

Endovascular Treatment of Ruptured AAA

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The effect of patient transfer on outcomes after rupture of an abdominal aortic aneurysm

Hames H, et al. Can J Surg. 2007 February; 50(1): 43–47.

81 patients

Although transferred patients took twice as long as direct patients to get to the operating room (6.3 v. 3.2 h, $p = 0.03$), there was no difference in mortality between the 2 groups (50% v. 54%, $p = \text{ns}$).

Feasibility of preoperative CT in patients with rAAA: a time-to-death study in patients without operation.

Lloyd GM et al. J Vasc Surg. 2004;39:788-91.

A retrospective case review of 56 patients with rAAA (85 y; range 71-98).

Reasons for no operation by frequency: QoL, respiratory and cardiac disease, age, cardiac arrest, shock.

Death < 2 hours of hospital admission 12.5%

Death > 2 hours of hospital admission 87.5%.

Median delay from admission to death: 10 hours 45 minutes.

Existing delays following the presentation of rAAA allow sufficient time to assess patients for EVAR.

Boyle JR et al. Eur J Vasc Endovasc Surg. 2005;29:505-9

100 patients (75 y; range 54-94), 79 surgical repair and 21 were palliated.

Median delay from arrival to operation: 2.5 hours (range 16-1450 min).

Median time from arrival to death in palliated group: 7 hours 15 min (15min-6d).

Mortality in the surgical group was not affected by the length of delay ($p = 1.0$) or by CT scanning ($p = 0.34$).

Glasgow aneurysm score.

Samy AK et al. Cardiovasc Surg. 1994;2:41–44.

Using multivariate analysis, the following independent risk factors were identified:

age ($P = 0.02$)

shock ($P = < 0.001$)

myocardial disease ($P = 0.02$)

cerebrovascular disease ($P = 0.02$)

renal disease ($P = 0.003$).

Risk score = age (years) + 17 (for shock) + 7 (for myocardial disease) + 10 (for cerebrovascular disease) + 14 (for renal disease).

Score > 84 significantly increases the mortality rate.

Arrival at emergency room

Clinical diagnosis
Lab, blood units, score

Stabilize in controlled hypotension
RR syst. ~70mmHg

CT with contrast - Diagnosis

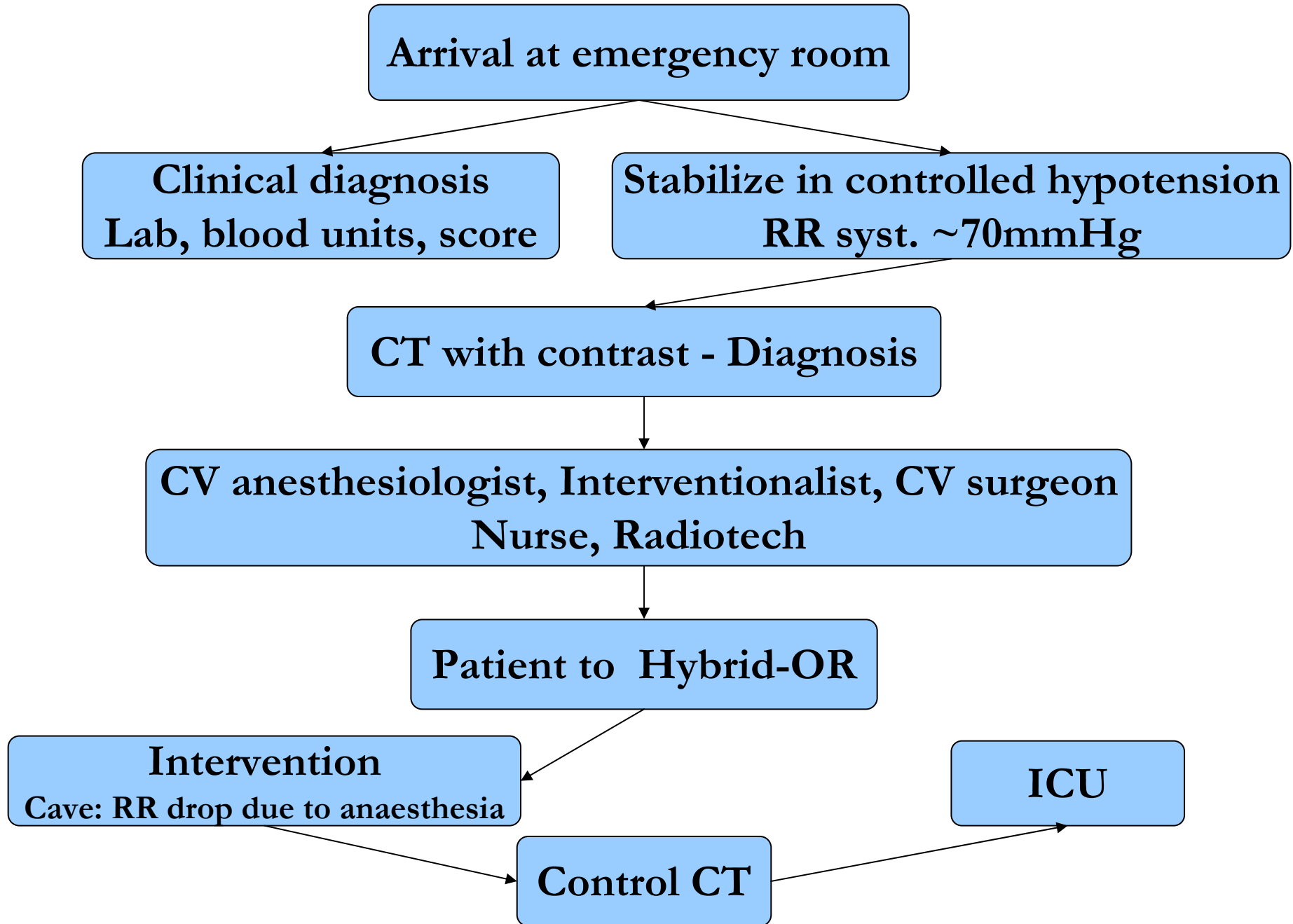
CV anesthesiologist, Interventionalist, CV surgeon
Nurse, Radiotech

