

Management of Acute Secondary Peritonitis

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Abstract

Acute secondary peritonitis is afflicted with a high morbidity. The treatment of the disease should be interdisciplinary. The combination of intensive care therapy, antibiotics and surgical procedures for source control are mandatory. The patients often need relaparotomies and open abdominal lavages. Continuous negative pressure therapy seems to be beneficial. There are several different treatment options for example concerning right point of time, on-demand versus planned, amount of lavage solution used, which solution used, CNP system yes or no, which CNP system, which pressure and many more. We would like to describe the treatment in our clinic and compare it with the existing literature.

Keywords: Peritonitis; Open abdomen; Damage control surgery; Continuous negative pressure therapy; Relaparotomy

[4]. At the time the standard treatment is open abdominal lavage. This involves scheduled relaparotomies or relaparotomies on demand with lavage of the abdomen. With that an effective reduction of germs is ensured. On top you can control the local success of the treatment and avoid intraabdominal raise of the pressure [5,6].

But the open abdominal lavage is associated with a high morbidity. Problems are among other things injury of the bowel and retraction of the fascia leading to an abdomen apertum [7]. Many options were tried to reduce the morbidity, for example synthetic nets, zippers, strips but they all failed [8,9]. Another disadvantage is the discontinuous evacuation of peritoneal fluid. The duration of the treatment and the high morbidity have a relevant influence on the health care system [10]. To improve the outcome of the peritonitis therapy continuous negative pressure systems have been invented [11]. Their duty was to drain the peritoneal fluid and evacuate germs and proinflammatory cytokines reliably. They should also function as a barrier to the surroundings and prevent further infections. Furthermore they should have a positive effect on earlier fascial closure [12].

Because there were no clinical studies with a high evidence level we tested different CNP therapy systems ourselves in our department [13]. But still there are many questions left concerning the optimal management of the acute secondary peritonitis.

Abbreviations:

CNP: Continuous Negative Pressure; MPI: Mannheim Peritonitis Index; SSS: Septic Severity-Score; GI: Gastrointestinal; P: Point.

Introduction

The acute secondary peritonitis still has a high morbidity and mortality [1]. The foundation of the local therapy for perforated abdominal hollow organs or anastomotic insufficiency still is, regarding to Kirschner et al. [2] at the beginning of the last century, the

- Elimination of the source,
- Abdominal lavage,
- Derivation of the exudate.

The reason for that is rehabilitation of the focus, mechanical reduction of germs and effective evacuation of proinflammatory cytokines from the abdomen [3]. This requires surgical treatment

Method

In the department of surgery of the Charité Campus Mitte Campus Virchow we indicate exploration, evacuation of the source and lavage of the abdomen in combination with antibiotic and intensive care treatment if we are suspicious of secondary peritonitis. The evaluation of the intraabdominal situation lies within the experience of the operator. It depends on clinical macroscopic findings (pus, stool, bile fluid in the abdomen, foetor) as well as laboratory and microbiological findings (raise of infection parameters, positive swab in the abdomen) and patient selected aspects (vital parameters, immune-suppression). If we see peritonitis in more than one quadrant we use CNP therapy.

We would like to describe our own therapeutic approach and discuss it with the current literature.

Discussion

In patients with acute secondary peritonitis open abdomen treatment often is necessary [14]. But even with optimal treatment there still is a high mortality of about 50-80% [15]. Retraction of the fascia (up to 82%), intestinal bleeding (18-24%) and fistula (15-29%) are common complications of this therapy, which are described with varying incidence [16,17].

There are several open abdomen and lavage options. They all have in common that the elimination of the source should take place as soon as possible, because this can lead to a reduction of mortality [18,19].

If we see the indication for exploration because of possible acute secondary peritonitis the evaluation of the intra-abdominal situation lies within the experience of the operator. Because of the severity of the disease these operations are normally performed by a senior physician. His acting depends on clinical macroscopic findings (pus, stool, bile fluid in the abdomen, foetor) as well as on laboratory and microbiological findings (raise of infection parameters, positive swab in the abdomen) and patient selected aspects (vital parameters, immunosuppression). For prognostic reasons we use the Mannheim Peritonitis-Index (MPI). This is a score to evaluate the prognosis of our patients. For the existence of certain risk factors and intra-abdominal findings there are several points to distribute (**Table 1**).

Table 1: Mannheim Peritonitis Index used for the prognosis of the patient. MPI<20P=mortality nearly 0%; MPI>29P=mortality>50%.

MPI			
Age>50	Yes/5P	No	
Female	Yes/5P	No	
Organ insufficiency	Yes/7P	No	
Malignoma	Yes/4P	No	
Duration of peritonitis prior operation more than 24 h	Yes/4P	No	
Source of peritonitis NOT colon	Yes/4P	No	
Expansion diffuse	Yes/6P	No	
Exudate	Clear/6P	Unclear/6P	Stool/12P

The MPI is the sum of all points. Is the MPI ≤ 20 , the mortality is to be expected about 0%. With an MPI>29 there is a mortality of more than 50%. The MPI is based upon the analysis of courses of diseases of patients with peritonitis in Mannheim and Frankfurt/Main. Later on the score could be validated in other clinics [20-22]. There are other scores which can be used like the APACHE-II score which we use on our intensive care unit and the Septic-Severity-Score (SSS). Mortality increased significantly with increasing score ranges (<20, 20 to 30, and >30 points) for MPI

from 0% to 28% to 81%, for APACHE-II day 1 from 20% to 46% to 100%, and for SSS day 1 from 10% to 37% to 71% [23,24].

