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Acute Abdominal Compartment Syndrome complicating a chronic mesenteric ischemia revascularization

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ABSTRACT

BACKGROUND: Abdominal Compartment Syndrome (ACS) is a pathological condition that results from an increase in pressure within the abdomen associated with organ failure. It can be acute or chronic, primary or secondary.

ACS poses a serious diagnostic challenge for physicians as the clinical presentation is varied and can mimic other medical pathologies. To prevent a multi-organ failure and ultimately death due to this disease, the World Society of Abdominal Compartment Syndrome (WSACS) suggested clinical criteria and biology tests to facilitate an early diagnosis of acute ACS.

CASE PRESENTATION: We report a case of 61 year-old man diagnosed with chronic mesenteric ischemia that has been successfully treated by prosthetic bypass. The postoperative period was eventual, the patient presented complications corresponding essentially to a manifest acute ACS. The treatment consisted on abdominal decompression and resuscitation measures.

CONCLUSIONS: An early diagnosis of ACS disease for an appropriate therapeutic initiation is mandatory to prevent its complications and save the patient's life prognosis.

1. Introduction

Abdominal Compartment Syndrome (ACS) represents unbalanced situation between the contents and the container of the abdominal cavity. It associates an intra-abdominal pressure superior than 20 mmHg and a new organ dysfunction [1]. In late of 1980s, Kron et al. [2] were the first to describe the physiopathology of intra-abdominal hypertension (IAH). A few years later, Frietsam et al. [3] set, for the first time, the term of ACS in their published work where they reported 4 cases of ruptured aortic aneurysm.

ACS remains a fatal disease that carries a significant morbi-mortality. Thus, the aim of the manuscript publication is to report a rare presentation of ACS after chronic mesenteric ischemia (CMI) revascularization that was successfully treated. Through this rare case report, we would like to sensitize the readers to the absolute necessity of an early diagnosis of this pathology; only effective solution to prevent ACS complications and save the patient's life prognosis.

2. Case presentation

A 61-year-old man, with the followings history: Unbalanced type 2 diabetes under oral treatment, chronic cigarette smoking and alcoholism, was presented at emergency room with abdominal pain, nausea and vomiting. The anamnesis revealed that the symptoms onset date since 3 years ago for which he had colonoscopy returning without particularities. The persistence of gastrointestinal symptoms required a medication (analgesic and proton pump inhibitors) without any major reliefs, thus a voluntary significant restricted food intake was followed causing 6 kg weight loss in a month. Despite the fasting and auto-medication, the symptoms had become more intense and unbearable by the patient in the past month prompting his current consultation in our hospital. Physical examination found an exhausted facies with a cachexic body leaning forward. His abdomen was non-distended, tender

Abbreviations: ACS, Abdominal Compartment Syndrome; WSACS, World Society of Abdominal Compartment Syndrome; IAH, intra-abdominal hypertension; CMI, chronic mesenteric ischemia; CA, celiac artery; SMA, superior mesenteric artery; CRP, C-reactive proteins; IAP, intra-abdominal pressure.

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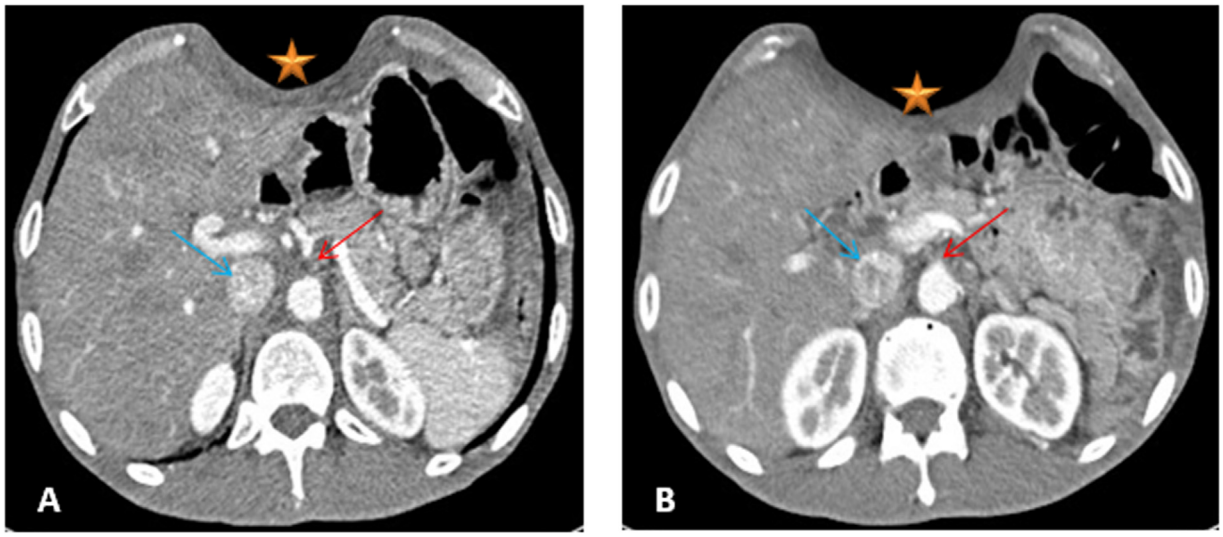

