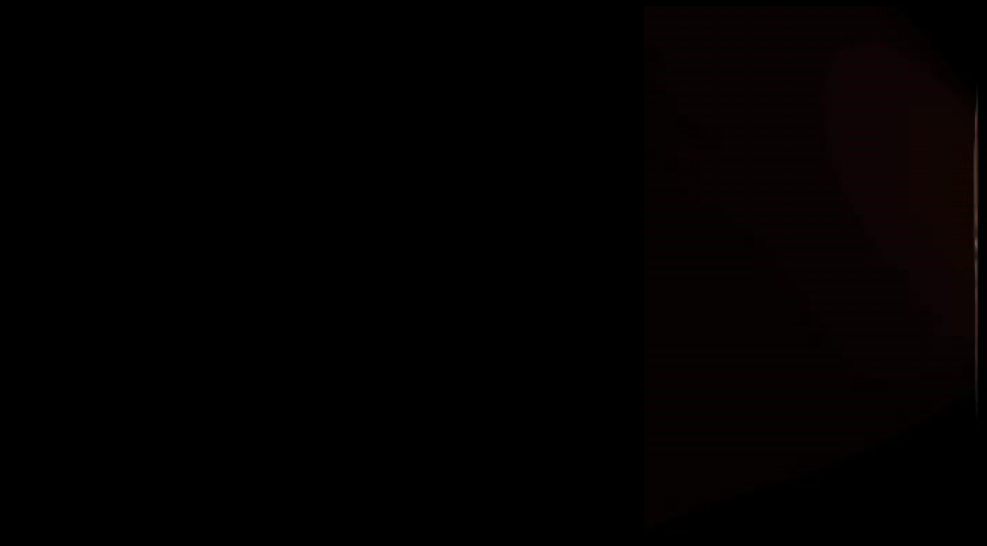
Less invasive cooling strategies for aortic aneurysm surgeries



Academician d-r Zan Mitrev MDFETCS, Tanja Anguseva,MD

Special hospital for surgery
“Fillip II” Skopje - Macedonia

June, 2012

History

Dr. C. Walton Lillehei

- **1918-1999**
- **Bubble oxygenator**

1953: First Heart Lung Machine
John Gibbon, Philadelphia

- **Improvements of the Heart Lung Machine**

- **Greater infrastructure**

Hypothermia in cardiovascular surgery

Hypothermia

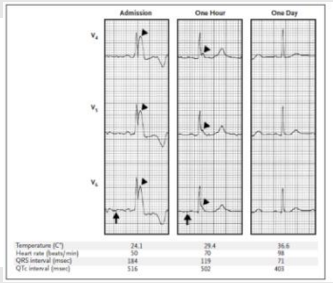
- **Definition: a condition in which an organism's temperature drops below the required level for normal metabolism and body functions.**
- **Subdivided into four different degrees:**

Mild (32 - 35ºC) **Severe (20 - 28ºC)**

Moderate (28 - 32ºC) **Profound (< 20ºC)**

Hypothermia preserves organ functions during cardiac surgery

Protective effects of hypothermia

CNS	**Depression of cerebral metabolism; EEG abnormality; decline in cerebral blood flow and cerebral function**
Cardiovascular 	**Tachy/bradycardia, vasoconstriction, ↑CO, HTA, prolonged systole, decreased ventricular arrhythmia threshold**
Respiratory	**tachypnea., decrease in oxygen compsumption;50% ↓ in carbon dioxide production per 8oC drop in temperature**
Renal and endocrine	**↑ in renal flow, intact renal autoregulation, decrease in basal metabolism**
Neuromuscular	**shivering**
Metabolism	**Decreased metabolism, acidosis, ↑lactates**

Adverse consequences of hypothermia

Cardiovascular	**Arrhthymias secondary to potassium loss**
	Increased plasma viscosity
	Vasoconstriction impairing microcirculation
Coagulation	**Impaired coagulation**
	Reduced platelet count
Renal and metabolic	**Reduced glomerular filtration rate**
	Metabolic acidosis
	Hyperglycaemia secondary to impaired glucose metabolism
	Effects on pharmacodynamics and pharmacokinetics
Cerebral	**Vasoconstriction during cooling**
	Brain injury from hyperthermia during rewarming

