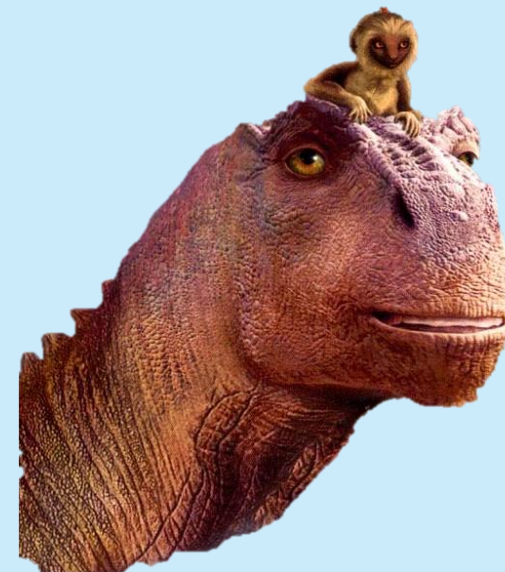


# Lesson from the past: arch fenestrations and the first devices

Timothy Resch, MD PhD  
Professor of Vascular Surgery  
Copenhagen University Hospital - Rigshospitalet





## Disclosures

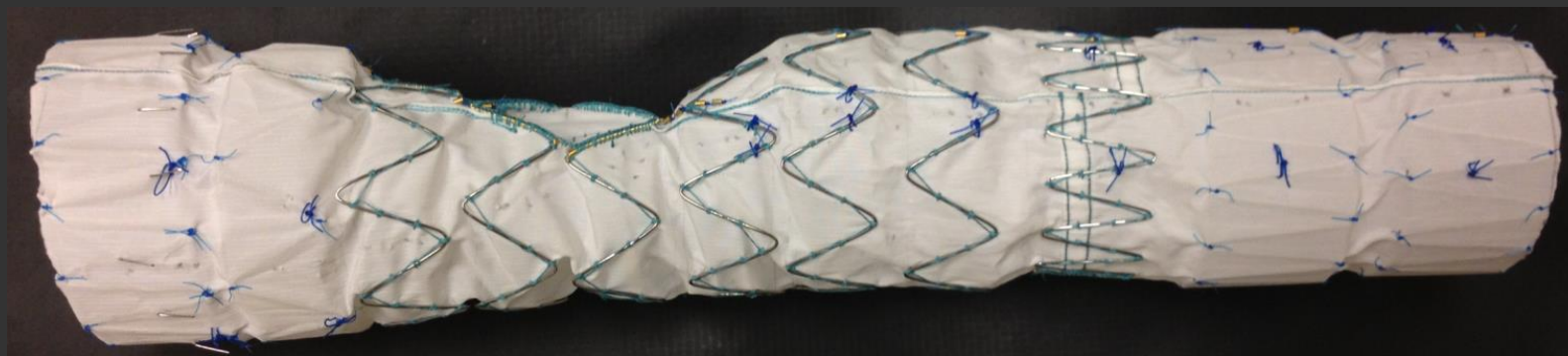
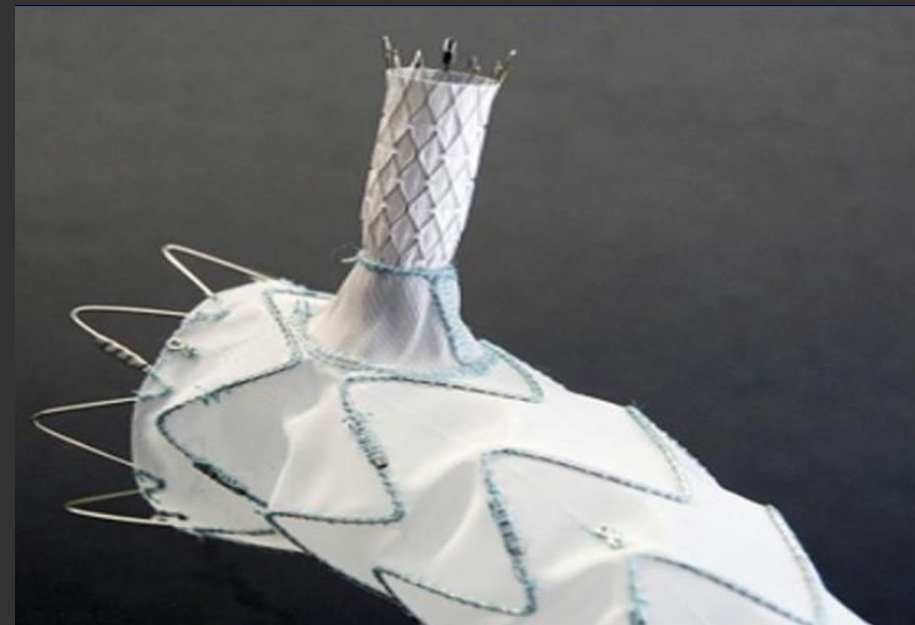
- COOK Medical Inc – Consulting, IP
- JOTEC/Cryolife – Consulting
- Bentley Innomed – Consulting
- GORE – Speaker
- Medtronic – Advisory Board

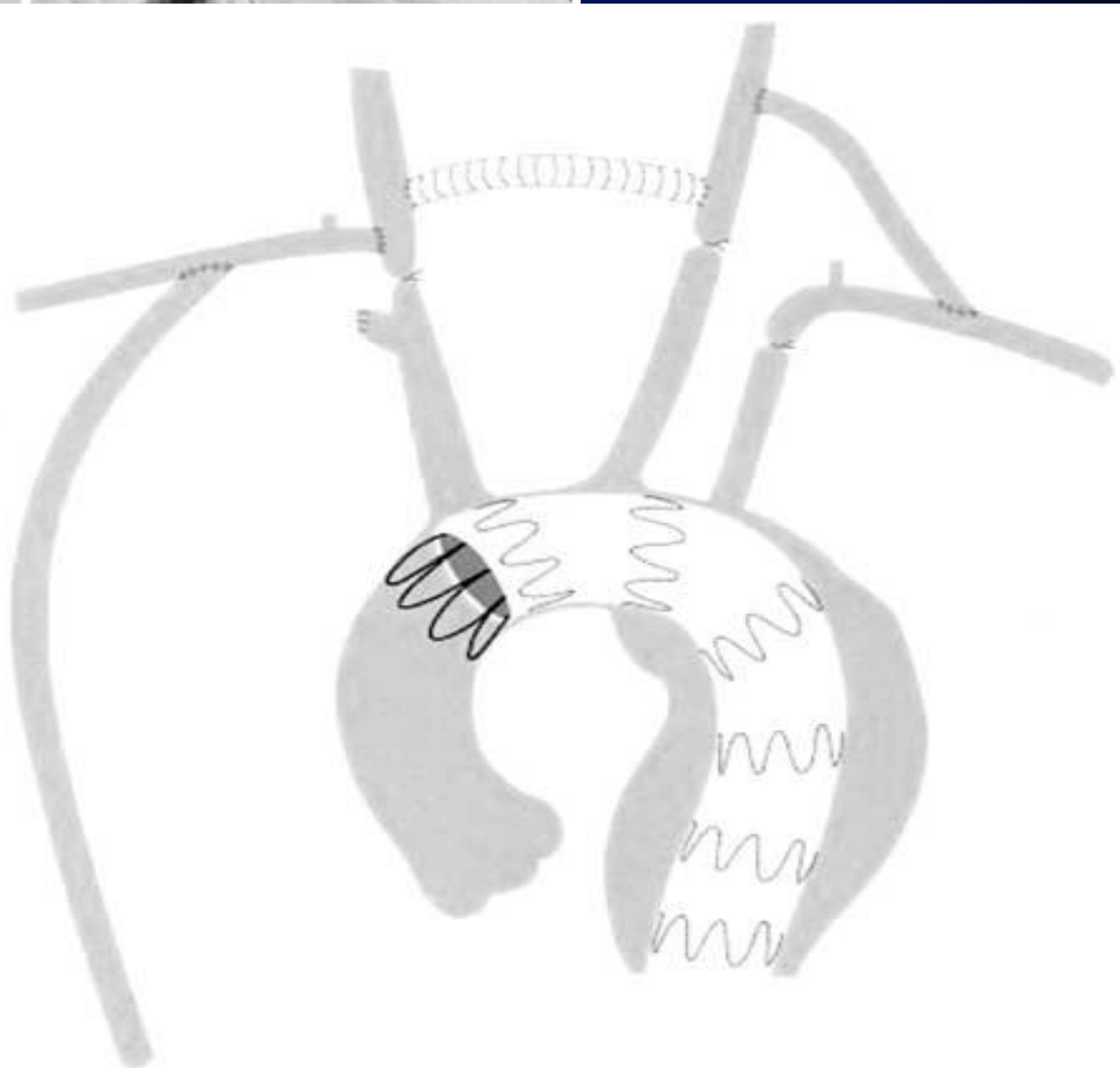
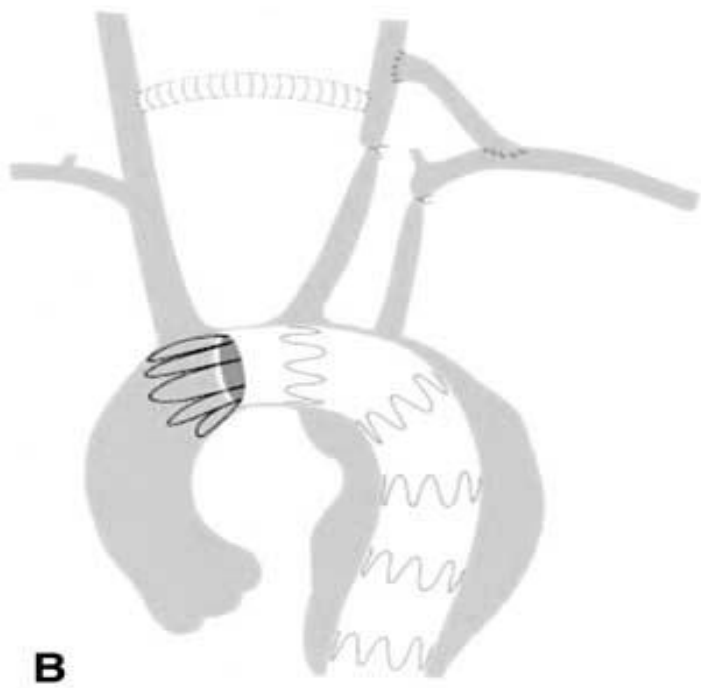


# Acknowledgements

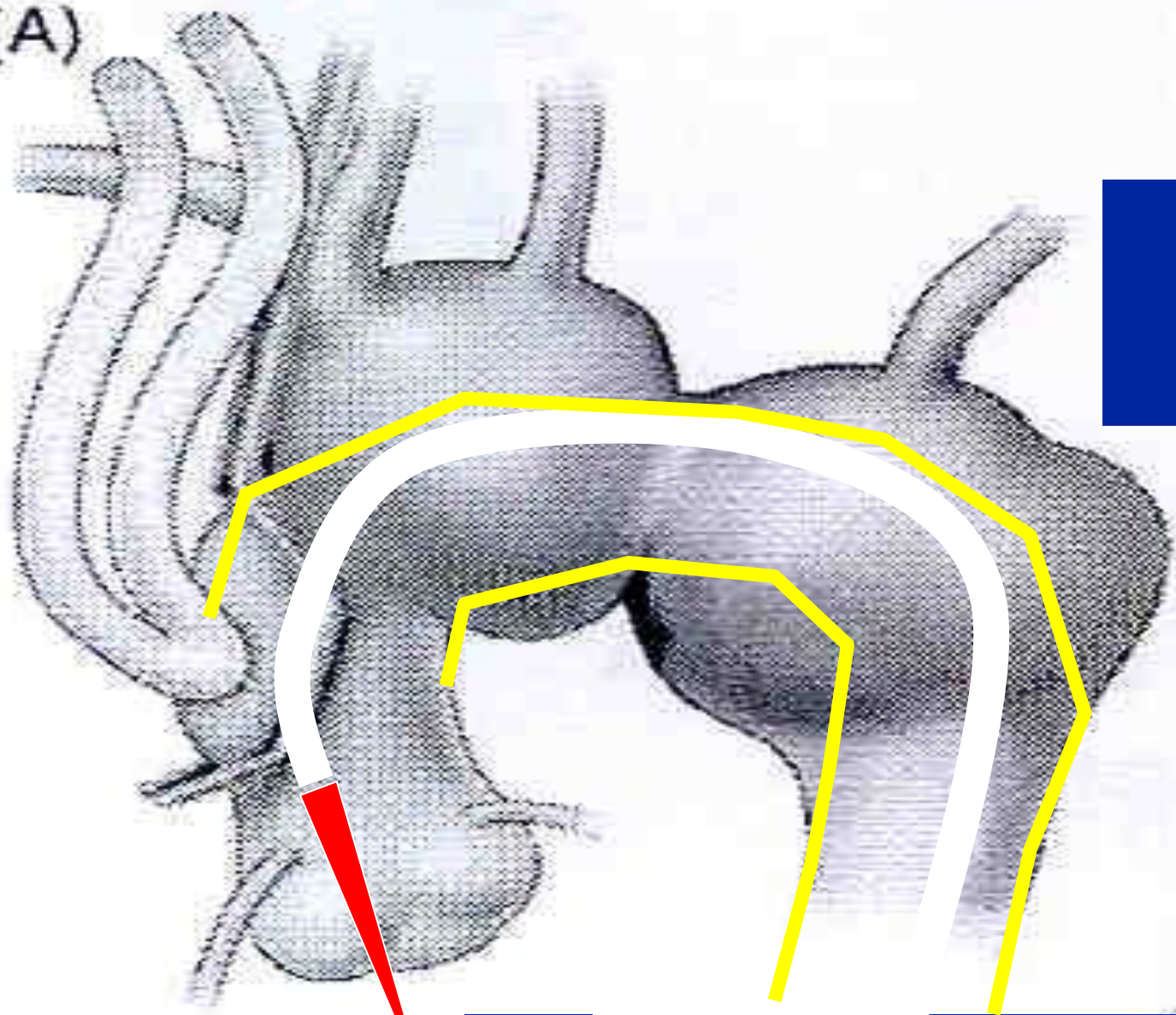
- Krassi Ivancev
- David Hartley
- Tilo Kolbel
- Tim Chuter
- Bjorn Sonesson



