OUTCOME OF ENDOVASCULAR REPAIR OF RUPTURED DESCENDING THORACIC AORTIC ANEURYSM

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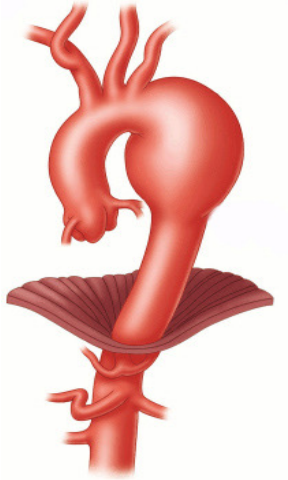
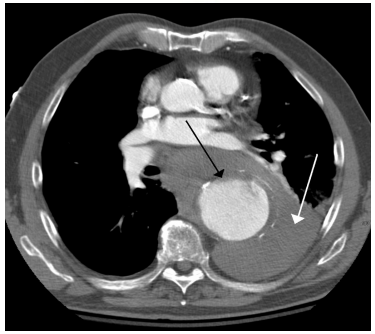
RUPTURED DESCENDING THORACIC AORTIC ANEURYSM



- **rDTAA: life-threatening**
- **Need early diagnosis & treatment**
- **Rate: 5 / 100.000 persons/year [1]**
- **rDTAA: accounts for 30% Thoracic Aortic Ruptures[2]**
- **High morbidity & mortality: more than 90%[3]**



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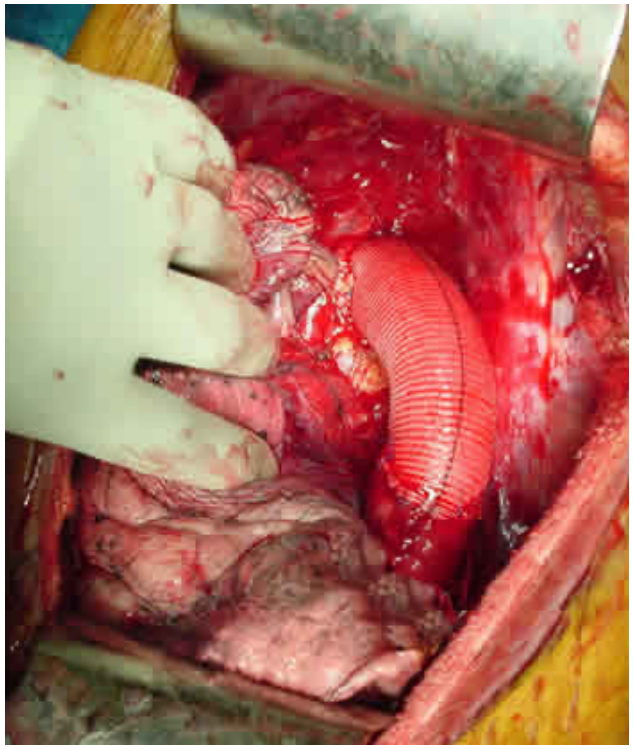
2. Moore , S.W. (2013), Vascular and endovascular surgery, Elsevier Saunders, Philadelphia. pp.597-605.

3. Amer Harky, Nichola Manu, Rafal Al Nasiri, Dilan Sanli, Ciaran Grafton-Clarke, Jeffrey Shi Kai Chan, et al. (2018) "Ruptured isolated descending thoracic aortic aneurysm: open or endovascular repair?". Vessel Plus, 2 (5)

OPEN REPAIR OF RUPTURED DESCENDING THORACIC AORTIC ANEURYSM

Morbidity & Mortality	Rate (%) [1-3]
Mortality	**12,3 – 28,5**
Stroke	4,1 – 7
Paraplegia	5 – 12,5
Myocardial Infarction	10 – 23
Respiratory failure	4,8 – 9
Renal failure	2- 8,8

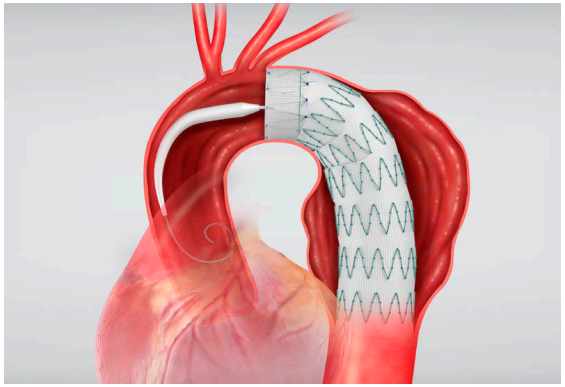


1.Minatoya, K., et al. (2008), "Replacement of the descending aorta: recent outcomes of open surgery performed with partial cardiopulmonary bypass", J Thorac Cardiovasc Surg. 136(2), pp. 431-435.

2. M. Gaudino, C. Lau, M. Munjal, L. N. Girardi (2015) "Open repair of ruptured descending thoracic and thoracoabdominal aortic aneurysms". J Thorac Cardiovasc Surg, 150 (4), 814-21

3. Girardi LN, Krieger KH, Altorki NK, Mack CA, Lee LY, Isom OW. Ruptured descending and thoracoabdominal aortic aneurysms. Ann Thorac Surg 2002;74:1066-70.