Perfusion techniques during surgery of thoracic and thoraco-abdominal aorta

Standard rules

- **Surface induced hypothermia**
- **Full cardiopulmonary bypass**
- **Deep hypothermia with circulatory arrest**
- **Apico-aortic shunting with heparin coated tubing (Gott shunt)**
- **Left heart bypass with heparin coated centrifugal pump and tubing**
- **Partial cardiopulmonary bypass with heparin coated perfusion equipment**

- Oxford Journals Medicine Multimedia Manual Cardio-Thoracic Surgery Volume 2007, Issue 061***910.1510/mmcts.2006.002535***

Perfusion techniques during surgery of thoracic and thoraco-abdominal aorta our strategies

N=405 pts.

- Moderate - mild hypothermia (28-32oC)
- Organ perfusion during whole surgery
- Femoral artery and right atrium cannulation
- Off pump thoracoabdominal surgery-no circulatory support

- Follow-up 1-144 months

Surgery in aortic dissection n = 301 pts.

88pts in cardiogenic shock
80 pts tamponada and severe metabolic acidosis

CBP time(min) 98 ±23.5
Xclamp time (min) 56.5 ±6.2
Antegrade perfusion (min) 23 ±9
Deepest rectal temperature 30.9 ±2.4

Mortality rate - 4.3% (17 pts)

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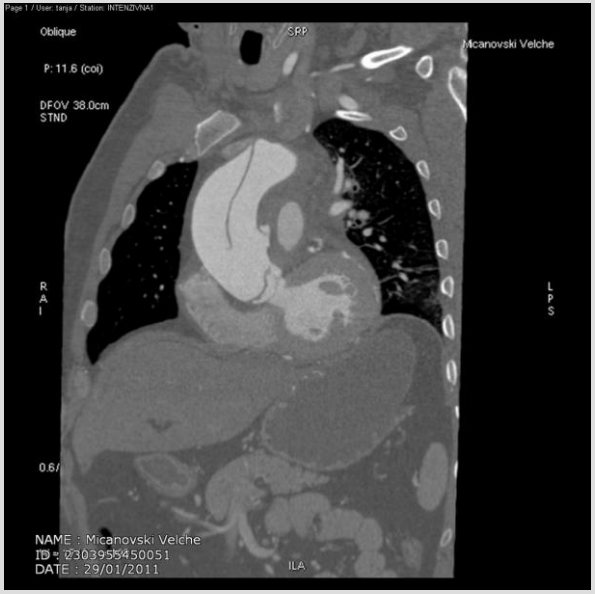
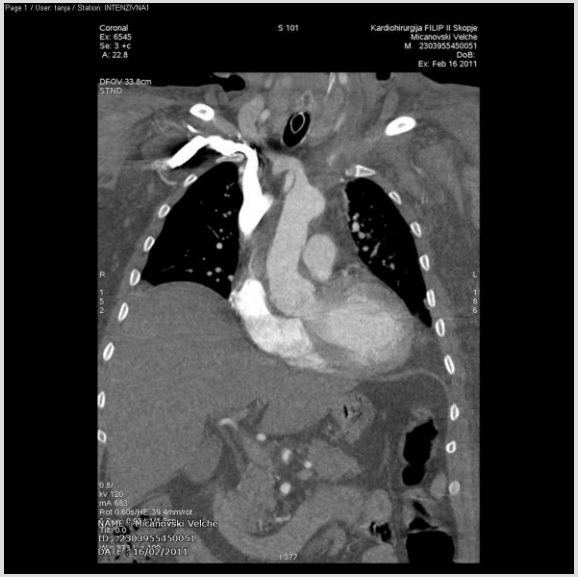
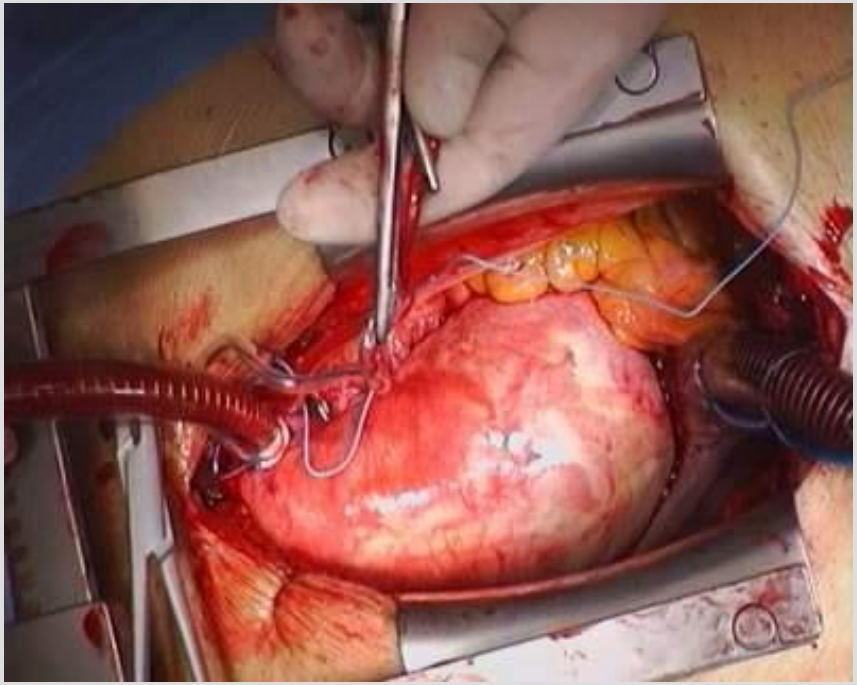




