

## Rectus repair for midline ventral abdominal wall hernia

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*Recurrence-free repair of midline ventral abdominal wall hernia continues to elude surgeons, despite the abundance of described techniques. Based on the observation that spontaneous herniation through the rectus abdominis muscles is unknown, a new technique of repair was devised. The rectus muscles and their sheaths on either side of the hernial defect are directly brought together to obliterate the hernia, the intervening linea alba and intact hernia sac being 'keeled' into the abdominal cavity. Using this technique, 85 consecutive midline abdominal hernias were repaired over an 11-year period. Follow-up was from 18 months to 12 years; there was one recurrence. The rectus repair is recommended as an effective method of dealing with ventral midline abdominal wall hernia.*

Midline ventral abdominal wall hernia is a common problem in general surgery, but no definitive repair for this condition is acknowledged as recurrence rates of over 30 per cent<sup>1</sup> are reported. Although numerous techniques of repair have been practised over the past century, all employ approximation of the linea alba or rectus sheath (not muscle) to obliterate the hernial defect. However, in many spontaneously occurring hernias the linea alba itself is a very weak layer so that divarication of the rectus muscles, fatty hernia of the linea alba, and paraumbilical hernia all occur *de novo* through defects of this fibroaponeurotic band. Spontaneous herniation through the rectus abdominis, however, is virtually unknown. Thus, the logical repair for ventral midline abdominal wall hernia would be to approximate the rectus muscles in the midline, allowing no linea alba to intervene between them.

Such a repair has been used in this unit since 1978. Paraumbilical, umbilical, epigastric and midline incisional hernias were regarded as suitable for this 'rectus repair', since the underlying weakness, a defect in the linea alba, is common to all of them. The technique of repair and experience with it are presented.

### Patients and methods

All adult patients presenting for surgery with midline ventral abdominal wall hernia from 1978 to 1989 underwent repair by the method described below. Their ages ranged from 25 to 72 years; there were 71 women and 14 men. Of 85 hernias repaired, 44 were paraumbilical, 23 incisional, 11 umbilical and seven epigastric.

Through an appropriately placed incision, depending on the type of hernia, the sac was dissected down to its neck and freed from the linea alba extraperitoneally. The subcutaneous fat was mobilized from

the hernia sac and dissection extended laterally for a distance of at least 3 cm from the medial edge of the rectus abdominis (not linea alba). The sac and linea alba were inverted and no attempt made to dissect sac contents. Repair was commenced with the left index finger (of a right-handed surgeon) inserted into the hernial defect extraperitoneally (Figure 1). This served two purposes: it ensured that the tissue taken by the suture included a generous full-thickness bite of the medial border of the rectus muscle and sheath, and it also aided in guiding the needle through an extraperitoneal course, ensuring that no underlying viscus was penetrated. An inverting suture technique was used, starting about 5 cm above the hernia and extending approximately the same distance below. Sutures were placed 2-3 cm

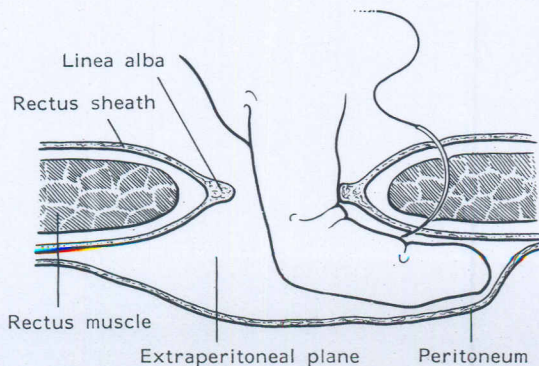


Figure 1 Index finger guiding needle through the full thickness of the rectus abdominis muscle and sheath in the extraperitoneal plane

