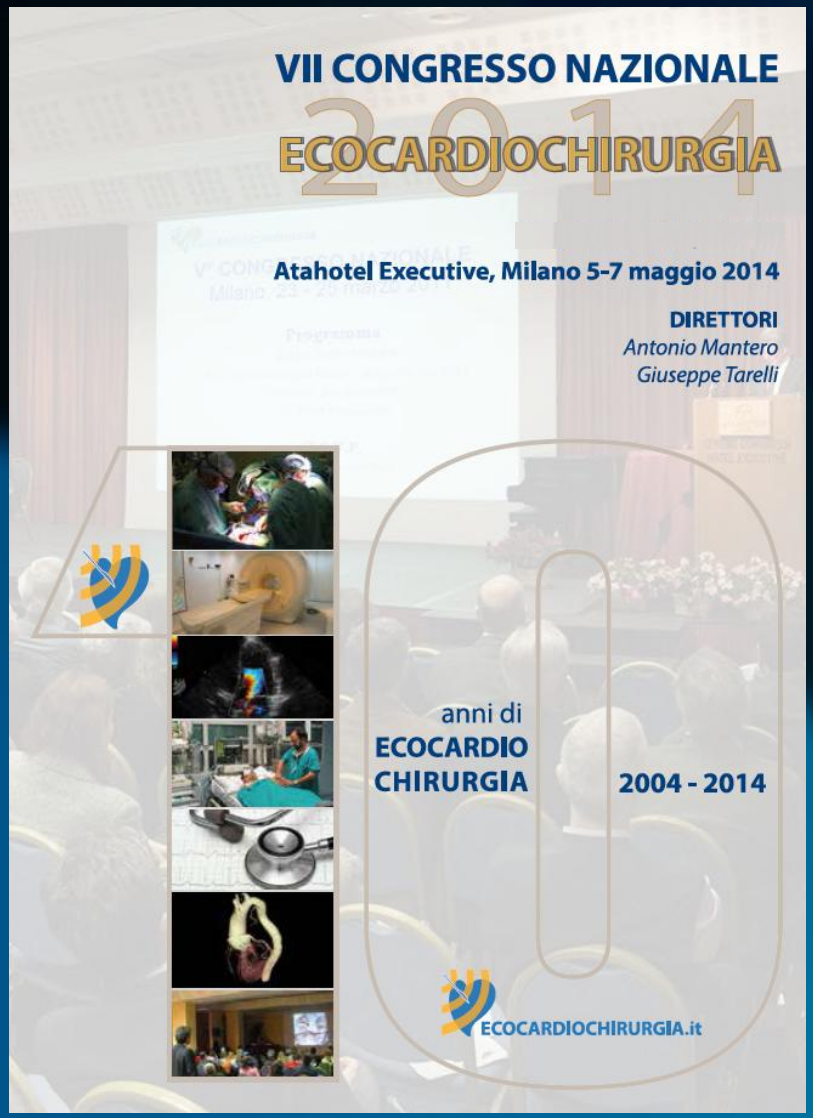


DISSECAZIONE AORTICA

Follow-up

Risultati a medio e lungo termine

La gestione del falso lume

Type I Acute Aortic Dissection, aims of the surgery

- Prevent ascending aortic rupture
- Redirect blood flow into the true vessel lumen
- Correct aortic valve insufficiency
- In the majority of patients surgical repair is limited to the ascending aorta, in some cases, additionally to the aortic arch

Surgical treatment remains essentially palliative

- Residual dissected aorta
- Patent false lumen
- Distal aortic dilatation
- Subsequent aneurysm formation
- Aortic rupture and reoperation

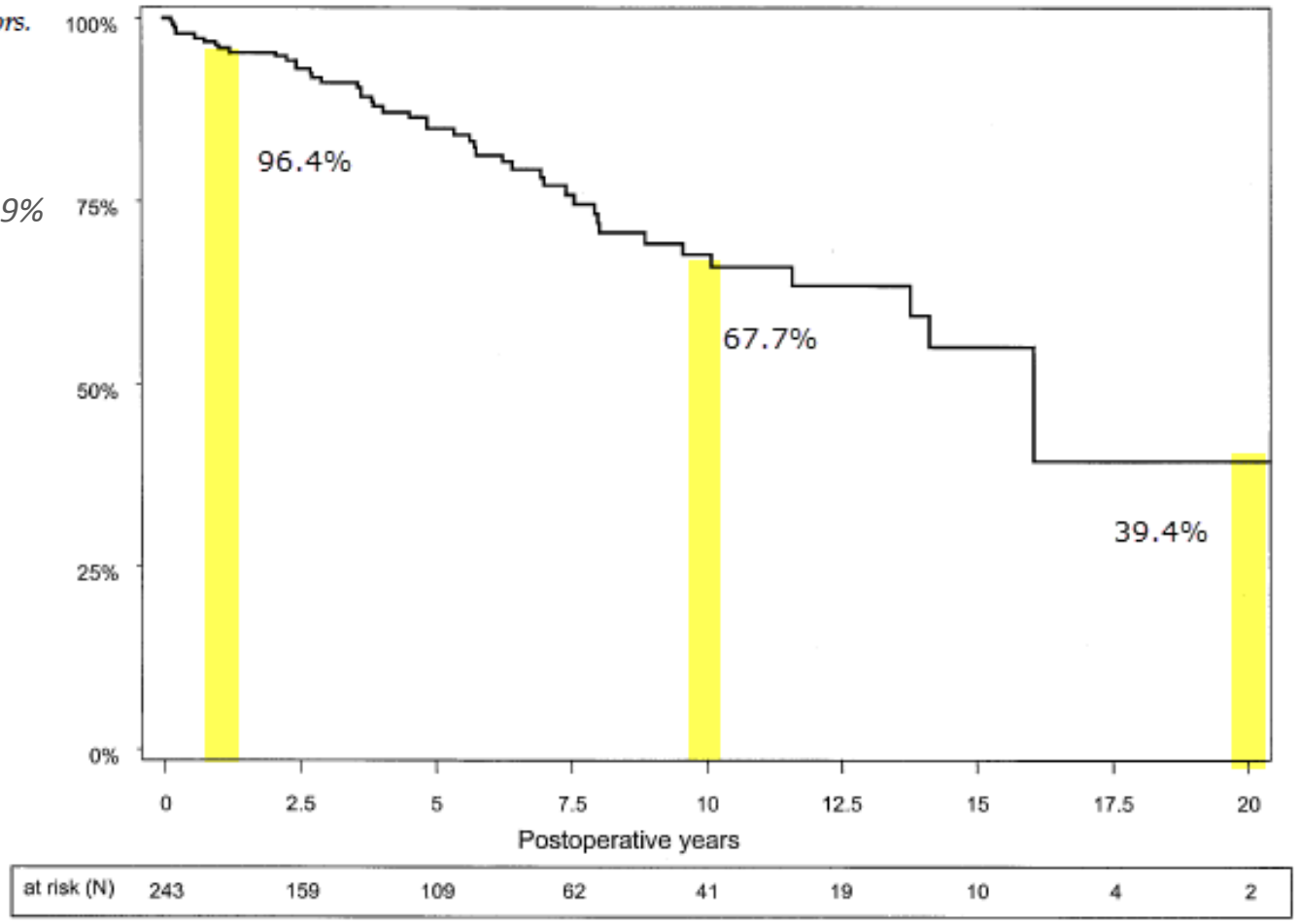
Long-Term Results After 27 Years of Surgical Treatment of Acute Type A Aortic Dissection

M. Erwin S. H. Tan, MD, PhD, Wim J. Morshuis, MD, PhD, Karl M. E. Dossche, MD, PhD, Johannes C. Kelder, MD, Frans G. J. Waanders, and Marc A. A. M. Schepens, MD, PhD

Departments of Cardiothoracic Surgery, Cardiology Research and Statistical Analysis, and Clinical Perfusion, St. Antonius Hospital, Nieuwegein, the Netherlands

Ann Thorac Surg
2005;80:523–9

Fig 1. Survival of operative survivors.



- *Period: 1974-2001*
- *315 consecutive pts.*
- *Operative mortality: 22,9%*
- *243 survivors*
- *58 patients required reoperation*

Long-Term Results After 27 Years of Surgical Treatment of Acute Type A Aortic Dissection

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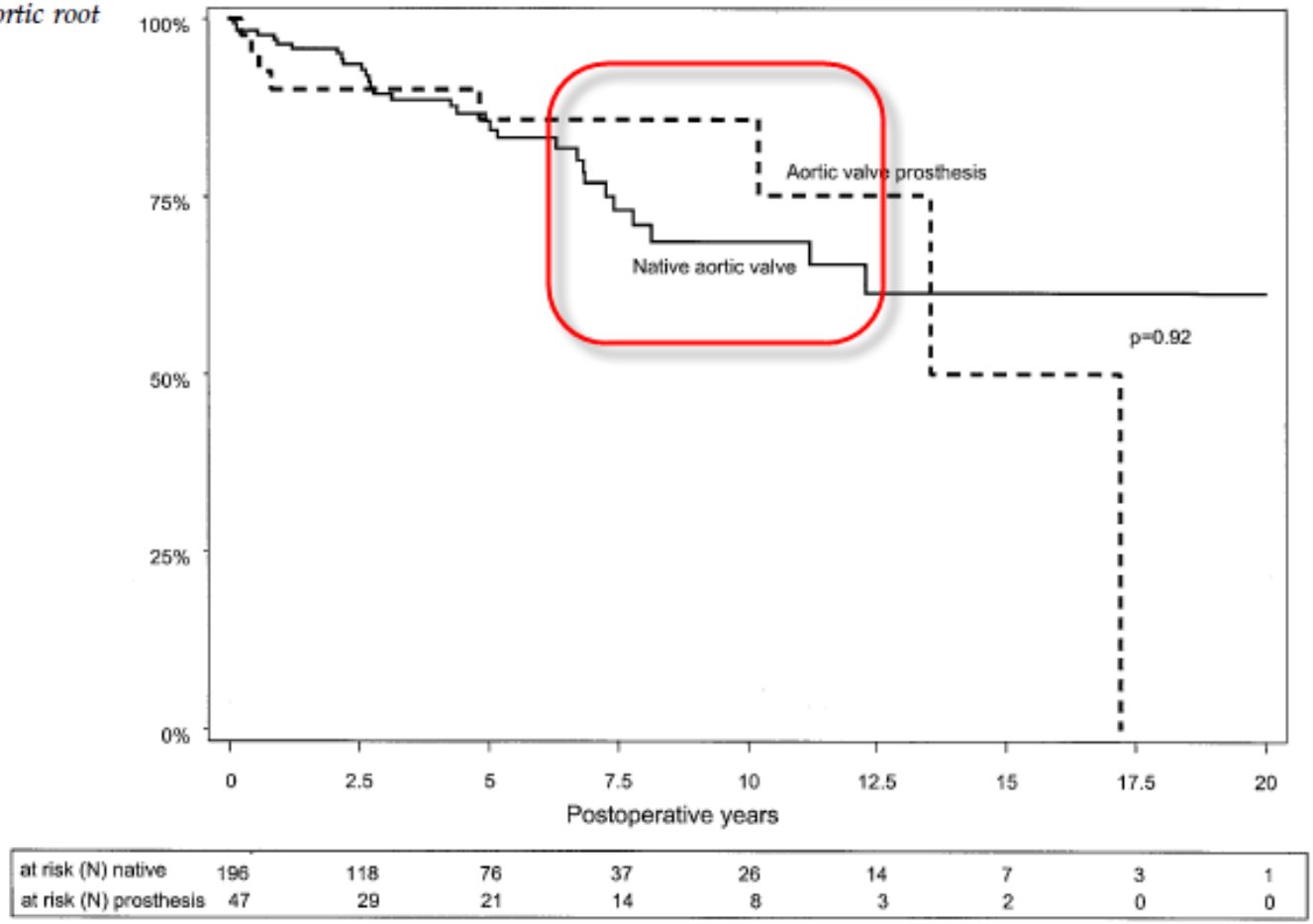
Fig 3. Freedom from aortic root intervention.



Fate of the Residual Distal and Proximal Aorta After Acute Type A Dissection Repair Using a Contemporary Surgical Reconstruction Algorithm

Arnar Geirsson, MD, Joseph E. Bavaria, MD, Daniel Swarr, BS, Martin G. Keane, MD, Y. Joseph Woo, MD, Wilson Y. Szeto, MD, and Alberto Pochettino, MD

Division of Cardiothoracic Surgery and Cardiovascular Medicine, University of Pennsylvania Medical Center, Philadelphia, Pennsylvania

Background. I
results of our c
agement algori
dissections. Pri
techniques and

Methods. From 1993 to 2004, 221 consecutive patients underwent repair of acute type A aortic dissection at our aortic center. Hemiarch repair was performed in 97.7% (216 of 221), and total arch in 2.3% (5 of 221). Of these, 72.9% (161 of 221) underwent aortic valve resuspension, and 27.1% (60 of 221) had aortic root replacement.

Results. In-hospital mortality for a primary operation was 12.7% (28 of 221). Actuarial survival was 79.2% at 1 year, 62.8% at 5 years, and 46.3% at 10 years. Significant risk factors for decreased survival included prior stroke, cerebral malperfusion, and length of cardiopulmonary bypass. Freedom from proximal reoperation after aortic

DeBakey type I dissection are risk factors for distal reoperation. To further improve long-term outcome, means to prevent progression of distal aortic disease need to be developed.

(Ann Thorac Surg 2007;84:1955–64)
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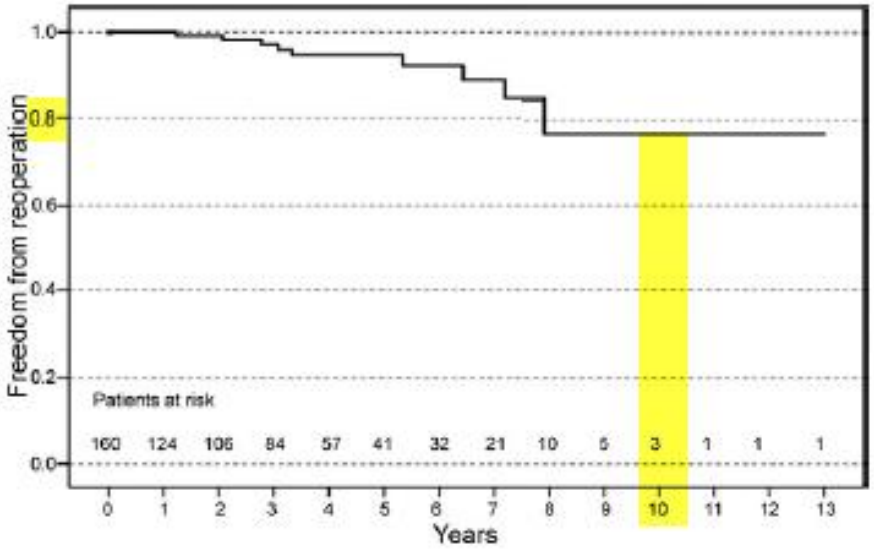

Fig 2. Kaplan-Meier estimate of freedom from proximal reoperation in patients undergoing aortic valve resuspension.

