

Subcostal Incision

Richard Davis

Introduction:

The subcostal incision is most useful for situations where the location of the pathology is to one side of the midline. Examples on the left side include adrenalectomy, splenectomy and trans-abdominal nephrectomy. Examples on the right side include cholecystectomy, limited hepatic resections, adrenalectomy and nephrectomy. A bilateral subcostal incision gives excellent access to all of the upper abdomen, such as for major hepatic resections. Some surgeons prefer a central subcostal incision for the abdominal part of esophagectomy.

The subcostal incision involves division and repair of all layers of the central and abdominal wall, so an understanding of this anatomy is important for both opening and closure. The anatomy is explained further in "Approach to Abdominal Incisions."

The subcostal incision opening and closure proceeds in the following steps:

- Make the incision down to the external oblique fascia and the anterior rectus sheath
- Divide the anterior rectus sheath, crossing over the midline.
- Puncture the preperitoneal fat and peritoneum between the two rectus muscles.
- Divide the rectus muscle, slowly to assure hemostasis.
- With a finger in the peritoneum, divide the posterior rectus sheath and the lateral abdominal muscles.
- Close the posterior rectus sheath and the inner lateral wall muscles starting at each end of the incision and meeting in the middle
- Close the anterior rectus sheath and the external oblique muscle.

Steps:

1. Measure a space two fingerbreadths below the palpable costal margin. This assures that you will have enough tissue to suture on the cranial side of the wound when you close.



The muscle incision should be two fingerbreadths below the costal margin, assuring that there is enough tissue on the cranial side when you close the wound. These pictures were taken from a left subcostal incision for adrenalectomy.

2. Make an incision parallel to the costal margin crossing over the midline by 1cm. Carry the incision through the subcutaneous fat.
3. Divide all the subcutaneous fat evenly to expose the anterior rectus sheath and the external oblique aponeurosis.



Clear the subcutaneous fat off the fascia for the length of the incision before dividing any of the fascia.

4. Divide the anterior rectus sheath, crossing over the midline slightly. As you cross the midline, you divide the single layer of the linea alba horizontally. You will see the preperitoneal fat below it.

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Incise the fascia near the midline, exposing the vertical fibers of the rectus muscle.



Enter the peritoneum bluntly at the transversely divided linea alba.



Carry your incision slightly over the midline (in this case, to the patient's right) dividing the linea alba transversely. In the midline, the fascia is one layer thick, and the preperitoneal fat will appear in between the two exposed rectus muscles.

5. Insert your finger through the linea alba and perforate the peritoneum bluntly with your fingertip.



Slide a clamp or your finger between the rectus muscle and the posterior rectus sheath. Elevate the muscle anteriorly and divide it slowly with diathermy. Take time to control any bleeding that appears as you do this.

7. Insert your finger into the peritoneal cavity and divide the posterior rectus sheath. As you proceed more laterally this will become more

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muscular and fuse with the internal oblique and transversus abdominis.



The posterior rectus sheath is divided separately, after the rectus muscle has been divided. Note that the lateral aspect of the rectus muscle has not been completely divided- its division will be finished before dividing the remaining posterior rectus sheath.



With your fingers still inside the abdomen, make the transition from posterior rectus sheath to all 3 layers of the lateral abdominal wall

8. Continue laterally, dividing all three layers with the diathermy until you reach the edge of the incision.



While your assistant retracts the skin and subcutaneous tissue, divide all 3 layers of the lateral abdominal wall to the edge of the skin incision.

9. Proceed with the operation.
10. To close, begin laterally. With proper retraction, visualize all three layers of the lateral abdominal wall. Place retractors so that they are retracting the external oblique fibers only, so that the internal oblique and transversus abdominis are accessible.



The lateral part of the wound. The two retractors are holding back the external oblique aponeurosis. The divided edges of internal oblique (Blue dots) and transversus abdominis (Green dots) can be seen.