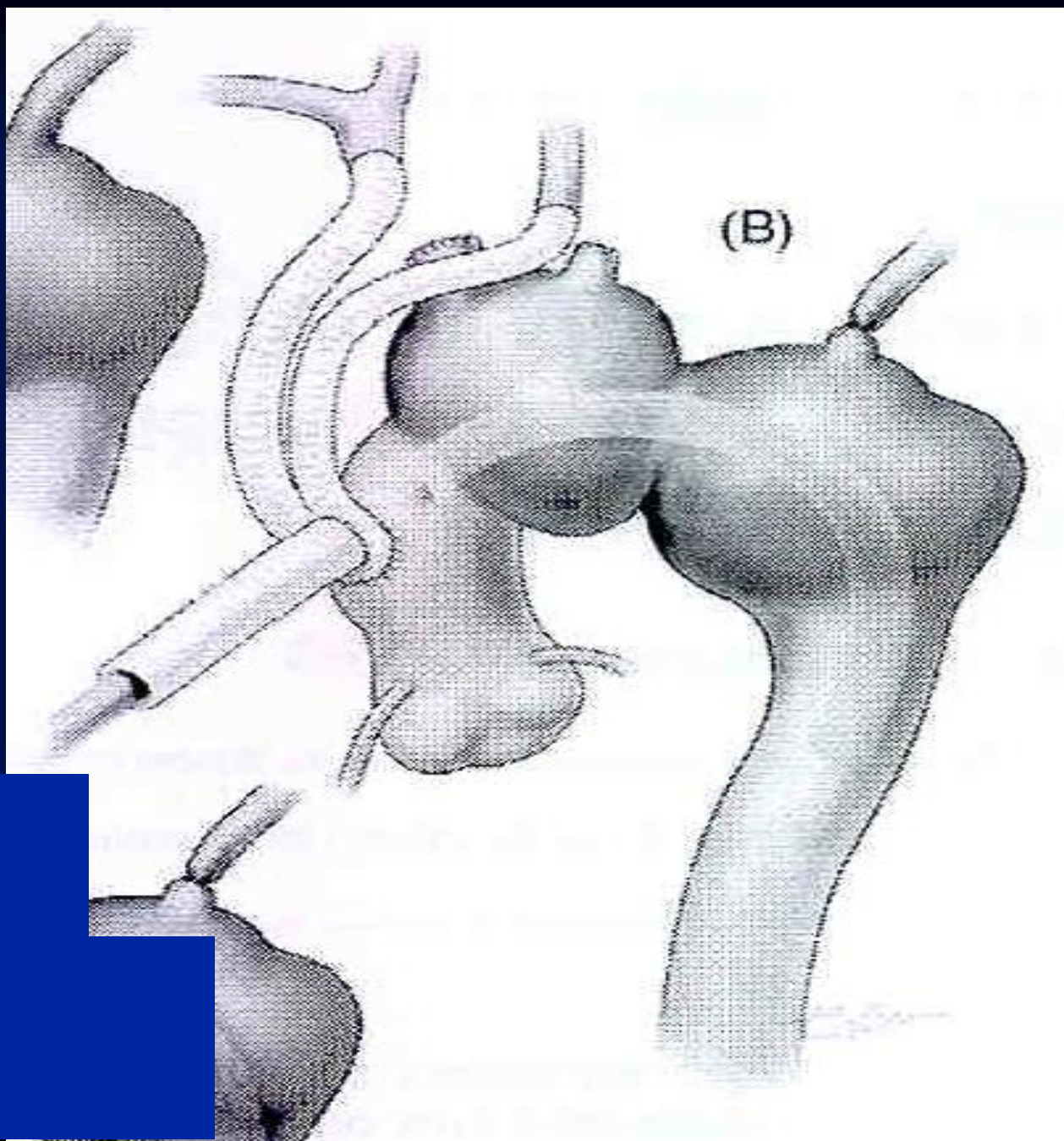


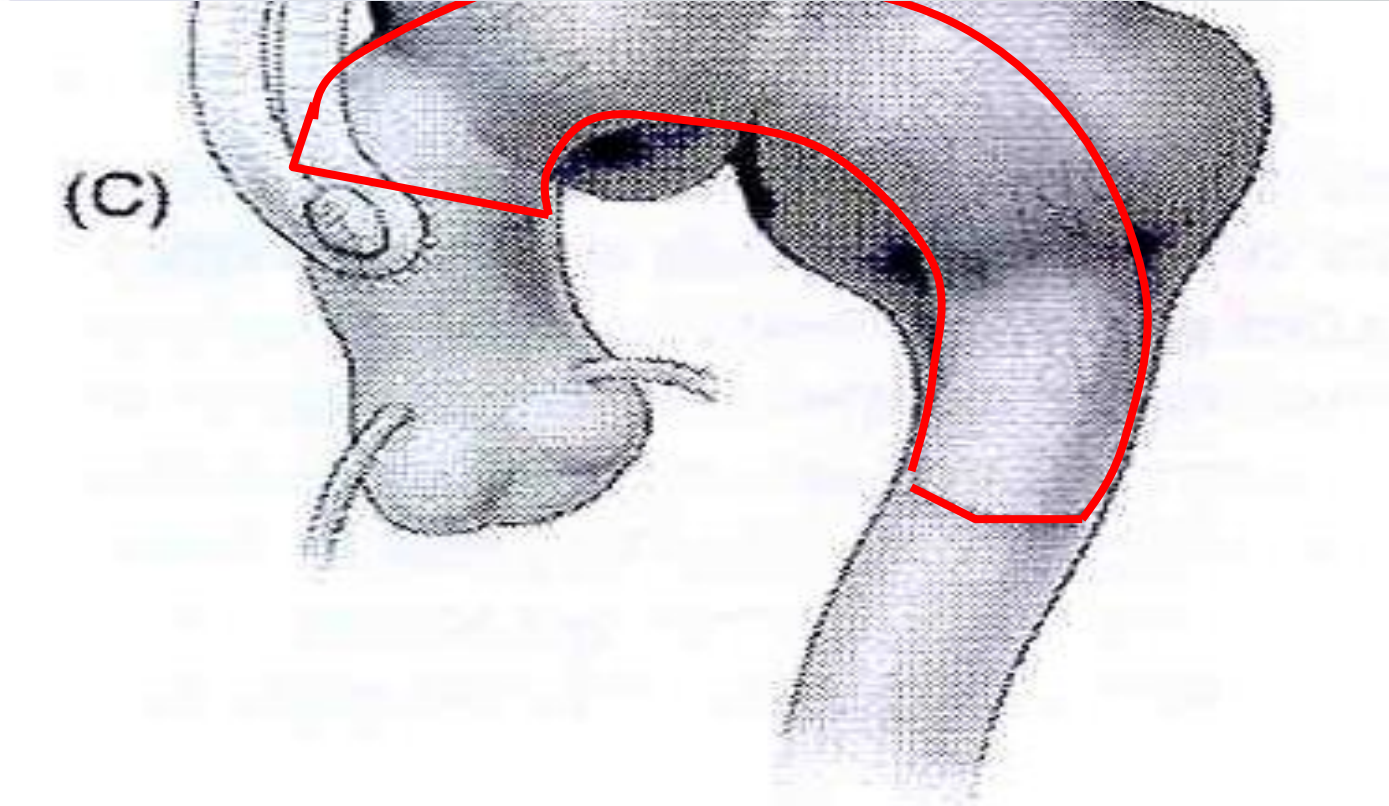
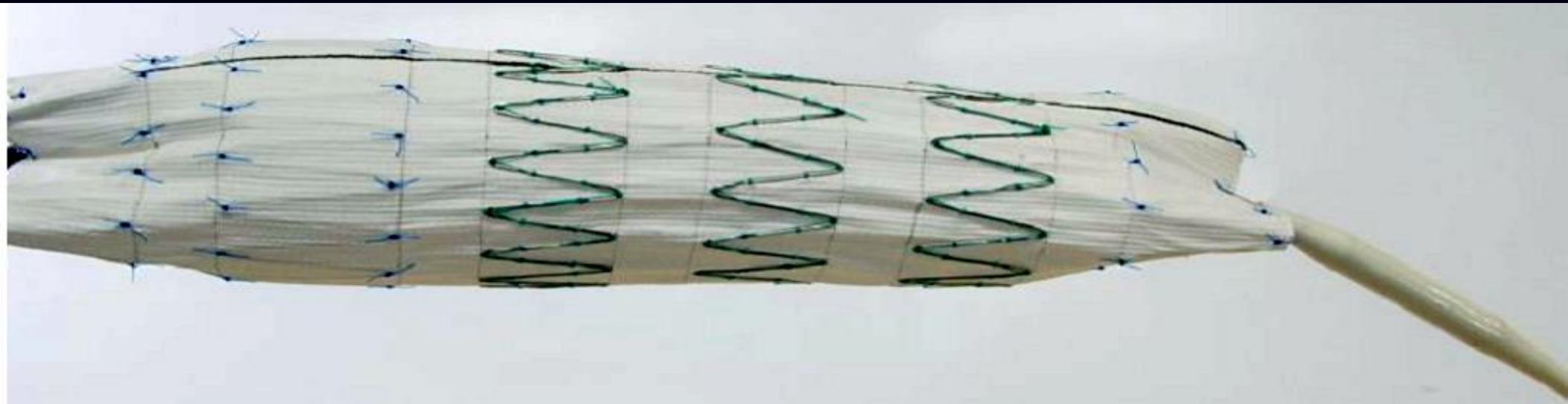


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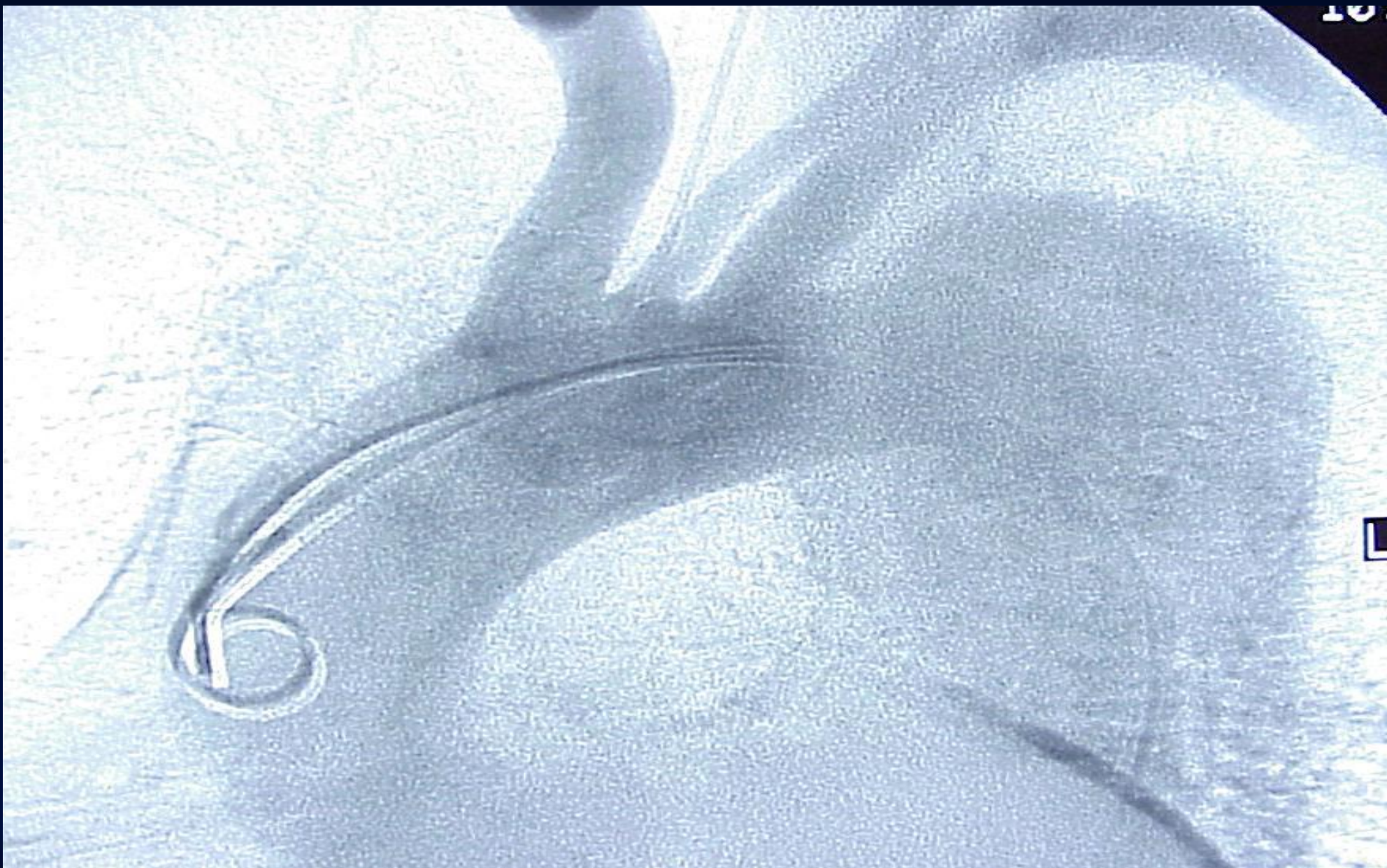




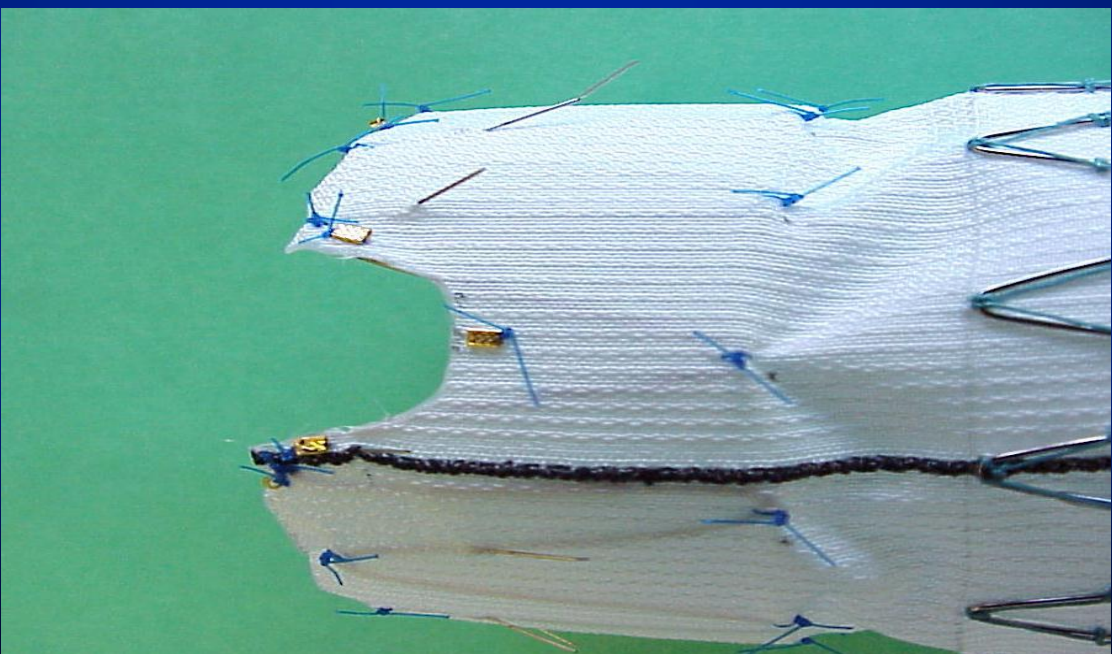
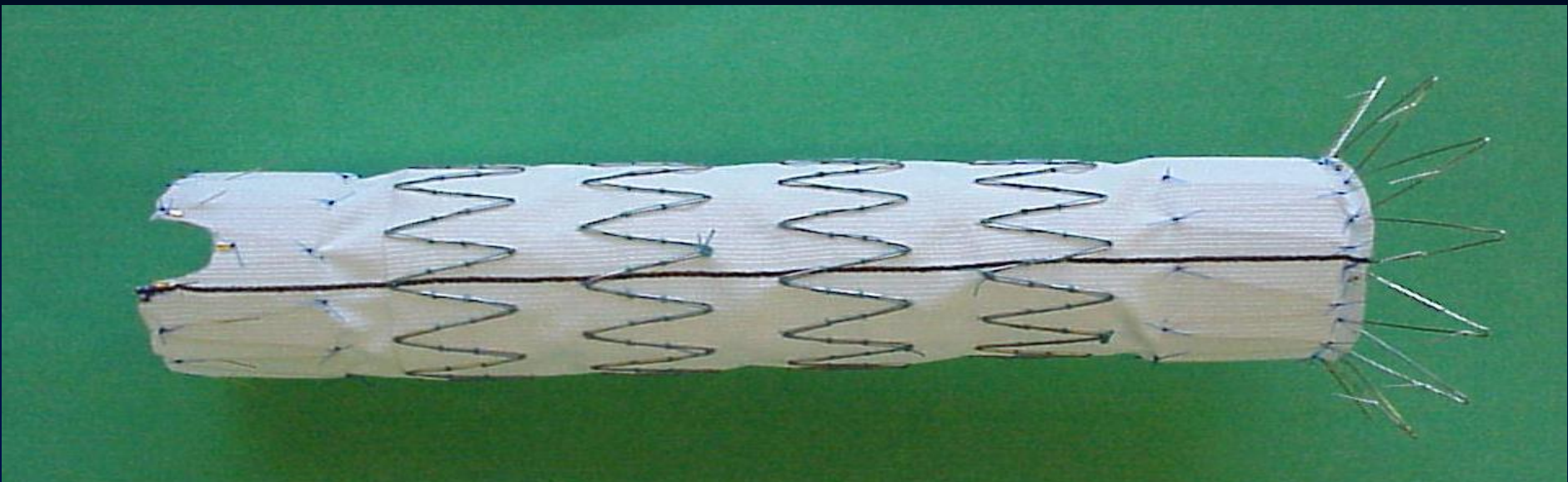


