Management of Complications after Major Gastrointestinal Surgery

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Question 1: In the case of anastomotic leakages, do you think that the decision to reoperate or to treat the patient with interventional procedures depends on the severity of illness and/or the severity of sepsis?

Angele: Anastomotic leakage represents a septic focus. The management of such a focus, i.e. interventional procedure versus reoperation, certainly depends on the severity of sepsis. Nonetheless, other parameters have to be considered, i.e. time interval between anastomotic leakage and primary surgery, presence of adhesions (localized vs. diffuse abdominal infection), and loop stoma proximal to the insufficient anastomosis. Reoperation is indicated in patients with severe sepsis, short time interval to bowel anastomosis, diffuse abdominal infection, and no proximal loop stoma. Interventional procedures are rather indicated in patients with rectal anastomotic leakage in the small pelvis with no diffuse abdominal infection.

Fellermann: Severity is indeed an important driver to guide the decision. Profound sepsis and diffuse abdominal infection may favor an operation. On the contrary, locally defined complications can be managed by endoscopic or radiological interventions. The time interval seems to be secondary.

Hummel: Yes, definitely. Severity of illness or fulminate sepsis clearly have an impact on the decision for different treatment options (surgery vs. interventional therapies). This also applies to the

cases of failure of initiated conservative or interventional treatment with progressive clinical deterioration. In these cases, severity of illness or progressive sepsis mandate reassessment of the treatment strategy.

Hunold: First of all, the patients we are talking about have all had major surgery during the last few days or weeks and obviously suffer from severe post-surgery complications. This means that re-surgery should, in most cases, be avoided if ever reasonably possible. So, as in many other post-surgery complications, these are the typical patients we are facing in interventional radiology in hospitals that offer major visceral surgery. Hence, the decision to consult the interventionalist typically comes at an early stage after confirming the diagnosis of leakage. Interventional treatment is minimally invasive, and patient handling during the procedure as well as technical treatment success are relatively independent from illness severity – making interventional treatment advantageous over re-surgery. So, to answer the question: Yes, patient status does have an impact on the decision between re-surgery and intervention in a sense that intervention will frequently be the method of first choice in severe illness and/or sepsis.

Kähler: The decision for reoperation or intervention depends on the prospect of success. In cases where the infection is confined to the anastomotic site, a local therapy might be sufficient. If the problem involves a larger region, reoperation is more promising. Severe sepsis tends to require reoperation.

Wellner: The short answer is no as the least invasive approach is preferred. However, the issue is rather complex. We think that the decision depends more on the technical feasibility of management and the success thereof than on the severity of sepsis. Sophisticated methods of interventional and endoscopic treatment have become available and are outlined in this issue of VISCERAL MEDICINE. The available scientific evidence is low-level because i) randomized trials are lacking and ii) observational data suffers from selection bias. With regard to anastomotic leakages in the upper gastrointestinal tract, some basic principles for decision making might be suggested:

- Operative treatment might be considered first-line if the leak occurs in the early postoperative period, i.e. up to 3 days after the initial operation. These leaks are considered to be related to technical problems.
- Interventional treatment is the treatment of choice for leaks occurring later in the postoperative course. Postoperative peritoneal adhesions can be expected which complicate the reoperation and increase the risk of collateral damage. Furthermore, these adhesions wall off the septic focus of leakage, which can be desirable.
- The feasibility of interventional treatment depends on the anatomical situation and the institutional experience. Leakage is a rare event, and experience with novel methods can only be expected in high-volume centers.
- Importantly, success of therapy has to be monitored. If interventional therapy fails to improve a critical patient's condition within 24 h, reoperation must be considered.
- Another indication for operative therapy are abscesses not amenable to or not sufficiently drained by interventional measures.

Question 2: The interventional transhepatic drainage and stenting of a ruptured hepatojejunal anastomosis is extremely difficult if the intrahepatic bile ducts are not dilated. How to weigh risks and benefits for the individual patient?

Hunold: Indeed. The difficulty in patients with small intrahepatic bile ducts is to hit one of the ducts by puncture to establish an access to the bile system – e.g. by ultrasound guidance. So, the likelihood to fail at an early stage of the procedure is higher. However, this does not necessarily correlate with a higher rate of complications of the interventional procedure (e.g. bleeding, biloma), whether successful or not. Therefore, the risk in those patients is comparable to the ones with dilated ducts while the anticipated benefit is as high, resulting in a similar risk-benefit ratio. That is why I think that lean bile ducts are not a contraindication for transhepatic procedures.

Question 3: Some of the interventional procedures for the treatment of anastomotic leakages presented in this special issue are usually only available in university hospitals. In which cases would you

recommend the transfer of the patient to a specialized center? In which cases would you recommend an operation instead?

Fellermann: To be honest, there does neither exist a time line nor a location preference. Hence, general recommendations cannot be given and the decision should be based on personal preference and expertise. However, specialized centers guarantee a maximum of staff and technical support.

A revisional operation is feasible in the early and late stage (4 weeks after the initial operation), with increments in morbidity and mortality. Endoscopically guided treatments are an upcoming alternative, with stent placement in the early phase and endoluminal vacuum therapy in later stages. To my knowledge, there is no evidence to favor one of the approaches. Instead, I would combine the best of both in an individualized fashion for each patient.

Hunold: On the one hand, interventional radiology is a rising star with more and more practitioners and hospitals offering high-level interventional services. On the other hand, more sophisticated surgery and a widening of indications require more support of conservative disciplines like interventional gastroenterology and radiology. In many cases, intervention is the first choice nowadays. A transfer to more specialized centers should, from my point of view, be done if the only available option 'at home' is merely the second-best option. So I think that re-surgery instead of intervention should only be performed with an equally low risk for the patient, if possible.

