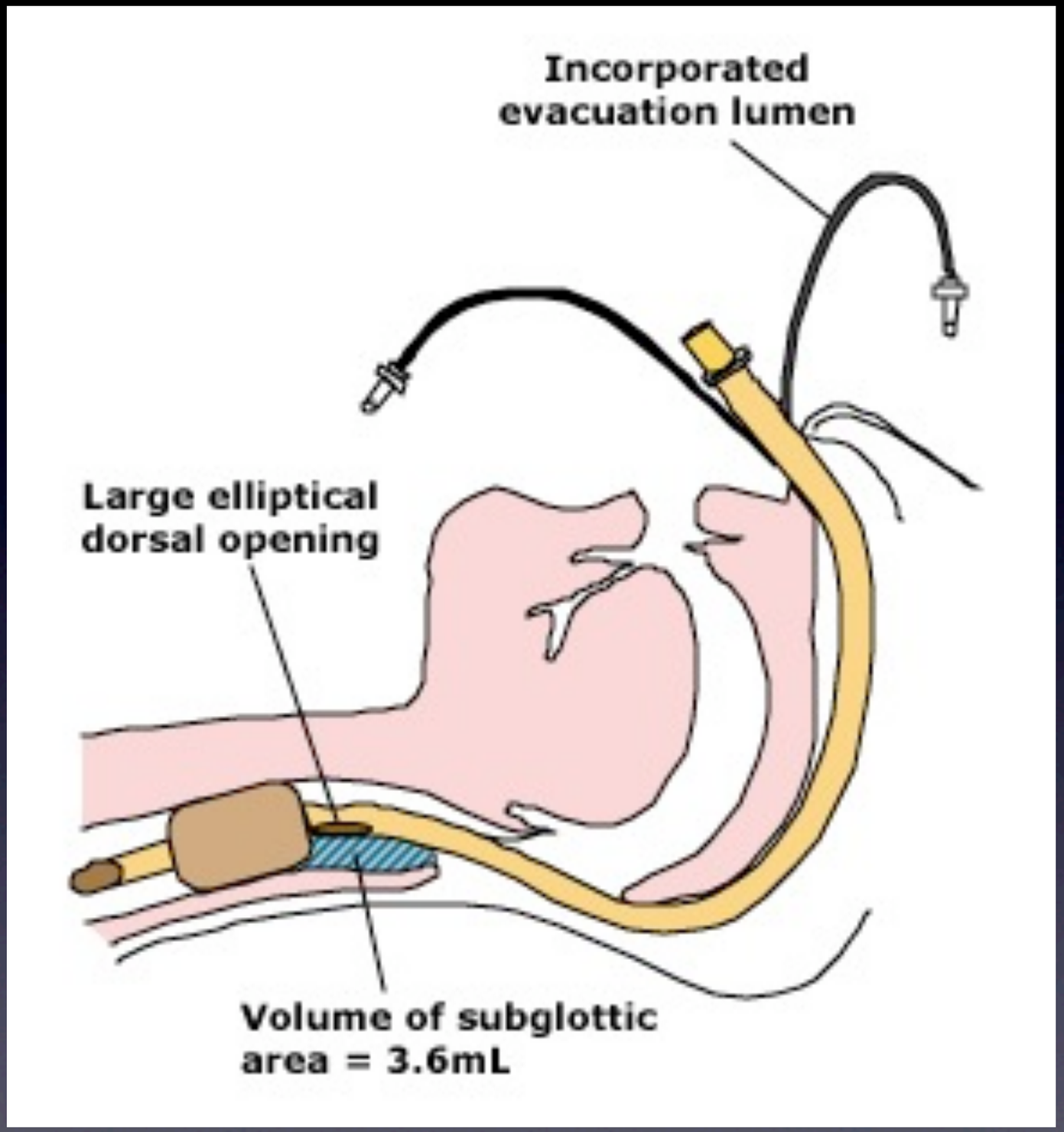
# Is subglottis zuigdrainage nuttig en veilig bij het voorkomen van VAP in IC-patiënten?

PICO-search

sept 2010

- Ventilator Associated Pneumonia (VAP) is en blijft een belangrijke bron van morbiditeit en mortaliteit.

