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DIPLÔME D'ÉTAT DE DOCTEUR EN MÉDECINE

Qualification en ANESTHESIOLOGIE - REANIMATION.

CONTRIBUTION OF VENTILATION PROTOCOL (weaning and adjustment of FiO2), A BEFORE AFTER STUDY.

Apport de la modification d'un protocole de soin de ventilation (sevrage et réglage de la FiO2), une étude avant-après.

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Abbreviations

MV	Mechanical ventilation
FiO2	Fraction of inspired oxygen
RR	Respiratory rate
PSV	Pressure support ventilation
PSV7	Pressure support ventilation 7 cmH_20
PSV0	Pressure support ventilation 0 cmH_20
cmH_20	Centimeters of water
ABG	Arterial blood gas
SBT	Spontaneous breathing trial
PEEP	Positive end expiratory pressure
CPAP	Continuous airway pressure
PaO2	Arterial partial pressure of oxygen
OSA	Obstructive Sleep apnea syndrom
RSBI	Rapid shallow breathing index
VAP	Ventilator associated pneumonia
VT	Tidal Volume
O2	Oxygen

PLAN

BACKGROUND

Critically ill patients often require invasive mechanical ventilation (MV). But, weaning from MV should be considered as soon as possible [1], because prolongation of MV remains a source of complications such as pneumonia [2] [3], diaphragmatic dysfunction , increased mortality [4], multiple organe failure syndrome [5]. In addition to this increased risk of complications and mortality, prolongation of MV is associated with increased costs [6]. Not to extubate a patient who theoretically could be increases the risk of pneumonia, the length of stay etc... compared to patients who are extubated on time [7]. Usually, the weaning period of MV can represent 40 to 50% of the total duration of MV [1] [8] [9] [10]. A prolonged weaning period is associated with higher mortality [11] [12]. The physician's clinical judgment to identify which patient can be extubated is relatively poor, with positive and negative predictive values of 50% and 67% respectively [13], and tend to underestimate patients ability to breathe without respiratory support [14]. In case of accidental extubation, only 50% of the patients are reintubated, showing that for many patients, maintenance of MV is excessive [15] [16]. This is why weaning protocols are needed and help reducing the duration of MV [17], the incidence of tracheotomies, health costs, and the need for reintubation [18] [19].

The spontaneous breathine trial (SBT) is the main test for predicting successfull extubation and is the most commonly used [20] . In practice there are different methods for performing SBT:

- the T-piece trial, in which only supplemental oxygen is supplied through a T-piece connected to an endotracheal tube, without pressure support.
- the pressure support trial (with low level of inspiratory presures, around 5-8 cmH2O) (PSV) with or without positive end-expiratory pressure (PEEP). The level of PSV is set to compensate for the resistance of the endotracheal tube and the respiratory circuit [21] [22] [23].

These differents methods influence differently the work of breathing [24] and the best is still debated. As a result, extubation failure despite SBT success can occur in 10 to 20% of cases [11] [14] [25] [26]. The 2017 US guidelines recommend a low level of PSV rather than the T-piece trial [27]. Work of breathing during SBT with PSV 0 cmH_20, or T-piece trial are regarded as representing at best the post-extubation physiologic conditions [20].

The evolution of technology in MV (ventilators, electromagnetic inspiratory valves, turbines, increased sensitivity of inspiratory trigger, triggering delay ....) probably leads to an over-assistance during the SBT with PSV 7 cmH_20 [28] [29] and probably a lower sensitivity of SBT with PSV 7 cmH_20. This is why we choose to modify our weaning protocol, changing the level of PSV from 7 to 0 cmH_20.

In addition ventilated patients are exposed to oxygen, and sometimes to high FiO2. Oxygen in excess can be toxic, notably by promoting oxidative stress, wich may damage the cells [30]. It may also prolonge MV. Higher arterial partial pressure of oxygen (PaO2) increases mortality in septic patients in a recent randomized controlled trial [31] and a recent meta-analysis confirms that liberal oxygen therapy increases mortality in critically ill patients (Chu et al, Lancet 2018 [32]). It is thus recommend to adjust FiO2 to the lowest level, and we have introduce a nurse-driven protocol to adjust FiO2 according to target SpO2, rather than prescribing a level of FiO2.

The aim of this study was to evaluate the impact of our modified ventilation protocol (weaning protocol using a 0 cmH_20 PSV test and nurse-driven FiO2 setting) on MV duration.

METHODS

This is an observational, monocentric, retrospective, before-after study, aimed to evaluate the impact of the modification of the ventilation protocol of the surgical intensive care unit (ICU) A of the Angers University Hospital.

All patients hospitalized in the ICU, mechanically ventilated for ≥24 hours during two periods of seven months (between May and November 2015 and the between May and November 2016), and having performed at least one SBT were included.

Patients under non-invasive MV, ventilated through a tracheotomy or without SBT were not included.

The five months period between the two periods correspond to the implementation of the new ventilation protocol with nurse driven FiO2 protocol, and the modification of the weaning protocol with a SBT unsing a 0 cmH_20 PSV instead of a 7 cmH_20 PSV test (fig 1.).

Weaning protocol

The weaning protocol was the same during the 2 periods. Every morning, between 6-7 AM, a SBT was started when the following criteria were present: no catecholamines, no sedation, patient awake, PEEP ≤ 6 cmH2O, FiO2 ≤50%, effective cough. Arterial blood gases (ABG) were collected at the end of the SBT, hemodynamic and respiratory parameters were controlled. Duration of SBT was 30 or 120 min in presence of neuromyopathy.

During the first period (May to November 2015), the SBT was performed in PSV 7 cmH_20 PEP 0 cmH_20 and during the 2nde (May to November 2016), the SBT was performed in PSV 0 cmH_20 PEP 0 cmH_20.

