

## Review Article

# Open abdomen: a comprehensive review

Gustavo E. Muñoz Delgado\*, María A. Lastra Santiago

Department of surgery, Unidad Médica de Alta Especialidad Hospital de Especialidades Centro Médico Nacional de Occidente, Guadalajara, Jalisco, Mexico

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### \*Correspondence:

Dr. Gustavo E. Muñoz Delgado,  
E-mail: [gustavomd.96@hotmail.com](mailto:gustavomd.96@hotmail.com)

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### ABSTRACT

When the abdominal viscera are visible due to a defect in the abdominal wall, which is usually caused intentionally or as a result of abdominal compartment syndrome, it is referred to as an open abdomen. As a protracted open abdomen can result in problems including fluid and protein losses, intestinal fistulization, and loss of abdominal dominance, the main goals of temporal abdominal closure techniques are to prevent fluid losses and loss of dominance. There are several techniques for short-term abdominal closure, each having advantages and disadvantages. These techniques include patch closure, silo closure, and negative pressure systems based on towels and sponges. After temporary abdominal closure, the patient is monitored in the critical care unit while any required adjustments are made to the abdominal dressings. Observational studies have shown that the Wittmann Patch has the highest average rate of primary fascial closure when compared to other operations. Yet, a temporary closure of this sort might not be adequate to stop fluid loss on its own. To monitor fluid loss, a negative pressure device (sponge- or towel-based) is advised. It can be used either on its own or in combination with other techniques for closing the temporal abdominal cavity. When the sign of an open abdomen has been removed, the abdomen is closed, ideally using a major fascial closure. If primary fascial closure cannot be achieved, functional closure may be accomplished using a biological mesh inlay method. While there is a good probability of developing a posterior hernia, this treatment adds new fascial tissue where the natural fascial limits are located. The fascia defect may be filled in with primary skin closure or skin grafts once a layer of granulation tissue has developed over the consolidated visceral mass if the space between the fascia's borders is too large for functional closure. Effective abdominal closure and the prevention of issues ultimately depend on proper management and supervision of temporary abdominal closure.

**Keywords:** Open abdomen, Surgery, Trauma

## INTRODUCTION

When an opening in the abdominal wall allows the abdominal viscera to be seen, the condition known as a "open abdomen" results. This can be purposely created by leaving an abdominal incision open following surgery or by opening or reopening the abdomen as a result of abdominal compartment syndrome. On the other hand, an extended open abdomen may cause issues such protein and fluid loss, intestinal fistulization, and loss of abdominal dominance. Hence, the main goals of temporal abdominal closure techniques are to limit loss of dominance and to manage fluid losses.<sup>1</sup>

## ABDOMINAL WALL DEFECT

Unintentionally keeping an abdominal incision open after surgery or reopening the abdomen because of concern for abdominal compartment syndrome or major soft tissue abnormalities brought on by abdominal wall injuries are both examples of having an open abdomen.<sup>1</sup> Damage control surgery linked to abdominal trauma is the most frequent justification worldwide. The grounds for doing an open abdomen differ from place to region.<sup>2</sup> After creating an open abdomen, numerous approaches are used to temporarily close it. This is followed by an

interval abdominal closure, ideally with primary closure of the abdominal fascia.<sup>3</sup>

There might be issues with abdominal fluid leaking, the intestine being exposed, or the abdominal muscles contracting. Protein loss, the development of fistulas, and dominance loss are some of these consequences. These dangers must be evaluated against the advantages of leaving the abdomen exposed, such as the decrease of postoperative infections and the avoidance of abdominal compartment syndrome.<sup>4</sup>

When appropriate, leaving the abdomen open is advantageous, but it can also lead to issues such fluid leakage, intestinal exposure, and abdominal muscle retraction. A risk/stress analysis should be a part of appropriate decision.<sup>5</sup>

### **Fluid loss**

An open abdomen can cause a large quantity of fluid loss. The patient's fluid intake can be controlled to prevent hypovolemia if a closed suction device is employed as part of the temporary abdominal closure. This fluid can be measured and included in the evaluation of daily fluid balance. Certain temporal abdominal closure techniques, like the Bogotá burse, are unable to measure and collect fluid losses. It's critical to keep an eye out for electrolyte imbalances and hypovolemia.<sup>6</sup>

### **Protein loss**

Peritoneum secretes a fluid that is high in protein, and for every liter of fluid withdrawn, the abdomen loses about 2 gm of protein. Patient's dietary strategy should take these losses into consideration, and protein supplementation could be necessary to avoid protein deficiency.<sup>7</sup>

### **Fistula formation**

The danger of damage increases when the abdomen is exposed and the intestine is often moved. Eight days after the first laparotomy, enterocutaneous or enteroatmospheric fistulas can develop with a 20% chance of occurring. The most vulnerable patients are those who have intestinal anastomoses. All material related with temporary abdominal closure, as well as any intestinal anastomoses, should be covered with omentum or other viscera and kept from exposure to air whenever feasible. Moreover, it is important to maximize mesenteric blood flow while the abdomen is open to reduce the chance of fistula development, especially when there are recently formed enteric anastomoses.<sup>8</sup>

