

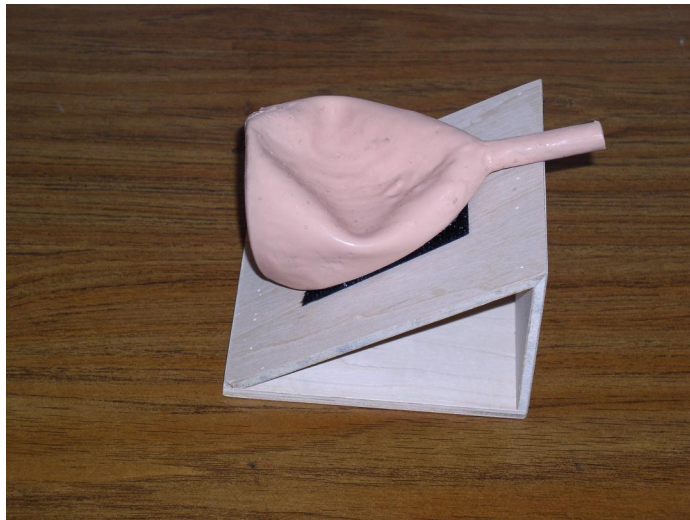
**3-D Med® 4-in-1 Silicone Training Aid for Practicing Laparoscopic Skills and Tasks**

**INSTRUCTION MANUAL**

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**SKILLS TRAINING IN THE 3-D<sub>med</sub>® (4 in 1) MODEL**  
**EXERCISE NO. 1: LAPAROSCOPIC URETHRO-VESICAL ANASTOMOSIS**  
**(DURING A RADICAL PROSTATECTOMY PROCEDURE)**

**BASIC PRINCIPLES OF SUTURING:**

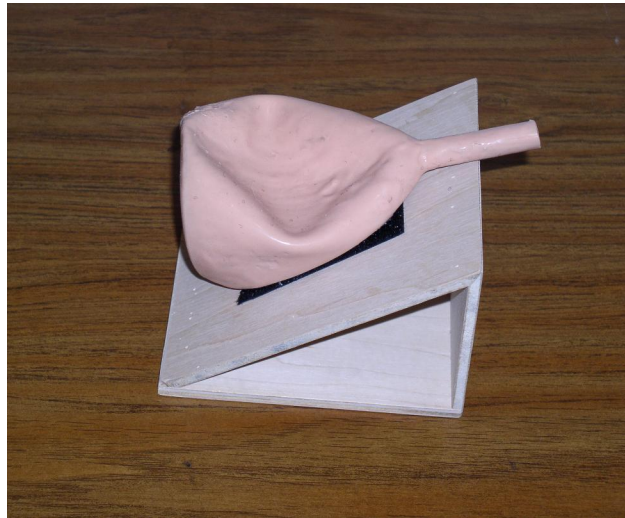
The plane of approach to the model should be between 20-50° and the two instruments being used should enter such that they form a 40-50° angle where the two jaws would meet in the laparoscopic field at the site of the planned anastomosis.

**INSTRUMENTS**

- **2 needle holders** (or one needle holder and one grasper, preferably the grasper should have a curved tip (i.e. a Flamingo type) in order to see the jaws when they separate. Having two needle holders is important because this allows the surgeon to alternate between left and right hands when throwing a particular stitch for a specific suture line. If using two needle holders, they can either both be curved, straight, or one of each dependent upon the surgeon's preference. One option would be to have curved needle driver in the dominant hand. This allows one to grasp the needle between tissues after the stitch has been passed.
- If there isn't an extra needle holder available, a **Maryland grasper** may be used. \*\*However, in this situation, alternating from left to right hands will require switching the needle holder and the grasper to opposite ports.
- **6-inch dyed Monocryl or Vicryl 4.0 on an SH needle tied to another 6-inch undyed Monocryl 4.0 bearing another SH needle**; this creates the van Velthoven suture for a running anastomosis.