Patient to Hybrid-OR

Intervention
Cave: RR drop due to anaesthesia

ICU

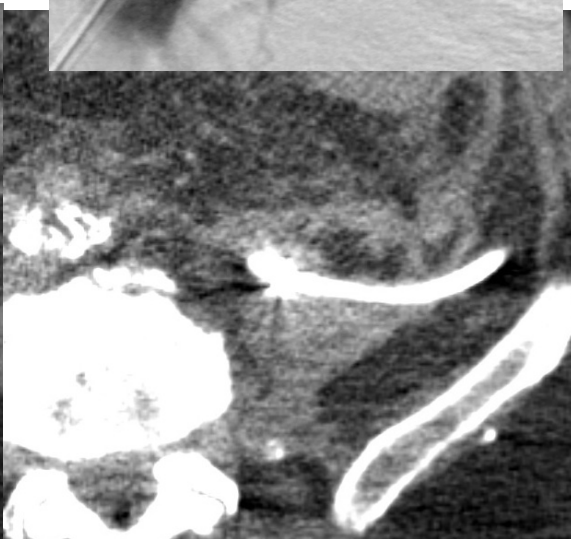
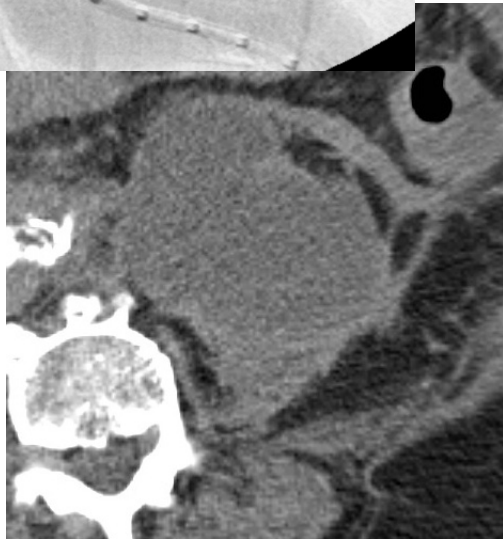
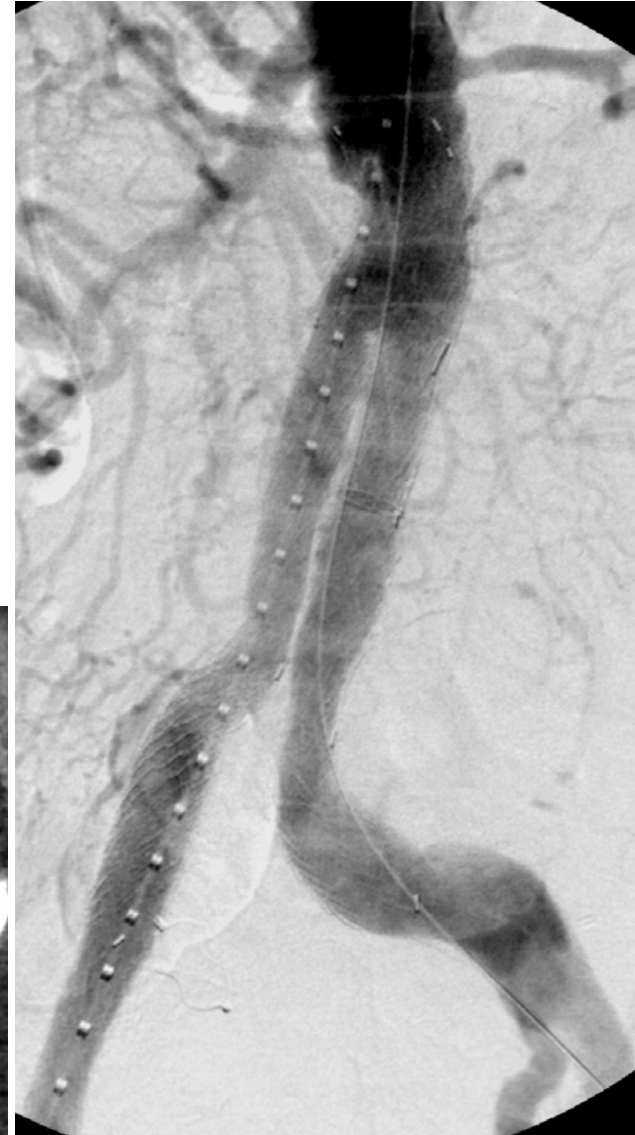
Control CT



