# Hirudotherapy and Maggot debridement therapy as alternative management of a chronic nonhealing ischemic wounds

## Our experience in Hirudotherapy in Slovakia

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# Scientica, ltd.

- was established by Partnership Agreement on March 5, 2010.
- Scientica, ltd. was certified by Ministry of Education of Slovak republic to conduct research activities in all aspects on natural and technical sciences including relevant medical research.
- From legal point of view, this certificate equalizes Scientica, ltd. to academic institutes or university research institutes
- Scientica, ltd. focus its research activities in following:

1) Biomedical research – development of biotherapeutic methods with using of animals as therapeutic agents and study of bioactive molecules produced by these organisms
2) waste management – development of bio-methods for elimination of organic waste by larvae of insects
3) Biological pest control – development of biological methods for control of insect pests.

Staff: Scientica, ltd. is operated by 2 managers. 33 researchers and technicians are employed for full or part time on solved projects.

- **Since 2010 research in the field of biotherapeutic methods is provided by the company SCIENTICA, Ltd, which received the grant from Operational Program of Research and Development of European Union**

***Research projects actually solved by Scientica, ltd.***

**Tittle: Research and development of new biotherapeutic methods for treatment of selected diseases**
**Contractor: Scientica, ltd.**
**Partner/s: Institute of Zoology SAS, Medical Faculty of Commenius University, Bratislava**
**Funding: EU Structural funds**
**Research period: 2010-2014.**

**Tittle: *The development of ecological methods for forest pests control in mountainous regions of Slovakia***
**Contractor: Scientica, ltd.**
**Partner/s: State Forests – High Tatras, Institute of Zoology SAS**
**Funding: EU Structural funds**
**Research period: 2010-2014.**

- **In the frame of these projects, modern laboratory for biotherapy production and research was developed**


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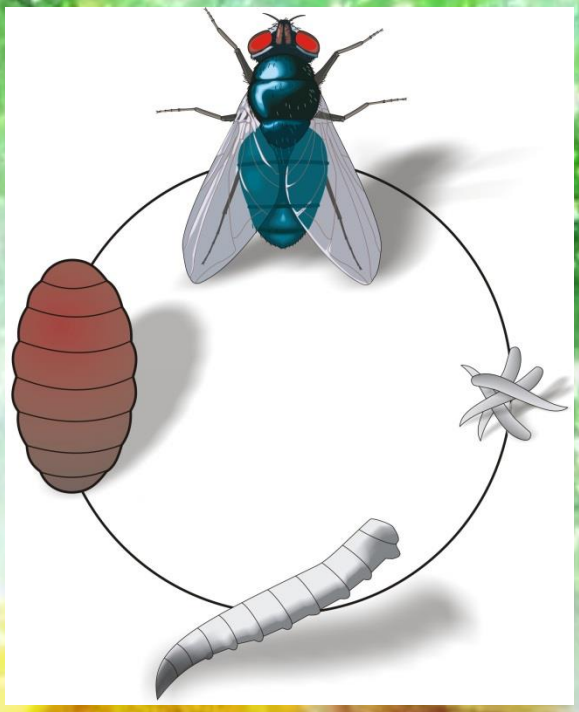
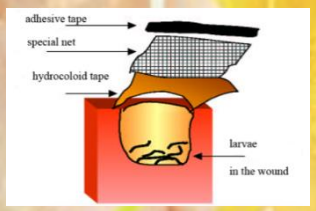
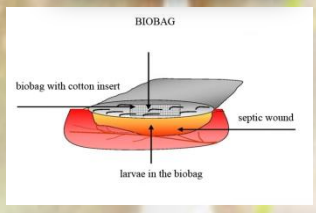
# Maggot debridement therapy



## Life cycle of the *Lucilia sericata* fly




# KARI- Trypanosomiasis Research Centre, Muguga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# Tenwek Hospital, Bomet, Kenya


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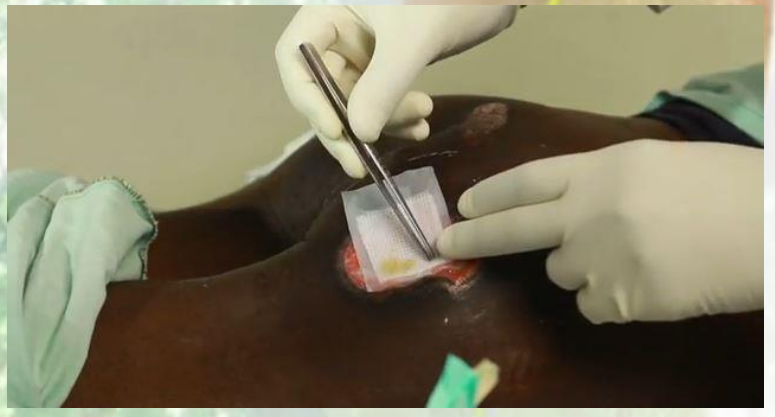
# Training in Slovakia


**DR. Saratiel Nyabera Luginu**
**Moi Teaching & Referral Hospital, Eldoret, Kenya**

# Kenyata National Hospital, Nairobi, Kenya

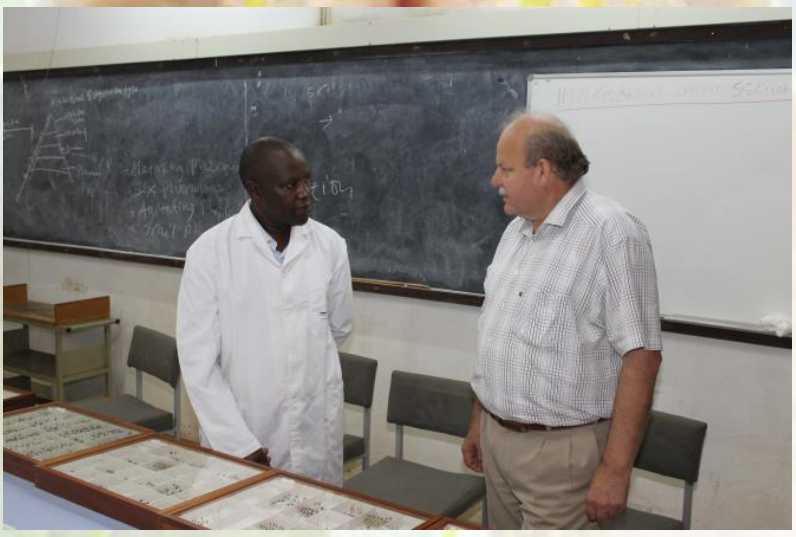




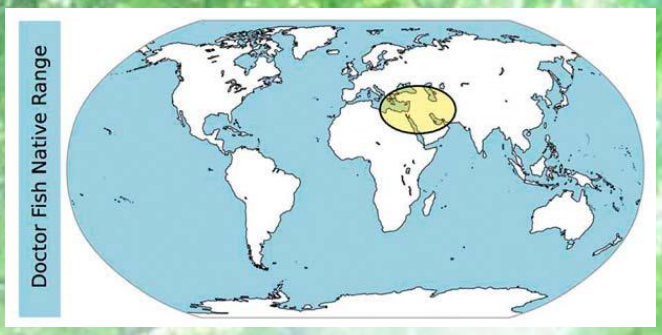
Včela medonosná *Apis mellifera*

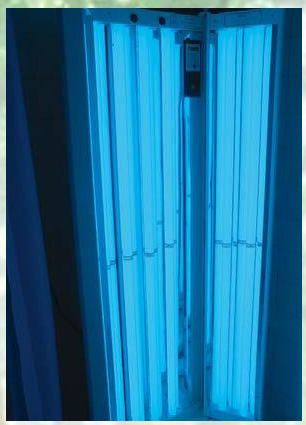
# Research on other Dipteran necrophagous insect





# Ichtyotherapy



# Apitherapy

- Honey is a popular natural product that is extensively used in the treatment of a broad spectrum of injuries, in particular chronic wounds.
- However, not all honeys exhibit equal antimicrobial potency and only a few of them meet the criteria for clinical usage.
- Slovak fir honeydew honey produced in Medar apiary (Bardejov) has a potential to be another medical-grade honey.
- It exhibits a strong antibacterial, anti-biofilm, immuno-modulatory and anti-inflammatory properties.
- It has successfully been used for treatment of infected gluteo-femoral fistulas and as a prophylactic agent of endophthalmitis


Treatment of leg ulcers with honeydew honey before and after 3, 6 and 9 weeks (in case of Case#1). Honey was sterilized and applied to a depth of 3 mm (20 g of honey to a 10 x 10 cm area).


