Case Report

Bilateral axillo-breast approach robotic thyroglossal duct cyst resection in an adolescent: a case report and literature review

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Background: Thyroglossal duct cyst (TGDC) is a common congenital neck mass that is the most frequent cause of neck swelling in children. The traditional open Sistrunk procedure for TGDC often leaves a visible scar on the neck. Therefore, it is essential to consider the impact of neck scarring on the quality of life for children and adolescents. Our study aimed to assess the safety and efficacy of robotic TGDC resection using the bilateral axillo-breast approach (BABA) in adolescents.

Case Description: A 16-year-old female patient presented with a neck mass (no pain or redness) that had been present for 3 years. The palpable neck mass moved with swallowing and there was no history of other significant medical conditions. An ultrasound scan of the neck indicated a weak hypoechoic area in the thyrohyoid region measuring 29 mm × 20 mm. Additionally, the ultrasonography of the thyroid gland showed no obvious abnormalities. A computer tomography (CT) scan confirmed a low-density lesion on the right hyoid bone, measuring 27 mm × 18 mm × 26 mm, consistent with a TGDC. We successfully performed a BABA robotic TGDC resection on the 16-year-old female adolescent who had a strong desire for scar-free surgery.

Conclusions: BABA robotic TGDC resection could achieve the same surgical effect as conventional open surgery while providing better cosmetic outcomes, which are essential for the physical and mental well-being of teenagers. Therefore, BABA robotic TGDC resection may be a safe and feasible treatment option with excellent cosmetic results in adolescents.

Keywords: Thyroglossal duct cyst (TGDC); adolescent; robotic surgery; bilateral axillo-breast approach (BABA); case report

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Introduction

Thyroglossal duct cyst (TGDC) is a congenital malformation associated with the thyroid gland, most commonly found in children and adolescents (1). It often manifests as an asymptomatic midline neck mass. The Sistrunk operation is the most widely used treatment for TGDC (2), significantly reducing the recurrence rate from 40% with simple cyst resection to 3.5% (3). However, this operation leaves a visible scar on the neck, which can have a profound impact on cosmetic outcomes and the mental well-being of patients, particularly adolescents.

To avoid neck scarring, several endoscopic and robotic-assisted TGDC resections have been used in clinics. Although endoscopic surgery can avoid neck scarring, it has a long and steep learning curve due to the two-dimensional (2D) visual field, which differs from the conventional open operation. Moreover, long, straight endoscopic instruments are likely to collide in the narrow working space (4).

Nowadays, with the advancements in robotic surgical system, the bilateral axillo-breast approach (BABA) using the da Vinci robot is increasingly utilized in remote access head and neck surgery (5). We have performed thousands of BABA robotic thyroidectomies, and it is the first time TGDC is treated with this procedure for teenagers. In our study, we found that BABA via da Vinci robot may be safe and feasible in TGDC resection in adolescents. We present this article in accordance with the CARE reporting checklist (available at https://gs.amegroups.com/article/view/10.21037/gs-24-10/rc).

Case presentation

A 16-year-old female patient presented with a neck mass that had been present for 3 years without pain or redness. The palpable neck mass moved with swallowing, and there was no history of any other significant medical conditions. The rest of the systemic review was unremarkable [174 cm, 50 kg, body mass index (BMI): 16.7 kg/m^2].

After an ultrasound scan of the neck, a subtle hypoechoic area measuring 29 mm × 20 mm was discovered in the thyrohyoid region. Additionally, the thyroid gland appeared normal on ultrasonography. Computer tomography (CT) further revealed a low-density mass on the right hyoid bone, measuring 27 mm × 18 mm × 26 mm (*Figure 1*), consistent with a TGDC. Lab results were unremarkable. In consultation with imaging findings and clinical presentations, the patient was diagnosed with TGDC.

We had completed more than 3,000 cases of robotic thyroidectomy since 2014. Both traditional open Sistrunk surgery and BABA robotic surgery were offered to the young patient and her parents. The advantages and disadvantages of both surgical methods were also explained to them. Due to the patient's strong aesthetic needs, they chose BABA robotic TGDC dissection and signed the informed consent.

After receiving general anesthesia, the patient was placed in a supine position with the neck hyperextended backward. A 10 mm long incision was made next to the right areola as the camera port of the da Vinci surgical system. An 8 mm incision was made on the left areola margin and the right anterior axillary fold as the operation approach, and the ultrasound knife and the Cadiere forceps were respectively connected after the trocar was inserted. Additionally, a 5 mm incision was made on the left anterior axillary fold as the operation approach, and a Maryland dissector was used after the trocar was inserted.