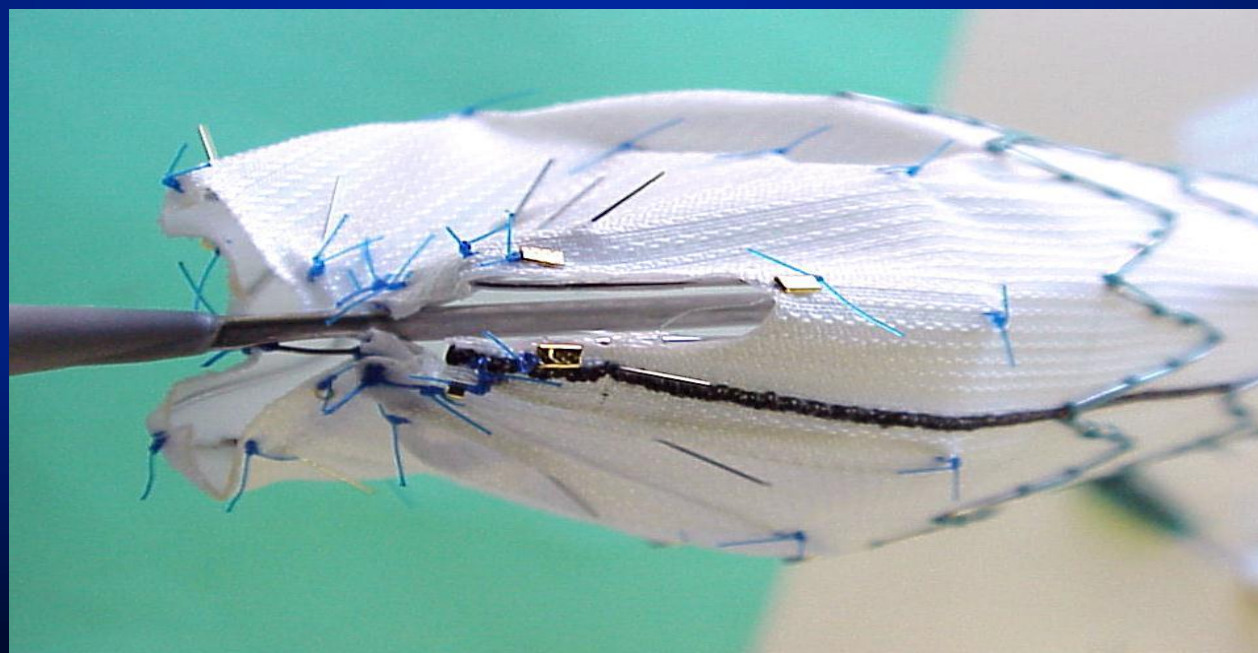




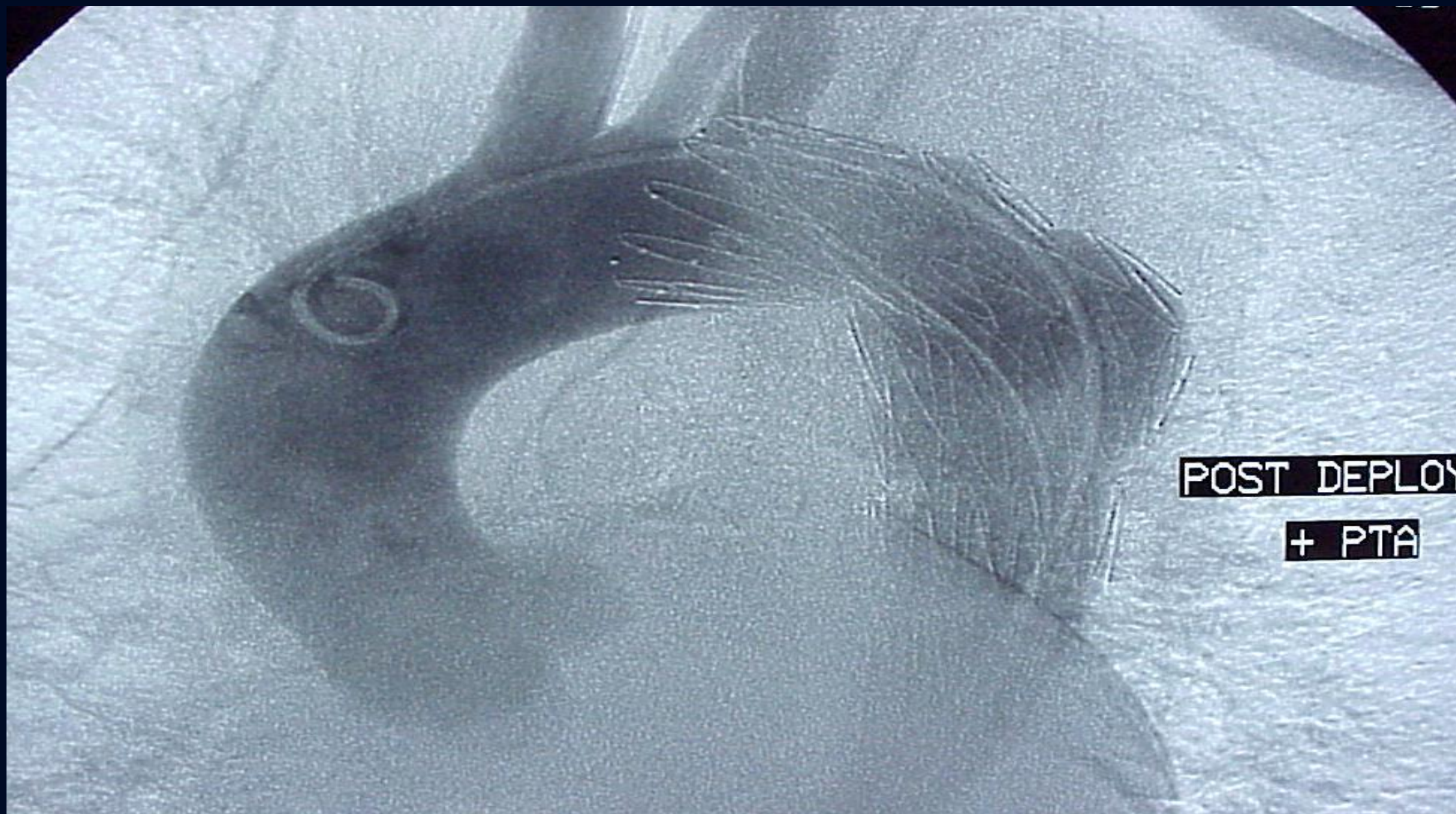












POST DEPLOY

+ PTA

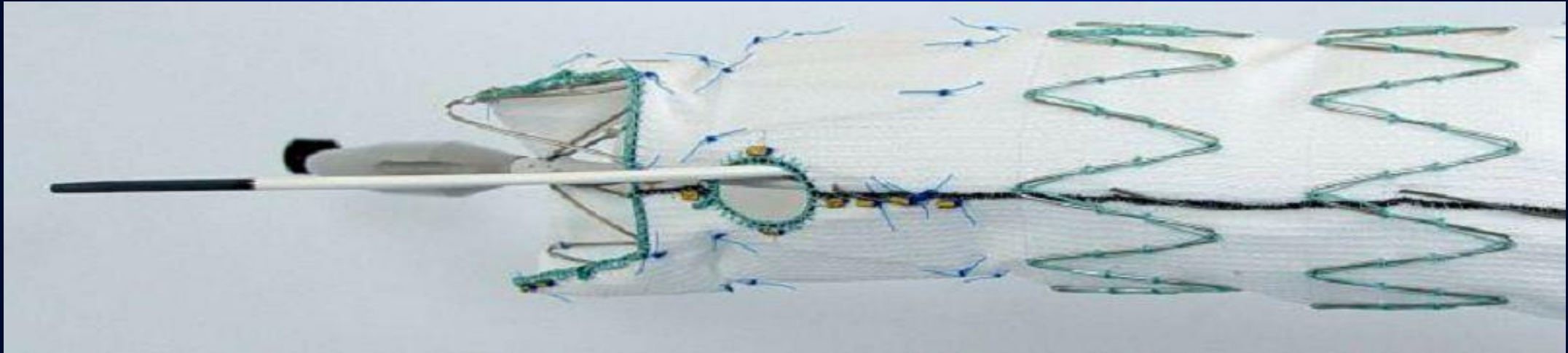
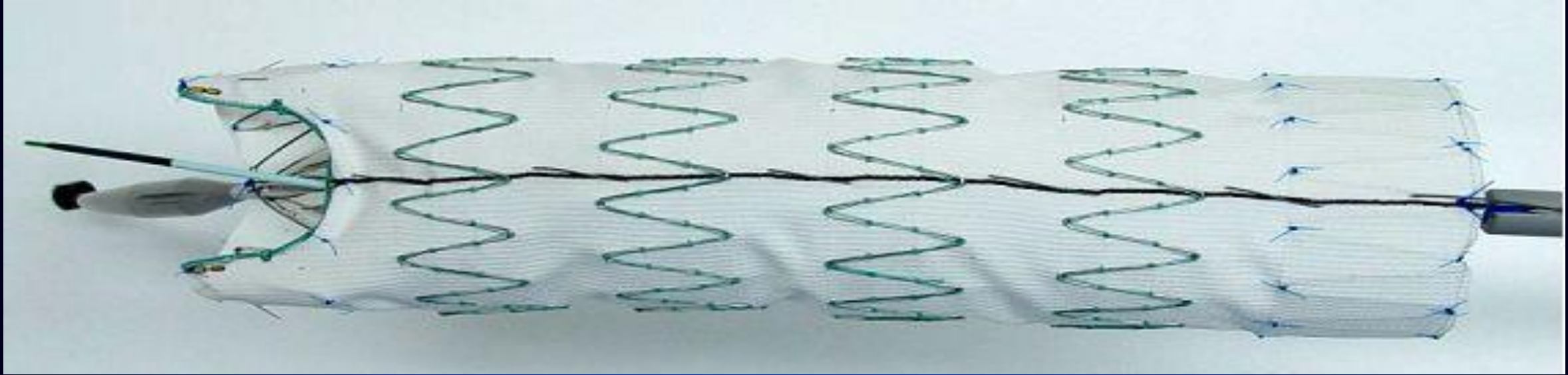


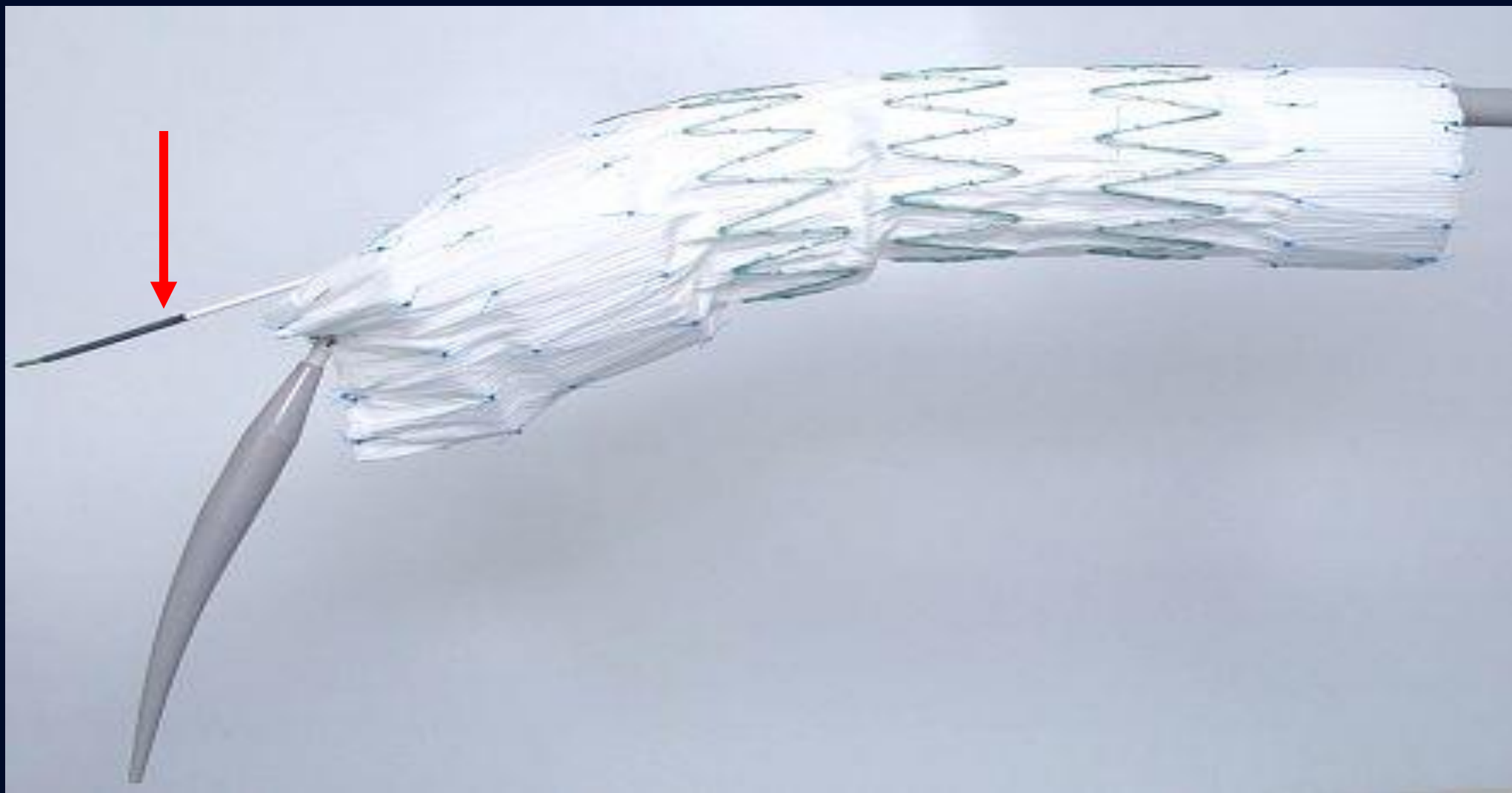


RIGHT  
RIG

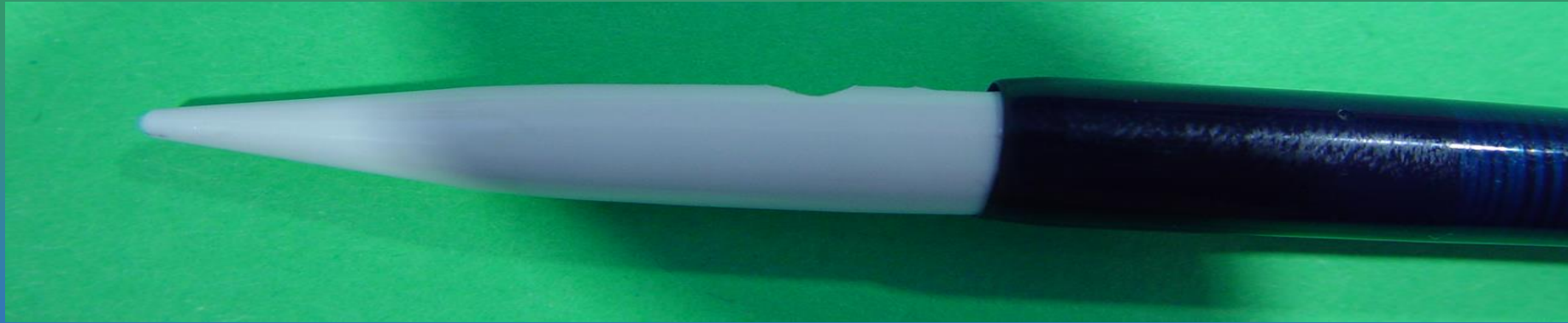
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TIME 4.



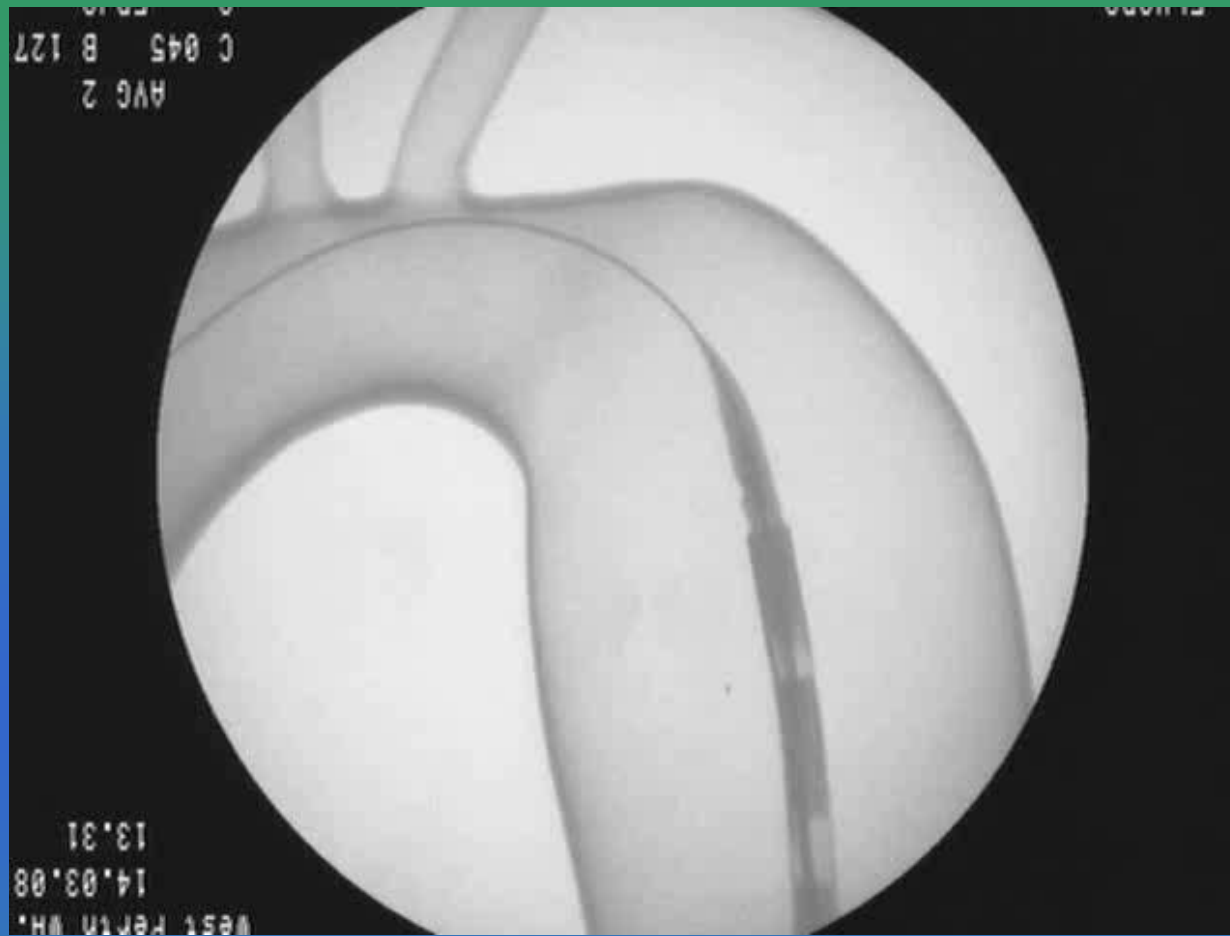






**The graft is loaded into a Z-Trak Plus introducer with Flexor sheath**

**There is an orientation notch to show the alignment of the scallop and fenestration**



Initially the device was advanced with its orientation purposefully misaligned with the orientation notch, and therefore, the scallop and fenestration towards the inner curve of the arch

When it was partially around the arch, it was not possible to rotate to the correct alignment



The device was then withdrawn, and rotated so that the orientation notch, and fenestration/scallop, were towards the greater curve of the arch , -- it was then re-advanced towards the arch, and as can be seen, maintained correct alignment



The pre-loaded guide wire had been replaced with a hydrophilic coated nitinol core wire, which was advanced, and manipulated into the innominate artery

