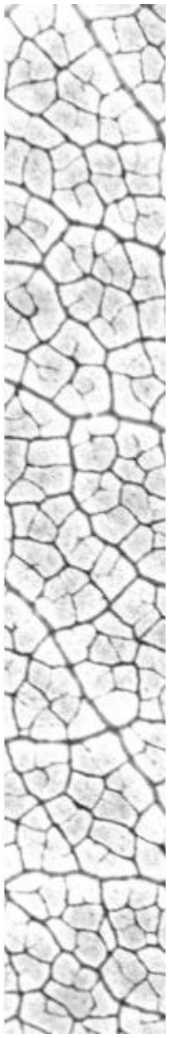

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Early versus late tracheostomy in critically ill patients

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Abstract

Introduction: Tracheostomy is a common surgical procedure which is done in intensive care unit patient ICU. We examined the potential effects of time tracheostomy in ICU.

Aim: A retrospective and prospective study was designed to clarity the effect, outcome and prognosis of early and late tracheostomy in such two groups.

Patients and methods: This study was conducted at department of otolaryngology in Al-Hilla Teaching General Hospital over a period of two years from Feb 2014 to Feb 2016, regardless the age, sex and type of tracheostomy.

Tracheostomy was considered as early ET if it is performed before or on day ten of mechanical ventilation MV of 263 ICU patients,64 require tracheostomy,23 of whom were early and 42 were late.

Results: 1 Most common causes of ICU admission who need ET was traumatic patient

2 Overall mortality rate was less in ET vs LT group

3 Other outcomes like (duration of MV, LOS, VAP, laryngotracheal lesions) were also less with ET vs LT

Conclusion: Based on our study, ET is expected to have better outcome on ICU patient

Keywords: early tracheostomy, ICU, mechanichal ventilation, late tracheostomy

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INTRODUCTION

Tracheostomy

The first successful tracheostomy was attributed to Antonio Brasavola, who recorded saving the file of a patient close to death from an “abcess of the windpipe in 1546” Tracheostomies are most common procedures performed in ICU(Kim, & Kimy, 1985. Seder, et al. 2009).,Tracheostomy has the following benefits, it is easier nursing care become easier, improved comfort, more secure tube with increased patient mobility, allowance of speech, oral nutrition and in some studies early weaning from mechanical ventilation(Bardell, & Drover, 2005. Rodriguez, et al. 1990)., on the other hand, some studies have suggested that tracheostomy is associated with an increased risk of nosocomial pneumonia (Lesnik, et al. 1992. Cross, & Roup, 1981). Main side effects of tracheostomy may occur early (misplacement, subcutaneous emphysema, wound infection and bleeding) or late (tracheal stenosis (Cavalier Bezzim,Toninelli Foccoli, 2007)., especially subglottic, stoma infection, swallowing problems tracheosophageal fistula and mediastinitis),occationally death. The incidence of these complications often depends on the experience of the physician (Harrop, et al. 2004. De Leyn, et al. 2007). Now a days, both surgical and percutaneous tracheostomies can be safely performed at the bed side by experienced, skilled practitioners, with low complications rates (Delaney, Bagshaw, & Nalos, 2006). The evidence on the advantages attributed to early over late tracheostomy is somewhat conflicting but includes shorter hospital stays and lower mortality rates. (Latour, Abraira, & Cabello, 1997; Sahito, et al, 2017).

PATIENTS AND METHODS

Our study was performed in Al – Hillah teaching general hospital ICU. From the 300 hospital bed there were 10 bed ICU staffed by full – time staffs, on – site intensive care for the 24 hours per day and 7 days per week. medical care in the ICU is provided by the ICU specialists.

The decision to perform tracheostomy and when to perform it was at the discretion of the treating I.C. specialist and was typically based on clinical assessment, including the failure to wean, the inability to “protect the air way”, and the inability to cough spontaneously. Tracheostomy was performed in certain patients without an attempt to extubate, if the IC

