Subadventitial dissection for removal of a papillary thyroid carcinoma encasing the common carotid artery: case report

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Abstract

This research aims to describe the surgical management of a patient with advanced papillary thyroid carcinoma that has completely encircled the common carotid artery. A woman who had a gradually enlarging thyroid mass over 20 years presented with progressive dysphagia and hoarseness for 3 months. Computed Tomography (CT) of neck revealed a huge thyroid mass completely encasing the common carotid artery. Doppler ultrasonography demonstrated patent flow and intact intima without transmural infiltration. The tumor was excised off the carotid artery in a subadventitial plane. Minimal residual tumor extending into the retrosternal region was treated with postoperative radioiodine therapy. Histopathology report of the specimen confirmed a papillary thyroid carcinoma. The use of Doppler ultrasonography, careful preoperative planning and the technique of subadventitial dissection are crucial for a safe and successful outcome in advanced papillary thyroid carcinoma with involvement of the common carotid artery.

Keywords: Thyroid Cancer; Thyroidectomy; Carotid Artery; Neck Dissection.

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Introduction

Complete encasement of the carotid artery has technically been deemed inoperable and staged as a very advanced disease (T4b) in head and neck malignancies. This is probably due to the high morbidity and mortality risk associated with attempt at dissection. Advanced disease indicates poor prognosis especially in squamous cell carcinomas of the head and neck. A notable trend is the increasing reported incidence of differentiated thyroid cancer but decreasing rate of mortality which signifies a better prognosis of this type of cancer compared to other head and neck cancers.[1]

One of the reasons for the better outcome in the management of differentiated thyroid cancers is central compartment clearance which offers good control of disease and a relatively fair prognosis. A previous retrospective review by Krol et al [2] identified invasion of major vessels by head and neck malignancies as a marker for poor survival. Among the head and neck malignancies involved are squamous cell carcinoma, thyroid cancer, sarcoma, parotid

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tumour and paraganglioma. Historically, any tumour encircling the carotid artery more than 270^0 is generally deemed inoperable.[3] We would like to highlight the use of Doppler untrasonography in determining the resectability of any tumour involving the carotid artery as well as the safe technique of subadventitial dissection for removing tumour off the carotid artery in this case report.

Case Description

A 64-year-old woman with a long standing goiter of more than 20 years presented with a history of progressive dysphagia, hoarseness and loss of weight of 3 months duration. The mass had gradually increased in size. She subsequently developed soft inspiratory stridor. She was euthyroid and family history for thyroid malignancy was unremarkable. Clinically, a multilobulated, non-pulsatile firm mass on the right anterolateral neck extending from the angle of mandible to the clavicle, mobile on deglutition, was palpable (**Figure 1**). Mass effect caused the trachea to be deviated to the left side and the laryngeal inlet was minimally visualized on flexible nasendoscopy. Ipsilateral vocal fold paralysis was noted.

Fine needle aspiration cytology done 2 weeks earlier demonstrated papillary thyroid carcinoma. Computed tomography (CT) of the neck revealed a large heterogenously enhancing mass arising from the right thyroid lobe, measuring 7 x 9 x 10 cm. The mass compressed the internal jugular vein and completely encircled the common carotid artery (**Figure 2**). The superior margin of the mas was just at the level of carotid bifurcation and inferiorly a small component extended into the retrosternal region ending just superior to the subclavian vessels. Multiple neck node involvement at levels II, III and IV were seen. A Doppler ultrasound examination demonstrated the tumour has not invaded the common carotid artery while angiography showed normal blood flow along the common carotid artery.

Total thyroidectomy and right radical neck dissection was performed for this patient after successful awake flexible fiberoptic nasal intubation. After raising the skin flap in the subplatysmal plane between the mandible and the clavicle, the right sternocleidomastoid muscle was removed. The right internal jugular vein was ligated at its proximal and distal end by using silk suture ligation. The right common carotid artery was identified deep to the right sternocleidomastoid muscle and right internal jugular vein. Vessel loops were placed at the proximal and distal parts of the right common carotid artery away from the involved portion of the artery. Tumour was cut-through as in a 'open book' method, dissected with alternate blunt and sharp dissection, peeled off the carotid artery in a subadventitial plane and delivered in two hemi sections. The right recurrent laryngeal nerve was sacrificed. The vagus nerve and carotid artery with its branches were safely preserved (**Figure 3**) while the integrity of the tracheal rings was maintained. There was however, minimal residual tumour extended infraclavicularly into the retrosternal region and the portion of carotid artery here appeared thinned out. This was deemed unsafe for resection as cardiothoracic or vascular backup was unavailable for proximal intrathoracic major vessel control. Histopathological report confirmed a papillary thyroid carcinoma. The patient received 150 mci radioiodine ablation post operatively. The patient was seen during follow-up at the outpatient clinic initially one monthly for the first 6 months followed by three monthly for another 6 months. After one year of follow-up, there was no tumour recurrence observed.

