Risk Analysis for Perioperative Stroke after Crawford Extent I or II Aortic Repair with Deep Hypothermic Circulatory Arrest

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Objective

- ✓ For thoracoabdominal aortic repair, we routinely employ straight incision with rib-cross (SIRC) incision to ensure good visual field and deep hypothermic circulatory arrest (DHCA) to prevent cerebral and spinal cord complications.

- ✓ In this study, we investigated risk factors associated with the perioperative strokes in these combined procedures.

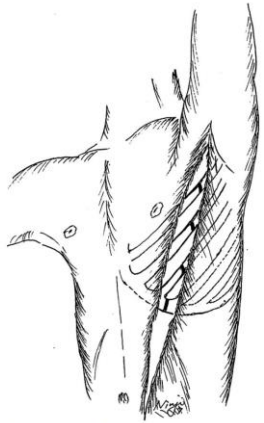

Figure 1: Approach using straight incision with rib-cross.

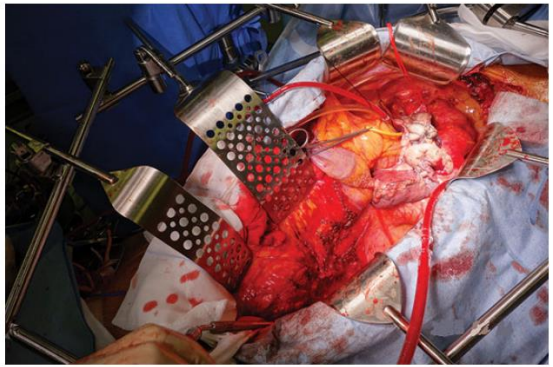

Figure 2: Operative view with straight incision with rib-cross.

Interact Cardiovasc Thorac Surg. 2016;23:367-70.

Methods

- ✓ We reviewed records of patients who underwent repair for thoracoabdominal aorta related disease between 2016 to 2023.
- ✓ Sixty patients underwent Crawford extent I or II aortic repair using SIRC and DHCA (39 men, 21 women; mean age, 63.5 ± 15.9 years)
- ✓ The patients were divided into two groups: those who experienced perioperative stroke **(Stroke group)** [with obvious image findings and persistent or temporary neurologic deficits] and those who did not **(Non-stroke group)**.
- ✓ Perioperative and postoperative data from patients' record were collected retrospectively and the variables were compared between the 2 groups.

Methods

Between 2016 to 2023
Crawford extent I or II aortic repair using
SIRC and DHCA
N=60
(39 men, 21 women; mean age, 63.5 ± 15.9 years)

Stroke group:
those who experienced perioperative stroke [with obvious image findings and persistent or temporary neurological deficits]

Non-stroke group:
those who did not

N=60
11 (18.3%) cases of aneurysm
49 (81.7%) cases of dissection

14 (23.3%) cases needed total or partial arch replacement via SIRC view or via median sternotomy

Results

Eleven (18.3%) patients experienced stroke in Crawford extent I or II aortic repair using SIRC and DHCA.

✓ Major stroke (10%): persistent neurological deficits
- Hemiplegia: 2 cases
- Impaired consciousness: 4 cases

✓ Minor stroke (8.3%): temporary neurological deficits or asymptomatic
- Seizure: 3 cases
- Obvious image findings without symptoms: 2 cases

Results

	Stroke (n=11, %)	**Non-stroke (n=49, %)**	p value
Age (years)	70.5±9.0	62.0±16.7	0.069
Male gender	8 (72.7)	31 (63.2)	0.731
Body surface area (m^2)	1.63±0.3	1.66±0.2	0.572
Hypertension	9 (81.8)	38 (77.6)	1.000
JapanSCORE2 predicted 30 days mortality (%)	16.3±10.7	12.8±12.8	0.196

Kruskal-Wallis test / Fisher’s exact test

Results

	Stroke (n=11, %)	**Non-stroke (n=49, %)**	p value
Operative data			
Crawford extent	I:4 (36.4) / II:7 (63.6)	I:27 (55.1) / II:22 (44.9)	0.327
Operation time (min)	644±234	639±223	0.923
CPB time (min)	280±132	256±96	0.619
Circulatory arrest (brain)(min)	22±13	21±16	0.667
Arch reconstruction via SIRC view	4 (36.4)	2 (4.1)	**0.008**
Arch reconstruction via median sternotomy	0 (0)	8 (16.3)	0.33
Minimal body temperature (℃)	19.0±1.3	19.2±2.2	0.674

Kruskal-Wallis test / Fisher's exact test

Results

	Stroke (n=11, %)	**Non-stroke (n=49, %)**	p value
Postop outcome			
ICU stay (days)	14±13	10±12	0.371
Hospital stay (days)	48±39	46±54	0.796
Hospital death	2 (18.0)	4 (8.2)	0.302
Acute kidney injury	3 (27.3)	13 (26.5)	1.000
Pneumonia	5 (45.5)	10 (20.4)	0.122
Spinal cord injury	1 (9.1)	5 (10.2)	1.000

Kruskal-Wallis test / Fisher's exact test

Perioperative risk factor of stroke	Univariate analysis
	Odds ratio (95%CI), p value
Age	**1.05 (0.99-1.12) 0.033**
Arch reconstruction via SIRC view	**13.4 (2.06-87.47) 0.005**

Conclusion

- ✓ We experienced 18.3% strokes (10% major strokes, 8.3% minor strokes) in Crawford extent I or II repair with SIRC/DHCA.
- ✓ Although not statistically significant, the occurrence of stroke may worsen the short-term prognosis.
- ✓ Higher age and performing arch reconstruction via SIRC view were found to be associated with the occurrence of strokes.
- ✓ Even if the procedure is performed under SIRC and DHCA, care should be taken or furthermore adding median sternotomy should be considered when performing arch repair.