

Short reports

Pregnancy and ventral hernia repair

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Summary: Reluctance to repair anterior abdominal wall hernias in women of childbearing age is probably unjustified. A unique series is described of 27 women who gave birth to 41 full-term babies following repair of an anterior abdominal wall hernia with no recurrence of the hernia. Nineteen had primary and recurrent umbilical hernias and an incisional hernia in a low transverse incision repaired by the onlay darn technique and have produced 29 babies. Eight had umbilical hernias, gross diastasis of the recti and post-cesarean section vertical incisional hernias repaired by the Shoelace technique followed by 12 full-term pregnancies. Little is written about the fate of the abdominal wall subjected to pregnancies following repair of ventral hernias, since the majority of women having these hernias repaired are past the childbearing age or are warned off further pregnancies by their doctors or undergo tubal ligation with the hernia repair. The Shoelace repair is described, stressing its advantages over mesh hernioplasties in women who wish to have further pregnancies. There is apparently no reason to refuse to repair these hernias. There are even positive indications in view of serious complications associated with pregnancy in the presence of an anterior wall hernia. Prosthetic mesh tends to contract and harden and may seriously interfere with abdominal expansion in pregnancies so these hernias are probably best repaired by the Shoelace technique.

Key words: Ventral abdominal hernia – Pregnancies – Cesarean section – Incisional hernia – Shoelace repair

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The aim of this study was to resolve the dilemma when faced with young women suffering from ventral hernias who wish to have the hernias repaired but who intend to have further pregnancies following the repair. Most surgeons are reluctant to repair these

hernias for fear of being blamed for recurrence of the hernia after further pregnancies. Yet reluctance to repair anterior abdominal wall hernias in women of childbearing age is probably unjustified as borne out by this study.

Material

The overall series consists of 27 women who gave birth to 41 full-term babies following repair of an anterior abdominal wall hernia with no recurrence of the hernia (Table 1). The hernia repairs

Table 1. Pregnancies and ventral hernia repair. Number of cases, types of hernias, method of repair and number of births in each group.

	Onlay darn		Shoelace repair	
	# patients	births	# patients	births
Primary Umbilical Hernia	17	26	2	2
Diastasis Recti + UH	-	-	1	3
Recurrent Umbilical Hernia	1	1	-	-
Incisional Hernia in Cesarean Section:				
low transverse incision	1	2	-	-
midline incision	-	-	5	7
Total patients (27)	19	29	8	12

were performed by the authors. All the women were examined for recurrence by one of the authors and none was lost to follow-up. Seventeen of the women had a primary umbilical hernia repaired by the onlay darn technique (Fig. 1) previously described by one of the authors [Abrahamson 1989, 1997] followed by 26 full-term births. A further two women had large primary umbilical hernias repaired by the Shoelace method [Abrahamson 1988, 1989, 1997, Eldar 1999] followed by one full-term birth each. One woman had a gross degree of diastasis recti combined with a large umbilical hernia repaired by the Shoelace technique followed by 3 full-term births. One woman had a recurrent umbilical hernia repaired by the onlay darn method followed by one full-term birth. Six of the 27 women had post-cesarean section hernias repaired. One of these six, in a low transverse incision, was repaired by onlay darn and had two normal full-term births following the repair. The other 5 through vertical midline incisions were repaired by our Shoelace technique and gave birth to 7 full-term infants following the repair.

The 8 women in the series who developed herniations of the anterior abdominal wall after pregnancies and whose hernias were repaired by the Shoelace technique, followed by 12 births with no recurrence of the hernia, are the core material of this report and are described in detail.

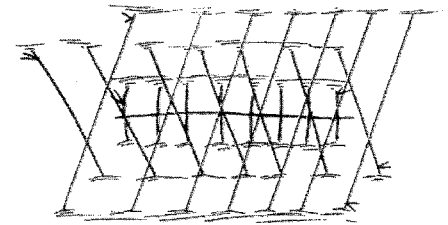
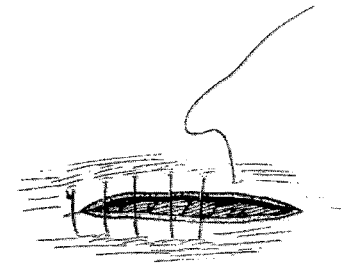
Case 1. (Born 1958). Grossly obese. Developed an incisional hernia following a cesarean section through a verti-

cal incision in 1981 for the second of 7 births before the Shoelace repair of the hernia in September 1992. The defect was 15 cm long and 9 cm wide. She gave birth to two further babies 15 m and 4 yr 2 m after the Shoelace repair and is now 7 yr 11 m since the repair and has no recurrence of the hernia.