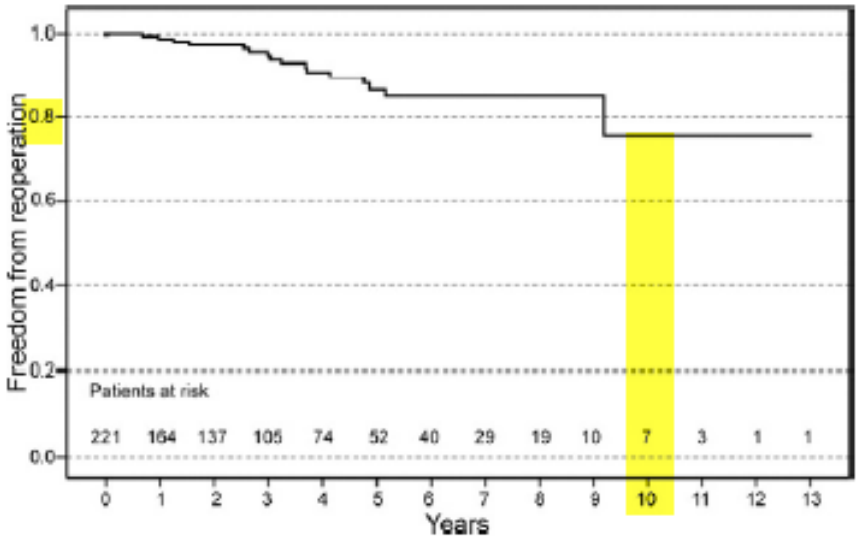

Fig 4. Kaplan-Meier estimate of freedom from distal reoperation in all patients.

Fate of the Residual Distal and Proximal Aorta After Acute Type A Dissection Repair Using a Contemporary Surgical Reconstruction Algorithm

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Division of Cardiothoracic Surgery and Cardiovascular Medicine, University of Pennsylvania Medical Center, Philadelphia, Pennsylvania

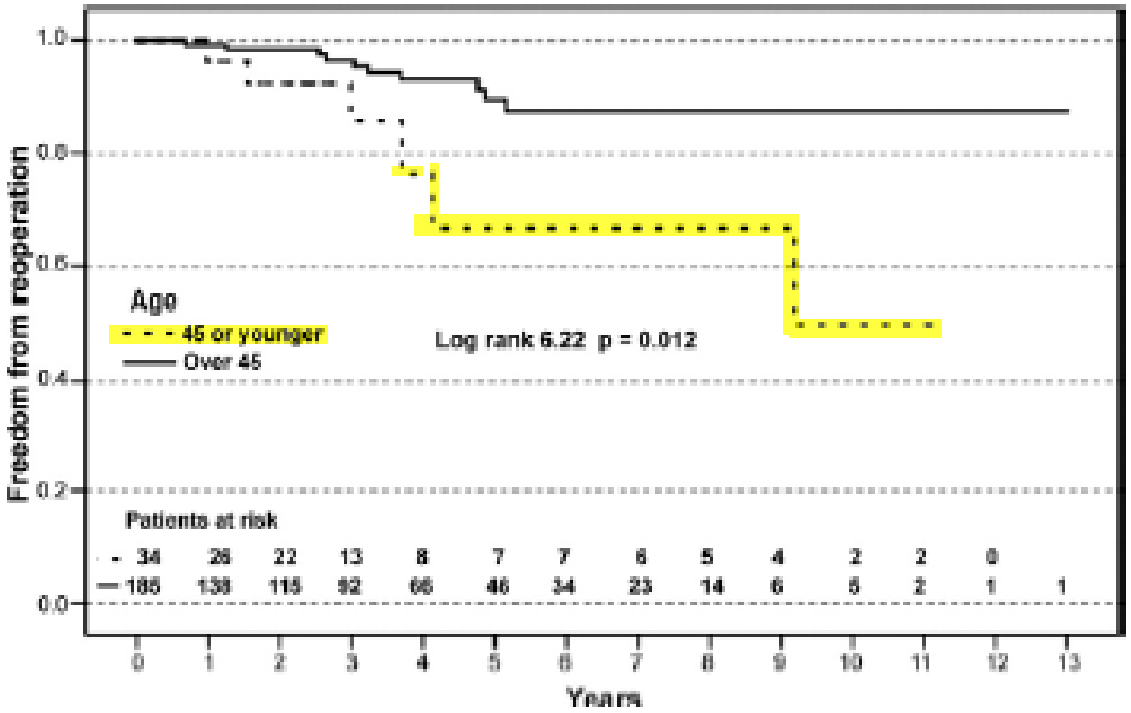

Fig 5. Kaplan-Meier estimate of freedom from distal reoperation patients aged younger than 45 years (dashed line) compared with patients 45 years and older (solid line).

Type A Aortic Dissection in Marfan Syndrome

Extent of Initial Surgery Determines Long-Term Outcome

Bartosz Rylski, MD; Joseph E. Bavaria, MD; Friedhelm Beyersdorf, MD, PhD; Emanuela Branchetti, PhD; Nimesh D. Desai, MD, PhD; Rita K. Milewski, MD, PhD; Wilson Y. Szeto, MD; Prashanth Vallabhajosyula, MD; Matthias Siepe, MD; Fabian A. Kari, MD

From the Division of Cardiothoracic Surgery, Hospital of the University of Pennsylvania in Philadelphia (BR., J.E.B., E.B., N.D.D., R.K.M., W.Y.S., P.V.); and Department of Cardiovascular Surgery, Heart Center Freiburg University, Freiburg, Germany (B.R., F.B., M.S., F.A.K.).

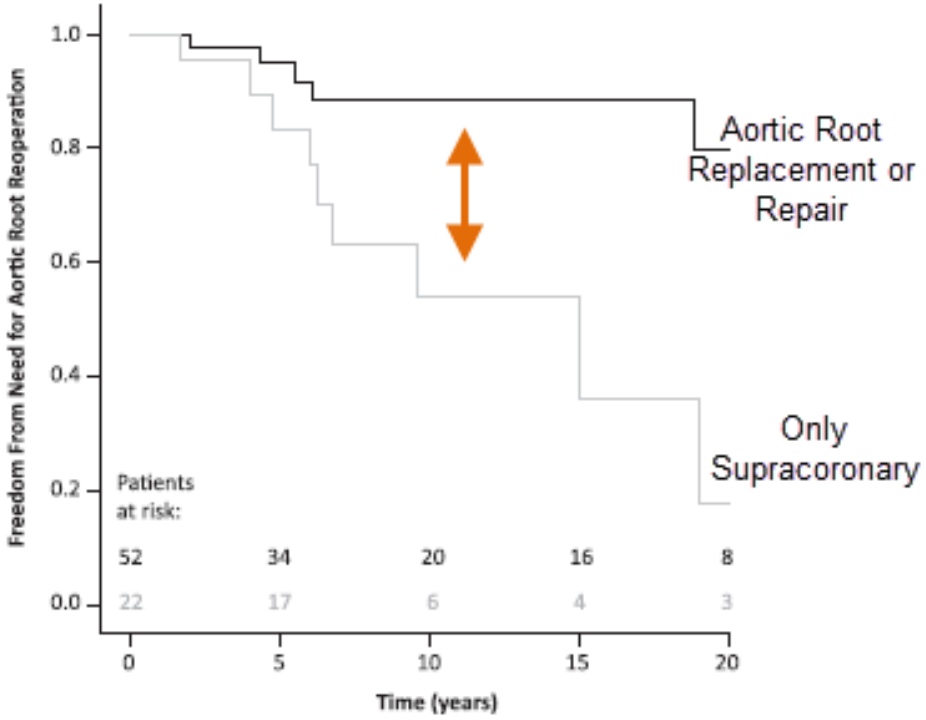

Figure 2. Freedom from need for aortic root reoperation in patients who underwent initially supracoronary ascending replacement vs those with initial aortic root replacement (composite valved graft [CVG]) or repair (valve-sparing aortic root replacement [V-SARR]).

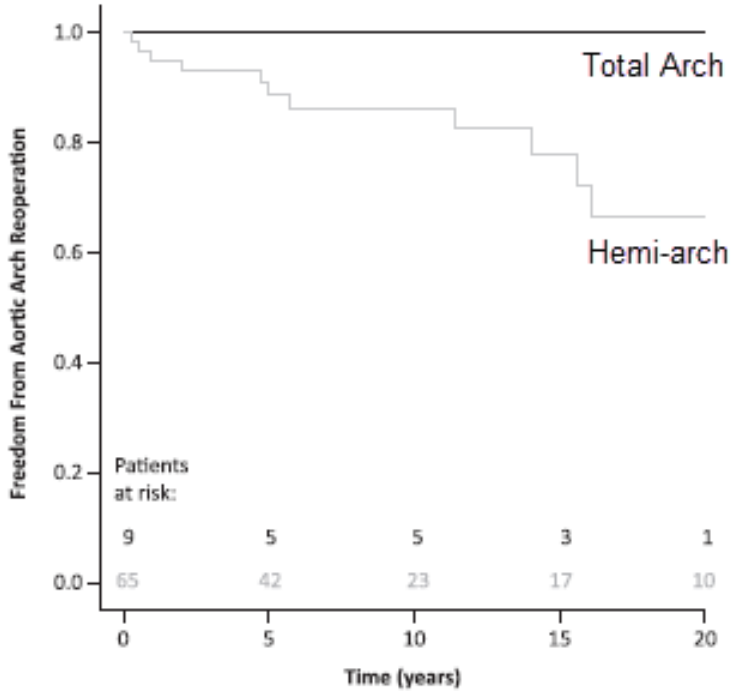

Figure 3. Freedom from aortic arch reoperation in patients who underwent primary total aortic arch vs hemi-arch replacement.

- Late aneurysms evolution after surgical correction of Type A Aortic Dissection

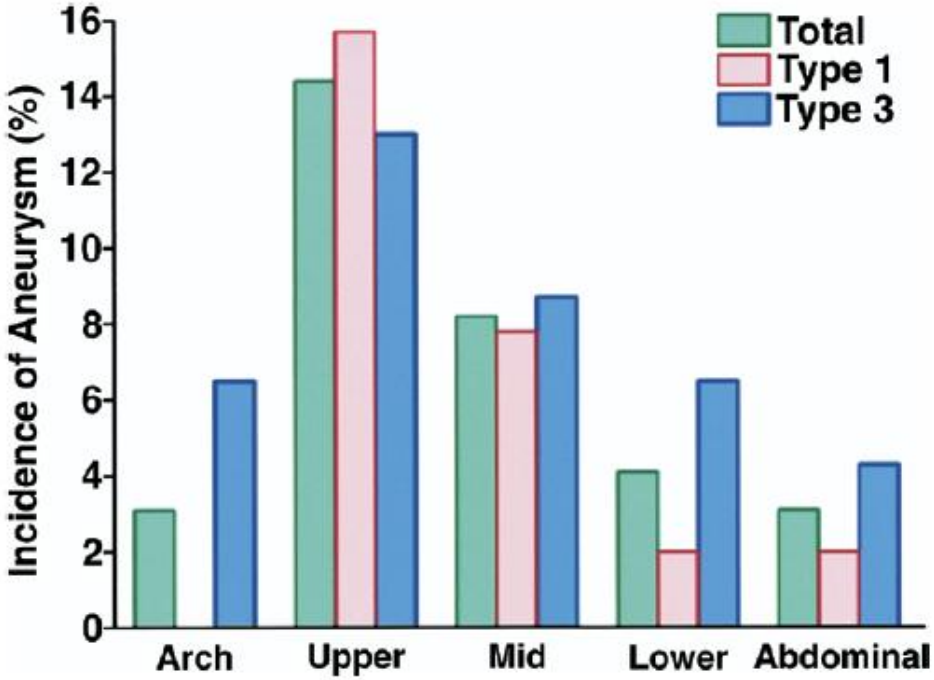

Figure 1 **Incidence of Distal Aorta Aneurysm**

Incidences of aneurysm at the aortic arch; upper, mid, and lower descending thoracic aorta; and abdominal aorta in patients with type 1 and type 3 aortic dissection.

Song *et al.*
Late Aneurysmal Change of Distal Aortic Dissection

JACC Vol. 50, No. 8, 2007
August 21, 2007:799–804

Predictors of Late Aneurysmal Change

- Initial False Lumen Diameter at the Aortic Upper Tract is the most powerful Predictor of late aneurysmal change
- The initial false lumen diameter correlates with the rate of aorta dilatation in the upper tract
- The ratio false lumen diameter/aorta diameter Increases in upper and middle descending aorta in late aneurysmal change
- Marfan Syndrome

Initial False Lumen Diameter: Different Event-Free Survival

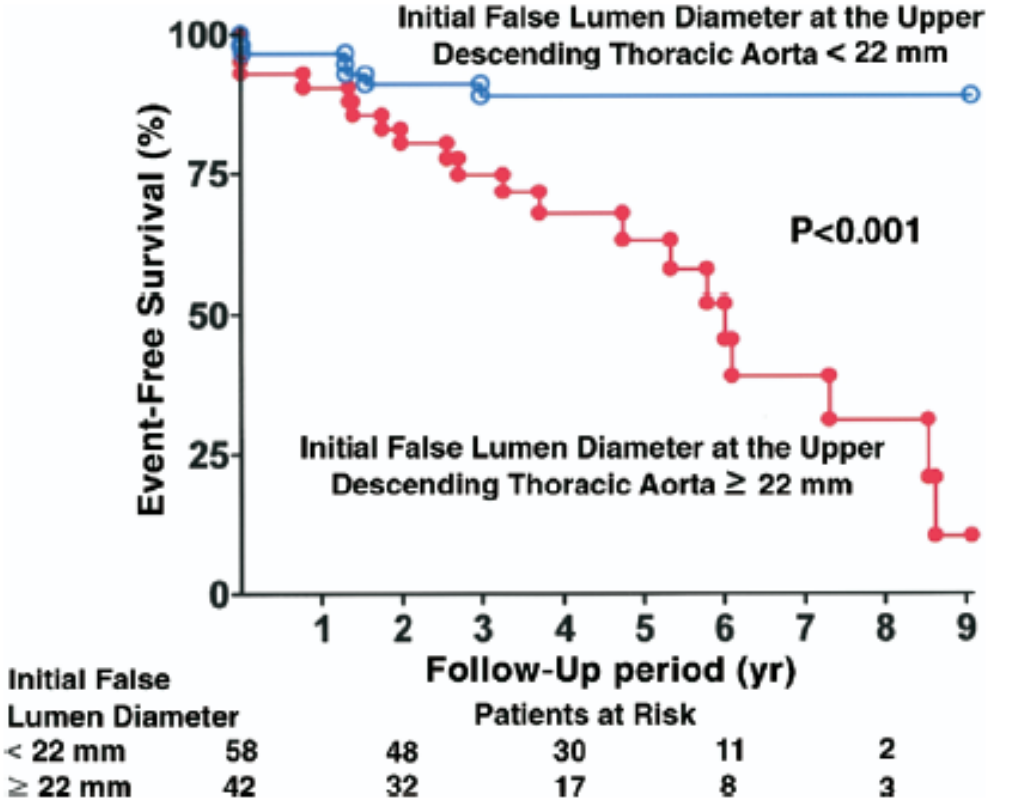

Figure 5 Event-Free Survival Curves

Event-free survival curves for patients with small and large initial false lumen diameters at the upper descending thoracic aorta.

