Controversy

AVF creation
small veins at the forearm
Postoperative balloon angioplasty

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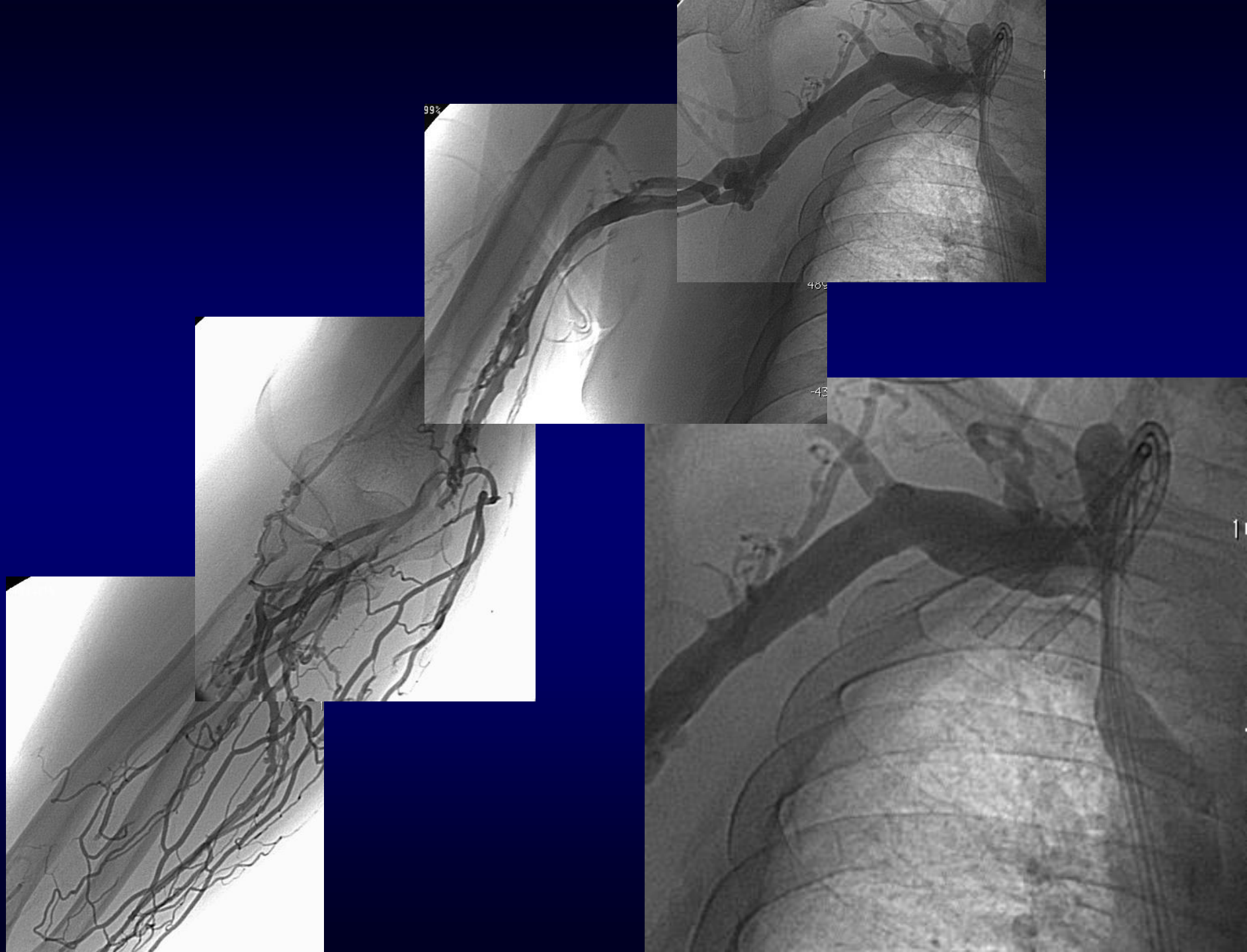
I do not have any potential conflict of interest

