SUCCESSFUL MANAGEMENT OF NON-OCCLUSIVE MESENTERIC ISCHEMIA (NOMI) – CASE REPORT

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Patients with non-occlusive mesenteric ischemia (NOMI) are still confronted with high mortality. The diagnostic is challenging and difficult because of the unspecific symptomatology. The aim of this systematic scientific report on an extraordinary and uncommon single clinical case and its successful course was to demonstrate the great potential of a partially novel non-surgical approach including its perinterventional management.

A 73-year old female is precisely described, who developed an acute abdomen during the postoperative course after cardiosurgical intervention. Only explorative laparotomy clarified the correct diagnosis – NOMI. Despite general intensive care, patient developed multi-organ failure after this second intervention. Using consequently an image-guided minimally invasive radiological approach comprising the introduction of a catheter into the superior mesenteric artery (Seldinger’s technique) and the continuous application of vasodilating medication such as alprostadil (prostaglandin) through this catheter enabled us to improve mesenteric perfusion effectively and to overcome multiorgan failure.

In conclusion, specific risk factors may help to focus on the suspicion of NOMI. Diagnostic of choice is the arterial mesentericography, which allows specifically to exclude vascular occlusion including the consequence of a prompt surgical approach. Simultaneously, using the setting of the mesenteric angiography catheter can be placed for initiation of regional vasodilating treatment in case of NOMI. Only this approach may avoid fatal outcome.

Key words: non-occlusive mesenteric ischemia, mesentericography, intraarterial perfusion catheter, vasodilating treatment

Disturbances of mesenteric perfusion occur occasionally in the daily work of surgical intensive care units. They are associated with a high rate of complications and even mortality. Only an early and correct diagnosis as well as initiation of surgical intervention or aggressive conservative treatment can provide significant impact against the fatal outcome of natural course. Early mesentericography to exclude mesenterial occlusion, which would require surgical intervention, is feasible to avoid a prolongation of the diagnostic process. In case of “Non-Occlusive Mesenteric Ischemia” (NOMI), the image-guided radiological treatment options to dilate mesenteric branches have been increasingly favored. Thus, in addition to the intensive care, septic or toxic multiorgan failure caused by a lack of mesenteric perfusion can be prevented.

CASE REPORT

A 73-year old female underwent aneurysm resection and 2-fold aortocoronaric bypass operation because of ischemic cardiomyopathy (LVEF, 20%) with aneurysm of the left ven-

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tricle and multiple coronaric stenoses using temporary extracorporal cardiac bypass. Her medical history was significant for arterial hypertension, hyperlipidemia, glaucoma and euthyreotic goiter. On the 3\textsuperscript{rd} postoperative day, the patient developed acute abdomen (no signs and symptoms of cardiac decompensation). Because of no improvement of the patient’s clinical condition, fever and white blood cell count (35 Gpt/l) as well as paralytic bowel movement (clinical examen; plain film of the abdomen), indication for explorative laparotomy was seen. Intraoperatively, only a dilated jejunal loop and “just sufficient” mesenteric perfusion with no further pathological finding were found. Postoperatively, patient was transferred to the Surgical ICU with sufficient spontaneous respiration but unstable cardiopulmonary and cardiocirculatory condition as well as absolute tachyarrhythmia. In addition to the administration of crystalloideal and colloidal solutions (positive fluid excess of the total balance, 4,200 mL/18 h), continuous administration of Arterenol\textsuperscript{®} (Nor-epinephrine, up to 1.1 µg/kg/min; Aventis, Frankfurt/Main, Germany) needed to be initiated because of steadily falling systolic blood pressure. Attempts to stabilize and improve mesenteric perfusion using Dopacard\textsuperscript{®} (Dopexamin, Elan Pharma, Munich, Germany) were stopped because of tachyarrhythmia. Cardiac insufficiency was not detectable. Impairing diuresis required administration of diuretics despite of balanced volume and stabilization of blood pressure, pulmonal partial insufficiency required insufflation of oxygen. Liquemin\textsuperscript{®} (Heparin, Roche, Grenzach-Wyhlen, Germany) was given using therapeutic dosages.