- Er zijn verschillende preventieve maatregelen mogelijk, waaronder CASS/SSD.




Representation of a specially designed endotracheal tube that permits the drainage of subglottic secretions. Hi-Lo EVAC tube (Mallinckrodt).
*Redrawn from Valles, J, Artigas, A, Rello, J, et al, Ann Intern Med 1995; 122:179.*

| | |
|---|---|
| **P**atient/**P**roblem: **M**edical condition: | ICU, intensive care, ventilated |
| **I**ntervention: | CASS, aspiration subglottic secretions |
| **C**ompare to: | |
| **O**utcome: | VAP, Ventilator Associated Pneumonia |

1. Prevention of nosocomial pneumonia in intubated patients: respective role of mechanical subglottic secretions drainage and stress ulcer prophylaxis.
Mahul P, Auboyer C, Jospe R, Ros A, Guerin C, el Khouri Z, Galliez M, Dumont A, Gaudin O.
Intensive Care Med. 1992;18(1):20-5.

2. Continuous aspiration of subglottic secretions in preventing ventilator-associated pneumonia.
Vallés J, Artigas A, Rello J, Bonsoms N, Fontanals D, Blanch L, Fernández R, Baigorri F, Mestre J.
Ann Intern Med. 1995 Feb 1;122(3):179-86.

3. A randomized clinical trial of continuous aspiration of subglottic secretions in cardiac surgery patients.
Kollef MH, Skubas NJ, Sundt TM.
Chest; 1999 Nov ; 116(5):1339-46.

4. Influence of the subglottic secretion drainage on the morbidity of ventilator associated pneumonia in mechanically ventilated patients
Bo H, He L, Qu J.
Zhonghua Jie He He Hu Xi Za Zhi; 2000 Aug ; 23(8):472-4. CHINEES

5. A randomized clinical trial of intermittent subglottic secretion drainage in patients receiving mechanical ventilation.
Smulders K, van der Hoeven H, Weers-Pothoff I, Vandenbroucke-Grauls C.
Chest. 2002 Mar;121(3):858-62.

6. Subglottic secretion drainage for preventing ventilator-associated pneumonia: a meta-analysis.
Dezfulian C, Shojania K, Collard HR, Kim HM, Matthay MA, Saint S.
Am J Med. 2005 Jan;118(1):11-8.

7. Investigating the failure to aspirate subglottic secretions with the Evac endotracheal tube.
Dragoumanis CK, Vretzakis GI, Papaioannou VE, Didilis VN, Vogiatzaki TD, Pneumatikos IA.
Anesth Analg. 2007 Oct;105(4):1083-5

8. Influence of an endotracheal tube with polyurethane cuff and subglottic secretion drainage on pneumonia.
Lorente L, Lecuona M, Jim鮥z A, Mora ML, Sierra A.
Am J Respir Crit Care Med; 2007 Dec 1 ; 176(11):1079-83.

9. Effect of continuous aspiration of subglottic secretions on the prevention of ventilator-associated pneumonia in mechanically ventilated patients: a prospective, randomized, controlled clinical trial
Yang CS, Qiu HB, Zhu YP, Huang YZ, Xu XT, Gao L.
Zhonghua Nei Ke Za Zhi; 2008 Aug ; 47(8):625-9. CHINEES

10. Continuous aspiration of subglottic secretions in the prevention of ventilator-associated pneumonia in the postoperative period of major heart surgery.
Bouza E, P鮥z MJ, Mu P, Rinc⑭, Barrio JM, Hortal J.
Chest; 2008 Nov ; 134(5):938-46.

11. Intermittent Subglottic Secretion Drainage and Ventilator-associated Pneumonia: A Multicenter Trial.
Lacherade JC, De Jonghe B, Guezennec P, Debbat K, Hayon J, Monsel A, Fangio P, Appere De Vecchi C, Ramaut C, Outin H, Bastuji-Garin S.
Am J Respir Crit Care Med. 2010 Jun 3.

# Up-to-date

Last lit review: mei 2010

- Subglottic drainage — Drainage of subglottic secretions may lessen the risk of aspiration and thereby decrease the incidence of VAP. Specially designed endotracheal tubes have been developed to provide continuous aspiration of subglottic secretions (CASS).