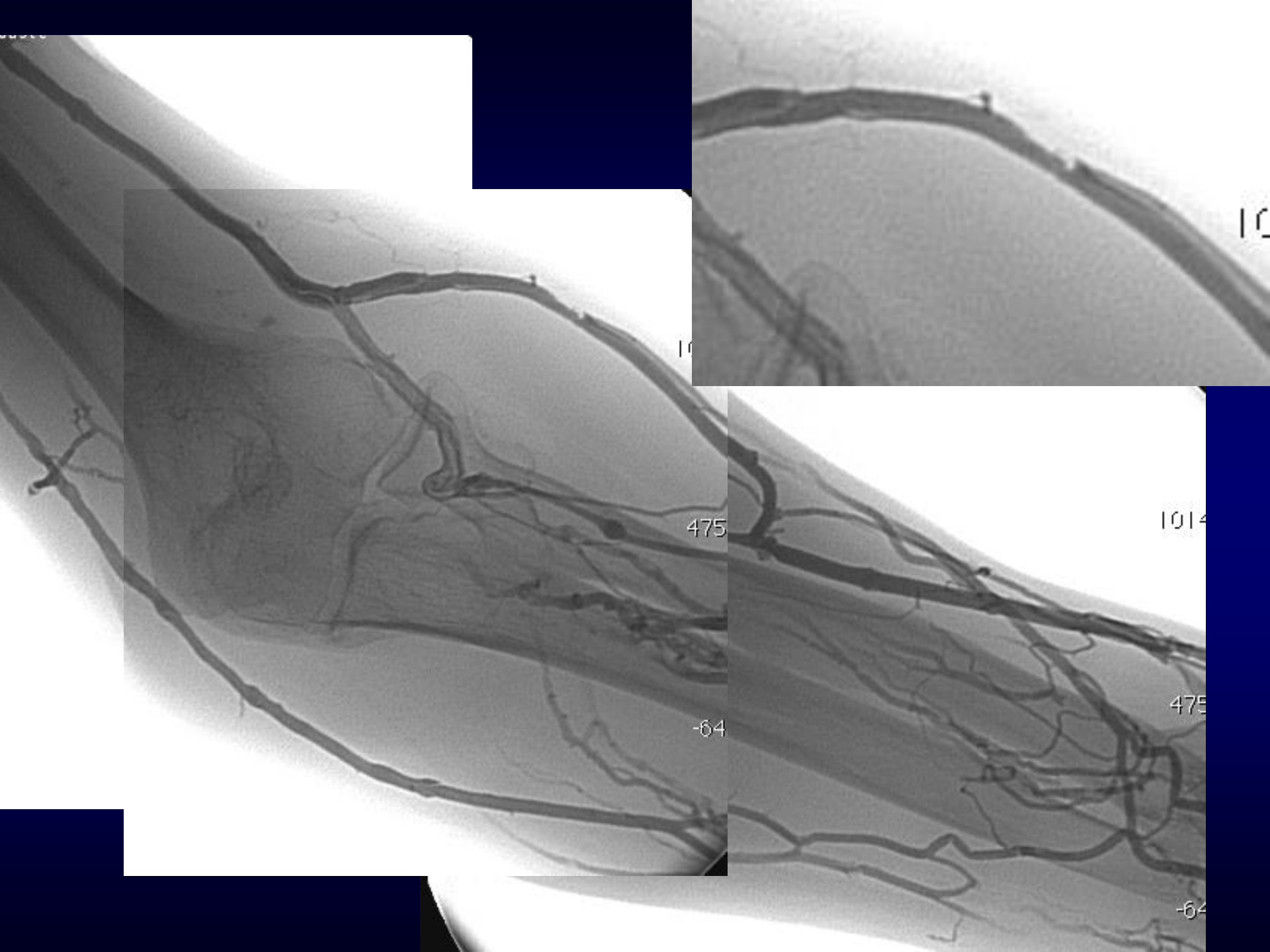
AVF creation

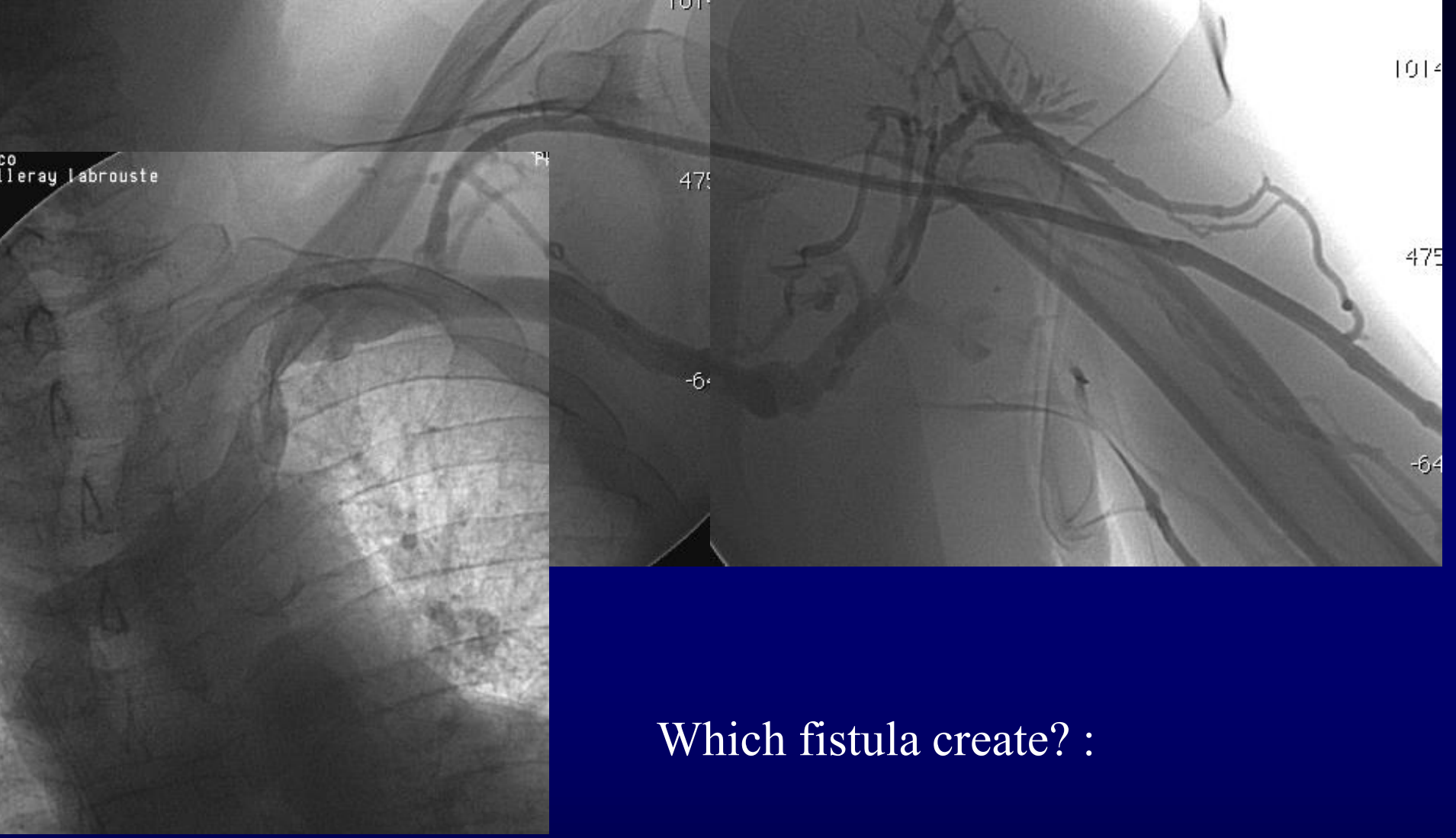
- The maturation of a fistula requires :
  - Arteries able to provide a flow of at least 500ml/min fistula
  - Superficial veins able to develop and to be punctured 3 times a week
  - Normally patent central veins
- Pre operative assessment of arteries and veins patency is required before the creation of an access (clinical examination, arteries and veins ultrasonography ,venography)

AVF creation

- Radiocephalic fistula is the first choice access. When radial arteries or cephalic veins are not suitable, other sites should be considered for access creation mainly ulnobasilic or more proximal access
- Seldomly, when possibilities of access creation are very limited, the creation of a distal access should be considered despite not optimal radial artery or cephalic veins. This is the case when the cephalic vein is small







Which fistula create? :

- radiocephalic + per operative dilatationof the accessory cephalic
- radiocephalic + post operative dilatation of the accessory cephalic when and if the fistula does not maturate
- brachiocephalic fistula (the choice of the surgeon)

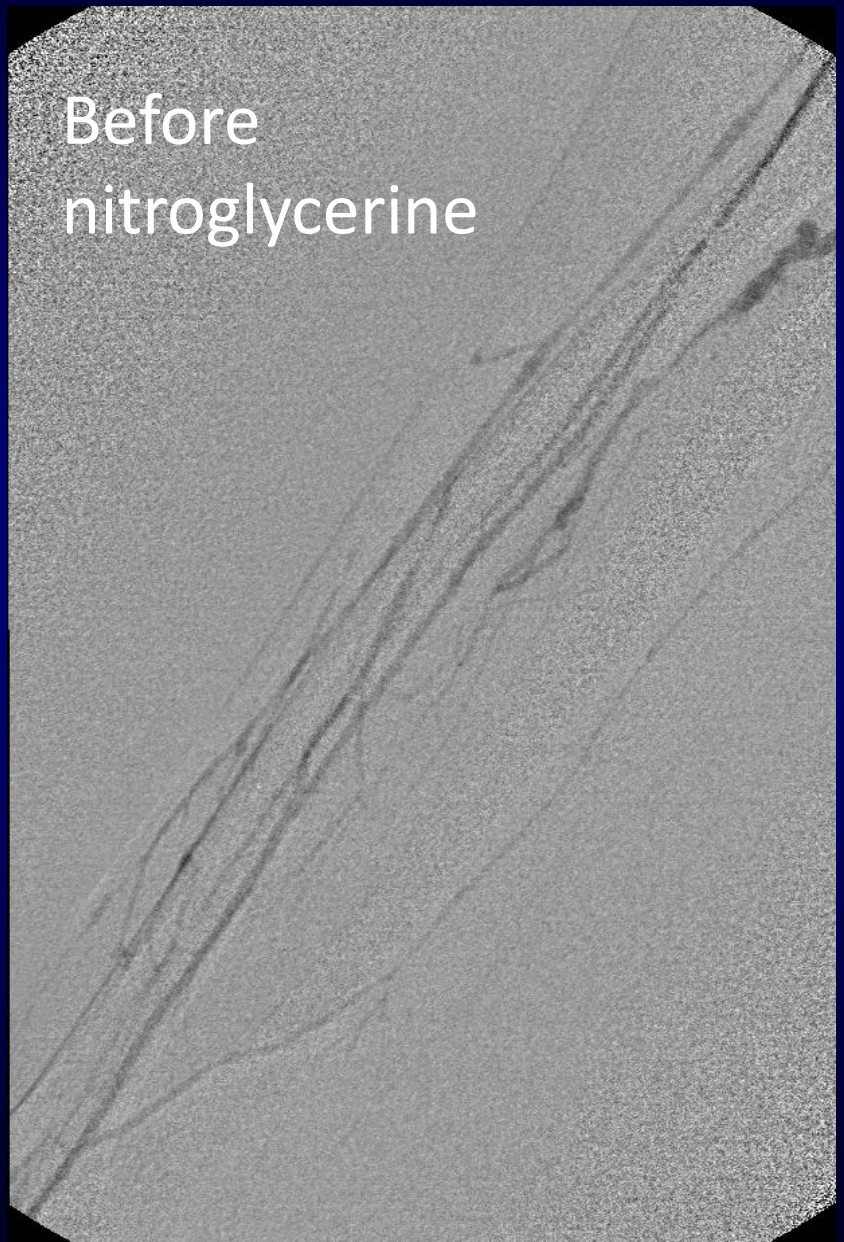
Cephalic vein size

- The minimal diameter of the forearm cephalic vein required for creation of a fistula depends on the surgeon; it varies from 1.5 to 2.5 mm
- Why such a discrepancy ?
  - Surgeon skill?
  - Operative technique and use of a microscope?
  - Percentage of maturation failure tolerated by the operator and by the patients?
  - Population: infants and young adults are more prone to dilate their veins?
  - Method of cephalic vein measurement?
- Is venous diameter measurement reliable?

