ORİJİNAL MAKALE / ORIGINAL ARTICLE

Balıkesir Sağlık Bilimleri Dergisi / BAUN Sağ Bil Derg
Balıkesir Health Sciences Journal / BAUN Health Sci J
ISSN: 2146-9601- e ISSN: 2147-2238
Doi: https://doi.org/10.53424/balikesirsbd.1284998

Retrospective Comparison of Percutaneous Forceps Dilatation Tracheostomy and Conventional Surgical Tracheostomy

Serkan UÇKUN[1], Hafize Fisun DEMİR[1], Fatih UGÜN[1], Nazan KOCAOĞLU[1], Özlem SAĞIR[1], Ahmet KÖROĞLU[1]

[1] Balikesir University, Faculty of Medicine, Department of Anesthesiology and Reanimation

Geliş Tarihi / Received: *26.04.2023,* ***Kabul Tarihi / Accepted:*** *06.08.2023*

ABSTRACT

Objective: We aimed to retrospectively evaluate the early complications of conventional surgical and percutaneous forceps dilatation tracheostomies in intensive care patients. **Materials and Methods:** Electronic records of ICU patients hospitalized in our unit between 2019 and 2022 were retrospectively scanned. Demographic data, the tracheostomy tecnique and early complications related to the procedure were recorded. **Results:** A total of 64 patients underwent a tracheostomy in our ICU. 34 (53.2%) patients underwent conventional surgical tracheostomy (CST) and 30 (46.8 %) patients underwent percutaneous forceps dilatation tracheostomy (PFDT). The mean age of the patients was 73.30±14.45 y, and 29 (45.31%) patients were male. The mean length of intubation before the procedure was 19.36±7.76 days, it was significantly longer in the CST group (21.74±9.34 days) compared to the PFDT group (16.67±7.31 days) (p=0.02). Early complications occured in 7 patients (20.58%) in the CST, and in 5 patients (16.66%) in the PFDT group. **Conclusion:** We believe that in the rate of early complications of PFDT is similar to CST.

Keywords: Intensive Care, Percutaneous Tracheostomy, Complications.

Perkütan Forseps Dilatasyon Trakeostomi ve Konvansiyonel Cerrahi Trakeostominin Retrospektif Karşılaştırılması

ÖZ

Amaç: Yoğun bakım hastalarında retrospektif olarak, konvansiyonel cerrahi ve perkütan forseps dilatasyon trakeostomilerinin erken dönem komplikasyonlarını değerlendirmeyi amaçladık. **Gereç ve Yöntem:** 2019-2022 yılları arasında ünitemizde yatan yoğun bakım hastalarının elektronik kayıtları retrospektif olarak tarandı. Demografik veriler, trakeostomi tekniği ve işleme ilişkin erken komplikasyonlar kaydedildi. **Bulgular:** Yoğun bakım ünitemizde toplam 64 hastaya trakeostomi açıldı. 34 (%53.2) hastaya konvansiyonel cerrahi trakeostomi (KCT) ve 30 (%46.8) hastaya perkütan forseps dilatasyon trakeostomi (PFDT) uygulandı. Hastaların yaş ortalaması 73.30±14.45 idi ve 29 (%45.31) hasta erkekti. İşlem öncesi ortalama entübasyon süresi 19.36±7.76 gün olup, KCT grubunda (21.74±9.34 gün) PFDT grubuna göre (16.67±7.31 gün) anlamlı olarak daha uzundu (p=0.02). KCT'de, 7 hastada (%20.58) PFDT grubunda 5 hastada (%16.66) erken komplikasyon gelişti. **Sonuç:** PFDT'nin erken komplikasyon oranlarının KCT'ye yakın olduğunu düşünüyoruz.

Anahtar Kelimeler: Yoğun Bakım, Perkütan Trakeostomi, Komplikasyonlar.