During the second period, a nurse-driven FiO2 protocol was also applied during mechanical ventilation (fig 2.). Nurse were asked to decrease the FiO2 when SpO2 was too high, and to increase it when it was too low. When they increased the FiO2 2 times (ie by more than 20%), they should inform the physician. Objectives for SpO2 were standardized as follow : SpO2 ≥ 90% and <95% in case of acute respiratory distress syndrom (ARDS), SpO2 ≥ 92% and ≤96% in case of Chronic Obstructive Pulmonary disease (COPD), SpO2 ≥ 95% for other patients. The objectives were registered on the daily prescription. It was recommended to increased or decreased FiO2 by 10% every 10 minutes, to stay in the prescribed ranges (fig 3.).

The main purpose of the study is to evaluate the impast of this new ventilation protocol on MV duration. The secondary objectives of the study are: to evaluate the extubation failure rate (reintubation within 48 hours post extubation), the success rate of the 1st SBT (SBT1), the number of SBT before extubation, and the mortality rates in intensive care unit.

Primary and secondary endpoints

The primary endpoint was the mechanical ventilation duration in hours. The secondary endpoints were: extubation failure rate (%), number of SBT before extubation, SBT1 failure rate (%), RR / VT at the end of SBT1, delay before SBT1 (in hours), Ventilator associated pneumonia (VAP) rate (%), mortality in intensive care unit (%).

Data collection method

For each patient we collected the following data: body mass index (BMI), age in years, gender, admission SAPS II score, comorbidities among: asthma, COPD, hypertension, coronary heart disease or heart failure, Obstructive sleep apnea syndrom (OSA), neurological disease, the type of admission (scheduled surgery, urgent surgery, medical), brain injury, date and time of the onset of mechanical ventilation, presence of VAP.

The principal indication of MV (lung injury, coma, shock, cardiac arrest, postoperative, polytrauma patient) was also collected.

Regarding the MV weaning, we recorded: date and time of the SBTs, Mechanical ventilation duration before each SBT in days and hours, number of SBT during hospitalization, first SBT (SBT1) failure, number of reintubation within 48 h after extubation, date of successfull extubation, MV duration in hours, death in intensive care. Before each SBT, ABG, Fio2, PaO2 / FiO2 ratio, PEEP were collected. At the end of each SBT, RR , VT and RR / VT were recorded.

Statistical analysis

Results are expressed as medians [Q1-Q3], mean ± SD or n (%) and compared by Wilcoxon or Fisher test, as appropriated. Patients were separated into 2 groups, according to the 2 periods: PSV7 (for the first period) and PSV0 (for the second, where SBT was perfomed in 0 PSV and FiO2 was set according to a nurse-driven protocol). To evaluate the impact of our new MV protocol, we conduct a logistic regression to compare the mechanical ventilation duration (in hours) between groups, adjusted for severity, MV indications and brain injury.

In addition, we compared during each period the risk factor for SBT failure. SBT failure was defined clinically as: a RR≥35, an arterial desaturation, variations of blood pressure or heart rate by more than 20% (higher or lower than baseline), respiratory distress signs or a patient's agitation.

We used the JMP stat software (SAS Institute, Brie Comte Robert, FRANCE). $P<0.05$ was considered significant.

RESULTS

During the first period (called PSV7), from May to November 2015, 216 patients were hospitalized, 183 were ventilated and 92 were included. During the second period (PSV 0), from May to November 2016, 285 patients were hospitalized, 219 ventilated, and 103 were included (fig. 4). Among the 195 patients included, data from 565 SBT were collected.

Population

Mean age of patients was 61 ± 18 years in PSV0 group and 63 ± 18 years in PSV7 group (p = 0.5). Populations were very similar between the 2 periods: Women (31 vs 33%, p = 0.88), admission SAPSII score (50 vs 48, p = 0.27) and BMI (27 vs 27, p = 0.3). Their comorbidities were similar, except that Patients in PSV0 group had more asthma (9 vs 1%, p = 0.02) and heart failure (9 vs 2%, p = 0.047) compared to PSV7 group (Table I).

Type of admission (urgent surgery (73 vs 70%), scheduled surgery (3 vs 5%), and medicine (24 vs 25%)) were not different between the 2 groups (p = 0.84). However, indications for orotracheal intubation and MV were different (p = 0.01) with more coma (42 vs 22%), shock (20 vs 18%) and less cardiac arrest (1 vs 7%), postoperative (10 vs 23%), polytrauma patient (9 vs 11%) or lung injury (17 vs 18%) in group PSV0 (Table I).

Primary endpoint

During PSV0 phase, the mechanical ventilation duration decreases compared to PSV7 phase (90 [32-215] vs 97 [27-287] hours, p = 0.78) without significant difference (Table II).

Secondary endpoints

The first SBT (SBT1) was performed after 45 [23-132] vs 42 [21-126] hours respectively in PSV0 and PSV7 periods (p = 0.4). Number of SBT before extubation was also comparable between periods (2 [1-3] vs 1 [1-4], p = 0.84), as well as the percentage of SBT1 failure (15 % vs 19%, p = 0.42). The RR / VT in the end of SBT1 was not significantly higher in PSV0 patients (65 [45-96] vs 56 [36-84], p = 0.18).

Before SBT1, the ventilator settings and modes were similar except for FiO2 that was significantly lower in PSV0 compared to PSV7 (36 ± 1% vs 39 ± 1%, p = 0.04). PaO2/FiO2 was comparable in both groups (302 ± 11 mmHg vs 277 ± 12 mmHg, p = 0.94). Before the SBT prior to extubation (SBTe), FiO2 is also significantly lower in PSV0 group compared to PSV7 group (35 ± 1% vs 38 ± 1%, p = 0.04) and PaO2/FiO2 also comparable in both groups (309 ± 11 mmHg vs 284 ± 11 mmHg, p = 0.94). Extubation failure rate was not significantly different between the two groups (14% vs. 16%, p = 0.59). Patients in PSV0 group had less VAP than PSV7 group, but this was not significant (26 VS 35%, p = 0.21). Moratlity was comparable (Table II).

