Management of Difficult Abdominal Wall Problems by Components Separation Methods: A Preliminary Study in Thailand

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Background: *Acute (open abdomen) and late (ventral hernia) abdominal wall defects are difficult surgical problems requiring appropriate management for acceptable results. Several methods of abdominal wall reconstruction in these patients have been introduced with varying outcomes. Components separation method (CSM) is an autologous tissue repair that has been employed for such situations with satisfaction by many investigators. The authors have adopted this method of abdominal wall repair or reconstruction and used it in our patients with difficult abdominal wall problems since May 2005. The aim of the present study was to examine results of treatment of patients with large abdominal wall defects by CSM at our institution. A brief demonstration of surgical techniques and discussion of the related issues were also made.*

Material and Method: *All patients with difficult abdominal wall problems treated by CSM at King Chulalongkorn Memorial Hospital, Bangkok, Thailand between May 2005 and June 2012 were examined and analyzed. The patients were divided into two groups, i.e. acute (open abdomen) and late (ventral hernia). Different methods of repair or reconstruction by CSM were described. No prosthetic mesh was used in the present study. Postoperative follow-up was done until August 2012. Operative morbidity and late sequelae were studied.*

Results: *Twenty-six patients entered into the study. Eight (30.8%) underwent closure of acute abdominal wall defects and 18 (69.2%) underwent late ventral hernia repair. Four patients (50%) who underwent closure of acute abdominal wall defects also had closure of associated entero-atmospheric or small bowel fistulae. Four patients (22.2%) who underwent late ventral hernia repair also had closure of associated ileostomy or colostomy. Three types of CSM were used in the present study; i.e. original or standard components separation (SCS), modified components separation (MCS), and SCS plus bilateral anterior rectus abdominis sheath turnover flap (RSTF). Complications included seroma under the skin flap in one patient in the early closure group, two wound infections, two seroma under the skin flap, and one skin flap dehiscence in the late ventral hernia repair group. One small, asymptomatic recurrent ventral hernia was found during the follow-up period of the late ventral hernia repair patients (5.6%).*

Conclusion: *CSM is a good alternative for management of difficult abdominal wall problems, especially in situations that employment of prosthetic mesh may be inappropriate. Its advantages are avoidance of prosthetic mesh and low risk of infection in potentially infected environment. It is versatile in various abdominal wall problems even in large abdominal wall defects. CSM is recommended when associated enteric fistula, ileostomy, colostomy closure, or other potentially infected procedures are simultaneously performed.*

Keywords: *Acute abdominal wall defect, Open abdomen, Ventral hernia, Components separation method, Modified components separation method*

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Difficult abdominal wall problems may occur during early and late postoperative period. During early postoperative period, it is presented as an open abdomen secondary from damage control surgery for abdominal trauma, abdominal compartment syndrome, severe secondary peritonitis, and other abdominal catastrophe such as ruptured abdominal aortic aneurysm[1-5]. For late postoperative period, it is presented as a large ventral hernia or abdominal wall defect, which usually results from previously treated open abdomen, planned ventral hernia, or other surgical complications[6,7]. In the early postoperative period, when surgeons encounter difficulty in closing the

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abdomen, it is usually left open and managed by vacuum-assisted wound closure with the primary goal of definite fascial closure that may be successful in approximately 70 to 90% of patients who survive[1,8,9]. The remaining may undergo planned ventral hernia management resulting in late ventral hernias or abdominal wall defects requiring subsequent repair or reconstruction. These hernias or abdominal wall defects are frequently large and difficult to repair. The primary goal for large ventral or incisional hernia repair is minimal recurrence, which conventionally can be achieved by using non-absorbable mesh or other prosthesis[10-12]. Prosthetic repair of large ventral hernias is a standard practice when autogenous tissue repair is inappropriate or not possible. However, certain complications associated with the non-absorbable mesh used for such repair render its employment more cautiously. Furthermore, when associated ileostomy or colostomy closure is simultaneously performed, prosthetic mesh is also not recommended for repairing of the abdominal wall defect. Components separation method (CSM) originally described by Ramirez et al in 1990 was introduced with the purpose of repairing large abdominal wall defects by separation of the components of the abdominal wall and medial advancement of the rectus abdominis muscle bilaterally to suture together at the midline of the abdomen. This original method of autogenous tissue repair of abdominal wall defects is referred to standard components separation (SCS)[13]. Since the first report of using SCS, it has undergone several modifications of both surgical techniques and indications to use. For the surgical techniques, a variety of different methods from the original SCS has been reported[2,14-23]. Among them, the two modifications most frequently employed by us are: 1) the method described by Fabian et al in 1994, Jernigan et al in 2003, and DiCocco et al in 2010 (modified components separation or MCS)[14-16], and 2) the method described by Ennis et al in 2003 and Kushimoto et al in 2007 (bilateral anterior rectus abdominis sheath turnover flap method or RSTF)[2,23].

The indications to use CSM are also extended to other conditions apart from repair or reconstruction of large ventral hernias or abdominal wall defects, which was the original purpose of this autogenous tissue repair. Such extension is early closure of acute abdominal wall defect or open abdomen and sometimes with concomitant closure of associated entero-atmospheric or entero-cutaneous fistula[18-20]. In addition, reconstruction of large contaminated abdominal wall defects by CSM have also been reported with acceptable outcome[21,22].

The purpose of the present study was to examine results of treatment of patients who had difficult abdominal wall problems and underwent abdominal wall closure or repair or reconstruction by CSM at our institution. Data collections included causes of difficult abdominal wall problems, indications for abdominal wall closure with CSM, size and area of the abdominal wall defect, results of treatment, complications, and late occurrence or recurrence of ventral hernia. A brief discussion of advantages and disadvantages of these methods of abdominal wall management was also presented.

Material and Method

All patients who had difficult abdominal wall problems and underwent surgical closure or repair or reconstruction of the abdominal wall defects by CSM at King Chulalongkorn Memorial Hospital, Bangkok, Thailand between May 2005 and June 2012 were enrolled into the study. The present study was approved by the Institutional Review Board of the Faculty of Medicine, Chulalongkorn University. The difficult abdominal wall problems were classified as early and late postoperative periods. Early postoperative period was presented in the form of open abdomen with or without entero-cutaneous or entero-atmospheric fistula. Late postoperative period was presented in the form of large ventral hernia or abdominal wall defect with or without ileostomy or colostomy. The size and area of the abdominal wall defects were measured and calculated only in patients who had late repair of the ventral hernias or abdominal wall defects. The size of the abdominal wall defect was measured in centimeter (transverse width X vertical length). The area of the elliptical or ovoid shape abdominal wall defect was calculated with the formula A = 3.14159xB/2xC/2, where A = area (cm^2), B = transverse width (cm), and C = vertical length (cm) of the abdominal wall defect. Surgical techniques for CSM used in this study have been previously well described, i.e. original or SCS[13], MCS[14-16], and SCS plus RSTF[2,23]. When CSM was considered for abdominal wall closure, adequacy of the anterior abdominal wall muscles, and fascia for such employment should be carefully determined by experienced surgeons. Failure to estimate accurately the anterior abdominal wall components for medial advancement and tension-free abdominal closure may result in unsuccessful repair, necessitating the use of prosthetic mesh. When the abdominal wall status

allowed for CSM, the SCS was employed first. If the SCS was not adequate for abdominal closure and attempted to close the abdomen only by this method would result in undue tension, necessitating the use of prosthetic mesh; the modified one (MCS or RSTF) was then applied. No prosthetic mesh was used in this study.

