PD CATHETER/KIDNEY BIOPSY MODEL
Instructions for Use
HemoCleanse, Inc.
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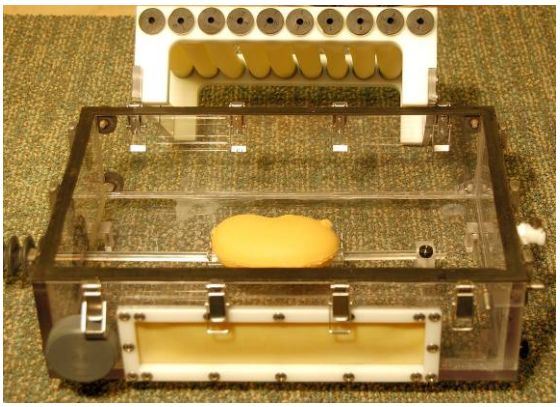
OVERVIEW

The PD Catheter/Kidney Biopsy Model is designed to give physicians experience with the mechanical steps of placing chronic tunneled peritoneal dialysis catheters by peritoneoscopy, fluoroscopy, or blind techniques. The model provides a simulation of the physical characteristics of the abdominal wall including the anterior and posterior rectus sheath, subcutaneous tissue and skin. The "two pop" feel as a needle or trocar pass through the rectus muscle is replicated well by the model. The model allows ultrasound imaging of the abdominal wall and abdomen and provides a video camera image from below to simulate a fluoroscopic picture of a patient's abdomen. A second video camera and adaptor is provided to attach to a peritoneoscope to give a videolaparoscopic view of the inside of the abdomen. Practice with the model does not provide sufficient experience to perform procedures on patients but it does give familiarity with the steps and equipment needed.

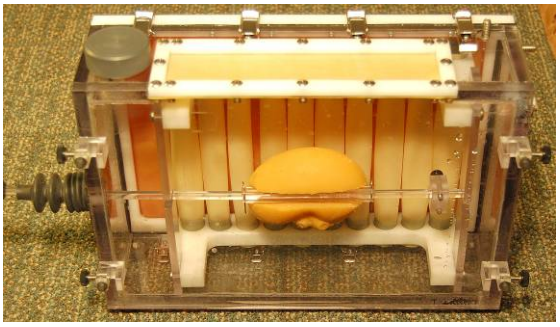
The model includes simulated bowel loops and a single kidney attached to a rod which creates motion of the organs as would be seen with respiration in the patient. The model may be used for practice in kidney biopsy using real time ultrasound or simulated fluoroscopy.

MODEL APPEARANCE AND COMPONENTS

The appearance viewed from the anterior abdominal surface is as at left. The abdominal wall contains a skin surface, subcutaneous tissue, external rectus sheath, rectus, and internal rectus sheath. The side skin is for passage of a kidney biopsy needle or as a window for ultrasound visualization of the kidney.



At left the abdominal wall is removed from the model, revealing a sliding rod that can provide "paradoxical" motion as occurs with respiration for the simulated kidney and loops of bowel. The kidney and bowels are each detachable from the rod. Removal of the kidney is advised when the model is used for placement of PD catheters.

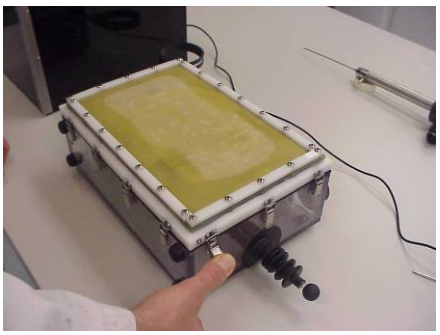


The model at left is assembled and filled with water. The model can be turned on its side to check the progress of PD catheter placement (though it is easier to use the WebCam Box for this as described below). The model is placed on its side also for kidney biopsy under ultrasound with the biopsy needle passed through the side skin.

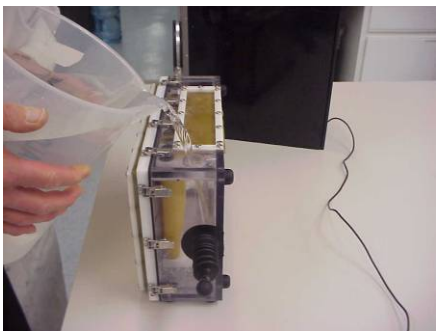
ASSEMBLY OF MODEL

Open the WebCam Box, and screw the WebCam holder to the lower border of the box. Attach cable from WebCam to the portable computer provided.