ENDOVASCULAR REPAIR



MICHAEL DAKE 1994 [1]

SEMBA 1997 [2]

1. *Dake Michael (1994) "Transluminal placement of endovascular stent graft for the treatment of descending thoracic aortic aneurysm". New England Journal Medicine, 331, 1729-1734.*
2. *Charles P. Semba, Noriyuki Kato, Stephen T. Kee, Gerald K. Lee, R. Scott Mitchell, D. Craig Miller, et al. (1997) "Acute Rupture of the Descending Thoracic Aorta: Repair with Use of Endovascular Stent-Grafts". Journal of Vascular and Interventional Radiology, 8 (3), 337-342.*

ENDOVASCULAR REPAIR OF RUPTURED DESCENDING THORACIC AORTIC ANEURYSM

- **TEVAR: performed widely in the world**
- **TEVAR become the preferred treatment for descending thoracic aneurysms (DTAs).[1]**
- **Mortality & Morbidity lower than Open repair [2,3]**

1. Chen, Zehang et al, Thoracic Endovascular Aneurysm Repair Trends and Outcomes in Over 27,000 Medicare Patients for Descending Thoracic Aneurysms, the Annals of Thoracic Surgery, Volume 109, Issue 6, 1757 – 176

2. R. R. Gopaldas, T. K. Dao, S. A. LeMaire, J. Huh, J. S. Coselli (2011) "Endovascular versus open repair of ruptured descending thoracic aortic aneurysms: a nationwide risk-adjusted study of 923 patients". J Thorac Cardiovasc Surg, 142 (5), 1010-8.

3. N. J. Swerdlow, W. W. Wu, M. L. Schermerhorn (2019) "Open and Endovascular Management of Aortic Aneurysms". Circ Res, 124 (4), 647-661

METHOD

- Retrospective
- TEVAR in ruptured DTAA
- Vascular Surgery Dept, Cho Ray Hospital, Vietnam
- From 2014-2021

RESULTS

BASELINE CHARACTERISTICS

	PATIENTS (N=31)	RATE (%)
Age	64,12 ±15,1	
Male	25	80,7
Smoking	20	64,5
Hypertension	27	87,1
Coronary disease	19	61,2
Carotid stenosis	7	22,5
Abdominal aortic aneurysm	3	9,7
Hyperlipidemia	19	61,2
Diabetes mellitus	11	35,4
COPD	5	16,1
Mean diameter of aneurysm	60,3 ± 4,1 mm	

BASELINE CHARACTERISTICS

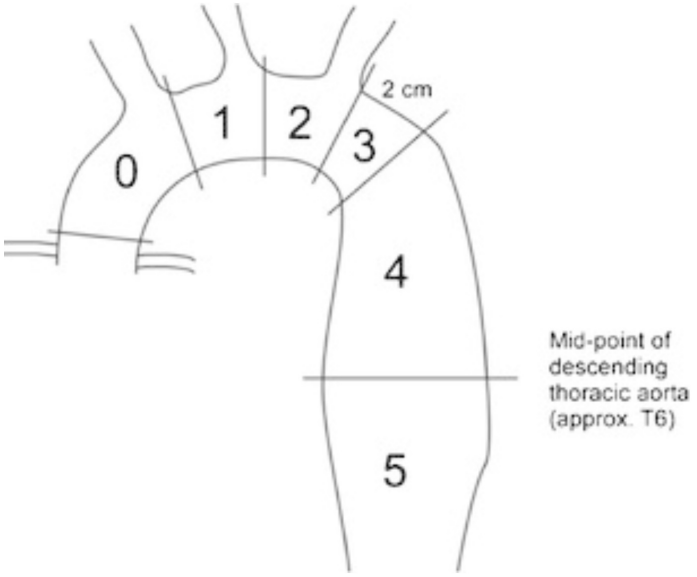
CLINICAL SYMTOMS	PATIENTS (N=31)	RATE (%)
Chest pain	24	77.4%
Dyspnea	6	19.3%
Hemoptypsis	2	6.4%
Hypovolemic shock	4	12.9%
Mediastinal hematoma	19	61.3%
Hemothorax	15	48.4%

STENT GRAFT SEALING ZONE

Zone 1: **12.9%**

Zone 2: **29.1%**

Zone 3,4,5: **58%**



ADJUNCT TECHNIQUE

TECHNIQUE	PATIENTS (N=31)	RATE (%)
Aortic arch branches transposition	4	12,9
LSA coverage	9	29.1
Celiac trunk coverage	1	3,2

ANESTHESIA

	PATIENTS (N=31)	RATE (%)
Local anesthesia	12	38,8
General anesthesia	19	61,2

PERIOPERATIVE RESULTS

	PATIENTS	RATE
Technical success	31	100 %
Open repair conversion	0	0 %
Intraoperative complications		
- Artery dissection	0	0 %
- Aortic rupture	0	0 %
- Cerebral & Splanchnic artery coverage	0	0 %
- Access artery trauma	1	3,2 %

