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Case Report

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Ischemic Intestinal Perforation Due to Cardiac Shock in a Patient with Complex Covid-19 Pneumonia Syndrome

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1. Abstract

Stercoral perforation is a rarely suspected life-threatening condition due to an extensive and widespread contamination of the peritoneal cavity with fecal matter. Various pathological conditions associated with acute abdomen and suspected intestinal perforation are usually linked to complicated diverticulitis due to foreign objects. They may also be caused by a diastatic condition (e.g. stenosing colon neoplasms) or by a penetrating abdominal trauma. The suspected condition can be diagnosed by a pre-operative contrast-enhanced Computed Tomography (CT scan), as in our experience. The patient experienced a secondary intestinal perforation due to mesenteric ischemia caused by vascular hypoxia following cardiac shock and micro-thrombosis of the mesenteric vessels, related to COVID-pneumonia. She was treated and hospitalized for a long period after surgery in intensive unit, before starting rehabilitation. Efficiently managing complex pathological situations, such as the one observed in our experience, requires a complete multidisciplinary approach, involving different specialized doctors in decision-making agreement to achieve better outcomes.

2. Introduction

Stercoraceous peritonitis caused by intestinal perforation can be defined as the perforation of the bowel due to pressure necrosis leading to an extensive and widespread contamination of the peritoneal cavity with fecal matter. While early diagnosis can be challenging , it is absolutely essential. All patients with suspected acute abdomen must undergo a contrast- enhanced Computed Tomography (CT) because this radiological exam is decisive in order to achieve a precise diagnosis and to avoid catastrophic complications. Fecal peritonitis can lead to severe infectious complications including sepsis and multiple organ failure, as in our case report. We present a case involving a young female patient who suffered from a massive stercoral ileum-colonic perforation and fecal peritonitis, following a previous hospitalization due to a cardiac shock related to COVID-pneumonia.

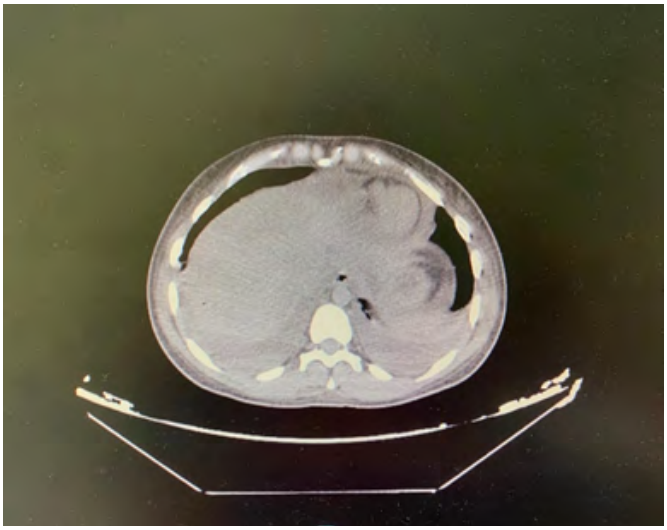
3. Case Report

A 28-year- old female patient who had not been previously vaccinated against COVID was admitted to our emergency unit because of a cardiac complication (myocarditis and cardiac arrest) associated with SARS-2 COVID 19 infection (COVID-19). The

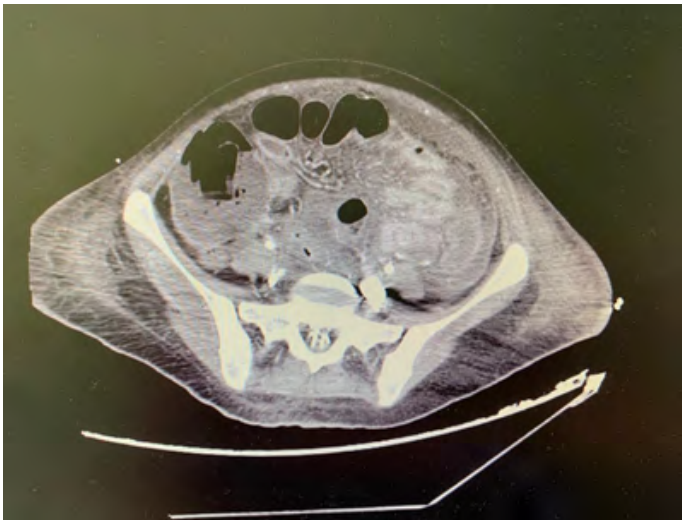
cardiac arrest was managed with veno-arterial extracorporeal membrane oxygenation (ECMO), implanted through a sternotomy by direct insertion of the cannula into the right atrium. [1-2] The young patient exhibited typical COVID-19 pneumonia findings (peripheral ground-glass opacities in both lung parenchyma and bilateral pleural effusion) on the thorax CT scan. The patient underwent oro-tracheal intubation, mechanical ventilation and pharmacological therapy in a drug induced coma. (Picture a) ECMO support was removed after 5 days, however, during this period the patient developed severe peritonitis stemming from secondary peripheral hypo-oxygenation, caused by the cardiac shock and a suspected mesenteric thrombosis.

