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**Literature search results**

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**Search details**

Should endotracheal cuff pressures be monitored throughout anaesthetic times?

**Resources searched**

NHS Evidence; TRIP Database; Cochrane Library; BNI; CINAHL; EMBASE; MEDLINE; Google Scholar

**Database search terms:** endotracheal intubation, endotracheal tube, cuff pressure, monitor*, measure*, anaesthetic*

**Evidence search string(s):** endotracheal intubation and monitor* measure* anaesthetic*

**Google search string(s):** anaesthesia* (measure OR monitor) "endotracheal tube cuff pressure"

**Summary**

Articles published 2006 – 2012. Many indicate that endotracheal cuff pressures should be monitored in theatres.

**Guidelines**

None found

**Evidence-based reviews**

None found
Published research

1. Prospective audit to determine endotracheal tube and laryngeal mask airway cuff pressures during general anaesthesia

**Author(s)** Sandhu G., Thanawala V., Flack J.

**Citation:** Anaesthesia, October 2012, vol./is. 67/(67), 0003-2409 (October 2012)

**Publication Date:** October 2012

**Abstract:** Excessive endotracheal tube (ETT) and laryngeal mask airway (LMA) cuff pressures can lead to airway endothelial and nerve damage. It is recommended that ETT cuff pressures are ideally below 25 cm H2O to reduce the risk of hypoperfusion associated tracheal endothelial damage and lingual nerve injury [1]. It is recommended that LMA cuff pressures are below 60 cm H2O to reduce the incidence of sore throat and risk of injury to the lingual, hypoglossal and recurrent laryngeal nerves[2-3].

**Methods** Cuff pressures were measured using a hand held manometer within 30 minutes of the airway device being inserted. We collected data over a one month period in 61 patients undergoing surgery under general anaesthesia where the airway was maintained using a single lumen ETT or LMA. Results The cuff pressure had been measured in 61 patients; this had not been determined or recorded in any of the cases by the primary anaesthetist. An ETT was used in 27 (44%) cases and an LMA in 34 (56%) cases. The mean ETT cuff pressure was 38.6 (SD) cm H2O with 13 (48%) cases having a cuff pressure below the ideal 25 cm H2O. Only one (three percent) LMA cuff pressure was below the recommended 60 cm H2O, with a further eight (24%) having cuff pressures between 60 and 120 cm H2O, and a further 25 (74%) having cuff pressures of above 120 cm H2O, the maximum measurable value on the manometer being used. Discussion It was concerning to note that approximately 52% of ETT and 97% of LMA cuff pressures measured in our cohort were greater than the recommended. Given that routine cuff pressure monitoring does not take place and studies exist demonstrating that we are not able to accurately estimate cuff pressure[4] this is perhaps not surprising. The situation is likely to be improved by making manometers available in every area where general anaesthesia is undertaken and cuffed devices used to maintain a patent airway. A prompt on the anaesthetic chart may assist with compliance once manometers are routinely available. Even a single measurement is likely to reduce the number of patients exposed to excessively high pressures although it is important to note that cuff pressures can change during of anaesthesia secondary to temperature, anaesthetic gas mixture, head and neck position and muscle relaxation.

**Source:** EMBASE

Available in **print** at

Available in **print** at

2. Should endotracheal cuff pressure be routinely measured during elective surgery?

**Author(s)** Ramadan M, Pushpanathan E, Sultan P

**Citation:** British Journal of Hospital Medicine, September 2012, vol./is. 73/9(538-Unknown), 1750-8460;1750-8460 (2012 Sep)

**Publication Date:** September 2012

**Abstract:** The pressure exerted by an endotracheal tube cuff against the tracheal wall depends on the compliance of the trachea and cuff.

**Source:** Medline
3. Prediction of optimal endotracheal tube cuff volume from tracheal diameter and from patient height and age: a prospective cohort trial.

Author(s): Shibasaki M, Nakajima Y, Shime N, Sawa T, Sessler DI

Citation: Journal of Anesthesia, August 2012, vol./is. 26/4(536-40), 0913-8668;1438-8359 (2012 Aug)

Publication Date: August 2012

Abstract: PURPOSE: Endotracheal tube intra-cuff pressure should be maintained between 20 and 30 cmH(2)O to prevent damage to the tracheal wall. However, cuff pressure is rarely measured, and clinicians estimate cuff pressure poorly. The goal of the present study was to predict the cuff volume that produces optimal cuff pressure either from tracheal diameter or from patient height and age.