Discussion

Proper preoperative assessment and surgical planning is extremely important prior to embarking on resection of such tumours. Contrast enhanced CT can provide relevant information with regard to the extent of tumour as well as relationship of the tumour to major vessels. However, CT may be less accurate in defining pure encasement versus transmural involvement of a vessel, especially so if there is more than 180^0 involvement. [4,5] Doppler ultrasonography, which can be performed quickly, can provide superior information on the pattern of flow of the vessel as well as the integrity of the tunica intima along the entire

length of the vessel.[6] The ideal optimal investigation in select cases would be direct angiography coupled with a balloon occlusion test to test the integrity of cross circulation from the contralateral cerebral hemisphere in the event the internal carotid artery would have to be ligated.

Dissection directly on the subadventitial plane of the carotid artery is an effective technique to resect such tumours. However, tumour would have to be cut through and opened up to gain access to the carotid artery. In such instance, the use of bipolar cautery with alternate blunt and sharp dissection minimizes bleeding from the tumour. The plane between the tumour bulk and carotid artery could be elegantly demonstrated in this patient probably due to the fact that it had not dedifferentiated into an anaplastic cancer. The same cannot be applied for anaplastic or squamous cell carcinoma (SCC). Although carotid arteries are tough resistant structures, the infiltrative nature of anaplastic thyroid cancers and SCC confer them not amenable to surgery due to the local inflammatory and microthrombotic reactions involving the tunica intima.[4] In such instances, minimal debulking or palliative surgery to secure the airway with a tracheostomy may be considered.

Early identification and obtaining proximal and distal control of major vessels in the surgical field with the use of vessel loops is a safe practice. Unlike a conventional thyroidectomy, this surgery is more of an extensive neck dissection of a large cervical mass coupled with a thyroidectomy of the normal contralateral lobe. Ligation of the external carotid artery carries low morbidity. On the other hand, ligation of the common carotid or internal carotid artery is associated with severe morbidity. Resection of common or internal carotid artery without reconstruction carries a morbidity rate of 30 % to 50 %, whereas with reconstruction, the stroke and mortality rate drop remarkably to 5% and 7% respectively.[7,8] A possible option in the event tumour is found infiltrating the artery is an en bloc resection of the tumour together with the vessel, and a saphenous vein graft or expanded polytetrafluoroethylene (ePTFE) graft be used as a bypass reconstruction option.[9, 10] In squamous cell carcinoma of the head and neck, even with reconstruction of the resected carotid artery, 80% of patients eventually die of their cancer. However, in differentiated thyroid cancers, central compartment clearance with postoperative radioiodine, confers good disease control and a reasonably fair survival rate. The survival rate of the patients following surgery correlated significantly with complete tumour clearance. Five-year survival rate is 94.4% when there is complete resection with negative margin, 87.6% in positive margin of resection and 67.9% in patients with gross residual disease.[11]

Treatment options for differentiated thyroid cancer include surgery, radioactive iodine ablation, external beam radiation therapy and systemic chemotherapy.[12] Surgery plays the main role in patients with localized and uncomplicated disease. It must be emphasized that patient and family counseling as well as documentation on all the possible risks of surgery is extremely pertinent prior to embarking on surgery. The risks involved here are tracheal injury, pharyngeal and oesophageal injury, vagal and hypoglossal injury, spinal accessory nerve sacrifice, bleeding, infection and neurovascular morbidity due to ligation of the common or internal carotid artery. The most dreaded risk is mortality on table due to an uncontrollable bleeding from a carotid artery injury. Irrespective of the modalities being chosen the intention of treatment is to eradicate the disease and oncologic completeness. Besides surgery, both radioactive iodine ablation and external beam radiation therapy can be considered to achieve this goal. The selection of which treatment should come first is still unsettled and left to the clinical judgement of the managing team on a case by case basis together with the consideration of comorbidities and risk status. There is still inadequate data to determine which modalities should be chosen for thyroid cancer with extension to the carotid artery and the risk-benefit ratio of each intervention forms a crucial role in their consideration. However, a meta-

analysis by Sanabria et al hinted that radioactive iodine ablation may play a role in treating patients with microscopically positive surgical margin following surgery.[13] A review by Carling and Udelsman reiterated that the role of external beam radiation therapy is limited to unresectable gross residual local disease, painful bone metastases and metastases to brain or pelvis which is not amenable by surgery.[14]

Conclusions

A differentiated thyroid cancer completely encasing the carotid artery can safely be resected in a subadventitial plane provided there is no intraluminal infiltration. Vessel loops are useful intraoperative tools to gain proximal and distal control of vessels and also for avoiding accidental injury to vessels during dissection. Doppler ultrasonography is useful to determine the resectability of the tumour when the carotid artery is involved.

