Chronische venöse Insuffizienz: Ultraschall-gesteuerte Interventionen

PD Dr med Rolf Engelberger

HFR Fribourg - Service d'Angiologie

rolf.engelberger@h-fr.ch

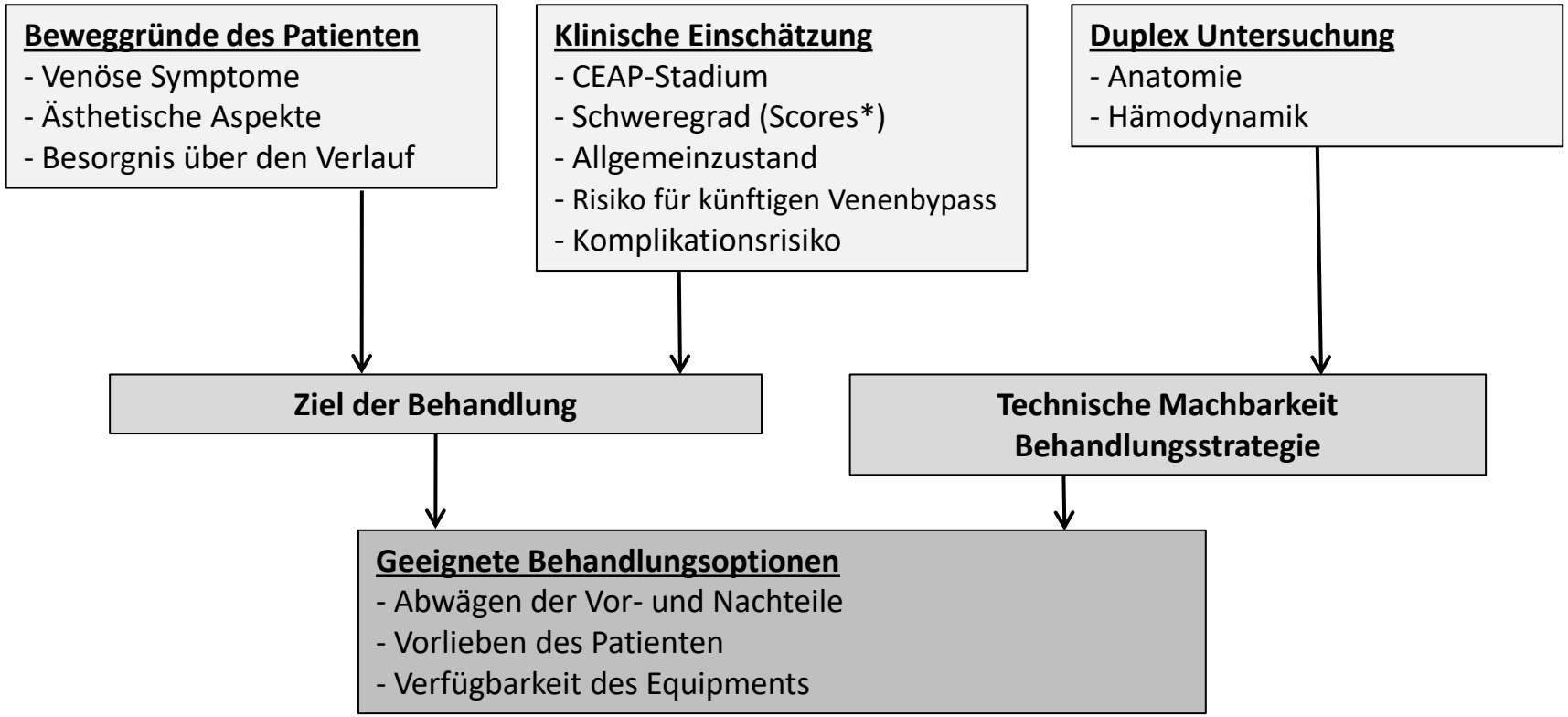
SGUM Sektion Gefässe *Abschlusskurs Periphere Arterien und Venen* in Basel, 23-24 April 2026

Ultraschall-gesteuerte Interventionen

- Rolle des
  - Ultraschall vor … → Dr Thomas Baldi
  - Ultraschall während …
  - Ultraschall nach …

invasiver Varizentherapie

Therapie „à la carte“



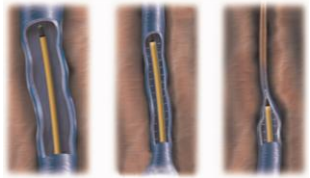
Invasive Varizentherapie

Thermisch

Thermal Tumescent

- **Endovenöse Lasertherapie**

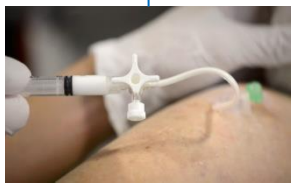
- **Endovenöse Radiofrequenz-Therapie**



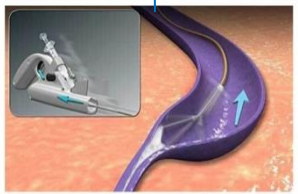
Chemisch

Non-Thermal Non-Tumescent

- **US kontrollierte Schaum-Sklerotherapie**



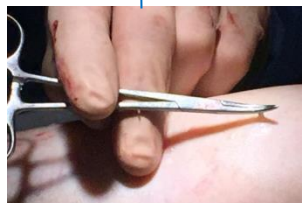
- **Pharmaco-mechanisch (ClariVein™)**



- **Non-Sclerosant**
  - **Klebstoffe (VenaSeal™)**

Mechanisch

Surgical



Ultraschall während invasiver Varizentherapie

	Thermal Tumescent		Non-Thermal Non-Tumescent			Surgical
					Non-Sclerosant	
	Endovenöse Lasertherapie	Endovenöse Radiofrequenz-Therapie	US kontrollierte Schaum-Sklerotherapie	Pharmaco-mechanisch (ClariVein™)	Klebstoffe (VenaSeal™)	
Punktion	+	+	+	+	+	
Lokalisierung Sonde	+	+		+	+	
Lokalisierung Nerven	+	+				
Tumeszenz	+	+				
Ausdehnung/Vasospasmus			+			
„Lokalisation Vene“			+			+/-
Kompression mit US Sonde					+	
Kontrolle tiefes Venensystem sofort nach Intervention	+	+	+	+	+	

Ultraschall während invasiver Varizentherapie

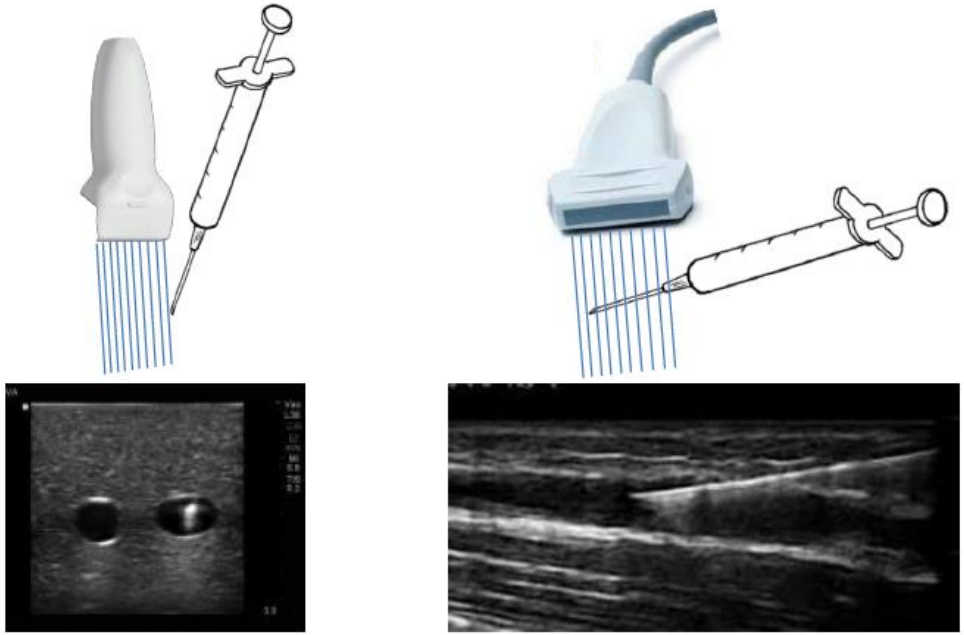
→ Punktion

- Venenlage/Tiefe → Nadellänge
- Perivenöse Strukturen
- Möglichst hochfrequentige US Sonde
- Längs- oder Querpunktion