Sorumlu Yazar / Corresponding Author: Serkan UÇKUN, Balikesir University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Balikesir, Turkey
E-mail: serkan.uckun@balikesir.edu.tr

Bu makaleye atıf yapmak için / Cite this article: Uckun, S., Demir, H. F., Ugun, F., Kocaoglu, N., Sagir, O., & Koroglu, A. (2024). Retrospective comparison of percutaneous forceps dilatation tracheostomy and conventional surgical tracheostomy. *BAUN Health Sci J, 13*(1), 40-44. https://doi.org/10.53424/balikesirsbd.1284998

INTRODUCTION

Tracheostomy should be considered for patients with respiratory failure who need long-term mechanical ventilation (over ten days) in the intensive care unit (ICU) (Hosokawa et al., 2015). Tracheostomy is preferred due to its advantages such as reducing the need for sedation and facilitating weaning from the ventilator (Delaney et al., 2006; Hosokawa et al., 2015). In addition, it has been reported to improve patient comfort, oral nutrition, hygiene and communication (Bösel, 2014). Apart from these, it is preferred to overcome upper airway obstruction (including vocal cord paralysis), and for neurological disorders which require airway protection.

In conventional surgical tracheostomy (CST), the surgeon makes an incision (tracheotomy) below the anterior part of the neck at the midline. After passing the skin, connective tissues and muscle structures, the second and third tracheal cartilages are reached. The tracheostomy cannula is placed following this line. In recent years, the percutaneous dilatation tracheostomy (PDT); which can be performed safely at the bedside; gained popularity (Hashimoto et al., 2014). With this technique, the trachea is reached with the help of a punction needle. After the insertion of a guidewire through the needle the tracheostomy cannula is placed into the trachea. The skin, tissues and trachea are dilated with one or multipl dilatators according to the method. Studies in the literature report that PDT is easier, safer and more advantageous in terms of complications compared to surgical tracheostomy (Cabrini et al.,2012; Higgins & Punthake, 2007).

Numerous studies have compared different PDT techniques with each other or with CST. Many methods have been described previously, but Ciaglia et al. (1985) and Griggs et al. (1990) are the most frequently used. The Griggs method; which is found to be easier and safer than standard tracheostomy techniques, facilitates the procedure by using a forceps. Thereby described as percutaneous forceps dilatation tracheostomy (PFDT) (Griggs et al.,1990). In addition, it has been shown that the complication rate of PDT is low with the Griggs technique (Cicek et al., 2007). For this reason, we prefer to perform PFDT with the Griggs technique in our ICU.

The aim of our study was to compare the early complication rates between PFDT and CST tracheostomy.

MATERIALS AND METHODS

Study type

In this retrospective study, the files of patients admitted to the intensive care unit of our university hospital between 2019-2022 were scanned.

Procedures

Patients who underwent tracheostomies were identified and patient data was further evaluated. The reasons for hospitalization, death or discharge status were recorded.

The inclusion criteria of the patients were determined as being older than 18 years of age, not having had a tracheostomy before, and being hospitalized in the intensive care unit for 72 hours or more. The exclusion criteria of the patients were determined as tracheostomy opening during admission to the intensive care unit and lack of patient data. Demographic data, length of intubation (in days), tracheostomy technique (surgical or percutaneous), application site, laboratory values before the procedure and location of the procedure (ICU or operating theatre) were collected. Complications during and in the early period after the procedure were evaluated. Complications during the procedure were determined as airway loss, hypoxemia and cardiopulmonary arrest. Complications in the early period after the procedure were determined as minor bleeding, major bleeding, subcutaneous emphysema, pneumothorax, malposition of the cannula and cartilage damage. Blood leakage from the stoma or through the cannula which could be treated without surgical intervention was defined as minor bleeding, if surgical intervention was necessary it was defined as major bleeding.

Statistical analysis

In this study, statistical analyzes were performed with NCSS (Number Cruncher Statistical System) 2007 Statistical Software (Utah, USA) package program. Distribution of variables was examined with the Shapiro-Wilk normality test. The independent t-test was used to compare the normally distributed variables between paired groups. Mann-Whitney U test was used for comparison of not normally distributed pairwise groups. Chi square test was used for the comparison of qualitative data. P values under 0.05 were regarded as statistically significant.

