Treatment of Complex Diseases of Aorta Experience at a Single Center in Latin America Using The Frozen Elephant Trunk Technique

Rômullo Medeiros Santos[1], José Augusto Duncan Santiago[1], Vagner Madrini Junior[2], Vinícius Machado Correia[2], Fabio Fernandes PhD[2], Félix José Alvarez Ramires PhD[2], Fabio Biscegli Jatene PhD[1] e Ricardo Ribeiro Dias PhD[1].

[1]Division of Cardiac Surgery of Heart Institute of University of Sao Paulo (InCor), Sao Paulo, SP, Brazil.
[2]Division of Cardiology of Heart Institute of University of Sao Paulo (InCor), Sao Paulo, SP, Brazil.

Objective

- To evaluate the short and long-term results after treatment of aneurysm or aortic dissection using the FET technique using an integrated prosthesis.

Methods

- Database of patients who underwent surgery using the Frozen Elephant Trunk (FET) technique using the E-vita Open® prosthesis (Jotec GmbH, Hechingen, Germany).
- Between Jul/2009 and Jun/2023.
- The adverse effects evaluated were: paraplegia, stroke and AKI. Bleeding, need for re-intervention to treat remaining segments of the aorta and mortality were also assessed.
- Statistical program: GraphPad Prism v.10.0.1(218). The test used to compare categorical or non-categorical variables between groups was the chi-square, with a significant “p” <0.05.

Results

- **158 patients who underwent FET using the E-vita Open® prosthesis were evaluated.**

DEMOGRAPHICS	
MEDIAN AGE (years)	59,1
GENDER	M 98 (62%) / F 60 (28%)
BODY MASS INDEX – BMI (Kg/m²)	25.38
HYPERTENSION	130 (89%)
PREVIOUS OR ACTIVE SMOKING	69 (43.6%)
HEART FAILURE (EJECTION FRACTION <50%)	19 (12.02%)
DIABETES	16 (10.1%)
CHRONIC RENAL DISEASE	16 (10.1%)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)	8 (5.06%)
STROKE	6 (3.79%)
MYOCARDIAL INFARCTION	5 (3.16%)

CLINICAL MANIFESTATION	
ACUTE AORTIC SYNDROME	16 (10.12%)
CHRONIC ASYMPTOMATIC CHEST OR ABDOMINAL PAIN DYSPHONIA LOWER LIMB ISCHEMIA	 35 (22.15%) 94 (59.49%) 3 (1.89%) 2 (1.2%)
NYHA CLASS III or IV	13 (8.2%)
HEMODYNAMIC INSTABILITY	2 (1.2%)
MANIFESTATION OF RUPTURE	55 (34,81%)
AORTIC VALVE REGURGITATION MILD MODERATE SEVERE	 59 (37.3%) 29 (18.3%) 28 (17.7%)

AORTIC CHARACTERISTICS	
DEGENERATIVE ANEURYSM	42 (26.58%)
ACUTE TYPE A AORTIC DISSECTION	21 (13.29%)
CHRONIC TYPE A AORTIC DISSECTION	91 (57.59%)
CRONIC TYPE B AORTIC DISSECTION	4 (2.53%)
AORTIC MEDIAN DIAMETER (mm) ASCENDING ARCH DESCENDING ABDOMINAL	 65,01 66,68 65,28 68,85
AFTER RE-OPERATIONS AFTER ASCENDING AORTA OP. AFTER AORTIC ROOT OP OTHERS (VALVAR OP / MIOCARDIAL REVASCULARIZATIONS OP)	40 (25%) 23 (57,5%) 12 (30%) 5 (12,5%)

