Surgical Outcomes in Acute Type A Aortic Dissection Complicated by Coma

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Objectives

➢Acute type A aortic dissection (ATAAD) with preoperative neurologic deficits including coma remains high mortality rate after surgical repair.

Dumfarth J, et al. Immediate Surgery in Acute Type A Dissection and Neurologic Dysfunction: Fighting the inevitables? J Thorac Cardiovasc Surg 2013;145:S213-21.

➢Specifically, the management of ATAAD complicated by preoperative coma remains controversial.

Eusanio M, et al. Patients with type A acute aortic dissection presenting with major brain injury: Should we operate on them? J Thorac Cardiovasc Surg 2013;145:S213-21.

➢The aim of this study is to evaluate the postoperative outcomes of immediate surgical repair for patients with ATAAD complicated by coma without patient selection.

Methods

➢Between January 2016 and December 2019, Our institution received 200 patients with acute type A aortic dissection (ATAAD). All patients underwent immediate surgical repair of ATAAD without any preoperative patient selection.

➢The study population was categorized into two: those with preoperative coma (Coma+) and those without preoperative coma (Coma−). Coma was defined as a Glasgow Coma Scale (GCS) score of less than 11 upon arrival.

➢Characteristics, neurological symptoms, CT or MRI findings, echocardiographic studies, the interval from symptom onset to operation, and operative details were retrospectively reviewed and compared through univariable analyses.

Surgery

➢ All cases were performed through median sternotomy. Cardiopulmonary bypass was established using three main arterial cannulations (the femoral artery, the axillary artery, and the ascending aorta) and bicaval venous cannulation (femoral vein and superior vena cava). Circulatory arrest was achieved at tympanic temperature of 25°C to 27°C.

➢ If an intimal tear was identified in the ascending aorta or proximal transverse aorta, we performed replacement of the ascending aorta or hemiarch replacement using an open distal anastomosis technique under circulatory arrest only.

➢ For cases with an intimal tear in the transverse aorta, total arch replacement was conducted to exclude the intimal tear, utilizing selective cerebral perfusion . In instances where no intimal tear could be identified in the ascending or transverse aorta, only the ascending aorta was replaced.

Result 1: Patient characteristics 1

Variables	All (n = 200)	Coma + (n = 30)	Coma− (n = 170)	P-Value
Age, year	69.3 ± 13.4	73.8 ± 10.8	68.6 ± 13.7	.051
Male gender	101 (50.5)	9 (30.0)	92 (54.1)	**.015**
Diabetes	14 (7.0)	2 (6.7)	12 (7.1)	.649
Hypertension	140 (70.0)	17 (56.7)	123 (72.4)	.084
Preoperative creatinine, mg/dL	1.25 ± 1.37	1.52 ± 2.09	1.20 ± 1.20	.429
History of cardiovascular operation	7 (3.5)	0 (0)	7 (4.1)	.315
Old cerebral infarction	5 (2.5)	0 (0)	5 (2.9)	.440
Coronary artery disease	6 (3.0)	1 (3.3)	5 (2.9)	.628
Interval from symptom onset to operation (IQR), hours	3.7 (2.9-5.1)	2.8 (2.0-4.5)	3.7 (2.9-5.2)	**.017**

Results are given as number (%) for categorical variables and as the mean SD for continuous variables.
Bold P values are statistically significant (P < .05).