Perianal fistula is a common disease that affects particular patients with inflammatory bowel disease.
Here we report a patient with persistent fistulas, in whom conventional medical and surgical therapy failed. In this case, most of fistulas in gluteofemoral region were completely healed and closed after 6 months of treatment with honey. In addition, honey reduced inflammation, pain and induration of affected region. This medical approach positively affected patient's mental condition and also improved his quality of life.

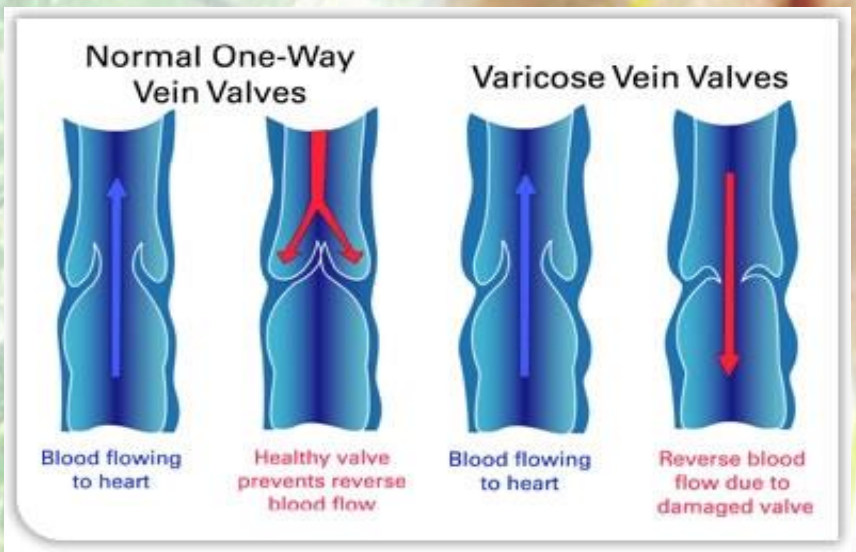
Taken together, honeydew honey is promising wound healing agent, represents an ideal inexpensive agent that meets all criteria to be therapeutically useful in treating chronic wounds.

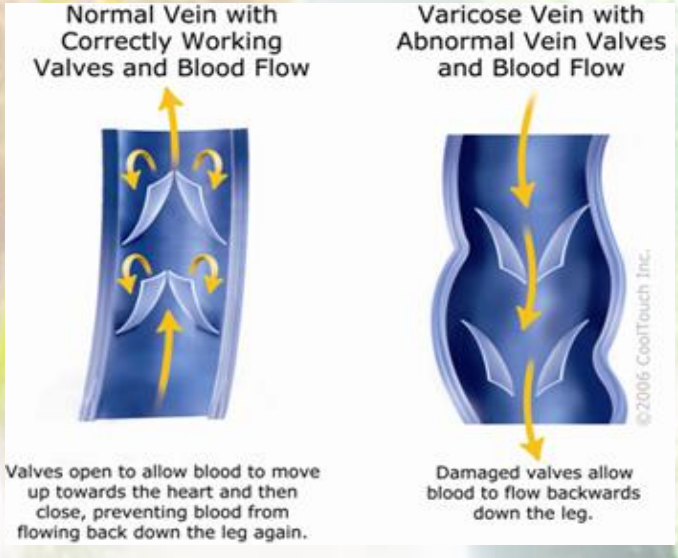
# Hirodotherapy

- our main interest is focused on the treatment of patients with venous disorders
- Venous disease is one of the best-established traditional indications for leech therapy

**Patients with:**

- **Chronic venous insufficiency** (CVI II-IV, VI stage CEAP classification ) CEAP classification (C – clinical, E – etiological, A – anatomical, P – pathophysiological classification)
- as functional venous valves are required to provide for efficient blood return from the lower extremities, Chronic venous insufficiency often occurs in the veins of the legs.
- Symptoms - Itching is sometimes a symptom, along with hyperpigmentation of the legs.
- Symptoms of CVI include phlebetic lymphedema and chronic swelling of the legs and ankles.
- The skin may react with varicose eczema, local inflammation, discoloration, thickening, and an increased risk of ulcers and cellulitis.



- **Post-thrombotic syndrom**
- can affect 23-60% of patients in the two years following Deep vein thrombosis
- of those, 10% may go on to develop severe PTS, involving venous ulcers
- symptoms of PTS in the leg may include pain, heaviness itching or tingling, swelling (edema), varicose veins brownish or reddish skin discoloration, ulcer
- **Thrombophlebitis**
- is related to a thrombus in the vein. Risk factors include disorders related to increased tendency for bloo clotting, injury to vein wall and reduced speed of blood in the veins such as varices and prolonged immobility.
- Specific disorders associated with thrombophlebitis include superficial thrombophlebitis (affects veins near the skin surface) and deep venous thrombosis (affects deeper, larger veins).
- Symptoms - skin redness or inflammation

**Phlebothrombosis**

- occurs when a blood clot in a vein (venous thrombosis) forms independently from the presence of inflamation of the vein (phlebitis).
- Symptoms - pain and swelling foot or calf

| Diagnosis | Number of patients | Results | Complications |
|---|---|---|---|
| CVI II-IV CEAP | 10 | 7x improvement of symptoms CVI (pain, spasm), swelling – 2 cm | 1x erythema, increased temperatures |
| CVI VI CEAP | 4 | Healing in 2 months | |
| Post-thrombotic syndrome | 6 | Clinical improvement(swelling, symptoms CVI) | 1 x increased temperature, bleeding |
| Acute thrombophlebitis, VSM *(vena saphena magna)* VSP *(vena saphena parva)* | 5 | Clinical improvement in 7 days, recanalisation after 4 weeks (CCDS = Color-Coded Duplex Sonography) | 1x erythema, increased temperature |
| Acute phlebothrombosis, VP *(vena porte)*, VTP *(vena tibialis posterior)*, VFi *(vena fibularis)* | 3 | Recanalisation after 4 weeks (CCDS) | |