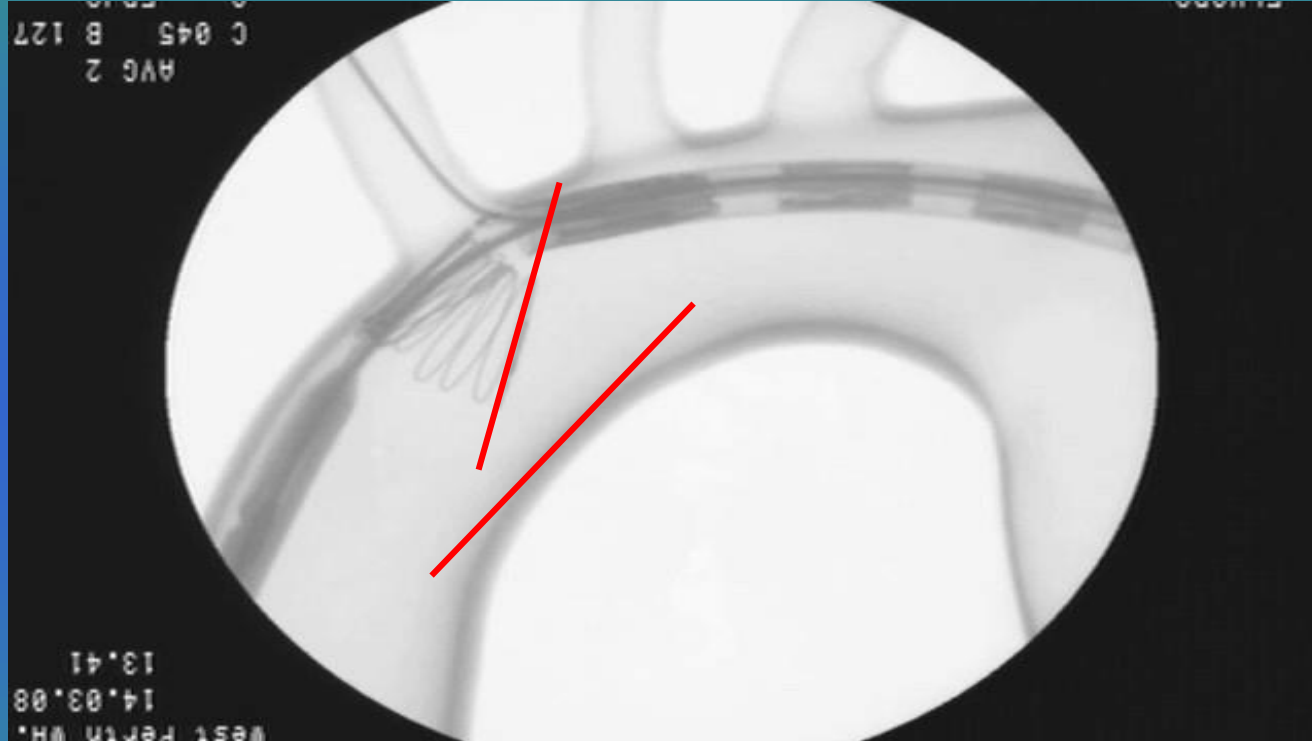




The fenestration was catheterised from access through its target vessel

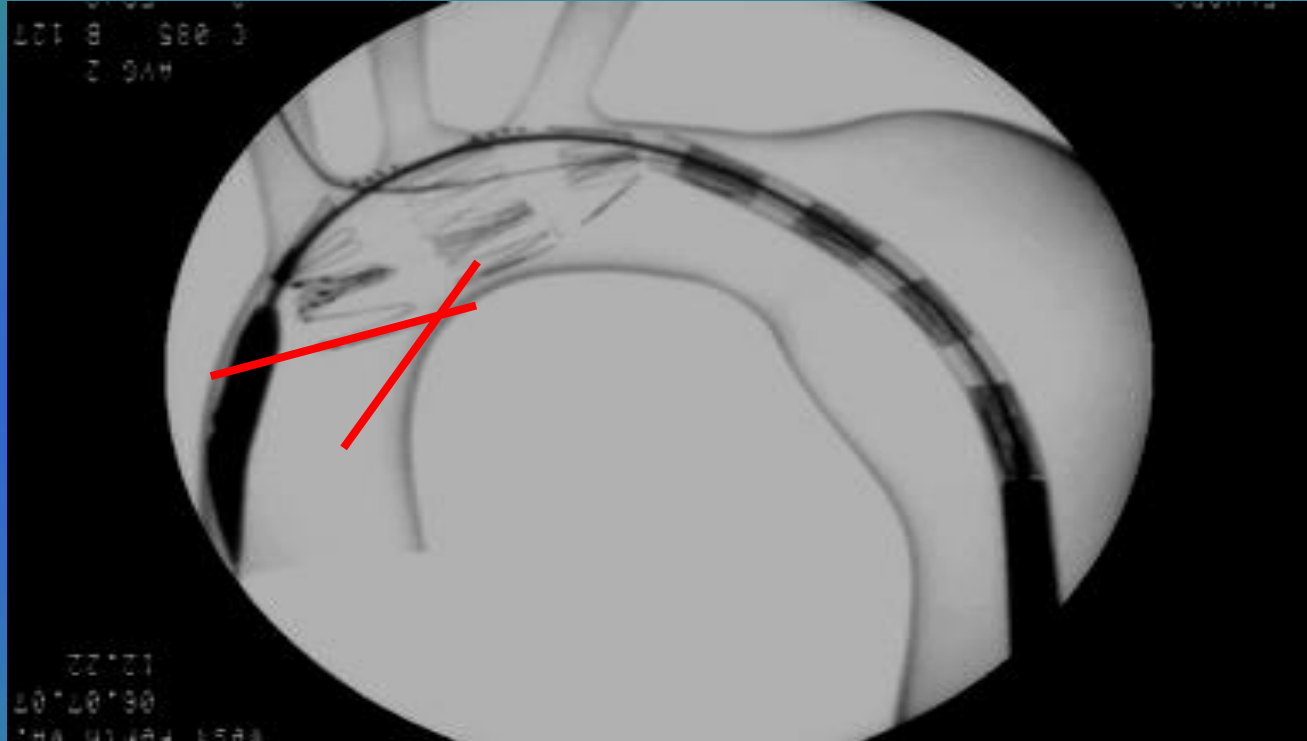
Some tension was maintained on the through wire, to ensure stability, and apposition of the scallop and fenestration with the respective target vessels

It is at this stage that the inner margin of the most proximal stent is in its best position, relating to apposition with the inner curve of the arch



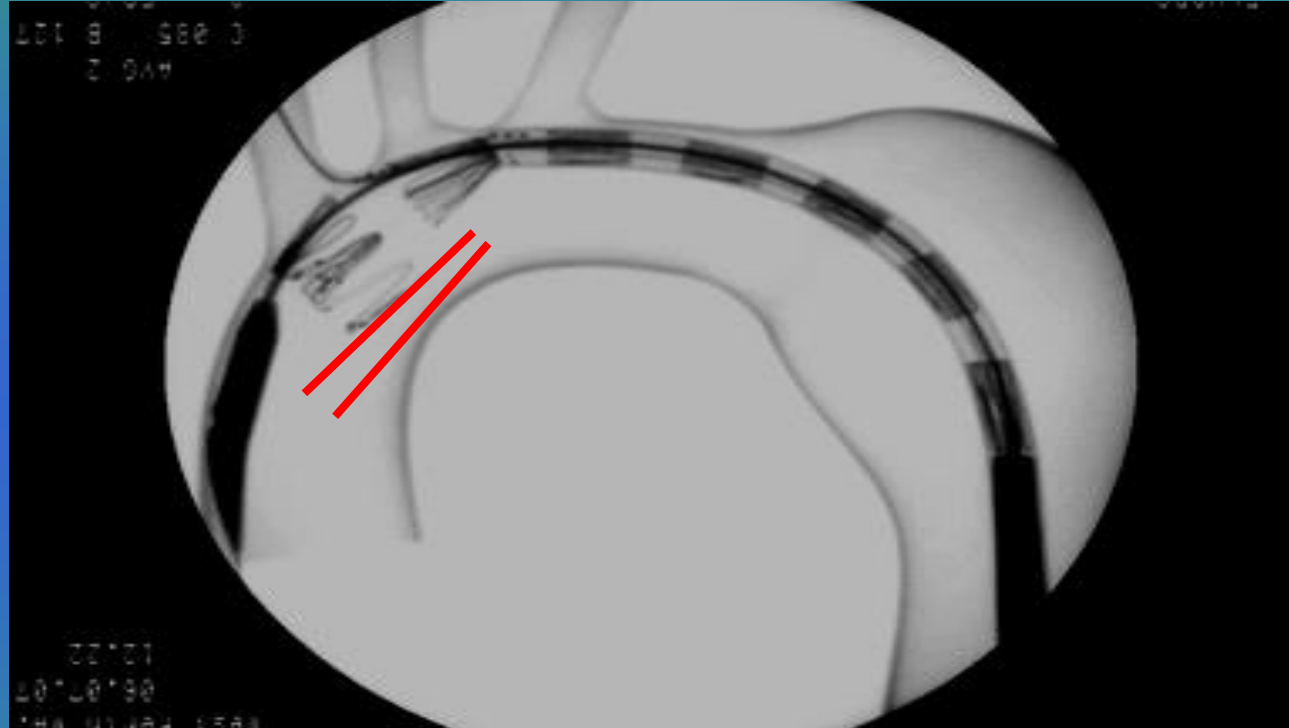
With one stent deployed, it is too early, and if released, the graft would not expand into contact with the aortic wall

It is at this stage that the inner margin of the most proximal stent is in its best position, relating to apposition with the inner curve of the arch



With three stents ( and more) deployed, it angles away from its parallel apposition to the aorta on its inner curve, and when released is unlikely to expand with good contact in this region

It is at this stage that the inner margin of the most proximal stent is in its best position, relating to apposition with the inner curve of the arch

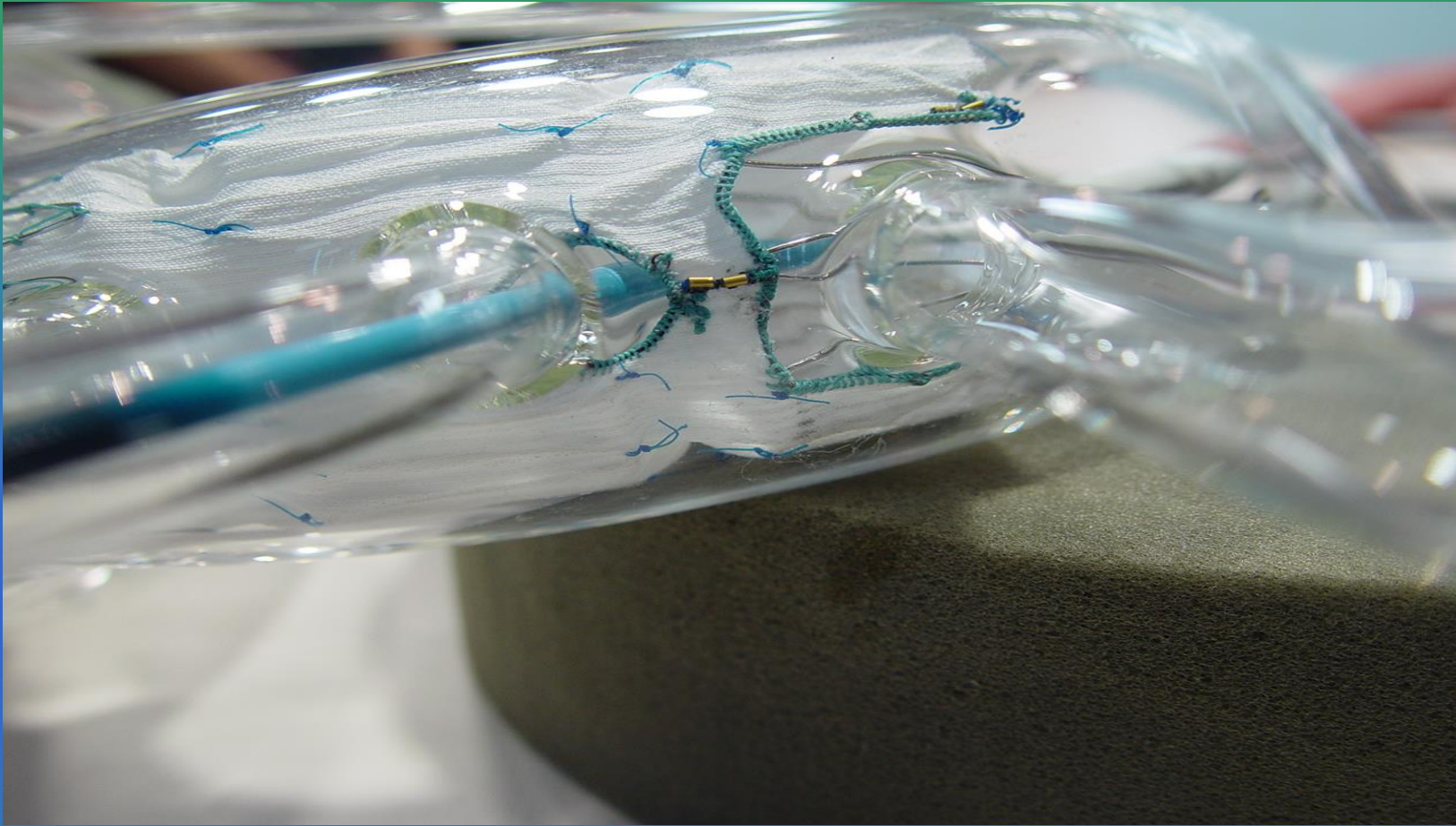


Consideration could be given to releasing the proximal attachment when two stents are deployed, so that it will expand in good apposition to the inner curve

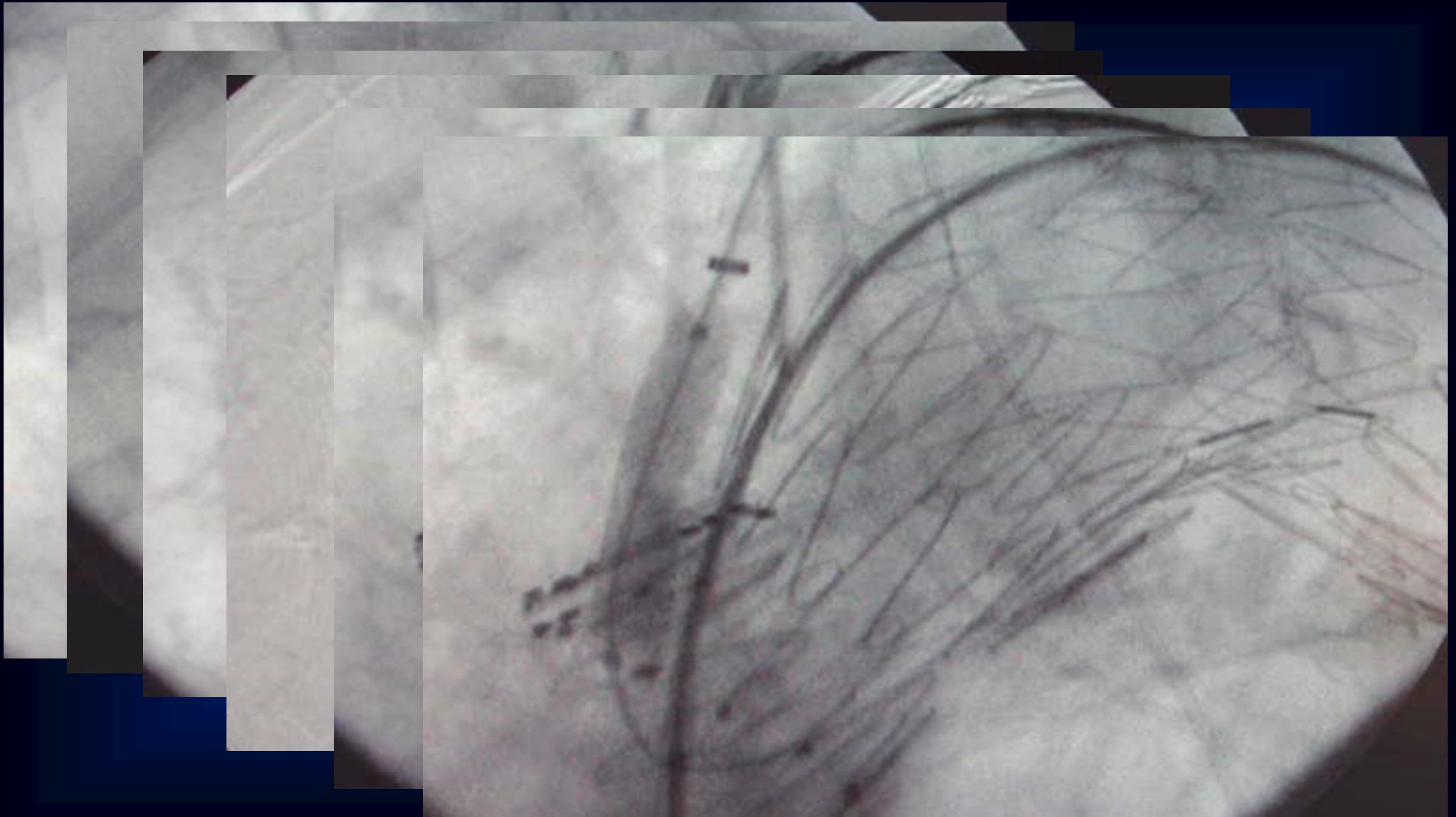




In this deployment final apposition of the fenestration and scallop to the target vessels was good



In this deployment final apposition of the fenestration and scallop to the target vessels was good