Following an evaluation by infectious disease specialists, she started treatment with Tocilizumab (8 mg/pro kg) as an immunosuppressive drug to prevent COVID-19 related inflammation symptoms, but its use may have played an additional role in exacerbating the abdominal disfunction. The patient also experienced a hepato-renal insufficiency which required hemodialysis support; the radiological examinations revealed an anasarcatic state with pleural, pericardial and peritoneal effusion. This condition was complicated by a severe sepsis and Multiple Organ Failure (MOF) resulting from the intestinal perforation. In all this period , the patient developed as last long-term complication a " critical illness neuropathy-miopathy" and a severe flaccid tetraparesis which affected her lower limbs. During this clinical observation , the CT examination revealed a substantial contamination in the mesentery, water levels, thickening and dilatation of the late ileum loops, congestion in the mesenteric venous structures caused by a suspected thrombosis in the terminal branches of the superior mesenteric veins, diffuse abdominal effusion, free air in the right sub-diaphragm area and a large fecal agglomeration in the pelvis (measuring 13 by 11 cm) leading to fecal peritonitis .(Pictures b-c-d) Radiological examination revealed loss of wall integrity in the ileum, the cecum and the right colon loops due to ischemia resulting in perforation and collection areas containing air consistent with an abscess and fecal matter. During the resuscitation assistance, the patient received anticoagulant and broad spectrum antibiotic therapy. A surgical consultation was requested and a decision to intervene surgically was taken only after a 3- week- period after drug-induced coma. An urgent exploratory laparotomy was performed and an extensive intestinal perforation with fecal material was found. The patient underwent a small bowel resection (70 cm of ileum) and a right colectomy without the creation of a stoma, despite the diffuse peritoneal contamination. A mechanical side to side isoperistaltic anastomosis was performed, without any anastomotic leak despite the peritonitis in the post-operative period. An extensive peritoneal lavage was carried out and four drainage tubes were placed. Severe anemia was treated with polytransfusion and all hemostasis factors were correctly balanced and continuously monitored under the guidance of a haematologist. Following the surgical operation, biopsy specimens from the right-ileum and the colon were submitted to the Histopathology Laboratory for examination.The characteristic histopathological features included transmural necrosis of the intestinal walls, acute perivisceritis and nonspecific reactive lymphadenitis in the mesenteric lymph nodes of the resected intestinal tract. During the microscopic examination interesting aspects were examined, such as subserous lymphatic telangiectasias, granulomatous inflammation and a small vessel thrombosis. (Pictures e.1, e.2, e.3, e.4). The patient's general condition remained critical for weeks progressing from septic shock and cardio-respiratory failure to a very gradual improvement. The young patient experienced a temporary tetraparesis from the cervical level down to her feet, a consequence of hypoxia. During her intensive cardiac hospitalization, a thoracic and abdominal CT was performed. The thorax CT scan showed a web-like filling defect consistent with pulmonary embolism, traction bronchiectasis consistent with the late findings of COVID-19 pneumonia and poorly circumscribed sub-pleural ground glass opacities. Pulmonary thromboembolism is usually connected to a potential thrombosis in peripheral districts such as intestinal vascular irrigation. After 2 weeks in the post-operative period, the cardiopulmonary resuscitation team decided to suspend the drug-induced coma.