**CVI, IV, CEAP**
**before leech treatment**

**after 2 month leech treatment**

**Post-thrombotic syndrom before leech treatment**

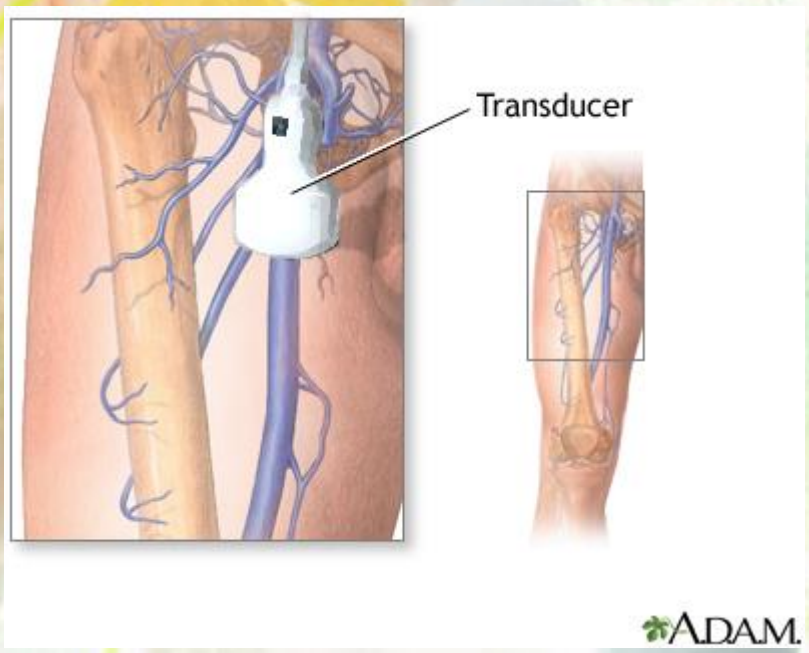
**after 1 month leech treatment**

**CVI II, CEAP**
**before leech treatment**

**after 1 month leech treatment**

## Doppler Ultrasonography

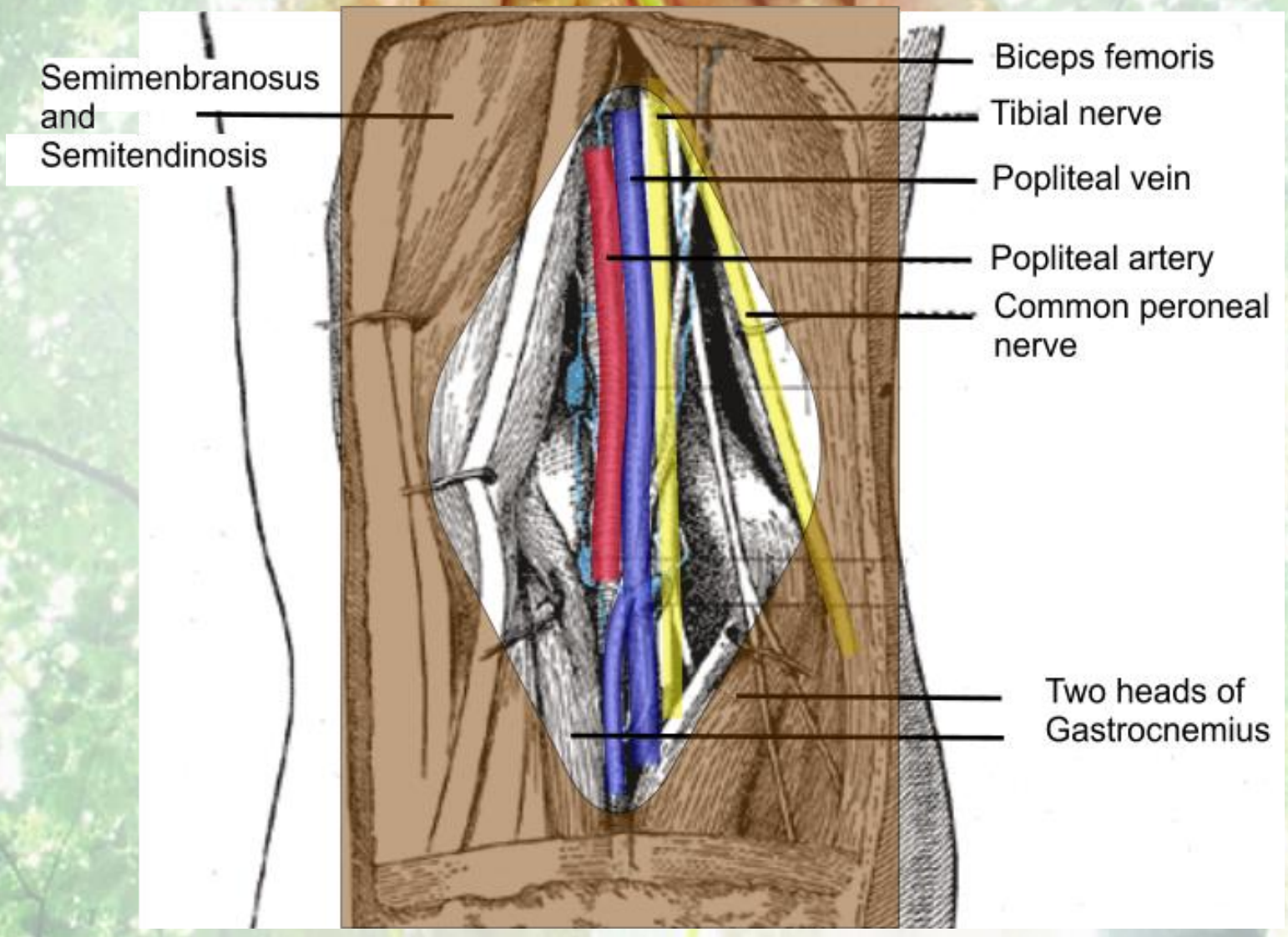
- is a non-invasive diagnostic procedure that changes sound waves into an image that can be viewed on a monitor.
- can detect the direction, velocity, and turbulence of blood flow.
- It is frequently used to detect problems with heart valves or to measure blood flow through the arteries. Specifically, it is useful in the work up of stroke patients, in assessing blood flow in the abdomen or legs, and in viewing the heart to monitor carotid artery diseases.