Result 2: Preoperative Data Related to Aortic Dissection

Variables	All (n = 200)	Coma + (n = 30)	Coma− (n = 170)	P-Value
Shock	53 (26.5)	24 (80.0)	29 (17.1)	**< 0.001**
Cardiac tamponade	37 (18.5)	16 (53.3)	21 (12.4)	**< 0.001**
Intubation upon arrival	15 (7.5)	15 (50.0)	0 (0)	**< 0.001**
Cardiopulmonary arrest	9 (4.5)	8 (26.7)	1 (0.6)	**< 0.001**
Aortic insufficiency	30 (15.0)	2 (6.7)	28 (16.5)	.130
Non cerebral malperfusion	60 (30.2)	11 (36.7)	49 (28.8)	.387
Coronary	21 (10.5)	4 (13.3)	17 (10.0)	.389
Spinal	2 (1.0)	0 (0)	2 (1.2)	.722
Visceral	21 (10.5)	7 (23.3)	14 (8.2)	**.022**
Extremities	28 (14.0)	3 (10.0)	25 (14.7)	.361
Preoperative CT angiographic available	180 (90.0)	26 (86.7)	154 (90.6)	.350
DeBakey I dissection	138/180 (76.7)	20/26 (76.9)	118/154 (76.6)	.973
Dissection of supra-aortic vessel	119/180 (66.1)	22/26 (84.6)	97/154 (63.0)	**.031**

Results are given as number (%) for categorical variables and as the mean SD for continuous variables.
Bold P values are statistically significant (P < .05).

Result 3: Operative data 1

Variables	All (n = 200)	Coma + (n = 30)	Coma− (n = 170)	P-Value
CPB time, min	104.5 ± 35.2	110.7 ± 25.2	103.3 ± 36.7	.291
Aorta clamp time, min	52.7 ± 26.9	54.0 ± 19.9	52.5 ± 28.0	.767
Circulation arrest time, min	21.4 ± 8.3	20.9 ± 9.0	21.5 ± 8.3	.707
Lower temperature, ℃	24.6 ± 2.4	24.5 ± 2.5	24.6 ± 2.3	.862
Arterial cannulation site				
Axillary artery	26 (13.0)	1 (3.3)	25 (14.7)	.068
Femoral artery	155 (77.5)	28 (93.3)	127 (74.7)	**.024**
Axillary artery + femoral artery	8 (4.0)	0 (0)	8 (4.7)	.266
Ascending aorta	11 (5.5)	1 (3.3)	10 (5.9)	.487
CNS protection				
DHCA	172 (86.0)	25 (83.3)	147 (86.5)	.414
Antegrade	24 (12.0)	4 (13.3)	20 (11.8)	.502
Retrograde	4 (2.0)	1 (3.3)	3 (1.8)	.481

Results are given as number (%) for categorical variables and as the mean SD for continuous variables.
Bold P values are statistically significant (P < .05).

Result 3: Operative data 2

Variables	All (n = 200)	Coma + (n = 30)	Coma− (n = 170)	P-Value
Location of intimal tear				
Ascending aorta	94 (47.0)	16 (53.3)	78 (45.9)	.451
Aortic arch	54 (27.0)	6 (20.0)	48 (28.2)	.349
Unknown	62 (31.0)	8 (26.7)	54 (31.8)	.578
Range of replacement				
Hemiarch replacement	182 (91.0)	29 (96.7)	153 (90.0)	.210
Total arch replacement	18 (9.0)	1 (3.3)	17 (10.0)	
Frozen elephant trunk	14 (7.0)	2 (6.7)	12 (7.1)	.649
Concomitant procedures				
CABG	19 (9.5)	4 (13.3)	15 (8.8)	.312
Valve surgery	20 (10.0)	1 (3.3)	19 (11.2)	.161
AV plasty	8 (4.0)	0 (0)	8 (4.7)	.266
AVR	5 (2.5)	0 (0)	5 (2.9)	.440
Bentall procedure	7 (3.5)	1 (3.3)	6 (3.5)	.717
Femoral bypass	10 (5.0)	1 (3.3)	9 (5.3)	.541

Results are given as number (%) for categorical variables and as the mean SD for continuous variables.
Bold P values are statistically significant (P < .05).