METHODS: In the development phase, initial cuff pressure and cuff volume were measured in 240 patients. Optimal cuff volume, defined as the volume halfway between the volumes required to produce cuff pressures of 20 and 30 cmH(2)O, was determined in each patient. Then, regression equations relating optimal cuff volume to tracheal diameter on chest X-ray, and between optimal cuff volume and a combination of height and age, were calculated. The primary outcome was the proportion of patients in a validation set (n = 104) who achieved a cuff pressure of 20-30 cmH(2)O when cuff volume was selected by each regression formula. RESULTS: Only 28% of the cuffs were optimally inflated using clinical criteria during the development phase. There was good correlation between optimal cuff volume and tracheal diameter and moderate correlation between optimal cuff volume and both height and age. Predicted cuff volume was more likely to provide optimal cuff pressure when based on tracheal diameter (65% of patients) than when based on both height and age (45% of patients). CONCLUSIONS: Optimal cuff volume was better estimated from tracheal diameter and patient height and age than from the manual palpation method.

Source: Medline

Available in print at

4. Technical communication: design and in vitro testing of a pressure-sensing syringe for endotracheal tube cuffs.

Author(s): Slocum AH Jr, Slocum AH Sr, Spiegel JE

Citation: Anesthesia & Analgesia, May 2012, vol./is. 114/5(967-71), 0003-2999;1526-7598 (2012 May)

Publication Date: May 2012

Abstract: Endotracheal intubation is a frequently performed procedure in the prehospital setting, intensive care unit, and for patients undergoing surgery. The endotracheal tube cuff must be inflated to a pressure that prevents air leaks without compromising tracheal mucosal blood flow. For simultaneous endotracheal tube cuff inflation and measurement, we designed and tested a novel pressure-sensing syringe in vitro. The prototype was developed using a standard 10-mL polycarbonate syringe body that houses a plunger and a silicone rubber bellows, the pressure-sensing element. Bellow feasibility was determined and modeled using finite element analysis. Repeatability testing at each pressure measurement for each bellows (pressure versus deflection) was within an average standard deviation of 0.3 cm to 1.61 cm (1%-5% error). Using an aneroid manometer for comparison, there was
excellent linear correlation with a Spearman rank of 0.99 (P < 0.001), up to 30 cm H(2)O.

Source: Medline
Available in fulltext from Anesthesia & Analgesia at the ULHT Library and Knowledge Services' eJournal collection
Available in print at

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5. Tracheal rupture after endotracheal intubation - A report of three cases -

Author(s): Lim H, Kim JH, Kim D, Lee J, Son JS, Kim DC, Ko S
Citation: Korean Journal of Anesthesiology, March 2012, vol./is. 62/3(277-80), 2005-6419;2005-7563 (2012 Mar)
Publication Date: March 2012

Abstract: Tracheal rupture is a rare but serious complication that occurs after endotracheal intubation. It usually presents as a linear lesion in the membranous wall of the trachea, and is more prevalent in women and patients older than 50 years. The clinical manifestations of tracheal injury include subcutaneous emphysema and respiratory distress. We report the cases of three female patients of old age presenting tracheal rupture after endotracheal intubation. Two cases received surgical repair without complication and one recovered uneventfully after conservative management. We presume that the tracheal injuries were caused by over-inflation of cuff and sudden movement of the tube by positional change. Therefore, we recommend cuff pressure monitoring during general anesthesia and minimized movement of the head and neck at positional change.

Source: Medline
Available in fulltext from Korean Journal of Anesthesiology at National Library of Medicine
Available in print at

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6. Changes in cuff pressure of endotracheal tube during laparoscopic and open abdominal surgery.

