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Title: "Sun's Seven-Step Technique" for Endoscopic En-Bloc Resection of Thyroid Cancer via the Chest-Breast Approach

Authors and Affiliations:

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Author Questionnaire

1. We have marked your project as author-provided footage, meaning you film the video yourself and provide JoVE with the footage to edit. JoVE will not send the videographer. Please confirm that this is correct.

✓ Correct

2. Microscopy: Does your protocol require the use of a dissecting or stereomicroscope for performing a complex dissection, microinjection technique, or something similar? **NO**

3. Software: Does the part of your protocol being filmed include step-by-step descriptions of software usage? **NO**

4. Proposed filming date: To help JoVE process and publish your video in a timely manner, please indicate the proposed date that your group will film here: **2/28/2026**

When you are ready to submit your video files, please contact our China Location Producer, [Yuan Yue](#).

Current Protocol Length

Number of Steps: 19

Number of Shots: 48

Introduction

INTRODUCTION:

~~What is the scope of your research? What questions are you trying to answer?~~

- 1.1. **Fenglong Zhang:** We focus on the application of endoscopic techniques in thyroid surgery to offer better surgical procedures and outcomes.
 - 1.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera

CONCLUSION:

~~What significant findings have you established in your field?~~

- 1.2. **Peng Sun:** In this study, we present the "Sun's Seven-Step Technique" for endoscopic en-bloc resection and demonstrate its superior efficiency compared to conventional resection methods.
 - 1.2.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera

~~What questions will future research focus on?~~

- 1.3. **Peng Sun:** We look forward to future studies with larger sample sizes, longer follow-up periods, and prospective designs.
 - 1.3.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera

Ethics Title Card

This research has been approved by the Human Research Ethics Committee at the Chaozhou Central Hospital

Protocol

NOTE: Timecodes are added as provided by authors. The writer has not reviewed the footage for regular (talent) shots"

2. Surgical Setup and Site Access

Demonstrators: Peng Sun, Fenglong Zhang

- 2.1. To begin, place the patient in a supine position on the operating bed with the lower limbs abducted by approximately 30 degrees [1]. Elevate the shoulders using padding to maintain cervical hyperextension [2]. After performing routine disinfection, apply surgical drapes to the area [3].
 - 2.1.1. WIDE: Talent adjusting the supine lying patient's position on the operating bed with legs abducted.
 - 2.1.2. Talent placing padding under the patient's shoulders to achieve cervical hyperextension.
 - 2.1.3. Talent and draping the surgical area.
- 2.2. Place the endoscope holder lateral to the patient's right leg and to the left of the surgeon [1] and instruct the second assistant to stand on either side of the patient [2].
 - 2.2.1. Talent placing the endoscope holder lateral to the patient's right leg and left of the surgeon.
 - 2.2.2. Second assistant taking position beside the patient.
- 2.3. Make a 12-millimeter incision at the 2 to 4 o'clock position of the right areola and then make bilateral 5-millimeter incisions at the 11 o'clock positions of both areolae [1]. Using a Veress needle, inject approximately 30 milliliters of normal saline with adrenaline at a 1 to 200 thousand concentration to distend the subcutaneous tissues [2]. Use a specially designed separation rod to create a subcutaneous tunnel extending to the suprasternal fossa [3].
 - 2.3.1. Talent making a 12-millimeter incision on the right areola between the 2 to 4 o'clock position. Talent making two 5-millimeter incisions at the 11 o'clock positions of both areolae.
 - 2.3.2. Talent injecting the solution using a Veress needle to distend subcutaneous tissues.
 - 2.3.3. Talent inserting and manipulating the separation rod to create the tunnel toward the suprasternal fossa.

- 2.4. Now, insert a 10-millimeter trocar through the previously made incision [1] and introduce a 10-millimeter, 30-degree endoscope [2]. Set the carbon dioxide gas pressure to 6 millimeters of mercury [3]. ~~and then make bilateral 5-millimeter incisions at the 11 o'clock positions of both areolae [4].~~ Under endoscopic visualization, insert a 5-millimeter trocar into each incision, designating the left areolar port as the dominant operating channel [4]. **NOTE: The VO is edited for the deleted shots**
- 2.4.1. Talent inserting a 10-millimeter trocar into the initial incision.
- 2.4.2. Talent introducing a 30-degree endoscope through the trocar.
- 2.4.3. Show settings on the insufflator being adjusted to 6 millimeters of mercury.
- ~~2.4.4. Talent making two 5-millimeter incisions at the 11 o'clock positions of both areolae.~~ **NOTE: Not filmed**
- 2.4.5. Talent inserting 5-millimeter trocars under endoscopic view and designating the left port as the dominant channel. V1 (00:53-01:00, 01:15-01:23)