Surgical techniques

The normal anatomy of the anterior abdominal wall should be thoroughly reviewed before performing this operation (Fig. 1).

Developing the skin and subcutaneous tissue flaps

Under general anesthesia, the skin is prepared widely from the nipples to the upper thigh anteriorly and to both posterior axillary lines laterally. In patients with acute abdominal wall defect, the skin and subcutaneous tissue around the open abdomen is dissected from the anterior rectus sheath on both sides of the abdominal wound to the posterior axillary lines. In large ventral hernia repair after a planned ventral hernia, midline incision is performed on the grafted skin of the hernia sac (Fig. 2, 3). The hernia sac is opened and adhesions of the visceral organs, especially small and large bowels, to the hernia sac are sharply divided. The dissection continues laterally on both sides until the edge of rectus abdominis muscle which forms the rim of the hernia sac is found (Fig. 4). The skin and subcutaneous tissue is then dissected out from the anterior rectus abdominis sheath in the same manner as mentioned above in acute abdominal wall defect (Fig. 5). The skin and subcutaneous flaps are made cephaladly to the level of xiphoid cartilage and caudadly to the anterior superior iliac spine on both sides.

Standard components separation technique (SCS) (Fig. 6)

A longitudinal (vertical) incision is made on the external oblique muscle approximately 1 to 2 cm lateral to the lateral border of the rectus abdominis muscle (Fig. 7). This incision is made parallel to the lateral border of the rectus abdominis muscle (linea semilunaris) to the costal cartilage cephaladly, and to 1 to 2 cm above the inguinal ligament caudadly. The divided external oblique muscle is then separated from the underneath internal oblique muscle by sharp and blunt dissections (Fig. 8). The procedure is repeated on the opposite side of the anterior abdominal wall (Fig. 9).

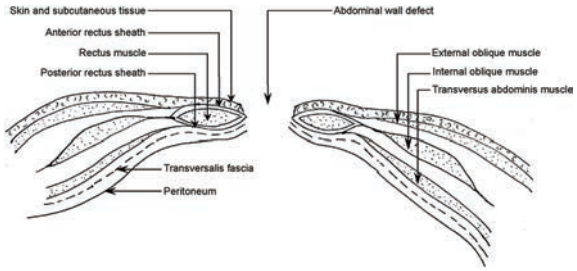

Fig. 1 Drawing demonstrates anatomy of the horizontal section of the anterior abdominal wall above the arcuate line (linea semicircularis) which located a few centimeters below the level of the umbilicus. The abdominal wall defect is also shown.

Fig. 2 Photograph of a large ventral hernia resulted from previous management of open abdomen by planned ventral hernia method. The abdominal wall defect is covered with a split thickness skin graft.

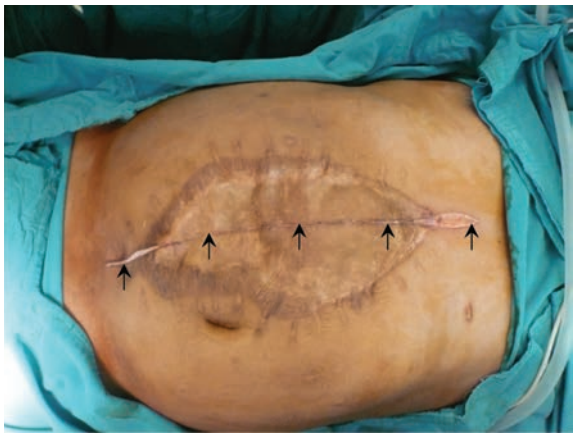

Fig. 3 Operative photograph showing an incision made on a grafted skin (arrows).

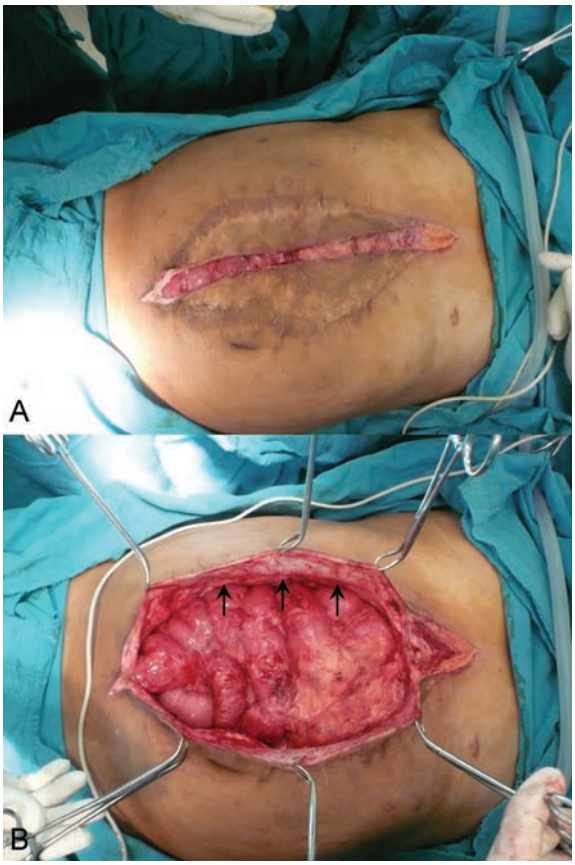

Fig. 4 A) the hernia sac is opened. B) dissection is made to separate the hernia sac from the underlying small and large intestines to the edge of the hernia sac which is the rectus abdominis muscle (arrows).