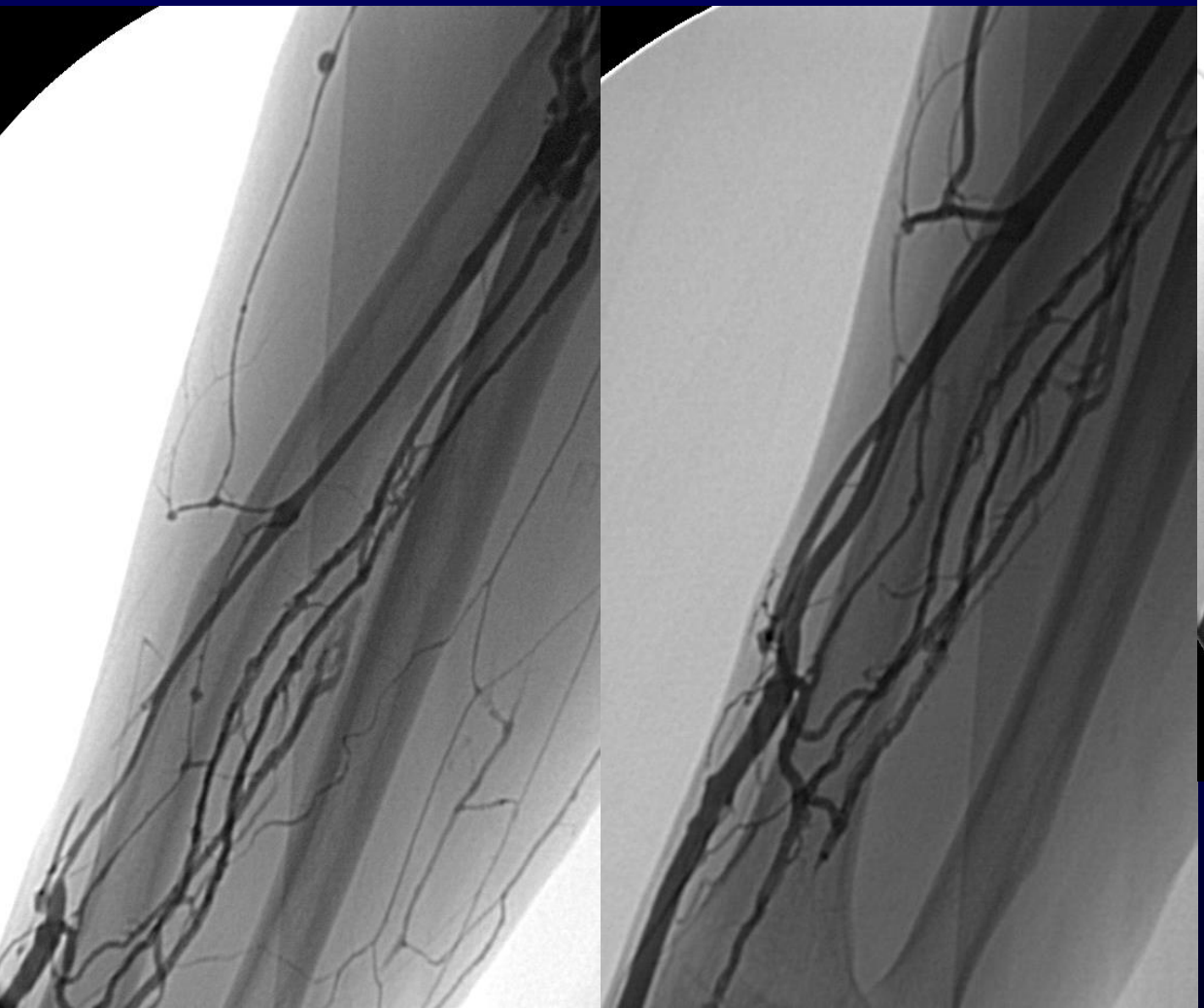
Cephalic vein measurement

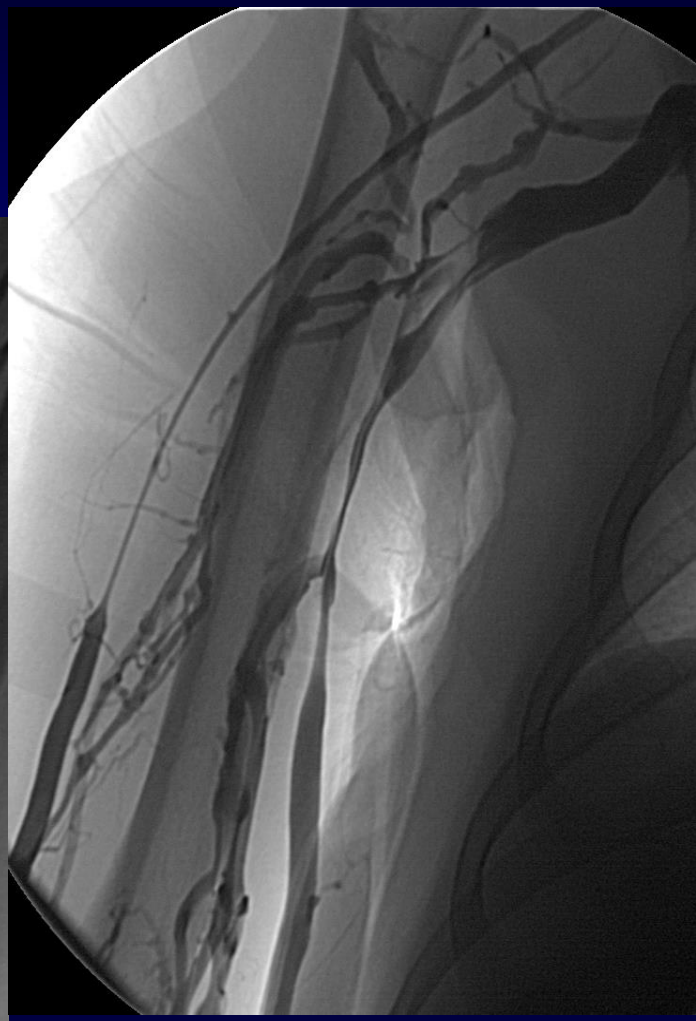
- Even when necessary cautions are taken (examination in a warm enough room, tourniquet enough tightened at the root of the limb for at least a few minutes). Spasms may persist and veins may not dilate.
- Cephalic vein diameter may also be under estimated. The injection of nitroglycerine upstream to the tightened tourniquet may cause a supplementary venous dilatation
- Preoperative dilatation of such a vein with under estimated size is useless