PERIOPERATIVE RESULTS

	PATIENTS (N=31)	RATE (%)
Mortality	2	6,4
Myocardial infarction	2	6,4
Pulmonary complications	3	9,6
Stroke	2	6,4
Paraplegia	1	3,2

PERIOPERATIVE RESULTS

	PATIENTS (N=31)	RATE(%)
Stent graft migration	0	0 %
Endoleak		
- Type I	0	0 %
- Type II	1	3,2 %
- Type III	0	0 %
- Type IV	0	0 %

MIDTERM RESULTS

	PATIENTS (N=29)	RATE (%)
Mortality	9	31 %
Myocardial infarction	6	20,6 %
Pulmonary complications	2	6,8 %
Renal failure	0	0 %
Stroke	3	10,3 %
Paraplegia	2	6,8 %
Aneurysm rupture	1	3,4 %
Re-intervention	0	0 %
Follow-up time	20,8 ± 7,5	

MIDTERM RESULTS

	PATIENTS (N=29)	RATE(%)
Stent graft migration	0	0 %
Endoleak		
- Type I	*0*	*0 %*
- Type II (LSA)	*6*	*20,6 %*
- Type III	*0*	*0 %*
- Type IV	*0*	*0 %*
Aortic rupture	1	3,4 %
Aortoesophageal fistula	1	3,4 %

DISCUSSION

RUPTURED DESCENDING THORACIC AORTIC ANEURYSM

- Emergency situation
- High morbidity & mortality
- In the past: Surgery is gold standard
- Today : TEVAR : intact or ruptured DTAA
- Appropriate anatomy , sealing zone, access, stent graft sizes and surgeon's experience
- Decrease perioperative morbidity & mortality, especially in patients contraindicated for surgery

Outcomes of Endovascular Repair of Ruptured Descending Thoracic Aortic Aneurysms

Frederik H.W. Jonker, MD; Hence J.M. Verhagen, MD, PhD; Peter H. Lin, MD;
Robin H. Heijmen, MD, PhD; Santi Trimarchi, MD; W. Anthony Lee, MD; Frans L. Moll, MD, PhD;
Husam Athamneh, MD; Bart E. Muhs, MD, PhD

2002-2009, 7 centers, 87 pts, age: 69.8

Hypovolemic shock: 21.8%, hemodynamic instablity: 40.2%

Perioperative mortality: 18.4%, Stroke: 8%, Paraplegia: 8%,

Endoleak 18.4%

Hypovolemic shock, hemothorax: increase perioperative death

Circulation. 2010;121:2718-2723.)

Outcome After Endovascular Repair of Ruptured Descending Thoracic Aortic Aneurysm: A National Multicentre Study☆

Sari Hammo [a], Thomas Larzon [b], Rebecka Hultgren [a], Anders Wanhainen [c], Kevin Mani [c], Timothy Resch [d], Mårten Falkenberg [e], Claes Forssell [f,g], Björn Sonesson [d], Artai Pirouzram [b], Håkan Roos [e], Tina Hellgren [c], Shazhad Khan [d], Jonas Höijer [h], Carl-Magnus Wahlgren [a,*]

[a] Department of Vascular Surgery, Karolinska Institutet and Karolinska University Hospital, Stockholm, Sweden
[b] Department of Cardiothoracic and Vascular Surgery, Faculty of Medicine and Vascular Surgery, Örebro University Hospital, Örebro, Sweden

