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PEFR IN DECANNULATION OF TRACHEOSTOMIZED PATIENTS

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ABSTRACT

Introduction: The weaning of tracheostomized patients off their mechanical ventilation dependency through decannulation is often a fundamental procedure. However, it is a common occurrence for a decannulation procedure to fail. As much as there are various protocols for carrying out decannulation, none of these has been accepted as conventional. Importantly, it is useful to undertake the assessment of particular patient parameters prior to carrying out the process of decannulation. One such assessment is the measurement of the peak expiratory flow rate (PEFR). **Objective:** The objective of this study was to describe the significance of the PEFR in decannulation of tracheostomized patients. **Methods**: An experimental approach was carried out in this study involving 50 patients who had been tracheostomized and were due to undergo decannulation at the at King Abdul Aziz medical city in Jeddah. All the 50 patients underwent the highest peak expiratory flow rate measurement using a flow meter before decannulation was carried out. **Results**: Out of the 50 patients who all luckily yielded normal PEFR values, 47 underwent successful decannulation while only three was decannulation unsuccessful. The findings showed that PEFR is a significant assessment parameter that can be employed in the decannulation of tracheostomized patients. **Conclusions**: The flow meter is a significant device that can be used to measure PEFR in tracheostomized patients before decannulation can be carried out. Its use in the measurement of PEFR is more likely to grant critical findings that can grant guidance on the extent of success of the decannulation procedure.

KEYWORDS: Tracheostomy; Decannulation; Flow Meter; Weaning; Peak Expiratory Flow Rate.

INTRODUCTION

Tracheostomy remains an important clinical intervention for patients who are in need of protracted airway protection and mechanical ventilation (MV)/ intubation (Esteban et al., 2000). However, upon recovery, it is imperative to carry out decannulation to wean the patient off his or her dependence of the MV support gradually so that he or she can attain normal spontaneous airway protection and respiration. The process usually takes a while since it is quite slow (Heffner & Hess, 2001). For patients who have undergone a tracheostomy, the process of decannulation plays a significant role in their liberation from mechanical ventilation (MV). A prolonged occurrence of tracheostomy may elicit anxiety in a patient as it interferes with the patient's ability to speak (O'Connor et al., 2009). While decannulation is an important procedure for transitioning tracheostomized patients into the normal breathing mechanism, a conventional protocol for its operation is still non-existent (Singh, Saran, & Baronia, 2017). This study looks into the role of peak flow expiratory rate (PEFR) measurement in the decannulation of tracheostomized patients.

Multiple clinical judgment criteria that may be considered as a minimum threshold are useful for carrying out what may be termed as a successful decannulation procedure. Such minimum requirements include a protective coughing and a sensorium coordinated swallowing (Singh et al., 2017). While it is significant to ensure certain parameters such as breathing mechanisms are well-coordinated failures to observe such elements may result in the risk of failure of the procedure and relapse into intubation after the process of decannulation. It is therefore imperative to conduct sufficient assessment to diminish the possibility of the failure of the procedure that could be influenced by sepsis, poor neurological status, old age, tenacious secretions, or obesity (Singh et al., 2017). When it comes to assessing a tracheostomized patient's breathing system, the evaluation of the PEFR can help grant guidance towards the best time for a successful decannulation as a model of risk minimization of an unsuccessful procedure. The normal values for PEFR for both males and females are shown in figure 1 presented below. PEFR refers to the maximum airflow achieved after a forceful when the lungs are fully inflated (Jiang, Esquinas, & Mina, 2017).

