

Prospective evaluation of self-extubations in a medical intensive care unit

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Abstract. Objective: To evaluate the incidence, associated factors and gravity of self-extubations.

Design: Prospective study about all patients intubated over an 8 month period.

Setting: A medical intensive care unit of a University Hospital

Patients: Patients were divided into two groups: self-extubated and those that did not. The self-extubations were separated into deliberate acts by the patients and accidental.

Results: 24 of the 197 patients included presented a total of 27 extubations (12%). There were 21 deliberate incidents and 6 accidental. The only differences between the cases and the rest of the population were a higher mean age (67 vs 59 years) and a larger proportion of chronic respiratory failure (66% versus 35%). Reintubation was necessary in 20 cases (74%) within 30 min in 16 cases. The main indication for reintubation was acute respiratory distress (90%). Reintubation was associated with one death.

Conclusion: Self-extubation is a frequent and serious complication of mechanical ventilation. Deliberate self-extubation, the most frequent type of incident could possibly be reduced by better sedation of agitated patients and accidental self-extubation by better training of the nursing staff.

Key words: Self-extubation – Deliberate self-extubation – Accidental self-extubation – Oral intubation – Nasal intubation – Reintubation – Agitation – Sedation – Respiratory distress

Oral/nasotracheal intubation is routinely used in intensive care units. It is a simple and effective technique but complications can occur [1–6]. Among these, self-extubation must require a special attention because it can be fatal. However, there has only been one prospective study evaluating consequences of self-extubations [7] involving a patient population different from ours. The

purpose of this study was to determine frequency, contributing factors and gravity of self-extubations in a medical ICU.

Patients and methods

Patients

In a prospective study, we evaluated all patients intubated in the medical intensive care unit of the hospital Saint-Antoine over an 8-month period (November 1990–July 1991). The intubation catheters used were made of siliconized plastic (Portex, France) and had a caliber of 7–8.5 mm. They were held in place using a strip of cloth, secured around the head and changed every day. Among agitated patients, some were given continuous sedation with flunitrazepam (Narcozep) at a dose of 1–2 mg/h, restrained physically, or both. The patients were divided into two groups: those who self-extubated (SE) and those who did not (NSE). The SE group was sub-divided into two groups: deliberate self-extubation (DSE) was defined as patients who removed the tube deliberately while there was no tube occlusion or other mechanical problem, accidental self-extubation (ASE) was defined as extubation occurring during nursing, movement or coughing.

Methods

All patients hospitalized in our ICU have a computerized medical report which included the following indices: age, sex, simplified acute physiologic score (SAPS), Glasgow score, etiology and duration of mechanical ventilation. Our database has been developed on a specific program on 4 D software (Macintosh computer). Moreover a special questionnaire was used to establish the circumstances of extubation, as follows: time of the incident (nursing team), agitation prior to the accident, sedation, gastric tube status, need for reintubation or tracheotomy, and outcome. When reintubation was necessary, the cause, route and catheter diameter were recorded. The questionnaire was filled in by attending physician at the time of the incident, even during the night. The results are expressed as mean \pm standard deviation and were analyzed using Student's *t*-test and the χ^2 test.

All the epidemiologic information was recorded in our database after permission from patients or relatives. Our database has been approved by the French "Commission nationale informatique et liberté".

Results

From a total of 197 patients intubated and ventilated during the study period, 24 (12%) self-extubated intentional-

Table 1. Characteristics of the self-extubated (SE) and non self-extubated patients (NSE)

	NSE	SE	<i>p</i>
Number of patients	173	24	
Age (years)	59 ± 17	67 ± 16	<0.01
Sex (men/women)	114/59	15/9	NS
Simplified acute physiologic score	16 ± 5	15.5 ± 5	NS
Glasgow coma score	10 ± 7	13 ± 3	NS
Duration of ventilation (days)	10.5 ± 16.8	16.9 ± 23.5	NS

NS, Non significant

ly or accidentally. Intubation was performed by nasal route of 92% of cases of the entire population and 88.9% of patients involving the SE group. The characteristics of these patients are presented in Table 1. The only significant difference between the two groups was their age; the SE patients were older than the NSE patients (67 versus 59 years, $p < 0.01$).

The indications for mechanical ventilation in the two groups were: chronic respiratory disease (39.1%), post-surgical complications (7.6%), drug overdose (15.7%), neurological causes (13.7%) and miscellaneous (23.9%). The only significant difference between the two groups was for the category of chronic respiratory disease (66% in SE group versus 35%, $p < 0.01$). At the time of self-extubation, 21 of 24 patients were under controlled mechanical ventilation and 3 others were being weaned on a T-tube. The 24 patients in the SE group presented a total of 27 unexpected extubations, which fell into two categories: 21 (77.8%) were voluntary, while 6 (22.2%) were accidental. Factors associated with self-extubation and the frequency of reintubation are presented in Table 2. Half the extubations occurred between 0700 and 1500 h. Around 50% of the patients concerned were agitated but only 20% were sedated, the others being restrained physically. Endogastric tubes were present in all 27 cases of self-extubation, but they were only removed in 4 cases.