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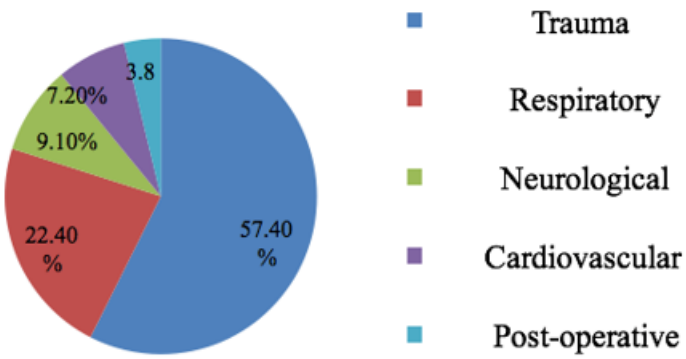

Fig. 1. Common causes of ICU admission

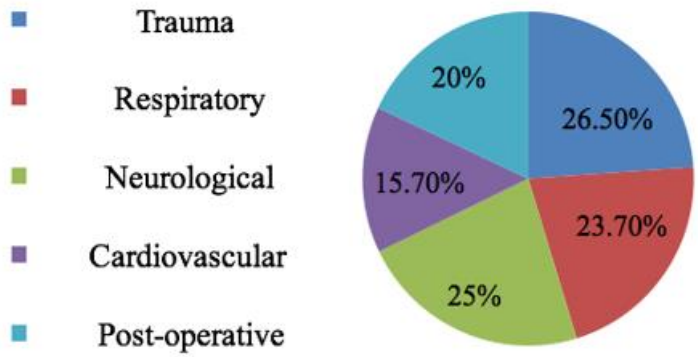

Fig. 2. Percentage of Tracheostomy

specialist judged that the chance for successful extubation was low. In other patients, tracheostomy was performed after one or more failed attempts to extubate.

Data Collection

We have maintained retrospective database including ICU patients admitted to the ICU over 2 year periods (February2014 –February 2016) Who underwent tracheostomy during their ICU stay.

Selection Criteria

We included all randomized controlled trails (RCT) comparing early tracheostomy on/< 10 days after endotracheal intubation against late tracheostomy > 10 days after Endotracheal intubation (EIT) for critically ill patients.

Inclusion Criteria

1- All age groups, both sexes.
2- Critically ill (ICU) patients
3- Patient how need tracheostomy predicted to be on prolong ETI
4- Common ICU patients who required ET
5- Calling from senior staff of ICU.

Exclusion Criteria

1- Burn
2- Coagulation disorders
3- Systemic, soft tissue infection of the neck
4- Previous tracheostomy
5- Anatomical anomalies of the neck
6- Type of tracheostomy (Surgical or percutaneous), or it's inscion (Vertical or Transverse).
7- Previous radiation to the neck
8- Elevated ICP
9- Haemodynamic instability

Types of interventions

We considered the following arms for comparison:

1- **Early tracheostomy**; if no serious attempt was made to wean the patient from the mechanical ventilator (MV) tracheostomy based only on clinical or laboratory results and performed on /< 10 days after ETI
2- **Late tracheostomy**, if weaning had not been successful, performed on or later than 10 days after ETI.

Outcomes

1- Mortality rate.
2- Duration of MV
3- length of stay in ICU / hospital stay
4- Ventilator – associated pneumonia (VAP)
5- Lryngotracheal lesions (in epiglottis, vocal cords, larynx, subglottic ulceration, inflammation, stenosis).
6- Sedation requirement
7- Cost of hospitalization
8- Psychological outcome

RESULTS

During the period of our study there were 263 patients who represent the total number of patients who are admitted to our ICU.

Table 1. Most common causes of ICU admission, with No of tracheostomy done accordingly

Causes	Total N[%]	Tracheostomy N[%]
Trauma	151 (57.4)	40 (26.5)
Respiratory	59 (22.4)	14 (23.7)
Neurological	24 (9.1)	6 (25)
Cardiovascular	19 (7.2)	3 (15.7)
Post-operative	10 (3.8)	2 (20)

Table 2. Summarizes the percentages of ET,LT in different causes of ICU admission

Causes	ET less than 10 days	LT more than 10 days	P-value
Trauma	18 (78.2%)	22 (52.4%)	0.0949
Brain injury	11 (47.8 %)	15 (35.7%)	0.7127
Spinal cord injury	2 (8.7%)	2 (4.8%)	0,9542
Others	5 (21.7%)	5 (11.9%)	0.8602
- Respiratory	12 (52.2%)	2 (9.1%)	0.2753
- Neurological	4 (17.4%)	2 (9.1%)	0.8045
- Cardiovascular	Nill	3 (7.1%)	
- Post-operative	1 (4.3%)	1 (2.4%)	0.9579

