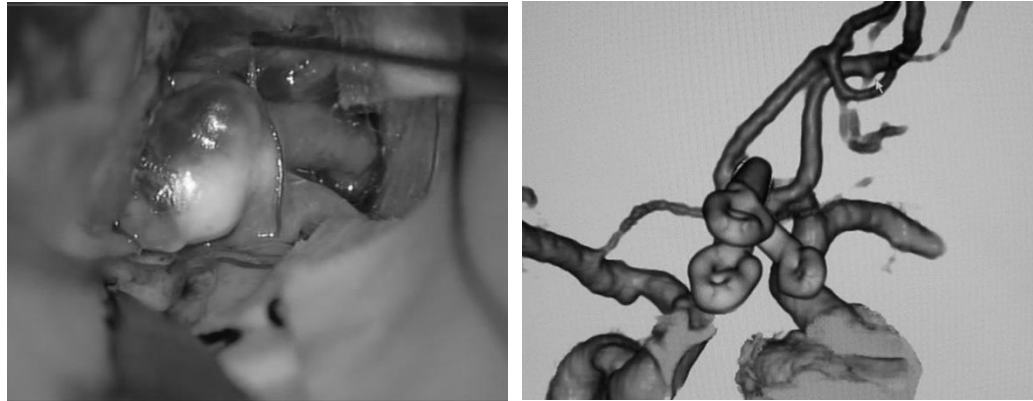


前交通動脈瘤に対する開頭クリッピング術 アプローチ法の選択



Jan. 17, 2017 Review Tsuyoshi Izumo

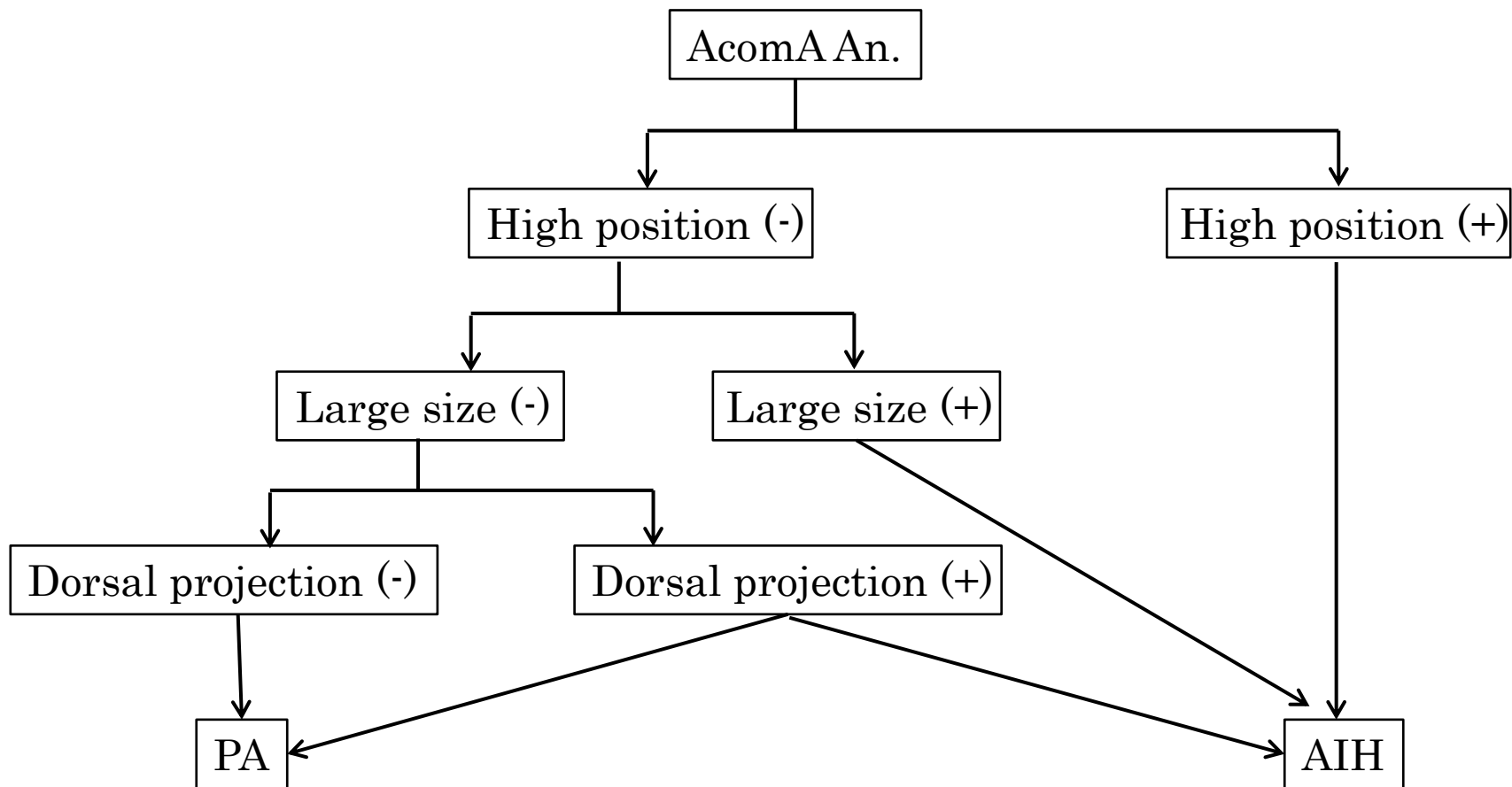


Fig.1 Selection of surgical approach for AcomA An.

AcomA An.: anterior communicating artery aneurysm, PA: pterional approach, AIH: anterior interhemispheric approach

論文に採用されたFigure

AcomA complex
および動脈瘤の状態

Preoperative 3D-CTA

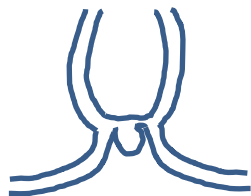
A-P view

Left lateral view

適切な
アプローチ

アプローチの
利点

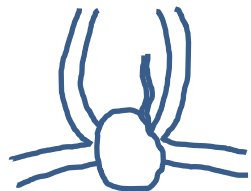
high position



AIH

前頭葉の圧排が軽度

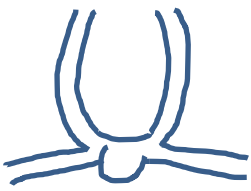
大型動脈瘤



AIH

後方の穿通枝の確認がより容易

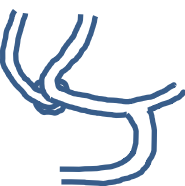
左右A2の前後に
差が無い



非優位側からのPA

優位側脳損傷の回避

所謂“逆捻れ”



A2前方側からのPA

A2が視野の妨げにならずAcomA complexの確認容易

A1非優位側のA2
がより後方



A2後方側からのPA

A2が視野の妨げにならずAcomA complexの確認容易

Fig.8a Schematic representation of selection of surgical approach for AcomA An.AcomA An.: anterior communicating artery aneurysm, PA: pterional approach, AIH: anterior interhemispheric approach

