



Incisional Hernia Recurrence following “Vest-Over-Pants” or Vertical Mayo Repair of Primary Hernias of the Midline

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Abstract. A series of 68 primary midline incisional hernias with a vertical Mayo repair was evaluated retrospectively. Patients without documented hernia recurrence following this repair were invited for physical examination. Life-table methods were used for statistical analysis. The 1-, 3-, 5-, and 10-year cumulative recurrence rates were 35%, 46%, 48%, and 54%, respectively. Also, generally accepted risk factors were studied. Multivariate analysis identified the size of the hernia ($p = 0.02$) and the use of steroids ($p = 0.04$) as the most important independent risk factors of first time recurrent incisional hernia. Considering the high recurrence rates found, the results of this study strongly suggest that the vest-over-pants repair should no longer be used for closure of midline incisional hernias.

Incisional hernias appear in at least 10% of patients with midline laparotomies [1]. Patients with an incisional hernia often complain of the aesthetic appearance or suffer from discomfort, pain, or intestinal obstruction [2]. A variety of operative procedures for incisional hernia repair have been in use, but the results are often disappointing. Five-year cumulative recurrence rates as high as 41% have been reported [3].

Mayo believed that a scar in one plane, from within out, was an important risk factor for developing a hernia [4, 5]. He therefore advocated an overlapping repair in which each line of sutures is protected by normal structures. These sutures hold the structures in apposition, and the intraabdominal tension itself prevents displacement [4]. Mayo's technique is considered to be a major step in the history of hernia repair. Formerly, surgeons attempted to unite extensively dissected rectus muscles vertically in the midline, with poor results [4].

The present study was performed to evaluate the results of the vertical “vest-over-pants” Mayo repair. In addition, various potential risk factors for recurrent incisional hernia were analyzed.

Patients and Methods

The records of all patients with a vertical Mayo repair operated at the Department of Surgery of the Sint Franciscus Gasthuis

Rotterdam between 1981 and 1990 were reviewed retrospectively. Because recurrent hernias are known to have higher recurrence rates [3, 6] and incisional hernias occur more often in the midline than in other vertical [1, 7–9] or transverse [7, 10–14] incisions, only patients with a primary hernia of the midline were selected for analysis. *Patient-related factors* of sex, age, obesity, chronic cough, prostatism, constipation, diabetes mellitus, history of oncologic disease, and use of steroids were noted. Obesity was measured using the Quetelet index. *Operation-related factors*, including surgical technique, suture materials, wound hematoma, wound infection, and the surgeon's experience (resident, consultant), were also analyzed. *Hernia-related factors*, such as the hernia-free interval, type of incision, previous hernia repairs, and the size and number of the hernias, were evaluated as well. Midline hernias were divided into upper, lower, umbilical (≤ 3 cm proximal or distal from the umbilicus), or full length (>3 cm proximal and distal from the umbilicus) hernias. Patients without documented hernia recurrence after the repair were invited for physical examination. In patients without recurrence, follow-up time was defined as the interval from hernia repair to present physical examination. In patients aware of a recurrence, the month of first detection was used as the time to the event. In patients having a recurrence of which they were not aware, the time to the recurrence was estimated as the time halfway between the most recent control visit and the study examination. Whenever physical examination was not possible due to death or other reasons, the most recent documented physical examination was used to determine hernia recurrence and follow-up time.

For incisional hernia repair the vertical Mayo technique was used, being a modification from the classic transverse Mayo technique for umbilical hernia repair [4, 5, 15, 16]. This repair includes excision of the nonvital edges of the fascial defect and clearing of the rectal fascia over 3 to 5 cm. Mattress sutures (1-0 Vicryl, polyglactin 910) are introduced approximately 2.5 cm from the margin of the aponeurosis on one side of the linea alba and 1 cm from the margin of the opposite side. When these sutures are tightened it draws one fascia underneath the other, creating a vertical fascial scar. The free margin of the overlapping flap is

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Table 1. Cumulative percentages of patients with recurrent incisional hernia following a primary vertical Mayo repair of the midline after 0–120 months of follow-up.

