

RADRIOFREQUENCY , LASER IS THERE ANY DIFFERENCE

- Dr Jean Luc GERARD

■ Cannes 25 th June 2008

The advantages of the endovenous technic compared to vein stripping

- Advantages:
 - ◆ Ambulatory technique (versus in average 1 or 2 days of hospitalisation for stripping)
 - ◆ Less risk from a local anesthetic
 - ◆ Less complications (dysesthesies paresthesias)
 - ◆ No need for the patient to take much time off work (1 to 2 days compared to three weeks for stripping)
 - ◆ Reduced hospital costs
- Using this technique will achieve similare results to traditional vein stripping.

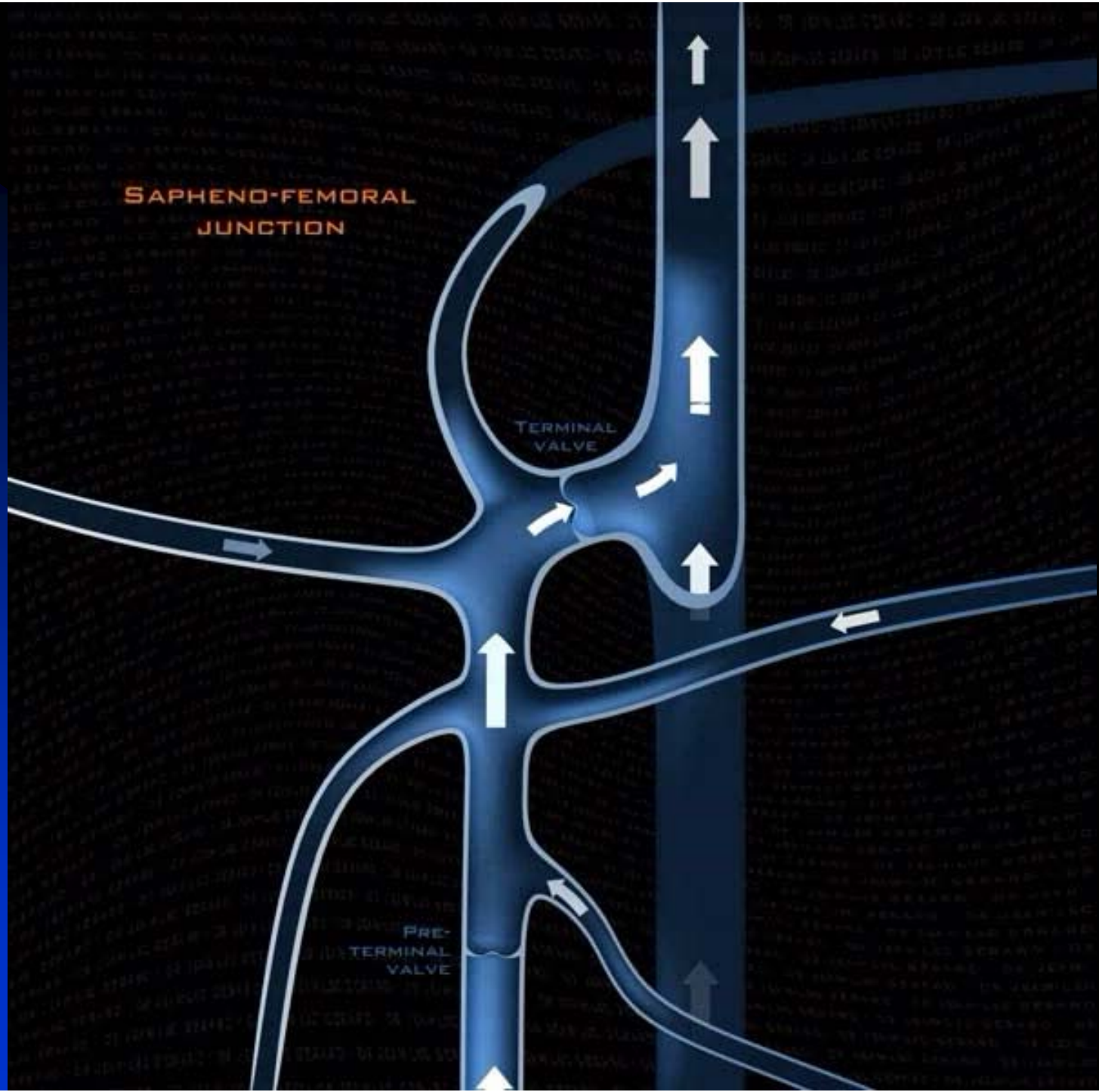
Endovenous technic

- SIMPLER
- SAFE
- EFFICIENT

WHY HIGH LIGATION IS NOT NEEDED

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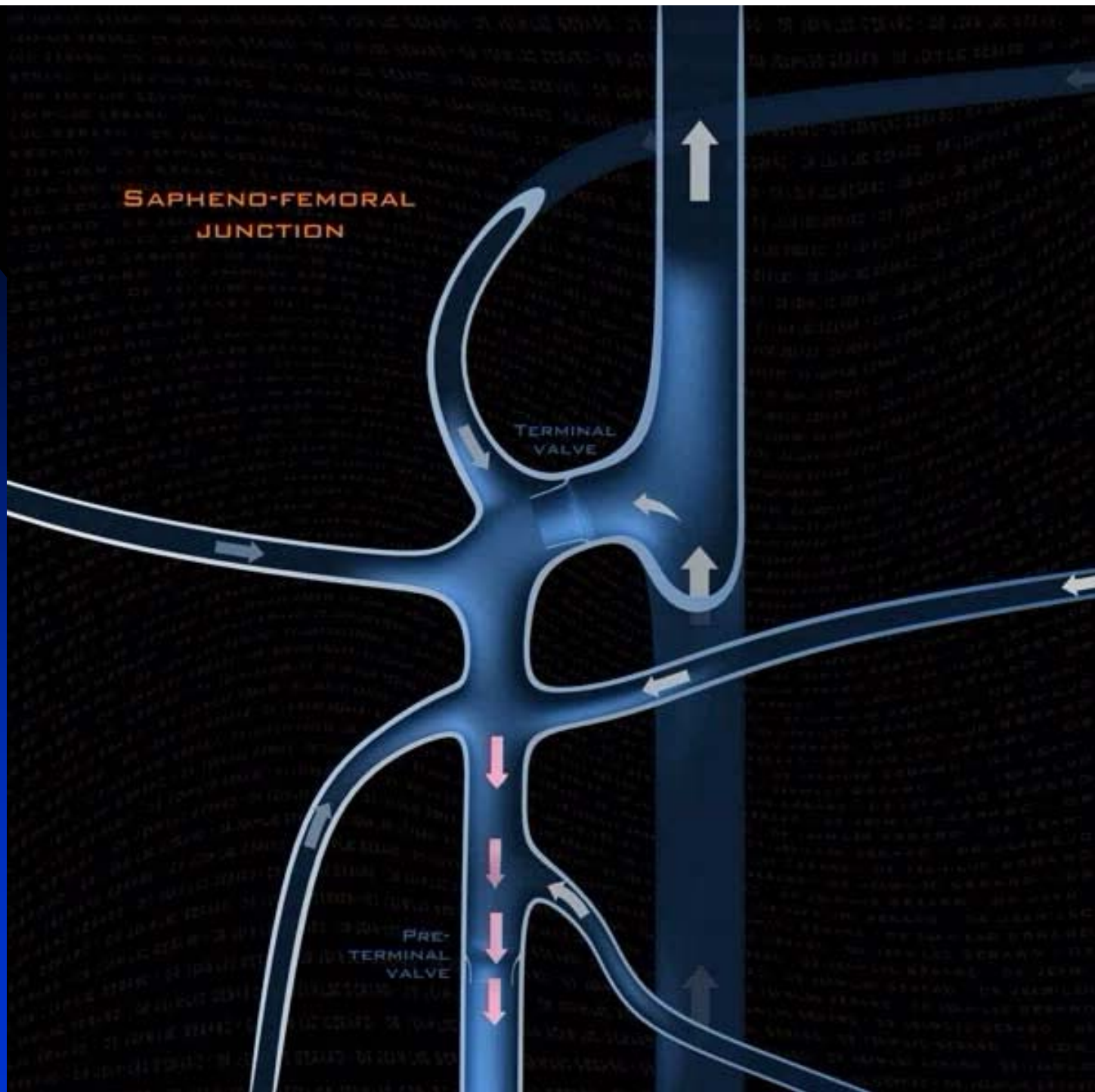
SAPHENO-FEMORAL
JUNCTION

