

第7回大動脈解離シンポジウム

「Malperfusionの治療戦略」 (特に脳、冠動脈、腸管)

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A型急性大動脈解離で救命が困難な症例とは？

CPA症例

1. 発症直後に CPAとなる院外CPA症例
(大動脈破裂 massive, LMT閉塞)
2. 入院後手術待機中にCPAに陥った症例
(心タンポナーデ⇒心停止 など)

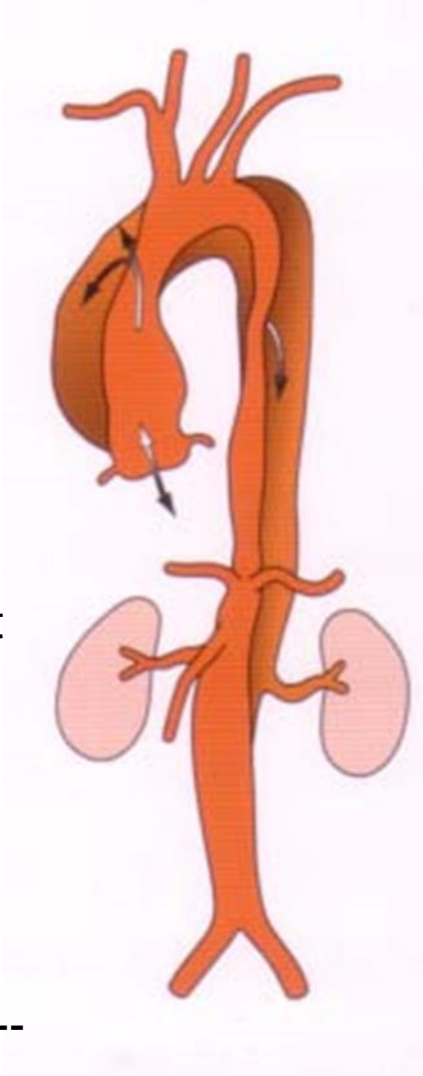
Malperfusion合併例 (特に脳、LMT, SMA)

1. 意識障害合併例
2. 左冠動脈主幹部の閉塞例
3. 上腸間膜動脈起始部の完全閉塞例

Malperfusion：定義

- ❑ a radiographic finding of reduced enhancement of a vascular bed ?
- ❑ simply the loss of a pulse or flow in neck vessels or extremities ?
- ❑ significant end-organ dysfunction from prolonged ischemia ?

Distribution of peripheral vascular complications

<u>Clinical event</u>		<u>Site-occlusion</u>
22 Strokes		Carotid 26
8 Arm Ischemia		Subclavian 17
11 Renal Failure		Renal 17
8 Mesenteric Infarct		Mesenteric 10
9 *AAA/TAAA	ABD Aorta 9	
38 Lower Extremity Ischemia	Iliiofemoral 43	
96		122

From "Vascular complications associated with spontaneous aortic dissection". Cambria RP et al. J Vasc Surg 1988;

“The Impact of Pre-Operative Malperfusion on Outcome in Acute Type A Aortic Dissection”

Results From the GERAADA Registry

Czerny M et al. J Am Coll Cardiol 2015;65:2628–35

- A total of 2,137 consecutive patients enrolled in GERAADA (German Registry for Acute Aortic Dissection Type A) who underwent surgery between 2006 and 2010, of whom 717 (33.6%) had any kind of pre-operative malperfusion, were retrospectively analyzed.
- All-cause 30-day mortality was 16.9% and varied substantially according to the number of organ systems affected by malperfusion (none, 12.6%; 1 system, 21.3%; 2 systems, 30.9%; 3 systems, 43.4%; $p < 0.001$).

Type of pre-operative malperfusion	n (%)
Coronary	205 (10)
Cerebral	236 (11)
Spinal	44 (2)
Visceral	124 (6)
Renal	185 (9)
Peripheral	270 (13)

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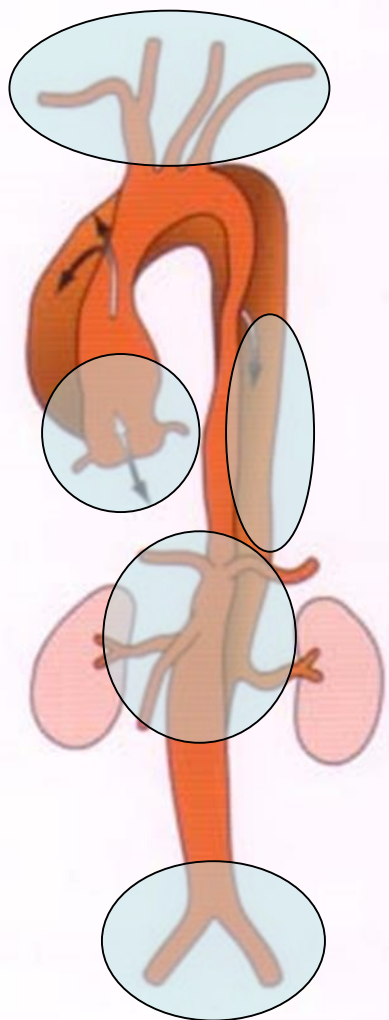
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Malperfusion defined as “Compromised blood flow in 1 or more organ resulting in ischemia and organ dysfunction.”