Note: If a Vicryl suture is used, the stitches should be tightened every two throws in order not to cause tissue tears.

- **3-D<sub>med</sub>® Silicone Model** attached on its base simulating a 45° Trendelenburg position.



Attaching the **3-D<sub>med</sub>®** Model to the board allows simulation of the Trendelenburg position during actual laparoscopic radical prostatectomy.

## **PRINCIPLES OF SUTURING**

Prior to practicing these tasks, the following basic skills should have been learned using both hands:

1. Needle loading on to the needle holder in forehand and backhand positions with both right and left hands.
2. Suturing along vertical and horizontal and hexagon figure suture lines
3. Suturing along left and right diagonal suture lines
4. Using the needle to enter the suture lines along a perpendicular plane
5. The needle holder should be held such that the needle tip is directed at a 90 degree angle to the tissue to be sutured and a 90° rotation of the wrist of the hand holding the needle holder is used to drive the needle through the tissue.

**Note: The appropriateness of the needle position can be checked by rotating the wrist prior to suture placement. When the wrist has been rotated, the needle should lie across the line of the intended stitch.**

## **THE POSTERIOR SUTURE LINE**

1. A Van Velthoven stitch as described above is brought into the operative field.
2. The first stitch is applied in the midline, at the 6 o'clock position of the bladder side with the *dyed* Monocryl 4.0, passed from outside to inside, and advanced until the knot of the van Velthoven stitch is positioned at the outside of the posterior bladder neck. The *undyed* Monocryl 4.0 is also applied about 5 mm to the right of the initial stitch, at 5:30 o'clock. Both needle passes are performed using the *right forehand*.



A van Velthoven stitch is applied on the posterior bladder neck.

3. The left sided, *dyed* Monocryl 4.0 is run *clockwise* using the *left forehand* technique entering the urethra *inside-out* and a left forehand technique entering the bladder *outside-in* until the lateral angle or 9 o'clock position is reached. Usually three sutures are passed to reach the 9 o'clock position; as such a suture is placed at the 7, 8, and 9 o'clock position.

4. Following this, in a similar manner, the right sided *undyed* Monocryl is run *counterclockwise* using the *right forehand* technique entering the urethra *inside-out* and a right forehand technique entering the bladder *outside-in* until the lateral angle or the 3 o'clock position of the bladder neck is reached. Usually 3 sutures are passed to reach the 3 o'clock position; as such a suture is placed at the 5, 4, and 3 o'clock positions.
5. When both the 3 and 9 o'clock positions have been reached, the two sutures are pulled gently and alternately on each side in order to tighten the suture down and approximate the two edges of the anastomosis. Care must be taken to do this gently so the tissues of the urethra and bladder neck do not tear. An alternate technique would also be to tighten the sutures after two passes are made on each side.
6. Note that all the stitches on the posterior closure of this anastomosis are done using the *forehand* technique.
7. In order to make a stitch on the posterior closure of the urethra, an *exaggerated forehand* is used to apply the needle tip perpendicular to the urethral mucosa prior to rotating the needle so that it exits the urethra.

**Note: In the operating room, an assistant inserts a Fr 18 Foley catheter into the urethra in order to help the surgeon identify the urethral lumen. It is inserted partly every time the needle is introduced into the lumen of the urethra and withdrawn while the needle is driven in to the urethra to make the stitch.**

## THE ANTERIOR SUTURE LINE

1. The left sided *dyed* Monocryl is now continued *clockwise* using the *left forehand* or *right backhand* positioning of the needle so that the needle maintains an *outside-in* orientation on the bladder side and an *inside-out* orientation on the urethra. Suture is passed at the 10 and 11 o'clock positions.
2. The right sided *undyed* Monocryl is then continued *counterclockwise* using the right forehand or *left backhand* entering the bladder *outside-in* and the urethra *inside-out* at the 2 and 1 o'clock positions

