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分担研究報告書

５、腹部大動脈瘤の冠状動脈病変に関する基礎研究

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研究要旨

腹部大動脈瘤症例の冠状動脈病変について術前に評価したところ、高率に冠動脈狭窄を認め、同時に瘤径の大きい例では冠動脈病変も重篤であった。大動脈瘤治療時には全身的な血管病変への対応が必要である。

A. 研究目的

当院における腹部大動脈瘤の手術症例において、大動脈瘤径と冠動脈疾患との関連を明らかにする。

B. 研究方法

2004 年 1 月から 2008 年 12 月の期間において当院で腹部大動脈瘤のため、外科的手術を施行した症例を電子カルテ、紙媒体のカルテや記録、心臓カテーテルの画像所見を後ろ向き調査にて評価し、その関連を解析をした。

（倫理面への配慮）

調査は、手術入院時に研究対象者に同意書を取得し、十分な理解が得られた状況で行った。

C. 研究結果

2004 年 1 月から 2008 年 12 月の 5 年間において当院で腹部大動脈瘤のため、外科的手術を施行した症例は 208 例であった。心臓カテーテル検査などの術前冠動脈評価を

施行した症例は、170 症例(78%)であり、全体で 97 症例(76%)に有意狭窄を認め、術前血行再建を要したのは 39 症例(18%)であった。また瘤の最大径を 5cm 未満、5cm 以上の 2 群に分類すると、瘤径 5cm 以上の群では有意(P=0.041)に冠動脈に有意狭窄を認めた。更に左前下行枝病変を含んでいた症例は、瘤径 5cm 以上の群で有意に多かった(P=0.003)。

D. 考察

大動脈瘤径が重度の動脈硬化症の進行を反映している可能性があり、冠動脈など他の動脈硬化疾患の有無を確認する必要がある。

E. 結論

大動脈瘤の外科症例は、高率に冠動脈疾患を合併しており瘤径の大きい群では左前下行枝近位部病変が多く、冠動脈疾患に対する検査と治療を十分に行う必要がある。

F. 健康危険情報

なし

G. 研究発表

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H. 知的所有権の出願・取得状況

なし

Ⅲ. 研究成果の刊行に関する一覧表

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Protective Effect on Preserved Aortic Valve Cusps of Reconstructed Pseudosinuses in the Aortic Root Reimplantation Technique

Kan Nawata, Shinichi Takamoto, Kansei Uno, Aya Ebihara, Tetsuro Morota, Minoru Ono, and Noboru Motomura

Summary

Background: Since 1998, we have experienced forty-three aortic root reimplantations. The former nineteen patients underwent so-called David I procedure (D1 group), and the latter twenty-four patients modified David V procedure (D5 group), in which pseudosinuses were reconstructed. Early outcomes of D5 group have been more satisfactory than that of D1 group.

Objective: To compare the root dimension and characteristic of the aortic valve motion after two types of reimplantation technique.

Methods: For twelve patients in D1 group and eighteen in D5 group, left ventricular dimension, aortic root diameter, and severity of aortic insufficiency were measured by transthoracic echocardiography (long axis view via left parasternal approach). Aortic valve motion was also investigated via M mode scan.

Results: Aortic annular diameter and left ventricular dimension were similar in both groups. Sinus of Valsalva was significantly larger in D5 group. Rapid valve opening/closing time, ejection time, maximal opening distance and opening distance just before rapid closing didn't show significant difference. Calculated rapid valve opening/closing velocity was the same, but slowly closing displacement before rapid valve closing was significantly larger in D5 group.

Conclusion: Slowly closing valve motion before rapid closing might contribute to the better valve durability in D5 group with pseudosinuses reconstruction.

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Keywords reimplantation · pseudosinus · valve leaflet motion · outcome · aortic root replacement

Background

Our primary strategy for patients with aortic root dilatation and normal aortic cusps is valve-sparing aortic root replacement. Since August, 1998 to October, 2007, we have experienced 44 cases of reimplantation technique. The first nineteen of them underwent David-I type reimplantation (original David-I: the D1 group), and the rest twenty-five patients underwent modified David-V type reimplantation (the D5 group). Early outcomes have been more satisfactory in the D5 group. Our modification of David-V reimplantation (UT modification) has been described before [1]. Shortly speaking, we use only one straight graft. To make pseudosinuses, one end of the graft is plicated at three triangular parts. Then the trimmed aortic root is reimplanted inside the tubular graft, securely tied onto the aortic root, sutured along the remnant cusps' line, and coronary buttons are anastomosed. Three longitudinal suture lines are made to make the tube narrow and the distal anasotomosis is done.