140 pts, 74.1 y.o, 64.8 mm

Contained rupture: 40%

Hemothorax: 64%

58.8% general anesthesia, 35.3 % local anesthesia

LSA coverage 37.9%, aortic arch branches transposition

17.9%, Celiac trunk coverage 10.7%

Perioperative: 20%

Eur J Vasc Endovasc Surg (2019) 57, 788-794

Ruptured DTAA: Surgery or TEVAR

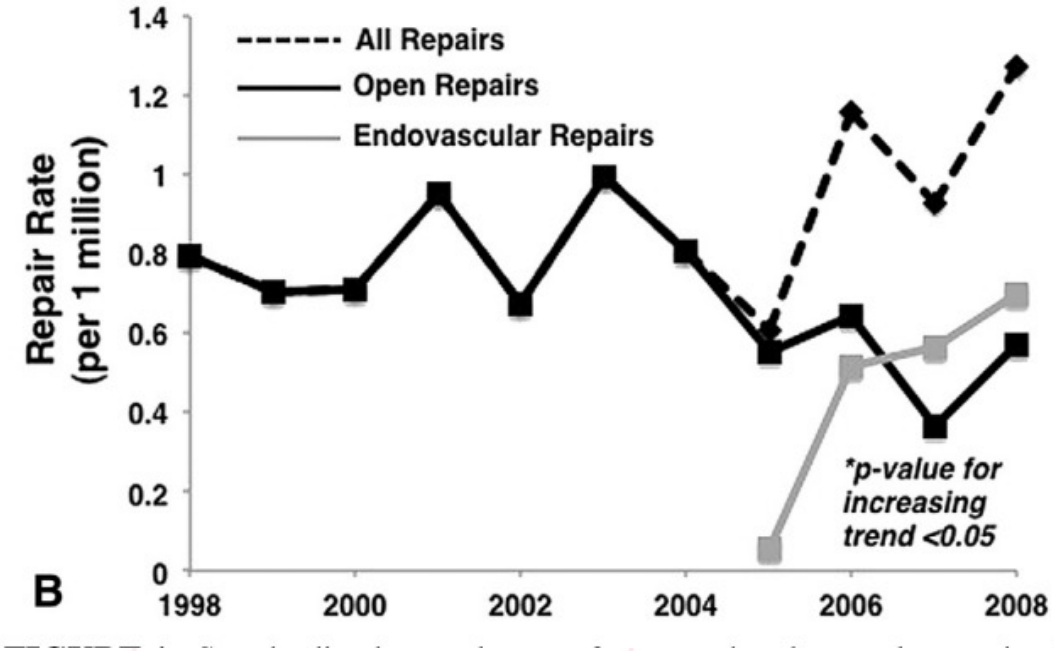
- Meta-analysis, 28 studies, 224 pts

	TEVAR	Open Repair
Patients	143 (63.2%)	81 (36.2%)
30 d Mortality	18.9%	33.3%
Myocardial Infarction	3.5%	11.1%
Stroke	4.1%	10%
Paraplegia	3.1%	5.5%
Additional Vascular Intervention	9.1%	2.3%
3 yr Aneurysm related survival	70.6%	unavailable

Jonker et al, J Vasc Sur, April, 2010

Trends in repair of intact and ruptured descending thoracic aortic aneurysms in the United States: A population-based analysis

Arman Kilic, MD,[a] Ashish S. Shah, MD,[a] James H. Black III, MD,[a] Glenn J. R. Whitman, MD,[a] David D. Yuh, MD,[b] Duke E. Cameron, MD,[a] and John V. Conte, MD[a]



1998-2008, USA, 2788 pts ruptured DTAA

Mortality: 21.5% vs 36.6% , p < 0.001

J Thorac Cardiovasc Surg 2014;147:1855-60

AORTIC ARCH BRANCHES TRANSPOSITION, LSA, CELIAC ARTERY COVERAGE

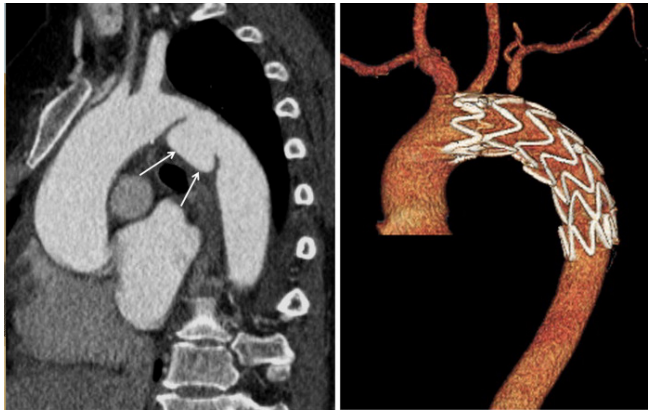
Study	N	Aortic arch transposition (%)	LSA coverage (%)	Celiac trunk coverage (%)
P.Q.Hung	31	12,9	29	3,2
Minami [1]	23	8,7	39,1	0
Jonker [2]	87	0	37,9	5,7
Hammo [3]	140	17,9	37,9	10,7

Hammo: Non-significant relation between LSA coverage and stroke, paraplegia

1. *T. Minami, K. Imoto, K. Uchida, N. Karube, S. Yasuda, T. Choh, et al. (2015) "Thoracic endovascular aortic repair for ruptured descending thoracic aortic aneurysm". J Card Surg, 30 (2), 163-9.*
2. *F. H. Jonker, H. J. Verhagen, P. H. Lin, R. H. Heijmen, S. Trimarchi, W. A. Lee, et al. (2010) "Outcomes of endovascular repair of ruptured descending thoracic aortic aneurysms". Circulation, 121 (25), 2718-23.*
3. *S. Hammo, T. Larzon, R. Hultgren, A. Wanhainen, K. Mani, T. Resch, et al. (2019) "Outcome After Endovascular Repair of Ruptured Descending Thoracic Aortic Aneurysm: A National Multicentre Study". Eur J Vasc Endovasc Surg, 57 (6), 788-794.*

LSA COVERAGE

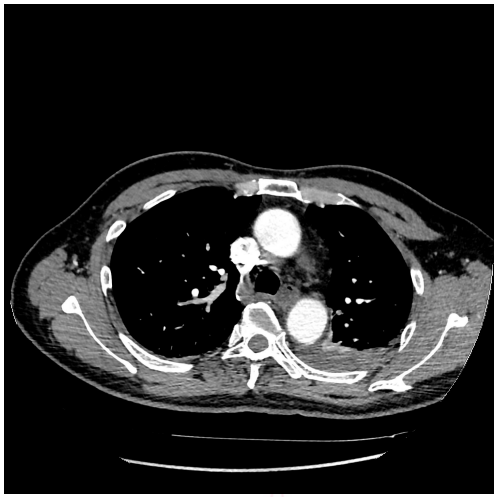
- **In urgent situation**
- **Endoleak type II**
- **SVS: Individualised according to anatomy, urgency and surgeon's experience**
- **ESVS: LSA revascularisation in left IM coronary bypass, one vertebral artery or dominant left vertebral artery : IC**



