

# Vascular Anomalies – the key role of ultrasound in making the diagnosis

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## VASCULAR ANOMALIES

### Vascular Malformations

#### Low-flow

Capillary malformations  
Venous malformations  
Lymphatic malformations

#### High-flow

Arteriovenous malformations

### Haemangiomas

#### Congenital

Rapidly involuting congenital haemangiomas (RICHs)  
Non-involuting congenital haemangiomas (NICHs)

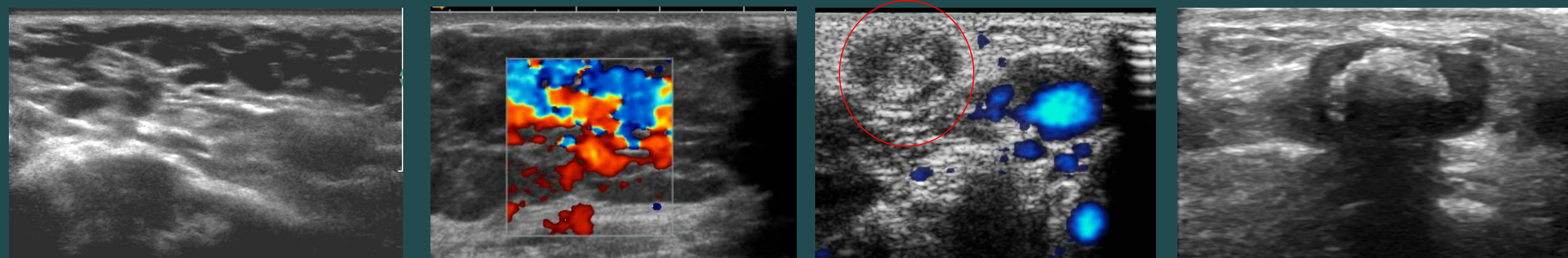
#### Infantile

## VASCULAR MALFORMATIONS

These are collections of vessels/cysts within otherwise normal tissue. They are present at birth but can become more obvious and troublesome with time.

### Venous malformations (VMs)

- Collections of large, dysplastic veins, usually with minimal connections to neighbouring veins.
- **Clinical:** Overlying skin can be blue. Usually compressible, enlarges with Valsalva manoeuvres
- **Ultrasound:**
  - Usually hypoechoic mass, can be ill-defined, intramuscular lesions can be hard to see
  - Extremely slow flow, can be easier to see on greyscale rather than Doppler. Try 'compress and release' to see inflow on colour Doppler. Phleboliths (calcified thrombus) almost always signify a VM

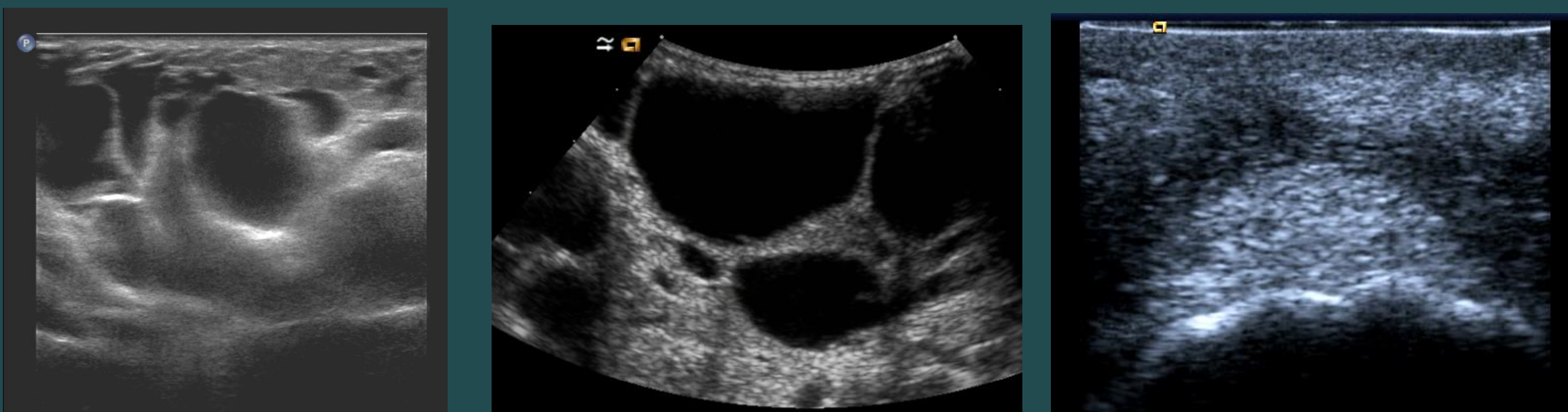


Thrombus in a venous malformation

Phlebolith

### Lymphatic malformations (LMs)

- Composed of thin-walled abnormal lymphatic spaces, forming macro and/or microcysts.
- **Clinical:** Compressible swelling. Overlying skin usually normal. Don't change in size with posture/Valsalva. Often larger when child is unwell.
- **Ultrasound:**
  - Always confined to fat.
  - Macrocysts (>10mm): large thin-walled cysts, no internal flow, may have normal flow within the septae, may contain debris or clot.
  - Microcysts: dense stroma, can be very hard to identify on USS, fat may simply look disorganised, may need MRI.