Fig. 1. Contrast-enhanced axial CT-scans of CMI case showing a curved abdomen (orange stars), a patent inferior vena cava (blue arrows), a tight stenosis of CA in A (red arrow) and SMA occlusion in B (red arrow).

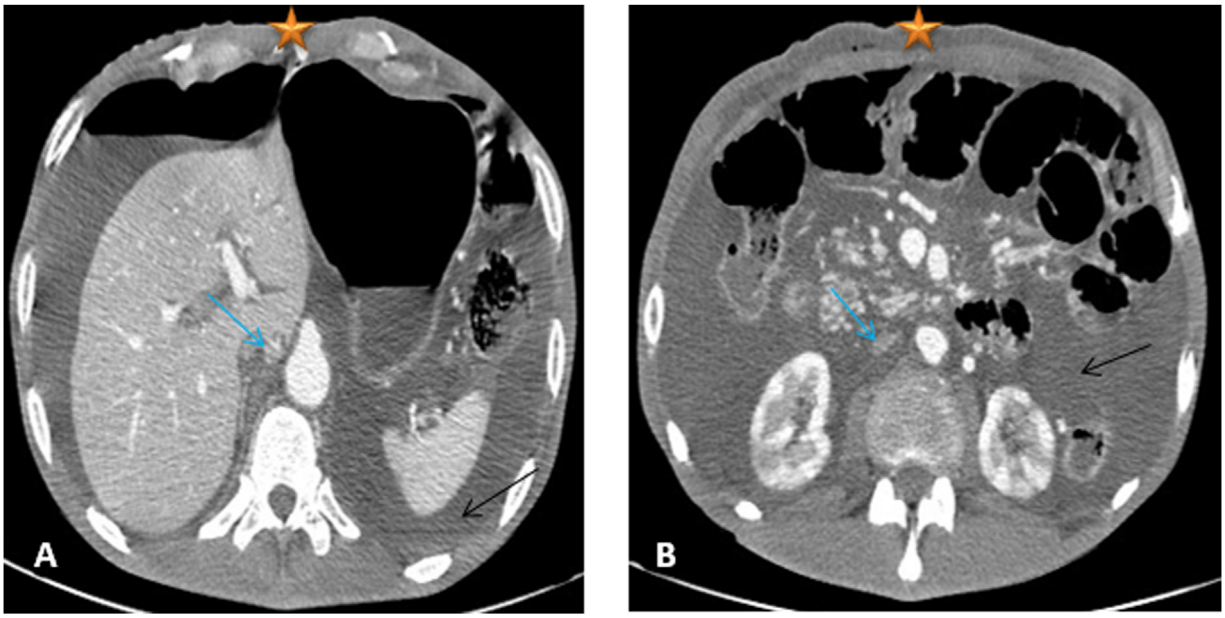

Fig. 2. Contrast-enhanced axial CT-scans of ACS showing distended abdomen (orange stars), a collapsed inferior vena cava (blue arrows), and a peritoneal effusion (black arrows).

in the epigastrium without the perception of a bruit auscultated. An abdominal doppler-ultrasound completed with angio-CT scan revealed the etiology of the CMI: a tight stenosis at the level of the celiac artery (CA) and an occlusion of the proximal segment of superior mesenteric artery (SMA) with rich collateral branches (Fig. 1).

As for biological results, the complete blood count showed a slight increase of leukocyte count (13190/mL) with predominance of neutrophils (10970/mL). Platelets were normal (211000/mL). Hematocrit was low to 34% (normal: 40–52%). C-reactive proteins (CRP) as well as the coagulation profile were normal. The electrolyte panel indicated a normal sodium and potassium value (respectively 136 and 3.3 mEq/l). Albumin dosage was within normal limits while calcium and total protein levels were below the normal rage (respectively 79 mg/l and 52 g/l).

After cardiovascular and respiratory evaluation, the patient, in agreement, was subjected to an open surgical treatment. The surgical procedure (laparotomy) was performed, by vascular surgery team, under general anesthesia using transperitoneal approach. The exploration of the peritoneal cavity revealed an atherosclerotic stenosis at the origin of CA associated with the absence of pulse at the proximal segment of SMA. Subsequently, using a bifurcated prosthesis, an aorto-SMA bypass was performed followed by a direct implantation of CA on the prosthesis bypass. The intervention duration was 185 min and the blood loss was minimal.