AGITTALMPVR

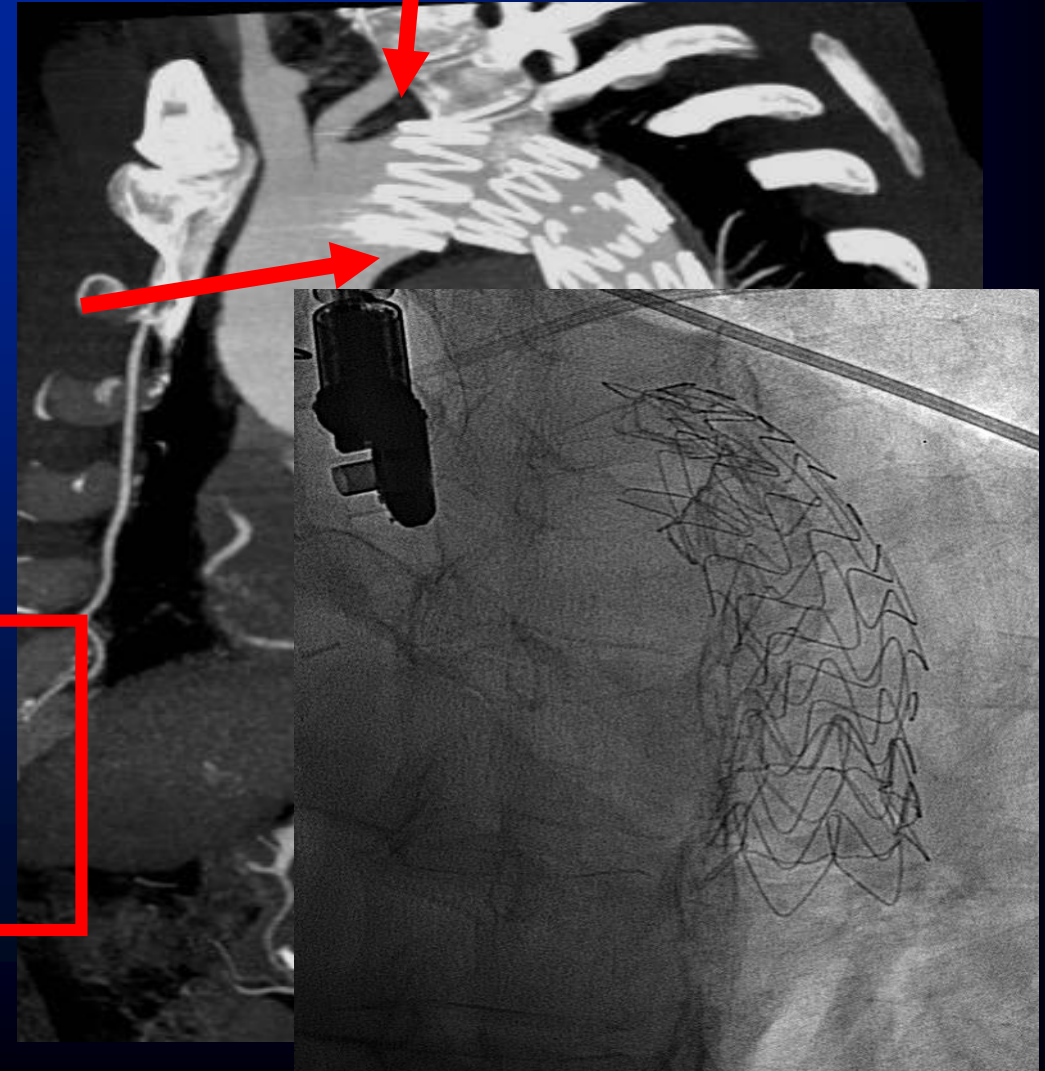


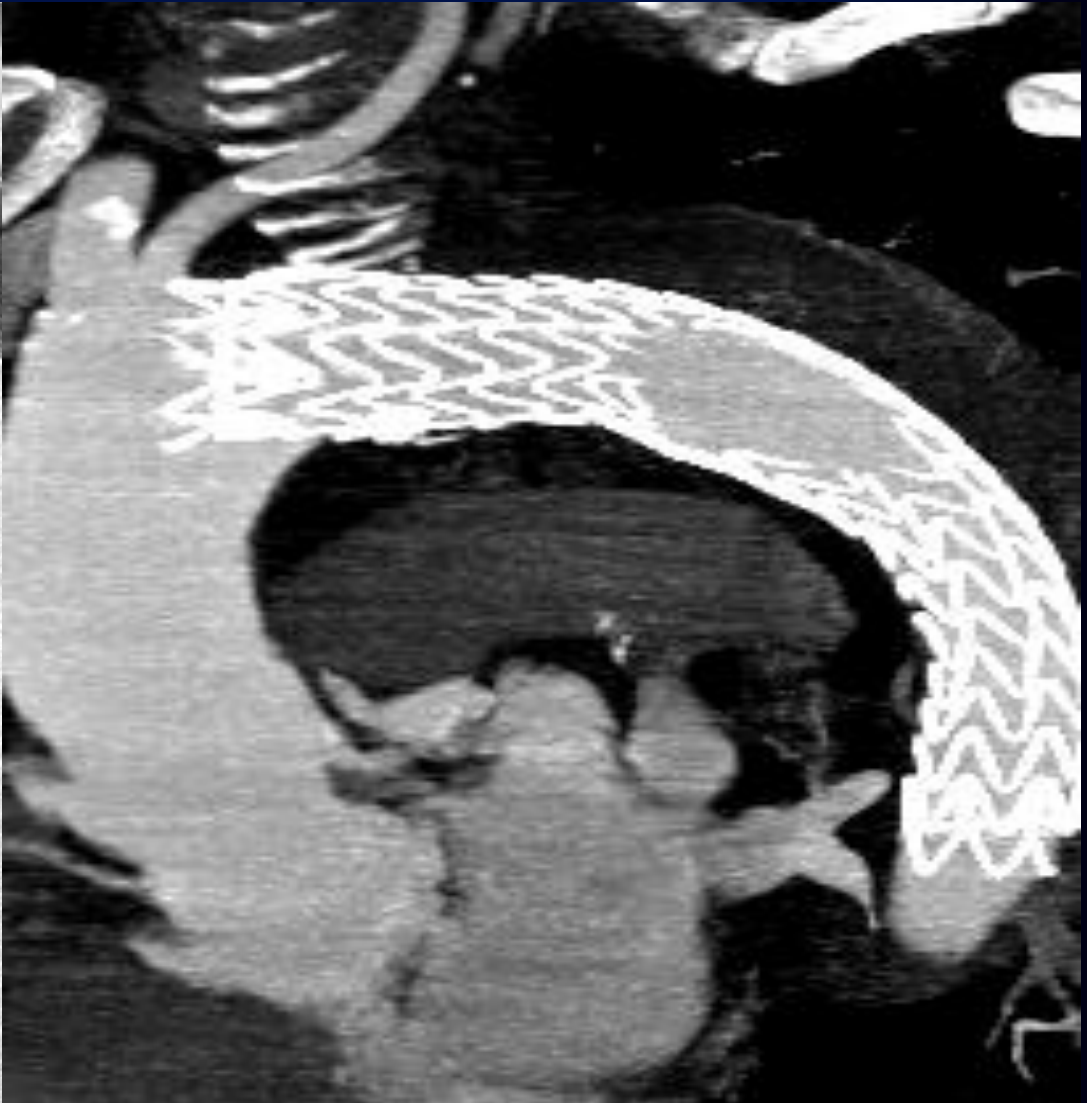
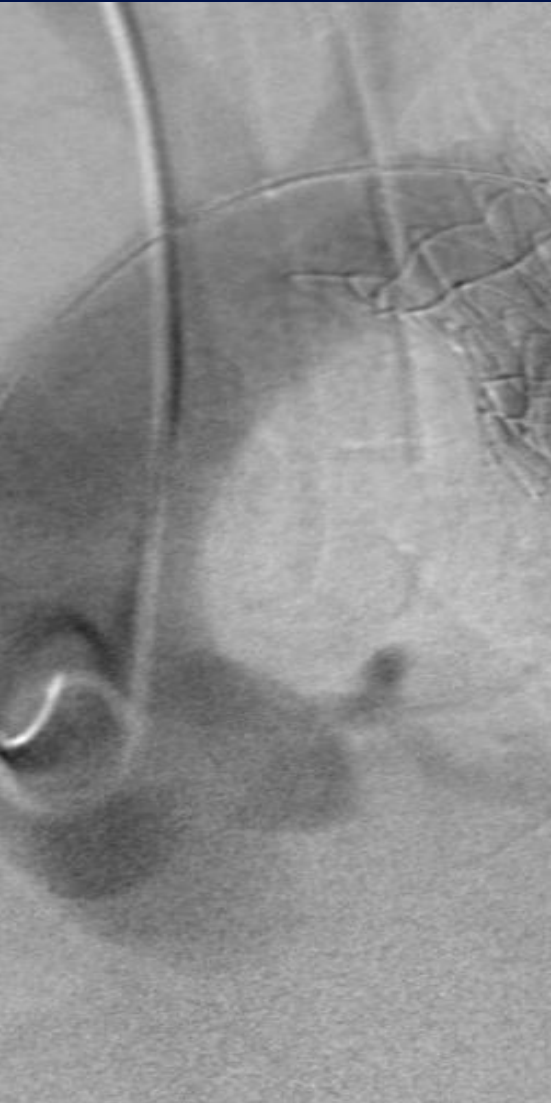
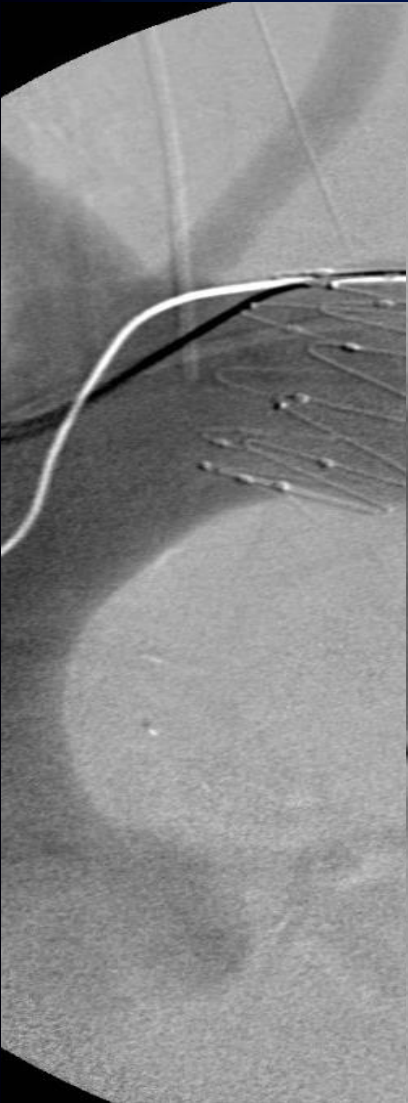


# Orientation of the first Stent

- Risk for aortic wall erosion
- Type 1 endoleak
- Stent-graft collapse

Insufficient SG-conformity to the anatomy of the arch







# Precurved Stent-Graft



**Ann Thorac Surg 2008;86:780–6**

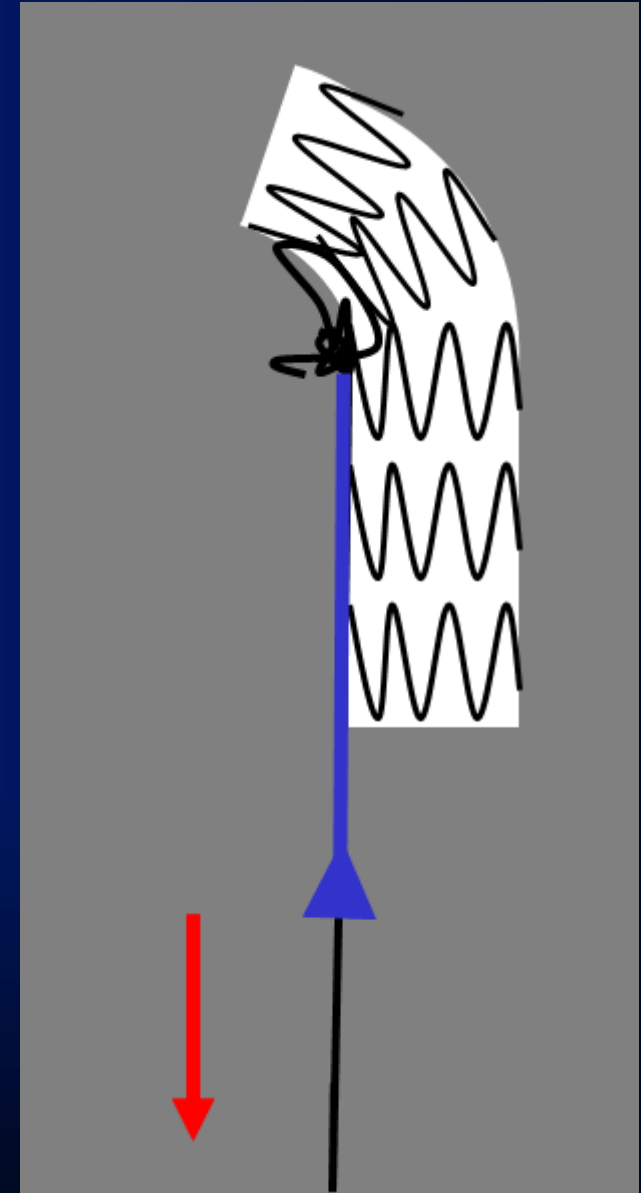
## **Curved Nitinol Stent-Graft Placement for Treating Blunt Thoracic Aortic Injury: An Early Experience**

Masato Yamaguchi, MD, Koji Sugimoto, MD, Takuro Tsukube, MD, Takeki Mori, MD, Toshihiro Kawahira, MD, Taro Hayashi, MD, Masahiko Nakamura, MD, Ryota Kawasaki, MD, Rajdeep S. Sandhu, MD, Kazuro Sugimura, MD, Syuichi Kozawa, MD, and Yutaka Okita, MD

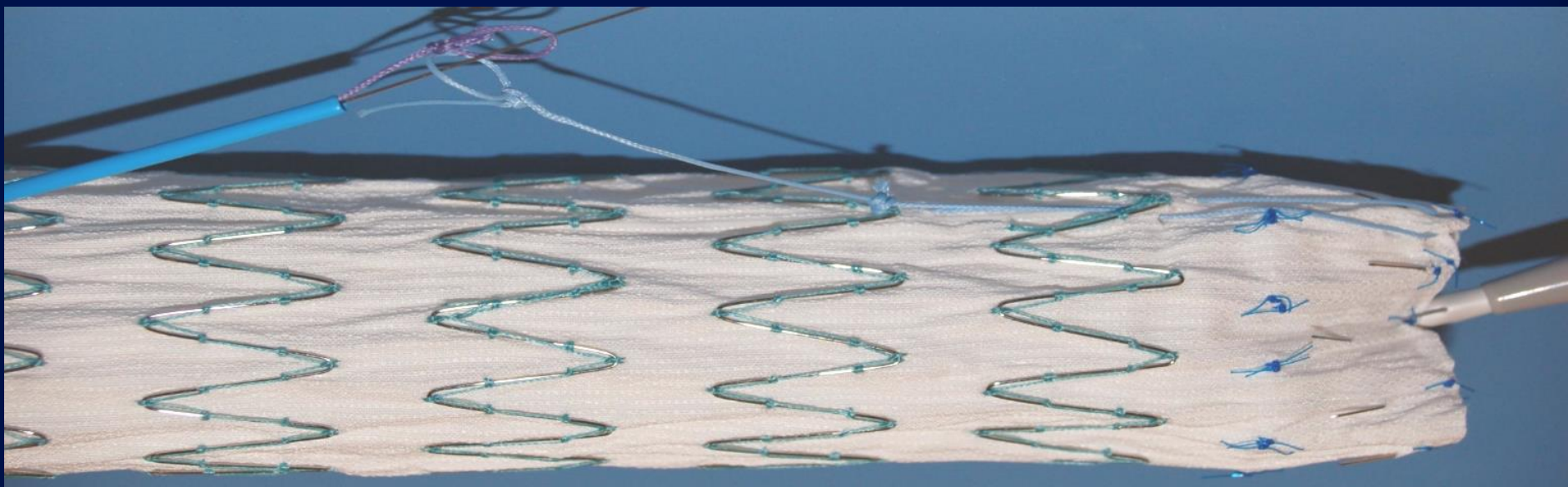
Departments of Radiology, Cardiovascular Surgery, and Emergency, Kobe Red Cross Hospital/Hyogo Emergency Medical Center, Departments of Radiology, and Cardiovascular Surgery, Kobe University Hospital, Kobe, Japan; and Division of Vascular and Endovascular Surgery, University Hospitals Case Medical Center, Cleveland, Ohio