3. Surgery: Sun's Seven-Step Technique

- 3.1. Expose the lower segments of the bilateral sternocleidomastoid muscles [1]. In the midline of the neck, separate and expose the sternohyoid muscle closely adhering to the deep layer [2]. Continue dissection upward along the surface of the sternohyoid muscle, then separate the sternocleidomastoid muscle, subcutaneous fat, and anterior cervical vein toward the upper part of the visual field to form the skin flap [3].
- 3.1.1. WIDE: Talent exposing the lower ends of both sternocleidomastoid muscles.
V1 (01:25-01:38, 02:08-02:26)
- 3.1.2. Talent separating and exposing the sternohyoid muscle in the neck's midline.
V1 (02:32-07:47)
- 3.1.3. Talent dissecting upward, then separating the sternocleidomastoid muscle. V1 (08:00-09:42) v2 (00:00-02:50)
- 3.1.4. subcutaneous fat, and anterior cervical vein to elevate the skin flap.
- 3.2. Extend the surgical field superiorly to the level of the thyroid cartilage [1] and laterally to the medial borders of the bilateral sternocleidomastoid muscles to complete delineation of the operative space [2].
- 3.2.1. Talent dissecting upwards toward the thyroid cartilage. V2(05:05-06:54)
- 3.2.2. Talent extending the dissection laterally to the inner edges of the

sternocleidomastoid muscles. V2 06:54-07:10,07:45-07:53)

- 3.3. Make an inferior-to-superior incision through the linea alba at the lower end of the surgical field to expose the thyroid gland [1]. Insert a number 7 silk suture percutaneously from the cervical skin surface to suspend the anterior cervical muscles and retract them laterally [2]. Further separate the anterior capsule of the thyroid gland [3].
 - 3.3.1. Talent making a vertical incision through the linea alba at the lower field to expose the thyroid. V2 (08:25-09:42) v3 (00:00-02:08)
 - 3.3.2. Talent inserting a number 7 silk suture through the skin and using it to laterally retract the anterior cervical muscles. V3(02:15-04:32)
 - 3.3.3. Talent separating the anterior capsule of the thyroid. V3(04:55-06:00)
- 3.4. Now, using a custom-designed Z-shaped long needle, inject 0.1 milliliter of lymphatic tracer into the thyroid gland [1]. Apply a gentle digital massage to distribute the tracer evenly, then wait for approximately 1 minute [2].
 - 3.4.1. Talent injecting 0.1 milliliter of lymphatic tracer into the thyroid using the Z-shaped long needle. V3(06:34-07:20)
 - 3.4.2. Talent gently massaging the thyroid area with fingers. V3 (07:36-08:00)
- 3.5. Continue lateral and deep dissection of the thyroid capsule to identify the common carotid artery, which marks the lateral boundary for central lymph node dissection [1].
 - 3.5.1. Talent dissecting laterally and deeply along the thyroid capsule until exposing the common carotid artery. V3 (08:04-09:42) V4 3.5.1(00:00-06:21)
- 3.6. Then, carefully divide the visceral fascia layer by layer along the medial border of the carotid sheath to isolate the initial segment of the recurrent laryngeal nerve located posterior to the carotid sheath [1].
 - 3.6.1. Talent delicately dividing the visceral fascia along the inner edge of the carotid sheath to reveal the recurrent laryngeal nerve. V4 3.6.1(06:21-06:35,07:10-07:19,08:32-08:38)
- 3.7. Continue dissection along the lateral thyroid capsule in an inferior direction, tracing the common carotid artery downward to expose the innominate artery [1]. Identify the lingual lobe of the thymus located anterior to the innominate artery [2]. ~~then trace the thymus to its distal extent to observe if any inferior parathyroid glands are present.~~
NOTE: The Vo is edited for the deleted shot