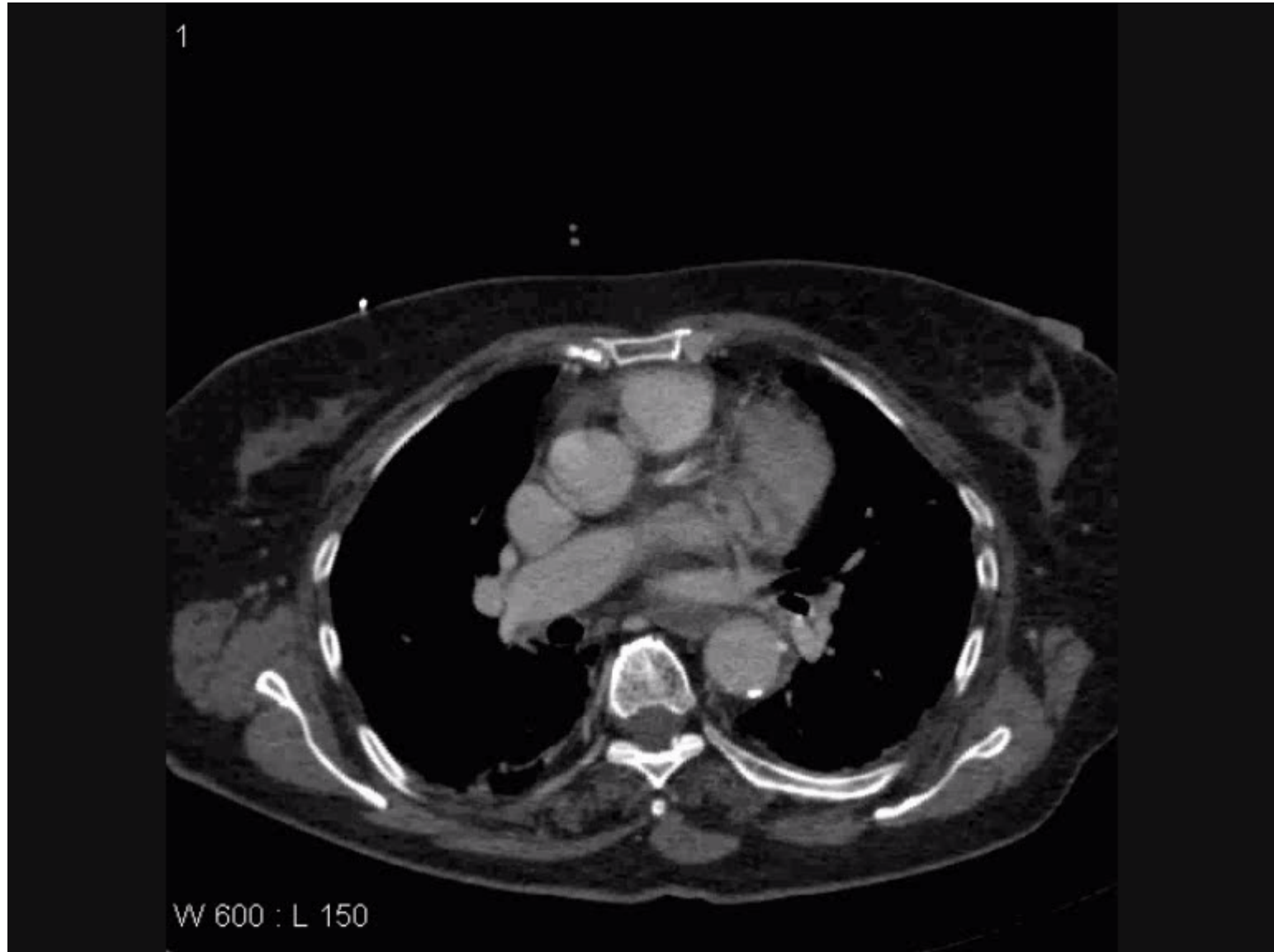
79 y, man, ruptured AAA and CIAA, systolic RR 100 mmHg



**79 y, man, ruptured AAA and CIAA,
systolic RR 100 mmHg**



81y, female, admitted to the emergency room with heavy abdominal pain and shock (RR systolic 60mmHg)



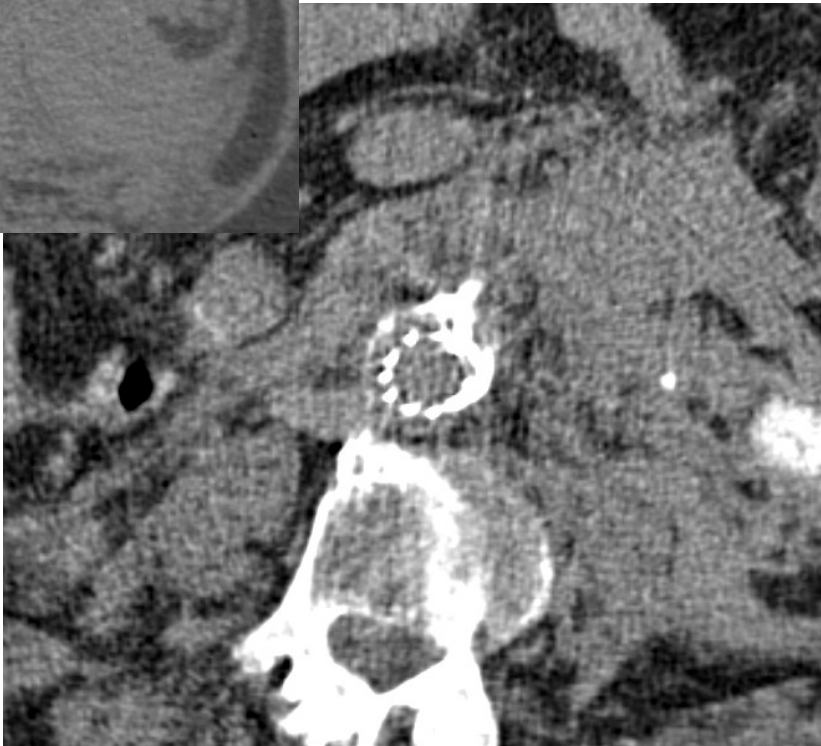
81y, female, admitted to the emergency room with heavy abdominal pain and shock (systolic RR 60mmHg)