Ultraschall während invasiver Varizentherapie

→ Punktion

- Querpunktion

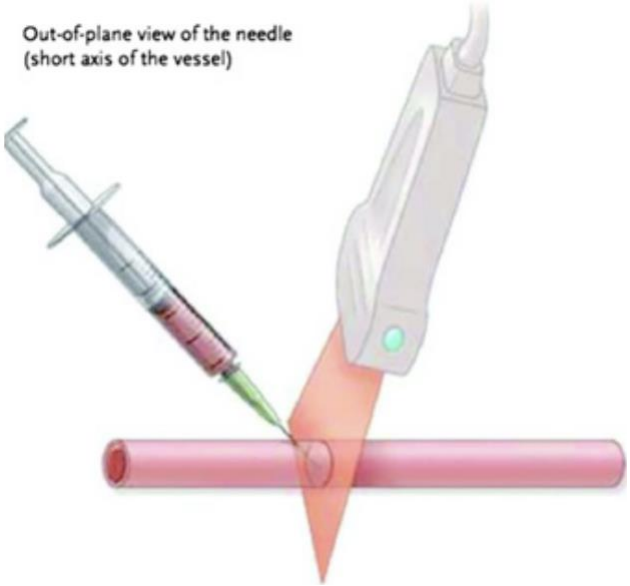


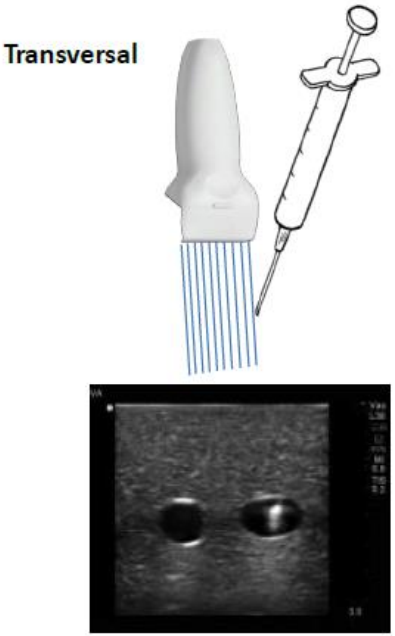
- Längspunktion

Ultrasound during venous intervention

→ Puncture

Out-of-plane / Transverse





Advantage

- Simpler
- Anatomical orientation (structures / direction)

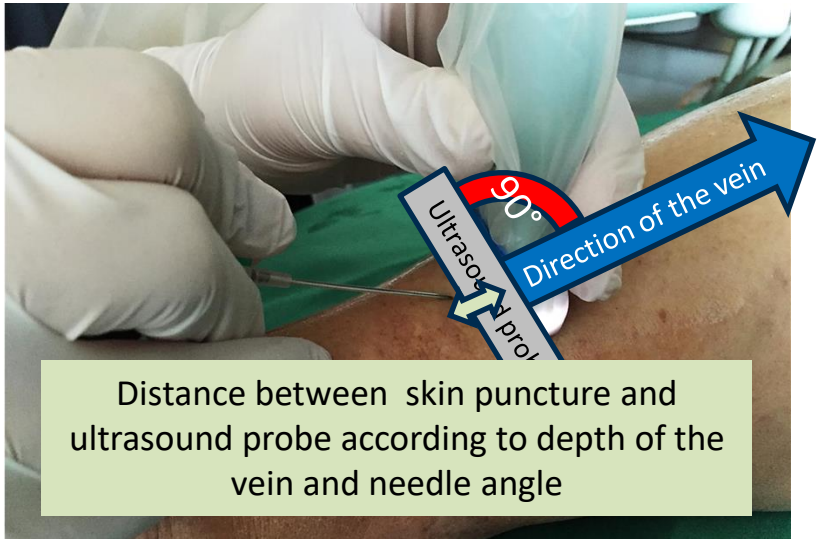
Disadvantage

- Pinpoint visibility of the needle
- Needle tip?

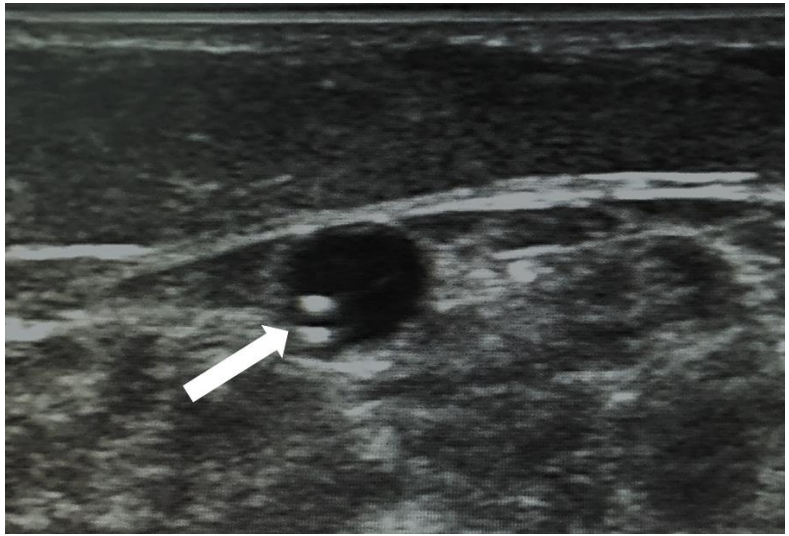
Ultrasound during venous intervention

→ Puncture

Out-of-plane / Transverse



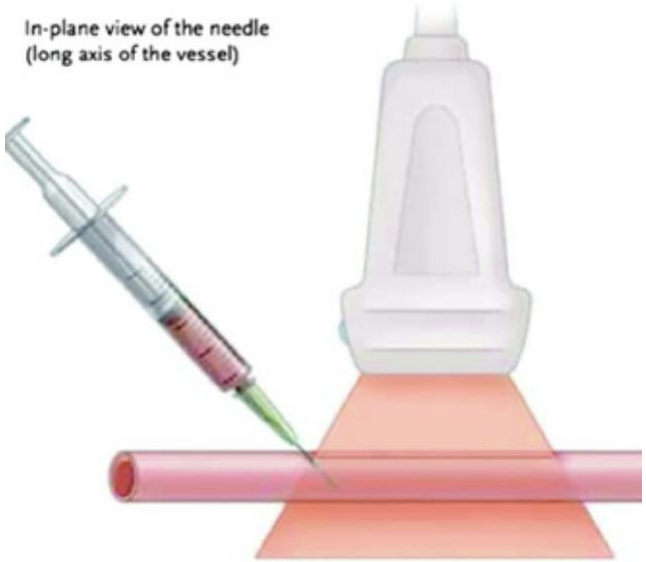
Distance between skin puncture and ultrasound probe according to depth of the vein and needle angle

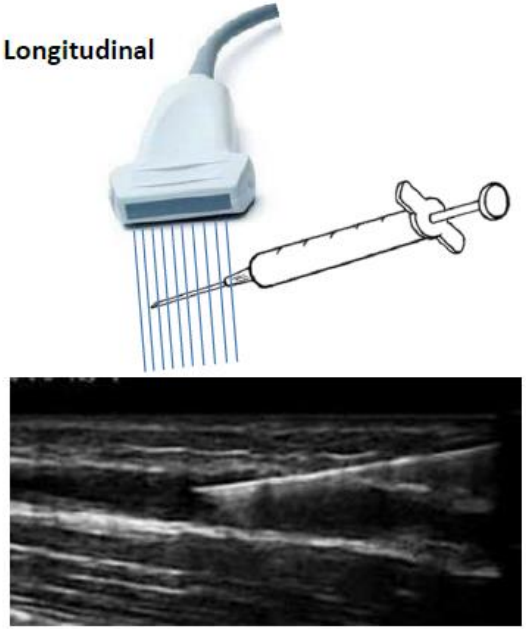


Ultrasound during venous intervention

→ Puncture

In-Plane / longitudinal





Advantage

- Good visibility of the needle/tip from the skin down to the vessel
- Control of surrounding tissues to avoid complications

Disadvantage

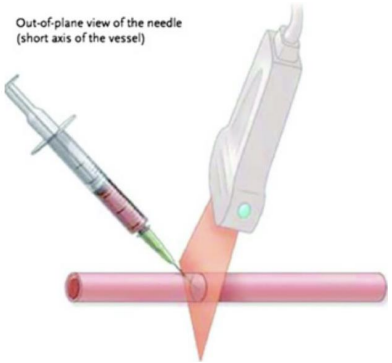
- More difficult - a matter of practice

Ultrasound during venous intervention

→ Puncture… My way

For *superficial veins*

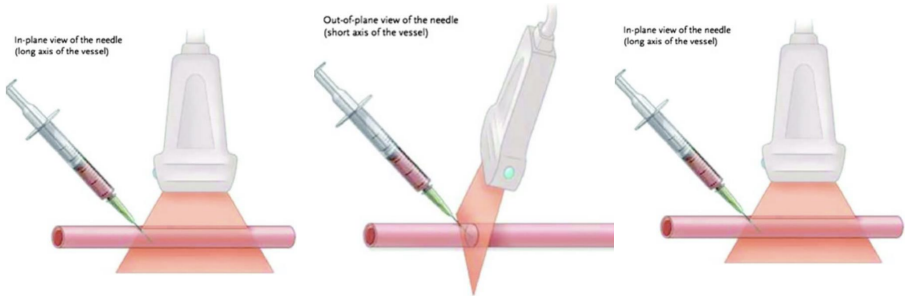
→ ***transverse***



For *deep veins or arteries*

→ **Combination**

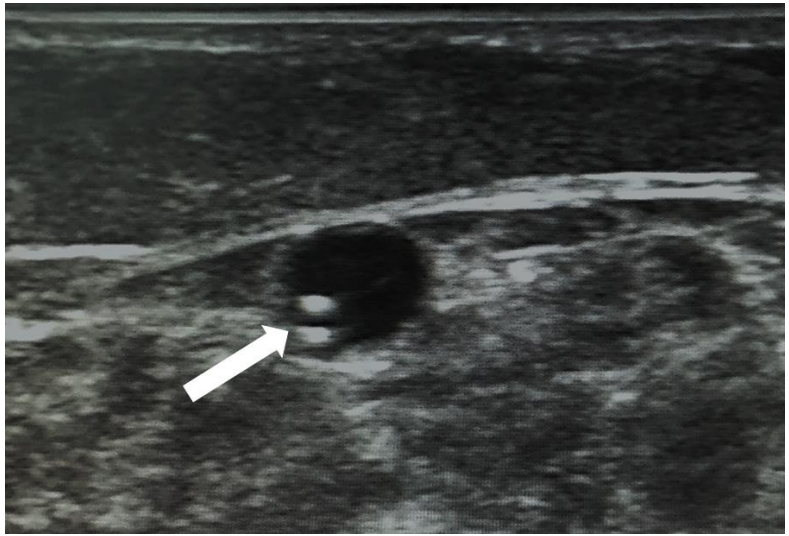
- → ***Longitudinal*** **to see the needle tip all the time**
- → ***Transverse*** **to be sur to be at the apex of the vx**
- → ***Longitudinal*** **to enter into the vx (and follow the guidewire)**