11. Place a wide malleable retractor to protect the bowels and close the transversus abdominis and internal oblique layers together. Continue until you are near the middle of the incision.

OPEN MANUAL OF SURGERY IN RESOURCE-LIMITED SETTINGS

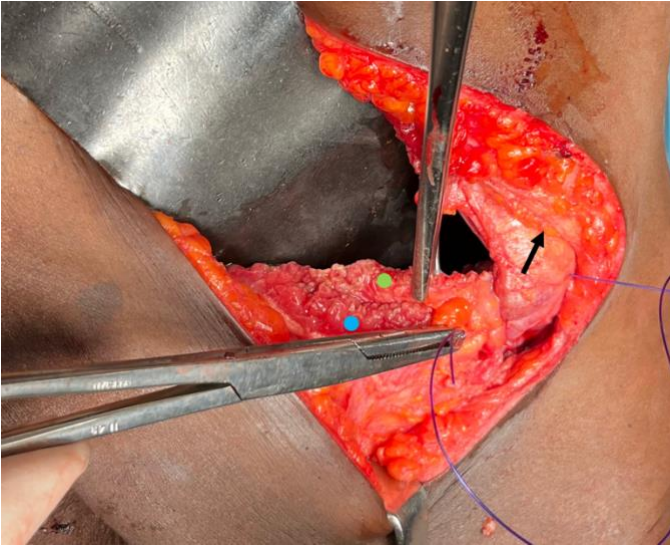
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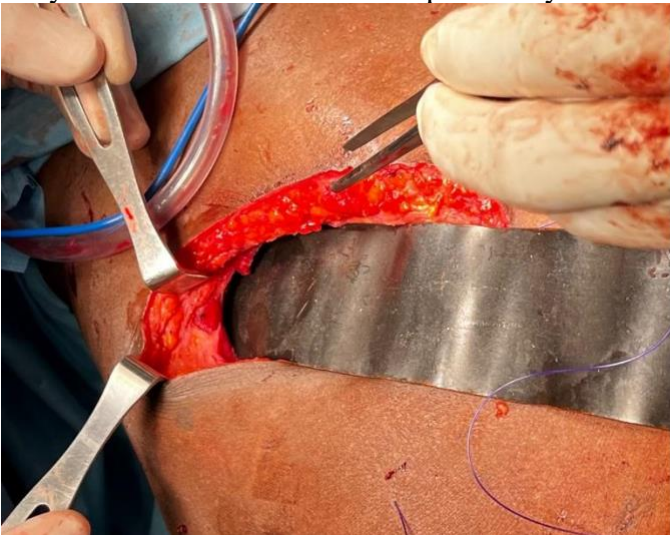
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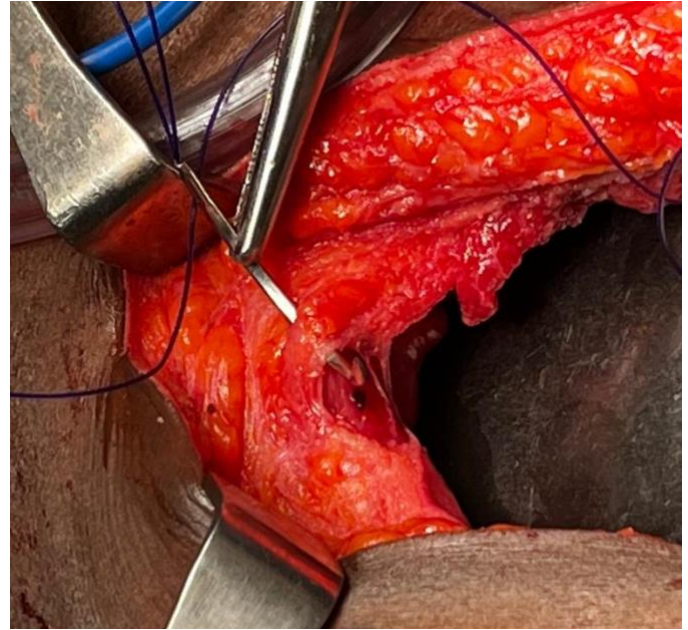


Close the internal oblique (Blue dot) and transversus abdominis (Green dot) muscles while the external oblique muscle (Black arrow) is avoided.

