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Hybrid Surgical Strategy for Totally Aortic Repair in Complicated Type B Intramural Hematoma

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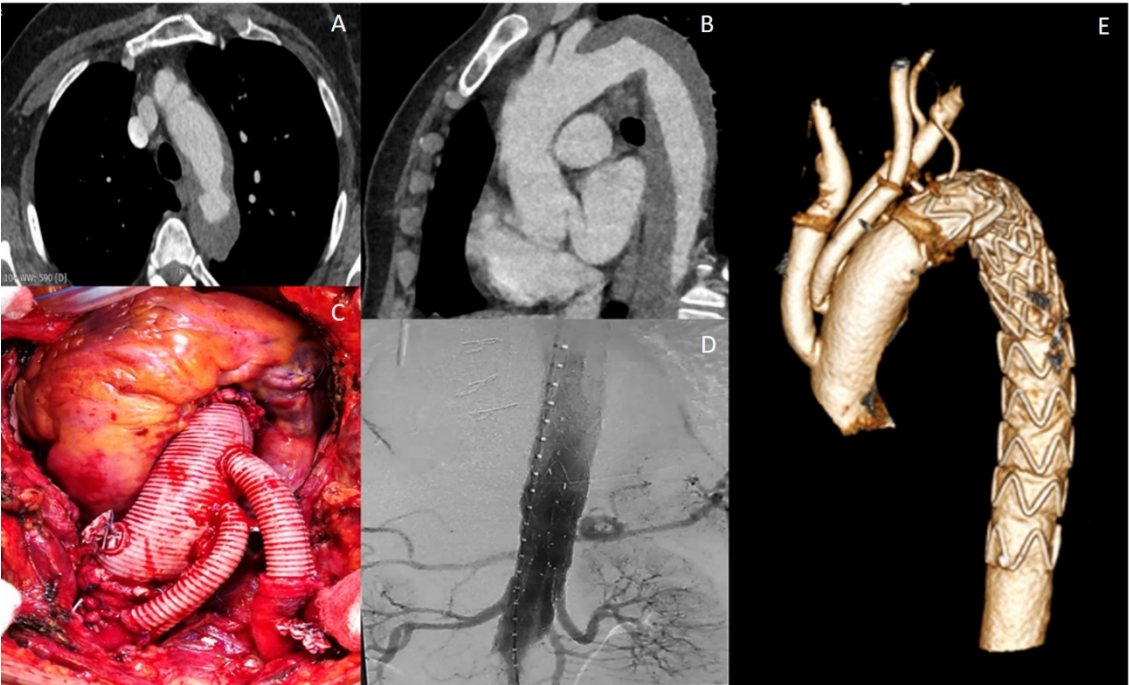
Introduction: Aortic intramural hematoma is a life-threatening and subtle emergency that involves aortic wall integrity and is characterized by either a direct rupture of the vasa vasorum or spontaneous bleeding of an arterial plaque located in the tunica media of the aortic wall. Acute aortic syndrome (AAS) is an umbrella term that encompasses several aortic pathologies with similar symptoms including aortic dissection, penetrating atherosclerotic ulcer, intramural hematoma (IMH), and iatrogenic traumatic aortic injury. A notable difference between intramural hematoma and acute aortic dissection is the absence of an intimal flap, a finding discernible on computed tomography angiography (CTA). This entity may represent 10%–25% of the AAS involving the ascending aorta and aortic arch in 10%–30% of cases and the descending thoracic aorta in 60%–70% of cases. The surgical approach changes depending on the site of the aortic pathology and the anatomical predisposition of the patient, so a study tailored to the patient is required to optimize the surgical strategy.

Case Report: A 61-year-old woman was admitted to our department on an emergency basis following chest pain and dyspnea, with a diagnosis of type B IMH (Ishimaru zone 3). Her medical history included arterial hypertension treated with diuretics. On admission, the hemodynamic condition was stable (blood pressure 135/70 mmHg, heart rate 75 bpm, SpO₂ 97%). Preoperative transthoracic echocardiogram revealed normal biventricular size and function with no significant valve abnormalities. According to the guidelines, regarding type B aortic disease the patient was monitored and followed up basing on the watchful waiting strategy. After assess a worsening of the hemodynamic condition, a second CTA was performed, which showed bilateral pleural effusion and the presence of distal ‘re-entries’ sites, as the indicators of impending rupture and complicated AAS. Thus, an emergent treatment of the IMH with total replacement of the aortic arch and reimplantation of the epiaortic vessels was executed with the Frozen Elephant Trunk (FET) procedure, using circulatory arrest, deep hypothermia and cerebral selective antegrade perfusion (CSAP) with Kazui technique. An optimized surgical strategy for a better post-operative outcome includes the choice of cannulation sites, tailored to the patient's anatomy. In this case, we chose to cannulate the brachiocephalic trunk to ensure good systemic perfusion and proper cerebral perfusion during the circulatory arrest, in order to realize the distal anastomosis with an open technique. Twenty-four hours after FET, the patient underwent hybrid treatment for thoracic endovascular aortic repair (TEVAR), taking advantage of the correct landing zone obtained from the open implantation of the trifurcated prosthesis. The post-operative course was uneventful; On the 13th post-operative day the patient was discharged home and followed up for residual IMH of the abdominal aorta. One month after discharge, the abdominal aorta was also treated with endovascular aortic procedure (EVAR) to perform a complete aortic repair.

Discussion: According to the current guidelines on AAS, IMH should be considered aortic emergencies when they involve the ascending aorta. In our case, IMH extended from zone 3 of the aortic arch involving the entire descending and abdominal aorta. As recommended, the procedure of choice in these cases is TEVAR, but this approach cannot be performed for pathology complicated by hemodynamic alterations and inadequate anatomical conditions. However, the unsuitable anatomy of the aortic arch, as there was no feasible landing zone 2, and the presence of reperfusion phenomena of the distal false lumen assessed at CTA, necessitated a hybrid surgical approach with total replacement of the aortic arch and reimplantation of the epiaortic vessels with open technique and endovascular repair for the thoracic and abdominal aorta.

Conclusion: To treat type B intramural hematomas complicated by malperfusion and hemodynamic instability, associated with anatomy unsuitable for TEVAR treatment, the hybrid strategy approach to replace the aortic arch with FET procedure in order to have a proper landing zone and perform a sequential extension to the descending and abdominal aorta with TEVAR/EVAR procedure can be a life-saving procedure and improve patient outcome.

Fig.1



A) Axial CTA scan B) Sagittal CTA scan showing extension of IMH, C) Intraoperatively view ascending aorta and aortic arch replacement D) abdominal aorta Angiography, after EVAR, E) 3D rendering of ascending aorta, aortic arch and descending aorta repair.