

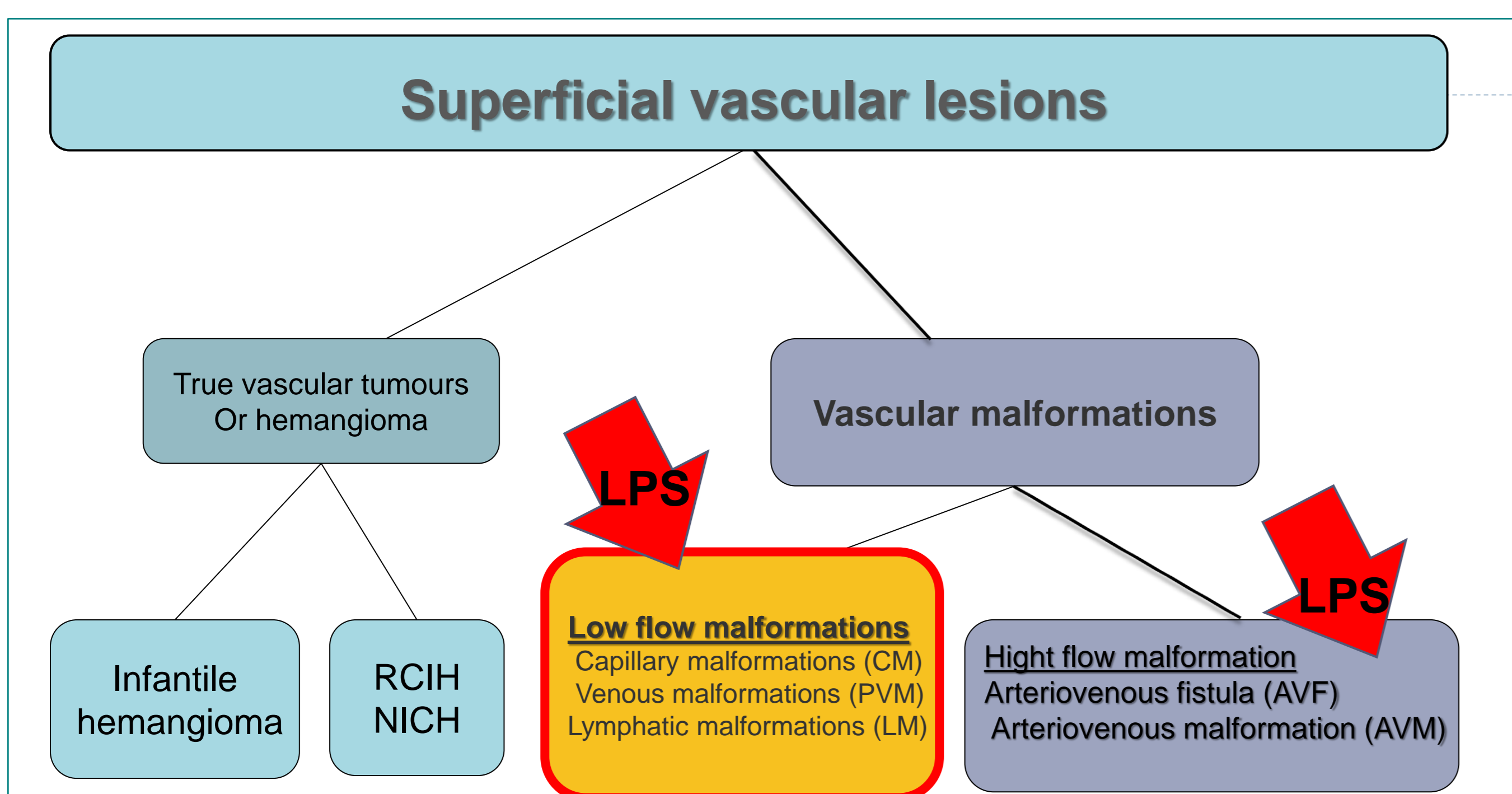
# Treatment of peripheral vascular malformation (PVM): A new concept of Low pressure sclerotherapy (LPS)