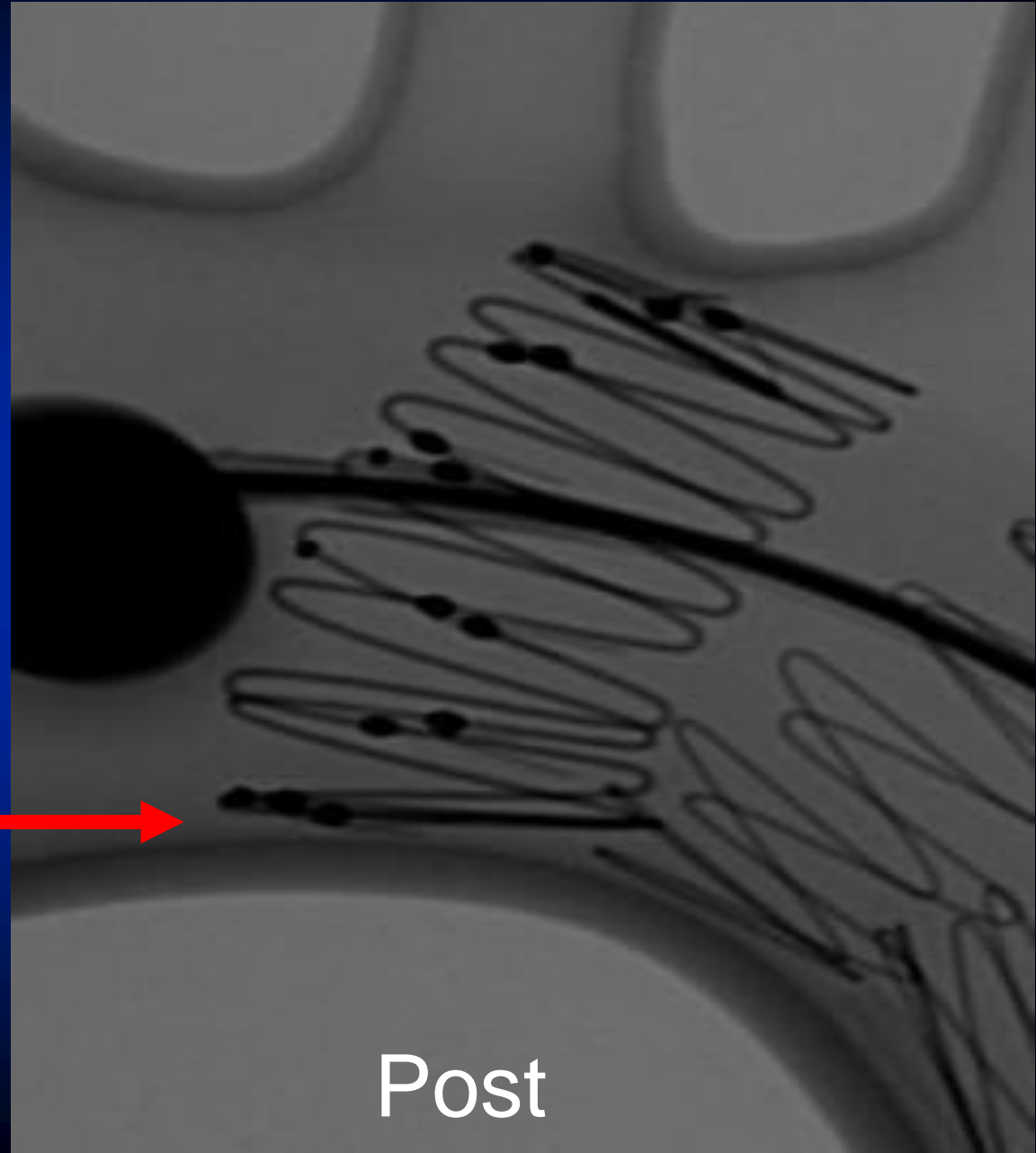
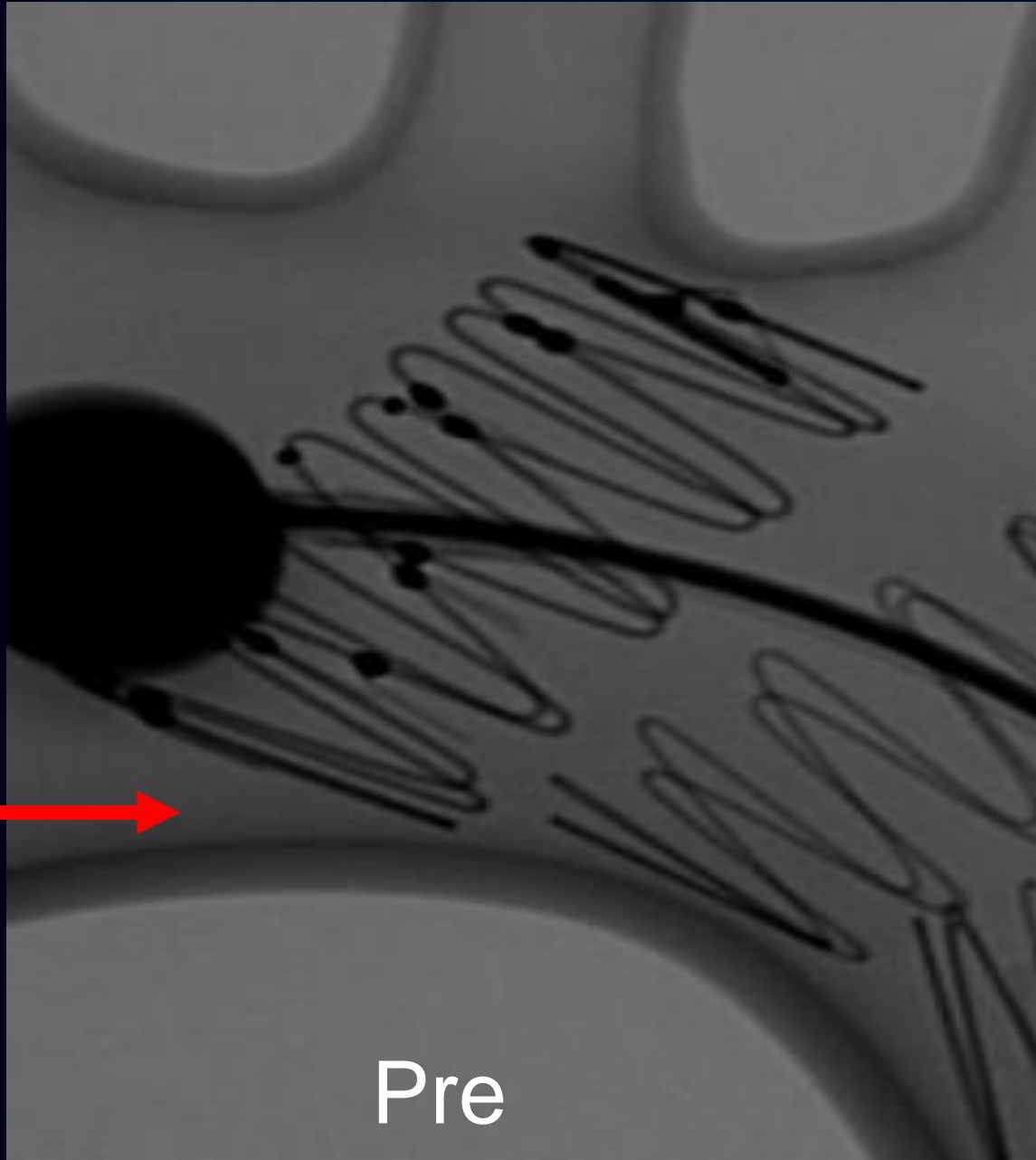
# Bowden cable

- A suture on the inner curve of the stent-graft to shorten the graft
- Self-locking knot
- Cable-housing that enables transmission of a pulling force from the groin







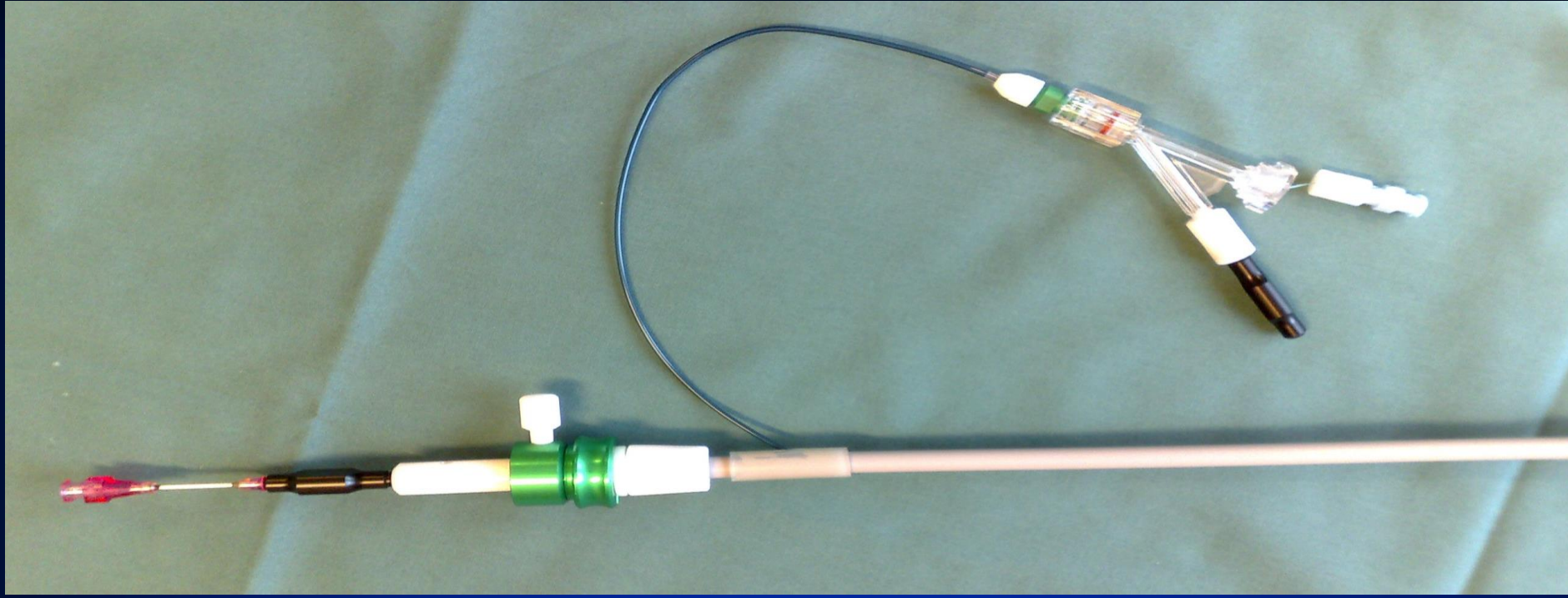


# 65 year old man, 7cm thoracic aneurysm

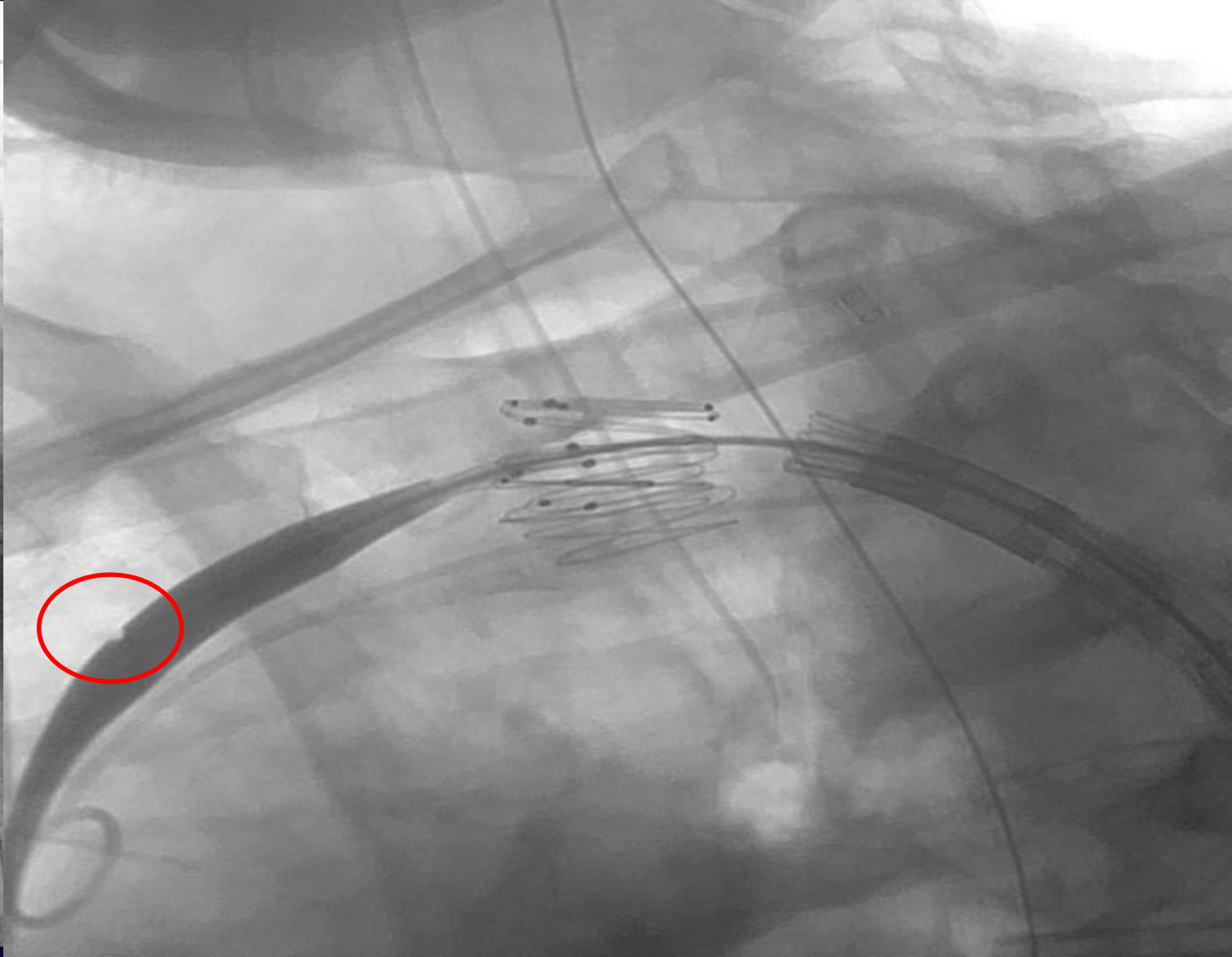
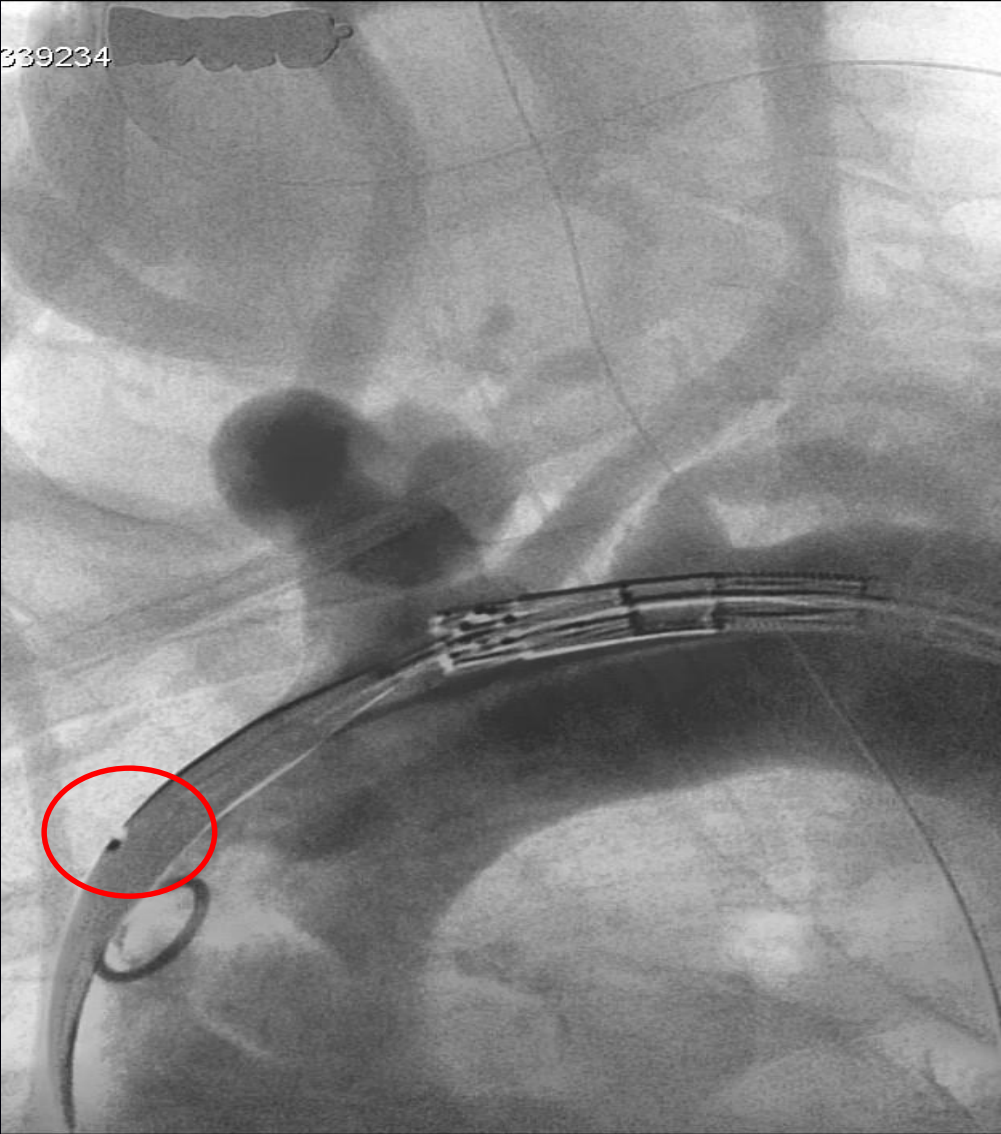