Cardiosurgery-Skopje

Surgery of aortic aneurysm n = 104 pts



Preop.

25 thoracoabdominal aneurysms
79 thoracic aneurysms

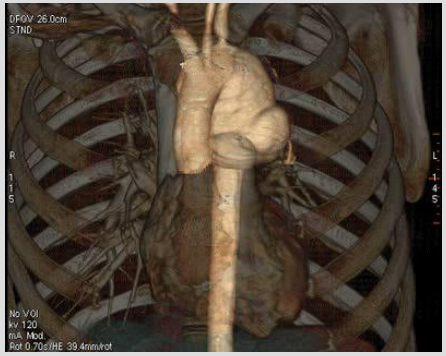
CBP time (min) 122 ±23.5
Xclamp time (min) 67.5 ±6.2
Antegrad perfusion (min) 23 ± 9
Deepest rectal temperature 29.9 ±2.4

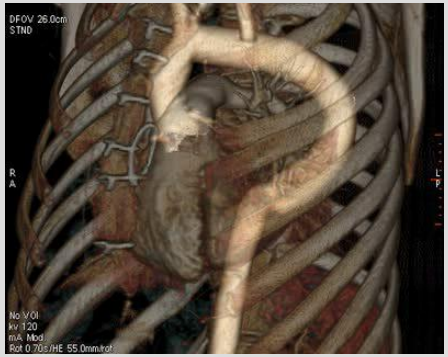
Post.op

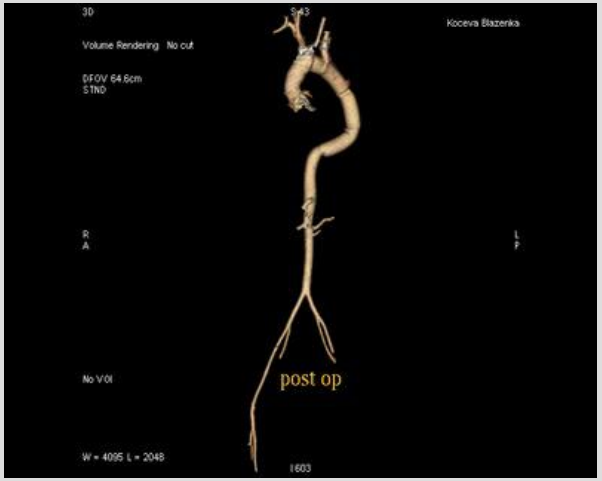
Mortality rate - 6 (5,76%)

