Combined Cervical and Video-assisted Thoracoscopic Thyroidectomy (CAVATT): A Simplified and Innovative Approach for Goiter with Posterior Mediastinal Extension

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Abstract We report a case of benign multinodular goiter with right sided posterior mediastinal extension managed by a simplified anaesthetic and surgical protocol. Single lumen endotracheal tube was used for intubation. Access to mediastinum was obtained by 2 working ports in 2nd and 4th intercostal spaces. Mediastinal extension is dissected thoracoscopically and delivered cervically. Post operative course was uneventful with no pulmonary and surgical morbidity.

Keywords SLETT = single lumen endotracheal tube ·
PME = posterior mediastinal extension · CAVATT =
Combined Cervical And Video-Assisted Thoracoscopic
Thyroidectomy

Introduction

Goiter with retrosternal extension constitutes about 5.7% [1], though the incidence ranges widely from 1–20% depending upon the definition used. Majority of them can be delivered by cervical approach. But occasionally posterior mediastinal goiters pose anaesthetic and surgical challenge, necessitating thoracic approach [2]. Advances in minimal access and thoracoscopic surgery have been utilized in operating on thoracic structures with more ease

and less morbidity. We highlight a simplified protocol for combined cervical and thoracoscopic thyroidectomy under double lung ventilation with SLETT for a case of multinodular goiter.

Patient and Methods

Case Details

A 45 year old man presented to us with a history of gradually enlarging goiter for 10 years with no features of hyper/hypothyroidism and no history of compressive symptoms except for nocturnal postural cough for 1 month. On examination, it is a large goiter with firm consistency and lower border was not felt with positive Pemberton's sign. Investigations showed normal cardiorespiratory and thyroid function. Computerized tomogram shows posterior mediastinal extension on right side. After discussing with patient, relatives and anaesthetist, we had to use a modified protocol for anaesthesia and surgery keeping in view the financial and technical constraints.

Operative Details

After adequate preoperative preparation and informed consent, the patient was taken up for surgery. Patient lies supine throughout the procedure. Intubation was done with SLETT for inhalational anaesthesia. Right side of chest prepared and draped separately and both arms kept by the side of body. Conventional cervical approach with long collar incision was used. Strap muscles cut and thyroid gland was mobilized. All the vascular pedicles are ligated, both recurrent laryngeal nerves and 3 parathyroids were identified and preserved without any damage. We

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attempted the delivery of PME through the neck, but were unsuccessful.

We abandoned further attempts, then right arm was abducted to 100°, right chest was exposed and table tilted to 20° right up position. A 10 mm port was placed in right 4th intercostal space 1 cm behind anterior axillary line for camera. Pneumothorax (carbothorax) was created with CO₂ insufflation of 6 mmHg pressure and simultaneous hypoventilation till adequate working space is created with >60% right lung collapsed. Entire procedure took about 5 minutes. After inspection of lung, pleural surface, goiter and posterior mediastinum, 2 working ports in 2nd intercostal space 2 cm lateral to midclavicular line and in 4th intercostal space in midclavicular line was placed respectively. PME was mobilized thoracoscopically after opening the overlying mediastinal pleura, fascia and gradual division of vascular attachments (Fig. 1). The goiter is separated from phrenic nerve and superior vena cava anteriorly, azygos vein inferiorly and trachea medially. The terminal part of dissection was simultaneously assisted by index finger from above (Fig. 2). PME is delivered in to the neck and total thyroidectomy specimen retrieved. Ports closed after placing intercostal drain through camera port. Throughout the procedure usual double lung ventilation is done with SLETT. Schematic diagram of technical aspects is depicted in Fig. 3. Final histopathology was benign multinodular goiter.

Discussion

Retrosternal goiters rarely require alternative thoracic approaches to conventional cervical method [1]. PME can be operated by sternotomy (partial or total), claviculotomy, anterior thoracotomy, posterolateral thoracotomy or by video-assisted thoracoscopy [2]. Only 1 out of 94 intrathoracic

Fig. 1 Thoracoscopic view of mediastinal goiter dissection

Fig. 2 Simultaneous thoracoscopic and finger dissection from neck, short arrow pointing to finger and long arrow pointing to phrenic nerve and superior vena cava

goiters required posterolateral thoracotomy in a study [3]. Combined cervical, thoracotomy and thoracoscopy approach was utilized for successful intrathoracic goiter delivery. Thoracotomy procedures usually require double lumen endotracheal tube and single lung ventilation with attended technical complexities, cost and complications. Further, total lung collapse and hypoventilation may lead to post operative atelectasis, hypoxia especially in elderly and those with preexisting lung disease [4]. Combined cervicotomy and robotic VATS was reported, but those cases were done under

Fig. 3 Schematic picture of anaesthetic and operative technique showing SLETT, partial collapse of right lung, combined cervical and thoracoscopic thyroidectomy

single lung ventilation and mediastinal goiter was dissected first. Thoracoscopic surgery using SLETT was successfully employed in various procedures of esophagectomy, pneumonectomy, and empyema [5]. Majority of mediastinal goiters requiring thoracoscopy reach up to upper third of thorax, obviating the need for total lung collapse. Apart from this technical and evidential basis, we had financial concerns, which made us devise a cost effective approach. The advantages of using CAVATT are minimal anaesthetic expertise, lower cost as it avoids costly equipment needed for single lung ventilation and thoracoscopic trocars. Doing the entire procedure, as the patient lies supine, preventing any malposition of endotracheal tube due to frequent movement and overall reduction in operating time. Thoracoscopic dissection ensures delivery of goiter under vision without the fear of bleeding and damage to vital mediastinal structures like phrenic nerve, azygos vein, posterior intercostal vessels or aberrant vasculature due to blind finger dissection through neck. As this procedure is done with partial lung collapse, major ventilation–perfusion mismatch and attendant morbidity is prevented. We also propose a pneumonic-CAVATT for this procedure.

We demonstrated how successfully CAVATT can be used with minimal technical complexities, cost, time and morbidity especially in centers with limited resources.

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