Matsumura, A. Z. Rizvi, Surgery Society for Vascular (2010) "Left subclavian artery revascularization: Society for Vascular Surgery Practice Guidelines". J Vasc Surg, 52 (4 Suppl), 65S-70S.

CELIAC ARTERY COVERAGE

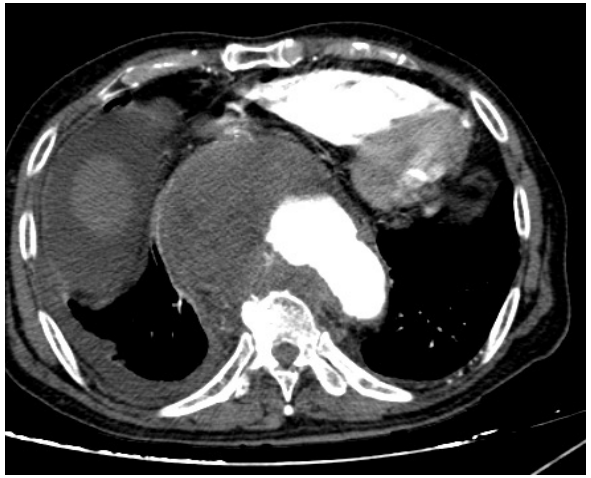
- Multiple collateral pathways provide flow from the SMA to branches of the CA origin
- Demonstrate collateralization between the celiac and SMA before coverage
- Visceral ischemia # 5%
- Suitability of covering the CA in selected patients for extending the distal landing zone



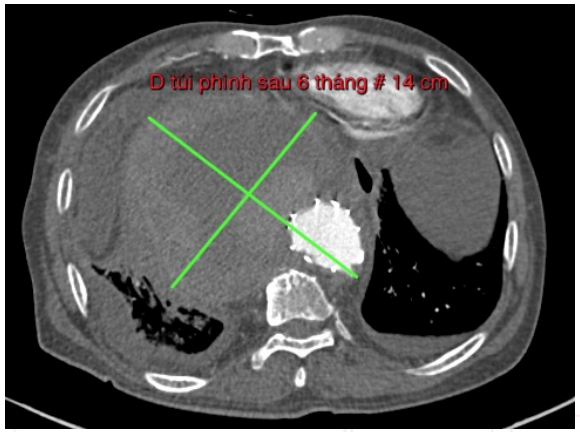
M. K. Rose, B. J. Pearce, T. C. Matthews, M. A. Patterson, M. A. Passman, W. D. Jordan (2015) "Outcomes after celiac artery coverage during thoracic endovascular aortic aneurysm repair". J Vasc Surg, 62 (1), 36-42.

