

Intraoperative endotracheal tube cuff leak during cerebral aneurysm surgery - A hard row to hoe

INTRODUCTION

Endotracheal tube (ETT) cuff leak is a serious and a nagging problem in an intubated patient, more so during critical stages during the intraoperative period. Intraoperative cuff leaks may occur even in cases where preoperative cuff leak test performed prior had confirmed that the cuff was intact.^[1,2] This offers a considerable challenge (especially in neurosurgical procedures) where access to the patient's airway is difficult and repositioning for intubation may not be feasible. This has led to development of innovative ways to identify and manage the source of ETT cuff leak without ETT replacements. We describe a case of intraoperative ETT cuff leak during surgery for aneurysmal subarachnoid haemorrhage which was managed with a combination of techniques to tide over the crisis.

CASE

A 65-year-old male was scheduled for clipping of right superior cerebellar artery aneurysm in left lateral position. The patient was intubated with 8.5-mm polyvinylchloride cuffed tube which was examined for any cuff leaks before intubation. The procedure was uneventful and the patient was positioned for surgery in the left lateral position. Anaesthesia was maintained with sevoflurane in air-oxygen mixture with intermittent doses of intravenous opioids and vecuronium bromide for skeletal muscle relaxation. After an hour of surgery, it was noticed that the exhaled tidal volume was low and the bellows were collapsing in spite of increasing the fresh gas flows to 5 L/min. The surgical team was informed and a thorough check for leaks in the machine and circuits was conducted which did not reveal any issue. On examining the ETT pilot balloon under the drapes, we found the pilot balloon was deflated. On inflating with 3 mL of air, the tidal volume was increased back to normal, and the bellows were filling even with fresh gas flows of <1 L/min. However, the issue recurred after 5 min and the cuff pressure monitor showed a pressure of 5 cm water. As at this stage the surgeons

had applied temporary clip to the aneurysm and there was intraoperative brain bulge, it was decided not to change the ETT.

There was an immediate need to find the source of leak, as to whether it was at the level of the inflation valve, pilot balloon, pilot tubing, or a cuff defect. A mixture of 5 mL saline and 5 mL lignocaine jelly was injected with the intent to seal any small rent in the inflation system. To make up for possible defective inflation valve, and at the same time to provide means to inflate the cuff when required, one end of a 100-cm arterial extension line was attached to the inflation valve and the other end was attached to the ETT cuff pressure monitor (Portex, Smiths Medical, Inc).

However, the cuff continued to deflate every 5 min with recurring ventilatory leak indicating that the seal caused by lignocaine jelly was not effective. An attempt was made to find a solution to keep the pilot cuff in an inflated state. To the three-way end of the arterial extension, in one port ET cuff pressure monitor was connected and to the other port a 50-mL syringe filled with air in an infusion pump was connected. This formed an inflation system which was attached to the inflation valve of the pilot balloon of the ETT [Figure 1]. The rate of infusion of air through the syringe pump was started at 10 mL/h increasing it stepwise by 10 mL till the rate at which there was no leak. At this stage, optimal ventilation was possible through the ETT without any leak. This was achieved at a rate of 50 mL/h which was sufficient to keep the cuff inflated making up for the loss. The surgery was successfully completed with no untoward complication. The patient was extubated

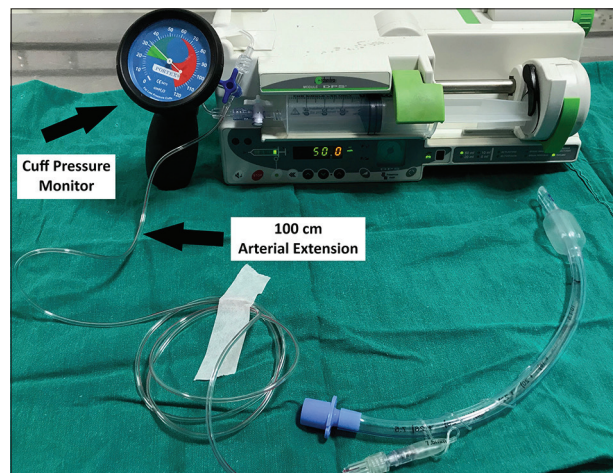


Figure 1: Infusion pump with arterial extension and cuff pressure monitor for inflation

and a thorough inspection of the tube revealed a rent in the cuff [Figure 2].

DISCUSSION

Endotracheal cuff leak is a cause of substantial worry to the anaesthesiologist as failure to manage it can result in serious consequences varying from a mere gurgling sound to life-threatening respiratory complications. During the intraoperative period, cuff leaks can cause leakage of anaesthetic gases and it can invariably lead to reduced delivery of gases to the patient, resulting in inadequate depth of anaesthesia.^[2]

Replacement of ETT may be technically difficult and may be risky in cases of difficult airway, raised intracranial pressure, and heart disease where the stress of intubation can have life-threatening implications and may not be an option midway during the surgery which was the case in our patient. Temporary solutions have been described by various authors depending on the site of leak.^[2] Packing with soft gauze has been shown to be effective reducing the volume of leak. Attachment of syringe, three-way stop cock, and arterial extension line have been used to make up for incompetent inflation valve system. Leaks at the pilot balloon have been averted by insertion of needle or intravenous cannula with stopcock valve.^[3] A technique of continuous inflation with syringe pump has been described to maintain adequate cuff pressure.^[4] Injection of lignocaine jelly has also been shown to seal small defects in the cuff and was effective in reducing leaks.^[5] The effectiveness of the

techniques described largely depends on the type and size of the leak in addition to the clinical scenario. With the lack of defined protocols and guidelines to manage intraoperative cuff leaks, the presence of mind and ability to make critical decisions by the anaesthesiologist cannot be overemphasised. The clinician also should be vigilant in identifying leaks early, and while resorting to conservative techniques of management, the intracuff pressure should be maintained within safe limits to prevent damage to tracheal mucosa. To the best of our knowledge, this is the first report to describe successful management of cuff leak in a stepwise manner with combined utilisation of different methods along with monitoring of cuff pressure.

CONCLUSION

The anaesthesiologist should be aware of many different possible solutions to combat the issue of intraoperative cuff leak. This report informs the readers that if one technique is not successful, cuff leaks can be safely managed with utilisation of combination of techniques tailored to specific clinical settings.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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Figure 2: Air bubbles with lignocaine jelly under water demonstrating site of cuff leak

REFERENCES

1. Tamakawa S, Sugawara K, Yanagita Y, Saito Y. Occult air leak of an endotracheal tube. *Anesth Analg* 1998;87:746.
2. El-Orbany M, Salem MR. Endotracheal tube cuff leaks: Causes, consequences, and management. *Anesth Analg* 2013;117:428-34.
3. Heusner JE, Viscomi CM. Endotracheal tube cuff failure due to valve damage. *Anesth Analg* 991;72:270.
4. Batra YK, Rajeev S. Infusion pump for managing endotracheal tube cuff incompetence. *Anesth Analg* 2006;103:1339.
5. Schubert A, Von Kaenel W, Ilyes L. A management option for leaking endotracheal tube cuffs: Use of lidocaine jelly. *J Clin Anesth* 1991;3:26-31.

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