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## Aims

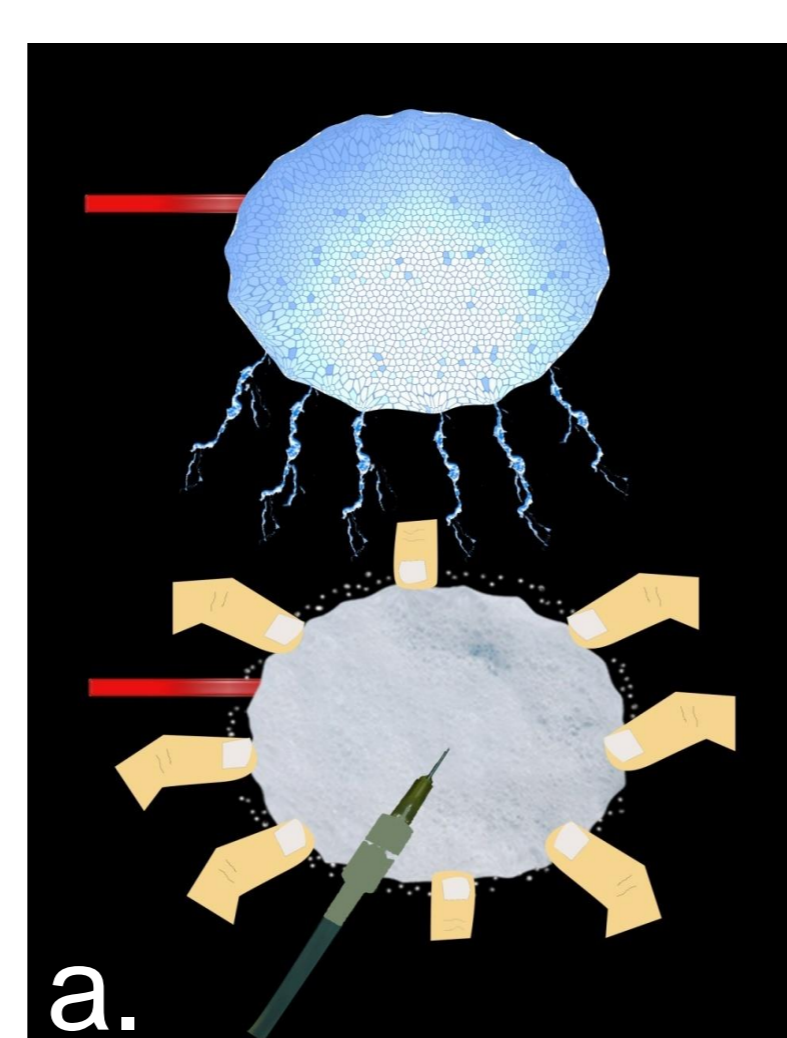
Percutaneous sclerotherapy is a well-established method for initial treatment of low-flow vascular malformations.



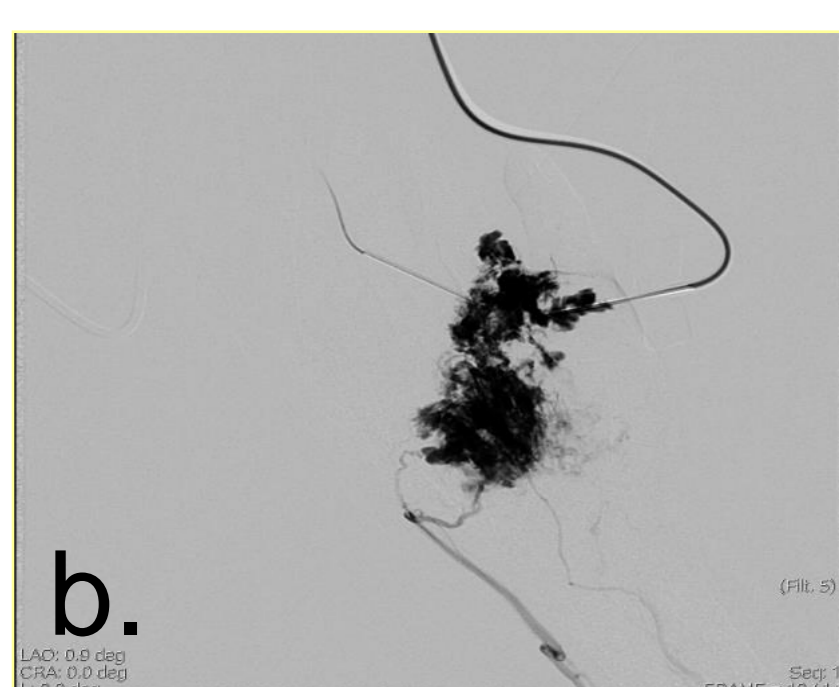
Prolonged contact of the sclerosant agent with the endothelial lining of the lesion is required [1]. In conventional sclerotherapy(a), peripheral compression of the malformation is performed to avoid venous leakage.

However, it is responsible of elevation of intra lesion's pressure which can induce interstitial extravasation of the sclerosant agent in normal adjacent tissues.

Thereby, tissues other than the targeted volume can be damaged and significant complications can occur (phlyctena, fistula, necrosis...).