CO_2 gas was insufflated to maintain a pressure of 5 mmHg. The subcutaneous tissue was dissociated with the ultrasonic knife and Cadiere forceps to establish the operating space, from the hyoid bone superiorly to the level of the thyroid isthmus inferiorly, and from both inner sides of the sternocleidomastoid muscle laterally. The linea alba between the strap muscles was divided, and the surface of the cystic mass was fully exposed. The pyramidal lobe was dissected from the thyrohyoid membrane, and the mass was carefully dissected from the surrounding tissues from below upwards. The fistulous tract was carefully identified and followed to detect the attachment with body of the hyoid bone, it was connected to the hyoid bone but could be completely separated. The cyst, including its attachment to the hyoid bone, was completely removed *en bloc* without rupture and preserving the hyoid bone using the ultrasound knife. Any suspected tracts connecting the hyoid bone towards the foramen caecum were traced and completely dissected. After the mass was removed, the operative area was irrigated, and the strap muscles were sutured. A suction drainage tube was placed through the left areola incision,

Highlight box

Key findings

- Bilateral axillo-breast approach (BABA) robotic thyroglossal duct cyst (TGDC) resection may be a safe and feasible treatment option in adolescents, providing excellent cosmetic results.

What is known and what is new?

- The Sistrunk operation typically leaves a scar in the anterior neck which can have a significant impact on the quality of life, particularly for adolescents. Several endoscopic or robot-assisted Sistrunk operation have been developed to hide the scar and improve postoperative cosmesis.
- It is the first time that BABA robotic surgery has been used in TGDC resection in teenagers.

What is the implication, and what should change now?

- It is an attempt at performing novel robotic surgery for the treatment of TGDC, offering a new option for young individuals with TGDC who have a strong aesthetic preference.

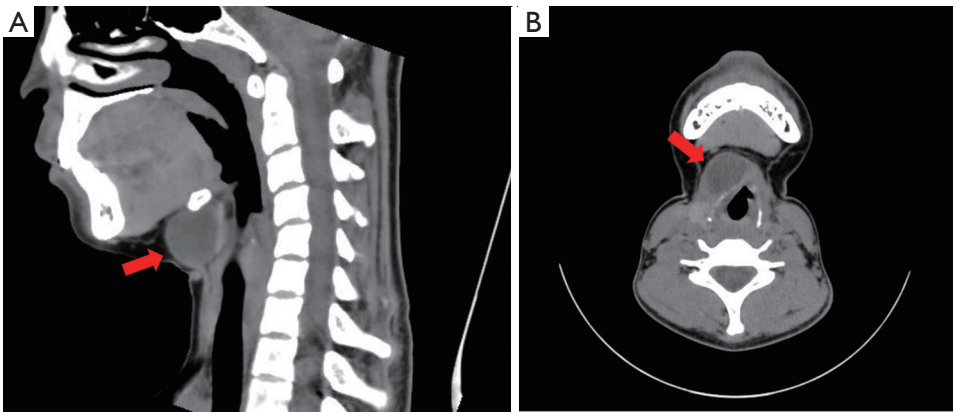

Figure 1 CT neck imaging. (A) A sagittal image obtained after 3D reconstruction can clearly show the relationship between the thyroglossal duct cyst (red arrow) and adjacent tissues. (B) The thyroglossal duct cyst (red arrow) is shown in the axial plane. CT demonstrated low density on the right hyoid bone with the size of 27 mm × 18 mm × 26 mm. CT, computed tomography; 3D, three-dimensional.

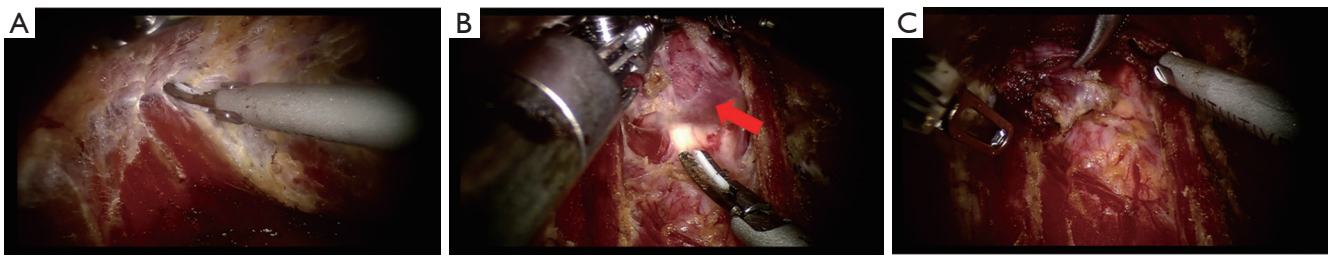

Figure 2 BABA-assisted robotic TGDC resection. (A) Separating muscles. (B) The thyroglossal duct cyst is at the arrow point. (C) Surgical area after thyroglossal duct cyst resection. BABA, bilateral axillo-breast approach; TGDC, thyroglossal duct cyst.

and the four skin incisions were close. The key steps of the operation were shown in *Figure 2*.

The total operative time was 67 minutes. The pathologic diagnosis of the mass was a cystic lesion of TGDC. The wounds healed without complications and the patient was discharged on the third day after the operation. The patient and her parents were satisfied with the postoperative cosmetic effect. After 15 months of follow-up, there was no evidence of recurrence.

