Surgical management and outcomes in patients with acute type A aortic dissection and cerebral malperfusion

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ABSTRACT

Objective: The study objective was to evaluate the surgical results in patients with acute type A aortic dissection and cerebral malperfusion.

Methods: From 2000 to 2019, 234 patients with type A aortic dissection and cerebral malperfusion were stratified into 3 groups: 50 (21%) with syncope (group 1), 152 (65%) with persistent loss of focal neurological function (group 2), and 32 (14%) with coma (group 3). Results were evaluated and compared by univariable and multivariable analyses.

Results: Median age was higher in group 1, and incidence of cardiogenic shock was higher in group 3. The femoral artery was the most common cannulation site, whereas the axillary artery was used in 18% of group 1, 30% of group 2, and 25% of group 3 patients (P = .337). Antegrade cerebral perfusion was performed in more than 80% of patients, and ascending aorta/arch replacement was performed in 40% of group 1, 27% of group 2, and 31% of group 3 (P = .21). In-hospital mortality was 18% in group 1, 27% in group 2, and 56% in group 3 (P = .001). Survival at 5 years is 57.0% in group 1, 57.7% in group 2, and 38.7% in group 3 (P = .0005). On multivariable analysis, age, cardiopulmonary bypass time, and group 3 versus group 2 were independent risk factors for mortality, whereas axillary cannulation was a protective factor.

Conclusions: Patients with aortic dissection and cerebral malperfusion without preoperative coma showed acceptable mortality, and those with coma had a high in-hospital mortality regardless of the type of brain protection. Overall axillary artery cannulation appeared to be a protective factor. (JTCVS Open 2022;10:22-33)

CENTRAL MESSAGE

In patients with A-AAD and CM, surgical outcomes depend on the severity of clinical presentation. Axillary artery cannulation seems to improve early results.

PERSPECTIVE

Patients with A-AAD are at high risk when presenting with CM. In this subset, surgical results depend on the severity of clinical presentation, but emergency repair, particularly using the axillary artery for CPB, appears advisable. Patients with coma show the highest mortality regardless of the surgical strategy.

Type A acute aortic dissection (A-AAD) is a life-threatening disease requiring emergency surgical repair.
Although early and late outcomes have been greatly improved in the last decade,¹ in patients presenting with neurological symptoms the prognosis seems poor with a significant reduction of short-term results.²⁻⁴ Cerebral malperfusion (CM) is known to be a risk factor for postoperative permanent neurological deficit (PND) with reported incidence rates of 10% to 30%.³⁻⁶ Early reperfusion of true lumen has been advocated as an important factor to reduce PND by some authors who have proposed various procedures of revascularization of the supra-aortic branches (SABs) to reduce the duration of brain ischemia.⁷⁻⁸ However, patients with A-AAD and neurological deficit often present with multiorgan malperfusion and hemodynamic instability,⁹ limiting the time available for a more accurate diagnosis or for procedures before establishing cardiopulmonary bypass (CPB). Previous studies have reported different results for such patients undergoing cardiac surgery.⁴,¹⁰ and the best surgical management remains controversial.

The aim of this study is to evaluate the surgical results of patients presenting with A-AAD and neurological symptoms based on the degree of clinical presentation and the intraoperative strategy.

**MATERIALS AND METHODS**

**Study Population**

From 2000 to 2019, a total of 1234 consecutive patients underwent A-AAD repair in 6 referral centers for aortic surgery. Of these, 234 (19%) presenting with neurological symptoms were considered for this analysis and stratified. Patients were divided into 3 groups according to the clinical presentation (Table 1): 50 (21%) with syncope (group 1), 152 (65%) with persistent loss of focal neurological function (group 2), and 32 (14%) with coma (group 3). In this study, syncope was defined as a loss of consciousness of fast onset, short duration, and spontaneous recovery without permanent deficits but with evidence of dissection of at least 1 supra-aortic vessel; 150 patients presented with syncope but without involvement of at least 1 supra-aortic vessel, such as that caused by transient hypotension, were excluded; coma was considered as any nonmedically induced complete mental unresponsiveness to external stimulation (Figure 1 and Video Abstract). The study protocol was approved by the local Ethics Committee (Institutional Review Board approval: n. 013/2020_IRB Tit. III cl.32 fasc.32 - June 12, 2020), and informed consent was waived.

**Outcomes**

Because the aim of this study was to evaluate the results of repair in patients with A-AAD and neurological symptoms at presentation, the primary end points of the study were time to in-hospital death from any cause and postoperative neurological function. The secondary end point was the impact of surgical strategy for brain protection.

**Surgical Technique**

Standard patient preparation was used without any cerebrospinal fluid drainage system. All operations were performed through a median sternotomy using CPB; myocardial protection was obtained with intracoronary injection of cold crystalloid or blood cardioplegia repeated every 30 minutes. Systemic perfusion was obtained through cannulation of 1 femoral artery, the right axillary artery or ascending aorta (central cannulation) depending on each center protocol. When the entrance tear was located in the ascending aorta and in the absence of dilatation of the aortic, only the ascending aorta and hemiarch were replaced. When multiple tears were present or A-AAD started in the arch, both the ascending aorta and arch were replaced. In all cases, the distal aortic suture line was carried out with the “open” technique. Initially, arch replacement was performed with reattachment of the epiaortic vessels contained in an island of arch tissue; subsequently, the aortic arch was replaced using a trifurcated or quadrifurcated graft, and adding the classic elephant trunk (ET) technique which was replaced, more recently, by the frozen ET in all centers. Deep hypothermic circulatory arrest was used whenever retrograde cerebral perfusion was selected, whereas selective antegrade cerebral perfusion was performed under moderate hypothermia through axillary artery cannulation and selective cannulation of the left carotid artery or only selective cannulation of the epiaortic vessels. The type of cerebral protection was also at the discretion of each center protocol and specific surgeon in some cases.

Postoperatively, a common protocol management included rapid awakening of the patient to evaluate and quantify any potential neurological damage as early as possible.

**Patient Evaluation and Follow-up**

Diagnosis of A-AAD was suspected on the basis of the clinical presentation and then confirmed by transthoracic 2-dimensional echocardiography, angio-computed tomography (CT), or their combination; CM was diagnosed by the presence of dissection involving the SAB on CT scans when available or by the intraoperative findings. When signs of preoperative neurological involvement were present, the degree of cerebral damage was assessed by neurological examination.