



## Venous Thermography And Its Clinical Use



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### NO DISCLOSURES



### DUS REMAINS THE GOLD STANDARD INVESTIGATION

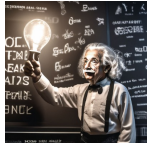
BUT

- Expensive equipment
- Specialized training to perform and interpret
- Operator dependent
- A can take approximately 45-60 contact minutes
- Patient discomfort with painful leg conditions
- Incomplete venous assessment and reflux mapping
- Miss pathology especially in early disease
- Difficult to detect microcirculatory changes
- Limited insurance coverage on repeat scans



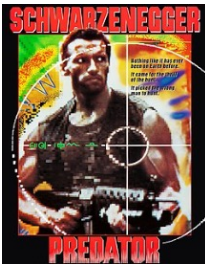
### WHAT'S THE SOLUTION?

- Screening test that is quick (approx. 1 min)
- Sensitive and specific
- Non-contact study – no patient discomfort
- Inexpensive equipment
- No need for highly trained technicians



Cholewicka, A., Kulewska, J., Marek, K. et al. How to use thermal imaging in venous insufficiency? J Therm Anal Calorim 190, 1317–1326 (2017). <https://doi.org/10.1007/s10973-017-6141-7>

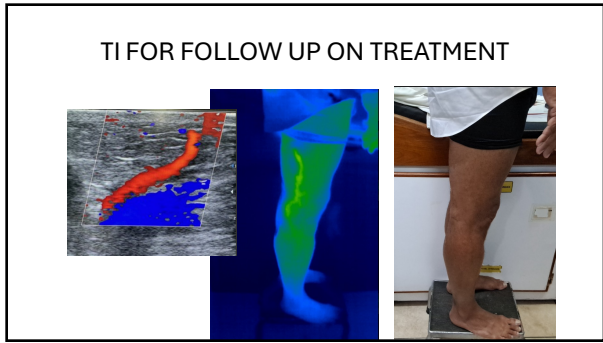
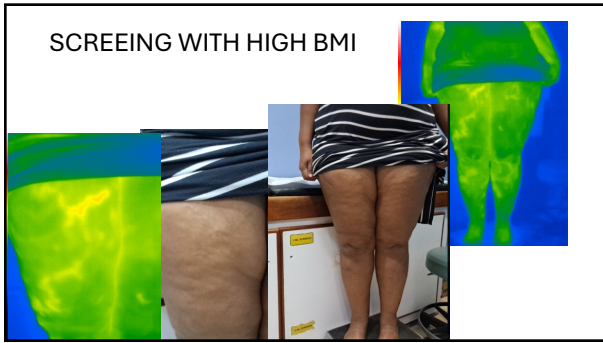
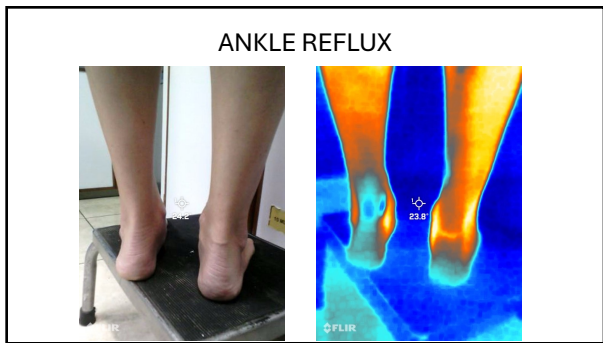
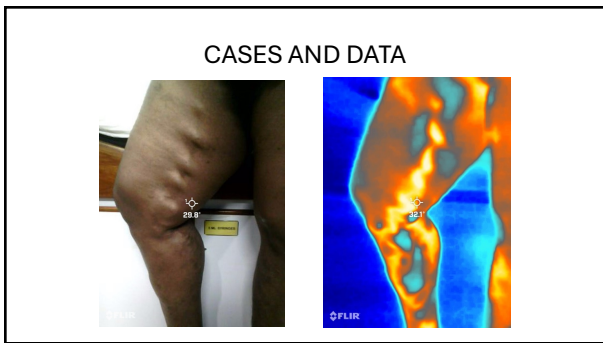
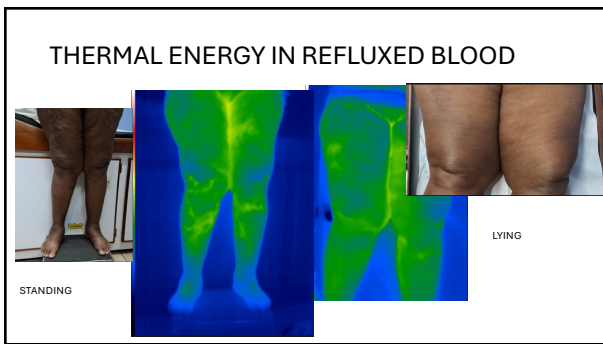
### IS THERE A PLACE FOR VENOUS THERMOGRAPHY