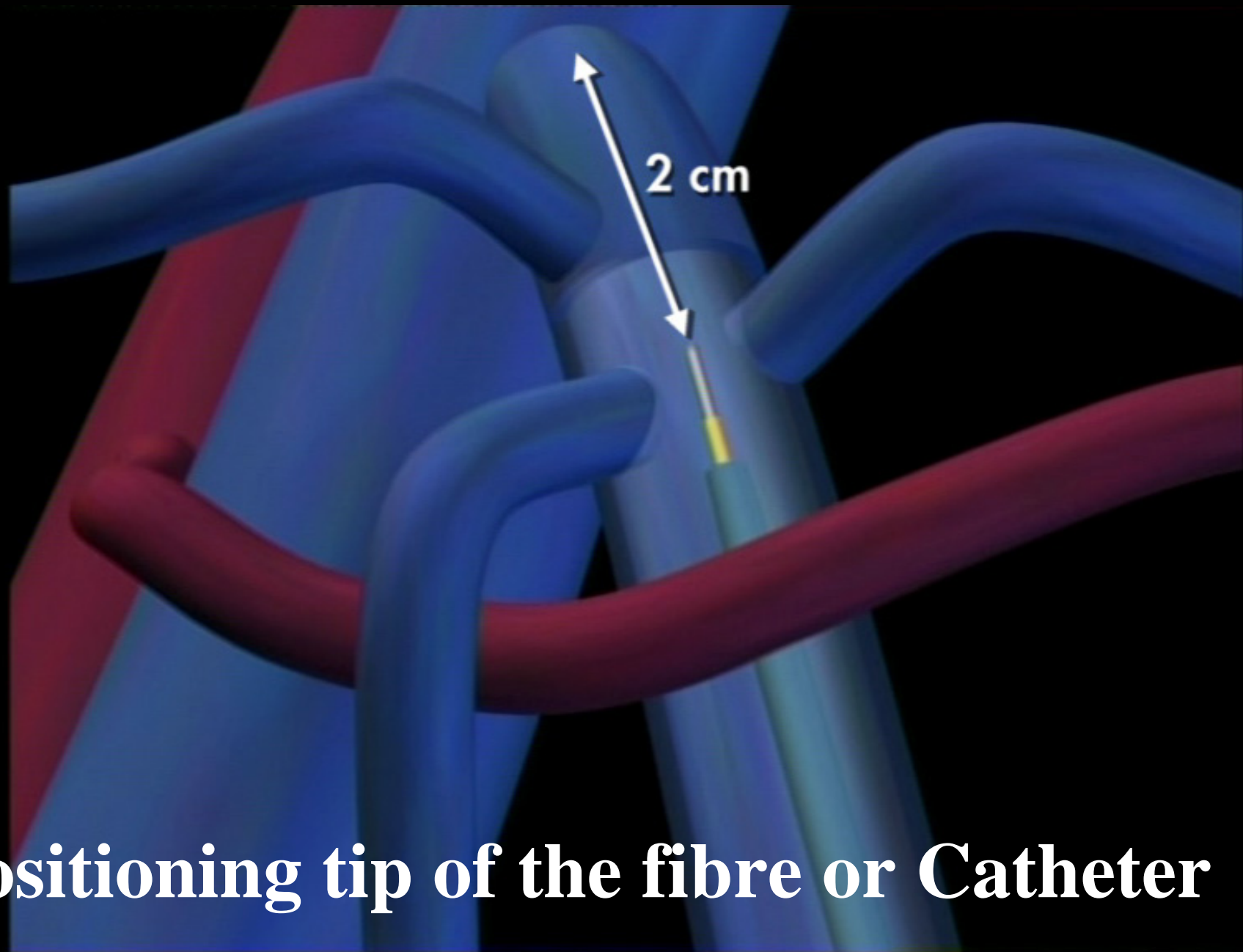


SAPHENO-FEMORAL
JUNCTION

TERMINAL
VALVE

PRE-
TERMINAL
VALVE





Positioning tip of the fibre or Catheter

PUBLICATIONS



L.K.16:30

Stacybourg Sep 1989

APPLICATION DU LASER ND-YAG DANS LE TRAITEMENT DU SYNDROME VARIQUEUX

B. Puglisi - A. Tacconi - F.M. San Filippo - *

E. Zanzi - **

Chirurgia Vascolare - Ospedale di Garbagnate Milanese - USSL 67 - MILANO - ITALIA

* Centro Laser Pluridisciplinare - c/o Casa di Cura Columbus - Via Buonarroti, 48- MILANO - ITALIA -

Les auteurs exposent un étude de la méthode personnelle du traitement du syndrome variqueux en se servant d'un Laser Nd.- YAG.