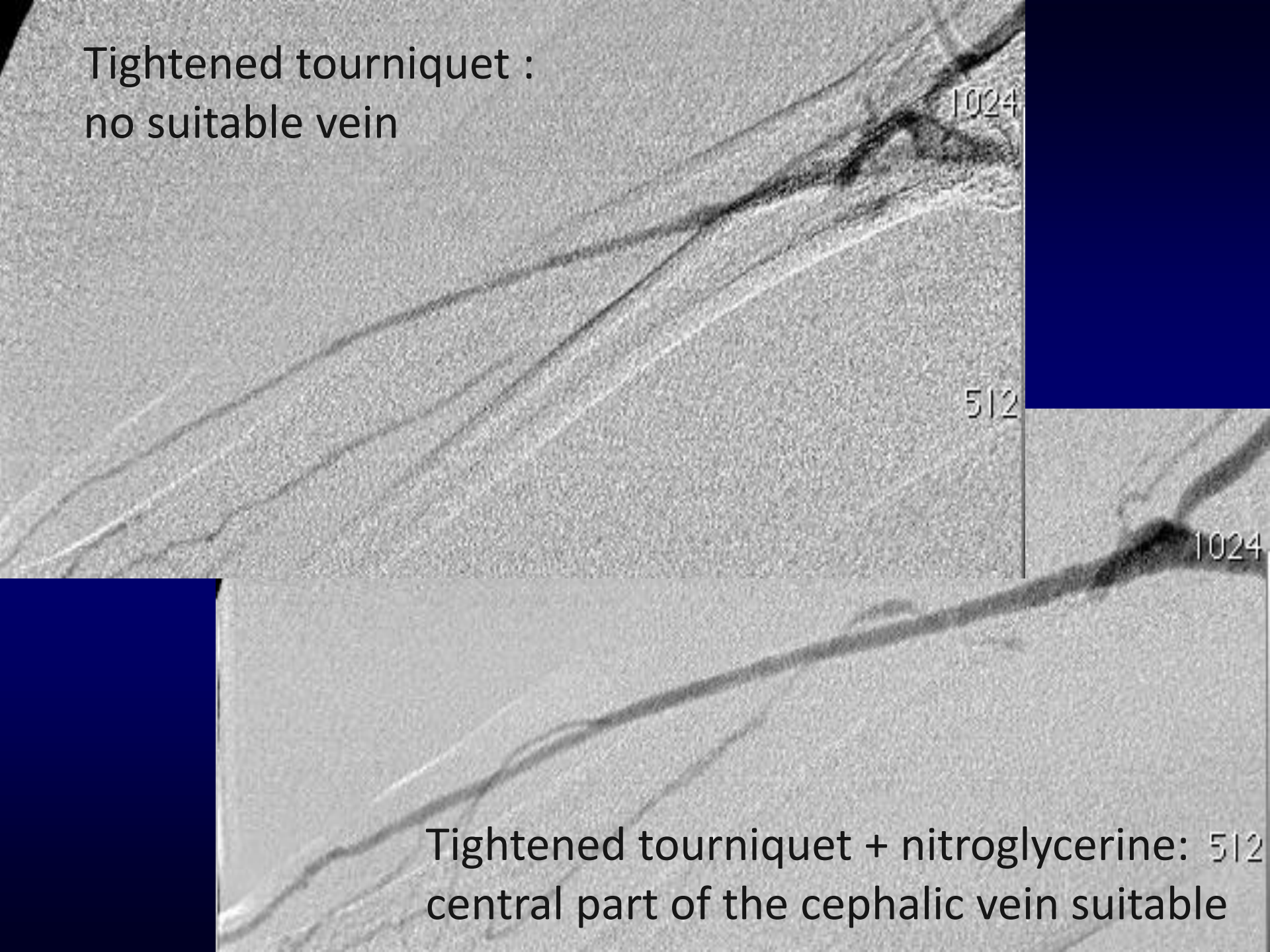
CO^2 Phlebography: tightened tourniquet

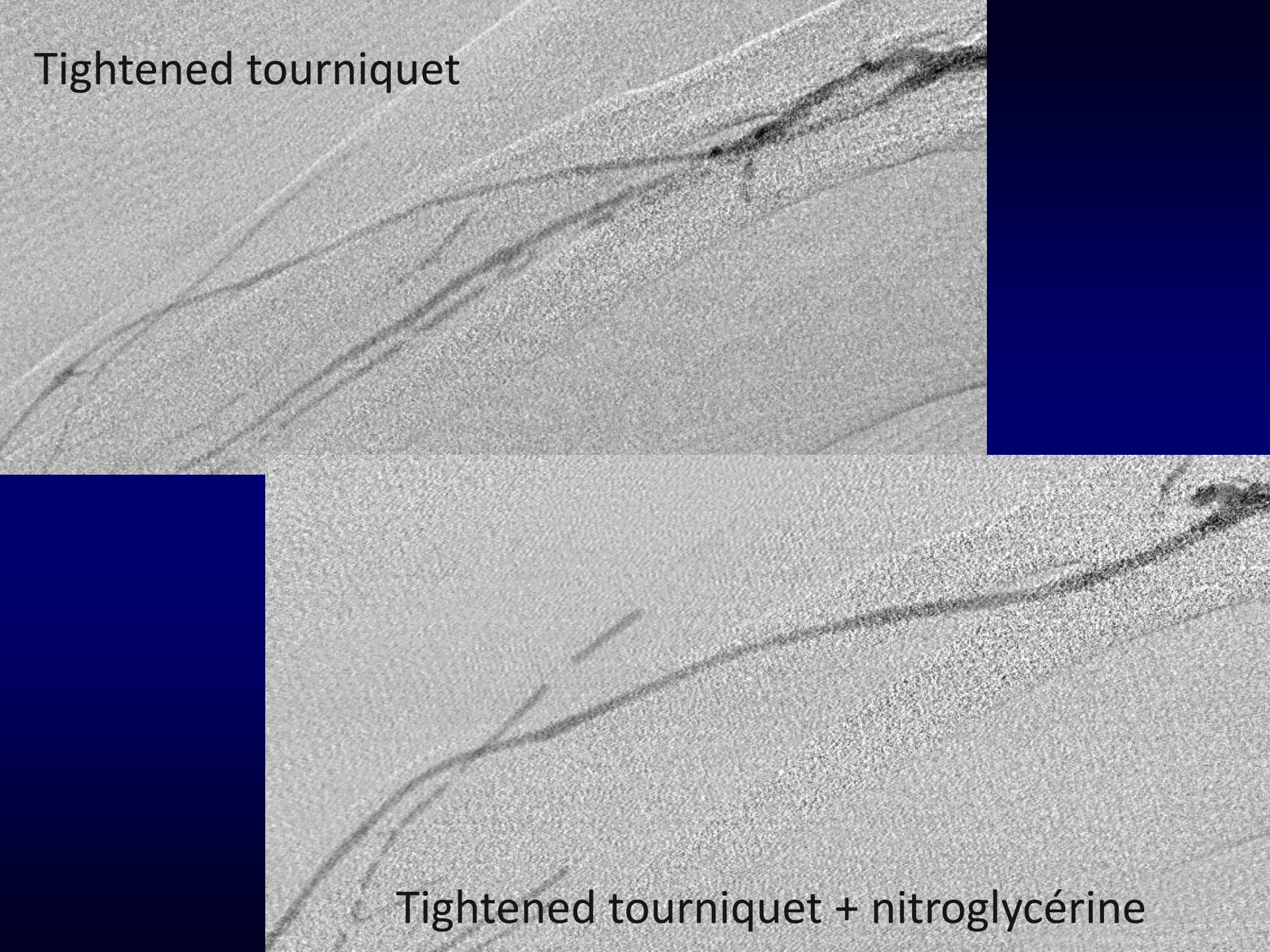


Spasms and tourniquet print






Tightened tourniquet :
no suitable vein
1024
512
1024
Tightened tourniquet + nitroglycerine:
central part of the cephalic vein suitable
512


Tightened tourniquet
Tightened tourniquet + nitroglycérine

Small vein

- When a surgeon creates a fistula, he avoids to traumatize the vein because he knows that a tiny trauma often engages a process leading to stenosis occurrence
- He takes care to obtain an harmonious and regular anastomosis because he knows that turbulences will traumatize the venous wall and will cause a post anastomotic stenosis
- Dilatation causes major parietal damages

Small vein

- the peroperative dilatation of a vein whose diameter is underestimated is not only useless but is also deleterious
- Dilatation causes major parietal damages leading to
  - Risk of rupture
  - High risk of early thrombosis
  - Very high risk to delayed stenosis occurrence (80%).
- Compared to post operative dilatation the risk of complications appears higher the venous wall being not at all developed, the access flow being lower and the vein being more prone to spasm

Really small vein with normal walls

- Such vein will maturate, however the maturation time will be somewhat longer. Therefore the aim of per operative is only to win few days or weeks on the maturation time
- When the venous diameter is really small, per operative dilatation has a prohibitive price:
  - Fistula loss due to ruptures or early post operative thrombosis related to endothelial damages in a low flow vessel (fistula not at all developed and more prone to spasm)
  - Occurrence of delayed stenosis which complicates about 80% of the venous dilatation