Result 4: Postoperative data

Variables	All (n = 200)	Coma + (n = 30)	Coma− (n = 170)	P-Value
Postoperative neurologic injury	37 (18.5)	14 (46.7)	23 (13.5)	**< .001**
Renal replacement therapy	11 (5.5)	3 (10.0)	8 (4.7)	.217
Revision due to bleeding	3 (1.5)	0 (0)	3 (1.8)	.612
Multiple organ failure	11 (5.5)	6 (20.0)	5 (2.9)	**.002**
Deep sternum wound infection	1 (0.5)	1 (3.3)	0 (0)	.150
In-hospital mortality	19 (9.5)	11 (37.9)	8 (4.7)	**< .001**
Causes of death				
Bleeding	3/19 (15.8)	2/11 (18.2)	1/8 (12.5)	.624
Aortic rupture	3/19 (15.8)	2/11 (18.2)	1/8 (12.5)	.624
Bowel ischemia	2/19 (10.5)	0/11 (0)	2/8 (25.0)	.164
Heart failure	2/19 (10.5)	1/11 (9.1)	1/8 (12.5)	.678
Neurologic injury	6/19 (3.0)	4/11 (36.4)	2/8 (25.0)	.494
Sepsis	3/19 (15.8)	2/11 (18.2)	1/8 (12.5)	.624

Results are given as number (%) for categorical variables and as the mean SD for continuous variables.
**Bold P** values are statistically significant (P < .05).

Result 5: Details of Postoperative Neurologic Deficits

Variables	All (n = 200)	Coma + (n = 30)	Coma− (n = 170)	P-Value
Etiology of postoperative neurologic deficits				
Spinal cord injury	3 (1.5)	0 (0)	3 (1.8)	.612
Postoperative stroke	34 (17.5)	14 (46.7)	20 (11.8)	**< .001**
Right-sided lesion	14/34 (41.2)	5/14 (35.7)	9/20 (45.0)	.673
Left-sided lesion	5/34 (14.7)	2/14 (14.3)	3/20 (15.0)	.694
Both-sided lesion	15/34 (44.1)	7/14 (50.0)	8/20 (40.0)	.486
Details of neurologic deficits				
Impaired consciousness	21 (10.5)	13 (43.3)	8 (4.7)	**< .001**
Paresis	17 (8.5)	6 (20.0)	11 (6.5)	**.026**
Paraplegia	3 (1.5)	0 (0)	3 (1.8)	.612
Amaurosis	3 (1.5)	0 (0)	3 (1.8)	.612
Higher brain function	6 (3.0)	2 (6.7)	4 (2.4)	.222

Results are given as number (%) for categorical variables and as the mean SD for continuous variables.
Bold P values are statistically significant (P < .05).

