Tracheal rupture after intubation and placement of an endotracheal balloon catheter (A-view®) in cardiac surgery

Simone T. Timman*a, Jo M. Mourisseb, Stefan M. van der Heidea and Ad F. Verhagena

a Department of Cardio-thoracic Surgery, Radboud University Medical Center, Nijmegen, Netherlands
b Department of Anaesthesiology, Pain and Palliative Medicine, Radboud University Medical Center, Nijmegen, Netherlands

* Corresponding author. Department of Cardio-thoracic Surgery, Radboud University Medical Center, Geert Grooteplein Zuid 10 (Route 615), 6525 GA Nijmegen, Netherlands. Tel: +31-24-14744; fax: +31-24-3635118; e-mail: simone.timman@radboudumc.nl (S.T. Timman).

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Abstract

The endotracheal balloon catheter (A-view®) is a device developed to locate atherosclerotic plaques of the ascending aorta (AA) in cardiac surgery to prevent stroke. The saline-filled balloon is located in the trachea and combines the advantages of transoesophageal echocardiography (e.g. used before performing the sternotomy) and intraoperative epiaortic ultrasound scanning (e.g. complete view of the AA). We report the first severe complication after the use of A-view®. This is a case of a 66-year old woman who underwent elective myocardial revascularization complicated by an intraoperative iatrogenic tracheal rupture of 6 cm, after uncomplicated intubation and the use of an endotracheal balloon catheter (A-view®), which required direct surgical repair with a posterolateral thoracotomy after the myocardial revascularization was completed, weaning from bypass and closure of the median sternotomy.

Keywords: Endotracheal balloon catheter • A-view® • Cardiac surgery • Iatrogenic tracheal rupture • Endotracheal intubation

INTRODUCTION

Atherosclerosis of the ascending aorta (AA) is associated with increased risk of stroke in cardiac surgery. Transoesophageal echocardiography (TOE) is widely used to locate atherosclerotic plaques. TOE, however, is unable to visualize the distal AA due to the ‘blind spot’ created by the air-filled trachea. Therefore, intraoperative epiaortic ultrasound scanning is recommended [1]. A recently available, saline-filled, balloon catheter, the A-View® (Fig. 1), makes it possible to inspect the distal AA with TOE before sternotomy [2, 3].

In the presented case, the posterior membranous wall of the trachea appeared ruptured after placement of the A-view®.

CASE REPORT

A 66-year old woman (162 cm, 55 kg) with a left main stenosis and severe three-vessel disease was accepted for myocardial revascularization with the use of cardiopulmonary bypass (CPB). Concomitant diseases were mild chronic obstructive pulmonary disease (COPD) without systemic corticosteroid use, mixed connective tissue disease (MCTD), systemic lupus erythematoses, Raynaud syndrome, pulmonary hypertension and peripheral artery disease with claudication.

Anaesthesia induction, intubation [grade 1, endotracheal tube (ETT) size 7.5, cuff pressure 28 cmH2O] and placement of a TOE probe were uneventful. The A-View® was placed according to the instruction for use (Stroke2prevent®, 2012, Hattem, Netherlands) and went smooth. Obtaining TOE images of the AA through the blind spot was successful. After removal of the A-view®, a little amount of blood on the proximal end of the endotracheal balloon was detected. Therefore, bronchoscopy was performed and a 6-cm tear on the posterior tracheal membrane above the carina was seen (Fig. 2A). Since there was no active bleeding and because of the severe coronary artery disease, myocardial revascularization was continued. After the initiation of CPB, the ETT was

Figure 1: The position of the endotracheal balloon catheter to the endotracheal tube (ETT). The minimal distance between the ETT cuff and the balloon catheter depends on the tip length of the ETT (~2–3 cm).
replaced by a left-sided bronchial tube to prevent developing a severe pneumomediastinum and in the preparation of left-sided one-lung ventilation. After closure of the median sternotomy and repositioning the patient, a posterolateral thoracotomy was performed. The defect was closed with separate sutures (Vicryl® 3-0; Fig. 2B). Patient was immediately extubated, after an uneventful postoperative recovery discharged from the intensive care unit on Day 1 and discharged from our hospital on Day 12.

**DISCUSSION**

No tracheal rupture after the use of the A-view® has been described, yet. Previously reported complications are: hypoxaemia during the apnoea period, without clinical consequences, in 1 patient, a massive pulmonary haemorrhage in another patient and small mucosal point-bleeding in 10 patients (2.9%) [2, 3].

Tracheal laceration and rupture are rare complications described after endotracheal interventions (i.e. endotracheal intubation, dilatation and bronchoscopy). The reported incidence is 0.05–0.37% after endotracheal intubation [4]. Mechanical factors as forced tube placement, overinflating the cuff (which causes typically a linear laceration of the posterior tracheal membrane), repositioning manoeuvres without deflating the cuff, inexperienced anaesthesiologist and the use of double-lumen tubes are most frequently described causes [4]. Patient-related risk factors are congenital tracheal anomaly, female gender, height less than 165 cm, older age, poor biological condition, COPD, chronic steroid treatment and inflammatory lesions of the tracheobronchial tree [4]. MCTD, comprising a number of connective tissue disorders, is probably also a risk factor, although not yet reported.

In the presented case, the balloon of the A-view®, measuring 10 cm, was placed by an experienced anaesthesiologist in the distal trachea and left or right main bronchus and then inflated, following the instructions for use. Only some blood on the tip of the balloon raised our attention and led to a bronchoscopy, as recommended by the manufacturer.

The tear in the posterior tracheal membrane can have several causes. First, overinflation of the cuff of ETT itself, since the patient had a lot of the known risk factors for tracheal laceration and the tear was linear. However, the cuff of the ETT was positioned ~2 cm above the tear, what makes a rupture due to the cuff unlikely (Fig. 1). Furthermore, the cuff pressure remained well below the safety limit. Secondly, overinflation of the A-view® balloon: yet, the tip of the A-view® balloon was running down in the main bronchus and there was no damage below the carina, as might be expected then. But, the membranous part of the bronchus may have been protected by the more rigid structure of the carina. Thirdly, the rupture may be caused by an initial small laceration of the membranous wall by the tip of either the A-view® catheter or the ETT against the TOE probe on the other side in the oesophagus, with a subsequent rupture of the trachea by filling the balloon, even with a regarded safe pressure and volume.

In conclusion, we encountered a case of an iatrogenic tracheal rupture, after placement of the A-view® during open heart surgery, which required direct surgical repair. Although we cannot prove that the damage was caused by the A-view, we advise to avoid the use of an A-view in patients with a high risk of tissue frailty (e.g. MCTD) and to perform a bronchoscopy in case of blood on the balloon.

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**REFERENCES**


