

## CASE REPORT

# Tracheoinnominate artery fistula - A case report with a review of the clinical management

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## SUMMARY

Poor intensive care practices are to be blamed for development of any complication of prolonged tracheal intubation. Especially, the complications of subglottic stenosis or more rarely, a fistula between the tracheal wall and the innominate artery cannot be justified on any account. Yet, these complications may occasionally be seen in underdeveloped countries with poor nursing training and meager resources. We present a case report of this fatal complication in a 17 years old patient of tetanus who underwent surgical tracheostomy for mechanical ventilation and subsequently developed a fatal massive bleeding.

**Key words:** Tracheostomy; Tracheal intubation; Tracheoinnominate artery fistula

**Citation:** Jain D, Arora S. Tracheoinnominate artery fistula - A case report with a review of the clinical management. *Anaesth pain & Intensive Care* 2012; 16(2): 183-85

## INTRODUCTION

Tracheostomy is commonly instituted in the intensive care units in patients requiring prolonged ventilation for better pulmonary toileting. However, poor intensive care practices may result in pressure necrosis of the tracheal wall from prolonged inflation of the cuff of the tracheostomy tube (TT) coupled with high inflation pressures, with development of prolonged hoarseness, subglottic stenosis or more rarely, a fistula between the tracheal wall and the innominate artery. The mortality rate of this rare complication is almost 100% without surgical intervention due to massive bleeding.<sup>1,2</sup> Even with surgical correction the prognosis remains poor.<sup>3</sup>

We recently encountered this fatal complication in a 17 years old patient, who contracted tetanus and underwent surgical tracheostomy for mechanical ventilation. He had a severe bout of bleeding on 27th day of tracheostomy. In spite of our best resuscitative efforts and surgical correction, the patient could not be saved. We discuss the modalities which can be instituted to prevent the formation of tracheoinnominate artery fistula (TAF) and the emergent resuscitation techniques

in detail, which can be adopted by the anesthetists facing this fatal complication.

## CASE REPORT

A 17 years old male was brought to our hospital with opisthotonus and restricted mouth opening. He was diagnosed as a case of tetanus and shifted to the tetanus intensive care unit, intubated and put on mechanical ventilation. Anticipating a prolonged disease course, early tracheostomy was done on 3rd day of admission. Later, he had two tracheostomy tube exchanges uneventfully.

On 27th day following tracheostomy, the patient developed acute onset bleeding from his oral and nasal cavities. Tracheostomy tube cuff was overinflated to prevent any aspiration of blood. Oral and nasal cavities were packed with adrenaline and tranexemic acid soaked packs. The patient was resuscitated with crystalloids, colloids and blood products. CT angiography was done which failed to reveal any major bleeding vessel. On the following day the patient was rushed to the operating room to be explored for an active bleeding site. Oral and nasal packs were removed.

Direct laryngoscopy and hypopharyngoscopy showed no signs of active bleeding. Later in the evening, on the same day the patient had another episode of massive bleeding from the tracheostomy stoma as well as oral cavity. Immediate resuscitation was done. Bleeding was controlled with digital pressure and later pressure dressing along the stomal site. On the clinical suspicion of TAF, the patient was shifted to the operating room. A large fistula was found between right posterolateral wall of the trachea and the right innominate artery near bifurcation which was repaired and right innominate artery ligated. Pericardial and retrosternal drains were placed. The patient's hemodynamic status was maintained with fluids and blood products.

Patient was kept on the infusion of dopamine and adrenaline. Postoperatively he was shifted to the intensive care unit for mechanical ventilation. On 3rd post operative day the inotropic support was stopped. His Glasgow coma score(GCS) showed gradual improvement. On 5th day the patient developed recurrent acute bleeding from the TT and oral cavity and despite the best of our efforts he succumbed to his massive hemorrhage.

## DISCUSSION

TAF is a rare complication of tracheostomy with an incidence of 0.1-1%.<sup>4</sup> Mortality of this fatal complication is 100% in untreated patients. It was first described in 1879 by Korte et al in a 5 year old child with tracheostomy for diphtheria. TAF generally occurs between 7-14 days after tracheostomy; 75% of the cases presenting between 2nd to 4th week.<sup>4,6</sup> Profound bleeding due to TAF has been reported as early as 2 days to several months after tracheostomy.<sup>7</sup> In our patient, the bleeding was first noticed on 27th day of the tracheostomy.