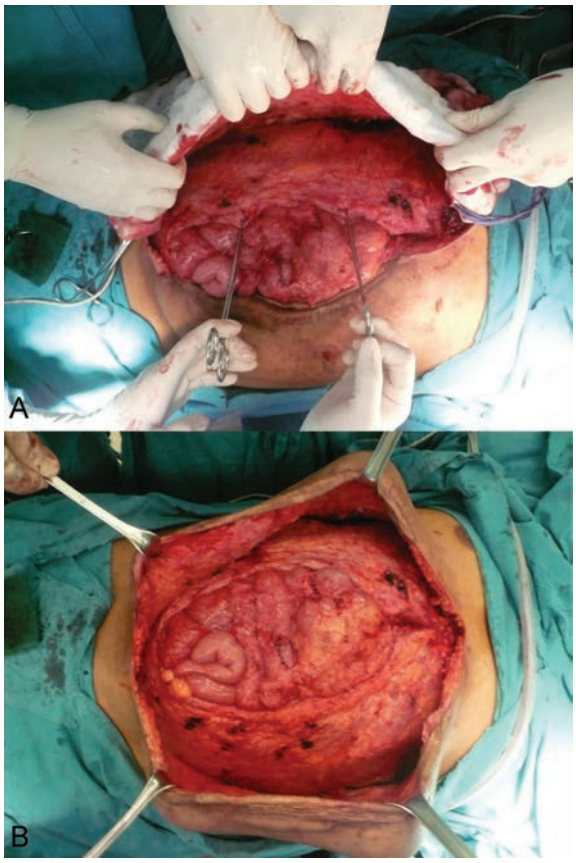

Fig. 5 Operative photographs showing development of skin and subcutaneous tissue flap from the anterior rectus sheath. A) unilateral, B) bilateral.

At this stage, separation of the anterior abdominal muscles has been completed and the abdominal wall defect is ready to close by medial advancement of the rectus abdominis components. The medial edge of the rectus abdominis muscle and sheath on both sides of the hernia sac are sutured together with number 1-0 absorbable sutures, interruptedly (Fig. 10). The skin and subcutaneous tissue flap on both sides are then sutured together after four small redivac drains are placed under the flaps (Fig. 11).

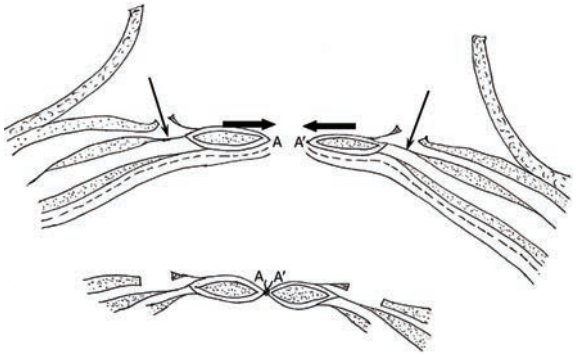

Fig. 6 Drawing demonstrates closing of the abdominal wall defect by SCS. The external oblique muscle is cut vertically approximately 2 cm lateral to the lateral edge of the rectus abdominis muscle or linea semilunaris (thin arrows). The rectus abdominis muscle is medially mobilized bilaterally (thick arrows) and the medial edges are sutured together (AA').

Modifications of SCS

When the medial edge of the rectus abdominis muscle and sheath on both sides of the abdominal wall defect cannot be sutured together without tension after SCS, the modified techniques are considered. This may be performed by the turnover flap of anterior rectus abdominis sheath (RSTF) as

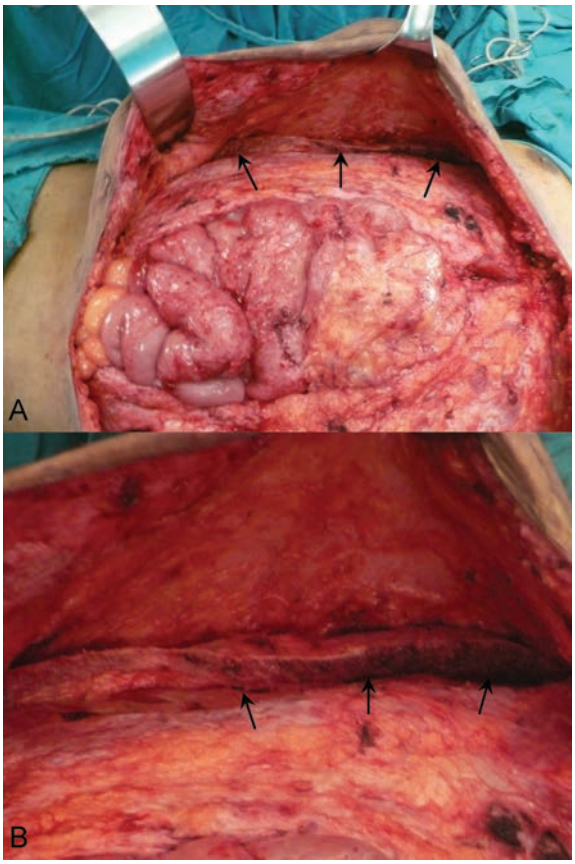

Fig. 7 A) and B) operative photographs showing a vertical incision made on the external oblique muscle (arrows).

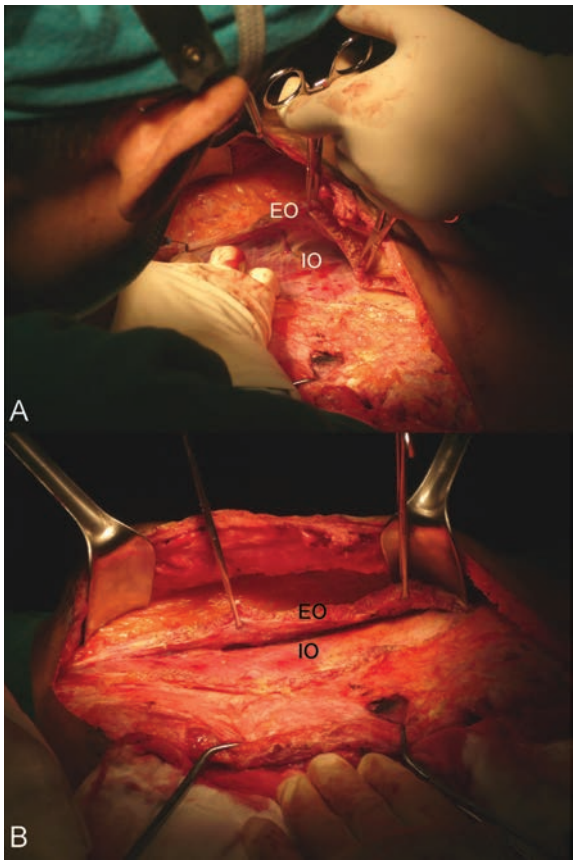

Fig. 8 A) and B) operative photograph showing dissection of the external oblique muscle (EO) from the internal oblique muscle (IO).

described by Ennis[23] and Kushimoto[2] or by modified technique (MCS) described by Fabian, Jernigan, and DiCocco[14-16]. The latter was employed more frequently in our patients.