Primary endpoint after adjustment

When we adjusted the duration of MV in the logistic regression model, the period PSV0 and the women gender were independently associated with shorter durations, while intubation for lung inury, brain injury, and higher SAPSII scores were independently associated with prolonged MV durations (Table III).

SBT failure risk factors

SBT1 failure was associated with a RR / VT ratio higher before SBT1 (79 [48-105] vs 52 [36-70], p = 0.0006), a lower PaO2 /FiO2 (207 [150-277] vs 292 [228-372], p = 0.0003), a longer delay from intubation (4 [2-7] vs 2 [1-5] days, p = 0.034) , and a longer duration of VM (71 [33-154] vs 39 [20-120] hours, p = 0.042) (Table IV). The period was not a risk factor for SBT failure (15(15%) vs 19(21%) for PSV0 and PSV7, p=0.42). In other word, the use of a PSV of 0 cmH_20, instead of 7 cmH_20, did not sensitize the SBT.

DISCUSSION

In this observational, monocentric, retrospective, before / after, single-center study we observed that new MV protocol was associated with a significant reduction of MV duration.

In this new protocol, we performed our SBT without any pressure support (PSV0). This was supposed to improve the detection of patients who will failed the weaning process and who will need a re-intubation. The MV weaning success is defined as the absence of reintubation within 48 hours after extubation. Inversely, weaning failure in most studies is defined as either the failure of SBT, or the need for reintubation within 48 hours after extubation [16] [25], the need for ventilator support within 48 hours after extubation, or death within 48 hours after extubation [1]. In our study we observed a weaning failure rate around 15%, which is in accordance with the published literature, showing rates between 10 to 20% [33]. The consensus conference published in 2007 [1], which analyzed 6 randomized controlled trials (including 2486 patients), found a weaning failure rate (SBT failure and extubation failure) of 31%, a reintubation rate of 13%. Improving our SBT potocol to predict extubation success could be regarded as necesserary. Because we have already implemented a nurse-screening process (as already described by others [1] [34] [35]) and a nurse-driven protocol for sedation, we thought that modifiying our SBT could help reducing the rate of extubation failure. The latest US recommendations suggest to perfom SBT using a low PSV rather than the T-piece trial [27]. The T-piece trial seems to be most realist and difficult trial for patients in terms of work of breath (WOB) (30% more compared to PSV [20]). However, when the PSV is at 0 cmH_20 during SBT, the WOB is no different from the T-piece trial [20] and he is similar to that performed through the airway after extubation [20] [36]. Both techniques appear to be equivalent in terms of weaning time and extubation success [37] [38]. WOB during SBT with PSV 0 cmh2o, CPAP 0 cmH2o or T-piece trial are the best reflect of post-extubation conditions [20] .In summary, SBT with PSV reduces respiratory effort compared to PSV 0 cmH_20 and T-piece trial [20] and is probably less sensitive. Nowdays, the technological evolution of the ventilators (electromagnetic valves for inspiratory, turbines, increased sensitivity of inspiratory trigger, triggering time ....) probably leads to a lower

sensitivity of PSV7 cmH_20 [28] [29]. The main risk is the extubation failure. This is probably the reason why SBT preceding each extubation does not predict the consequences of the removal of the endotracheal tube, in terms of WOB, protection of the upper airways, inefficiency of cough .... [39] [40]. The extubation failure despite SBT success can occur in 10 to 20% of cases depending on the studies and cohorts studied [11] [14] [25] [26]. In our study, extubation failures are not different. We did not distinguished the "type" of failure between the need for reintubation for pulmonary reasons (theoretically detected by the SBT) and for upper airway control. This could explain why we haven't see any difference.

The decrease of MV duration we observed could thus more probably be linked to the FiO2 protocol than to the decrease of the PSV during SBT. Indeed, FiO2 appear to be lower in the second period (PS0 group), while PaO2 / FiO2 ratios were similar, indicating that PaO2 were lower. Indeed, oxygen has side effects and toxicity. Pure oxygen causes an inhibition of hypoxic pulmonary vasoconstriction [41] and can also induce absorption atelectasis [42]. Finally, hyperoxia can induce an inflammatory reaction with activation of intra-alveolar neutrophils and a significant pulmonary edema [43]. In animal studies, this O2 pulmonary toxicity occurs after long-term exposure [44]. The HYPER2S study, studying hyperoxia at the early phase of septic shock, was interrupted following excess mortality in the hyperoxia group [45]. High PaO2 are correlated in a recent randomized controlled trial [31] with excess mortality and are associated with prolonged mechanical ventilation and increased risk of atelectasis [46].

Our study has several limitations. This is a retrospective, monocentric study of a relatively small population. Moreover the two groups of studies are not completely comparable, which leads to potential bias. This is why we conduct a logistic regression, to adjust for these factors. Another limitation of our study is the assessment of FiO2 only before SBT. The mean daily FiO2 or PaO2 would have been more representative and would have allowed us to better appreciate the decrease of FiO2 in PSV0 group. It will be interesting to recover all FiO2 collected at each arterial blood gas to measure

a daily mean FiO2 and limit this bias. At last we were unable to know the type of circuit humidification, filters could induce more resistance and thus PSV0 could be more discutable in presence of filters compared to heat circuit humidifier.

CONCLUSION

The use of a new ventilation protocol, including a decreased PSV during SBT from 7 to 0 cmH_20 and a nurse-driven protocol to set FiO2, allows for a reduction of MV duration. Reducing FiO2 seems to be the most important parameter. Prospective studies are needed to confirm this.