論文に採用されたFigure

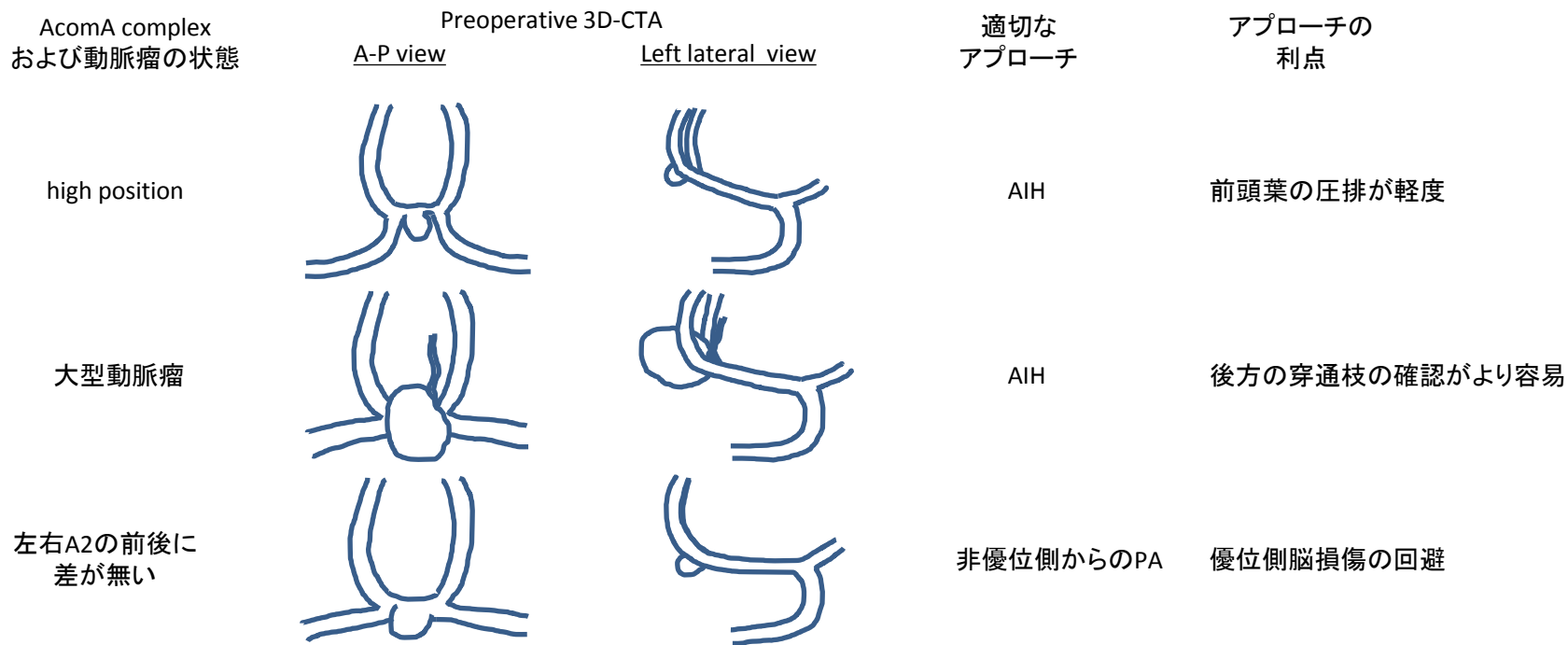
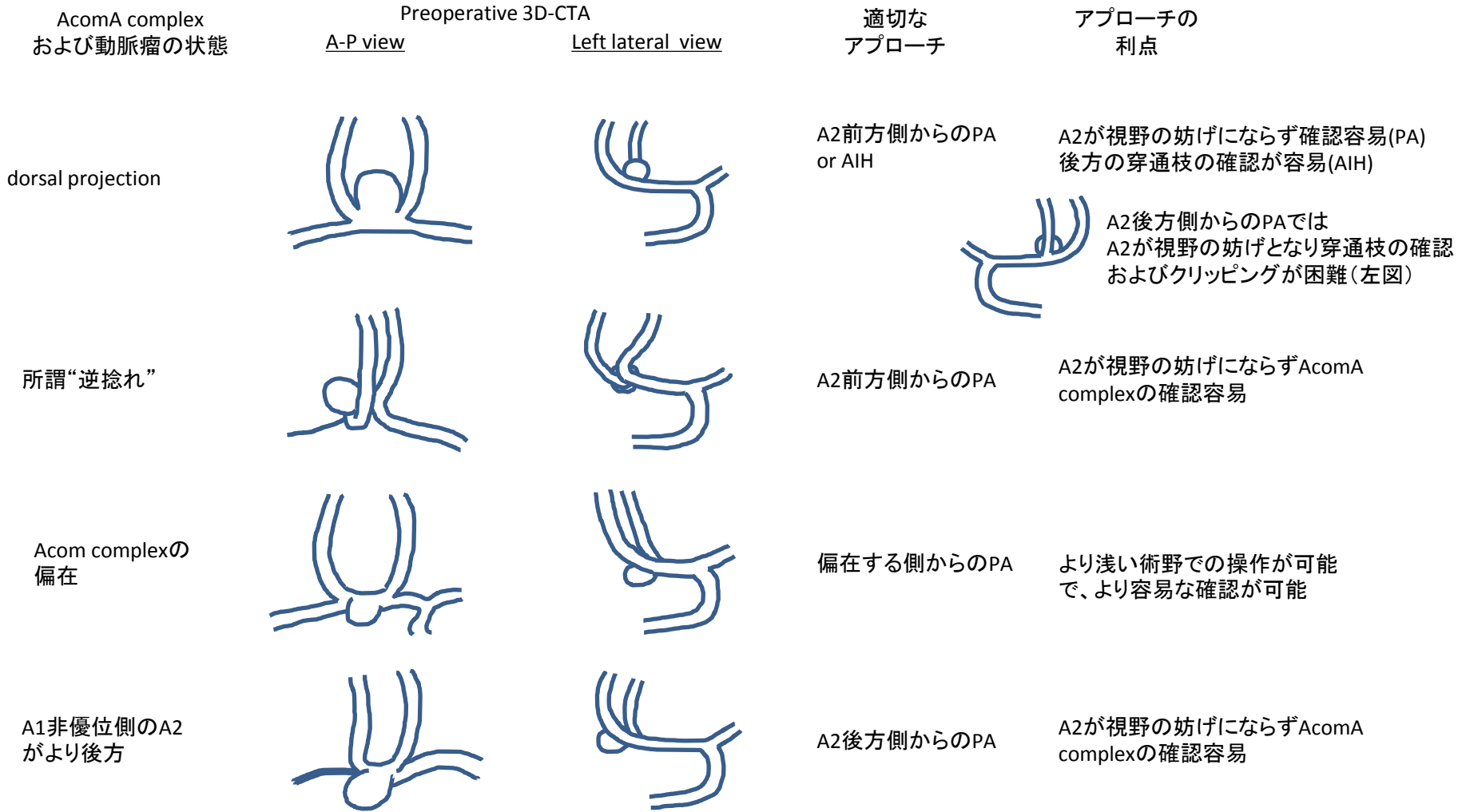


Fig.8a Schematic representation of selection of surgical approach for AcomA An.AcomA An.: anterior communicating artery aneurysm, PA: pterional approach, AIH: anterior interhemispheric approach



A2後方側からのPAでは
A2が視野の妨げとなり穿通枝の確認
およびクリッピングが困難(左図)

Fig.8b Schematic representation of selection of surgical approach for AcomA An.AcomA An.: anterior communicating artery aneurysm, PA: pterional approach, AIH: anterior interhemispheric approach