Song *et al.*
Late Aneurysmal Change of Distal Aortic Dissection

JACC Vol. 50, No. 8, 2007
August 21, 2007:799–804

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Predictors of outcome

- Large false lumen, ≥ 22 mm in the upper thoracic aorta, showed a higher rate of aorta dilatation and higher incidence of clinical events
- Initial false lumen diameter tends to be smaller in patients showing complete resorption during the follow-up
- An initial large false lumen diameter is not only a cause of accelerated aorta dilation, but is also the main aorta compartment undergoing dilation

Song *et al.*
Late Aneurysmal Change of Distal Aortic Dissection

JACC Vol. 50, No. 8, 2007
August 21, 2007:799–804

Large Area of False Lumen Fosters Secondary Dilatation

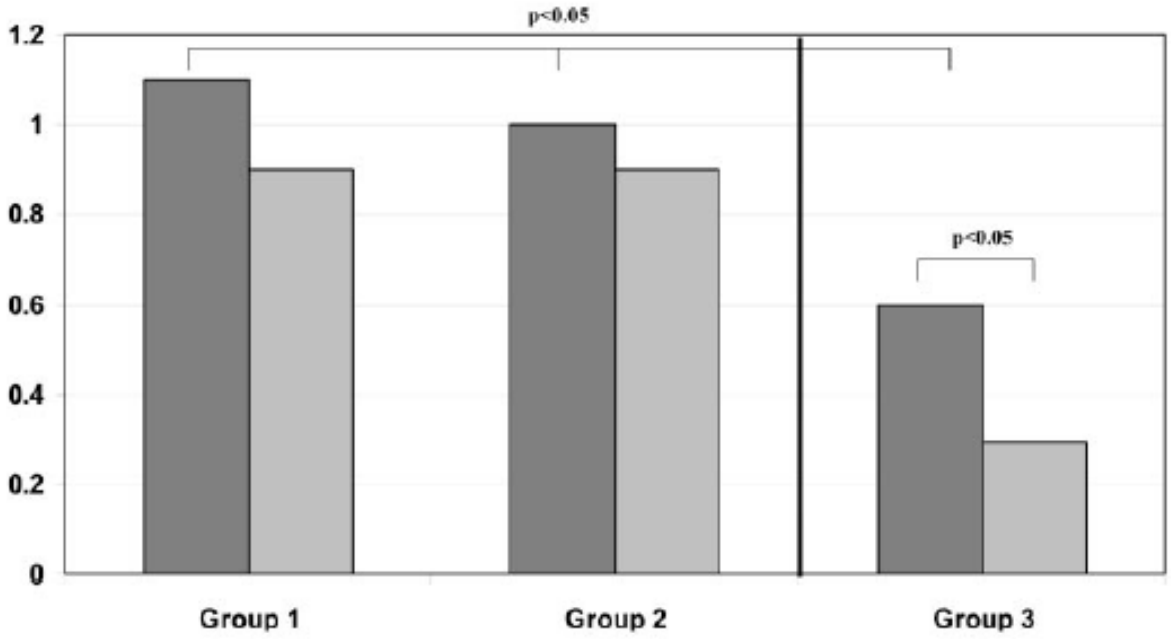

Figure 1. Quotient (Area true lumen/area false lumen) displayed for groups 1 to 3 at the time of diagnosis and 6 months after surgery for AADA. Probability value compares quotients from groups 1 and 2 with quotient from group 3 and quotient at the time of diagnosis and at follow-up (t=6 months) in group 3.

Group 1: no aortic diameter progression

Group 2: slight aortic diameter progression

Group 3: important progression requiring surgery

Large Area of the False Lumen Favors Secondary Dilatation of the Aorta After Acute Type A Aortic Dissection

Franz F. Immer, Eva Krähenbühl, Urs Hagen, Mario Stalder, Pascal A. Berdat, Friedrich S. Eckstein, Jürg Schmidli and Thierry P. Carrel

From the Department of Cardiovascular Surgery, University Hospital, Berne, Switzerland.

Circulation. 2005;112:I-249-I-252

- Large Area of False Lumen is a Strong Predictor for Secondary Dilatation
- Expansion of the aorta is mainly caused by a dilatation of the false lumen

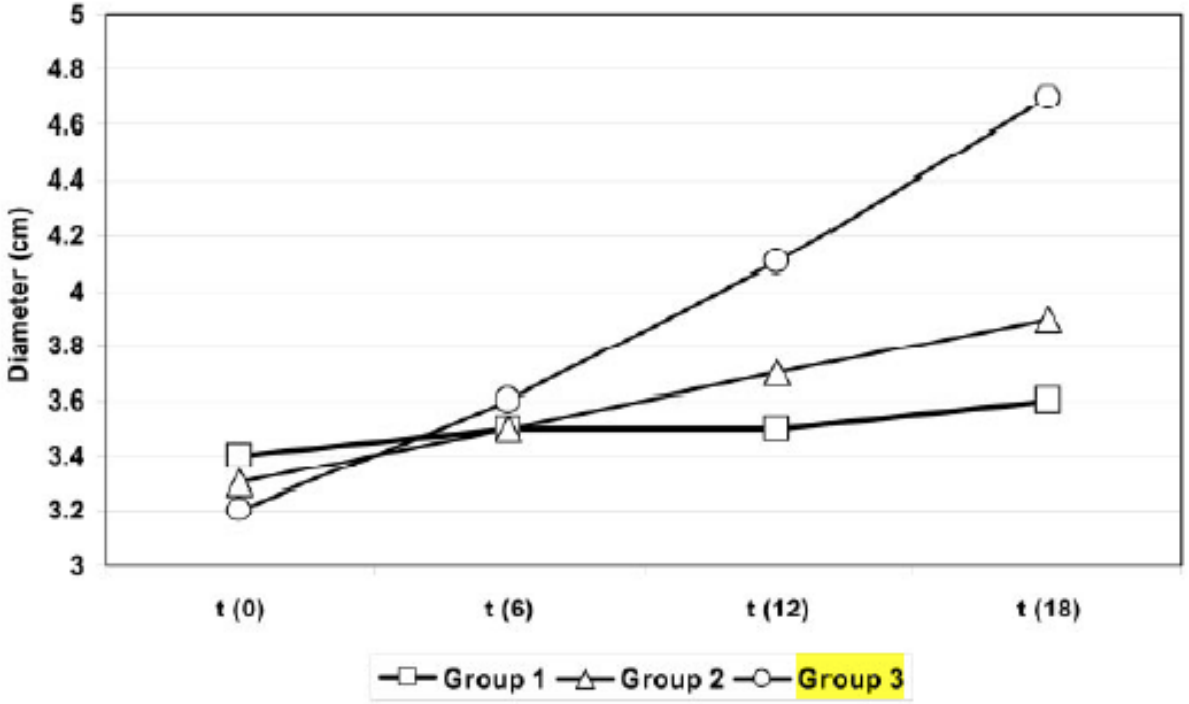

Figure 2. Progression of aortic diameter in groups 1 to 3 at the time of diagnosis and after 6, 12, and 18 months.

Large Area of the False Lumen Favors Secondary Dilatation of the Aorta After Acute Type A Aortic Dissection

Franz F. Immer, Eva Krähenbühl, Urs Hagen, Mario Stalder, Pascal A. Berdat, Friedrich S. Eckstein, Jürg Schmidli and Thierry P. Carrel

From the Department of Cardiovascular Surgery, University Hospital, Berne, Switzerland.

Circulation. 2005;112:I-249-I-252

Patent False-Lumen - Partially Thrombosed and Completely Thrombosed False Lumen

Evolution of Aortic Dissection After Surgical Repair

Rossella Fattori, MD, Letizia Bacchi-Reggiani, MSc, Paola Bertaccini, MD, Gabriella Napoli, MD, Francesca Fusco, MD, Massimo Longo, MD, Angelo Pierangeli, MD, and Giampaolo Gavelli, MD

Patients after aortic dissection repair still have long-term unfavorable prognosis and need careful monitoring. The purpose of this study was to analyze the evolution of aortic dissection after surgical repair in correlation to anatomic changes emerging from systematic magnetic resonance imaging (MRI) follow-up. Between January 1992 and June 1998, 70 patients underwent surgery for type A aortic dissection. Fifty-eight patients were discharged from the hospital (17% operative mortality) and were followed by serial MRI for 12 to 90 months after surgery. In all, 436 postoperative MRI examinations were analyzed. In 13 patients (22.5%) no residual intimal flap was identified, whereas 45 patients (77.5%) presented with distal dissection, with a partial thrombosis of the false lumen in 24. The yearly aortic growth rate was maximum in the descending aortic segment (0.37 ± 0.43 cm) and was significantly higher in the absence of thrombus in the false lumen (0.56 ± 0.57 cm) ($p < 0.05$). There were 4 sudden deaths, with documented aortic rupture in 2. Sixteen patients underwent reoperation for expanding aortic diameter. In all but 1 patient, a residual dissection was present (in 13 without any thrombosis of the false lumen). Close MRI follow-up in patients after dissection surgical repair can identify the progression of aortic pathology, providing effective prevention of aortic rupture and timely reoperation. Thrombosis of the false lumen appears to be a protective factor against aortic dilation. ©2000 by Excerpta Medica, Inc.

(Am J Cardiol 2000;86:868–872)

Effects of Early Anticoagulation on the Degree of Thrombosis After Repair of Acute DeBakey Type I Aortic Dissection

Suk-Won Song, MD, PhD, Kyung-Jong Yoo, MD, PhD, Do-Kyun Kim, MD, Bum-Koo Cho, MD, PhD, Gijong Yi, MD, PhD, and Byung-Chul Chang, MD, PhD

Department of Thoracic and Cardiovascular Surgery, Gangnam Severance Hospital, and Department of Thoracic and Cardiovascular Surgery, Yonsei Cardiovascular Hospital, Severance Hospital, Yonsei University Health System, Seoul; Department of Thoracic and Cardiovascular Surgery, Ilsan Hospital, National Health Insurance Corporation, Ilsan; and The Korea Heart Foundation, Seoul, Republic of Korea

Background. The degree of false lumen thrombosis after surgical repair of acute DeBakey type I aortic dissection can predict long-term outcomes. However, there are currently no evidence-based recommendations for anticoagulation. We analyzed the effect of early anticoagulation on the residual false lumen and long-term outcomes.

Methods. This was a retrospective observational study of 136 patients with acute DeBakey type I aortic dissection who underwent surgical repair between 1997 and 2007. We assessed the effect of early anticoagulation on the degree of thrombosis of the false lumen, segmental growth rates, repeat distal procedures, and long-term survival.

Results. Among the 136 patients who underwent operations, imaging data in 103 were sufficient for analyzing the degree of thrombosis of the false lumen. Of those, 56 (54%) received anticoagulation therapy immediately postoperatively. The early-anticoagulation group had a higher proportion of completely patent false lumens and lower partial thrombosis than the no-anticoagulation group. Mean segmental aortic growth rate was significantly lower in the early-anticoagulation group than in the no-anticoagulation group (2.9 ± 1.3 and 4.5 ± 2.8 mm/year, $p = 0.0184$). Overall survival and aorta-related repeat procedure-free survival were significantly better with early anticoagulation than with no anticoagulation ($p < 0.05$).

Conclusions. Early anticoagulation after surgical repair of acute DeBakey type I aortic dissection might have a favorable effect on the onset or extension of thrombosis, aortic growth rate, the need for repeat distal procedures, overall survival, and thrombosis-related complications during long-term follow-up.

(Ann Thorac Surg 2011;92:1367–75)

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rupture and timely reoperation. Thrombosis of the false lumen appears to be a protective factor against aortic dilation. ©2000 by Excerpta Medica, Inc.
(Am J Cardiol 2000;86:868–872)

Conclusions. Early anticoagulation after surgical repair of acute DeBakey type I aortic dissection might have a favorable effect on the onset or extension of thrombosis, aortic growth rate, the need for repeat distal procedures, overall survival, and thrombosis-related complications during long-term follow-up.
(Ann Thorac Surg 2011;92:1367–75)
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Patent False-Lumen - Partially Thrombosed and Completely Thrombosed False Lumen

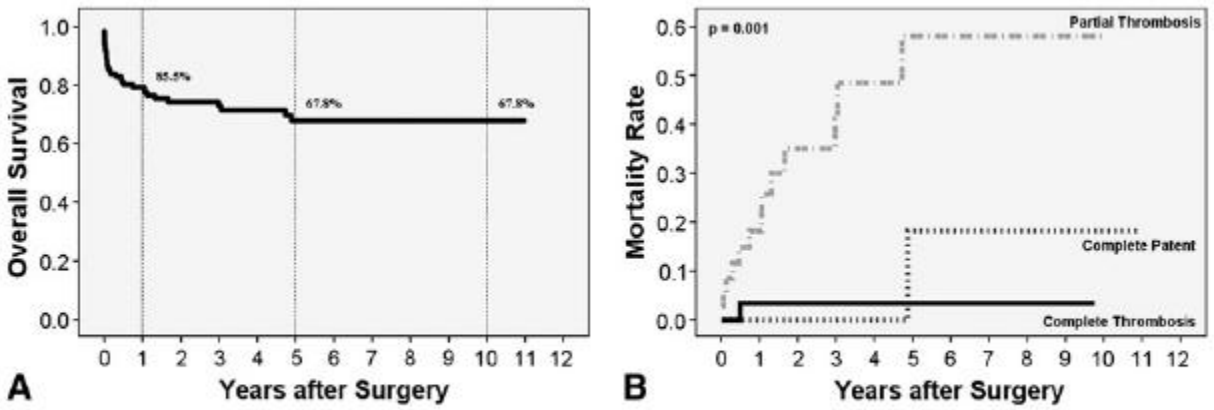


FIGURE 1. A, Overall survival after surgical repair of AIAD. B, Cumulative mortality rate after surgical repair of AIAD according to the thrombosis degree of false lumen in the distal aorta.