Author(s): Yildirim ZB, Uzunkoy A, Cigdem A, Ganidagli S, Ozgonul A
Citation: Surgical Endoscopy, February 2012, vol./is. 26/2(398-401), 0930-2794;1432-2218 (2012 Feb)
Publication Date: February 2012

Abstract: BACKGROUND: The purpose of this study was to investigate endotracheal tube cuff pressure alteration in patients during laparoscopic cholecystectomy surgery.METHODS: Forty patients with ASA I-II physical status, who were scheduled for elective laparoscopic (group I) or open abdominal surgery (group II) were enrolled in the study. Tracheal intubation was always performed by an experienced anesthesiologist. The endotracheal tube cuff was inflated with air through a 10-ml syringe. The cuff was connected to a manometer. The endotracheal cuff pressure was registered every 5 min after tracheal intubation. At the time of discharge from the Post-Anesthesia Care Unit (PACU) and 12 h after tracheal extubation, patients were asked about their laryngotracheal condition by an independent observer who was uninformed of the patient allocation groups. We investigated laryngotracheal complaints such as sore throat, dysphasia, and hoarseness.RESULTS: The endotracheal cuff pressures in group I were significantly higher than those in the group II at all time points studied (P < 0.05). The endotracheal cuff pressures exceeded the critical pressure of 30 cmH(2)O after 5 min in the group I (intra-abdominal pneumoperitoneum was started). The incidence of
sore throat was higher in group I than in group II in the PACU and at 12 h.

CONCLUSION: This study indicates that the CO(2) pneumoperitoneum and Trendelenburg position used during laparoscopy increase endotracheal cuff pressure and lead to discomfort in the postoperative patient. Measurement of endotracheal cuff pressure is a simple and inexpensive procedure and should be applied in patients under going laparoscopic surgery.

Source: Medline
Available in print at

Author(s) Sultan P, Carvalho B, Rose BO, Cregg R
Citation: Journal of Perioperative Practice, November 2011, vol./is. 21/11(379-86), 1750-4589;1750-4589 (2011 Nov)
Publication Date: November 2011
Abstract: Tracheal intubation constitutes a routine part of anaesthetic practice both in the operating theatre as well as in the care of critically ill patients. The procedure is estimated to be performed 13-20 million times annually in the United States alone. There has been a recent renewal of interest in the morbidity associated with endotracheal tube cuff overinflation, particularly regarding the rationale and requirement for endotracheal tube cuff monitoring intra-operatively.
Source: Medline
Available in fulltext from Journal of Perioperative Practice at EBSCOhost

8. Automatic endotracheal tube cuff inflator and continuous pressure monitor/controller.
Author(s) Muallem M, El-Khatib MF
Citation: Middle East Journal of Anesthesiology, October 2011, vol./is. 21/3(447-9), 0544-0440;0544-0440 (2011 Oct)
Publication Date: October 2011
Source: Medline
Available in print at

9. An audit of endotracheal cuff pressures on admission to cardiac surgical Intensive Care
Author(s) Quemby D., Bennett M., Robbins P.
Citation: Intensive Care Medicine, September 2011, vol./is. 37/(S161), 0342-4642 (September 2011)
Publication Date: September 2011
Abstract: INTRODUCTION. Recent studies have shown that postoperative respiratory complications can be related to endotracheal cuff pressures [1], and it is known that anaesthetists are unreliable at gauging cuff pressure by palpation alone [2]. We planned to measure the cuff pressures found in a cardiac surgical population on admission to intensive care to investigate our practice. In this way we would then be able to revise our management if required. METHODS. Fifty randomly selected patients had their endotracheal cuff pressures (Portex Profile) measured by a VBM pressure manometer within 60 min of their arrival on the post surgical care unit. All staff involved with the anaesthetic care were unaware of the audit. The cuffs were
inflated by trained anaesthetic assistants and in the majority of cases the pilot balloon was palpated to guide inflation. RESULTS. 34 males and 16 females were measured. All patients had undergone cardiac surgery with CPB. Mean cuff pressure was 79.6 cmH₂O (SD 22.2) (Table presented) CONCLUSIONS. It is thought that a high tracheal cuff pressure may cause ischaemic mucosal necrosis. Tracheal mucosal blood flow is thought to fall when the cuff pressure is >22 mmHg and reduces markedly >30 mmHg. 15 min >50 mmHg would cause ischaemic injury [3]. During a period of CPB where MAPs approximately 60 mmHg these ischaemic changes may be seen at lower inflation pressures. Pressures <25 cmH₂O are thought to increase the risk of aspiration. This audit has shown that our estimation of cuff pressure is poor and this may promote respiratory complications. We suggest that all ETT cuff pressures are monitored with a hand pressure gauge on insertion of the tube and a device should be available in all anaesthetic rooms.