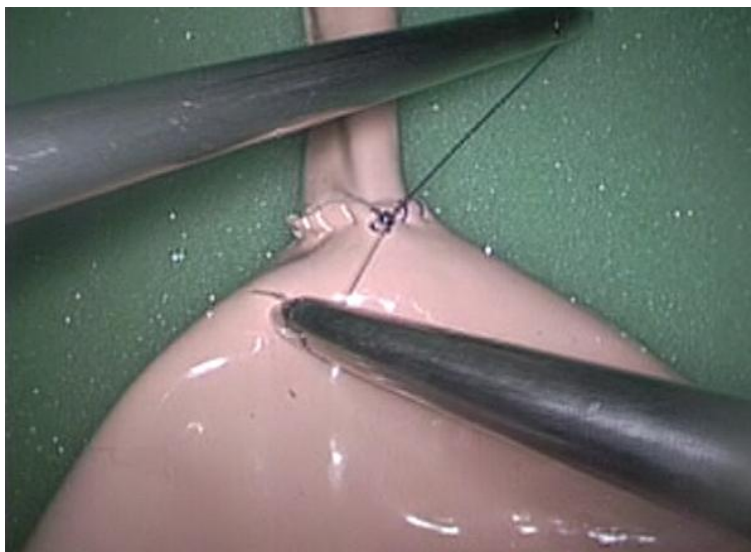
## THE TRANSITION STITCH

1. At the 12 o'clock position of the urethrovesical anastomosis, a transition stitch is placed by taking a second bite on the urethral side with the left sided dyed Monocryl; as such the suture going inside-out on the urethra is now passed again, outside-in through the urethra, entering the urethral lumen at 12 o'clock. The suture will now be on the inside of the urethra at 12 o'clock and this is then passed through the bladder inside-out at 12 o'clock also and it now lies opposite to the right-sided undyed Monocryl suture on the outside of the urethra at 1:00 o'clock.
2. The two sutures are then tied together applying 5 to 6 knots.
3. Once again, particular attention to detail is important in order to keep the distance between stitches about 5mm apart by applying them as one would on the face of a clock.

**Note:** *Alternately, the transition stitch could be done earlier (e.g. 10 o'clock position) so that the stitches on the left side could now be applied using the right forehand technique until it reaches the 12 o'clock position where it is now tied to the opposite undyed Monocryl suture.*

**Note:** *The choice of which side the dyed or undyed Monocryl is assigned to depends entirely on surgeon's preference but should be done consistently in order to avoid confusion during the actual laparoscopic operation.*

This results in a watertight and tension free urethrovesical anastomosis.



The dyed and undyed Monocryl sutures are tied together with 5 to 6 knots.

**SKILLS TRAINING IN THE 3-D<sub>MED</sub>® (4 in 1) MODEL**  
**EXERCISE NO. 2: LAPAROSCOPIC DISMEMBERED PYELOPLASTY**  
**(URETEROPELVIC OR URETEROURETEREAL ANASTOMOSIS)**

**INSTRUMENTS**

- **2 needle holders or 1 needle holder and 1 grasping forceps.** The needle drivers should preferably have a curved tip. This facilitates the visualization of the jaws when they are opened or closed. Having two needle holders is important because this allows the surgeon to alternate between left and right hands when throwing a particular stitch for a specified suture line. If using two needle holders, they can be both curved, straight, or one of each dependent upon the surgeon's preference.
- **6-inch dyed Monocryl or Vicryl 4.0 on an SH needle tied to another 6-inch undyed Monocryl 4.0 bearing another SH needle (a Van Velthoven stitch)**
- **A separate 6-inch dyed Monocryl or Vicryl 4.0 on an SH needle with a preformed loop tied in its tail.**
- **3-D<sub>MED</sub>® Silicone Model** secured to the floor of the pelvic box. The orientation of the model can be changed to simulate a right-sided versus a left-sided dismembered pyeloplasty.