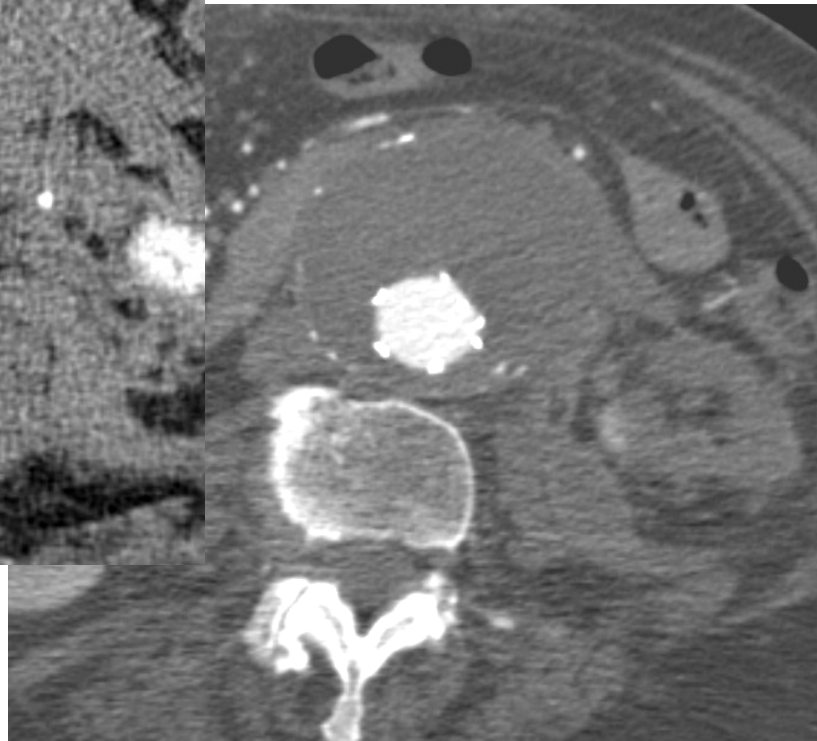
Emergency room CT



Immediately after stentgraft



4 weeks follow-up



The Amsterdam Acute Aneurysm Trial: Suitability and Application Rate for Endovascular Repair of Ruptured AAA.

Hoornweg LL, et al. Eur J Vasc Endovasc Surg. 2007; 33:679-83.

45.8% of patients were considered suitable for EVAR.

30-day mortality rate of EVAR in rAAA

	30d-day mortality rate
Vienna Group (CVIR 2008)	23%
Zurich Group (Ann Surg. 2009)	13%
Malmö Group (Eur J Vasc Endovasc Surg. 2009)	27%

A Systematic Review and Meta-analysis of EVAR for Ruptured Abdominal Aortic Aneurysm.

Rayt HS et al. Eur J Vasc Endovasc Surg. 2008; 36: 536-544.

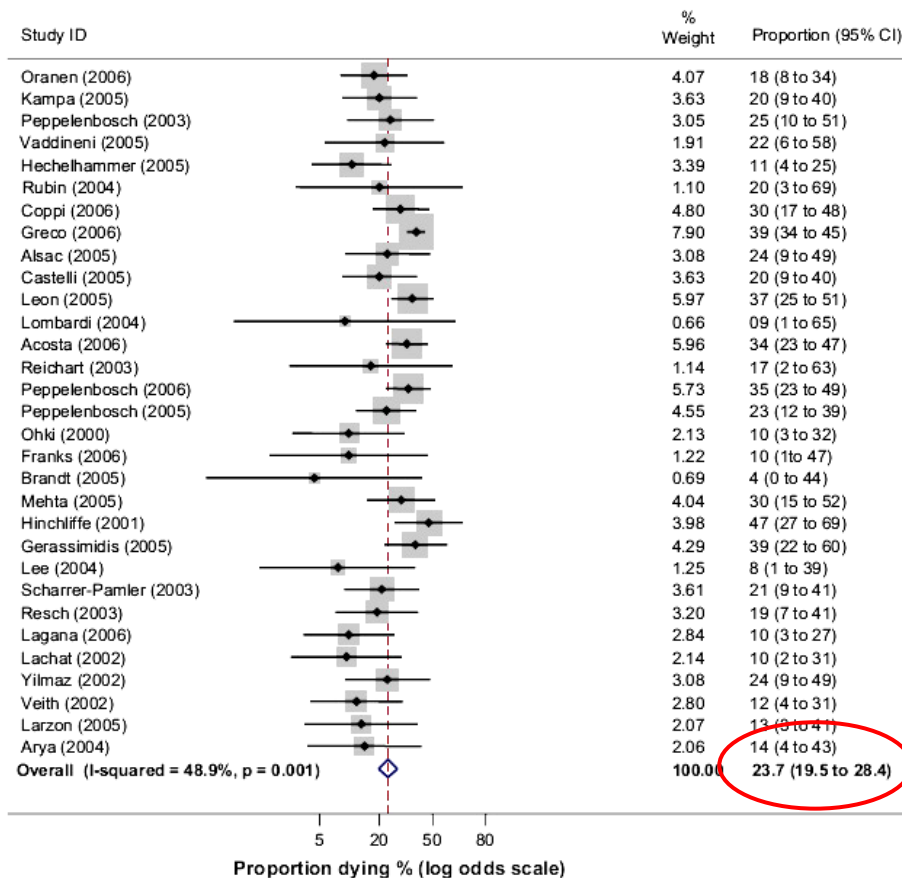
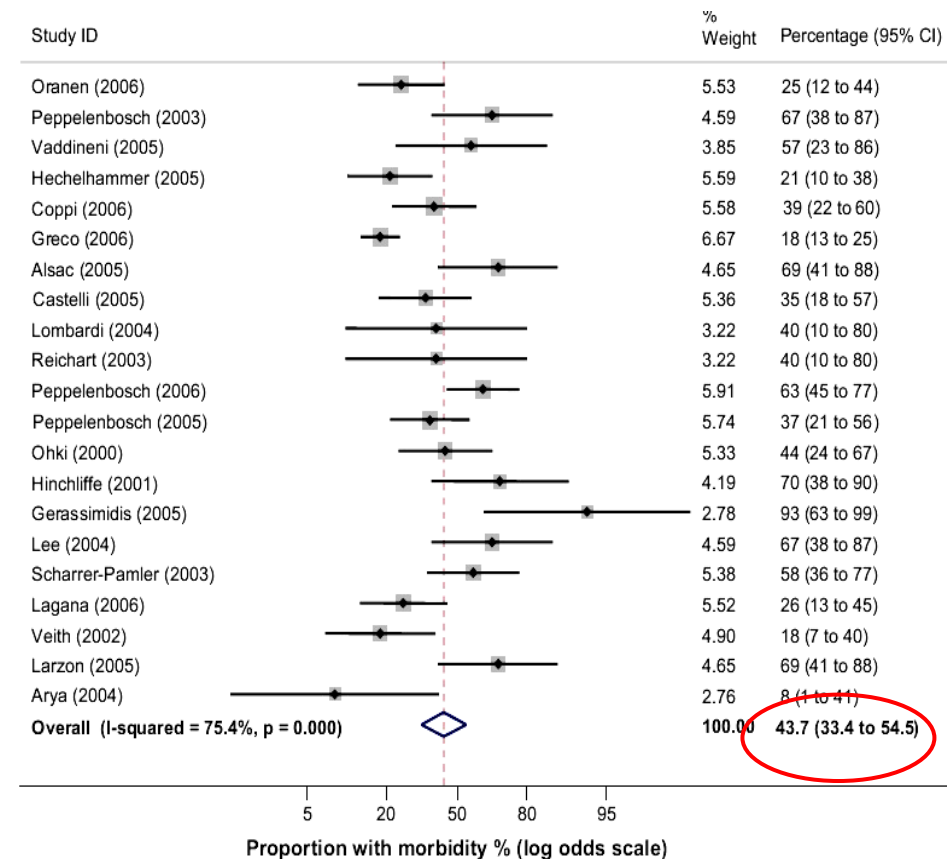