- A meta-analysis assessed the effect of subglottic secretion drainage on the incidence of VAP. Five studies were selected for inclusion, enrolling a total of 896 intubated patients. The use of CASS reduced the incidence of VAP by nearly half (risk ratio 0.51; 95% CI 0.37-0.71). The effect of CASS in limiting VAP was most pronounced among patients expected to require >72 hours of mechanical ventilation. CASS also significantly reduced the incidence of VAP, median length of ICU stay, and antibiotic use among patients who required mechanical ventilation for >48 hours following heart surgery.

- The most extensively employed CASS device is the Hi-Lo Evac (Mallinckrodt Inc; Athlone, Ireland); however, these tubes cost more than standard endotracheal tubes, and are not widely available. The potential economic impact of widespread use of CASS is unclear.

# Meta-analyse

Subglottic secretion drainage for preventing ventilator-associated pneumonia: a meta-analysis.
Dezfulian C, Shojania K, Collard HR, Kim HM, Matthay MA, Saint S. Am J Med. 2005 Jan;118(1):11-8.

- 110 studies, 5 geselecteerd: 896 pat
- SSD reduceert VAP-incidentie met de helft, voornamelijk de early-onset-VAP die ontstaat in de eerste 5-7 dgn
- Heterogene bevindingen op eindpunten, totdat 1 outlyer werd uitgesloten
- In de 4 overigen (includeren pat met verwachte beademing > 72 u) verkorte SSD de beademingsduur met 2 dgn en LOS-ICU met 3 dgn en vertraagde de onset van pneumonie met 6,8 dgn.

# Geincludeerde trials

**Table 1** Characteristics of included trials

| First Author (Reference) | Setting and Patients | Definition of Ventilator-Associated Pneumonia | Exclusion Criteria | Method of Subglottic Secretion Drainage | Stress Ulcer Prophylaxis | Other Interventions |
|---|---|---|---|---|---|---|
| Mahul [16] | Medical-surgical ICU patients expected to require >72 hours of mechanical ventilation | Positive bronchoalveolar lavage culture required | Gastrointestinal bleeding; risk of reintubation; intubated before ICU; tracheostomy | Hourly aspiration with syringe | Randomized to aluminum hydroxide or sucralfate | Antibiotics (not reported); endotracheal tube cuff pressure check every 8 hours |
| Valles [18] | Medical-surgical ICU patients expected to require >72 hours of mechanical ventilation | Clinical features confirmed with bronchoscopically obtained cultures or response to antibiotics | Intubated prior to arriving at the emergency department or ICU; tracheostomy | Continuous wall suction | All patients received sucralfate | Antibiotics (64% drainage, 58% control); endotracheal tube cuff pressure check every 8 hours |
| Kollef [17] | Cardiothoracic ICU patients mechanically ventilated after cardiac surgery | Clinical features; positive tracheal, blood, or pleural cultures; radiographic abscess; or positive histology | Intubated before ICU; transfer from outside hospital | Low intermittent wall suction | 73% of control and 75% of drainage patients received stress ulcer prophylaxis (no specific drug data) | Antibiotics (99% drainage, 98% control); head elevated (99% drainage, 95% control); circuit change mimized |
| Bo [20] | Surgical ICU patients expected to require >72 hours of mechanical ventilation | Clinical features or positive blood/pleural cultures or radiographic abscess or positive histology | Intubated at outside hospital; high-risk surgery or trauma; pre-existing infection | Continuous wall suction | All patients received histamine-2 receptor blocker or proton pump inhibitor | Antibiotics (29% drainage, 36% control) |
| Smulders [19] | Medical-surgical ICU patients expected to require >72 hours of mechanical ventilation | Clinical features or positive blood/pleural cultures or radiographic abscess, or positive histology | None reported | High intermittent wall suction | All patients received sucralfate | Antibiotics (48% drainage, 51% control); endotracheal tube cuff check every 4 hours |

ICU = intensive care unit; drainage = subglottic secretion drainage group.