At the 3rd postoperative day, the patient presented two complications. The first one corresponds to a right pneumothorax. The incident was iatrogenic resulting from a pleural breach; during supra-celiac aorta dissection; successfully treated by pleurocatheter drainage. The other complication we encountered was a manifest abdominal distension with severe pain not yielding to multimodal analgesia. The intra-abdominal pressure monitoring was estimated to 16 mmHg using intra-vesical pressure measurement approach. The biological exploration had shown disturbance

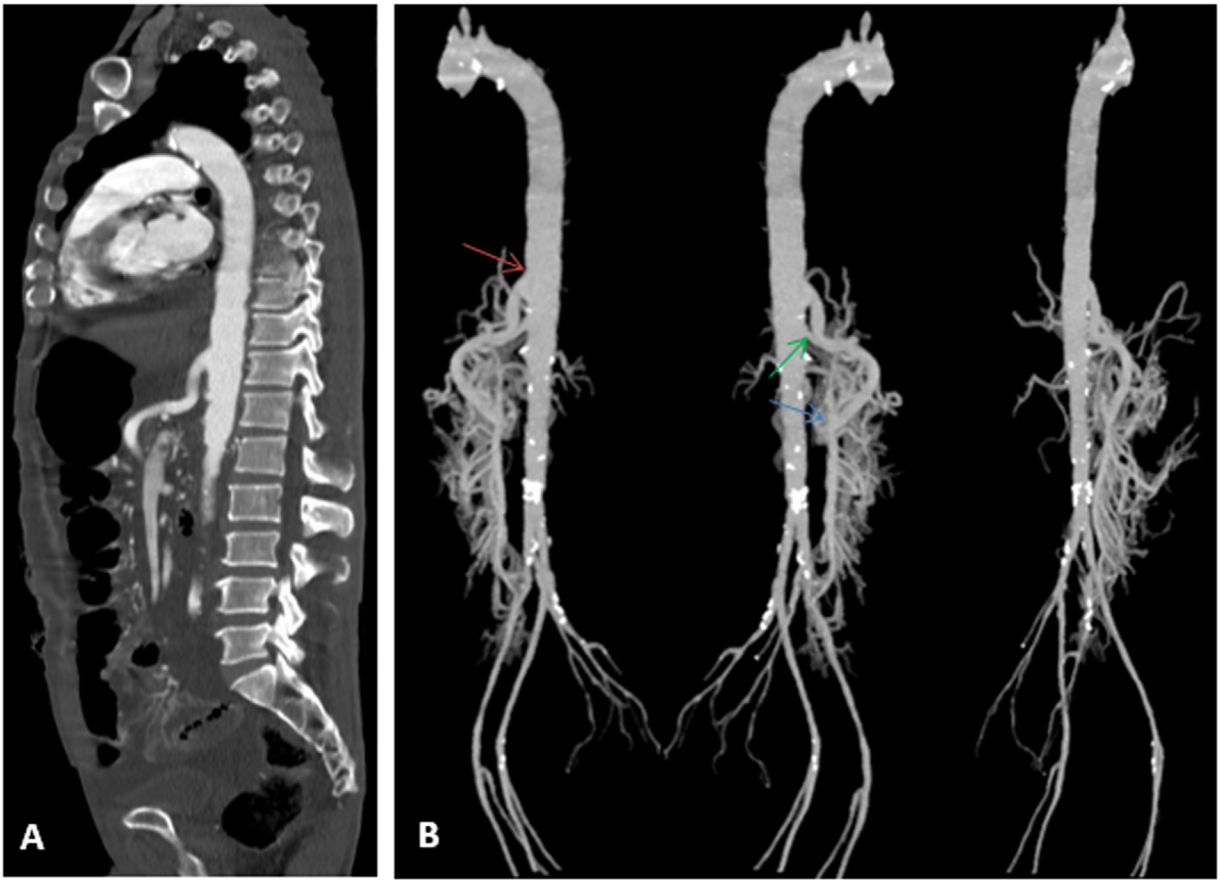

Fig. 3. Contrast-enhanced sagittal CT-scan of control post-treatment of complications (A); 3D reconstructions of the aorta visualizing the bypass configuration for CMI management. Prosthetic –aortic anastomosis: red arrow; prosthetic-SMA anastomosis: blue arrow; prosthetic-CA anastomosis: green arrow (B).