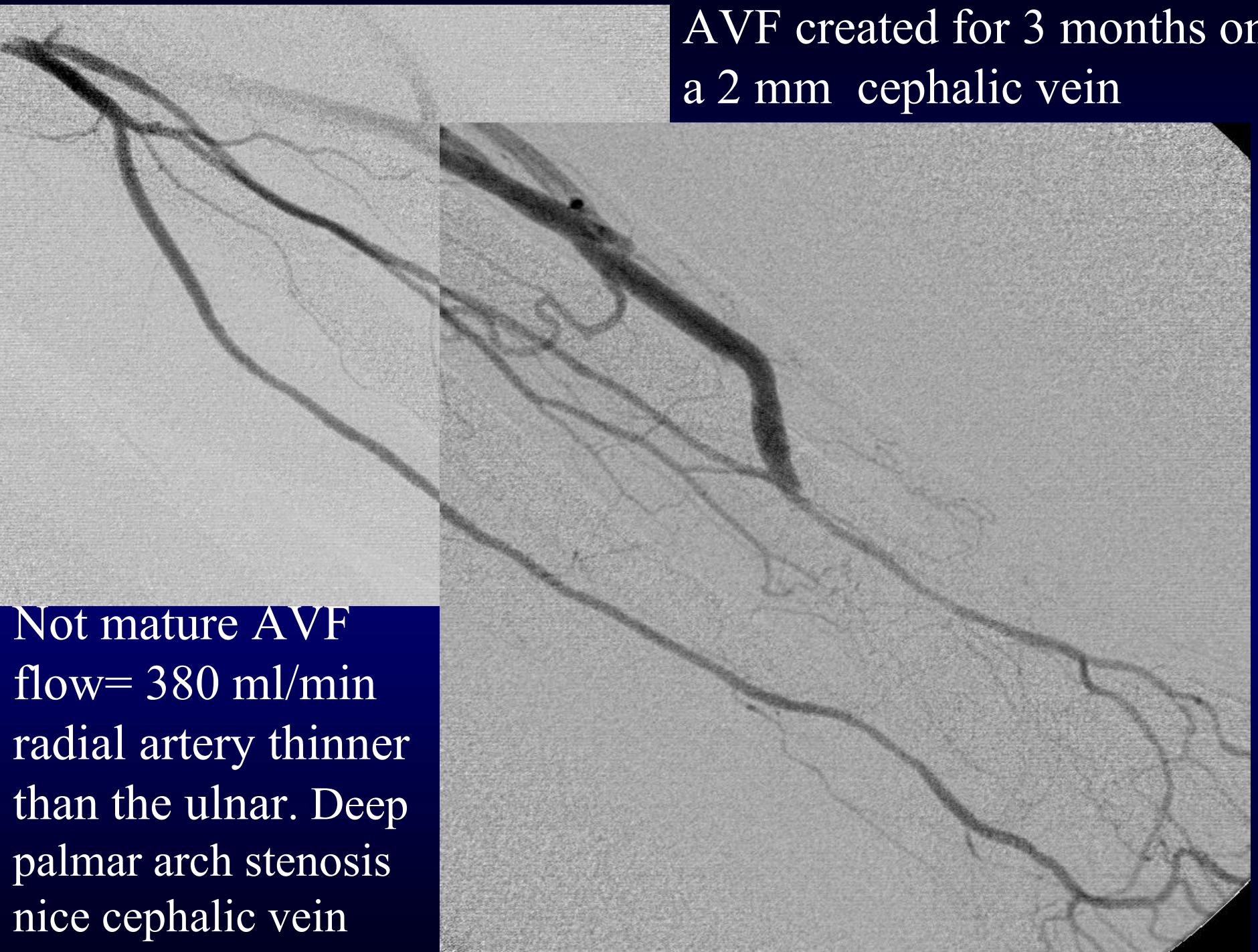
Post operative dilatation

- is achieved only when necessary
- is safer because it is achieved on partly developed vein:
  - less risks of rupture; the dilatation being performed on somewhat enlarged venous walls
  - Less risks of early thrombosis because of the higher flow which besides favors the venous wall remodeling
  - Less risks of spasms

Maturation failure of a fistula created on a small vein

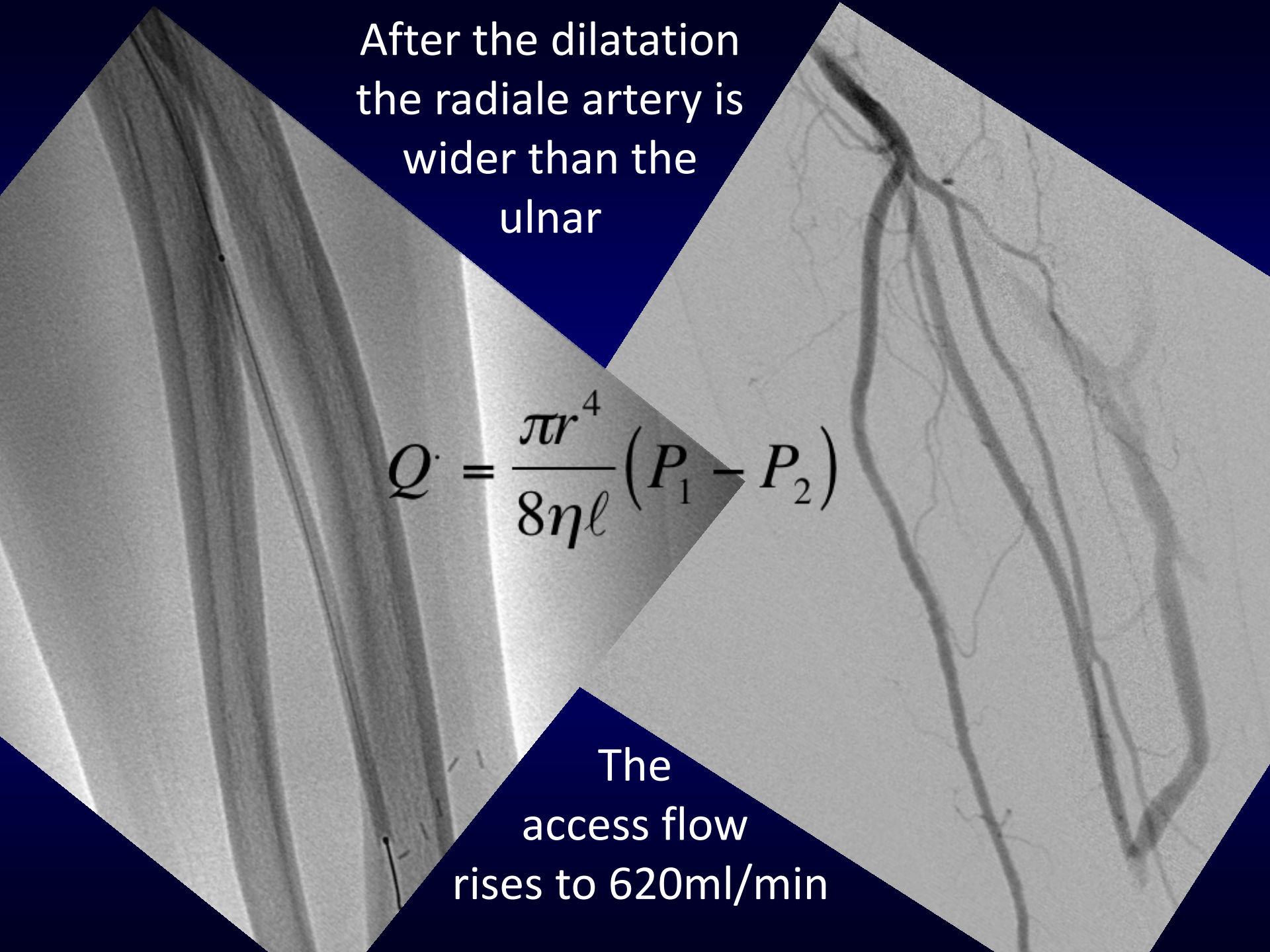
- Is due to a too low flow itself related to:
  - an overlooked preexisting venous lesion
  - an overlooked preexisting artery lesion; the most often diffuse infiltration and calcification of the radial artery
  - a lesion occurring after the fistula creation (the juxta anastomotic stenosis the more often)
- In none of theses cases a per operative dilatation may have been envisaged; contrariwise the fistula will maturate after a post operative dilatation

AVF created for 3 months on a 2 mm cephalic vein



Not mature AVF
flow= 380 ml/min
radial artery thinner than the ulnar. Deep palmar arch stenosis
nice cephalic vein