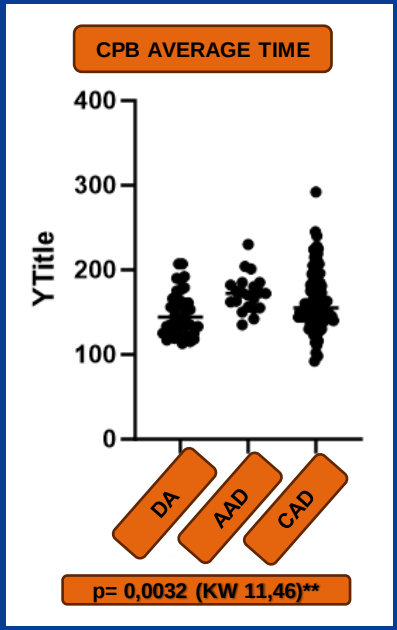
INTRAOPERATIVE	
MAXIMUM AORTIC DIAMETERS (mm)	65,6 (14,1; 41-130) mm
CPB ANOXIA SELECTIVE CEREBRAL PERFUSION (BILATERAL) MINIMAL RECTAL TEMPERATURE	160,6 (SD 32; 92-292) min 127,5 (SD 33,7; 55-249) min 60,6 (SD 12,5; 39-111) min 25 ° C
CANNULATION INNOMINATE ARTERY LEFT CAROTID SUBCLAVIAN ARTERY	 123 (77,84%) 23 (14.55%) 17 (10.75%)
CARDIOPLEGIC SOLUTION: CUSTODIOL® OTHERS	 91% 9%
RE-IMPLANTATION OF SUPRA-AORTIC VESSELS	ISLAND
ASSOCIATED OPERATIONS: CONCOMITANT (MITRAL VALVE/MYOCARDIAL REVASCULARIZATION) AORTIC ROOT AORTIC VALVE REPLACEMENT VALVE SPARING	 24 (15.18%) 25 (15.82%) 17 (10.75%) 6 (3.79%)
BLOOD COMPONENTS: RED BLOOD CELLS FRESH FROZEN PLASMA PLATELETS	95% 2.4 (SD 1,4; 1-5) unit 3.62 (SD 1,4; 2-9) unit 7.4 (SD 2,7; 5-17).unit

Results

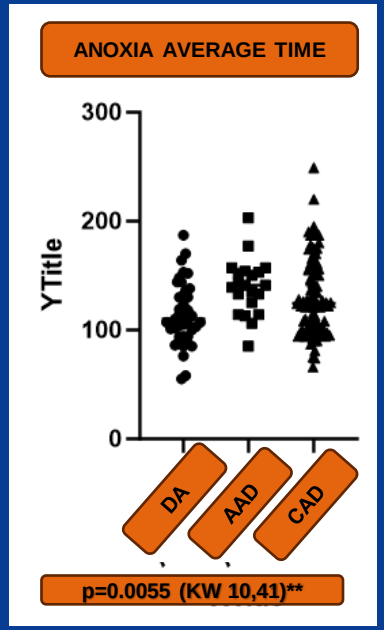
- Comparing CPB, Anoxia and SCP between the groups, there was a statistically significant difference with a “p” value of respectively: 0.003; 0.005 and 0.0001.

Intraoperative

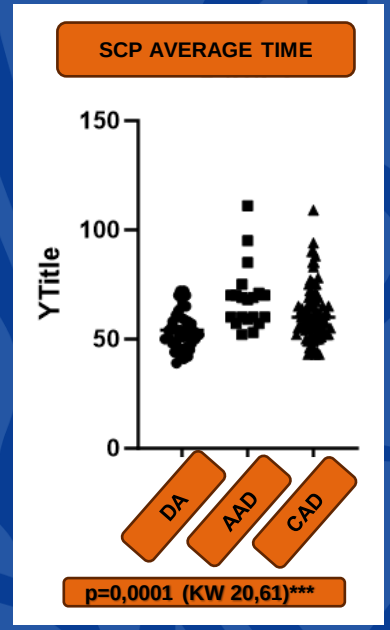
- **CPB AVERAGE TIME**
  - DA x AAD x CAD
  - DA: 148.7 (DP 25,6; 113-207)
  - AAD: 172 (DP 21,89; 135-230)
  - CAD: 163 (DP 35,1; 92-292)
  - p=0,0032 (KW 11,46)*