Cardiosurgery-Skopje

Surgery of aortic aneurysm and aortic arch n = 14 pts





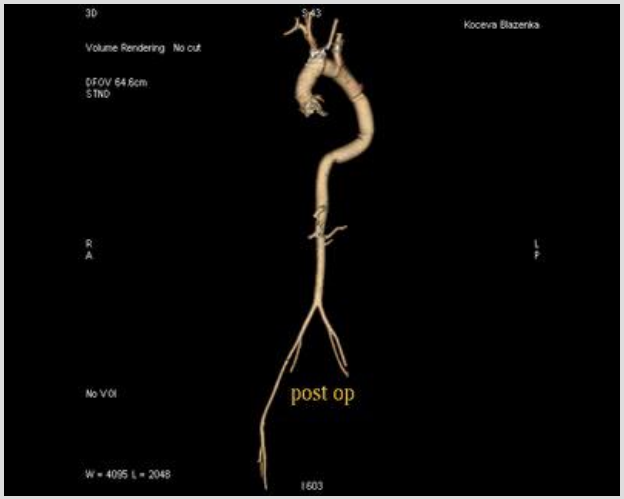


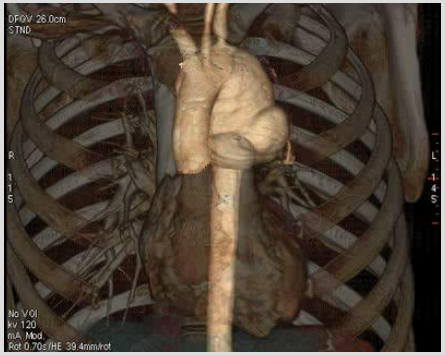
K.B. 25 y. old
02/2010 - arch mycotic aneurysm
Op. arch replacement with left a.subclavia re-implantation

09/2011 – reoperation, rupture on the new created aneurysm and broncho-aortal fistula

9 months surviving period after second operation

Surgery of aortic aneurysm and aortic arch n = 14 pts





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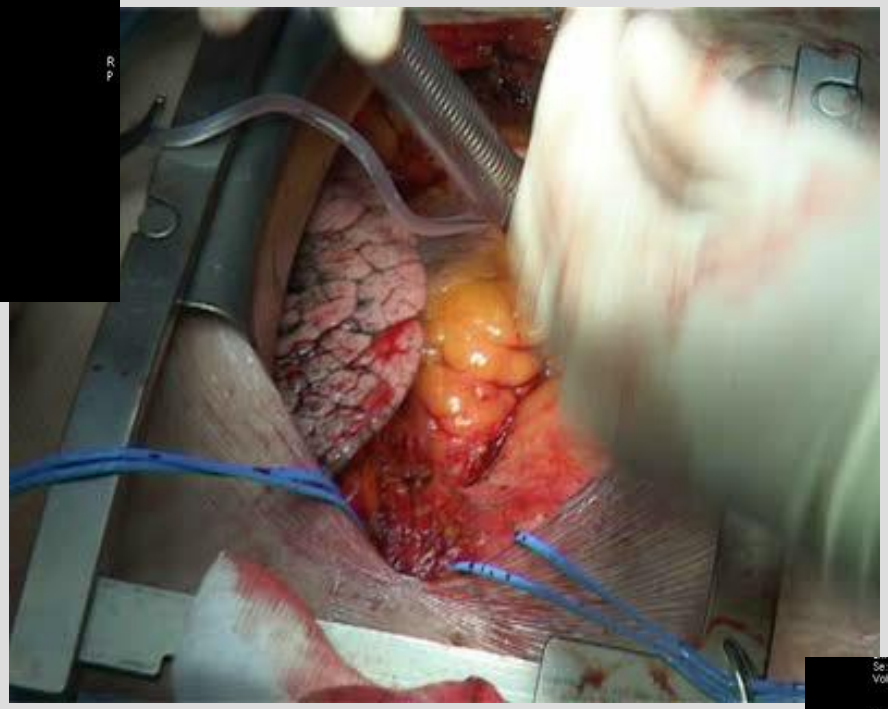