Table 1 Cases of AcomA An. treated with clipping

No. of case	Sex	Age	Concomitant aneurysms	Height from anterior clinoid process (mm)	Approach	Dominancy of A1	Posterior side of proximal A2	Aneurysmal projection	Size
1	M	63		2	rt PA	lt	rt	anterior	1.5
2	M	48		12	rt PA	equal	rt	anterior	10
3	F	49		8	rt PA	lt	rt	anterior	5
4	F	48		3.5	rt PA	lt	rt	anterior	5
5	M	65		10	rt PA	lt	lt	anterior	5.8
6	F	48		5	rt PA	lt	lt	anterior	5.3
7	M	45		5.5	rt PA	equal	rt	anterior	8.2
8	F	70		10	AIH	lt	lt	dorsal	6.4
9	F	56		8	lt PA	rt	lt	anterior	5
10	F	69	distalACA, bilateral MCA	2	rt PA	lt	rt	anterior	13.6
11	M	63		6	AIH	lt	equal	dorsal	5
12	F	67		5	lt PA	equal	lt	anterior	13
13	F	74		3	rt PA	lt	rt	anterior	3.3
14	F	62		6	rt PA	lt	rt	anterior	6
15	F	66		3	lt PA	lt	lt	anterior	8.6
16	F	72	rt MCA	8	rt PA	lt	rt	anterior	10
17	M	50	lt MCA	8	lt PA	rt	lt	anterior	8
18	F	42		4	lt PA	rt	rt	inferior	7
19*	M	45		5	rt PA	lt	rt	anterior	5.3
20	F	66		10	AIH	equal	equal	dorsal	6.5
21	F	67		8	rt PA	lt	rt	inferior	7.5
22	F	67	ICA	7.5	lt PA	rt	rt	dorsal	11
23	F	42		2.5	rt PA	lt	rt	anterior	4.5 and 2.5
24	F	61	lt ICA	7.1	lt PA	lt	lt	anterior	3.5
25*	F	76		4.5	rt PA	lt	lt	dorsal	1.5
26	M	67	rt MCA	6.5	rt PA	equal	rt	anterior	15
27	F	62		6.5	rt PA	lt	lt	anterior	5.5
28	M	43		3.5	rt PA	lt	rt	anterior	5.3
29	M	64		6	lt PA	lt	lt	anterior and dorsal	16 and 8.3
30	M	55		12	rt PA	rt	rt	anterior	4
31	F	46	rt MCA	5.5	rt PA	lt	rt	anterior	9.2 and 4.0
32	M	31		5.5	rt PA	rt	lt	dorsal	4.3
33*	F	65		9.5	rt PA	lt	lt	dorsal	3.3
34	F	59		12.5	rt PA	equal	rt	anterior	1.5
35	M	67		5	lt PA	equal	lt	anterior	7
36	F	71		13	AIH	lt	rt	anterior	5.2
37	F	64	lt ICA	5.5	lt PA	lt	lt	anterior	4.5
38	M	69	rt MCA	7.5	rt PA	equal	rt	anterior	3.4
39	M	65		6	lt PA	lt	lt	anterior	8
40	F	66		5	rt PA	rt	rt	anterior	4.9
41	F	58		2.5	rt PA	lt	rt	anterior	6.5
42	F	44	lt ICA	5.5	lt PA	lt	lt	anterior	3.2
43	M	62		16	AIH	lt	lt	anterior	4.1
44	M	57	lt ICA	6.7	lt PA	lt	lt	anterior	3.1
45	F	53		7.8	lt PA	lt	lt	anterior	5.5
46	M	74		6	rt PA	lt	rt	anterior	4.1
47	F	49		3	lt PA	rt	lt	anterior	4.8
48	M	68		3	AIH	lt	lt	dorsal	5
49	F	61		6.7	rt PA	rt	lt	anterior	9.1
50	F	53		13	AIH	lt	rt	anterior	13
51	F	61		3.5	rt PA	rt	rt	anterior	5.2
52	F	52	lt ICA	8	lt PA	lt	rt	anterior	9.2
53	F	77		3.5	rt PA	lt	rt	anterior	3.5
54	M	64		14	AIH	lt	lt	dorsal	4
55	F	74	rt MCA	1.5	rt PA	equal	rt	anterior	3.5
56	F	68		5.5	lt PA	lt	lt	anterior	15.5

Between March 2004 and August 2012, 56 cases with AcomA aneurysms were treated by clipping at our institute and retrospectively reviewed about surgical approaches and postoperative complications.

*:subarachnoid hemorrhage patient, A1: A1 segment of anterior cerebral artery, A2: A2 segment of anterior cerebral artery, ACA: anterior cerebral artery, MCA: middle cerebral artery, ICA: internal cerebral artery, rt.: right, lt.: left, PA: pterional approach, AIH: anterior interhemispheric approach

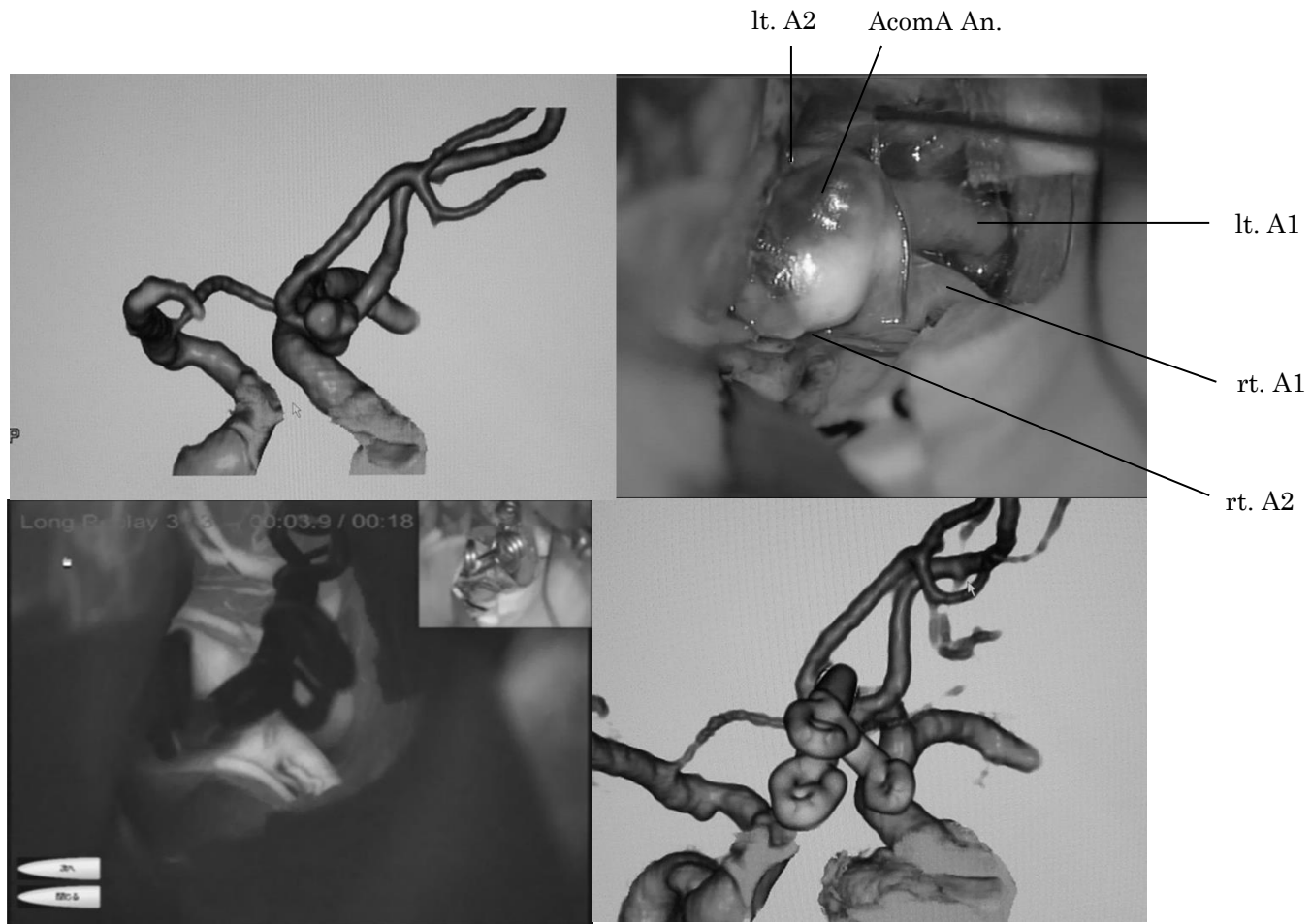


Fig.2 A 74-year-old man with an enlarging AcomA An. CTA showed that an AcomA complex was open to right side (A). Rt. PA was performed. Intraoperative findings clearly revealed an AcomA complex and An.(B), complete obliteration of the An. and preservation of each branches (C), confirmed by postoperative CTA (D).

