Canadian Agency for Drugs and Technologies in Health

Health Technology Inquiry Service

Health Technology Assessment HTA

TITLE: Failures and Defects with Endotracheal Tubes and Cuffs: Clinical Evidence

DATE: 27 August 2010

RESEARCH QUESTIONS:

1. What is the incidence of failures or defects with endotracheal tubes and cuffs?

2. What is the impact of endotracheal tube and cuff failures or defects on patient safety?

3. What is the comparative incidence of failures or defects with different brands of endotracheal tubes and cuffs?

4. What is the comparative safety of different brands of endotracheal tubes and cuffs?

METHODS:

A limited literature search was conducted on key health technology assessment resources, including PubMed, the Cochrane Library (Issue 8, 2010), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI (Health Devices Gold), EuroScan, international health technology agencies, and a focused Internet search. The search was limited to English language articles published between January 01, 2005 and August, 17 2010. Filters were applied to limit the retrieval to health technology assessments, systematic reviews, meta-analyses, randomized controlled trials and non-randomized studies. Internet links were provided, where available.

The summary of findings was prepared from the abstracts of the relevant information. Please note that data contained in abstracts may not always be an accurate reflection of the data contained within the full article.

RESULTS:

HTIS reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials and non-randomized studies.

The literature search identified three randomized controlled trials and two non-randomized studies pertaining to failures and safety of endotracheal tubes and cuffs. No health technology assessments, systematic reviews, or meta-analyses were identified. Additional articles of potential interest are included in the appendix.

OVERALL SUMMARY OF FINDINGS:

Three randomized controlled trials compared different types of endotracheal tubes. Lorenz et al. compared the EasyTube with conventional endotracheal tubes (ETTs) for adult patients. They found that leak pressure and arterial saturation were not significantly different between the different tubes, and that the end-tidal carbon dioxide was lower with ETTs. Weiss et al.[2] compared cuffed and uncuffed ETTs in small children. One outcome of interest was the number of ETT exchanges needed to find an appropriate sized tube. The exchange rate was 2.1% in the cuffed group and 30.8% in the uncuffed group, and the cuffed ETTs did not increase the risk for post-extubation stridor compared with uncuffed ETTs. The authors concluded that cuffed ETTs were reliable for small children and reduced the need for tube exchanges. Parravicini et al.[3] performed a pilot study comparing ultrathin-walled two-stage twin endotracheal tubes with conventional endotracheal tubes in very premature infants. No significant differences were found for insertion complications, traumatic injury of the upper airway, accidental extubations, number of re-intubations after attempted extubation, or prevalence of air-leak syndrome.

Two non-randomized studies focused on ETT failure. Cobas et al.[4] studied the incidence of failed prehospital intubations in trauma patients. Although the study showed a 31% incidence of failed prehospital intubations, there was no difference in mortality between patients who were properly intubated and those who were not. Kusumaphanyo et al.[5] studied the failure or malfunction of anesthetic equipment in Thailand for one year. ETT failure occurred in 3.3% of 92 cases of equipment failure or malfunction. No details on the repercussions of these failures were reported.

None of the included studies compared different brands of endotracheal tubes or cuffs, with the exception of the Lorenz study[1] which compared the EasyTube with conventional ETTs, and no studies provided information on endotracheal tube or cuff defects.

REFERENCES SUMMARIZED:

Health technology assessments
No literature identified.

Systematic reviews and meta-analyses
No literature identified.

