1 [1.1%]); ketoacidosis (1 [1.1%]) and hemorrhagic fever (1 [1.1%]). Surgical patients (34) were 39.1% of the total. From these, 10 (11.5%) were post heart surgery; 9 (10.3%) post neurological surgery; 8 (9.2%) post digestive system surgery; 7 (8.0%) for other surgeries post-operative period. One single case was admitted for trauma. The tracheostomy was performed by the percutaneous dilatational tracheostomy technique in 7 patients (8.0%). The patients in this sample were intubated for a mean 11.17 ± 4.8 days. The tracheostomy was performed early (≤ 7 days) in 23/87 patients (26.4%); it was late (> 7 days) in 64/87 patients (73.6%) (Table 2). The mean length of stay in ICU after the tracheostomy was 13 days (8-22) and the mean hospital stay after the procedure was 44 ± 27 days.

Table 1 – Clinical and epidemiological tracheostomy patients' characteristics

Clinical and epidemiological characteristics (N=87)	Results
Age (years)	58 ± 17
Male gender	48 (55.2)
APACHE II	$17,9 \pm 6,33$
Chronic respiratory disease	12 (13.8)
Mean hospital stay before ICU admission (days)	07 [3-18]
Mechanic ventilation time before tracheostomy (days)	11 ± 5
Dilatational percutaneous technique	7 (8)

APACHE II - Acute Physiology and Chronic Health Evaluation; ICU – intensive care unit. Results expressed as number (%); mean \pm standard deviation or median [25-75 percentiles].

Intensive care unit and hospital mortality-related aspects

The mortality rate in the ICU was 40.2% (35/87 patients), after ICU discharge (in the ward) was 36.5% (19/52) and the overall hospital mortality rate was 62.1% (54/87). No death or serious complication was procedure-related. No ICU and overall hospital mortality differences were identified between clinical and surgical patients.

Comparing timing (early or late), no difference was seen regarding ICU or hospital length of stay after tracheostomy, and ICU and hospital mortality rate (Table 2).

The mean ICU dead patients' age (64.9 ± 17 years) was higher than for those discharged from the ICU (53.7 ± 16 years) $p = 0.003$ (Table 3). Equally, the mean age of the patients who died in the hospital (both ICU and ward) (62 ± 17 years) was higher than

the survivors' (52 ± 16 years) $p = 0.008$ (Table 4). Senility (age ≥ 65 years) was an ICU mortality-related factor (OR 2.874; CI 1.165-7.088) $p = 0.020$ (Table 3), and also related with the overall hospital mortality rate ($p = 0.019$, OR 3.202; CI (1.188-8.628) (Table 4). No other mortality-related variables were found in this sample. These data comparison with other Brazilian and international studies are shown on charts 1 and 2.

Table 2 – Early versus late tracheostomy related outcomes

	Early TCT (≤ 7 days) (N=23)	Late TCT (> 7 days) (N=64)	P value
Tracheal intubation time before tracheostomy (days)	5 ± 2	13 ± 3	$< 0,001$
ICU stay after tracheostomy (days)	14 ± 15	19 ± 13	0,308
ICU mortality	7 (30,4)	28 (43,7)	0,326
Hospital mortality	15 (65,2)	29 (45,3)	0,805

TCT – tracheostomy; ICU = intensive care unit. Results expressed as number (%); mean \pm standard deviation or median [25-75 percentiles].

Table 3 – Intensive care unit mortality-related clinical and epidemiological aspects

	ICU death 35 patients	ICU discharge 52 patients	P value	OR + CI
Age (years)	65 ± 17	53 ± 16	0.003	
Old age (≤ 65 years)	18/35 (51.4)	14/52 (26.9)	0.020	OR 2.874 (1.165 to 7.088)
Male gender	20/35	28/52	0.828	
Apache II	19 ± 7	17 ± 6	0.117	
Time between hospital and ICU admission	7 [3-18]	7 [3-19.5]	0.972	
Orotracheal intubation time before tracheostomy (days)	12 ± 4	10 ± 5	0.110	
Chronic pulmonary disease	06/35	06/52	0.533	

ICU – intensive care unit; OR – Odds Ratio; CI – confidence interval; APACHE II - Acute Physiology and Chronic Health Evaluation. Results expressed as number (%); mean \pm standard deviation or median [25-75 percentiles].