A	B
C	D

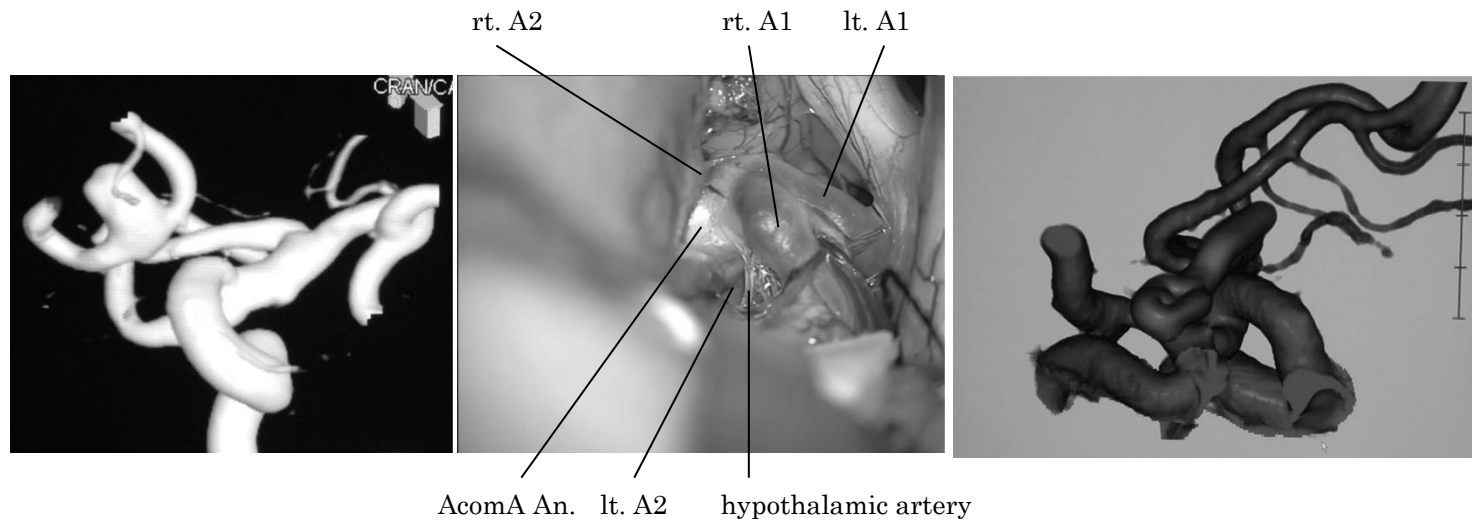


Fig.3 A 62-year-old woman with an AcomA An. CTA showed that an AcomA complex had reversed torsion (A). Rt. PA was performed. Intraoperative findings clearly revealed an AcomA complex, hypothalamic artery, and An.(B). A complete obliteration of the An. and preservation of each branches was confirmed by postoperative CTA (C).

A | B | C

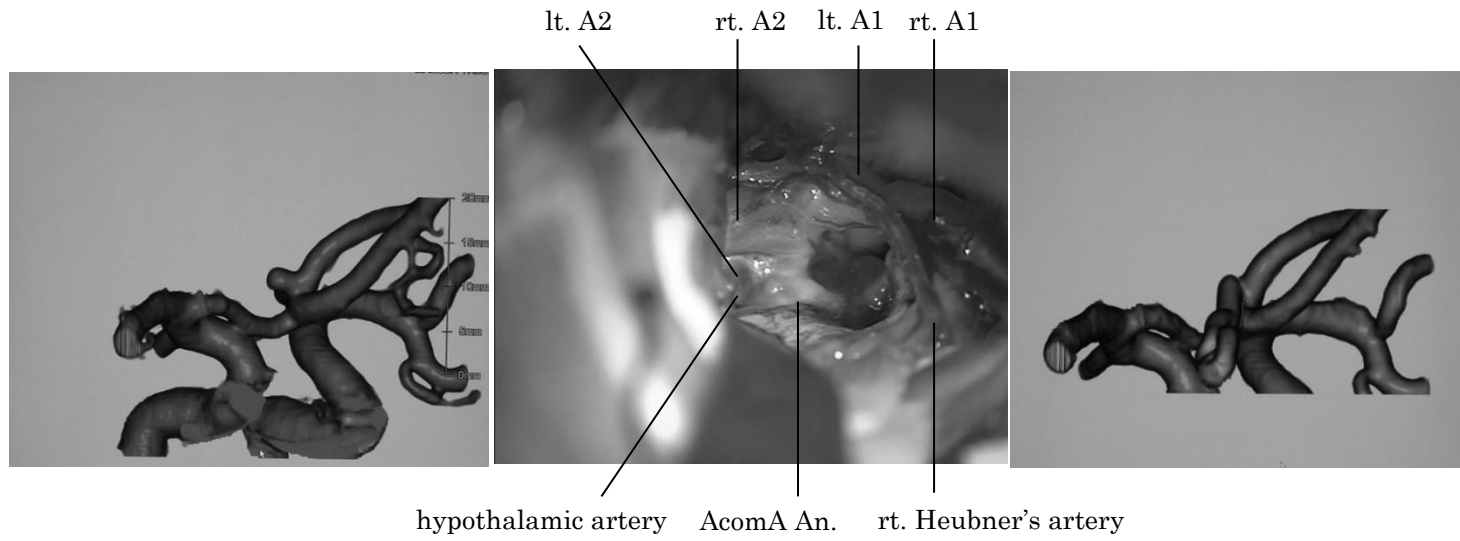


Fig.4 A 65-year-old woman with a dorsal projection AcomA An (A). An AcomA plane was open to left side. Rt. PA was performed. Intraoperative findings clearly revealed an AcomA complex, hypothalamic artery, and An.(B). A complete obliteration of the An. and preservation of each branches was confirmed by postoperative CTA (C).

A | B | C

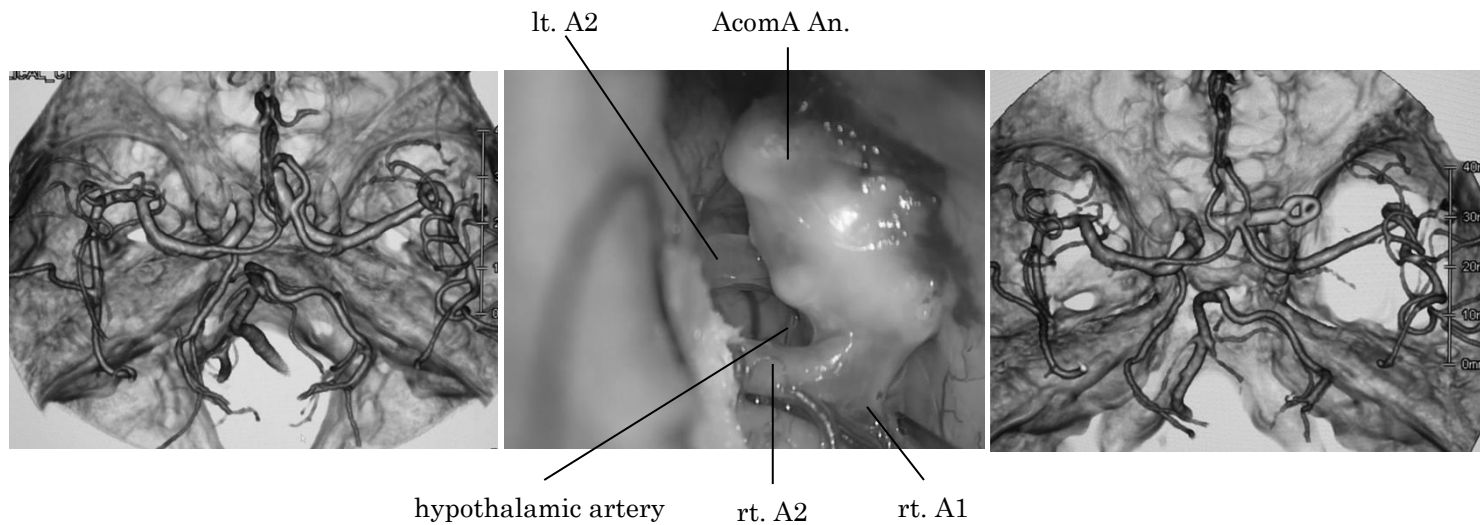


Fig.5 A 61-year-old woman with an anterior projection AcomA An (A). An AcomA complex was lateralized to right side. Rt. PA was performed. Intraoperative findings clearly revealed an AcomA complex, hypothalamic artery, and An.(B). A complete obliteration of the An. and preservation of each branches was confirmed by postoperative CTA (C).