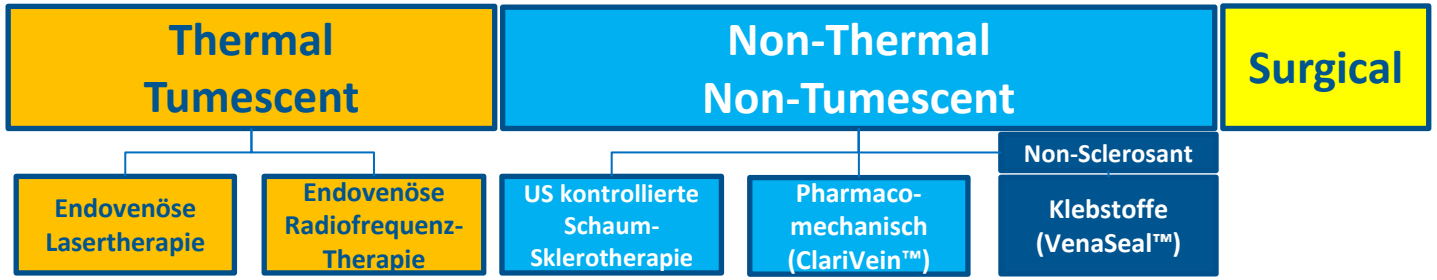
Ultraschall während invasiver Varizentherapie

→ Punktion

- Querpunktion



Ultraschall während invasiver Varizentherapie



Punktion	+	+	+	+	+

Ultraschall während invasiver Varizentherapie

→ Lokalisierung der Sonde

Beispiel LASER Sonde bei V. saphena parva

Ultraschall <u>während</u> invasiver Varizentherapie

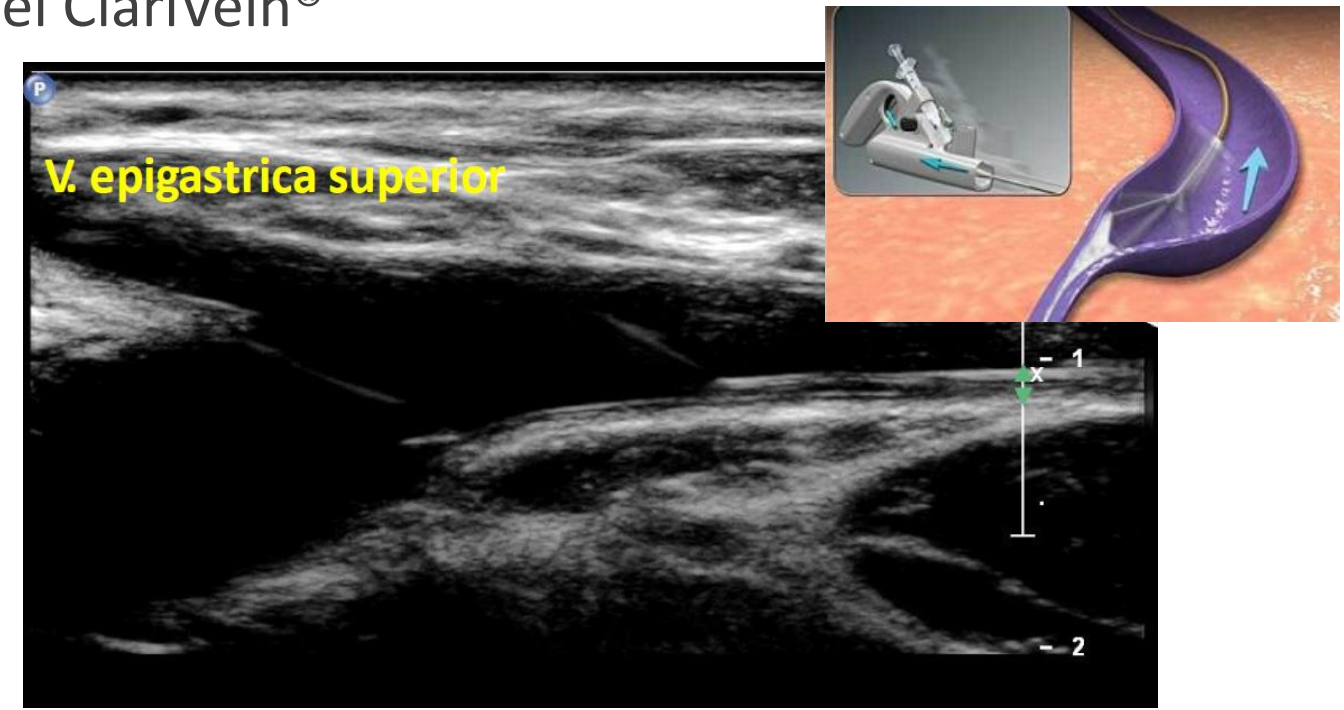
→ Lokalisierung der Sonde

Beispiel LASER Sonde bei V. saphena parva

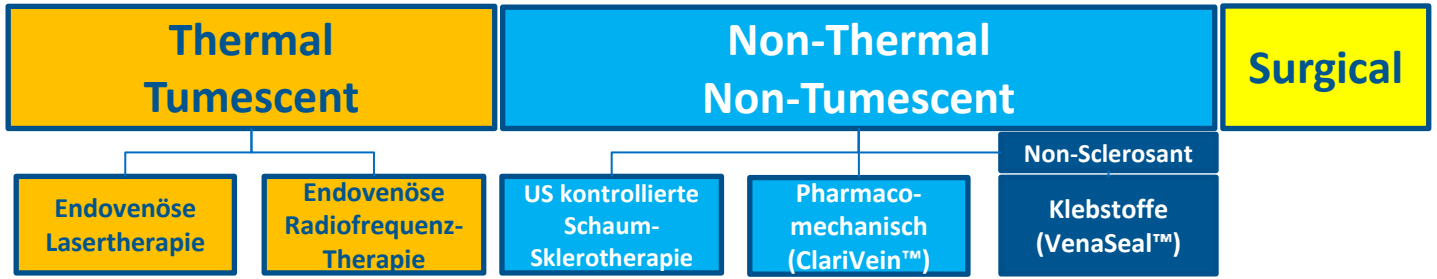
Ultraschall während invasiver Varizentherapie