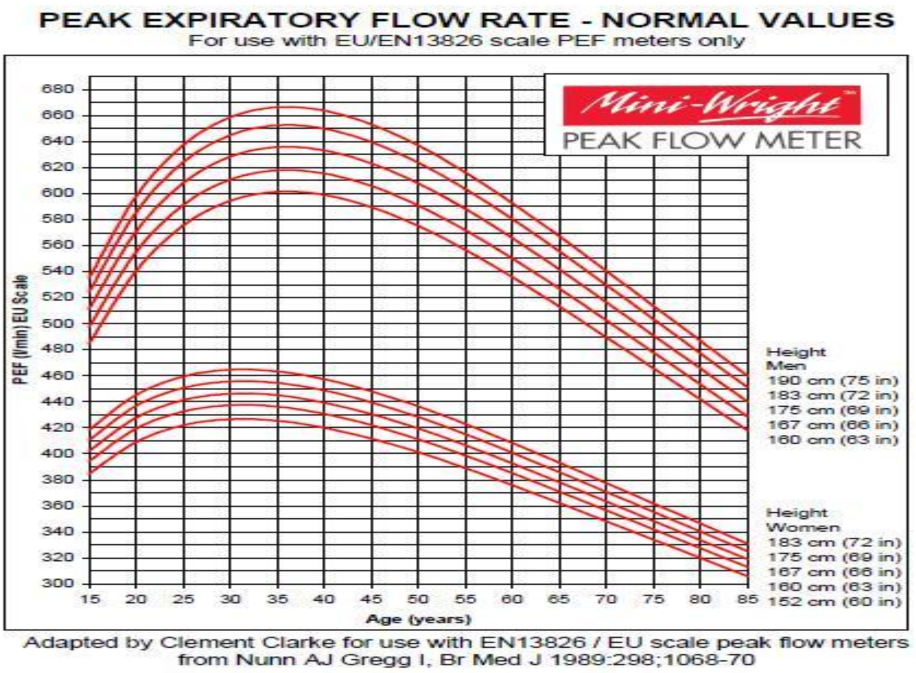

Figure 1: Peak flow expiratory rate normal values. Source: Ptgear. http://www.ptgear.co.uk/wp-content/uploads/2011/09/Peak-expiratory-flow-rate-Normal-Values.jpg

PEFR can be measured using the peak flow meter. A diagram of the peak flow meter is presented in figure 2 shown below.

Figure 2: A peak flow meter. Source: Shop Apotheke https://static.shop-apotheke.com/images/D09476603-p1.jpg

Decannulation failures are common and patients who have suffered cute brain injury can experience failures around 2% while patients who have suffered neuromuscular ventilator insufficiency may experience decannulation failures of up to 32.4% (Winck, LeBlanc, Soto, & Plano, 2015). Decannulation is important in tracheostomized patients since it is able to enhance their rates of survival and experience a shorter hospital stay compared to those who are still under tracheostomy. In instances where decannulation fails, the possible interventions may include readmission to the ICU translaryngeal intubation in a more adverse situation or a simple recannulation where there is no course for alarm which is often a majority representing 62.5% (Winck et al., 2015).

METHODOLOGY

The population observed in this study consisted of patients who had been under tracheostomy at the at King Abdul Aziz medical city in Jeddah and were to undergo the process of under process of decannulation. The patients had all been inserted with a tracheostomy tube and had been undergoing therapy and respiratory rehabilitation. A total of 50 tracheostomy patients were enrolled in the program. The procedure involved measuring the highest peak expiratory flow rate (PEFR). PEFR was measured using a flow meter for all the 50 patients who yielded normal values.

In order to use the flow meter, the device was first installed with connected using a bacterial/viral filter at the end of the mouthpiece and the marker ensured to have been at the bottom end of the numbered scale. Each patient at a time was then made to sit or stand upright depending on whichever way a patient deemed comfortable. The patients were then requested to take a deep breath and fill their lungs with air to their full capacity and were then instructed to hold their breath until they placed their lips around the mouthpiece so that air will not escape exteriorly and with their teeth biting hard at the mouthpiece. Importantly they were to ensure that their tongue did not obstruct the airway on the flow meter at the mouthpiece. The patents were then instructed to undertake a single deep expiration through the flow meter as hard and as fast as they could possibly without coughing. The measurement on the flow meter was recorded and the patients instructed to repeat the procedure two more times just to compare the measured findings. The highest of the three rounds was recorded as the peak expiratory flow for each patient. The intention was to evaluate the relationship between PEFR and the outcomes in terms of success or failure of the decannulation procedure for all the patients.

RESULTS

The findings of the study displayed mixed results. However, the variations in the findings were minimal. All the 50 patients who were part of this study indicated normal peak flow rate. Fortunately, enough 47 out of the 50 patients representing 94% who showed normal peak flow rate underwent successful decannulation. However, 3 out of the 50 representing 6% as much as they also displayed normal peak flow rate, did not experience successful decannulation and were placed back on recannulation due to the failed decannulation within 72 hours. The findings are shown in table 1 below.