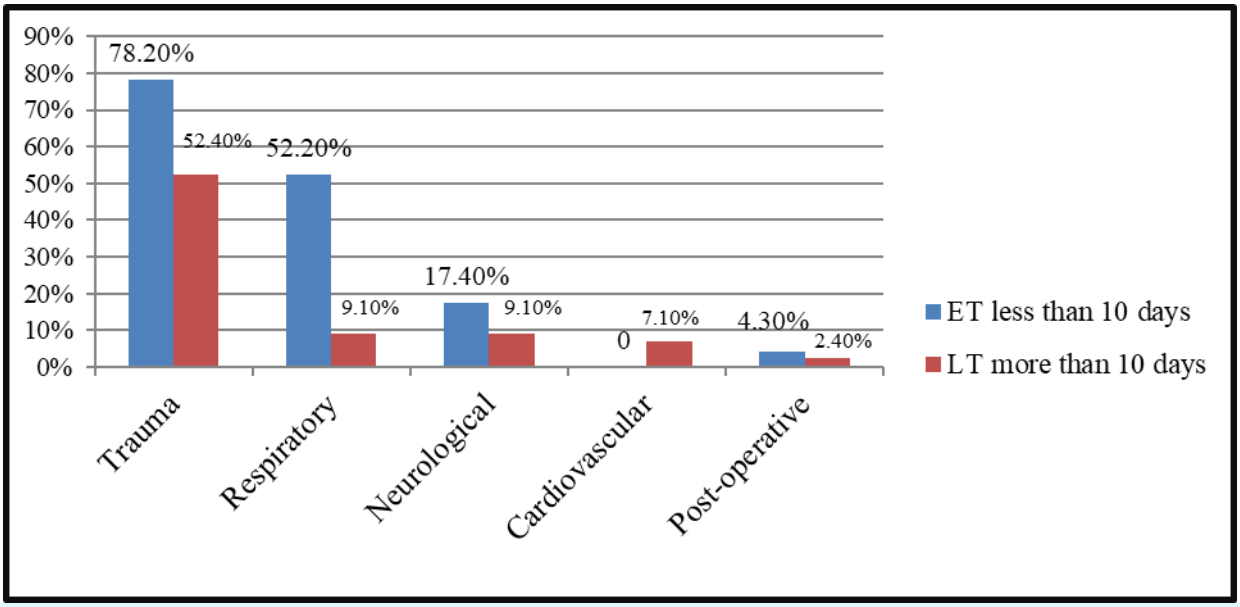

Fig. 3. Percentage of ET,LT in different causes of ICU

From 263 patients, the number of patients who required tracheostomy was 65 (23.6%); of whom there were 23 (35.4%) patients had tracheostomy on/within 10 days and the remaining 42 (64.6%) underwent tracheostomy after 10 days. There is no specific age or sex is included in our study, the two extreme ages from (2- 69y), and Male to Female ratio is nearly about 1.5:1.

Table 1 summarizes the most common causes of ICU admission with No. of tracheostomy done accordingly. The most common causes of ICU admission were trauma 57.4% and need tracheostomy 26.5% while the cardiovascular and postoperative cause were less common. **Table 2** summarizes the percentages of ET,LT in different causes of ICU admission and showed that the most common causes of ICU admission who need ET was traumatic patients (78.2) where as cardiovascular and postoperative patients were less common. **Table 3** showed that there were decrement in mortality rate, in ET was about(30.34%) while in LT was(35.7%) with short LOS(52.2%)& lessVAP(21.7%) in ET. While **Fig. 3** show the percentage of ET,LT in different causes of ICU admission.

DISCUSSION

Mortality

In our study, we found decrement in the over all mortality in the group of patient how subjected to early tracheostomy (ET) (30,34%) as compared to the late (LT) group (35.7%), (irrespective of follow uptime) (Andriolo, et al. 2015. Terragni, et al. 2010). support our results. This is may be due to proper selection of patients whom candidate for tracheostomy excluding those patients who were unlikely to survive,while other studies(Griffiths, et al. 2005. Rumbak, et al. 2004). Yassen et al. 2009). found that the MR between 2 two group were similar. Our results are consistent with theory proposed by (Walts, et al. 2006).that events occurring between the interval of admission to ICU and tracheostomy and the patient condition are the primary