Figure 2 Forest plot of studies reporting mortality figures.



Endovascular Ruptured Abdominal Aortic Aneurysm Repair (EVRAR): A Systematic Review

D.W. Harkin, et al. Eur J Vasc Endovasc Surg 2007; 34:673-681.

Table 1. Mortality after endovascular ruptured aneurysm repair (EVRAR)

Study	Design	%EVAR Suitable*	EVRAR	OPEN group (if quoted)	p value (if quoted)
Hinchcliffe 2006	PRCT	93%	8/15 (53)	9/17 (53%)	NS
Franks 2006	PCS†	100%	1/10 (10)	7/10 (70)	—
Arya 2006	PCCS	42%	4/17 (24)	11/23 (47)	NS
Lagana 2006	CS		4/38 (10.5)		
Visser 2006	RCS	47%	8/26 (31)	9/29 (31)	NS
Alsac 2005	PCS	73%	4/17 (23.5)	10/20 (50)	0.09
Brandt 2005	RCS	72%	0/11 (0)	2/13 (15)	NS
Greco 2005	RCS	—	114/290 (39)	2627/5508 (47)	0.05
Kapma 2005	RCS	36%	5/40 (13)	64/213 (30)	0.02
Larzon 2005	RCS	—	2/15 (13)	12/26 (46)	0.05
Peppelenbosch 2005	RCS		8/35 (23)		—
Vaddineni 2005	RCS	60%	2/9 (22)	4/15 (26)	NS
Castelli 2005	CS		5/25 (20)		
Gerassimidis 2005	CS		9/23 (39)		
Hechelhammer 2005	CS		4/37 (10.4)		
Mehta 2005	CS		7/30 (23)		
Lombardi 2004	CS		0/5 (0)		
Lee 2004	RCS	88%	1/13 (7.7)	1/4 (25)	—
Rubin 2004	CS		1/5 (20)		
Peppelenbosch 2003	PCS†	80%	4/26 (15)	4/14 (28)	—
Reichart 2003	PCS	42%	1/6 (16.6)	4/13 (30)	—
Resch 2003	PCS	79%	4/14 (29)	8/23 (35)	0.05
Scharrer-Pamler 2003	CS		3/24 (12.5)		
Van Herzele 2003	CS		1/9 (11)		
Verhoeven 2002	PCS	34%	1/9 (11)	7/31 (23)	—
Yilmaz 2002	PCS	81%	4/17 (24)	12/29 (41)	NS
Doss 2002	CS		0/6 (0)		
Lachat 2002	CS		2/21 (9.5)		
Orend 2002	CS		4/21 (19)		
Van Sambeek 2002	CS		6/22 (19)		
Hinchcliffe 2001	CS		9/20 (45)		
Ohki 2000	PCS	80%	2/20 (10)	0/5 (0)	—
Greenberg 2000	CS		0/3 (0)		
Ohki 1999	CS		2/12 (17)		
Overall ^{13,15,16,18-47}		67% (34-100)	18% (0-53)	34% (0-70)	

Population-based outcomes following endovascular and open repair of ruptured abdominal aortic aneurysms.

Giles KA et al. J Endovasc Ther. 2009;16:554-64.

EVAR: 2323 patients (1794 men; median age 75 years, range 45-98)

OSR: 26,106 patients (20,311 men; median age 73 years, range 22-99).

Mortality rate:

EVAR: 33%

OSR: 41% ($p < 0.001$).

Collected world and single center experience with endovascular treatment of ruptured abdominal aortic aneurysms.

Veith FJ et al. Ann Surg. 2009;250:818-24.

EVAR 1037 patients, OSR 763 patients.

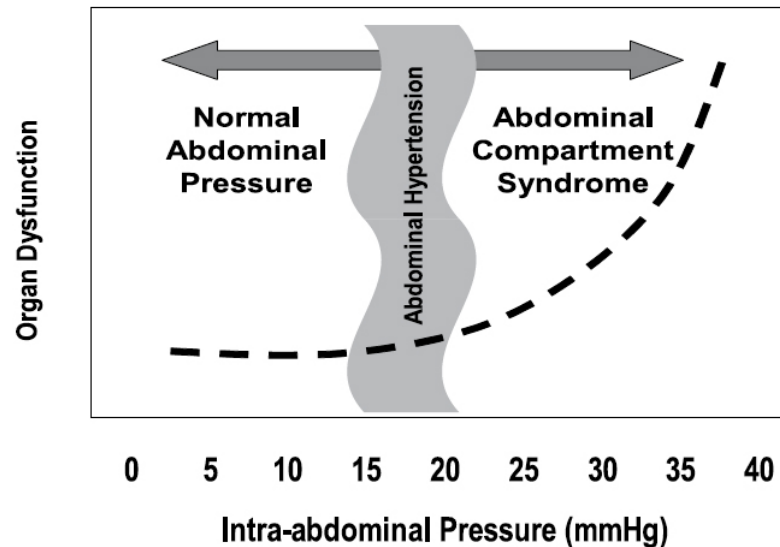
30-day mortality rate: EVAR 21.2%, OSR 36.3% ($P < 0.0001$).