Kähler: We have learned that the outcome of esophageal resectional surgery correlates with the institution's case load. Therefore, all hospitals that perform esophageal surgery should provide full endoscopic service including endoscopic vacuum therapy and stenting. In my experience, patient transfer is more often triggered by the lack of a comprehensive intensive care unit than by the availability of endoscopic methods.

Question 4: Some patients with anastomotic leakages exhibit with severe septic shock. Are interventional therapies also indicated in these patients? If your answer is 'Yes', within which time after technically successful treatment should we see a decrease of procalcitonin (PCT) and C-reactive protein (CRP) as well as the resolution of septic shock?

Angele: Whether interventional therapies may be a treatment option in patients with severe sepsis depends on the above-mentioned factors. Two clinical situations could be treated interventionally despite severe septic shock:

- Localized infections in the small pelvis with a proximal loop stoma.
- Anastomotic leakage in patients with pronounced abdominal adhesions leading to a localized abscess formation.

Nonetheless, in most patients with severe septic shock and anastomotic leakage reoperation is required to solve the septic focus.

Kähler: Renal und cardial function should improve very quickly. If PCT does not improve after 24 h and CRP after 48 h, the concept has to be re-evaluated strictly.

Wellner: These situations are very difficult because the available literature does not offer high-level evidence to help in the decision making. Surgeons might feel that reoperation is the best treatment because it is the most radical and consequent measure. In contrast, reoperation is associated with major surgical trauma, spillage of the septic agent in the abdominal cavity, abrogation of the physiological barriers established by peritoneal adhesion, and increased risk of collateral damage. Therefore, we feel that interventional therapy should also be pursued in critically ill patients. A time frame of 24 h to monitor success in terms of decrease of inflammatory markers and sepsis parameters might be considered appropriate.

Question 5: We know from the literature that it is extremely important to choose the right antibiotic chemotherapy in severe sepsis and septic shock. The sepsis guidelines recommend an antibiotic treatment – ‘hit hard and early’ – and a ‘step-down management’ of antibiotic treatment if the causative microbes and their resistance are identified. Which antibiotic treatment is recommended for patients with anastomotic leakages after upper gastrointestinal surgery, i.e. esophagectomy, gastrectomy, and pancreatic surgery? Do we need swabs from the site of infection and from drainages in the abdomen and/or blood cultures?

Hartl: At the time of the primary diagnosis swabs should be taken from the site of the infection and, serially, from abdominal drainages. Antibiotic treatment of nosocomial abdominal infections is mandatory, should be started as early as possible, and should be guided by specific resistance patterns. The type of empirical medication depends on the individual risk profile of the patient: with a low risk, a broad gram-positive and gram-negative spectrum should be covered (including *Enterococcus faecalis*, *Pseudomonas*, *Proteus*, etc.). Local resistance patterns should be considered when selecting the appropriate medication. A high risk (immunosuppression, preceding antibiotic therapy, incomplete surgical focus control) requires additional coverage of *Enterococcus faecium* and *Candida* sp. Medication should be adjusted to results of microbiological follow-up examinations and should be continued for a maximum of 7 days or up to the point of time where the patient has been free from infection for more than 2 days.

Hummel: Our standard protocols include mainly piperacillin/tazobactam or meropenem as first-line empiric antibiotic treatment in the case of clinical suspicion of leakage and/or beginning sepsis. Both antibiotics provide a broad spectrum of action that includes many gram-positive and gram-negative bacteria (including *Pseudomonas*) and anaerobic bacteria. Furthermore, antifungal treatment needs to be considered in these patients. Early involvement of specialists for infectious diseases is in our opinion essential in order to adjust or expand antibiotic/antifungal treatment based on clinical course and results from swabs or blood cultures. Swabs from the site of infection as well as from drainages in the abdomen and/or blood cultures are crucial in order to optimize treatment for the individual patient as well as to avoid unnecessary use of broad-spectrum antibiotics in the era of increasing development of drug resistance.

Kähler: The antibiotic regime has to reflect hospital-specific patterns of resistance and resulting recommendations regarding calculated antibiotic therapy. One of the advantages of endoscopic management is an easy and quick harvesting of pathogens from the insufficient anastomosis. The antibiotic susceptibility of the pathogens should be the basis for further antibiotic therapy.

Question 6: How can the risk of vomiting and aspiration into the trachea during endoscopy be assessed in patients with upper gastrointestinal anastomotic rupture? Can we identify high-risk patients who should be intubated before endoscopy?

Fellermann: The risk for aspiration is rare but increases owing to transport malfunction. In most cases, patients are already equipped with gastric tubes. The amount of reflux may be used as a risk index; however, there does not appear to exist a clear cutoff. Whenever the endoscopist is afraid of aspiration, intubation is warranted. Another option is to use a scope with a large-bore working channel.

Kähler: Intubation for endoscopic placement of vacuum sponges, nutritional tubes, stents, and clips is not required regularly. The decision for intubation and anesthesia has to weigh advantages (safe avoidance of aspiration, better endoscopic exposition) and disadvantages. Patients with high-volume gastric contents or ileus are high at risk for aspiration. Intubation is also recommended in patients with adynamia as well as in those patients which are severely hemodynamically affected with requirement of high volumes of fluids and/or vasopressors. If aspiration occurs, an immediate bronchoscopy and aspiration of secretion for microbiological analysis should be done.

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