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LEGENDS

FIGURES

Fig 1. Large multilobulated thyroid mass involving right anterolateral aspect of neck.

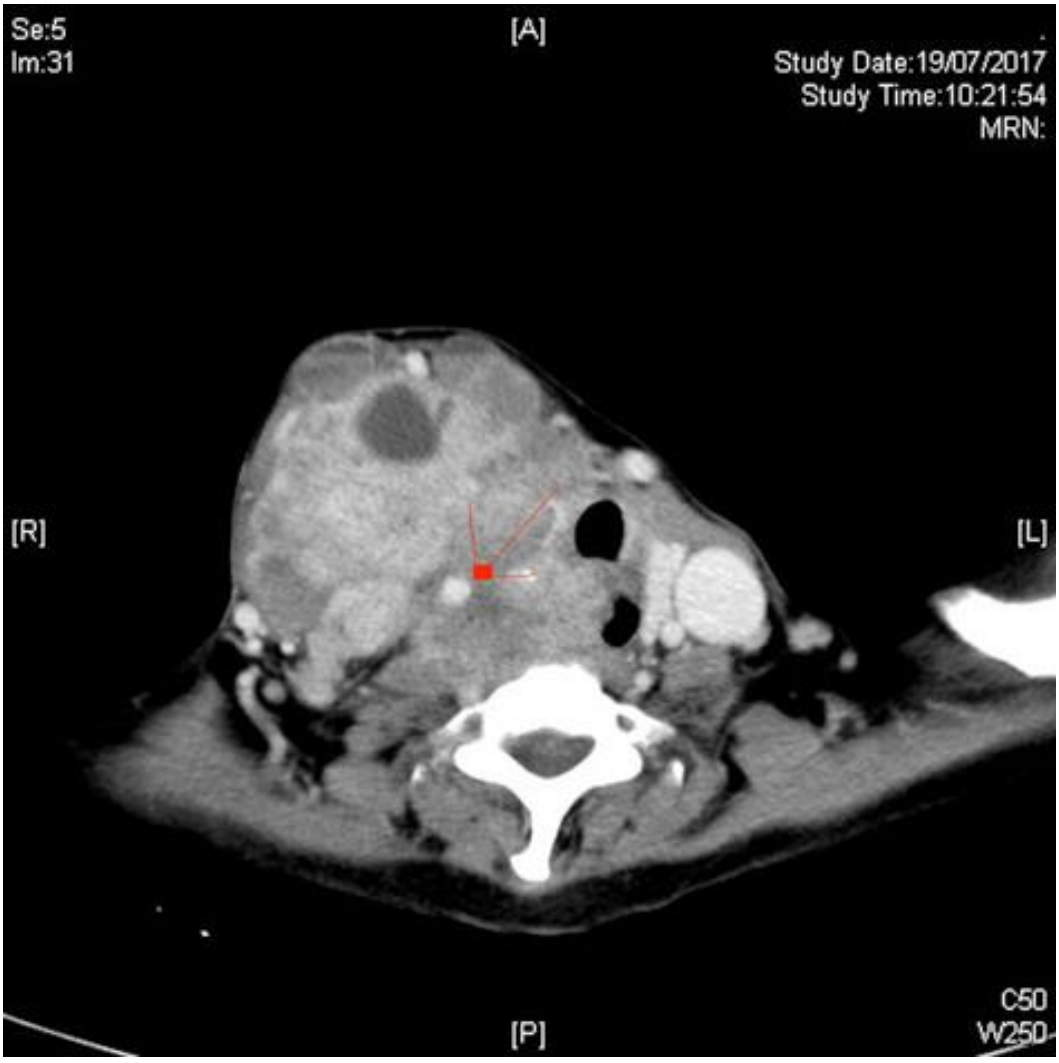

Fig 2. Common carotid artery completely encased by tumour (red arrow) on contrasted computed tomography (CT) scan.