After the dilatation the radiale artery is wider than the ulnar



$$Q = \frac{\pi r^4}{8\eta\ell}(P_1 - P_2)$$

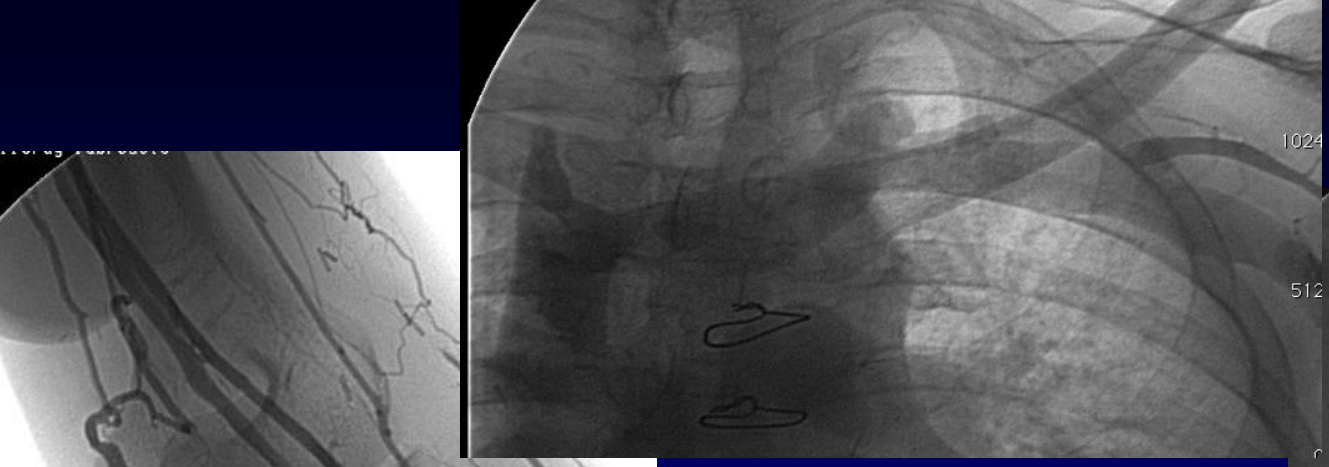
The access flow rises to 620ml/min

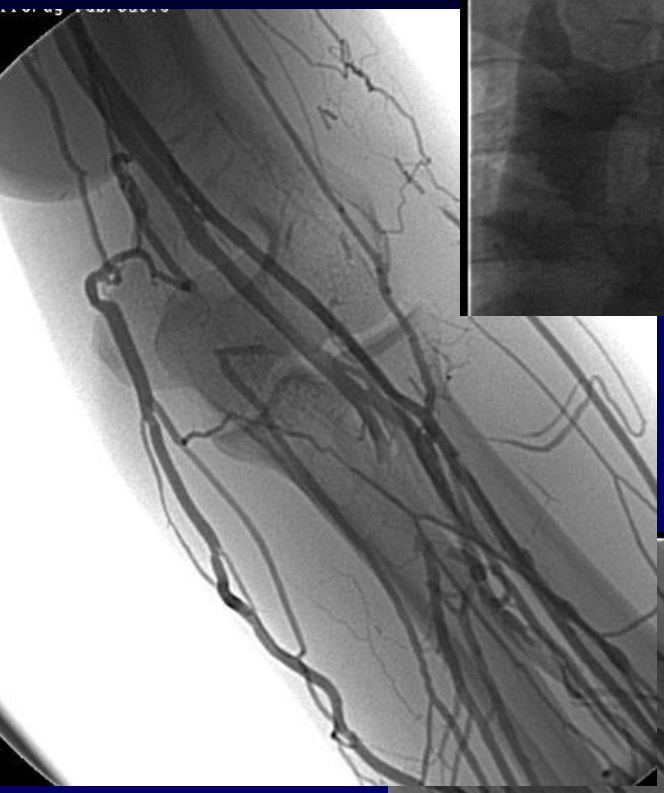
Conclusion: peroperative dilatation

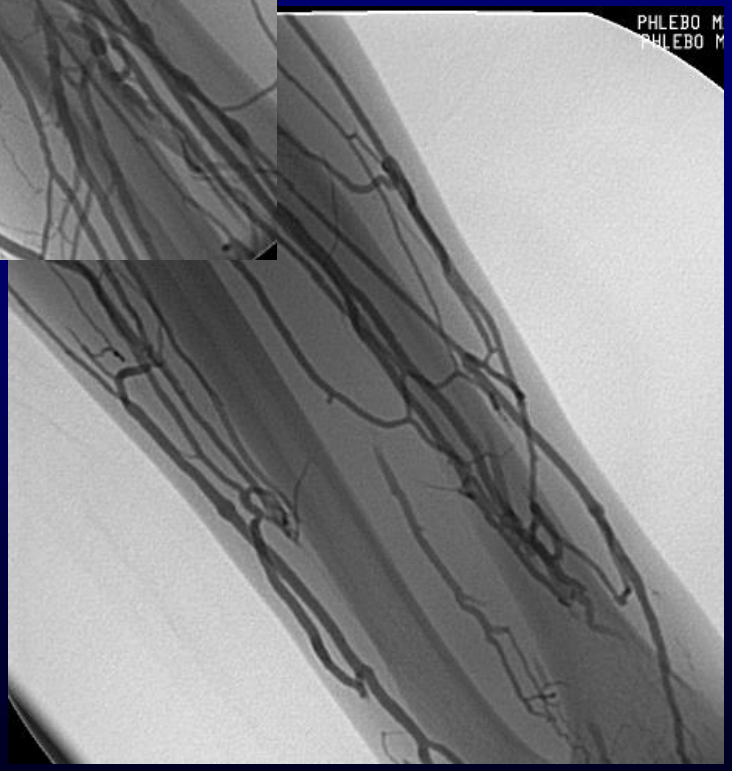
- Seldom evoked, because when a doubt exists about the abilities of a cephalic vein to maturate, the access is created on another site.
- Per operative dilatation of a small vein all along its length is for me unconceivable because:
  - The vein could be large enough but its diameter may be underestimated by ultrasonography then a peroperative dilatation is useless and deleterious
  - A small but normal vein will maturate alone only requiring few more time
  - Dilatation of a thin walls vein is at high risks of rupture, of early occlusion (low flow and spasm), and of secondary stenosis occurrence (80%)

Conclusion: post operative dilatation

- Postoperative dilatations are performed only when needed. Maturation failure due to insufficient flow:
  - overlooked preexisting venous or artery lesion(s)
  - lesion occurring after the fistula creation
- Postoperative dilatation is safer being attempted on partly mature fistula with:
  - larger diameter
  - more resistant wall
  - higher flow
  - Less risks of spasm







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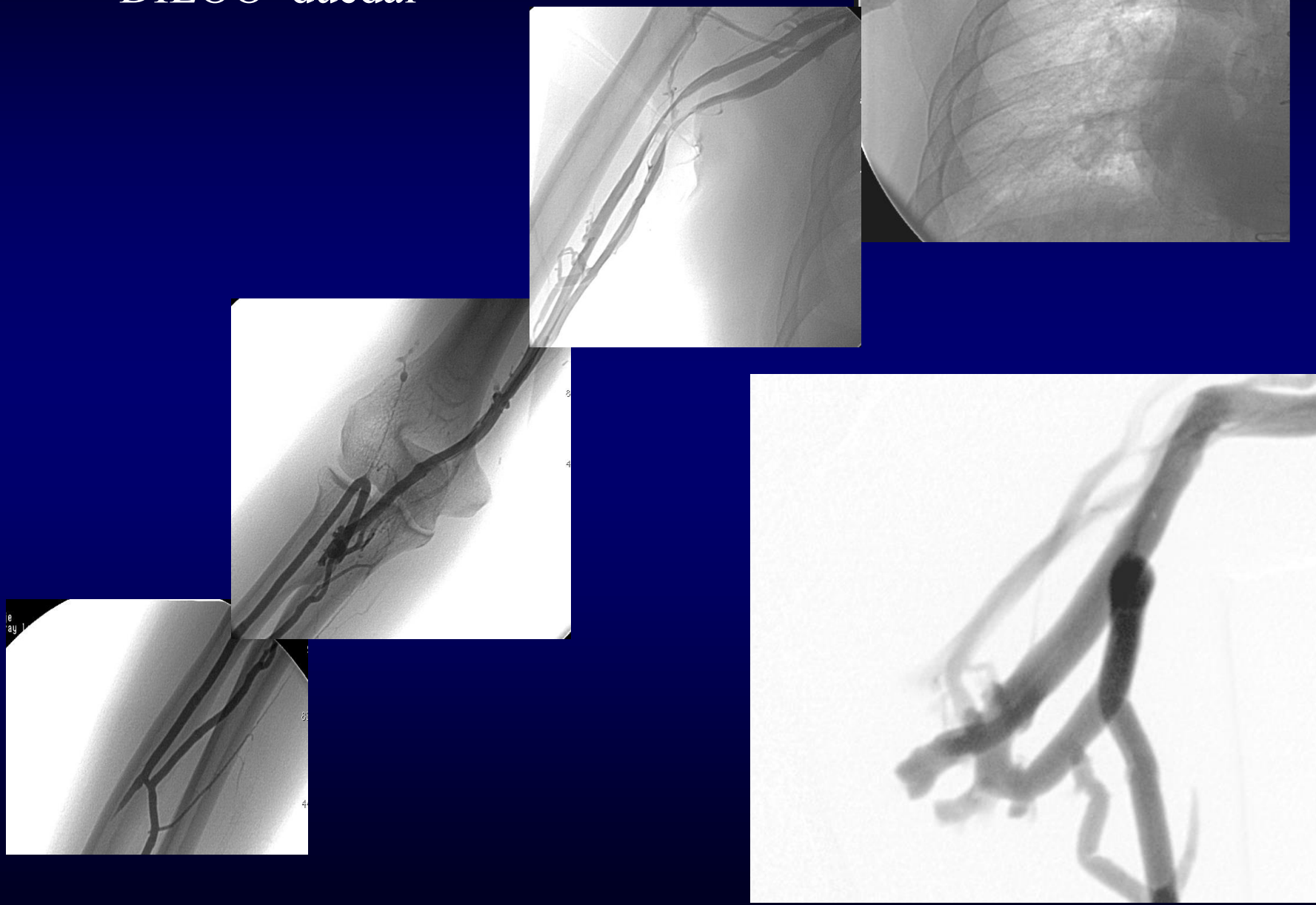