Table 3. Comparison between the outcomes of ET VS LT

Items	ET less than 10 days	LT more than 10 days	P-value
Overall mortality rate	7 (30.34%)	15 (35.7%)	0.8092
Duration of MV (days)	9 +/- 2	18 +/- 3	
ICU hospital stay	12 (52.2%)	16 (38.1%)	0.4653
VAP	5 (21.7%)	17 (40.5%)	0.4526

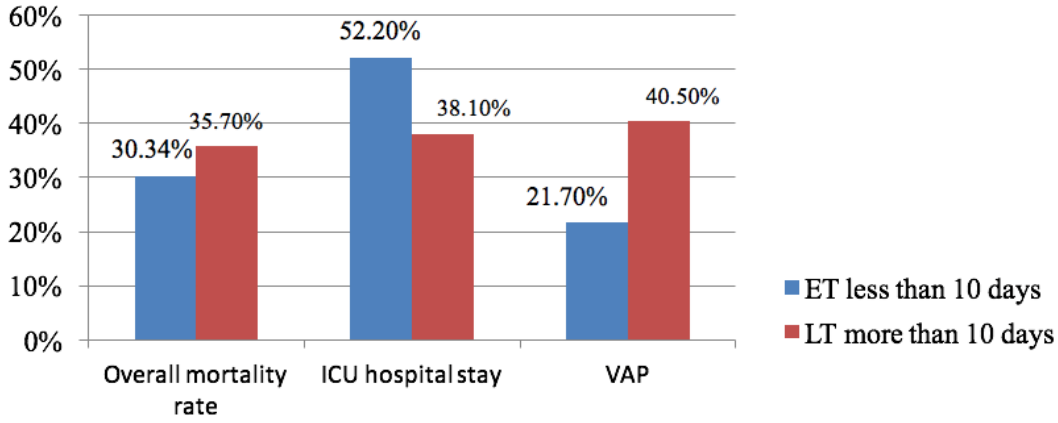

Fig. 4. Outcomes of ET Vs LT

Table 4. Summarizes the Laryngotracheal lesion in ET Vs LT

Items	ET less than 10 days	LT more than 10 days	P-value
Laryngeal edema	6 (26.1%)	38 (90.5%)	0.0002
Ulceration	4 (17.4%)	31 (73.8%)	0.0257
Granuloma	2 (8.7%)	18 (42.9%)	0.3602

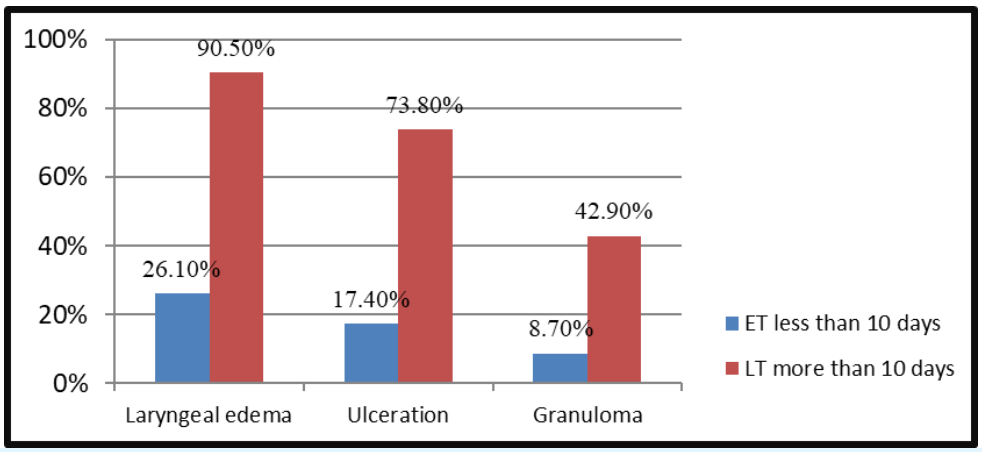

Fig. 5. Laryngeotracheal lesion in ET Vs LT

determining variables associated with long term outcomes. (**Murthy** et al 2007(Murthy, Set al. 2007).; **Jagan** et al 2012(Devarajan, et al. 2012). reported that the severity of illness, reals or perceived presumably affects tracheostomy timing and outcomes. i.e the decision to perform tracheostomy (atrach) might be delayed in severely ill patients because of increased risk; similarly, a trach might be delayed in patients who though to be improved.