Supraceliac aortic balloon control 19.1%.

Abdominal compartment syndrome treated by decompression in 12.2%.

Results from the International Conference on Intra-abdominal Hypertension and Abdominal Compartment Syndrome.

Malbrain MLNG et al. Intensive Care Med 2006; 32:1722–1732.



ACS is defined as a sustained IAP > 20 mmHg (with or without an APP < 60 mmHg) that is associated with new organ dysfunction/failure.

ACS abdominal compartment syndrome

APP abdominal perfusion pressure (MAP – mean arterial pressure minus IAP – intraabdominal pressure)

Open abdomen treatment following endovascular repair of rAAA.

Mayer D et al. J Vasc Surg. 2009;50:1-7.

102 patients with rAAA treated by emergency EVAR (eEVAR).

Abdominal compartment syndrome (ACS):

- intravesical pressure >20 mm Hg

- abdominal perfusion pressure was <50 to 60 mm Hg

- organ deterioration.

30-day mortality for eEVAR:

- overall 13%;

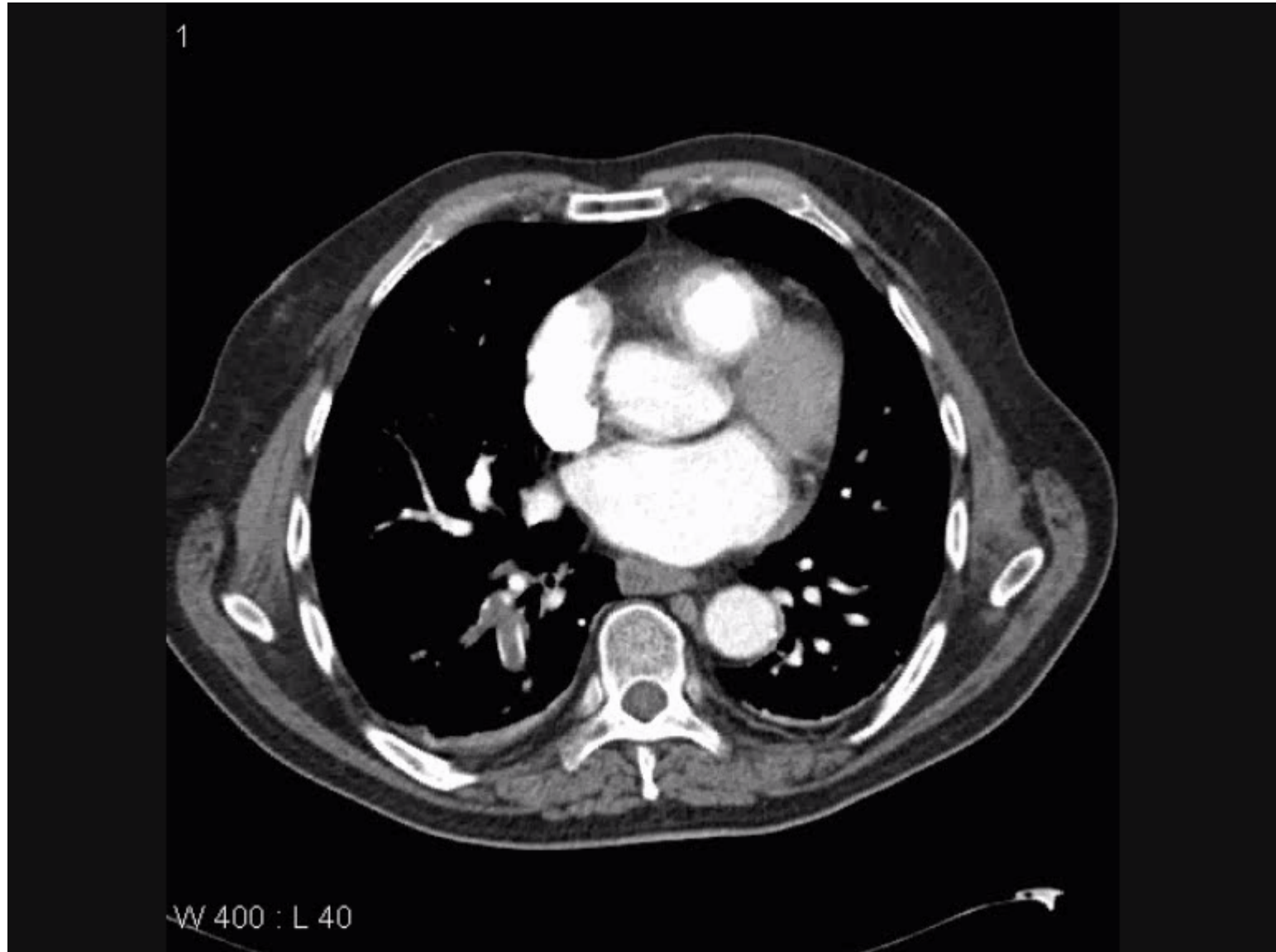
- without ACS 8%

- with ACS 30%.

