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LOW-COST HOME-MADE MODELS FOR REAL-TIME ULTRASOUND-GUIDED KIDNEY BIOPSY AND DIALYSIS CATHETER INSERTION

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Introduction:

There is a need for cost-effective, anatomically accurate models that replicate clinical situations, allowing young nephrologists to practice interventional nephrology.

Methods:

We constructed a model for renal biopsy and another one for dialysis catheter insertions.

For the renal biopsy model, we got **sheep kidneys** (1 kidney = 1 USD) as they were similar in shape and ultrasound appearance to human kidneys. For the media, we used **commercial gelatin** that is used in desserts (1kg = 3 USD). If you have a large plastic box (1 box = 1 USD), you can put more than one kidney in it. *Gelatin should be preserved in the refrigerator and be taken out just before the training.*

Steps For Making Home-made Kidney Biopsy Models

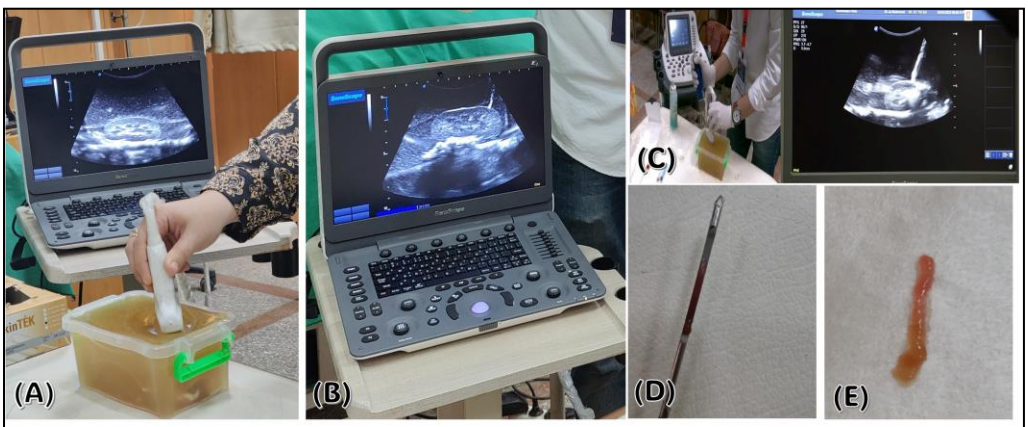
1. Mix gelatin with water (3.5 cups of warm water for each cup of gelatin).
2. Stir gelatin with a spoon or hand blender for 20-30 minutes till most solid particles are dissolved.
3. While gelatin in liquid state, pour 1st layer to a height of 3-4 cm into a plastic box.
4. Put the sheep kidney over this layer and leave it in the freezer for 30 minutes to stick in this depth of gelatin.
5. Pour the liquid gelatin, stopping 1-2 cm below the height of the plastic box. Ideally, ensure the upper surface of the kidney is approximately 5 cm below the gelatin surface to simulate the real kidney depth.
6. Leave the gelatin in the refrigerator overnight (can be used before that).

For the dialysis catheter insertion, we used the same steps for gelatin. Instead of the kidney, we used Foley urinary catheter after emptying the air and filling it with strawberry juice.

Results:

We organized a hands-on workshop for training young nephrologists in April 2023. More than 35 nephrologists were able to experience ultrasound-guided kidney biopsy.

The ultrasonic image and the obtained kidney cores were similar to real-life practice**.** The feedback was highly encouraging.



Pictures From Our Model In The Workshop.
(A) Sonographic appearance of the kidney model resembles real-life practice.
(B),(C) the needle appearance on the ultrasound in real-time practice.
(D),(E) The obtained kidney core on a biopsy needle and after extraction.

Frequent friction and heavy pressure by ultrasound probe can cause fissures in the top surface of Gelatin, but this usually happens after more than 15 trials so be ready with more than one box.

Conclusion:

These home-made models carry the advantage of being **cheap** (cost less than $5), **easy to make**, **and practical**. The lack of air in the gelatin media makes it ultrasound-friendly. Moreover, the real sensation of slight resistance once you reach the renal capsule may not be achieved by the models that use gelatin-made kidneys.