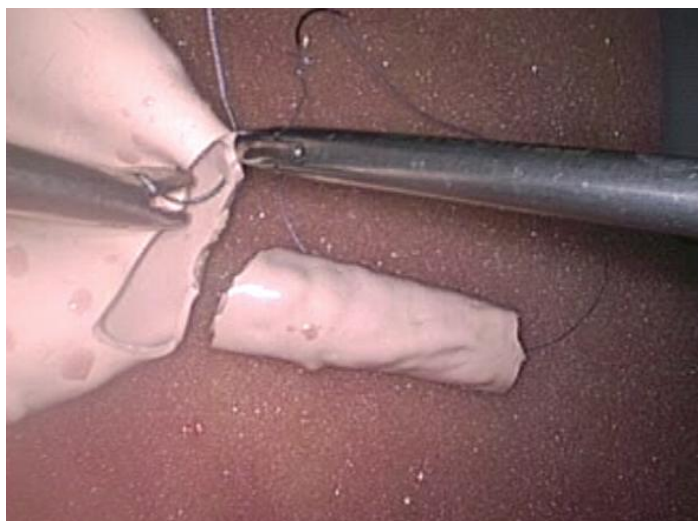
**PRINCIPLES OF SUTURING**

Prior to practicing these tasks, the following basic skills should have been learned using both hands:

1. Needle loading in forehand and backhand positions with both right and left hands.
2. Suturing along vertical and horizontal and hexagon figure suture lines
3. Suturing along left and right diagonal suture lines
4. Using the needle to enter the suture lines along a perpendicular plane
5. The needle holder should be held such that the needle tip is directed at a 90° angle to the tissue to be sutured such that a 90 ° rotation of the wrist of the hand holding the needle holder will drive the needle through the tissue.

**ANGLE STITCH**

1. A van Velthoven stitch as described above is brought into the operative field.
2. If the model has not been cut, the "ureter" is cut from the "pelvis" using a laparoscopic shears. The lateral lip is spatulated for 1 cm. before the entire ureter is "dismembered" from the pelvis.
3. The first stitch is placed using the *dyed* suture which is applied *outside-in* at the most dependent portion of the renal pelvis and going inside out on the posterior layer of the ureter at the distal point of the spatulation. The undyed end is also applied about 5mm lateral to this stitch going outside-in in the renal pelvis and then inside out on the ureter; as such the dyed end will be used for the posterior suture line, while the undyed end will be used for the anterior suture line of the anastomosis.



The van Velthoven suture is applied initially on the posterior layer of the renal pelvis.

**Note:** This insures that the knot on the Van Velthoven suture rests against the renal pelvis and not the ureter. The two sutures are then pulled gently at this point to bring the tissues together before continuing. This needs to be done at this point if Vicryl is used, or after two more bits are taken with either suture if Monocryl is being used.

It is also important to emphasize that it is technically easier to apply the stitch on the ureter from the inside-out rather than outside-in. The latter method may result in accidental “back-walling” of the posterior wall of the ureter.

#### **POSTERIOR OR LATERAL LAYER**

1. The *dyed* Monocryl is then run in continuous fashion going outside-in on the pelvis and inside-out on the ureter side using the *right backhand* for a *right pyeloplasty* and the *right forehand* for a *left pyeloplasty*. Attention to detail is necessary to apply the sutures about 5mm apart from each other.
2. As soon as the *angle of the heel* of the spatulated ureter is reached, an adjustment is made by increasing the distance between stitches by about 25% on the renal pelvic side until the tip of the medial surface (i.e. unspatulated) of the ureter is reached. The distance between stitches on the ureter side is maintained equivalent. This adjustment on the renal pelvic side is made in order to make a well funneled *spatulated* ureteropelvic anastomosis.



The posterior layer of the pyeloplasty is applied at an equivalent distance to create a watertight anastomosis.