Decompression for ACS was needed in 20 patients (20%)

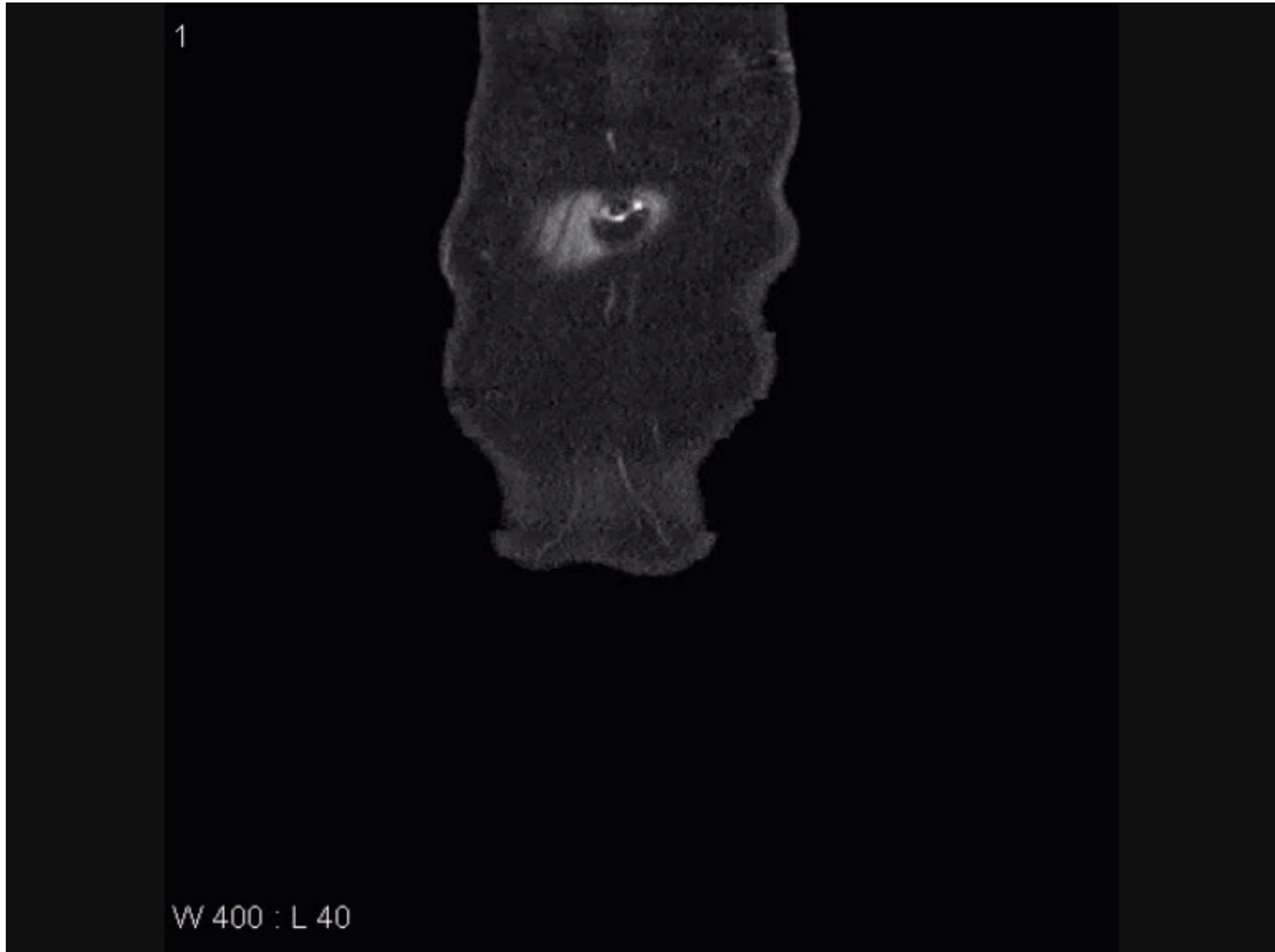
Helicopter transport from community hospital:

71y, male patient, acute abdominal pain, cardiac insufficiency, systolic RR 70mmHg, 2 blood units; cirrhosis, thrombocytopenia