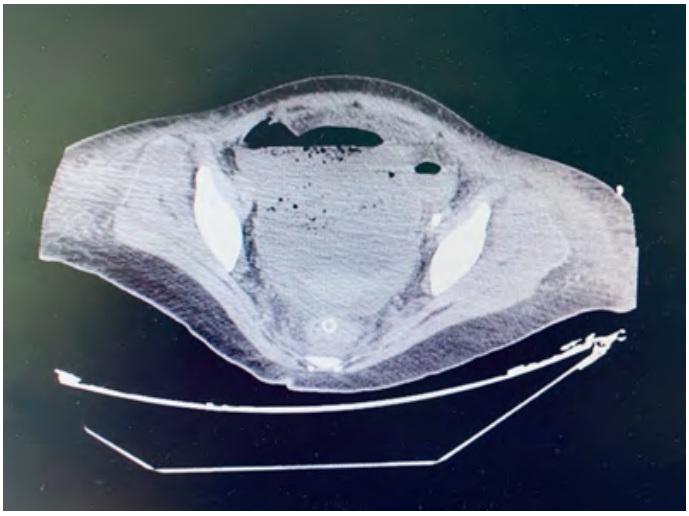
The pharmacological regime in the long-post operative period was very complex, guided by the results of radiological and laboratory diagnostic tests, programmatic adjustments were based on the microbiology of the peritoneal fluid and blood culture. Gradual therapeutic changes were made. The medical team made constant adjustments to the therapeutic program, particularly with regard to thrombolytic therapy. The patient recovered gradually with no further complications and was transferred to another hospital where she continued her post-operative care, receiving a high dose of heparin. This transition occurred after a 2- week period. (Pictures f.1, f.2) At the new rehabilitation hospital, the patient underwent various specialist assessments including neurological and physiatrist check-ups because of the development of " critical illness neuropathy-miopathy" . Here, the patient spent an additional 3 months. The psychomotor rehabilitation program and the nutritional support program allowed her to recover the supine position and ambulation. The short bowel syndrome caused the patient gastrointestinal upset, in particular hyperperistaltism, diarrhea, weight loss and anaemia. However, appropriate dietary advice, the correct adjustments to her eating behavior and the intake of vitamin supplements gradually corrected these adverse symptoms and she, consequently, gained 7 kg in weight.