Modified components separation (MCS) (Fig. 12)

Briefly, the medial edge of the rectus abdominis muscle is dissected by separating the posterior rectus sheath from the rectus abdominis muscle (Fig. 13). Care should be taken in avoiding injury to the superior epigastric artery, which is a continuation of the internal mammary artery and supplies the rectus abdominis muscle (Fig. 14). Dissection proceeds laterally until the anterior leaf of the aponeurosis of the internal oblique muscle is identified. This anterior leaf of the aponeurosis of the internal oblique muscle is divided longitudinally (vertically) from the costal cartilage downwards to the level of linea semicircularis (below this line the posterior rectus sheath is not formed). The medial edge

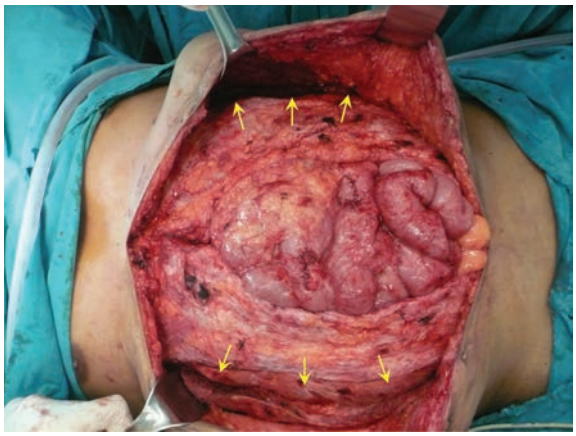

Fig. 9 Operative photograph showing bilateral incisions on the external oblique muscle in SCS (arrows).

of the rectus abdominis muscle on both sides is then sutured together with number 1-0 absorbable sutures, interruptedly (Fig. 15). After completion of midline

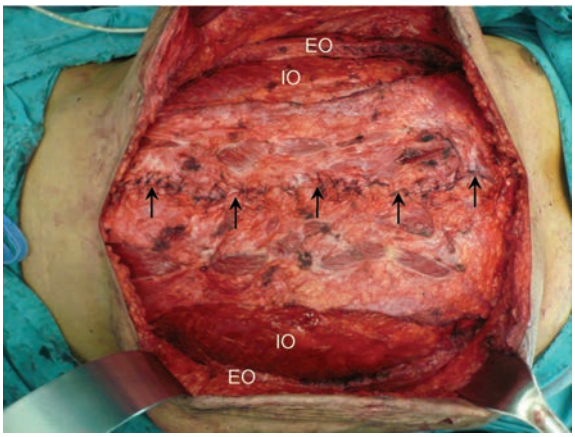

Fig. 10 Operative photograph showing complete repair of the abdominal wall defect in SCS (arrows). EO = external oblique muscle, IO = internal oblique muscle

Fig. 11 Operative photograph showing appearance after skin closure of patient in Fig. 2.

reconstruction, the defects on the lateral aspect of the rectus abdominis muscle on both sides are closed by suturing the lateral edge of the rectus abdominis muscle to the medial edge of the posterior rectus sheath (Fig. 16).

Bilateral anterior rectus abdominis sheath turnover flap method (RSTF) (Fig. 17)

Briefly, the anterior rectus abdominis sheath is dissected out from anterior aspect of the rectus abdominis muscle starting from the lateral aspect of this muscle. The dissection continues medially to the medial edge of the rectus abdominis muscle. The turnover flap of the anterior rectus abdominis sheath on both sides was then sutured together.

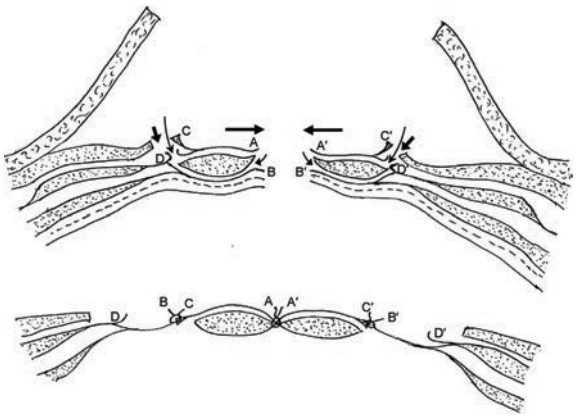

Fig. 12 Drawing demonstrates closing of the abdominal wall defect by MCS. The external oblique muscle is cut vertically approximately 2 cm lateral to the lateral edge of the rectus abdominis muscle or linea semilunaris (short, thick arrows). The posterior rectus sheath is dissected from the posterior aspect of the rectus abdominis muscle starting from the medial edge of the muscle towards the lateral edge (short, thin arrows). The dissection continues until the anterior leaf of the aponeurosis of the internal oblique muscle is identified and cut (long, thin arrows). The rectus abdominis muscle is then mobilized medially to be sutured together (long, thick arrows). The medial edge of the rectus abdominis muscle is sutured in the midline (AA'). The lateral aspect of the rectus abdominis muscle is sutured to the medial edge of the posterior rectus sheath (BC and B'C').

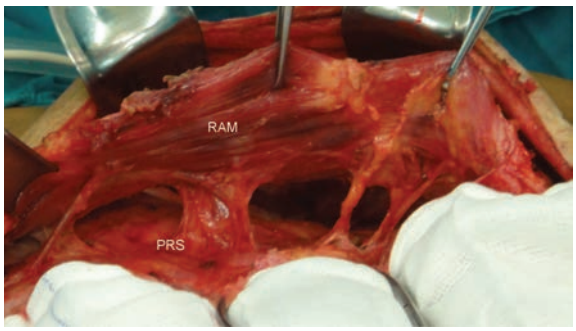

Fig. 13 Operative photograph showing dissection of the posterior rectus sheath (PRS) from the posterior aspect of rectus abdominis muscle (RAM) in MCS.

Postoperative care

Immediately after the operations, patients were admitted in the surgical intensive care unit for monitoring of the cardiovascular system, respiration, and intra-abdominal pressure via a Foley catheter. An abdominal binder was used during a few weeks of the

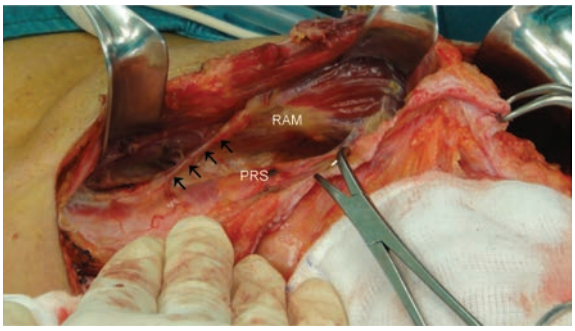

Fig. 14 Operative photograph showing the superior epigastric artery (arrows) which should be carefully preserved during dissection of the posterior rectus sheath (PRS) from the posterior aspect of the rectus abdominis muscle (RAM) during MCS.