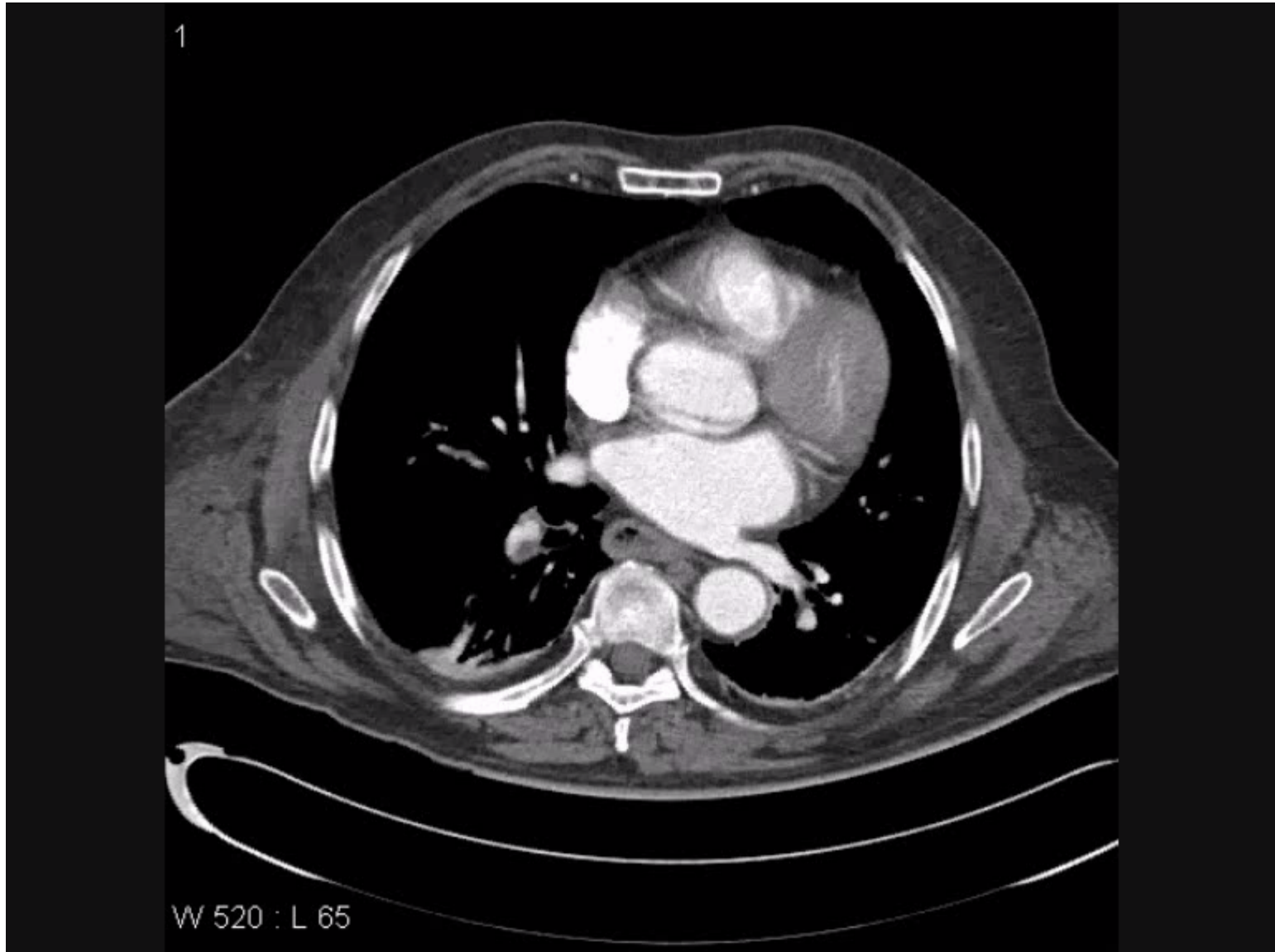
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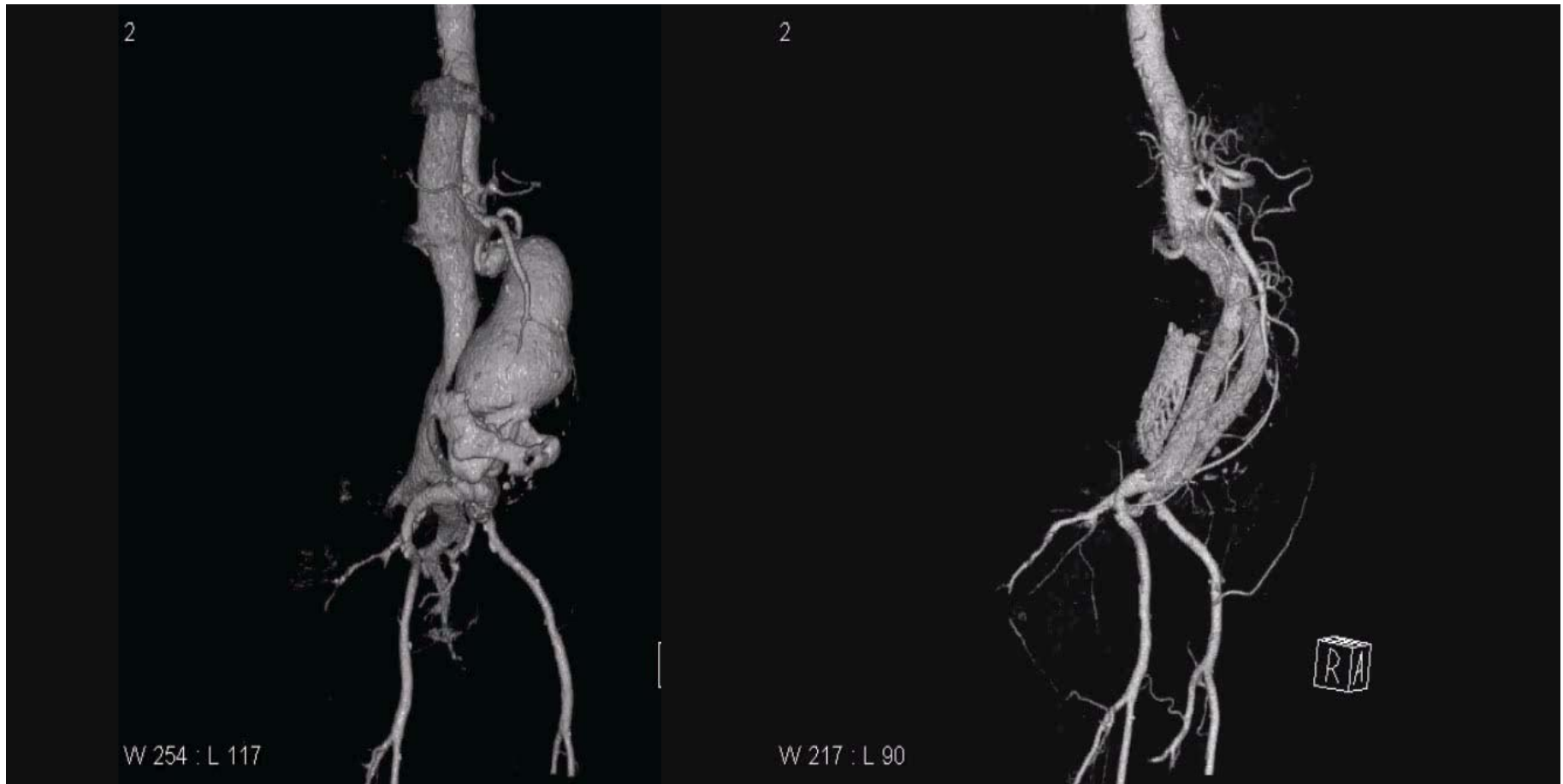




13 days later: patient fully mobilized, slightly elevated creatinine (1.5 mg/dl), was sent back to referring hospital



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Conclusion

- At least 45 % of the patients were found eligible for EVAR of rAAA.
- CT for planning does neither delay the therapy nor increases the mortality rate significantly.
- Mortality rate in rAAA is 10%-45% with EVAR compared to 25%-70% with open surgical repair.
- Every 10% increase in application of EVAR for rAAA decreases mortality rates by ~3.5%.