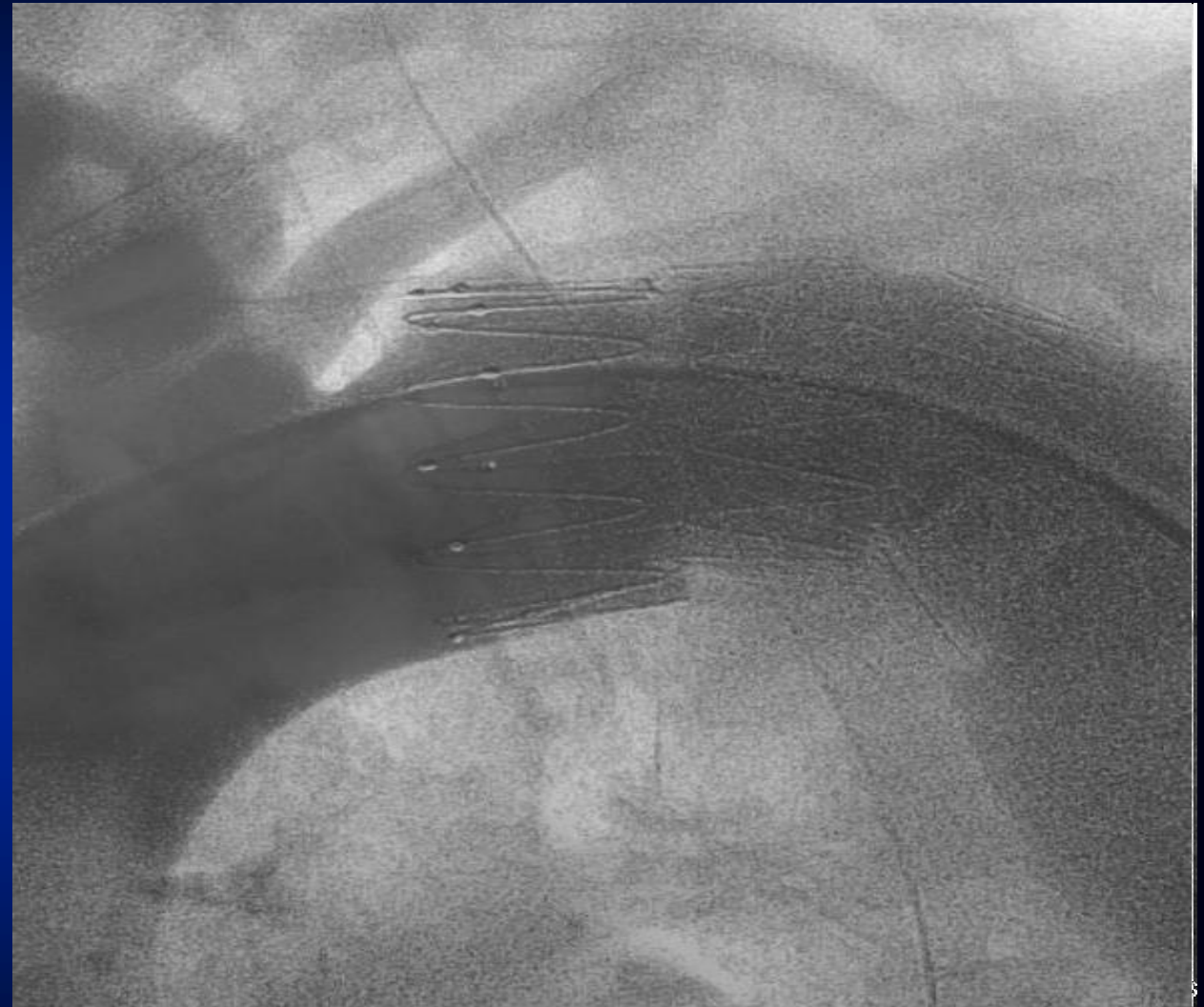
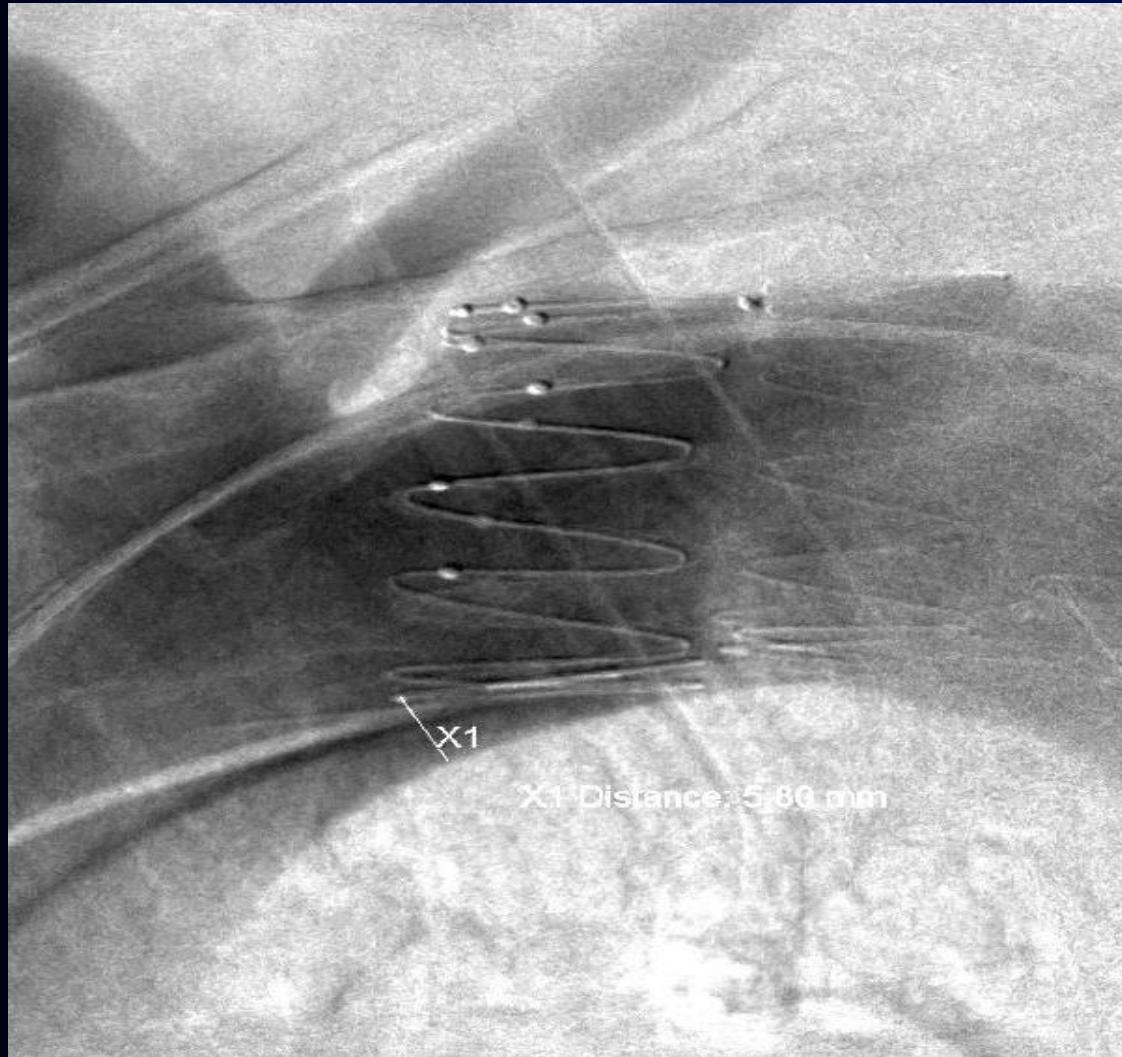
Tapered 38 – 34 mm  
Prox. Comp. TX2



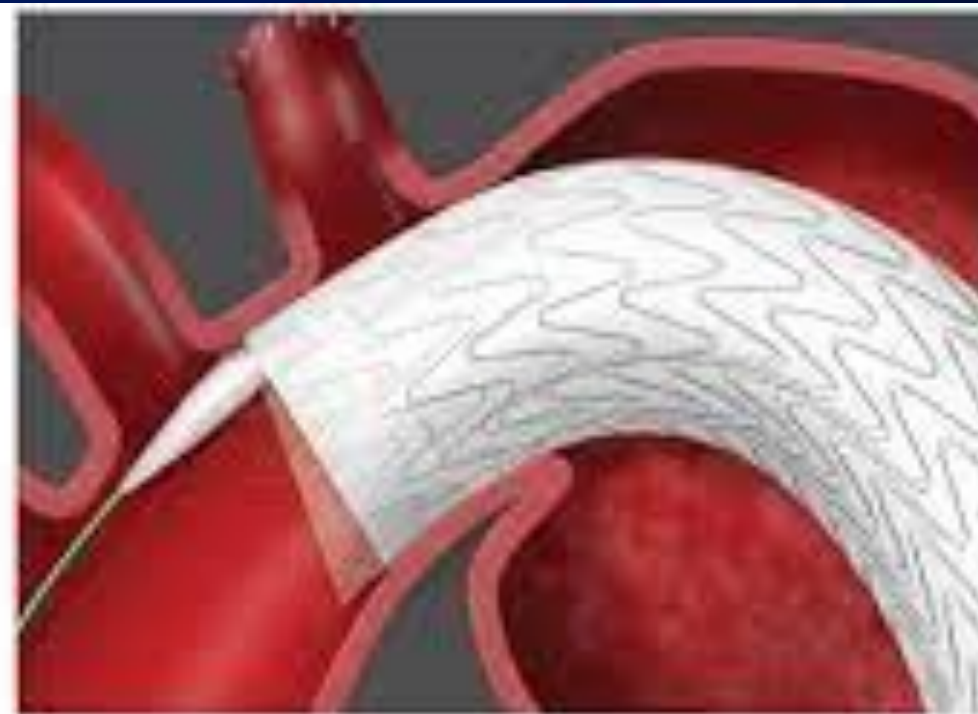
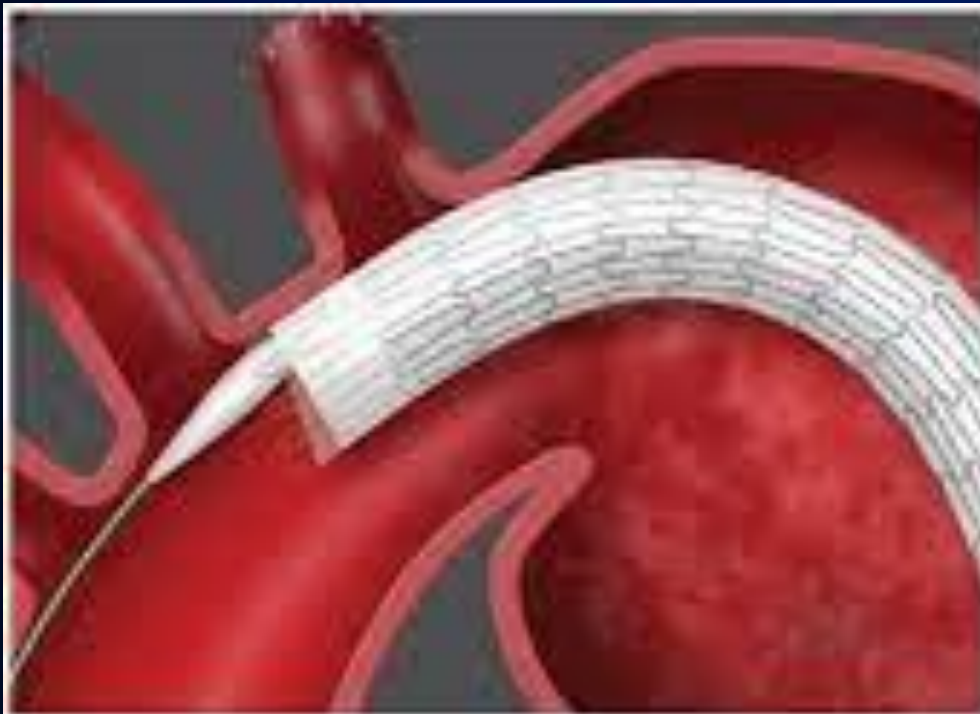




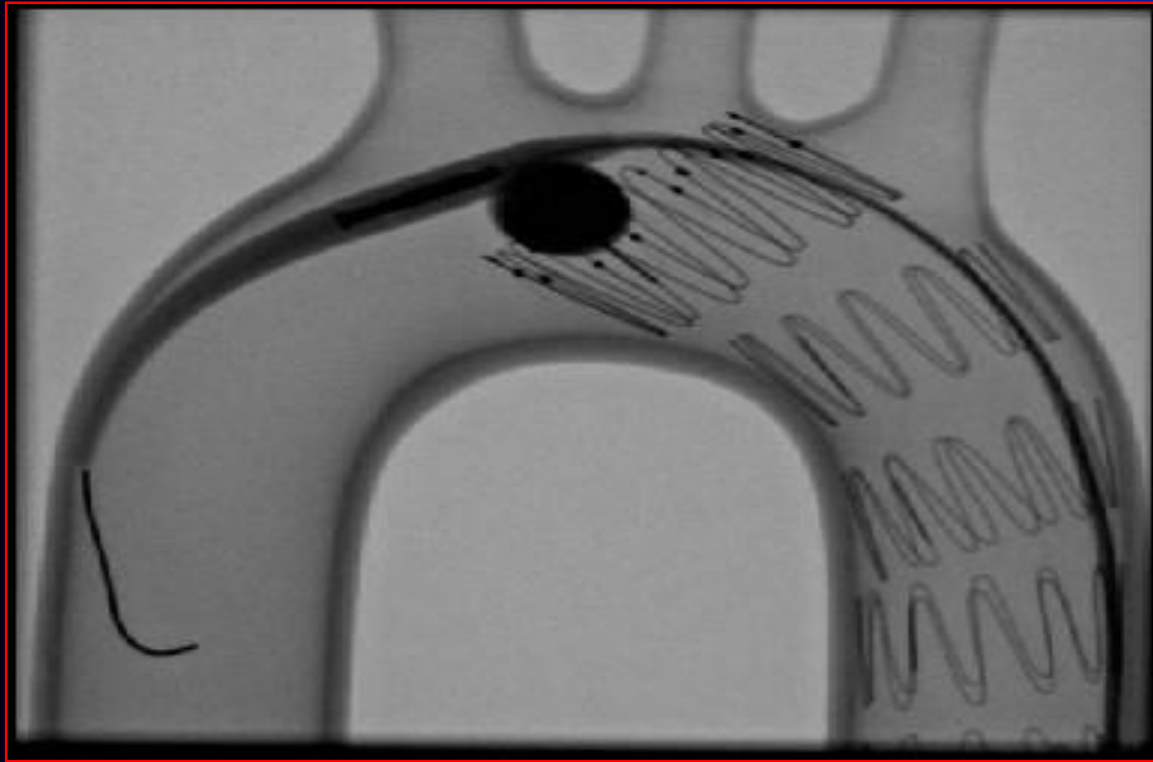




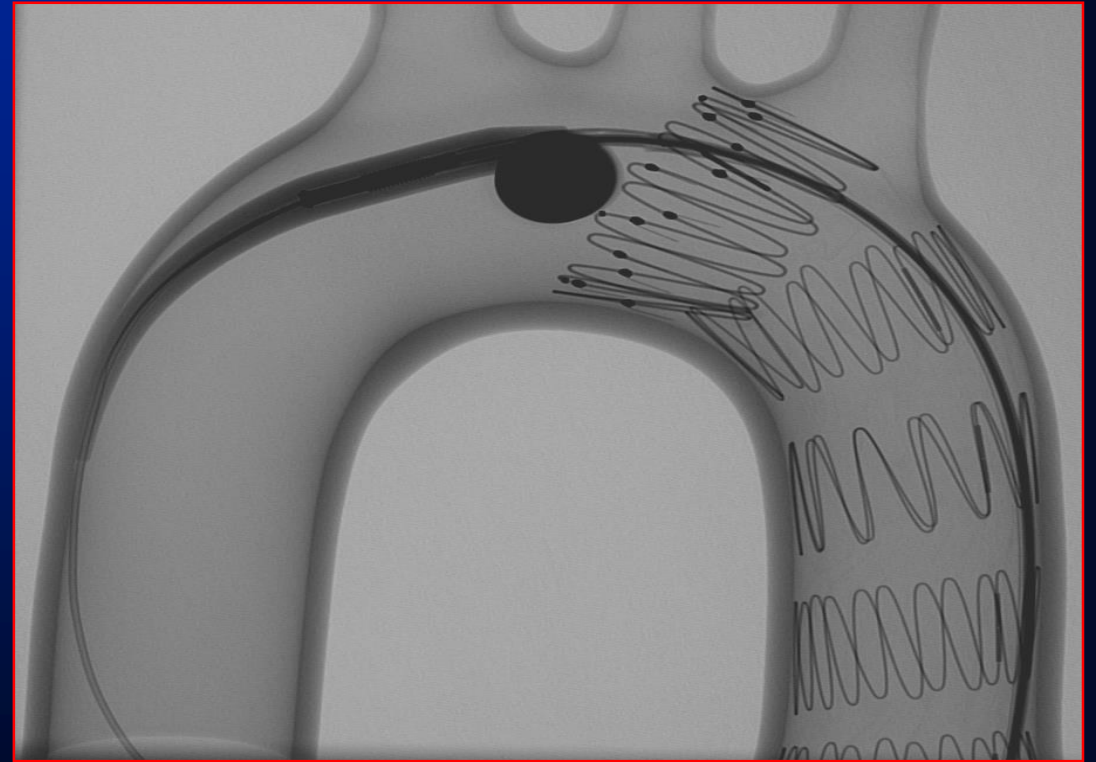




# Zenith Proform



"Old device"



"Proform"





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SM

Branched SG in the aortic arch

# Aortic Arch Reconstruction by Transluminally Placed Endovascular Branched Stent Graft

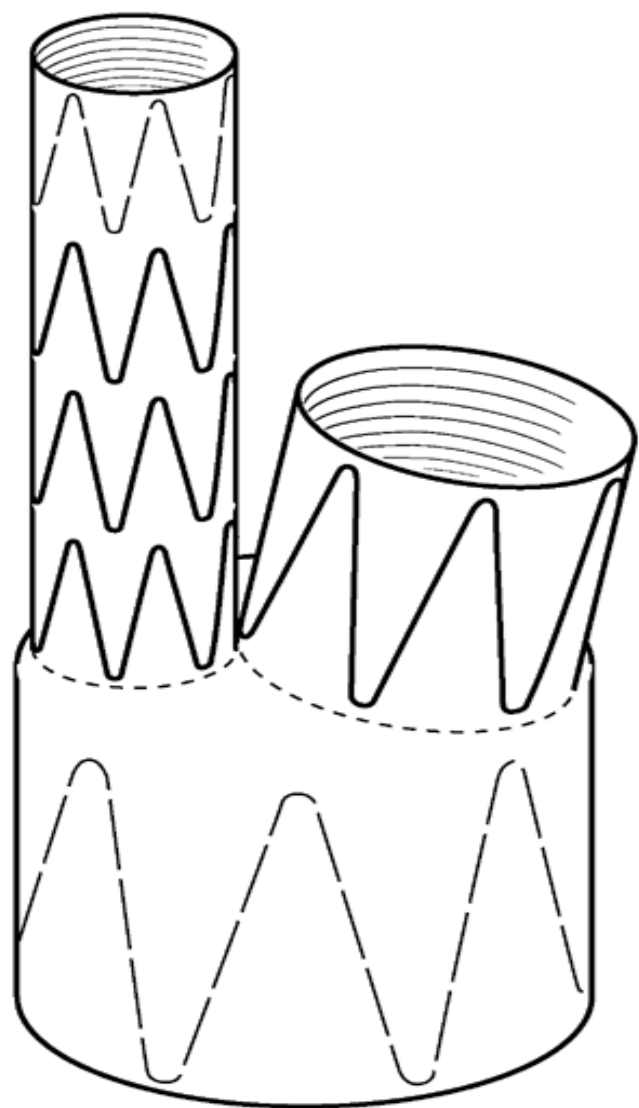
Kanji Inoue, MD; Hiroaki Hosokawa, MD; Tomoyuki Iwase, MD; Mitsuru Sato, ME;  
Yuki Yoshida, MT; Katsuya Ueno, RT; Akiyoshi Tsubokawa, MD; Terumitsu Tanaka, MD;  
Shunichi Tamaki, MD; Takahiko Suzuki, MD