→ Lokalisierung der Sonde

Beispiel ClariVein®



Ultraschall während invasiver Varizentherapie



Punktion	+	+	+	+	+
Lokalisierung Sonde	+	+		+	+

Ultraschall während invasiver Varizentherapie

→ Lokalisation der Nerven

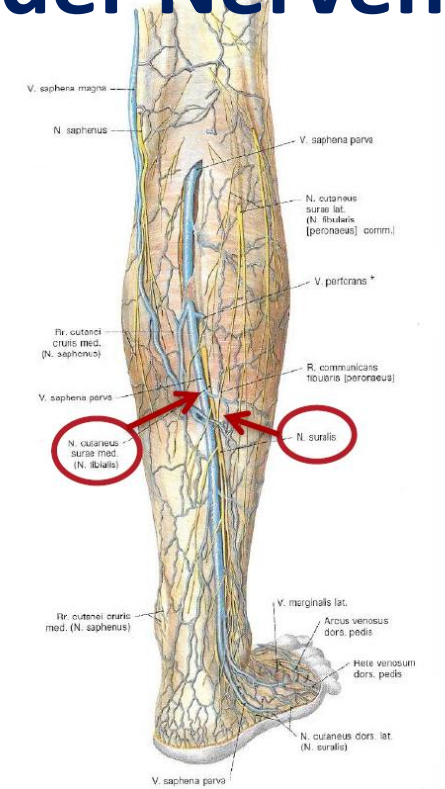
V. saphena parva

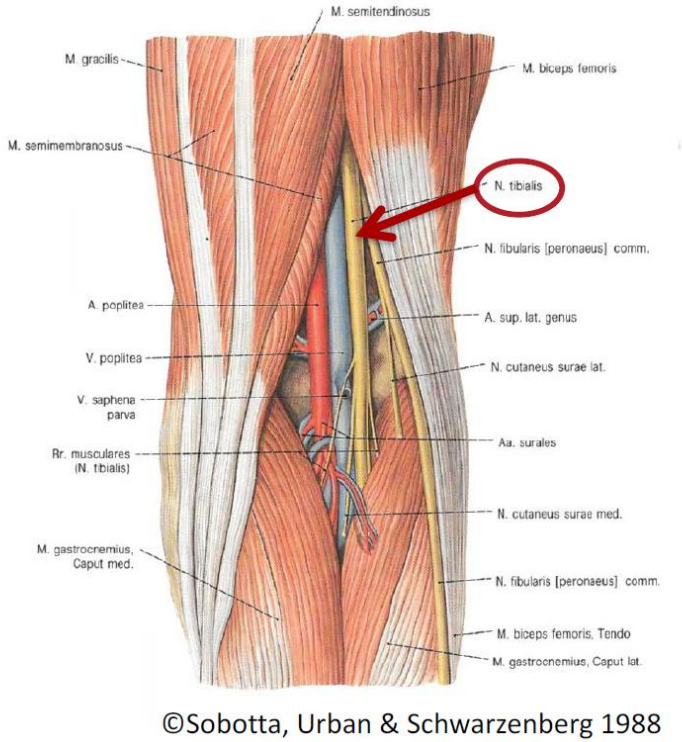
-N. tibialis

- moteur/sentitiv

-N. suralis

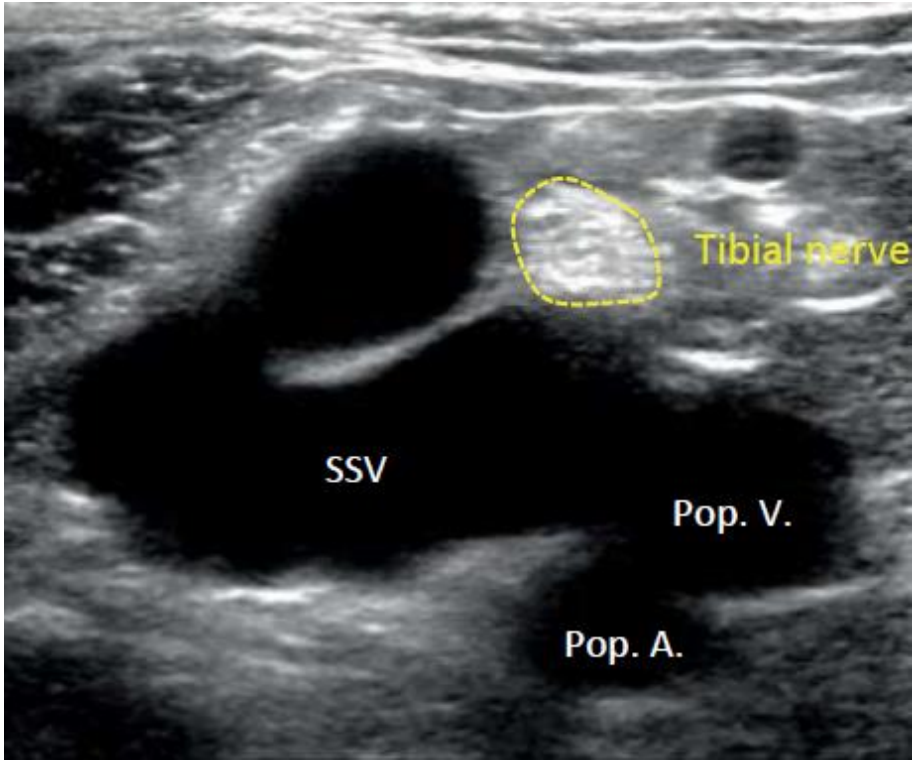
- sensitiv

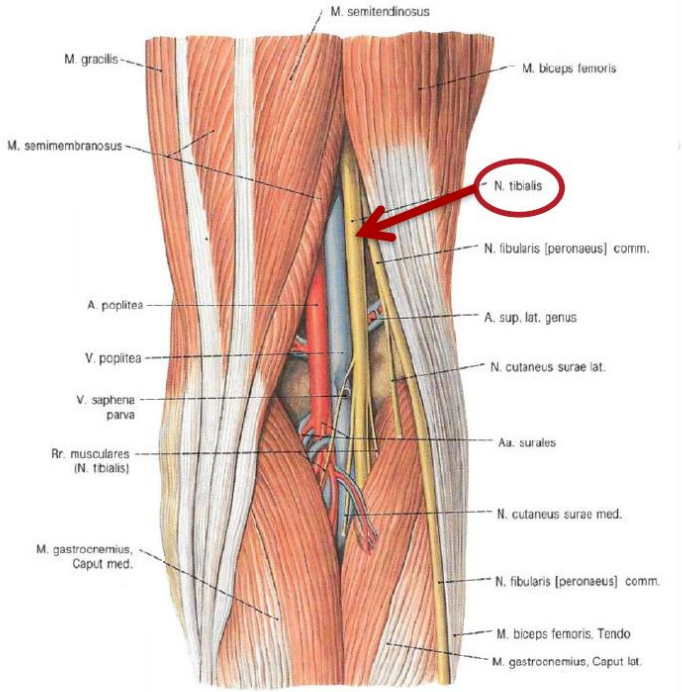




Ultraschall <u>während</u> invasiver Varizentherapie

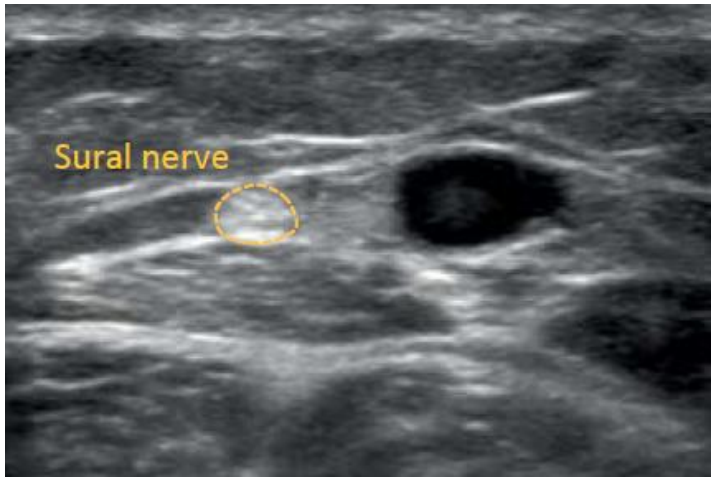
→ Lokalisation der Nerven

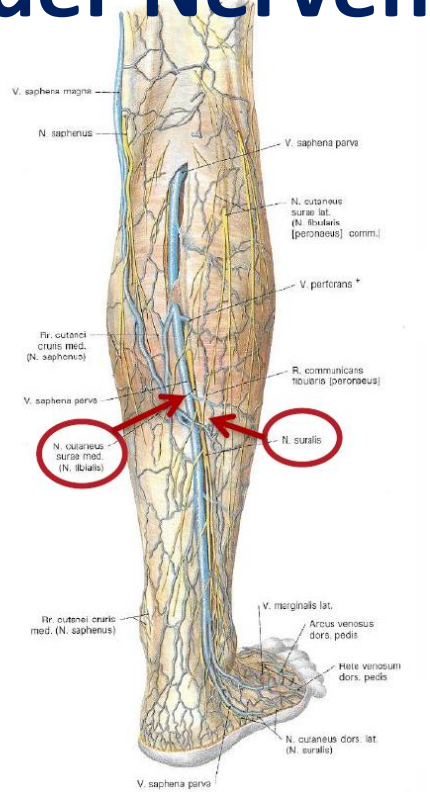


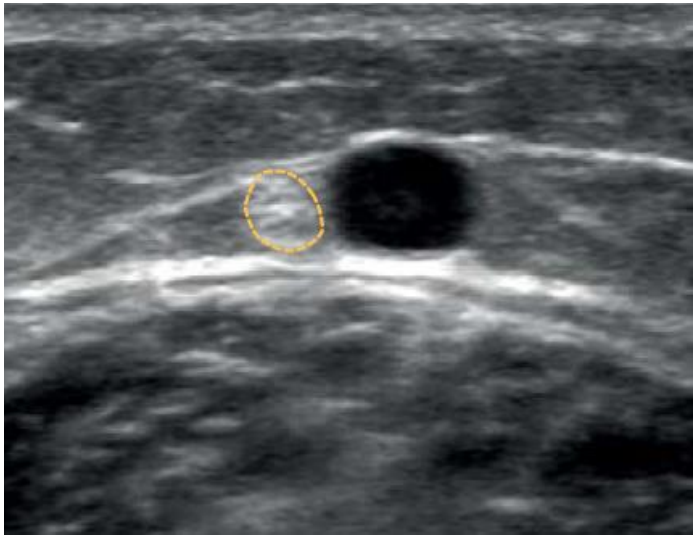


Ultraschall <u>während</u> invasiver Varizentherapie

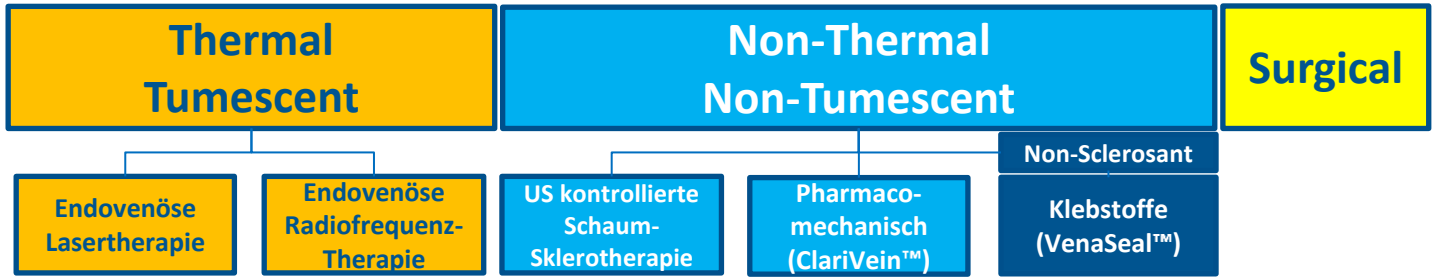
→ Lokalisation der Nerven