Months after operation	Patients in follow-up without hernia recurrence (no.)	Cumulative recurrence rate (%)	Standard error (%)
0.5	68	7	3
1–1.5	63	13	4
6	40	29	5
12	33	35	6
24	30	39	6
36	26	46	6
48	21	46	6
60	15	48	7
120	5	54	8

sutured to the surface of the opposite aponeurosis, creating a second suture line [4, 5, 15, 16].

Life-table methods were used for statistical analysis. Cumulative percentages of patients having a recurrence along time were calculated and compared using Kaplan-Meier curves and log rank tests, the latter including the trend test version [17]. Multivariate analysis of various factors was done using Cox regression. The *p* values given are two-sided; *p* = 0.05 was considered the limit of significance.

Results

A series of 68 patients was analyzed. This group comprised 31 men and 37 women with a mean age of 65 years (range 20–82 years). Follow-up examination varied from 0.5 to 152 months (mean 35 months). For cases without recurrence (*n* = 40), mean follow-up was 50 months (range 1–152 months). The cumulative recurrence rates after 1, 3, 5, and 10 years were 35%, 46%, 48%, and 54%, respectively (Table 1).

Of the 28 with a recurrence, 9 patients (32%) had a recurrence during the first month, 12 patients (43%) after 1 month and within 1 year, 2 patients (7%) during the second year, and 3 patients (11%) during the third year. Hence most of the recurrences (75%) occurred within the first postoperative year.

Univariate analysis of *patient-related risk factors* (Table 2) demonstrated that only the use of steroids was related (*p* = 0.05) to recurrence (Fig. 1). Of the *hernia-related factors*, full length resulted in more recurrences than the combined group of median upper, median lower, or umbilical incisions (*p* = 0.01), whereas there was no difference (*p* = 0.61) between the latter three groups. Also the size of the hernia correlated with the risk of recurrence in cases with a single defect. Smaller defects generally had a lower risk of recurrence (*p* = 0.03) (Fig. 2). Of the *operation-related factors*, none significantly correlated with recurrence. There was a trend, though, for a higher recurrence rate in patients who had had a wound infection (*p* = 0.09).

Multivariate analysis demonstrated that the size of the hernia for patients with a single defect and use of steroids were the most important factors predicting a recurrence. A doubling of the size of the defect resulted in a 1.6-fold increased recurrence rate (*p* = 0.02). The use of steroids led to a 2.9-fold increased recurrence rate (*p* = 0.04). Full-length incisions generally had a higher recurrence rate when considered alone, but this factor was of no importance when adjusted for the size of the defect.

Table 2. Recurrence rates in relation to various risk factors in patients with a vertical Mayo repair of a primary incisional hernia of the midline.

Factors	No. of pts. ^a	No. of pts. with recurrence	5-Year cumulative recurrence rate (%)	<i>p</i>
Patient-related				
Sex				
Male	31	16	64	0.12
Female	37	12	36	
Age				
≤65 Years	34	17	55	0.43
>65 Years	34	11	39	
Obesity (Q ≥ 25)				
No	27	10	46	0.84
Yes	39	18	50	
Cough				
No	55	22	47	0.82
Yes	13	6	51	
Constipation				
No	64	26	47	0.97
Yes	4	2	66	
Prostatism				
No	31	16	64	—
Yes	0	0	—	
Diabetes				
No	65	27	49	0.95
Yes	3	1	33	
Oncology				
No	57	23	47	0.99
Yes	11	5	56	
Steroids				
No	59	22	44	0.05
Yes	9	6	≥72	
Hernia-related				
Incision				
Full length	13	9	75	0.01 ^b
Median upper	29	11	48	
Median lower	11	3	28	
Umbilical	14	4	45	
Size (cm)				
1.5–3.0	15 ^c	4	31	0.03 ^d
3.1–6.0	15 ^c	7	44	
6.1–12.0	14 ^c	8	73	
12.1–25.0	9 ^c	5	≥78	
Multiple	14	4	42	
Operation-related				
Surgeon				
Resident	15	5	38	0.56
Consultant	45	21	56	
Both ^e	8	2	25	
Postoperative infection				
No	60	23	45	0.09
Yes	8	5	75	
Hematoma				
No	61	24	47	0.55
Yes	7	4	≥57	

^aBecause of missing data, the numbers of patients do not always add up to 68.