Because of the severe circulatory insufficiency, the patient was intubated for artificial respiration. On the 2\textsuperscript{nd} postoperative day, heamatin was seen in the nasogastric tube. Endoscopy under suspicin of a bleeding within the upper gastrointestinal tract revealed only little diffuse hemorrhage but ischemic gastric mucosa. During further clinical course, patient was extubated with respiratory parameters within normal range and stable cardiocirculatory condition. Arrhythmia was treated with verapamil and digitoxin. Clinical examen revealed paralytic bowel movement and tensed abdomen.

Because of progressive multiorgan failure (renal and hepatic function), patient under-went abdominal angiography on the 3\textsuperscript{rd} postoperative day to exclude postoperative mesenteric ischemia, which revealed a considerable reduction of the caliber of mesenteric and hepatic artery according to a NoMI. Again, administration of dopexamin (8 mg/h) was attempted and Prostavasin\textsuperscript{®} (Alprostadil, 40 µg/d; Schwarz, Monheim, Germany) was infused i.v. to improve mesenteric perfusion. Simultaneously, antibiotic prophylaxis, infusion therapy, stress ulcer prophylaxis and continuous administration of high-dosage Fluimucil\textsuperscript{®} (Acetylcystein, 10 g/24 h; Zambon, Kerpen, Germany) as radical scavenger were initiated.

The following laboratory parameters were determined at this time: White blood cell count, 52 Gpt/L; platelet count, 137 Gpt/L; prothrombin time, 24%; aPTT, 59.7 s; AT III, 24%; creatinine, 283 µmol/L; creatinine clearance, 0.13 mL/s; bilirubin, 21 µmol/L; AST, 104 µmol/s/L; ALT, 33.7 mmol/s.L; Gamma GT, 5.02 µmol/s.L; GLDH, 47,700 nmol/s.L; p-amylase, 8.82 mmol/s.L; CrP, 120 mg/L; lactate, 5.5 mmol/L. On the following day, a control angiography via the kept arterial access device revealed similar findings of the arteries but, due to systemic vasodilation, earlier and more distinct contrast enhancement of the portal vein.

Because of unsatisfying systemic mesenteric vasodilation and manifest multiorgan failure, a Sidewinder-II catheter was introduced into the superior mesenteric artery for continuous administration of Alprostadil starting with 10 µg as bolus via the catheter. The immediate control angiography demonstrated still comparable spastic vessels but significantly better venous filling. The following days, 40 µg Alprostadil / d for 24 h were given via the arterial catheter. The further clinical course improved dramatically. Functional capacity of the liver indicated by the prothrombin time value reached normal range on the 7\textsuperscript{th} day after initiating arterial vasodilation of the mesenteric artery. In addition, p-amylase normalized down from the 15-fold increased level. Diuresis re-started and dosage of Arterenol could be lowered in addition to cessation of chronic venovenous hemofiltration on the 8\textsuperscript{th} day, which had been performed since the 6th postoperative day because of renal failure and urea values around 30.6 mmol/L.
Two days after initiation of arterial vasodilation, bowel movement was already detectable, stool excretion on the 5th day. A repeat control angiography on the 3rd day after catheter insertion showed a further improvement of contrast enhancement of the superior mesenteric artery and portal vein. After 6 days of continuous stabilization of the physical condition and mesenteric perfusion, in particular, within the region of right colic artery and ileocolic artery, the catheter was removed (figs. 1-4). Regression of multiorgan failure was interrupted by a recurrent intubation because of pneumonia and subsequently occurring respiratory insufficiency as well as temporary absolute tachyarrhythmia with atrial fibrillations. After 5 days of respiration, patient was extubated again. On the 29th day of treatment, patient was transferred to normal ward, on the 36th day discharged from the hospital with no further complaints.

DISCUSSION

Acute mesenteric ischemia belongs to the diseases associated with the highest mortality (1). Occlusive ischemias (embol or thrombosis of the mesenteric artery, thrombosis of the mesenteric vein) need to be distinguished from the non-occlusive mesenteric ischemia (NOMI).