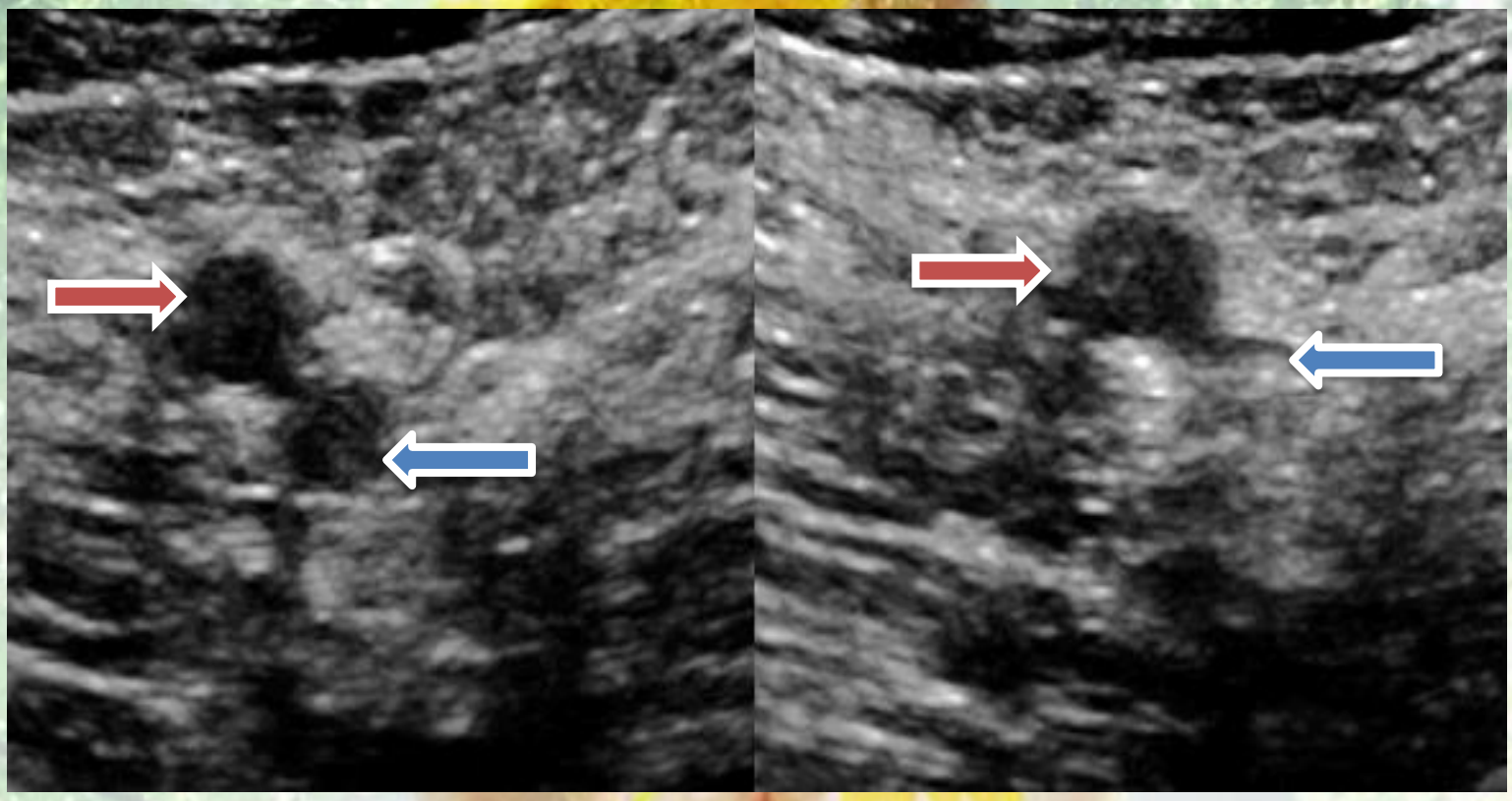
**Diagnosis:**

**Thrombophlebitis of distal vena poplitea and medial branch of calf vein, absence of recanalisation.**

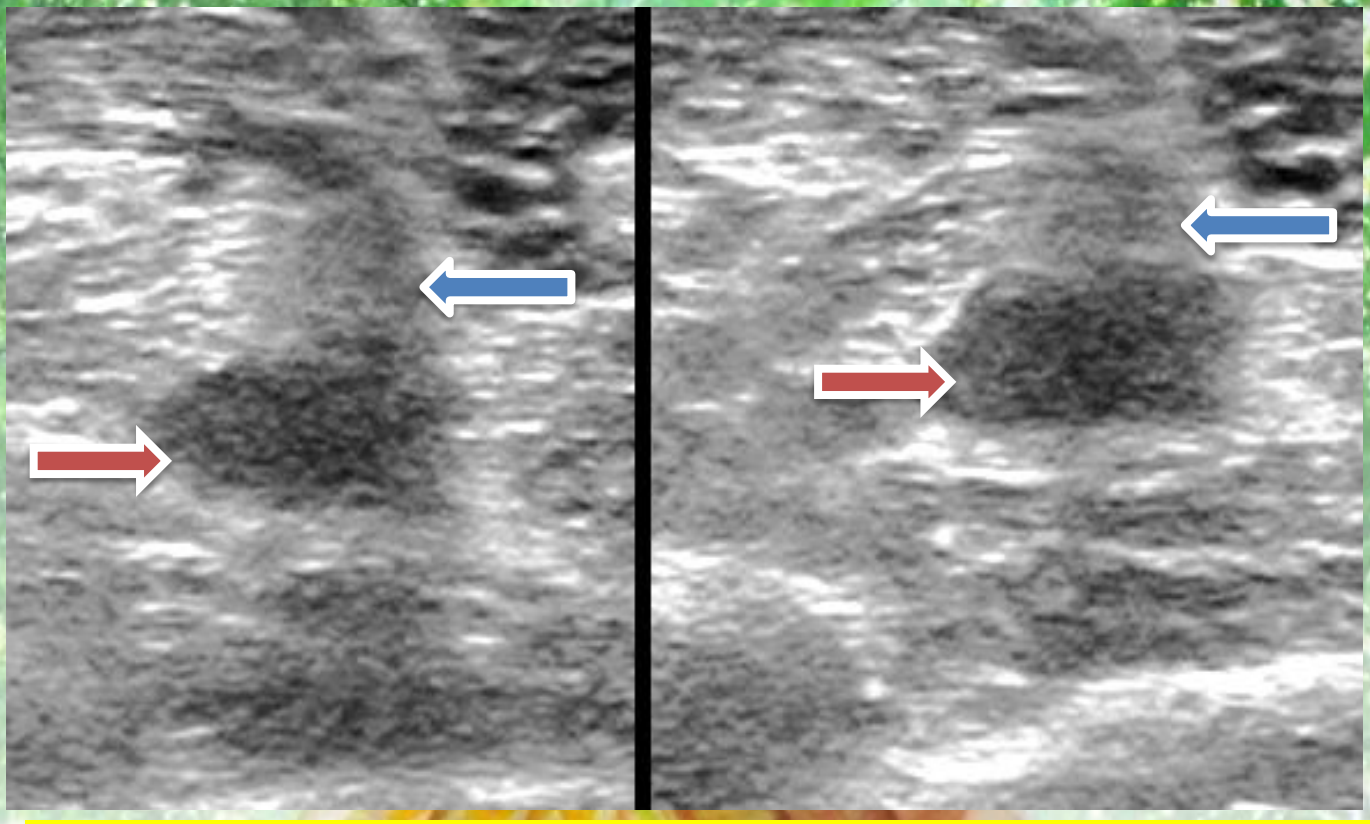
**The popliteal vein is located behind the knee. Its course runs alongside the popliteal artery, but carries the blood from the knee joint and muscles in the thigh and calf back to the heart.**



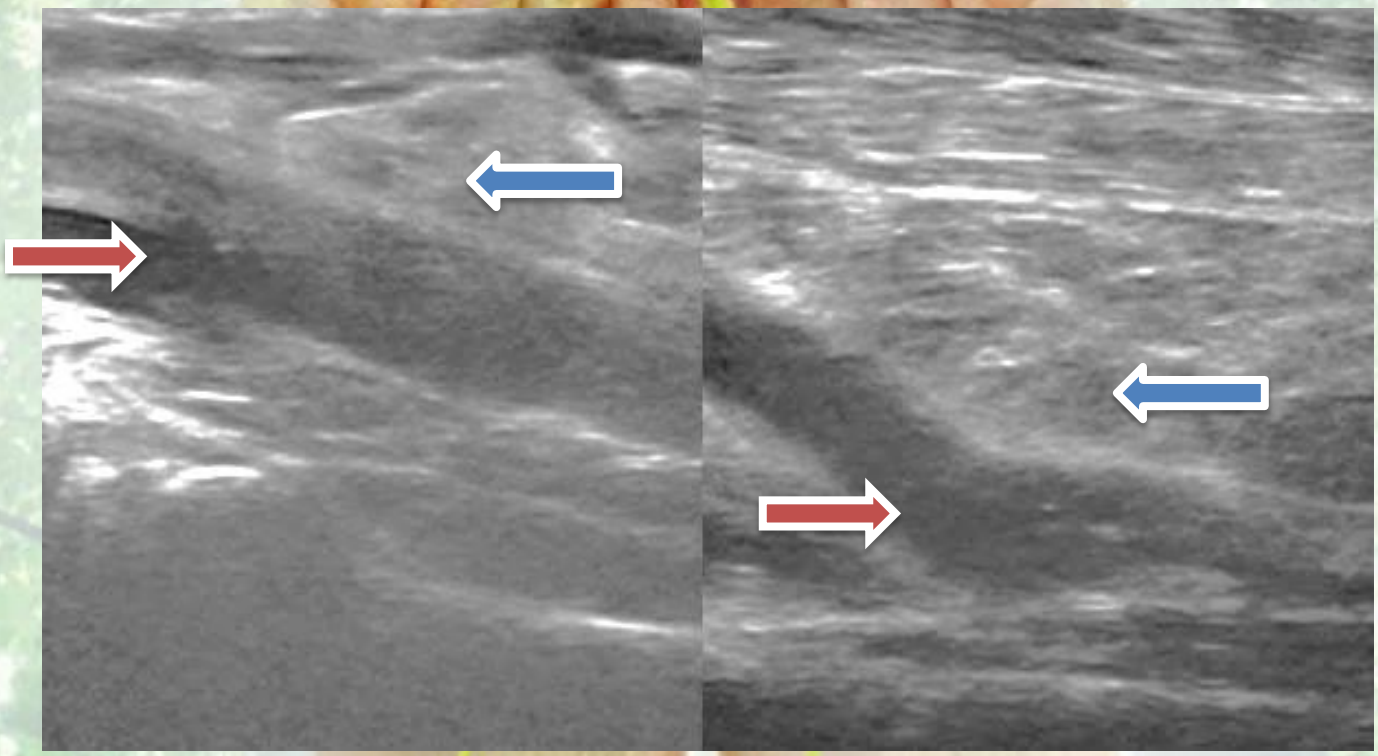
**Arteria and vena poplitea under Hunters´canal , over thrombus = normal arteria and vein, left – no compression,
right – compression, vein is without thrombosis.**