Effects of partial thrombosis on distal aorta after repair of acute DeBakey type I aortic dissection

Suk-Won Song, MD, PhD,[a] Byung-Chul Chang, MD, PhD,[b] Bum-Koo Cho, MD, PhD,[b] Gijong Yi, MD,[a] Young-Nam Youn, MD,[b] Sak Lee, MD,[b] and Kyung-Jong Yoo, MD, PhD[b]

Conclusion: Partial thrombosis of the false lumen after repair of acute DeBakey type I aortic dissection, compared with complete patency or complete thrombosis, is a significant independent predictor of aortic enlargement, aorta-related reprocedures, and poor long-term survival. (J Thorac Cardiovasc Surg 2010;139:841-7)

Patent False-Lumen - Partially Thrombosed and Completely Thrombosed False Lumen

- Partial thrombosis, compared with complete patency or complete thrombosis, seems to be a predictor of aortic enlargement
- The mechanism remains speculative
- A completely patent false lumen may be perfused by en entry tear and decompressed through another re-entry
- In a partial thrombosis false lumen the thrombus may occlude the re-entry, impending the outflow, increasing the false lumen pressure, wall tension and subsequent dilation

Type I Sub-Acute Aortic Dissection

Case 1

History

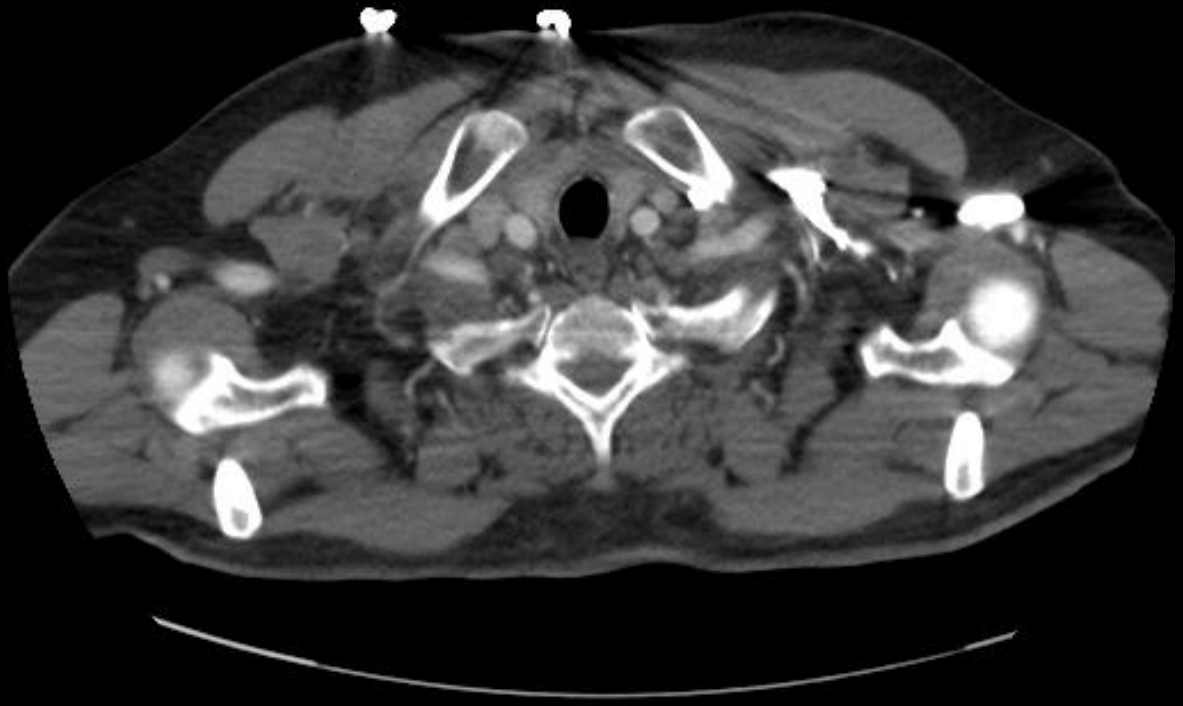
Male
Age: 60 y.o.
Symptoms' onset, two weeks before hospitalization
Type I Aortic dissection
Severe Aortic regurgitation, dyspnea at rest
Paroxysmal nocturnal dyspnea
No neurologic damage
Normal renal function
No abdominal ischemia

Surgery

Bentall operation plus hemi-arch replacement
Moderate hypothermia 25°, ASCP
28 mm. vascular prostheses
25 mm, St.Jude biological valve with 28 mm. "Valsalva" type vascular prostheses

Type I Sub-Acute Aortic Dissection
CT scan at presentation

Case 1



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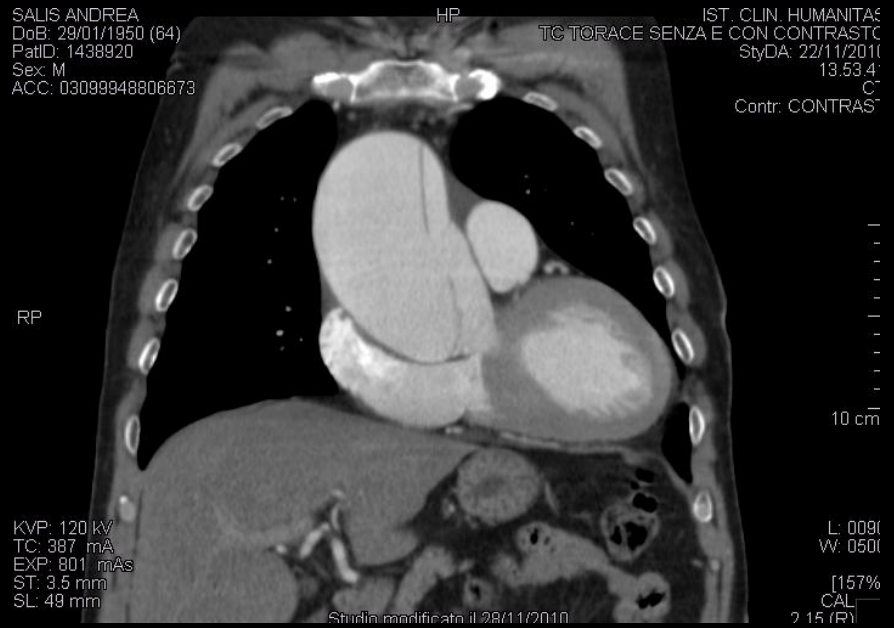
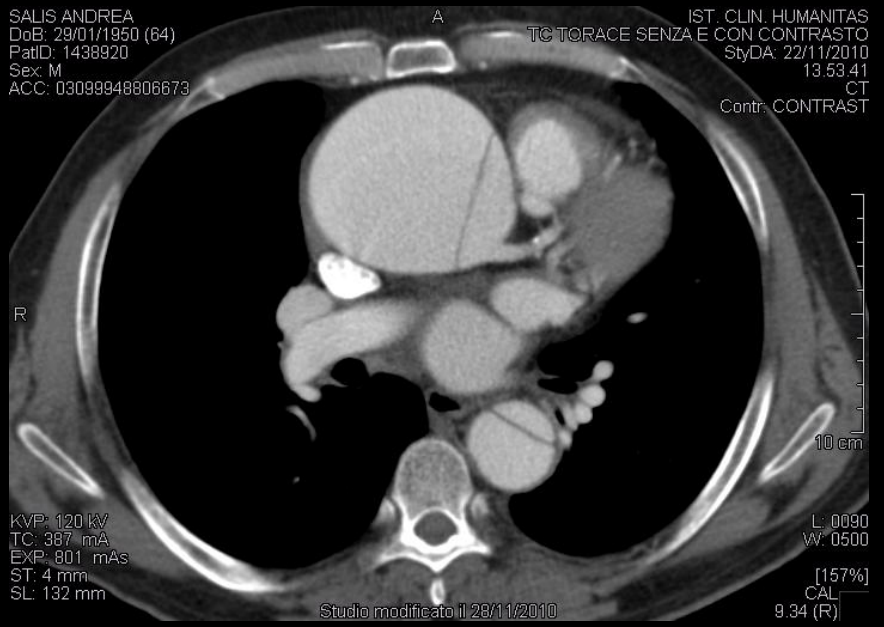
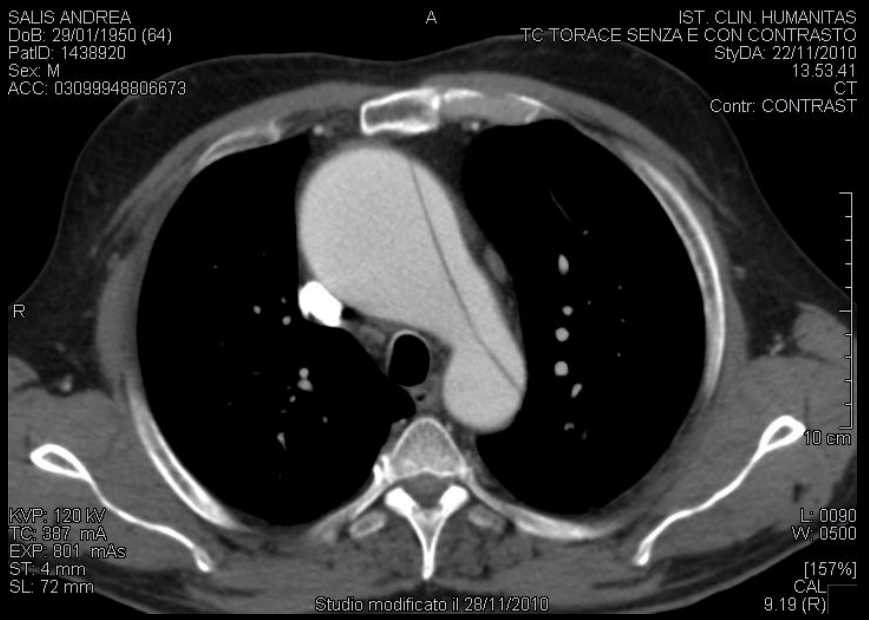
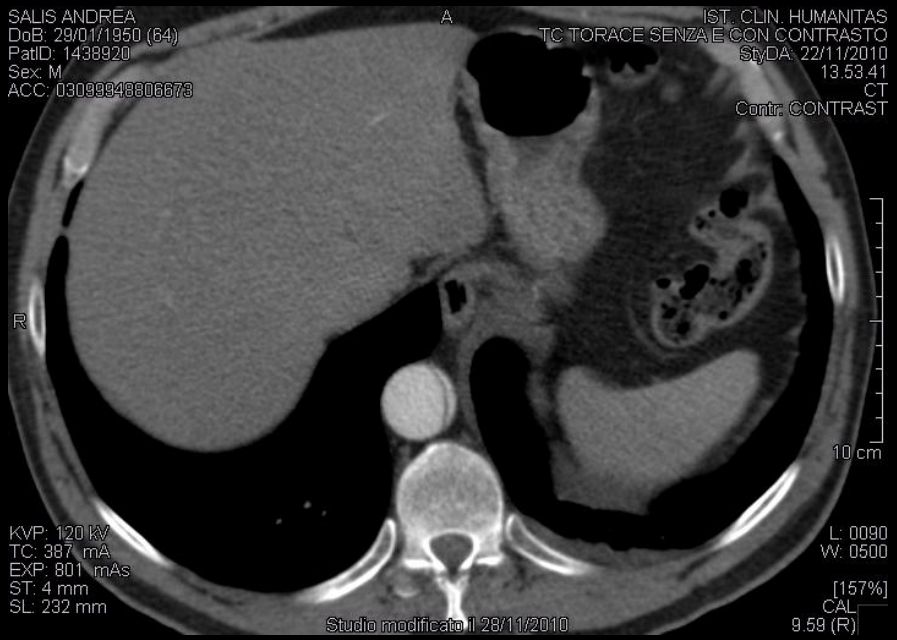
Type I Sub-Acute Aortic Dissection – CT scan at presentation