M.R. 65yold

1st op. (2001) Sy Leriche - aorto-bilijacal bypass

2nd op. (2004) re-op.extranatomical by-pass right subclavian ar

femoro-femoral (due to oclusion of the abdominal aorta –

proximal of the previous implanted graft

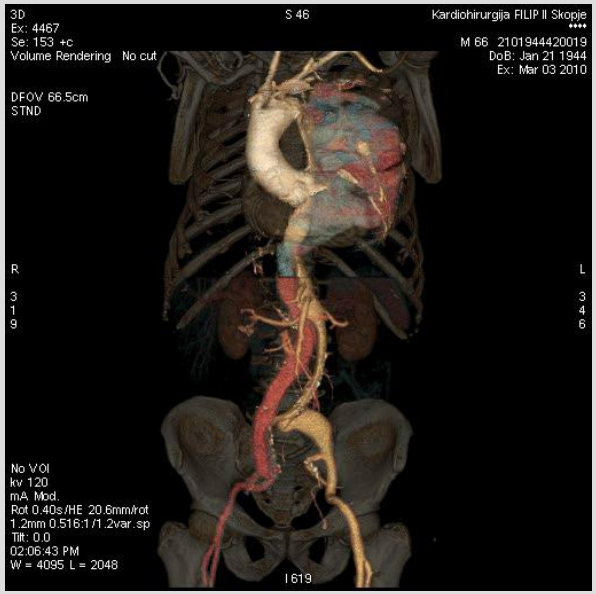
3rd (2011)op. re-operation –graft right subclavia-femoro-fem.

4th (02/2012)op. aortic arch-descending aneurysm -

Follow up 7 months

Cardiosurgery-Skopje

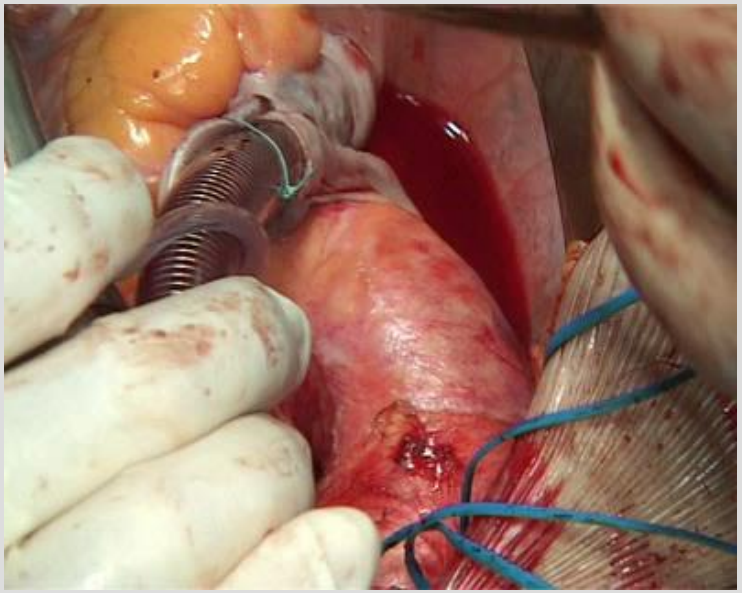
Surgery of descending aorta n = 74 pts



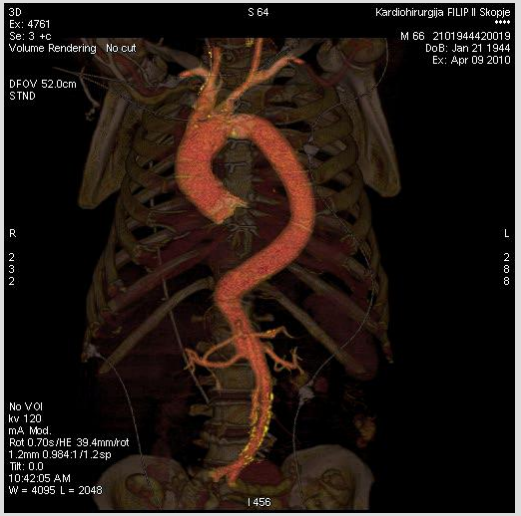
A 66-year-old man, dysphagia, breathless period, chest pain, fatigue.