- 3.7.1. Talent dissecting inferiorly along the thyroid capsule, following the carotid artery to the innominate artery. V4 3.7.1(07:25-08:06)
- 3.7.2. Talent identifying the lingual lobe of the thymus anterior to the artery. V4 (08:39-09:28)
- ~~3.7.3. Talent tracing the thymus downward to expose the inferior parathyroid gland.~~
NOTE: Not filmed
- 3.8. After managing the inferior parathyroid gland, retract and dissect the pretracheal lymphatic-adipose tissue toward the affected side using the contralateral inferior thyroid vein as an anatomical landmark [1]. Continue dissection along the plane extending to the affected tracheoesophageal groove [2].
 - 3.8.1. Talent retracting and dissecting the pretracheal lymphatic-adipose tissue toward one side using the contralateral inferior thyroid vein as reference. V5 3.8.1(00:00-06:10), V6 (00:00-03:28)
 - 3.8.2. Talent continuing the dissection toward the tracheoesophageal groove on the affected side. V6 (04:10-09:42) V7 3.8.2 (00:00-03:45)
- 3.9. Enter the plane posterior to the recurrent laryngeal nerve between the nerve and trachea on the affected side [1]. Expose the prevertebral space and dissect the lymphatic-adipose tissue located behind the recurrent laryngeal nerve [2].
 - 3.9.1. Talent accessing the space between the recurrent laryngeal nerve and trachea. V7 (03:50-04:46,)
 - 3.9.2. Talent exposing the prevertebral space and dissecting the posterior lymphatic-adipose tissue. V7 (05:10-06:45)
- 3.10. Retract the posteromedial tissue of the recurrent laryngeal nerve anterolaterally [1]. Progressively expose the recurrent laryngeal nerve in the superior direction while dissecting the surrounding lymphatic-adipose tissue until the inferior thyroid pole is reached [2].
 - 3.10.1. Talent retracting posteromedial tissue anterolaterally to mobilize the recurrent laryngeal nerve. V7(06:50-07:30)
 - 3.10.2. Talent dissecting upward along the nerve to complete the central lymph node dissection. V8 (06:50-07:30)
- 3.11. Next, divide the isthmus anterior to the trachea near the contralateral side [1], then dissect in the superior direction to expose the cricothyroid muscle [2].

- 3.11.1. Talent dividing the thyroid isthmus in front of the trachea near the opposite side. V8 (01:41-04:08)
- 3.11.2. Talent dissecting upward to expose the cricothyroid muscle. V8 (05:29-06:29)
- 3.12. Resect the pyramidal lobe in the prelaryngeal region [1] and dissect the prelaryngeal lymph nodes [2].
 - 3.12.1. Talent resecting the pyramidal lobe from the area in front of the larynx. V8 (06:20-07:34)
 - 3.12.2. Talent dissecting prelaryngeal lymph nodes.
- 3.13. Retract the inferior thyroid pole and previously dissected central lymphoadipose tissue in the superior direction [1]. Place a dark protective strip anterior to the recurrent laryngeal nerve [2], then dissect along the recurrent laryngeal nerve tunnel superiorly until reaching its laryngeal entry point [3].
 - 3.13.1. Talent lifting the inferior thyroid pole and lymphoadipose tissue upward. V8 (07:55-09:42)
 - 3.13.2. Talent placing a dark strip to protect the recurrent laryngeal nerve. V9 (02:39-08:34)
 - 3.13.3. Talent dissecting along its path toward the laryngeal entry. V10 (01:57-06:46, 07:11-08:08)
- 3.14. At the laryngeal entry point of the recurrent laryngeal nerve, identify and preserve the superior parathyroid gland in situ on the posterior side of the thyroid gland [1]. Then, divide the superior pole vessels [2].
 - 3.14.1. Talent identifying and preserving the superior parathyroid gland at the laryngeal entry of the nerve. V11 (01:00-02:53, 04:23-04:40)
 - 3.14.2. Talent dividing vessels at the superior pole of the thyroid. V11 (05:20-07:19)
- 3.15. Next, remove the thyroid specimen from the surgical site [1]. Irrigate the field thoroughly [2] and insert a drainage tube into the thyroid fossa through the chest incision [3]. Maintain negative pressure drainage, then withdraw the trocars and surgical instruments [4]. Finally, suture and close the incisions to complete the operation [5-TXT].
 - 3.15.1. Talent extracting the thyroid lobe from the surgical cavity. V11 (07:38-08:32)
 - 3.15.2. Talent irrigating the area. V11 (03:10-06:44)
 - 3.15.3. Talent inserting a drainage tube via the chest incision. V14 (07:08-09:44), V15 (00:00-05:18)
 - 3.15.4. Talent removing the surgical instruments and trocars.