a. conventional sclerotherapy

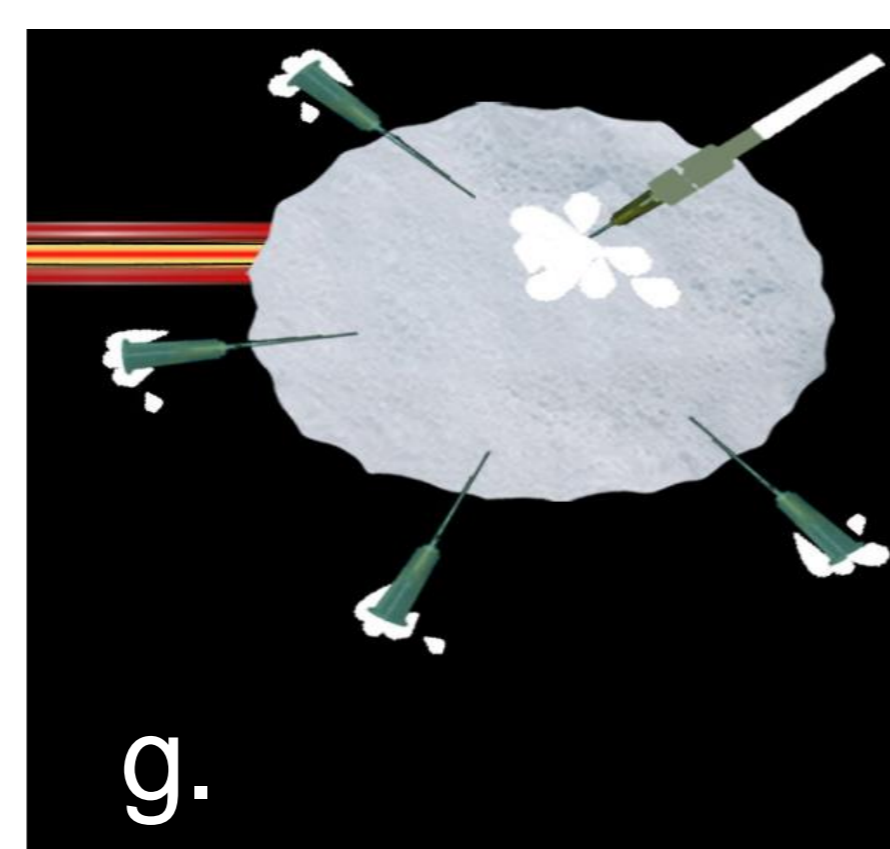
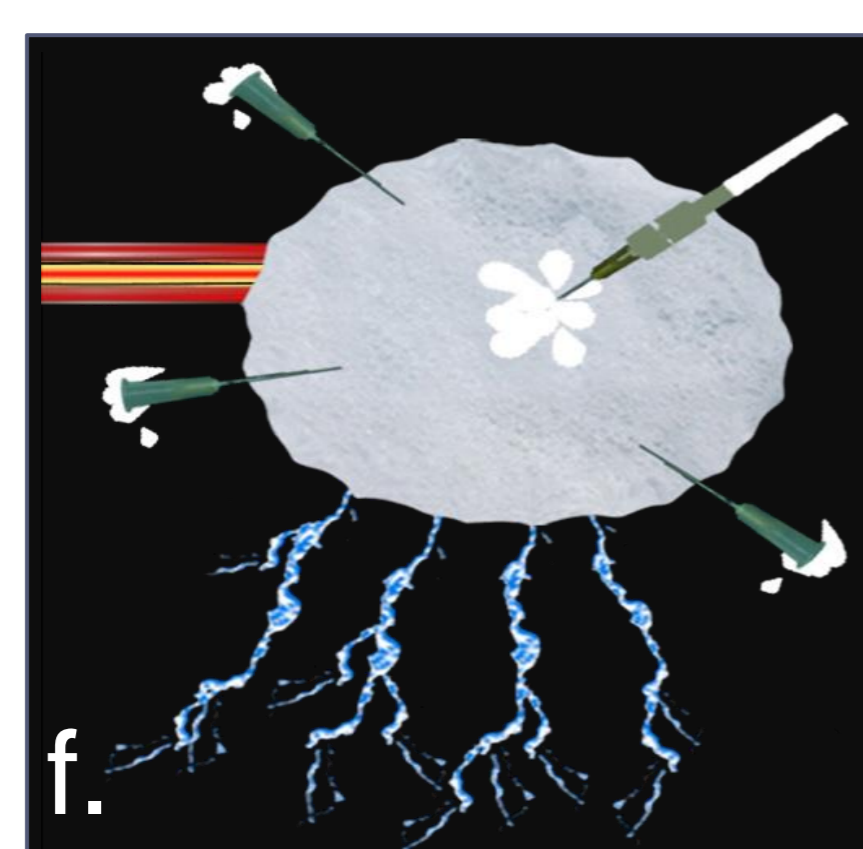
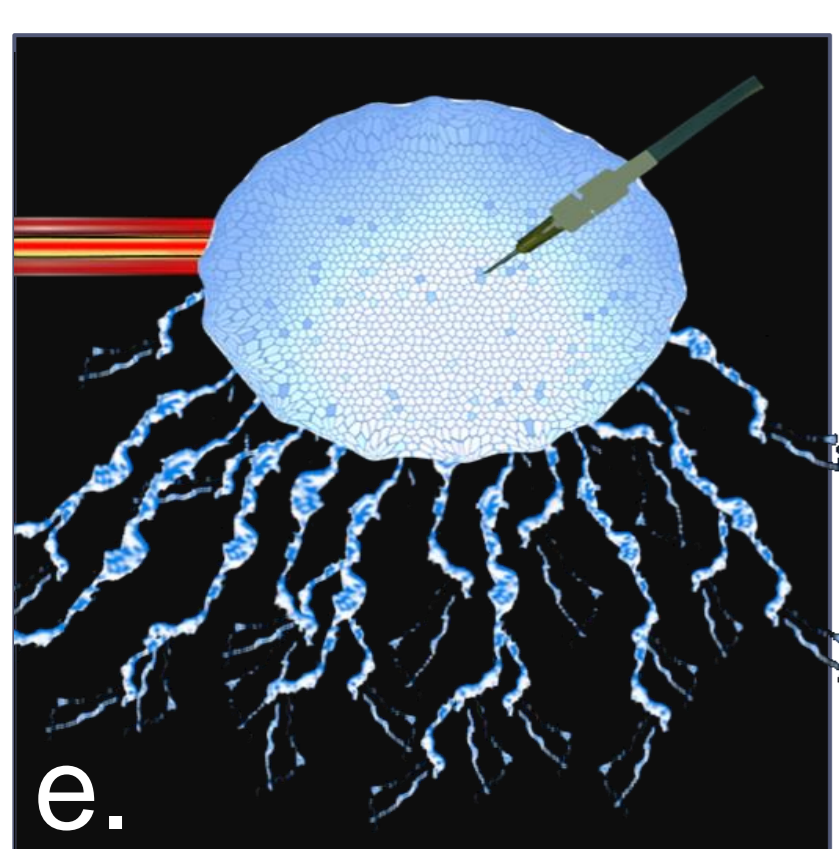


Angiographic findings during conventional sclerotherapy of hand PVM (b) with consequent phlyctena (c) and necrosis (d).



