

# Endovascular Procedures for Isolated Common Iliac and Internal Iliac Aneurysm

Chungbuk Regional Cardiovascular Center,  
Division of Cardiology, Departments of Internal Medicine,  
Chungbuk National University Hospital

Sangmin Kim



# Introduction

- **Aneurysmal degeneration of the iliac arteries** can occur in isolation, or in association with other large vessel aneurysms.
- Iliac artery aneurysms (IAAs) are often diagnosed as **a result of screening or other imaging studies**.
- Like AAAs, IAAs have a **propensity for life-threatening rupture as diameter increases**.
- The management of asymptomatic IAAs **depends upon the size of the aneurysm**, the presence or absence of **coexisting abdominal aortic aneurysm or other aneurysm** (eg, femoral, popliteal), and **patient comorbidities**.
- Patients with symptomatic IAAs should be referred for **prompt vascular evaluation and repair**.

# Anatomic Issues

- 70 % of iliac aneurysms occur in the CIA
- 20 and 10 % are found in the IIA and EIA, respectively.
- 2/3 of patients with IAA have involvement of more than one segment of the iliac arterial tree.
- 1/3 of IAAs are bilateral.

# Definition of Iliac Aneurysm

- CIA aneurysm : > 1.85 cm in males and >1.5 cm in females.
- IIA aneurysm : > 0.8 cm

Krupski WC et al (1998), J Vasc Surg 28:1–11

**Table 1** Data for the normal diameters from Subcommittee on Reporting Standards for Arterial Aneurysms of The Society for Vascular Surgery (1991)

Artery	Normal diameter (cm)	Aneurysmal diameter (cm)
CIA	0.97–1.02 ± 0.15 (female)	≥1.5
	1.17–1.23 ± 0.2 (male)	≥1.7
IIA	0.54 ± 0.15	≥0.8

# Iliac Artery Expansion

## **\*\* Isolated iliac artery aneurysms**

- Retrospective review for aneurysm growth rates,  
isolated IAAs <3 cm : average rate of 1.1 mm/yr  
>3 cm : 2.6 mm/yr

Nakajima T, et al. J Vasc Surg 2001; 33:476.

## **\*\* Rupture**

- Average size of ruptured IAA : 5 ~ 7 cm (median 6 cm)
- Size of ruptured EIA : slightly smaller at 4 cm

Engelke C, et al. J Vasc Interv Radiol 2002; 13:667.

# Management

\* Indications for AAA:  
 symptomatic or ruptured AAA  
 asymptomatic AAA with >5.5 cm or rapid expansion >0.5 cm/yr  
 or associated with other peripheral artery aneurysm or peripheral artery disease requiring repair.

¶ 6 months after Dx, then if stable, annual surveillance.

Δ > 1.0 cm/yr or 0.7 cm in 6 months.

◇ Endovascular repair is generally preferred

§ Method of repair determined by aortoiliac anatomy and pelvic circulation. Endovascular coil embolization of the hypogastric artery may be needed to achieve a proper seal of the endovascular graft components.