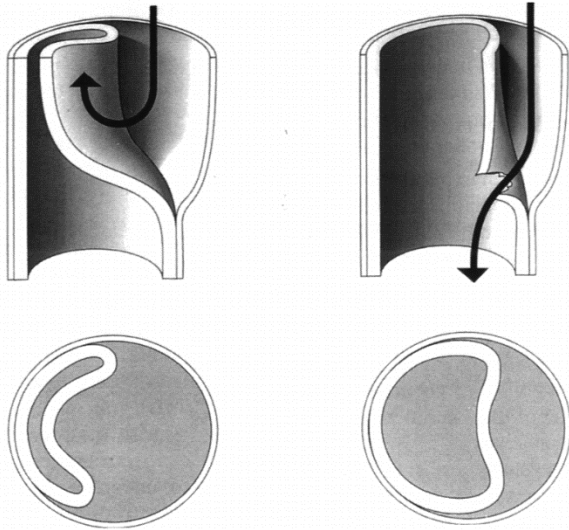
大動脈の分枝閉塞と症状

Malperfusion = 画像上分枝に解離が及んでいる+有症状

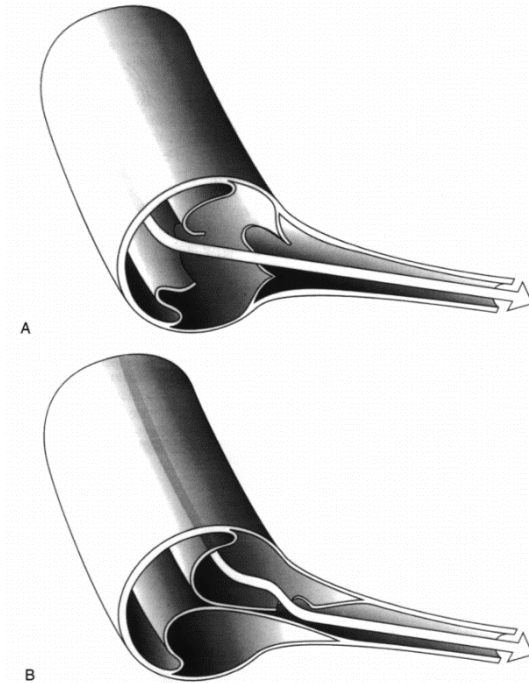


- 冠動脈 +心電図変化(胸痛はある)
- 弓部分枝
 - 頸動脈 +症状(意識障害、麻痺等)
 - 上肢 +脈の欠損、虚血肢症状
- 脊髄 +(不全)対麻痺
- 腹部主要4分枝
 - SMA,CA +急性腹症、下血
 - 腎動脈 +(尿量?)
- 下肢 +脈の欠損、虚血肢症状

Malperfusion of the aortic branches in aortic dissection: mechanism

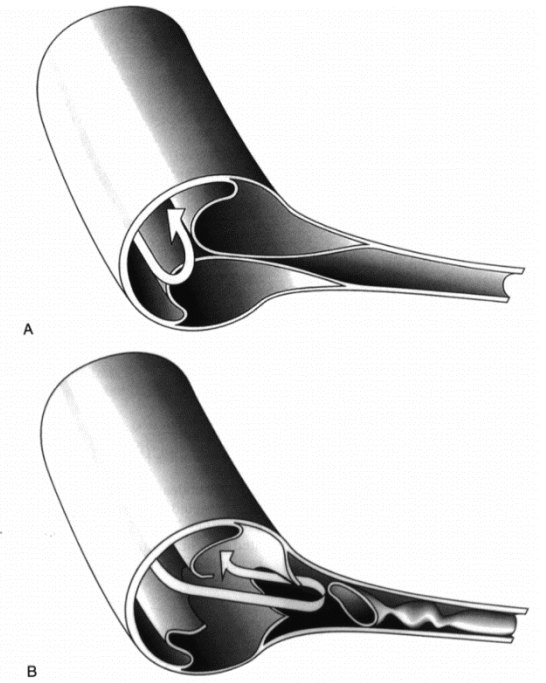


Decompressed



Decompressed

Dynamic



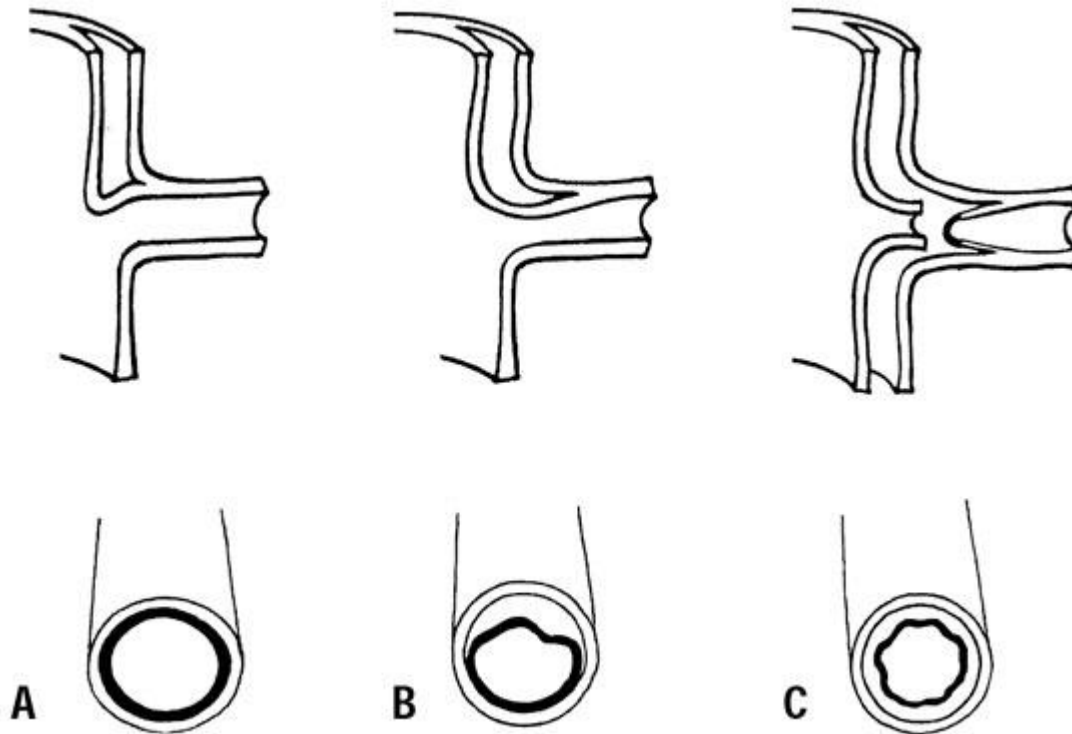
Occluded branch

Static

虚血症状の変動・固定

Coronary malperfusion

Neri E, et al. JTCVS 2001



Type A, ostial dissection;

Type B, dissection with a coronary false channel;

Type C, circumferential detachment with an inner cylinder intussusception.