## Low flow malformations: PVM and lymphatic malformations

We developed the concept of LPS by placing multiple needles in the PVM. These needles work as multiple valves that allow the outflow of contrast material and sclerosant agent without significant elevation of the pressure. The extra injected fluid will follow the path of least pressure and prevent interstitial extravasation. Thus, dramatic decreasing complications is noticed [2].



Opacification of the PVM and the venous drainage (e) Needles allow outflow of the contrast material and sclerosant agent (f) till the pressure is significantly low and the peripheral venous drainage is no longer opacified (g).

Swelling of the lesion and local inflammation are frequent after LPS. They are tolerated and managed medically. Nevertheless, necrosis is inevitable when the malformation is superficial and involve the skin layers. Wound healing by secondary intention offers satisfactory results

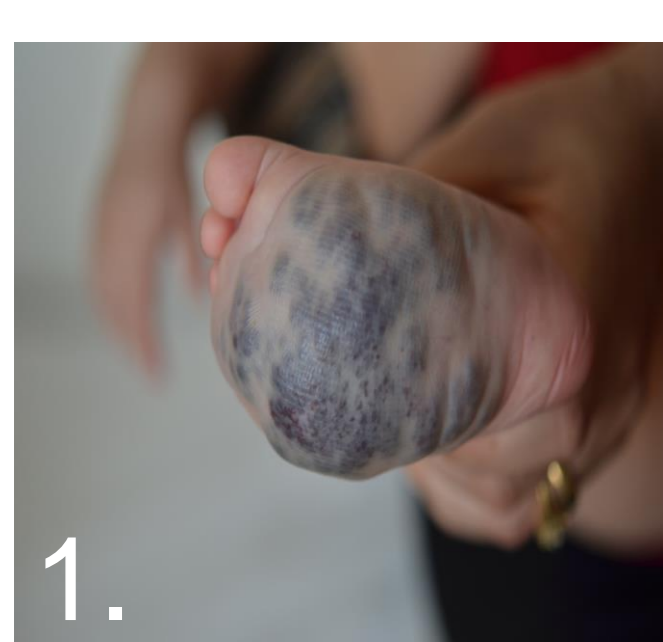


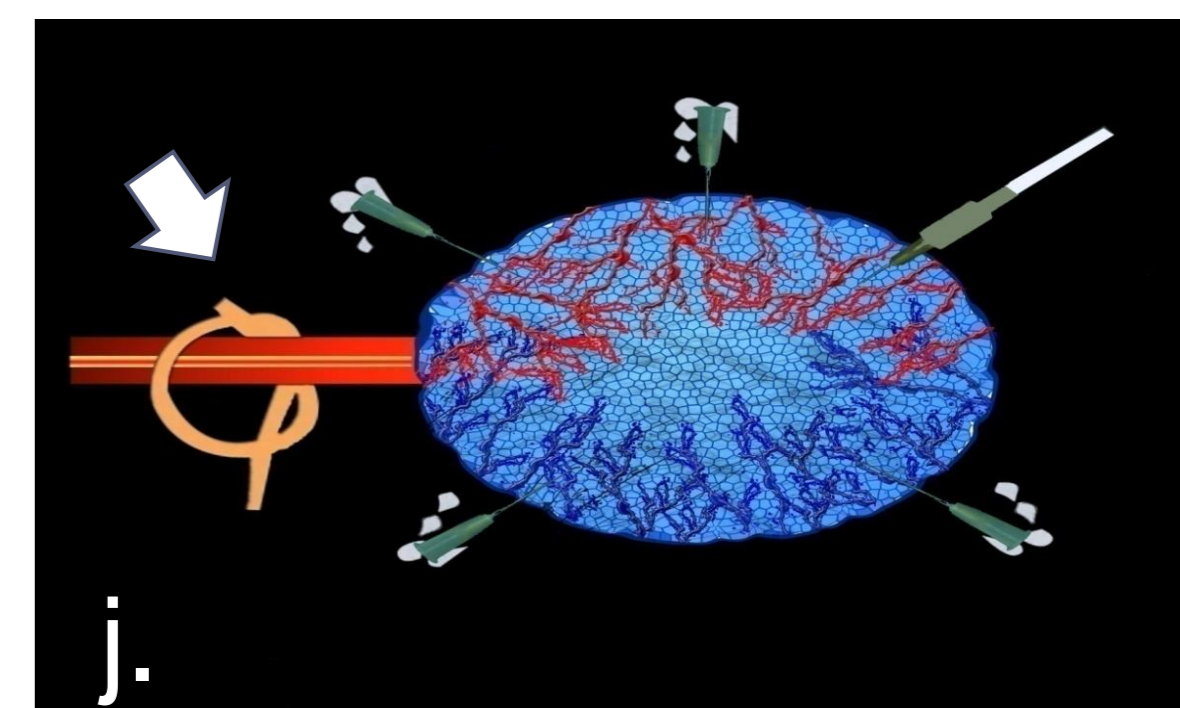
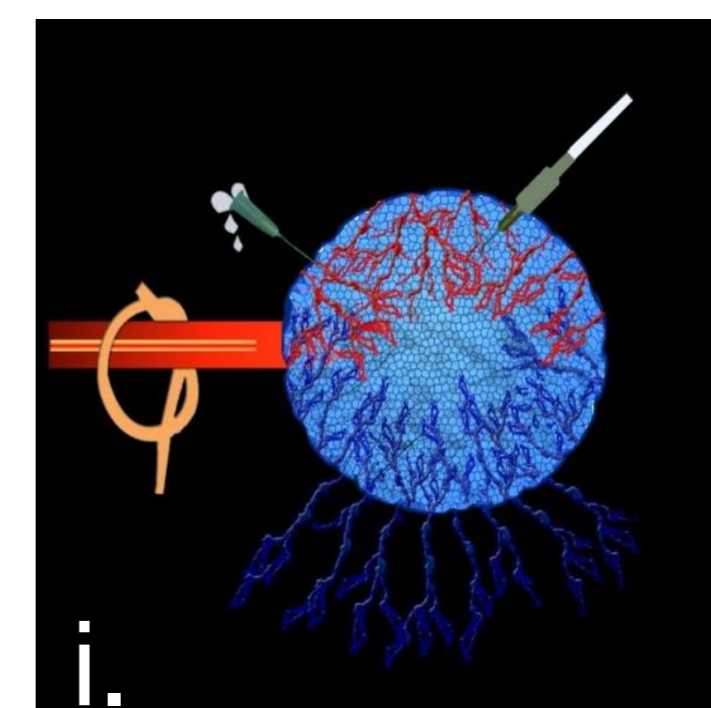
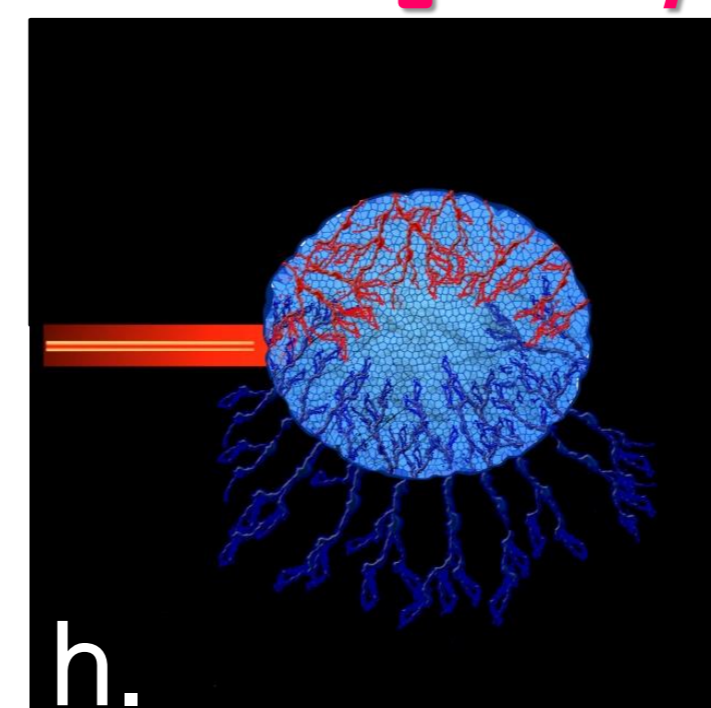
Fig. i. 8 months i male infant with foot superficial PVM.