\*\* Mortality

For emergent repair of IAA

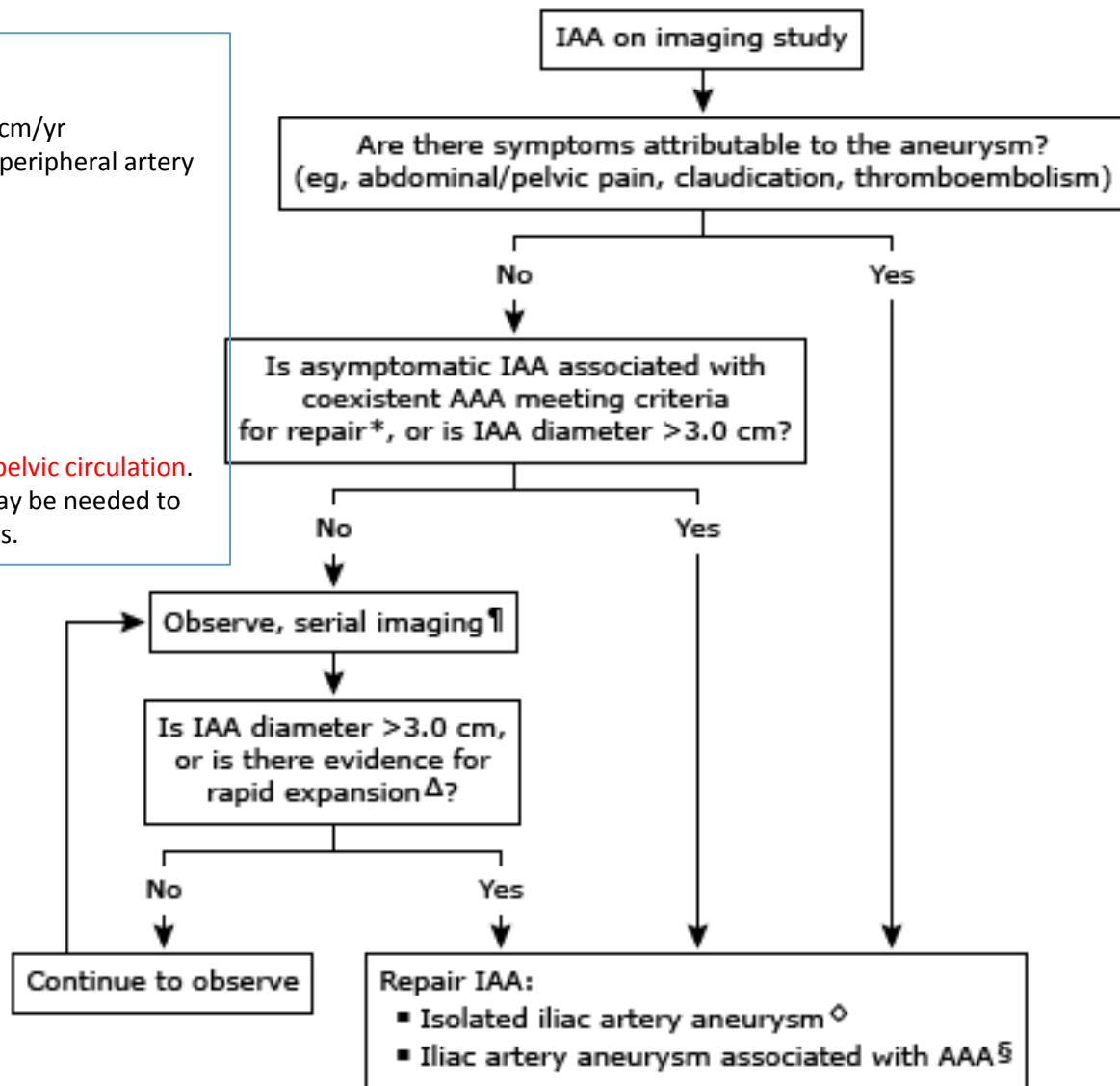
: 20 ~ 55 %

For elective repair

: 1 %

\*\* All pts with IAA

: manage their risk factors for CVD



# Indications for Repair

## **Ruptured IAA**

: surgical emergency and repair should be performed without delay.

## **Symptomatic IAA**

: Pts with Sxs generally have larger aneurysms that are at a high risk for rupture and IAA should be repaired urgently.

## **Rapidly expanding IAA**

:  $\geq 7$  mm in 6 months or  $>1$  cm in 1 yr

## **Asymptomatic IAA $\geq 3.0$ cm**

## **Coexistent AAA repair**

: AAA with CIA aneurysm any size

→ Treated by using a bifurcated graft rather than a tube graft.

For obtaining an adequate distal seal zone.

# Endovascular Repair

- **The goal of endovascular repair**  
to exclude the aneurysm sac from the circulation.
- **The specific procedure**  
Standard EVAR  
Isolated iliac stent-graft + adjunctive embolization of IIA
- **Local anesthesia and sedation**  
allows treatment of patients who might have a high risk for perioperative surgical morbidity
- **Conversion to OSR is uncommon**  
but may be needed in the event of a technical complication that cannot be managed by endovascular means



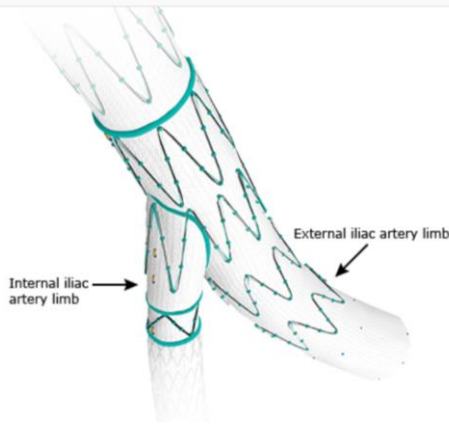
# Interventional Treatment Strategies

- **Interventional treatment options**  
: dependent on the anatomy of the aneurysm
  
- **Anatomic factors that influence endovascular treatment strategy**
  - (1) length of the proximal and distal normal artery (proximal/distal landing zones)
  - (2) concomitant involvement of the IIA
  - (3) the presence of bilateral/unilateral aneurysmal disease
  - (4) the presence or absence of a concomitant AAA

# Stent grafts

- Available iliac stent-grafts in Korea  
: SEAL , **S&G** biotech Inc., Korea (self expandable)  
Lifestream, Bard (balloon expandable)
- Limb devices from AAA stent grafts  
(especially proximal CIA > 12 mm)

**\*\* Branched graft**  
: Zenith, Cook medical



## 바드코리아, 풍선팽창형 스텐트 '라이프스트림' 출시

국내 유일 풍선팽창형 커버드 스텐트... "말초혈관질환 새로운 치료옵션"

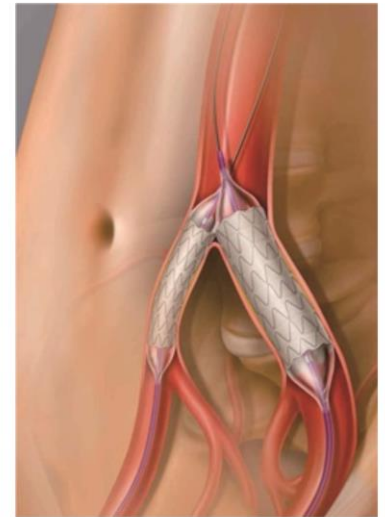
[1호] 승인 2018.05.03 10:56:27

바드코리아는 말초혈관질환 치료에 사용하는 풍선팽창형 커버드 스텐트 라이프스트림(Lifestream)'을 출시했다고 3일 밝혔다.

해당 제품은 말초혈관 협착 치료용으로는 국내에서 유일하게 스테인리스 스틸(Stainless steel) 재질의 풍선팽창형 커버드 스텐트라는 게 특징이다.