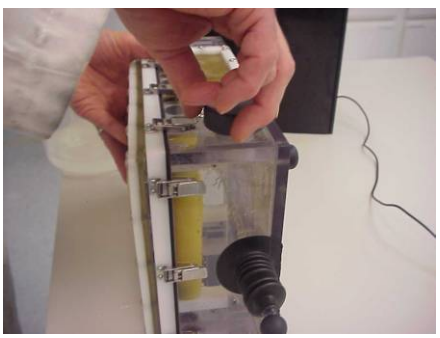
Attach a second WebCam to the Y-Tec™ scope if the model is to be used for peritoneoscopic PD catheter placement. Attach cable from WebCam to the portable computer provided. Turn on the portable computer and the WebCam software will recognize the video devices.



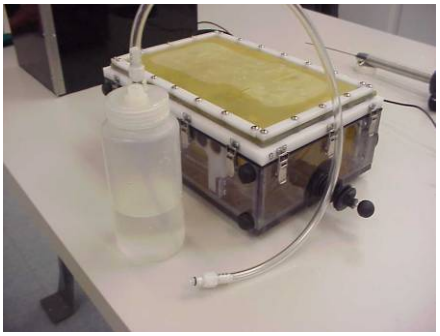
Attach abdominal wall to the model using the spring clips.



Set model on side and fill model through port with 4 liters of water. The level will rise to the upper clamp.

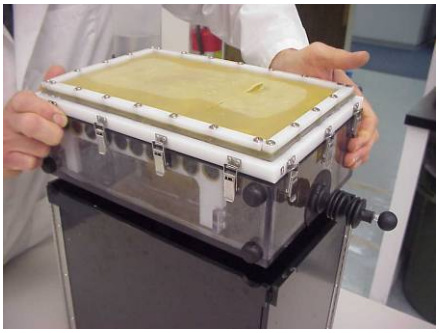


Press on anterior abdominal wall of model to bring the air-fluid level up to the entry of the port. Screw in port cap.



Fill Reservoir with water to about 1/3 of full volume.
Attach tubing end that has no internal valve to the Reservoir.

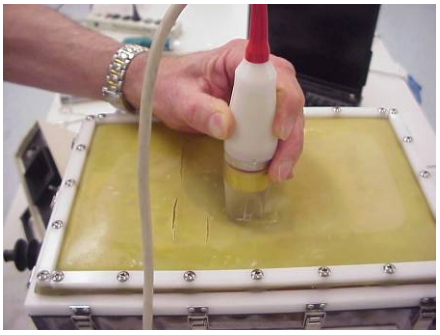
Thread tubing through the Reservoir Ring and plug into the model.



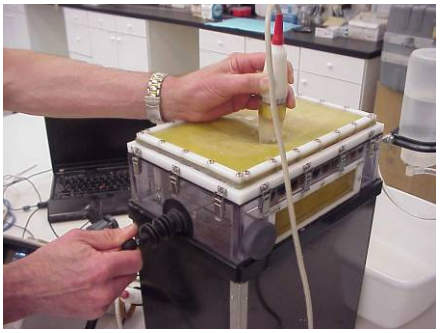
Place model on top of WebCam box. Fit feet of the model into depressions on top of the box.

Create an incision through the skin and SQ tissue using a scalpel and hemostat, to the level of the external rectus sheath. Pour a small amount of water into this opening to facilitate ultrasound imaging.