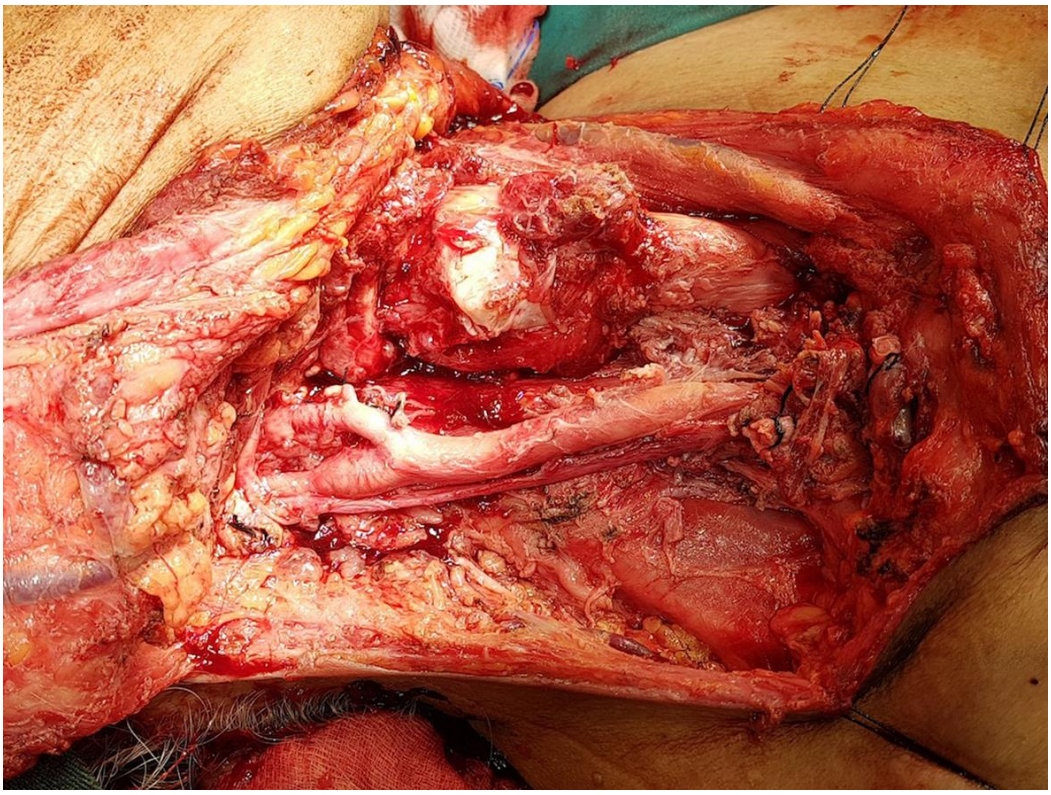

Fig 3. Vagus and common carotid artery and its branches demonstrated on the dissection bed.

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تشريح الغلالة البرانية لإزالة سرطان الغدة الدرقية الحليمي الذي يغلف الشريان السباتي الأصْلي: تقرير عن حالة طبيه

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الملخص

هدفنا هو وصف العلاج الجراحي لمريض مصاب بسرطان الغدة الدرقية الحليمي المتقدم والذي أحاط بالشريان السباتي الأصْلي بالكامل. المرأة التي عانت من تضخم تدريجي في كتلة الغدة الدرقية على مدى 20 عامًا عانت من عسر بلع متزايد وبحة في الصوت لمدة 3 أشهر. كشف التصوير المقطعي المحوسب (CT) للرقبة عن وجود كتلة درقية ضخمة تغطي بالكامل الشريان السباتي الأصْلي. أظهر تخطيط الصدى دوبلرأن الانسياب سالك والبطانة الداخلية سليمة دون ارتشاح بطريق الجدار. تم استئصال الورم من الشريان السباتي في مستوى الغلالة البرانية. تم علاج الورم المتبقي الممتد إلى منطقة خلف القص باستخدام علاج اليود المشع بعد الجراحة. أكد تقرير الهيستوباثولوجيا للعينة وجود سرطان الغدة الدرقية الحليمي. يعد استخدام تخطيط الصدى دوبلر والتخطيط الدقيق قبل الجراحة وتقنية التشريح الغلالة البرانية أمرًا ضروريًا لتحقيق نتيجة آمنة وناجحة في سرطان الغدة الدرقية الحليمي المتقدم المرتبط مع إصابة الشريان السباتي الأصْلي.

الكلمات الدالة: سرطان الغدة الدرقية؛ استئصال الغدة الدرقية. الشريان السباتي؛ تشريح العنق..