Ethical considerations

After the approval of the Balıkesir University Faculty of Medicine Clinical Research Ethics Committee, the files of the patients who were administered to the ICU of our University hospital between 2019-2022 were scanned (Approval no: 2023/16).

RESULTS

Files of 659 patients, who were admitted to the ICU between 2019-2022, were evaluated. 64 patient who underwent tracheostomy with PFDT or CST were included. Those who underwent PFDT were classified as Group P, and those who underwent CST were classified as Group C. There was no difference between groups in means of age and gender (Table 1). ($p>0.05$)

The reasons for admission to the ICU are listed in Table 2. The mean length of intubation before the procedure was 19.36±7.76 days, it was significantly longer in the CST group (21.74±9.34 days) compared to the PFDT group (16.67±7.31 days) ($p=0.02$).

Conventional surgical tracheostomies were performed under general anesthesia by otolaryngologists in the operating room.

Table 1. The distribution of mean age and gender of the patients.

		All Patients (n:64)		Group P (n:30)		Group C (n:34)		p
Age		73.30±14.45		76.6±9.47		70.38±17.35		0.086
Gender	**Male**	29	45.31%	12	40.00%	17	50.00%	0.423
	Female	35	54.69%	18	60.00%	17	50.00%	

The percutaneous method was applied by anesthetists at the bedside in the intensive care unit using a tracheostomy tube kit (SCW, Shenzhen, P.R. China). All patients were orotracheal intubated and mechanically ventilated during the procedures. Bronchoscopy was not used during the procedure. All patients received standart monitorisation including electrocardiography, pulse oxymetry and invasive/noninvasive blood pressure measurements. Patients in both groups received anesthesia with propofol, fentanyl and rocuronium. Platelet count, activated partial thromboplastin time and prothrombin time values were within normal limits in all patients. Laboratory values were not different between groups. (p>0.05)

There was no statistically difference between minor and major bleeding between the groups respectively. Among the early complications no statistically significant difference was observed between the two groups in terms of malposition and emphysema (p=1, p=0.998) (Table 3)

In our study, 2 patients discharged from the intensive care unit were decannulated, 12 patients were discharged at home with mechanical ventilator.

None of the patients in both groups died due to complications during or after the procedure. Fifty cases (23 in group P, 27 in group C) died due to their underlying pathologies. There was no difference between the two groups in terms of mortality.

DISCUSSION

We found that PFDT was similar to conventional surgical tracheostomy in terms of early complication rate. Although percutaneous tracheostomy is an easy method, the incidence of peroperative complications and death may be high when performed by inexperienced people (Crofts et al.,1995; Hutchinson & Mitchell, 1991). Patients may die in the early period because of serious complications such as subcutaneous emphysema and esophageal rupture as a result of a pseudo-transition formation (Memmedova et al. 2022). Perioperative complications, particularly cardiorespiratory arrest and death, are higher than surgical tracheostomy, but these reports are old and primarily relate to tracheostomies in patients not in the intensive care unit (Friedman, 1996).

There are also studies in which percutaneous tracheostomy was performed with the Griggs method and no cardiorespiratory arrest and perioperative death were reported in any patient (Ersoy et al., 2012; Seker et al., 2017). In our study, cardiorespiratory arrest and perioperative death were not observed. In our study 50 patients died because of underlying conditions.

Table 2. Indications for ICU admission.