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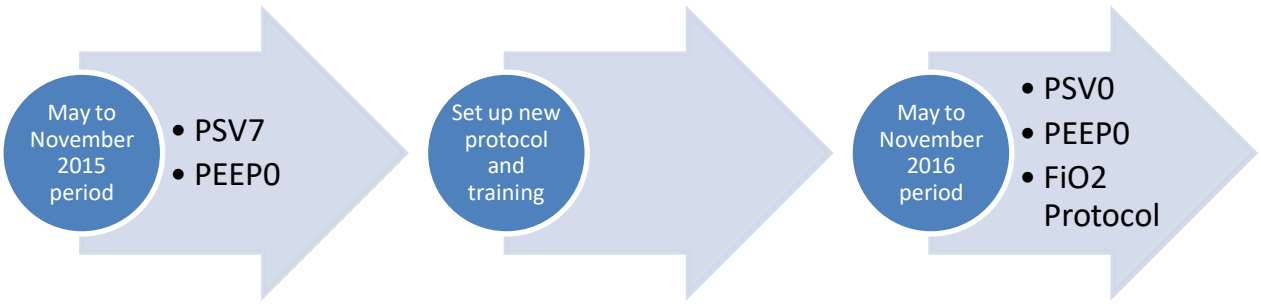
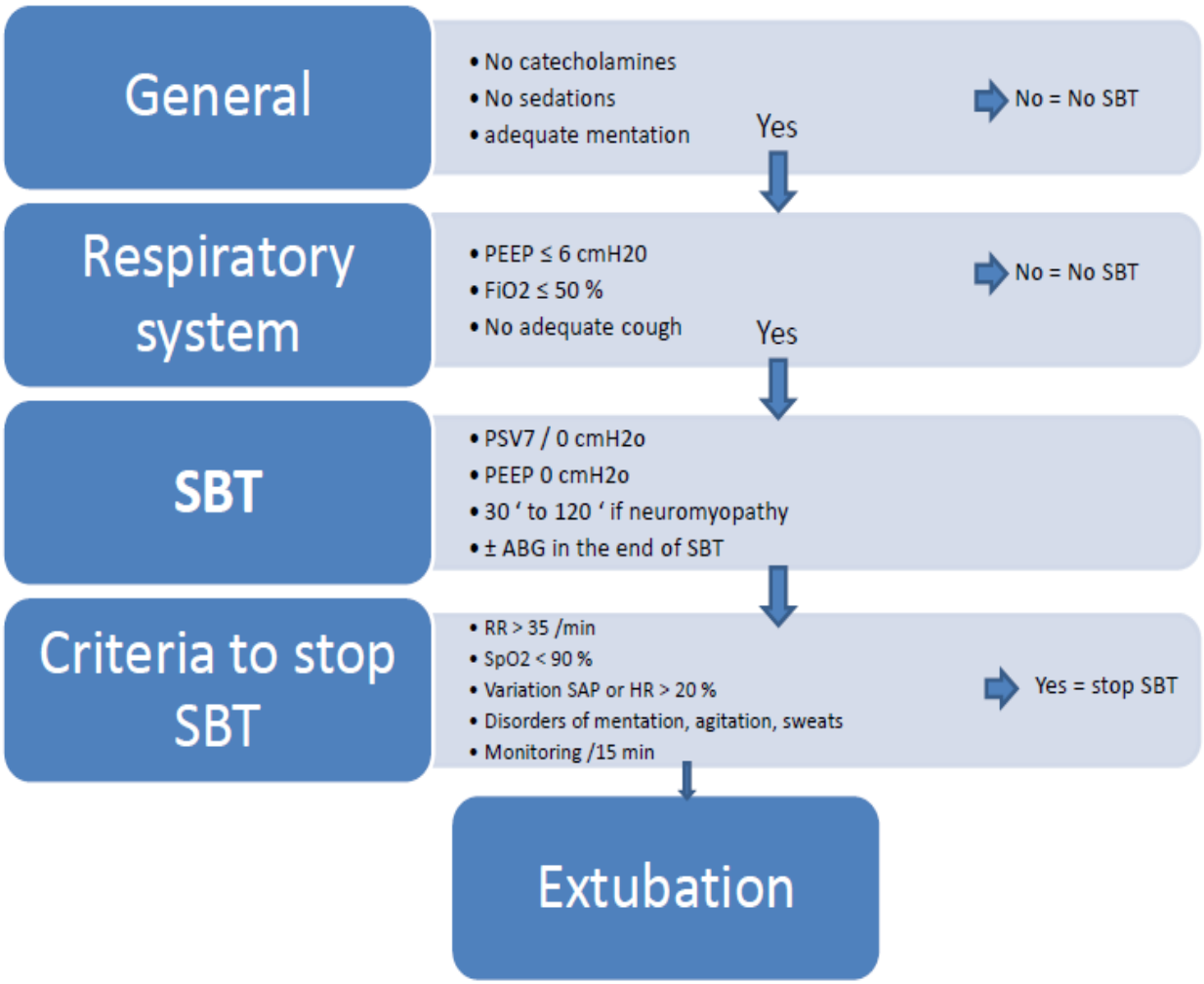
FIGURES