Case 2. (Born 1963). Grossly obese. Had 4 births resulting in 6 children including one set of triplets who were born by cesarean section through a low transverse incision. Following this she had a large umbilical hernia 10 cm long by 6 cm wide repaired by a Shoelace in August 1993. She gave birth to one baby 4 yr 4 m after the Shoelace repair and is now 6 yr 10 m since the repair and has no recurrence of the hernia.

Case 3. (Born 1964). Had 3 normal births, then had an umbilical hernia 15 cm in length and 6 cm in width repaired by a Shoelace in November 1993. After the repair she had a further 3 births 2 1/2 yr, 3 1/2 yr and 5 yr post repair respectively. She is now 6 yr 7 m post repair and has no recurrence.

Case 4. (Born 1962). Grossly obese. Had her first cesarean section through a vertical midline incision for the birth of her second child. Her second cesarean section, in 1991, for her fifth child, was through the previous vertical incision and was complicated by a wound infection resulting in a major incisional hernia 24 cm long and 15 cm wide. The hernia was repaired by the Shoelace technique in January 1994 and has successfully withstood two further pregnancies and births, 1 yr 8 m and 5 yr respectively after the hernia repair. She is now 6 yr 5

**Fig. 1**

Onlay darn repair of an umbilical hernia. (Abrahamson J. Hernias. In: Zinner MJ ed. *Maingot's abdominal operations*. 10th ed. Stanford, CT: Appleton & Lange, 1977: 479-580. Reproduced with permission of The McGraw-Hill Companies).

m after the Shoelace repair. There is no evidence of herniation.

Case 5. (Born 1962). Obese. Her first baby was born by cesarean section but through a low transverse incision. Her second child was born normally. Her third child was born by cesarean section through a vertical midline incision through which developed an incisional hernia 12 cm long and 6 cm wide which was repaired in May 1996 by our Shoelace technique. She gave birth to her fourth child in May 1999, 3 yr 1 m following the hernia repair. She is now 4 yr 2 m since the Shoelace repair. There is no evidence of recurrence.

Case 6. (Born 1967). Mildly obese. Developed a combined defect of an umbilical hernia and wide divarication of the recti after 5 normal births. The defect measured 7 x 7 cm and was repaired by the Shoelace procedure in November 1996. She delivered her sixth child in March 1999, 2 yr 4 m after the operation. She is now 3 yr 7 m since the Shoelace repair and has no recurrence of the hernia.

Case 7. (Born 1972). Developed an incisional hernia combined with an umbilical hernia after three pregnancies, all delivered by cesarean section. The

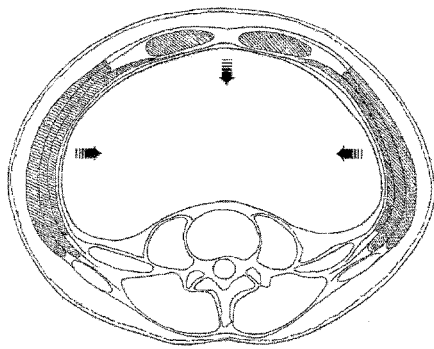


Fig. 2
The normal state of tonic contractions of the lateral sheet muscles flattening the abdominal wall and holding back the contents of the abdomen (Abrahamson J. *Hernias*. In: Zinner MJ ed. *Maingot's abdominal operations*. 10th ed. Stanford, CT: Appleton & Lange, 1997: 479-580. Reproduced with permission of The McGraw-Hill Companies).

first two through a Pfannenstiel incision and the third through a vertical midline incision through which the hernia developed. The defect was 17 cm long and 8 cm wide and was repaired by the Shoelace operation in May 1998. She has had one pregnancy delivered normally 15 m after the repair. She is now 2 yr since the Shoelace repair, with no evidence of recurrence.

