

# Surgical Treatment of Superior Thyroid Artery Aneurysm with Concomitant Thyroid Cancer

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In 2015, the incidence rate of thyroid cancer was 4.2/100,000 in China, which accounted for 2.1% of all new cancer cases.<sup>[1]</sup> Aneurysms of the carotid artery or its branches account for only 0.4% of all peripheral artery aneurysms.<sup>[2]</sup> The coexistence of these two lesions has seldom been observed. Here, we reported a case of a superior thyroid artery (STA) aneurysm with concomitant thyroid cancer and discussed surgical treatment strategies.

A 40-year-old woman was diagnosed with thyroid cancer and right STA aneurysm by a local hospital. Embolization of the right external carotid artery (ECA) was attempted but was unsuccessful, and no further treatments were performed. Four weeks before presentation, the patient developed a cough with expectoration. After no relief of the symptoms, she was admitted to our center. Physical examination revealed a huge mass in the right neck, which was found to be a bilaterally enlarged thyroid gland; another pulsatile mass located superior to the right lobe of thyroid, from which systolic bruits could be auscultated [Figure 1a]. Computed tomography revealed a right STA aneurysm and thyroid cancer with metastases in bilateral lung compartments and multiple lymph nodes in the neck, pulmonary hila, and mediastinum [Figure 1b].

The patient denied history of neck injury, infection, or autoimmune diseases; therefore, the aneurysm was considered to be spontaneous. Intervention to avoid asphyxiation was needed because the giant mass was compressing the airway, causing coughing and expectoration. However, to perform a thyroidectomy, one must consider that the aneurysmal wall could be injured resulting in rupture of the aneurysm. We, therefore, chose to embolize the artery from which the aneurysm originated before attempting thyroidectomy. Digital subtraction angiography (DSA) showed a right STA pseudoaneurysm, with a previously positioned spring coil in the aneurysmal sac [Figure 1c]. A fibered detachable coil of

Interlock-35 9 mm × 40 cm (Boston Scientific, Massachusetts, USA) was placed into the aneurysmal sac, and then, another coil of Interlock-35 6 mm × 40 cm was deposited to embolize the right STA. DSA revealed satisfactory results and the pulsation disappeared [Figure 1d]. The following day, the neck was explored, revealing (1) a huge mass measuring 7 cm × 10 cm × 10 cm in the thyroid region, which compressed the right carotid artery; (2) an aneurysm superior to the right part of the thyroid mass, measuring 6 cm × 4 cm × 3 cm; (3) compression and left displacement of trachea; and (4) multiple enlarged neck lymph nodes. Therefore, the decision was made to perform a pseudoaneurysm resection and total thyroidectomy. During the procedure, the right ECA and all surrounding blood vessels were first cut and ligated. With a wide base, the tumor was tightly adhered to the aneurysm and closely attached to the surrounding tissue. Therefore, an *en bloc* resection of the two lesions was performed [Figure 1e and 1f], which was followed by dissection of the right neck lymph nodes. A tracheotomy was also conducted to avoid postoperative asphyxiation. Histopathological examination of tissues diagnosed a poorly differentiated follicular carcinoma in the bilateral lobes of the thyroid gland, which infiltrated the right STA pseudoaneurysm. The patient was discharged uneventfully and administered radioactive iodine-131 and levothyroxine sodium tablets.

The coexistence of an aneurysm and malignancy in adjacent organs is not common. In previous decades, resection of tumors, rather than aneurysms, was the main issue considered