#### **ANTERIOR OR MEDIAL LAYER**

1. The *undyed* Monocryl of the van Velthoven stitch is now run from the angle of the ureteropelvic anastomosis using either the *right forehand* for a *right pyeloplasty* or a *left forehand* for a *left pyeloplasty*. This stitch is applied on the renal pelvis side going *outside-in* and going *inside-out* on the ureter side. This stitch is gradually pulled to tighten the suture at the angle.
2. The forehand technique is used to throw the stitches on the *ureteral* side going *inside-out*.

#### **SUPERIOR TIP OF THE PYELO-URETERAL ANASTOMOSIS.**

1. The *dyed* Monocryl which exits on the ureteral side is then passed from *outside-in* on the ureter and then passed through the *anterior renal pelvis wall* going *inside-out* at the heel of the anastomosis; this is a transition suture. This is then tied to the *undyed* Monocryl suture which exits on the *ureteral* side from *inside-out*. The tail-ends of these sutures are cut at least one inch long after they are tied together.
2. This constitutes the end of the ureteropelvic anastomosis. The *pyelotomy*, of the reduction pyeloplasty portion of the procedure, is now ready for closure.

#### **CLOSURE OF THE PYELOTOMY OF THE REDUCTION PYELOPLASTY.**

1. A *continuous forehand* non-locking stitch using a 6-inch *dyed* Monocryl 4.0 on an SH needle is prepared with a preformed loop at the end of the suture. The needle and suture is passed *from outside-in* on the medial edge of the pyelotomy, and then from *inside-out* on the lateral edge of the pyelotomy, at the most superior portion of the pyelotomy. The needle is then passed through the preformed loop, thereby securing the suture at the apex of the pyelotomy. The suture is then run caudad to the tip of the previously done ureteropelvic anastomosis.
2. As soon as it terminates at the junction of the ureteropelvic anastomosis, this is tied to the one-inch tail end of the previously tied ureteropelvic anastomotic sutures and cut.

This technique results in a watertight and tension free ureteropelvic anastomosis.

***Note: Alternately, the repair of the pyelotomy could start at the angle. This is then tied to the one-inch suture and the continuous stitch continued cephalad. At the end of the pyelotomy, the suture is tied to itself with 5 knots.***

***Note; An alternative technique would be to run the stitches all the way up the pyelotomy repair but this will entail having a very long stitch which is more technically difficult to handle. This may also result in crumpling of the anastomosis.***

## **SKILLS TRAINING IN THE 3-D<sub>med</sub>® (4 in 1) MODEL** **EXERCISE NO. 3: LAPAROSCOPIC CYSTORRHAPHY (BLADDER REPAIR)**

### **INSTRUMENTS**

- 2 needle holders (preferably one with a curved tip). This principle is important because this allows the surgeon to alternate between left and right hands when throwing a particular stitch for a specified suture line.
- A curved laparoscopic shears
- 8-inch *dyed* Monocryl or Vicryl 3.0 on an SH needle
- **3-D<sub>med</sub>®** Silicone Model secured to the flat pelvic box floor or attached to recreate a 45° Trendelenberg position.

### **PRINCIPLES OF SUTURING**

Prior to practicing these tasks, the following basic skills should have been learned using both hands:

1. Needle loading in forehand and backhand positions with both the right and left hands.
2. Suturing along vertical and horizontal and hexagon figure suture lines
3. Suturing along left and right diagonal suture lines
4. Using the needle to enter the suture lines along a perpendicular plane
5. The needle holder should be held such that the needle tip is directed at a 90 degree angle to the tissue to be sutured so that a 90° rotation of the wrist of the hand holding the needle holder can be used to drive the needle through the tissue.

### **MAKING THE CYSTOTOMY**

1. A 7-cm. cystotomy is made using a curved laparoscopic shears. This can be done either longitudinally or transversely. It is recommended, that one cut be done on one side of the model and the oppositely directed incision be done on the other side of the model.



A longitudinal cystostomy could be done on the model to simulate a bladder injury.