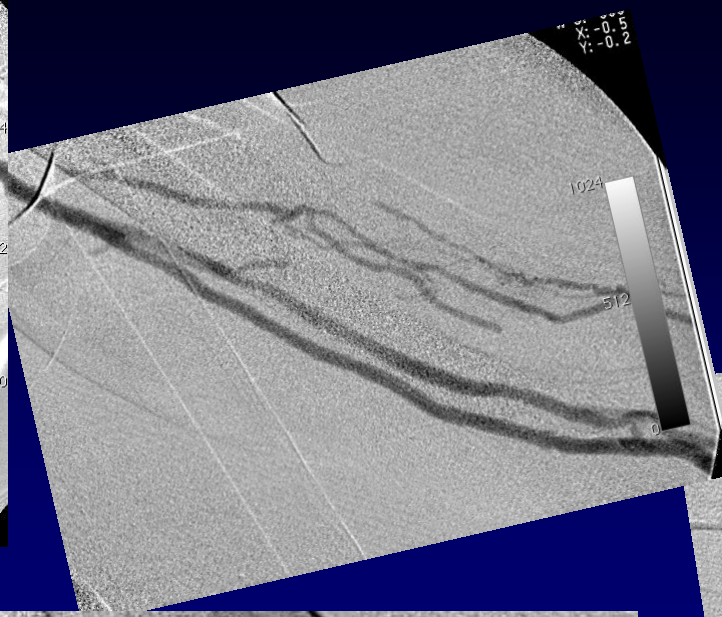

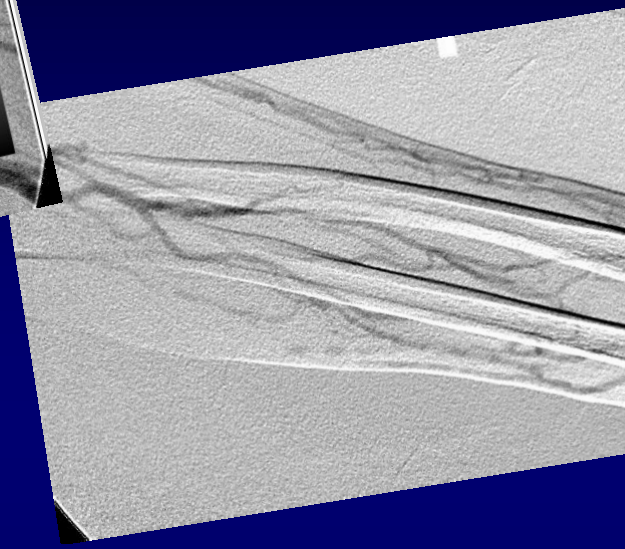

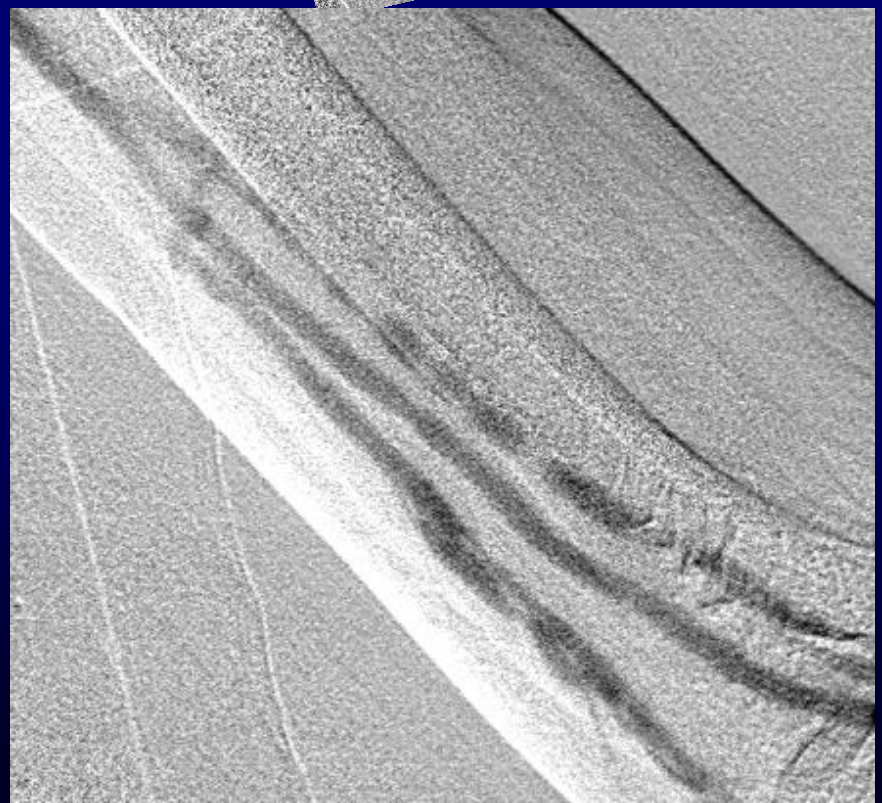

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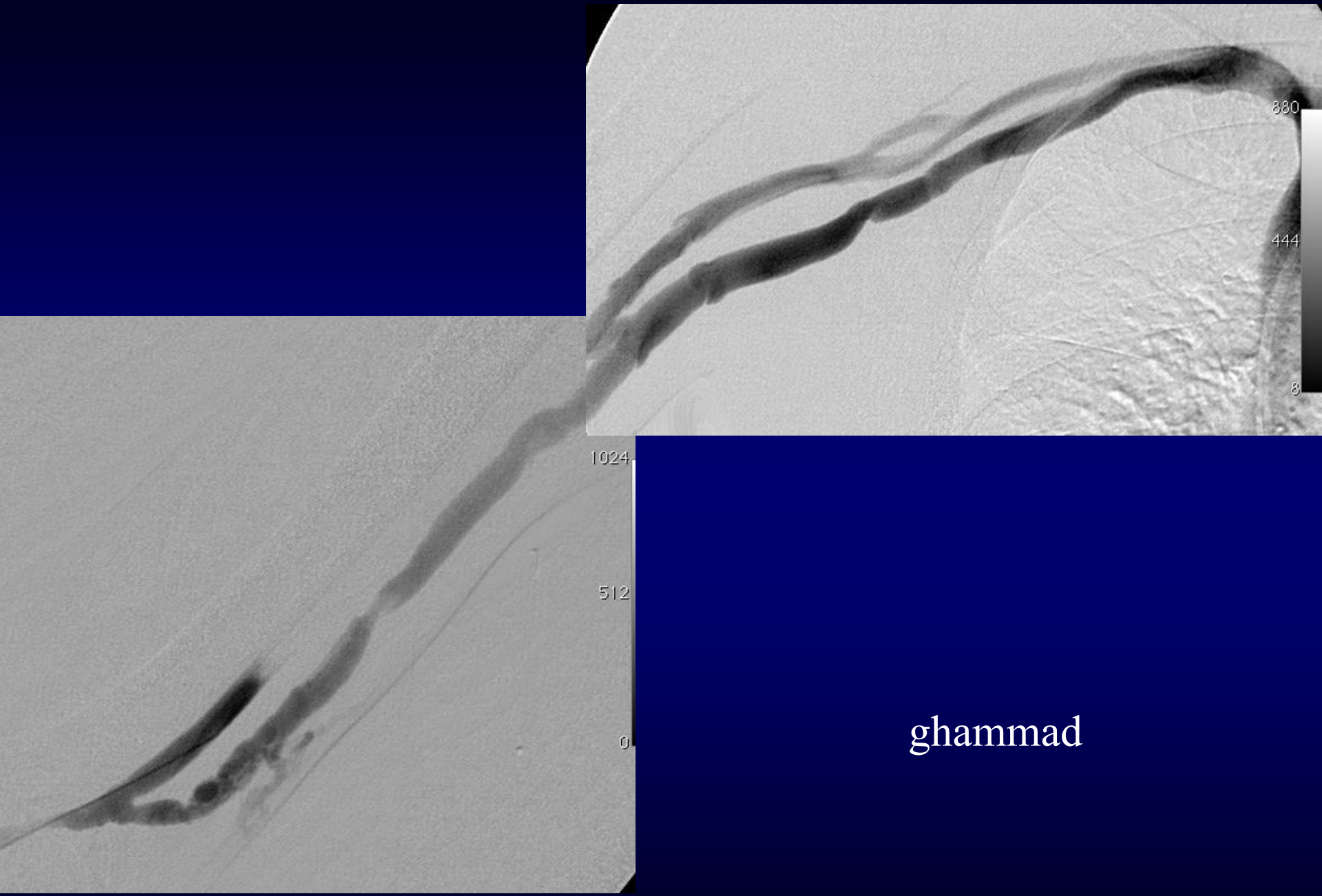