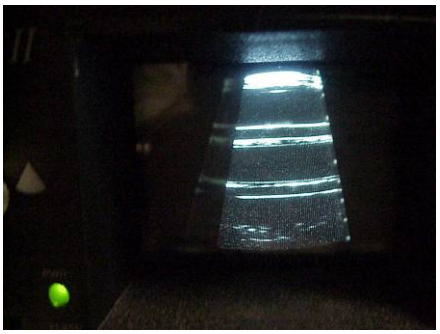
PERITONEOSCOPIC CATHETER PLACEMENT WITH ULTRASOUND EVALUATION



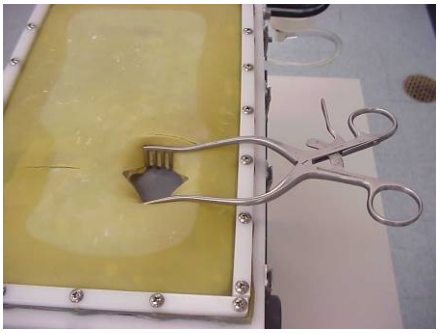
Place ultrasound gel on the probe and hold probe on the abdominal wall.



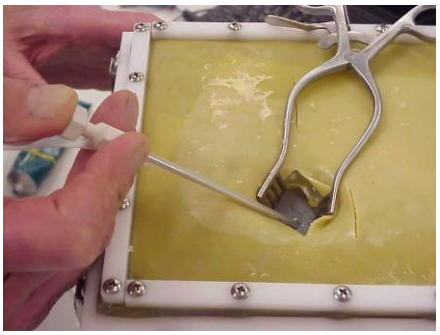
Move the bowel layer back and forth and observe the ultrasound image.



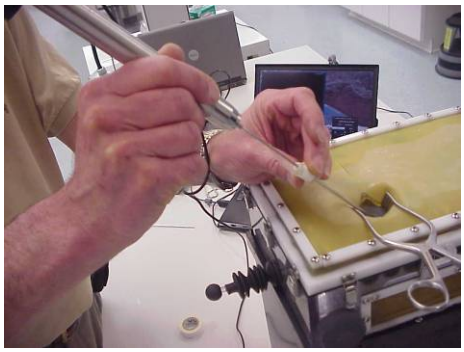
Bowel surfaces and visceral omentum moving next to the parietal peritoneum indicates that there are no significant adhesions in the peritoneum at this point. Note that ultrasound also can determine a position near the lateral or medial border of the rectus muscle through which to place the catheter, assuring that there is sufficient muscle tissue to receive the cuff. It also measures the depth of subcutaneous fat.



Open the skin and SQ tissue incision with Weitlaner retractors (provided with model).

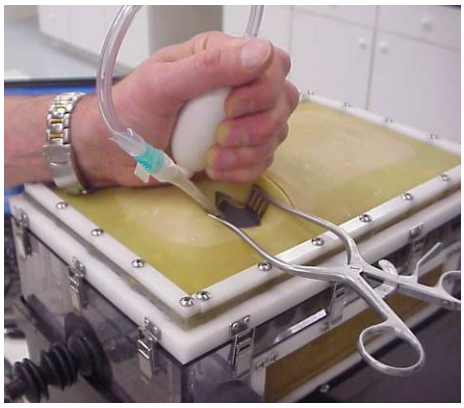


Insert trocar, cannula and Quill guide through the abdominal wall. When two distinct "pops" are felt, stop advancing the trocar. NOTE: an alternative approach is to create a pneumoperitoneum using a Veress needle, and then insert the Y-Tec cannula.



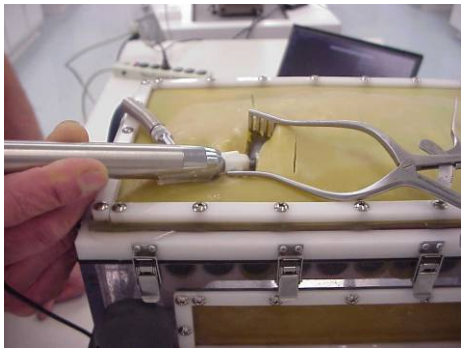
Insert scope and camera into the cannula, attach light source and turn on at low intensity.

The view depicts contact vision of the scope with the viscera, which is indistinct. In the patient each inspiration moves bowel loops or omentum across the tip of the scope, from cranial to caudal direction. In the model, moving the bowels up and down creates a similar movement. This "paradoxical" movement confirms intraperitoneal location of the scope and cannula.