## DOING THE CYSTORRAPHY

1. An 8-inch dyed Monocryl or Vicryl 3.0 is brought into the operative field.
2. An initial stitch is applied at the angle of the cystotomy, farthest from the needle holder ports, such that the suturing will be towards the laparoscope rather than away from it. The needle and suture are placed from *outside-in* on one side of the suture line and exiting *inside-out* on the other side. The needle should be *perpendicular* to the tissue every time it is applied and should be rotated 90° to *perforate* the wall. Each passage of the needle should be applied individually on each side of the cystotomy rather than trying to take both sides with one pass..
3. With each pass of the needle, the dominant hand is used to grasp the needle after its tip is seen exiting the tissue and rotated following the curve of the needle. The tissue could be grasped with the non-dominant hand before the needle is grasped in order to avoid losing it.
4. The suture is run in a *continuous* manner using either a *locking* or a *non-locking* stitch. The suture is tightened using both needle holders by pulling on the suture alternately, making sure that they are both visible on the monitor at all times. The purpose of this part of the exercise is to maintain the instruments in a "*safe*" *position* throughout the suturing procedure. Alternately, multiple *figure-of-eight* stitches may be applied to close the cystotomy.



A continuous stitch is used to repair the cystotomy on the model.

5. The stitches should be applied equidistant to each other about 5 mm apart and should appear *perpendicular* to the suture line and *parallel* to each other.
6. At the opposite end of the suture line, the suture is tied to itself using a *surgeon's* knot for the first and reinforced with 4 multiple single knots to tighten it.
- 7.
8. This exercise should be repeated several times by varying the angles of the suture lines to different diagonal planes including the horizontal plane.
9. **Alternately, the exercise can also be repeated with the *dominant* and the *non-dominant* hand using *backhand* and *forehand* techniques.**

**SKILLS TRAINING IN THE 3-D<sub>MED</sub>® (4 in 1) MODEL**  
**EXERCISE NO. 4: REPAIR AFTER A PARTIAL NEPHRECTOMY**  
**(CLOSURE OF THE COLLECTING SYSTEM, APPLICATION OF BOLSTER AND SUTURE OF THE RENAL PARENCHYMA)**

**INSTRUMENTS**

- 2 needle holders or 1 needle holder and 1 grasping forceps on the dominant hand and a straight needle holder or parrot tip /Flamingo grasping forceps]
- A curved laparoscopic shears
- One 6-inch Vicryl 2.0 sutures on an SH needle ??? I think you need only one of these...
- One 10-inch or Vicryl 0 suture on a CT-1 needle WOULD NOT USE MONOCRYL BECAUSE OF PULL THROUGH LIKELIHOOD CLINICALLY
- 2.5 cm surgical bolsters rolled previously and tied with Vicryl 3.0 or 4.0 sutures. For practice purposes these can be fashioned from non-sterile gauze 2"x2" or 4"x4".
- **3-D<sub>MED</sub>®** Silicone Model secured to the flat pelvic box floor.

**PRINCIPLES OF SUTURING**

Prior to practicing these tasks, the following basic skills should have been learned using both hands:

