ACCESS ROUTES TO THE MEDIASTINUM FOR PERCUTANEOUS THORACIC BIOPSIES: PROTECTIVE CAPNOTHORAX AND MEDIASTINAL WIDENING

Thoracic Procedures and Interventions
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Learning Objectives & Outcomes

• Indications for protective capnothorax and hydrodissection assisted mediastinal widening for the access of difficult mediastinal and paramediastinal lung lesions.

• How to safely induce capnothorax and perform hydrodissection to access the mediastinum without traversing lung.

• Limitations, safety considerations and post procedural care of capnothorax and hydrodissection.
Indications for Capnothorax and Hydrodissection

• Challenging mediastinal and paramediastinal lesions
• Desire to avoid traversing lung due to increased risk of uncontrolled pneumothorax, prolonged air leak or co existent morbidity
CAPNOTHORAX FOR MEDIADSTINAL/PARAMEDIADSTINAL LESIONS
64 year old male

A) Target lesion: an enlarging right lower lobe pulmonary nodule in patient with previously treated DLBCL.

B) Continuous infusion of carbon dioxide at 2000cc/minute via 19G coaxial needle and three way tap allows creation of a capnothorax.

C) 18G Core biopsy instrument aided biopsy of a right lower lobe pulmonary nodule via a second entry point without traversing lung in patient with DLBCL.

D) Spontaneous resolution of the capnothorax post biopsy can be assisted by suction.

Core biopsy results showed organizing acute lung injury and focal parenchymal necrosis, no malignancy. CT Chest 3 months later showed decreasing nodule size in the context of likely granulomatous disease.
64 year old man with RUQ pain

A) Right hemidiaphragm soft tissue thickening identified on CT abdo/pelvis scan. No other abnormality on dedicated Chest CT.

B) Capnothorax induced by hand injection of 300cc carbon dioxide titrated into the right pleural cavity.

C) 18G core biopsy taken without traversing lung.

D) Rapid resorption of the residual capnothorax.

Core biopsy results showed diaphragmatic pseudotumor.
63 year old female with history of treated lung cancer. Enlarging LLL mass.

A & B. While easily visualized with IV contrast, the lesion is difficult to distinguish from aorta without.

C & D. 30cc carbon dioxide hand injected via 22G spinal needle to delineate descending aorta.

E. Lesion seen clearly separate to descending aorta. Core samples taken with 18G needle

Core biopsy shows poorly differentiated non small cell carcinoma.
Self limiting small volume iatrogenic left capnothorax

1 hour post procedure

2 hours post procedure
48 year old female. Mediastinal mass detected on cardiac CT

A. 10cm x 19G coaxial needle advanced into the left pleural space via left paramediastinal approach with induction of iatrogenic capnothorax by hand injection of 30cc carbon dioxide.

B. 18G core biopsy needle introduced via a second entry point (same local anaesthesia site).

C. Single core sample taken of the left mediastinal mass without traversing lung.

D. Capnothorax reversed with hand aspiration of carbon dioxide.

Core biopsy results showed thymoma, WHO type AB
HYDRODISSECTION FOR MEDIASTINAL/PARAMEDIASTINAL LESIONS
Anterior approach hydro dissection with 1:7 contrast saline mix avoiding lung and risk of pneumothorax

A. 80 y.o male with lung adenocarcinoma metastasis
B. 68 y.o female with carcinoid tumor

Posterior approach hydro dissection to create mediastinal “window” avoiding lung and risk of pneumothorax

C. 63 y.o male with B cell lymphoma
D. 52 y.o female with carcinoid tumor
46 year old male
Previously resected thymoma 10 years prior
Increasing aorto pulmonary soft tissue on follow up imaging
Hydrodissection with 1:7 contrast: saline mix infiltrated via anterior paramediastinal approach to widen the anterior mediastinum.

Core biopsy result - Thymoma, WHO type B2 with adipose tissue invasion.
45 year old female
Hx of neurofibromatosis
Previous resection of left buttock benign nerve sheath tumour
Enlarging pulmonary nodules
Left hilar soft tissue mass - previous biopsy non diagnostic
Challenging access due to oblique fissure anterior and left inferior pulmonary vein posteriorly
Which approach?
A. 17G coaxial needle introduced via left anterior approach

B. Introduction of 1:7 contrast: saline solution to widen the left epiphrenic fat and left pleural space

C. Coaxial needle advanced along the left cardiac border with continued hydrodissection of the tract lifting the lesion away from the heart.

D. Biopsy taken with 18G inner needle as initial 20G fine needle aspirates were non diagnostic

Core biopsy result – Metastatic low grade fibromyxoid sarcoma
Safety Considerations & Post Procedural Care

Pre procedural
Planning of access route
Consideration of comorbid conditions
Platelet and INR count
Withhold anticoagulants 7/7, antiplatelets for 5/7

Intra-procedural
Maximum carbon dioxide
  Infusion
  Hand injection
Continuous intraprocedural blood pressure and oxygen saturation monitoring
Judicious use of IV benzodiazepine(midazolam 1mg) and IV opioid (fentanyl 50mcg)

Post- procedural
Consider immediate low dose (10-20mA) CT Chest
Age <70, 1 hour post procedure portable AP chest radiograph
Age >70, 1 & 2 hour post procedure portable AP chest radiographs
Monitoring in a dedicated interventional radiology unit with specialist nursing care
References/Suggested Readings


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