Malperfusionを伴う場合の治療選択

Immediate aortic repair: quick surgery

To reconstitute antegrade true lumen flow

To resolve dynamic flow obstruction in aortic branches

To depressurize the false lumen

VS

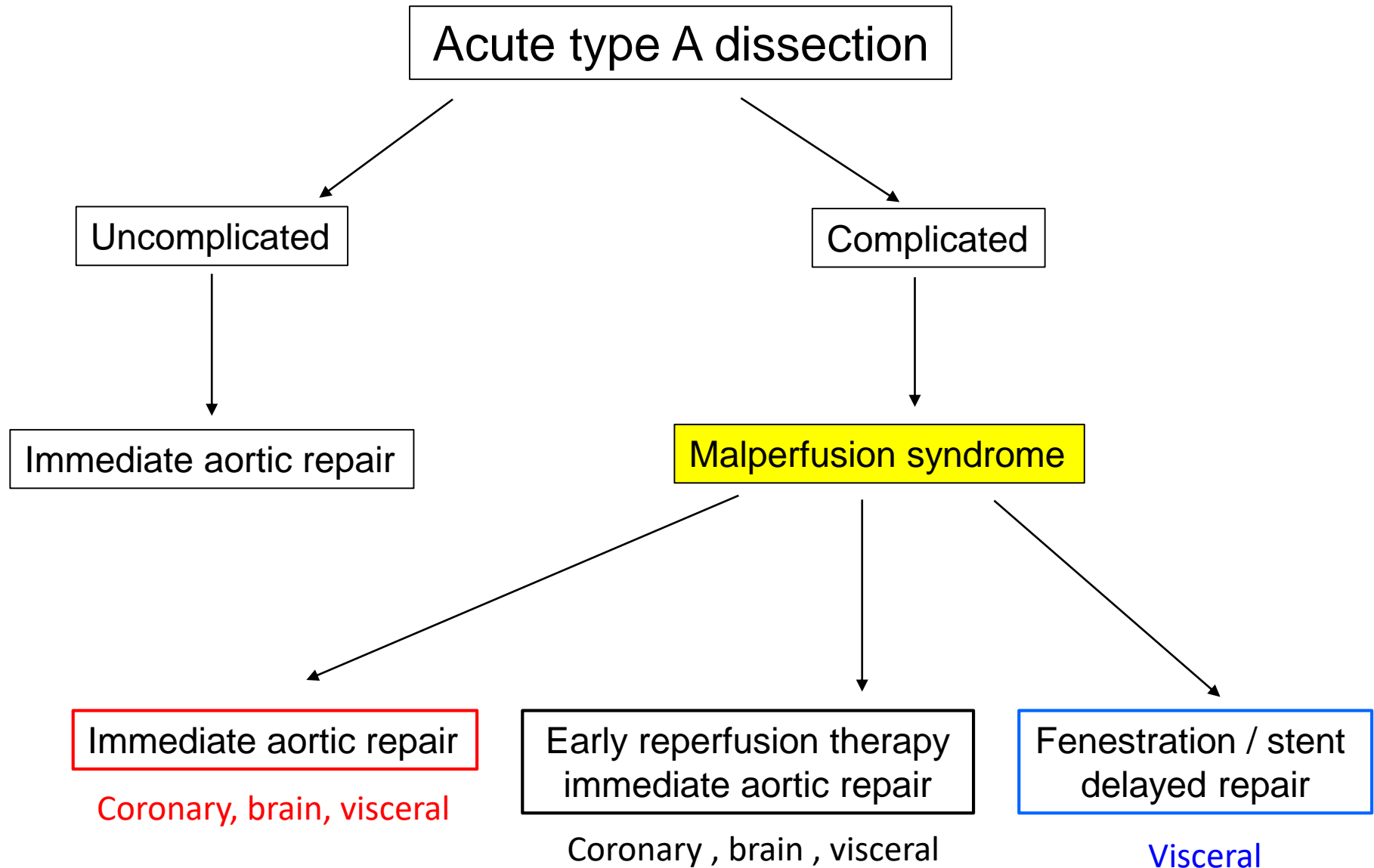
Restoration of true lumen flow to threatened end-organs **first**

Historically, open fenestration

Recently, endovascular techniques or

Direct perfusion: early perfusion

急性A型大動脈解離の手術治療戦略



いずれも虚血臓器の再灌流までの時間短縮を目指している

発症から治療開始までの時間短縮の重要性

院外心肺停止 → bystander CPRの重要性、AED

ACS → door to balloon time ≤ 90分

Acute stroke → time is brain

急性上腸間膜動脈閉塞症 → Golden time 6-10時間

A型大動脈解離 + malperfusion → ?

Immediate aortic repair

“Acute type A aortic dissection complicated by **stroke**:
Can immediate repair be performed safely ?“

(Estrera, Safi et al, JTCS, 2006; 132 : 1404-8)

Type A aortic dissection n=151 (September 1999 ~ March 2005)
preoperative stroke n=16 (10.6%)

Hospital mortality 18.8% (3/16)

Operative mortality 7% (1/14)

Time to Operating room	Clinical status		
	Complete recovery	Improved	No change
within 10 hrs (range 1-10)	2	6*	2
beyond 10 hrs (range 72-240)	0	0	4

(* : 1 patient was died on POD 14 of small bowel necrosis)

Lack of neurologic improvement after aortic repair for acute type A aortic dissection complicated by cerebral malperfusion: Predictors and association with survival

Naoto Morimoto, MD, Kenji Okada, MD, and Yutaka Okita, MD

Background: Surgical treatment of acute type A aortic dissection complicated by cerebral malperfusion remains challenging. This study evaluated predictors of lack of neurologic improvement after aortic repair for acute type A dissection complicated by cerebral malperfusion and assessed relationship with survival.

Methods: We retrospectively reviewed 41 consecutive patients operated on between 1999 and 2008 for acute type A dissection complicated by cerebral malperfusion. Lack of postoperative neurologic improvement was defined as a difference between baseline and postoperative National Institutes of Health Stroke Scale scores of 3 points or less.