Duration of MV

In our study we found lower days of MV in the ET group when compared with the late group(Bickenbach, Jet al. 2011. support our results, while Dunham 1984 (Dunham, & LaMONICA, 1984). reported that the risk of MV observed with the ET group (51.5%) as compared to the late group 42% also (Griffiths, Barber, Morgan, & Young, 2005).showed the same results. Terrangi (Terragni, et al. 2010). observed the ET group experienced asuccessful weaning as compared to the LT group. Also scales (Scales, Thiruchelvam, Kiss, A., & Redelmeier, 2008). et al (Combeset al. 2007. Hsu, et al. 2004) support these results. This effect of weaning may be due to decrease in the airflow resistance and reduce dead space after tracheostomy lead to successful MV weaning.

Length of stay ICU / hospital stay

In our study we found that the patients who subjected to ET seemed to have a higher probability of earlier ICU

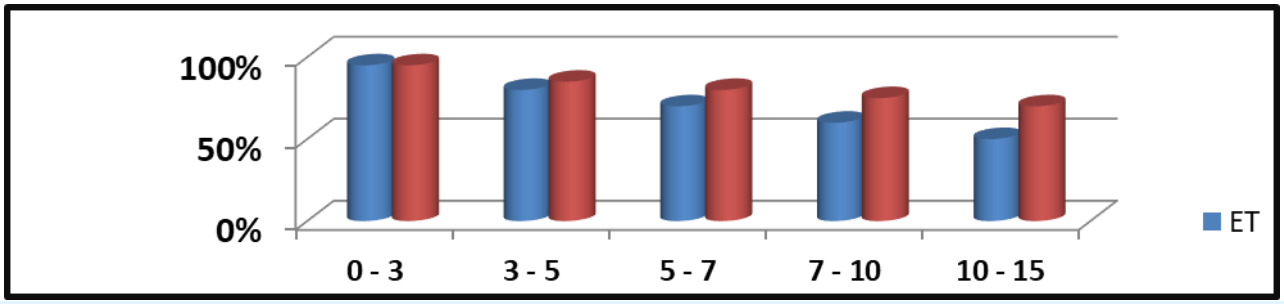

Fig. 6. Sedation requirement in ET Vs LT

discharge at (52.2%) as compared to the patient in the LT group (38.1%)(Terragni, et al. 2010. Griffiths, Barber, Morgan, & Young, 2005. Bickenbach, et al. 2011. Durbin, Perkins, & Moores, 2010. Villar, et al. 2011). support our study. Regarding the length of hospital stay LOS, Terragni 2010(Terragni, et al. 2010). observed no clinically relevant difference between the two groups but Moller (Möller, et al. 2005)**.** uggested that the LOS were longer in the LT group, (comebes et al 2007) found that the LOS is decreased with ET as compared with LT.

VAP

The association of tracheostomy with VAP is very important, MV is known to be associated with infection include local wound infection, VAP, and septicemia(Feldman, et al. 1999)., Because endotracheal tube provide direct conduit to lower airway and often colonized with pathogenic organisms, proliferation of those organisms colonizes the trachea and in compromised patients, results in an invasive infection distally in the lung(Agbaht, et al. 2007)., In addition, a route of secondary infection from the lungs to the blood stream with resultant septicemia may contribute to high mortality observed in medical patients with VAP.(Nseir, et al. 2007). The aim of placing a tracheostomy sooner than later to remove the portal for bacterial invasion, this idea is strongly supported by(Griffiths, et al. 2005. Rumbak, et al. 2004. Bickenbach, et al. 2011. Dunham, & LaMONICA, N. N. 1984. Combes, et al. 2007. Möller, et al. 2005. Kluge, et al. 2008). Our results are seems it be supported by previous studies, where we found decrement in development of VAP in ET in compares with higher results in LT group. But in the 1980s suggested that complications including lung infection were increased after placement of a tracheostomy, this led to that tracheostomy be considered only if an artificial air way was needed for 21 days or more, Also (Griffiths, Barber, Morgan, & Young, 2005).conclusions stated that an ET had no significant effect on development of VAP. Our study found high incidence of aspiration (40.5%) in the LT group compared to the ET group (21.7%), this may be due to poor nursing care. **Freeman** etal.2008(Freeman, et al. 2008)., he found that the prevention of VAP had inverse relationship with in adequacy of nursing care and care of health workers to the patients receiving MV and ***/*** or with tracheostomy and prolong ICU patients stay (Rello, et al2002). Vincent, Lobo, & Struelens, 2001). Finally, the incidence of VAP is related directly to the duration of MV(a complication that carries significant morbidity and mortality(Ranas, et al. 2005).