Diagnoses at Hospitalization	Group P (n:30)		Group C (n:34)		p
Sepsis	3	10.00%	4	11.76%	0.812
Cancer	1	3.33%	1	2.94%	0.928
CHF	5	16.67%	7	20.59%	0.936
Neuromuscular diseases	2	6.67%	0	0.00%	0.481
CPR	6	20.00%	3	8.82%	0.359
Pulmonary	1	3.33%	5	14.71%	0,259
Neurological	12	40.00%	11	32.35%	0.707
Multi-trauma	0	0.00%	3	8.82%	0.241

CHF: Chronic Heart Failure, PCA: Post Cardiorespiratory Arrest

Gysin et al. studied 140 patients undergoing percutaneous and surgical tracheostomies, with 70 patients in each group, and reported minor complications like bleeding, difficulty in cannula insertion, pseudo-transition formation and subcutaneous emphysema in 11% of the patients in the surgical group and in 37% in the percutaneous group (Gysin, 1999). In percutaneous tracheostomy, usually 50-100 mL blood loss leaking from the stoma is observed (VanHeurn et al., 1996). Minor bleeding may occur in prolonged procedures and can often be

Table 3. Early complications.

Early complications		All Patient Group (n:64)		Group P (n:30)		Group C (n:34)		p
	None	52	81.25%	25	83.33%	27	79.41%	-
	Minör bleeding	6	9.38%	4	13.33%	2	5.88%	0.665
	Major bleeding	3	4.69%	0	0.00%	3	8.82%	0.242
	Malposition	2	3.13%	1	3.33%	1	2.94%	1
	Emphysema	1	1.56%	0	0.00%	1	2.94%	0.998

controlled with compression, but ligation may be required in major bleeding (Petros & Engelmann, 1997). In our study, major bleeding requiering surgical intervention was observed in 3 patients in the CST group only. Minor bleeding was Patients can be decannulated by closing the stoma after percutaneous tracheostomy, which is an important step to save the tracheostomy patient from mechanical ventilation (Singh et al., 2017). Or, as in the study of Marchese et al., the patient can be discharged with a mechanical ventilator at home with a tracheostomy with or without a mechanical ventilator at home. (175 patients) (Marchese et al., 2010). In our study, 2 patients were decannulated, one patient had CST and one patient had tracheostomy with PFDT technique. 12 patients were discharged with home ventilator.

Retrospective study design, the small number of patients, unability to present long-term complication rates due to the lack of data are the limitations of this study. Also the tracheostomy procedures were only performed with CST between 2019-2021 because the tracheostomy tube kit was not available this is another limitation.

We attribute the longer mean intubation time before conventional surgical tracheostomy to the operating room preparation process and the intensity of the operating room work schedule.

CONCLUSION

As a result of our study, we thought that the early complication rates of PFDT were similar to CST.

Acknowledgement

The authors would like to extend their sincere thanks to anyone who contributed to this study.

Conflict of Interest

The author declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Author Contributions

Plan, design: SU; HFD, FU, NK, OS, AK **Material, methods and data collection:** HFD, FU, NK, OS, AK; SU **Data analysis and comments:** SU, HFD, FU, NK, OS, AK **Writing and corrections:** SU; HFD, FU, NK, OS, AK.

REFERENCES

Bösel, J. (2014). Tracheostomy in stroke patients. *Current Treatment Options in Neurology, 16*(1), 274. https://doi.org/10.1007/s11940-013-0274-1.

Cabrini, L., Monti, G., Landoni, G., Biondi-Zoccai, G., Boroli, F., Mamo, D., Plumari, V. P., Colombo, S., & Zangrillo, A. (2012). Percutaneous tracheostomy, a systematic review. *Acta Anaesthesiologica Scandinavica, 56,* 270-81. https://doi.org/10.1111/j.1399-6576.2011.02592.x.

Cicek, M., Gedik, E., Yücel, A., Köroglu, A., & Ersoy, M.O. (2007). Our conclusions at percutaneous tracheostomy performed with Griggs Technique. *Journal of Inonu University Medical Faculty, 14*(1), 17-20.

Crofts, S.L., Alzeer, A., McGuire, G.P.,Wong, D.T., & Charles D. (1995). A comparison of percutaneous and operative tracheostomies in intensive care patients. *Canadian Journal of Anaesthesia, 42,* 775-79. https://doi.org/10.1007/BF03011175.