2011年 神戸大学からの報告
術前に脳のmalperfusionのあった41例
術後神経学的回復がみられたものは26例
手術までの時間が9.1時間以下、
術前のNIHSSが低いものは改善した。

当院での意識障害合併例に対する治験

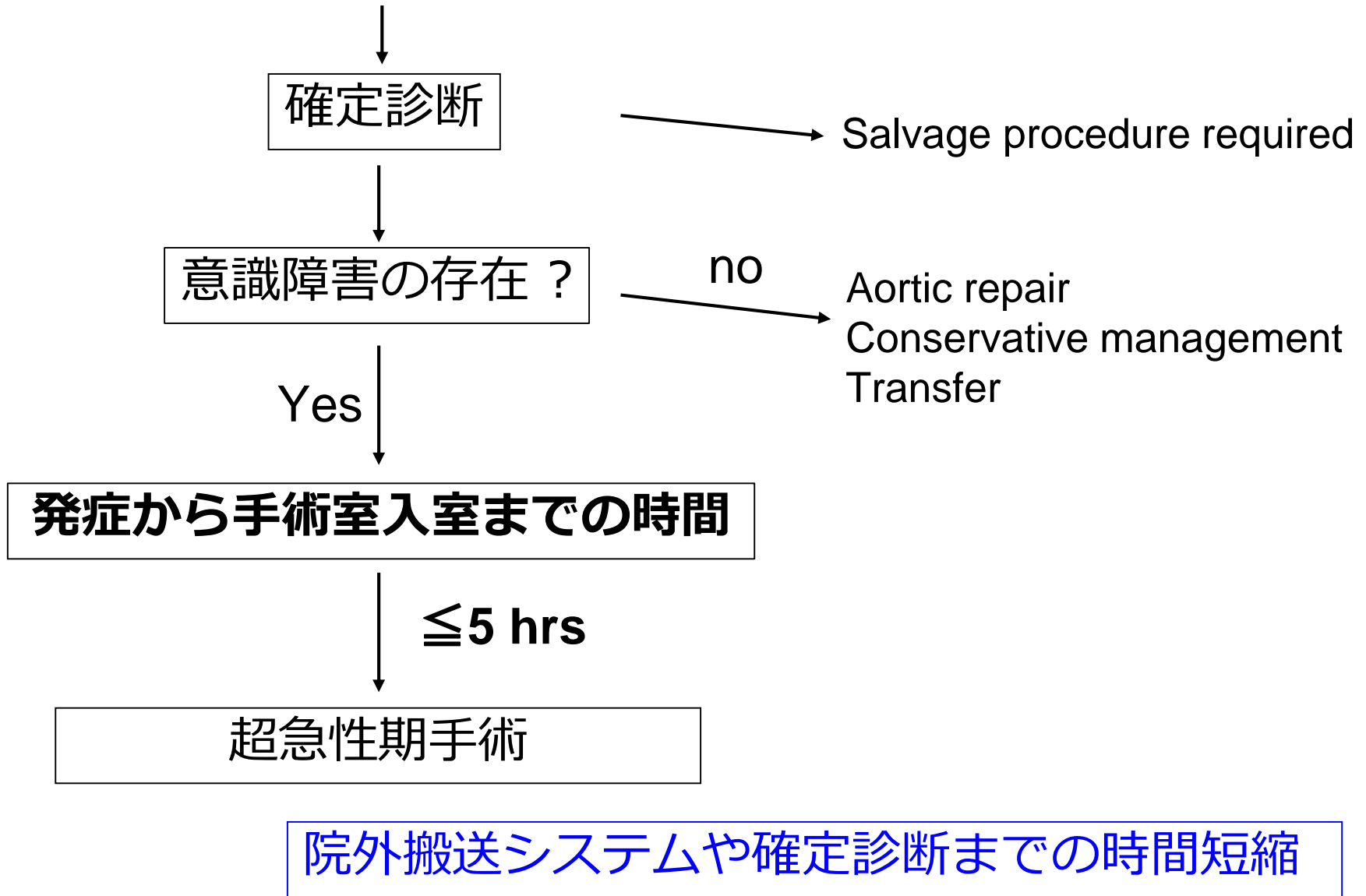
- 重度の意識障害を伴ったA型急性大動脈解離でも、**発症から5時間以内に手術室に入室**し手術ができれば79%で意識は回復し50%でADLの自立を得ることができた。
- 術後の出血性脳梗塞は認められなかった。
- 重度の意識障害を伴ったA型急性大動脈解離に対する超急性期手術は推奨される。

(Tsukube et al. Circulation 2011)

- 遠隔成績は良好であり10年後の累積生存率は48%であった。
- 超急性期手術が5年後の生存の唯一の予測因子であった。
- 遠隔成績からみても重度の意識障害を伴ったA型急性大動脈解離に対する超急性期手術は推奨される。

(Tsukube et al. J Thorac Cardiovasc Surg 2014)