^bFull length compared to other median incisions combined (difference among the latter three groups: *p* = 0.61).

^cSingle fascial defects.

^dTrend test.

^eOperation performed by resident under assisting supervision of consultant.

Discussion

With respect to “vest-over-pants” incisional hernia repairs, van der Linden et al. [18] reported 26 recurrences among 47 repairs,

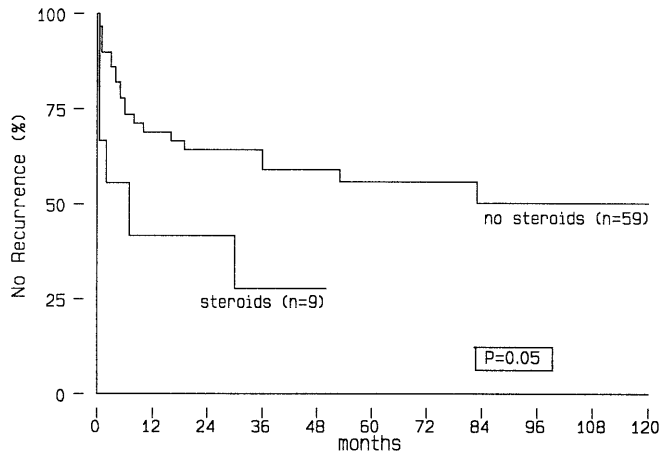


Fig. 1. Kaplan-Meier curves for recurrence of incisional hernia according to the use of steroids.

and Fischer and Turner [19] reported 11 recurrences for 57 repairs. A variety of incisions were included, however; and at that time life-table analysis was not yet performed. Because incisional hernias develop with time [20], and patients have variable lengths of follow-up, life-table methods are essential for studying hernia recurrence rates. Failure to do so may lead to underestimation of recurrence rates and therefore may result in erroneous conclusions. With respect to primary incisional hernia repair with various incisions and techniques but using life-table analysis, the literature reveals high cumulative recurrence rates (Langer et al. [6] reported a 10-year rate of 31% and Hesselink et al. [3] a 5-year rate of 41%). Seeking better results, we deliberately changed our technique in 1980 to the vertical Mayo repair, hoping the double-breasted vest-over-pants technique would serve our needs. The outcome, a 10-year cumulative recurrence rate of 54%, is disappointing.

As with all suture techniques, the tension on the tissues might be responsible for these results, by increasing the risk of tissue ischemia and suture cut-out [21, 22]. Due to the nature of the Mayo repair, which creates an overlap, this risk might be even more pronounced. Second, the use of absorbable suture material might have an influence [23, 24]. Absorbable 1-0 Vicryl sutures were used, which maintain their tensile strength for approximately 2 to 3 weeks. In this series, 32% recurred within the first postoperative month, suggesting that permanent suture material, by maintaining its tensile strength throughout the life of the wound, might be advantageous. However, Pollock and Evans [25] showed that early fascial separation may be responsible for a subsequent incisional hernia as well. If so, early loss of tensile strength might *not* be a major influence. Prospective studies studying primary abdominal wall closure have not yet given a clear answer [23, 24].

With respect to risk factors, *wound infection* is often considered to be the most important factor contributing to the development of incisional hernia [7, 10, 11, 14, 19, 21, 26–29]. In the present study we observed a higher (though not significantly) recurrence rate after wound infection. This nonsignificant finding may be due to the small number of patients with infection ($n = 8$) in this study. The *size of the hernia* was observed to be a significant factor for recurrence, confirming the findings of others. Hesselink et al.