The profiles of the patients who underwent a reimplantation procedure are shown in Table 1. Operative outcomes after reimplantation are as shown in Tables 2a and 2b. Postoperative changes in aortic regurgitation after two types of reimplantation are demonstrated in Figure 1. The D1 group showed gradual progress or recur-

Table 1 Patients' profiles (Reimplantation)

	D1	D5	p value
n	19	25	–
Gender (Male:Female)	12:7	16:9	NS
Marfan Syndrome	15 (79%)	18 (72%)	NS
Age (years old)	31±13	36±16	NS
Valsalva sinus (mm)	55.5±8.7	55.3±8.4	NS
AR grade	1.6±1.1	1.7±1.4	NS
Follow-up (months)	58±21	22±14	<0.001

AR: aortic regurgitation

Table 2a Operative outcomes after reimplantation

mortality/morbidity	D1	D5
n	19	25
Hospital death	0	0
Remote death	4	1
(Suspected of rhythm death)	2	1
Major morbidity	3	3
(Major bleeding)	3	2
(Right heart failure)	0	1
AVR	4	1

AVR: aortic valve replacement

Table 2b NYHA (New York Heart Association Classification)

NYHA	D1	D5
I	15	24
II	3→AVR	0
III	0	0
IV	1→AVR	1→AVR

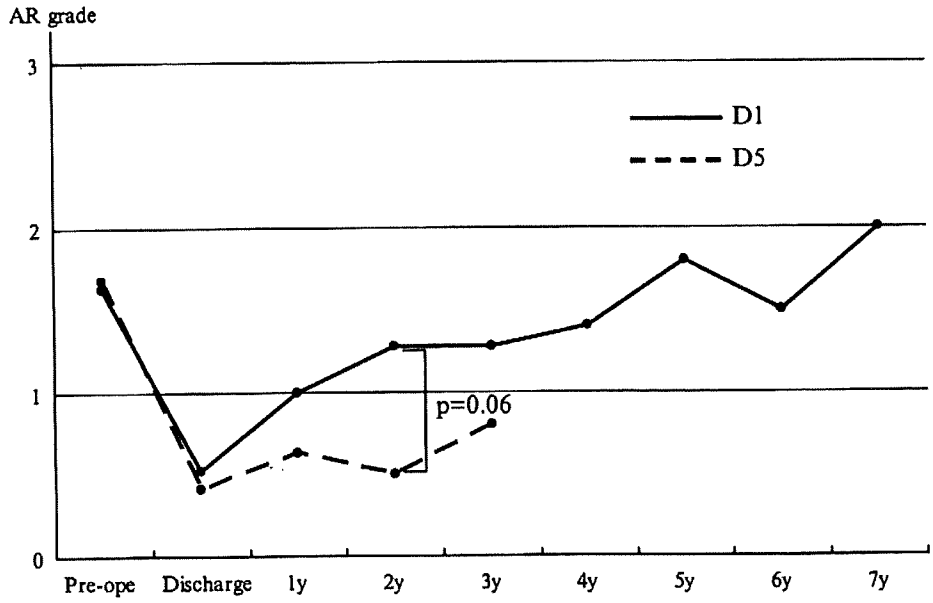

Fig. 1 Postoperative changes in aortic regurgitation after two different types of aortic reimplantation procedures

rence of aortic insufficiency after the operation. Though the number of the patients is small and the follow-up duration is short, the D5 group patients seemed to enjoy better outcome than the D1 group patients.

Objective

The purpose of this study is to compare the root dimension and characteristics of the aortic valve motion after two types of reimplantation technique, David-I (the D1 group) and modified David-V (the D5 group), and find out the protective factors on the valve durability after valve sparing aortic root replacement.

Patients and Methods

Postoperative follow-up examinations were available in 15 patients of D1 group and 19 patients of D5 group. Transthoracic echocardiography was performed by either of two specific cardiologists to evaluate left ventricular dimensions (long axis view), the grade of aortic regurgitation (AR), left ventricular outlet tract velocity (4 chamber view) and valve leaflet motions (M mode, Fig. 2) [2].