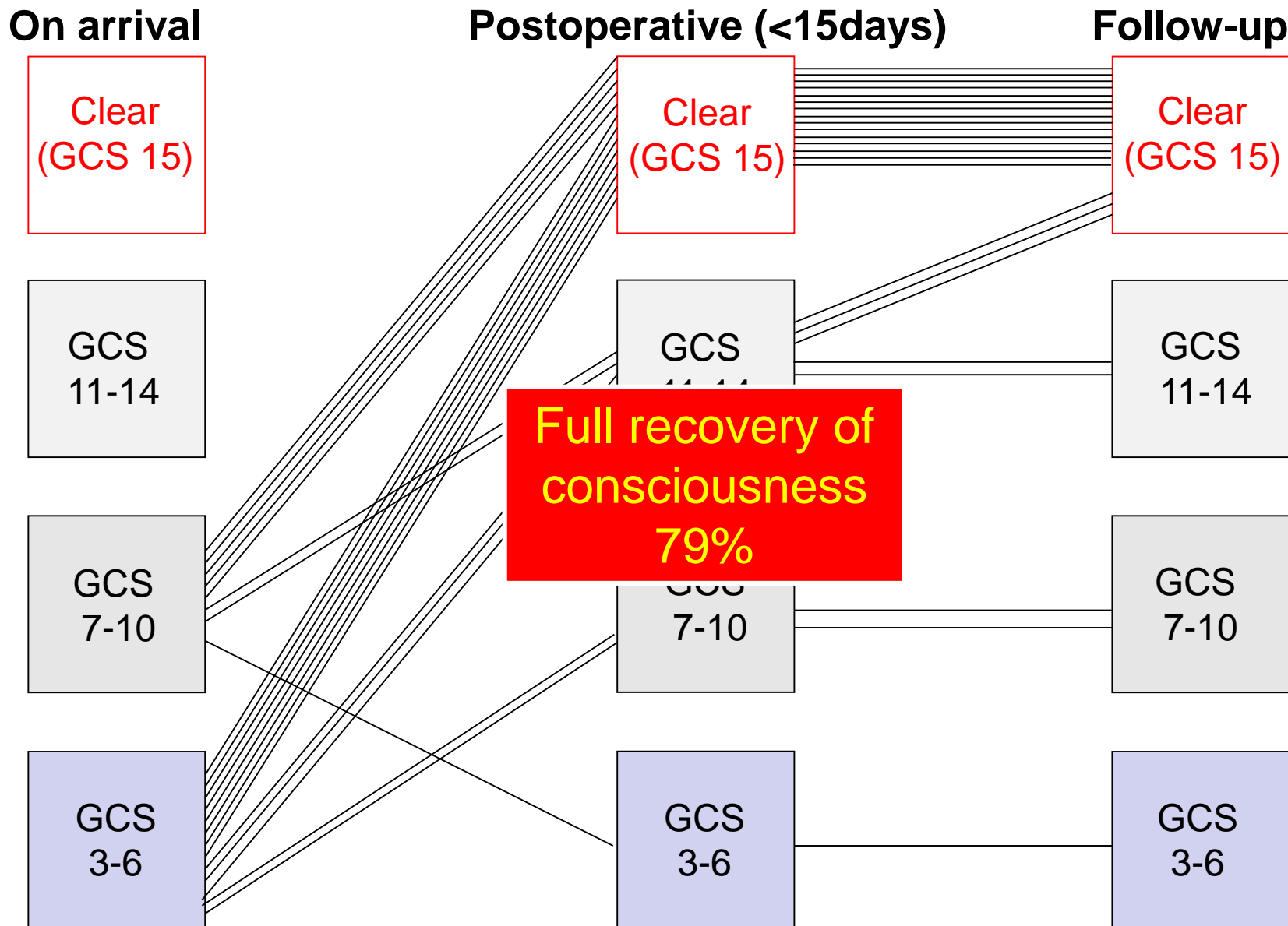
意識障害を伴った急性A型大動脈解離に対する治療戦略



症例

	Immediate repair (n=24)	Initially medical (n=6)	<i>p</i>
Age (y.o.)	71.0±11.0	76.0±11.8	NS
Male	9 (38%)	1 (17 %)	NS
GCS	6.6 ± 2.4	6.5 ± 3.1	NS
NIHSS	30.7 ± 7.0	28.3 ± 9.5	NS
Shock on arrival (BP<80mmHg)	16 (60%)	5 (83%)	NS
Existence of pericardial effusion	17 (67%)	5 (83%)	NS
Existence of carotid dissection	18 (72%)	2 (67%)	NS
Aortic repair performed	24 (100%)	3 (50%)	0.004
Time from onset to OR (min)	233±99	2129±501	<0.0001
In-hospital mortality	3 (13)	4 (67)	0.027
Intra-cerebral hemorrhage	0 (0)	0 (0)	NS
Full recovery of consciousness	19 (79)	1 (16)	0.006
NIHSS (at discharge)	8.5 ± 10.9	29.7 ± 16.7	0.021
modified Rankin scale (mRS)	3.0 ± 2.2	5.2 ± 1.6	0.038

Recovery of Consciousness: Immediate aortic repair n=24 (Changes in Glasgow Coma Scale)



Functional Recovery: Immediate aortic repair (n=24) (NIHSS and ADL independence)

On arrival

NIHSS
0

NIHSS
1-10

NIHSS
11-20
(n=3)

NIHSS
21 -36
(n=21)

Postoperative (at discharge)

NIHSS
0
(n=7)

NIHSS
1-10
(n=7)

NIHSS
11-20
(n=8)

NIHSS
21 -36
(n=2)

**Late results
(1 year)**

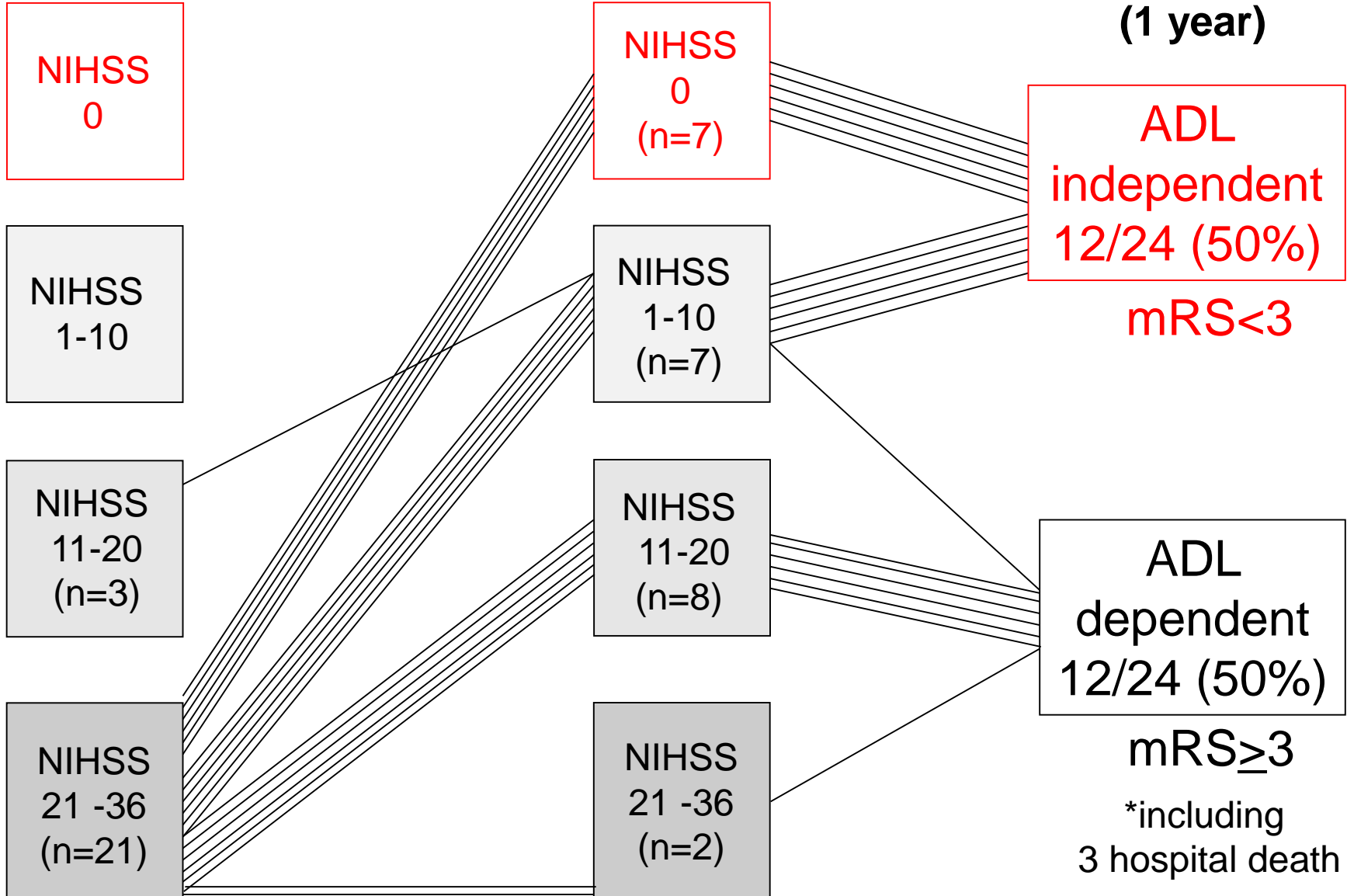
ADL
independent
12/24 (50%)

