

Thoracoabdominal Aortic Aneurysm의 수술

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1. SURGICAL INDICATION OF Indication of TAAA

1) Absolute Indications

Operative Indications for Thoracoabdominal Aortic Aneurysms

Pain

Ascending aortic dilatation more than 5cm in patients with Marfan's syndrome

Maximal diameter more than 8cm unless there are strong operative contraindications

Saccular aneurysms suggestive of localized wall weakness

2) Relative Indications

Operative Indications for Thoracic Aortic Aneurysms with Diameters Between 6 and 8cm

Aggressive approach

Resection

Conservative approach

Repeat CT scan every 3 to 6 months to determine whether size is stable or expanding

Weigh risk versus benefit

Since morbidity and mortality of surgery increase as one progresses distally, and with more extensive resections, a more aggressive approach is warranted for localized lesions in the proximal aorta than for diffuse disease in the distal descending aorta

2. SURGICAL TECHNIQUE of TAAA

The period during the operation when the flow through the descending aorta is interrupted imposes a serious physiological burden on many patients with significant preexisting cardiovascular, renal, and pulmonary pathology,

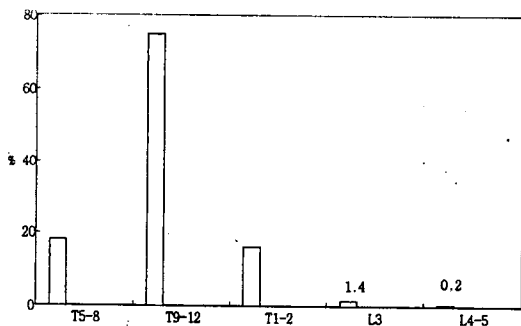
The clinical management during this critical period may be the most important determinant of the outcome in a substantial number of patients.

1) Physiology of Interruption of Flow through the Descending Aorta

- = Two major consequences; proximal hypertension; MI, PE, brain edema distal organ ischemia; -spinal cord, kidney
- ** Factors possible responsible for spinal cord ischemia(30min)
 - the anatomy of arteria radicularis magna(a. of A damkiewioz)
 - subclavian steal
 - open aorta with freely bleeding intercostals
 - proximal hypertension with attendant increase in CSF pressure
 - too aggressive use of vasodilators
- ** Renal ischemia(temporary renal dysfunction after 45~60 min of warm ischemia)

Factors Associated with Spinal Cord Ischemic Injury following Operations on the Descending Thoracic and Thoracoabdominal Aorta

- Perioperative hypotension
- Use and duration of aortic clamping
- Increased cerebrospinal fluid pressure
- Sacrifice of critical intercostal/lumbar arteries
- Extensive aortic disease/presence of dissection



Group showing the approximate frequency of the arteria radicularis magna (ARM) according to the vertebral level in humans, T, thoracic; L, lumbar, e

2) Method of Distal Perfusion

- = low aims; proximal unloading, distal perfusion
- But the morbidity of the distal perfusion method and the unpredictability of spinal cord injuries in certain subset of patients have fostered the ongoing debate whether distal perfusion is a necessity in operations on the descending aorta & TAAA
- A trend towards simpler HEPARINLESS systems within the last decade becomes readily apparent.
- = passive shunts
- = active pump bypass-Currently, most frequently used methods of distal perfusion FV-FA bypass with reservoir and oxygenator and full-dose of HEPARIN LA-FA bypass HEPARINLESS centrifugal bypass w or W/O reservoir
- Maintain normal or near normal proximal BP and distal BP about 60mmHg

Active Pump Bypass Methods for Distal Perfusion

Description	Oxygenator	Reservoir	Heparin
Venoarterial			
SVC to FA	+	+	No
FV-RA to FA	+	+	No
FV to FA	+	+	Full dose
LA to FA	-	+	Full dose
LA to FA	-	-	No
centrifugal pump			

3) Strategies for Prevention of Paraplegia

- (1) Simple cross clamping
 - with special care about acidosis and hypothermia and hypovolemia
 - overall 10% neurologic deficit
- (2) Pump bypass
 - = not so helpful in preventing paraplegia
 - use it to make the proximal clamping much

more subtle and less injurious, Use clamp with padded jaw.

- 14% of paraplegia

(3) Monitoring SEP

- not of help in preventing paraplegia

(4) Profound hypothermia

- 11% of paraplegia

- promising result by Dr. Kouchoukos

(5) CSF drainage

- no effect by Houston group

(6) Future approaches toward preventing paraplegia

= preoperative identification and reattachment of intercostal vessels; Dr. Kieffler-identify the source of cord blood supply, and the to do something(paraverine) to provide circulation to his aorea.

; Dr. Williams-able to identify the vessel supplying spinal cord in 18/19 patients.

= intraoperative identification and reattachment of spinal cord blood supply; platinum electrode in suvarachnoid space and inject saline with liquid hydrogen.