Case 1



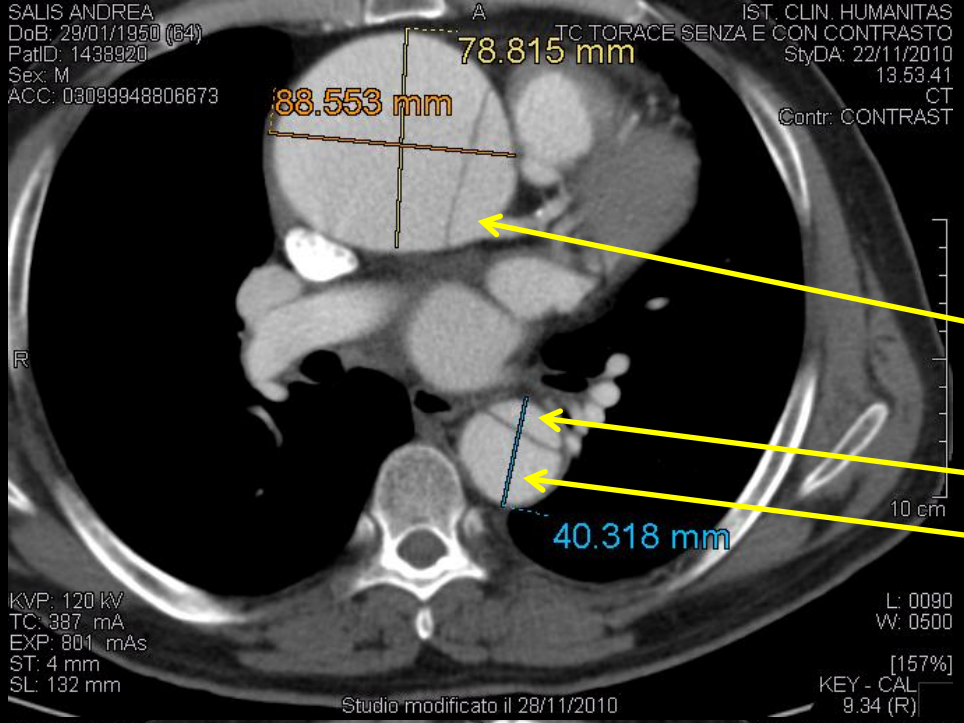


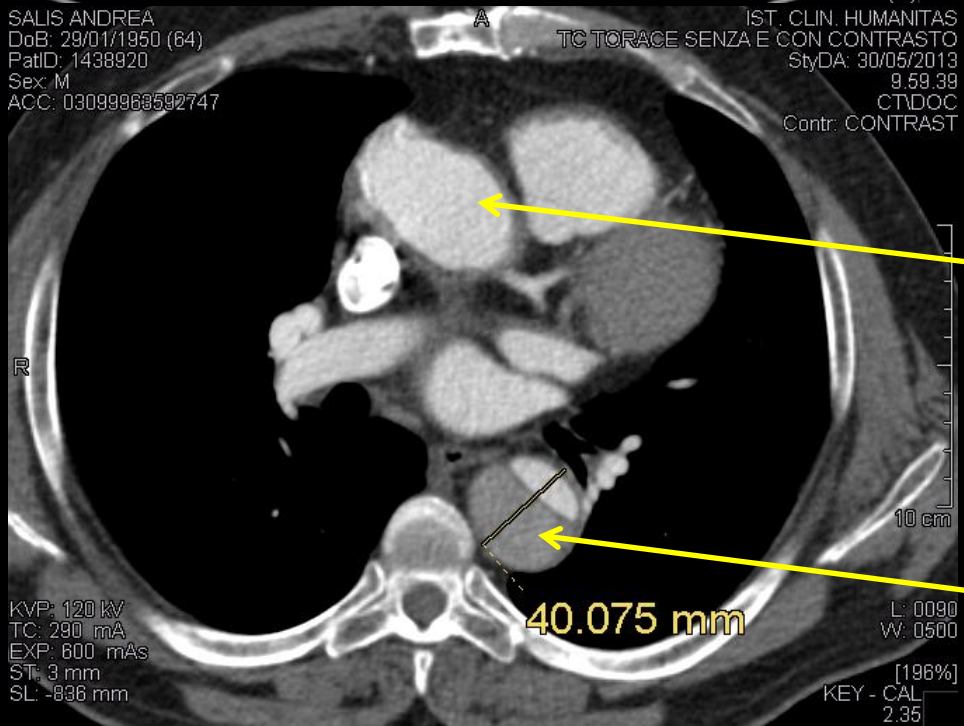




CT-Scan Follow-up at three years

Case 1





DeBakey Type I Aortic Dissection, CT-scan at presentation

Case 1

Left Coronary Artery from True Lumen

True Lumen

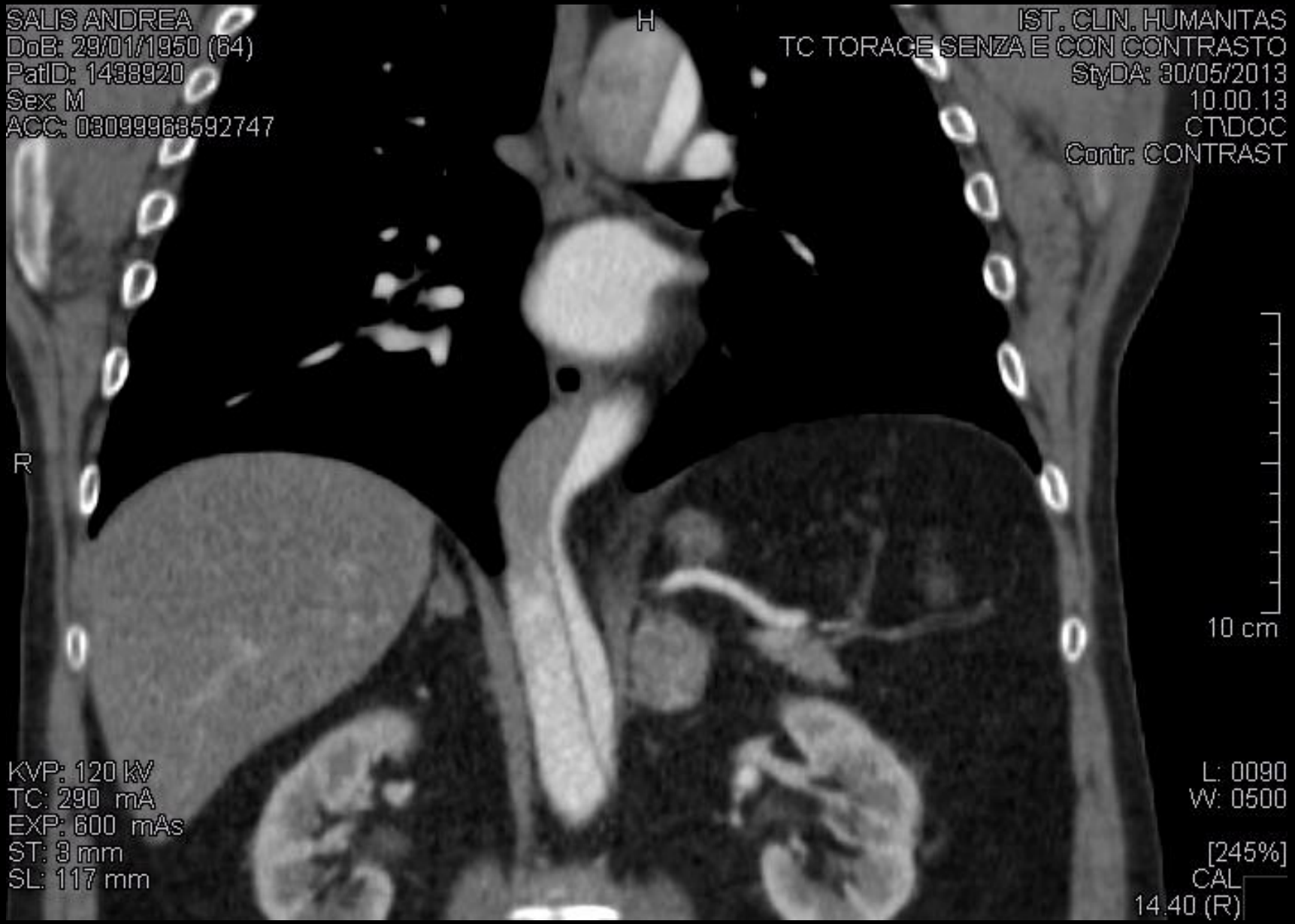
False Lumen

CT-Scan at three years

Ascending Aorta Prosthesis

False Lumen Thrombosis

Case 1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TC: 290 mA
EXP: 600 mAs
ST: 3 mm
SL: 117 mm
L: 0090
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CAL
14.40 (R)

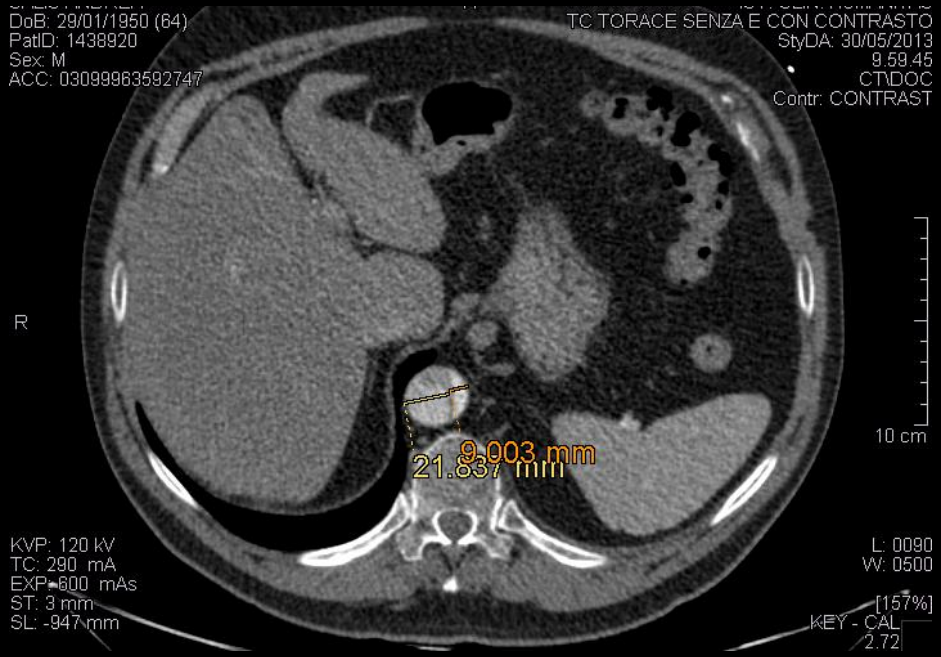
Case 1

Acute

True Lumen = 4.24 mm

False Lumen = 27.15 mm

Follow-up at three years



True Lumen = 9.03 mm

False Lumen = 21.8 mm

Type I Acute Aortic Dissection

Case 2

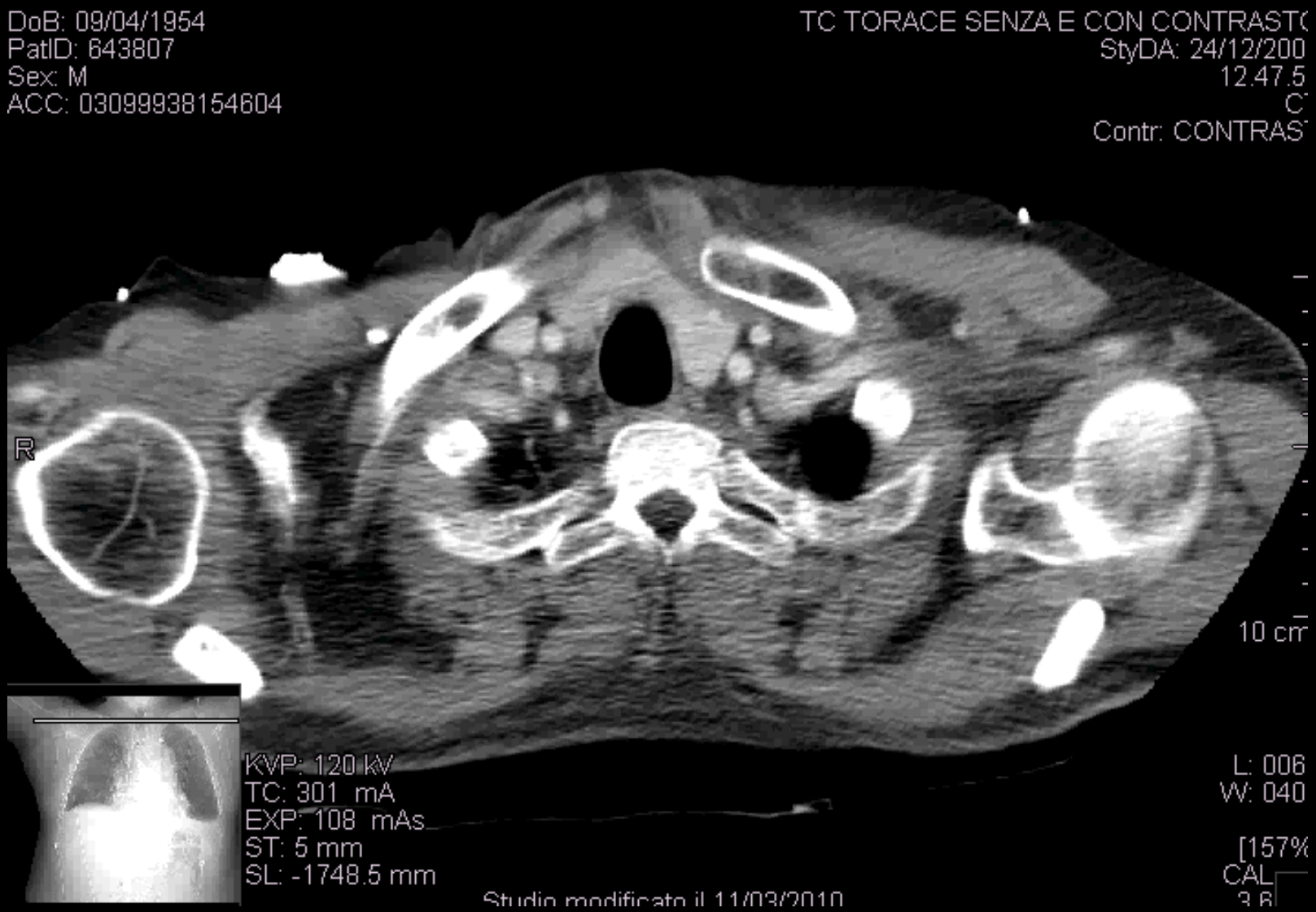
History

Male
Age: 54 y.o.
CAD, surgical revascularization 25 days before readmission
Double mammary plus saphenous vein graft on RC
CT-scan: Type I Aortic dissection
Stable conditions at admission
No neurologic damage
Normal renal function
No abdominal ischemia

Surgery

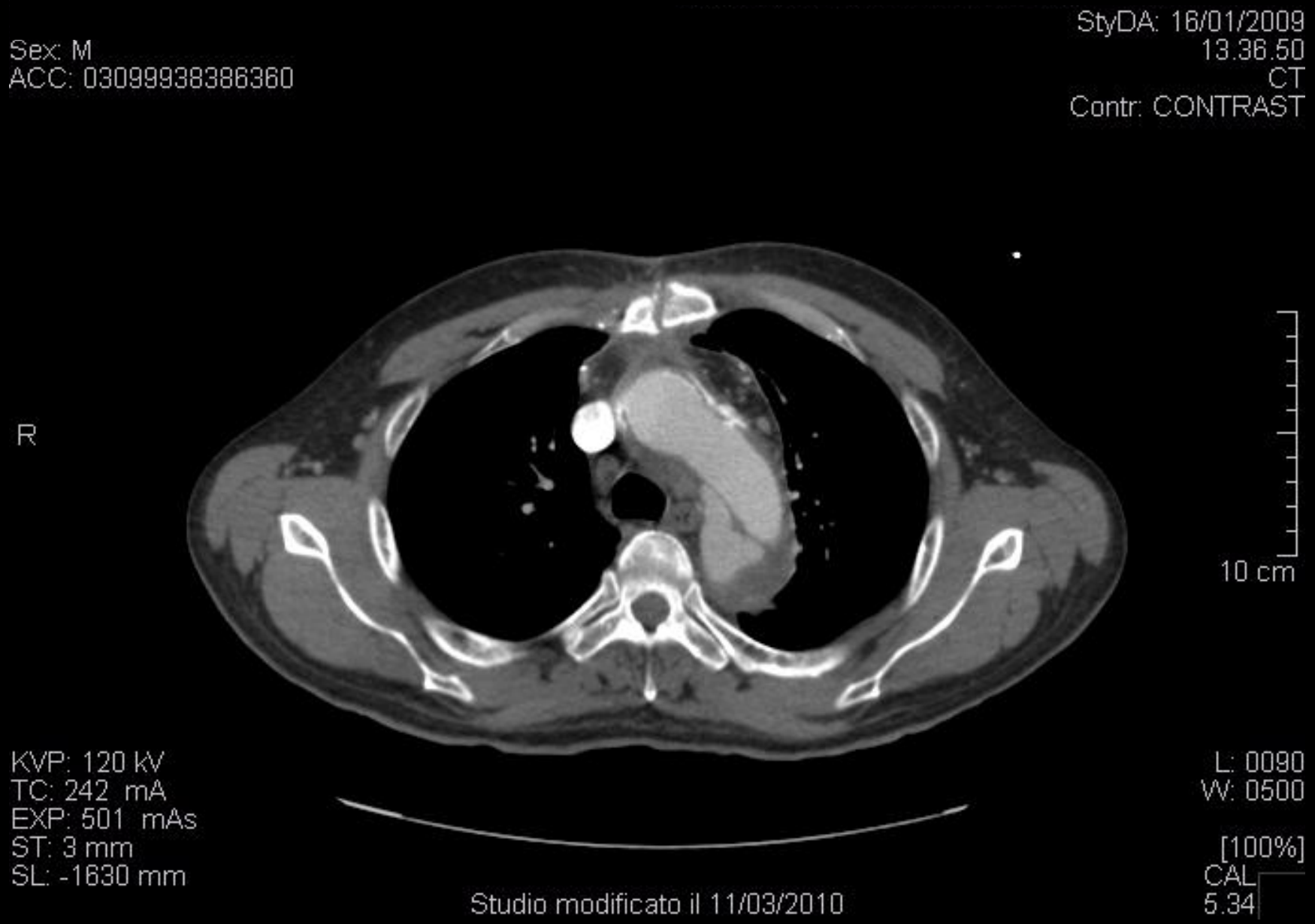
Ascending aorta replacement, 28 mm. vascular prostheses
Circulatory arrest
Moderate hypothermia 25°, ASCP

