

How to Make a Cheap and Simple Prostate Phantom

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Transrectal ultrasound-guided biopsy of the prostate is the most common ultrasound-guided procedure performed by urologists, with more than 20,000 procedures performed per year.¹ Learning how to perform the procedure often involves commercially available prostate biopsy phantoms. These phantoms range in price from £200 to £2000 (approximately \$295–\$2950), and not all allow biopsies to be taken. A prostate phantom that is inexpensive and easy to produce but gives an accurate sonographic appearance of the prostate and surrounding soft tissue would be an asset to training. We have developed such a phantom. It is made using basic ingredients that are widely available at any large supermarket, and the steps to follow are described below (Appendix).

A soft tissue imitating mixture was adapted from that devised by Fornage.² By investigation, it was found that a combination of cooked beets and corned beef gave the best sonographic appearance of a prostate, both showing the zonal anatomy and being of an appropriate size (Figures 1 and 2). The corned beef could be replaced by more gelatin mixture, but this would not provide as clear a sonographic appearance, and the corned beef part of the “prostate” gives more information when the biopsy is taken. The phantom is best stored refrigerated and can be kept for approximately 2 weeks.

There are many potential applications for this prostate phantom. The model can be used to practice measuring prostate volume. It can also be used to practice taking prostate biopsies. Biopsying the prostate is an invasive and often painful procedure. An inexpensive model that could be used by trainees to hone their technique of local anesthetic infiltration and subsequent biopsy would aid learning and improve the experience of patients.

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Appendix 1: Recipe for Making the Prostate Phantom

Ingredients

- 140 g of gelatin
- 100 g of cornstarch (corn flower)
- Generous splash of olive oil
- 2 containers, approximately 1 L in volume and at least 7 cm in depth with straight sides (not circular)
- 2 cooked beets (not pickled); these can be purchased precooked or boiled for 20 minutes
- 1 small tin of corned beef
- 1.5 L of water
- Other utensils: kettle, measuring cup, teaspoon, knife, fork, egg whisk

- Step 1. Add 450 mL of boiling water to 140 g of gelatin and stir until all of the gelatin has dissolved.
- Step 2. Add 900 mL of cold water to the solution and stir thoroughly.
- Step 3. Mix together 150 mL of the resulting mixture and 100 g of cornstarch. This needs to be stirred thoroughly with a fork or an egg whisk to ensure that it is completely mixed.
- Step 4. Pour this back into the original mixture and stir well.
- Step 5. Use the olive oil to grease the inside of your chosen containers. Each container should be able to hold approximately 1 L and must be square or rectangular. It should not be circular.
- Step 6. Pour half of the now opaque mixture into each container and place in the refrigerator.
- Step 7. After 15 minutes, stir the mixture to prevent the cornstarch from settling and creating layers. Replace in the refrigerator.
- Step 8. While the mixture is setting, prepare the 2 prostate phantoms. Cut the top off of a cooked beet and hollow out the center with a teaspoon.
- Step 9. Heat the corned beef in a microwave oven to soften it.
- Step 10. Tightly pack the now warm corned beef into the beet.
- Step 11. After a further 30 minutes of refrigeration time, remove the gelatin-filled container from the refrigerator. It should be beginning to set and have a firm crust of about 1 cm at the top. Carefully make a slit in the middle of the surface and insert the beet. It is best to insert it with the open "top" of the beet first so that when it comes to the biopsy procedure, different "zones" are appreciated. Try to position it at the middle of 1 side of the container. More than 1 beet can be inserted in each container with practice.
- Step 12. Return the container to the refrigerator and leave overnight.
- Step 13. The biopsy model is best transported within its container. When required, the container can be inverted onto a suitable surface such as a cutting board and the model removed.

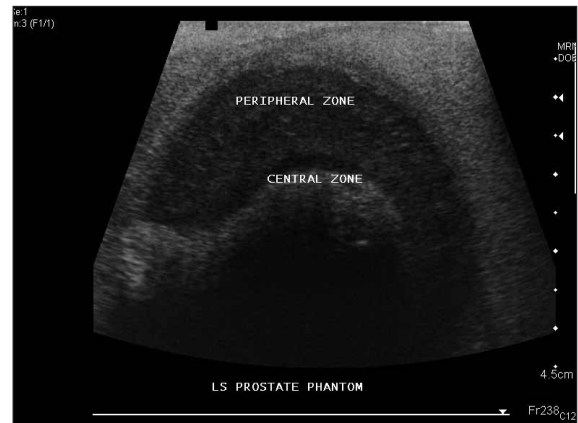


Figure 1. Sonogram of the prostate phantom showing different acoustic properties between the peripheral and central zones.

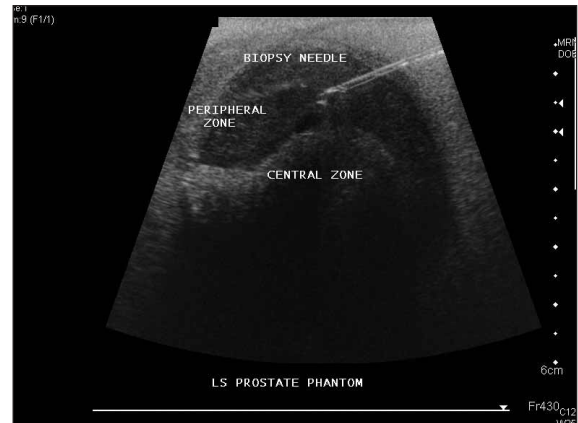


Figure 2. Sonogram of a biopsy needle in the phantom.

References

1. National Health Service Information Center. Hospital Episode Statistics Online website. <http://www.hesonline.nhs.uk>.
2. Fornage BD. A simple phantom for training in ultrasound-guided needle biopsy using the freehand technique. *J Ultrasound Med* 1989; 8:701–703.