라이프스트림은 스테인리스 스틸 재질의 스텐트를 인조혈관으로도 사용되는 ePTFE(확장형 폴리테트라플루오로에틸렌) 재질로 감싼 디자인으로, 시술로 인해 혈관이 터지는 응급상황에서도 대처가 용이하다.

주로 총장골동맥과 외장골동맥의 협착에 사용될 수 있도록 고안돼 5~12mm의 직경과 26~58mm 길이 제품으로 구성돼 있다.



# Embolization

- Tx for IIA aneurysms  
: embolization + stent-grafting
- Adequate coil embolization of IIA aneurysms  
: interruption of the blood flow into the aneurysm (origin of IIA)  
+ outflow from (IIA branches) the aneurysm  
→ effectively arrest flow within the aneurysm sac  
→ thrombose
- Post-embolization of the IIA  
12 ~ 55 % risk of buttock claudication  
1 ~ 13 % risk of erectile dysfunction
- \*\* Bilateral embolization
  - Prefer staged approach (1~2 weeks) for collaterals
  - 1<sup>st</sup> stage, either of the IIA aneurysms is embolized
  - 2<sup>nd</sup> stage, the other IIA aneurysm is embolized (with aortic endografting)

# 5 categories

- The length of the proximal neck and distal landing zone
  - : Crucial !!
  - : At least **1.5 cm of nonaneurysmal artery (proximal/distal)** to achieve an adequate seal to prevent an endoleak.
  
- Based on IAA anatomy and configuration, patients may be divided into **five categories** as follows :

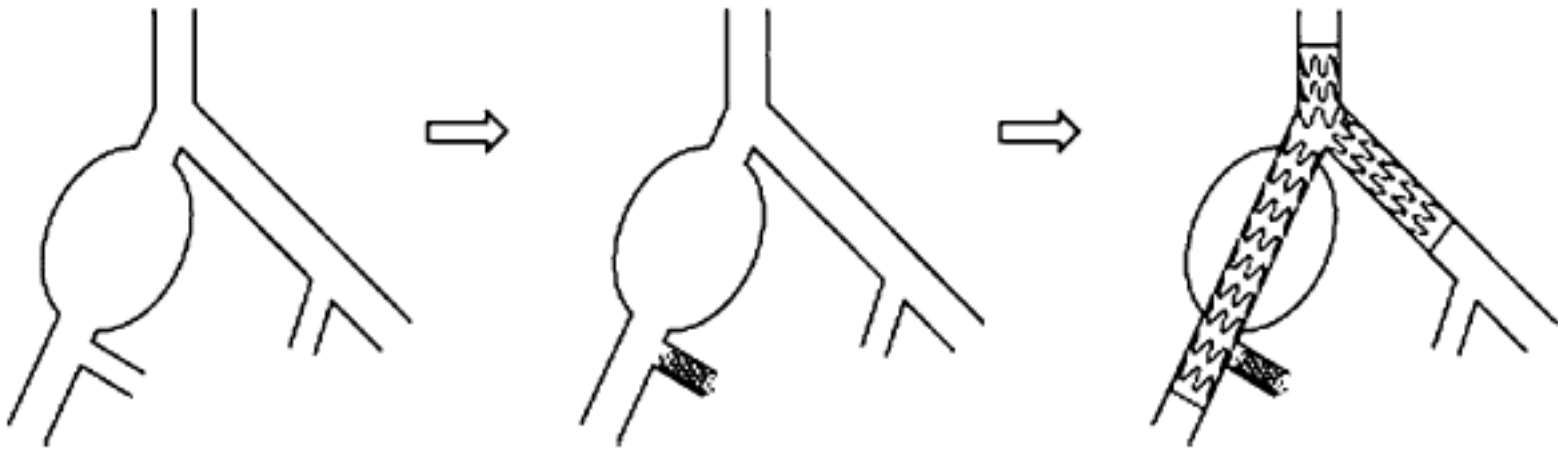
Hiromatsu S, et al. 2007 Asian Cardiovasc Thorac Ann  
15:280–284

# Treatment strategy

**No proximal landing zone** of 1.5 cm in CIA

The origin of the ipsilateral IIA is first occluded with coils or Amplatzer plugs

Standard EVAR



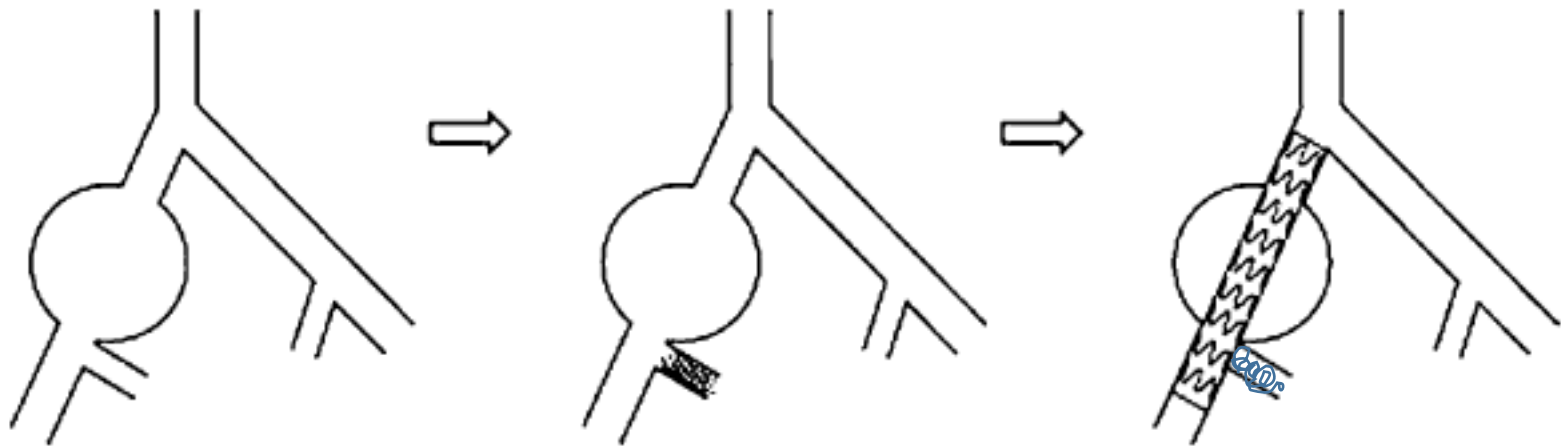
**Fig. 1** Treatment strategy for IIA type A anatomy