Abdomen CT and Pneumoperitoneum

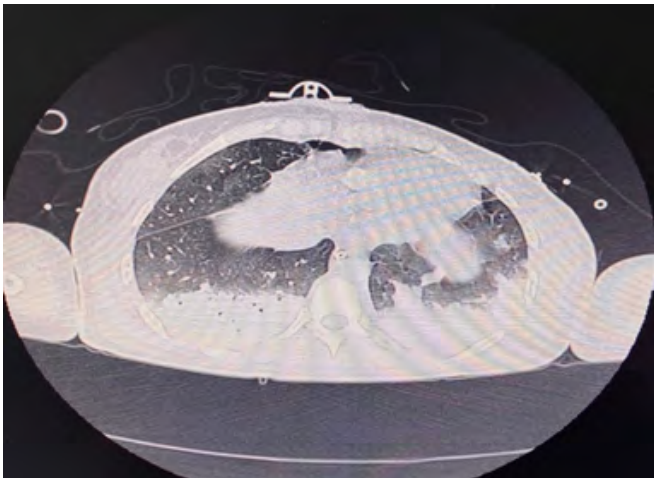


Abdomen CT and Thickening and Dilatation of Ileum Loops

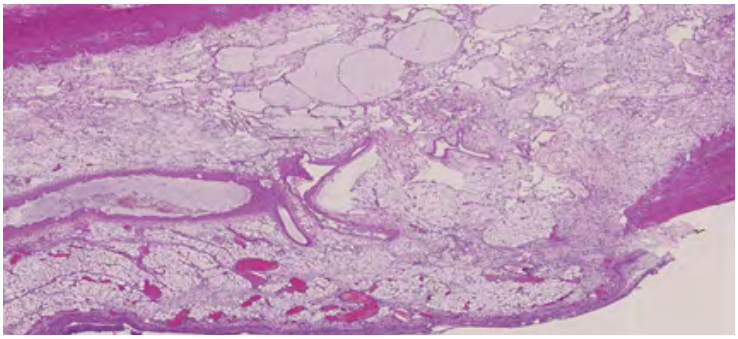


Abdomen CT and Fecal Mass in the Pelvis

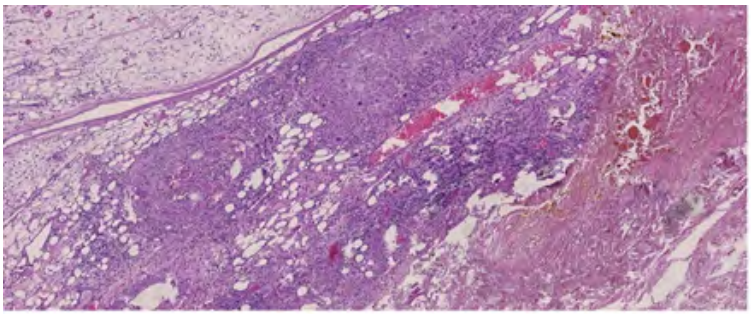
Abdomen CT and Thickening and Dilatation of Ileum Loops



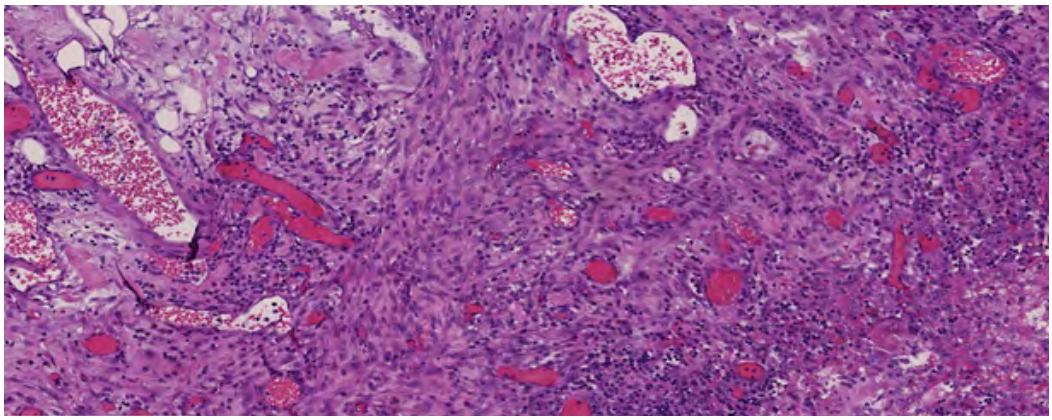
Thorax CT Scan and Pneumonia COVID-Related



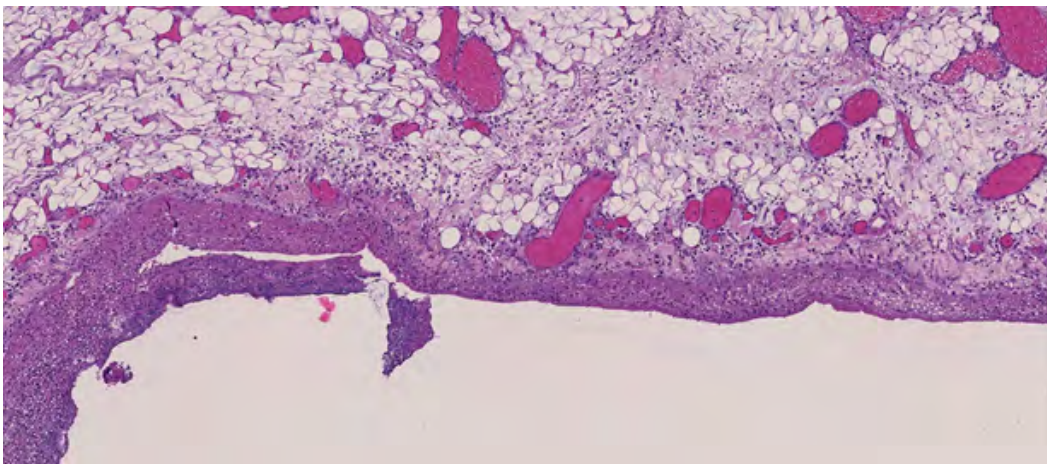
e.1) Subserous Lymphatic Telangiectasias;