ANEURYSM RUPTURE

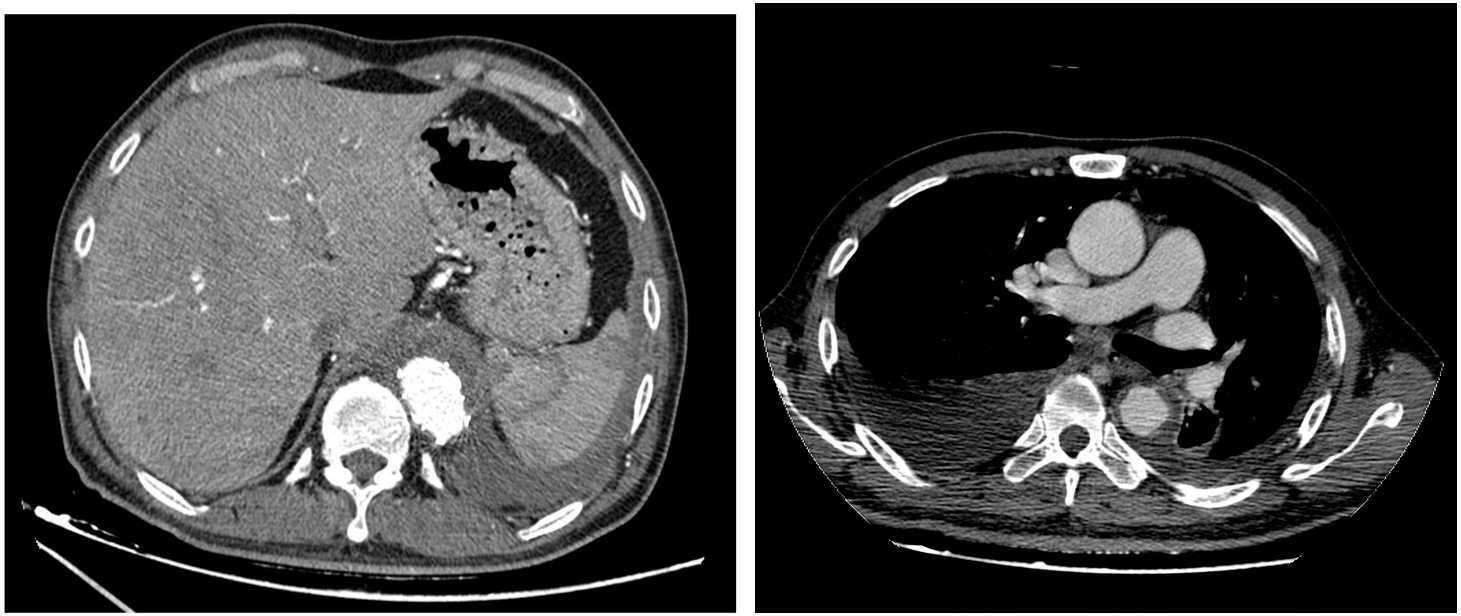
POST OPERATIVE



6 MONTHS



AORTOESOPHAGEAL FISTULA



Male patient, 65 y.o, stent graft infection, aortoesophageal fistula, death of sepsis

ENDOLEAK

AUTHOR	N	FOLLOW UP (MONTH)	TYPE I, III (%)	TYPE II (%)	TYPE IV(%)	TYPE V(%)
P.Q.HUNG	29	20.8	0	20,6	0	0
Minami [1]	22	15,8	0	10	0	0
Jonker [2]	71	13	11,2	7,4	0	2,5
Hammo [3]	111	17	7,3	22,1	0	0

Re-intervention when aneurysm diameter increases more than 5mm/6 months