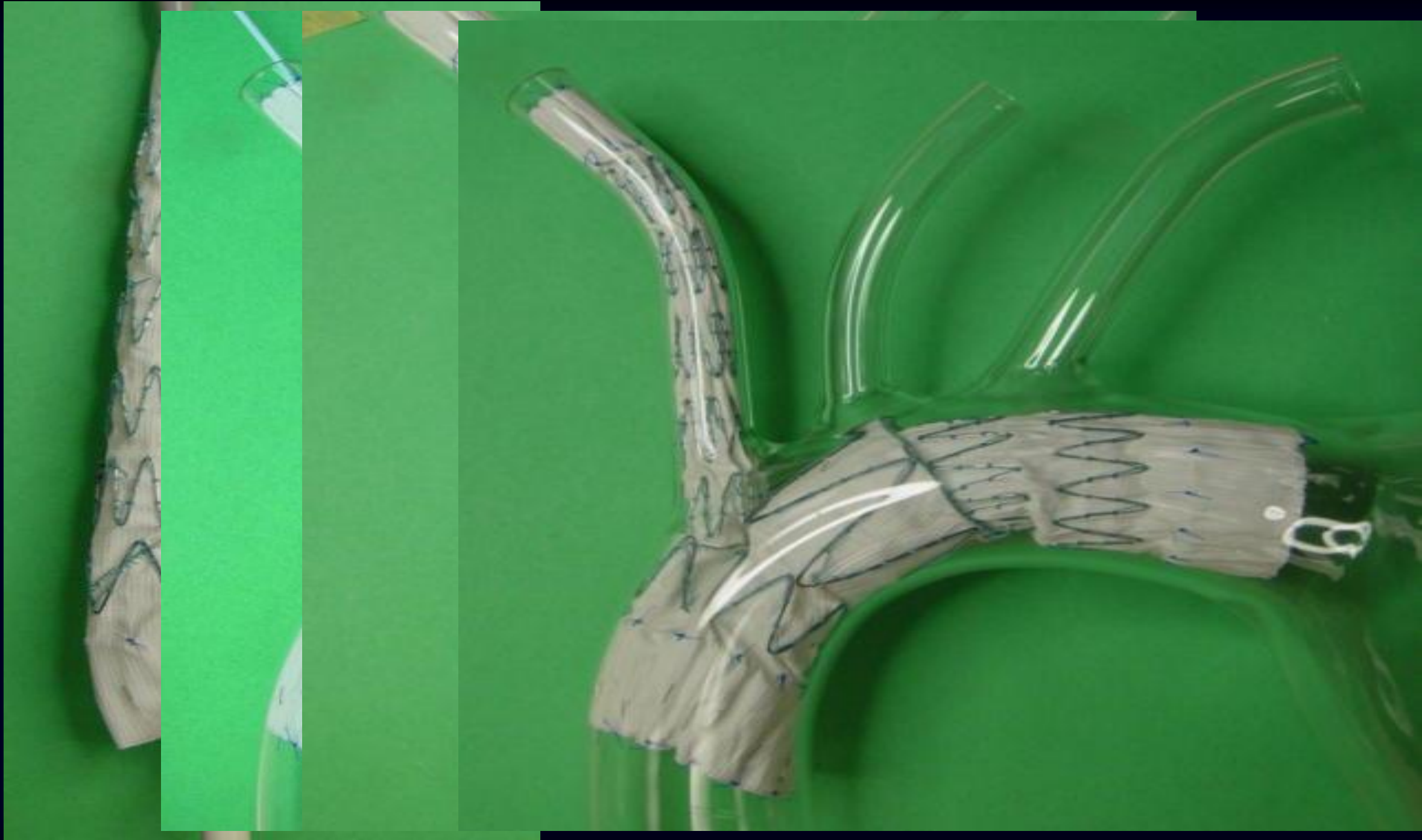
**Background**—Recently, thoracic aortic stent grafting has emerged as an alternative therapeutic modality for patients with thoracic aortic aneurysms and aortic dissections. However, its application has been limited to descending thoracic aortic aneurysms distal to the aortic arch. We report our initial clinical experience of endovascular branched stent graft repair for aortic arch aneurysms.

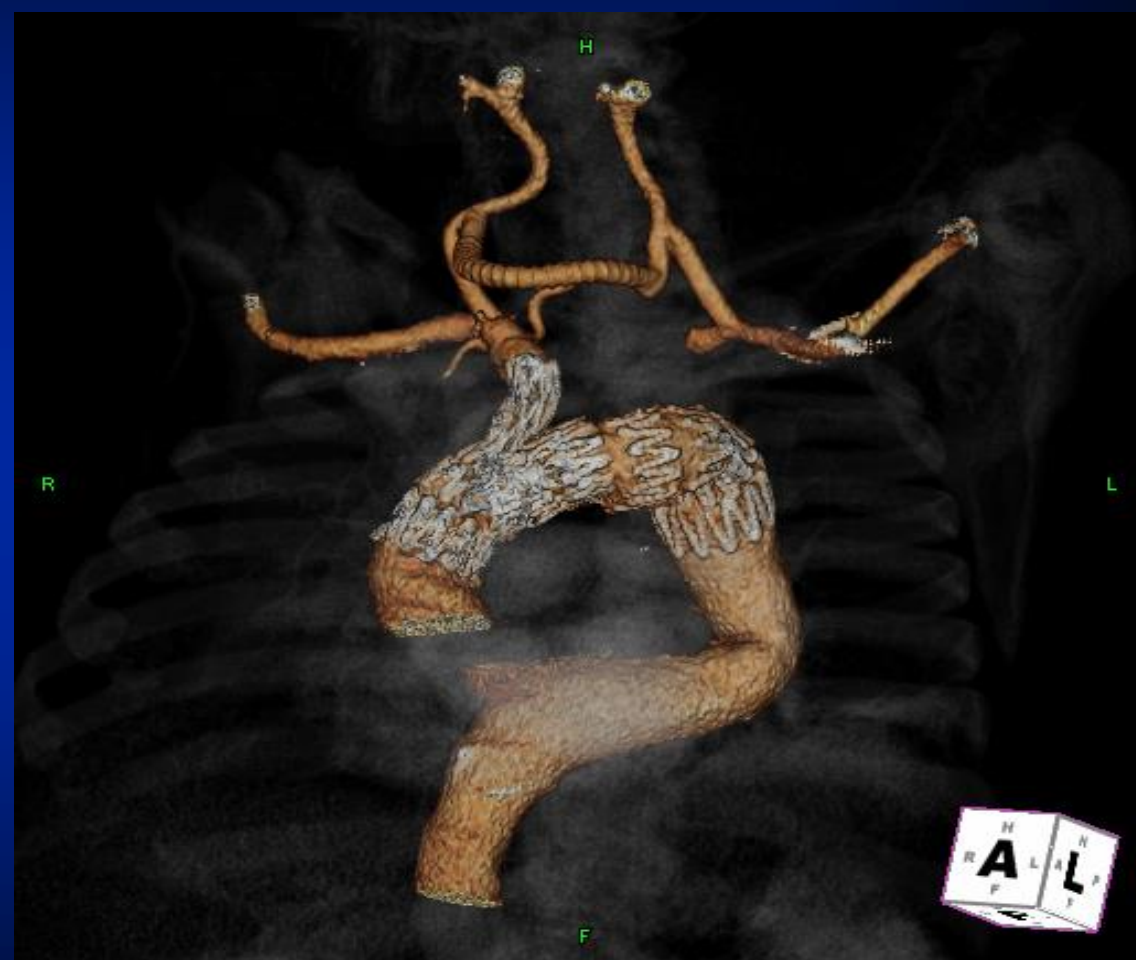
**Methods and Results**—Endovascular grafting with Inoue branched stent grafts was attempted for 15 patients with thoracic aortic aneurysms and aortic dissections under local anesthesia (n=14) or general anesthesia (n=1). Single-branched stent grafts were used in 14 patients, and a triple-branched stent graft in one. The branched stent grafts were delivered through a 22F or a 24F sheath under fluoroscopic guidance and implanted across the aneurysmal aortic arch. In 2 patients, the single-branched stent graft did not pass through the 22F sheath used. Complete thrombosis of the aneurysm was ultimately achieved in 11 patients (73%). Of 4 persistent leaks, 1 minor leak spontaneously thrombosed and 1 major leak was successfully treated by additional straight stent graft placement. In 1 patient, the right external iliac artery ruptured during the withdrawal of the sheath and was successfully repaired by the implantation of a straight stent graft. One patient with severe stenosis of the aortic graft section was successfully managed by additional stent deployment. Peripheral microembolization to a toe occurred in 1 patient, and cerebral infarction occurred in 1 other patient. Two patients who had failed to receive endovascular stent grafts died during an average follow-up of 12.6 months, 1 of pneumonia and the other of rupture of a concomitant abdominal aortic aneurysm.

**Conclusions**—This report demonstrates the technical feasibility of endovascular branched stent graft repair for aneurysms located at the aortic arch. Careful, longer follow-up and further extensive clinical trials are awaited toward establishing this technique as a recommendable alternative to surgical treatment of thoracic aortic aneurysms. (*Circulation*. 1999;100[suppl II]:II-316-II-321.)



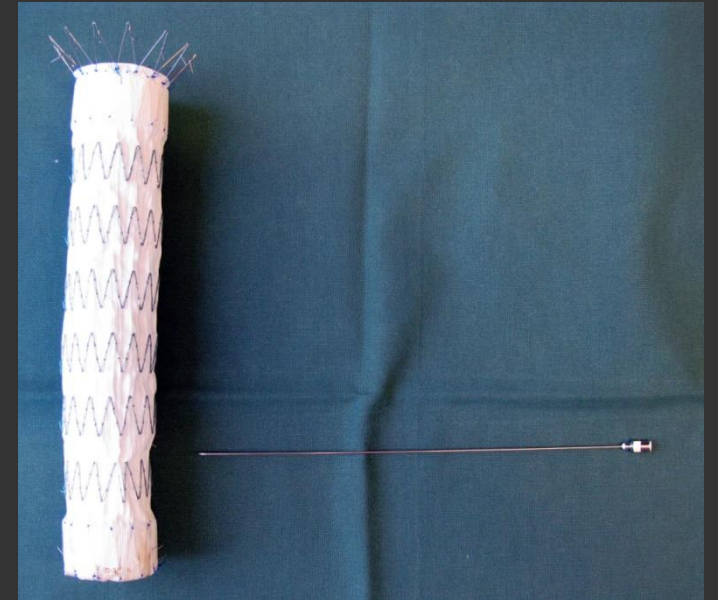
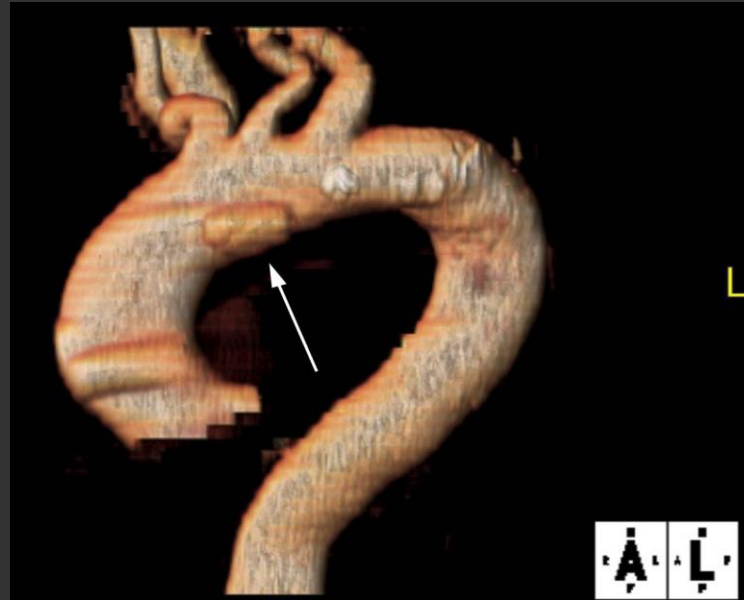
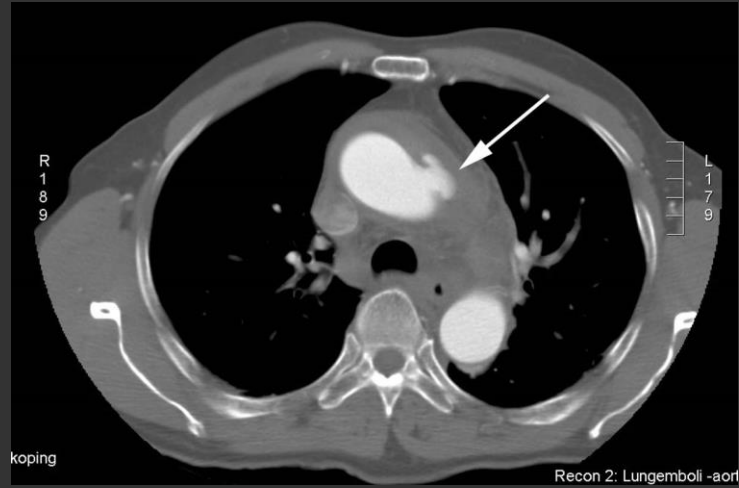




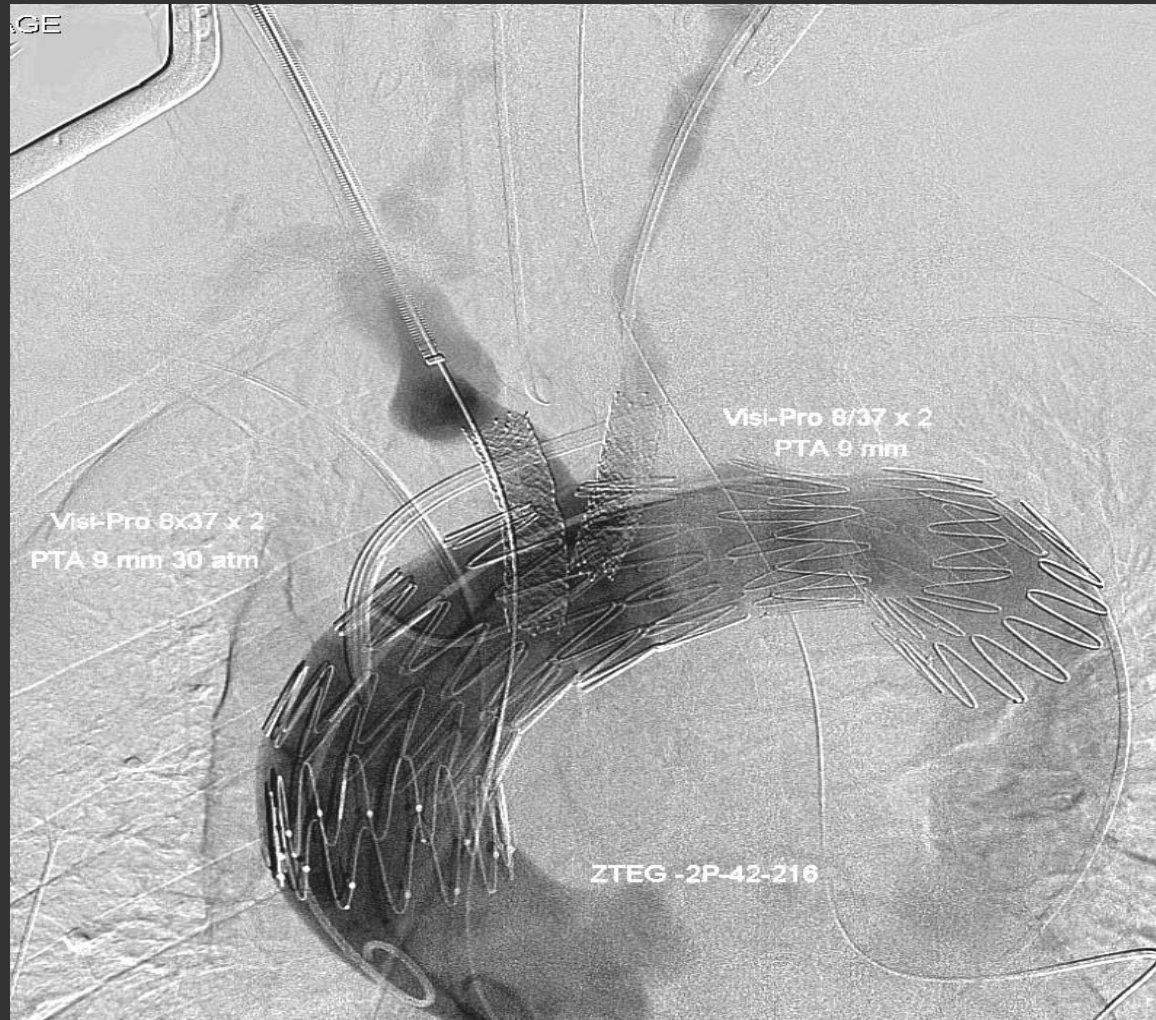




# Ruptured Aortic Arch



# Final angiogram



7 years post-op



## Lessons Learned

- Preloaded catheters are helpful
- Device orientation in the arch is difficult (impossible)
- Precurved devices are helpful
- Conformability of devices is vital
- Stroke prevention is important