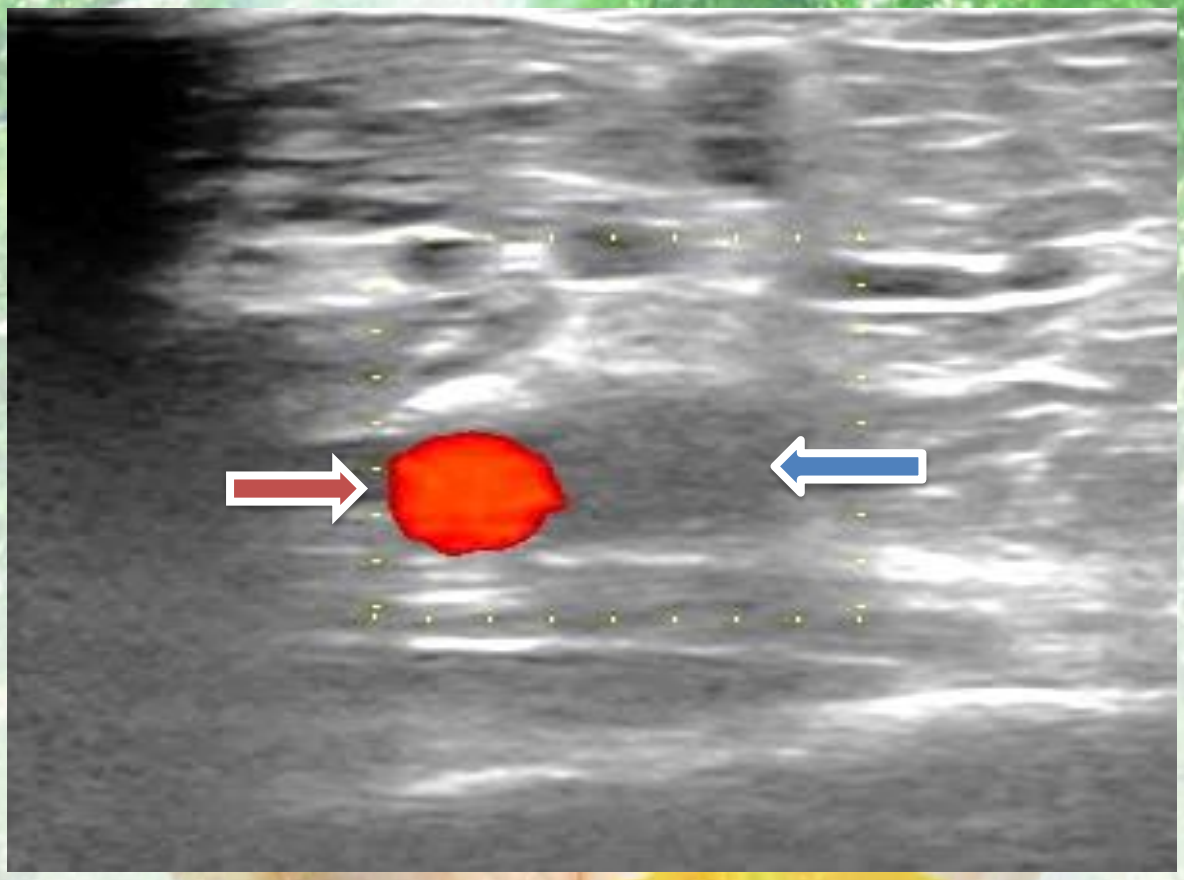
cross section arteria and vena poplitea



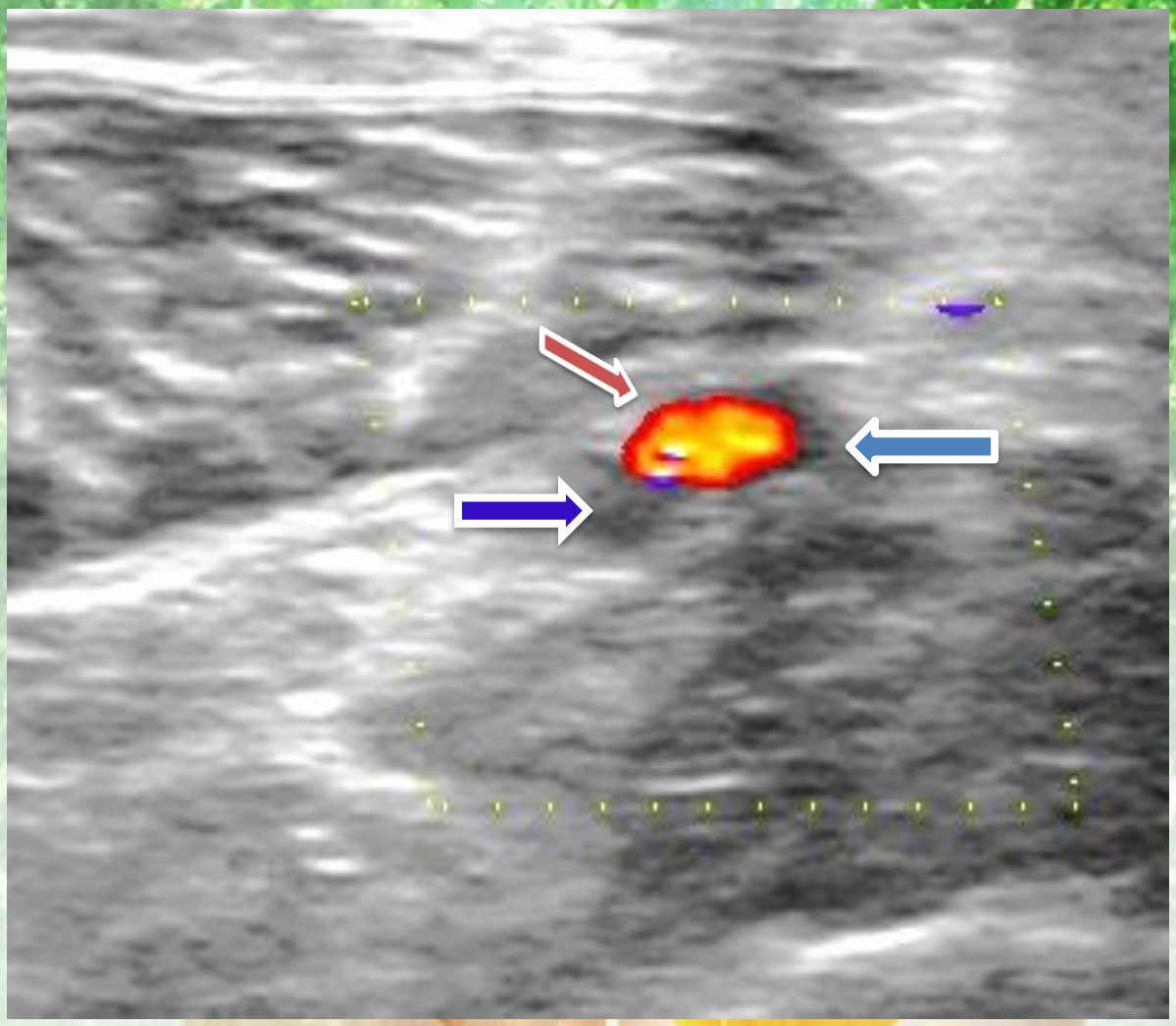
longitudinal section arteria and vena poplitea