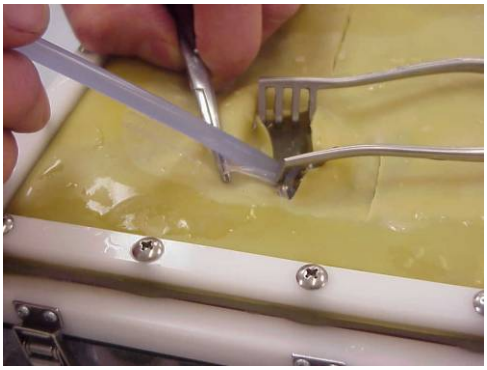
Infuse air through the cannula into the peritoneum using a sphygmomanometer bulb or syringe/valve/filter. Disconnect the Reservoir from the model at this time to avoid transferring too much fluid into the Reservoir.

Reinsert the Y-Tec Scope and rotate the cannula to the horizontal position. The view now should be across the top of the bowel loops, looking towards the opposite end of the peritoneum through the air space. If this view is not seen, retract the scope to place the tip of the scope in the airspace and rotate the scope to the horizontal position.

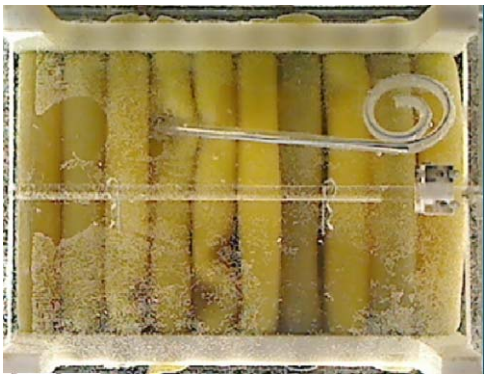


While maintaining the view across the bowel loops, advance the scope into the abdomen into the most distant part of the lower abdomen.

Remove the scope, un-tape the cannula from the Quill guide, clamp the tab of the Quill guide and remove the cannula.

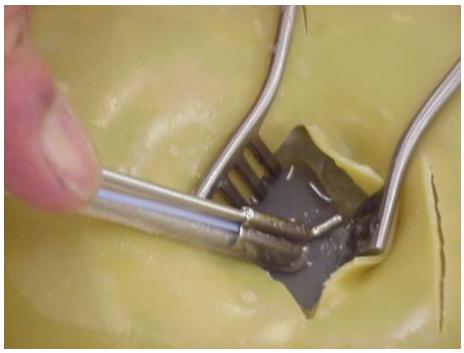


Place a few drops of pure glycerol (provided) into the Quill guide, as lubricant. Then dilate the Quill guide with 4 and 6 mm diameter dilators.

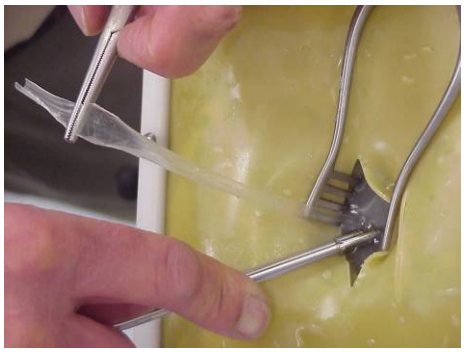


Advance the catheter with internal stylet through the Quill guide, retracting the stylet intermittently. Observe progress of catheter placement on the WebCam image, if desired.

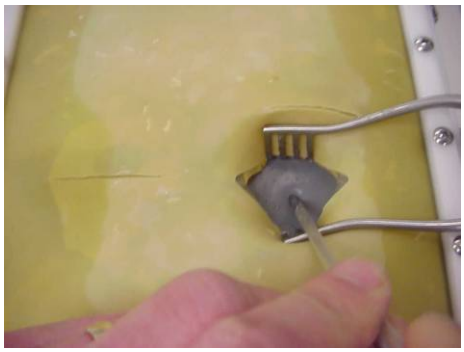
When the cuff reaches the external rectus sheath, place the Cuff Implantor behind the cuff, hold the Quill firmly, and advance the cuff into the musculature.