Descending and Thoracoabdominal Aorta: Paraplegia According to Method of Operation

Method	Yes		No	
	No of Cases	Paraplegia	No of Cases	Paraplegia
Crossclamp	1,510	154(10%)		
Pump bypass	433	60(14%)	1,510	154(10%)
Pump bypass SEP	99	8(8%)	95	7(7%)
Profund hypothermia	18	2(11%)		
Spinal fluid drainage	50	15(30%)	50	115(30%)

3. INDEPENDENT PREDICTORS OF PARAPLEGIA of TAA

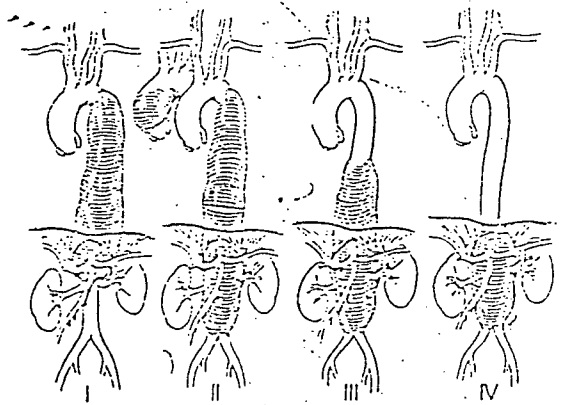
A. The extent of disease

B. The nature of the disease; whether it is a dissection or not

C. The duration of aortic crossclamping

1) Classification of TAA(Dr. Calword)

type I, II, III, IV



Classification of thoracoabdominal aneurysms

2) Type I TAA

- no pump assist if no rupture of aorta or no proximal disease
- problem of whether proximal or distal surgery first in case of combined aneurysms
- the staged procedures are better tolerated and the survival rate is higher—THE ELEPHANT TRUCK PROCEDURE of Dr Borst.
- second operation on descending aorta after 4 or 6 weeks later.

3) Type II TAA

- It is important to reduce the incidence of RLN paralysis-cut the vagus just beyond where the RLN arises.
- Another important point is to mobilize the aorta completely from the eophagus-abscess fromation and fistula. -ie, complete transection of aorta and end to end anastomosis
- SPINAL CORD BLOOD SUPPLY
- 75% FROM T-9 THPU T-12, ESP LEFT SIDED ONES(85%)

Patients Treated for Thoracoabdominal Aneurysms, Incidence of Spinal Cord Ischemic Injury in 1960 to 1988

Extent Etiology	No. of Patients	Paraparesis	Paraplegia
TAA I			
Nondissection	198	12(6%)	12(6%)
Dissection	41	4(10%)	4(10%)
TAA II			
Nondissection	201	25(12%)	30(15%)
Dissection	92	15(16%)	18(20%)
TAA III			
Nondissection	236	5(2%)	6(3%)
Dissection	25	2(8%)	2(8%)
TAA IV			
Nondissection	258	3(1%)	5(2%)
Dissection	11	0(6%)(1(9%)
Total	1.062	66(6%)	78(7%)

Twenty-five patients excluded: 11 operative deaths; 14 preoperative neuromuscular deficits.

Crawford et al, JVasc Surg 13:37, 1990

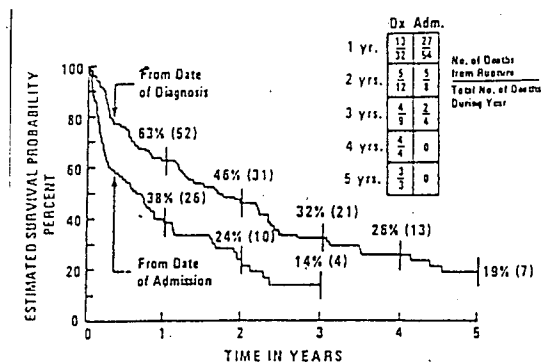
- 4) thoracoabdominal Dissections
- 5) Type III TAA
- 6) Type IV TAA
- 7) Mycotic Aneurysm
in situ grafting and lifelong antibiotics
- 8) Result of Operation

92% survive; 0% of them got fairly good motor function

But, 10% of patients with permanent neurologic sequelae with only wheelchair ambulation

4. COMPLICATIONS OF AORTIC SURGERY

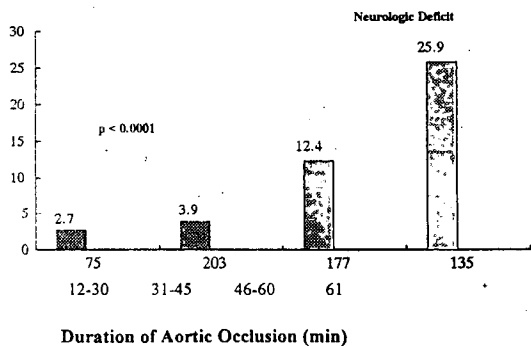
1. Hemorrhage



Survival graph of 94 patients with thoracic and thoracoabdominal aneurysms treated nonoperatively

Thoracoabdominal Aorta Survival According to Extent (1,410 patients)

Extent	Nondissection		Dissection	
	no. cases	Deaths	no cases	Deaths
Type I	265	15(6%)	75	9(12%)
Type II	283	29(10%)	135	11(8%)
Type III	298	29(10%)	30	2(7%)
Type IV	312	17(5%)	16	2(13%)
Total	1,158	90(8%)	256	24(9%)



Incidence of neurologic deficits of the lower extremities following resection thoracoabdominal aneurysms according to the duration of aortic occlusion. The number of patients at risk appears below each bar in the graph (Modified and reprinted with permission.)

2. Infection of Prosthetic Graft
3. Pulmonary Complications.

4. Central Nervous System Injury

- 1) Embolization
 - 2) Inadequate CNS Protection During Operations on Aortic Arch
 - 3) Spinal Cord Injury During Op
 - 4) Phrenic and RLN Injury
5. Perioperative Injury to the Aorta-clamp injury

6. Pseudoaneurysms at Anastomotic suture Lines

7. Complication Unique to Aortic Dissection

- 1) Problems with Perfusion
- 2) Hemorrhage
- 3) Persistent or Recurrent Dissection and Aneurysm Formation
- 4) Ischemic Syndromes