3.15.5. Talent suturing and closing the incisions to complete the procedure. **TXT: Offer post-operative care**

Results

4. Results

- 4.1. The operation time was significantly shorter in Group ER [1-TXT] than in Group CR [2].
 - 4.1.1. LAB MEDIA: Table 2. *Video editor: Highlight the row "Operation time (min)" under Group ER.* **TXT: ER: En-bloc Resection; CR: Conventional Resection**
 - 4.1.2. LAB MEDIA: Table 2. *Video editor: Highlight the row "Operation time (min)" under Group CR.*
- 4.2. No significant difference was observed in intraoperative blood loss, number of dissected lymph nodes, or number of metastatic lymph nodes between the groups ER and CR [1].
 - 4.2.1. LAB MEDIA: Table 2. *Video editor: Highlight the rows "Intraoperative blood loss", "number of dissected lymph nodes" and "number of metastatic lymph nodes between the groups"*
- 4.3. One case of transient recurrent laryngeal nerve palsy occurred in Group ER [1].
 - 4.3.1. LAB MEDIA: Table 2. *Video editor: Highlight the row "Temporal RLN palsy" and the value "1" under Group ER.*
- 4.4. No cases of hypoparathyroidism or recurrence were observed in either group [1].
 - 4.4.1. LAB MEDIA: Table 2. *Video editor: Highlight the row "Hypoparathyroidism" and "Recurrence" under both Group CR and Group ER.*

1. Supine

Pronunciation link: <https://www.merriam-webster.com/dictionary/supine>

IPA: /'suːpaɪn/

Phonetic Spelling: soo·pine

2. Abducted
Pronunciation link: <https://www.merriam-webster.com/dictionary/abducted>
IPA: /æb'dʌktɪd/
Phonetic Spelling: ab·duhk·tuhd
3. Cervical
Pronunciation link: <https://www.merriam-webster.com/dictionary/cervical>
IPA: /'sɜ:vɪkəl/
Phonetic Spelling: sur·vuh·kuhl
4. Hyperextension
Pronunciation link: <https://www.merriam-webster.com/dictionary/hyperextension>
IPA: /ˌhaɪpərɪk'stɛnfən/
Phonetic Spelling: hy·per·ik·sten·shuhn
5. Endoscope
Pronunciation link: <https://www.merriam-webster.com/dictionary/endoscope>
IPA: /'ɛndɒsˌkɒp/
Phonetic Spelling: en·doh·skohp
6. Incision
Pronunciation link: <https://www.merriam-webster.com/dictionary/incision>
IPA: /ɪn'sɪʒən/
Phonetic Spelling: in·sizh·uhn
7. Areola
Pronunciation link: <https://www.merriam-webster.com/dictionary/areola>
IPA: /ə'ri:ələ/
Phonetic Spelling: uh·ree·uh·luh
8. Bilateral
Pronunciation link: <https://www.merriam-webster.com/dictionary/bilateral>
IPA: /ˌbaɪ'lætərəl/
Phonetic Spelling: by·lat·uh·ruhl
9. Veress
Pronunciation link: No confirmed link found
IPA: /'vɛrɛs/
Phonetic Spelling: veh·res
10. Adrenaline
Pronunciation link: <https://www.merriam-webster.com/dictionary/adrenaline>
IPA: /ə'drɛnəlɪn/
Phonetic Spelling: uh·dreh·nuh·lin
11. Subcutaneous
Pronunciation link: <https://www.merriam-webster.com/dictionary/subcutaneous>
IPA: /ˌsʌbkju:'teɪniəs/

Phonetic Spelling: sub·kyoo·tay·nee·uhs

12. Suprasternal

Pronunciation link: No confirmed link found

IPA: /ˌsuːprəˈstɜːnəl/

Phonetic Spelling: soo·pruh·stur·nuhl

13. Trocar

Pronunciation link: <https://www.merriam-webster.com/dictionary/trocar>

IPA: /ˈtroʊˌkɑːr/

Phonetic Spelling: troh·kar

14. Endoscopic

Pronunciation link: <https://www.merriam-webster.com/dictionary/endoscopic>

IPA: /ˌɛndəˈskɑːpɪk/

Phonetic Spelling: en·doh·skah·pik

15. Sternocleidomastoid

Pronunciation link: <https://www.merriam-webster.com/dictionary/sternocleidomastoid>