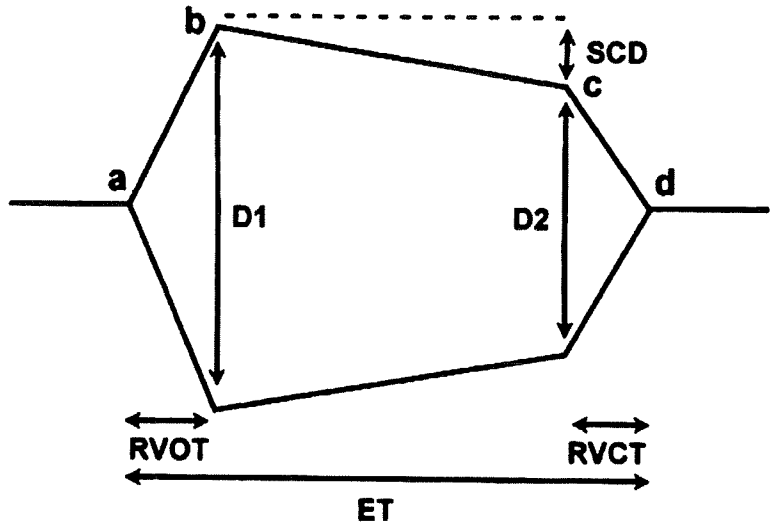

Fig. 2 Valve leaflet motions quoted from [2]
Values are obtained from M-mode of echocardiography. RVOT: Rapid Valve Opening Time, RVCT: Rapid Valve Closing Time, RVOV: Rapid Valve Opening Velocity, = D1/RVOT RVCV: Rapid Valve Closing Velocity, = D2/RVCT ET: Ejection time, D1: Maximum valve opening width, D2: Valve opening width just before rapid closing, SCD: Slowly Closing Displacement, = (D1-D2)/D1

Results

Data about aortic root dimensions, AR and valve leaflet motions are as shown in Tables 3a, 3b and 3c.

Discussions

In the D5 group, as we intended to make pseudosinuses, the estimated postoperative Valsalva sinus diameter was significantly larger than in the D1 group. This difference in aortic root dimensions didn't seem to affect global cardiac function or LV diameters. But, massive regurgitant flow through aortic valve seemed to influence the aortic valve leaflet motions and to lead to misinterpretation of the data, therefore, measured values from patients with grade 2 or 3 AR were excluded from the analysis of valve leaflet motions. Valve leaflet motions in the D5 group showed the equivalent maximal opening width and significantly larger slow closing displacement just before rapid valve closing, compared with the D1 group. This slow valve closing movement during the systolic phase seemed to contribute protectively to the better valve durability of the D5 group, and this valve motion is compatible to the larger vortex flow in significant pseudosinuses achieved in this group.

Table 3a Transthoracic echocardiography data (Aortic root dimension)

	D1	D5	p value
n	15	19	–
Preoperative AVD (mm)	25.6±2.4	25.4±2.5	NS
Postoperative AVD (mm)	20.2±1.3	20.3±1.9	NS
Postoperative Valsalva sinus (mm)	22.8±2.6	29.5±3.3	<0.0001
Postoperative Valsalva / AVD	1.13±0.08	1.47±0.22	0.0005
LVOT velocity (m/sec)	1.6±0.7	1.3±0.4	NS
LVDd (mm)	51.7±4.8	50.6±6.8	NS
LVDs (mm)	32.9±4.6	32.5±5.8	NS
LVEF	0.67±0.06	0.67±0.12	NS

AVD: aortic valve diameter
LVOT: left ventricular outlet tract
LVDd: left ventricular diameter in a diastolic phase
LVDs: left ventricular diameter in a systolic phase
LVEF: left ventricular ejection fraction

Table 3b Transthoracic echocardiography data (Aortic regurgitation)

AR grade	D1	D5
0	3	9
1	7	9
2	2	1
3	3	0
4	0	0

Patients with AR≧2 were excluded from the analysis of valve leaflet motions

Table 3c Transthoracic echocardiography data (Valve leaflet motions)

	D1	D5	p value
n	10	18	–
RVOT (msec)	35.3±16.3	33.8±10.8	NS
RVCT (msec)	45.5±16.0	44.9±18.3	NS
ET (msec)	339±49	324±70	NS
D1 (mm)	20.2±3.3	19.2±3.6	NS
D2 (mm)	18.8±3.1	16.1±3.8	0.03
SCD (%)	6.7±6.6	16.5±9.2	0.0015
RVOV (cm/sec)	70.6±44.1	61.8±16.2	NS
RVCV (cm/sec)	45.2±14.6	39.6±12.8	NS

Study Limitations

This study has some limitations. First, all of the operations examined here were performed by a single surgeon, and the operative outcomes might be affected by significant learning curve in the selection of patients and the surgeon's surgical technique. Secondly, the follow-up length is much different between the D1 and the D5 groups, and the influence of the secular change of valve leaflets on their motion might not be neglected, especially in the D1 group.