Ultraschall während invasiver Varizentherapie



Punktion	+	+	+	+	+
Lokalisierung Sonde	+	+		+	+
Lokalisierung Nerven	+	+			

Ultraschall während invasiver Varizentherapie

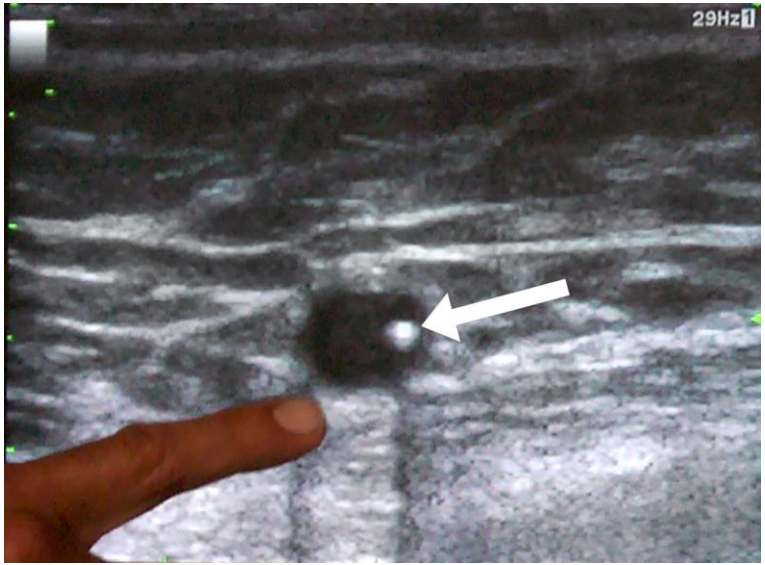
→ Tumeszenz Anästhesie

- Verlauf der zu behandelnden Vene (meist Querschnitt)
- Lokalisation der Nadel
- Kontrolle der Tumeszenz-Flüssigkeit
- Distanz zu anderen Gewebestrukturen

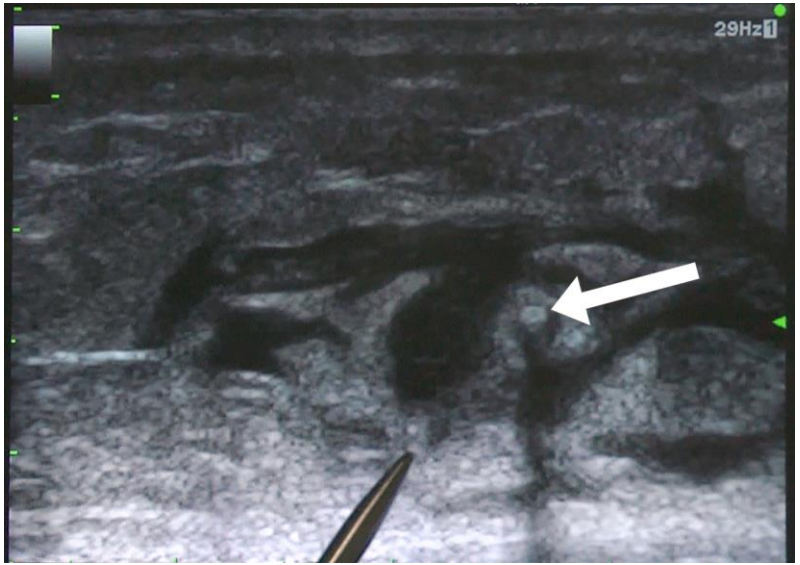
Ultraschall während invasiver Varizentherapie

→ Tumeszenz Anästhesie

Vor …

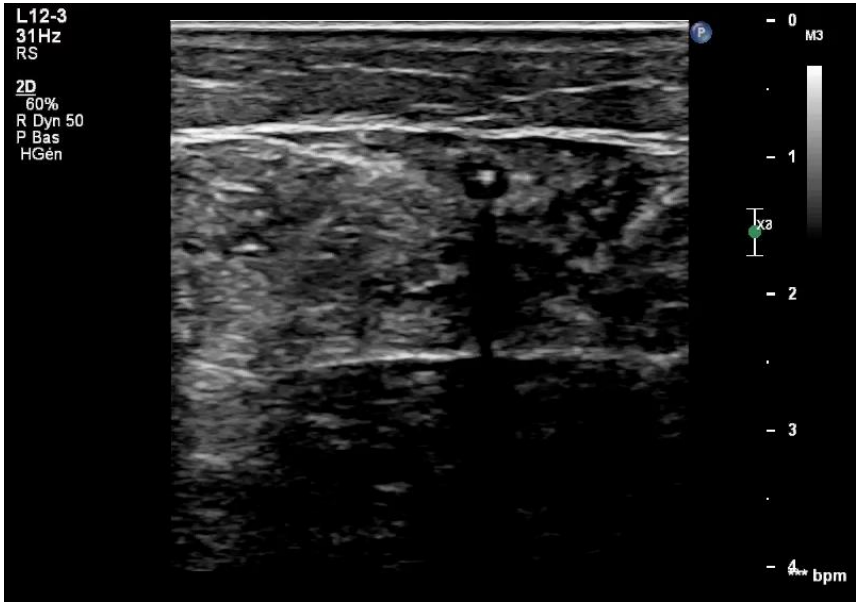


Nach Tumeszenz



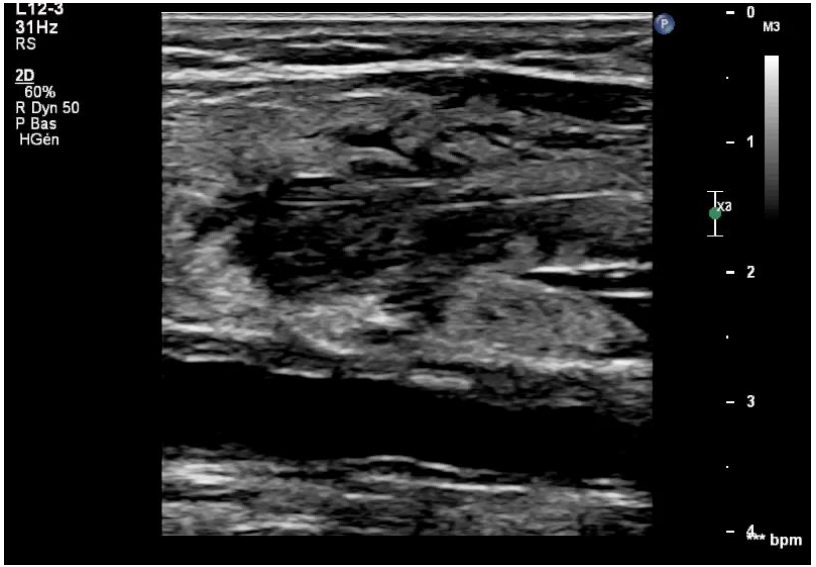
Ultraschall während invasiver Varizentherapie

→ Tumeszenz Anästhesie



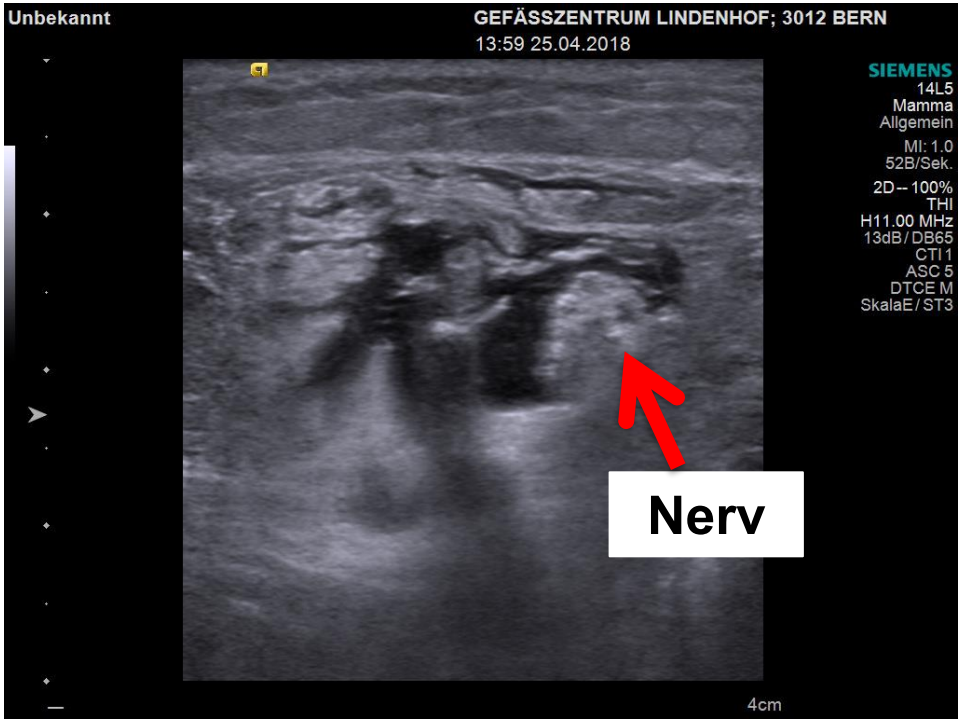
Ultraschall während invasiver Varizentherapie

