Perkütan Dilatasyonel Trakeostomi

Doç. Dr. Çetin KAYMAK

SBÜ Ankara SUAM

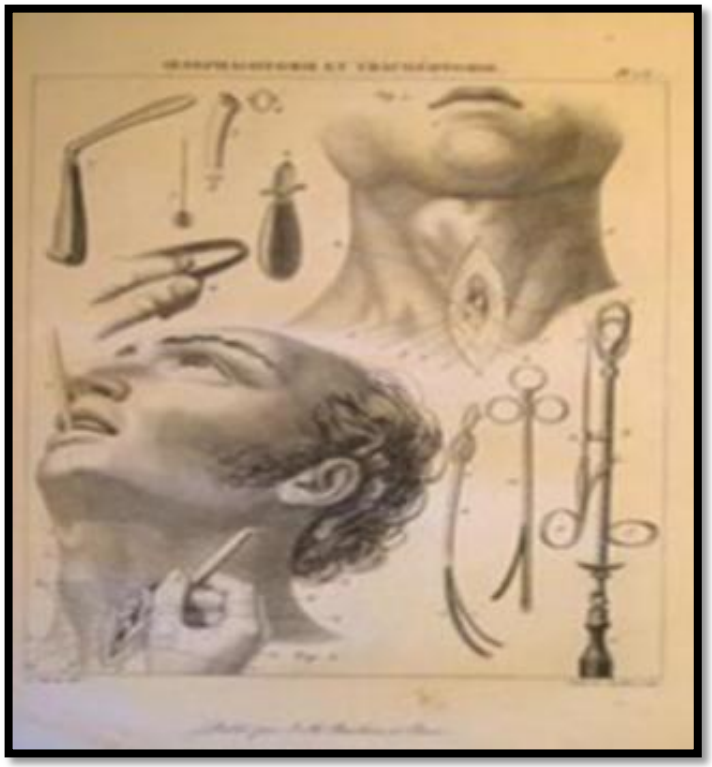
Anesteziyoloji ve Reanimasyon Kliniği-Yoğun Bakım Ünitesi

Eğitim Görevlisi

Tanım

Trakeostomi
- Cerrahi Trakeostomi

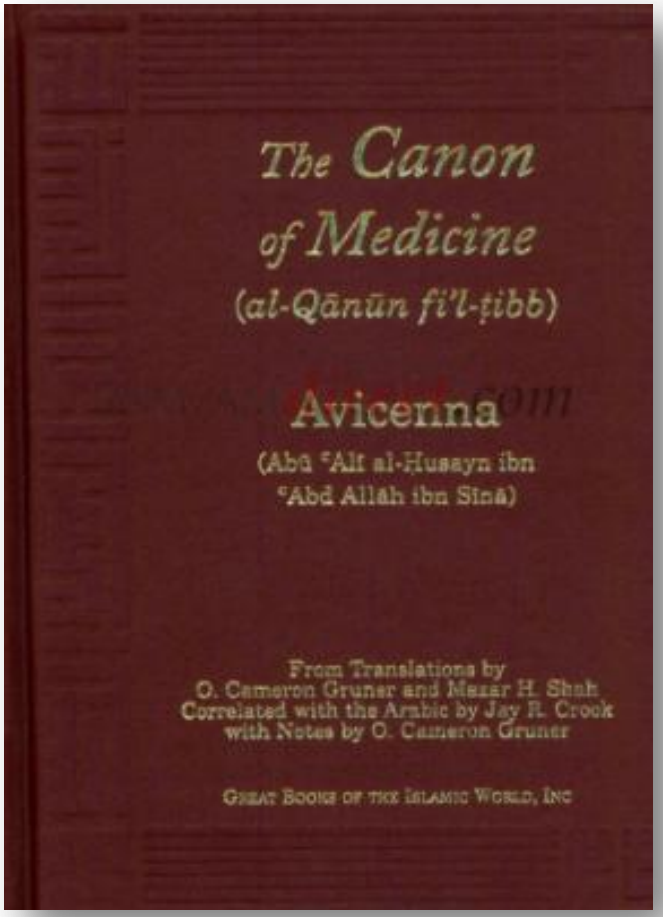
Açık (Ameliyathane)
Açık (Hasta başı)
- Translaringeal teknik
- Perkütan teknik



Perkütan trakeostomi
Cerrahi olarak stoma yaratma yerine perkütan olarak dilatasyon tekniği ile trakeal stoma oluşturulmasıdır

Tarihçe

Ibn Sina (980-1037)	
Ibn Zuhr (1091-1161)	
Trousseau (Diphtheria)	1833
Cerrahi trakesotomi (Jackson)	1909
Poliomyelit	1932
Myastenia Gravis	1943
Tetanus	1943
KOAH-Pnömoni	1951
Difteri-Ludwig's Angina	1955



Perkütan Trakeostomi

Perkütan trakestomi	(Sheldon)	1957
Seldinger trakeostomi	(Weinstein)	1969
Perkütan dilatasyonel	(Ciaglia)	1985
Perkütan forceps	(Criggs)	1991
Translaringeal	(Fantoni)	1993
Modifiye Single Step	(Ciaglia)	2000
Percu-Twist teknik	(Frova)	2001

Laryngoscope. 2004 Sep;114(9):1517-21.

Percutaneous tracheostomy: don't beat them, join them.

Blankenship DR[1], Gourin CG, Davis WB, Blanchard AR, Seybt MW, Terris DJ.

Department of Otolaryngology-Head and Neck Surgery, Medical College of Georgia, Augusta, GA, USA.

Objectives: The introduction of percutaneous tracheostomy (PercTrach) has resulted in tension over the scope of practice between otolaryngologists and pulmonary/critical care (PCC) specialists. We sought to determine the value of a collaborative approach to the performance of PercTrach at the bedside in the intensive care unit setting. *Study Design and Meth-*

Endikasyon

Consensus conference on artificial airways in patients receiving mechanical ventilation.

A L Plummer and D R Gracey

Chest 1989;96;178-180
DOI 10.1378/chest.96.1.178

symposium
CHEST / 96 / 1 / JULY, 1989

Consensus Conference on Artificial Airways in Patients Receiving Mechanical Ventilation

INDICATIONS FOR PLACEMENT OF TRACHEOSTOMY TUBES

Conference Participants

Edward L. Applebaum, M.D., Chicago
David Astrachan, M.D., New Haven
Alan Barker, M.D., Portland, Oregon
Michael Bishop, M.D., Seattle
Philip G. Boysen, M.D., Gainesville, Florida
Gene Colice, M.D., White River Junction, Vermont
Michael P. Habib, M.D., F.C.C.P., Tucson
John E. Heffner, M.D., Charleston, South Carolina
Gerald Kerby, M.D., Kansas City, Kansas
H. Michael Marsh, M.D., Rochester, Minnesota
Douglas Mathisen, M.D., Boston
Jerome H. Modell, M.D., Gainesville, Florida
Jerry D. Mohr, M.D., Phoenix
Donald Prough, M.D., Winston-Salem, North Carolina
Robert L. Rosen, M.D., Chicago
Clarence Sasaki, M.D., New Haven
E. Neil Schachter, M.D., New York
Paul Selecky, M.D., Newport Beach, California
Barry A. Shapiro, M.D., F.C.C.P., Chicago

Recommendations

The following guidelines are recommended:

1. For anticipated need of the artificial airway up to 10 days, the translaryngeal route is preferred;
2. For anticipated need of the artificial airway for greater than 21 days, tracheotomy is preferred;
3. When the time anticipated for maintenance of an artificial airway is not clear, daily assessment is required to determine whether conversion to tracheotomy is indicated;

Endikasyon

Consensus conference on artificial airways in patients receiving mechanical ventilation.

A L Plummer and D R Gracey

Chest 1989;96;178-180
DOI 10.1378/chest.96.1.178

- Mekanik obst. azaltmak
- Potansiyel tıkanıklığı önlemek
- Aspirasyonu yönetmek
- Ventilasyonu yönetmek
- Ventilatörden ayırmak

Ön Koşullar;

- Boyun hiperekstansiyonu
- Krikoid kıkırdak →

Suprasternal çentik mesafe > 3 cm

- Hemodinamik stabilite
- FiO2 < %60
- PEEP < 10 cmH2O

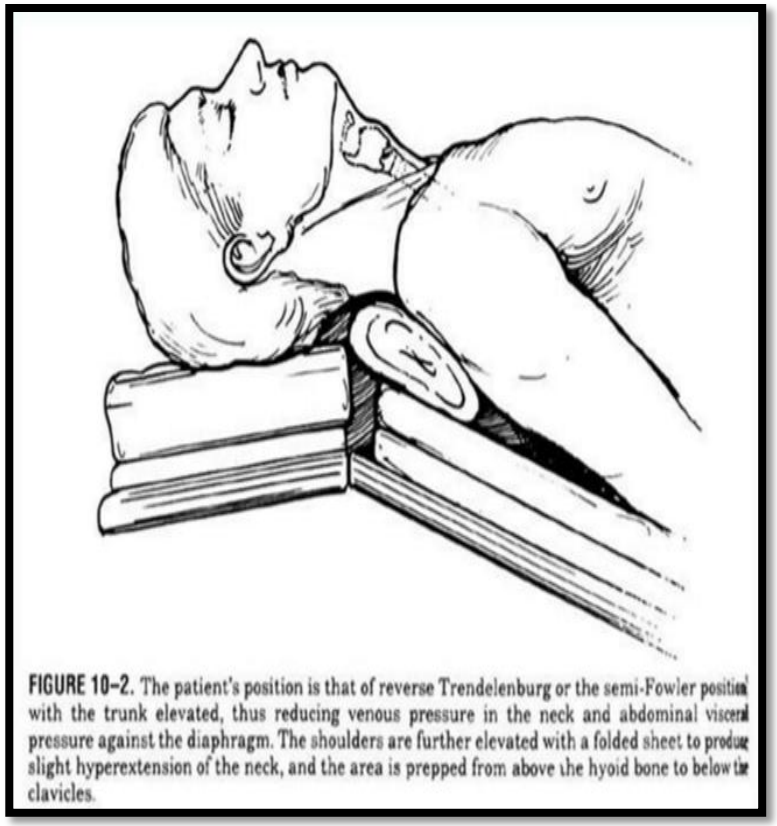


FIGURE 10–2. The patient's position is that of reverse Trendelenburg or the semi-Fowler position with the trunk elevated, thus reducing venous pressure in the neck and abdominal visceral pressure against the diaphragm. The shoulders are further elevated with a folded sheet to produce slight hyperextension of the neck, and the area is prepped from above the hyoid bone to below the clavicles.

Kontrendikasyon

Consensus conference on artificial airways in patients receiving mechanical ventilation.

A L Plummer and D R Gracey

Chest 1989;96;178-180
DOI 10.1378/chest.96.1.178

- Acil
- Boyunda kitle (orta)
- Non - Entübe
- PEEP> 20 cmH2O
- Koagülopati
- Obezite
- Geçirilmiş trakeostomi
- Servikal travma

Contraindications against PDT:

Unstable fractures of the cervical spine
Severe local infection of the anterior neck
Uncontrollable coagulopathy

Relative contraindications:

Controlled local infection
Coagulopathy
High PEEP or FiO2 requirements
Difficult anatomy (e.g. morbid obesity, short thick neck, reduced neck extension, excessive goiter, tracheal deviation)
Proximity to extensive burns or surgical wounds
Elevated intracranial pressure
Haemodynamic instability
Previous radiotherapy to the neck