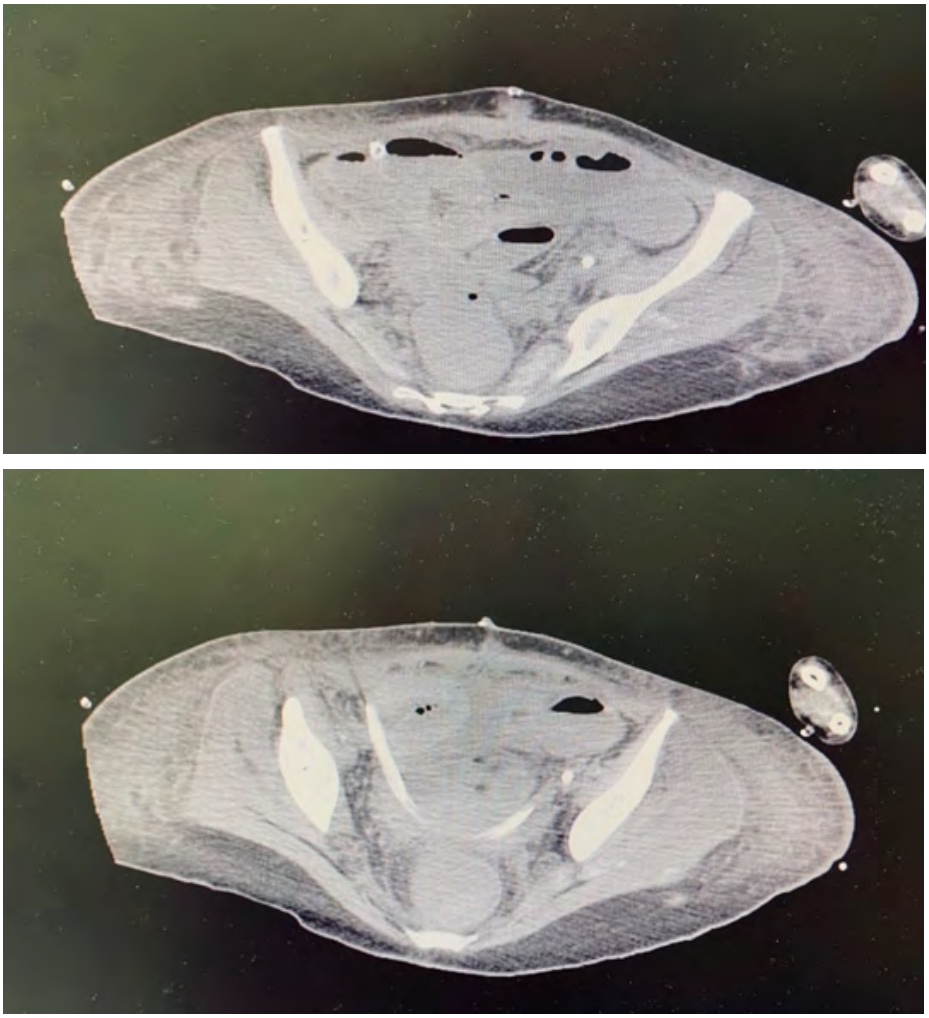
e.2) Granulomatous Inflammation



e.3) Small Vessel Thrombosis;



e.4) Perivisceritis



Abdomen CT Scan after Emergency Surgery Time

4. Discussion

A key-aspect in the treatment of acute abdomen is early diagnosis, emphasizing the most importance of carrying out abdominal CT with contrast medium in conjunction with the application of medical therapy (rehydration, antibiotics, nil per os) and immediate surgery, that should only be carried out after hemodynamic and cardiorespiratory stabilization [3]. Making a surgical decision and a calculated therapeutic approach is more critical if a COVID- 19 disease is connected with the acute abdomen. In case of complicated acute abdomen, in complex patients who suffer from multifactorial comorbidities, a multidisciplinary consultation can prove to be a valuable resource in tailoring the most suitable therapeutic approach. A CT scan with contrast medium usually defines the intestinal involvement in cases of acute abdomen by the presence of at least one of the typical radiological features (irregular wall thickening, pneumatosis or some microbubbles consistent with fecal peritonitis, reduced wall enhancement, jejunum and proximal dilatation, signs of free air indicating clear perforation and acute diffuse peritonitis). A comprehensive diagnostic framework necessitates vascular reconstruction, examining both arterial and venous structures to assess the patency or the potential blockage of mesenteric vessels. In patients with acute mesenteric ischemia after cardiac shock and suspected mesenteric thrombosis due to COVID -19 Syndrome (as in this patient with pulmonary thromboembolism), the right colon is more frequently involved and the acute diffuse stercoral peritonitis is associated with an increase in morbidity and mortality due to septic shock [4-5]. Intensive heart and respiratory procedures and treatments have been carried out in conjunction with the administration of a targeted antibiotics pharmacotherapy. Although the fatality rates in patients with these conditions is high, today a significant number of patients can be treated successfully thanks to the advances in combined intensive-surgical treatments. ECMO support , highly invasive technique with considerable risks, can be effective in all cases of cardio-respiratory insufficiency with refractory hypoxia, cardiac arrest, massive pulmonary embolism, extensive myocardial infarctions, ventricular arrhythmias and severe hypothermia [6]. In cases of acute abdomen , especially in frail patients, it is important to know the etiopathology, the severity of the pathological condition and many factors must be taken into consideration for an appropriate assessment regarding risk stratification and treatment planning.