Delaney, A., Bagshaw, S.M., & Nalos, M. (2006). Percutaneous dilatational tracheostomy versus surgical tracheostomy in critically ill patients: a systematic review and meta-analysis. *Critical Care, 10*(2), R55. https://doi.org/10.1186/cc4887.

Ersoy, A., Ali, A., Ünlü, N., Kara, D,. & Turgut, N. (2012). 53 Percutaneous tracheostomy cases performed with Griggs Method. *European Archives Of Medical Research, 28*(3), 134-137. https://doi.org/10.5222/otd.2012.134.

Friedman, Y. (1996). Indications, timing, techniques and complications of tracheostomy in the critically ill patient. *Current Opinion in Critical Care, 2*(1), 47-53.

Griggs, W.M., Worthley, L.I.G., Gilligan, J.E., Thomas, P.D., & Myburg, J.A.(1990). A simple percutaneous tracheostomy technique. *Surgery, Gynecology and Obstetrics, 170*, 543-5.

Gysin, C. (1999). Percutaneous versus surgical tracheostomy: a double-blind randomized trial. *Annals of Surgery, 230*, 708-14. https:// doi: 10.1097/00000658-199911000-00014.

Hashimoto, D.A., Axtell, A.L., & Auchincloss H. G. (2014). Percutaneous tracheostomy. *The New England Journal of Medicine*, *383*, 20. https://doi.org/10.1056/NEJMvcm2014884.

Higgins, K. M., & Punthake, X. (2007). Meta-analysis comparison of open versus percutaneous tracheostomy. *Laryngoscope*, *117*, 447-54. https://doi.org/10.1097/01.mlg.0000251585.31778.c9.

Hosokawa, K., Nishimura, M., Egi, M., & Vincent J. L. (2015). Timing of tracheotomy in ICU patients: a systematic re view of randomized controlled trials. *Critical Care*, *19*, 424. https://doi.org/10.1186/s13054-015-1138-8.

Hutchinson, R.C., & Mitchell, R. D. (1991). Life-threatening complications from percutaneous dilatational tracheostomy. *Critical Care Medicine*, *19*, 118-20. https://doi.org/10.1097/00003246-199101000-00027.

Marchese, S., Corrado, S., Scala, R., Corrao, S., & Ambrosino, N. (2010). Tracheostomy in patients with long-term mechanical ventilation: A survey. *Respiratory Medicine, 104*(5), 749-53. https://doi.org/10.1016/j.rmed.2010.01.003.

Memmedova, F., Akarsu, F.G., Mehdiyev, Z., Aykaç, Ö., Pınarbaşlı, M.Ö., Gürbüz, M.K., & Özdemir, A.Ö.(2022). Evaluation of percutaneous and surgical tracheostomy results in neurocritical care unit. *Turkish Journal Neurology*, *28*, 31-37. https://doi.org/10.4274/tnd.2022.77200.

Seker, Y. T., Tülübaş, E. K., Hergünsel, O., & Çukurova, Z. (2017). Evaluation of late term complications dilatation tracheostomy of intensive care unit. *Medical Journal of Bakırköy, 13*(4), 170-74. https://doi.org/10.5350/BTDMJB.20170110061719.

Singh, R.K., Saran, S., & Baronia, A.K. (2017). The practice of tracheostomy decannulation—a systematic review. *Journal of Intensive Care, 5*, 38. https://doi.org/10.1186/s40560-017-0234-z.

Petros, S., & Engelmann, L. (1997). Percutaneous dilational tracheostomy in a medical ICU. *Intensive Care Medicine*, *23*, 630-4. https://doi.org/10.1007/s001340050385.

VanHeurn, L.W., VanGeffen, G.J., & Brink, P.R. (1996). Clinical experience with percutaneous dilational tracheostomy: Report of 150 cases. *The European Journal of Surgery*, *162*, 531-5.