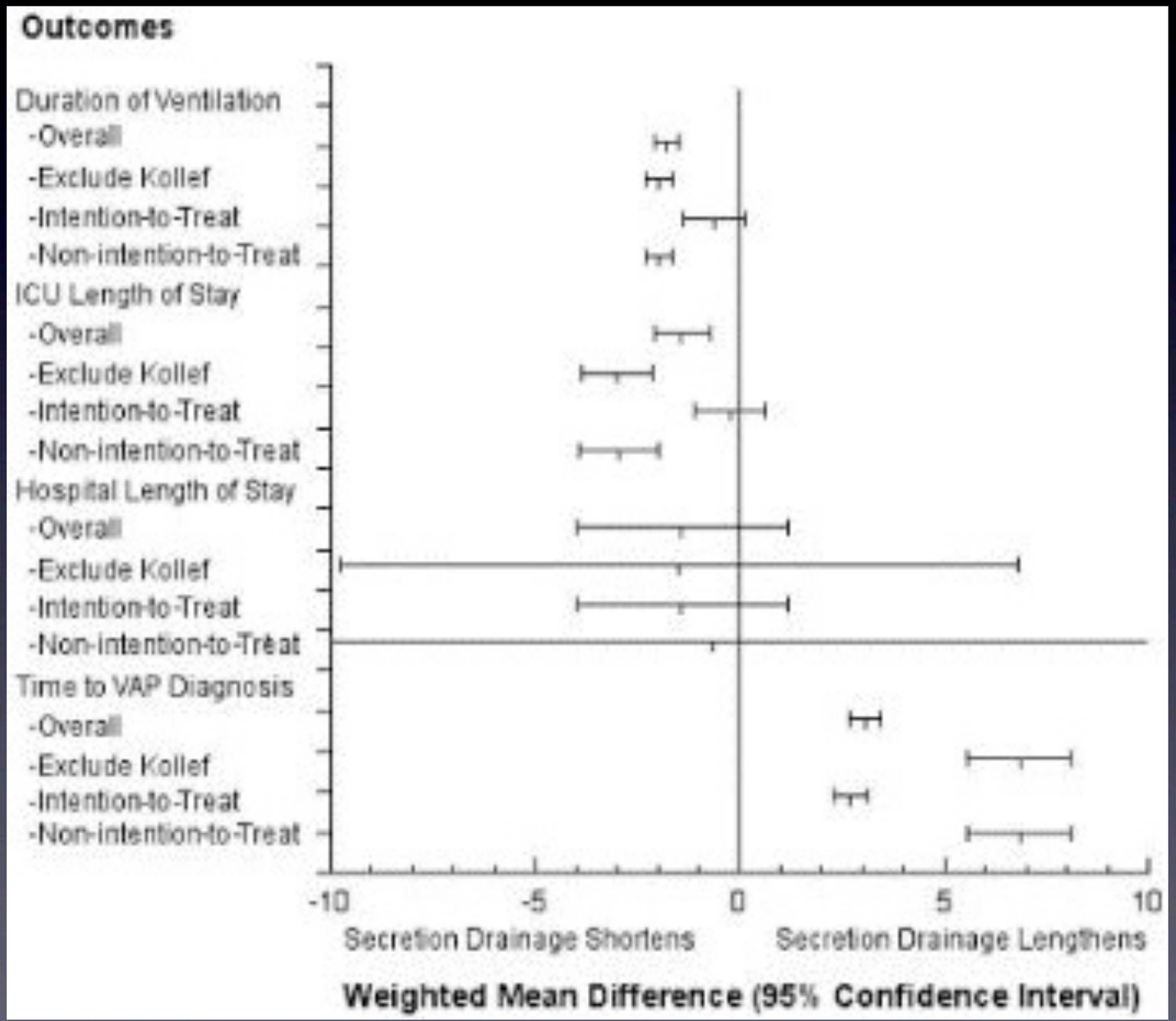
# Meta-analyse

Table 2. Summary of results of included trials*

| First Author (Reference) | Frequency of Pneumonia | | Mortality | | ICU Length of Stay (days) | | Hospital Length of Stay (days) | | Ventilation Duration (days) | | Time to Pneumonia (days) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Secretion Drainage | Control | Secretion Drainage | Control | Secretion Drainage | Control | Secretion Drainage | Control | Secretion Drainage | Control | Secretion Drainage | Control |
| | n/N (%) | | | | Mean ± SD | | | | | | | |
| Mahul [16] | 9/70 (13)† | 21/75 (28) | 17/70 (24) | 16/75 (21) | | | | | | | 16.2 ± 11† | 8.3 ± 5 |
| Valles [18] | 16/95 (17) | 25/95 (26) | 39/95 (41) | 35/90 (37) | 19 ± 4 | 22 ± 2 | | | 11 ± 1 | 13 ± 1 | 12 ± 7† | 6 ± 2 |
| Kollef [17] | 8/160 (5) | 15/183 (8) | 6/160 (4) | 8/183 (4) | 3.7 ± 4.6 | 3.2 ± 4.5 | 11 ± 11.2 | | 12.4 ± 14.2 | 1.5 ± 3.3 | 1.9 ± 5.1 | 65.6 ± 2.3† | 32.9 ± 1.2 |
| Bo [20] | 8/35 (23)† | 15/33 (45) | | | | | | | | | 14 ± 8† | 6 ± 4 |
| Smulders [19] | 3/75 (4) | 12/75 (16) | 12/75 (16) | 10/75 (13) | 9.3 ± 7.4 | 12.3 ± 3.6 | 26.8 ± 23.3 | | 28.3 ± 28.2 | 5.8 ± 4.4 | 7.1 ± 5.4 | | |

ICU = intensive care unit. * For each outcome in the overall meta-analysis, data derived by intention-to-treat analysis were used preferentially.

† The result in the subglottic secretion drainage group was significantly different ($P \leq 0.05$) from the control group for this outcome measure.


Outcomes
Duration of Ventilation
-Overall
-Exclude Kollef
-Intention-to-Treat
-Non-intention-to-Treat
ICU Length of Stay
-Overall
-Exclude Kollef
-Intention-to-Treat