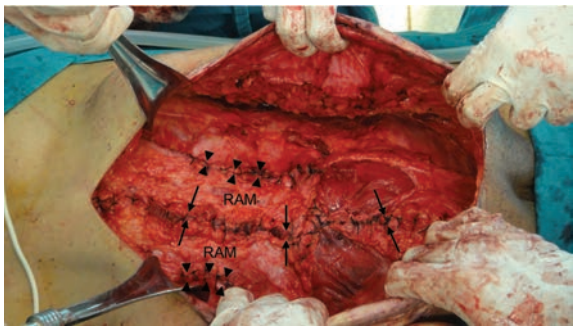

Fig. 16 Operative photograph of the patient in Fig. 15 showing complete midline (arrows) and lateral (arrowheads) closure of the abdominal wall during MCS. RAM = rectus abdominis muscle.

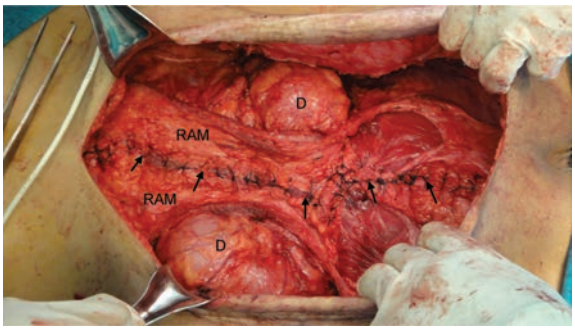

Fig. 15 Operative photograph showing midline closure of the rectus abdominis muscle (RAM) during MCS (arrows). The defects (D) lateral to the rectus abdominis muscle are closed later (see Fig. 16).

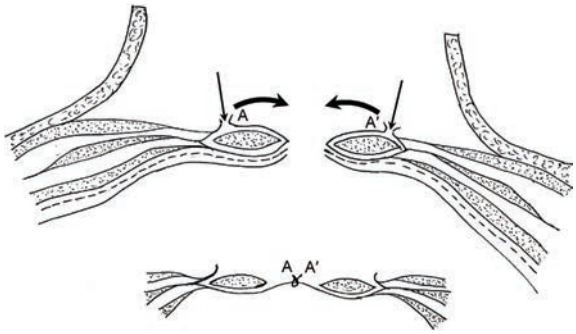

Fig. 17 Drawing demonstrates closing of the abdominal wall defect by using turnover flap of the anterior rectus sheath (RSTF). The anterior rectus sheath is cut vertically at the lateral edge of the rectus abdominis muscle (thin arrows) and is dissected medially, separating the anterior rectus sheath from the rectus abdominis muscle. The flap of the anterior rectus sheath is then dissected from the anterior aspect of the rectus abdominis muscle and turned over (thick arrows) to suture together (AA'). This drawing does not demonstrate the incision on the external oblique muscle for SCS (Fig. 6) which is performed before using RSTF in this study.

postoperative period to enhance abdominal integrity and patients' comfort. All patients were regularly followed after discharging from the hospital at the out-patient clinic where evidence of ventral hernia (for early closure) or recurrent ventral hernia (for late ventral hernia repair) was examined. The follow-up was done until August 2012. Results were reported case by case and descriptive statistics were applied to summarize this study.

Results

During the 7-year-period, 26 patients entered into the study. Twenty-four patients (92.3%) were male and two (7.7%) were female. The age ranged from 13 to 71 years (mean 38.8±15.2), in the early closure group 13 to 61 years (mean 39.9±18.0), and in the late repair group 15 to 71 years (mean 38.3±14.4). Eight patients (30.8%), two of whom were female, underwent early post operative closure of acute abdominal wall defects (open abdomen) and 18 (69.2%) all of whom were male, underwent late postoperative repair of large ventral hernias. Six patients in the early postoperative closure (75%) underwent SCS and two (25%) underwent MCS. In the late ventral hernia repair patients, 15 (83.3%) underwent SCS and three (16.7%) underwent MCS. Two patients who had SCS in these late hernia repairs also had RSTF. Details of patients who underwent early closure of acute abdominal wall defect are shown in Table 1. Details of patients who underwent late repair of large ventral hernia or planned ventral hernia are shown in Table 2. In the early

Table 1. Patients with early closure of abdominal wall defects by CSM

Patient number	Gender	Age	Indications for operation	Complication	F/U time (month)	Method of repair	Late hernia
1	Female	53	Recurrent Ca colon with gut obstruction	None	3	SCS	Death from cancer
2	Male	47	Closure small bowel fistula	Seroma under skin flap	82	SCS	No*
3	Male	49	DCS for stab wound of the liver	None	65	SCS	No
4	Male	20	DCS for multiple stab wounds of the abdomen	None	64	SCS	No
5	Male	24	DCS for IVC injury	None	63	SCS	No
6	Female	52	Entero-atmospheric fistula associated with open abdomen	None	55	SCS	No
7	Male	61	Entero-atmospheric fistula associated with open abdomen	None	20	MCS	No
8	Male	13	Entero-atmospheric fistula associated with open abdomen	None	9	MCS	No

DCS = damage control surgery; IVC = inferior vena cava; SCS = standard components separation; MCS = modified components separation
* Laxation of anterior abdominal wall