Source: EMBASE
Available in print at
Available in fulltext from Intensive Care Medicine at EBSCOhost
Available in fulltext from Intensive Care Medicine at the ULHT Library and Knowledge Services' eJournal collection

10. Endotracheal tube cuff pressure monitoring during neurosurgery - manual vs. automatic method
Author(s) Jain M.K., Tripathi C.B.
Citation: Journal of Anaesthesiology Clinical Pharmacology, July 2011, vol./is. 27/3(358-361), 0970-9185 (July-September 2011)
Publication Date: July 2011
Abstract: Background: Inflation and assessment of the endotracheal tube cuff pressure is often not appreciated as a critical aspect of endotracheal intubation. Appropriate endotracheal tube cuff pressure, endotracheal intubation seals the airway to prevent aspiration and provides for positive-pressure ventilation without air leak. Materials and Methods: Correlations between manual methods of assessing the pressure by an experienced anesthesiologists and assessment with maintenance of the pressure within the normal range by the automated pressure controller device were studied in 100 patients divided into two groups. In Group M, endotracheal tube cuff was inflated manually by a trained anesthesiologist and checked for its pressure hourly by cuff pressure monitor till the end of surgery. In Group C, endotracheal tube cuff was inflated by automated cuff pressure controller and pressure was maintained at 25-cm H2O throughout the surgeries. Repeated measure ANOVA was applied. Results: Repeated measure ANOVA results showed that average of endotracheal tube cuff pressure of 50 patients taken at seven different points is significantly different (F-value: 171.102, P-value: 0.000). Bonferroni correction test shows that average of endotracheal tube cuff pressure in all six groups are significantly different from constant group (P = 0.000). No case of laryngomalacia, tracheomalacia, tracheal stenosis, tracheoesophageal fistula or aspiration pneumonitis was observed. Conclusions: Endotracheal tube cuff pressure was significantly high when endotracheal tube cuff was inflated manually. The known complications of high endotracheal tube cuff pressure can be avoided if the cuff pressure controller device is used and manual methods cannot be relied upon for keeping the pressure within the recommended levels.
Source: EMBASE
Available in print at
11. We should care more about intracuff pressure: The actual situation in government sector teaching hospital.

**Author(s)** Trivedi L, Jha P, Bajiya NR, Tripathi D

**Citation:** Indian Journal of Anaesthesia, July 2010, vol./is. 54/4(314-7), 0019-5049;0976-2817 (2010 Jul)

**Publication Date:** July 2010

**Abstract:** Endotracheal tube (ETT) should have intracuff pressure (ICP) in the range of 20 to 30 cm water (H(2)O). In this observational study, we studied the trend amongst anaesthesiologist in choosing the type of ETT and their ability to assess optimum ICP clinically. After institutional ethics committee approval, we observed 75 patients under general endotracheal anaesthesia in Government Medical College. Anaesthesiologists were blinded to study purpose. The type of ETT used and magnitude of ICP was recorded. ICP was measured using simple aneroid manometer. Once the pressure was measured, it was readjusted to normal range and nitrous oxide was allowed to start. Red rubber tube was used in 18.7% and polyvinyl chloride (PVC) in 81.3% cases. The anaesthesiologists were not able to assess ICP in the recommended range clinically in 100% cases when red rubber ETT was used and in 40% cases when portex ETT was used. Red rubber ETT (reusable) with low-volume high-pressure cuff is still in use, though the trend is shifting towards more of using PVC ETT. Anaesthesiologists were not able to inflate the ETT cuff to the recommended range in spite of their clinical expertise (more than 5 years of teaching experience) in significant number of cases. We recommend the use of simple aneroid manometer for objective monitoring of ICP over subjective assessment, not only in red rubber, but also in PVC ETT.

**Source:** Medline

Available in fulltext from *Indian Journal of Anaesthesia* at **National Library of Medicine**

Available in print at

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12. Role of spontaneous and assisted ventilation during general anaesthesia.