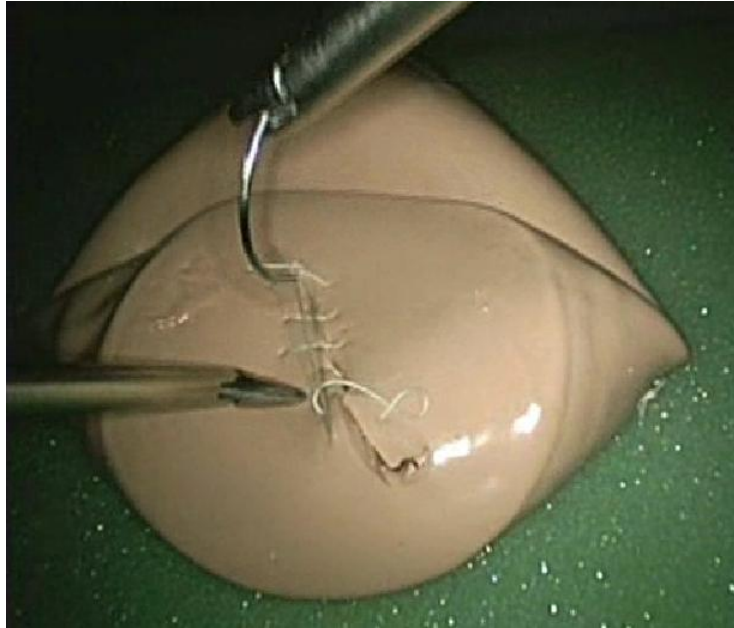
1. Needle loading in forehand and backhand positions with both the right and left hands.
2. Suturing along vertical and horizontal and hexagon figure suture lines
3. Suturing along left and right diagonal suture lines
4. Using the needle to enter the suture lines along a perpendicular plane

**CLOSING THE COLLECTING SYSTEM**

1. The flat surface, with the slit to simulate the cut collecting system, of the Lap ED<sup>®</sup> 4 in 1 model is used for this exercise.
2. A midline longitudinal incision is made on the flat surfaced portion of the silicone model measuring about 3-4cm. This will simulate the collecting system that needs to be repaired when it is opened during a partial nephrectomy. [This is already done in the preparation of the model]
3. THE 6-inch dyed Monocryl or Vicryl 2.0 suture is brought into the operative field.
4. An initial stitch is applied at the angle of the incision, farthest from the laparoscope, going *outside-in* on one side of the collecting system hole and exiting *inside-out* on the other side. The needle should be *perpendicular* to the tissue every time it is applied and should be rotated through a full arc of 90° to *perforate* the wall. Each passage of the needle should be applied individually on each side of the suture line.
5. Using the non-dominant hand, the needle is grasped after its tip is seen exiting the tissue and rotated following the curve of the needle.
6. The suture is run in a *continuous* manner using a *non-locking* stitch. The suture is tightened using both needle drivers by pulling on the suture alternately, making sure that they are both

visible on the monitor at all times. The purpose of this aspect of the exercise is to maintain the instruments in a “safe” position throughout the suturing procedure. Alternatively, multiple *figure-of-eight* stitches may be applied to close the incision.

7. The stitches should be applied equidistant to each other about 5 mm apart and should appear perpendicular to the suture line and parallel to each other.
8. At the end of the suture line, the Vicryl is tied to itself using a *surgeon’s knot* for the first and reinforced with 4 simple knots to tighten it.



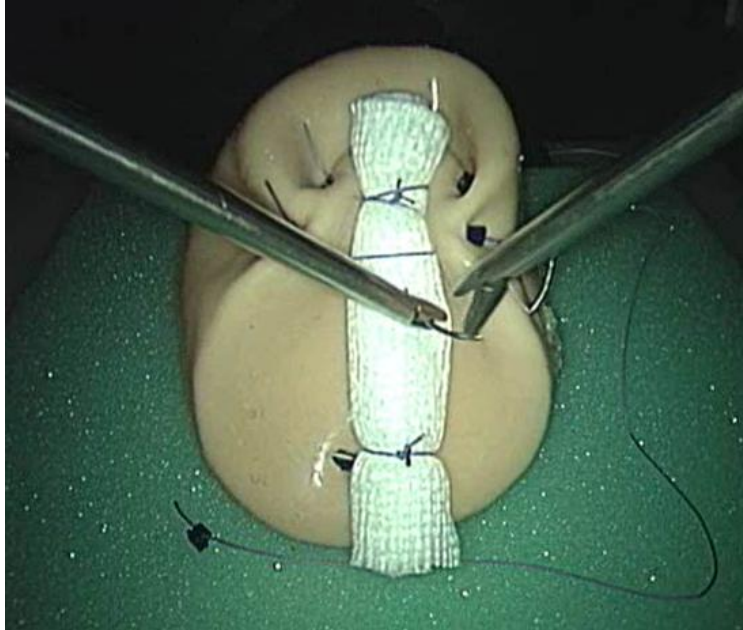
The base of the model could be used to simulate the renal collecting system.