1. *T. Minami, K. Imoto, K. Uchida, N. Karube, S. Yasuda, T. Choh, et al. (2015) "Thoracic endovascular aortic repair for ruptured descending thoracic aortic aneurysm". J Card Surg, 30 (2), 163-9.*
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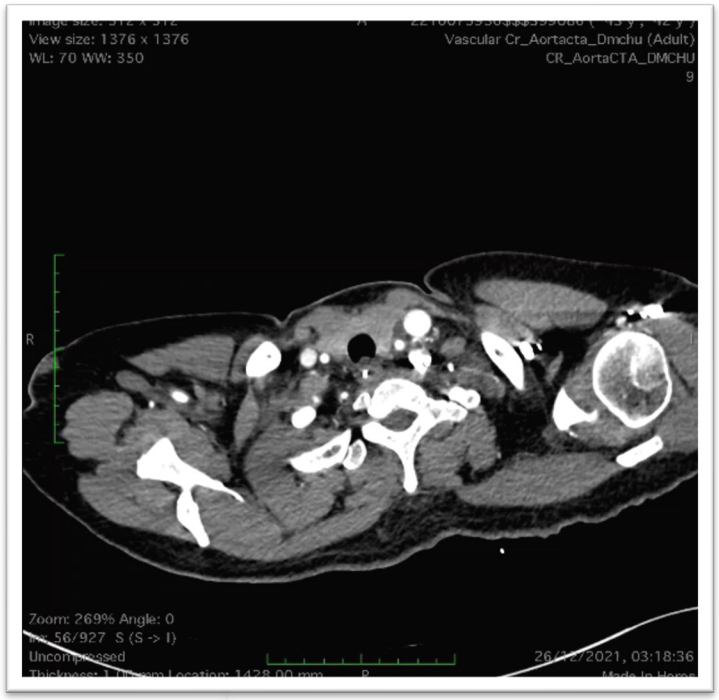
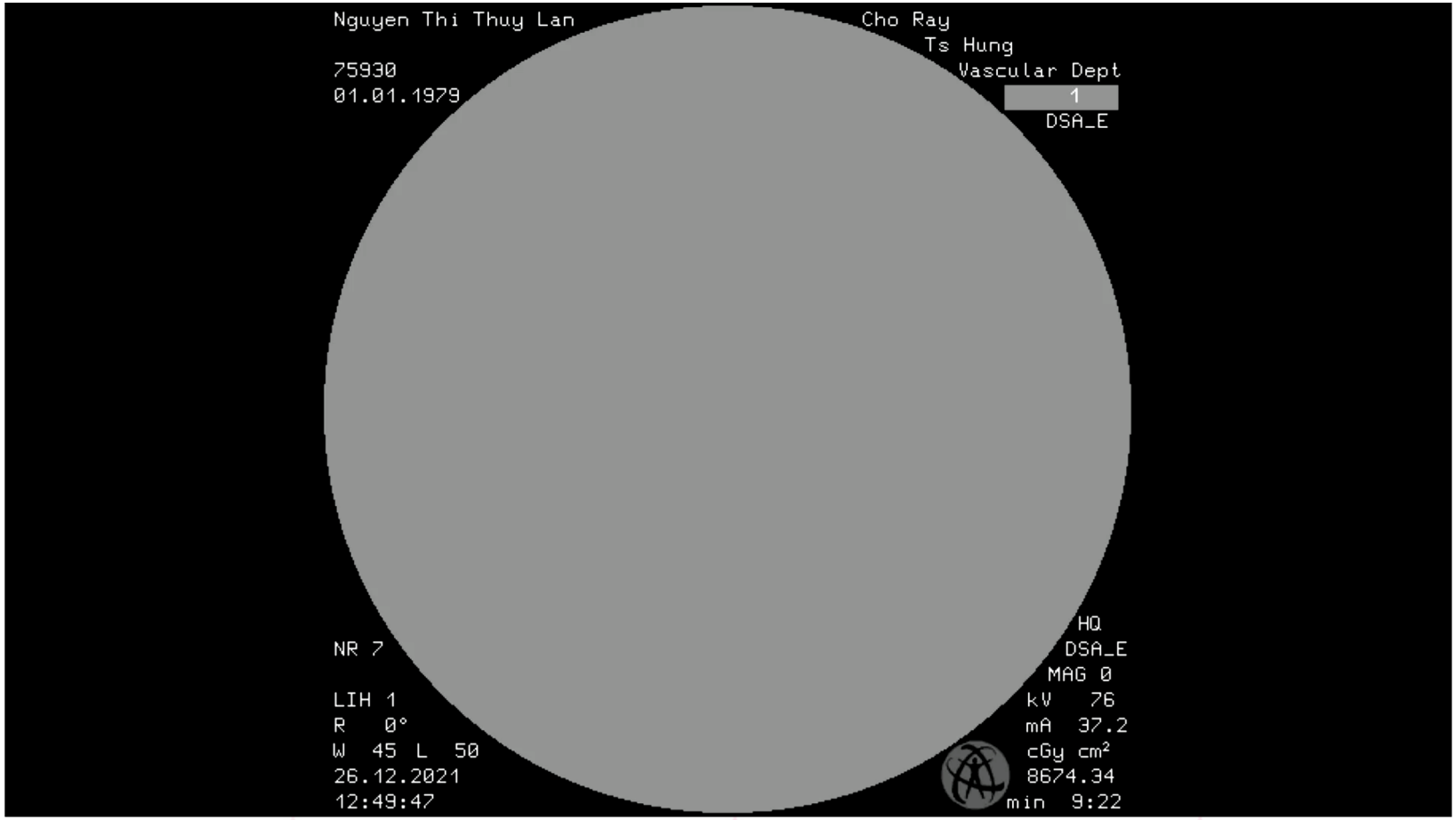
3. *S. Hammo, T. Larzon, R. Hultgren, A. Wanhainen, K. Mani, T. Resch, et al. (2019) "Outcome After Endovascular Repair of Ruptured Descending Thoracic Aortic Aneurysm: A National Multicentre Study". Eur J Vasc Endovasc Surg, 57 (6), 788-794.*