of platelets (124000/mL), renal clearance (creatinine: 13 mg/l), electrolytes (Na: 103 129 mEq/l), albumin (26 g/l), coagulation profile (TP: 60%) and CRP (elevated at 258 mg/l). An angio-CT scan was realized visualizing signs in favor of ACS (Fig. 2). The patient quickly developed hemodynamic instability (mean arterial pressure: 50 mmHg) and anuria. He was therefore urgently taken to the operating theater. The abdominal exploration using the previous median incision revealed a peritoneal cavity filled with serous fluid that has been aspirated. A total of 2 L was evacuated. Three suction drains were left in place with an easy closure of the abdominal wall without tension. The cyto-bacteriological result of the aspirated liquid was negative. Postoperatively, the patient received a perfusion of albumin (1 g/kg) and potassium with a good evolution. 13 days later of follow-up, he was discharged as there was no recurrence of symptoms and he started to eat. The angio-CT scan of control was clean (Fig. 3).

Two months later, the patient was seen in consultation, he seems satisfied and has gained weight as he was able to eat properly.

The present case report has been reported in line with the SCARE 2020 criteria [4].

3. Discussion

ACS is considered a lethal syndrome as the mortality rate has been reported in the literature is significant, ranging between 60% and 70% [5–7]. Indeed, for decades, the diagnosis of this disease has been difficult and unclear. Thereby, physicians found themselves faced with an error or a delay in diagnosis with irreversible consequences drawing a warning signal for the necessity to treat this subject. In 2004, The World Society of Abdominal Compartment Syndrome (WSACS) [8] was founded and has published guidelines treating IAH and ACS from different perspectives including diagnosis, measurement and management.

ACS has protean clinical manifestations, which are massive abdominal distension and pain, acute respiratory failure with increased ventilatory pressure and decreased urinary out-put. As IAH rises progressively the patient's life risks a constant threat. Multiple organ dysfunctions may be revealed in the respiratory, cardiac, renal, gastrointestinal and intracranial systems leading to a polycompartment syndrome [9]. Renal and respiratory systems are the most affected [10].

Various etiologies have been reported in the literature regarding the ACS. We distinguish primary ACS related to pathology within the abdomino-pelvic cavity and secondary ACS where the disease is located outside the abdomino-pelvic region [11–14]. In our case, the fundamental cause of primary ACS was the expansion of intra-abdominal contents in the form of fluid secondary to post-reperfusion of CMI.

Clinical data is the key for ACS diagnosis. The WSACS reported many risk factors. Once two or more of those factors are encountered in any patient, monitoring the intra-abdominal pressure becomes a mandatory [8]. Different methods were described for measuring Intra-abdominal pressure (IAP) via intra-gastric, intra-uterine, rectal or most commonly intra-vesical pressure.

The WSACS [1] categorized the management of ACS into surgical and non-surgical treatments. Non-surgical options consist on early initiation of measures and medical drugs that may contribute to reduce the IAP and reinforce the perfusion of target organs. It includes a nasogastric tube, endoscopic or percutaneous

decompression of the gastrointestinal tract to evacuate abdominal fluid or air and an appropriate sedation that helps for a transitory abdominal muscles paralysis. The restitution of adequate fluid and the hemodialysis sessions aim to treat hypovolemia and renal failure. In another hand, ensuring good ventilation allows organs support towards oxygen requirement. The other option is represented by surgical abdominal decompression, performed by using laparotomy. It helps to restore stable hemodynamic and respiratory parameters by drainage of intra-abdominal fluids and a direct inspection of the abdomino-pelvic region in order to detect and treat the pathology in question.

To the best of our knowledge, only one similar case has been reported in 2001. It concerns a 65 year-old woman who had acute ACS two days after surgical revascularization for chronic mesenteric ischemia [15]. Our case, along with that of Sullivan et al., was due to peritoneal effusion. As a treatment, the two patients benefited from abdominal decompression. Indeed important improvements have been noticed and the two cases remained completely recovered thanks to the urgent therapeutic management.

4. Conclusion

ACS is a rare entity. This life threatening condition is of clinical importance because of its nonspecific symptoms and grim prognosis. The treatment efficiency is related to the early diagnosis of the pathology. Thus, the only way to avoid negative outcomes is to suspect, promptly, the diagnosis in patients with associated risk factors.

Declaration of Competing Interest

All authors have no conflict of interests.

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Ethical approval

Not Applicable.

Consent

Consent was obtained from patient who participated in this study.

Author contribution

-Study conception and writing: SM.
-Data Collection: SE.
-Analysis: AB, OE.
-Investigation: TA, RB.
-Critical review and revision: all authors.
-Final approval of the article: all authors.
-Accountability for all aspects of work: all authors.

Registration of research studies

Not Applicable.

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