Acute Type I Aortic Dissection, Post-operative CT-Scan Case 2



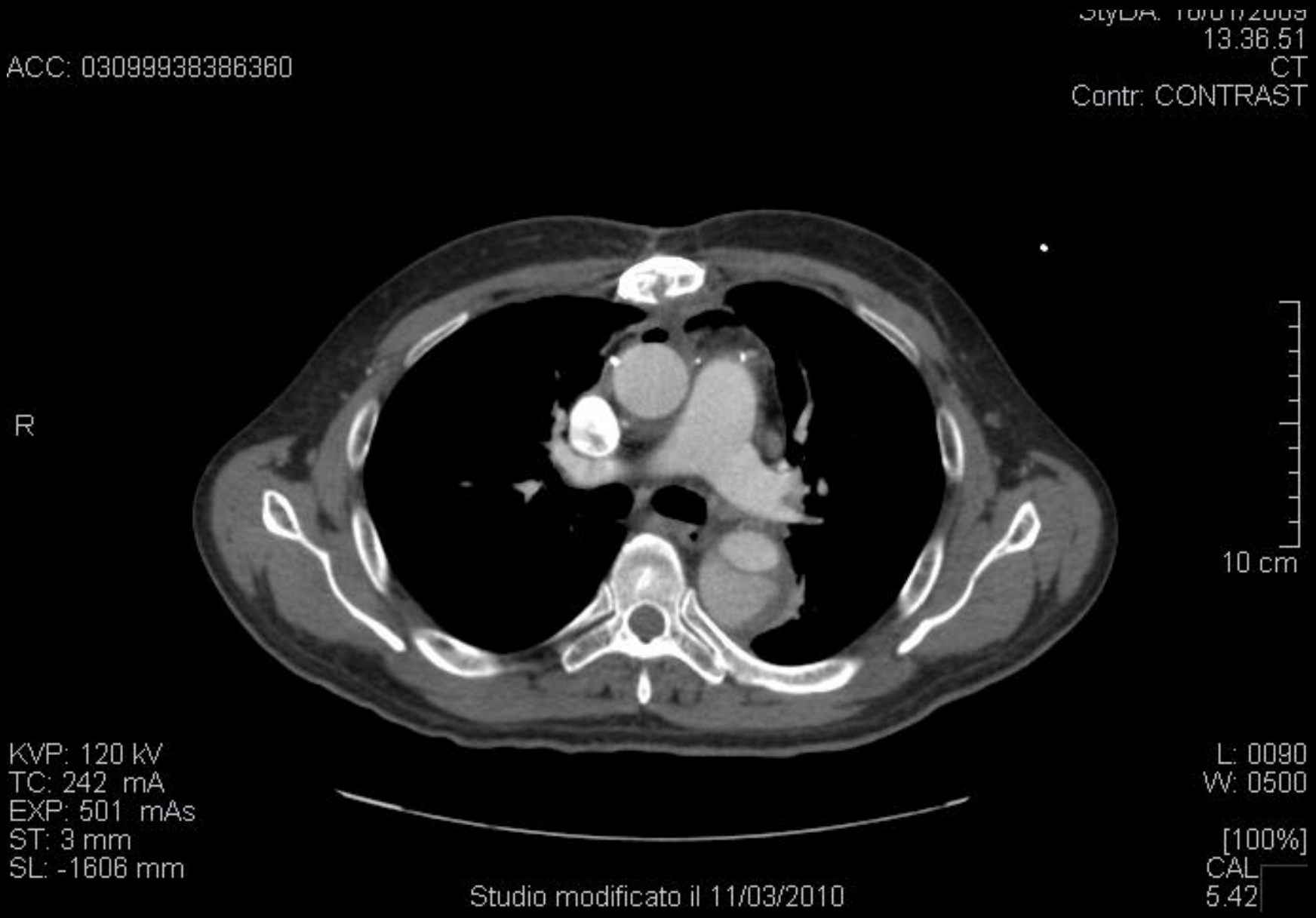
Acute Type I Aortic Dissection, CT-Scan at one month

Case 2



Acute Type I Aortic Dissection, CT-Scan at one month

Case 2

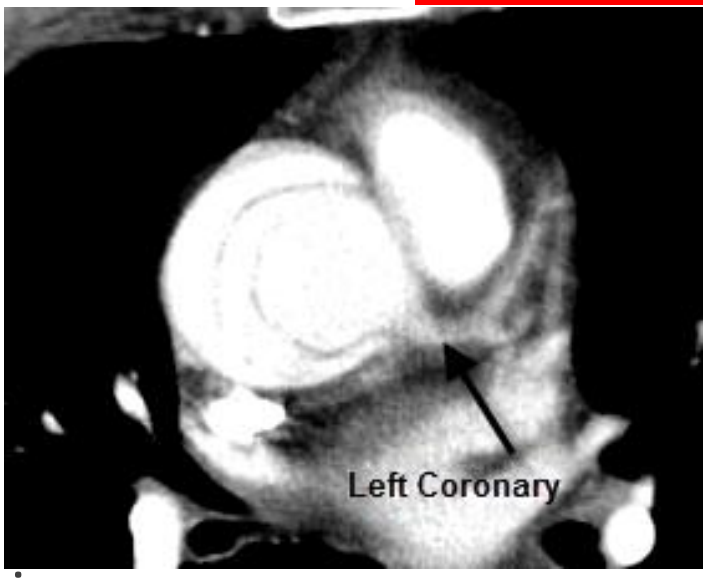


Acute Type I Aortic Dissection, MR at three years

Case 2

1st Admission

Case, 3



- Male, 55 y.o. Hypertension
- Stable conditions on admission
- 3/6 Diastolic murmur
- Normal peripheral pulses
- Echo: Aortic regurg. , pericardial effusion

Surgery:

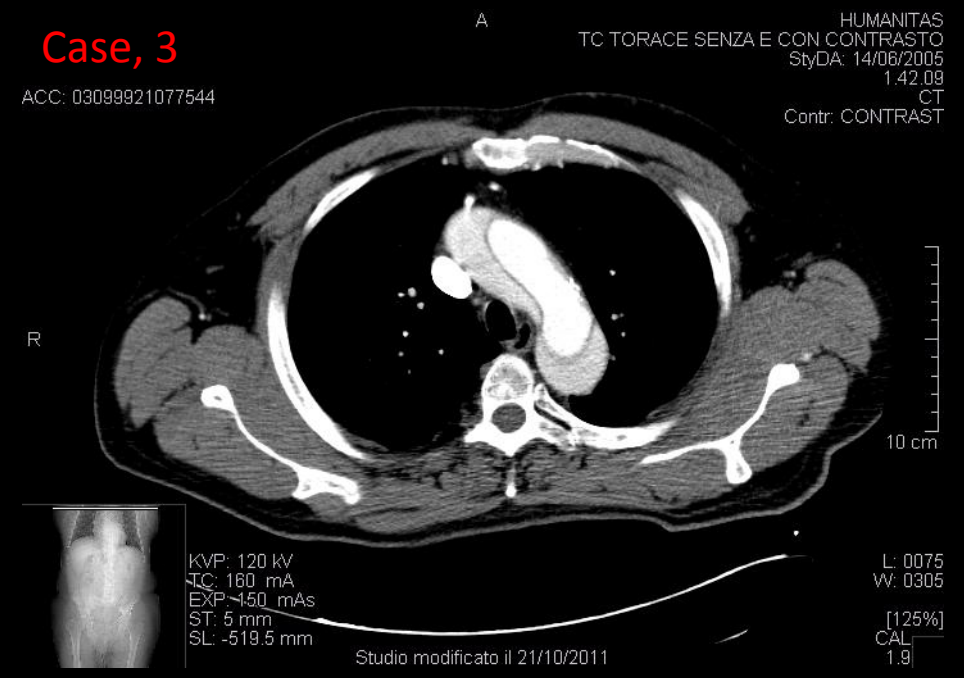
- Bentall (Carbomedics 25 mm) plus hemi-arch replacement
- Moderate hypothermia (24°) ASCP (Kazui)
- Uneventful procedure

Case, 3

1st Admission

CT-Scan on Admission, Type I Acute Aortic Dissection

Case, 3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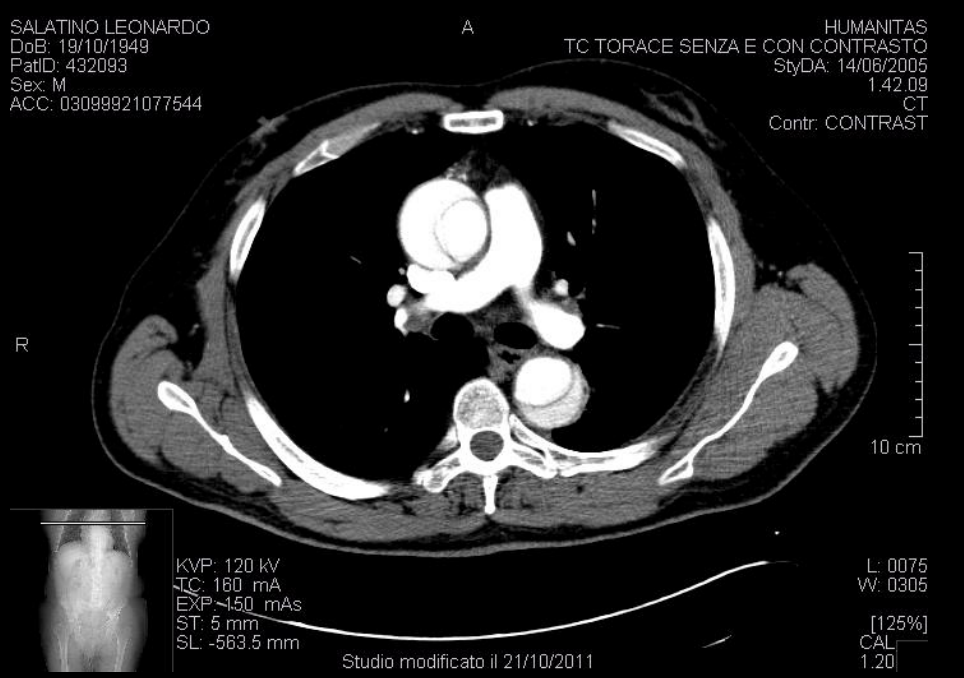
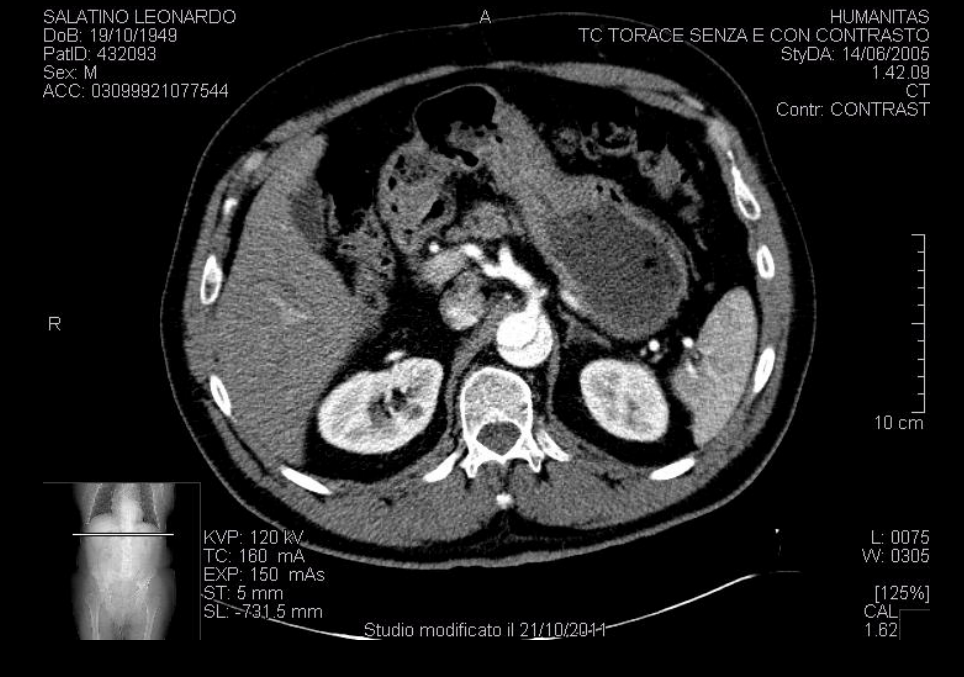
KVP: 120 kV
TC: 160 mA
EXP: 150 mAs
ST: 5 mm
SL: -519.5 mm
L: 0075
W: 0305
[125%]
CAL
1.9
Studio modificato il 21/10/2011


SALATINO LEONARDO
DoB: 19/10/1949
PatID: 432093
Sex: M
ACC: 03099921077544
A
HUMANITAS
TC TORACE SENZA E CON CONTRASTO
StyDA: 14/06/2005
1.42.09
CT
Contr: CONTRAST
R
10 cm
KVP: 120 kV
TC: 160 mA
EXP: 150 mAs
ST: 5 mm
SL: -563.5 mm
L: 0075
W: 0305
[125%]
CAL
1.20
Studio modificato il 21/10/2011


SALATINO LEONARDO
DoB: 19/10/1949
PatID: 432093
Sex: M
ACC: 03099921077544
A
HUMANITAS
TC TORACE SENZA E CON CONTRASTO
StyDA: 14/06/2005
1.42.09
CT
Contr: CONTRAST
R
10 cm
KVP: 120 kV
TC: 160 mA
EXP: 150 mAs
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SL: -731.5 mm
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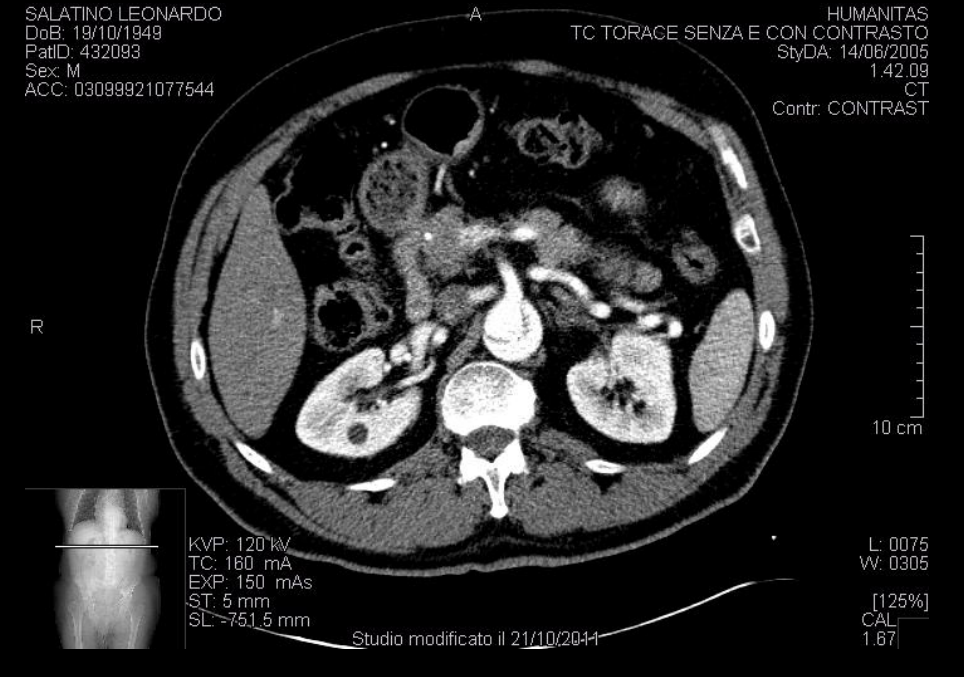
[125%]
CAL
1.62
Studio modificato il 21/10/2011