CLINICAL CASE

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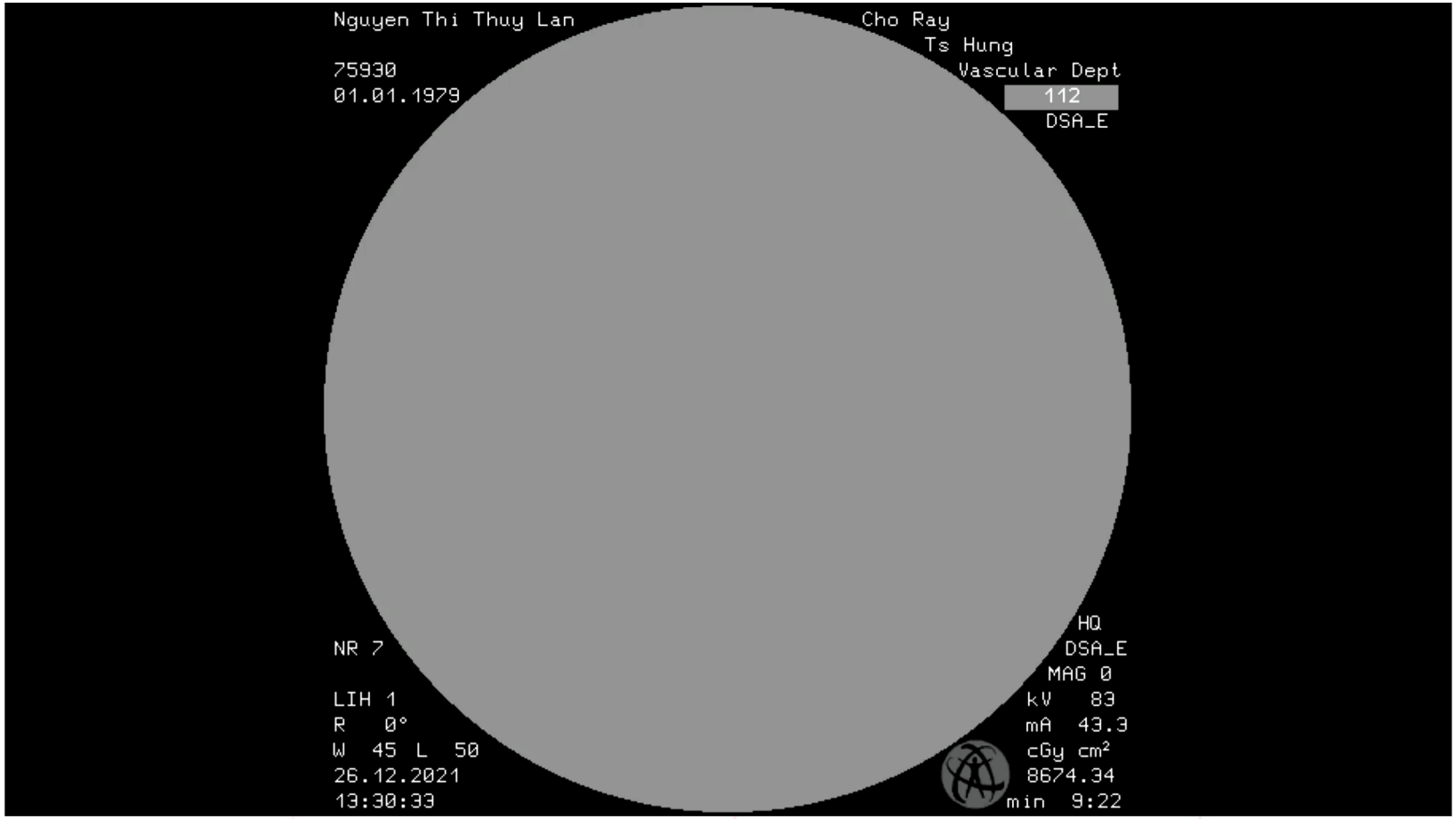
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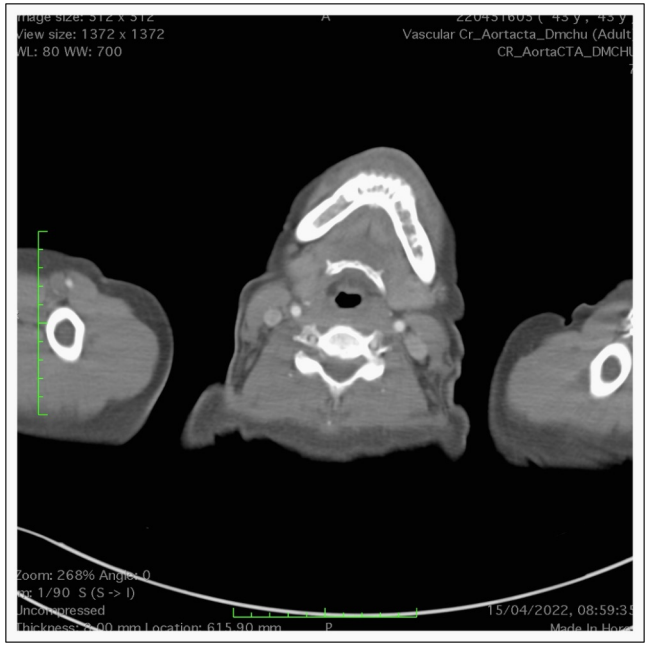
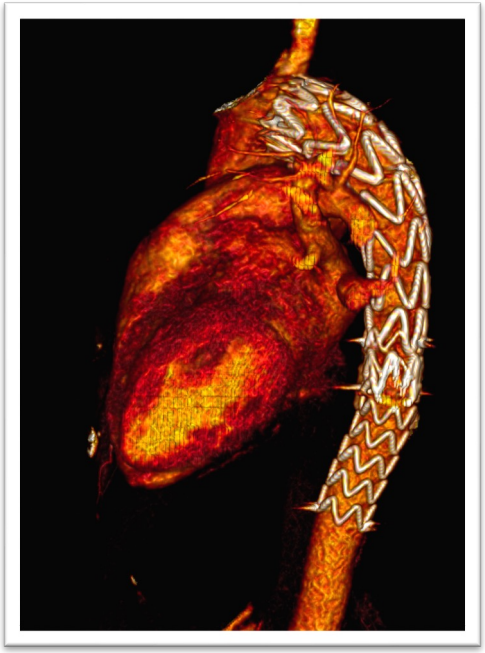
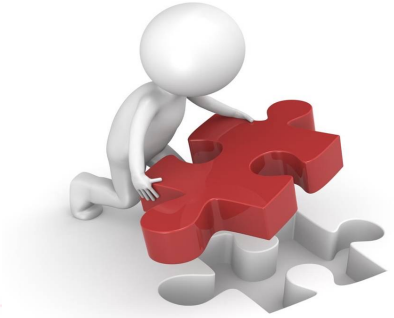
3 MONTHS POST OPERATIVE CTA





CONCLUSION

- **TEVAR: feasible for rDTAA treatment**
- **Perioperative and midterm complications related to cardiovascular event → control cardiovascular diseases post intervention**
- **Need to evaluate long-term outcome**



THANK YOU FOR YOUR ATTENTION

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