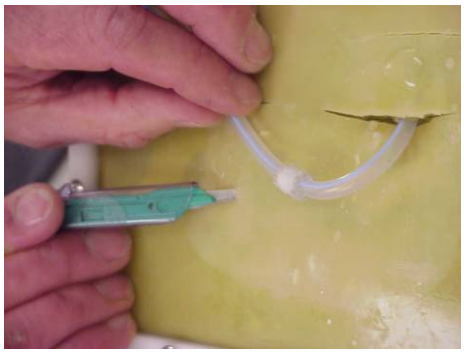
The tab of the Cuff Implantor stops forward motion of the cuff when it enters the rectus muscle, avoiding advancement of the cuff through the muscle layer.



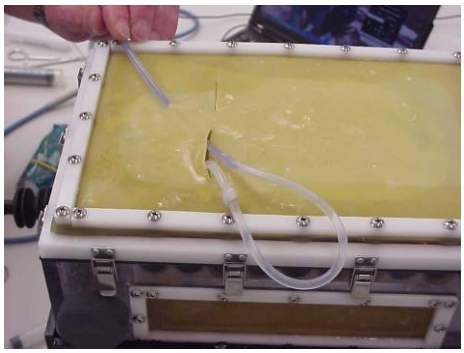
Hold the catheter, Cuff Implantor and internal stylet firmly, and remove the Quill Guide from around the catheter. Remove the stylet and finally the Cuff Implantor.



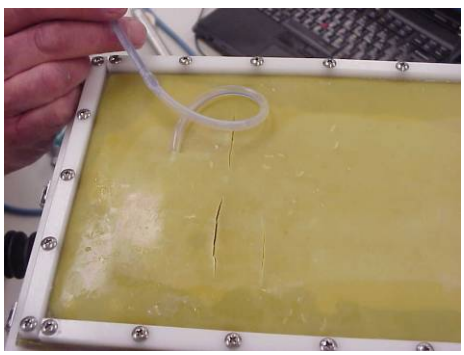
The cuff is firmly implanted in the rectus sheath, as demonstrated by giving a gentle pull on the catheter. Placing a finger next to the external rectus sheath confirms that the cuff is just below the sheath. A.



To create the subcutaneous tunnel, first determine an exit site 2-3 cm distal to the superficial cuff. Make a single stab incision through the skin, in direction of the catheter.

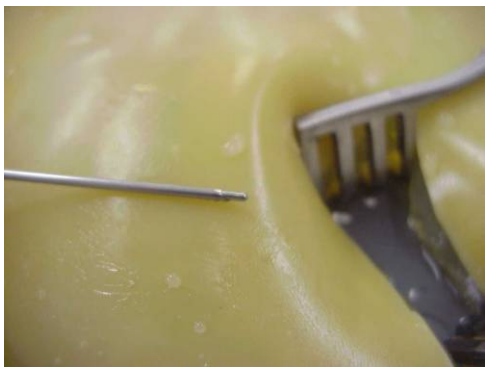


Pass the Tunnelor Tool through the exit site, above the subcutaneous tissue and through the primary incision (in patients the course will be through the middle of the SQ fat layer). Attach the catheter and draw it through the SQ tract to and through the exit site (in patients, the tract may be easily dilated by attaching a hemostat to the catheter, drawing the hemostat into the tunnel and expanding the hemostat to create a passageway for the cuff).

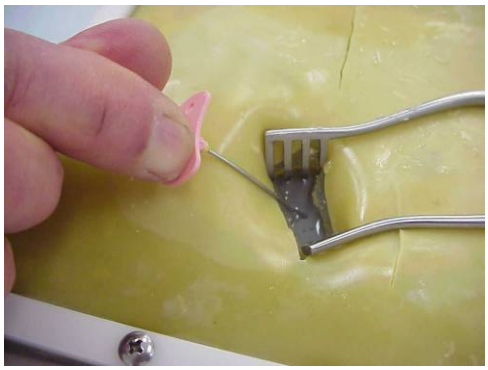


Final position of catheter: The primary incision can be closed and sutured if desired.