A | B | C

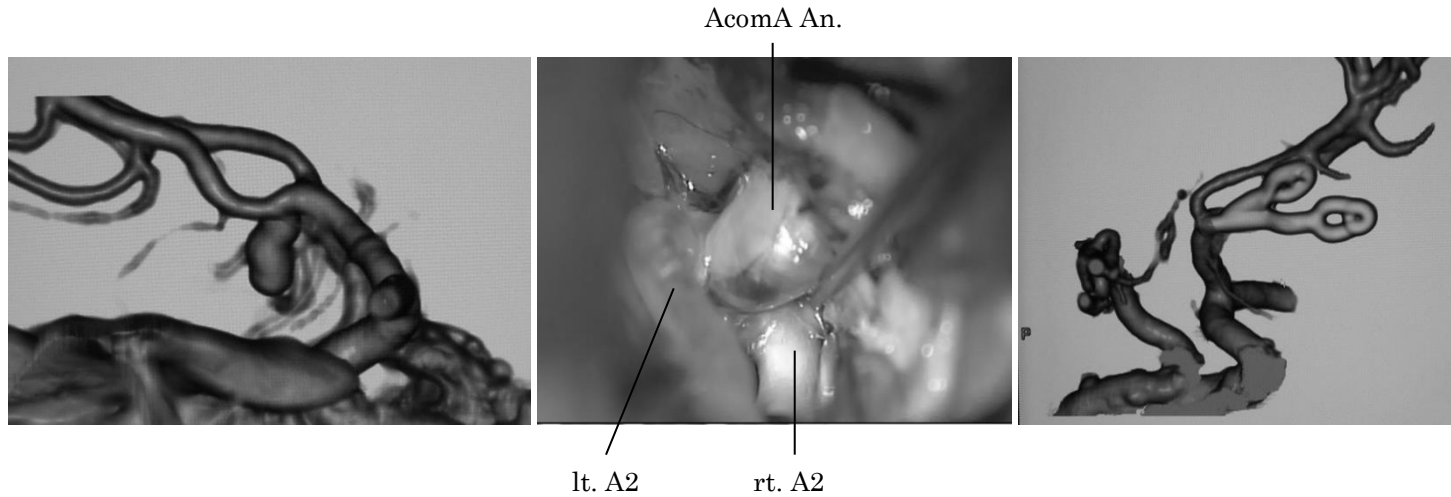


Fig.6 A 53-year-old woman with a large and high positioned AcomA An (A). AIHA was performed. Intraoperative findings revealed an AcomA complex and An.(B). A complete obliteration of the An. and preservation of each branches was confirmed by postoperative CTA (C).

A | B | C

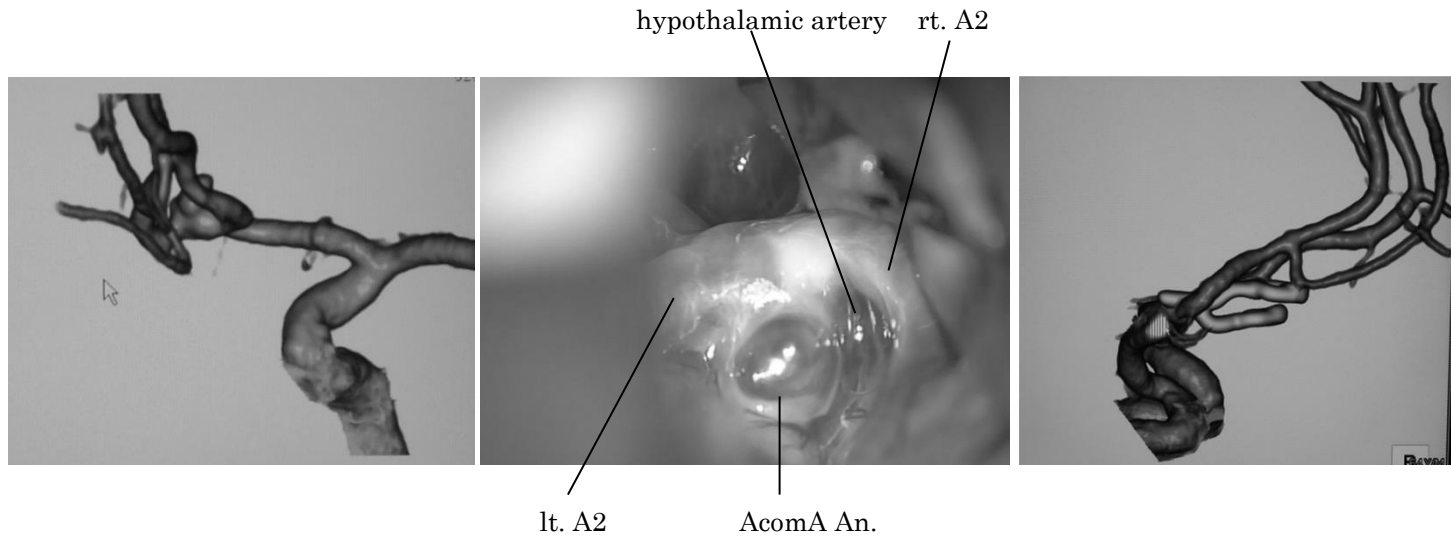
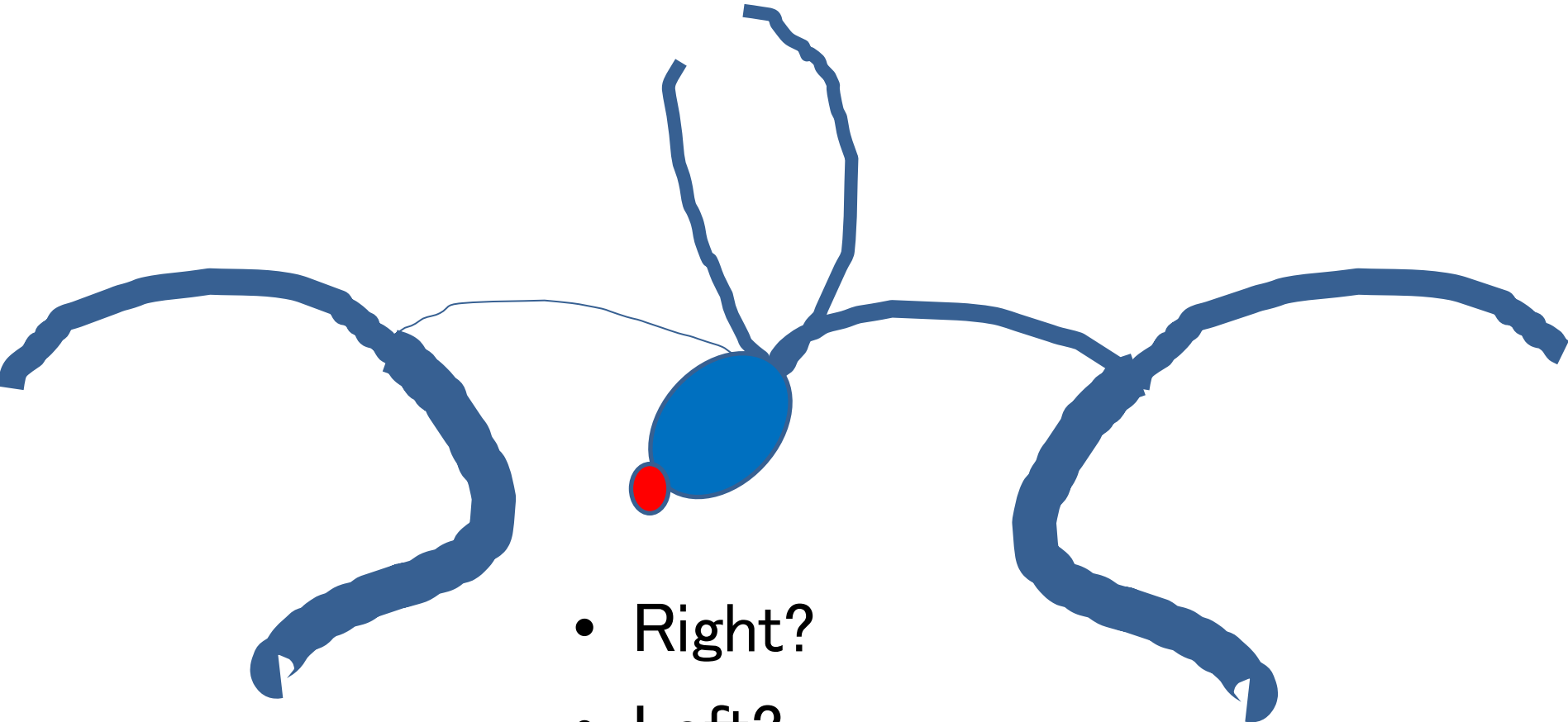


Fig.7 A 64-year-old woman with a dorsal projection AcomA An (A). AIHA was performed. Intraoperative findings revealed an AcomA complex, hypothalamic aretry, and An.(B). A complete obliteration of the An. and preservation of each branches was confirmed by postoperative CTA (C).

