More Publicity for Ultrasound: an Agar Model for Introducing the Technique

Introduction

Sonography is a widely accepted first-line method of examining the body. We introduced sonography to children in our hospital during a public event. For this purpose an agar model was created that contained different objects.

Case

The ultrasound model consisted of an eleven-liter plastic box (**Fig. 1**) containing several objects and filled with agar. The holes in the side walls of the box were closed with an adhesive. The agar components of 30 g peptone from casein, 30 g sodium chloride, 15 g yeast extract, and 45 g Agar (all chemicals obtained from Merck, Darmstadt, Germany) were stirred in 3 liters of boiling water. After the mixture had cooled down to 80 °C, we poured five equally high agar layers in the box while avoiding air bubbles.

We put the following randomly selected objects on the first agar layer: an apple, a walnut, a rubber ball, a lime, a plastic mouse, a plastic spoon, a water-filled syringe and a pretzel. The items were covered by four additional agar layers. The objects were no longer visible (**Fig. 2**). The Sequoia ultrasound system (Siemens, Erlangen, Germany) with a 6 MHz curved array transducer was provided for the examination. Before presenting the model to the public, three radiologists tested it to determine whether the objects in the agar could be detected and identified by sonography. As part of a public hospital event the ultrasound-model was demonstrated in a children's program. 40 children in groups of five were introduced to the ultrasound device and the ultrasound technique. The children then examined the items in the plastic box with the assistance of a radiologist. The three examiners and the children were blinded with respect to the quantity and type of items in the box.

The three radiologists and the groups of children detected and correctly named the apple and the rubber ball (**Fig. 3, 4**). The plastic mouse, the lime, the walnut and the water-filled syringe were also found, but their identification was impossible. The pretzel and the plastic spoon were not detected.

Discussion

The use of agar as an ultrasound material has already been reported by some authors (Zell Ket al. Phys Med Biol 2007; 52: 475 – 484; Patel AS et al. Australas Radiol 1996; 40: 185 – 186). Our case report is the first one focusing on the acceptability and practical use of agar as a learning model for both medically educated and uneducated users. Both groups were able to detect and identify objects in our model. Detection was possible for 6/8 objects, while identification was possible for only 2/8. The plastic spoon might have been too flat to be detected. The pretzel was broken during the preparation of the ultrasound model. Its disfigured shape and air content may have made detection impossible. In our case object selection turned out to be the most important factor for successful demonstration of the ultrasound technique.

Agar has acoustic properties equal to those of human tissue in contrast to other materials offered by the industry (Zell K et al. Phys Med Biol 2007; 52: 475 – 484). The cost of the ultrasound model was very low at 10 €s. Preparation took 6 hours. This inexpensive model can be used as a teaching object according the new section “Virtuelle Sonogaphie” issued by DEGUM. Other authors mentioned that self-built models provide a low-cost medium for learning to biopsy (Harvey JA et al. Acad Radiol 1997; 4: 565 – 569). We focused on the didactical side of the model which was accepted by both groups. Practical use can be expanded to test physical qualities of ultrasound such as diffraction and reflectance on interfaces and different degrees of pe-

Fig. 1 Plastic box with different objects after casting in the first layer of agar: rubber ball, pretzel, walnut, plastic spoon, apple, syringe, plastic mouse, lime.

Abb. 1 Plastikbox mit unterschiedlichen Objekten nach Fertigstellung der ersten Lage Agar: Gummiball, Brezel, Walnuss, Plastiklöffel, Apfel, Spritze, Plastikmaus, Limone.

Fig. 2 Plastic box was filled with agar. After hardening of the last layer, the objects were no longer visible.

Abb. 2 Die Plastikbox wurde mit Agar aufgefüllt. Nach dem Aushärten der letzten Schicht sind keine Objekte mehr erkennbar.

Fig. 3 Visualization of an apple in the plastic box filled with agar.

Abb. 3 Darstellung eines Apfels in der Plastikbox, die mit Agar aufgefüllt ist.

Fig. 4 Visualization of a rubber ball in the plastic box filled with agar.

Abb. 4 Darstellung eines Gummiballs in der Plastikbox, die mit Agar aufgefüllt ist.

netration of transducers. A disadvantage of agar is the limited durability of one day at room temperature or up to 6 months in refrigerated ambient conditions.

Conclusions

Agar is an adequate and low-cost substance that is appropriate for public demonstrations of the ultrasound technique. Both medically educated and uneducated users can learn about ultrasound with this vivid model.

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