Ultrasound - massive aortic thoracic aneurysm

Medical History – positive for HTA



(2010) Thoracoabdominal aneurysm- surgical technique through median sternotomy partial CBP – T-27,6oC, Ao clamp-45min,CBP 180min



18days respiratory machine percutaneus tracheotomy
29th day decannulation
38th day discharged
Complication- amputation of the distal phalanga of the left II finger

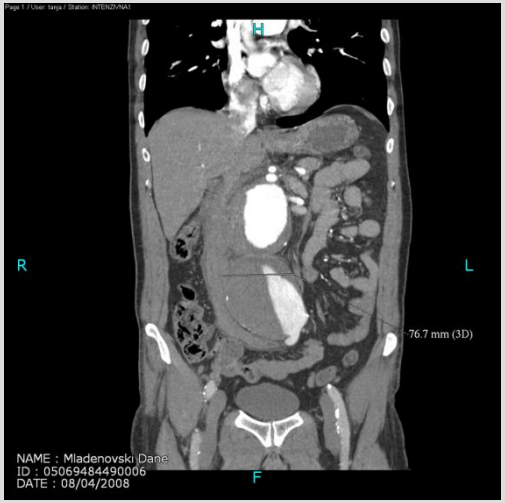
Cardiosurgery-Skopje

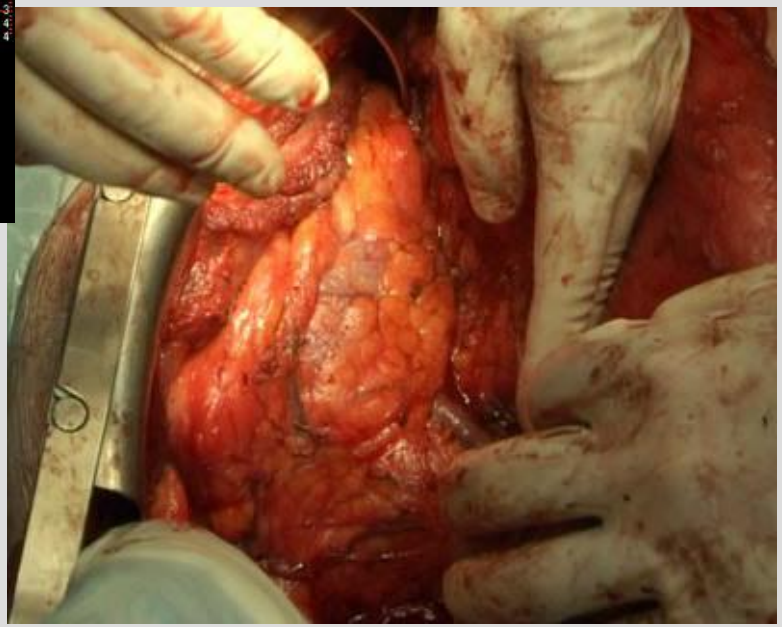
Off-pump surgery of thoracoabdominal aneurysm- urgent case

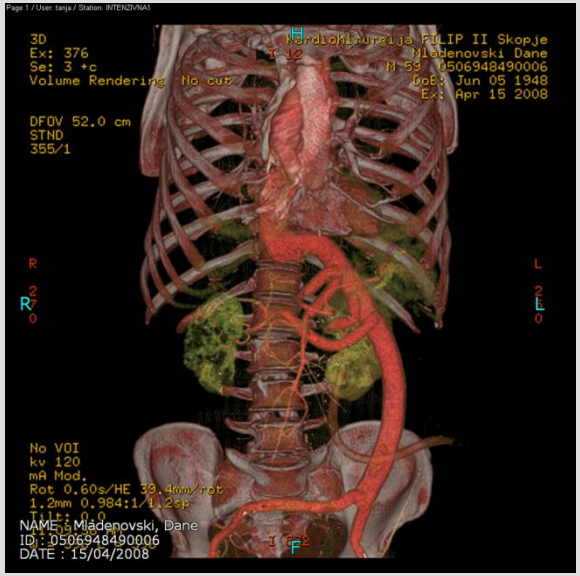
60 old man-
Severe abdominal pain, vomiting, pulsatio in the abdominal region