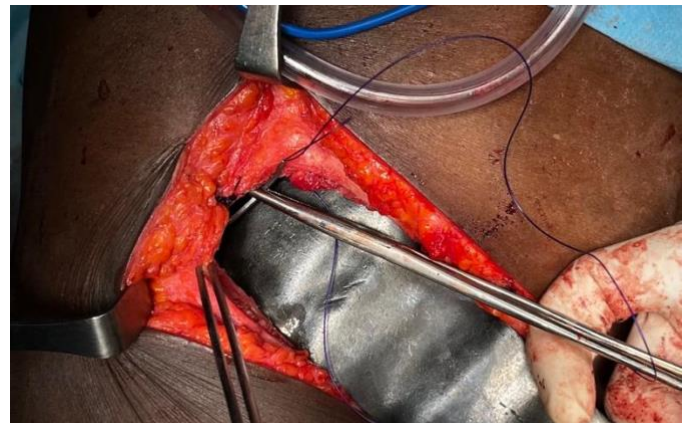
12. Now close the incision beginning medially. Reapproximate the rectus sheath and the linea alba on the side opposite your incision, where you crossed over the midline previously.



The incision into the fascia covering the contralateral rectus muscle must be closed as well (in this case it is the right rectus muscle.) It is acceptable to close only the anterior sheath, cross the linea alba, then transition onto the posterior sheath.



The suture line is begun on the anterior sheath of the contralateral rectus muscle.

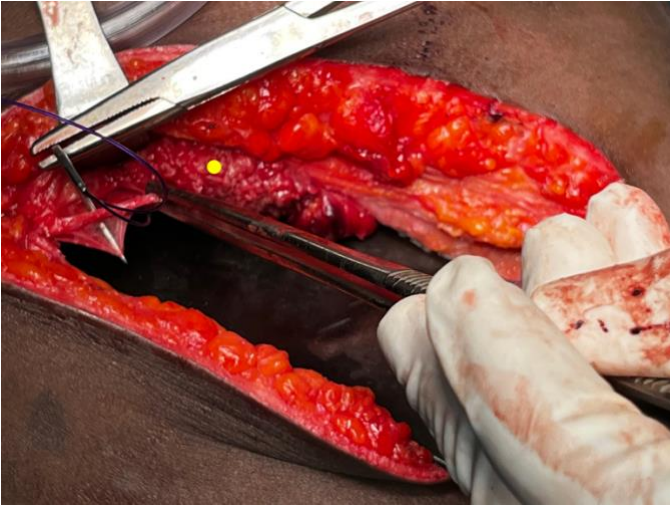


The closure continues, approximating the horizontally divided linea alba.

13. Continue laterally, transitioning to close only the posterior rectus sheath.

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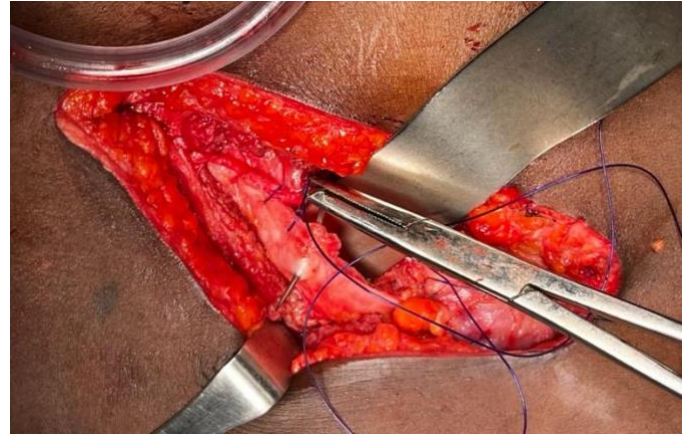
Transitioning from the linea alba to the posterior rectus sheath. The rectus muscle, anterior to the sheath, is shown by a Yellow dot. It is not necessary to suture the muscle itself, only the posterior rectus sheaths is closed.