Fig 1. Schema of the study



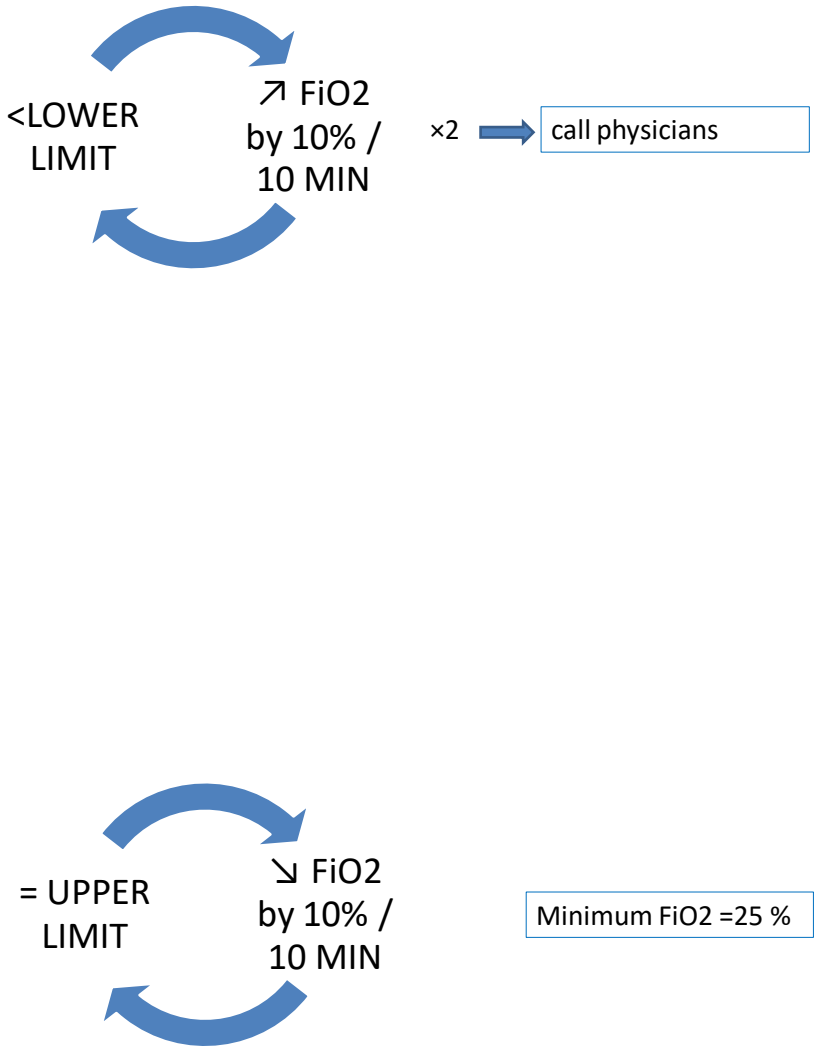
PEEP Positive End Expiratory Pressure , *FiO2* Fraction of Inspired Oxygen, *PSV* Pressure Support Ventilation, *PSV0* Pressure support ventilation 0 cmH_20, *PSV7* Pressure support ventilation 7 cmH_20

Fig 2. SBT protocol



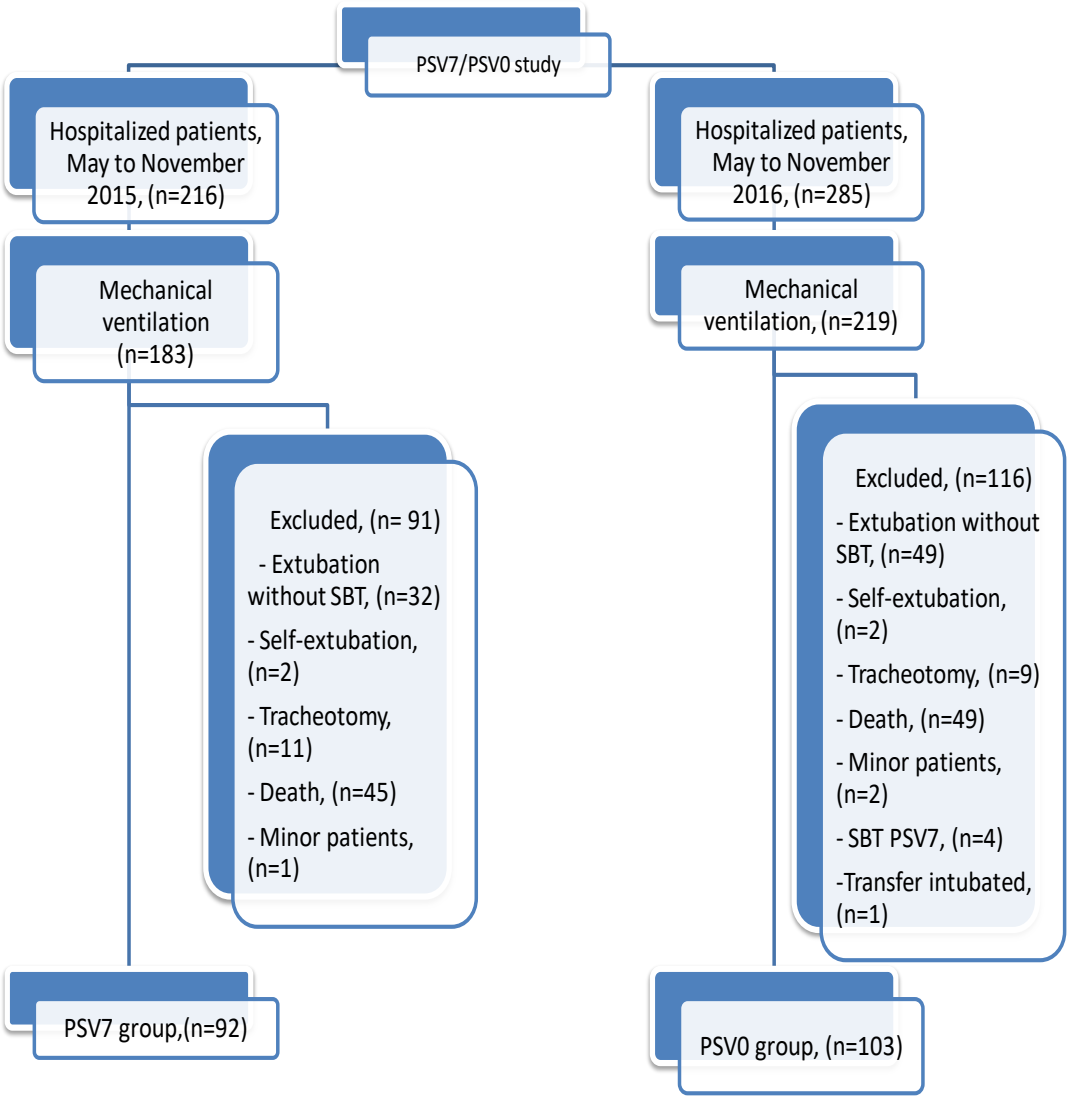
SBT Spontaneous Breathing Trial, *PEEP* Positive End Expiratory Pressure , *FiO2* Fraction of Inspired Oxygen, *PSV* Pressure Support Ventilation , *ABG* Arterial blood gas, *RR* Respiratory Rate, *SAP* Systolic Arterial Pressure, *HR* Heart Rate