Table 1: Patients' decannulation outcomes

Variable	n = 50	%
Normal peak flow rate	50	100
Successful decannulation	47	94
Failed decannulation	3	6

From the above findings, it is evident that PEFR with a 94% outcome played a significant role as a determinant for the best time for a successful decannulation in tracheostomized patients. The findings are best described by the pie chart shown in figure 3 below.

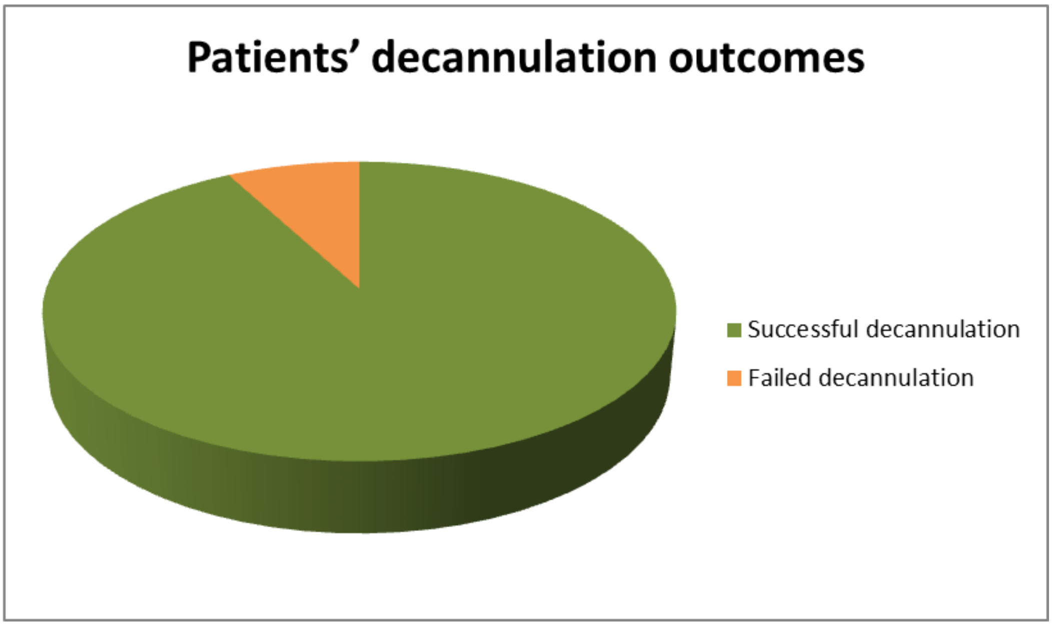

Figure 3: Patients' decannulation outcomes.

DISCUSSION

For the tracheostomized patient, the process of decannulation is very fundamental since it serves as the terminal undertaking that frees them from MV dependency. That said, there is no standard protocol that can be termed as the most universally accepted approach for this clinical intervention considering that several protocols exist. However, instead of focusing attention to multiple practices applicable in the process of carrying out decannulation in tracheostomized patients, this study chose to measure the peak expiratory flow rate as a significant parameter and protocol in determining the readiness of a sample of tracheostomized patients for the process of a successful decannulation. In most cases, the measurement of PEFR is usually carried out using a mechanical device called a flow meter (shown in figure 2 above).

The peak flow meter known mostly as a flow meter is usually a handheld device, which means that it is portable and easily accessible since it is inexpensive used to measure how well air moves out of the lungs of a patient who has been experiencing normal breathing difficulties including those that have been under tracheostomy. It actually establishes how fast the air comes out of the inflated lungs when the patient exhales forcefully which is also known referred to as the PEFR. Measuring of PEFR is significant for tracheostomized patients as it helps to judge whether such patients can withstand normal breathing in the absence of MV. The determination of the PEFR using the flow meter can help a clinician determine the readiness of a patient for the process of decannulation hence liberating them from MV dependency. In most cases, the patient who usually exhibits normal PEFR values as shown distinctly in figure 1 for both males and females would usually experience successful decannulation to a greater extent through the outcomes are never a hundred percent (100%) as revealed in the findings of this study. The findings in this paper are almost similar to those of (Pierson, 2005) in whose research exhibited an outcome of 95% success for decannulation in tracheostomized patients who had indicated normal PEFR values. Since tracheostomy is usually carried out on the large airways of the lungs, an individual's peak flow meter helps to establish the amount of airflow out of this region. Usually, the PEFR is the highest peak airflow a patient can exhale at any given time. It is a vital parameter in judging how normal or how close to normal, a patient undertakes his or her breathing.