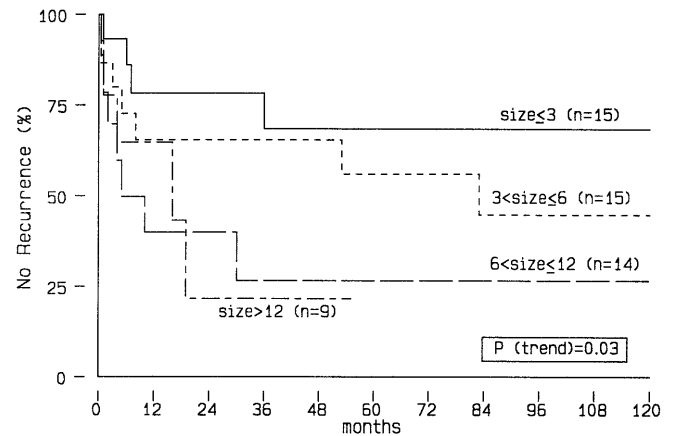


Fig. 2. Kaplan-Meier curves for recurrence of incisional hernia according to the size of the single lesion defect (< 3, 3–6, 6–12, and > 12 cm). Significantly fewer ($p = 0.03$) recurrences were found in patients with small hernias. The 5-year cumulative recurrence rates of these groups were 31%, 44%, 73%, and $\geq 78\%$, respectively.

[3] demonstrated that hernias smaller than 4 cm had a significantly lower recurrence rate than larger ones. The lower tension associated with repair of small hernias may be responsible. The use of *steroids* was identified as a risk factor, for small and large hernias, which may reflect the fact that steroids delay wound healing [10].

At this time no consensus has been reached about whether, how, and when to operate on a patient with an incisional hernia. Data from this and other series certainly are worrisome, making many surgeons hesitant to undertake a repair. Incisional hernia, however, is a significant source of morbidity, and delay in repair can have serious clinical consequences. Fascial defects, especially the small ones, predispose to incarceration or strangulation [10, 12]. The mortality rate of complicated incisional hernia repair is approximately 1% [30]. Second, nonoperated hernias might increase in size [10], with increasing difficulty of repair and higher recurrence rates. Third, massive hernias may give rise to dystrophic ulceration of skin, chronic abdominal and back pain, and respiratory complications due to diaphragmatic dysfunction [12, 31]. Therefore more efficacious techniques of hernia repair are needed.

Since the mid-1980s several series have shown low recurrence rates with inlay of prosthetic material [31–36], even in large defects, presumably due to the tension-free repair [21]. Although randomized trials are lacking, we now use prosthetic materials for repair of large defects (>6 cm). For smaller defects, an objective comparison between a one-layer approximating closure using nonabsorbable sutures and closure with intraperitoneal prosthetic material is currently being undertaken by means of a prospective randomized multicenter trial.

In conclusion, the size of the hernia and the use of steroids were identified as independent risk factors for first-time recurrent incisional hernias. The 5-year cumulative recurrence rates for hernias <3 cm, 3 to 6 cm, 6 to 12 cm, and >12 cm differed significantly: 31%, 44%, 73%, and 78%, respectively. These high recurrence rates strongly indicate that the vest-over-pants repair should not be used for closure of midline incisional hernias.

Résumé

Les résultats d'une série de 68 éventrations médianes traitées par la technique de Mayo ont été évalués rétrospectivement. Tous les patients sans récurrence prouvée ont été revus et ont fait l'objet d'un nouvel examen physique. La méthode des courbes de survie a été utilisée pour analyser les résultats. Le taux cumulatif des récurrences à 1, 3, 5, et 10 ans a été respectivement de 35, 46, 48 et 54 pourcent. Les facteurs de risque, en analyse multivariée, étaient la taille de la hernie ($p = 0.02$) et l'utilisation de corticoïdes ($p = 0.04$). En tenant compte du taux élevé de récurrence, les résultats de cette étude suggèrent fortement que la technique de verticale Mayo ne doit pas être utilisée pour les éventrations médianes.

Resumen

Se hizo la evaluación retrospectiva de una serie de 68 casos de hernia incisional primaria de línea media sometidos a reparación vertical de Mayo. Los pacientes con hernia recurrente documentada luego de este tipo de reparación fueron llamados para examen físico. Se utilizó el método de las tablas de vida para el análisis estadístico. Las tasas de recurrencia acumulativa a 1, 3, 5 y 10 años fueron 35, 46, 48 y 54 por ciento, respectivamente. También se hizo el estudio de los factores de riesgo. El análisis multivariable identificó el tamaño de la hernia ($p = 0.02$) y el uso de esteroides ($p = 0.04$) como los más importantes factores independientes de riesgo de recurrencia de la hernia incisional. En consideración a la alta tasa de recurrencia encontrada, los resultados del estudio sugieren fuertemente que la técnica de vest-over-pants ("chaleco sobre pantalón") no debe ser utilizada en la reparación de hernias incisionales de línea media.