5. Conclusion

Complications stemming from COVID-19. including coagulopathy and associated secondary vascular problems can contribute to the development of various ischemic events. Mesenterial vein thrombosis, suspected because of pulmonary embolism findings on Thorax CT scans and confirmed through microscopic examinations, is often a late complication in complex COVID cases, as illustrated in our case report. Cardiac shock was the major trigger-mechanism for all these emergency complications. Reduced mucosal perfusion and bacterial proliferation can lead to intestinal perforation as a result of due to mesenteric vein thrombosis or of an intestinal ischemia. This emergency condition requires surgery, preferably through laparoscopy when possible, but a diffuse acute stercoral peritonitis requires an emergency laparotomy (using an extensive peritoneal lavage and surgical resection to remove diseased intestinal tissue) because bowel perforation, severe ischemia and general clinical deterioration make it necessary as a life-saving therapy. A CT abdomen scan is the most helpful imaging modality for diagnosis of stercoral perforation [7] and in acute COVID-19 infection patients the contrast-enhanced CT should be used to detect potential pulmonary and mesenteric thromboembolism in case of central and peripheral hypoxenation' signs. Timely interventation is critical to prevent serious fatal complications. Overall mortality rates are usually high and the percentage could even be higher when considering other comorbidities and acute COVID-19 related diseases. Deciding the exact timing and appropriate surgical technique for the treatment of this critical emergency situations needs specific experience and large surgical case history of handling significant volume : it makes the real difference in final outcomes and survival rates [8]. The authors have declared that no competing interests exist.

6. Summary

The complex clinical case of a young unvaccinated woman suffering from COVID-19 in an acute-severe form is illustrated by the Authors, who had to treat cardiogenic shock secondary to myocarditis at the onset and counteract the rapid worsening of the patient's clinical conditions , forcing them to proceed sequentially with a series of invasive treatments to stabilize the basic functions and then, through continuous intensive monitoring, after various multidisciplinary specialist evaluations but inserted in a single conclusive diagnostic-therapeutic perspective, to be able to act, to avoid the highly probable exitus, surgically to treat the picture of stercoraceous peritonitis due to massive perforation of the right ileocolic tract, highlighted subsequently in the period of induced coma. The acute abdominal pathology in fact developed secondary to peripheral hypoxia due to cardiogenic shock, related to mesenteric micro-thrombosis demonstrated by histological examination and demonstrated by radiological signs of pulmonary embolism on chest CT. The diagnostic contribution of the multilayer contrast-enhanced CT examination was fundamental both in the initial and subsequent phases of classification and intensive monitoring, influencing multi-specialist therapeutic choices and subsequent outcomes. The laparotomy operating procedure was the shared and only viable choice to treat diffuse stercoraceous peritonitis and septic shock, a correct strategy, despite the foreseeable complications connected to the highly infected and inflamed operating field, such as anastomotic dehiscence, not highlighted here. The pathological sequelae associated with the COVID-19 complex syndrome, when it affects multiple functional systems or organ systems, as analytically described in the case report, must push the various specialists not to forget the high systemic thromboembolic risk in fragile patients and with severe comorbidities, pathological category that requires intensive, complex and modulable therapeutic approaches only on the basis of the correct observation of clinical evolution and an adequate inter-relational capacity for «Shared Multidisciplinary Decision-Making».

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