mRS < 3

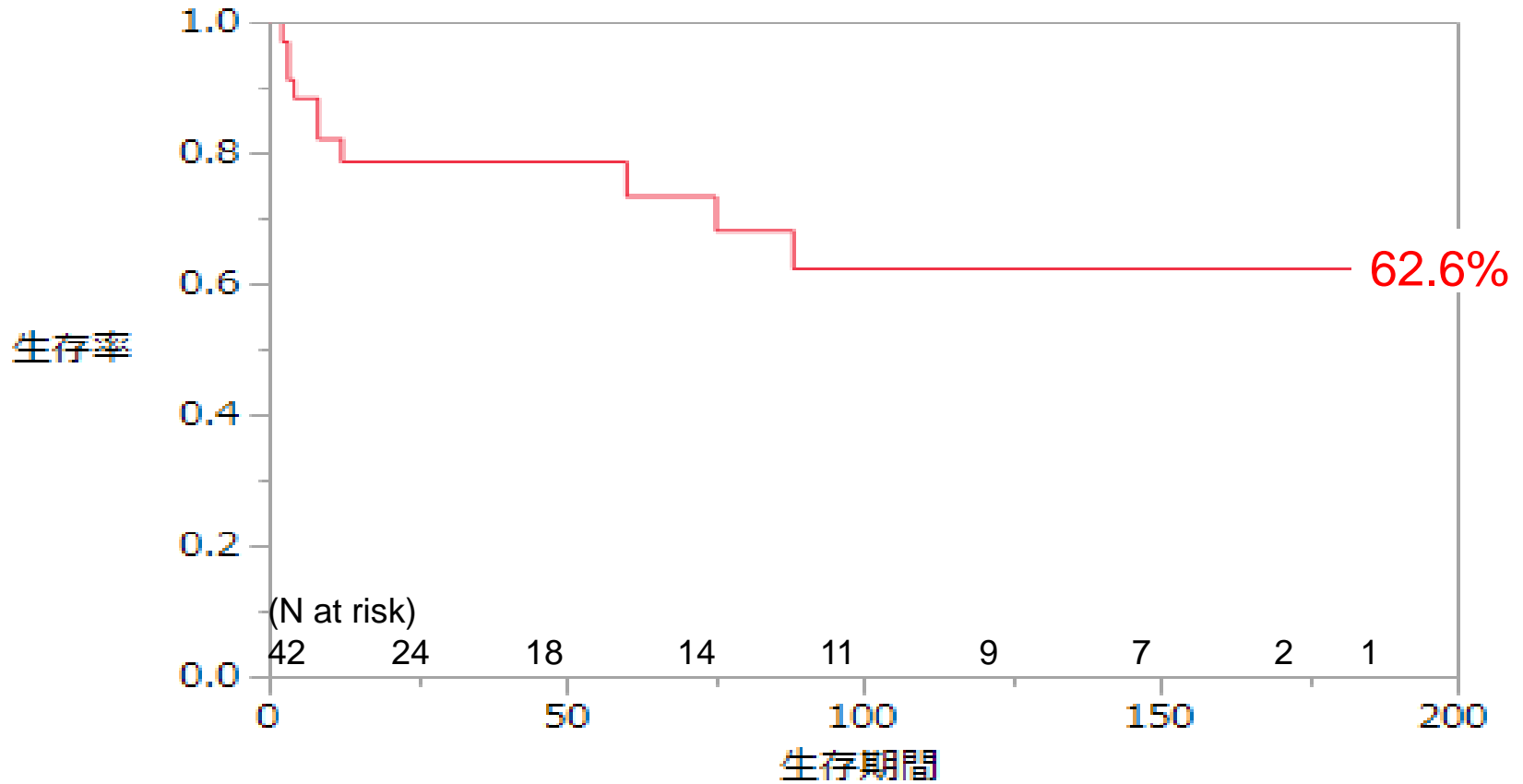
ADL
dependent
12/24 (50%)

mRS ≥ 3

*including
3 hospital death



15 year follow-up (AADA with coma n=42)