- **ANOXIA AVERAGE TIME**
  - DA x AAD x CAD
  - DA: 114,4 (DP 28,67; 55-187)
  - AAD: 139,3 (DP 25,63; 85-203)
  - CAD: 130 (DP 35,9; 66-249)
  - p=0.0055 (KW 10,41)



- **SCP AVERAGE TIME**
  - DA x AAD x CAD
  - DA: 54,27 (DP 8,7; 39-72)
  - AAD: 68,55 (DP 14,5; 52-111)
  - CAD: 61,75 (DP 12,35; 43-66)
  - p=0,0001 (KW 20,61)



HOSPITAL OUTCOMES	
HOSPITAL ADMISSION AVERAGE TIME	20.4 (SD 16.71; 5-103) days
PERMANENT NEUROLOGIC DEFCIT	3.6%
TEMPORARY NEUROLOGIC DEFCIT	8.02%
PARAPLEGIA	2.16%
ACUTE KIDNEY INJURY (07 DAYS) DIALYTIC SUPPORT NON DIALYTIC SUPPORT	 10.6% 25.3%
RE-OPERATION: BLEEDING COMPRESS REMOVAL CARDIAC TAMPONADE	 6 (3.79%) 5 (3,16%) 2 (1.26%)
MORTALITY AT 7 DAYS MORTALITY AT 30 DAYS MORTALITY BETWEEN 30 DAYS AND ONE YEAR MORTALITY BETWEEN ONE YEAR AND FIVE YEARS	17 (10.7%) 23 (14.5%) 11 (6.9%) 5 (3.1%)
MORTALITY BY CAUSES	Sepsis: 29% Multiple Organic Disfunction: 26% Hemorrhagic Shock: 26% Others: 19% (Neurologic causes, arrhythmias, after correction of abdominal or thoracic aneurysm)
MORTALITY BY CAUSES (30 DAYS)	Hemorrahagic Schock: 43,4% Multiple Organic Disfunction: 21,7% Sepsis: 13,04% Shock: 8,69% Others: 13,04% (Neurologic causes, liver failure e arrhytmias)

Follow-up

	DA x AAD x CAD
GENERAL MORTALITY	p=0.37 (DF 1.98)
MORTALITY AT 7 DAYS	p=0,32 (DF 2,27)
RE-INTERVENTION	p=0,24 (DF 2,84)
FREEDOM OF RE-INTERVENÇÃO (TIME)	p=0,25 (KW 2,72)

	MORTALITY AT 7 DAYS x NON MORTALITY AT 7 DAYS
RE-OPERATION	p=0,3
COMBINED AORTIC ROOT RE-OPERATION	p=0,56
ACUTE AORTIC DISSECTION	p=0,19
STROKE	p=0,07
DIALYTIC AKI	p=0,01

Follow-up

- **Re-operations:**
  - **Untill one year: 15,8%**
    Stent at Descending Thoracic Aorta (SDTA): 84%
    Correction of Abdominal Thoracic Aneurysm (CATA): 12%
  - **Between one and 05 years: 6,9%.**
    SDTA: 54,4%
    CATA: 36,3%
  - **Between 05 and 10 years:**
    Three patients (1,9%): two cases of SDTA and one of ATA.

Conclusions

- We observed statistically significant differences regarding the time of CPB, Anoxia and PCS, however, without apparently contributing to an increase in short- or long-term mortality when comparing the DA, AAD and CAD groups.
- The prevalence of stroke, paraplegia and acute kidney injury due after FET operation remains low in this new serie.
- Mortality within 30 days was observed to be lower than that of other representative single-center series and in relation to an international multicenter registry[1,2,3].
- Retrospective nature and divergence between the size of the groups treated in this sample can also influence and limit interpretations; prospective and randomized studies are needed to test hypotheses.
- In this service, the treatment of complex aortic diseases using the FET technique proved to be safe, effective and with good long-term results, comparable with results from other centers of excellence.

References

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