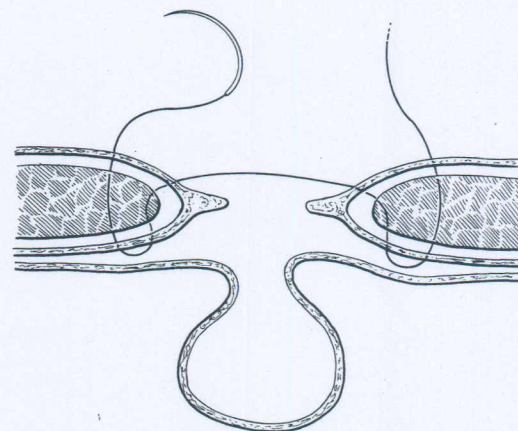


Figure 2 Suture placement

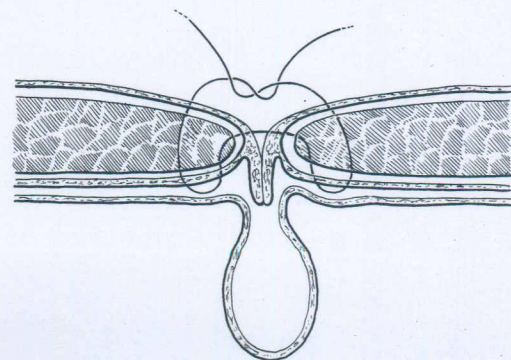


Figure 3 Rectus muscles approximated in midline with 'keeled' of linea alba into the abdomen

laterally to the medial border of the rectus, exiting medially to the border of the rectus on the same side. The needle then entered the medial edge of the rectus on the opposite side and exited 2–3 cm laterally through the muscle (Figure 2). Longitudinally, suture placement was no more than 1 cm apart. Suture-line tension was made just sufficient to approximate the tissues. The effect of this suturing technique was to bring the muscle bellies of the rectus muscles together in the midline to close the hernial defect, while inverting the hernia sac and potentially weak linea alba in 'keel' fashion into the abdominal cavity (Figure 3).

With small hernias, the last one or two sutures were placed by relaxing the tension on the suture line, allowing the left index finger to remain in position. With large defects, two lengths of suture from opposing ends were used. This served two purposes. First, the widest part of the defect, its centre, was gradually narrowed by the opposing sutures, eliminating undue stress on both suture and tissues. Second, the last sutures could be placed under direct vision since the edges of the rectus muscles and sheath were already raised as ridges by sutures from cephalad and caudad ends of the repair.

A continuous suture of 0 loop nylon was used routinely. Good haemostasis was generally achieved but, in large hernias requiring extensive mobilization of fat, a subcutaneous suction drain was used. Skin edges were approximated with a subcuticular suture. General anaesthesia with muscle relaxation was employed in all cases.

## Results

Follow-up was routinely performed at 6 and 18 months after operation and all patients were reviewed for the purpose of this study. Follow-up was for a mean of 71 months (range 18 months to 12 years). There was one recurrence (1 per cent), which was detected at 18-month follow-up. At reoperation this was attributed to technical error, since the suture line was found intact but not engaging the rectus muscle on one side. This patient remains well 18 months following the second operation.

## Discussion

The recurrence-free repair of midline ventral abdominal wall hernia continues to challenge the general surgeon, despite the abundance of described techniques. Although prolonged tissue support while fascial healing takes place<sup>2</sup> and proper suture placement<sup>3</sup> have contributed in the recent past towards reducing recurrence, this continues to occur with an incidence of over 30 per cent<sup>1</sup>. The widespread use of non-absorbable suture material has significantly reduced the incidence of incisional hernia<sup>4,5</sup> and virtually eliminated suture failure as a cause of recurrent herniation. This is demonstrated at surgery for recurrence, when an intact suture line is almost invariably found displaced to one side of thin attenuated tissue, which forms the edge of the hernia sac. Tissue failure is the major cause of hernia recurrence.

