

Tracheal granulation tissue after percutaneous tracheostomy treated with Nd:Yag laser: three cases

BRENDAN P. MADDEN, M.D., M.Sc., F.R.C.P.I., F.R.C.P., SUBIR DATTA, F.R.C.S.,
GREGORY McANULTY, F.R.C.A.

Abstract

Three adult patients who received percutaneous serial dilatational tracheostomy post-cardiac surgery developed histologically confirmed tracheal granulation tissue superior to the point of entry of the tracheostomy tube into the trachea. This tissue significantly occluded the trachea in all patients and, in two, led to serious haemorrhage.

Each patient had serial dilatational percutaneous tracheostomy using the Cook/Ciaglia technique. On each patient fibre-optic bronchoscopy confirmed satisfactory position of the guidewire and tracheostomy tube. Nd:Yag laser therapy was applied to areas of tracheal granulation tissue and was also employed to secure haemostasis. In each patient endobronchial Nd:YAG laser therapy successfully cleared the granulation tissue and secured haemostasis. Follow-up bronchoscopy showed no recurrence.

Fibre-optic bronchoscopy at the time of tracheal decannulation may identify granulation tissue requiring appropriate referral and intervention.

Key words: Tracheostomy; Granulation Tissue; Laser Surgery

Introduction

The introduction of bedside tracheostomy has been a major development in the ICU over the past decade. It has been shown to be safe and cost effective.¹ However, follow-up after discharge from intensive care is often by a medical or surgical team not directly concerned with the patient's airway and ventilatory management and the late-presenting complications of tracheostomy may be under-reported. Lesions within the trachea may cause obstruction and/or haemorrhage and may range from being asymptomatic to being a threat to life. We present three cases in which patients were found to have histologically proven granulation tissue formation after percutaneous serial dilatational tracheostomy using the Cook/Ciaglia technique.² On each patient fibre-optic bronchoscopy confirmed satisfactory position of the guidewire and tracheostomy tube. Early diagnosis and appropriate treatment of such complications may have avoided precipitant presentation.

Case reports

Case 1

A 74-year-old woman received coronary artery bypass surgery for triple vessel disease. Her recovery was complicated by hypotension, left ventricular failure and right lower lobe respiratory infection. Weaning from mechanical ventilation was therefore prolonged and a percutaneous serial dilatational tracheostomy was performed on the 10th post-operative day. Three weeks after the procedure blood was suctioned from the tracheostomy tube. Rigid bronchoscopy revealed bleeding granulation tissue superior to the point of entry of the tracheostomy

tube obstructing the tracheal lumen by 60 per cent. The tissue was successfully removed using endotracheal Nd:YAG laser therapy (non-contact). Full tracheal patency was restored and there has been no recurrence of bleeding.

Case 2

A 66-year-old woman received coronary artery bypass for left anterior descending coronary artery disease. She developed a respiratory infection post-operatively, that was successfully treated with antibiotics. On the fifth post-operative day a percutaneous dilatational tracheostomy was performed to allow reduction of sedation for weaning and to facilitate suctioning of secretions. She was weaned off mechanical ventilation one week later and the tracheostomy tube was removed. Nine days later she developed stridor and respiratory distress. Rigid bronchoscopy was performed and bleeding granulation tissue identified in the trachea, above the site of entry of the tracheostomy tube, occluding the lumen by 60 per cent. Nd:YAG laser therapy secured haemostasis and debulked the lesion. There was no further bleeding and one week later a further laser treatment completely removed the remaining tissue. Subsequent check bronchoscopy showed no recurrence.

Case 3

A 51-year-old man with a history of asthma underwent aortic root replacement (including a mechanical aortic valve) and received warfarin post-operatively. Cardiac failure, bronchospasm and a respiratory infection with *Pseudomonas aeruginosa* complicated recovery and weaning from mechanical ventilation was prolonged. On the

ninth post-operative day a tracheostomy was fashioned using a percutaneous serial dilatational technique. Fresh frozen plasma was given prior to tracheostomy and the clotting study was normal at the time of the procedure. Thirteen days later fresh blood was suctioned from the tracheostomy tube. Rigid bronchoscopy revealed bleeding granulation tissue above the site of entry of the tracheostomy tube occluding the tracheal lumen by 70 per cent. Nd:YAG laser therapy was used to debulk the tissue and to achieve haemostasis. The patient received three further treatments. One month after tracheostomy the patient was successfully weaned from mechanical ventilation and was decannulated. Check bronchoscopy one week later showed normal tracheal patency with no recurrence of granulation tissue.

The technique employed for endobronchial Nd:YAG laser therapy has been reported elsewhere.³ In two patients the laser therapy was performed whilst the tracheostomy tube remained *in situ*. The tube was protected with metal foil and a non-contact probe was employed.

Discussion

Percutaneous serial dilatational tracheostomy is a well-recognized and safe technique for establishing a tracheal stoma in patients receiving longer-term ventilation on the ICU.⁴ The incidence of serious complications is low⁵ and may be less frequent than after surgical tracheostomy, although a randomized trial would not be practical.⁶ An alternative percutaneous dilatational technique appears to have a higher complication rate.⁷

Tracheal granulation tissue formation has been reported as a complication of long-term tracheostomy.⁸ In a study of 41 surviving patients who had undergone percutaneous tracheostomy in one general ICU, four were found to have a greater than 10 per cent tracheal stenosis on laryngo-tracheoscopy performed at least six months after the procedure.⁶ No patient was symptomatic in this series. In another study of nine patients at least six months after percutaneous dilatational tracheostomy no evidence of tracheal stenosis was seen on magnetic resonance imaging (MRI) although scarring was demonstrated in the tracheal wall in all of the patients.⁹ The reported incidence of late stenotic or haemorrhagic complications after percutaneous tracheostomy performed on post-operative cardiac surgical patients is also low and appears to be in the order of nine per cent of survivors.¹⁰ Tracheal stenosis may be asymptomatic even when the tracheal lumen is severely reduced in diameter¹¹ but presentation may be precipitous and life-threatening especially at induction of anaesthesia.¹²

In the patients presented here tracheal granulation tissue formation occurred superior to the point of entry of the tracheostomy tube into the trachea. This appears to be a less commonly reported site of post-tracheostomy intraluminal tracheal lesions than infra-stomally.¹³ However, tracheal stenosis and even minor haemorrhage may be unrecognized until after decannulation and may present a particular danger to patients decannulated in areas of low supervision when specific examination of the proximal trachea has not been made. In each of our patients the tracheal lumen was significantly obstructed by granulation tissue and in two there was considerable associated haemorrhage. The haemorrhage was of increased concern in the patient who was anticoagulated. Respiratory infection may have contributed to the formation of granulation tissue in our patients. Symptomatic granulation tissue, which has arisen after prolonged tracheostomy has been successfully treated with endoscopic laser

therapy.¹⁴ However, investigating and treating such complications only after symptoms have emerged may place patients with undiagnosed intratracheal pathology at considerable risk. Fibre-optic endoscopy of the trachea at the time of tracheal decannulation may reveal the presence of granulation tissue. If so, the tracheostomy tube can be left in place and referral made for appropriate investigation and treatment.

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Address for correspondence:

Dr Brendan P. Madden
The Department of Cardiothoracic Surgery,
Knightsbridge Wing,
St George's Hospital,
Blackshaw Road,
London SW17 0QT, UK.

Fax: +44 208 725 1411

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