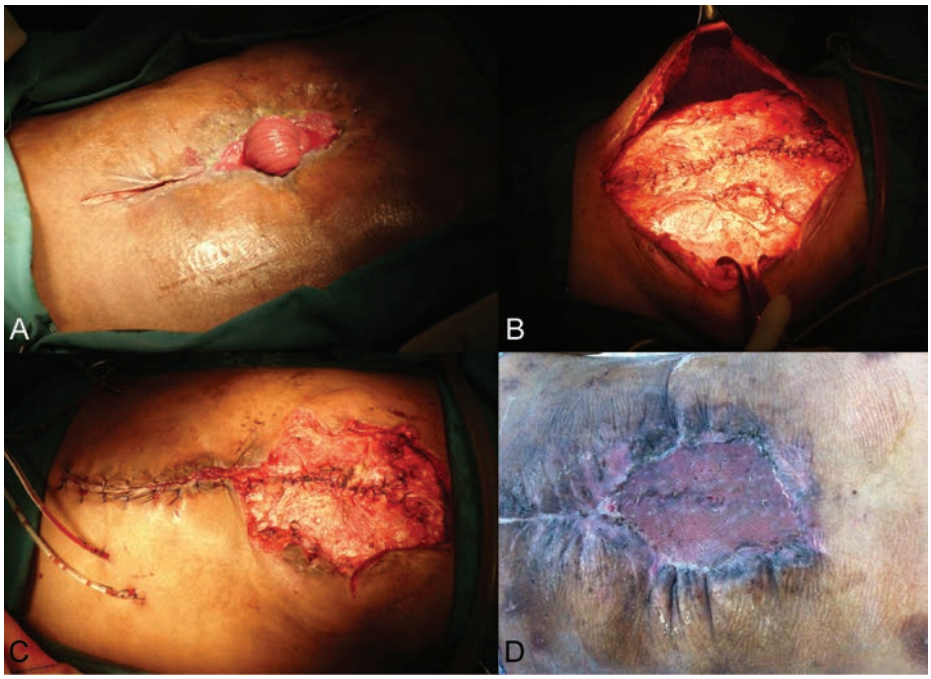

Fig. 18 Photographs of a patient with entero-atmospheric fistula who underwent fistula closure with abdominal wall reconstruction by MCS. A) preoperative photograph, B) operative photograph of abdominal wall reconstruction by MCS, C) operative photograph after skin closure, the skin defect at upper part of the surgical wound was subsequently covered with a split thickness skin graft. D) postoperative photograph, showing surgical wound appearance after complete recovery of the patient.

Table 2. Patients with late repair of large ventral hernias by CSM (all were male)

Patient No.	Age	Disease or injury causing large ventral hernia	Timing of repair (month)*	Size of hernia or defect (cm)	Area of hernia or defect (cm^2)	Method of repair	Ostomy closure	Complication	F/U after repair (month)**	Recurrent hernia
1	44	BAT with pancreatic injury	7	14x28	308	SCS	No	None	66	No
2	16	BAT with liver injury	11	10x12	94	SCS	No	None	66	No
3	40	BAT with pancreatic and colonic injuries	22	14x20	220	SCS	Yes (ileostomy)	Wound infection	48	No
4***	40	BAT with retroperitoneal hematoma	8	15x30	353	SCS+RSTF	No	Seroma under skin flap	48	No
5	40	BAT with multiple visceral organs injuries	10	15x30	353	SCS	No	None	43	No
6	33	BAT with liver injury	8	15x30	353	SCS	No	None	40	No
7	26	GSW with multiple visceral organs injuries	13	20x20	314	SCS	No	None	38	No
8***	30	Stab wound with rectal injury	8	10x14	110	SCS	Yes (colostomy)	Seroma under skin flap	34	No
9	48	GSW with colonic injury	12	10x15	118	SCS	No	None	32	Yes
10	53	Peptic perforation (delayed diagnosis)	9	18x25	353	SCS	No	None	32	No
11	15	BAT with iliac vein injury	5	10x12	94	SCS	No	None	28	No
12	39	GSW with liver injury	12	15x26	306	SCS	No	Skin flap dehiscence	14	No
13	18	BAT with liver and kidney injuries	6	19x26	388	MCS	No	None	13	No
14	57	BAT with small bowel injury (delayed diagnosis)	20	23x25	402	MCS	No	None	12	No****
15	43	BAT with colonic injury	12	16x26	327	SCS	Yes (colostomy)	None	9	No
16	71	Perforated sigmoid diverticulitis	8	20x26	408	MCS	Yes (colostomy)	Wound infection	4	No
17	41	Gut obstruction with multiple operations	24	13x25	255	SCS	No	None	3	No
18	35	GSW with multiple visceral organs injuries	19	17x24	320	SCS+RSTF	No	None	3	No

* After discharged for original surgery or injuries, ** Until August 2012, *** Hemophiliac, **** Laxation of anterior abdominal wall
CSM = components separation method; BAT = blunt abdominal trauma; GSW = gunshot wound; RSTF = bilateral anterior rectus abdominis sheath turnover flap method

abdominal wall reconstruction patients, four (50%) also had closure of associated entero-atmospheric or small bowel fistulae (3 entero-atmospheric and 1 small bowel fistulae) (Fig. 18). In the late postoperative repair of large ventral hernias, the area of abdominal wall defects ranged from 94 cm^2 to 408 cm^2 (mean 282±108). Four patients (22.2%) in the late reconstruction of large ventral hernia also underwent closure of ileostomy (1) or colostomy (3) (Fig. 19). In the late repair group, the timing of repair after discharging from the hospital for original surgery or injuries ranged from five to 24 months (mean 11.9±5.7). Complications occurred in six patients (23.1%). Seroma under the skin flap occurred in one patient in the early closure group, two wound infections, two seroma under the skin flap, and one skin flap dehiscence occurred in the late ventral hernia repair group. All of them were local wound problems that were successfully managed by conservative treatment. The follow-up time after abdominal wall reconstruction ranged from three to 82 months (mean 37.4±6.7). In the early closure group, the follow-up time ranged from three to 82 months (mean 45±30). In the late repair group, the follow-up time ranged from three to 66 months (mean 29.6±20.4). No ventral hernia was observed in the early closure group. One small, asymptomatic recurrent ventral hernia occurred in the late repair group (5.6%). Asymptomatic laxation of the anterior abdominal wall that did not interfere with regular life-style and did not require operative repair were observed in two patients, one in the early and one in the late closure.

Discussion

Current advancement in the care of abdominal trauma patients has resulted in improvement in survival. Damage control surgery has been accepted as an important armamentarium for patients' survival[24,25]. In spite of such remarkable outcome, a new problem of acute abdominal wall defect has emerged. Acute abdominal wall defect or open abdomen after damage control surgery is a direct

Fig. 19 Photographs of a patient with large ventral hernia and a colostomy who underwent colostomy closure and abdominal wall reconstruction with MCS. A, B and C preoperative photographs; D, E, and F postoperative photographs, minor superficial wound infection is noted.

consequence of soft tissue and visceral edema after massive fluid and blood products resuscitation. Other causes of open abdomen include severe secondary peritonitis[3], multiple reoperations[14], and emergency laparotomy for ruptured abdominal aortic aneurysm[2,5]. Open abdomen by itself is a life-saving method that helps to prevent the occurrence of abdominal compartment syndrome from forceful fascial closure. However, it is associated with significant problems. Loss of fluid, electrolytes, and proteins are uniformly present. Increasing workload of the attending surgical team and cost expenditure are burdened to the responsible organization, faculties, and hospital[26-28]. The most feared complication of open abdomen is formation of an entero-atmospheric fistula, which is very difficult to manage[29]. Late complication of open abdomen is large ventral hernia requiring an appropriate operative repair that is usually a technically demanding operation in order to minimize the occurrence of recurrence[6,7]. The timing for repair large ventral hernia in the present study was in the range of six to 12 months or longer after a planned ventral hernia depending on severity of the original insults and clinical status or physical well-being of the patients.

