ACE Anesthesiology Continuing Education

ACE Question

Increasing which of the following is MOST likely to improve the axial resolution of a transesophageal echocardiogram?

- ☐ (A) Depth
- ☐ (B) Wavelength
- ☐ (C) Frequency

Ultrasound waves are characterized by their frequency (f) and wavelength (λ). These variables have significant impact on the depth of penetration and image resolution. The product of these variables is the velocity (v) of the ultrasound signal. Frequency and wavelength are inversely related:

$$v = f \times \lambda$$

Spatial resolution lends detail to an ultrasound image and has three geometric components: axial, lateral, and elevational resolution (Figure). *Axial*, or *linear*, resolution is the shortest distance along the ultrasound beam that two objects can separately reflect the ultrasound signal. In other words, axial resolution is parallel to the ultrasound beam. Since axial resolution is limited to one wavelength, shorter wavelengths (and thus higher frequencies) will have better axial resolution. Therefore, increasing the frequency will improve the axial resolution of a transesophageal echocardiogram.

Increasing the depth of an image will decrease the pulse repetition frequency and worsen the axial resolution. Increasing the wavelength will in turn decrease the frequency of the signal and worsen axial resolution. ■

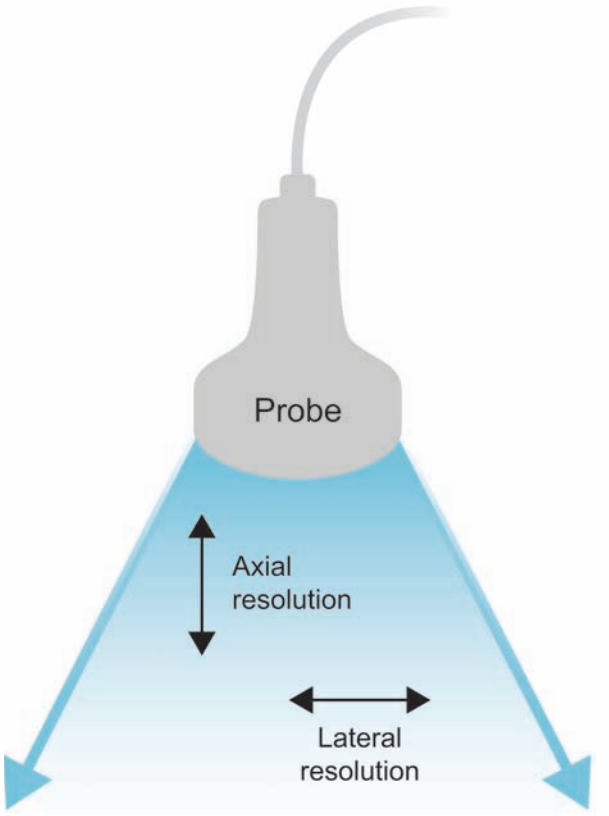

Figure: Components of Spatial Resolution
© 2019 American Society of Anesthesiologists.

Bibliography:

1. Perrino AC Jr, Reeves ST, eds. *A Practical Approach to Transesophageal Echocardiography*. 3rd ed. Philadelphia, PA: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2014:1-19.
2. Sidebotham D, Merry AF, Legget ME, Edwards ML, eds. *Practical Perioperative Transesophageal Echocardiography with Critical Care Echocardiography*. 2nd ed. Philadelphia, PA: Elsevier Saunders; 2011:2-20.

Answer: C

Anesthesiology Continuing Education (ACE) is a self-study CME program that covers established medical knowledge in the field of anesthesiology. ACE can help fulfill the CME requirements of MOCA®. To learn more and to subscribe, visit asahq.org/ace.

For More Information

Need to refer to past articles of the *ASA Monitor*? Want to share an article with a colleague? Be sure to visit us online at **asamonitor.org** for additional resources.

The ASA Community is your hub for conversation, connection, and collaboration. Find your voice **community.asahq.org**

ASA + YOUR COMMUNITY

Tap into the collective experience and expertise of 50K+ ASA members. Join the conversation, share your knowledge and insights, and make valuable connections for you and your practice.

Peer-to-peer collaboration, 24/7. Just one of your member benefits.

American Society of Anesthesiologists | ASA® Community

20-125

Downloaded from http://asa2.silverchair.com/monitor/article-pdf/85/9/18/1837/20210900.0-00009.pdf by guest on 20 April 2024