A | B | C

- Ruptured Acom aneurysm
- A2 fork: Open to right
- Left A1 dominant



- Right?
- Left?
- AIHA?

前交通動脈瘤に対する
A1優位側pterional approachによる
開頭脳動脈瘤クリッピング術

The pterional approach through the dominant
A1 side for anterior communicating artery
aneurysms.

長崎労災病院 脳神経外科
出雲 剛、横山博明

前交通動脈(AcomA)瘤に対する

開頭クリッピング術

pterional approach(PA)

interhemispheric approach(IHA) →

<当院の方針>

前頭蓋底から動脈瘤までの高さ
に問題なければPAを選択



脳動脈瘤に接近する前の早期に
proximal controlが可能となるよう



→A1優位側PAを選択

A1優位側の決定

左右内頸動脈撮影において
脳動脈瘤が造影される側

3D-CTAにてより太いA1

を優位側と判定

PAにおける開頭側の決定因子

1. 脳の非優位性
2. A1の優位性
3. A2 fork (plane)の開き方
4. 動脈瘤の突出方向
5. 動脈瘤の大きさ
6. 術者の利き手
7. 脳内血腫の存在
8. 多発性脳動脈瘤の存在

**【対象】2006年4月より2011年11月までに当院において
筆者が術者として経験した前交通動脈瘤手術15例中、
A1優位側PAにて手術を施行した14例を対象とした。
(他1例はIHAにて手術)**

Case No.	Age	SAH or unruptured	H and K	projection of An.	Size of An. (mm)
No.1	71	SAH	2	inferior	5.5
No.2	65	SAH	3	inferior	3.3
No.3	34	SAH	2	anterior and dorsal	4.0
No.4	49	SAH	1a	anterior	4.6
No.5	79	SAH	3	dorsal	6.9
No.6	83	SAH	3	inferior	2.2
No.7	76	unruptured	-	anterior	3.4
No.8	64	unruptured	-	anterior	1.6
No.9	67	SAH	4	anterior	3.7
No.10	51	SAH	2	anterior	7.1
No.11	90	SAH	5	anterior	4.1
No.12	59	SAH	5	dorsal	7.8
No.13	63	SAH	2	anterior	6.6
No.14	50	SAH	3	dorsal	5.1

SAH: subarachnoid hemorrhage, H and K: Hunt and Kosnik grade, An.: aneurysm, Size of An.:
Size of aneurysm in maximum diameter

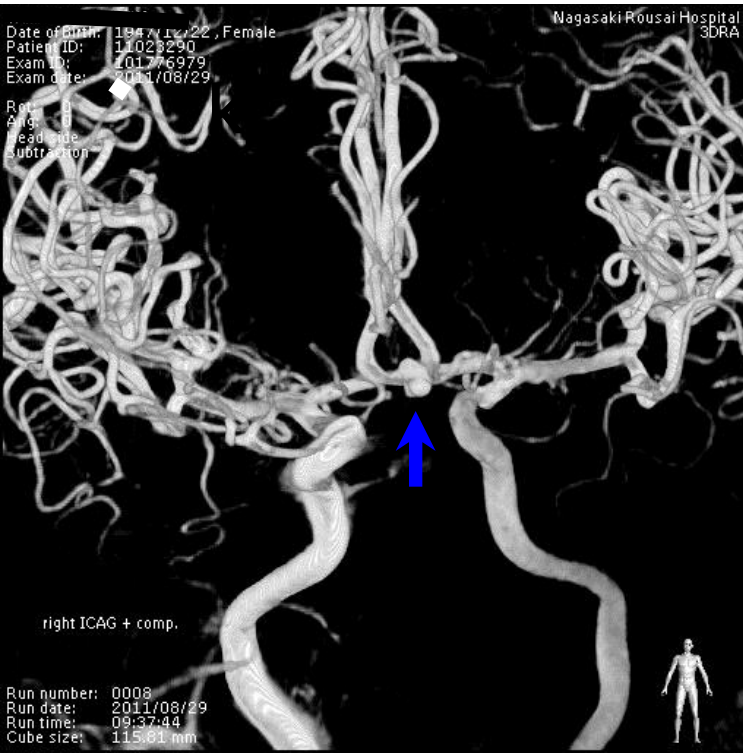
Case No.	height from ant. skull base (mm)	approach side	A2 fork orientation	multiple An.
No.1	5.0	left	open to right	no
No.2	4.2	left	open to right	no
No.3	7.2	left	open to right	yes
No.4	6.1	left	open to right	no
No.5	11.6	left	open to left	no
No.6	6.7	left	open to left	yes
No.7	6.6	left	open to right	yes
No.8	4.4	left	open to right	yes
No.9	8.6	left	open to right	yes
No.10	4.4	left	open to right	no
No.11	6.3	right	open to left	yes
No.12	10.1	right	open to left	yes
No.13	4.7	right	open to left	no
No.14	8.4	left	open to right	no

【手術】

- 通常の前頭側頭開頭、蝶形骨縁を削除。
- 早期の近位遮断を担保するために内頸動脈近位を確保の後にシルビウス裂を深部に至るまで開放し内頸動脈先端部を同定、A1近位を確保。
- 視交叉槽・終板槽を開放しつつA1を遠位まで剥離し、安全に一時遮断の可能な血管部位を想定。(下向きの動脈瘤以外では引き続き対側A1まで確保)
- 前半球間裂を開放。高位動脈瘤では可能な限り遠位まで開放し、嗅神経槽も開放することで前頭葉の牽引に備える。
- Acom complex及び穿通枝、動脈瘤頸部を確実に同定した後にclippingを行った。