14. Note the point where the posterior rectus sheath transitions into the internal oblique and transversus abdominis muscles as you suture in a lateral direction.



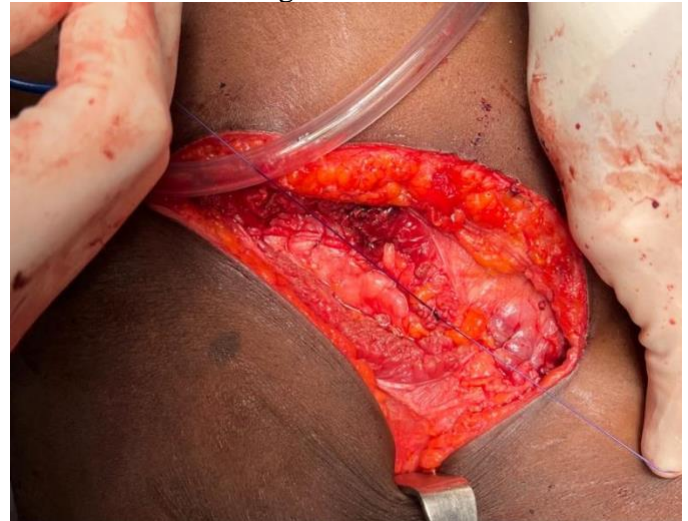
Continuing laterally on the posterior rectus sheath, you will make the transition to the internal oblique and transversus abdominis muscles. The rectus muscle is shown by a Yellow dot.

15. As you approach the opposite suture, instruct your assistant to stop providing traction on the suture as you place it. These last few stitches must be directly visualized.



As in all abdominal closures, the last stitches are taken without tension on the sutures. A narrow malleable retractor is inserted perpendicular to the closure for each individual stitch.

16. Tie the sutures together.

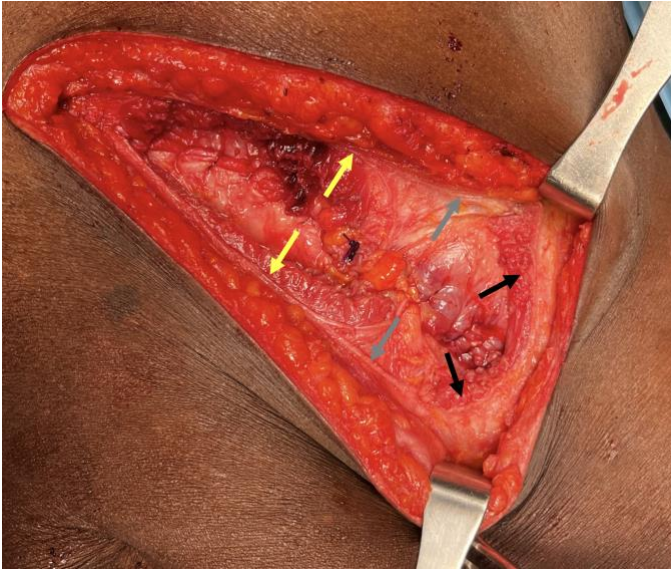


The two sutures have closed the inner layer of the wound, the posterior rectus sheath medially and the internal oblique and transversus abdominis laterally. The sutures meet in the middle of the wound and are tied there.