Table 4 – Hospital mortality-related clinical and epidemiological aspects

	Hospital death (ICU + ward) 54 patients	Hospital discharge 33 patients	P value	OR-CI
Age (years)	62 ± 17	52 ± 16	0.008	
Old age (≤ 65 years)	25/54 (46.2)	07/33 (21.2)	0.019	3.2 (1.2- 8.6)
Male gender	33/54 (61.1)	15/33 (45.4)	0.186	
Apache II	17 ± 7	18 ± 5	0.474	
Time between hospital and ICU admission	6.5 [2.0-20.5]	8.0 [3.0-16.5]	0.706	
Orotracheal intubation time before tracheostomy (days)	11 ± 5	11 ± 5	0.951	
Chronic respiratory disease	9/54 (16.6)	3/33 (9.1)	0.523	

ICU – intensive care unit; OR – odds ratio; CI – confidence interval; APACHE II - Acute Physiology and Chronic Health Evaluation. Results expressed as number (%); mean \pm standard deviation or median [25-75 percentiles].

Chart 1 – Epidemiologic profile comparison of tracheostomy patients – international studies

	Oliveira et al. (study)	Kollef et al. ⁽¹⁸⁾	Frutos-Vivar et al. ⁽¹⁹⁾	Freeman et al. ⁽¹¹⁾
Year	2007	1996	1998	2000-2003
Place	Brazil	USA	Europe, Latin America, USA, Canada	USA
Study type	Retrospective	Prospective	Prospective	Retrospective – databank
Tracheostomy patients	87	51	546	2473
Intubation time before tracheostomy (days)	11 ± 5	9.7 ± 6.4	12 [7-17]	9[5-14]
Age	58 ± 17	53.1 ± 20.6	59 ± 17	59.7 ± 0.4
APACHE II	17.9 ± 6.33	19.2 ± 6.1	–	–
SAPS II	–	–	43 ± 15	–
ICU mortality	40.2	–	20	12.4
Hospital mortality	62.1	13.7	39	21.9

APACHE II - Acute Physiology and Chronic Health Evaluation; SAPS - Simplified Acute Physiology Score; ICU – intensive care unit. Results expressed as number (%); mean ± standard deviation or median [25-75 percentiles].

Chart 2 - Epidemiologic profile comparison of tracheostomy patients – brazilian studies

	Oliveira et al. (study)	Santos et al. ⁽²²⁾	Pasini et al. ⁽²¹⁾	Aranha et al. ⁽²⁰⁾	Perfeito et al. ⁽²³⁾
Year	2007	1992-1995	2005-2006	2005	2003
Study type	Retrospective	Prospective	Prospective	Retrospective	Retrospective
Tracheostomy patients	87	109	33	32	73
Study focus	Epidemiology	Surgical technique	Patients with TCE. Time for performing tracheostomy	Incidence and time of tracheostomy	Surgical complications
Tracheal intubation before tracheostomy (days)	11 ± 5	1-5 (17.45) 6-10 (46.7) >10 (30.3) Undetermined (5.5)	ET (0-6):(30.3) IT (7-11): (36.3) LT (≥12): (33.3)	13.5 ± 2.2	–
Age (years)	58 ± 17	0-30 (15.6) 31-60 (43.1) 61-90 (41.3)	ET: 30.7 +14 IT: 39+-18.4 LT: 37.7+18.4	50 ± 16.7	55.2(mean)
APACHE II	17.9 ± 6.3	–	ET: 20.4+4.2 IT: 20.8+4.4 LT: 20.9+3.6	15.68±5.9	–
ICU mortality	40.2	49.5	–	21.87	–
Hospital mortality	62.1	–	3	43.75	63

APACHE II - Acute Physiology and Chronic Health Evaluation; ET – Early tracheostomy (0-6 days); IT – Intermediate tracheostomy (7-11 days); LT – Late tracheostomy (≥ 12 days) (according to the referenced study); ICU – intensive care unit. Results expressed as number (%); mean ± standard deviation or median [25-75 percentiles].

DISCUSSION

This study has shown high tracheostomy patients' mortality rate. We emphasize that no death was related to the procedure. International data show lower death rates (13.7-39%) for patients with these characteristics (Chart 1).^(11,18,19)

In Brazil, data are lacking and controversial (Chart

2). Aranha et al. identified low mortality rates in tracheostomy patients, and additionally, identified lower ICU mortality versus trans-laryngeal intubation patients (21.8% versus 61.9%, $p = 0.001$).⁽²⁰⁾ Pasini et al., in a young head trauma patients study found a low mortality rate.⁽²¹⁾ Santos et al. found 49.5% ICU mortality⁽²²⁾ and more recently, Perfeito et al. found 63% hospital mortality.⁽²³⁾ The tracheostomy patients' mortality rate varia-

tion may be either from individual ICUs tracheostomy indications, weaning protocols, and patients' epidemiological profiles.⁽⁸⁾ In this study ICU, tracheostomy is indicated by individual approach, and the mechanic ventilation weaning protocol involves daily disconnections, and in refractory cases, progressive time disconnections. In this sample, the mean orotracheal intubation time was 11 days, similar to large international surveys (11 days for Etaban et al.⁽²⁴⁾ and 12 days for Frutos-Vivar et al.⁽¹⁹⁾) The percutaneous dilatational tracheostomy technique was used in 7 patients only.

