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POST ENDOVASCULAR STENT REPAIR OF DESCENDING AORTA:
SIDE EFFECTS AND DEVELOPMENT OF ANEURYSM IN THE
ASCENDING AORTA
M Altamimi
Calgary, Alberta

INTRODUCTION: Thoracic aortic aneurysms are an indolent but
catastrophic process. The purpose of this study was to evaluate
changes in the wall mechanics in the ascending aorta proximal
to where the endovascular stent graft is placed. Secondary
purpose was to investigate the growth of the ascending
segment after endovascular placement of a stent in the
descending aorta.

METHODS: Patient’s population: From December 2005 to
December 2013, 16 patients (14 males and 3 females, aged of
60 ± 10 years) with descending thoracic aortic lesions sub-
jects. Patients were monitored prior to surgery and between
2 to 24 months after the surgery with repeated contrast-
enhanced multislice Computed Tomography (CT). Geome-
try Reconstruction: A 3D model of the thoracic aorta was
obtained from CT images using the segmentation features of
the image processing software ScanIP (Simpleware Ltd.,
Exeter, UK). The maximum diameter was manually evalu-
ated directly from CT images by using the existing measuring
tool in Scan IP.

FINITE ELEMENT ANALYSIS: Non-linear isotropic constitutive
descriptions of the wall as proposed previously were used for
the FE analysis. The mean arterial blood pressure of 100
mmHg (13.33 kPa) was prescribed, and the nodal degrees of
freedom of the distal ends of supra-aortic vessels, the
descending aorta and the proximal aortic sinus were
fixed in all directions. No contact with the surrounding organs was
considered. The stress field was evaluated and the Maximum
Wall Stress of the Ascending aorta (MWSA) was computed.

RESULTS: The maximum principal Cauchy stress distribution
obtained for one representative preoperative model is plotted
in Figure 1. Stress and a diameter increase was observed in the
postoperative analysis. In details, for the postoperative repre-
sentative model the MWSA increased from 200 kPa to 212
kPa, while the ascending aorta diameter increased from 32
mm to 33.2 mm with an average growth rate of 0.2 mm/
months. Additionally, not only the magnitude of MWSA was
increased in the postoperative model but also the location
changed over time.

DISCUSSION: The tissue response to implantation of an
endovascular device involves a complex interplay among
device design, materials, and deployment technique. Our
data underlines the sensitivity of the ascending aorta to
endovascular grafting of the descending aorta. The maximum
diameter growth was about 0.36 mm/months in our cohort.
As an immediate consequence of diameter increase and
geometrical changes of the ascending aorta, the stress distri-
bution changes and the maximum stress rise post stent-graft
in the descending aorta.

Figure 1: Changes in maximum principal Cauchy stress distribution of the aortic wall prior and
after endovascular treatment of the descending aorta. The arrow points to the location of the
Maximum Wall Stress of the Ascending aorta (MWSA).

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RISK FACTORS OF MORTALITY AFTER SURGICAL CORRECTION
OF VENTRICULAR SEPTAL DEFECT FOLLOWING MYOCARDIAL
INFARCTION
A Cinq-Mars, S Veilleux, P Voisine, F Dagenais, F Le Ven,
P Poirier, K O’Connor, M Bernier, S Bergeron, M Sénéchal
Québec, Québec

BACKGROUND: Rupture of the ventricular septum following
myocardial infarction (MI) is an uncommon but serious
complication, usually leading to congestive heart failure and
cardiogenic shock. Surgical repair is the only definitive treat-
ment for this condition but is associated with a high operative
mortality. This study sought to analyze the associated risk
factors and outcomes in this population.

METHOD/RESULTS: A retrospective review was performed on
34 consecutive patients who had undergone surgical repair of
ventricular septal defect (VSD) following MI from December
1991 to June 2013. Preoperative, clinical and echocardi-
ographic variables were analysis. Mean age was 69±5 years and
44% were females. The VSD was anterior in 11 (32%) and
posterior in 23 (68%) patients. Twenty-four (71%) patients
were in cardiogenic shock. Mean aortic cross clamp time was
94 minutes and mean cardiopulmonary bypass time was 141
minutes. Median interval from MI to VSD repair was 7 days.
Overall operative mortality within 30 days was 65%.
Mortality within the posterior VSD group was 74% and the
anterior VSD group was 46% (p=0.1) Concomitant CABG
did not influence early or late survival. Multivariate analysis
identified age and time between MI and operation as inde-
pendent predictors of 30-day and long-term mortality.

CONCLUSION: Surgical repair of post-infarction VSD carries a
high operative mortality. Age and time between MI and operation are independent predictors of 30-days and long-
term mortality. In presence of such high-expected post-
operative mortality with conventional surgery, alternative