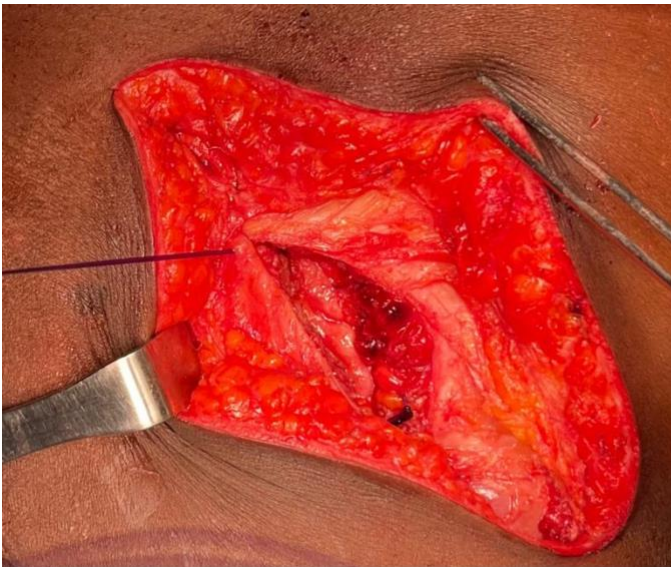
17. Close the anterior rectus sheath and the external oblique aponeurosis. You may suture straight from one side of the incision to the other, beginning at either side, as there is no longer a danger of injuring bowel.

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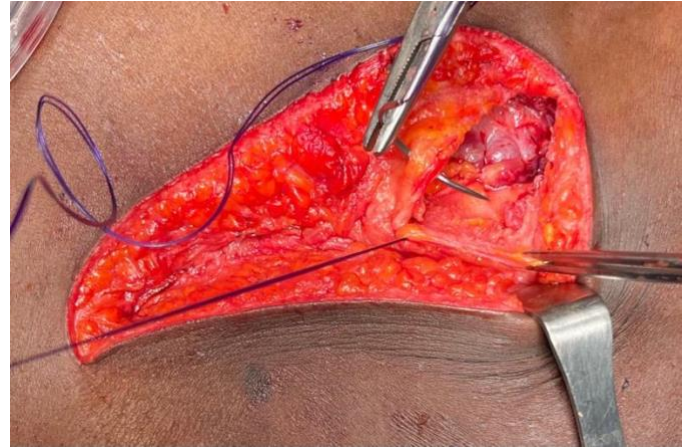
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The inner layer has been closed. The transition can clearly be seen between the muscular part of the external oblique (Black arrows,) the aponeurotic part of the external oblique (Gray arrows) and the anterior rectus sheath (Yellow arrows.)



One continuous running suture closes the outer layer of the incision, starting at either end: in this case the surgeon started medially, closing the anterior rectus sheath first.



As the closure continues laterally, the transition is made to the external oblique aponeurosis and muscle.

18. Irrigate the subcutaneous space, assure hemostasis, and close the skin.



Before closing the skin, irrigate and assure hemostasis, as blood in the wound can increase the risk of infection.

Pitfalls

- Poor visualization of the lower abdomen: use this incision only if you are certain where the pathology is. Otherwise, a midline incision is more appropriate. It is acceptable to extend a subcostal incision in either direction if you need to.
- Ongoing bleeding during surgery, or postoperatively, from the branches of the superior epigastric vessels that run through the rectus muscle. Take time to coagulate each one with diathermy as you divide the muscle. If you do not have diathermy, apply a hemostat and ligate each branch individually.

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- Visceral injury during closure: be sure to see the needle at every point as it passes through the muscle and fascia. Do not close the inner layer of the fascia from one end of the wound to the other, begin at both ends and meet in the middle so that the needle can be seen during the final stitches.
- Placing the wound too close to the costal margin: this makes closure more difficult and incisional hernia more likely. Be sure that you start the incision two fingerbreadths below the costal margin to leave enough tissue on the cranial side of the wound.
- Incisional hernia: This is usually the result of a technical error during closure, especially failure to see and close the individual layers as described here. Alternatively, the risk of an incisional hernia increases when closure is done with a rapidly absorbable suture such as polyglycolic acid (Vicryl®.)

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