a standard bifurcated aortic stent graft is deployed to exclude the CIA aneurysm sac, extending the limb on the aneurysmal side to the EIA.

# Treatment strategy

Sufficient proximal neck,  
but **no distal landing zone** (of 1.5 cm or more)

The ipsilateral IIA origin is occluded

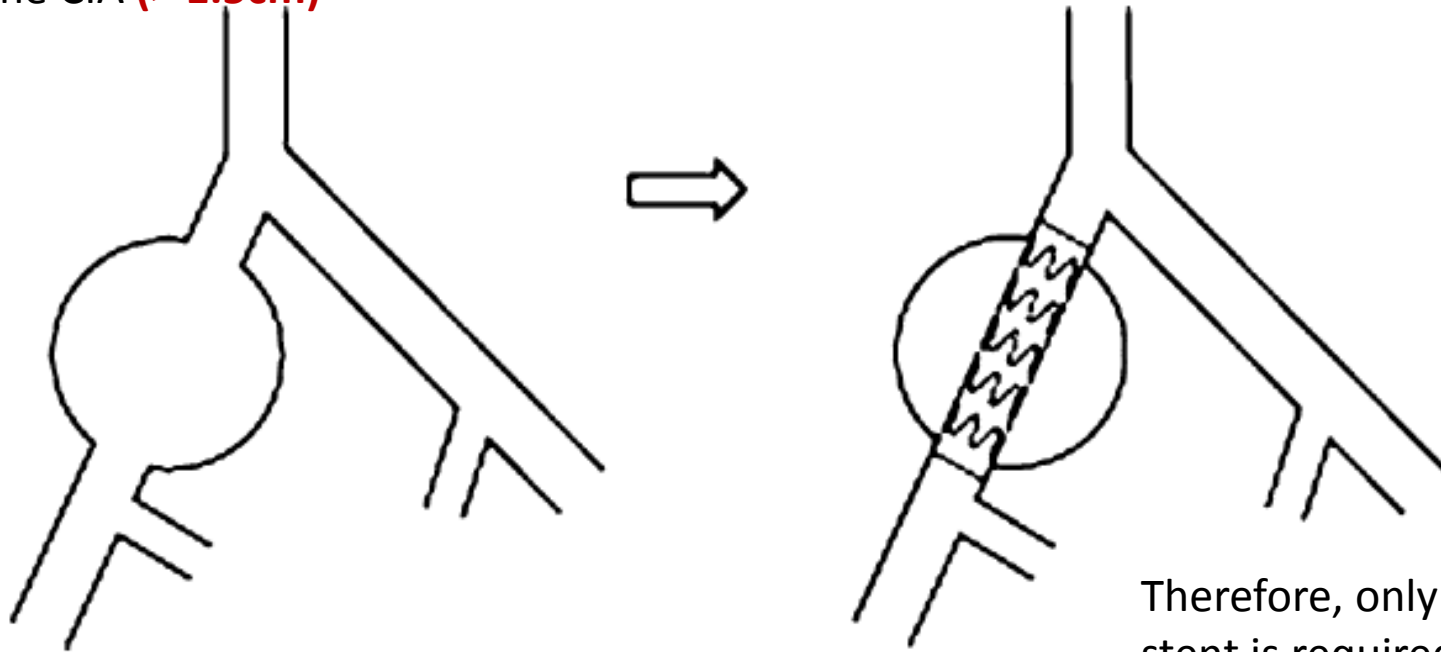


**Fig. 2** Treatment strategy for IIA type B anatomy

a covered stent graft is deployed across the CIA aneurysm from the proximal CIA to the distal landing zone of the stent within the EIA

# Treatment strategy

Adequate proximal and distal landing zones within the CIA (> 1.5cm)