Before application of leeches: distal section of the arteria and v.poplitea (in the slot at the knee joint) - thrombosis in the v. poplitea (gray color ).
V.poplitea is completely filled of subacute, homogenous hypoechogenal thrombus = gently dilated

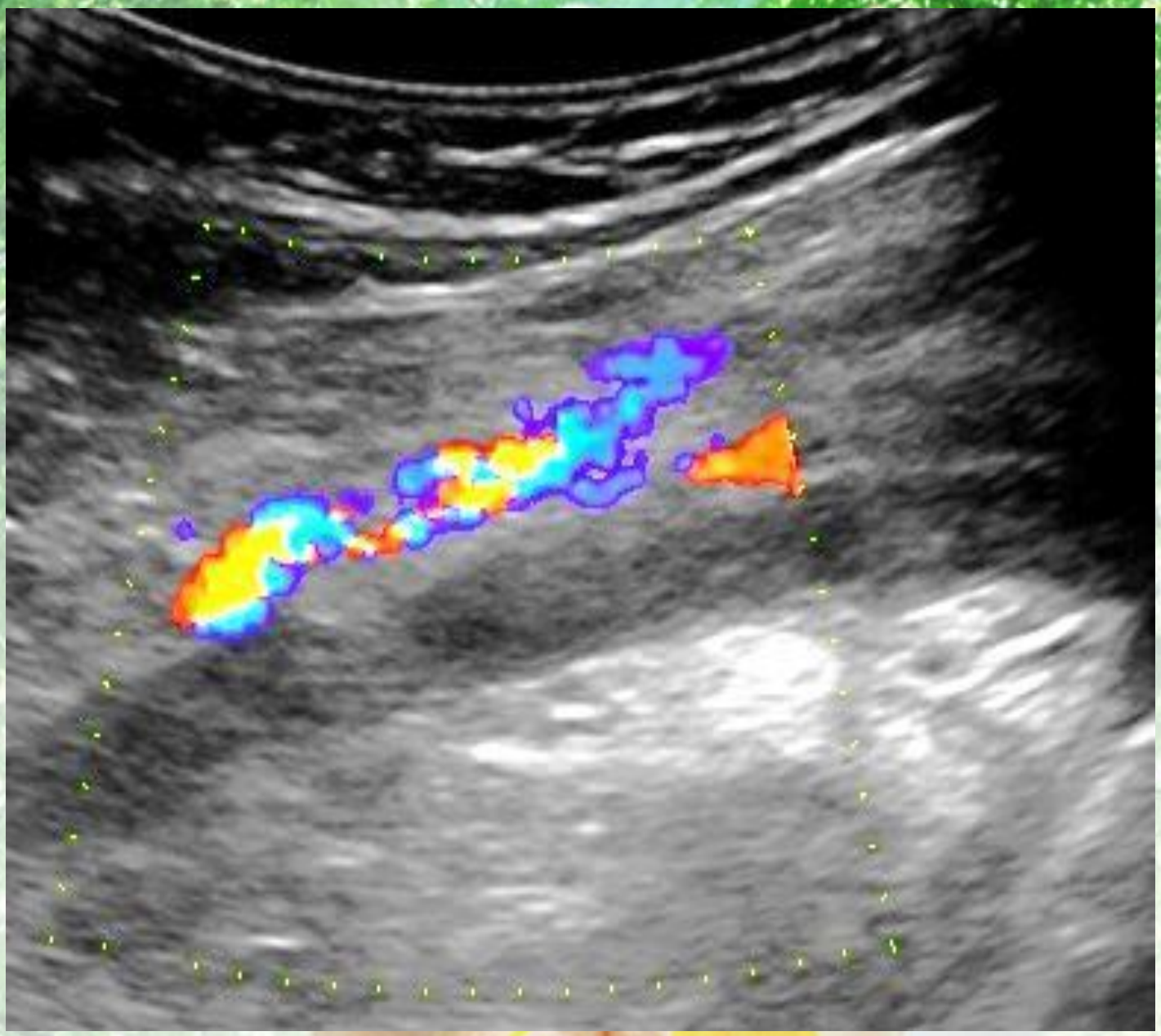


**Cross section of the Thrombosis vena poplitea during augmentation maneuver + CFM / color flow mapping,**
**Red colour - flow in arteria poplitea,**
**Gray colour to the right of it – vena poplitea without flow, no color = thrombosis**