13 h. respiratory machine
2nd day mobilization
3rd day chest tube out
9th day discharged
No - complications

Pre-op 64 MSCT scan







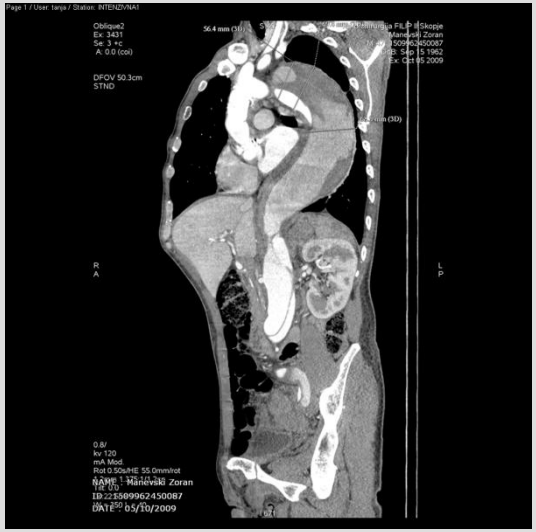
Post-op 64 MSCT scan

(2008) Replacement of distal thoracal and abdominal aorta Y graft with both illiacal arteries); reimplantation of truncus coeliacus and art.mesenterica

Cardiosurgery-Skopje

Off-pump surgery of thoracoabdominal aneurysm- urgent case

Preop. 64 MSCT



Postop. 64 MSCT

M.Z. 47y, 2006 – I st op. replacement of acsending aorta (dissection)

2009- Dg- aneurysm of thoraco-abdominal part of the aorta

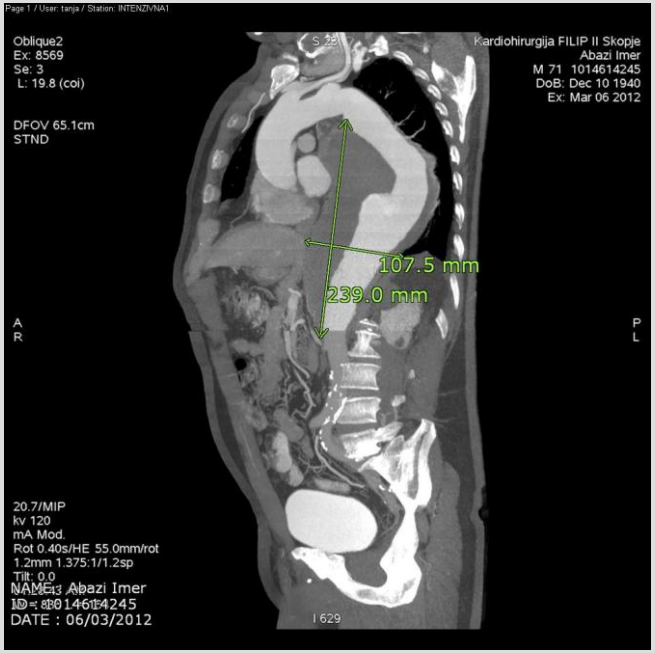
Postoperatively-
Hemodinamicaly stabile
Late paraplegia
Deep depressive syndrome
Exitus lethalis after 6,5 months

3D reconstruction

European Journal of Cardio-thoracic Surgery 35 (2009) 905
Images in cardio-thoracic surgery DeBekay repair for type III thoracoabdominal aortic aneurysm
Zan Mitrev, Vladimir Belostotski, Lidija Veljanovska, Nikola Hristov *
Special Hospital for Surgery ''Filip Vtori'', Skopje, Macedonia **Available online 9 March 2009**