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). The study was approved by the Institutional Review Board of the 960th Hospital of the Chinese People's Liberation Army (No. 2018028). Written informed consent was taken from the patient's guardians for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

Discussion

TGDC is the most common cause of neck swelling in children (1). The main clinical manifestations include anterior neck mass, neck pressure sensation, and movement of the mass upon tongue extension. Anatomically, the thyroglossal duct is a blind tube growing downward from the endoderm at the median line of the original pharyngeal base (2). Atresia of the thyroglossal duct always occurs at 6 weeks of embryonic development, if this does not occur, it can result in a congenital cyst due to incomplete degeneration. Following infection, it may progress to a thyroglossal fistula.

The Sistrunk operation is frequently recommended for the treatment of TGDC (6). It involves the resection of the middle portion of the hyoid bone and core of tongue muscle up to the foramen cecum. Nevertheless, there has been controversy over the necessity of routinely resecting the hyoid bone during TGDC surgery. Some studies have

proposed that preserving the hyoid bone during such procedures also can decrease the postoperative recurrence rate, while simultaneously limiting the surgical extent and minimizing complications (7). What's more, as a traditional surgical therapy, it inevitably leaves a 5–6 cm scar in the middle of the neck (7). Since TGDC commonly affects young patients, numerous studies have demonstrated that scarring in the neck draws increased attention from onlookers. This can have a profoundly negative impact on adolescents, as they may feel self-conscious or embarrassed about their appearance (8). Research has shown that neck scars can have a significant impact on adolescents, leading to decreased life satisfaction, negative body image, and an increased risk of post-traumatic stress disorder (9). Furthermore, children and adolescents have a higher risk of developing hypertrophic scars (10), with the peak incidence of keloids occurring between the ages of 10 to 30 years (11). Therefore, it is essential to consider the impact of neck scarring on the psychological development of young patients. Surgical methods that aim to avoid scarring hold significant implications for children and adolescents.

In order to prevent visible neck scarring, several endoscopic-assisted Sistrunk operations have been attempted and gradually implemented in clinical settings, utilizing approaches such as bilateral axillo-breast approach (12-14), oral vestibular approach (15,16), transoral approach with a frenotomy incision (17), and bilateral areolar approach (18). The endoscopic operation has the advantage of preventing neck scarring while ensuring a low recurrence rate (19). However, due to its 2D surgical field of view, limited range of motion, and challenges with eye-hand coordination, the learning curve for endoscopic operations can be steep for beginners, and operating in such a confined space can be challenging (20).

The robotic surgical system offers a magnified three-dimensional (3D) surgical view and flexible robotic instruments, and it can effectively reduce hand tremor (20,21). In recent years, with the advancement of remote access head and neck surgery, there has been a growing interest in exploring robotic-assisted Sistrunk operations using various external cervical approaches. The commonly utilized external cervical approaches for robot-assisted TGDC resection include the transoral approach (22,23), transoral approach using vestibular and sublingual incisions (24) and postauricular facelift approach (25). While all these approaches have been proven to be safe and feasible with excellent postoperative cosmesis, they each come with certain disadvantages. For instance, the transoral robotic surgery is exclusively suitable for lingual TGDC. In the case of the retroauricular approach, while the postauricular scar may be concealed by hair, some scars may heal with hypertrophy, thereby compromising the patient's privacy. The transoral vestibular approach with a sublingual incision may damage the structure of the floor of the mouth, leading to swallowing and speech difficulties, and carries a risk of mental nerve injury. Additionally, studies have shown that the transoral approach has a higher risk of infection (26). Furthermore, the retroauricular and transoral approaches have limited workspace, which can hinder instrument movement and increase surgical difficulty.

To the best of our knowledge, this is the first time that BABA was used in robotic TGDC resection in teenagers, and our study indicates that BABA-assisted robotic TGDC resection is also safe and feasible. We chose the BABA for the following reasons. Firstly, the BABA approach allows for the avoidance of scarring on the neck, thus providing a satisfactory postoperative cosmetic outcome. Secondly, it enables full exposure of the hyoid bone and removal of the residual cyst wall on its periosteal surface, thus reducing the recurrence rate. Thirdly, compared to other approaches, the BABA approach offers a symmetrically adequate surgical view similar to that of open surgery, making it easier for surgeons to perform robotic Sistrunk operations. Nevertheless, the BABA approach also has some limitations. For instance, the path from the incision to the surgical site is further, and the flap dissection range is larger compared to other approaches, resulting in greater surgical trauma. To further validate the safety and feasibility of this promising robotic approach, larger sample sizes and longer follow-up studies are required.

Conclusions

In conclusion, the BABA-assisted robotic Sistrunk operation may be effective, achieving excellent cosmetic outcomes and offering an alternative to traditional surgery, particularly for children and adolescent patients with TGDCs.

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Footnote

Reporting Checklist: The authors have completed the CARE

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://gs.amegroups.com/article/view/10.21037/gs-24-10/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). The study was approved by the Institutional Review Board of the 960th Hospital of the Chinese People's Liberation Army (No. 2018028). Written informed consent was taken from the patient's guardians for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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