→ Tumeszenz Anästhesie

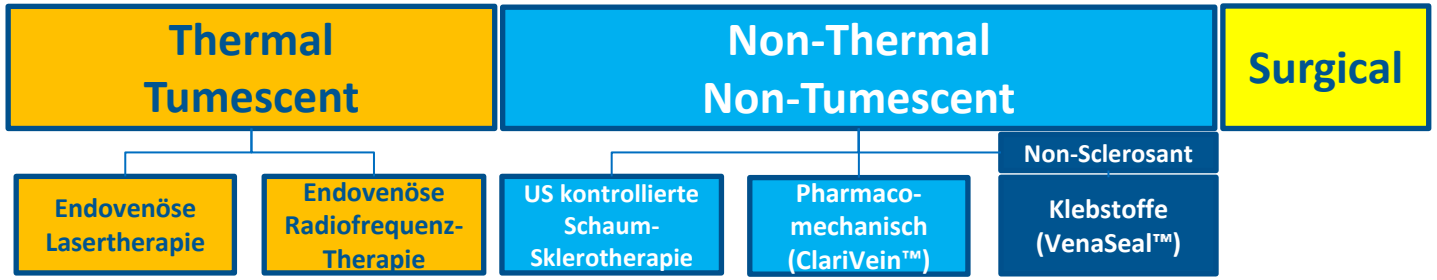


Ultraschall während invasiver Varizentherapie

→ Tumeszenz Anästhesie



Ultraschall während invasiver Varizentherapie



Punktion	+	+	+	+	+
Lokalisierung Sonde	+	+		+	+
Lokalisierung Nerven	+	+			
Tumeszenz	+	+			

Ultraschall während invasiver Varizentherapie

→ Ausdehnung/Vasospasmus bei UGFS

- Ausdehnung des Schaums → Perforanten!
- Vasospasmus
- Extravasation

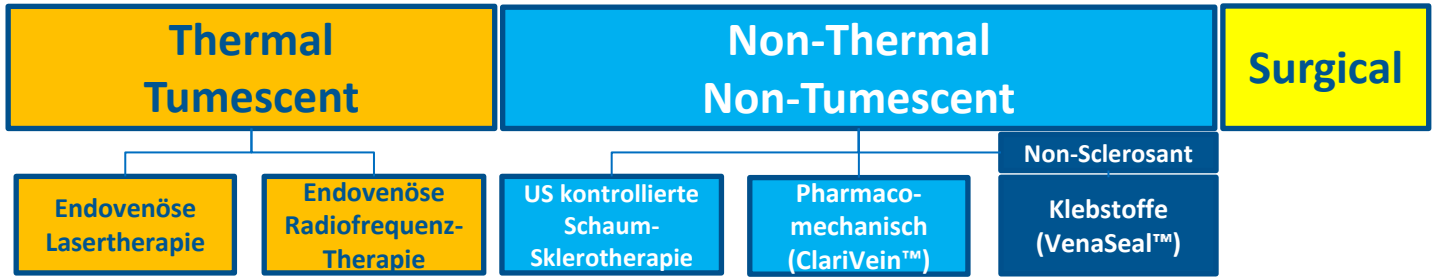
Ultraschall während invasiver Varizentherapie

→ Ausdehnung/Vasospasmus bei UGFS

Ultraschall während invasiver Varizentherapie

→ Livekontrolle bei Lasertherapie

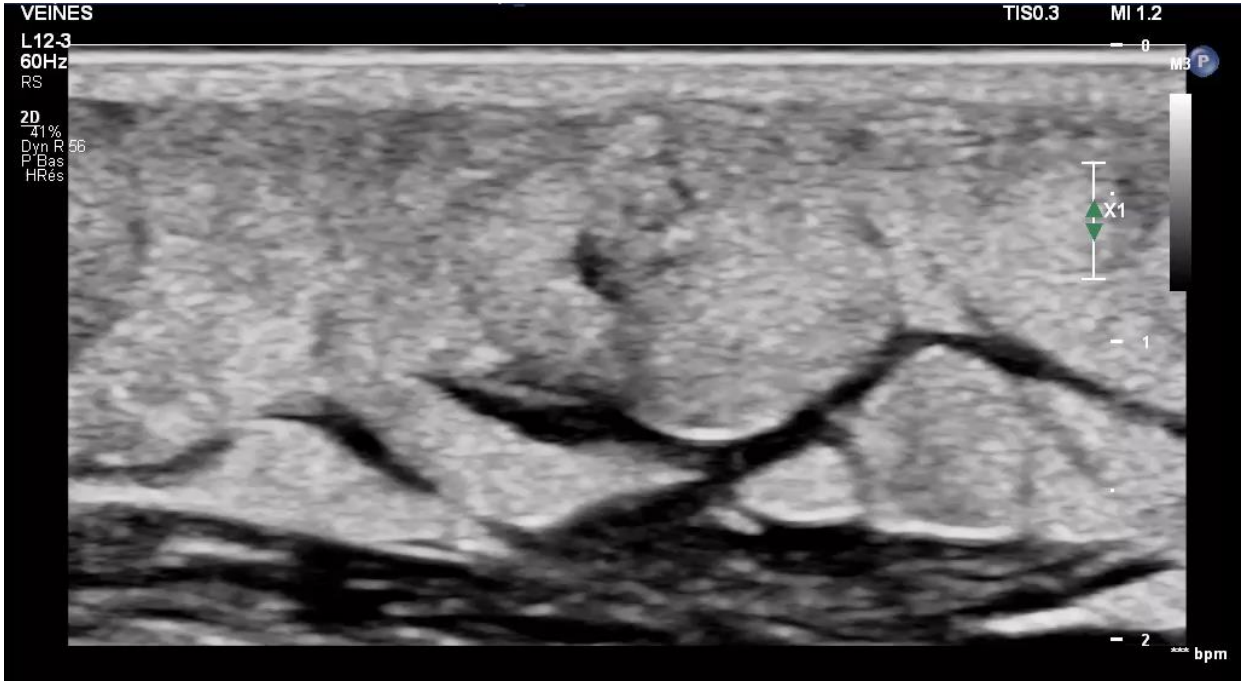
Ultraschall während invasiver Varizentherapie



Punktion	+	+	+	+	+
Lokalisierung Sonde	+	+		+	+
Lokalisierung Nerven	+	+			
Tumeszenz	+	+			
Ausdehnung/Vasospasmus			+		

Ultraschall während invasiver Varizentherapie

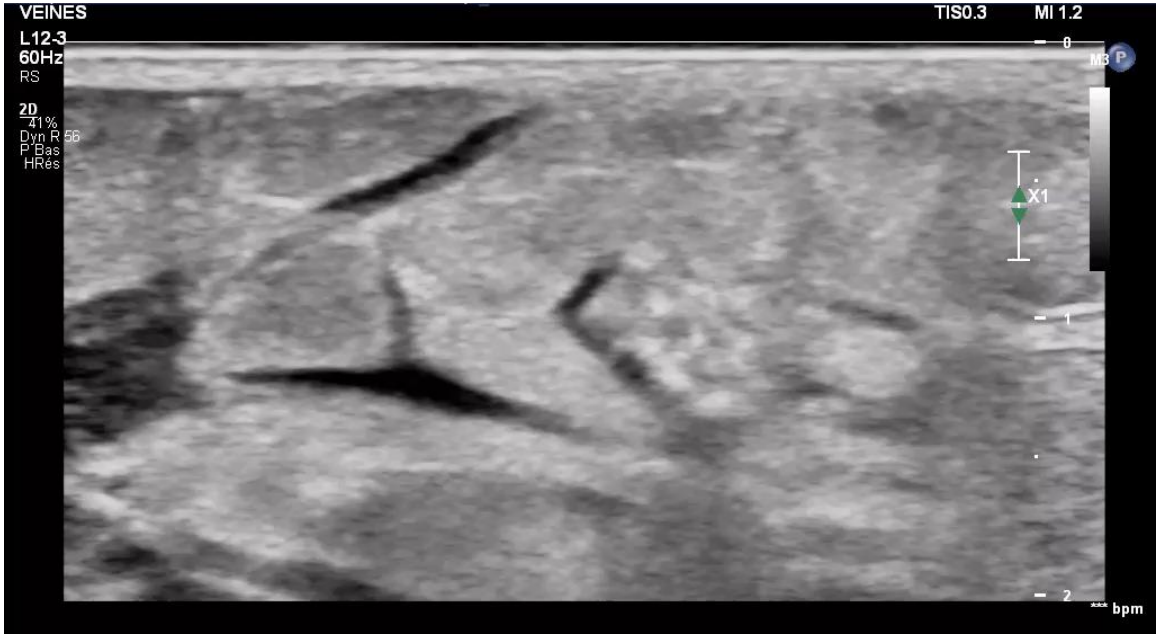
→ Lokalisierung der Vene bei Phlebektomie