Conclusion

Creation of pseudosinuses in valve-sparing aortic root replacement contributed to the better valve leaflet motion, durability of the preserved valves and better clinical outcome.

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One-stage Repair of Total Descending Aorta for Extended Pathologies

Tetsuro Morota, Shinichi Takamoto, Tetsufumi Yamamoto, Kan Nawata, and Mitsuhiro Kawata

Summary

Objectives: One of the potential solutions for embolic events in aortic surgery is to perform aggressive replacement for extended pathologies. The aim of this review was to assess outcomes for aggressive one-stage repair of total descending aorta.

Methods: Consecutive procedures, replacing the descending aorta at least from the distal arch to diaphragmatic crus, from March 2000 to May 2007 were reviewed. Our strategy consists of: 1; anterolateral thoracotomy through *single* 5th intercostal space with costal arch division, 2; "arch first" under deep hypothermic circulatory arrest with retrograde cerebral circulation, 3; open proximal anastomosis, 4; segmental clamping, 5; carbon dioxide insufflation.

Results: There were 36 patients, 28 men and 8 women, with a mean age of 62 yr, ranging 28–77. The type of aneurysm was dissection in 18, true aneurysm in 15, and combined lesion in 3. Four of them were emergent cases for symptomatic aneurysms. More extended replacement to the arch vessels was applied in 15 and to the abdominal vessels in 5. No hospital death, but serious stroke in 2 and delayed paraparesis in 1 occurred.

Conclusion: One-stage repair of total descending aorta provided excellent early results, prohibiting embolic events originated in extended pathologies.

Keywords aortic aneurysm · thoracotomy · circulatory arrest · retrograde cerebral perfusion · paraplegia

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Introduction

There has been significant increase in number of patients who undergo thoracic aortic surgery in the past decade. Among them, one of the most common and serious perioperative complications is embolic events, such as stroke, renal dysfunction, or mesenteric ischemia, since vast majority of the patients have diffuse, extended atherosclerosis in the descending thoracic aorta. Clamping the diseased aorta or leaving atheromatous lesion results in arterial embolism.

A possible solution to avoid embolic events is to perform extensive replacement of the total descending thoracic aorta, although the surgical invasiveness could be higher.

Materials and Methods

From March 2000 to May 2007, 36 patients, 28 men and 8 women, with a mean age of 62yr, ranging 28–79, underwent one-stage repair of total descending aorta for extended pathologies. The term "one-stage repair of total descending aorta" was defined as "to replace at least distal arch to Th10 level descending aorta as a single procedure". The type of aneurysm was dissection in 18 patients, true aneurysm in 15, and combined lesion in 3. There were 9 patients with shaggy aorta and 1 patient with porcelain aorta. Four of them were emergent cases for symptomatic aneurysms. The concomitant procedures were described in Table 1.

Surgical Procedure

Anterolateral thoracotomy was carried out through single 5th intercostal space with costal arch division to obtain an optimal surgical view of the entire descending aorta. The arch aorta was reconstructed with so called "arch first technique" under deep hypothermic circulatory arrest and retrograde cerebral circulation [1] to minimize brain damage. For the purpose of spinal cord protection, "segmental clamping" was used whenever possible, and the body temperature was kept at moderate hypothermia until reperfusion of the intercostal arteries. During the procedure, carbon dioxide insufflation into the surgical field was used to reduce air embolisms.

Results

The operation data were demonstrated in Table 2. There was no operative or hospital mortality. Major stroke, with significant new lesion on brain CT, occurred in 2 patients and transient neurological deficit without significant new lesion occurred

Table 1 Concomitant procedures

	Number of cases
CABG	9
Arch replacement	15
Total arch	13
LSA	2
Visceral brances	5
CA	3
CA+SMA	1
CA+SMA+RAs	1
Intercostal arteries	25

CABG, coronary artery bypass grafting; LSA, left subclavian artery; CA, celiac artery; SMA, superior mesenteric artery; RAs, renal arteries.