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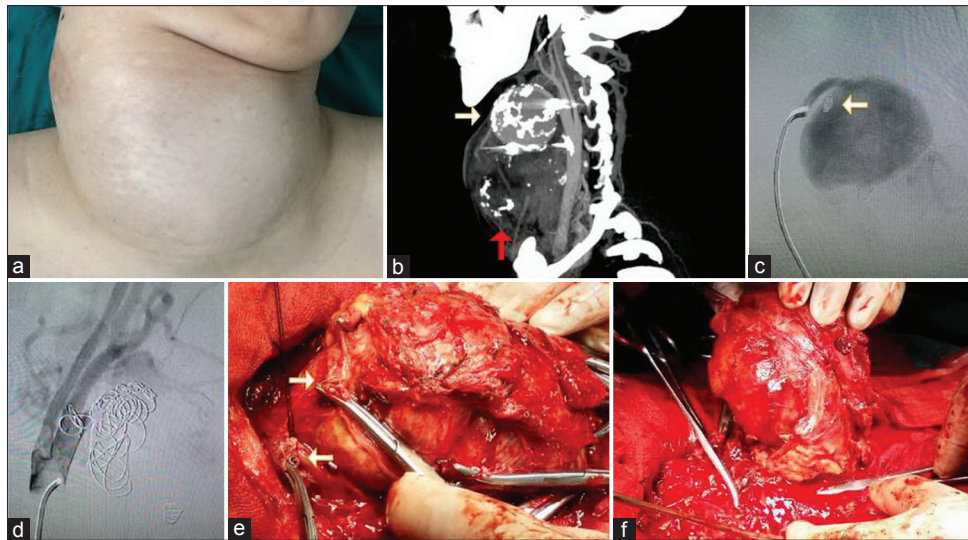
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**Figure 1:** Representative images of the patient. (a) A huge mass in the right neck; (b) the right superior thyroid artery pseudoaneurysm (white arrow) and thyroid carcinoma (red arrow); (c) pseudoaneurysm of the right superior thyroid artery, with a previously placed spring coil in the aneurysmal sac (arrow); (d) satisfactory results from the embolization; (e) the right external carotid artery and jugular vein are cut and ligated, and a coil is seen in the right superior thyroid artery (arrows); (f) resection of the aneurysm and the closely associated thyroid tumor.

by surgeons. However, it is possible that the aneurysm could enlarge or even rupture before a second stage surgery is scheduled. Therefore, progressively, surgeons have begun to prioritize aneurysm resection, addressing the tumor in either a one- or two-stage operation.<sup>[3]</sup> As endovascular techniques evolved, aneurysms have been more often treated with stents or coils as an initial step. This strategy not only eliminates the complications of aneurysmectomy but also prevents the risk of graft infection associated with the gastrointestinal procedures.<sup>[4]</sup> In recent years, minimally invasive treatment of the two lesions using an endovascular procedure and a laparoscopic or thoracoscopic surgery results in enhanced outcomes and fewer complications.<sup>[5]</sup>

To the best of our knowledge, an evidence-based therapeutic regimen to treat concomitant cervical aneurysms and thyroid cancers is not available. For treatment of a concomitant aneurysm and carcinoma of other body parts, as described above, the aneurysm is first addressed, followed by either simultaneous or second stage tumor resection, which is based on each patient's situation. A carotid aneurysm could be treated with embolization, stent coverage, or surgical resection. However, the pseudoaneurysm in this case was very large and infiltrated by a tightly adhered thyroid carcinoma. Therefore, aneurysmectomy might induce rupture and uncontrollable hemorrhage. Carotid artery stenting was not necessary because the ECA could be easily ligated without severe complications. Embolization of the right ECA or STA was the best choice to reduce hemorrhage during the following surgery. Although lung metastases were confirmed, operation of thyroid cancer was still needed due to tracheal compression. Therefore, total thyroidectomy and neck lymph nodes dissection were performed.

Surgery is the optimal treatment for concomitant thyroid cancer and aneurysm of ECA or its branches. For giant masses with abundant blood supply, endovascular treatment

of cervical aneurysms and subsequent thyroidectomy with or without aneurysmectomy is a safe and efficacious therapeutic strategy. Multi-institutional collaboration is needed to perform clinical trials of adequate sample size in these cases.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s)/ patient's guardians has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients/patient's guardians understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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