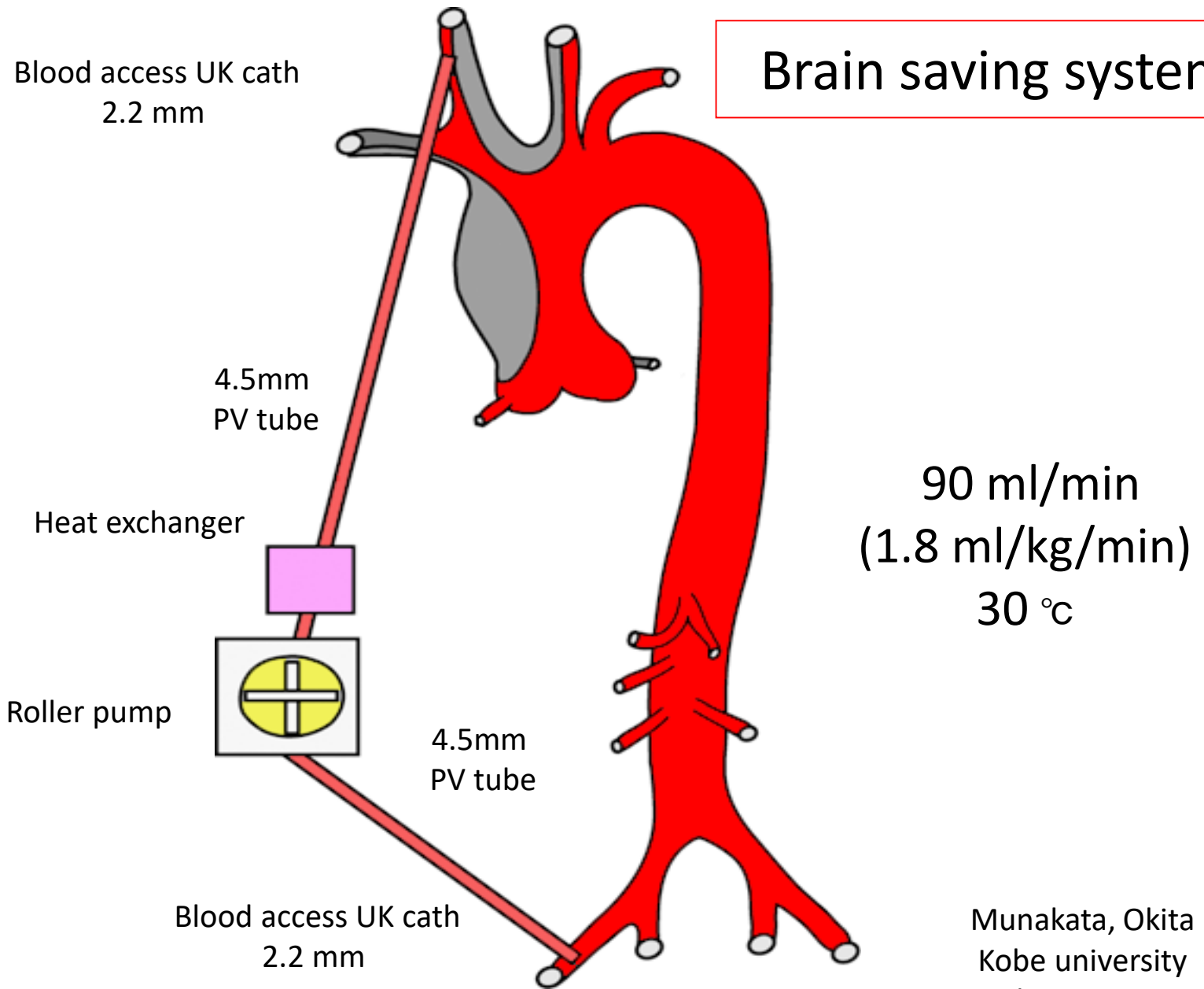


Age (yrs)	71.6 ± 11.1
GCS	6.0 ± 2.5
Prevalence of shock	69% (29)
Carotid dissection	64% (27)
CPA before surgery	31% (13)
Pre-neurological deficit	88%,

Onset to OR time (min)	219 ± 74
Hospital mortality	19%
GCS (=15)	69%
ADL independence (mRS < 3)	
achieved in	48%

Early reperfusion therapy
followed by
immediate aortic repair

Brain saving system



90 ml/min
(1.8 ml/kg/min)
30 °C

“Early reperfusion strategy improves the outcomes of surgery for type A acute aortic dissection with malperfusion”

Uchida K et al, J Thorac Cardiovasc Surg 2018;156:483-9

Early reperfusion strategy consists of percutaneous coronary artery intervention for coronary malperfusion, direct surgical fenestration for carotid artery occlusion, active perfusion of the superior mesenteric artery for visceral malperfusion, and external shunting from the brachial artery to the femoral artery for lower limb ischemia. Central repair is performed without delay after reperfusion therapy, but if irreversible organ damage is recognized, further aggressive treatment is discontinued.

Among 438 patients, malperfusion in one or more organs was diagnosed in 108 patients (24%). Early reperfusion strategy were applied in 33 patients, (coronary, 14 patients; carotid, 4; visceral, 7; lower extremity, 8).

