Our Experience with Femoro-Femoral Bypass in the Management of Critical Airway Problems

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Abstract The authors present a case report of a 64 year old male patient with thyroid mass and extensive secondaries of the neck and infiltration of the trachea producing severe tracheal stenosis at the level of the thoracic inlet presenting with stridor. Due to the large mass, endotracheal intubation was ruled out; hence a femoro-femoral Cardiopulmonary Bypass was done followed by a median sternotomy, resection of the involved tracheal segment, a total thyroidectomy with neck dissection and finally a tracheal end-to-end anastomosis. The surgery was done in May 2011.

Keywords Tracheal stenosis · Femoro-femoral cardiopulmonary bypass · Total thyroidectomy · Tracheal anastomosis

Introduction

The intraoperative management of patients with large neck mass compressing the airway and mediastinal extension is challenging. Complete airway obstruction and cardiovascular collapse may be encountered during the induction of general anaesthesia, tracheal intubation, and positive pressure ventilation. The intubation of trachea may be difficult or even impossible due to the compressed, tortuous trachea. Here we describe successful management of a male patient with

thyroid mass and extensive secondaries of the neck and infiltration of the trachea producing severe narrowing of the trachea at the level of the thoracic inlet presenting with stridor.

Case Report

Mr. M. K., a 64 year old male, presented with a large midline lower neck swelling for the past 4 months and progressive difficulty in breathing for the past 3 months. He had a previous history of ischaemic heart disease and hypertension for the past 8 years.

On examination there was an enlarged, firm, fixed, non-tender left lobe of the thyroid gland and a large level III, hard, fixed node on the left side. The patient was having stridor at the time of presentation. A provisional diagnosis of carcinoma thyroid with tracheal invasion and secondaries was made.

Routine blood, urine and thyroid function tests were normal. His chest radiograph was normal and X-ray soft tissue neck showed shifting of the tracheal air shadow to the right. Fine needle aspiration cytology done elsewhere showed papillary carcinoma of thyroid. CT and MRI scan of the neck revealed a large heterogenous left thyroid mass lesion with tracheal and oesophageal infiltration causing tracheal shift to the right side along with a large cystic lymph node in the left deep cervical region adjacent to the mass lesion (Figs. 1, 2).

Since there was no interval between the upper border of sternum and the thyroid swelling, tracheostomy below the stenosed segment and endotracheal intubation was thought not possible. Under epidural anaesthesia, the right femoral vein was catheterized with the cannula reaching up to the right atrium and the right femoral artery was cannulated up to the bifurcation of the aorta. Both cannulae were now connected to a heart–lung machine. This equipment thus overtook the functions of the heart and Lung.

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Under intravenous anaesthesia with Fentanyl and Midazolam, a 'T' shaped incision was made, the horizontal part being in the neck and vertical segment over the sternum up to the manubrium. The thoracic segment of trachea below the stenosis was exposed, mobilized and entered into. Endotracheal intubation was then done through the tracheal opening after which the femoral artery and vein were decannulated.

Around 3 cm of the stenotic segment of the trachea along with the secondary node and the thyroid gland was removed *en mass*. A tracheal end-to-end anastomosis was

done. Post operatively the patient developed bilateral vocal cord palsy for which he had to undergo a tracheostomy. Histopathology of the specimen confirmed papillary carcinoma of thyroid. The patient is doing well on follow up and continues to have the tracheostomy 6 months post op.

Discussion

Among all causes of tracheal stenosis, secondary infiltration by a thyroid carcinoma accounts for around 4 % of cases [1]. Papillary and follicular thyroid carcinomas are reported to directly invade the airway in 1–6.5 % of patients [2]. Tracheal invasion tends to be more common in poorly differentiated tumors and in older patients [2].

The severity of stenosis poses a challenge for the surgeon because of the precarious airway wherein a failed intubation can be fatal [3, 4]. In 1970s the risk of fatal airway obstruction or cardiovascular collapse during induction of anaesthesia in patients with large anterior mediastinal masses was first time recognized [5]. The complications which can arise as a result of difficult intubation could be hypoxia, carbon dioxide accumulation, asphyxia, cardiopulmonary arrest, cerebral edema or haemorrhage [5].

The need for an artificial circulation to overcome the hazards of compromised airway was recognized in the twentieth century and Dr. John H. Gibbon (Jr) was the first to use a heart–lung machine in 1953 to repair an atrial septal defect in a 18 year old girl [6]. The principle

Fig. 1 CT scan of neck showing infiltration of the trachea

Fig. 2 CT neck—axial cuts (clockwise from left). A Thyroid mass. B Large cystic lymph node on the left side. C Mass infiltrating the trachea. D Almost complete occlusion of the air column

of the heart–lung machine (also known as pump-oxygenator or cardiopulmonary bypass) is actually quite simple. Venous blood is drained (by gravity siphon) into a reservoir. From there, the blood is pumped through an artificial lung. This component is designed to expose the blood to oxygen. Oxygen gas is delivered to the interface between the blood and the device, permitting the blood cells to absorb oxygen molecules directly. Finally, the heart–lung machine actively pumps the oxygenated blood back into the patient through a tube connected to the arterial circulation.

Therefore it may be concluded that a femoro-femoral bypass is a safe and effective method of hemodynamic control in cases of severe tracheal stenosis which otherwise pose a threat to the conventional method of intubation or tracheostomy and hence jeopardize the life of the patient.

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