Ils exposent les avantages de cet étude, de cette méthode par rapport a celle traditionnelle, en analysant les mines techniques intraopératoires, post opératoires et les résultats au bout d'un an.

131

Montreal 1992

Nd-Yag laser and Argon laser for the radical and cosmetical

treatment of the varicose syndrome

B. Puglisi A. Mazza F.M. San Filippo

The Authors, after their experience of 276 cases through three years describes the results and the new technique that allows to make safenotomy instead of a safenectomy by stripping.

Further the Authors underline the indications and the advantages of this new technique that's less thraumatic than stripping, doesn't give hematoma and related septic compliances and offer a best cosmetical result.

First publications LASER

- Boné C

Tratamiento endoluminal de las varices con laser de diodo : estudio preliminar . Rev Patol Vasc. 1999; 5: 35-46

- Navarro L, Min RJ, Bone C

Endovenous laser : a new minimally invasive method of treatment for varicose veins- preliminary observations using an 810 nm diode laser. Dermatol Surg 2001; 27 : 117-122

First publications in RF

- Chandler JG

Treatment of primary venous insuffisance by
endovenous saphenous vein obliteration .

J Vasc Surg 2000; 34: 201-1

MATERIALS

A large, solid blue curved shape, resembling a quarter-circle or a large arc, is positioned on the left side of the image. The background is a solid black color. The word "MATERIALS" is written in a bold, white, sans-serif font in the upper right quadrant of the image.

Different wavelenghts in Laser

DOES THE WAVELENGTH MATTER

WAVELENGTH

➤ 1064nm

➤ 810nm

➤ 940nm

➤ 980nm

WAVELENGTH

➤ 810nm

➤ 940nm

➤ 980nm

WAVELENGTH

➤ 940nm

➤ 980nm

WAVELENGTH

➤ 940nm

➤ 980nm

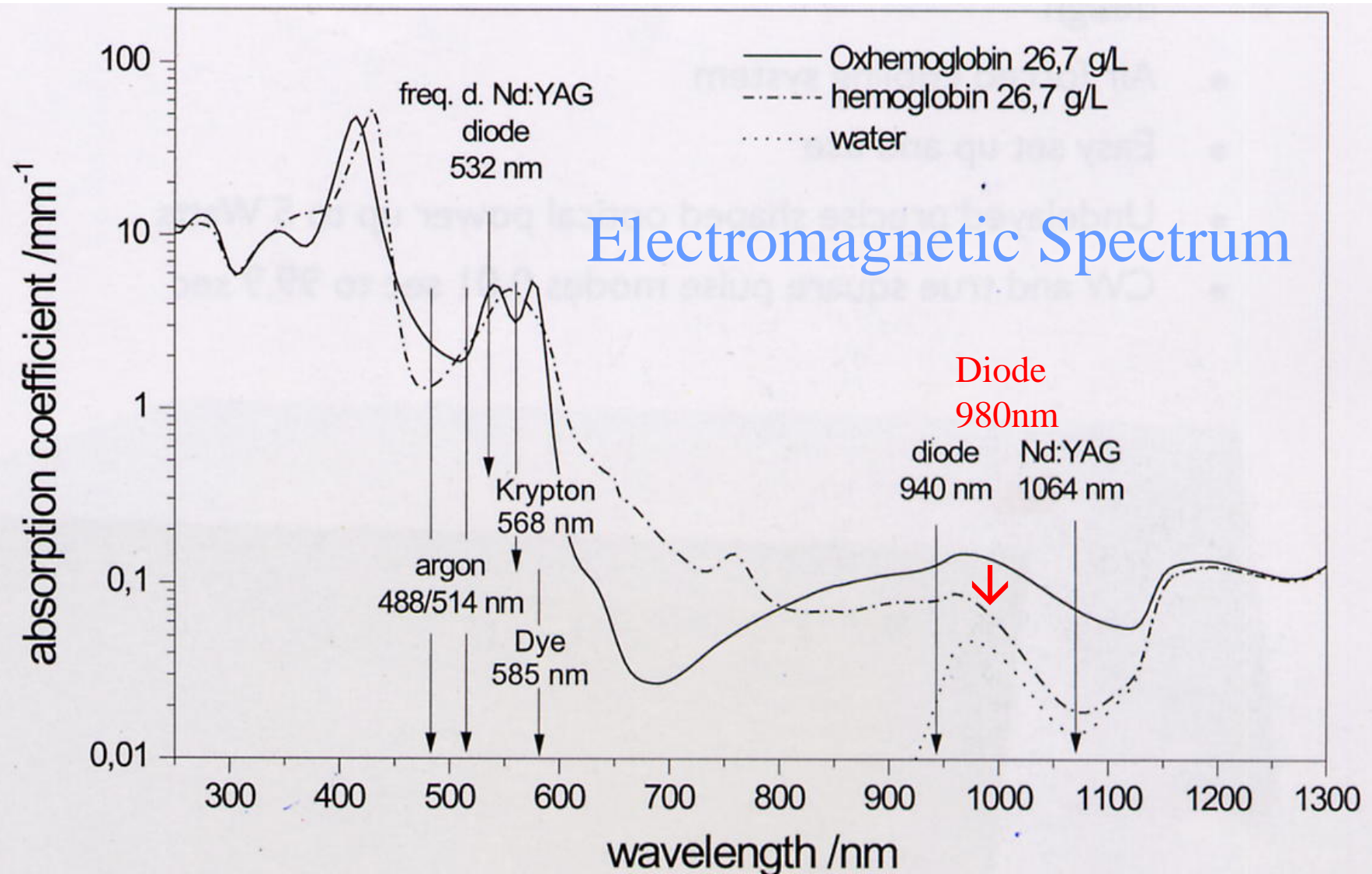
➤ 1320nm ?