**Author(s)** Magnusson L

**Citation:** Best Practice & Research. Clinical Anaesthesiology, June 2010, vol./is. 24/2(243-52), 1521-6896;1521-6896 (2010 Jun)

**Publication Date:** June 2010

**Abstract:** Spontaneous ventilation during general anaesthesia has been shown to favour atelectasis formation and decreased functional residual capacity. Therefore, general anaesthesia is commonly associated with endotracheal intubation and mechanical ventilation. Laryngeal lesions, residual curarisation, haemodynamics impairment, but most importantly, situation of cannot ventilate-cannot intubate may occur. Recently developed anaesthetic ventilators are able to detect spontaneous ventilation (triggering) and to give a pressure-limited flow cycled assisted breath (pressure support ventilation, PSV). Spontaneous ventilation assisted by PSV with laryngeal mask may avoid all the complications of endotracheal intubation and mechanical ventilation. Therefore, PSV should be a valid alternative for all patients having general anaesthesia with the exception of some contraindication. A close monitoring of tidal volume and minute ventilation is also needed.

**Source:** Medline
13. **Assessment of endotracheal tube cuff pressure after tracheal intubation during general anaesthesia**

**Author(s)** Emadi S.A., Zamani A., Nasiri E., Khademlo M., Tatar A.M.

**Citation:** Journal of Mazandaran University of Medical Sciences, 2010, vol./is. 20/76(9-13), 1735-9279;1735-9260 (2010)

**Publication Date:** 2010

**Abstract:** Background and purpose: The cuff of tracheal tube is important and secures the airway during anaesthesia. This study evaluates the effect of endotracheal tube cuff pressure after tracheal intubation during general anesthesia.

Materials and methods: This is a descriptive observational study that recruits 500 ASA physical status I and II patients undergoing elective surgery under general anaesthesia. The tracheal cuff pressure was assessed using manometer instrument 10 min after tracheal intubation. Results: It has been observed that at a mean intracuff pressure of 92 +/-131 cm H20 more than 95% of patients were over-inflated. There was no significant association between the cuff pressure and how experienced were the anaesthesiologists (p<0.05). Conclusion: Routine method to inflate the tracheal tube cuff is not suitable during induction of anesthesia, because it results in over-inflation.

**Source:** EMBASE

Available in print at

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14. **Tracheal tube cuff pressure depends on the anaesthesiologist’s experience. A follow-up study.**

**Author(s)** Wujtewicz MA, Sawicka W, Owczuk R, Dylczyk-Sommer A, Wujtewicz M

**Citation:** Anestezjologia Intensywna Terapia, October 2009, vol./is. 41/4(205-8), 0209-1712;0209-1712 (2009 Oct-Dec)

**Publication Date:** October 2009

**Abstract:** BACKGROUND: Excessive tracheal tube cuff pressure can cause ischemia of the tracheal mucosa, and possible serious complications, such as tracheal stenosis, formation of tracheo-oesophageal fistula or even life-threatening haemorrhage. Inadequate cuff pressure increases the risk of aspiration of gastric contents.

METHODS: The cuff pressures were analysed on the basis of the anaesthesiologists’ experience. The results were compared to those obtained during the previous study which had been conducted seven years earlier (2002). The physicians were divided into three groups, according to their experience: group I - less than 2 years of practice; group II--2 to 10 years of practice; and group III--over 10 years of practice. High-volume, low-pressure tubes were used for intubation. The anaesthesiologists were not informed of the planned audit.

RESULTS: Statistical analysis demonstrated significant differences between cuff pressure readings in the respective study groups. Cuff pressures in group II (p < 0.05) and group III (p < 0.0005) were greater than those in group I. In 2002, no statistically significant differences had been observed between the three groups (p = 0.1156). When comparing results from 2002 and present one differences were observed inside individual groups, concerning group II (p < 0.05) and group III (p < 0.0005).

CONCLUSION: There is a tendency to overinflation of endotracheal tube cuffs in all groups. This problem is more common in the group of highly experienced anaesthesiologists, and is more more prevalent at present than in 2002.