Anatomi

Critical Care and Resuscitation 1999; 1: 101-109

Percutaneous Tracheostomy

L. I. G. WORTHLEY, A. W. HOLT
Department of Critical Care Medicine, Flinders Medical Centre, Adelaide, SOUTH AUSTRALIA

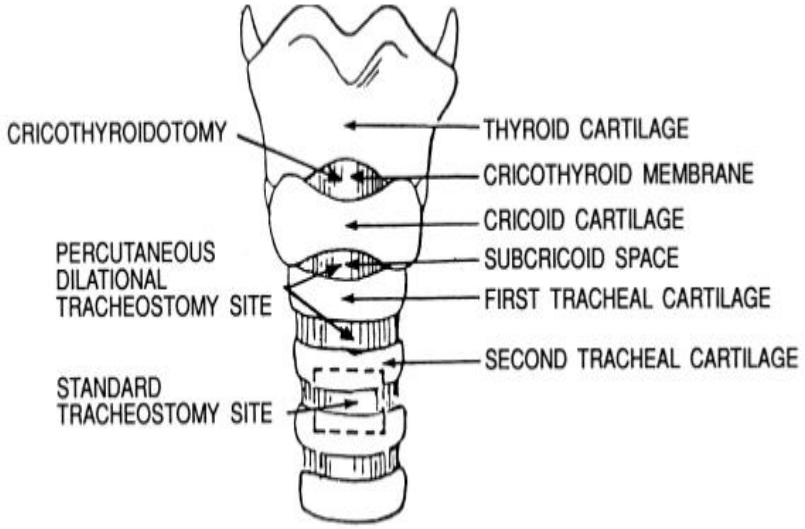
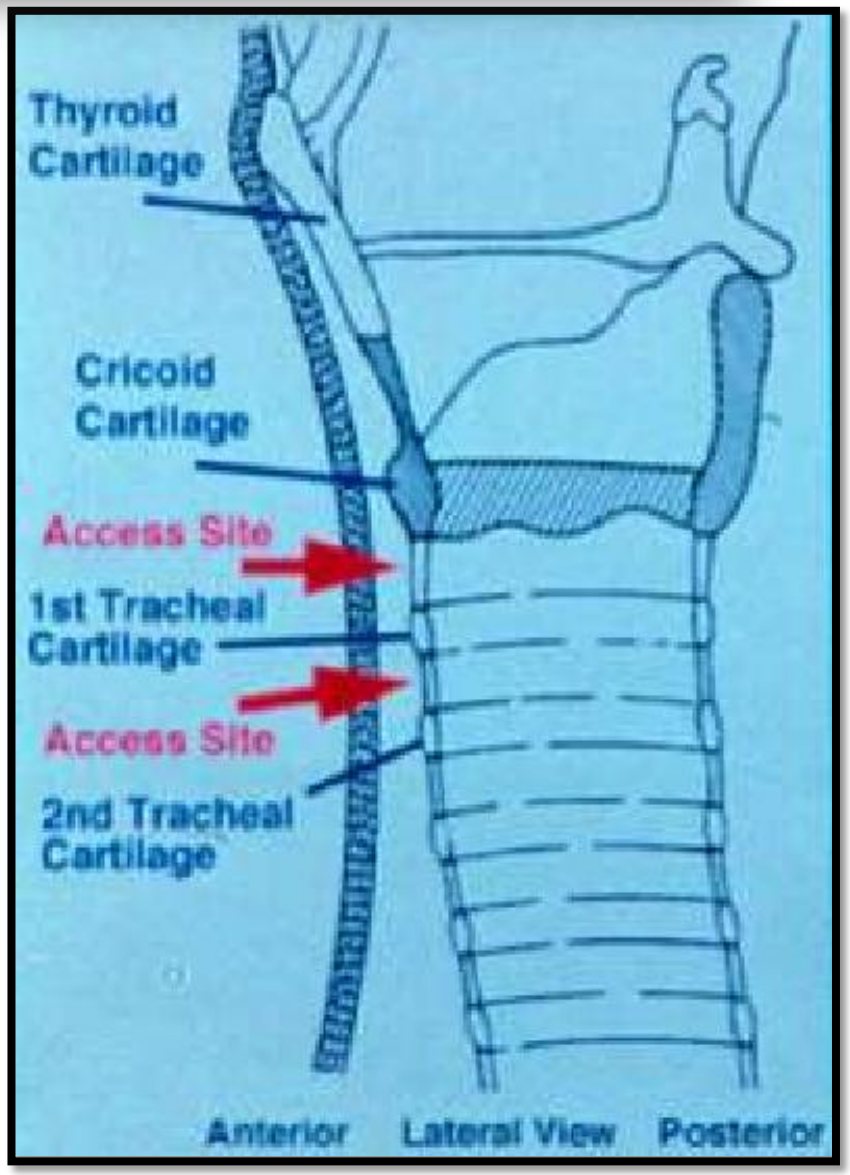
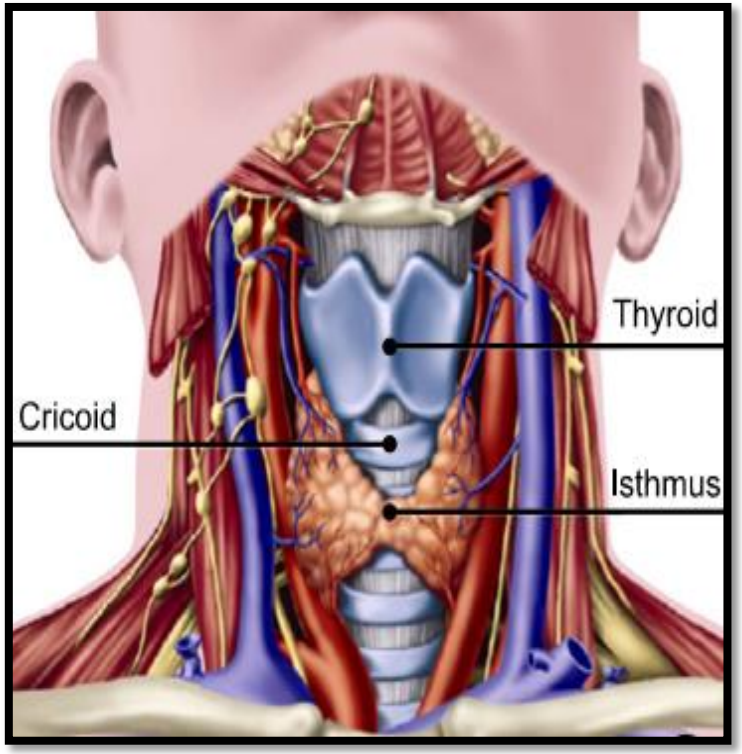
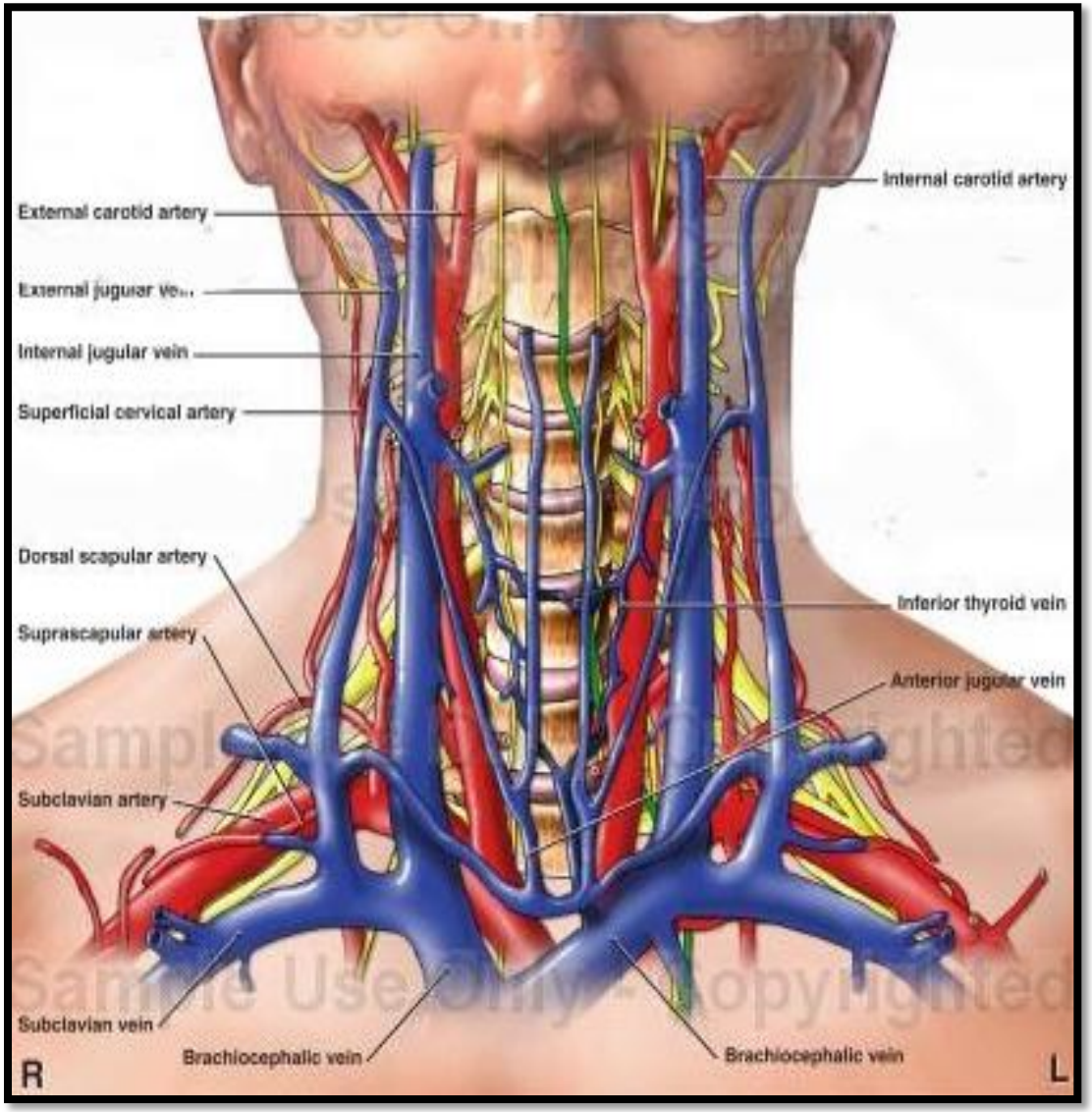


Figure 1. A diagram of the larynx and trachea indicating the sites of tracheal tube insertion for cricothyrotomy, surgical tracheostomy and percutaneous tracheostomy.



Anatomi


Thyroid
Cricoid
Isthmus


External carotid artery
External jugular ve...
Internal jugular vein
Superficial cervical artery
Dorsal scapular artery
Suprascapular artery
Subclavian artery
Subclavian vein
Brachiocephalic vein
Internal carotid artery
Inferior thyroid vein
Anterior jugular vein
Brachiocephalic vein
R
L

Teknik

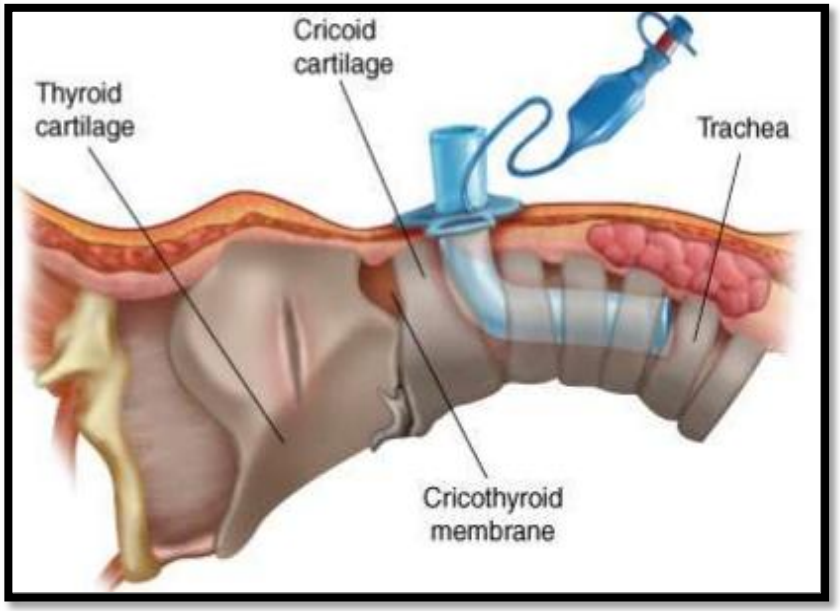
Critical Care and Resuscitation 1999; 1: 101-109

Percutaneous Tracheostomy

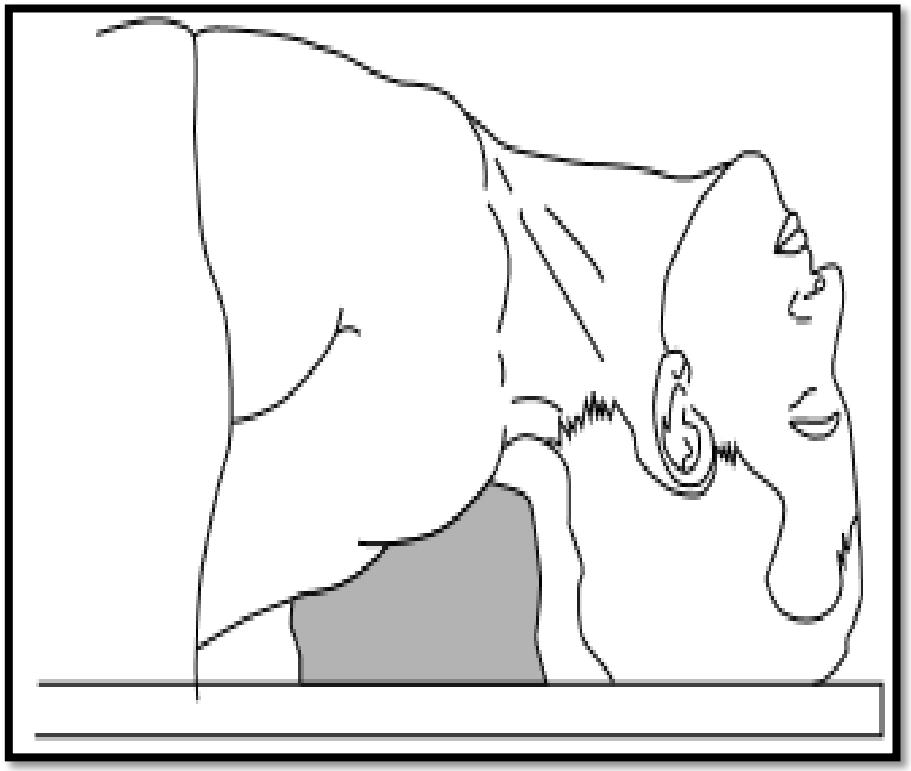
L. I. G. WORTHLEY, A. W. HOLT

Department of Critical Care Medicine, Flinders Medical Centre, Adelaide, SOUTH AUSTRALIA

Şekil 11- Enjektörle trakeaya girilmesi



Hasta Pozisyonu



Giaglia Tekniği

Cerrahi trakesotomi	1909 (Jackson)
Perkütan trakestomi	1957 (Shelden)
Seldinger trakeostomi	1969 (Weinstein)
Perkütan dilatasyonel	1985 (Ciaglia)
Perkütan (Forceps)	1991 (Criggs)
Translaringeal teknik	1993 (Fantoni)
Modifiye Ciaglia (Single Step)	2000
Percu-Twist teknik	2001

(Chest 1992; 101:464-67)

Percutaneous Dilatational Tracheostomy*

Results and Long-term Follow-up

P. Ciaglia, M.D., F.C.C.P.;† and Kenneth D. Graniero, M.D.‡

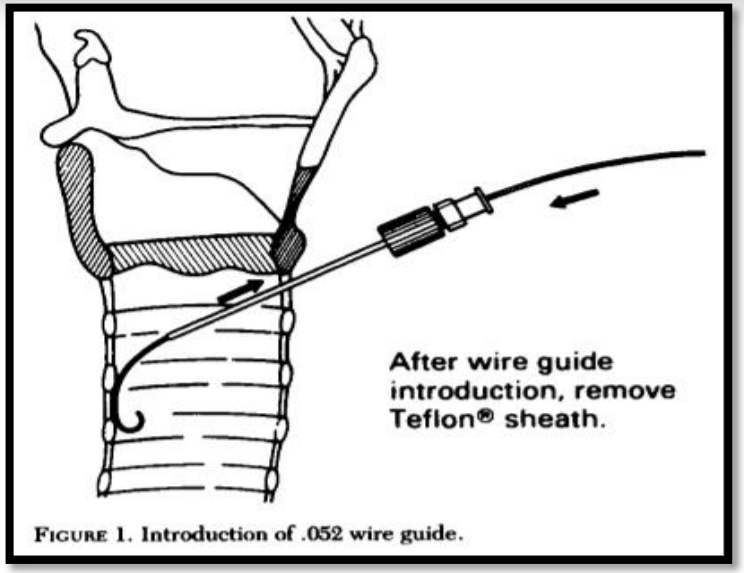


FIGURE 1. Introduction of .052 wire guide.