WAVELENGTH

➤ 940nm

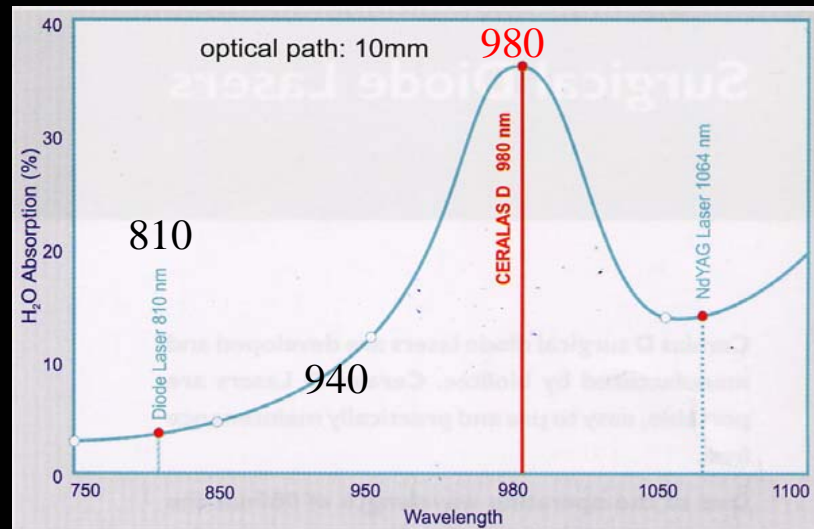
➤ 980nm

➤ 1470nm

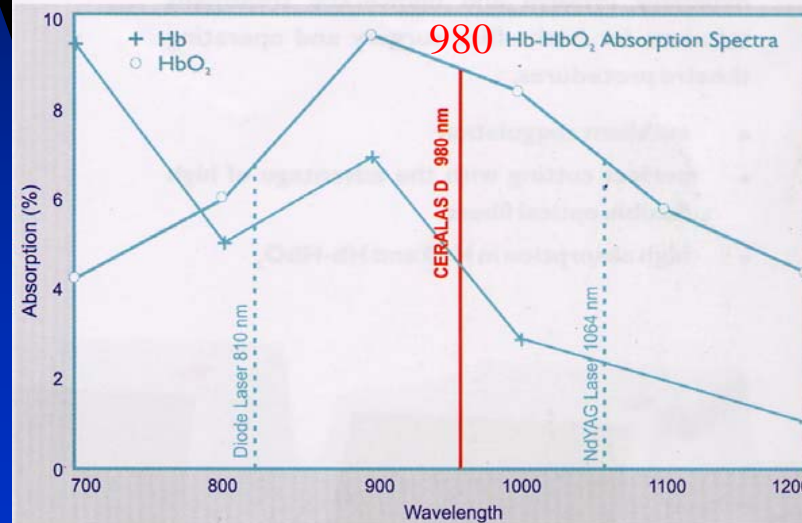