After eliminating the source (suture, Hartmanns procedure, damage control surgery) we lavage the abdomen with 10 L Ringers solution and if we see peritonitis in more than one quadrant we use CNP therapy with a very low negative pressure of -50 mmHg and schedule a planned relaparotomy after 48 h.

The elimination of the source is depending on the source of infection. Anastomotic leaks can occur in every part of the gastrointestinal tract, at the gastric remnant or at the esophagus, at the small bowel or at the colon and the rectum. Problems at these sites require a tailored approach from an experienced surgeon. For upper GI problems like the esophago-jejunosomy or the gastro-jejunosomy or problems with the duodenal stump we are more likely to perform and over sewing or create a new anastomosis. For problems with colon or rectal anastomoses we are more likely to use a diversion operation. For anastomotic leaks after upper gastrointestinal there was a major paradigm shift in the management from surgical towards conservative and endoscopic treatment approaches as first-line treatment options. Hummel et al. stated that the operation still is indicated in selected patients, depending on the severity of symptoms, the condition of the patient, and failure of initial treatment [25]. Kähler et al. described stenting, clipping, the application of glue and the endosponge therapy as promising treatment options [26]. Further studies are required.

Blumetti et al. described the problem of diversion operations after colorectal or coloanal anastomoses leaving the patient possibly with a permanent stoma [27]. If there is already a diverting stoma present at the time of the leak there are several different treatment options like CT guided percutaneous drainage for pelvic leaks, or trans-anal stented drainage, or endoscopic clipping. We also sometimes use an endosponge. This is an endoscopically placed vacuum device, which can be inserted by a surgeon or endoscopist. The sponge should be exchanged every 48-72 h. Weidenhagen et al. described the first series in 2008 [28]. It consisted of 29 patients who underwent endosponge treatment over a median of 34 d, with 28 having healing of the anastomosis. More studies are needed to evaluate the significance of these therapies.

Patients who do not improve with non-operative treatment or who have severe sepsis need to undergo surgical treatment. By that time we do not perform minimally invasive treatment for these patients. This is an active area of study. Lee et al. showed at a retrospective analysis of 77 patients with anastomotic leakage after laparoscopic colorectal surgery [29]. Laparoscopic reintervention was associated with a shorter hospital stay, fewer postoperative complications, and a higher stoma closure rate than open surgery. Therefore they say it is feasible and safe.

We perform planned laparotomies after 48 h. In the literature there is no benefit shown respective laparotomy on demand versus planned laparotomy [15,19,30]. After the lavage of the abdomen with 10 L Ringers solution we place a continuous negative pressure device if we see peritonitis in more than one quadrant. We use either the ABThera® device of KCI Medizinprodukte GmbH or the Suprasorb® CNP Drainagefolie of

Lohmann & Rauscher GmbH. We use a very low negative pressure of -50 mmHg. We did an own study with patients with acute secondary peritonitis treated with abdominal negative pressure therapy of the two different devices. There were no differences concerning patient characteristics, duration of abdominal vacuum therapy, the possibility of direct fascial closure or morbidity and mortality with the two different systems used [13]. The average duration of the treatment is given with 5-26 days in the literature [7,31]. Our findings are conforming to that. What was very uncommon and outstanding in our study that we had an intestinal fistula rate of 0%. In the international literature there are rates of fistulas for open abdomen treatment of 4-35% [7]. We suggest this is because of the low negative pressure that we are using. We choose to use this pressure because of many years of experience and because of recommendation of a current review concerning this therapy [32]. We could not find any differences concerning the amount and the solution (Ringer, Saline Solution, Saline and Na Bicarbonate, Taurolidin) used for the lavage [33,34].

If we suspect acute secondary peritonitis we start with broad-spectrum antibiotics with gram negative and anaerobic coverage. Most of the time we have to deal with a mixture of pathogens of the sterile abdominal cavity with pathogens of the natural gut flora. There are gram-negative enterobacteriae, klebsiella, gram-positive coccus like enterococcus and anaerobics. Yeast is also a problem [35]. We take swabs during the reoperation of the patient for the de-escalation of the antibiotics in regard of pathogen and resistance. We also take a peritoneal biopsy to test the presence of fungus. The perioperative therapy of the patient is of outstanding importance. We treat the patient interdisciplinary on an intensive care unit.

The closure of the abdominal cavity is carried out at the time when intra-abdominal signs of infection clinically (fibrin cover of the gut, pus, unclear fluid) are not detectable anymore. If the fascia appears to be stable and there is a tension free closure possible we perform a direct closure with a monofil absorbable suture (**Figure 1**). If this is not possible an absorbable mesh is implanted. If there is more conditioning of the wound required we use subcutaneous negative pressure therapy.



Figure 1: Fortelny et al. describe a combination of continuous negative pressure therapy with dynamic fascial sutures for closure of the abdominal wall [36].

Conclusion

The acute secondary peritonitis still is associated with a high morbidity and mortality. Fast acting for the elimination of the source, abdominal lavage, derivation of the exudate and interdisciplinary treatment with antibiotics on an intensive care unit is still the treatment of choice. Interventional treatment and different lavage options need to be further studied.

Conflict of Interest

Dr. V. Müller and Dr. W. Raue have undertaken consultancy work for Lohmann & Rauscher GmbH & Co. KG in the area of continuous negative pressure therapy and have received honoraria from Lohmann & Rauscher.

Authors Contribution

Dr. Koplin and Dr. Strauchmann made equal contributions to the article, and both are considered to be first authors.

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