ABDOMINAL CAVITY EVENTRATION TREATED BY MEANS OF THE „OPEN ABDOMEN” TECHNIQUE USING THE NEGATIVE PRESSURE THERAPY SYSTEM – CASE REPORT AND LITERATURE REVIEW

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Wound dehiscence is a surgical complication in which the wound ruptures along the surgical suture with abdominal cavity bowel displacement. It is observed in 0.2-6% of operated patients. The extensive wound is a gateway for infection. Moreover, increased secretion of serous fluid induces a hygienic problem and may lead to secondary skin infections or bedsores. The negative pressure wound therapy (NPWT) system is an innovative therapeutic method. It perfectly executes the TIME strategy, receiving more and more recognition.

The study presented a case of a 62-year old male patient after several consecutive wound dehiscence episodes who was primarily treated for rectal cancer by means of low anterior resection of the rectum. Due to acute respiratory insufficiency after several operations, wound necrosis with dehiscence was observed. Considering the high risk of perioperative death we abandoned surgical treatment and introduced conservative management using negative pressure wound therapy until the patient’s health improved. Literature regarding the above-mentioned issue was also reviewed.

Key words: wound dehiscence, negative pressure wound therapy, dressing, open abdomen, laparotomy

Eventration, which is the dehiscence of the abdominal cavity integuments along the entire length or part of the postoperative wound with displacement of the bowels outside the abdominal cavity is a complication observed in 0.2-6% of operated patients. Factors contributing to poor wound healing, include: patient age (>65 years), male gender, hypoalbuminemia, emergency surgery, the length of the wound exceeding 10 cm, wound infection, intraabdominal infection, lung diseases, circulatory insufficiency, obesity, neoplastic disease, ascites, chronic steroid therapy, prolonged postoperative paralytic ileus, diabetes mellitus, and jaundice (1). An extensive wound is the gateway to infection, one often may observe extensive fluid secretion, which might induce a hygienic problem and lead to secondary skin infections and bedsores. Another problem consists in integumental shrinkage, which leads to wound enlargement and wound closure difficulties (2). The method of choice consists in surgical abdominal cavity closure with peritoneal control.

NPWT (Negative Pressure Wound Therapy) is a new method of treating wounds considered as one of the most innovative wound treatment methods, perfectly fitting with the modern TIME strategy (3, 4). The term “vacuum” is used in physics to determine the situation where the pressure in the closed system is lower than that surrounding it. The system used for wound treatment comprises polyurethane foam or gauze, which after being covered by foil using a set of drains connected to a mechanical suction unit leads to negative wound pressure (5). Therefore, excessive wound exudate is discharged by means of a closed system to a separate container. The above-mentioned is responsible for faster wound healing. Direct control of the pressure facilitates wound debridement and prepares for its closure. The negative pressure wound
Eventration and "open abdomen" with negative pressure therapy

The therapy system is responsible for excessive exudate discharge and wound debridement from necrotic tissues, stimulates granulation tissue growth, improves blood circulation within the wound, and prevents cross-infections by means of the closed system. Thanks to the removal of toxins and reduced bacterial colonization, one may observe smaller wound swelling (6, 7). Negative pressure wound therapy systems support acute and chronic wound healing, 2-4 stage bedsores, according to the NPUAP scale, diabetes foot, poorly healing postoperative wounds, burn wounds, as well as skin and tissue grafts (8).

The study presented a case of a patient treated many times in our department, due to abdominal cavity eventration.