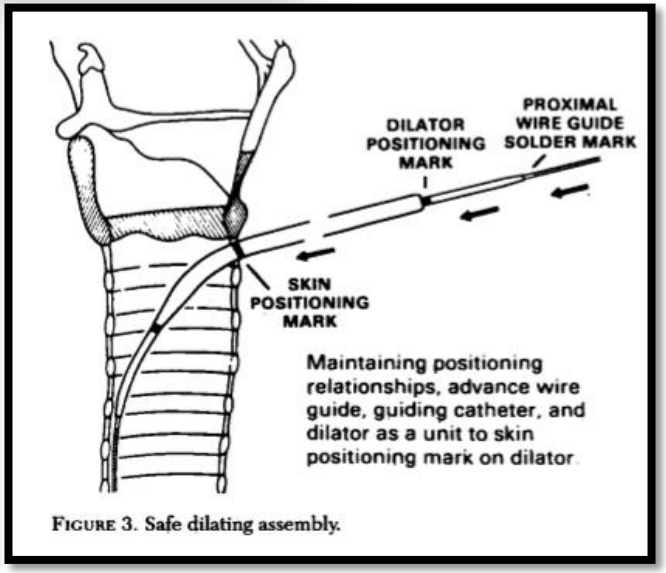
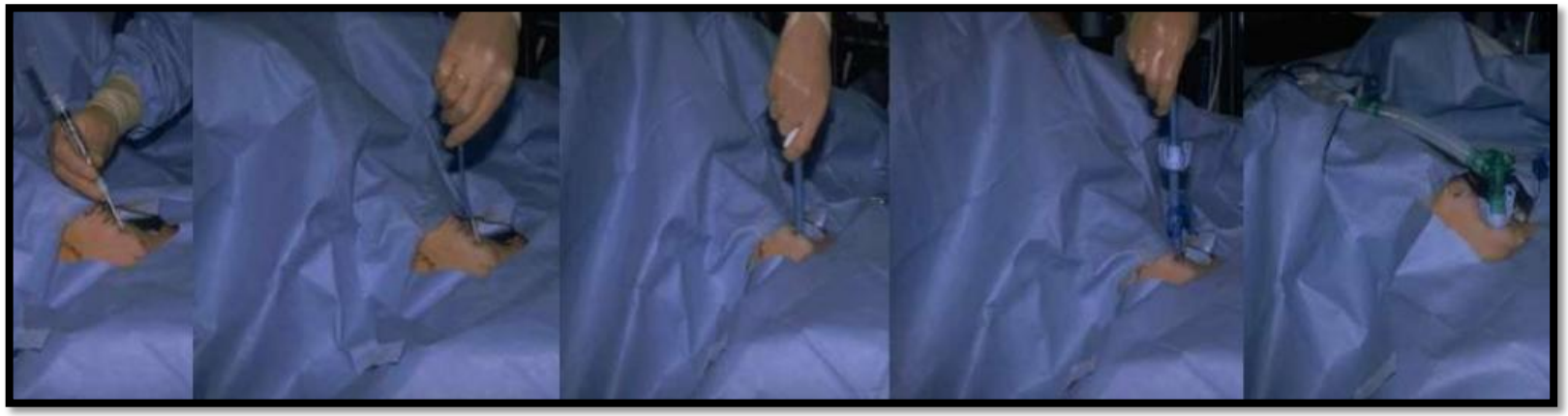


FIGURE 3. Safe dilating assembly.



Giaglia Tekniği

(Chest 1992; 101:464-67)

Percutaneous Dilatational Tracheostomy*

Results and Long-term Follow-up

P. Ciaglia, M.D., F.C.C.P.;† and Kenneth D. Graniero, M.D.‡

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Modifiye Ciaglia (Single Step)	2000
Percu-Twist teknik	2001

Table 1—*Elective Percutaneous Dilatational Subcricoid Tracheostomy

Total number of patients	165	
Total number of procedures	170	
Males	89	
Females	76	
Average age (range 17-91)	65	
No. died with tracheostomy—of original diseases	108 (65%)	108/165
No. survived to decannulation	52 (31%)	52/165
No. died postdecannulation with no laryngotracheal problems	20 (12%)	20/165
No. alive postdecannulation at present date (Aug 1990)	32 (19%)	32/165
No. alive at present time with tracheostomy	5	

*From 4/2/82 to 8/1/90.

Griggs Tekniği

Surg Gynecol Obstet. 1990 Jun;170(6):543-5.

A simple percutaneous tracheostomy technique.

Griggs WM[1], Worthley LI, Gilligan JE, Thomas PD, Myburg JA.

Cerrahi trakesotomi	1909 (Jackson)
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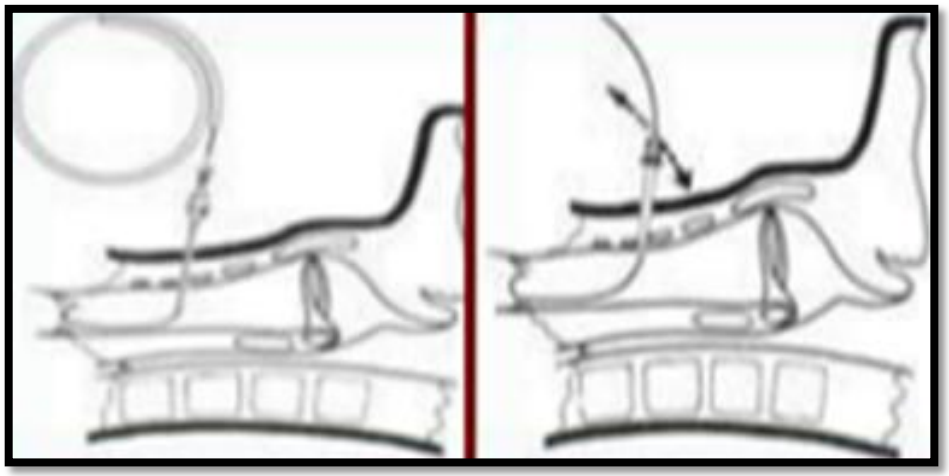
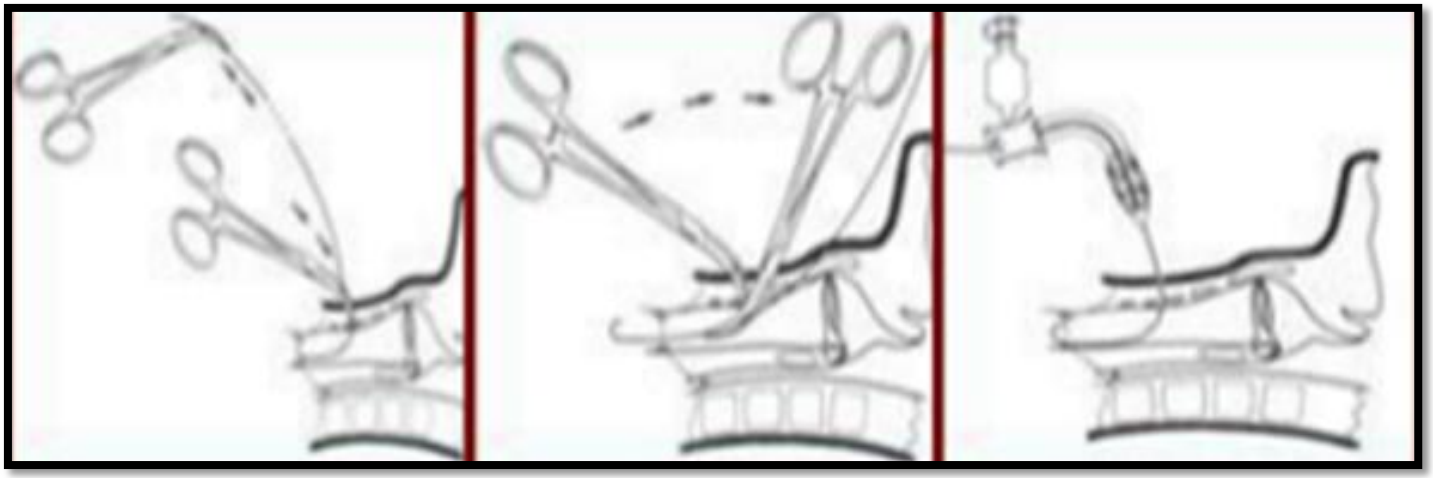




Fantoni Translaringeal Tekniği

Cerrahi trakesotomi	1909 (Jackson)
Perkütan trakestomi	1957 (Shelden)
Seldinger trakeostomi	1969 (Weinstein)
Perkütan dilatasyonel	1985 (Ciaglia)
Perkütan (Forceps)	1991 (Criggs)
Translaringeal teknik	1993 (Fantoni)
Modifiye Ciaglia (Single Step)	2000
Percu-Twist teknik	2001

Ann Thorac Surg 1999;68:486–92

Tracheostomy in Cardiosurgical Patients: Surgical Tracheostomy Versus Ciaglia and Fantoni Methods

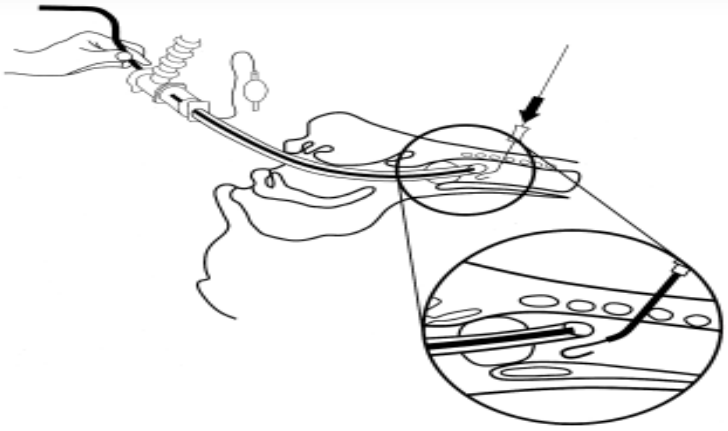


Fig 1. After bronchoscopically guided puncture of the trachea, the guide wire is introduced and advanced retrograde parallel to the endotracheal tube.

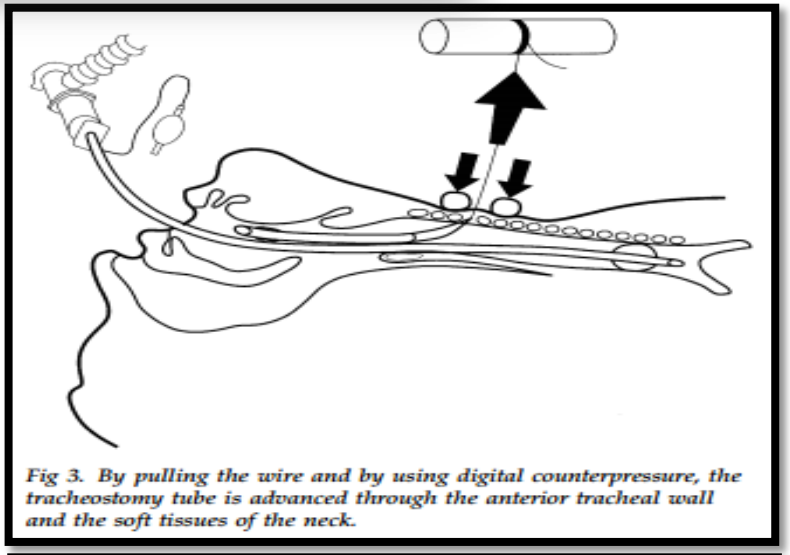


Fig 3. By pulling the wire and by using digital counterpressure, the tracheostomy tube is advanced through the anterior tracheal wall and the soft tissues of the neck.