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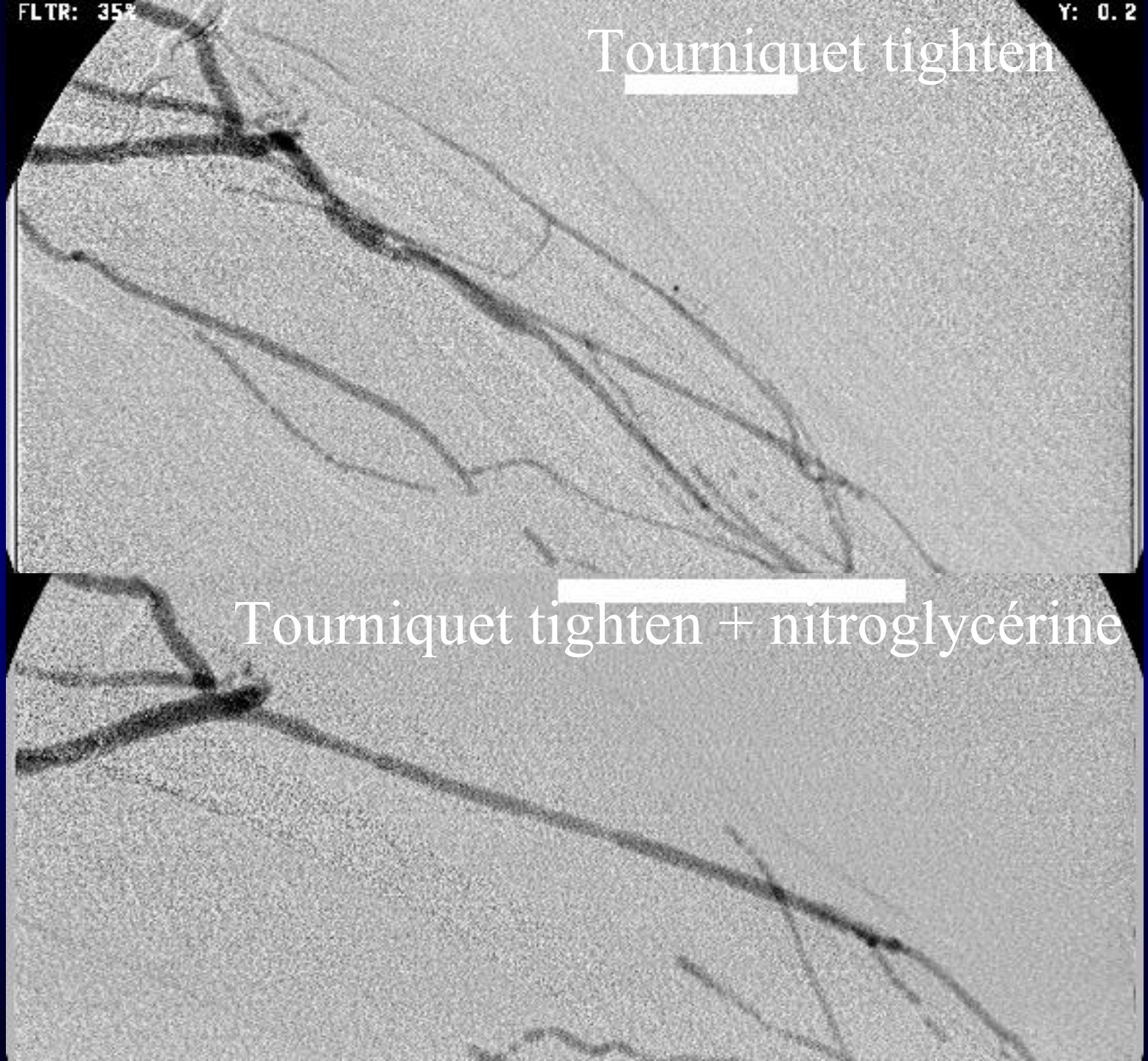
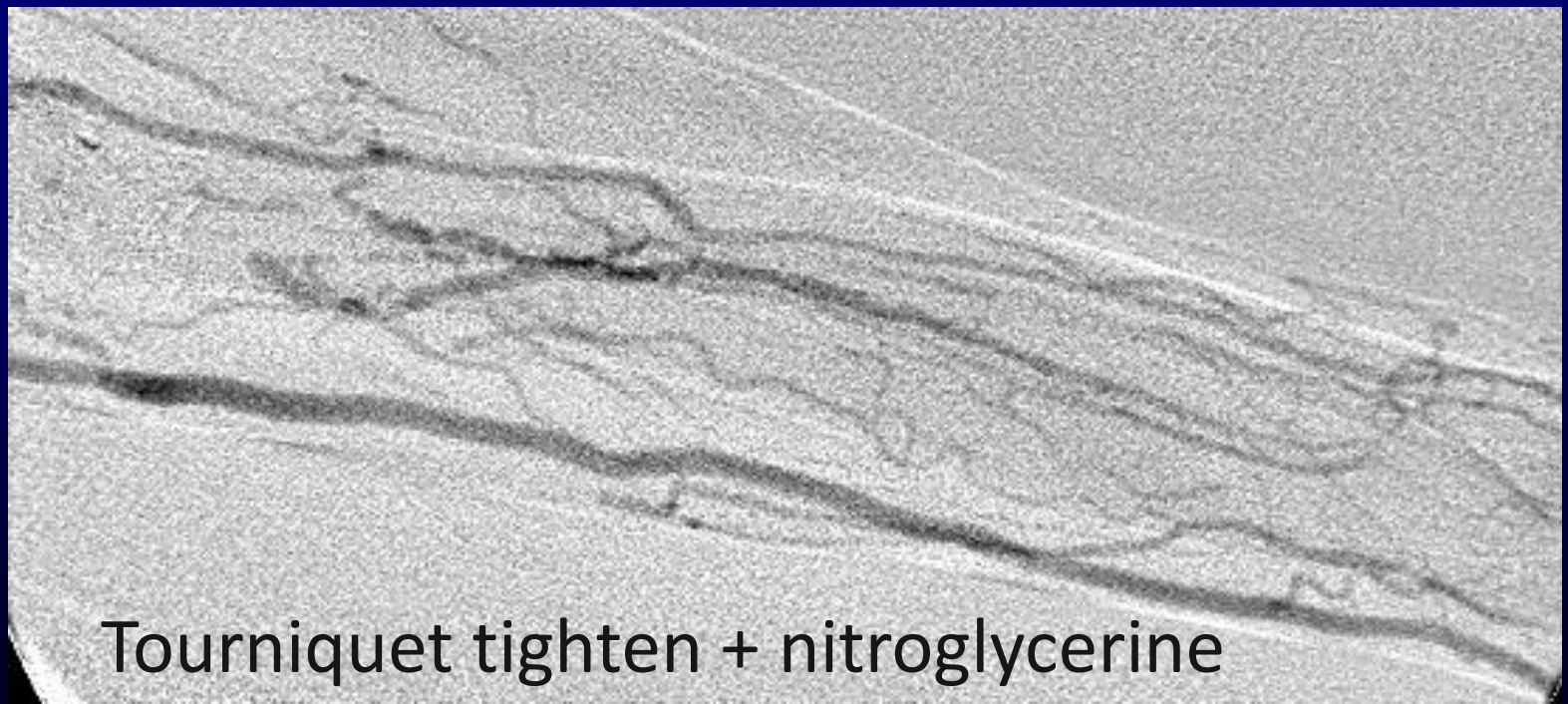

FLTR: 35%
Y: 0.2
Tourniquet tighten
Tourniquet tighten + nitroglycérine


Tourniquet tighten


Tourniquet tighten + nitroglycerine

Post operative dilatation

- Attempted only when necessary (when the fistula fail to mature)
- Performed on partly developed, enlarged and less brittle veins (less risks of rupture)
- Low risk of early thrombosis because of the higher flow
- Better vein wall remodeling after the dilatation due to the higher flow

Per-operative dilatation

- Often attempted in useless cases
- Performed for a shortening of the maturation time with
- Higher risks of rupture as performed in not at all developed vessels
- High risk of thrombosis due to low flow and parietal damages
- Very high risks of occurrence of post dilatation stenosis