### **Loss of dominance**

The muscles of the abdominal wall pull the fascia laterally when the abdomen is open due to a midline abdominal incision. The fascia (and occasionally the skin) may not be able to return to the midline for primary

closure once the reason for opening the abdomen has subsided, leading to a significant ventral hernia. This complication has a 10% incidence rate and is more frequent in individuals who have had their abdomens left open for an extended period of time. Progressive closure and component separation are two methods for achieving primary closure that have been described to reduce this issue.<sup>9</sup>

### **Complications with the abdominal wall**

When the abdomen is left open, the skin and subcutaneous tissues come into touch with the internal organs and are vulnerable to infection. This may cause the skin and subcutaneous tissue to become necrotic, which may result in the development of abscesses, cellulitis, or even necrotizing fasciitis. To reduce these consequences, proper wound care, including frequent dressing changes, is crucial.<sup>10</sup>

### **Effects on patients' mental health**

Individuals who have an open abdomen may feel quite distressed. They could feel exposed, helpless, and vulnerable. Some of these psychological impacts can be lessened with appropriate patient information, support, and engagement in treatment decision-making.<sup>11</sup>

There is no one technique that works best for temporary abdominal closure, and no technique is suitable in every clinical circumstance. Nevertheless, several methods, such as patch closure, negative pressure devices (based on towels and sponges), and silo closure, are available for temporary abdominal closure. Regarding the capacity to regulate fluid loss, the frequency of dressing changes, the minimizing of domain loss, convenience of use, and cost, each of these approaches has benefits and drawbacks.<sup>12</sup>

Systematic studies have found that the use of continuous fascial traction and negative pressure in wound systems may improve results, however the quality of the evidence is often subpar. One study on negative pressure wound care systems discovered a potential mortality advantage for utilizing AbThera, a commercially available sponge-based system, as opposed to Barker, a towel-based method; however, the study did not allow researchers to pinpoint the explanation for this. The broad plastic skirt of the AbThera device may help reduce adhesion development between the viscera and abdominal side wall, although no studies have been done to demonstrate that this leads to a faster/ more powerful fascial closure.<sup>13</sup>

Using sutures, prosthetic material is inserted between the fascia's margins as part of patch closure procedures. Abdominal closure and simple re-entry into the abdomen are achieved using two major patching procedures. Patch approaches are frequently used in conjunction with a negative pressure device to avoid skin maceration and streamline wound care since the patch can reduce fascia retraction but has poor fluid control.<sup>14</sup>

The greatest drawback of patch closure is the potential for fascial necrosis brought on by repetitive fascial sutures or severe tension on the fascia. Future main fascial closure is less likely if there is any fascial loss. If the integrity of the fascia tissue has been damaged, other closure methods that do not involve manipulating the fascia may be recommended.<sup>15</sup>

Vacuum-assisted closure (VAC), commonly known as the use of dressings for the treatment of negative pressure wounds (NPWT), is another common method for momentary abdominal closure. Applying negative pressure reduces loss of dominance, prevents lateral retraction of the abdominal muscles, and increases the possibility of primary fascial closure. The two most often utilized NPWT systems are those based on sponge and towels.<sup>16</sup>

## ABDOMINAL CLOSURE

Timing of closure: Early fascial closure, as opposed to late closure, seems to be crucial for achieving the optimum long-term functional result. One research contrasted early closure (7 days) with late closure (>7 days), finding that individuals in the early group had less daily discomfort, higher quality of life ratings, and were more likely to go back to work (54 versus 10 percent). In a study of 499 individuals, 327 patients experienced primary fascial closure (65.5 percent). Primary fascial closure was related with a decreased chance as the time to initial withdrawal increased. At 24 hours, the risk of primary closure decreased by 1.1 percent for every hour of delay. Moreover, there was a tendency for intra-abdominal problems to become more severe in individuals who returned after 48 hours. The goal is early rather than later closure of the abdominal wall, despite the fact that these trials lacked randomization and their findings may be the product of self-selection.<sup>17</sup>

The abdomen should be examined to see whether it can be closed each time the patient visits the operating room. If closure cannot be accomplished, the temporary abdominal closure bandage is changed, keeping the fascia edges as near together as possible, and a second surgery is scheduled in another 48 hours. In a survey of 344 traumatized individuals, 63% of those who had the second revision treatment had their abdominal fascia closed. This was done in order to limit damage. The time for fascia approach will be delayed if continuous fluid resuscitation is required or if a systemic inflammatory reaction manifests. It may not be feasible to achieve facial closure in some instances. Less frequently will the abdomen be closed primarily the longer the abdomen remains open.<sup>18</sup>

## CONCLUSION

In the domains of trauma and other surgical specialties, managing the open abdomen is a difficult challenge. The open abdomen is a result of the urgent need to address

ischemia, infection, or bleeding. In order to facilitate final repair and reduce the likelihood of problems, the care of the open abdomen should adhere to the principles of damage control surgery. The best course of action is primary fascial closure. A functional closure or basic covering can be offered if this is not possible. The time of closure is crucial, because earlier fascia closure is linked to better results. In the event that primary or functional closure is not possible, a planned ventral hernia may be the sole choice. The best management of the open abdomen requires a multidisciplinary approach with close collaboration between surgeons, intensive care experts, and wound care nurses.

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