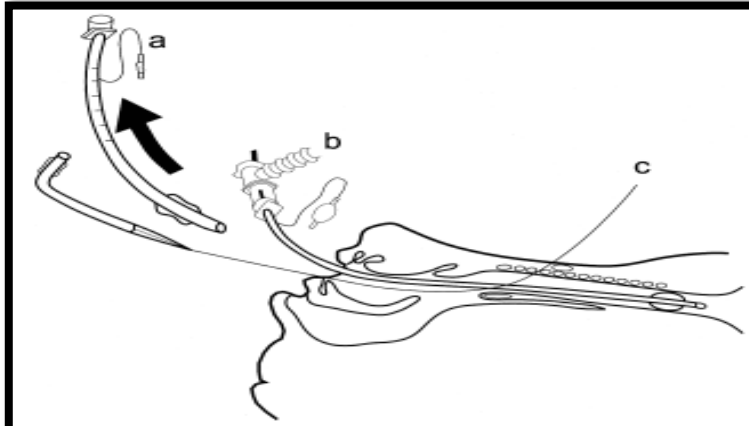


Fig 2. When the endotracheal tube is in place, (a) was replaced under direct laryngoscopy with the thin tube of the set (b), the tracheostomy tube is connected to the guide wire and, (c), by pulling the wire's distal end, is advanced to the trachea.

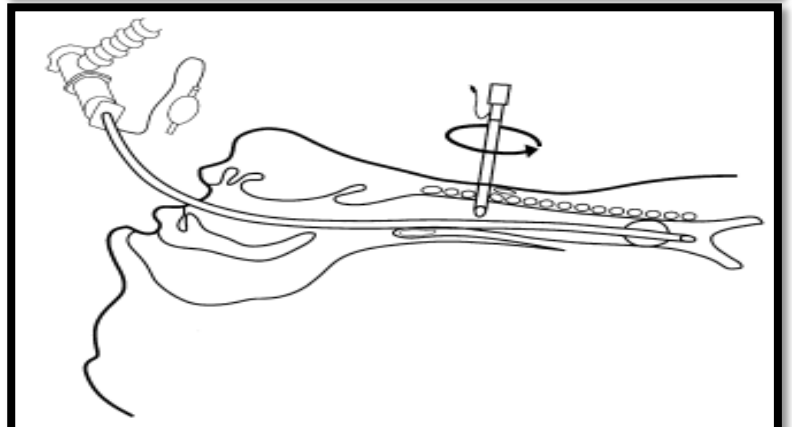
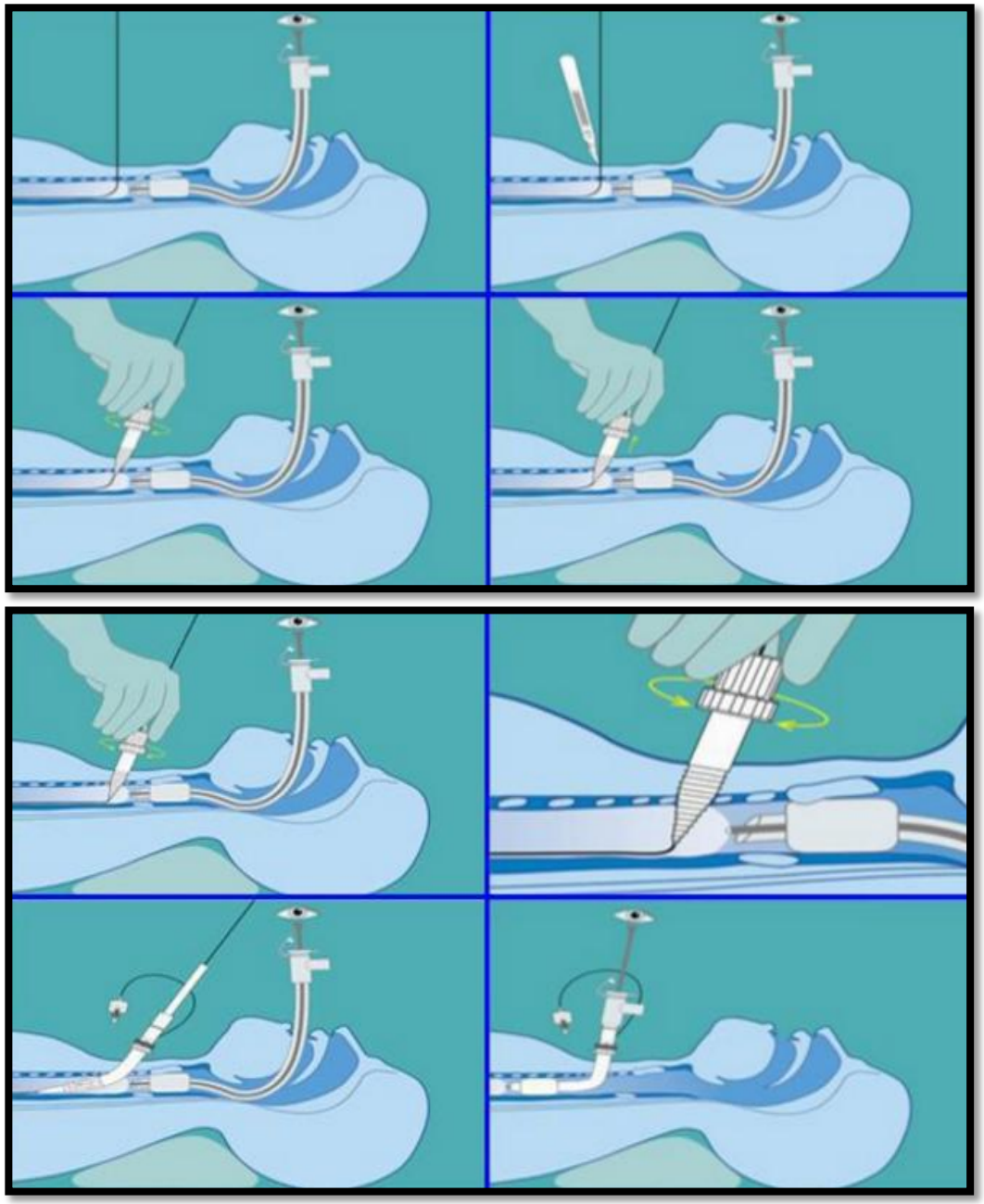


Fig 4. Correct placement of the tracheostomy tube is achieved with 180° rotation by means of an obturator. Intratracheal rotation of the tracheal cannula can be done either with the thin endotracheal tube in place or after removal.

Percu-Twist Tekniği



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Percu-Twist teknik	2001

Crit Care 2000, 4:124–128

Percutaneous tracheostomy: comparison of Ciaglia and Griggs techniques

José M Añón, Vicente Gómez*, Mª Paz Escuela, Vicente De Paz, Luis F Solana, Rosa M De La Casa*, Juan C Pérez, Eugenio Zeballos and Luis Navarro

Hospital Virgen de la Luz, Cuenca, and *Clínica Moncloa, Madrid, Spain

Abstract

Background: Although the standard tracheostomy described in 1909 by Jackson has been extensively used in critical patients, a more simple procedure that can be performed at the bedside is needed. Since 1957 several different types of percutaneous tracheostomy technique have been described. The purpose of the present study was to compare two bedside percutaneous tracheostomy techniques: percutaneous dilatational tracheostomy (PDT) and the guidewire dilating forceps (GWDF).

Materials and methods: A prospective study in two medical/surgical intensive care units (ICUs) was carried out. Sixty-three critically ill patients who required endotracheal intubation for longer than 15 days were consecutively selected to undergo PDT (25 patients) or GWDF (38 patients) technique. Intraoperative and postoperative complications were recorded.

Results: Age (mean ± standard error) was 63 ± 1.1 years. The patients had been mechanically ventilated for an average of 19.8 ± 1.2 days. The GWDF technique was significantly faster than PDT technique ($P=0.02$). Fifteen complications occurred in 10 out of 63 (15%) patients. They were as follows: tracheal tear (one patient in each group; in one case this was due to false passage); transient hypotension (one patient in the PDT group and two patients in the GWDF group); atelectasis (one patient in the PDT group); and haemorrhage (one patient in the PDT group and three patients in the GWDF group). In both patients with tracheal tear, reduced arterial oxygen saturation (SaO_2) with concomitant subcutaneous emphysema ensued.

Conclusion: We found no statistical differences between complications with both techniques. The surgical time required for the GWDF technique was less than that for PDT.

Keywords: complications, percutaneous, tracheostomy

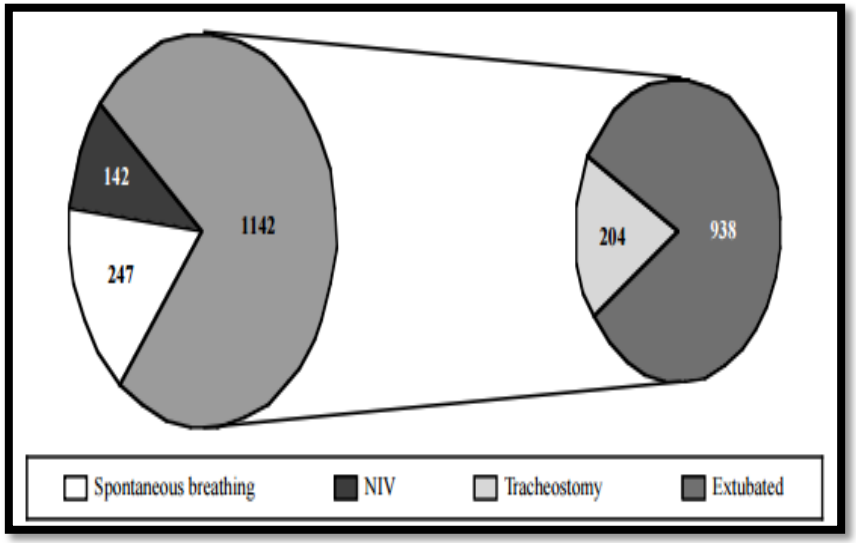
İnsidans

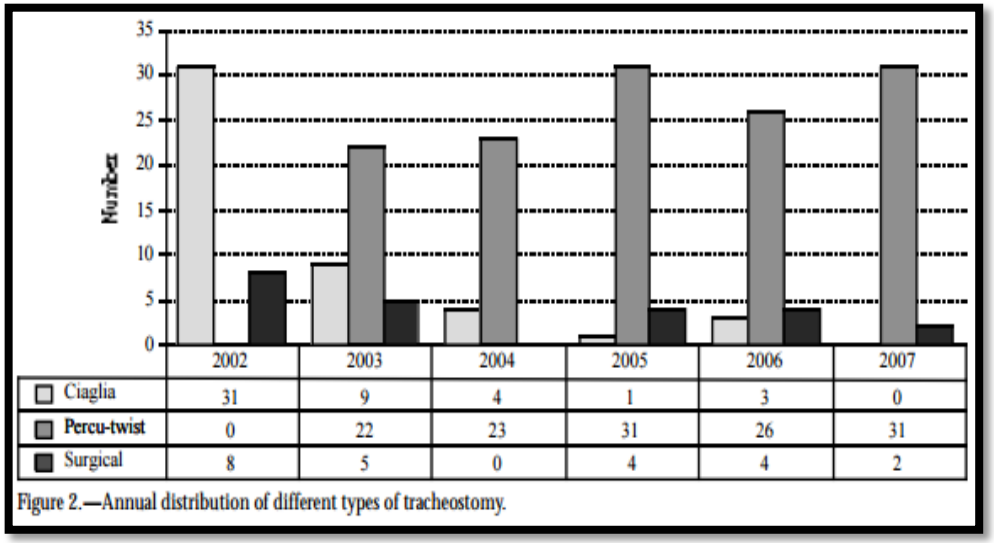
Minerva Anestesiol 2009;75:607-15,

Outcomes of percutaneous tracheostomy

S. CARRER [1], S. BASILICO [1], S. ROSSI [1], A. BOSU [1], S. BERNORIO [2], G. M. VAGHI [1]

Methods. Prospective observational study to evaluate efficacy, safety and long-term consequences of PDT performed over a 6-year period (January 2002-December 2007) in a combined medical/surgical ICU in Rho, Milan, Italy. A total of 181 patients were subjected to PDT, 26.5% with the Ciaglia technique and 73.5% with the Percu-twist technique.





	2002	2003	2004	2005	2006	2007
Ciaglia	31	9	4	1	3	0
Percu-twist	0	22	23	31	26	31
Surgical	8	5	0	4	4	2

Figure 2.—Annual distribution of different types of tracheostomy.

Trakeostomi insidansı % 17.8

Komplikasyon

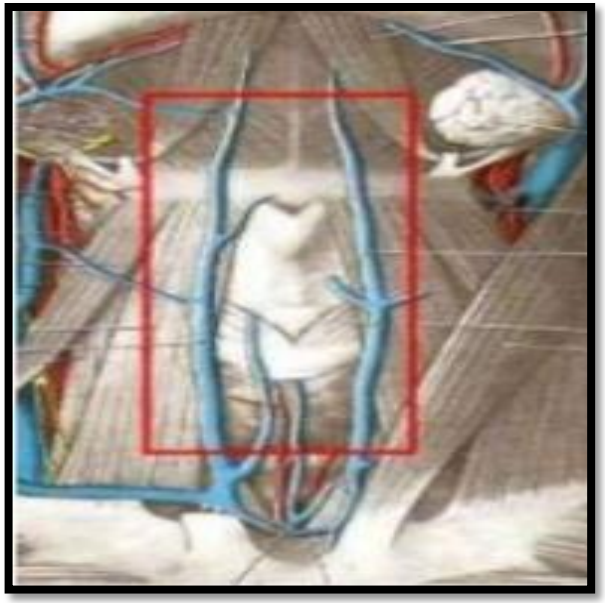
Minerva Anestesiol 2009;75:607-15,

Outcomes of percutaneous tracheostomy

S. CARRER [1], S. BASILICO [1], S. ROSSI [1], A. BOSU [1], S. BERNORIO [2], G. M. VAGHI [1]

Complications of tracheostomy (both PDT and surgical tracheostomy)

Immediate/early	Late
Bleeding	Stomal infection
Hypoxia / loss of airway	Displaced tracheal tube / via falsa
Tracheal lesion; posterior wall perforation or tracheal ring fracture.	Bleeding from erosion into blood vessels (including innominate artery)
Oesophageal lesion	Subglottic or tracheal stenosis
Displaced tracheal tube / via falsa	Delayed healing after decannulation
Obstruction of tracheal tube by blood clot	Tracheo-oesophageal fistula
Hypercapnia	Permanent voice changes
Raised intracranial pressure	Scarring of the neck
Simple or tension pneumothorax	Dysfagia
Pneumomediastinum	
Surgical emphysema	
Atelectasis	
Needle damage to fibre bronchoscope (PDT)	



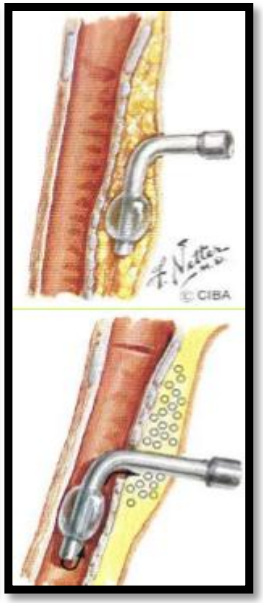


TABLE III.—*Incidence of complications.*

	No.	%
Early Complications		
Minor bleeding	4/181	2.2
Stomal infection	8/181	4.4
Hypoxia	3/181	1.6
Late Complications		
Clinically relevant		
Tracheal stenosis	1/141	0.7
Stomal granuloma	2/141	1.4
Subclinical		
ETT* cuff mucosa injury	3/75	4

*Endotracheal tube.