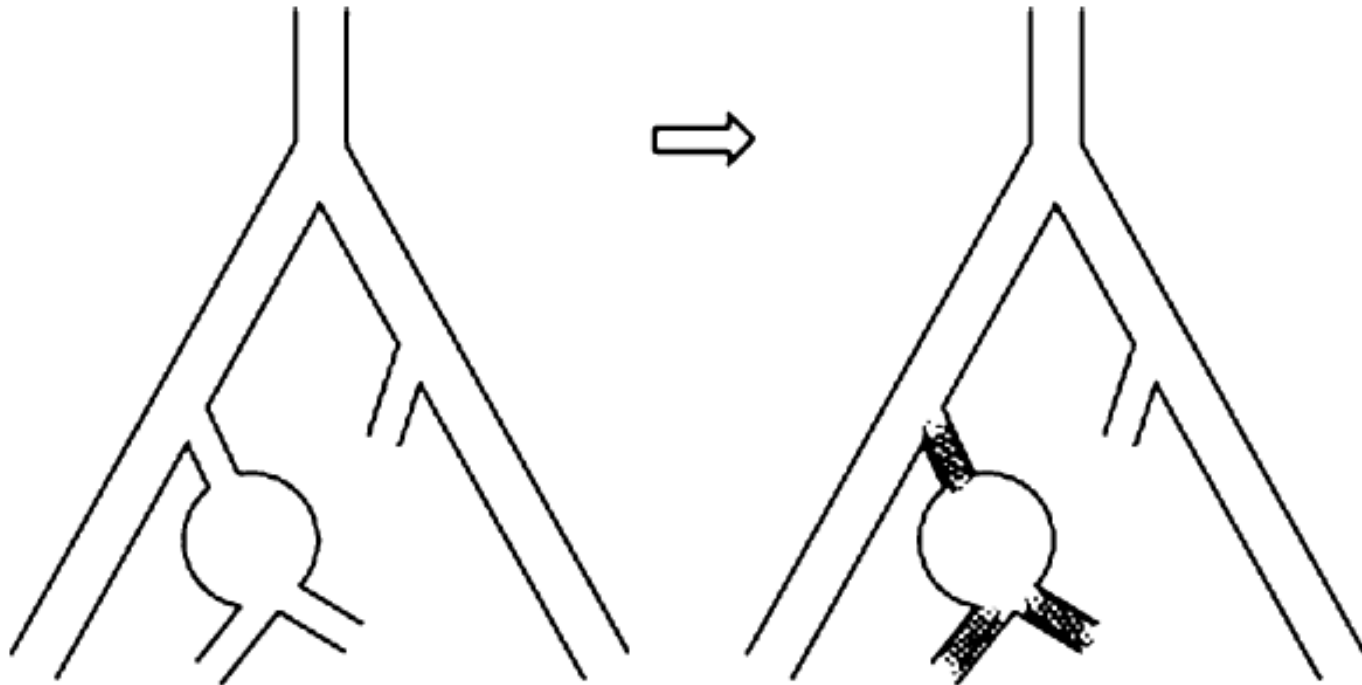
**Fig. 3** Treatment strategy for IIA type C anatomy

Therefore, only a covered stent is required to adequately exclude the aneurysm from the circulation

Another option : occluding the CIA origin and IIA + fem–fem cross-over.

# Treatment strategy

**Solitary IAA that does not extend to the IIA origin**  
and has a length of proximal IIA of at least 1 cm



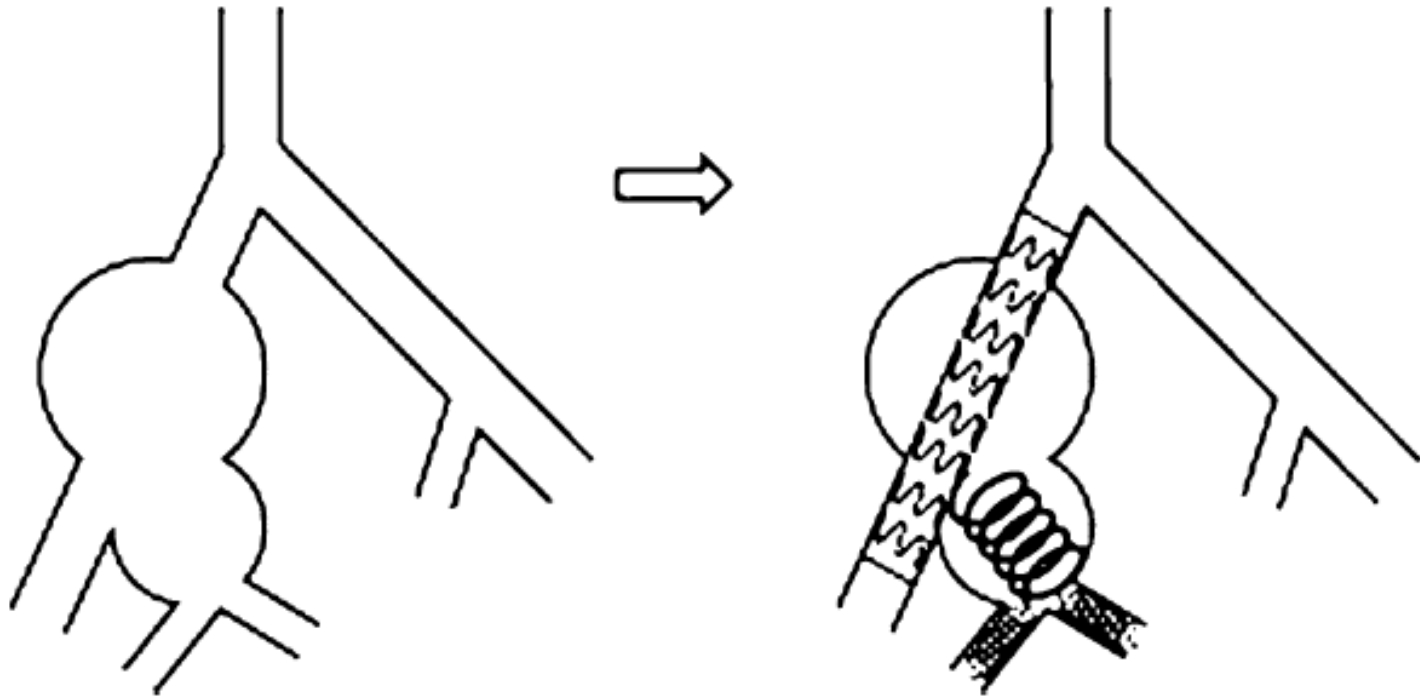
**Fig. 4** Treatment strategy for IIA type D anatomy

The arterial branches distal to the aneurysm must be embolized with coils or plugs to prevent retrograde perfusion of the aneurysm sac. Once these distal branches are occluded, the origin of the IIA is occluded with either coils or a plug.