CASE REPORT

A 62-year old male patient was admitted to our department for surgical treatment with diagnosis of rectal adenocarcinoma. The patient had a history of arterial hypertension. The physical examination showed abdominal obesity (BMI – 33 kg/m²). The patient was subject to an anterior resection of the rectum with complete excision of the mesorectum and end-to-end anastomosis. During the postoperative period the patient was on parenteral nutrition for a period of 6 days. On the 7-th day after surgery we observed a serous leakage from the lower pole of the wound from which a sample was collected for bacteriological examination. The patient was discharged from the hospital on the 10-th postoperative day with recommendations for daily wound lavage using lavaseptic and typical metronidazole administration. During the control visit after 5 days at home the patient additionally received ampicillin, according to the antibiogram— the postoperative wound serous exudate was still present. During ampicillin administration the patient complained of hiccups. Four days thereafter (18-th postoperative day) the patient was admitted to the department, due to eventration. The abdominal plain film showed no signs of ileus, the abdominal ultrasound—no fluid presence. Morphology, TP and basic biochemical parameters were within normal limits. During the preparation of the patient for surgery bronchial gastric content aspiration was observed. The intraoperative examination revealed muscular fascia dehiscence of approximately 5 cm with incarceration of a single loop of the small intestine. Abdominal cavity control revealed no pathologies. The fascia was closed by means of a monofilament continuous loop suture (100% tissue maintenance after 14 days and 50% after 90 days since implantation). After surgery the patient returned to the Department of Surgery.

During the first postoperative day, eventration was once again observed. The patient underwent surgery. The peritoneum and fascia were supplied by means of monofilament interrupted non-absorbable sutures. Additionally, the abdominal cavity integuments were closed using anti-eventration sutures. After surgery the patient required mechanical ventilation at the ICU, due to respiratory insufficiency. Since the first day after surgery we observed serous leakage from the wound. Three days after surgery marginal necrosis of the abdominal integuments was observed. The patient continued to be on mechanical ventilation with acute respiratory insufficiency and pneumonia. During hospitalization at the ICU a third eventration episode was observed (fig. 1). Due to the patients’ severe condition and inability to close the abdominal wall conservative therapy was implemented (wound lavage with

Fig. 1. Abdominal cavity integuments at the ICU
lavaseptic, mechanical compression, surgical drapes, cummerbund). After 31 days of hospitalization the patient was referred to the Department of Surgery with symptoms of significant eventration (fig. 2). The decision concerning negative pressure wound therapy was undertaken. The dressing sponge was soaked in Octenilin, prior to being placed in the wound. Cultures from the wound were collected every 10-14 days. During the initial 10 days of hospitalization the patient received intravenous ertapenem. Following antibiotics according to the antibiogram. Initial treatment applied constant 140 mm Hg pressure. The dressing was additionally compressed using surgical drapes and a cummerbund. Dressings were changed every 2 days. From the 8-th day variable pressures were used: 120 mm Hg for a period of 4 minutes, followed by 30 mm Hg for 2 minutes (fig. 3). The patient remained on continuous parenteral nutrition. After 21 days of negative pressure wound therapy, one observed wound debridement, smaller width, and granulation tissue growth (fig. 4).

Since the beginning of the first hospitalization the patient lost 10 kg. The decision concerning surgical intervention was undertaken. After wound debridement and wide dissection of the edges of the fascia OmyraMesh® was implanted (20x30 cm in size) using continuous, non-absorbable monofilament sutures. Additionally, interrupted sutures were used to fix the mesh to the edges of the prepared muscular fascia. The skin was then sutured over the implanted mesh. Two Redon suction drains were left between the mesh and skin. During the postoperative period we observed pleural fluid in the subcutaneous tissue. Cultures showed no bacterial flora growth. The exudate was treated by means of negative pressure dressings, placing a drain between the sutures to the subcutaneous tissue, and placing a negative pressure sponge over the drain. The fluid compartment was subjected to lavage twice daily using lavaseptic. The dressing was connected to continuous suction of 100 mm Hg. Fourteen days after surgery exudate symptoms regressed. Eighty days since the first episode of eventration the patient was discharged from the hospital in good general condition with a healed wound (fig. 5).