Table 2 Operation data (in minutes)

	Mean	S.D.	Minimum	Maximum
Operation time	561	119	320	775
Pump run	299	67	177	408
RCC	51	14	25	83
Lower body CA	53	28	0	113

RCC, retrograde cerebral circulation; CA, circulatory arrest.

Table 3 Early surgical results

Hospital mortality	0
Morbidity	
Major stroke	2
Transient neurological deficit	4
Spinal cord injury (delayed parapare	1
respiratory failure	0
Renal dysfunction (Cr > 2.0)	11
Liver dysfunction (GOT and/or GPT > 100)	14
Hospitalization (mean ± SD)	32 ± 9 days

in 4 patients. One patient developed delayed paraparesis on the third postoperative day. There were no serious respiratory complications except one in a patient who required tracheotomy for prolonged consciousness disturbance after major stroke. Renal and liver function were maintained well although nearly one-third of the patients developed temporary dysfunction that was recovered within a couple of

weeks. The early results were summarized in Table 3. After mean follow-up of 49 months, late death occurred in 5 patients; heart failure in 3, aspiration pneumonia in 1, rupture of infrarenal abdominal aorta in 1. No patients required re-thoracotomy so far.

Discussion

One-stage repair of total descending aorta eliminated the risk of atheromatous embolism. Although 2 patients were complicated with major stroke, all the patients in this series had extremely high risk for atheromatous embolism in manipulating the aorta, setting up cardiopulmonary bypass, and clamping the aorta. It was true that this procedure entailed significant longer time of operation and pump run, the patients tolerated well. For distal aortic anastomosis, lower half body circulatory arrest was employed to make open anastomosis in most of the patients, however, moderate hypothermia protected the visceral organs and minimized kidney and liver damage. As for visualization of the entire thoracic aorta, costal arch division gave us very good surgical field (Fig. 1a, b), from the ascending aorta to the lower descending aorta, even to the abdominal aorta when an extensive incision was made to open the retroperitoneal space. In spite of extended dissection of the aorta, no bleeding tendency was observed and no re-thoracotomy for bleeding was made.

As a tip in the wide opening of the thorax, we consider that the 4th intercostal should be cut posteriorly to the rib angle, close to the vertebra, from the thoracic cavity, without longer skin incision to the back. The latissimus dorsi muscle was preserved completely, and the serratus muscle was just divided in parallel with the muscle fibers. Then the respiratory muscles were preserved well and postoperative respiratory function was also maintained. On the other hand, this approach seemed to be technically difficult in certain patients with obesity, respiratory dysfunction, or heart dysfunction. And the longer operation time might risk in elderly patients.

It was speculated that the cause of 2 major strokes in this series was atheromatous embolism due to retrograde perfusion from the femoral artery. The pump perfusion line should be placed on the ascending aorta or the axillary artery [2], when there was serious atheromatous change in the abdominal aorta or iliac arteries.

Conclusion

One-stage repair of total descending aorta would be a justified procedure with acceptable surgical results in patients with extended aortic pathologies such as mega-aorta or chronic type B aortic dissection.