Komplikasyon

Laryngoscope. 2012 January ; 122(1): 25–29.

Tracheotomy Outcomes and Complications: A National Perspective

Rahul K. Shah, MD, Lina Lander, ScD, Jay G. Berry, MD, Brian Nussenbaum, MD, Albert Merati, MD, and **David W. Roberson, MD**

- Amerika
- 2006
- 38 Eyalet
- 1000 Hastane
- 113.653 Trakeotomi

Mortalite → % 0.6

TABLE I

Tracheotomy Complication Prevalence.

Tracheotomy Complication	No.	All Discharges, % (N = 113,653)	Complications, % (N = 3,748)
Tracheoesophageal fistula or tracheal hemorrhage due to tracheostomy*	2,223	2.0	59.3
Tracheal stenosis	962	0.8	25.8
Infection of tracheostomy	572	0.5	15.3
Tracheotomy complication, unspecified	77	0.1	2.0

* The *International Classification of Diseases, Ninth Revision, Clinical Modification* code combines these two different complications together.

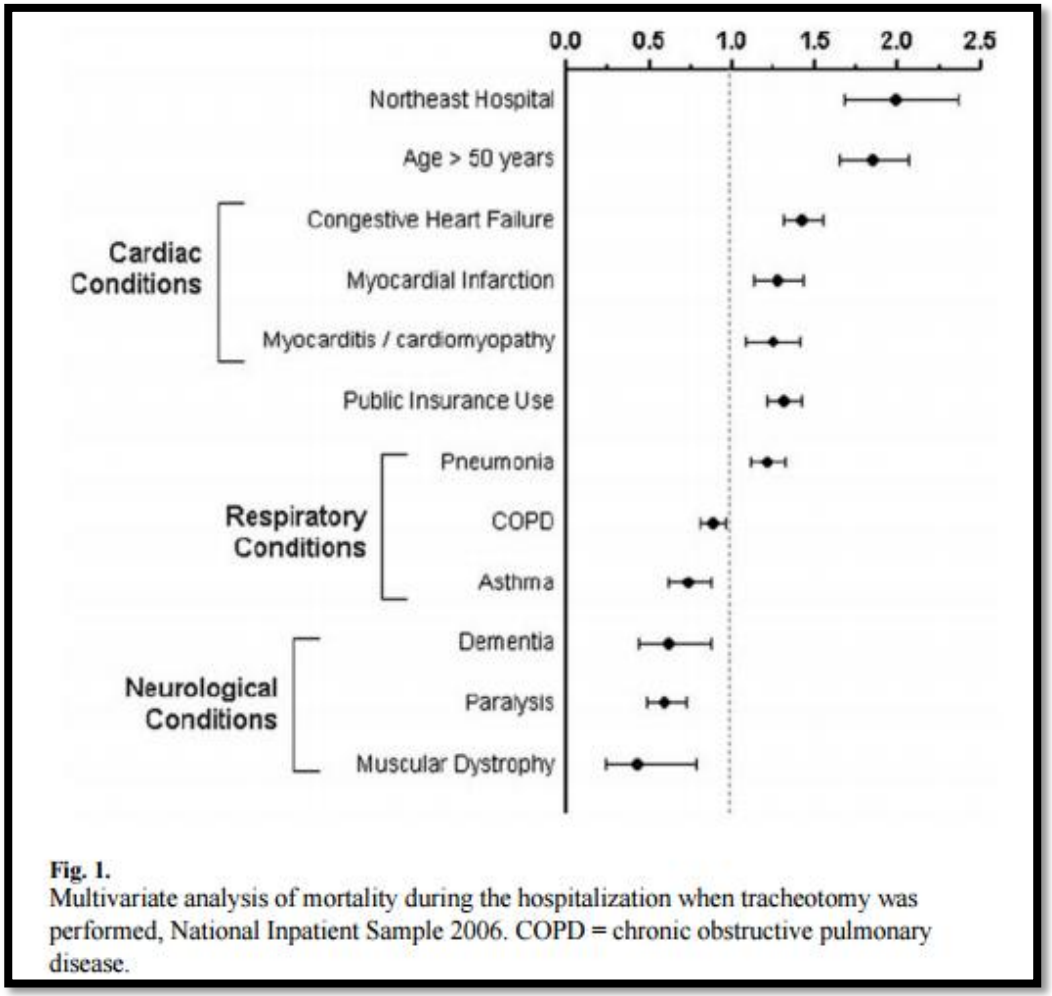


Fig. 1.
Multivariate analysis of mortality during the hospitalization when tracheotomy was performed, National Inpatient Sample 2006. COPD = chronic obstructive pulmonary disease.

Komplikasyon

Critical Care 2013, **17**:R258

Death after percutaneous dilatational tracheostomy: a systematic review and analysis of risk factors

Marcel Simon[1†], Maria Metschke[1†], Stephan A Braune[1], Klaus Püschel[2] and Stefan Kluge[1*]

Methods: We analyzed cases of lethal outcome due to complications from PDT including cases published between 1985 and April 2013. A systematic literature search was performed and unpublished cases from our own departmental records were retrospectively analyzed.

Results: A total of 71 cases of lethal outcome following PDT were identified including 68 published cases and 3 of our own patients. The incidence of lethal complications was calculated to be 0.17%. Of the fatal complications,

8324 Hasta

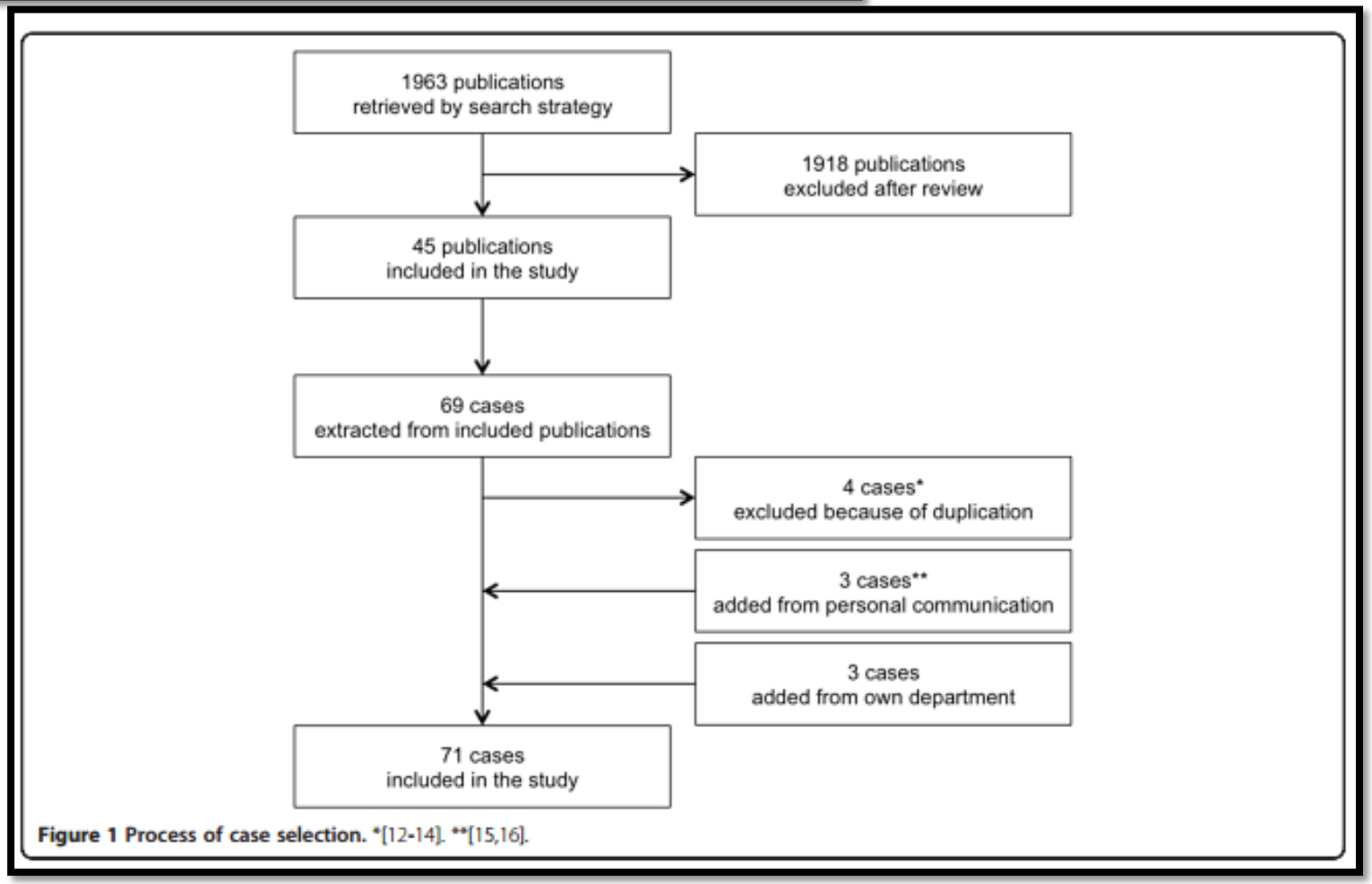


Figure 1 Process of case selection. *[12-14]. **[15,16].

Komplikasyon

Critical Care 2013, **17**:R258

Death after percutaneous dilatational tracheostomy: a systematic review and analysis of risk factors

Marcel Simon[1†], Maria Metschke[1†], Stephan A Braune[1], Klaus Püschel[2] and Stefan Kluge[1*]

Table 3 Causes and time of death after PDT

Cause of death	Total number		Time of death			
			Intra-procedural		Post-procedural	
Total number	71		22	(31.0%)	49	(69.0%)
Hemorrhage	27	(38.0%)	3	(11.1%)	24	(88.9%)
- innominate artery	11	(40.7%)			11	(100.0%)
- aortic arch	2	(7.4%)			2	(100.0%)
- subclavian artery	1	(3.7%)	1	(100.0%)		
- thyroid artery	1	(3.7%)			1	(100.0%)
- other artery	1	(3.7%)	1	(100.0%)		
- venous	5	(18.5%)	1	(20.0%)	4	(80.0%)
- diffuse/unknown	6	(22.2%)			6	(100.0%)
Airway complications	21	(29.6%)	7	(33.3%)	14	(66.7%)
- dislocation of the tracheal cannula	11	(52.4%)	1	(9.1%)	10	(90.9%)
- lost airway during the procedure	4	(19.0%)	3	(75.0%)	1	(25.0%)
- paratracheal misplacement of the tracheal cannula	3	(14.3%)	3	(100.0%)		
- obstruction of tracheal cannula	2	(9.5%)			2	(100.0%)
- hypoxemia during cannula replacement	1	(4.8%)			1	(100.0%)
Tracheal perforation	11	(15.5%)	1	(9.1%)	10	(90.9%)
Pneumothorax	4	(5.6%)	4	(100.0%)		
Bronchospasm	3	(4.2%)	3	(100.0%)		
Cardiac arrest/arrhythmia	3	(4.2%)	3	(100.0%)		
Sepsis	1	(1.4%)			1	(100.0%)
Unknown	1	(1.4%)	1	(100.0%)		

Komplikasyon

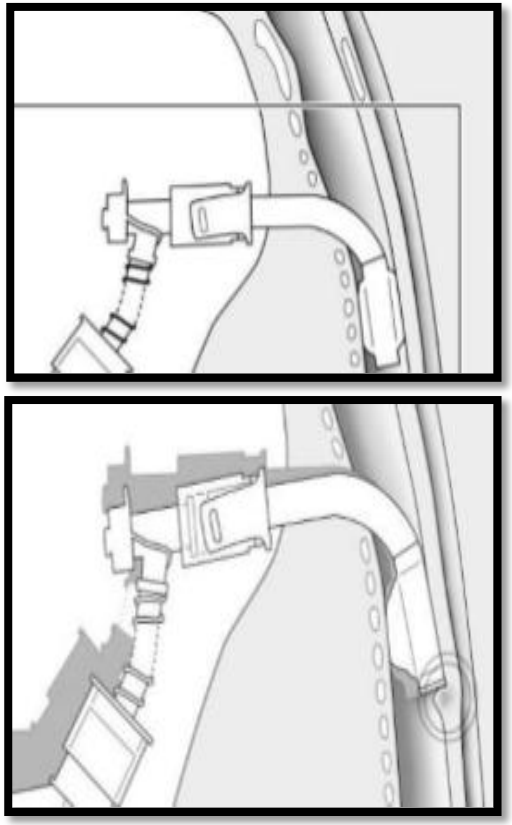
Oman Med J. 2010 Jan; 25(1): 57.