SALATINO LEONARDO
DoB: 19/10/1949
PatID: 432093
Sex: M
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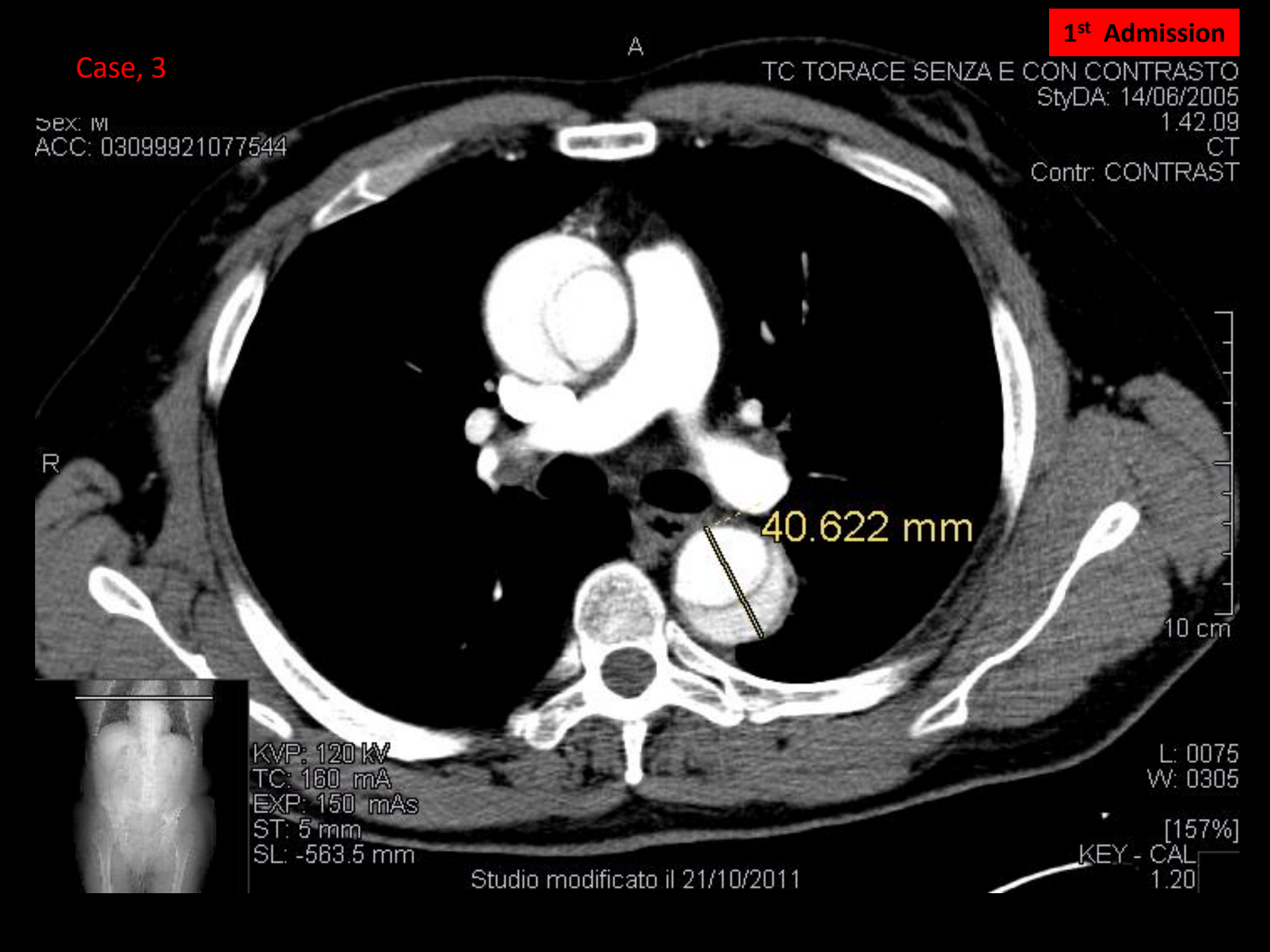
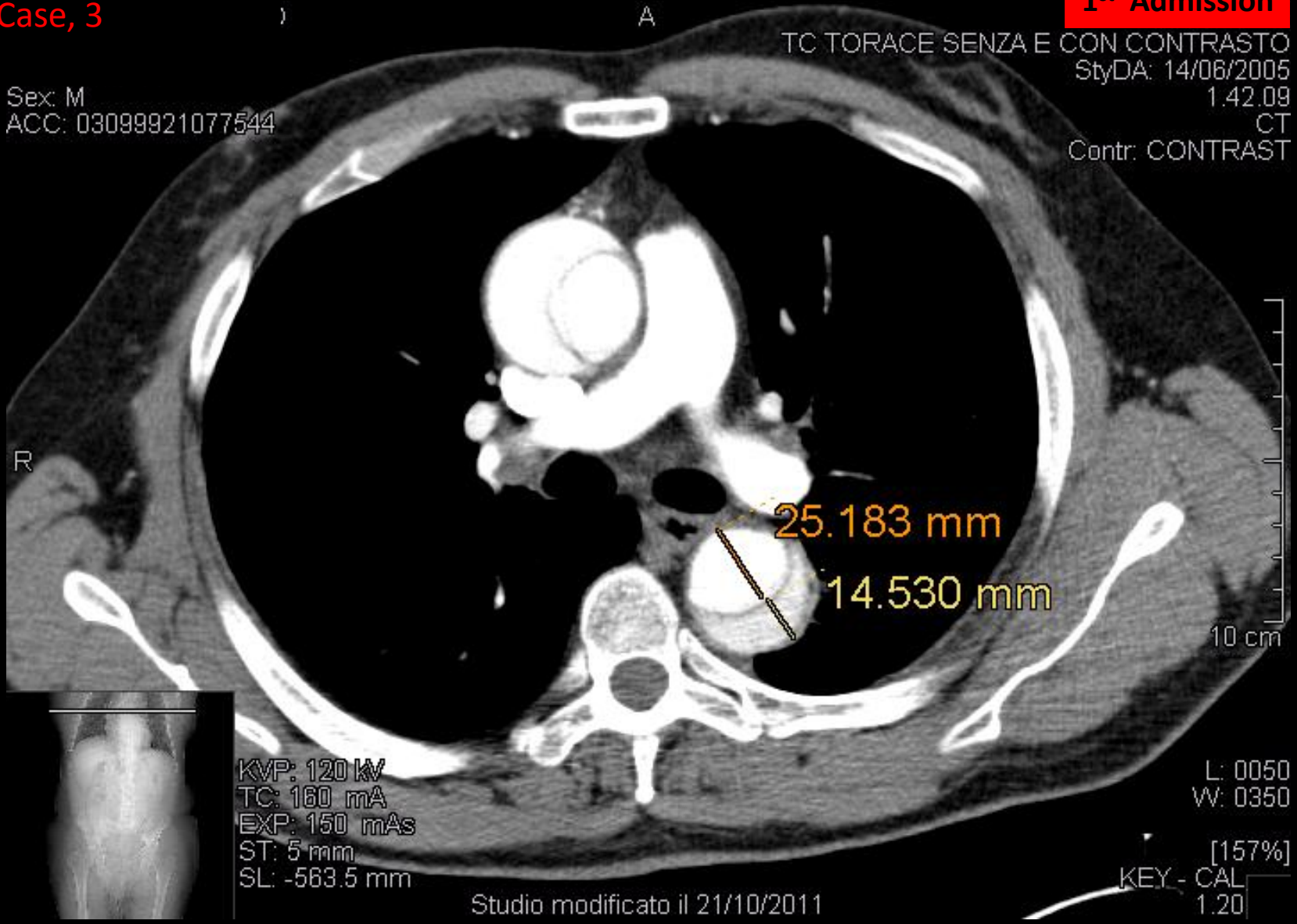
A
HUMANITAS
TC TORACE SENZA E CON CONTRASTO
StyDA: 14/06/2005
1.42.09
CT
Contr: CONTRAST
R
10 cm
KVP: 120 kV
TC: 160 mA
EXP: 150 mAs
ST: 5 mm
SL: -751.5 mm
L: 0075
W: 0305
[125%]
CAL
1.67
Studio modificato il 21/10/2011


1st Admission
Case, 3
A
TC TORACE SENZA E CON CONTRASTO
StyDA: 14/06/2005
1.42.09
CT
Contr: CONTRAST
Sex: M
ACC: 03099921077544
R
40.622 mm
10 cm
KVP: 120 kV
TC: 160 mA
EXP: 150 mAs
ST: 5 mm
SL: -563.5 mm
L: 0075
W: 0305
[157%]
KEY - CAL
1.20
Studio modificato il 21/10/2011

Case, 3

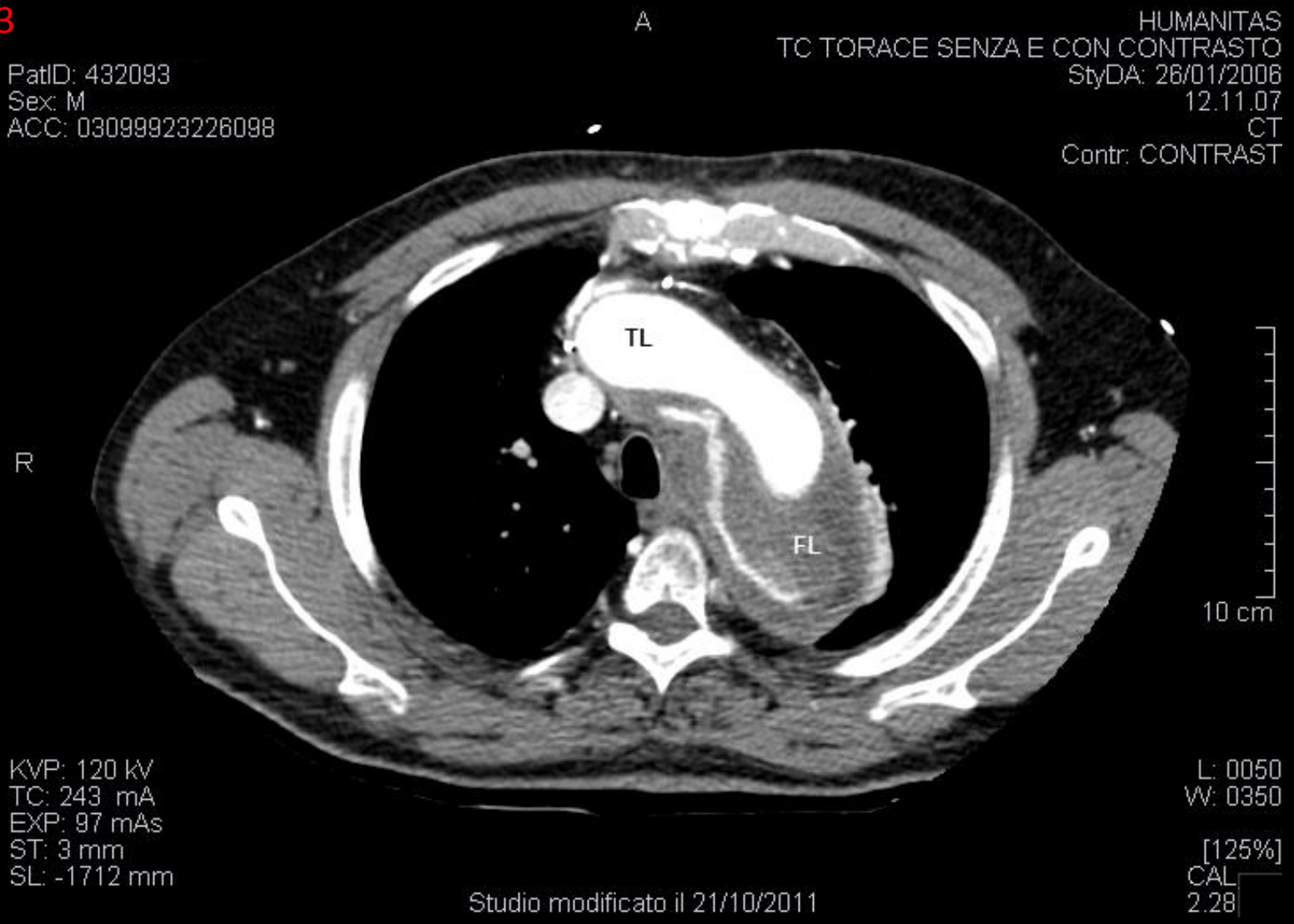
1st Admission



CT-scan at 6 months: Severe dilatation of the distal aortic arch and descending aorta (Ø=7.1 cm.)

2nd Admission

Case, 3



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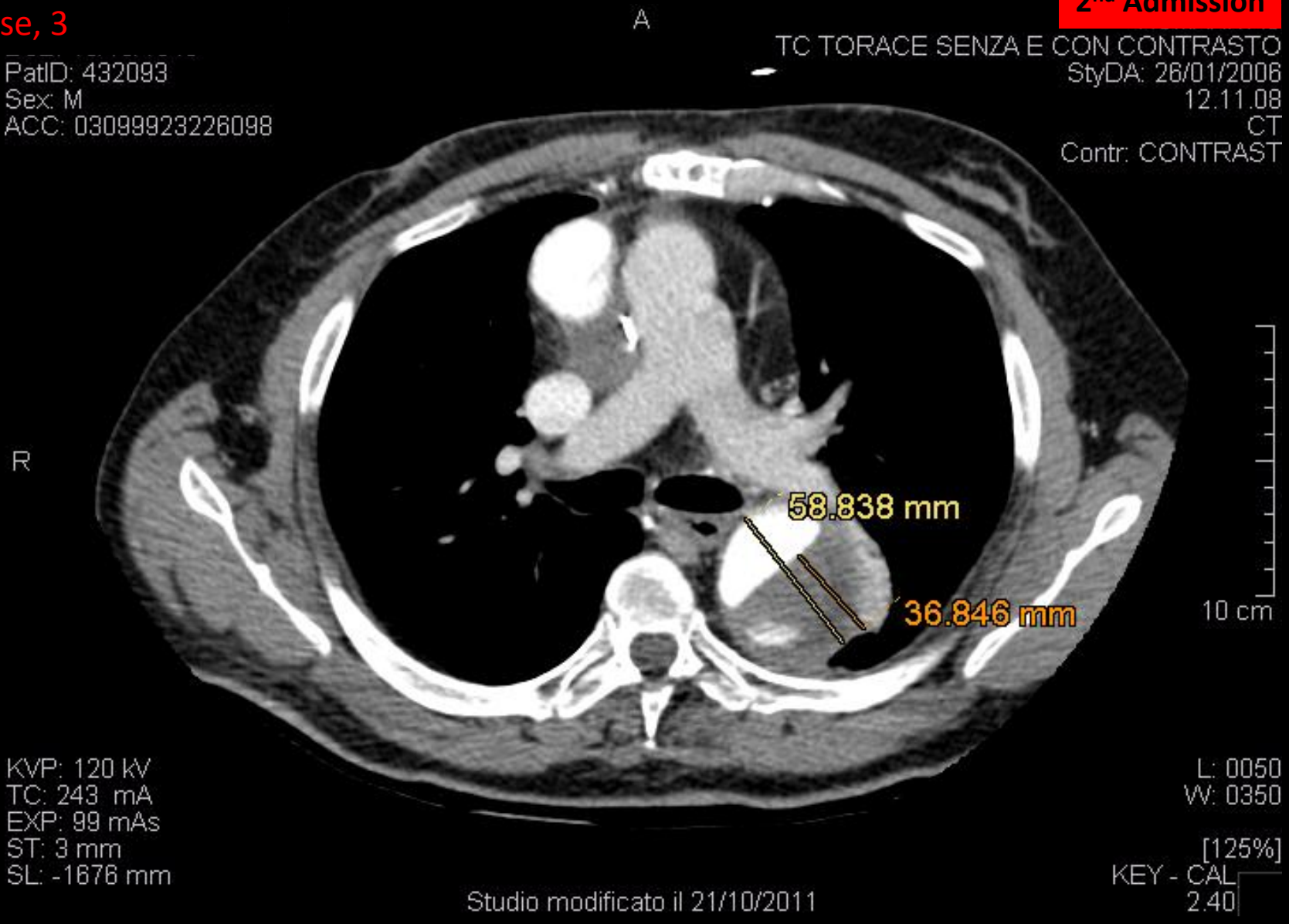
Case, 3