Fig 3. FiO2 protocol



FiO2 Fraction of Inspired Oxygen

Fig 4. Flow Chart



SBT Spontaneous breathing trial, *PSV0* Pressure support ventilation 0 cmH_20, *PSV7* Pressure support ventilation 7 cmH_20

TABLES

Table I Characteristics of patients

	PSV7 group (n= 92)	PSV0 group (n= 103)	p
Age (years)	63 ± 18	61 ± 18	0,5
Female gender (n)	30 (33)	32 (31)	0,88
SAPSII score	48 ± 16	50 ± 15	0,27
BMI (kg/m2)	27 ± 7	27 ± 6	0,3
Asthma (n)	1 (1)	9 (9)	0,02*
COPD (n)	3 (3)	9 (9)	0,14
Coronary heart disease (n)	9 (10)	15 (15)	0,38
Heart failure (n)	2 (2)	9 (9)	0,047*
Sleep Apnea Syndrom (n)	6 (7)	7 (7)	1,00
Admission			0,84
Medical (n)	23 (25)	25 (24)	
Urgent surgery (n)	64 (70)	75 (73)	
scheduled surgery (n)	5 (5)	3 (3)	
Indication OF MV			0,01*
Coma (n)	20 (22)	43 (42)	
Lung injury (n)	17 (18)	18 (17)	
Shock (n)	17 (18)	21 (20)	
Cardiac arrest(n)	6 (7)	1 (1)	
Postoperative (n)	21 (23)	10 (10)	
Polytrauma (n)	10 (11)	9 (9)	

Value are median [Q1-Q3], mean ± SD or n (%).*p<0.05

BMI Body Mass Index, *COPD* Chronic Obstructive Pulmonary disease, *MV* Mechanical Ventilation.

Table II. Endpoints

	PSV7 group (n=92)	PSV0 group (n=103)	p
mechanical ventilation duration (hours)	97 [27-287]	90 [32-215]	0.78
SBT1 failure (n)	19 (21)	15 (15)	0.42
Delay before SBT1 (hours)	42 [21-126]	45 [23-132]	0.4
RR / VT in the end of SBT1 (breath/min/L)	56 [36-84]	65 [45-96]	0.18
FiO2 before SBT1 (%)	39+/-1	36+/-1	0.04*
PaO2/FiO2 before SBT1 (mmHg)	277+/-12	302+/-11	0.94
FiO2 before SBTe (%)	38+/-1	35+/-1	0.04*
PaO2/FiO2 before SBTe (mmHg)	284+/-11	309+/-11	0.94
Number of SBT before extubation	1 [1-4]	2 [1-3]	0.84
Extubation failure (n)	16 (17)	14 (14)	0.59
VAP (n)	32(35)	27(26)	0.21
Mortality (n)	6(7)	8(8)	0.78

Value are median [Q1-Q3], mean ± SD or n (%).*p<0.05

VAP Ventilator associated Pneumonia, *FiO2* Fraction of Inspired Oxygen, *PaO2* Arterial Partial Pressure of oxygen, *SBT* Spontaneous Breathing Trial, *SBTe* Spontaneous Breathing Trial before extubation, *SBT1* First Spontaneous breathing Trial, *RR* Respiratory Rate,*VT* Tidal Volume

Table III. Primary endpoint after adjustment

Parameter	Correlation coefficient [IC95%]	p
PSV0 group	-32,8[-71 ; -3,2]	0,03*
Indication of MV		
- **Lung injury**	78,7[1,5 ;156]	0,046
- **Coma**	38,1[-53,7 ;130]	0,41
- **Postoperative**	-59,5[-140 ;21,6]	0,15
- **Shock**	-10,6[-87,6 ;66,4]	0,79
- **Cardiac arrest**	-10,1[-150 ;130]	0,89
Brain injury	51,9[4,2-99,5]	0,033*
Female gender	-42,3[-73 ;-11]	0,0078*
SAPSII score	2,5[0,5-4,4]	0,01*

Logistic regression model.*p<0.05

MV Mechanical Ventilation, *PSV0* Pressure support ventilation o cmH_20

Table IV. SBT failure risk factors

	SBT1 failure (n=34)	SBT1 success (n=161)	p
RR/Vt (Breath/min/L)	79 [48-105]	52 [36-70]	0,0006*
PaO2/FiO2 (mmHg)	207 [150-277]	292 [228-372]	0,0003*
Delay before SBT1 (days)	4 [2-7]	2 [1-5]	0,034*
MV duration (hours)	71 [33-134]	39 [20-120]	0,042*

Value are median [Q1-Q3], mean ± SD or n (%).*p<0.05

FiO2 Fraction of Inspired Oxygen, *PaO2* Arterial Partial Pressure of oxygen, *RR* Respiratory Rate,*VT* Tidal Volume, *MV* mechanical Ventilation, *SBT1* First Spontaneous breathing Trial