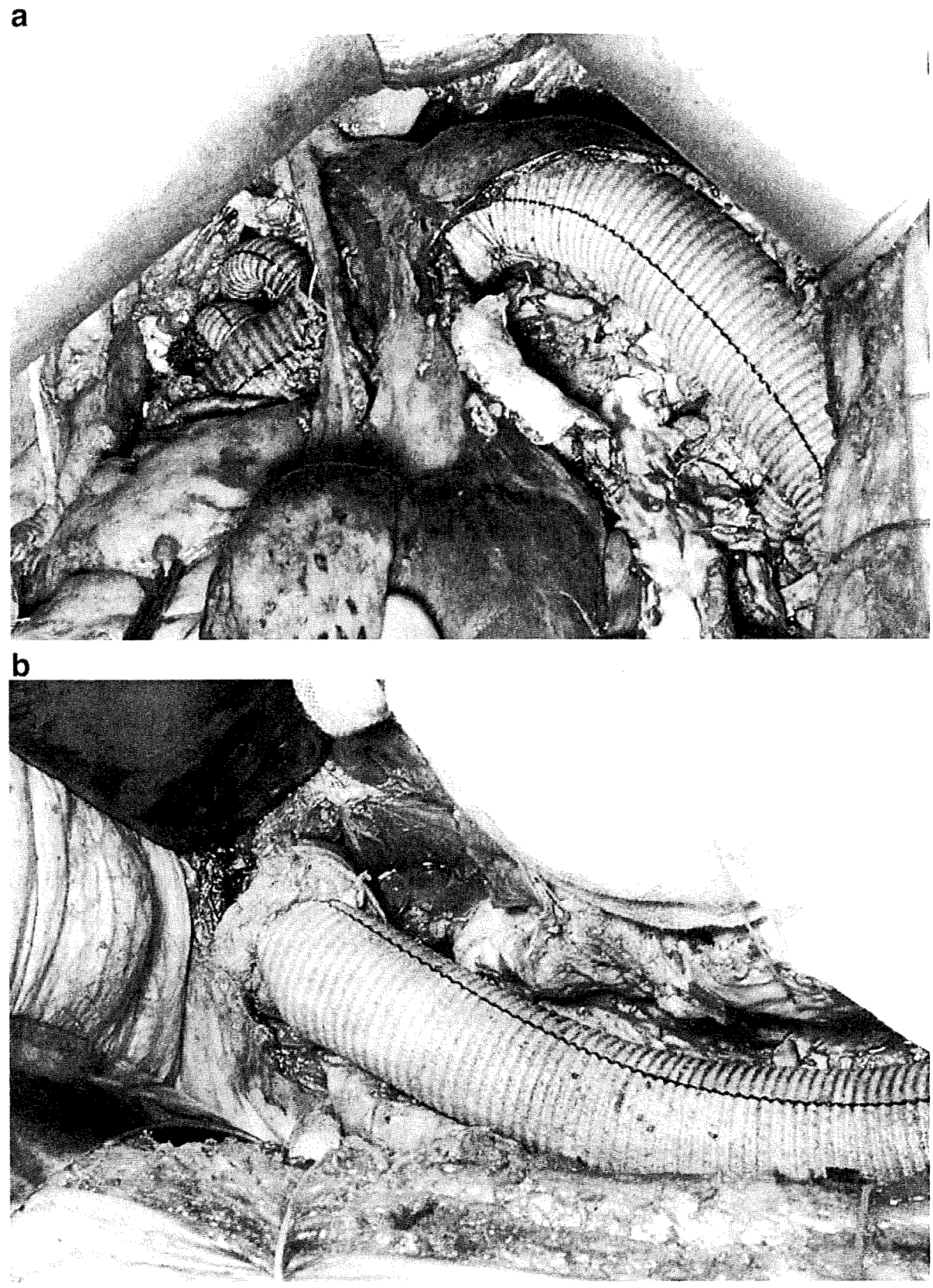

Fig. 1 Surgical view of "one-stage repair of total descending aorta". (**a**) The transverse arch to proximal descending aorta. White arrow: arch vessels. (**b**) The distal descending aorta. The anastomosis was made at Th11 level

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Intermittent Pressure Augmented Retrograde Cerebral Perfusion

Shinichi Takamoto, Kan Nawata, Tetsuro Morota, Kazuo Kitahori, and Mitsuhiro Kawata

Having an experimental finding that intermittent pressure augmented RCP (IPA-RCP) significantly reduced postoperative brain damage in a canine model, we utilize IPA-RCP in clinical settings. IPA-RCP requires intermittent augmentation of superior vena caval pressure up to 45 mmHg every thirty seconds, while conventional RCP (C-RCP) continuous pressure of 15 mmHg. We examined the impact of IPA-RCP on the outcome of aortic arch surgery. Methods Since January 1999, we have had seventy-seven operations of total arch replacement via midsternal incision, excluding cases of emergency, active infection or with any history of cerebrovascular events. We retrospectively compared 45 patients undergoing C-RCP from January 1999 to April 2002 with 36 patients undergoing IPA-RCP from May 2002 to December 2006. Univariable and multivariable analysis were performed to examine statistically about the incidence of neurological morbidity, that is, delayed awakening, stroke and postoperative delirium.