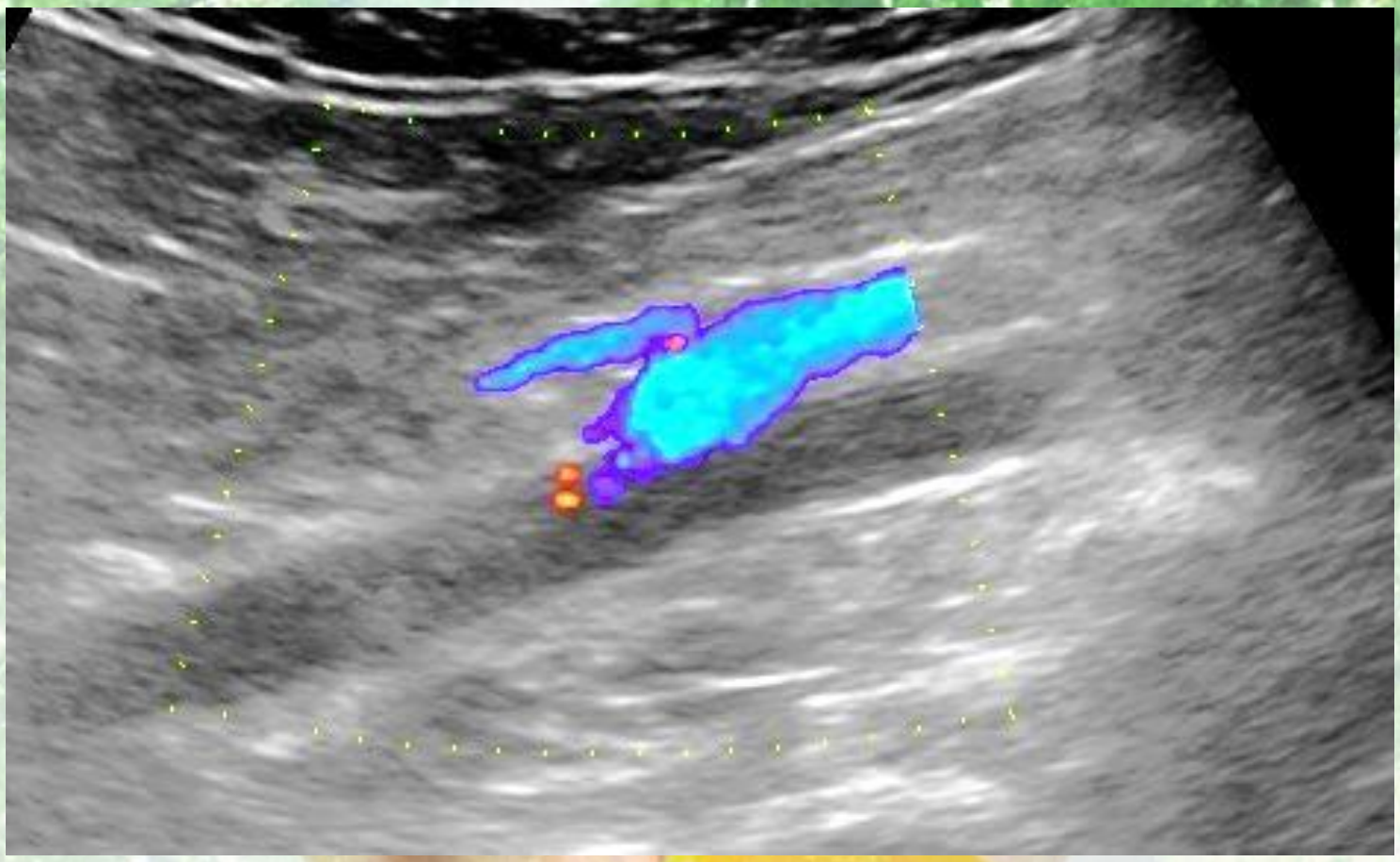


caudal part of the  vena tibialis posterior - in the middle third of the calf
 both branches gray / around the artery red / both thrombotic

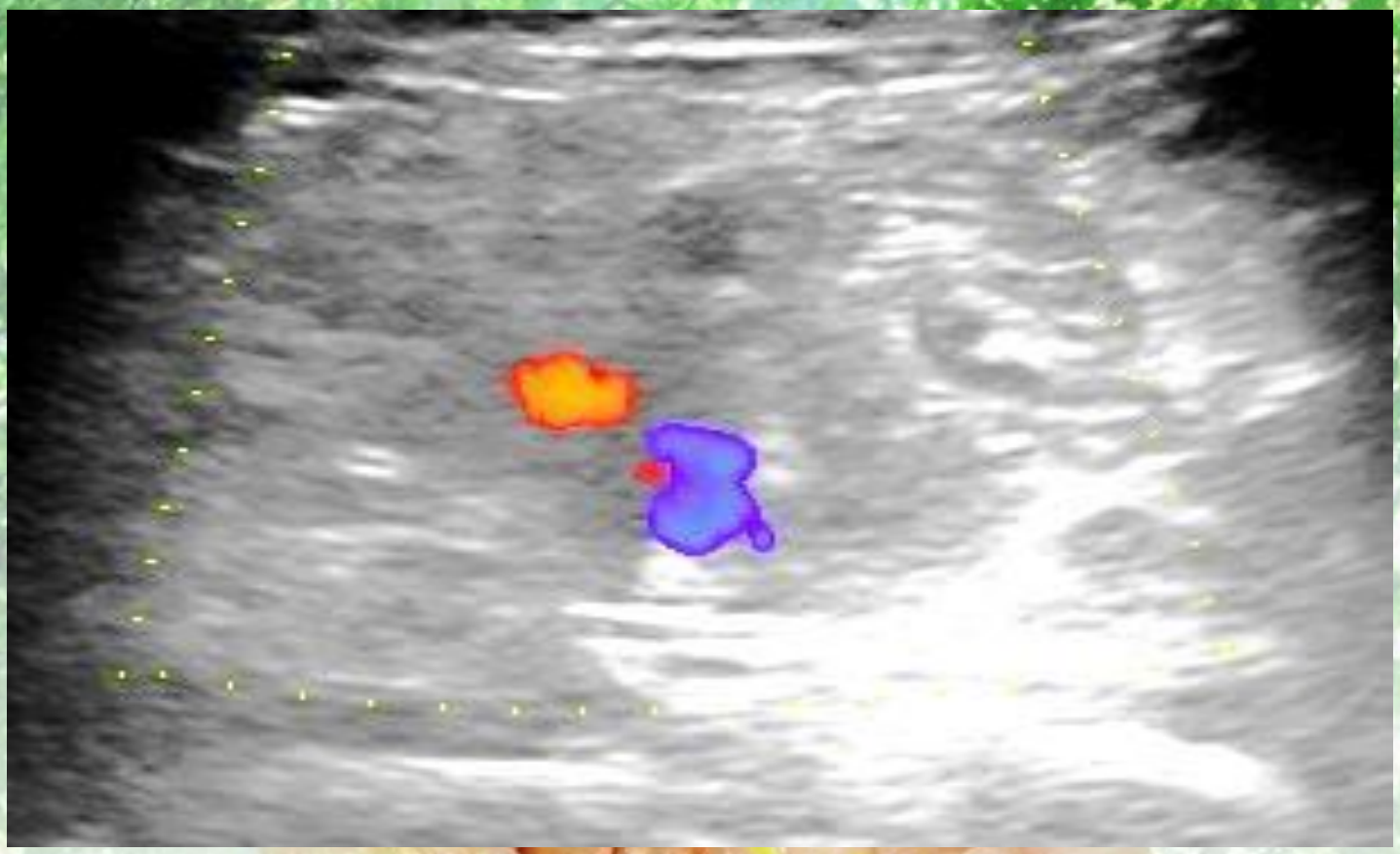
**After application of leeches**
**parcial recanalization v.poplitea - about 30%,**
**red = flow in the central part - in about one third during augmentation maneuver**
**gray bars above and below = thrombus on the wall - to fill about 2/3 vein lumen**