IPA: /ˌstɜːnoʊˌklaɪdɒsˈmæstɔɪd/

Phonetic Spelling: stur·noh·kly·doh·mas·toyd

16. Sternohyoid

Pronunciation link: No confirmed link found

IPA: /ˌstɜːnoʊˈhaɪɔɪd/

Phonetic Spelling: stur·noh·hy·oyd

17. Dissection

Pronunciation link: <https://www.merriam-webster.com/dictionary/dissection>

IPA: /dɪˈsekʃən/

Phonetic Spelling: di·sek·shuhn

18. Thyroid

Pronunciation link: <https://www.merriam-webster.com/dictionary/thyroid>

IPA: /ˈθaɪˌrɔɪd/

Phonetic Spelling: thy·royd

19. Linea alba

Pronunciation link: No confirmed link found

IPA: /ˈlɪniəˈælbə/

Phonetic Spelling: li·nee·uh al·buh

20. Percutaneously

Pronunciation link: <https://www.merriam-webster.com/dictionary/percutaneously>

IPA: /ˌpɜːkjuːˈteɪniəsli/

Phonetic Spelling: per·kyoo·tay·nee·uhs·lee

21. Lymphatic

Pronunciation link: <https://www.merriam-webster.com/dictionary/lymphatic>

IPA: /lɪmˈfætɪk/

Phonetic Spelling: lim·fat·ik

22. Carotid

Pronunciation link: <https://www.merriam-webster.com/dictionary/carotid>

IPA: /kəˈrɑːtɪd/

Phonetic Spelling: kuh·rot·id

23. Visceral

Pronunciation link: <https://www.merriam-webster.com/dictionary/visceral>

IPA: /ˈvɪsərəl/

Phonetic Spelling: vis·uh·ruhl

24. Laryngeal

Pronunciation link: <https://www.merriam-webster.com/dictionary/laryngeal>

IPA: /ləˈrɪndʒiəl/

Phonetic Spelling: luh·rin·jee·uhl

25. Thymus

Pronunciation link: <https://www.merriam-webster.com/dictionary/thymus>

IPA: /ˈθaɪməs/

Phonetic Spelling: thy·muhs

26. Parathyroid

Pronunciation link: <https://www.merriam-webster.com/dictionary/parathyroid>

IPA: /ˌpærəˈθaɪrɔɪd/

Phonetic Spelling: par·uh·thy·royd

27. Pretracheal

Pronunciation link: No confirmed link found

IPA: /ˌpriːˈtreɪkiəl/

Phonetic Spelling: pree·tray·kee·uhl

28. Tracheoesophageal

Pronunciation link: No confirmed link found

IPA: /ˌtreɪki.oʊs.əˈfəːdʒiəl/

Phonetic Spelling: tray·kee·oh·uh·sof·uh·jee·uhl

29. Prevertebral

Pronunciation link: No confirmed link found

IPA: /ˌpriːˈvɜːtəbrəl/

Phonetic Spelling: pree·vur·tuh·bruhl

30. Cricothyroid

Pronunciation link: No confirmed link found

IPA: /ˌkraɪkoʊˈθaɪrɔɪd/

Phonetic Spelling: cry·koh·thy·royd

31. Pyramidal

Pronunciation link: <https://www.merriam-webster.com/dictionary/pyramidal>

IPA: /pəˈrɪmɪdəl/

Phonetic Spelling: puh·rim·uh·duhl

32. Prelaryngeal

Pronunciation link: No confirmed link found

IPA: /ˌpriːləˈrɪndʒiəl/

Phonetic Spelling: pree·luh·rin·jee·uhl

33. Lymphoadipose

Pronunciation link: No confirmed link found

IPA: /ˌlɪmfəʊˈædɪˌpoʊs/

Phonetic Spelling: lim·foh·ad·uh·pohs

34. Intraoperative

Pronunciation link: <https://www.merriam-webster.com/dictionary/intraoperative>

IPA: /ˌɪntrəˈɑːpərətɪv/

Phonetic Spelling: in·truh·op·uh·ruh·tiv

35. Metastatic

Pronunciation link: <https://www.merriam-webster.com/dictionary/metastatic>

IPA: /ˌmetəˈstætɪk/

Phonetic Spelling: meh·tuh·stat·ik

36. Hypoparathyroidism

Pronunciation link: <https://www.merriam-webster.com/dictionary/hypoparathyroidism>

IPA: /ˌhaɪpoʊˌpærəˈθaɪˌrɔɪˌdɪzəm/

Phonetic Spelling: hy·poh·par·uh·thy·roy·diz·uhm