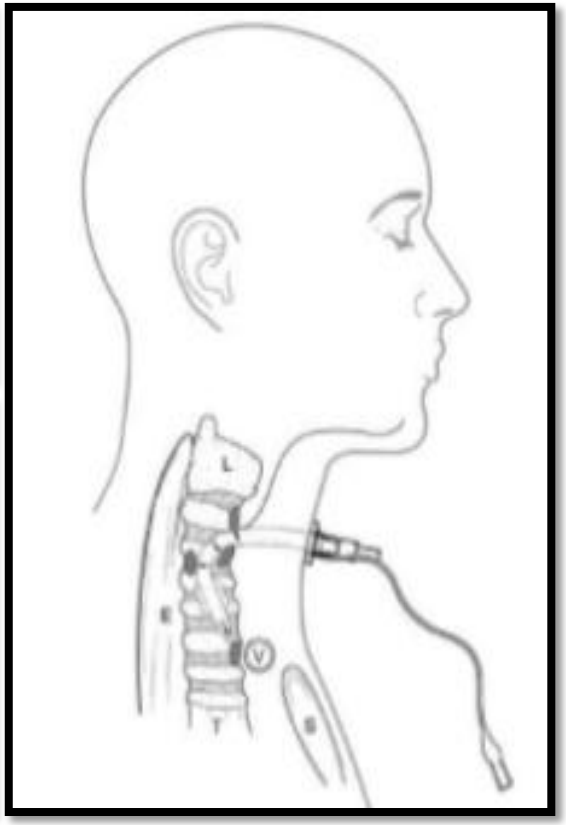
Rotational Collapse of Trachea after Percutaneous Dilatational Tracheostomy

Ata Mahmoodpoor[1,*] and Kasra Karvandian[2]

TWISTED Sendromu

Tracheal Wall Injury with Stoppage of the Tracheostomy and Episodes of Dyspnea





Komplikasyon

Acta Clin Croat (Suppl. 1) 2016; 55:98-102

BILATERAL PNEUMOTHORAX AS A COMPLICATION OF PERCUTANEOUS TRACHEOSTOMY: CASE REPORT

On day 15, we decided to perform percutaneous tracheostomy using Seldinger guidewire technique with single dilator (Portex® with Blue line Ultra®) to aid further management in the ICU with the prospect of prolonged ventilation. The procedure was performed by two anesthetists/intensivists and senior

Fig. 2. Left side tension pneumothorax with mediastinal shift.

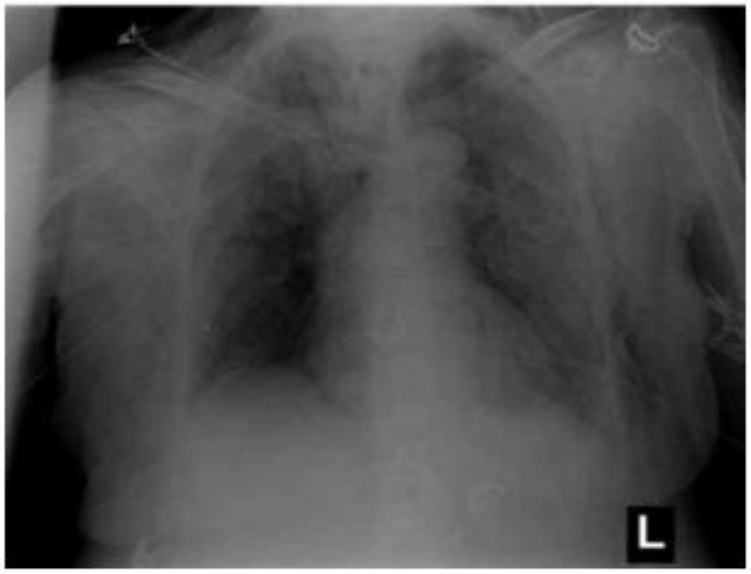


Fig. 3. Re-inflation of both lungs and confirmed chest drain position in the pleural space.

sounds were heard. Subcutaneous emphysema started to appear rapidly at the face, neck and precordia, and as mentioned before, no breath sounds were heard. Re-intubation via the endotracheal route was immediately performed and the tracheostomy tube was

Bronkoskopi

Anaesthesia, 1995, Volume 50, pages 863–864

A cadaver study appraising accuracy of blind placement of percutaneous tracheostomy

T. J. DEXTER

Bronkoskopi yoksa → Rehber tel;

- % 45 istenen seviyeden trakeaya giriş yapar;

Ancak

- Sadece % 15'i trakeaya merkezden giriş yapabilir

Fig. 3. The catheter can be seen piercing the cricothyroid membrane to the left of centre. Dye injected through the catheter can be seen running sub-mucosally over the anterior wall of the trachea and larynx.

Zamanlama

The Timing of Tracheotomy*

A Systematic Review *CHEST 1998; 114:605–609*

Table 2—*Summary of Study Results*

Data Point	Rodriguez[12]	Lesnik[13]	Blot[14]	Dunham[15]
Randomization method	Yes	None	None	Yes
Population	Adult (n=106)	Adult (n=111)	Adult (n=53)	Adult (n=74)
Early tracheotomy defined	≤7 d (n=51)	≤4 d (n=32)	2 d (n=20)	3-4 d (n=34)
Late tracheotomy defined	≥8 d (n=55)	>4 d (n=69)	≥7 d (n=33→12)	>14 d (n=40→20)
Long-term follow-up	Hospital stay	ICU only	Hospital stay	4-12 mo
Length of ventilation, d*				
E	12±1	6±3.4	23.8±21.1	N/A
L	32±3	20.6±12.2	13.3±12.2	N/A
Length of ICU stay, d*				
E	16±1	N/A	28.2±24.2	N/A
L	37±4	N/A	18.8±17.8	N/A
Hospital stay, d*				
E	34±4	N/A	30.5±25.9	N/A
L	51±4	N/A	22.6±20.8	N/A
Complications from tracheotomy, %				
E	4	yes	5	N/A
L	4	yes	N/A	N/A
Death from tracheotomy, %				
E	0	0	N/A	N/A
L	0	0	N/A	N/A
Incidence of pneumonia, %				
E	78	19	10	N/A
L	96	59	9	N/A
Incidence of tracheal stenosis, %				
E	2	N/A	N/A	17.6
L	2	N/A	N/A	12.5
Long-term complications	N/A	N/A	N/A	N/A

Conclusions: **There is insufficient evidence to support that the timing of tracheotomy alters the duration of mechanical ventilation or extent of airway injury in critically ill patients.**

(CHEST 1998; 114:605–609)

Zamanlama

Clin Chest Med. 2003 Sep;24(3):389-98.

Tracheotomy application and timing.

Heffner JE[1].

Abstract

Tracheotomy is one of the most commonly performed surgical procedures among critically ill patients. In the past, tracheotomy was delayed as long as possible in ventilator-dependent patients because of concerns regarding injury to the airway from the surgical procedure. Greater recognition of the benefits of tracheotomy in terms of greater patient comfort and mobility has promoted its earlier performance. No data identify an ideal time for tracheotomy. The decision to convert a patient from translaryngeal intubation to a tracheostomy requires anticipation of the duration of expected mechanical ventilation and the weighing of the expected benefits and risks of the procedure. The convenience of percutaneous tracheotomy performed in the ICU by critical care specialists without formal surgical training has further promoted the adoption of tracheotomy for ventilator-dependent patients. Regardless of the method for performing tracheotomy, meticulous surgical technique and careful postoperative management are necessary to maintain the excellent safety record of tracheotomy for critically ill patients.

Consensus conference on artificial airways in patients receiving mechanical ventilation.

A L Plummer and D R Gracey

Chest 1989;96;178-180
DOI 10.1378/chest.96.1.178

- Mekanik ventilasyonun ilk birkaç günü içinde ekstübasyonun düşünülürse gerek yok;
- Ancak uzamış entübasyon (> 7 gün) söz konusu olacaksa trakesotomi yapılmalıdır

Zamanlama

Journal of Critical Care (2009) 24, 435–440

The impact of time to tracheostomy on mechanical ventilation duration, length of stay, and mortality in intensive care unit patients

Time to tracheostomy and outcome

Table 1 Baseline characteristics

Variable	
Number	531
Age in years	49 ± 22
Male sex	386 (73)
APACHE II score	22 ± 8
Main reason for ICU admission	
Respiratory	129 (24)
Cardiovascular	122 (23)
Neurologic	47 (9)
Other medical	5 (1)
Nontrauma postoperative	137 (26)
Trauma	91 (17)
Characteristics at the first 24 h of ICU admission	
Coma	297 (56)
Shock	298 (56)
Hypoxemia	66 (12)
Renal impairment	92 (17)
Coagulopathy	205 (39)
Chronic underlying illnesses	
Chronic respiratory disease	45 (8)
Chronic renal disease	25 (5)
Chronic immunosuppression	24 (5)
Chronic cardiovascular disease	16 (3)
Chronic liver disease	15 (3)
Other	
Reintubation	116 (22)

Values are expressed as number, mean ± SD, or numbers (percentages) where appropriate.

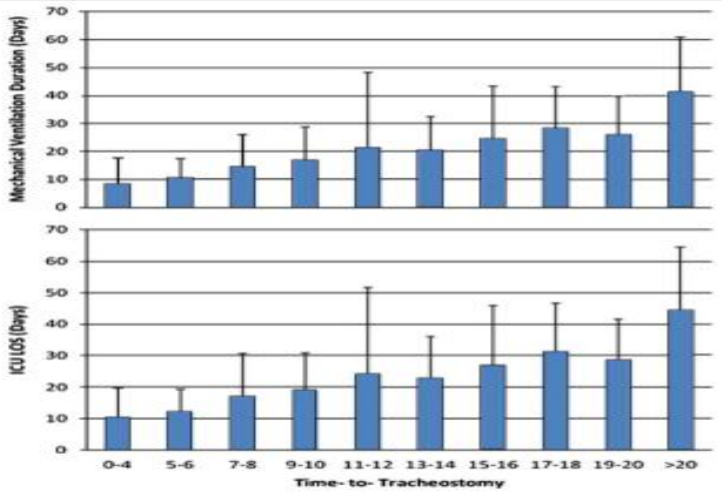


Fig. 1 Mean ± SD of mechanical ventilation duration, ICU LOS, and hospital LOS plotted in relation to time to tracheostomy.

Time to tracheostomy and outcome

Table 3 Factors associated with ICU and hospital mortality using multivariable analysis (logistic regression)

Parameter	OR	95% CI	*P*
For ICU mortality			
Time to tracheostomy (for each 1-d increment)	1.03	0.99-1.07	.1
APACHE II score	1.05	1.01-1.10	.02
Surgical tracheostomy	0.54	0.27-1.10	.09
Nontrauma postoperative admission	0.24	0.05-1.09	.06
Cardiovascular admission	2.53	1.30-4.97	.006
Chronic cardiovascular disease	3.12	0.91-10.68	.07
Chronic liver disease	5.78	1.80-18.55	.003
Chronic respiratory disease	2.31	0.97-5.54	.06
For hospital mortality			
Time to tracheostomy (for each 1-d increment)	1.00	0.97-1.02	.97
Age (for each 1-y increment)	1.03	1.02-1.04	<.0001
APACHE II score	1.04	1.00-1.07	.03
Nontrauma postoperative admission	0.50	0.27-0.91	.02
Renal impairment	2.48	1.40-4.39	.002
Hypoxemia	0.62	0.33-1.16	.1
Chronic liver disease	8.35	1.74-40.10	.008
Reintubation	0.65	0.38-1.10	.1

OR indicates odds ratio.
For the ICU mortality model, χ^2 likelihood ratio = 60.43, $P < .0001$.
For the hospital mortality model, χ^2 likelihood ratio = 129.12, $P < .0001$.