**Source:** Medline

Available in print at
15. Endotracheal tube cuff pressures are too high during anaesthesia
Author(s) Rose B., Kyle B., Koshy-Delaffon A., Cregg R.
Citation: European Journal of Anaesthesiology, June 2009, vol./is. 26/(26), 0265-0215 (June 2009)
Publication Date: June 2009
Abstract: Background and Goal of Study: Endotracheal tubes (ETT) are routinely used to aid positive pressure ventilation and prevent aspiration of pharyngeal and gastric contents. Tracheal mucosal capillary blood flow is compromised at endotracheal tube cuff (ETTc) pressures above 25 cm H2O [1], and increased ETTc pressures have been associated with laryngo-tracheal morbidity such as sore throat, hoarseness or dysphagia [2]. Routine ETTc pressure measurement is well established in the Intensive Care Unit setting [3] but not during anaesthesia. We therefore audited ETTc pressures in the operating theatre in three hospitals in London. Materials and Methods: Participating hospitals were Barnet General Hospital (BGH), Chase Farm Hospital (CFH), and the Royal Free Hospital (RFH). In a prospective audit, we measured end-expiratory ETTc pressure in 119 patients. In addition, we evaluated the influence of secondary variables (ETT size and site, patient positioning, use of N<sub>2</sub>O, and laparoscopy) on ETTc pressure. Values are represented as median [IQR]. The Mann-Whitney test was used to determine differences in ETTc pressures between hospitals and the influence of secondary variables on ETTc pressures. A p-value of < 0.05 was considered significant. Results and Discussion: ETTc pressures were 41 [27-55] cm H<sub>2</sub>O across the three hospitals which is well above the recommended pressure of 25 cm H2O. We noted a statistically significant difference between RFH (31. 00 [24. 00-45. 00] cm H2O) and CFH (53. 00 [42. 25-74. 50] cm H2O; p < 0. 001) as well as BGH (45. 00 [29. 25-58. 75] cm H<sub>2</sub>O; p < 0. 05), respectively. We could not find statistically significant differences in ETTc pressures for ETT size, patient positioning, use of N<sub>2</sub>O or laparoscopy. Intraoperative ETTc pressure measurement was not standard practice in the participating hospitals. Conclusion(s): The observed median ETTc pressures during anaesthesia exceeded the recommended maximum pressure of 25 cm H<sub>2</sub>O by 16 cm H<sub>2</sub>O. In our opinion, the risk of complications with increased ETTc pressures should lead to routine monitoring during anaesthesia.
Source: EMBASE
Available in print at

16. Endotracheal tube cuff overinflation: Incidence & prevention
Author(s) O'Brien A., Morris I.
Citation: Canadian Journal of Anesthesia, June 2009, vol./is. 56/(S28), 0832-610X (June 2009)
Publication Date: June 2009
Abstract: Introduction: Inflation of the endotracheal tube (ETT) cuff is a routine activity in anaesthesia practise. Cuff inflation volume is at times arbitrary and cuff pressure is not always measured. However, an overinflated cuff can exert pressure on the tracheal wall which exceeds perfusion pressure. Pressure-related loss of regional blood flow can lead to tissue necrosis and post-intubation tracheal stenosis. It has been recommended that cuff pressure be maintained at or below 30 cm H<sub>2</sub>O, at least during long term use. However, short-term intubation has also been cited as a risk factor for tracheal stenosis. In a recent emergency department study, over half of 62 patients had cuff pressures measured at greater than 40 cm H<sub>2</sub>O. Estimation of cuff pressure via palpation of the pilot
balloon is notoriously inaccurate. We tested the hypothesis that ETT cuff pressure is often above 30 cm H₂O in the elective operating room setting. In addition, we sought to determine whether ETT cuffs inflated to a "just seal" pressure can sometimes exceed the recommended maximum of 30 cm H₂O.

