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Mediastinal Teratoma Diagnosed Via Ultrasound Guided Biopsy

Clinical History:

A 21 year old female presented with incidental findings of complex anterior mediastinal mass. This patient was otherwise healthy, without contributory medical, surgical, family or social history. CT imaging identified a right paracardiac mediastinal mass with components of variable attenuation, including fluid, soft tissue and fat components. Mediastinal mature teratoma was suspected. Cystic or necrotic neoplasms, as well as immature teratoma, required exclusion [1].

While visible on CT, and accessible for CT guided biopsy, ultrasound was chosen as the imaging modality for guidance of percutaneous biopsy of this lesion. This is discussed in depth below. A parasternal approach was chosen as the safest and most direct path. A phased array P6-3 transducer with the ATL HDI 5000 system was used. Free hand technique was utilized, with real time visualization throughout administration of local anesthetic, needle advancement and tissue acquisition. The procedure was uncomplicated and well tolerated, yielding diagnostic histologic results.
Figures:

Figures 1a/b: Non-contrast and contrast enhanced axial CT images of the chest demonstrating anterior mediastinal mass. Discrete components of various attenuation are identified, including soft tissue, fluid and fat.

Figure 1c: Non-contrast axial CT through lower aspect of right anterior mediastinal mass.
Figure 2a: Transverse right parasternal ultrasound image depicts cystic and solid components.
Figure 2b: Transverse right parasternal doppler ultrasound image demonstrates adjacent cardiac activity. No vascular structures are identified within the biopsy trajectory.

Figure 3a: Ultrasound image during biopsy targeted at solid component.

Figure 3b: Image during aspiration of cystic component.
Figure 4: Post biopsy AP radiograph, confirming lack of pneumothorax.

**Diagnosis:** Mature Teratoma

**Discussion:**

Percutaneous biopsy with image guidance is often a critical component of a patient’s workup when a mediastinal mass is identified. Numerous factors contribute to choosing the optimal biopsy tactic for each individual patient situation. While this case would have been technically feasible with CT guidance, it perfectly illustrates the many advantages of ultrasound guidance.

While all factors are considered with the goal of optimal patient care, several factors are directly related to patient experience. Ultrasound guidance allows for increased flexibility in patient position. This is a particularly useful feature when patients are limited in mobility or restricted in position due to dyspnea [2,3]. In our experience, conscious sedation is less frequently necessary for procedures performed with ultrasound rather than CT guidance. Subsequently, all other factors being equal, a shorter post procedure monitoring period may be used, given no need to recover from sedation. The use of ultrasound also provides a safety advantage over CT, by avoiding patient exposure to ionizing radiation. Specifically in our case, a young female would have required a
significant dose of radiation to her chest and overlying breasts, in order to obtain tissue from each distinct component of the mediastinal mass with CT guidance.

Additional features of ultrasound guidance can potentially result in a technically simpler, safer and more diagnostic procedure. Real time ultrasound guidance allows for constant needle visualization and each biopsy pass to be accomplished in a single breath hold. Oblique needle trajectories, particularly in semi-coronal pathways, can be chosen with ultrasound guidance. Doppler ultrasound use allows for rapid identification of adjacent vascular structures. While often these vessels are obvious on non-contrast CT, occasionally contrast is required to definitively exclude vessels within the biopsy path. Doppler evaluation of the targeted mass lesion can also assist in identifying the most diagnostic tissue components. Perfusion can be documented with the use of Doppler ultrasound, and thus biopsy of necrotic tissue avoided [2,3]. Other adjacent structures to be avoided are also easily recognized by ultrasound, such as lung. Preprocedure imaging can be performed to choose a trajectory which avoids lung by confirming no lung in the anticipated biopsy path at both end inspiration and end expiration. With a cooperative patient, pathways can be chosen to accomplish the biopsy during a single breath hold if the target can only be reached safely at a particular moment during the breath cycle.

In our patient’s scenario, real time visualization allowed for rapid sampling of each discrete tissue component. Individually, each component would have been histologically insufficient, but in combination, and in conjunction with radiologist confidence of each sample having been acquired from within the mass, the correct diagnosis was reached.

Clearly, compared to CT, ultrasound is the more cost-effective and often more readily available modality for image guidance. While fusion technology is available to utilize the benefits of both modalities, often real time ultrasound guidance is sufficient.

There are scenarios in which ultrasound guidance for an anterior mediastinal mass would be suboptimal. While subxiphoid, suprasternal and parasternal approaches allow for multiple pathways to a target lesion, obviously the target lesion must be well visualized [9]. Intervening air or bone precludes visualization by ultrasound, but not by CT. Free hand technique is necessary, as the chest wall anatomy precludes the use of attached needle guides. Ultimately, there needs to be complete confidence in the sonographic visualization of the lesion and the necessary technical skills to obtain a free hand biopsy.

In conclusion, our patient received a diagnostic biopsy of an anterior mediastinal mass with ultrasound guidance, while many such cases are often performed with CT guidance. Given the many potential advantages of ultrasound guidance, discussed above, we advocate for consideration of ultrasound as the guidance modality of choice whenever clinically feasible.

References:


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