-Non-intention-to-Treat
Hospital Length of Stay
-Overall
-Exclude Kollef
-Intention-to-Treat
-Non-intention-to-Treat
Time to VAP Diagnosis
-Overall
-Exclude Kollef
-Intention-to-Treat
-Non-intention-to-Treat
-10
-5
0
5
10
Secretion Drainage Shortens
Secretion Drainage Lengthens
Weighted Mean Difference (95% Confidence Interval)

# Hoe weet je van >72 u?

A retrospective study found that clinical variables were approximately 60% accurate in accounting for variation in the duration of mechanical ventilation in general medical and surgical ICU patients. Two studies in our analysis reported both intention-to-treat and non-intention-to-treat data; their accuracy of predicting the need for >72 hours of mechanical ventilation was 70% and 80%. Thus, ICU physicians appear fairly accurate predicting the need for prolonged mechanical ventilation.

J. Valles, A. Artigas and J. Rello et al., Continuous aspiration of subglottic secretions in preventing ventilator-associated pneumonia, Ann Intern Med 122 (1995), pp. 179–186

K. Smulders, H. van der Hoeven, I. Weers-Pothoff and C. Vandenbroucke-Grauls, A randomized clinical trial of intermittent subglottic secretion drainage in patients receiving mechanical ventilation, Chest 121 (2002), pp. 858–862.

| | |
|---|---|
| **P**atient/**P**roblem: **M**edical condition: | ICU |
| **I**ntervention: | Subglottic secretion drainage OR continuous aspiration of subglottic secretions |
| **C**ompare to: | |
| **O**utcome: | Safety |


1. A randomized clinical trial of continuous aspiration of subglottic secretions in cardiac surgery patients.
Kollef MH, Skubas NJ, Sundt TM.
Chest; 1999 Nov ; 116(5):1339-46.