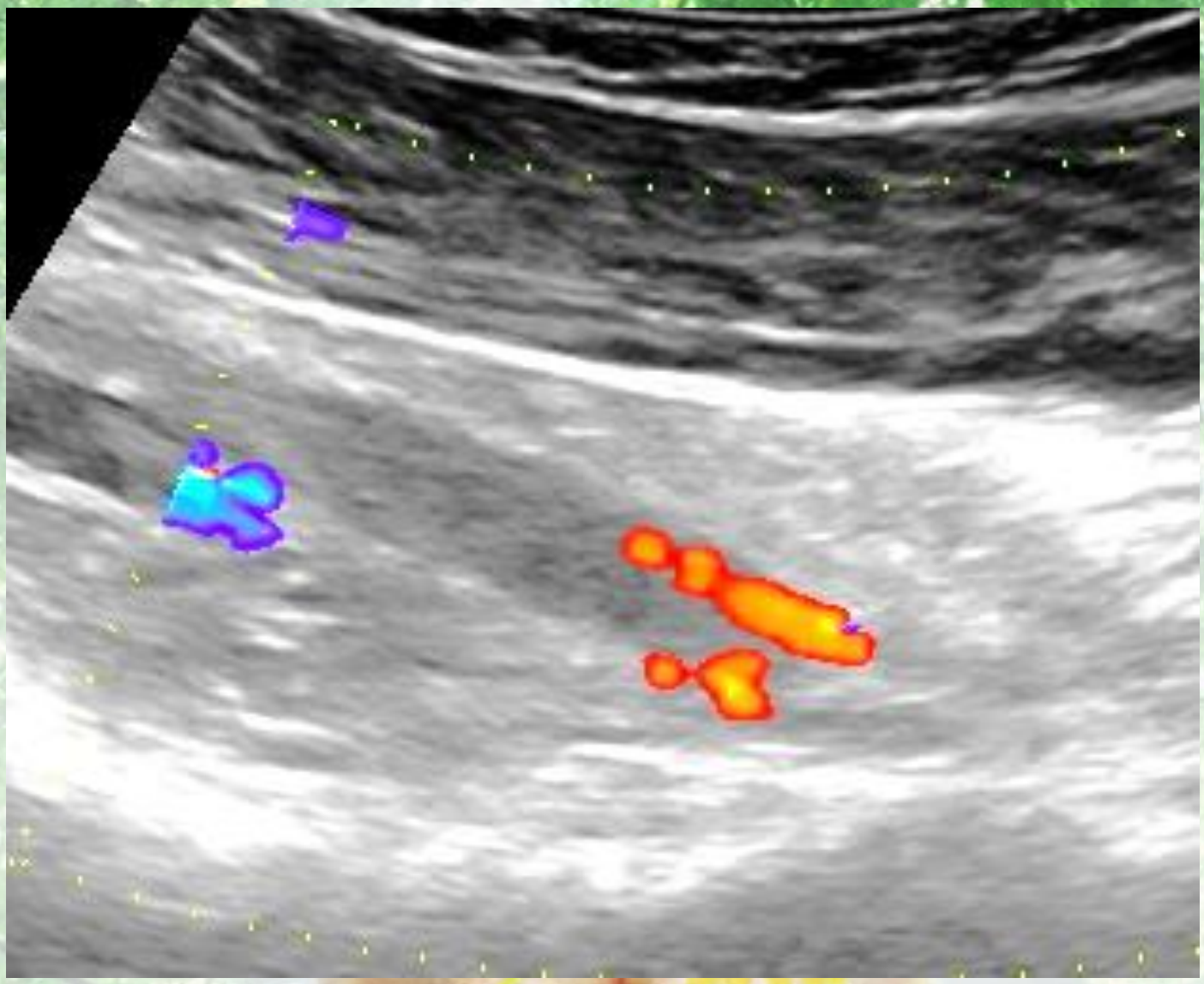
**distal part of vena poplitea**
**turbulent flow in irregular lumen, thrombus wrap,**
**recanalization about 1/3 of the lumen**



**short section of vena poplitea with almost complete recanalization**

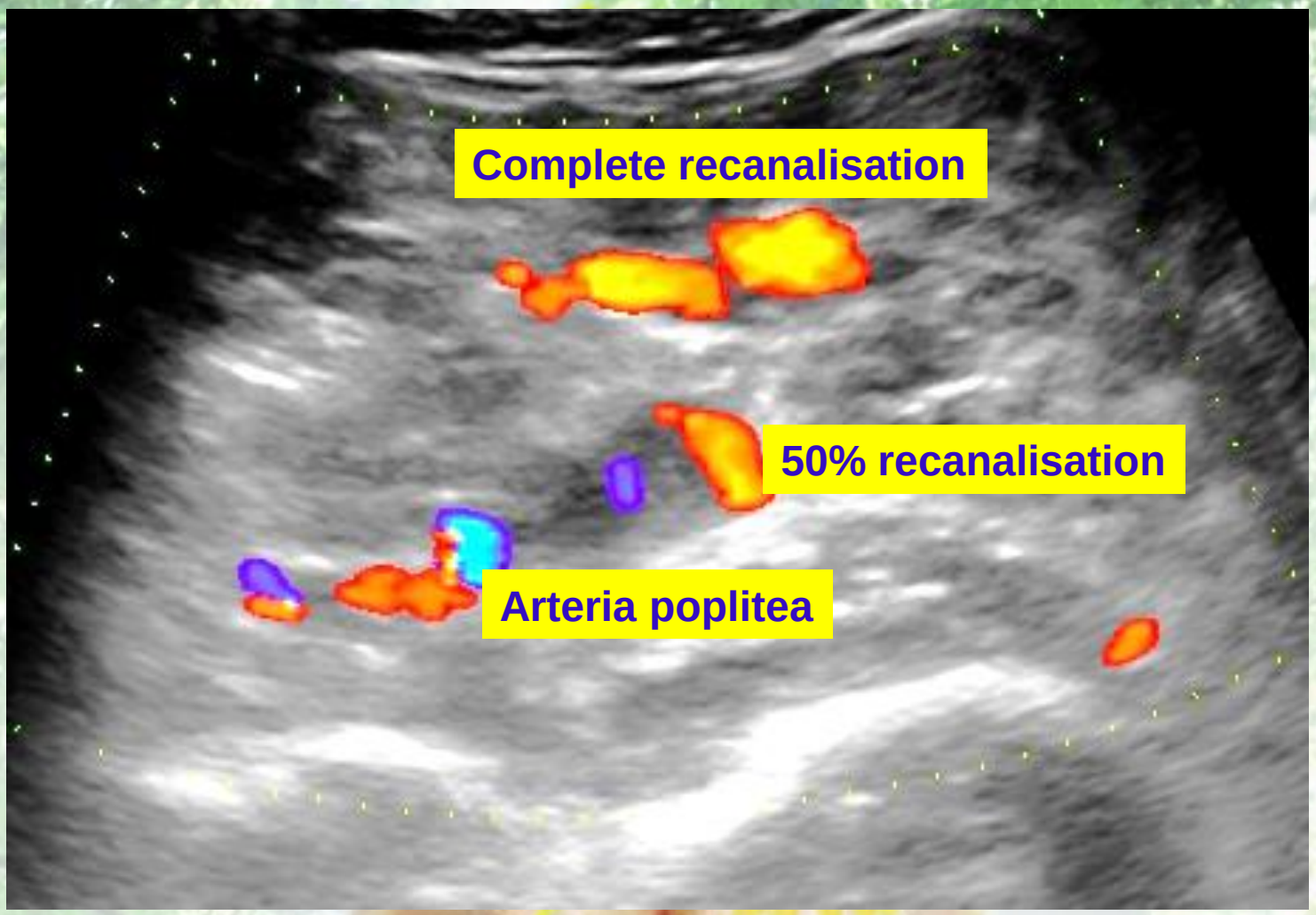


**Cross-section of artery and vena poplitea**
**recanalization vena poplitea - about 30% in augmentation maneuver**
**red - the central blood flow in1/3 of  the vein**



red color – peripheral thrombus drain – flow in 2/3 of vein

**Complete recanalisation in v.poplitea (red color), without thrombosis.**


Complete recanalisation
50% recanalisation
Arteria poplitea

## Next aim: Combination of the Hirudotherapy and Maggot debridement therapy as alternative management of a chronic nonhealing ischemic wounds

- in severe wound cases complicated by the presence of necrosis and infection, alternative forms of wound therapy have been successful when traditional medicine have failed. The application of fly larvae (maggots) is referred to as maggot debridement therapy.

- Worldwide another organism used for biotherapy the leech, is considered standard of care for venous congestion of the nonhealing wound.
- The first phase of treatment consisted of the continuous application of sterile larvae of the common green bottle fly (Lucilia sericata) over open wound for 3 days.
- The goal was to debride the necrotic tissues through the proteolitic action of maggot secretions, while sparing the surrouinding live structures.
- When the complete maggot debridement was achieved, medical grade leeches were used for consecutive applications twelve hours apart.
- The goal of the leech therapy was to temporarily maintain blood drainage until complete revascularization occurence

# Example of successful treatment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