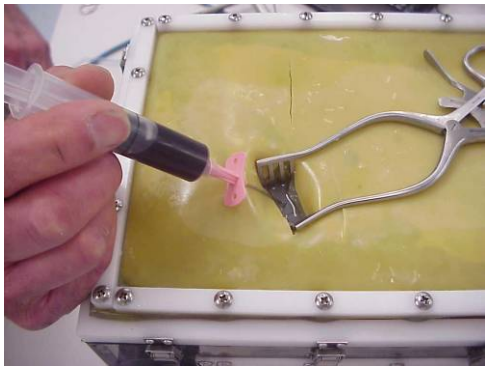
PLACEMENT OF PD CATHETER BY SELDINGER TECHNIQUE WITH FLUROSCOPY



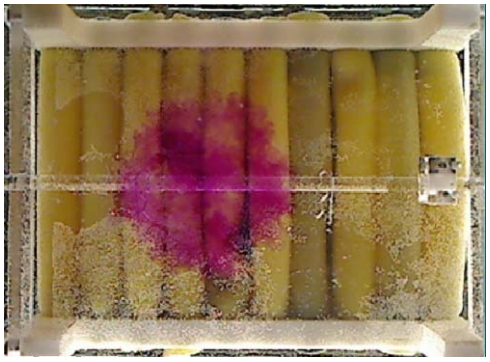
For the blind entry of the peritoneum it is best to use an 18 gauge needle with a blunt obturator, as shown here by the Seldinger needle. This gives the best tactile feeling as the needle passes through the external and internal rectus sheath.



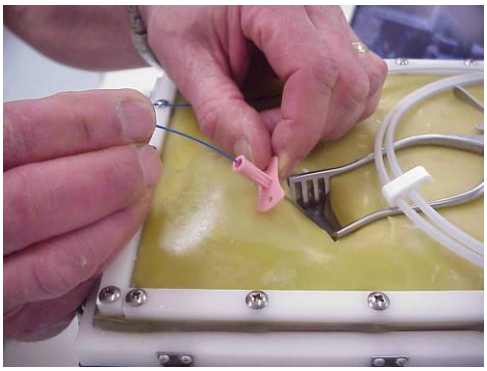
The Seldinger needle is advanced through the rectus sheath towards the peritoneum, feeling two distinct pops as the tip passes through the anterior and posterior rectus sheaths.



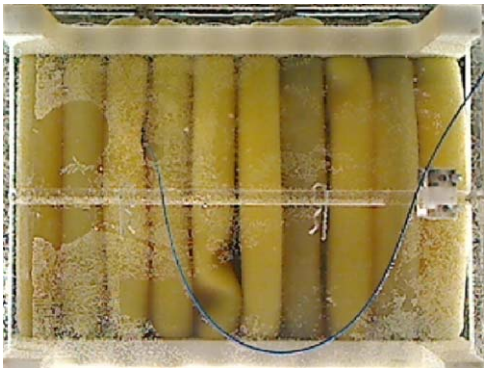
The obturator is removed and a syringe is attached with a pH sensitive dye (provided). The dye is injected quickly.



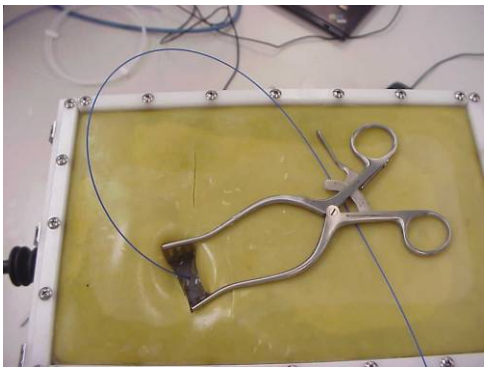
As viewed through the WebCam, the dye creates a "peritoneogram" picture, simulating the fluoroscopic picture after dye injection. If the red color remains in the model, injecting a few ml of citric acid (provided) will remove the color.



After the intraperitoneal position of the needle is confirmed, a long Teflon-coated guidewire is inserted through the needle.

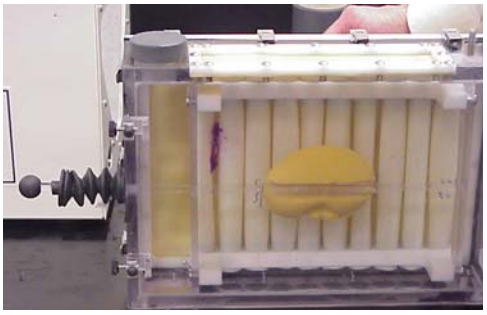


Progress of the wire insertion may be viewed through the WebCam from below, simulating the fluoroscopic picture. Advance the wire until it makes a large curve within the peritoneum.