Ultraschall während invasiver Varizentherapie

→ Lokalisierung der Vene bei Phlebektomie

Kontrolle nach Phlebektomie

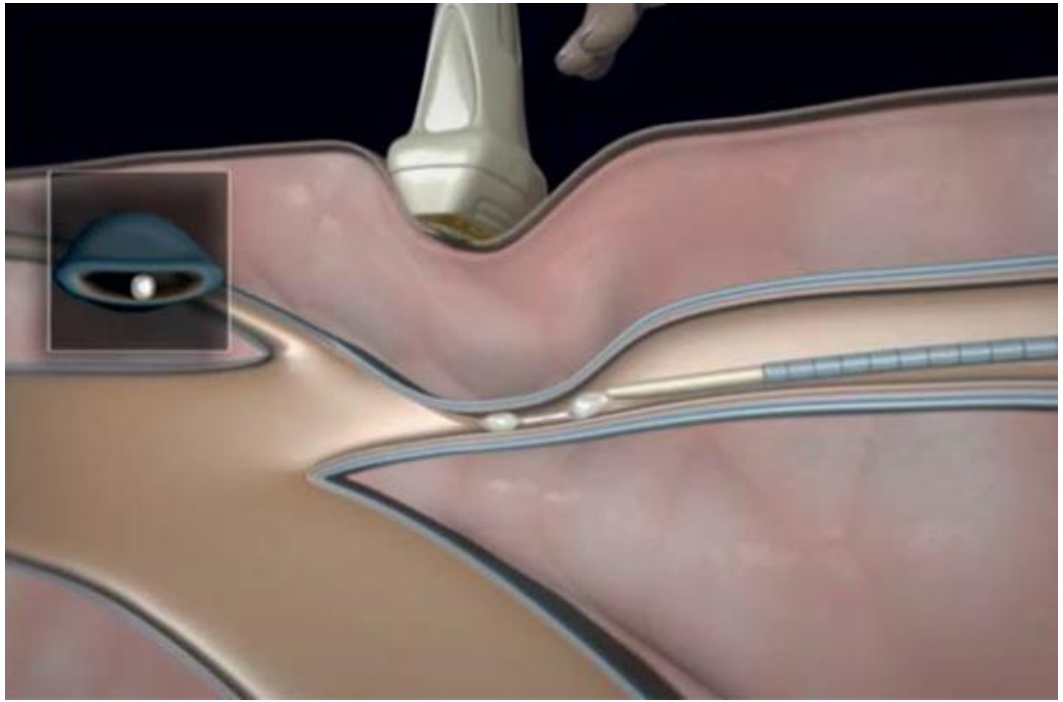


Ultraschall während invasiver Varizentherapie

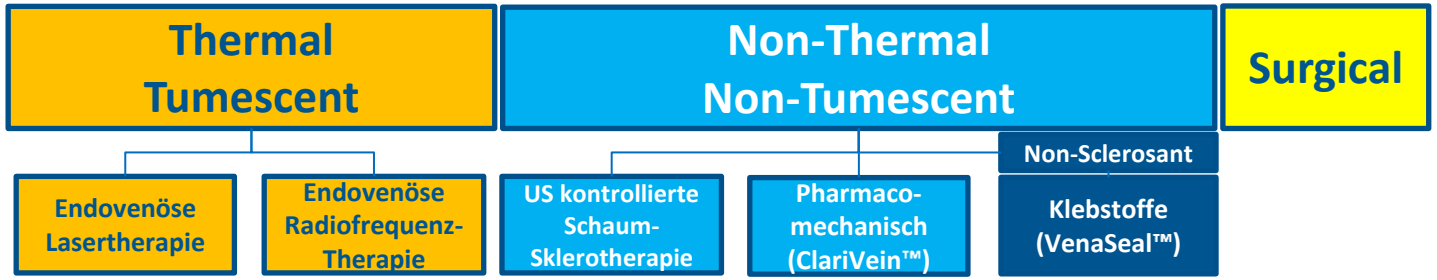
	Thermal Tumescent		Non-Thermal Non-Tumescent			Surgical
	Endovenöse Lasertherapie	Endovenöse Radiofrequenz-Therapie	US kontrollierte Schaum-Sklerotherapie	Pharmaco-mechanisch (ClariVein™)	Non-Sclerosant Klebstoffe (VenaSeal™)	
Punktion	+	+	+	+	+	
Lokalisierung Sonde	+	+		+	+	
Lokalisierung Nerven	+	+				
Tumeszenz	+	+				
Ausdehnung/Vasospasmus			+			
„Lokalisation Vene“			+			+/-

Ultraschall während invasiver Varizentherapie

→ Kompression mit US Sonde bei VenaSeal™



Ultraschall während invasiver Varizentherapie



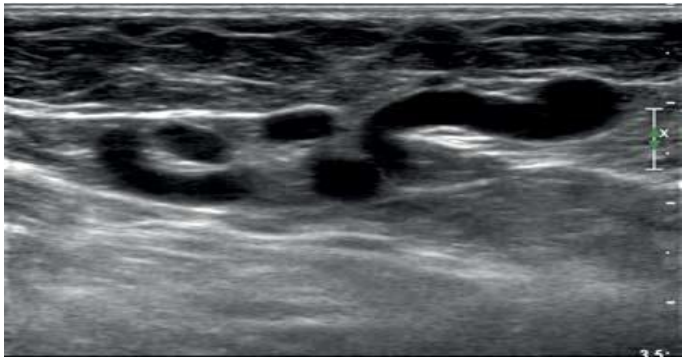
Punktion	+	+	+	+	+	
Lokalisierung Sonde	+	+		+	+	
Lokalisierung Nerven	+	+				
Tumeszenz	+	+				
Ausdehnung/Vasospasmus			+			
„Lokalisation Vene“			+			+/-
Kompression mit US Sonde					+	

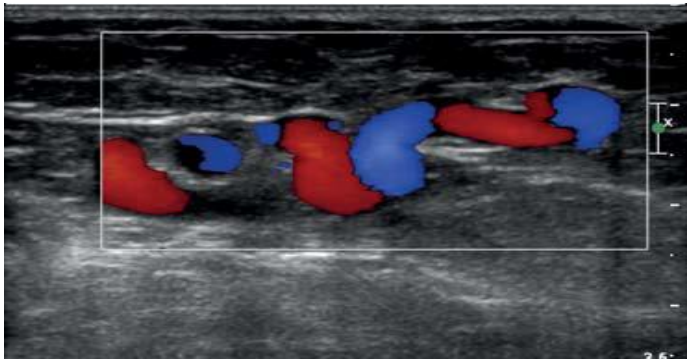
Ultraschall nach invasiver Varizentherapie

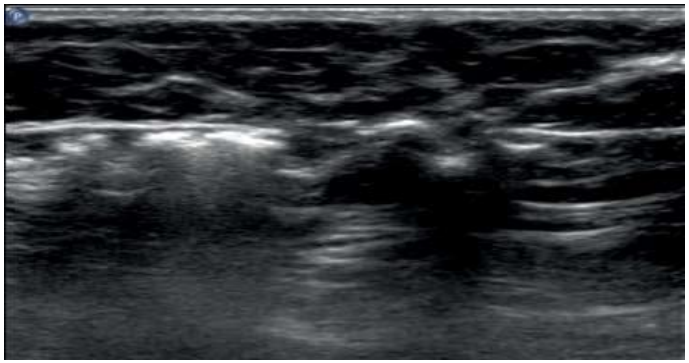
- Kontrolle des Therapieerfolges
  - Zusätzliche Therapie?

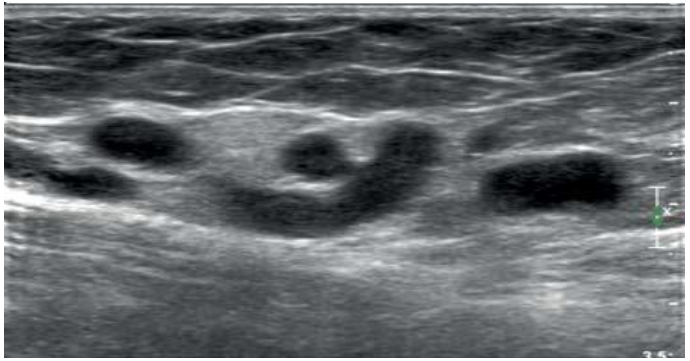
Ultraschall nach invasiver Varizentherapie