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Appendix I: CRF

AI 7 cmH2O VS AI 0 cmH2o

1

CHU ANGERS
CENTRE HOSPITALIER UNIVERSITAIRE

CARACTERISTIQUES DU PATIENT

Étiquette patient

N° D'INCLUSION: |__|__|

DEMOGRAPHIE

SEXE	M ☐ F ☐	AGE (ans):	|__|__|__|
POIDS (kg):	|__|__|__|	TAILLE (cm) :	|__|__|__|
BMI (kg.cm-2) :	|__|__|			

ANTECEDENTS

BPCO	☐
INSUFFISANCE RESPIRATOIRE CHRONIQUE (O2 à domicile) :	☐
ASTHME	☐
CORONAROPATHIE	☐
HTA	☐
INSUFFISANCE CARDIAQUE	☐
SAS APPAREILLE	☐
MALADIE NEUROLOGIQUE (centrale ou periphèrique)	☐

TYPE D ADMISSION

CHIRURGIE URGENTE	☐
CHIRURGIE PROGRAMMEE	☐
MEDICALE	☐

VENTILATION

DATE DE DEBUT DE VENTILATION : |__|__| / |__|__| / |__|__|__|__|

RAISON DE LA VENTILATION

ATTEINTE PULMONAIRE PRIMITIVE:

- PNEUMOPATHIE ☐
- OAP ☐
- BPCO ☐
- ASTHME ☐
- SDRA ☐
- PNEUMOTHORAX ☐
- TRAUMATISME ☐
- CONTUSION ☐
- HEMOTHORAX ☐
- AUTRE ☐

Si autre, précisez: _____

- COMA ☐
- ARRET CARDIO-RESPIRATOIRE ☐
- DYSFONCTION RESIRATOIRE POST OPERATOIRE ☐
- MALADIE NEUROMUSCULAIRE ☐
- ETAT DE CHOC (utilisation de NAD): ☐

NOMBRE DE JOUR DE CHOC (nombre de jour d'utilisation de NAD): |__|__|__|

POSTOPERATOIRE

- TRAUMATISE ☐
- CHIRURGIE VISCERALE ☐
- CHIRUGIE UROLOGIQUE ☐
- CHIRURGIE VASCULAIRE ☐
- CHIRURGIE THORACIQUE ☐
- AUTRE ☐

Si autre, précisez: _____

- AUTRE ☐

Si autre, précisez: _____

PA/FiO2 INITALE: |_____|

COMPLICATION DE LA VENTILATION

- SURVENUE DE PAVM (antibiothérapie ≥ à 5 jours) OUI ☐ NON ☐
- NEUROMYOPATHIE DE REANIMATION OUI ☐ NON ☐

GRAVITE

IGS II ADMISSION: |__|__|__|

LE SEVRAGE

EVS

DATE 1ère EVS : |__|__| / |__|__| / |__|__|__|__| soit J |__|__|__|

AVANT EVS (EVS precedent la 1ere extubation)
DUREE DE LA VENTILATION MECANIQUE AVANT l'EVS (en jours) |__|__|__|
GDS:
- pH |__|,|__|__|
- SATURATION (%) |__|__|__|
- PaO2 (mmhg) |__|__|__|
- PaCO2 (mmhg) |__|__|__|
- HCO3- |__|__|

FiO2 (%) |__|__|__|
PaO2/FiO2 |__|__|__|
PEP (cmH2O) |__|__|
VT (mL) |__|__|__|
FR (min-1) |__|__|
FR/VT (respiration /min/L) |__|__|__|
VM (L/min) |__|__|__|
BALANCE HYDRIQUE (dans les 24h avant EVS) (mL) |__|__|__|
SEDATION (midazolam ou propofol dans les 24h avant EVS) OUI ☐ NON ☐

AVANT EXTUBATION (fin de l'EVS precedent la 1ere extubation)
FR (min-1) |__|__|
VT (mL) |__|__|__|
FR/VT |__|__|__|
VM (L/min) |__|__|__|
GDS:
- pH |__|,|__|__|
- SATURATION (%) |__|__|__|
- PaO2 (mmhg) |__|__|__|
- PaCO2 (mmhg) |__|__|__|
- HCO3- |__|__|

NOMBRE TOTAL d'EVS |__|__|
- -NOMBRE TOTAL DE SUCCES D'EVS |__|__|
- -NOMBRE TOTAL D'ECHEC D'EVS |__|__|

TEMPS DE TOLERANCE MOYEN DE L'EVS (en min) EN CAS D'ECHEC |__|__|__|
ou non applicable (absence d'echec) ☐

VENTILATION

DATE 1ere EXTUBATION: |__||__| / |__||__| / |__|__|__||__|
NECESSITE DE REINTUBATION (dans les 48h postextubation) OUI ☐ NON ☐

NOMBRE TOTAL DE RE INTUBATION (dans les 48h postextubation) |__|__|
SUCCES D'EXTUBATION OUI ☐ NON ☐
DATE DE SUCCES D'EXTUBATION |__||__| / |__||__| / |__|__|__||__|
DUREE TOTALE VENTILATION MECANIQUE INVASIVE (j): |__|__|__|
NOMBRE DE JOUR SANS VENTILATION MECANIQUE INVASIVE à J 21
(y compris les jours sans ventilation entre 2 intubations sont comptés) : |__|__|__|

FR apres 1ere extubation |__|__|__|
GDS apres 1ere extubation
- Oxygene aux lunettes apres extubation OUI ☐ NON ☐
- si oui : L/min |__|__|
- PaCO2 (mmhg) |__|__|__|
- PaO2 (mmhg) |__|__|__|
- pH |__|,|__|__|
- SATURATION (%) |__|__|__|
- HCO3- |__|__|