The study hospital is a high complexity Governmental health system referral hospital. We believe our sample's epidemiological profile involved severely ill patients due to the repressed demand for intensive care unit beds, resulting in admissions of patients with ongoing therapy, already under mechanic ventilation and with pressure levels corrected with vasoactive, and also corrected metabolic disorders, thus leading APACHE II score underestimation.

The comparative analysis has shown that the patients who died were older, and that the elderly have increased ICU and overall hospital mortality rates. This is consistent with the international literature.⁽²⁴⁻²⁷⁾ Evidences suggest that old age determines independent adverse prognosis for mechanic ventilation patients.^(22,24) Specially for tracheostomy patients, it was shown that older subjects have increased post-ICU discharge mortality.⁽²⁸⁾ Baskin et al. suggest that strict criteria should be considered when indicating tracheostomy in mechanically ventilated elderly patient.⁽²⁹⁾ It is highlighted that other aspects such as comorbidities, previous cognitive disorders and functional dependency may be involved in these patients outcomes.

Tracheostomy patients' care and follow-up should be individualized. Semi-intensive units and multidisciplinary teams could reduce mortality rates in this group of patients. Invasive mechanic ventilation indication-related strategies, mechanic ventilation weaning, and timing of tracheostomy should be further investigated.

Study limitations

This study has relevant limitations such as: 1) it was a retrospective analysis involving medical records and databank evaluation, and this prevented the analysis of relevant variables such as sensorial level, nutritional status and mechanic ventilation associated pneumonia; 2) this study was developed in one single center; 3) the small sample size prevented appropri-

ate comparisons between the groups, such as between dilational percutaneous and surgical bedside tracheostomy techniques.

CONCLUSION

The epidemiological profile of these tracheostomy patients has shown increased mortality rate as compared to international studies. Old age was the only mortality-related variable in this sample. Individual follow-up is suggested. Further studies are warranted on predictive factors and possible therapeutic strategies identification.

RESUMO

Objetivos: A traqueostomia é frequentemente realizada com a finalidade de favorecer o desmame da ventilação mecânica. No entanto, não se conhece o real impacto da traqueostomia nos diversos grupos de pacientes em nosso meio. O objetivo deste trabalho foi avaliar características epidemiológicas dos pacientes submetidos à traqueostomia na unidade de terapia intensiva da Santa Casa de Belo Horizonte e traçar paralelos com outros estudos semelhantes.

Métodos: Estudo descritivo, retrospectivo, através de revisão de prontuários e banco de dados do sistema "QuaTI" (Qualidade em Terapia Intensiva) de 87 pacientes traqueostomizados no ano de 2007.

Resultados: A análise dos 87 pacientes estudados mostrou média de idade de 58 ± 17 anos, média do APACHE II de 18 ± 6 , tempo médio de intubação orotraqueal de $11,17 \pm 4,78$ dias, mortalidade na unidade de terapia intensiva de 40,2% e mortalidade hospitalar geral de 62,1%. A média de idade dos pacientes que faleceram na unidade de terapia intensiva (65 ± 17 anos) foi maior que a daqueles que receberam alta (53 ± 16 anos) $p = 0,003$. A média de idade dos indivíduos que faleceram no hospital (62 ± 17 anos) foi maior que a dos sobreviventes (52 ± 16 anos) $p = 0,008$. A senilidade (idade maior ou igual a 65 anos) constituiu fator relacionado a mortalidade na unidade de terapia intensiva ($OR\ 2,874$, $IC\ 1,165$ a $7,088$ $p = 0,020$) e à mortalidade hospitalar geral ($OR\ 3,202$, $IC\ 1,188$ a $8,628$ $p = 0,019$). Não foram observadas outras variáveis associados a mortalidade.

Conclusões: O perfil epidemiológico de pacientes traqueostomizados na unidade de terapia intensiva deste estudo revelou elevada taxa de mortalidade ao se comparar com estudos internacionais. A senilidade esteve relacionada a pior desfecho nestes pacientes. Não foram identificados outros aspectos relacionados a mortalidade no grupo estudado.

Descritores: Desmame do respirador; Respiração artificial; Idade; Traqueostomia

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