→ Therapieerfolg nach Schaumsklero





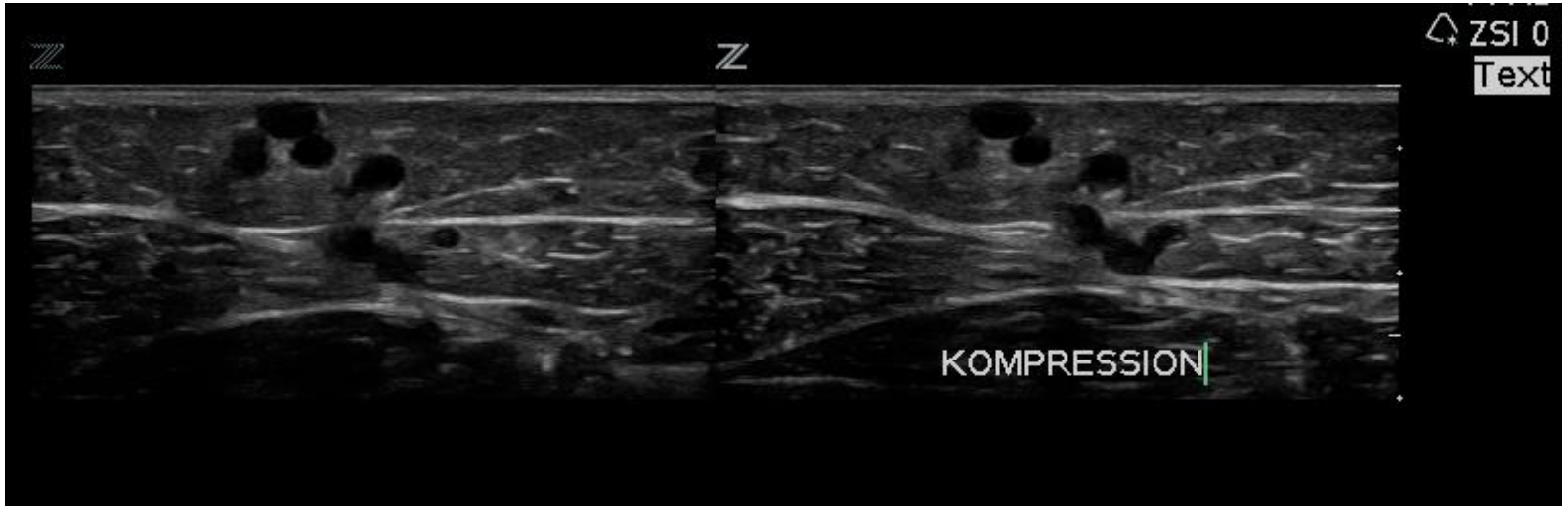




Ultraschall nach invasiver Varizentherapie

→ Therapieerfolg nach Schaumsklero

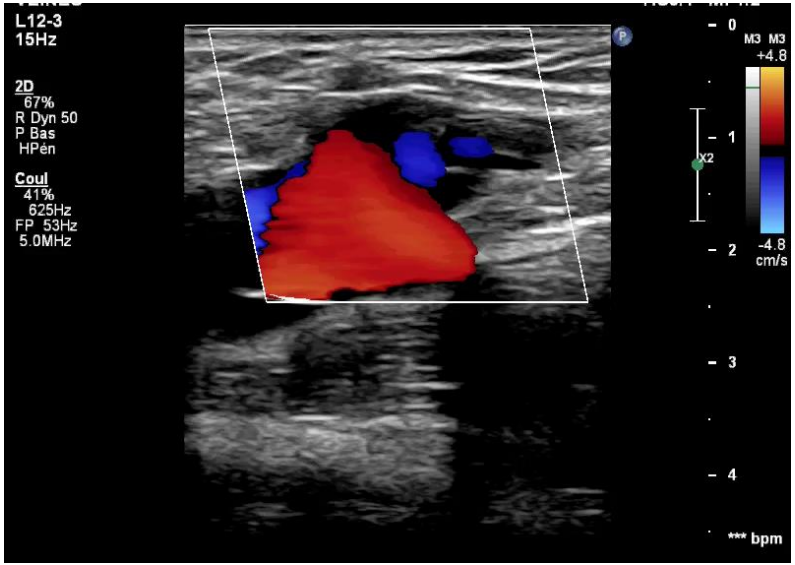
2 Wochen nach Schaumskero



Ultraschall nach invasiver Varizentherapie

→ Therapieerfolg nach Laser

Kontrolle der Crosse



Ultraschall nach invasiver Varizentherapie

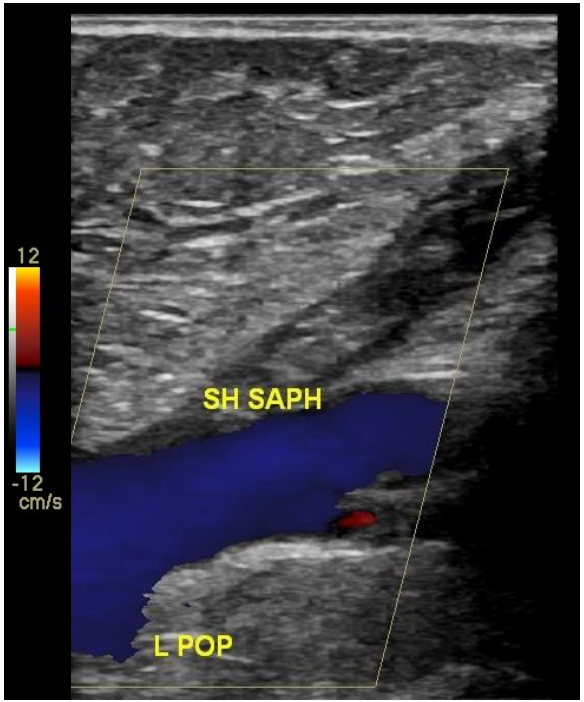
- **Kontrolle des Therapieerfolges**
  - **Zusätzliche Therapie?**
- **Suche nach Komplikationen**
  - **Tiefe Venenthrombosen**
  - Endovenous **H**eat **I**nduced **T**hrombosis **(EHIT)**
  - Endovenous **F**oam **I**nduced **T**hrombosis **(EFIT)**

  → **A**blation-**R**elated **T**hrombus **E**xtension **(ARTE)**

  - **Lymphzysten etc.**

Ultraschall nach invasiver Varizentherapie

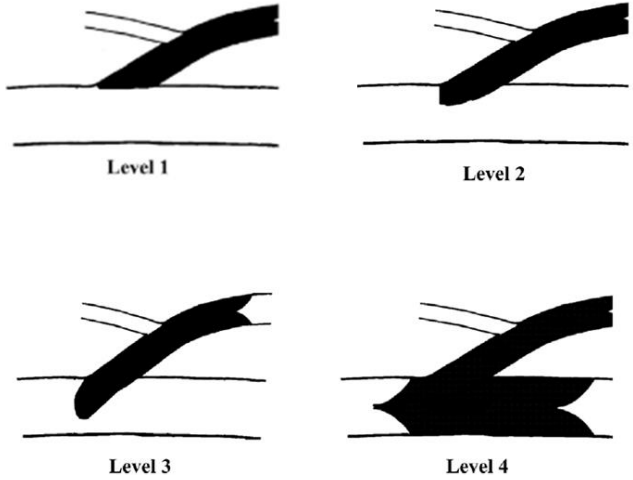
→ Ablation-Related Thrombus Extension (ARTE)



Ultraschall nach invasiver Varizentherapie

→ Ablation-Related Thrombus Extension (ARTE)

Table 9. American Venous Forum endothermal heat induced thrombosis (EHIT) classification[188]	
Class	**Definition**
I	Thrombus without propagation into the deep vein
	a. Peripheral to superficial epigastric vein
	b. Central to superficial epigastric vein, up to and including the deep vein junction
II	Thrombus propagation into the adjacent deep vein but comprising < 50% of the deep vein lumen
III	Thrombus propagation into the adjacent deep vein but comprising > 50% of the deep vein lumen
IV	Occlusive deep vein thrombus contiguous with the treated superficial vein



Ultraschall nach invasiver Varizentherapie

→ Ablation-Related Thrombus Extension (ARTE)

The 2023 Society for Vascular Surgery, American Venous Forum, and American Vein and Lymphatic Society clinical practice guidelines for the management of varicose veins of the lower extremities. Part II

11. Management of ablation-related thrombus extension (ARTE) and deep vein thrombosis (DVT) after endovenous ablations		
11.1. Postprocedure duplex ultrasound scanning (DUS)		
Guideline	Grade of recommendation	Quality of Evidence
11.1.1. In an average-risk patient who is asymptomatic following thermal ablation of the saphenous vein, we recommend against routine early postprocedural DUS to detect ARTE (ARTE, formerly known as endovenous heat-induced thrombosis [EHIT]) or DVT.	1 (strong)	B (moderate)
Consensus statement		
11.1.2. In an average-risk patients who is asymptomatic following nonthermal ablation of the saphenous vein, routine early postprocedural DUS may be performed to detect ARTE or DVT.		
11.1.3. In a high-risk patient who is asymptomatic following thermal or nonthermal saphenous ablation early DUS to exclude ARTE or DVT should be performed.		
Guideline	Grade of recommendation	Quality of Evidence
11.1.4. In patients who are symptomatic following thermal or nonthermal ablation, we recommend early DUS to exclude ARTE or DVT.	1 (strong)	A (high)
11.2. Pharmacological thromboprophylaxis		
Guideline	Grade of recommendation	Quality of Evidence
11.2.1. For high-risk patients undergoing endovenous ablation we suggest pharmacological thromboprophylaxis.	2 (weak)	C (low to very low)
Consensus statement		
11.2.2. For patients undergoing endovenous ablation routine risk stratification should be performed to assess the need for periprocedural thromboprophylaxis.		
11.3. Treatment of varicose vein procedure related DVT and ARTE		
Guideline[b]	Grade of recommendation	Quality of Evidence
11.3.1. For patients with acute isolated distal DVT after varicose vein procedure, without symptoms or risk factors for extension, we suggest serial imaging of the deep veins for 2 weeks.	2 (weak)	B (moderate)
11.3.2. For patients with isolated distal DVT after varicose vein procedure and symptoms or risk factors for extension we suggest anticoagulation.	2 (weak)	C (low to very low)
11.3.3. For patients with acute proximal DVT after varicose vein procedure, we recommend anticoagulation with a direct oral anticoagulant (over a vitamin K antagonist).	1 (strong)	B (moderate)
11.3.4. For patients with symptomatic ARTE after endovenous ablation, we recommend anticoagulation with a direct oral anticoagulant (over a vitamin K antagonist).	1 (strong)	C (low to very low)
[b]We endorsed the recommendations of Stevens SM, Woller SC, Kreuziger LB, Bounameaux H, Doerschug K, Geersing GJ, et al. Antithrombotic Therapy for VTE Disease: Second Update of the CHEST Guideline and Expert Panel Report. Chest. 2021; 160(6):e545-e608. The evidence base for these guidelines was adopted without review.		
Consensus statements		
11.4.1. For patients with asymptomatic ARTE III and IV after endovenous ablation, anticoagulation with a direct oral anticoagulant (over a vitamin K antagonist) should be performed.		
11.4.2. For patients who receive anticoagulation for ARTE following endovenous ablation, treatment should be continued until the thrombus retracts.		

Gloviczki et al, J Vasc Surg Venous Lymphat Disord. 2024 Sep;12(5):101923. doi: 10.1016/j.jvsv.2024.10192

Zusammenfassung

- Heutzutage ist der Ultraschall für die invasive Varizentherapie unabdingbar für die
  - Planung
  - Durchführung
  - Erfolgs- und Komplikations-Kontrolle
- Während der invasiven Varizentherapie hängt die Rolle des Ultraschall von der entsprechenden Therapie ab