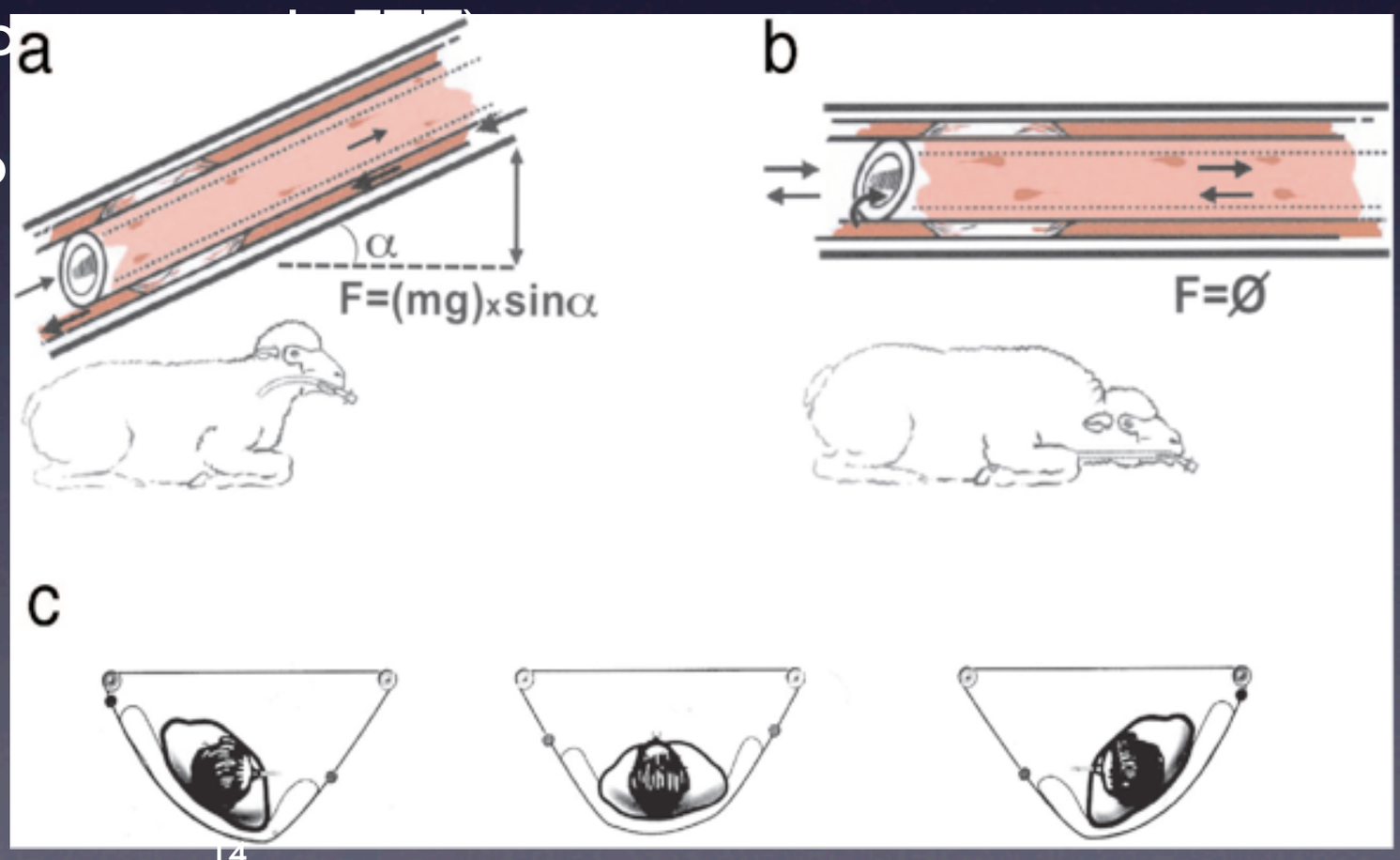
2. How to use an article on therapy or prevention: pneumonia prevention using subglottic secretion drainage.
Cook DJ, H顫rt PC, Heyland DK, Guyatt GH, Brun-Buisson C, Marshall JC, Russell J, Vincent JL, Sprung CL, Rutledge F.
Crit Care Med; 1997 Sep ; 25(9):1502-13.