# Treatment strategy

## CIA aneurysm that extends into the ipsilateral IAA



**Fig. 5** Treatment strategy for IIA type E anatomy

The distal branches that arise from the IIA are occluded, and a stent graft is then deployed to exclude the CIA aneurysm component with the distal landing zone within the EIA. If the CIA aneurysmal component extends to the within 1.5 cm of the aortic bifurcation, then a bifurcated graft should be used.

# Treatment strategy : Isolated CIA aneurysm (Summary)

- Under circumstances where these anatomic criteria are not satisfied, isolated common iliac artery aneurysm can be managed in the following manner:
  - **No proximal landing zone**
    - aorto-iliac endograft as with concomitant abdominal aortic aneurysm
  - **Adequate proximal but no distal landing zone**
    - IIA will need to be sacrificed, unless a branched iliac device is available
    - Prior to stent-graft placement, the origin of IIA is embolized with thrombogenic coils or by using a vascular plug device to prevent back-bleeding from the IIA into the aneurysm sac from pelvic collaterals.
    - The stent-graft in the CIA can then be extended distal to the origin of the IIA to normal-caliber for fixation.

**Table 3** Patency of iliac endografts

Duration of follow-up (years)	Primary patency (%)
2	81–95 [5, 11, 49, 56]
3	86–97.5 [45–47]
5	97 [21]

Ramman Uberoi, et al. Cardiovasc Intervent Radiol (2011) 34:3–13

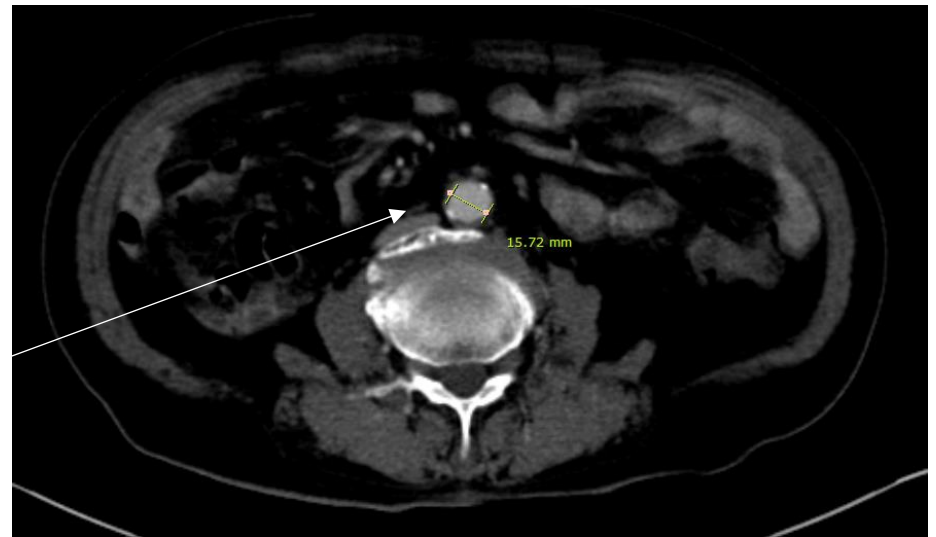
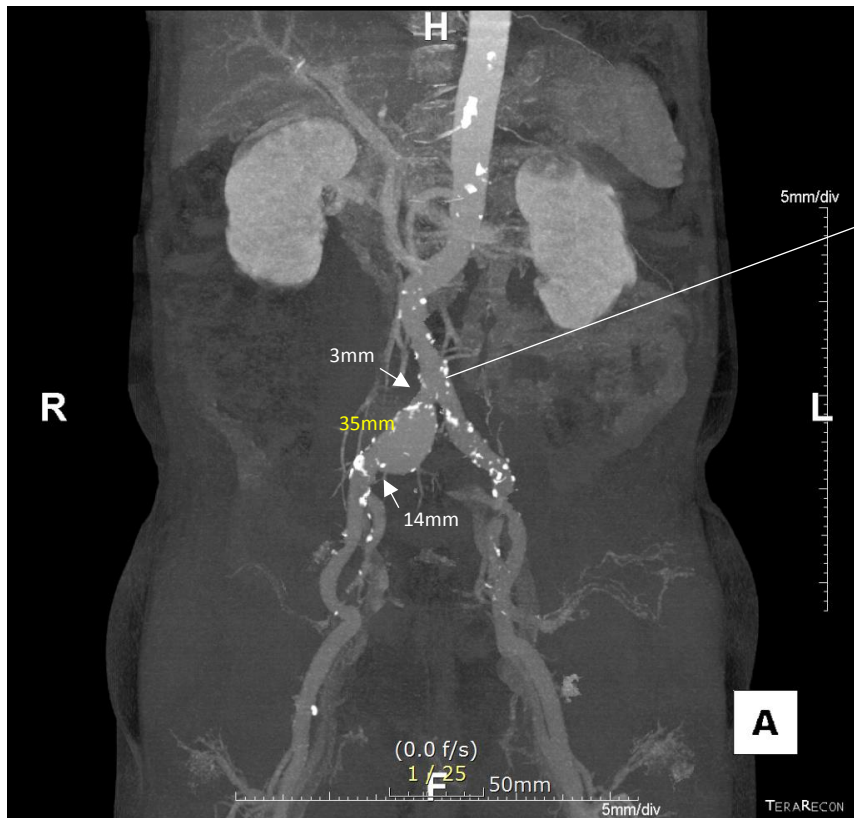
# Complications