The cause of the injury is pressure necrosis of the tracheal wall due to the constant pressure exerted by the inflated cuff of the tracheostomy tube.<sup>8,9</sup> The innominate artery is the 1st branch of the aortic arch which divides into right common carotid and right subclavian artery. At the area of superior thoracic inlet the innominate artery crosses from left to right as it moves superiorly and lies anterior to the trachea.<sup>10</sup> It's close proximity to the trachea at this junction results in the development of the arterial fistula. Low lying tracheostomy, high innominate artery or head injury patients due to excessive head and neck movements are risk factors for TAF.<sup>11,12</sup> Considering the high mortality associated with TAF, care should be taken

to prevent the occurrence of this fatal complication. Regular monitoring of the cuff pressure using Endotest Cuff pressure gauge should be instituted. The cuff of the tracheostomy tube should be periodically deflated. Tight closure of the tracheostomy site should be avoided to prevent wound sepsis. Any peristomal infection should be promptly treated. Use of long tracheal tube connections can prevent excessive movement of the tracheostomy tube.

Massive hemoptysis or profound bleeding from the tracheostomy site should raise the suspicion. However, other sources of bleeding like superficial vessels at tracheostomy site, granulation tissue, thyroid vessels or jugular veins must be ruled out. Bronchoscopy has been advocated by Grant et al to confirm the site of bleeding.<sup>6</sup> However, it may not always be feasible due to severe bleeding, as was seen in our case. CT angiography has also been recommended but is not found to be of much diagnostic value. In our patient, it failed to reveal any major bleeding vessel.

Excessive bleeding, leading to hemodynamic instability and respiratory compromise, necessitates prompt intervention. Failure to control bleeding will result in cardiovascular collapse or hypoxemic arrest due to inadequate ventilation. Various methods have been described to control bleeding. As an initial resuscitation measure we tried to control it by packing the oral and the nasal cavity. The cuff of the tube was overinflated. This generally helps to stop bleeding temporarily in 85% of cases<sup>13</sup>, as in our case. If this fails to stop bleeding, orotracheal intubation should be attempted and tracheostomy tube withdrawn. Utley et al had described a maneuver to achieve homeostasis by inserting the finger through the stoma, putting pressure on the anterior tracheal wall and simultaneously compressing the neck of the trachea with the thumb.<sup>14</sup> Even after surgical intervention the prognosis is extremely grave due to secondary complications like ischemic brain damage, aspiration pneumonitis or sepsis.<sup>15-17</sup> In our patient the most likely cause of rebleeding was disruption of sutures due to secondary infection. Nan - Chun Wu recommended the use of innominate ligation with extra anatomical bypass to prevent the occurrence of rebleeding.<sup>2</sup>

The definite management of TAF is the surgical correction, without which the mortality is almost 100%. Massive bleeding presenting after 72 hours of tracheostomy should raise the suspicion for this lethal complication and surgical intervention should be instituted as early as possible and care taken to prevent secondary complications.

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## QUOTATIONS

- “The greatest danger for most of us is not that we aim too high and we miss it, but we aim too low and reach it.” - Michelangelo
- “To climb steep hills requires slow pace at first.” - Shakespeare
- “Nothing is a waste of time if you use the experience wisely.” - Auguste Rodin
- “Great minds have purposes; others have wishes.” - Washington Irving
- “All glory comes from daring to begin.” - William Shakespeare
- “Don’t find fault, find a remedy.” - Henry Ford
- “Tell everyone what you want to do and someone will want to help you do it.” - W. Clement Stone
- “A superior man is modest in his speech, but exceeds in his actions.” - Confucius
- “Keep in mind that neither success nor failure is ever final.” - Roger W. Babson
- “If you’ll not settle for anything less than your best, you will be amazed at what you can accomplish in your lives.” - Vince Lombardi
- “People rarely succeed unless they have fun in what they are doing.” - Dale Carnegie
- “If opportunity doesn’t knock, build a door.” - Milton Berle
- “It is hard to fail, but it is worse never have tried to succeed.” - Theodore Roosevelt
- “I am the greatest, I said that even before I knew I was.” - Muhammad Ali
- “If you learn from defeat, you haven’t really lost.” - Zig Ziglar
- “It is not length of life, but depth of life.” - Ralph Waldo Emerson
- “If a window of opportunity appears, don’t pull down the shade.” - Tom Peters
- “Persistent questioning and healthy inquisitiveness are the first requisite for acquiring learning of any kind.” - Gandhi
- “Plans are only good intentions unless they immediately degenerate into hard work.” - Peter Drucker.
- “A man of ability and the desire to accomplish something can do anything.” - Donald Kircher
- “Making good decisions is a crucial skill at every level.” - Peter Drucker