Results (NS: not significant)

	C-RCP	IPA-RC`	p value
30 day mortality	2.22%	2.78%	NS
Time length needed to awake	7.1+/–4.9	3.8+/–2.9	0.013
Postoperative ventilatory support time	61+/–146	33+/–59	NS
Operative dosage of fentanyl	24.0+/–10.7	16.2+/–7.5	0.0009
Operative dosage of morphine	17.3+/–11.7	1.3+/–5.0	<0.0001
Operation time	508+/–221	457+/–146	NS
Cardiopulmonary bypass time	262+/–109	243+/–73	NS
Myocardial ischemia time	143+/–68	145+/–22	NS
RCP time	53+/–20	59+/–16	NS
Stroke	4.4%	2.9%	NS
Paraplegia	4.4%	2.9%	NS
Postoperative delirium	31.1%	8.3%	0.02

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Clinical outcomes of C group and IPA group were similar in mortality and operative data. As for postoperative delirium, univariable analysis revealed conventional RCP group, concomitant CABG, concomitant valve surgery and intraopertive body weight gain were correlated. Multivariable analysis for delirium showed conventional RCP group and concomitant CABG as risk factors, but not for the dosages of fentanyl and morphine. In conclusion, Conventional RCP and IPA-RCP demonstrated comparable postoperative outcomes after aortic arch repair via median sternotomy. IPA-RCP was suggested to contribute to the low frequency of delirium after aortic arch repair.

IMHおよびPAUの診断，治療*

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Key Words : acute aortic syndrome (AAS), aortic dissection, intramural hematoma (IMH), penetrating atherosclerotic ulcer (PAU), ulcer-like projection (ULP)

はじめに

IMH(intramural hematoma；壁内血腫)およびPAU(penetrating atherosclerotic ulcer；穿通性粥状硬化潰瘍，通常，和名は用いられない)は，いずれも近年の画像診断の進歩により独立して認識されるようになった病態で，広義の大動脈解離の一形態でもあり，狭義の大動脈解離の亜型あるいは前段階的状態でもある．

IMHとPAUを論ずるに先立って，Vilacostaにより提唱され[1]，最近しばしば用いられるようになったAAS(acute aortic syndrome；急性大動脈症候群)という用語をまず解説する．AASとは，大動脈に由来する疼痛を主徴とする一連の疾患群で，その多くは高い生命的危険に晒されている．AASは病理学的にも広いスペクトラムを有し，この中に古典的大動脈解離(classic aortic dissection)，IMHおよびPAUが包含されている(図1)[2]．AASの中でIMHやPAUを一つの範疇として認識するということの意義は，古典的大動脈解離との発症機序の相違が自然予後の相違をもたらし，それゆえに治療方針決定にも影響を及ぼすことにある[3]．しかし，以下に述べるとおりIMHやPAUにも主として診断基準の曖昧さによる病態および自然予後のばらつきが認められ，かつ古典的大動脈解離と三つ巴に微妙に重複しうる病態が存在し，課題の多く残された領域でもある．

Classic aortic dissection；古典的大動脈解離

そもそも古典的大動脈解離という用語自体の定義も確固たるものがあるわけではないが，「大動脈解離」あるいは「解離性大動脈瘤」との病理学的疾患概念が記載されたのは19世紀初頭(Maunoir JP. Memories physiologique et practiques sur l'aneurisme et ligature des arteres, Geneva, 1802)に遡る．臨床的疾患群として確立したのは，その後150年を経た20世紀中盤のHirstらによるレビュー[4]からであり，近代の，しかし"古典的"といえる大動脈解離の概念の礎はSlater[5]やdeSanctis[6]らにより記載されたと考えられる．

日本循環器学会の大動脈瘤・大動脈解離診療ガイドライン[7]による大動脈解離の定義は，「大動脈壁が中膜のレベルで二層に剥離し，動脈走行に沿ってある長さを持ち二腔になった状態」とされる．古典的大動脈解離とは，平たく表現するならば「脆弱化した中内膜に突然として亀裂が生じ，流入した血流が中膜を二層に剥離して偽腔を形成したもの」で，偽腔に血流の残存した「偽腔開存型」と，血流の消失した「偽腔閉塞型」に分けられる．

* Clinical consideration in diagnosis and treatment for IMH and PAU.