Methods: Institutional REB approval was obtained for this study. Due to the nature of the study, patient consent was deemed to be unnecessary by the REB. One hundred elective surgeries were selected at random, and the pressure in the ETT cuff was measured by the primary investigator using a handheld manometer. The attending anesthesiologist was blinded and not aware of the anesthetic parameter being studied. In an additional 20 patients undergoing elective surgery, the ETT cuff was deflated until an audible air leak was heard, and then reinflated until the leak just disappeared. This was done during the maintenance phase of general anesthesia to incorporate typical ventilating volumes and pressures. The cuff pressure was then measured and termed the "just seal" pressure. Results: The mean cuff pressure was 46 cm H₂O (range 12 - 112 cm H₂O). The median cuff pressure was 44 cm H₂O. A cuff pressure greater than 30 cm H₂O was present in 73% of the patients (see table). The "just seal" pressure was greater than 30 cm H₂O in 0% of 20 patients. Discussion: This study revealed that a large proportion of the elective surgical patients studied were exposed to high ETT cuff pressures. Although the pressure transmitted to the tracheal wall has been shown to less than the intracuff pressure\textsuperscript{5}, high intracuff pressures have been implicated in post-intubation tracheal stenosis.\textsuperscript{1} Inflation of the ETT cuff to the "just seal" pressure may reduce this risk. The routine use of manometry may also be beneficial, and is recommended by many authors.\textsuperscript{1,4}.

Source: EMBASE
Available in print at

Author(s) Sole ML, Penoyer DA, Su X, Jimenez E, Kalita SJ, Poalillo E, Byers JF, Bennett M, Ludy JE
Citation: American Journal of Critical Care, March 2009, vol./is. 18/2(133-43), 1062-3264;1062-3264 (2009 Mar)
Publication Date: March 2009
Abstract: BACKGROUND: Endotracheal tube cuff pressure must be maintained within a narrow therapeutic range to prevent complications. Cuff pressure is measured and adjusted intermittently.OBJECTIVES: To assess the accuracy and feasibility of continuous monitoring of cuff pressure, describe changes in cuff pressure over time, and identify clinical factors that influence cuff pressure.METHODS: In a pilot study, data were collected for a mean of 9.3 hours on 10 patients who were orally intubated and receiving mechanical ventilation. Sixty percent of the patients were white, mean age was 55 years, and mean intubation time was 2.8 days. The initial cuff pressure was adjusted to a minimum of 20 cm H₂O. The pilot balloon of the endotracheal tube was connected to a transducer and a pressure monitor. Cuff pressure was recorded every 0.008 seconds during a typical 12-hour shift and was reduced to 1-minute means. Patient care activities and interventions were recorded on a personal digital assistant.RESULTS: Values obtained with the cufflator-manometer and the transducer were congruent. Only 54% of cuff pressure measurements were within the recommended range of 20 to 30 cm H₂O. The cuff pressure was high in 16% of measurements and low in 30%. No statistically significant changes over time were noted. Endotracheal suctioning, coughing, and positioning affected cuff pressure.CONCLUSIONS: Continuous
monitoring of cuff pressure is feasible, accurate, and safe. Cuff pressures vary widely among patients.

**Source:** Medline
Available in *print* at
Available in *fulltext* from *American Journal of Critical Care* at [EBSCOhost]
Available in *fulltext* from *American Journal of Critical Care* at [Highwire Press]

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**18. A comparison of intra cuff pressures in high-flow and low-flow nitrous oxide anesthesia.**

**Author(s):** Postaci A, Karabeyoglu I, Erk G, Ayerden T, Sastim H, Barcin S, Dikmen B

**Citation:** Saudi Medical Journal, December 2008, vol./is. 29/12(1719-22), 0379-5284;0379-5284 (2008 Dec)

**Publication Date:** December 2008

**Abstract:** OBJECTIVE: To investigate intra cuff pressure changes in low-flow anesthesia (LFA) and high-flow (HFA) N2O anesthesia during moderate-duration surgical procedures.METHODS: We carried out this prospective, randomized, single blind study at Numune Educational and Research Hospital, Ankara, Turkey between January to December 2005. Seventy patients aged between 18-65 years, American Society of Anesthesiologists (ASA) physical status grades I-III, undergoing elective surgery were enrolled in this study. Following a standardized induction, anesthesia was maintained with isoflurane (end-tidal 0.9-1%) at 4 L/minute for the HFA group, or 1 L/minute for the LFA group fresh gas flows. Endotracheal tube cuff (intra cuff) pressures were measured continuously with a pressure manometer, and inspired oxygen and N2O levels were noted every 10 minutes throughout the study.RESULTS: There was no significant difference between HFA and LFA groups for initial (first) cuff pressures (mean+/SD, HFA=20.9+/-.4.19, LFA=20.4+/-.4.11, cmH2O), and maximum cuff pressures (MCP) (mean+/SD, HFA=32.3+/-.18.74, LFA=33.5+/-.8.89, cmH2O) (p>0.05). The time to reach the maximum intra cuff pressure was significantly shorter in the LFA group (77.4+/-.20.33 minutes), than the HFA group (89.3+/-.23.94 minutes), (p=0.038). Between the tenth and nineteenth minutes, inspired oxygen level was significantly higher in the HFA group (p=0.001), whereas inspired N2O was significantly higher in the LFA group (p=0.001).CONCLUSION: The intra cuff pressures should be monitored carefully during LFA, since the duration to reach the maximum intra cuff pressures was shorter than that of HFA.