SCS was originally introduced for repair of large abdominal wall defects by Ramirez et al in 1990[13]. The advantage of this method is avoidance of using permanent mesh and its subsequent complications. The disadvantage is its limitation when the abdominal wall defect is quite large impeding a safe midline fascia closure after bilateral medial mobilization of the rectus abdominis muscle complex necessitating implantation of a prosthetic bridge or closure under excessive tension. MCS was designed and employed to overcome the disadvantage of the original one (SCS). It has been successfully used in a variety of large ventral hernia repair with low occurrence of recurrence[14-16]. Practically, in our opinion, MCS is an extension of SCS. In the original SCS, more medial advancement of the rectus abdominis muscle after division of the external oblique muscle can be achieved by separating the posterior rectus sheath from the posterior aspect of the rectus abdominis muscle[13]. In the patients who had abdominal wall reconstruction with SCS, we did not perform this step (separating the posterior rectus sheath from the posterior aspect of the rectus abdominis muscle). Instead, we would prefer to proceed to MCS if a simple SCS could not be safely performed (division of the external oblique muscle only). For the abdominal closure by adding RSTF to the SCS, we employed this technique in only two of our patients. In our opinion regarding the technical point of view, RSTF is a more simple procedure compared to MCS. However, the authors feel that MCS contributes a wider application when dealing with a large abdominal wall defect.

Application of using CSM to close acute abdominal wall defect or open abdomen has been recently reported by several investigators[18,19,30,31]. The purpose of early closure of open abdomen by this method is to eliminate the disadvantages of a planned ventral hernia in patient with open abdomen and providing a long-term abdominal wall integrity. Consequently, late ventral hernia repair is not necessary. Early closure of open abdomen helps to avoid development of entero-atmospheric fistula, the most feared complication of open abdomen of all attending surgeons. Practically, when CSM was considered for closure of acute abdominal wall defect or repair of late ventral hernia, the authors used SCS first. If the midline defect could not be closed safely (without tension), the MCS or RSTF was then employed.

The advantage of CSM in management of acute and late abdominal wall defects is that no foreign prosthesis is used, therefore complications of absorbable or non-absorbable mesh is prevented. Furthermore, since it employs only autogenous tissue for repair, the risk of infection is low even in potentially infected fields and should be an ideal method in reconstruction of abdominal wall defects associated with contamination, fistula, or stoma. Recent studies have shown impressive results when using CSM in contaminated environment[17,20-22]. The present study has confirmed these concepts. The authors had four patients who underwent successful closure of associated entero-atmospheric or small bowel fistulae in acute abdominal wall defect reconstruction and four patients who underwent uneventful closure of associated ileostomy or colostomy in the late ventral hernia repairs. The authors believe that CSM is a procedure of choice when the patient has associated intestinal fistula, ileostomy, or colostomy requiring simultaneous closure.

The disadvantages of CSM are operative trauma to the abdominal wall and requirement of adequate healthy tissue around the abdominal wall defect for a successful repair. In acute abdominal wall defects, CSM may not be suitable in patients who are not hemodynamically or physiologically stable. Operative trauma from extensive soft tissue dissections may be deleterious to an already compromised surgical

patient. When the abdominal wall defect is too large for the available anterior abdominal wall components, CSM is also not recommended. Since the surgical techniques are somewhat technically demanding and failure of the procedure may worsen the abdominal wall condition, great care should always be taken when considering these methods of abdominal wall reconstruction.

The common complications of CSM in our case series were skin flap problems. These complications included seroma under the skin flap, skin flap dehiscence, and wound infection. All these problems could be simply managed by administration of antibiotics and wound management with simple wound dressing or vacuum-assisted wound dressing. The authors also found that the method of wound management by using vacuum-assisted wound dressing with interval changing of the dressing every two or three days was convenient for both care takers and the patients. Moreover, we observed that the pain associated with extensive dissections of the skin and subcutaneous tissue from the anterior abdominal wall muscles and fascia was lessened by vacuum-assisted method. For long-term outcome, the authors had only one asymptomatic, small recurrent hernia in the late ventral hernia repair patients (5.6%), comparable to previous studies[2,14-16].

In conclusion, CSM is a useful method for closure of open abdomen or repairing large ventral hernia. Postoperative abdominal wall integrity is acceptable and the recurrent hernia is low. In addition, no permanent prosthesis is used so its acute and long-term complications are avoided. The authors recommend this method of closure of abdominal wall defect when local tissue is available. In potentially infected situations such as repairing of abdominal wall defect with simultaneous closure of intestinal fistula or ileostomy or colostomy, CSM is also strongly recommended. However, since the number of patients in the present study was limited owing to our highly selection of appropriate patients, these procedures of abdominal wall reconstruction should be employed with extreme caution.

Potential conflicts of interest

None.

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การรักษาผู้ป่วยที่มีปัญหาผนังหน้าท้องบกพร่องอย่างยากโดยวิธีผ่าตัดแยกผนังหน้าท้องมาเย็บเข้าหากัน: การศึกษาเบื้องต้นในประเทศไทย

สุวิทย์ ศรีอัษฎาพร, สุกัญญา ศรีอัษฎาพร, รัฐพลี ภาคอรรถ, กฤตยา กฤตยากีรณ, ศุภฤกษ์ ปรีชายุทธ, พสุรเชษฐ์ สมร

ภูมิหลัง: *ภาวะผนังหน้าท้องบกพร่องอย่างยากอาจพบได้ในผู้ป่วยหนักที่มีผนังหน้าท้องเปิดไม่สามารถเย็บเข้าหากันได้ด้วยวิธีปกติ หรือพบในระยะยาวในรูปแบบของไส้เลื่อนของผนังหน้าท้องขนาดใหญ่ การผ่าตัดปิดผนังหน้าท้องในภาวะดังกล่าวมักทำได้ยากและมีผู้เสนอไว้หลายวิธีโดยมีผลการรักษาต่าง ๆ กันไป การผ่าตัดแยกผนังหน้าท้องมาเย็บเข้าหากัน เป็นวิธีหนึ่งที่นำมาใช้ในระยะเวลาประมาณ 20 ปีที่ผ่านมา ซึ่งมีข้อดีคือไม่ต้องใช้วัสดุสังเคราะห์ เช่น ตาข่ายสังเคราะห์ชนิดไม่ละลาย ทำให้วิธีนี้มีความเหมาะสมในหลายสถานการณ์ที่มีความจำเป็นต้องปิดหน้าท้อง และต้องการหลีกเลี่ยงการใช้ตาข่ายสังเคราะห์ชนิดไม่ละลาย ผู้นิพนธ์ได้นำวิธีการนี้มาใช้ในการปิดหน้าท้องผู้ป่วยที่มีผนังหน้าท้องบกพร่องอย่างยาก ตั้งแต่เดือนพฤษภาคม พ.ศ. 2548 และมีความประสงค์จะศึกษาผลการรักษาและเผยแพร่วิธีผ่าตัด รวมถึงบรรยายถึงข้อดีข้อเสียและค้นคว้ารายงานอื่น ๆ ที่เกี่ยวข้องประกอบการเขียนบทความนี้*