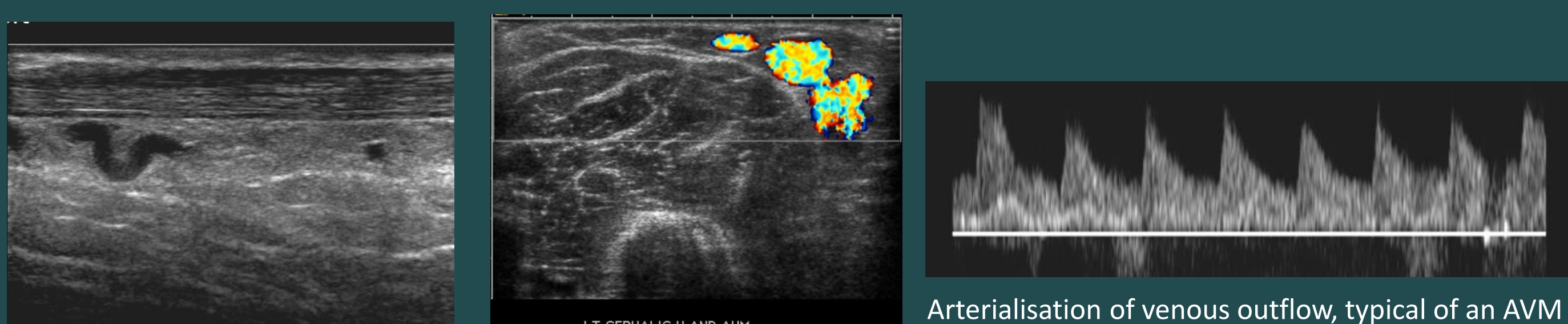


Macrocystic LMs

Microcystic LM

### Arteriovenous malformations (AVMs)

- AVMs are composed of directly communicating arteries and veins. Because they bypass the high resistance of capillary beds, they have high-flow and shunt blood from arterial to venous circulation.
- **Clinical:** hot, sweaty, pulsatile malformations
- **Ultrasound:**
  - No actual mass
  - High systolic and diastolic flow, with low resistance waveforms
  - If unsure → look for arterialisation of venous outflow

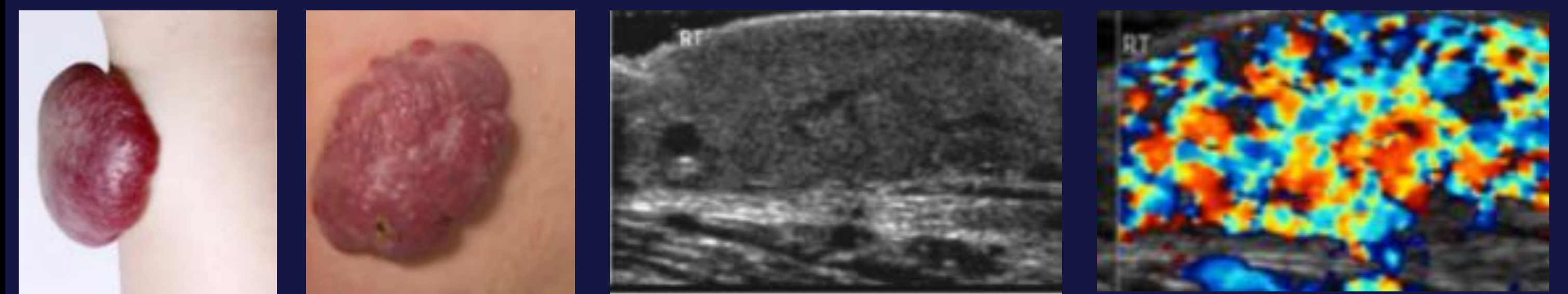


Arterialisation of venous outflow, typical of an AVM

## HAEMANGIOMAS

Haemangiomas are highly vascular tumours made of endothelial cells. Infantile lesions typically appear a few weeks after birth and grow rapidly until 6-8mths of age, then involute.