2nd Admission



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Case, 3

Severe dilatation of the aortic arch and descending aorta

2nd Admission

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2nd Admission

Aortic arch replacement plus "elephant trunk" with 30 mm. trifurcated vascular prostheses

Circulatory arrest with moderate hypothermia (24°) plus ASCP

Uneventful course

Discharged on 6th p.o. day

Six months later

3rd Admission

Sudden chest pain, shoulders and back,

Emergency CT-scan

Case, 3

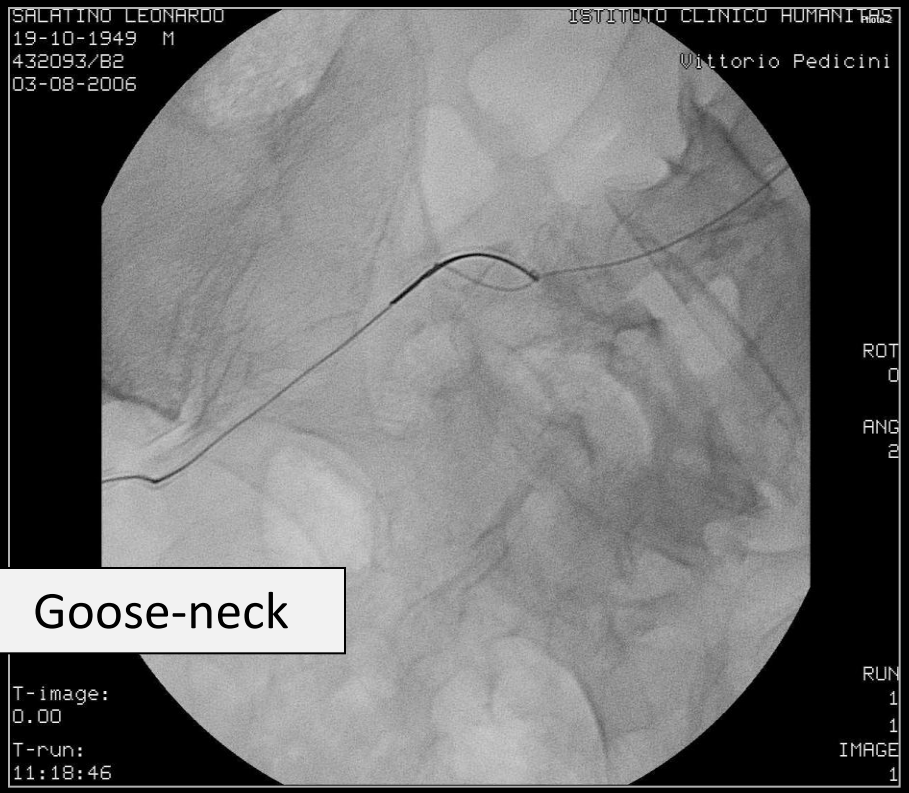
Emergency CT-scan six months later

3rd Admission

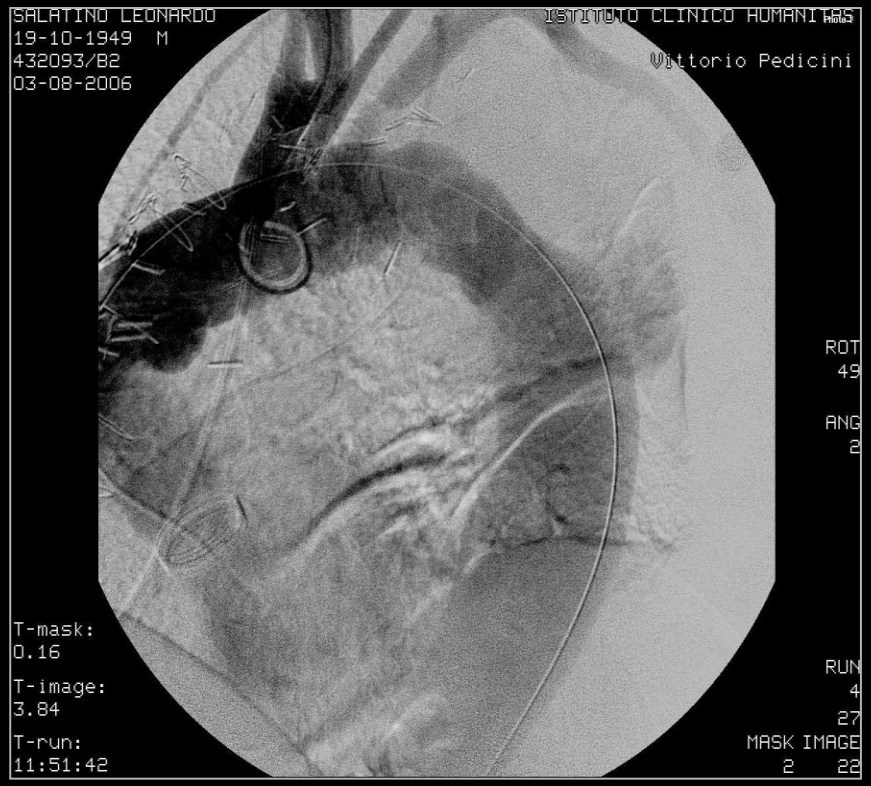
Case, 3

Thoracic Stent Graft, deployed from the elephant trunk

3rd Admission



Goose-neck



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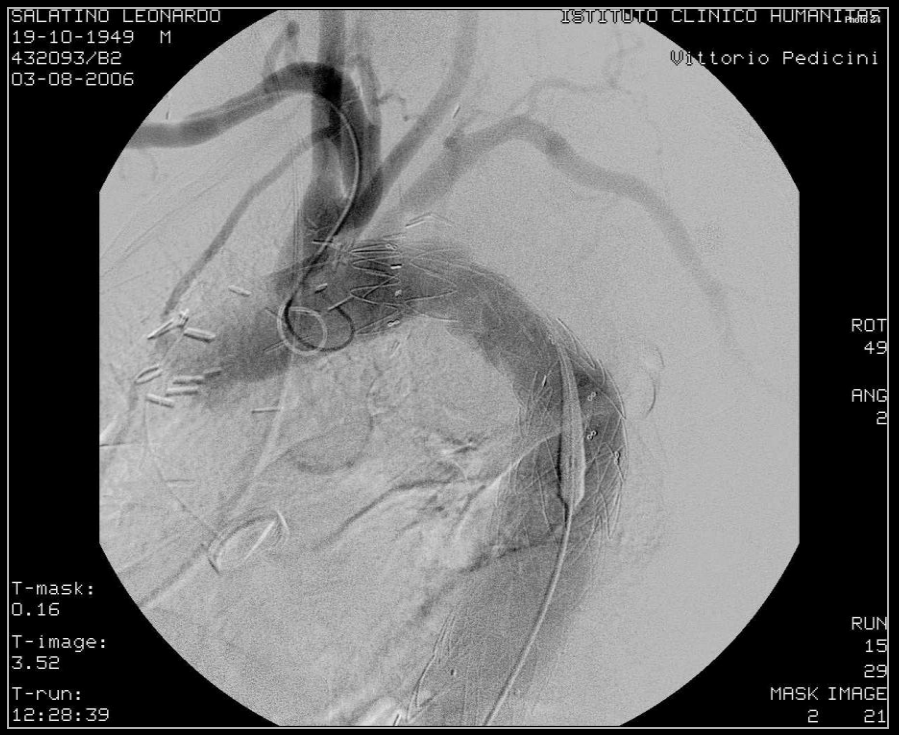
Case, 3

Proximal Stent Graft (Ø = 36 mm, length 22 mm)

3rd Admission



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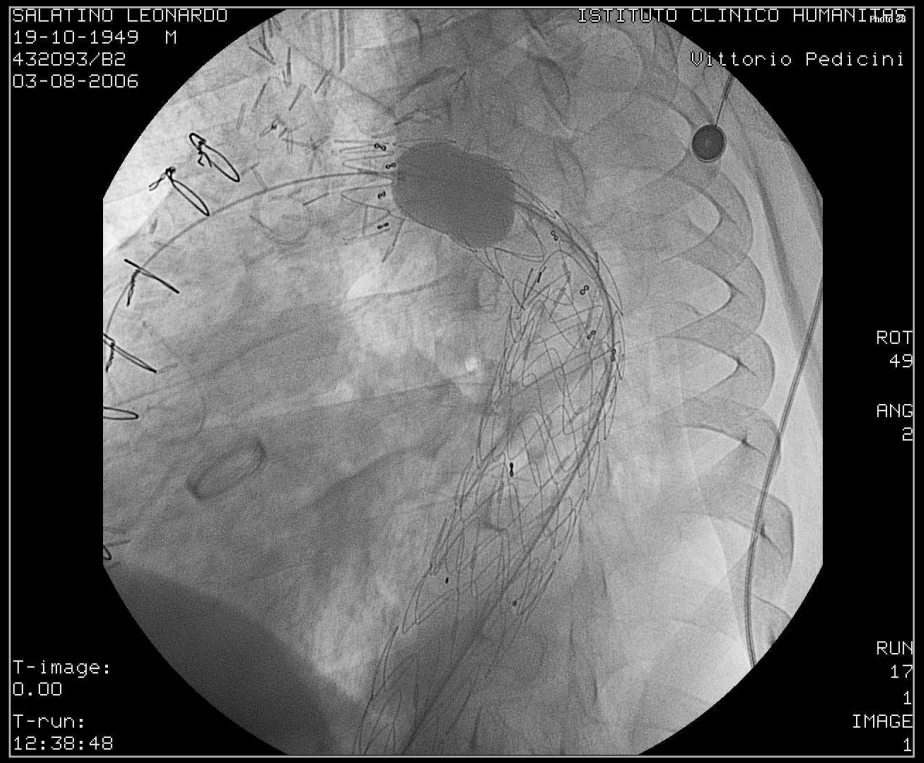
Case, 3

Distal Stent Graft (Ø = 42 mm, length 20 mm)

3rd Admission



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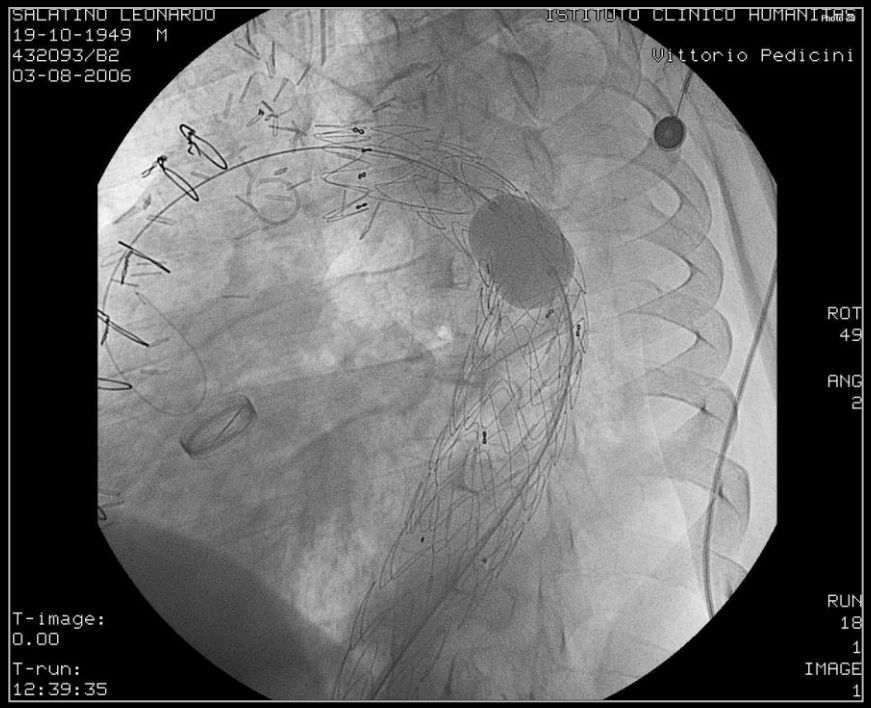
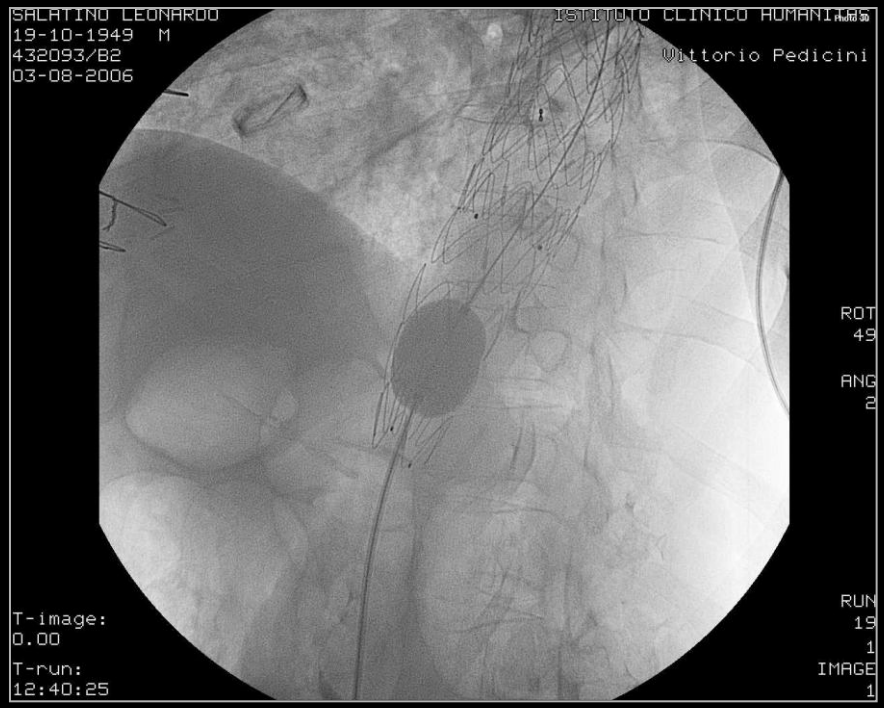
Case, 3

3rd Admission

Balloon expansion of the junction area between the two stents



Balloon expansion of the distal landing zone



Conclusions

- Acute Aortic dissection, after surgical repair, constitutes a life-long chronic disease
- Careful monitoring of post-surgical correction is mandatory
- The upper and middle descending aortic tract dilates more frequently
- Large patent false lumen in the upper aortic tract is a bad prognostic sign
- Anti-hypertensive drugs reduces the risk of further dilation
- Repeated surgical procedures and stent-graft insertion can modify natural history