# Unsafety in sheep

- Evaluation of continuous aspiration of subglottic secretion in an in vivo study, Berra L, et al. Crit Care Med. 2004 Oct;32(10):2071-8
- Prospective randomized animal study. 22 sheep, 72 u
- Drie groepen:
  - ✦ Conventioneel (30gr. Prone, normale ETT)
  - ✦ CASS Head-up continuously at <20 mmHg
  - ✦ CASS Head-down (ETT en trachea horizontaal) continuously at <20 mmHg

# Unsafety in sheep

- Evaluation of continuous aspiration of subglottic secretion in an in vivo study, Berra L, et al. Crit Care Med. 2004 Oct;32(10):2071-8
- Prospective randomized animal study. 22 sheep, 72 u
- Drie groepen:
  - ✦ Conventioneel (30gr. Pro
  - ✦ CASS Head-up continuo
  - ✦ CASS Head-down (ETT



# Tracheal Gross Findings

There were no gross tracheal lesions in the control group intubated with standard Hi-Lo ETT (C group) (Table 3).
CASS HU Group. The trachea showed necrosis and/or hemorrhage (Fig. 2a) and erythema (Fig. 2b) in all seven sheep, in an area immediately adjacent to the dorsal opening of the Evac lumen. Mucosal erosion with submucosal hemorrhage of 8 mm and 6 mm in diameter was found in two sheep; smaller hemorrhages (2– 4 mm) were observed in two other sheep.

Necrosis of 2–4 mm with exposed cartilage was seen in two studies.
CASS HD Group. Similar to the CASS HD group, all seven sheep showed various levels of tracheal injury adjacent to the Evac suctioning port. In one sheep, cartilage was exposed over a distance of 2 mm in close proximity to the suction port; six sheep showed hemorrhage of the submucosa (2–5mm).

# Investigating the Failure to Aspirate Subglottic Secretions with the Evac Endotracheal Tube

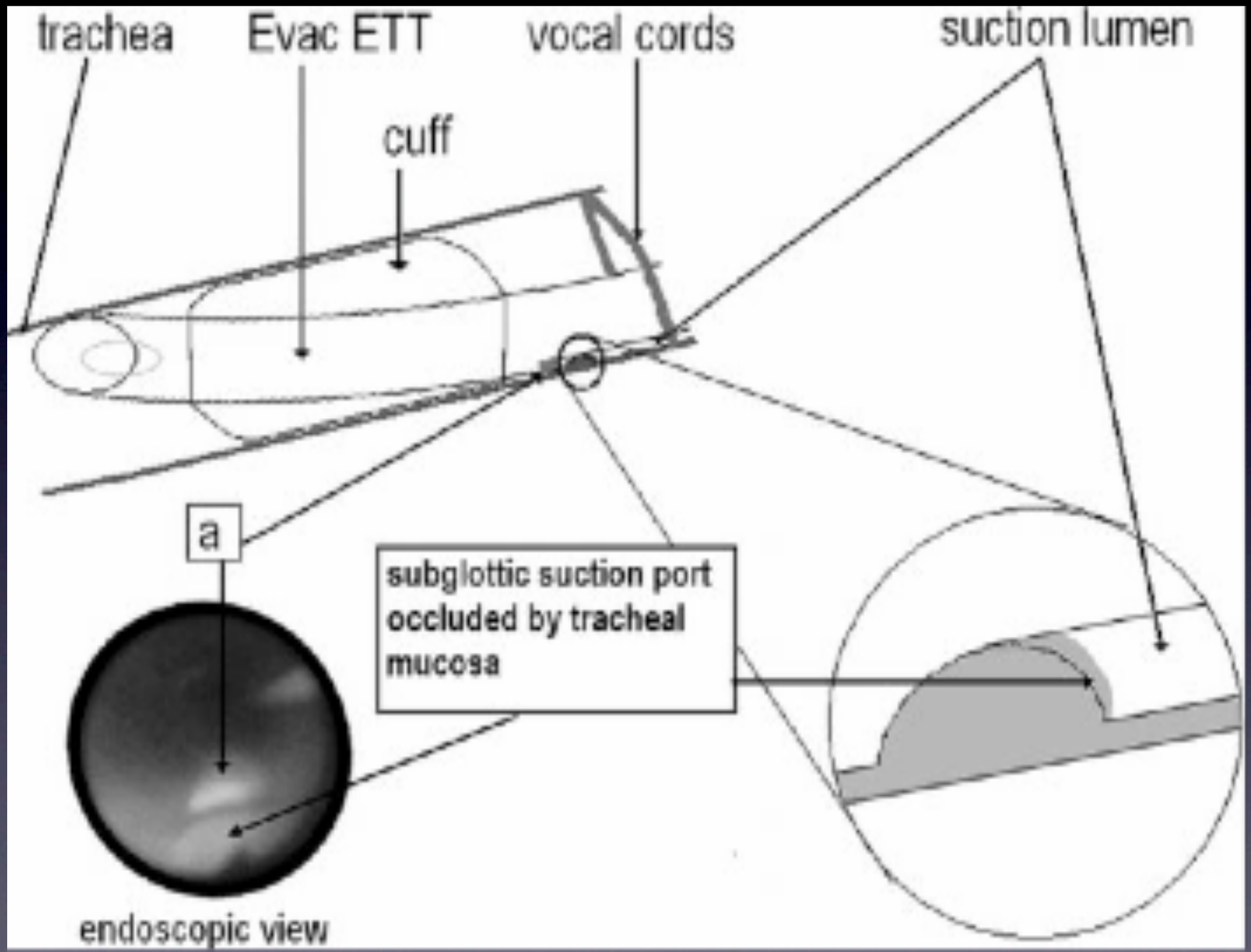
BACKGROUND: Our objective in this study was to determine the causes of suction lumen dysfunction experienced with the Evac ETT.

