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Title: CT-Guided Preoperative Localization of Pulmonary Nodules Using a Glucose Test and Tissue Adhesive

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. Interview statements: Which interview statement filming option is the most appropriate for your group? **Please select one.**

NOTE: Authors do not want any Introduction section

3. Proposed interview filming date: Please indicate the proposed date that your group will self-film interviews: NA

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

Current Protocol Length

Number of Steps: 08

Number of Shots: 16

Introduction

NOTE: Authors do not want any Introduction section

Ethics Title Card

This research has been approved by the Institutional Review Board (IRB) at the Zhongshan Hospital, Fudan University

Protocol

1. CT-Guided Localization of Pulmonary Nodules Using Alpha-Cyanoacrylate Adhesive

Demonstrator: Zhuoyang Fan

NOTE: Scripted from footage

- 1.1. To begin, position the patient in a prone position for nodule identification [1]. Use the biopsy grid and a surgical marker to identify and mark the optimal skin entry point [2-TXT].

1.1.1. LAB MEDIA: 2.1.MOV 00:00 – 00:05

1.1.2. LAB MEDIA: 2.1.MOV 00:06-00:18

TXT: Plan needle trajectory and depth based on baseline CT scan

- 1.2. After disinfecting the operative field with iodophor, apply sterile drapes to the surgical field [1].

1.2.1. LAB MEDIA: 2.2-1.MOV 00:00 – 00:15

- 1.3. Infiltrate local anesthesia using 2 percent lidocaine from the skin to the parietal pleura [1]. With a sterile vascular clamp, create a central perforation in a disposable dressing bowl [2].

1.3.1. LAB MEDIA: 2.3-1.MOV 00:00 – 00:15

1.3.2. LAB MEDIA: 2.2-3.MOV 00:13 – 00:20, 00:23-00:26

- 1.4. Invert and position the bowl over the operative site [1], then secure it to the drapes with a vascular clamp [2]. Align the puncture needle through the bowl perforation so that it lightly contacts the marked entry point [3].

1.4.1. LAB MEDIA: 2.3-1.MOV 00:16-00:20

1.4.2. LAB MEDIA: 2.3-1.MOV 00:21-00:27

1.4.3. LAB MEDIA: 2.3-1.MOV 00:29-00:43

- 1.5. Next, advance the 22 gauge Chiba needle along the planned trajectory [1]. Shift the entire secured system, including the drapes and bowl to adjust the needle angle or direction [2-TXT].

- 1.5.1. LAB MEDIA: 2.3-3.MOV 00:00 – 00:13
- 1.5.2. LAB MEDIA: 2.3-1.MOV 00:44-00:54
TXT: If pleural re-entry is required, complete it swiftly to reduce risk of pneumothorax
- 1.6. Perform intermittent CT scans 2 centimeters from the target after each 1 to 2 centimeter advancement [1-TXT].
 - 1.6.1. LAB MEDIA: 2.3-2.MOV 00:00 – 00:10
TXT: Stop advancement at 5 - 10 mm from pleural surface; readjust needle position if necessary
- 1.7. Inject 0.3 milliliters of 5 percent glucose solution slowly at a rate of 0.05 milliliters per second [1]. Then inject 0.3 to 0.5 milliliters of alpha cyanoacrylate medical adhesive [2]. After 3 seconds, withdraw the needle [3-TXT].
 - 1.7.1. LAB MEDIA: 2.4&2.5. MOV 00:00 – 00:11
 - 1.7.2. LAB MEDIA: 2.4&2.5.MOV 00:12 – 00:17
 - 1.7.3. LAB MEDIA: 2.4&2.5.MOV 00:18-00:22
TXT: Assess patient for pain, headache and cough
- 1.8. Perform a confirmatory CT scan immediately after injection [1]. Verify the presence of a spherical or flake shaped hyperdense marker adjacent to the nodule [2-TXT].
 - 1.8.1. LAB MEDIA: 2.6.MOV 00:00 – 00:07
 - 1.8.2. LAB MEDIA: 2.6.MOV 00:08-00:15
TXT: If pneumothorax is seen, repeat scanning after 5 min to assess progression

Results

2. Results

- 2.1. Localization of a peripherally located pulmonary lesion by targeting its medial aspect resulted in close spatial correspondence between the tumor nodule [1] and the deposited medical adhesive [2].