SAH, anterior projection
Acom aneurysm

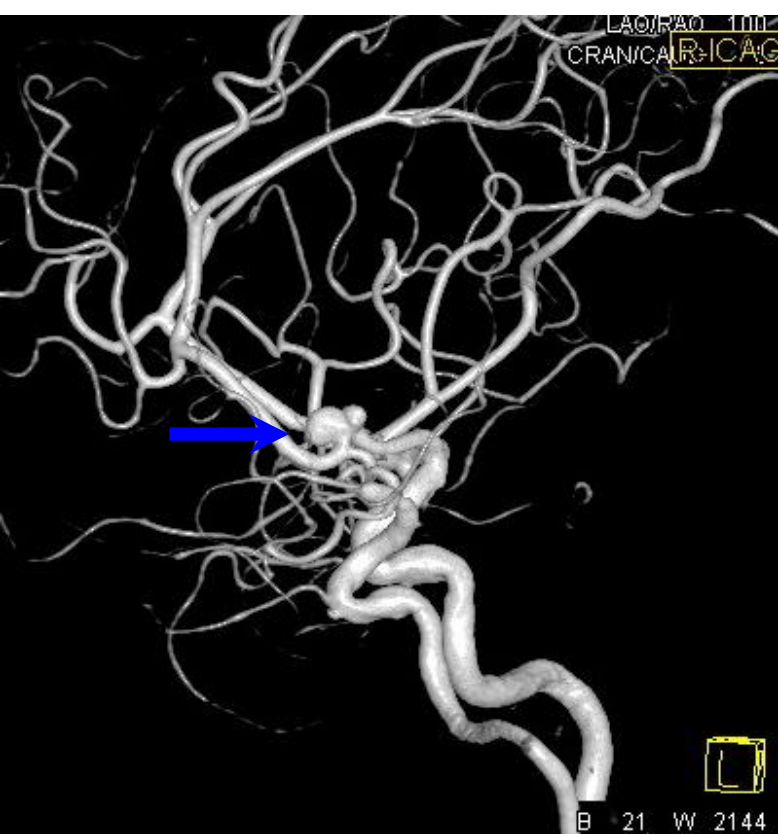


Rt. PA
closed A2 fork

SAH, dorsal projection
Acom aneurysm



Rt. PA
closed A2 fork



SAH,
dorsal projection /high position
Acom aneurysm

Rt. PA
closed A2 fork



動脈瘤に右A2が被る
しかもhigh position
動脈瘤の後方でhypothalamic arteryの確認
有窓クリップの使用が必要

SAH, dorsal projection～
～だが右A2は動脈瘤に被っていない
Acom aneurysm



Lt. PA
closed A2 fork



Rt. PA なら？
open A2 fork



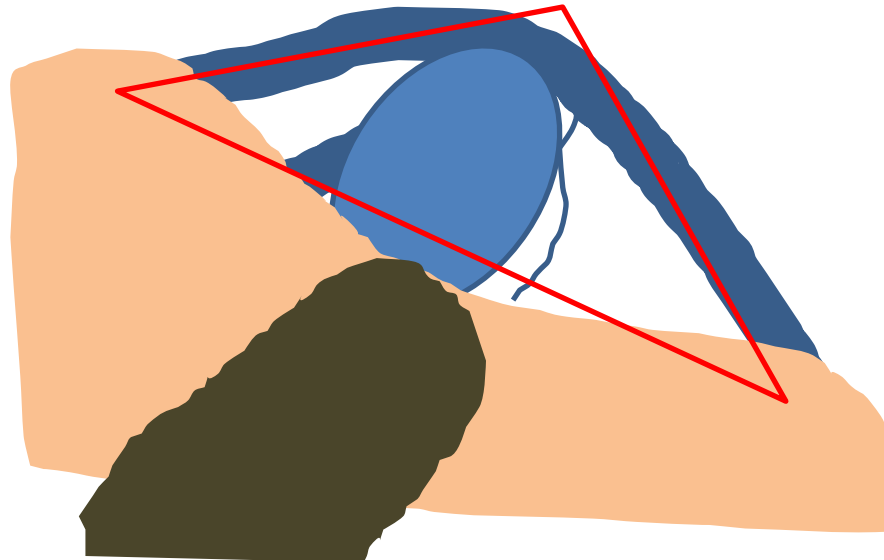
AIHAなら？
A2 fork関係ない

Case No.	Resection of rectal gyrus	temporary occlusion of ipsilateral A1	premature rupture	the time required	intraoperative bleeding (ml)
No.1	no	no	no	1hr.55min.	240
No.2	no	yes	yes	2hr.45min.	150
No.3	no	no	no	2hr.35min.	70
No.4	no	no	no	2hr.20min.	130
No.5	yes	no	no	2hr.45min.	20
No.6	yes	no	no	3hr.45min.	150
No.7	no	no	no	2hr.35min.	100
No.8	no	no	no	2hr.10min.	150
No.9	yes	no	no	2hr.40min.	100
No.10	no	no	no	2hr.15min.	100
No.11	no	no	no	2hr.15min.	100
No.12	yes	no	no	2hr.55min.	60
No.13	no	no	no	2hr.50min.	110
No.14	yes	yes	no	2hr.50min.	200

Case No.	complications	symptomatic vasospasm	complete clipping	outcome (mRS)
No.1	no	no	yes	0
No.2	anosima	yes	yes	1
No.3	no	yes	no	1
No.4	no	yes	no	3 (embolic stroke)
No.5	LDA on caudate (asymptomatic)	no	slight neck remnant	4 (deep vein thrombosis)
No.6	no	yes	not done	6 (aspiration pneumonia)
No.7	no		yes	0
No.8	no		yes	0
No.9	no	no	yes	1
No.10	no	no	yes	0
No.11	no	no	not done	6 (aspiration pneumonia)
No.12	no	no	yes	1
No.13	no	no	yes	4 (dysused atrophy due to paralytic ileus)
No.14	no	no	yes	1

結語

- AcomA瘤に対するA1優位側PAによるクリッピング術はclosed A2 fork側からのアプローチとなることが殆どである。
- 上記の理由により、rectal gyrusの吸引除去・前頭葉とA1A2のスペースからの動脈瘤及び穿通枝の確認・tentative clipの使用・親血管を跨いだ有窓クリップの使用など、を要する場合がある。



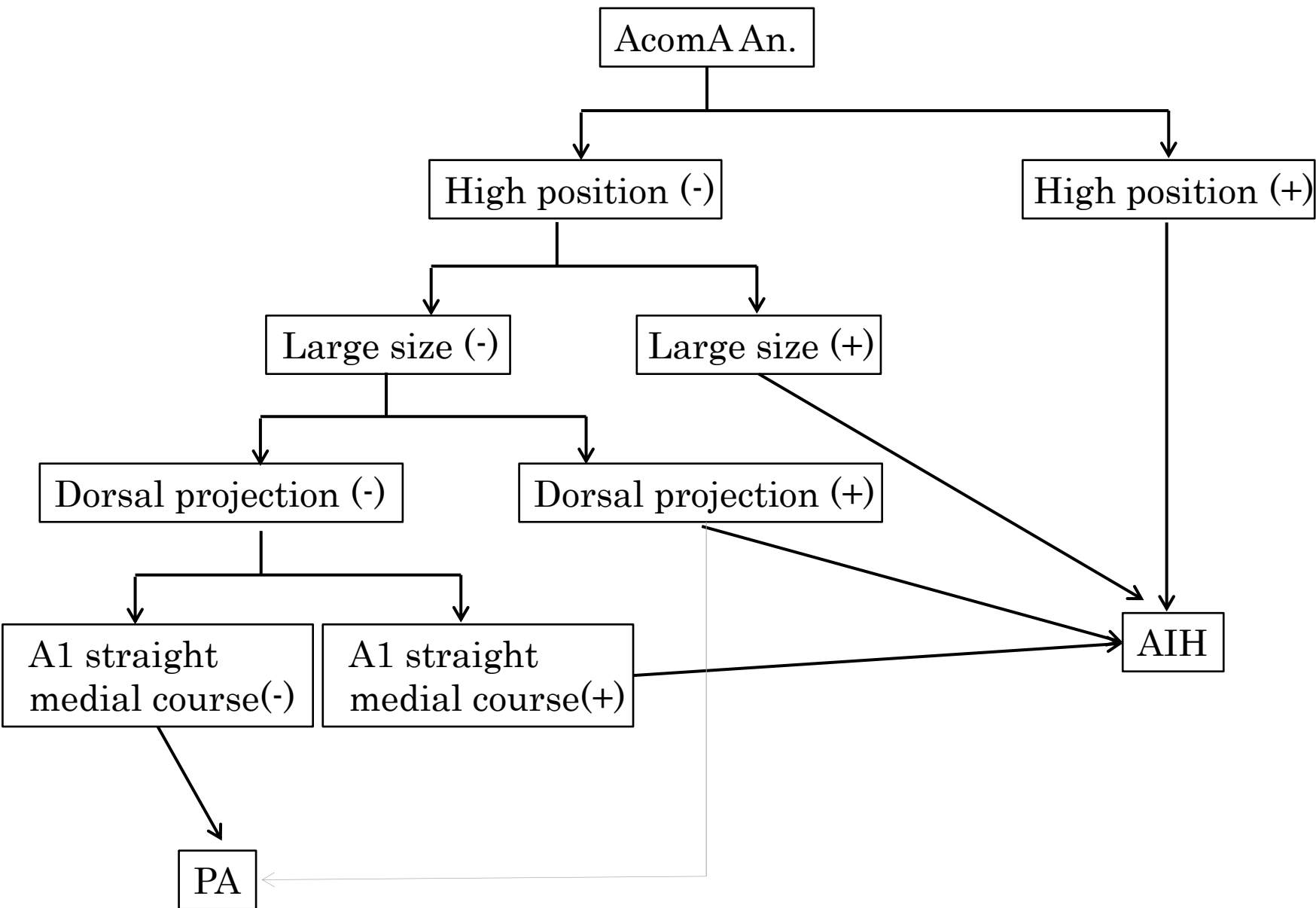


Fig.1b Selection of surgical approach for AcomA An.