Zamanlama

BMJ, doi:10.1136/bmj.38467.485671.E0 (published 23 May 2005)

Systematic review and meta-analysis of studies of the timing of tracheostomy in adult patients undergoing artificial ventilation

John Griffiths, Vicki S Barber, Lesley Morgan, J Duncan Young

Table 1 Summary of studies included in systematic review

Study	No of patients (n=406)	Timing of tracheostomy		Intensive care setting	Randomisation	Mortality expressed on intention to treat basis	Duration of ventilation and critical care stay expressed on intention to treat basis
		Early	Late				
Bouderka et al 2004[24]	62	5-6 days after admission	Prolonged endotracheal intubation	Unit for patients with head injuries	Randomised; method not stated	Implied	Implied both
Dunham et al 1984[25]	74	3-4 days after initiation of translaryngeal intubation	14 days after initiation of translaryngeal intubation	Trauma unit	Quasi-randomised	Mortality not recorded Pneumonia analysed by intention to treat	Yes
Rodriguez et al 1990[26]	106	1-7 days after admission to intensive care unit	8 or more days after admission to intensive care unit	Surgical unit	Quasi-randomised	Implied	Implied both
Rumbak et al 2004[17]	120	0-2 days after initiation of mechanical ventilation	14-16 days after initiation of mechanical ventilation	Three medical units	True randomisation	Implied	Yes
Saffle et al 2002[18]	44	Next available operative day	14 days after burn injury	Burns unit	True randomisation	Implied	Yes

Zamanlama

BMJ, doi:10.1136/bmj.38467.485671.E0 (published 23 May 2005)

Systematic review and meta-analysis of studies of the timing of tracheostomy in adult patients undergoing artificial ventilation

John Griffiths, Vicki S Barber, Lesley Morgan, J Duncan Young

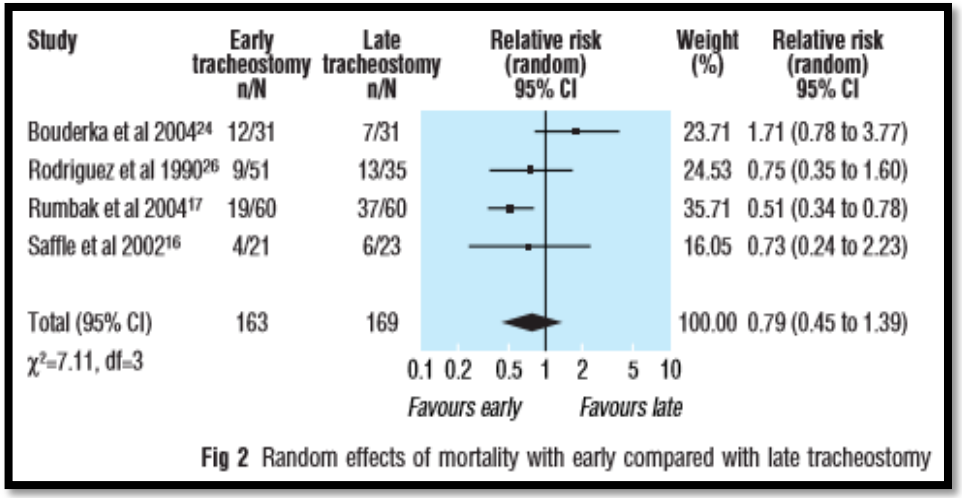


Fig 2 Random effects of mortality with early compared with late tracheostomy

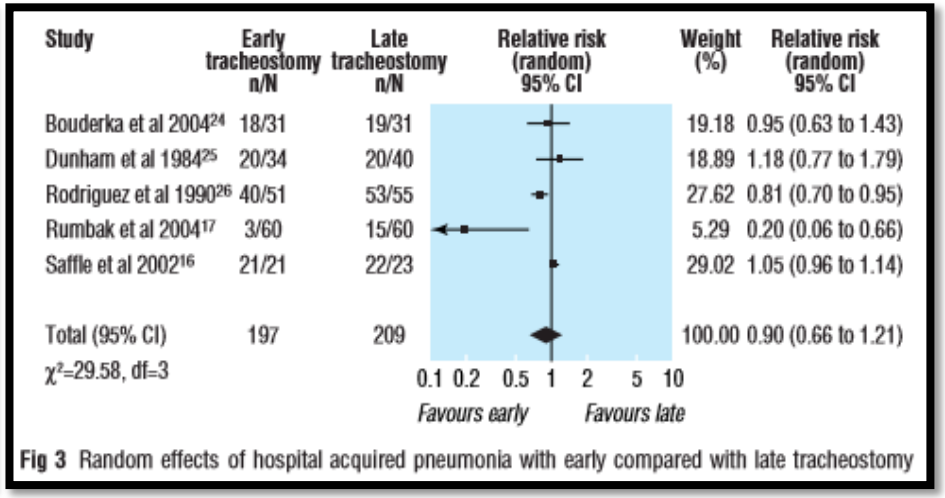


Fig 3 Random effects of hospital acquired pneumonia with early compared with late tracheostomy

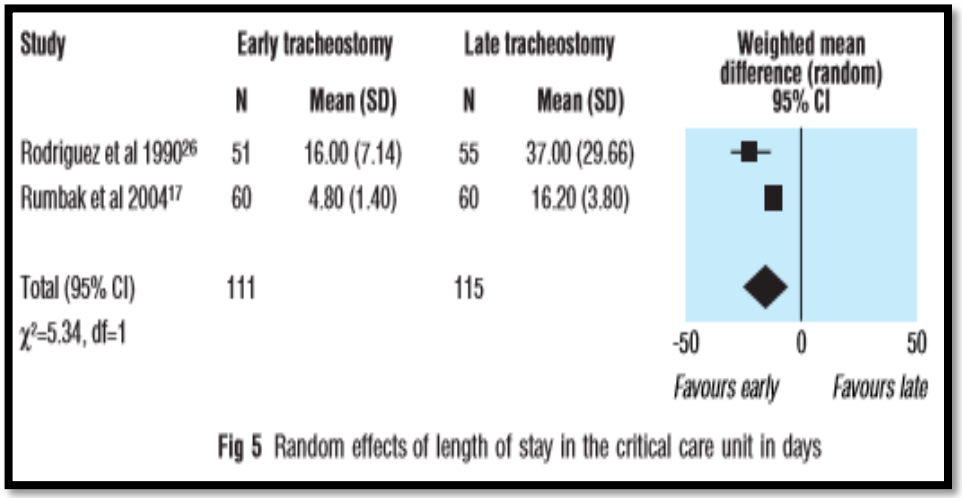


Fig 5 Random effects of length of stay in the critical care unit in days

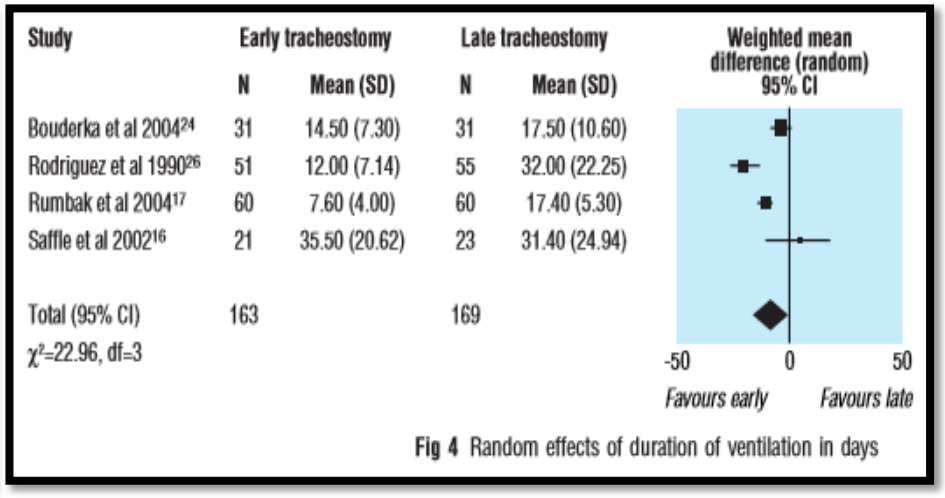


Fig 4 Random effects of duration of ventilation in days

CHEST Original Research

The Timing of Tracheotomy in Critically Ill Patients Undergoing Mechanical Ventilation

A Systematic Review and Meta-analysis of Randomized Controlled Trials

Fei Wang, MD, PhD; Youping Wu, MD, PhD; Lulong Bo, MD, PhD;

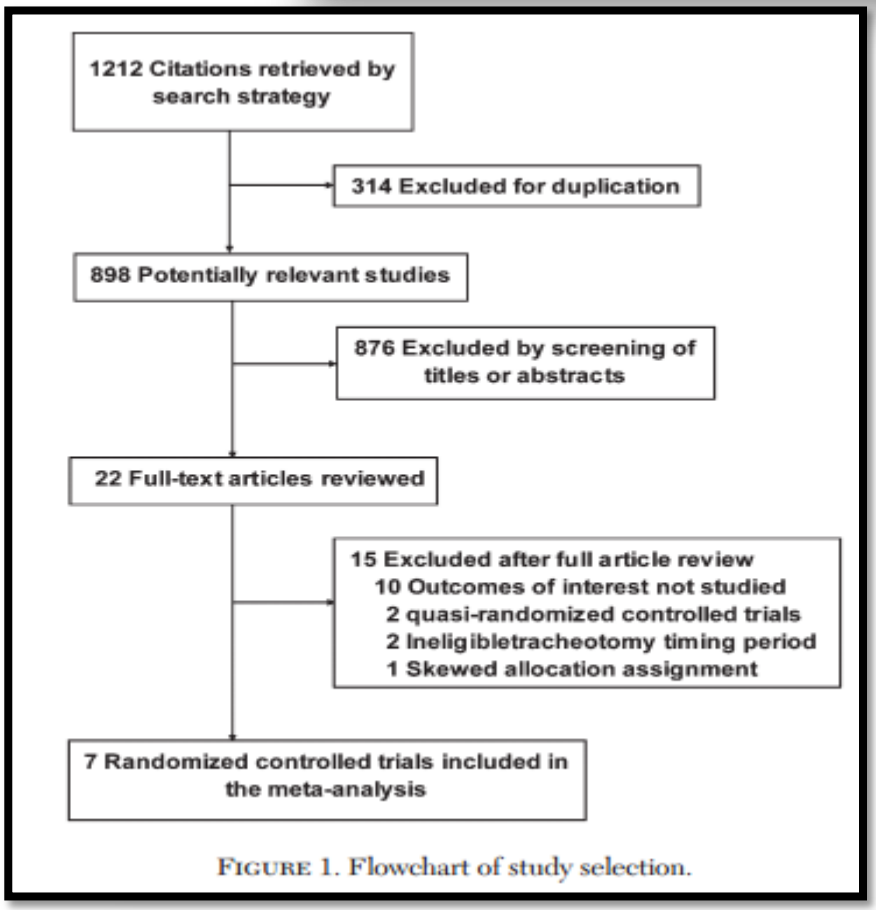


FIGURE 1. Flowchart of study selection.

Study/Year	Intensive Care Setting	Timing of Tracheotomy	
		Early	Late
Saffle et al[20]/2002	Burn ICU	Next available operative day	14 d after burn injury
Bouderka et al[21]/2004	Units for head injury patients	5-6 d after admission	Prolonged endotracheal intubation
Rumbak et al[4]/2004	3 Medical ICUs	0-2 d after initiation of MV	14-16 d after initiation of MV
Barquist et al[14]/2006	Trauma center	Before 8 d of admission	After 28 d after admission
Blot et al[15]/2008	25 Medical-surgical ICUs	Before 4 d of initiation of MV	After 14 d of initiation of MV
Terragni et al[22]/2010	12 ICUs	6-8 d after endotracheal intubation	13-15 d after endotracheal intubation
Trouillet et al[23]/2011	Postcardiac surgery ICU	Before 5 d after surgery	15 d after initiation of MV

Conclusions: **The present meta-analysis suggested that the timing of the tracheotomy did not significantly alter important clinical outcomes in critically ill patients. The duration of MV and sedation, as well as the long-term outcomes of ET in mechanically ventilated patients, should be evaluated in rigorously designed and adequately powered RCTs in the future.**

CHEST 2011; 140(6):1456–1465

Respir Care 2013;58(11):1856–1862.

Benefits of Early Tracheotomy: A Meta-analysis Based on 6 Observational Studies

Liang Shan MD, Panpan Hao MD, Feng Xu MD, and Yu-Guo Chen MD

- 2037 Hasta → 6 makale ; Erken & Geç trakeotomi;
- Mortalite; MV; YB; Hastanede kalış; VİP

Table. Chief Characteristics of Studies Included in the Meta-analysis

First author	Armstrong[19]	Arabi[20]	Moller[21]	Flaatten[22]	Zagli[23]	Tong[24]
Year of publication	1998	2004	2005	2006	2010	2012
Country	United States	Saudi Arabia	United States	Norway	Italy	United States
Study design	Single-center retrospective	Single-center retrospective	Multi-center retrospective	Single-center retrospective	Single-center retrospective	Single-center retrospective
Number of cases	157	136	185	461	506	592
Mean age, y	39	31	52	53	55	68
Male, %	75	91	62	ND	71	52
Timing of tracheotomy						
Early	< 6 d	< 7 d	< 7 d	< 6 d	≤ 3 d	< 7 d
Late	≥ 7 d	> 7 d	> 7 d	> 6 d	> 3 d	> 7 d
Study population	Ventilator-dependent trauma patients	Trauma ICU patients	Surgical ICU patients	ICU patients	Emergency ICU patients requiring mechanical ventilation	Non-trauma ICU patients
Available end points	ICU stay, hospital stay, mortality	Duration of ventilation, ICU stay, hospital stay, mortality	ICU stay, hospital stay, duration of ventilation, VAP	Duration of ventilation, ICU stay, hospital stay, mortality	VAP, duration of ventilation, ICU stay, hospital stay, mortality	Duration of ventilation, ICU stay, hospital stay, mortality, VAP
Type of tracheotomy	Open surgery	PDT	PDT or open surgery	PDT or open surgery	PDT	Open surgery

VAP = ventilator- associated pneumonia
ND = no data available
PDT = percutaneous dilational tracheotomy

Respir Care 2013;58(11):1856–1862.