Cardiosurgery-Skopje

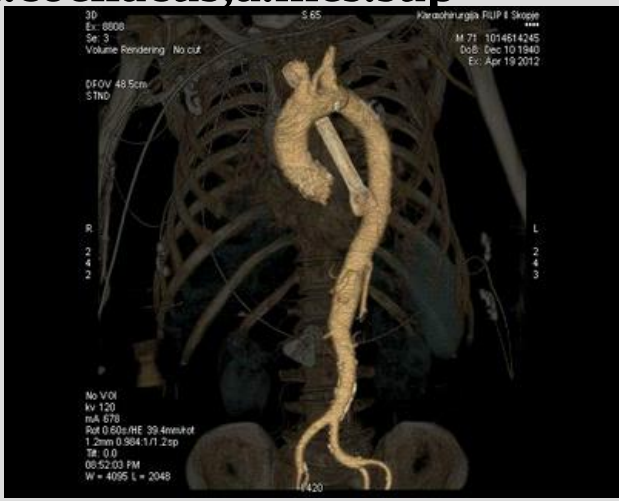
Thoracoabdominal aneurysm- urgent case



Pre op.

(03/2012)A.I. 70y old
Urgency- blood vomiting
CT scan-thoracoabdominal aneurysm with an aorto-esophageal fistula
Surgery
Thoracoabdominal aorta replacement with reimplantation of trunc.coeliacus,a.mes.sup left.a.renalis and distal intercostal arteries
T-33,6oC
Ao.clamp -105min
EKC – 160min

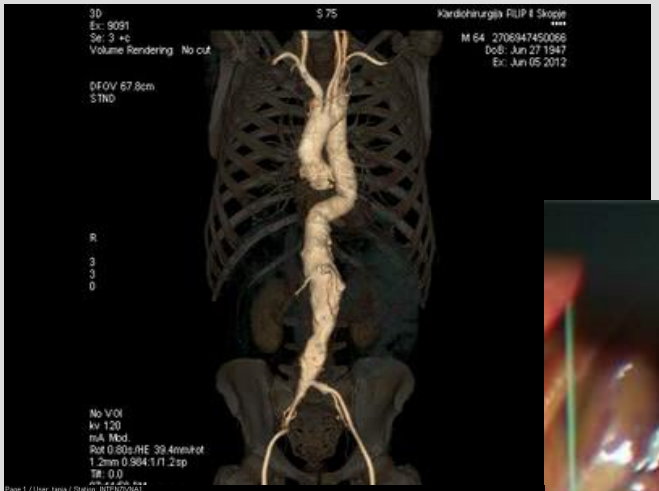
Cardiosurgery-Skopje



Post op.

Stenting of the aorto-esophageal fistula

Thoracoabdominal aneurysm- urgent case



Surgery
1.CABGx2 OPCAB
2.Thoracoabdominal aorta replacement with replacement of truncus coeliacus, a.mes.sup, both renal arteries

T=34oC hypothermia
Ao clamp 166min
EKC – 300 min

Pre op.

S.O.65y old
Retaint rupture of the thoracoabdominal aneurysm on the suprarenal level
Coronary artery disease

Cardiosurgery-Skopje

Postop.

Results N=405pts

Complications	Dissections (301pts)	Aneurysm (104pts)
Multiple organ failure	10(3,3%)	11(10,5%)
Cardiac complications	4 (1.3%)	6(5,7%)
Pulmonary complications	13 (4,3%)	6(5,7%)
Stroke	12 (3,9%)	5(4,8%)
Hemorrhage	15 (4,9%)	10(9,6%)
Acute renal insuff. with CVVHD treatment	15(4,9%)	&(6,7%)
Mortality	17(4,3%)	8 (7,6%)

Conclusion:

- Mild-moderate hypothermia is appropriate technique in most of complex surgical aortic procedures.
- Techniques avoiding EKC and hypothermia ensures better clinical outcome in patient with less metabolic disorders.
- Aortic dissections can be operated on mild hypothermia (32 C) with preserved cerebral and systemic organ perfusion.
- Thoracic and thoraco-abdominal aneurysms might be operated in mild hypothermia (30 C) on extracorporeal circulation (cannulating places: femoral vein and right atrium in a condition with or without cardioplegia.

Kao i uvjek - na kraju

I PORED OPERACIJE

PACIJENTU JE IPAK DOBRO

Prof dr.sc. Ino Husedžinović, dr.med.