- 1- Photography of the initial lesion.
- 2- Phlebogram before LPS shows the malformation with few venous leakage.
- 3- Necrosis of the skin one week after LPS.
- 4- Cicatrization by secondary intention one month after LPS.
- 5- total healing 3 months after LPS.

Lymphatic malformations (macro cystic) are similarly treated with LPS. The technique is less problematic. We insert multiples needles with sonography guidance to obtain near full aspiration before LPS, Due to non-leakage, ethanol is exclusively used in these cases.

## Extension of the concept of LPS to peripheral AVM :

When the lesion is located on a limb, after selective catheterization of the feeding artery, a tourniquet can be used at the root of the limb to reduce the inflow and to increase the pressure in the venous side (h, i, j). We **exclusively** treat the nidus and the venous side in case of AVM, **never the feeding artery!**



Extension of the concept of LPS to peripheral AVM and use of a tourniquet (h,i,j).

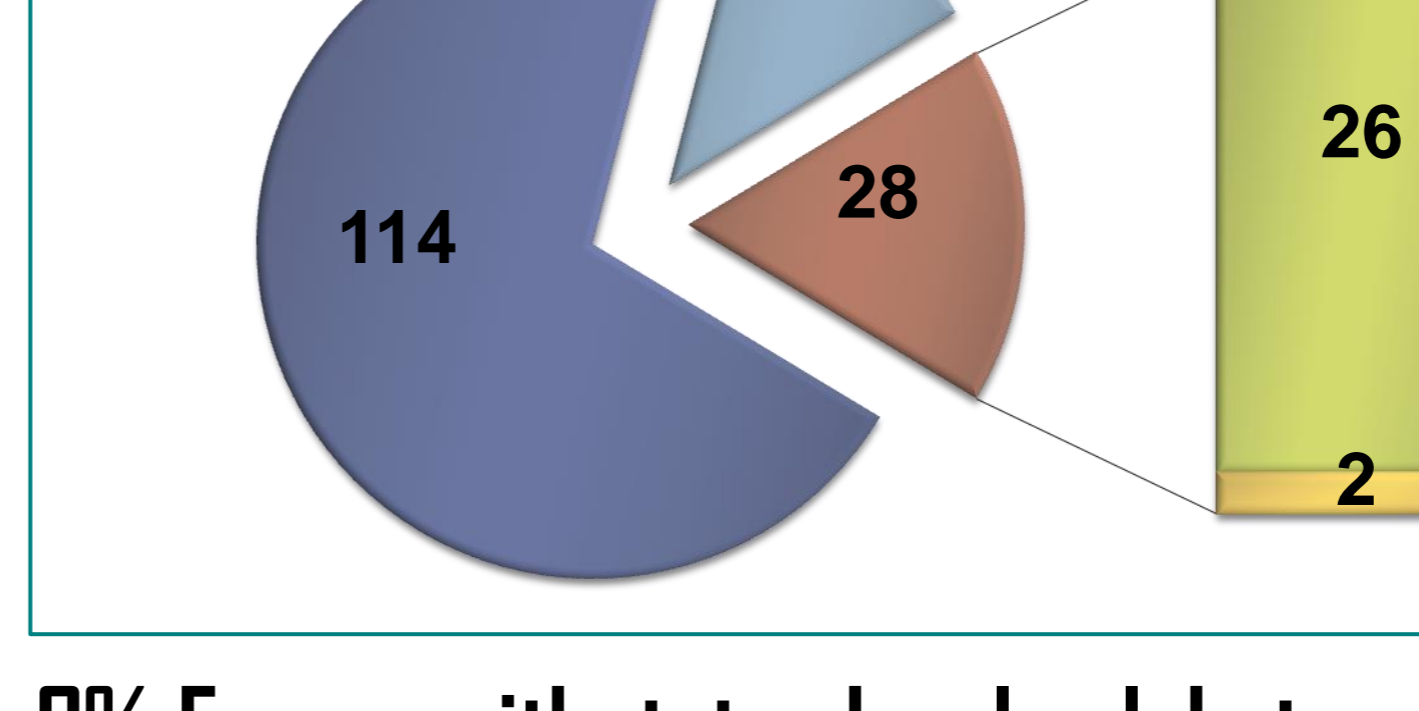
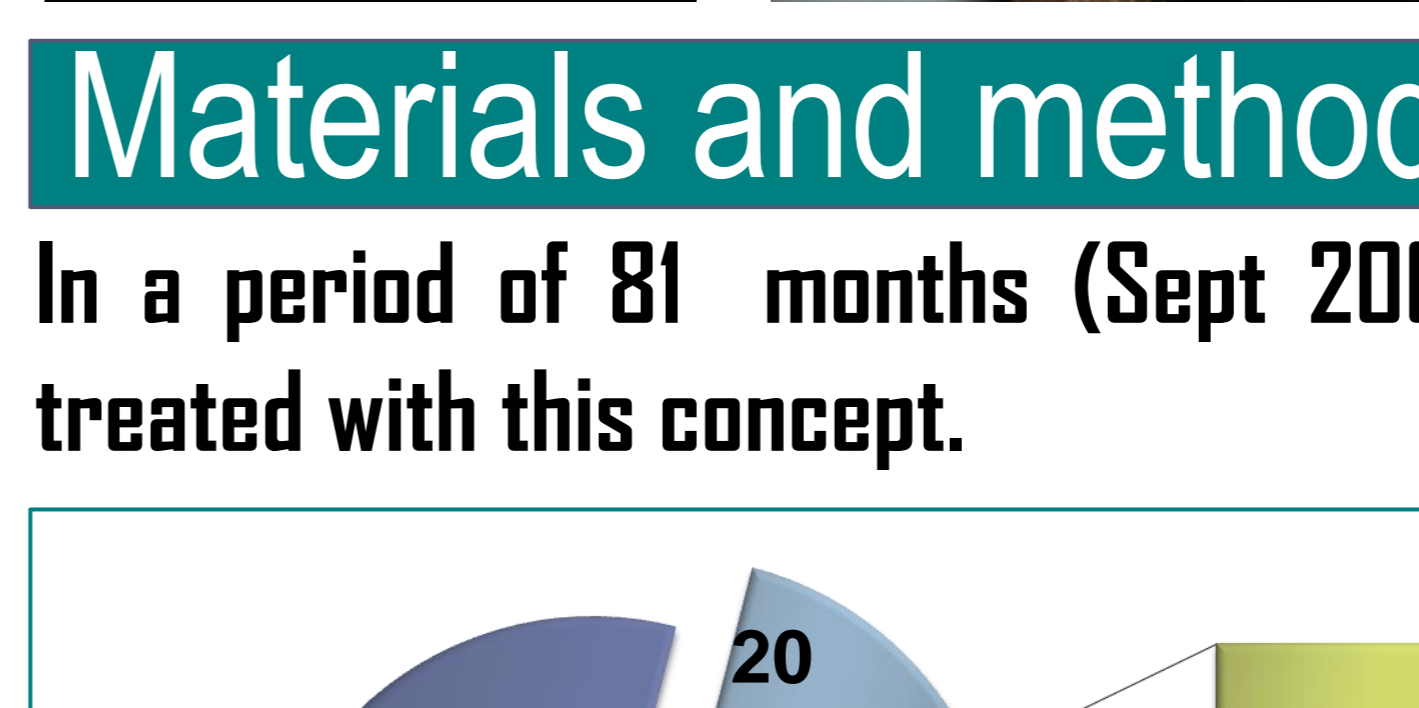
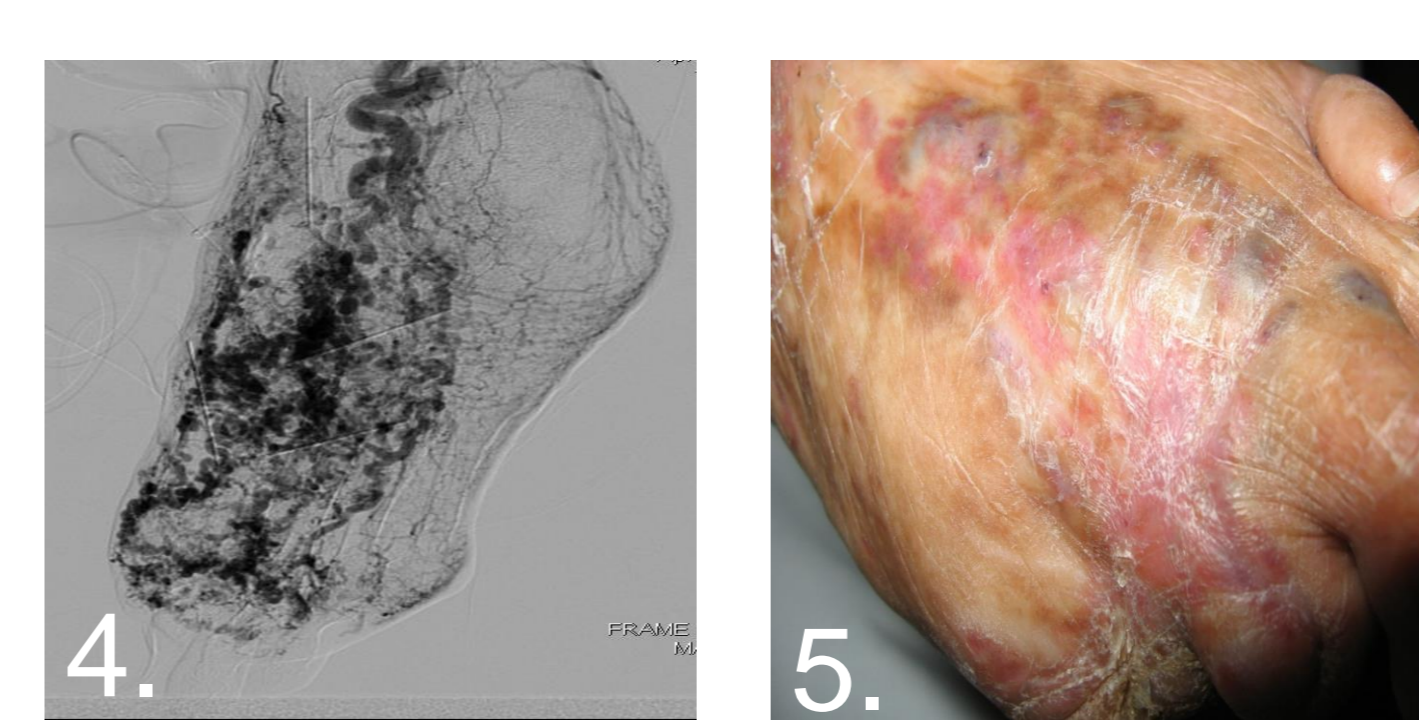
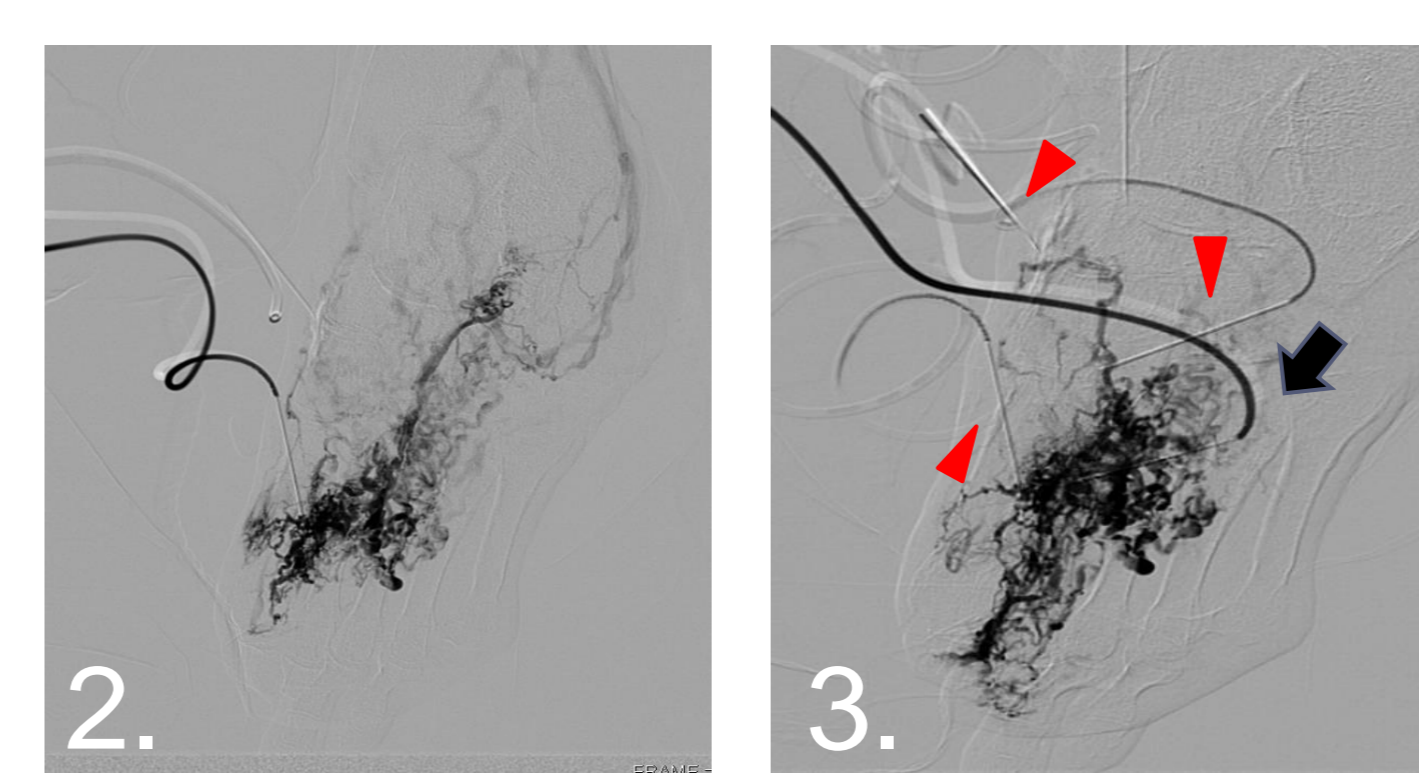
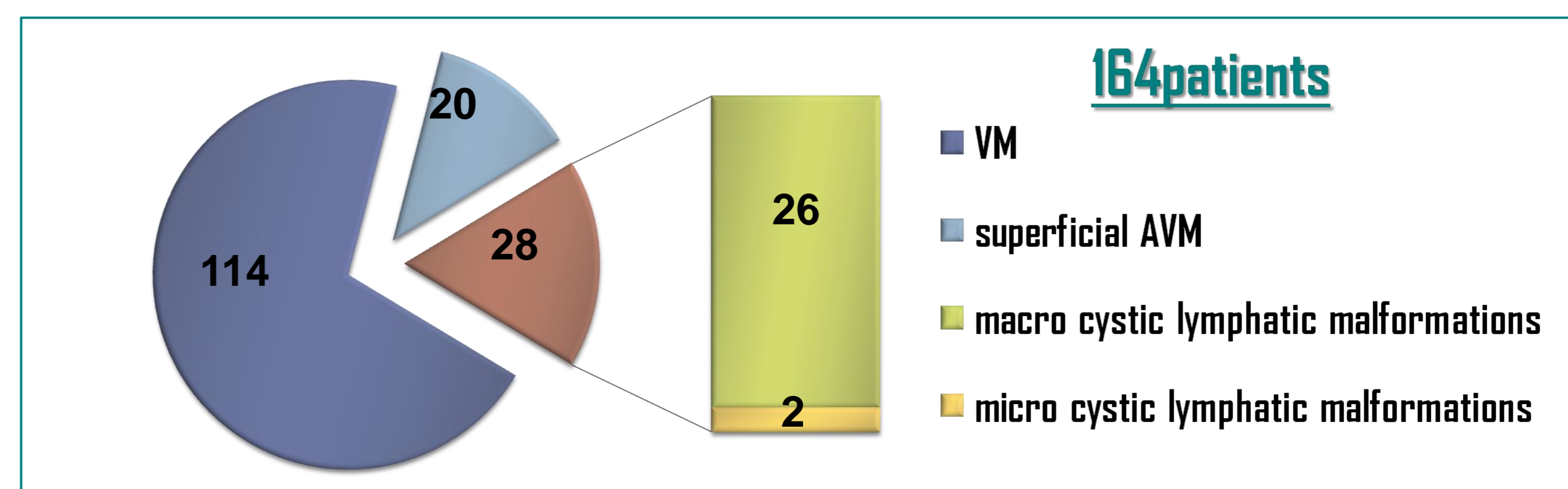