**Clinical:** usually raised and red but can be deep with no colour, feel soft & non-tender.



### Ultrasound:

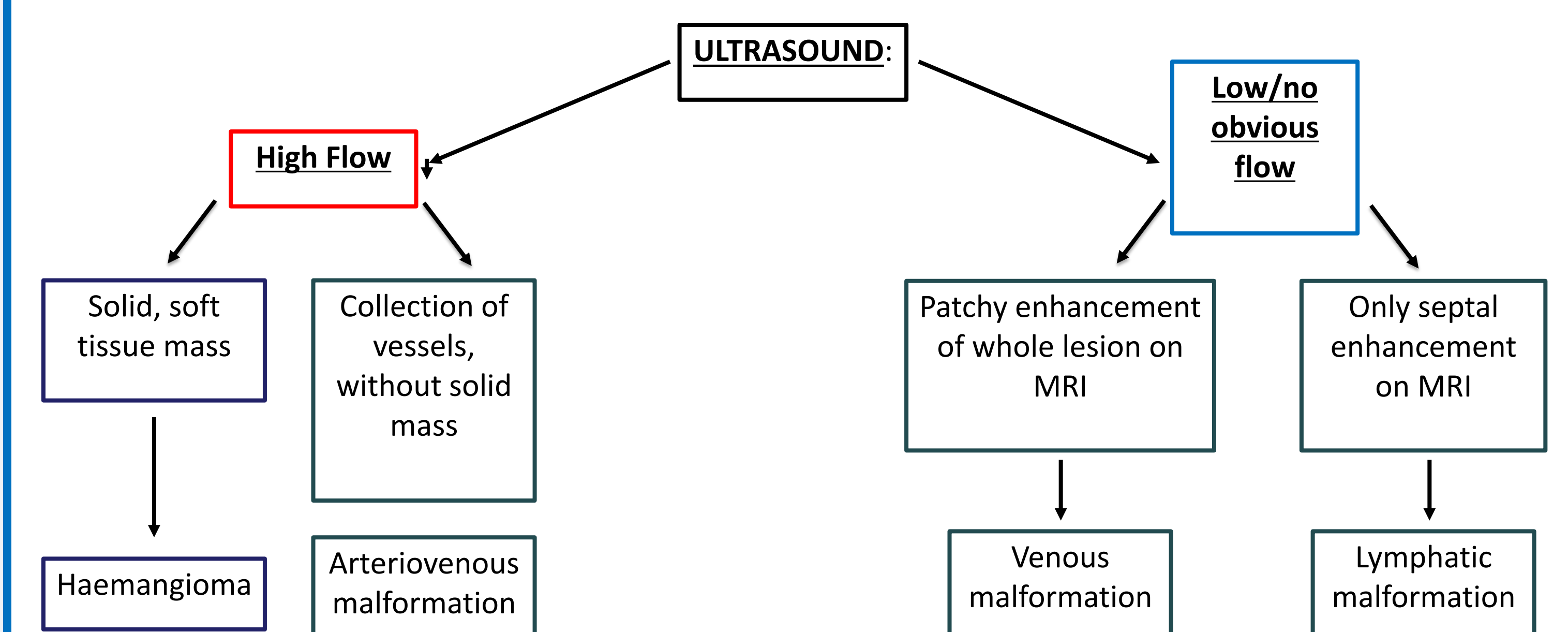
- Usually well defined, echogenic solid mass
- On Doppler: completely fills with colour
- Traces show high flow with a low resistance wave form

### Equipment:

High frequency linear transducer (or Hockey stick transducer for smaller lesions)

### Scan Technique:

- Expose region & support patient to reduce movement
- Examine lesion and take a history to gain extra clues
- Apply generous amount of warm gel to provide 'stand-off'
- Use minimum pressure when scanning – lymphatic malformations are susceptible to compression
- To improve visualisation of venous malformations, could ask the patient to perform a Valsalva or similar manoeuvre
- Use panoramic view to include the whole length of the malformation; this may avoid the need for MRI
- When assessing for vascularity – remember to adjust the PRF/scale for low flow; may be more obvious on greyscale



### References:

Mulliken, J. B., Glowacki, J., 1982. Haemangiomas and vascular malformations in infants and children: a classification based on endothelial characteristics. *Plast Reconstr Surg*, 69 (3): 412-22  
Mulligan, P. R., Prajapati, H. J. S., Martin, L. G. & Patel, T. H., 2014. Vascular anomalies: classification, imaging characteristics and implications for interventional radiology treatment approaches. *The British Journal of Radiology*, 87 (1035)