AcomA An.: anterior communicating artery aneurysm, PA: pterional approach, AIH: anterior interhemispheric approach

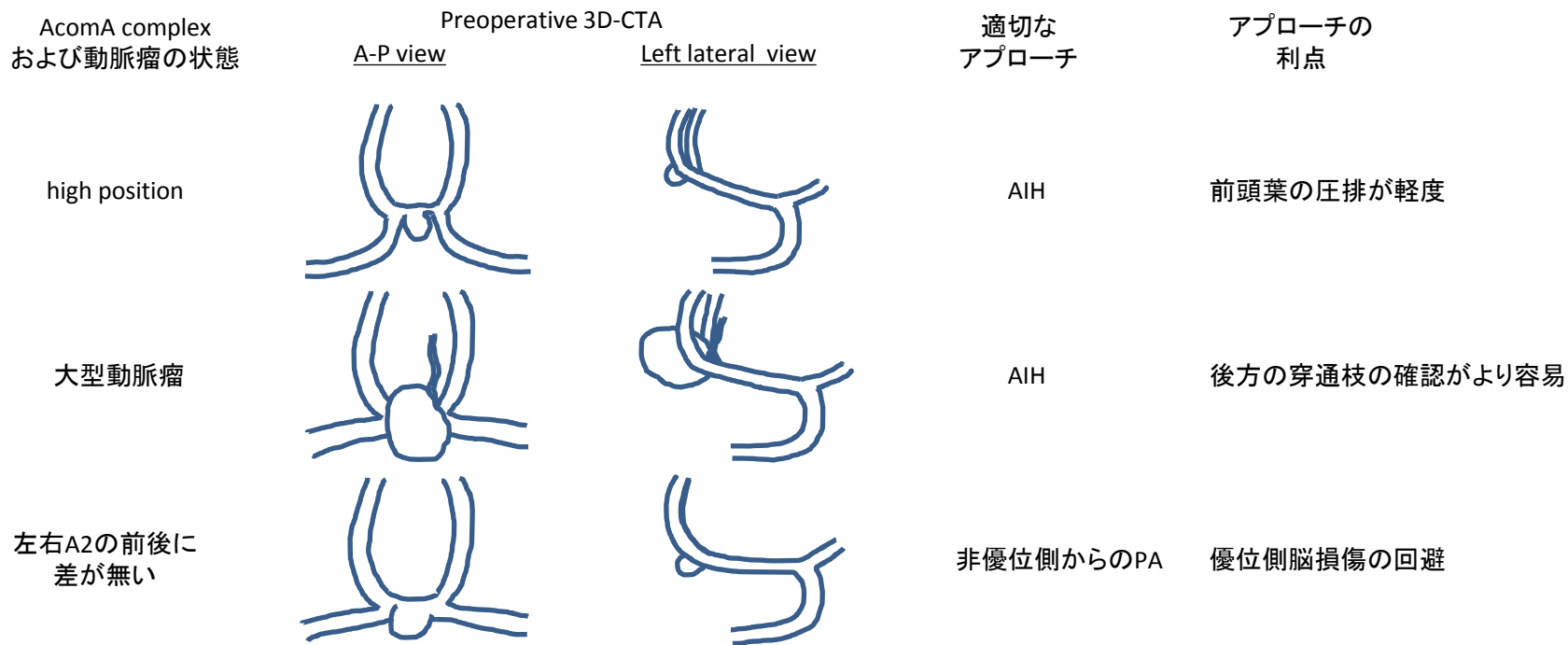
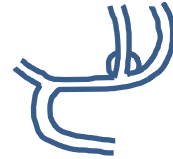
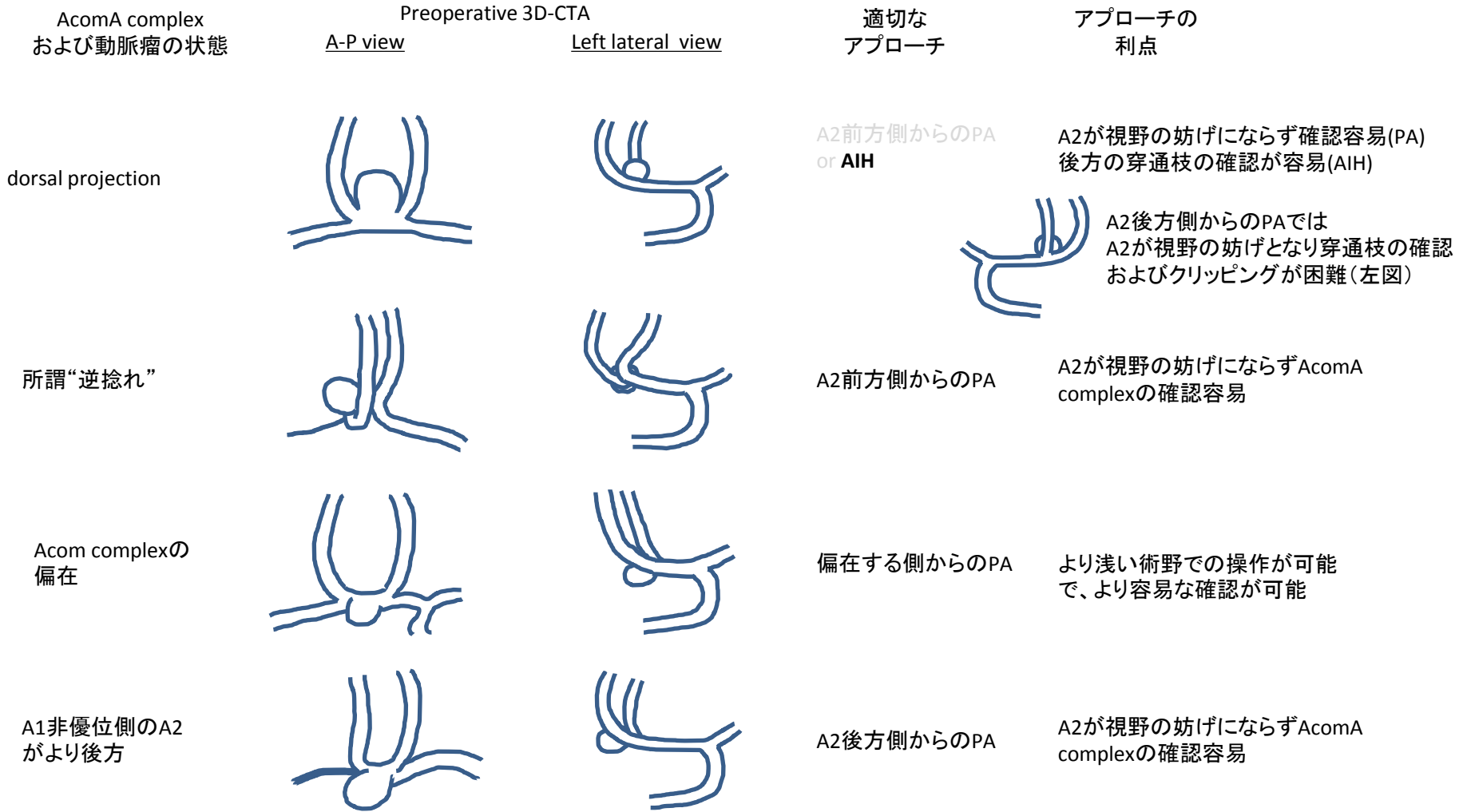


Fig.8a Schematic representation of selection of surgical approach for AcomA An.AcomA An.: anterior communicating artery aneurysm, PA: pterional approach, AIH: anterior interhemispheric approach



A2後方側からのPAでは
A2が視野の妨げとなり穿通枝の確認
およびクリッピングが困難(左図)

Fig.8b Schematic representation of selection of surgical approach for AcomA An.AcomA An.: anterior communicating artery aneurysm, PA: pterional approach, AIH: anterior interhemispheric approach