The overall rate of reintubation was 74%. Immediate reintubation was required for 5 of the 6 patients in the ASE group, the 6th patient was recovering from drug overdose. One of the 3 patients in the SE group undergoing weaning required reintubation. Of a total of 20 reintubations, 16 were done within 30 min, 2 within 60 min

Table 2. Conditions in which deliberate and accidental self-extubations occurred

	Deliberate	Accidental	Total
Number of cases	21	6	27
Time period:			
0700 – 1500 h	11	3	14 (51.8%)
1500 – 2300 h	3	1	4 (14.9%)
2300 – 0700	7	2	9 (33.3%)
Agitation	12	1	13 (48.1%)
Sedation	3	2	5 (18.5%)
Simultaneous removal of gastric tube	4	0	4 (14.8%)
Reintubation	15 (71.4%)	5 (83.3%)	20 (74%)

and 2 at a later stage (5 and 9 h). The most frequent reason for reintubation was respiratory distress (18/20), complicated in two cases by an anoxic cardiac arrest (the outcome was favourable in one patient). In this group, one patient had cardiogenic pulmonary oedema. The remaining 2 patients required reintubation because of sedation. The procedure was difficult in a 83-year-old woman with chronic respiratory failure and thrombocytopenia ($64000/\text{mm}^3$). An attempt to reintubate her via the nasal route led to abundant pharyngolaryngeal bleeding which rapidly caused anoxic heart failure and death.

Discussion

Self-extubations have rarely been studied, with only one prospective investigation [7] and two oral presentations [8, 9]. Other papers dealing with complications of intubation only give fragmentary data on this type of incident [1–3]. In addition, it is difficult to compare the results of these studies since the populations were very different, with mainly surgical patients in some series [2, 3, 7] but mainly patients with chronic respiratory failure in our own.

The frequency of SE in our study (12% of 197 patients) was similar to that in other reports: from 8.5% of 354 patients in the study by Zwillich [2] to 16% of 104 patients in that by Jayamanne [8]. While the related advantages of the nasal and oral routes with regard to certain complications (particularly traumatic) have been widely studied [2,3,10], this is not the case for unwarranted extubation. Coppolo [7] found a favourable influence of the nasal route, but 75% of the patients studied were intubated via the mouth. We were unable to confirm this finding, since 92% of our patients were intubated by the nasal route.

The total duration (before and after SE) of mechanical ventilation was slightly longer in the SE group than in the other patients, as was the case in the study by Zwillich [2]. In contrast, the duration of ventilation in the SE patients prior to incident was far longer in our study (4.5 days) than in that of Coppolo (29 h). These may have been due to the fact that our population included a large number of patients with chronic respiratory failure and who received effective sedation during the first 24–48 h of intubation.

More than half the incidents occurred during the period (0700–1500 h) in which staffing levels are highest, but the workload is also greatest. In contrast, Coppolo [7] found a clear predominance during the period 1500–2300 h, although no explanation was attempted.

Deliberate self-extubation accounted for more than two-thirds of the incidents in our study, as in that of Coppolo. The role of sedation and mechanical restraint in these patients is highly controversial. In a preliminary study concerning a very small number of patients, Brandstetter et al. [9] found that restraint was more effective than sedation in preventing recurrences of SE. In contrast, Coppolo [7] considered on the basis of his results (85% of the SE patients were sedated, restrained, or both) that if a patient wanted to remove the tube, he/she

would do so regardless. In our opinion, this is not the case, because our patients were sedated or restrained apparently improperly. Among the 5 patients in the SE group who were sedated, the three DSE concerned the patients with a Glasgow score of more than 8, i.e. the least sedated, while the two ASE had scores equal to 3. It would be of interest to know the precise agents, doses and duration of sedative therapy but they were not recorded in our study, or those of other authors. Our reintubation rate (74%) was higher than in previous studies (<50%). This difference may be explained by the higher proportion of patients with chronic respiratory failure in our population; 66% versus 14% in Jayamanne's study [8] and less than 30% in Coppolo's study [7].

Jayamanne [8] found that three factors were associated with the need for reintubation in his SE patients: altered neurological status, multiorgan failure and the need for permanent, controlled ventilation. Coppolo [7] explained that the low rate of reintubation (31%) in his study may be due to a poor evaluation of the patient's continued need for mechanical ventilation at the time of self-extubation. This would not appear to have been the case in our study since 15 of our 21 DSE patients required immediate reintubation for respiratory distress with a mean duration of ventilation after self-extubation of 12 days. Of the 6 patients who were not reintubated, 2 were being weaned and 3 had fluctuating consciousness which made it very difficult to evaluate the need for ventilation. Only one patient should perhaps have been weaned before the incident.

We did not analyze the potential complications of SE. For his part, Zwillich [2] found a significantly higher number of pneumonias in the SE group, which he explained by the absence of bronchoaspiration on protection of the respiratory tract. Rashkin [1] found no increase in the number of laryngotracheal lesions in patients who underwent reintubation.

In conclusion, self-extubation is a frequent complication (of the order of 10%) which can have serious consequences, since three-quarters of our patients had to be reintubated immediately because of respiratory distress. Effective sedation of agitated patients and a more thorough evaluation of the feasibility of weaning ventilated patients [11] might have reduced the frequency of

deliberate self-extubation, the most frequent type. Accidental extubation, which concerned one-quarter of the cases, might be reduced by taking greater care during the nursing of mechanically ventilated patients, particularly with regard to good position of the tube [12] and the way in which it is fixed in place.

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