Benefits of Early Tracheotomy: A Meta-analysis Based on 6 Observational Studies

Liang Shan MD, Panpan Hao MD, Feng Xu MD, and Yu-Guo Chen MD

First Author	Year	Early Tracheotomy Mean	SD	Total	Late Tracheotomy Mean	SD	Total	Weight (%)	Mean Difference I-V, Fixed, 95% CI
Arabi[20]	2004	9.6	1.2	29	18.7	1.3	107	25.1	-9.10 (-9.60 to -8.60)
Moller[21]	2005	12.2	0.9	81	21.9	1.3	104	25.1	-9.70 (-10.02 to -9.38)
Zagli[23]	2010	13.3	9.6	256	16.7	8.3	250	24.6	-3.40 (-4.96 to -1.84)
Tong[24]	2012	21.5	1.9	128	39.3	1.3	464	25.1	-17.80 (-18.14 to -17.46)
Total				494			925	100.0	-10.04 (-15.15 to -4.92)

Heterogeneity: $Tau^2 = 27.05$, chi-square = 1,521.45, degrees of freedom = 3, $P < .001$, $I^2 = 100\%$

Test for overall effect: $Z = 3.85$, $P = .001$

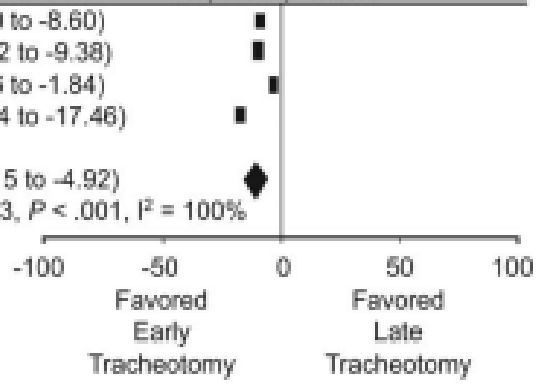


Fig. 2. Meta-analysis on the impact of early versus late tracheotomy on duration of mechanical ventilation.

First Author	Year	Early Tracheotomy Events	Total	Late Tracheotomy Events	Total	Weight (%)	Odds Ratio M-H, Fixed, 95% CI
Armstrong[19]	1998	7	62	11	95	4.3	0.97 (0.36–2.66)
Arabi[20]	2004	5	29	15	107	3.0	1.28 (0.42–3.87)
Flaatten[22]	2006	78	230	94	231	34.6	0.75 (0.51–1.09)
Zagli[23]	2010	63	256	72	250	30.7	0.81 (0.54–1.20)
Tong[24]	2012	31	128	150	464	27.5	0.67 (0.43–1.05)
Total			705		1,147	100.0	0.77 (0.62–0.96)
Total events		184		342			

Heterogeneity: chi-square = 1.46, degrees of freedom = 4, $P = .83$, $I^2 = 0\%$

Test for overall effect: $Z = 2.31$, $P = .02$

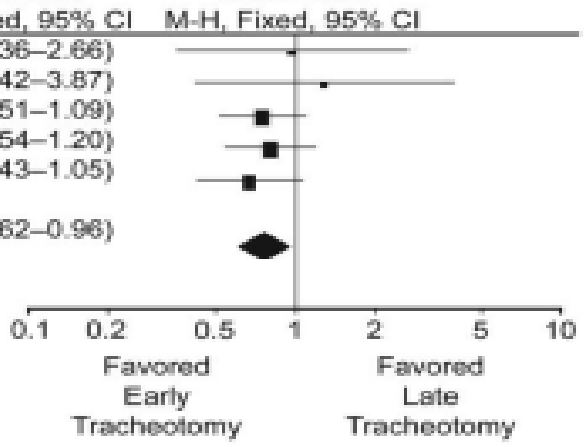
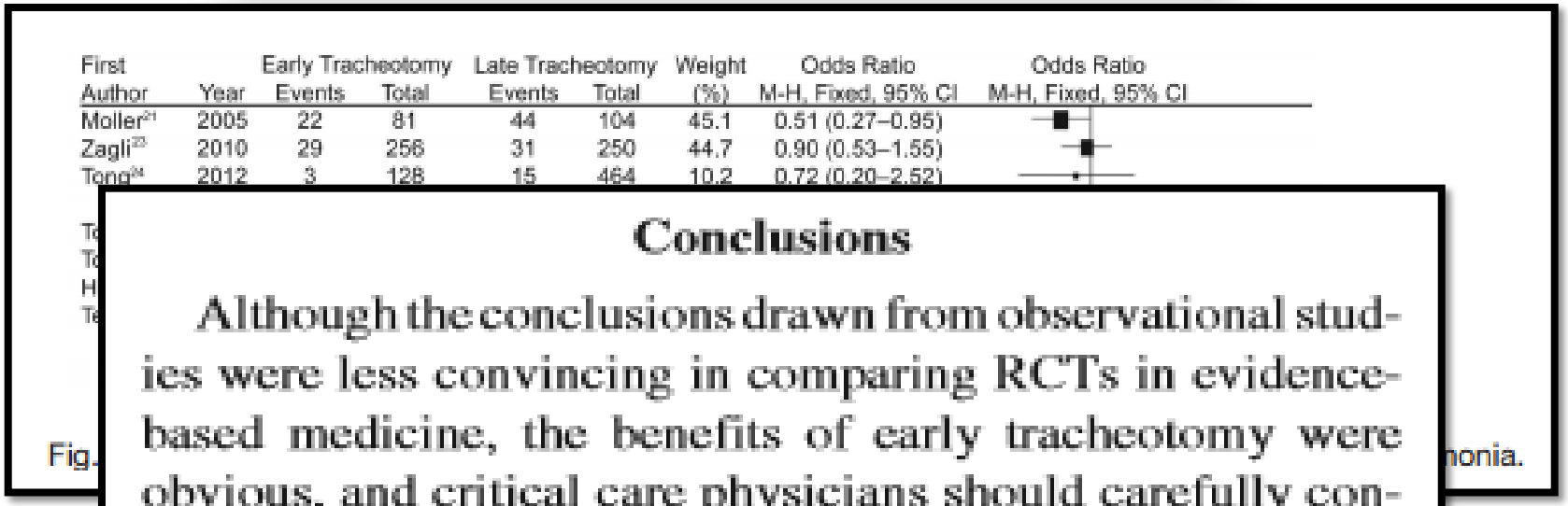


Fig. 1. Meta-analysis on the impact of early versus late tracheotomy on mortality.

Respir Care 2013;58(11):1856–1862.

Benefits of Early Tracheotomy: A Meta-analysis Based on 6 Observational Studies

Liang Shan MD, Panpan Hao MD, Feng Xu MD, and Yu-Guo Chen MD



First Author	Year	Early Tracheotomy Events	Early Tracheotomy Total	Late Tracheotomy Events	Late Tracheotomy Total	Weight (%)	Odds Ratio M-H, Fixed, 95% CI
Moller[21]	2005	22	81	44	104	45.1	0.51 (0.27–0.95)
Zagli[23]	2010	29	256	31	250	44.7	0.90 (0.53–1.55)
Tong[24]	2012	3	128	15	464	10.2	0.72 (0.20–2.52)

Fig. … nonia.

Conclusions

Although the conclusions drawn from observational studies were less convincing in comparing RCTs in evidence-based medicine, the benefits of early tracheotomy were obvious, and critical care physicians should carefully consider them when encountering the optimal timing of tracheotomy. Based on our findings, we recommend that tracheotomy be performed between days 3 and 7, once the decision had been made.

- MV süresi → Ort. fark 10.04 gün (p=0.001)
- YB kalış süresi → Ort. fark 8.8 gün (p<0.001)
- Hastanede kalış → Ort. fark 12.18 gün (p<0.001)
- VİP → fark yok

J Trauma Acute Care Surg. 2014 Jan;76(1):70-6; discussion 76-8. doi: 10.1097/TA.0b013e3182a8fd6a.

Tracheostomy timing in traumatic brain injury: a propensity-matched cohort study.

Alali AS[1], Scales DC, Fowler RA, Mainprize TG, Ray JG, Kiss A, de Mestral C, Nathens AB.

American Collage of Surgeon's Trauma Qualty Improvement;

- 2009-2011
- 1154 hasta
- Erken (<8 gün) ve Geç (>8 gün) trakeotomi
- MV gün sayısı →10 gün vs 16 gün
- YB kalış gün sayısı → 13 gün vs 19 gün
- Hastanede kalış süresi → 20 gün vs 27 gün
- VİP insidansı → % 41.7 vs % 52.7
- DVT riski → % 8.2 vs % 14.4
- Dekübitüs ülseri riski → % 4 vs % 8.9

- Mortalite iki grup arasında benzer bulunmuştur

S.B Ankara Eğitim ve Araştırma Hastanesi Tıp Dergisi 2011; 44 (1) :11-15

YOĞUN BAKIM ÜNİTESİNDE "ROTASYON DİLATASYON VİDA YÖNTEMİ" KULLANILARAK AÇILAN PERKÜTAN TRAKEOSTOMİ DENEYİMLERİMİZ

PERCUTANEOUS TRACHEOSTOMY EXPERIENCES BY USING "ROTATION DILATATION SCREW METHOD" IN INTENSIVE CARE UNIT

Çetin KAYMAK, Namık ÖZCAN, Hülya BAŞAR, Ayşe ONGUN ÖZCAN

S.B. Ankara Eğitim ve Araştırma Hastanesi Anesteziyoloji I. Kliniği, ANKARA

Gereç ve Yöntem: *Hastanemiz reanimasyon ünitesinde 2007 Eylül - 2010 Aralık zaman dilimlerinde trakeostomi açılmış 68 hastanın dosyası değerlendirildi. Hastaların demografik verileri, trakeostomi açılma süreleri, işlem süreleri ve gelişen komplikasyonlar kaydedildi. Sonuçlar ortalama ort± SD olarak verildi.*

Tablo 1- Hastalara ve trakeostomi işlemine ait veriler (ort ± SD)

Sayı	68
Yaş (yıl)	58.8 ± 15.6
Cinsiyet (E/K)	40/28
APACHE II*	30.8 ± 6.4
Trakeostomi açılma günü	14 ± 6
Trakeostomi işlem süresi (dak)	6.2 ± 2.2

*APACHE II: Acute Physiology and Chronic Health Evaluation.

Tablo 2- Percü-Twist yöntemi ile açılan trakeostomi olgularında erken görülen komplikasyonlar

	Hasta sayısı 68
Minör kanama (2-100 ml)	3
Major kanama (> 100 ml)	-
Satürasyon düşmesi	-
Kardiyak arrest	-
Subkutan amfizem	-
Pnömotoraks	-
Klavuz tel malpozisyonu	1
Kanama (Klemp ile tutmayı gerektiren)	1

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Danish Guidelines 2015 for Percutaneous Dilatational Tracheostomy in the Intensive Care Unit

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We *recommend* bedside PDT as the standard method for tracheostomy in intensive care patients (1B)
We *recommend* that surgical tracheostomy in the operating room remains the back-up method in difficult cases (ungraded best clinical practice)
We *suggest* that anaesthesia for PDT should consist routinely of intravenous general anaesthesia and neuromuscular blockade (2D)
We *suggest* that PDT can also be safely carried out in local analgesia (2D)
We *suggest* the laryngeal mask airway as a safe alternative to retracting an endotracheal tube during PDT (2B)
We *suggest* bronchoscopic guidance for PDT (2D)
We *suggest* ultrasound as a possible adjunct to PDT (2C)
We *recommend* that the Surgical Safety Checklist, as developed by WHO, and with local modifications, should be routinely applied to the surgical procedure of PDT (1B)
We *recommend* capnometry /-graphy should be used in cases of suspected tracheal tube displacement (1D)
We *suggest* that all clinical staff who work in ICU should be trained in interpretation of capnometry/-graphy (2D)
We *recommend* the presence of a difficult airway trolley in close proximity to the unit (1D)
We *suggest* the establishment of an algorithm to be used in the clinical scenario where there is suspicion of a displaced tracheostomy (2D)
We *suggest* that all ICU doctors receive ongoing training in the use of supraglottic devices and are familiar in the techniques of advanced airway management (2D)

Background:

Definitions of early tracheostomy vary from 2-10 days from start of mechanical ventilation. Thirteen RCTs with mortality data comparing early versus late tracheostomy were identified (table 2).

Table 2 : Early tracheostomy and ICU mortality in RCTs. Summary of findings.

Tracheostomy timing: Early Late or none Effect size

	Deaths/ total	Deaths/ total	Odds ratio (95% CI)
Young et al 2013[10]	133/448	132/445	1.00 (0.75-1.33)
Bosel et al 2013[11]	3/30	14/30	0.13 (0.03-0.51) *
Zheng et al 2012[12]	19/58	32/61	0.44 (0.21-0.93) *
Koch et al 2012[13]	9/50	7/50	1.35(0.46-3.96)
Trouillet et al 2011[14]	24/109	26/107	0.88(0.47-1.66)
Terragni et al 2010[15]	108/209	128/210	0.69(0.46-1.01)
Blot et al 2008[16]	12/61	15/62	0.77 (0.33-1.81)
Barquist et al 2006[17]	2/29	5/31	0.39(0.07-2.16)
Rumbak et al 2004[8]	19/60	37/60	0.29(0.14-0.61) *
Bouderka et 2004[18]	12/31	7/31	2.17(0.71-6.57)
Saffle et al 2004[19]	4/21	6/23	0.67(0.16-2.79)
Sugerman et al 1997[20]	13/53	11/59	1.42(0.57-3.51)
Rodriques et al 1990[21]	9/51	13/55	0.69(0.27-1.79)

Sonuç

Trakeostomi;

- Erken vs. geç trakeotomi
  - ilk 48 saat vs > 14 gün
  - < 7 gün vs. > 7 gün
- Mortalite; MV süresi; YB kalış süresi
- Hastanede kalış süresi; VİP insidansı
- Teknikler arasında fark yoktur

- Erken trakeotominin kesin yararlı denememesine rağmen;
- Faydalı olabileceğini düşündüren bazı çalışmalar bulunmaktadır
- Erken trakeostominin zararlı olduğuna işaret eden çalışma yoktur
- Erken trakeotomiyi öngörme yeteneğini inceleyen çalışmalar vardır
- Ancak henüz hangi hastanın entübasyona uzun süre ihtiyaç duyacağını belirlemek için geçerli bir kılavuz bulunmamaktadır

Teşekkürler …