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Invited Commentary

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Despite multiple efforts of the surgeon, a better choice of incision (more lateral and short than median and large), a better quality of suture, prophylaxis in obese patients by an intraabdominal resorbable prosthesis, and antibiotic prophylaxis incisional hernia appear to be a permanent and frequent (10% of laparotomies) surgical problem. Multiple procedures have been proposed with and without a prosthesis.

Luijendijk et al. have evaluated the results of the vertical "vest-over-pants" Mayo procedure in 68 patients over a long period, with documented parameters and a strict follow-up. This excellent study with its acknowledged poor results represents an important contribution to the understanding of this illness.

Most recurrences (75%) appear during the first year, and within 3 years most failures are obvious. Our experience concerning the time of recurrence is identical, as is the size of the hernia correlating with the risk of recurrence. For us obesity is a known determinant for choosing a surgical procedure. Because poor results without using a prosthesis are known in cases of large incisional hernias, with recurrence rates within 10 years from 30% to 54%, we have decided, after the reports of Rives and Stoppa (in France) [1-3] and most of the surgeons of the European Group of Research and Study on Wall Surgery (GREPA), to select the procedures and insert a prosthesis when the size of hernia is > 10 cm [4].

For small incisional hernias in the absence of a prosthesis, we always use (contrary to what is suggested in the Mayo repair study) nonabsorbable material, as for groin hernia surgery. The "tension-free" notion, which is accepted elsewhere, concerns cases of midline incisional hernia: It is the basis of the excellent Premont procedure [5] (using, after median suture, multiple short incisions on the anterior rectal fascia by three parallel vertical lines).

We have recently reported with Bouillot about 544 documented personal cases (GREPA, Paris, June 1996) our results of large incisional hernias (> 10 cm). We divided our patients in two groups: those with large median incisional hernias and those with lateral and complex incisional hernias. The second group benefited from the principles applied in the first: excision of skin scar, sac, and deficient fascia; freeing the abdominal viscera; closure of a posterior sheath (peritoneum or both with a transverse aponeurosis).

Then we inserted a large mesh, fixed by multiple sutures, and closed the anterior rectal fascia with absorbable suture. We used a prosthesis in 252 of 388 median incisional hernias. The mortality rate was 2 of 252 (2%), and morbidity was 42 of 252 (16%) (superficial abscesses 9, hematomas 14, pulmonary infections 10, phlebitis 2, parietal disunion 4, prosthesis removal 3). The mean follow-up was 42 months for 85% of patients. There were eight recurrences (5%). The causes of recurrence were an incorrectly placed or too small prosthesis. For large lateral and complex incisional hernias (160 patients, 190 orifices) we performed 133 primary operations, with 21 recurrences; six patients had a third recurrence. There were 62 iliac, 68 subcostal or bisubcostal hernias, 34 lateral and medial hernias, 25 on colostomy, 14 lateral and 4 pararectal, 7 lumbar and transversal hernia, and 5 after Pfannenstiel operation. We have used 114 Dacron prostheses, 4 PTFE, and 5 resorbable prostheses for infection. In 11 cases two prostheses were inserted as in a sandwich; 29 patients have been operated on without mesh. The mortality rate was 1 of 160 and the morbidity 30 of 160 (18%). Mean follow-up was 44 months in 85% of patients, with five recurrences among 160 patients (four were reoperated, all successfully).

In conclusion, the failure of large incisional hernia repair without using a prosthesis has been proved by the present excellent study. We share the conclusion of the authors that the procedure by "vertical Mayo repair" should no longer be used. The procedure using a prosthesis even in different procedures (intraperitoneal [6], posterior [3] anterior [7]) with a recurrence rate of less than 10% suggests that these methods are preferred.

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