Case 8. (Born 1973). Had two normal births then developed an incisional hernia after a cesarean section through a vertical incision for her third baby. The hernial defect was 6 cm long and 5 cm wide and was repaired by the Shoelace procedure in April 1999. She became pregnant 4 months later and delivered normally in May 2000. She is now 14 m after the Shoelace repair and has no recurrences of the hernia.

Method

The Shoelace darn repair has been previously described [Abrahamson 1988, 1989, 1997, Eldar 1999]. The flat muscles of the abdominal wall are normally in a state of tonic contraction but cannot shorten since they are fixed at the midline to those of the opposite side so that they function as a dynamic girdle, flattening the abdominal wall (Fig. 2). However, when a midline or paramedian incision fails to heal, the flat muscles lose their midline anchor and shorten, drag-

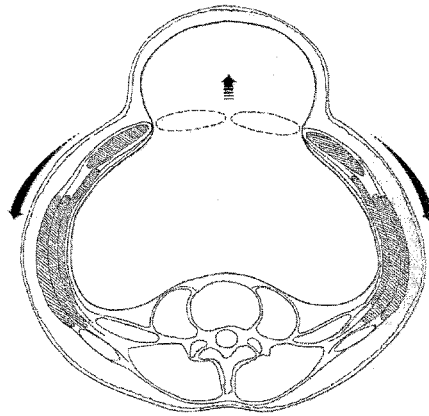


Fig. 3
As the hernia develops, the flat muscles lose their midline anchor and their tonic contractions cause them to shorten so that the gap between the recti muscles widens (Abrahamson J. *Hernias*. In: Zinner MJ ed. *Maingot's abdominal operations*. 10th ed. Stanford, CT: Appleton & Lange, 1997: 479-580. Reproduced with permission of The McGraw-Hill Companies).

ging the rectus muscles with them and so create the oval midline defect through which the hernia prolapses (Fig. 3). In the usual case, there is no loss of tissue or defect of the muscles or fasciae of the abdominal wall. The totally extraperitoneal Shoelace operation, using only two simple lines of suture, reconstructs a strong new linea alba midline anchor, straightens out the rectus muscles, returns them to lie alongside each other at the midline and reconstructs the anterior rectus sheaths and fixes them to the new linea alba. The operation achieves the two anatomic objectives of incisional herniorrhaphy which are to close the parietal defect and to reattach in the midline the tendons of the retracted lateral abdominal muscles as well as restoring the normal function of the abdominal wall [Symposium 1999].

The operation is done under general anesthesia with good relaxation. The old scar is excised. The sac of the hernia and the rectus sheaths on each side are exposed. The new linea alba is constructed by suturing together two vertical strips 1-1.5 cm wide, each split off the medial edge of each anterior rectus sheath, using a continuous over-and-over suture of a monofilament polyamide loop (Fig. 4, a,b,c) [Gibson 1920, 1920, Dixon 1929]. This suture line returns the unopened sac and its contents to the abdominal

cavity and approximates the posterior rectus sheaths and the rectus muscles to each other at the midline (Fig. 4, d).

The second step restores the recti muscles to their normal width and thickness and draws the flat muscles back to their former length by pulling closer together the lateral cut edges of the anterior rectus sheaths. This is done with a continuous suture of monofilament polyamide loop that passes to and fro between the cut edges as well as through the new linea alba for the whole length of the hernia, in the manner of a shoelace tightening up a boot (Fig. 4, e). This suture substitutes anatomically and functionally for the missing anterior rectus sheaths (Fig. 5). With narrow or moderately wide hernias or with divarications of the recti, this suture line