Fig. h. 70 Y old woman already multi operated for foot AVM and treated with vascular embolization

- 1-Photography shows the foot lesion before LPS.
- 2-Phlebogram shows the AVM with the venous outflow.
- 3-Contrast material being administered via catheter (arrow). Note the needles (arrowheads) inserted in the venous side, through which contrast fluid and sclerosant agent exit.
- 4- Final phlebographic result: it is **NOT WORSE!** Opacification of the arterial side of the AVM after exclusion of the venous side.
- 5-Total healing of the wound 3 months later.

## Materials and methods

In a period of 81 months (Sept 2006-June 2013) 162 patients were treated with this concept.



3% Foam with tetradecyl sulphate and since three year lauromacrogol 400 were used in all cases of PVM (20-60 ml) and in two cases of micro cystic LM. Absolute ethanol (AE) was used in 88 patients: 44 VM complementary to foam and 24 LM and 20 cases of peripheral AVM. The overall injected volume of AE does not exceed 0.5 ml/kg of body weight. Glue (isobutyl 2 cyanoacrylate) was used in 4 cases of AVM complementary to (AE). Up to 7 sessions were performed per patient.

## Results

Technical success was reached in all cases. Loss of volume at MR ranges from 25 to 80% except for two patients (large size VM). Patients were cosmetically improved and relieved of pain. Swelling of the lesion occurred in all patients and it was well tolerated and controlled with NSAID with resolution in few days (4-7days). Significant complications occurred in 3 patients (Phlyctena, fistula or necrosis ...) and were treated conservatively.

## Conclusion

LPS concept using 3% STS foam and AE in our experience over six years has proven the technique to be effective with dramatic decreasing of complication. AE is used to treat macro cystic LM and superficial AVM and complementary to foam STS in some VM with extreme care concerning the volume injected.