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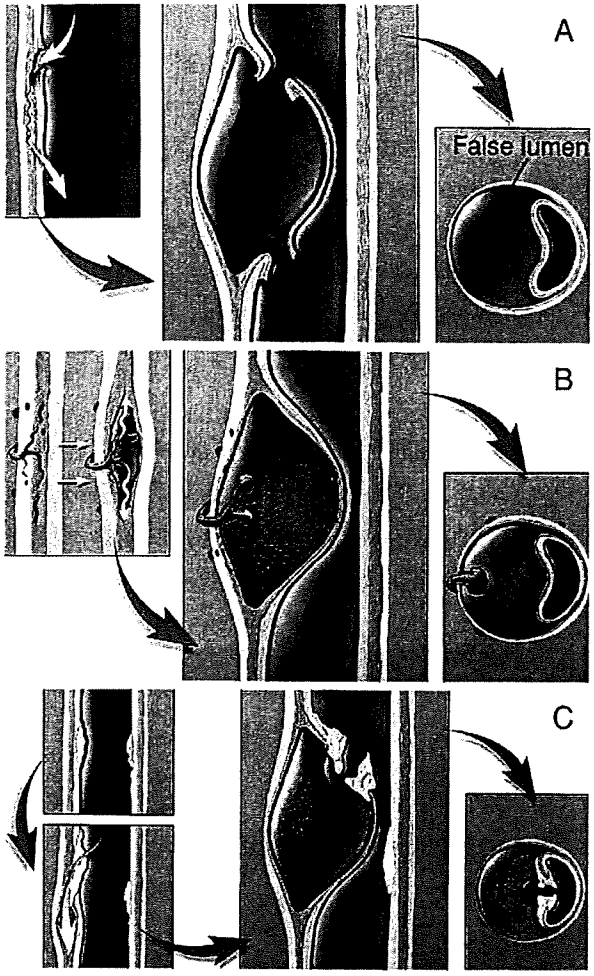

図1　古典的解離(A)，IMH(B)，PAU(C)の簡略イメージ　(文献[2]より改変)

IMH(intramural hematoma)；壁内血腫

IMHとは，大動脈中膜が血腫により剥離しているが内膜亀裂は認められない(真腔と偽腔との交通が証明されない)病態を指す．大動脈壁のvasa vasorumの破綻により生じ，血腫の吸収により自然消退するものがある一方で，内膜亀裂に至り古典的大動脈解離へと進展することもあるとされている[8][9]．IMHの語源に定説はないが，筆者が検索した範囲では，1952年にBarboniが著した“Intramural aortic hematoma with spontaneous rupture and hematopericardium”と題された論文が最も古いようである．血腫でなく出血(hemorrhage)という語を用いることもある．

自験例で，真腔と偽腔の交通がまったく見出せないにもかかわらず偽腔への造影剤流入が認められ，vasa vasorumの破綻もしくは肋間動脈からの血流残存が推測された症例(図2)と，解

図2　真腔との交通のない偽腔造影剤流入

離発症初期にはIMHと診断したが亜急性期に偽腔再開通し内膜亀裂が証明された症例(図3)を提示する．

IMHは，病理学的には「内膜亀裂のない大動脈解離」という明確な診断基準で表現できるが，画像診断的には内膜亀裂の有無を判定することは困難であるし，偽腔血流のないことが厳密に判定されれば内膜亀裂の有無に拘泥する必要性—予後の相違—も少ない．したがって，臨床的にはIMHを「真腔と偽腔に交通がなく，偽腔が閉塞した状態」と定義し，偽腔閉塞型大動脈解離とほぼ同義に取り扱うことで支障はないと思われる．加地修一郎氏の表現を借りると，IMHの画像診断上の基準は，①三日月型の偽腔を認めること，②偽腔と真腔の間に交通を認めないこと，というきわめてシンプルな2点に集約される．ただし，偽腔血流判定には厳格であるべきで，明らかなULP(ulcer-like projection；潰瘍状突出，内膜亀裂部位に相当する偽腔への造影突出像)を有するものを除外するのはもちろんのこと，造影CT遅延相または経食道エコーで交通のないことを確認することが診断上必須である．特に欧米諸国では，急性解離のCT診断において造影遅延相での撮影が施行されていない施設が多数あり，小さな内膜亀裂から凝固・血栓化の進みつつある偽腔への造影剤流入が動脈相のみでの撮像では捉えられていないだけである場合にもIMHと診断されている可能性が高い．また，外科治療時の肉眼的所見においても，置換範囲～可視範囲内に内膜亀裂がなくとも，それをもってイコール内膜亀裂の不在と断定することはで