**DISCUSSION**

Inability to close the fascia during laparotomy results in laparostomy, the so-called “open abdomen”. The above-mentioned method is applied in case of severe septic peritonitis, after decompensated laparotomy in case of patients with the intra-abdominal compart-
ment syndrome, or in case of trauma surgery (damage control). Another common cause of laparostomy is postoperative wound dehiscence with fascia necrosis rendering impossible tension-free closure, forcing the surgeon to leave the abdominal cavity open (9).

Treatment and proper supply of patients with an open abdomen is quite a challenge. This is associated with massive fluid loss, high risk of infection, peritoneal perforation, multiorgan failure and death. Moreover, prolonged abdominal cavity decompensation might lead to intestinal adhesions, fistula development, fascia atrophy, and massive postoperative hernias requiring complex reconstruction of the abdominal cavity walls (10, 11, 12).

Since 1979, when first “packing” was described in the treatment of an open abdomen, therapeutical possibilities have significantly evolved. Until now, several different abdominal cavity closure techniques have been described: Bogota Bag, Witmann patch, mesh and “zipper” implantation, as well as the negative pressure wound therapy system (13). Analysis showed that negative pressure wound therapy was the most frequently used method in the last decade (14).

The use of negative pressure during laparostomy was initiated by Brock, Baker and Burns in the mid nineties of the past century (15). Their dressing, the so-called “vacuum pack” consists of three layers. The first layer, being most profound is composed of a polyethylene film, perforated in several places by means of a scalpel, covering the visceral organs, protecting their adherence to the peritoneum. The middle layer consists of a soaked gauze comprising drains connected to the vacuum system. It is essential that the middle layer does not come in contact with the bowels, thus reducing the possibility of fistula development. The top layer is an adhesive foil tightly covering the dressing (16). Further development of the „vacuum pack” concept is the presence of NPWT dressings. The surgical gauze was replaced by a special polyurethane sponge. What’s more a drainage system and dedicated pump maintaining proper pressure values discharging excessive exudate from the peritoneal cavity were elaborated. Not many studies compared “vacuum pack” with NPWT. Numerous studies and systemic reviews often categorized the above-mentioned as negative pressure techniques (14). The largest prospective study was conducted in 20 American trauma centers comprising 280 patients. The study showed that the use of the negative pressure wound therapy system is associated with a greater percentage of primary fascial closure (69% vs 51%) and lower mortality, as compared to Baker’s technique (12). The above-mentioned observation was confirmed by Frazee et al., although their study comprised fewer patients (17). Differences in mortality can be explained by the more effective discharge of exudate from the peritoneal cavity along with proinflammatory cytokines, thereby, increasing blood flow through the wound and metabolites discharge, and thus, rarer occurrence of multiorgan failure (18). The above-mentioned hypothesis was confirmed by studies undertaken on animals (19), however, clinical observations are not as conclusive and require further verification.

Despite its usefulness in the management of laparostomy, NPWT is not free from complications. A frequent and complicating treatment technique consists in the development of an intestinal fistula. Their is no clear evidence that the use of negative pressure therapy directly favors fistula development (20, 21). It is worth mentioning that such complications occur in all techniques, considering laparostomy supply (14). The frequency of intestinal fistulas
during the use of NPWT ranges between several and more than 60% (22).

The relevance of negative pressure in the treatment of abdominal cavity eventration, based on literature data is hard to evaluate. First of all, eventration is a rare indication for the treatment by means of the open abdomen technique, since in many cases primary wound closure is possible (23). Thus, patients with eventration were rarely included in studies, and even if, comprised a small percentage of overall patients. Additionally, patient groups were very heterogenous in terms of the technique applied for temporary closure of abdominal integuments, as well as their general condition (14). It should also be noted that these patients required laparostomy, due to the extensive pathology of the postoperative wound. Thus, primary closure of the fascia might be rarely achieved and mesh implantation or reconstructive procedures might prove necessary (9, 23, 24). Moreover, the duration of NPWT in these patients is much longer, averaging approximately 6 weeks (18), as compared to post-injury patients in the Suliburk study amounting to 18 days (25).

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