Result 7: Recovery from Coma After Surgery

On arrival   **Postoperative (<15 days)**   **In-hospital (>15 days)**
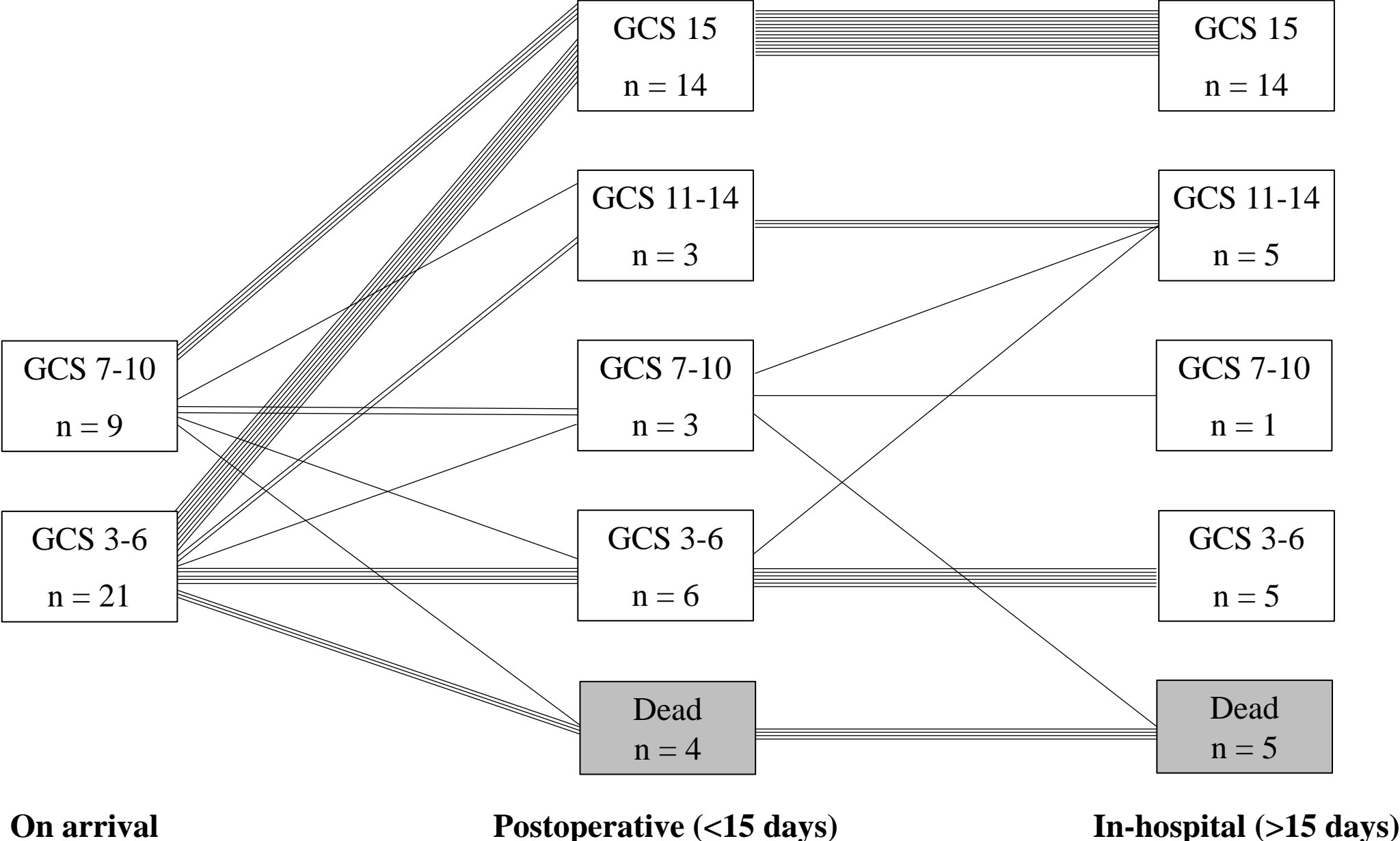
Result 6. Risk Factors for In-hospital Mortality

Factors	Univariable Analysis			Multivariable Analysis		
	OR	95% CI	P Value	OR	95% CI	P Value
Male gender	.996	.962-1.031	.811			
Age	2.265	.825-6.222	.113			
Median time from onset to OR	1.012	.886-1.154	.865			
Coronary malperfusion	.439	.448-6.354	.439			
Preoperative shock	6.000	2.216-16.248	**< .001**			
Preoperative CPA	27.231	6.101-121.549	**< .001**			
Preoperative coma	12.375	4.406-34.758	**< .001**	12.183	3.368-44.067	**< .001**
Dissection of supraaortic vessels	1.717	.535-5.513	.364			
Perfusion time	1.013	1.002-1.023	**.022**	1.023	1.003-1.042	**.022**
Cross clamp time	1.010	.997-1.024	.117			
Circulatory arrest time	1.008	.956-1.063	.776			
DHCA only	1.435	.313-6.581	.642			
Hemiarch replacement	1.877	.236-14.947	.552			

CPA, cardiopulmonary arrest; DHCA, deep hypothermic cardiac arrest.
Bold P values are statistically significant (P < .05).

Conclusion

➢ Preoperative coma was associated with high mortality after immediate surgery for ATAAD.

➢ Full recovery was observed in approximately half of the patients with preoperative coma after immediate surgery for ATAAD.

➢ Immediate surgical repair is warranted even if ATAAD is complicated by preoperative coma.