Usually, when an individual's intactness of sensorium has been established, PEFR can be adopted as a further assessment that can help judge the readiness of that patient for decannulation. The significance of the measurement of the parameters of PEFR is that unlike in other protocols where assessment relies on a clinician subjective impression (Singh et al., 2017), the measurement of PEFR using the flow meter is that it provides the exact peak expiratory flow of the patient at any given time. These values can then be compared with standards values of PEFR to ascertain whether the yielded values are normal or not to grant sufficient judgment on whether or not to carry on with decannulation. The flow meter, therefore, presents an easy to use tool that physicians in busy units can use with a greater accuracy compared to the other protocols that rely on their subjective impression. In fact, this certainty increases the quality of care they provide to their tracheostomized patients. This is because it enhances the consistency and objectivity of the care they provide to their tracheostomized patients who require decannulation.

Successful decannulation from the tracheostomy continues to be reported in various studies albeit through varying protocols (Denison, 2004; Choate, Barbetti, & Currey, 2009; Engels, Bagshaw, Meier, & Brindley, 2009). Importantly, such successes have been reported in patients ranging from different pathologies including either pulmonary or neurological illnesses (Heidler et al., 2018). This study adds to the literature by supporting the adoption of PEFR as an applicable and significant parameter for checking the readiness for decannulation and its measurement as a viable protocol to determine the best time for weaning. The findings in this study reported a 94% success, which falls within the establishment of 85–95%, in patients with aetiological issues such as neurological, pulmonary, or cardio-circulatory complications (Perin et al., 2017). However, it shows a huge disparity compared to a population of patients with infratentorial damage, which recorded an outcome of 33% (Perin et al., 2017). Therefore, it is largely evident that the type of medical complication reported in a given population or sample also plays a very significant role in guiding judgment on the level of possible success in a decannulation undertaking. In other words, while certain patients with a particular etiology may report a high level of success when it comes to weaning some may not be considering the underlying illness for which tracheostomy was carried out in the first place. There are also other studies that have reported decannulation outcomes that have been lower than that reported in this study including values such as D = 23.8%, D = 31.5%, D = 46%, and D = 60% (Mackiewicz-Nartowicz et al., 2008; Zanata, Santos, & Hirata, 2014; Matesz et al., 2014; Duan et al., 2014). The findings reported in the literature indicate fairly varied outcomes when it comes to the success of weaning tracheostomy patients from MV.

As reported in the findings of this study only 3 out of the 50 test subjects failed decannulation and regressed back to their previous tracheostomized state. The recannulation procedure was conducted within 72 hours after the three patients underwent unsuccessful decannulation. This was in line with the recommended 48/96 hours for recannulation after a failed weaning attempt (Stelfox et al., 2008). While various definitions for failure remains unequivocal as evident in various works of literature considering the vivid variations as also attached to duration, a most appropriate definition as adopted in this study is that of intolerance to breathing in the absence of MV (Ahmed et al., 2012).

CONCLUSIONS

Decannulation is vital for tracheostomized patients as an approach of liberating them from MV dependency. While this step is as important, possible failures resulting to relapse to the state of tracheostomy remains common. However, prior assessment is usually imperative to establish a patient's readiness to undergo weaning from MV through the process of decannulation. While the measurement for PEFR cannot be categorically stated as a conventionally accepted protocol of pre-assessing the readiness for decannulation, this study reports a successful outcome of 94% in a population of 50 subjects who were under tracheostomy and were due to undergo weaning. Importantly, it is vital to understand that the process of weaning and the transition as a whole must be considered from an individual perspective rather than a collective view (Mitchell et al., 2013). In other words, when considering weaning of patients and transitioning them from MV dependency each patient must be cared for on an individualized basis. In other words, it is not guaranteed that when a given protocol suffices for one patient it will readily show positive results in another patient. Therefore, it is a possible course why a better-standardized and universal protocol for assessing the readiness for decannulation is necessary for the future. Importantly, the measurement of PEFR using the flow meter as shown in this study is not only a simple intervention but also reproducible and is able to enhance the predictability of success with the possibility of a greater outcome. Furthermore, a more predictable and reliable protocol should help avoid the risks associated with unsuccessful decannulation as well as continued cannulation.

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