In case of occlusion, peritonitis caused by bacterial translocation with following multiorgan failure is threatened. Treatment is dominated by surgical intervention, lysis is less frequently used. In contrast, in NOMI no surgical intervention is required leading to higher mortality (2). From a pathophysiological point of view, NOMI is a functionally spastic disturbance of the arterial perfusion of the whole mesenteric region. The endoscopically detected relative ischemia of the gastric mucosa and the detectable relative lack of mesenteric perfusion can be considered evidence for this phenomenon. Risk factors for NOMI are cardiogenic or septic shock, extensive cardiosurgical interventions, patients with renal insufficiency and intake of drugs such as diuretics, ergotamines und digitalis (3-8).

The dilemma in mesenteric ischemia is still the sometimes considerably prolonged process of finding the correct diagnosis and, thus, the prolongation in initiation of an appropriate treatment. Due to translocation of enteral bacteria and toxines induced by ischemia within shortest time intervals, a severe SIRS...
is triggered and, subsequently, a septic condition can develop, which can lead to fatal outcome because of multiorgan failure.

In the case reported here, in addition to the abdominal discomfort a toxic cardiocirculatory failure, hepatic and renal failure, a respiratory insufficiency, a release of pancreatic enzymes due to organ ischemia and an immune paralysis (HLA-DR on CD14 value lower 30%) developed.

Finding the correct diagnosis of NOMI is difficult, and initially, it is based on exclusion of further differential diagnoses. If the diagnostic process does not clearly clarify the cause and if there is peritoneal defence in the clinical examen, laparotomy is favored as done in the case reported here.

Postoperatively, patient developed a progressive 6-fold organ failure. In addition to the general intensive care, the attempt of intravenous vasodilation using dopexamin and prostaglandin I was not successful. Only the insertion of a catheter into the mesenteric artery to provide local mesenteric vasodilation using alprostadil achieved to improve the patient’s clinical status significantly within a short time period.

Various references from the literature recommend various drugs for the intraarterial mesenteric vasodilation, e.g., papaverine (30-60 mg/h), prostaglandines such as alprostadil (20 µg bolus, 60 µg/24 h over 3 days) and phenoxybenzamine over a time frame of about 3 days. A severe complication caused by an introduced catheter has not been reported yet (4, 9).

Using this treatment protocol, spastic vessels can be effectively influenced and the multiorgan failure can be overcome. The patient reported here survived despite of the 6-fold organ failure, severe cardiac preconditions, and advanced age. In addition, despite missing studies, a significant impact on the usually fatal outcome or high mortality rate of NOMI can be assumed.

The today’s experiences with NOMI favor an early angiography either to exclude mesenteric ischemia or to detect NOMI. Thus, appropriate indications for a surgical intervention can be supported in case of mesenteric occlusion, or non-beneficial interventions can be avoided in case of NOMI usually associated with further critical impairment of the physical condition, thus favoring laparotomy.

For diagnostic purposes of the acute mesenteric ischemia, Duplex ultrasonography, helical computed tomography (CT), magnet resonance imaging and catheter-based angiography are recommendable. Using the helical CT, morphological assessment of proximal mesenteric vessels can be achieved. Selective mesenteric angiography is superior to the other diagnostic procedures with regard to the detection of a mesenteric ischemia or NOMI, exclusively providing:
1) early diagnosis by detection of early and small specifics of NOMI and, in additon,
2) possible initiation of the only effective, regional mesenteric vasodilation simultaneously (3, 6, 9, 10).

CONCLUSIONS

In patients with acute abdomen, mesenteric occlusion or NOMI need to be always taken in consideration. If the cause of abdominal discomfort can not be found, an early mesentericography is indicated, in particular, in risk patients. Only using this procedure, segmental ischemias or even NOMI can be found. At the same time, in case of NOMI a catheter can be introduced into the mesenteric arteries to initiate drug-based vasodilation. This interventional approach might have impact on course and mortality (untreated, 60-70%) of this disease.

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REFERENCES


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