### WHAT IS THERMOGRAPHY

#### What are we looking at?

- Thermography is a non-invasive technique using thermal radiation to measure and record temperature patterns and distribution in the body.
- The skin's surface temperature correlates with underlying tissue heat, in this case venous blood flow.
- Core temperature is about 2 Degrees higher than Peripheral (skin) Temperature.
- Refluxing blood from the deep system into the superficial system heats the overlying skin
- This thermal energy/radiation generated lies within the IR electromagnetic spectrum
- A specialized camera detects the thermal radiation pattern within the infrared range.



### TI CAN EXCLUDE CVI FASCIAL HERNIA

No thermal signature

### DETECTION OF REFLUX PATTERNS

- 101 patients underwent DUS alone in 2017 – 224 segments detected
- 101 different patients underwent IT followed by DUS in 2019 – 279 segments detected
- 24.6 % increase in detected segments (statistically significant)

Category	2017	2019
Venous Insufficiency	224	279
Total Venous Detection	112	139

**Figure 1.** Increase in venous insufficiency detection from addition of TI to clinical workflow between 2017 and 2019 by venous segment and total number detected.

Soffer A. Thermal Imaging of Superficial Leg Circulation Improves Venous Diagnostic Efficiency and Completeness. *Vascular Disease Management*. 2020;17.

### SENSITIVITY AND SPECIFICITY

- Retrospective study of 100 consecutive patients
- Sensitivity 98.3%
- Specificity 100%
- Overall accuracy was noted as 98.5%

Soffer A. Sensitivity and Specificity of Thermal Imaging When Used to Detect Superficial Venous Reflux as Compared to Duplex Ultrasound. *Vascular Disease Management*. 2021;18.

### TI and CEAP

Variation in Temperature -  $\Delta T$  (°C)

○ Mean (95% IC)

CEAP

- Davalos MPA, Broschi ML, da Rosa SE, Broschi GC, Neves EB. Can Dual Infrared-Visual Thermography Provide a More Reliable Diagnosis of Perforator Veins and Reflux Severity? *J Clin Med*. 2023;12(22)

### TI and CEAP

CEAP grade: C1, C3, C6

CEAP number the more area of the limb is characterized by higher temperature as a different isotherm areas

Kajewska J. May thermal imaging be useful in early diagnosis of lower extremities chronic venous disease? *Polish Journal of Medical Physics and Engineering*. 2023;29(1).

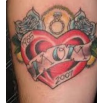
### Role of TI in Patient Compliance

PATIENT EDUCATION

Gong JM, Du JS, Han DM, Wang XY, Qi SL. Reasons for patient non-compliance with compression stockings as a treatment for varicose veins in the lower limbs: A qualitative study. *PLoS One*. 2020 Apr 28;15(4):e0231218. doi: 10.1371/journal.pone.0231218

### LIMITATIONS OF THERMOGRAPHY

- May not detect deeper SVI especially proximal GSV
- Thermal signatures of SVI obscured in certain areas – popliteal fossa, anterior tibial border and over hamstring tendons
- SVI also obscured by inflammatory conditions of the skin- even recent tattoos
- May not detect deep reflux and deep venous pathology
- No procedural protocol yet
- Studies are small and primarily retrospective



**NEED LARGER PROSPECTIVE STUDIES**

### THANK YOU