วัสดุและวิธีการ: *เป็นการศึกษาผู้ป่วยที่มีภาวะผนังหน้าท้องบกพร่องอย่างยากที่ได้รับการผ่าตัดรักษา โดยวิธีผ่าตัดแยกผนังหน้าท้องมาเย็บเข้าหากันที่โรงพยาบาลจุฬาลงกรณ์ ตั้งแต่เดือนพฤษภาคม พ.ศ. 2548 จนถึงเดือนมิถุนายน พ.ศ. 2555 และติดตามผลการรักษาจนถึงเดือนสิงหาคม พ.ศ. 2555 ผู้ป่วยแบ่งออกได้เป็น 2 กลุ่ม กลุ่มหนึ่งได้รับการผ่าตัดปิดผนังหน้าท้องบกพร่องในช่วงแรกที่มีผนังหน้าท้องเปิด อีกกลุ่มหนึ่งได้รับการผ่าตัดรักษาภาวะไส้เลื่อนขนาดใหญ่ของผนังหน้าท้อง ผู้นิพนธ์ได้บรรยายถึงวิธีการผ่าตัดแยกผนังหน้าท้องแบบต่าง ๆ ที่ใช้ในรายงานนี้โดยไม่มีการใช้ตาข่ายสังเคราะห์ในผู้ป่วยรายใด หลังผ่าตัดได้ศึกษาถึงภาวะแทรกซ้อนของการผ่าตัด รวมถึงติดตามผลการรักษาในระยะยาว*

ผลการศึกษา: *ในช่วงระยะเวลา 7 ปี มีผู้ป่วยได้รับการผ่าตัด 26 ราย ผู้ป่วยกลุ่มแรก 8 ราย (ร้อยละ 30.8) ได้รับการปิดหน้าท้องในช่วงแรกที่มีผนังหน้าท้องเปิด ผู้ป่วยในกลุ่มนี้ 4 ราย (ร้อยละ 50) ได้รับการปิดรูรั่วของลำไส้ร่วมด้วย ผู้ป่วยกลุ่มที่สองจำนวน 18 ราย (ร้อยละ 69.2) ได้รับการผ่าตัดรักษาไส้เลื่อนขนาดใหญ่ของผนังหน้าท้อง ผู้ป่วยในกลุ่มนี้ 4 ราย (ร้อยละ 22.2) ได้รับการปิดลำไส้ที่เปิดออกทางหน้าท้องมาก่อน (อีลีออสโตมี่หรือโคลอสโตมี่) ร่วมด้วย การผ่าตัดแยกผนังหน้าท้องเพื่อรักษาภาวะผนังหน้าท้องบกพร่องในรายงานนี้มีอยู่ 3 วิธี โดยวิธีแรกเป็นวิธีมาตรฐานดั้งเดิม และอีก 2 วิธี เป็นวิธีที่ดัดแปลงมาจากวิธีแรก ภาวะแทรกซ้อนหลังผ่าตัดพบในผู้ป่วย 6 ราย 1 ราย ในกลุ่มแรกที่เป็นการรักษาภาวะผนังหน้าท้องเปิด มีน้ำเหลืองคั่งใต้ชั้นผิวหนังและไขมันที่ถูกเลาะออกจากกล้ามเนื้อหน้าท้อง อีก 5 ราย เป็นผู้ป่วยในกลุ่มหลังที่ได้รับการผ่าตัดรักษาภาวะไส้เลื่อนขนาดใหญ่ของผนังหน้าท้อง โดยแบ่งออกเป็นแผลติดเชื้อ 2 ราย น้ำเหลืองคั่งใต้ชั้นผิวหนังและไขมัน 2 ราย และรอยเย็บที่ผิวหนังแยก 1 ราย จากการติดตามผู้ป่วยในระยะยาวพบว่า ผู้ป่วยกลุ่มหลังนี้พบภาวะไส้เลื่อนเกิดใหม่ 1 ราย (ร้อยละ 5.6) ซึ่งเป็นไส้เลื่อนขนาดเล็กและไม่มีอาการ*

สรุป: *การรักษาผนังหน้าท้องบกพร่องอย่างยากโดยวิธีแยกผนังหน้าท้องมาเย็บเข้าหากัน เป็นวิธีที่ดีวิธีหนึ่ง ในรายงานนี้ไม่พบการเกิดไส้เลื่อนของผนังหน้าท้องในผู้ป่วยที่มีแผลหน้าท้องเปิด และมีอัตราการเกิดซ้ำของไส้เลื่อนของผนังหน้าท้องเพียงร้อยละ 5.6 ในผู้ป่วยที่ได้รับการผ่าตัดซ่อมแซมไส้เลื่อนของผนังหน้าท้อง นอกจากนี้ยังเป็นวิธีผ่าตัดปิดผนังหน้าท้องที่แนะนำในสถานการณ์ที่การรักษาวิธีอื่นอาจไม่เหมาะสม เช่น ในกรณีที่มีการติดเชื้อ, มีรูรั่วของลำไส้, หรือ มีการปิดอีลีออสโตมี่หรือโคลอสโตมี่ร่วมด้วย ซึ่งในภาวะดังกล่าวการใช้ตาข่ายสังเคราะห์ชนิดไม่ละลายมาช่วยปิด อาจเกิดปัญหาการติดเชื้อของตาข่ายสังเคราะห์ในภายหลัง การผ่าตัดรักษาภาวะบกพร่องของผนังหน้าท้องอย่างยากโดยวิธีที่นำเสนอนี้สามารถทำได้แม้ในกรณีที่มีผนังหน้าท้องบกพร่องขนาดใหญ่ และวิธีการนี้มีความเหมาะสมมากในกรณีที่มีการปิดรูรั่วของลำไส้หรืออีลีออสโตมี่หรือโคลอสโตมี่ร่วมด้วย*