Complication type	Median incidence (%) (range)	Mean incidence (%) $\pm$ SD
Endoleak	6.6 (2.8–33)	11.7 $\pm$ 3.26
Graft kinking/occlusion	9.1 (2.8–38)	11.7 $\pm$ 11.53
Buttock claudication	19.3 (5.2–65.3)	21.8 $\pm$ 19.1
Access-site complications	6 (2.2–57)	12.9 $\pm$ 19.6
Colonic ischaemia	6.3 (3.2–12.1)	6.97 $\pm$ 4.36
Distal atheroembolisation	3.5 (3.2–9)	5.23 $\pm$ 3.2
Rupture	0	0
Procedure-related 30-day mortality	0	0

Ramman Uberoi, et al. Cardiovasc Intervent Radiol (2011) 34:3–13

# Case (1)

- 2017.02.15.
- M/73, HT +, ex-smoker, no Sx



type A anatomy..

But, small caliber of distal aorta

# Case (1)



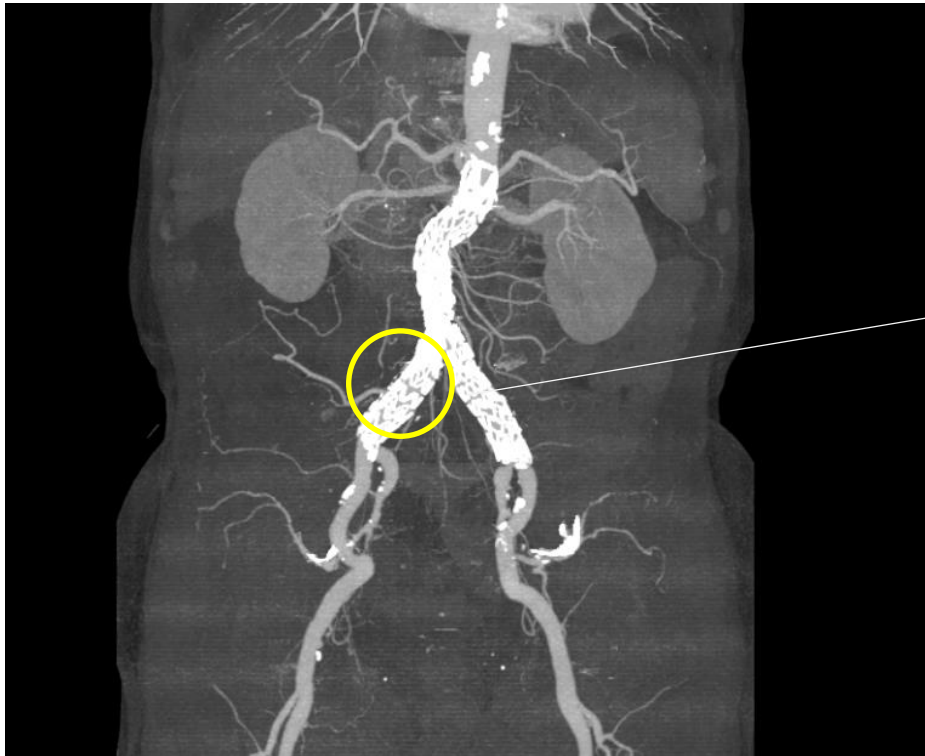
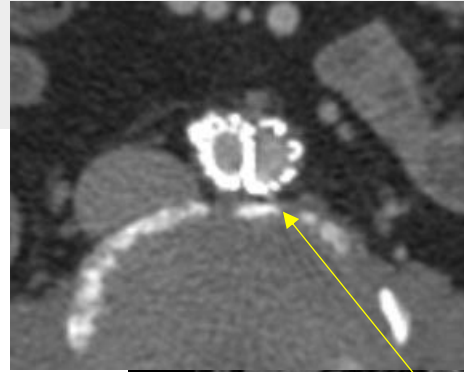
s/p EVAR + BMS for (Rt limb) (2017.07.26)

Endurant 23 x 14 x 103mm (Mainbody-Rt limb) / 16 x 16 x 124mm (Lt opposite limb) / 16 x 16 x 93 (Rt limb extension)