Laryngeotracheal l esions

The endotracheal intubation (ETI) can cause ulceration and injury to the pharynx, larynx and trachea. It limits the patients movements who are bedridden and involves the phonatary part of the larynx (glottis), and is associated with loss of speech during that period. It predisposes the patients to subglottic stenosis which difficult to manage(Kluge, et al. 2008). The subglottis is the narrowest part of the airway and the region where complications are likely to arise(Bouderka, et al. 2004).,which may lead to postoperative dyspnea, stridor cartilaginous type of subglottic stenosis caused by stomal infection or prolonged intubation. Our study found 31 patients in LT and 4 patient in the ET. **Bouderka** et al(Bouderka, et al. 2004). support our results. Our study founds that higher mucosal injury in LT group as compared with ET. (90.5% had laryngeal oedema, 73.8% ulceration, 42.9% had granuloma, the majority of these complication formed by 4^{th} wks after intubation, Also we found the healing of mucosal injury (pharynx, larynx, tracheal) takes a longer time in LT group as compared with ET group which has documented by using FFL at time of discharge these findings has been supported by(Nowak Cohn, Guidice 1987. Barquist, et al. 2006). While **Richard** etal(Richard, et al. 1996). found that the risk of laryngotracheal stenosis was not dependent on the duration of intubation. Postoperative adverse events like stoma inflammation ; stoma inflection ; miner bleeding major bleeding ; pneumothorax etc are more common with ET as these results are supported by (Terragni, et al. 2010. Rumbak, et al. 2004).

Sedation requirements

In our study we found decrease in the sedation requirement in ET group as compared with LT.These results supported by (Combes, et al. 2007)This is may be due to anticipated benefits of tracheostomy included improved patient comfort due to reduced nasopharyngeal and laryngeal stimulation, which might

in turn shorten duration of sedation. However, **Veelo** etal(Veelo, et al.2006). suggested that no reduction in sedation requirement was observed after tracheostomy.

Cost of hospitalization

In our study we found there is decrement in the cost of hospitalization this is may be due to decrement in the LOS, the MV duration, usage of drugs. **Brook** et al (Brook, et al. 2000). Support our results.

Psychological outcome

Our study found that there is more comfortable patients in ET than group of LT this is may be due to Endotracheal intubation restricts the patient movements, oral intake, and communication in addition to pharyngeal stimulation, prolonged LOS all these drawbacks may lead to physician preference to early(trach)(Armstrong, McCarthy, & Peoples, 1998). **Blot** etal. 2008(Blot, et al. 2008)., reported that oral comfort scares, feeling of mouth uncleanliness, perception of change in body image, feeling of safety, and overall comfort were lower in the prolonged intubation (LT) group. In addition; by our study we found that the most common causes of ICU admission is the **Trauma** (57.4%) with multiple sequel which may make the patients are more easily identified as candidate for ET. In patients with **acute sever brain injury** which form about (65%) of total traumatic tracheostomized patients we found that there was higher probability to do ET in such patients as compared with LT group. The above implies that tracheostomy should not be routinely performed during first seven day following sever traumatic brain injury due to increased mentality of relevance, same as literature indicate that a low probability of good outcome for severe brain injury exists when there is an admission GCS3 – 5, Age > 45 y, I.C hypertension, hypoxemia or hypotension.

CONCLUSIONS

Based on our study, early tracheostomy is expected to have a better outcome on critically patients which provide lower overall mortality rate than that of late tracheostomy. Also, ET provide larger number of ventilator free days (UFDs), shorter ICU stays, shorter duration of sedation, less larngotracheal injuries, less cost for hospitalization, and well psychological benefits among ET group. Also we found that the patients how had have acute brain injury, SCIs, stroke, maxillofacial trauma, difficult ETI as morbid obesity are more confidante for ET in our country to be drawn. Systemic weaning protocols should be used to reduce the effect of different approaches toward weaning.

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