METHODS: We studied 40 adult patients intubated with the Evac ETT. Suction was kept continuously at -15 mmHg In all cases for which dysfunction of the suction lumen was observed, the subglottic suction port was examined visually using a flexible bronchoscope.

RESULTS: Dysfunction of the suction lumen occurred in 19 of 40 patients (48%). In 17 of these (43%), it was attributed to blockage of the subglottic suction port by suctioned tracheal mucosa.

CONCLUSION: Evacuation of subglottic secretions using the Evac ETT is often ineffective due to prolapse of tracheal mucosa into the subglottic suction port.

(Dragoumanis, Anesth Analg 2007;105:1083–5)


trachea
Evac ETT
vocal cords
suction lumen
cuff
a
subglottic suction port occluded by tracheal mucosa
endoscopic view

# Laatste nieuws ahead of print

**Intermittent subglottic secretion drainage and ventilator-associated pneumonia: a multicenter trial, Jean-Claude Lacherade et al, Am. J. Respir. Crit. Care Med. June 2010**

333 Patients in 4 French ICU's were randomly assigned to undergo intermittent SSD (n=169) or not (n=164)

Primary outcome was the overall incidence of VAP based on quantitative culture of distal pulmonary samplings performed after each clinical suspicion. Other outcomes included incidence of early- and late-onset VAP, duration of mechanical ventilation, ICU mortality.

Results: Microbiologically-confirmed VAP occurred in 67 patients, 25/169 (14.8%) in the SSD group and 42/164 (25.6%) in the control group (P=.02) yielding a relative risk reduction of 42.2% (95% confidential interval, 10.4%-63.1%). Using the day 5 threshold, the beneficial effect of SSD in reducing VAP was observed in both earlyonset VAP (2/169 [1.2%] SSD patients vs 10/164 [6.1%] control patients, P=.02) and late-onset VAP (23/126 [18.6%] SSD patients vs 32/97 [33.0%] control patients, P=.01). VAP was clinically suspected at least once in 51/169 (30.2%) SSD patients and 60/164 (36.6%) control patients (P=.25). No significant between-group differences were observed in duration of mechanical ventilation and ICU mortality.

Conclusions: Subglottic secretions drainage during mechanical ventilation results in a significant reduction in VAP, including late-onset VAP

# Samenvattend

- Subglottis zuigdrainage werkt op het voorkomen van early EN late-onset VAP.
- 50% reductie op de kans, verkort de beademingsduur met 2 dgn, de LOS-IC met 3 dgn en vertraagd de onset van pneumonie met 6,8 dgn.
- De veiligheid bij schapen is slecht en hangt mogelijk samen met continue zuigen. Bij IC-patienten is hier nog niet over gepubliceerd

# Vragen?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