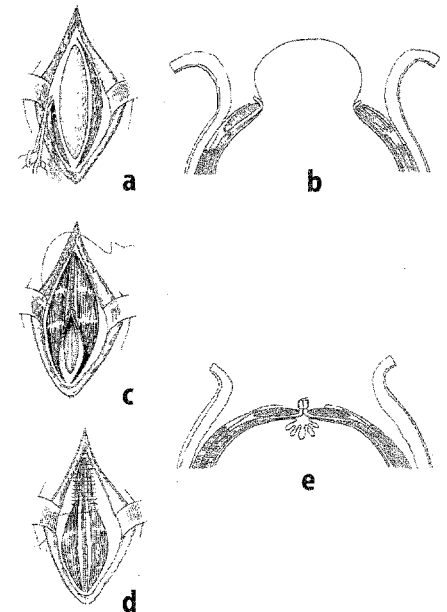


Fig. 4a-e
a. Creating the medial ribbons of the anterior rectus sheaths along the hernial sac. b. The slit in the anterior rectus sheaths on transverse section. c. The first suture line constructing the new linea alba. d. The unopened sac and its contents is returned to the abdominal cavity. e. The continuous heavy monofilament polyamide Shoelace suture passing in front of the rectus abdominis muscles, between the cut edges of the anterior rectus sheaths and through the new midline, restoring the recti muscles to their normal width and thickness, and drawing the flat muscles back to their former length. (Abrahamson J. *Hernias*. In: Zinner MJ ed. *Maingot's abdominal operations*. 10th ed. Stanford, CT: Appleton & Lange, 1997: 479-580. Reproduced with permission of The McGraw-Hill Companies).

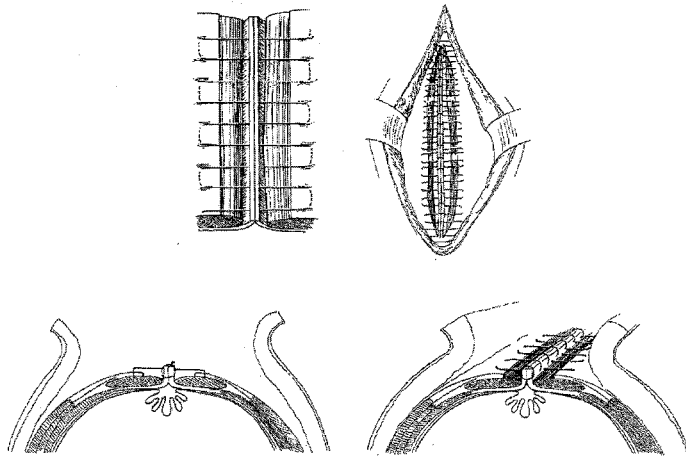


Fig. 5

The completed Shoelace repair substituting for the missing anterior rectus sheaths. (Abrahamson J. *Hernias*. In: Zinner MJ ed. *Maingot's abdominal operations*. 10th ed. Stanford, CT: Appleton & Lange, 1997: 479-580. Reproduced with permission of The McGraw-Hill Companies).

approximates the edges of the anterior rectus sheaths by bringing them together at the new linea alba. In larger hernias, a gap of varying width remains, with the continuous pliable to and fro shoelace suture adjusting itself to the differing widths and tensions across the fascial defect. Drains are placed, excess skin and fat are excised and the skin sutured. The operation is entirely extraperitoneal and involves only two simple suture lines placed in normal healthy tissue, consequently the postoperative recovery is smooth and rapid.

In the usual Shoelace repair where the patient has passed the childbearing age, the second suture, the shoelace, is pulled fairly tight under some tension in order to draw the flat muscles forward towards the midline [Symposium 1999]. However, when young women intend to have further children, allowance must be made for the future distension of the abdominal wall with pregnancy by leaving the shoelace suture fairly loose, with no tension. This requires a much longer length of suture material which creates a good ratio between wound length and length of suture and it is this that makes abdominal distension possible and with no recurrence of the hernia after pregnancies [Jenkins 1976, 1980, 1989, Abrahamson 1994]. The monofilament nonabsorbable synthetic polyamide suture is strong, extremely

smooth, pliable and inert and excites very little tissue reaction. These characteristics allow the suture to slide easily through the tissues and so adjust itself to the changing tensions and to the lengthening of the repair as the pregnancy progresses. Furthermore, the polyamide suture has the added advantage of excellent extensile strength, which confers on the material the ability to "give" or stretch with the changing tensions on the tissues and is therefore most suitable for the Shoelace repair in young women who plan future pregnancies.