2.1.1. LAB MEDIA: Figure 1. *Video editor: Highlight the area indicated by the red arrow*

2.1.2. LAB MEDIA: Figure 1 and 2. *Video editor: Highlight the area indicated by the blue arrow in Figure 1 and then show Figure 2*

- 2.2. Localization of a peripherally located pulmonary lesion by targeting its lateral aspect demonstrated adhesive deposition adjacent to the tumor margin [1] with clear separation between the tumor tissue [2].

2.2.1. LAB MEDIA: Figure 3. *Video editor: Highlight the region outlined by the red circle*

2.2.2. LAB MEDIA: Figure 3 and 4 . *Video editor: Highlight the region outlined by the blue circle in Figure 3 and then show Figure 4*

1. Prone

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

IPA: /proʊn/

Phonetic Spelling: prohn

2. Nodule

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

IPA: /'nɑːdʒuːl/

Phonetic Spelling: naa·jool

3. Biopsy

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

IPA: /'baɪ,ɑːp.si/

Phonetic Spelling: bye·op·see

4. Trajectory

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

IPA: /trə'dʒek.tə.i/

Phonetic Spelling: truh·jek·tuh·ree

5. Computed Tomography

Pronunciation link: <https://www.merriam->

[webster.com/dictionary/computed%20tomography](https://www.merriam-webster.com/dictionary/computed%20tomography)

IPA: /kəm'pjʊːtɪd tə'mɑːgrəfi/

Phonetic Spelling: kuhm·pyoo·tuhd tuh·maa·gruh·fee

6. Iodophor

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

IPA: /'aɪ.ouˌdɑː.fəːr/

Phonetic Spelling: eye·oh·daaf·or

7. Parietal Pleura

Pronunciation link: <https://www.merriam-webster.com/dictionary/parietal%20pleura>

IPA: /pə'raɪ.ə.təl 'plʊr.ə/

Phonetic Spelling: puh·rye·uh·tuhl ploor·uh

8. Lidocaine

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

IPA: /'lɪd.əˌkeɪn/

Phonetic Spelling: lid·uh·kayn

9. Vascular

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

IPA: /'væs.kjə.lə/

Phonetic Spelling: vas·kyuh·ler

10. Perforation

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

IPA: /ˌpɜː.ɪ.fə'reɪ.ʃən/

Phonetic Spelling: pur·fuh·ray·shuhn

11. Chiba

Pronunciation link: <https://www.howtopronounce.com/chiba>

IPA: /'tʃiː.bə/

Phonetic Spelling: chee·buh

12. Pneumothorax

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

IPA: /ˌnuː.mou'θɔːræks/

Phonetic Spelling: noo·moh·thor·aks

13. Glucose

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

IPA: /'gluː.koʊs/

Phonetic Spelling: gloo·kohs

14. Cyanoacrylate

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

IPA: /saɪˌæn.oʊ'æk.rə.lert/

Phonetic Spelling: sigh·an·oh·ak·ruh·layt

15. Hyperdense

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

IPA: /ˌhaɪ.pə'dens/

Phonetic Spelling: high·per·dens

16. Peripherally

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

IPA: /pəˈrɪf.ə.ə.li/

Phonetic Spelling: puh·rif·er·uh·lee

17. Pulmonary

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

IPA: /ˈpʊl.məˌner.i/

Phonetic Spelling: pool·muh·nair·ee

18. Adhesive

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

IPA: /ədˈhiː.sɪv/

Phonetic Spelling: ad·hee·siv