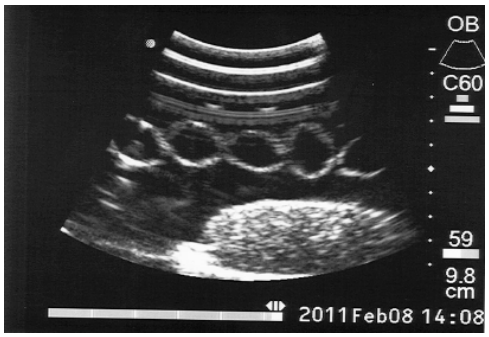


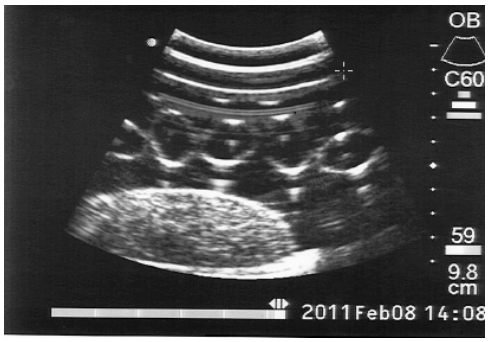
With the wire in place, dilate the tract, advance the split-sheath and dilator into the peritoneum, and remove the dilator and guidewire (steps not shown here). Advance the PD catheter through the split-sheath, splitting the sheath as the cuff advances. When cuff reaches the external rectus sheath, use small hemostats to press it into the muscle layer, and then remove the rest of the sheath.

RENAL BIOPSY UNDER ULTRASOUND OR FLUOROSCOPY

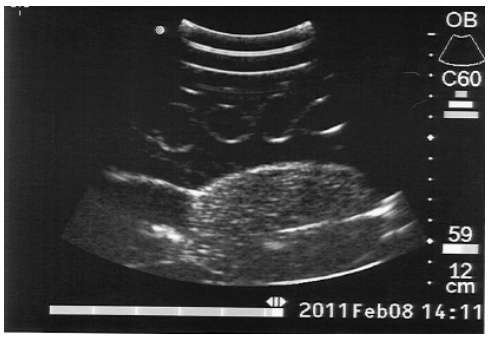


On assembly of the model, attach the kidney to the movable rod in the lower part of the model. You may leave the bowel layer in place or remove it. Finish assembly and filling of the model as above.

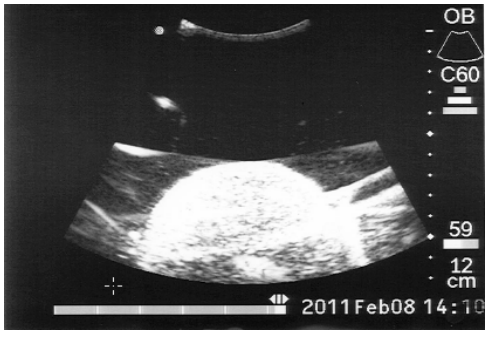




There are two approaches for ultrasound of the PD/BX model. One is through the muscle wall (called anterior abdominal wall above) which gives a cross-section or longitudinal image of the kidney, and also demonstrates the bowel loops. Moving the rod creates motion of the kidney and bowels as seen during respiration. The ultrasounds at left demonstrate the full extent of motion of the kidney (moving to left and right beneath a stationary ultrasound probe).



One approach to biopsy of the kidney is through the side skin while performing ultrasound through the muscle wall. The kidney may be viewed in cross section or in longitudinal section. Needle is being inserted into the kidney from the right in this ultrasound. Note that biopsy needles may or may not remove pieces of the silicone rubber kidney.



Another approach to biopsy of the kidney is to perform the ultrasound through the side skin and advance the needle through the muscle wall. Bowels should be removed when planning this approach.

For practice in kidney biopsy using fluoroscopy, view the kidney from the WebCam box as demonstrated above. The biopsy needle may be advanced through the muscle wall approach (simulating a posterior approach) or the side skin approach.

Any questions regarding this model may be forwarded to:

Mr. David Carr
dcarr@hemocleanse.com

or

Dr. Stephen Ash
sash@hemocleanse.com
765 427 7007