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Early neurologic injury after emergency aortic arch surgery – Single-center experience of different cerebral hypothermic antegrade perfusion techniques

C. Bassano[1], E. Bovio[1], M. Russo[1], G. Saitto[1], M. Pugliese[1], A. Scafuri[1], P. Nardi[1], D. F. Colella[2], G. Ruvolo[1]

[1]Cardiac Surgery, Policlinico Tor Vergata, Rome, Italy
[2]Anesthesiology, Policlinico Tor Vergata, Rome, Italy

Abstract objectives: Neurologic dysfunction remains one of the most significant and disabling complication of emergency aortic arch surgery. Many cerebral protection techniques are described, but their comparison has always been hampered by the wide spectrum of preoperative conditions, pathologic anatomies, complications, and surgical procedures. The **aim** of our study is to evaluate the incidence of early permanent neurologic injury (PNI) and in-hospital mortality after emergency aortic arch surgery splitted by different antegrade cerebral perfusion techniques combined with hypothermic circulatory arrest (HCA) [1-5] **Material and Methods:** Between January 2005 and December 2015, 249 patients (range 16-87 years, mean age 63.0±12.9 years, 175 males) underwent emergent surgery for acute "type A" aortic dissection. Of these, 112 (range 16-87 years, mean age 63.8±12.8 years, 82 males) received cerebral protection through antegrade perfusion of the supra-aortic vessels. Unilateral perfusion (UACP) was performed in 55 (49.1%) patients, while bilateral perfusion (BACP) was achieved via right axillary artery cannulation alone in 25 (22.3%) cases or according to the Kazui technique in 32 (28.6%). PNI was defined as the presence of new focal (stroke) or global (coma) permanent neurological dysfunction. **Results:** In-hospital mortality was 17.9% (UACP 20% vs. BACP 15.8%; p=0.56**)**. The global rate of the early PNI was 12.3% (UACP 10.9% vs. BACP 15.8%; p=0.45). **Conclusion:** There is no evidence that BACP combined with HCA is superior to UACP combined with HCA for emergency aortic arch surgery in preventing early PNI and in-hospital mortality. BACP can be achieved also via right axillary cannulation alone with no increased of PNI and in-hospital mortality. **References:** 1) Pacini D, Di Marco L, Fortuna D, Belotti LM, Gabbieri D, Zussa C, Pigini F, Contini A, Barattoni MC, De Palma R, Di Bartolomeo R (2013) Acute aortic dissection: epidemiology and outcomes. Int J Cardiol 167:2806–2812. 2) Zierer A, Risteski P, El-Sayed Ahmad A, Moritz A, Diegeler A, Urbanski PP (2014) The impact of unilateral versus bilateral antegrade cerebral perfusion on surgical outcomes after aortic arch replacement: a propensity-matched analysis. J Thorac Cardiovasc Surg 147:1212–1218. 3) Hagan PG, Nienaber CA, Isselbacher EM, Bruckman D, Karavite DJ, Russman PL, Evangelista A, Fattori R, Suzuki T, Oh JK, Moore AG, Malouf JF, Pape LA, Gaca C, Sechtem U, Lenferink S, Deutsch HJ, Diedrichs H, Marcos y Robles J, Llovet A, Gilon D, Das SK, Armstrong WF, Deeb GM, Eagle KA (2000) The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. JAMA 283:897-903.

Figure 1: Preoperative feature

Table 1. Preoperative characteristics

	Total n=112	UACP n=55	BACP n=57	p-value
Age (years), mean ± SD	63.8±12.8	62.7±13.8	64.8±11.8	0.39
Male sex, n (%)	82 (73.2)	41 (50.0)	41 (50.0)	0.75
Clinical history, n (%)				
Hypertension	98 (87.5)	45 (45.9)	53 (54.1)	0.07
Smoke habit	32 (28.6)	14 (43.8)	18 (56.2)	0.47
BMI (Kg/m^2) > 30	22 (19.6)	11 (50.0)	11 (50.0)	0.93
History of CAD	6 (5.4)	3 (50.0)	3 (50.0)	0.99
Previous cardiac surgery	5 (4.5)	2 (40.0)	3 (60.0)	0.99
Dialisys-dependent renal failure	1 (0.9)	0 (0.0)	1 (100)	0.99
Entry tear aortic dissection, n (%)				
Ascending aorta	59 (52.7)	28 (47.5)	31 (52.5)	0.71
Aortic arch	29 (25.9)	15 (51.7)	14 (48.3)	0.74
Descending aorta	5 (4.5)	2 (40.0)	3 (60.0)	0.99
Unknown	19 (17.0)	10 (52.6)	9 (47.4)	0.74

BMI, Body Mass Index; CAD, Coronary Artery Disease; SD, Standard Deviation

Figure 2: Risk factor analysis

Table 4. Permanent neurologic injury and in-hospital mortality risk factors analysis

Variable	Univariate	Multivariate		
	P-value	OR	IC 95%	P-value
Permanent neurologic injury				
Circulatory arrest time >30 min	0.09	2.2	0.6-7.7	0.23
Endovascular descending aorta repair	0.07	3.3	0.7-16.6	0.15
In-hospital mortality				
Age >75 ys	0.05	3.8	1.1-13.5	0.04
Arch replacement	0.06	4.7	1.2-18.2	0.03
Aortic root sparing	0.03	0.6	0.1-6.2	0.70
AKI requiring CVVHF	0.001	4.7	1.2-18.5	0.03
Respiratory failure	0.003	9.9	2.0-49.9	0.005

AKI, Acute Kidney Injury; CVVHF, Continuous Veno-Venous Haemofiltration