VNI postextubation (dans les 48h post extubation) OUI ☐ NON ☐
DUREE DE VNI post extubation (en J) |__|__|__|
OPTIFLOW postextubation (dans les 48h post extubation) OUI ☐ NON ☐
DUREE D'OPTIFLOW post extubation (en J) |__|__|__|
AUTOEXTUBATION OUI ☐ NON ☐
NOMBRE D'AUTOEXTUBATION |__|__|
SEVRAGE DE LA VENTILATION MECANIQUE à J21 OUI ☐ NON ☐
NECESSITE TRACHEOTOMIE en reanimation OUI ☐ NON ☐

EVOLUTION

DUREE DE SEJOUR EN REANIMATION (en jour) |__|__|__|
DECES EN REANIMATION OUI ☐ NON ☐

BROCHANT ANTOINE

Apport de la modification d'un protocole de soin de ventilation (sevrage et réglage de la FiO2), une étude avant-après.

RÉSUMÉ

Introduction : La prolongation de la durée de la ventilation mécanique (VM) augmente la morbi-mortalité et les coûts. Des épreuves de ventilation spontanée (EVS) sont recommandées pour réduire l'échec d'extubation. Il est recommandé de réaliser ces EVS en aide inspiratoire à +7cmH_20 et PEP 0 (AI7), pour compenser les résistances des circuits. L'amélioration de la technologie diminue ces résistances. L'oxygène est responsable d'une toxicité pulmonaire par de multiples réactions inflammatoires, pouvant prolonger la durée de VM. Nous avons changé notre protocole d'EVS en supprimant l'aide inspiratoire (AI) et en appliquant un protocole de baisse de la fraction inspirée en oxygène (FiO2) lors de la VM. Le but de cette étude est d'évaluer l'impact de ce protocole sur la durée de VM.

Sujets et méthodes : Il s'agit d'une étude rétrospective monocentrique, de type avant-après, comparant 2 périodes de 7 mois, avant et après modification du protocole de service : AI7 dans la première période et AI +0, associé à un protocole de diminution de la FiO2 dans la seconde (AI0). Le critère de jugement principal est la durée de ventilation mécanique en heure. Les données sont exprimées en médianes [Q1-Q3], moy±ET ou n(%) et comparées par test de Wilcoxon ou Fisher. Une régression logistique a été menée pour comparer la durée de ventilation mécanique entre les groupes.

Résultats: 195 patients ont été inclus, 103 et 92 pour AI0 et AI7. Durant la phase AI0 la durée de VM est non significativement plus basse (90[32-215] vs 97[27-287] heures, p=0,78), mais significativement après ajustement. Avant EVS1 la FiO2 était plus basse pour AI0 (0,3[0,25-0,4] vs 0,4[0,3-0,5], p=0,023). Le nombre d'EVS avant extubation était comparable (2[1-3] vs 1[1-4], p=0,84), de même que le nombre d'échec à l'EVS1 (15% vs 19%, p=0,42). Le FR/VT à la fin de l'EVS1 était non significativement plus élevé pour AI0 (65[45-96] vs 56[36-84], p=0,18). Le taux d'échec d'extubation n'était pas différent (14% vs 16%, p=0,59).

Conclusion : Notre nouveau protocole, EVS en AI0 et réduction des FiO2, est associé à une réduction de la durée de la VM.

Mots-clés : ventilation mécanique, épreuve de sevrage ventilatoire, extubation, Fraction inspirée en oxygène.

Contribution of ventilation protocol (weaning and adjustement of FiO2), a before after study.

ABSTRACT

Background: Extending the duration of mechanical ventilation (MV) increases morbidity, mortality and costs. Spontaneous Breathing trial (SBT) are recommended to reduce the failure of extubation. It is recommended to perform these SBT with a pressure support ventilation of + 7cmH_20 and PEEP 0 (PSV7), to compensate the resistances of the circuits. Improved technology decreases these resistances. Oxygen cause a pulmonary toxicity by multiple inflammatory reactions, which can prolong the duration of MV. We changed our SBT protocol by removing pressure support ventilation (PSV) and applying a protocol to decrease the fraction of inspired oxygen (FiO2) during MV. The aim of this study is to evaluate the impact of this protocol on the duration of MV.

Methods: This is a retrospective, single-center, before-after study, comparing two 7-month periods, before and after modification of the service protocol: PSV7 in the first period and PSV + 0 cmH_20, associated with a protocol of reduction of FiO2 in the second (PSV0). The primary endpoint is the MV duration in hours. Data are expressed as median [Q1-Q3], mean ± SD or n (%) and compared by Wilcoxon or Fisher test. A logistic regression was conducted to compare the duration of mechanical ventilation between groups.

Results: 195 patients were included, 103 and 92 for PSV0 and PSV7. During the PSV0 phase the MV duration is not significantly lower (90 [32-215] vs 97 [27-287] hours, p = 0.78), but significantly after adjustment. Before the first SBT (SBT1), FiO2 was lower for PSV0 (0.3 [0.25-0.4] vs 0.4 [0.3-0.5], p = 0.023). The number of SBT before extubation was comparable (2 [1-3] vs 1 [1-4], p = 0.84), as was the number of SBT1 failures (15% vs. 19%, p = 0.42). The RR / VT (RSBI) in the end of SBT1 was not significantly higher for PSV0 (65 [45-96] vs 56 [36-84], p = 0.18). The extubation failure rate was not different (14% vs. 16%, p = 0.59).

Conclusions: Our new protocol, SBT in PSV0 and reduction of FiO2, is associated with a reduction in duration of MV.

Keywords : mechanical ventilation, spontaneous breathing test, extubation, fraction of inspired oxygen, Weaning from mechanical ventilation.

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