Management of Compromised Airway due to Unusual Presentation of Cystic Hygroma

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Abstract

The successful management of a unique case of huge cystic hygroma in a fourteen month old child who presented in the emergency room with severe respiratory distress as a result of nearly complete upper airway obstruction, is presented.

Introduction

Cystic hygroma is a benign, painless, soft and compressible tumor of lymphatic system. Its frequency is one case per 6000 births in USA.\(^1\) The head and neck region is the most common site of presentation. Forty percent of the lesions appear in the newborn, 50% present by the end of the first year of life, and 75% by the end of the second.\(^2\)

Cystic hygromas have rarely been reported as a cause of acute upper airway obstruction with sudden neck swelling as a result of infection and haemorrhage into the lesion.\(^3\) Anaesthetic concern includes bleeding, difficulty in visualizing the airway, extrinsic and intrinsic pressure on the airway causing distortion and obstruction of the airway. Therefore a strategy needs to be developed in order to anticipate and manage patients with these types of difficult airways. Multi specialty approach can ensure the survival of a child presenting with dyspnoea due to airway obstruction. This includes identifying the potential problems and considering different options and selection of an appropriate plan in the particular scenario. We are reporting an airway crisis in a paediatric patient admitted with severe respiratory distress due to a huge cystic hygroma arising from the neck and extending into the base of tongue, pharyngeal space, mediastinum and diaphragm. In addition to involving the laryngeal inlet, it also causes deviation and compression of the trachea.

Case Report

A fourteen months boy presented in the emergency room with respiratory distress due to a large swelling situated in the anterior and posterior triangle on the right side of the neck. It was associated with fever and stridor. On examination respiratory rate was 52 breaths per minute, heart rate 130 beats per minute and arterial haemoglobin oxygen saturation (SpO₂) was 75-80% with 10-15 liter per minute oxygen via face mask. X-ray chest revealed large swelling extending from neck to mediastinum causing airway narrowing as well as displacing trachea towards the left side. However, lateral X-ray of the neck showed almost complete airway compression at the level of epiglottis (Figure 1). MRI showed a sharply defined lesion in front of the

Figure 1. Marked swelling surrounding larynx and trachea, almost occluding the airway at the level of epiglottis
cervical vertebra and behind the base of tongue (Figure 2a), making a slit like glottic opening and was compromising the airway (Figure 2b). On the basis of the clinical findings and MRI appearance he was diagnosed as a case of cystic hygroma. Considering the severity of the acute airway obstruction and respiratory distress, emergency tracheostomy was planned and the child was brought to the operating room.

In the operating room electrocardiograph, pulse oximeter, and blood pressure cuff were attached. Patient baseline $SpO_2$ was 75% and he was hypoxic ($SpO_2$ 75-80%) since his admission in ER which was approximately one hour before coming to the operation theater. Intravenous cannula was already in place in the dorsum of right hand. Inhalation induction was started by using sevoflurane along with 100% Oxygen. After five minutes $SpO_2$ rose to 90% but the patient was not anaesthetized adequately. To increase the depth of anaesthesia a small dose of thiopentone (10 mg) was given intravenously. This resulted in apnea and airway collapse. However, positive pressure ventilation via face mask was started which kept the $SpO_2$ to 90%. Laryngoscopy revealed marked swelling in the oropharynx and hypopharynx and laryngeal inlet was not visible. Mask ventilation resumed and laryngeal mask airway (LMA) size 1.0 was inserted. Inflation of LMA cuff displaced it to the left side of the mouth which is possibly due to the anatomical distortion of the oral cavity. Keeping LMA in this position positive pressure ventilation was started and kept inspired concentration of sevoflurane to 2 - 2.5% with 100% Oxygen. Further increase in sevoflurane concentration resulted in airway collapse, causing difficulty in ventilation and dropping of $SpO_2$ to 70%. In order to prevent this we kept sevoflurane concentration between 2-2.5%. Oxygenation was improved by applying continuous positive airway pressure (CPAP) of 10 cm of H2O and obstruction was relieved but $SpO_2$ could not be increased more than 90%.

Due to inadequate ventilation, end tidal carbon dioxide concentration (ETCO2) remained 75 - 80 mm of Hg. Tracheostomy was started after infiltration of 2% Xylocaine for local anaesthesia. No muscle relaxant was used throughout the procedure. Breathing Circuit was attached to the Tracheotomy Tube (TT) as soon as it was inserted. Ventilation via TT improved oxygenation markedly and $SpO_2$ rose to 98% while ETCO2 decreased to 40 mm of Hg. Sevoflurane was discontinued after the completion of the procedure. Patient regained consciousness after five minutes and was shifted to the recovery room.

In the recovery room breathing was normal and $SpO_2$ remained 98%. After meeting the discharge criteria child was shifted to paediatric special care unit.

**Discussion**

Airway compromise due to cystic hygroma, although rare, but remains an important cause especially in an emergency situation. Airway obstruction can occur in cystic hygroma due to infection and haemorrhage causing rapid increase in the size of swelling.

Different options are available for intubation. Blind
nasal intubation is associated with bleeding that would fur- 
ther compromise the airway. Fiberoptic intubation is an 
attractive option but expertise is required to handle pedi-
atriac airway emergency. While tracheostomy under local 
aesthesis is not only distressing for the child but also dif-
ficult for the surgeon, because of indistinguishable land-
marks.

Inhalation anaesthesia remains the preferred tech-
nique for management of a difficult pediatric airway. We 
also tried this technique in our patient along with keeping 
the patient spontaneously breathing but the airway obstruc-
tion worsened and he became restless.

The exact mechanism of obstruction in these patients 
under general anaesthesia remains unclear. The probable 
explanation is that during normal breathing intra pleural 
pressure and intra alveolar pressure is always more negative 
than intra tracheal pressure and thus airway remains open. 
When patient tries to breathe out forcefully to overcome 
resistance, the intra pleural and intra alveolar pressure 
increases markedly subjecting the trachea to compress 
transmural pressure especially at the lower trachea level. 
When positive pressure is applied to airway during forced 
expiration, the gradient between intra thoracic and intra trac-
cheal is reduced therefore tracheal collapse is less likely. 
Application of continuous positive airway pressure in our 
patient with intermittent positive pressure did alleviate trac-
cheal collapse. This has been described by several authors.

The neuromuscular blockage agent may relieve air-
way collapse during forceful expiration and straining but 
they may worsen the airway obstruction if the cause of 
obstruction is mechanical such as mediastinal mask. 
Therefore we did not use muscle relaxants.

In our patient, the causes of airway obstruction were 
not only pressurizing effect of primary pathology on trachea 
but also the loss of muscle tone during general anaesthesia 
aggravated the pressurizing effect of the mass.

The treatment and prevention of symptoms associ-
ated with acute neck swelling like cystic hygroma has not 
been established. Certain anaesthesia considerations will 
help in the management of such airway emergencies. 
Firstly, airway obstruction may get worse during general 
aesthesia, as airway dynamic (intrapleural - intratho-
racic pressures) may markedly change during this period. 
Secondly, it is important for the patient not to cause 
straining, since forced expiration worsens the narrowing 
of airway. Thirdly, positive pressure ventilation with 
CPAP during expiration will prevent collapse of upper 
and lower airway. In addition to these, awareness of 
potential airway complications, coordination and expert-
ise of an anaesthesiologist, paediatric otolaryngologist or 
paediatric surgeon are needed to manage these complex 
situations.

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