**Source:** Medline
Available in *print* at

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**19. Continuous measurement of endotracheal tube cuff pressure: how difficult can it be?**

**Author(s):** Sole ML, Aragon D, Bennett M, Johnson RL

**Citation:** AACN Advanced Critical Care, April 2008, vol./is. 19/2(235-43), 1559-7768;1559-7768 (2008 Apr-Jun)

**Publication Date:** April 2008

**Abstract:** Continuous monitoring and download of endotracheal tube cuff pressure for a 12-hour period were required to collect data for an ongoing program of research related to airway management of the critically ill patient. On the basis of reports from the anesthesia literature, continuous monitoring of cuff pressure via a traditional pressure transducer and monitor was identified as the best method to collect data.
Although continuous pressure monitoring of many physiologic variables is routine in critical care settings, application of the technology to measurement of endotracheal tube cuff pressure has not been reported outside the operating room. The research team conducted bench testing and pilot testing in human subjects to establish feasibility, accuracy, and safety of continuous cuff pressure monitoring. Monitoring was feasible with stringent procedures applied to ensure safety. A bias of 0.5 cm H2O between continuous and intermittent measures was obtained in both in vitro and in vivo testing.

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**20. Detection of tracheal malpositioning of nasogastric tubes using endotracheal cuff pressure measurement.**

**Author(s)** Fuchs J, Schummer C, Giesser J, Bayer O, Schummer W

**Citation:** Acta Anaesthesiologica Scandinavica, October 2007, vol./is. 51/9(1245-9), 0001-5172:0001-5172 (2007 Oct)

**Publication Date:** October 2007

**Abstract:** BACKGROUND: Insertion of a gastric tube (GT) in anaesthetized, paralyzed and intubated patients may be difficult. Tracheobronchial malposition of a GT may result in deleterious consequences. The purpose of this study was to determine the reliability of tracheal cuff pressure measurement to detect endobronchial malposition of GTs. We compared this new method with the measurement of exhaled CO(2) through the GT.

**METHODS:** Thirty patients under general anesthesia and orotracheal intubation were analysed. First, the cuff pressure of the low-volume endotracheal tube (ET; ID 7.0-8.5 mm) was increased to 40 cmH(2)O. Then, in a randomized fashion, the GT (18 Charriere) was inserted consecutively into the trachea and oesophagus or vice versa. Cuff pressure was monitored continuously while advancing the GT. Furthermore, a capnograph was connected to the gastric tube and the aspirated PCO(2) was monitored.

**RESULTS:** Advancement of the gastric tube into the oesophagus increased ET cuff pressure by 1 +/- 1 cmH(2)O, while endotracheal placement of the GT increased cuff pressure by 28 +/- 8 cmH(2)O (P < 0.001). Using an increase of >10 cmH(2)O in cuff pressure detected endotracheal malpositioning of the GT with 100% sensitivity and specificity. In 28 out of 30 cases, PCO(2) increased by more than 2.6 kPa. Thus, the PCO(2) approach failed to detect tracheal malpositioning in two cases resulting in a sensitivity of 93.3%. **CONCLUSIONS:** In intubated patients, cuff pressure measurement during insertion of a gastric tube is a new, simple and reliable bedside method to detect endotracheal malpositioning of a GT.

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Tracheal tube and laryngeal mask cuff pressure during anaesthesia - mandatory monitoring is in need

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