Randomized controlled trials

1. Lorenz V, Rich JM, Schebesta K, Taslakian S, Mullner M, Frass M, et al. Comparison of the EasyTube and endotracheal tube during general anesthesia in fasted adult patients. J Clin Anesth. 2009 Aug;21(5):341-7. PubMed: PM19700284

2. Weiss M, Dullenkopf A, Fischer JE, Keller C, Gerber AC, European Paediatric Endotracheal Intubation Study Group. Prospective randomized controlled multi-centre trial of cuffed or uncuffed endotracheal tubes in small children. Br J Anaesth. 2009 Dec;103(6):867-73. PubMed: PM19887533

3. Parravicini E, Baccarelli A, Wung JT, Kolobow T, Lorenz JM. A comparison of a new, ultrathin-walled two-stage twin endotracheal tube and a conventional endotracheal tube in very premature infants with respiratory distress syndrome: a pilot study. Am J Perinatol. 2007 Feb;24(2):117-22. PubMed: PM17304419

Non-randomized studies

4. Cobas MA, De la Pena MA, Manning R, Candiotti K, Varon AJ. Prehospital intubations and mortality: a level 1 trauma center perspective. Anesth Analg. 2009 Aug;109(2):489-93. PubMed: PM19608824

5. Kusumaphanyo C, Charuluxananan S, Sriramatr D, Pulnitiporn A, Sriraj W. The Thai Anesthesia Incident Monitoring Study (Thai AIMS) of anesthetic equipment failure/malfunction: an analysis of 1996 incident reports. J Med Assoc Thai. 2009 Nov;92(11):1442-9. PubMed: PM19938735

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APPENDIX – FURTHER INFORMATION:

Randomized controlled trials

6. Cavus E, Deitmer W, Francksen H, Serocki G, Bein B, Scholz J, et al. Laryngeal tube S II, ProSeal laryngeal mask, and EasyTube during elective surgery: a randomized controlled comparison with the endotracheal tube in nontrained professionals. Eur J Anaesthesiol. 2009 Sep;26(9):730-5. PubMed: PM19373095

7. Teoh WH, Sia AT, Fun WL. A prospective, randomised, cross-over trial comparing the EndoFlex and standard tracheal tubes in patients with predicted easy intubation. Anaesthesia. 2009 Nov;64(11):1172-7. PubMed: PM19825050

8. Kanazi GE, El-Khatib M, Nasr VG, Kaddoum R, Al-Alami A, Baraka AS, et al. A comparison of a silicone wire-reinforced tube with the Parker and polyvinyl chloride tubes for tracheal intubation through an intubating laryngeal mask airway in patients with normal airways undergoing general anesthesia. Anesth Analg. 2008 Sep;107(3):994-7. PubMed: PM18713919

Non-randomized studies

9. Dimitriou VK, Zogogiannis ID, Douma AK, Pentilas ND, Liotiri DG, Wachtel MS, et al. Comparison of standard polyvinyl chloride tracheal tubes and straight reinforced tracheal tubes for tracheal intubation through different sizes of the Airtraq laryngoscope in anesthetized and paralyzed patients: a randomized prospective study. Anesthesiology. 2009 Dec;111(6):1265-70. PubMed: PM19934870

10. Suzuki A, Tampo A, Abe N, Otomo S, Minami S, Henderson JJ, et al. The Parker Flex-Tip tracheal tube makes endotracheal intubation with the Bullard laryngoscope easier and faster. Eur J Anaesthesiol. 2008 Jan;25(1):43-7. PubMed: PM17666155

Review articles

11. Engels PT, Bagshaw SM, Meier M, Brindley PG. Tracheostomy: from insertion to decannulation. Can J Surg. 2009 Oct;52(5):427-33. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2769112 PubMed: PM19865580

12. Aker J. An emerging clinical paradigm: the cuffed pediatric endotracheal tube. AANA J. 2008 Aug;76(4):293-300. PubMed: PM18777815

Additional references

13. Product Recall: MALLINCKRODT® SATIN-SLIP® INTUBATING STYLET - 6 FR, Order code: 85863. 2006 Jul 18 [cited 2010 Aug 17]. In: Health Canada [Internet]. Ottawa: Health Canada; c1990 - . Available from: http://www.hc-sc.gc.ca/dhp-mps/medeff/advisories-avis/prof/_2006/intubat_stylet_nth-aah-eng.php