Complete SE 9.0 x 40mm for Rt limb

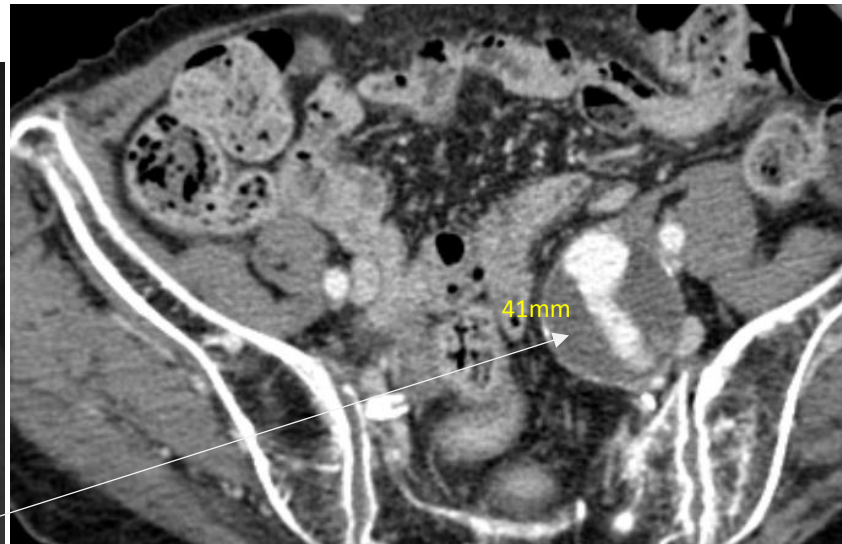
# Case (1)

f/u CT (2018.08.08)



## Case (2)

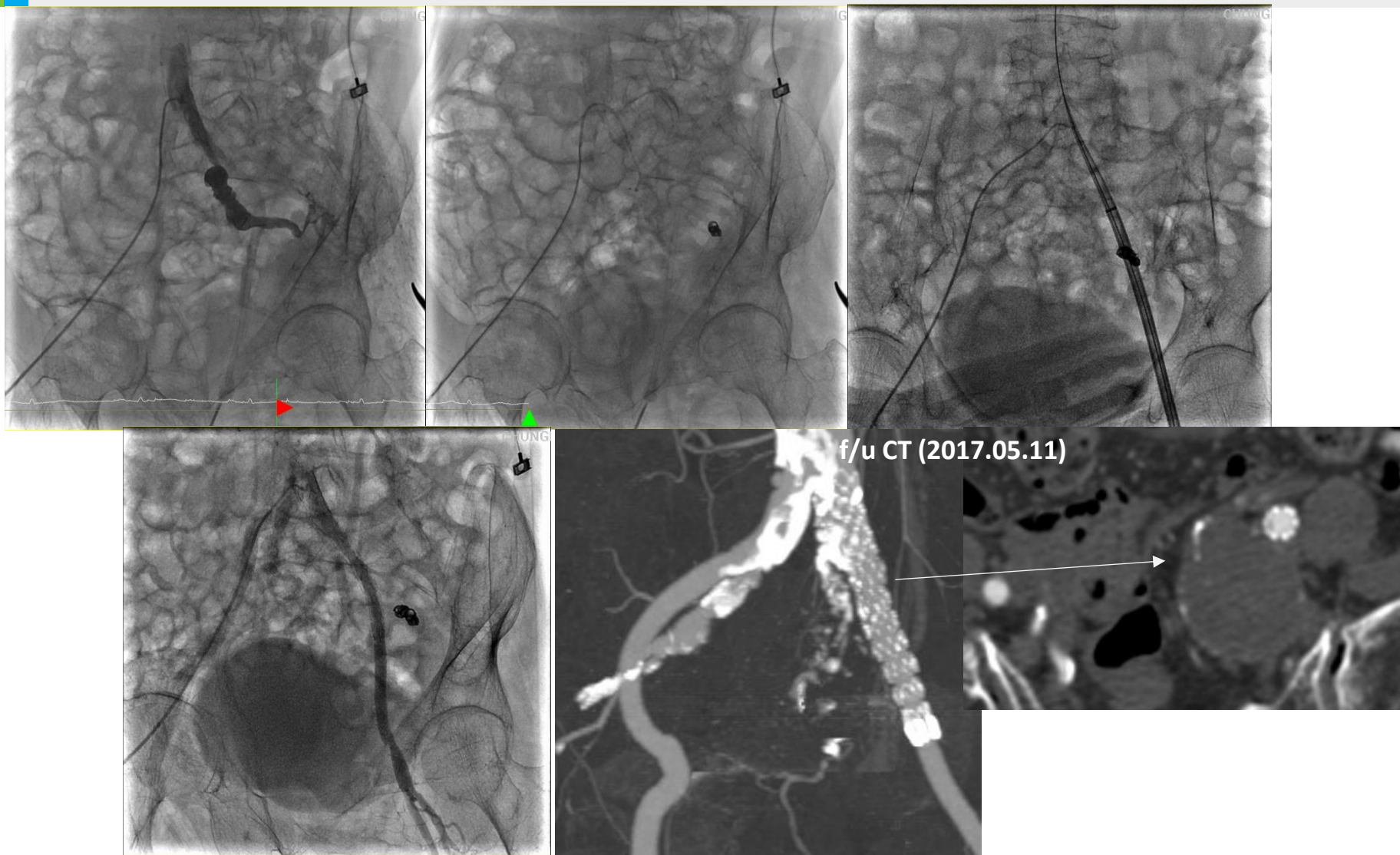
- 2017.04.10.
- F/88, HT +, no Sx



type D anatomy  
But, Aneurysm extend to the IIA os



## Case (2)



s/p Embolization for Lt IIA : Interlock 3x120(2), 4x150, 5x150 (2017.04.27)  
SEAL 12 x 10 x 80 mm for Lt CIA-EIA

# Conclusion

- With the increasing sophistication of technology and interventional techniques, interventional management of IIAs has evolved over the years to allow treatment of the majority of IIAs.
- Interventional treatment of IIAs is an attractive, minimally invasive option and should be considered a first-line treatment in these patients.

Thank you for your attention.



인류 건강과 의학발전을 선도하는 미래 의료의 새로운 중심