Discussion

Very little is written about the fate of the abdominal wall subjected to pregnancies following repair of ventral hernias, probably since the majority of women having these hernias repaired are past the childbearing age or are strictly warned off further pregnancies by their doctors. Others use the opportunity of the hernia repair to undergo tubal ligation to ensure no further pregnancies. We describe a special group of young and prolific and often adipose women who develop large umbilical hernias and wide divarications of the recti following repeated pregnancies and incisional hernias after single or repeated cesarean sections, who intend to and do have further pregnancies following repair of these

abdominal wall defects. We have not found any similar cases reported in the literature of pregnancy following repair of an anterior abdominal wall defect apart from three somewhat related cases [Ezra 1990, Ein 1990, Sutton 1999].

Should an anterior abdominal hernia be repaired in a young woman who intends to have further children? Most are anxious to have the operation in order to avoid in later pregnancies the discomfort they suffered with the previous pregnancies associated with the hernia. They complain of pain and heaviness which interfere with their normal functioning and are unrelieved by the various uncomfortable and more or less useless corsets designed to support the gravid uterus prolapsing through the hernia. Some request operative repair of the hernia for esthetic reasons. However, in view of the reported complications associated with pregnancy in the presence of an anterior abdominal wall hernia [Keill 1973, Aimakhu 1975, Badejo 1982, Awojobi 1983, Dare 1991], operative cure of the hernia should be seriously considered in women of the reproductive age. These complications include strangulation of bowel in the hernia, pressure necrosis of the wall of the hernia, spontaneous rupture of the hernia, abortion, premature labor, intrauterine death and maternal death. Although one's gut feeling is that the repair will not withstand the stress of the abdominal distention during the next pregnancy and that the hernia is sure to recur, there is no evidence for this. In view of the cases we report, it would appear that a properly repaired anterior wall hernia will hold in spite of repeated pregnancies.

Small umbilical, epigastric and narrow incisional hernias may be closed by simple suture [Eldar 1999]. Narrow divarication of the recti generally does not need to be treated. Medium-sized incisional hernias, umbilical hernias and divarications of any degree may be simply and efficiently repaired by the Shoelace technique [Abrahamson 1988, 1989, 1997, Eldar 1999]. Large hernias under certain circumstances, such as discussed here, where the patient is in the childbearing age and intends to have further pregnancies, can also be

repaired to advantage by the Shoelace method. It is held by some that all incisional hernias should be repaired with nonabsorbable prosthetic mesh. This is not necessarily so but certainly is true where there has been a loss of abdominal wall tissue [Flament 1998, Eldar 1999, Symposium 1999]. However, in most midline incisional hernias such as those discussed here after cesarean section, there is no loss of abdominal wall tissue, so that these hernias in young women are eminently suitable for the Shoelace repair. Repair of incisional hernias with synthetic mesh is a well-accepted method. [Rives 1977, Stoppa 1979, 1980, 1989, Wantz 1991, 1991, Flament 1998, Symposium 1999]. However, mesh repair may be associated with certain complications such as

intestinal adhesions to the mesh with bowel obstruction and intestinal fistula, fistula to the urinary bladder and others [Leber 1998, Morris-Stiff 1998, Symposium 1999]. Furthermore, mesh repair has certain disadvantages especially for young women who wish to continue reproducing. The mesh may contract up to even 20% with time and stiffen and harden, creating a boardlike, fixed abdominal wall, limiting activities such as bending and rotating as well as preventing abdominal distension in pregnancy [Klinge 1998, Müller 1998, Symposium 1999]. In contrast, the Shoelace darn repair reconstructs and restores the functional anatomy of the abdominal wall, resulting in a normal-looking, soft, pliable and expandable abdomen.

Conclusion

On the basis of our small series, it would appear that there is no reason to refuse to repair these ventral abdominal hernias in young women who wish to have further pregnancies. Reports in the literature suggest that there are even certain positive indications for recommending the operation in view of complications which may occur in the course of a pregnancy in the presence of a ventral hernia. There is nothing to indicate that a well-repaired hernia will recur because of the pregnancy. Certain disadvantages of prosthetic mesh repair may seriously interfere with abdominal expansion, so these hernias are probably best repaired by the Shoelace technique.

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