先行手技

Coronary: PCI

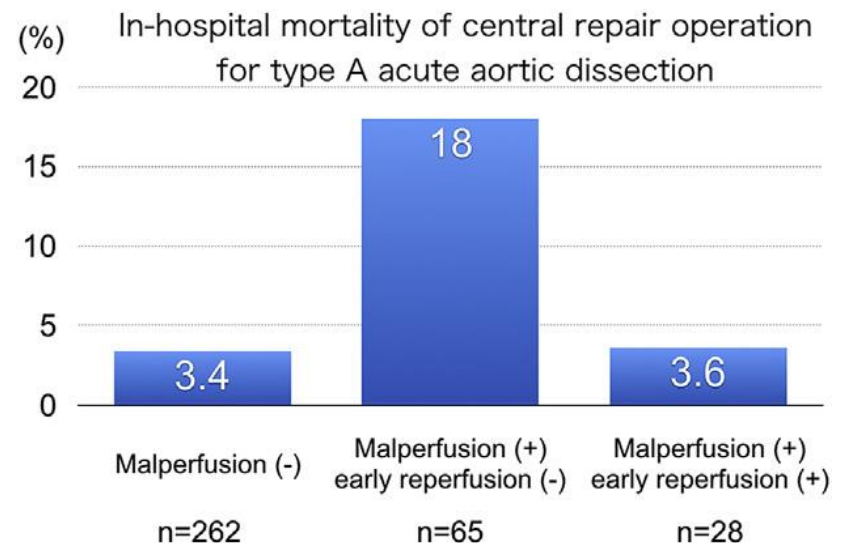
Carotid: direct fenestration

SMA: active perfusion

Lower limb: external shunt

引き続きいて

Central repair

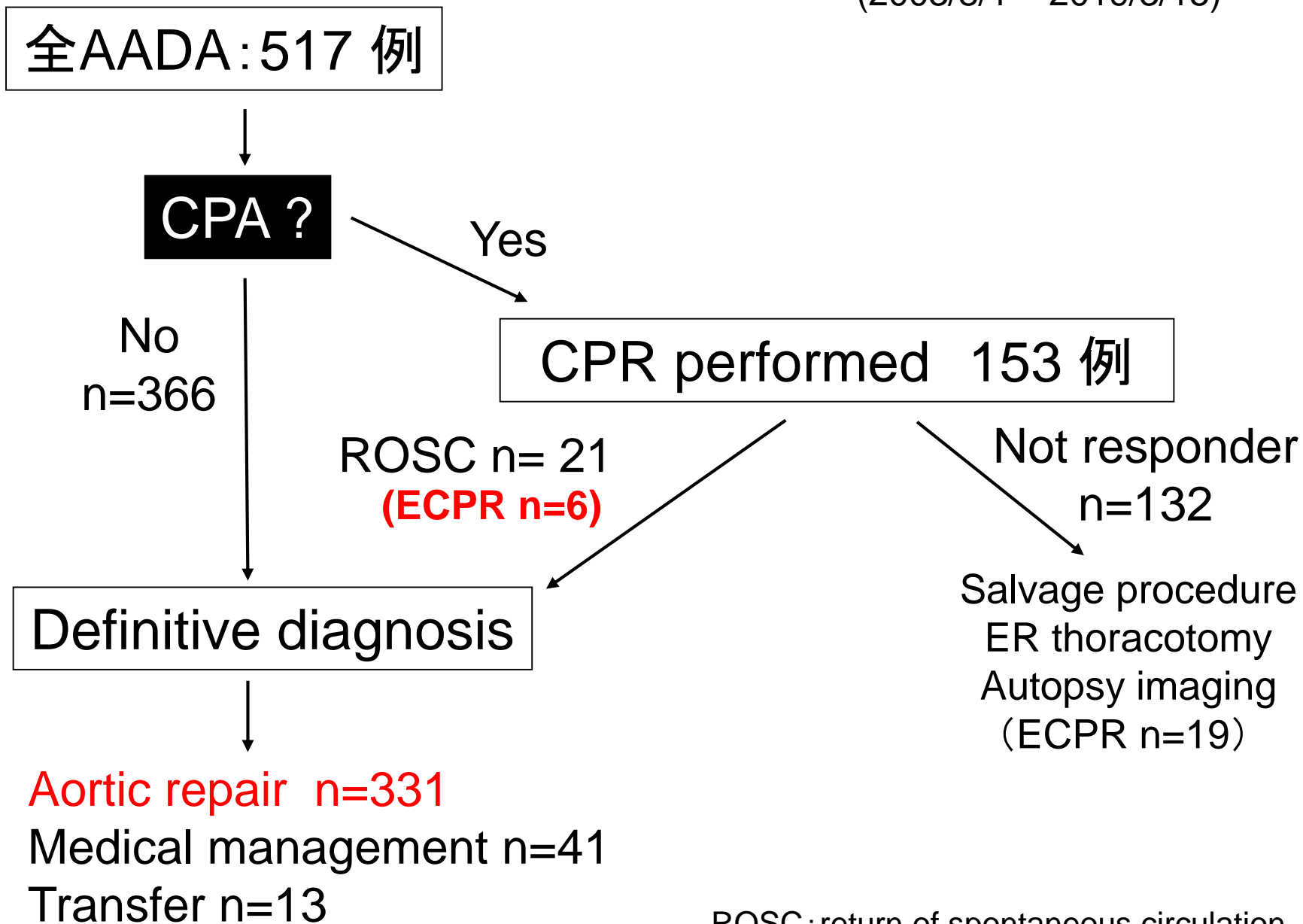


CPA症例でのpitfall

冠動脈malperfusionによるCPAに対するECPR例

来院した急性A型大動脈解離(AADA)の治療成績

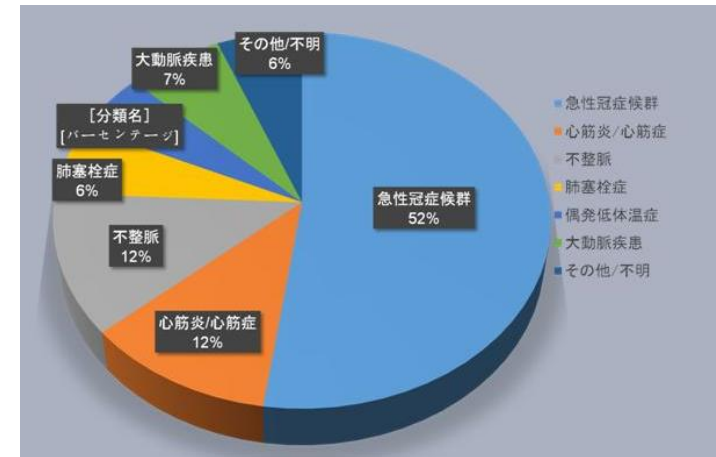
(2003/8/1 – 2019/3/15)



ROSC: return of spontaneous circulation

ECPRの導入

- Extracorporeal cardiopulmonary resuscitation (ECPR) protocol : 通常のCPRに反応しない症例にまずPCPSを行い、PCPS下に診断し治療をする
- ECPR: Indications include
 - The patient generally healthy prior to the arrest.
 - Circulatory collapse (within 45min)
 - Initial ECG: Vf or PEA with bystander(Exclusion criteria)
 - Initial ECG cardiac asystole
 - Age $\leq 15, \geq 76$
 - DNR



当院での経験 (2015年1月 –2019年2月 4年2ヶ月 間)

CPAOA 768例 (AADA 54例 (7%))

→ECPR 156例 (AADA 14例 (9%))

冠動脈のMalperfusion例の増加

まとめ

急性A型大動脈解離に伴うmalperfusionは予後不良因子である。

虚血臓器の再灌流を早期に行える方法の選択が、予後改善に重要である。