The common principle underlying all currently employed methods of repair is approximation of the fibroaponeurotic linea alba or anterior rectus sheath. The concept of muscular approximation described in the present paper is a marked deviation from this tradition; the integrity of the repair depends on the natural strength of the rectus abdominis and its sheath. Muscle is dynamic tissue capable of maintaining an isometric state with varying levels of load. The linea alba, however, is fibrocollagenous and lacks this ability, so that over a period of time with altering levels of load it becomes stretched beyond its elastic limit, predisposing to herniation. The relative weakness of the linea alba is underlined by the fact that incisional hernia occurs most commonly after midline incisions, while herniation through muscle-cutting abdominal incisions is much less common<sup>1</sup>. In fact the incidence of incisional hernia is increased after transverse abdominal incisions when they extend on to the midline<sup>1</sup>. Since the rectus repair inverts the linea alba, removing it from the plane of the anterior abdominal wall, all potentially weak tissue is avoided.

Current surgical teaching dictates that suture placement should be at least 1 cm from the wound edge when closing a midline abdominal incision<sup>6</sup>. This empirical distance is not useful since a thin attenuated linea alba can be several centimetres wide in some patients. A more important principle should be to insert the suture into the medial edge of the rectus abdominis muscle. In the obese or multiparous patient with divarication of the rectus muscles, the distance of the rectus from the wound edge would be considerably more than 1 cm, thus larger bites of tissue would be necessary to approximate the muscles in the midline.

The vertical nature of the repair is critical to its integrity. In transverse repairs, such as in the Mayo<sup>7</sup> technique, separation of the rectus muscles is increased and linea alba is used for the repair. These two factors in combination may predispose to hernia recurrence in the space between the rectus muscles.

Soliman's good results<sup>8</sup>, we believe, derive not from the number of layers involved in repair, but because the method used is the only technique that directly engages the rectus muscles from both sides. However, the approximating technique does not ensure that the muscles are closely apposed with no intervening linea alba. In addition, dissecting the contents of the hernia sac and mobilizing the adjacent intraperitoneal structures can be time consuming and bloody. Since the rectus repair is entirely extraperitoneal, tedious intraperitoneal dissection is avoided; ileus occurred in no patient in the present series. Although sac inversion has been objected to on grounds of predisposing to mechanical bowel obstruction, this complication has never been encountered and it is more likely to be a theoretical concern than a practical one<sup>9</sup>. Since the present method achieves 'keeling' of the hernia sac by one layer of suture, it is carried out more quickly than by the traditional Maingot<sup>10</sup> technique using several layers of sutures.

The efficacy of rectus repair is demonstrated by the fact that during 11 years of practice there was only a single recurrence and even this was entirely avoidable as it arose through a failure of technique. This repair is recommended for widespread adoption.

## Acknowledgements

Figures 1–3 were drawn by Gillian Lee.

## References

1. Fischer JD, Turner FW. Abdominal incisional hernias: a 10-year review. *Can J Surg* 1974; **17**: 202–4.
2. Douglas DM. The healing of aponeurotic incisions. *Br J Surg* 1952; **40**: 79–82.
3. Jenkins TPN. Incisional hernia repair: a mechanical approach. *Br J Surg* 1980; **67**: 335–6.
4. Jenkins TPN. The burst abdomen: a mechanical approach. *Br J Surg* 1976; **63**: 873–9.
5. Bucknall TE, Cox PJ, Ellis H. Burst abdomen and incisional hernia: a prospective study of 1129 major laparotomies. *BMJ* 1982; **284**: 931–3.
6. Dudley H. Access to the abdomen and lower chest. In: Dudley H, Carter DC, Russell RCG, eds. *Atlas of General Surgery*. 2nd ed. London: Butterworths, 1986: 126–45.
7. Mayo WJ. An operation for the radical cure of umbilical hernia. *Am Surg* 1901; **31**: 276–8.
8. Soliman SM. Anchorage overlapping repair of incisional hernia. *J R Coll Surg Edinb* 1989; **34**: 140–2.
9. Abrahamson J. Hernias. In: Schwartz SI, Ellis H, eds. *Maingot's Abdominal Operations*. 9th ed. Norwalk, Connecticut: Appleton and Lange, 1990: 215–96.
10. Maingot R. A further report on the 'keel' operation for large diffuse incisional hernias. *Med Press* 1958; **240**: 989–93.