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Short Communication

Mesenteric Malperfusion in Aortic Dissection: Diagnostic Challenge and Therapeutic Options

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Introduction

Malperfusion in Acute Type A aortic dissection (ATAAD) has a direct cataclysmic effect on morbidity and mortality, despite the advancements in diagnosis, techniques, and technology. Malperfusion syndrome is a complication caused by branch-vessel involvement and resulting in end-organ ischemia dysfunction with an incidence ranging from 16% to 34% [1, 2]. The complete obstruction of the vessel will present with full-blown symptoms, but it is also important to recognize incomplete or subtotal vessel occlusion which may produce intermittent symptoms of variable intensity. Mesenteric malperfusion (MMP), the most dreadful of all malperfusion, is associated with a 3- to 4-fold increase in mortality. The optimal therapeutic management of patients with malperfusion is still a topic of debate.

Mechanisms of Malperfusion

The relationship between the true lumen, false lumen and the mobile intimo-medial flap is complex. The pressure difference between both these two lumens will allow the mobile flap to bulge and cause *static obliteration* of branch vessel ostia. The hypercoagulable state of the false lumen provides a nidus for thrombosis leading to impaired perfusion of the end organ [3]. The mobile flap may protrude intermittently into the ostium of the branch vessel causing a *dynamic obstruction*.

Dilemma in MMP

MMP is extremely challenging for diagnosis and management. Since the symptoms are nonspecific, there is a delay in referral from the primary care centre to tertiary hospitals. It is intriguing to note that 20% of patients with abdominal pain do not have MMP, and 40% of patients with MMP do not have abdominal pain [4, 5]. As compared to symptoms of other end organ failure like stroke, anuria, loss of pulses in the limbs, the symptoms of MMP are very vague. The debate of whether the patient should undergo central repair followed by mesenteric evaluation or vice versa continues. Visceral malperfusion can occur at any stage of the disease process - at the time of aortic dissection, false lumen thrombosis, during surgery or even after the repair. There are anecdotal reports of visceral ischemia which has happened even after 8 days after the aortic repair [6].

The ischemia of the gut will lead to disruption of the gut mucosal barrier releasing endotoxins. This is further insulted in the setting of ATAAD. Hepatic macrophages produce TNF (Tumour necrosis factor) causing reperfusion injury. This reperfusion is bound to happen even after central aortic repair, which cannot be controlled. These factors place this clinical condition with high mortality, with most of the patients dying within the first 24 hours even though adequate mesenteric perfusion is established [7].

Management

The objectives in management would be

(i) Decision of which pathology to be addressed first - dissection or malperfusion

(ii) Perfusion of the occluded vessel

(iii) Measures to encounter the reperfusion injury

Acute Type A Aortic Dissection

The options for patient with MMP and ATAAD include

a) ***Immediate central aortic repair approach:*** Conventionally, in any patient of ATAAD, restoring blood into the true lumen and excising the entry point in ascending aorta is the gold standard treatment. Even with the best of efforts, 25% of the patients persist to have ischemia of the branch vessels (8,9).

b) ***Endovascular followed by central repair:*** With the advancement of techniques and technology in endovascular, many centers now advocate a primary endovascular management followed by central aortic repair. Recently Michigan group published their 20 years' experience, where 96% of patients either survived to discharge or underwent delayed open repair (69.5%). The physician must differentiate between patients who have ischemic but not necrotic bowel from those with necrotic bowel. Endovascular stenting of the branch vessel to restore blood to the branch vessel has been tried in hemodynamically stable patients.

c) ***Simultaneous Approach:*** This can be approached with anyone of the below options - resection of the necrotic bowel is performed followed by central repair or a continuous perfusion of the

mesenteric artery during central repair followed by bypass to the mesenteric artery.

d) ***Mechanism Specific Approach:*** Surgeons from Hokkaido University, Japan proposed an interesting concept, where they approach these patients based on the mechanism of the malperfusion [10]. After evaluation of the dynamicity of the intimomedial flap, they will follow" Immediate *central aortic repair approach",* if it is an aortic-type malperfusion *or a "Endovascular followed by central repair" if it is a branch-type malperfusion.*

We have previously published our protocol of managing such patients in our unit [7].

Acute Type B Aortic Dissection (ATBAD)

Since the dawn of endografts, the outcomes of patients undergoing thoracic endovascular aortic repair are superior to open surgery in ATBAD [11,12]. Techniques to mitigate MMP include central aortic fenestration and/or branch artery stenting. A static obstruction of the branch vessel can be managed with an Endograft to the descending thoracic aorta.

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