### **SUTURING THE SURGICAL BOLSTERS OVER THE DEFECT**

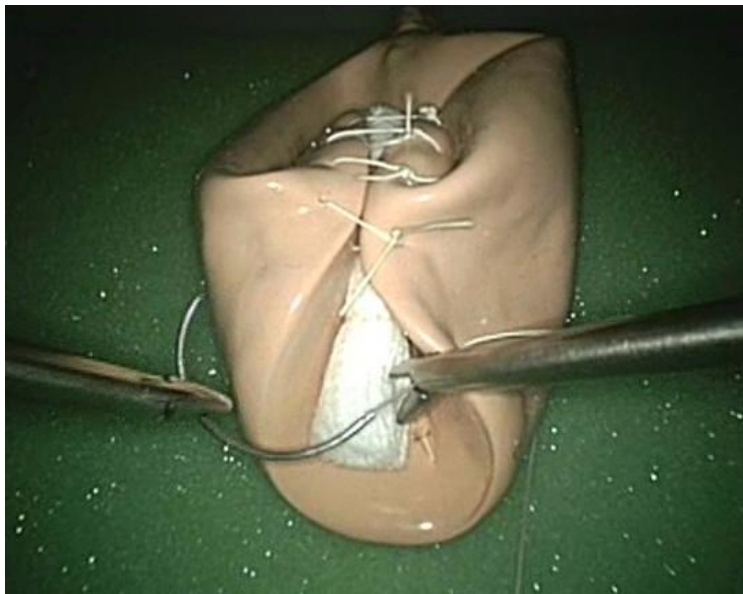
1. The previously made bolsters are brought into the operative field.
2. Using a 10-inch Monocryl or Vicryl 2.0 suture, a stitch is applied to the border of the flat surface of the **3-D Med® 4** in 1 model going “*outside-in*” on one edge and going “*inside-out*” on the opposite edge to bring the two sides together.
3. The prepared bolster is positioned under this stitch, which is tightened together to hold the bolster in place. A *figure-of-eight* stitch is made before the suture is tied over the bolster.
4. A *surgeon’s knot* is initially made to tie the suture to itself followed by multiple simple knots to tighten it. Alternately, Lapra-Ty clips can be applied to both ends of the suture as it is tightened over the bolster. If this is done, then two Lapra-Ty clips are applied to the suture as it exits the far wall of the model. A scissors is used to cut in between the two Lapra-Ty clips and then another simple suture can be taken, first through the near side of the model. The second of the previously placed two Lapra-Ty clips now serves as the anchoring Lapra-Ty clip on the near side of the model. The suture is passed over the previously placed bolsters and again passed through the far wall of the model; again two Lapra-Ty clips are affixed – one to snug the suture against the far wall and a second Lapra-Ty clip a cm. distal. The suture is again cut between the two Lapra-Ty clips, and now a third simple suture is placed. The same sequence is repeated and then a fourth and final simple suture is placed and secured on the far wall with just a single Lapra-Ty clip.

(Note: This maneuver of using Lapra-Ty clips to hold the suture is preferred by most laparoscopic surgeons to avoid the suture from creating a “cheese-slicing” effect on the “renal parenchyma” if the suture is tightened and tied to itself.) Remember that there is no need to tighten these bolstering sutures excessively since in the clinical scenario, when the vascular clamp is released, the kidney will expand and these sutures will “auto-tighten”.

5. Several *figure-of-eight* stitches could be applied in a similar manner to hold the entire bolster in place.



Preferred Technique: The surgical bolsters may be secured using With Lapra-Ty clips.



Alternative technique: A surgeon's knot may be used to secure the bolster in place.