Visible between 420 & 750nm

Laser Diode 980 nm : optimum wave length



Water



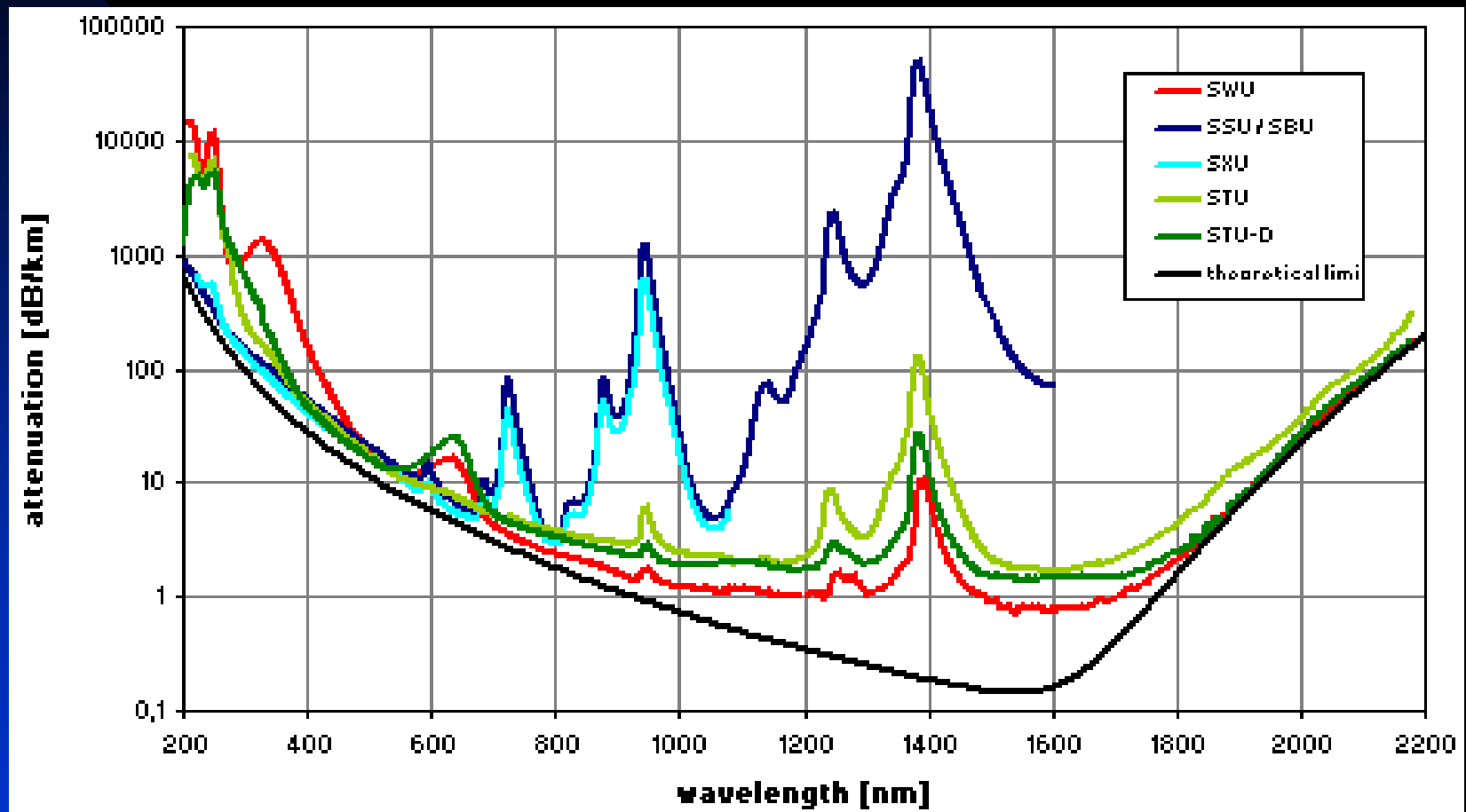
HbO₂

Hb

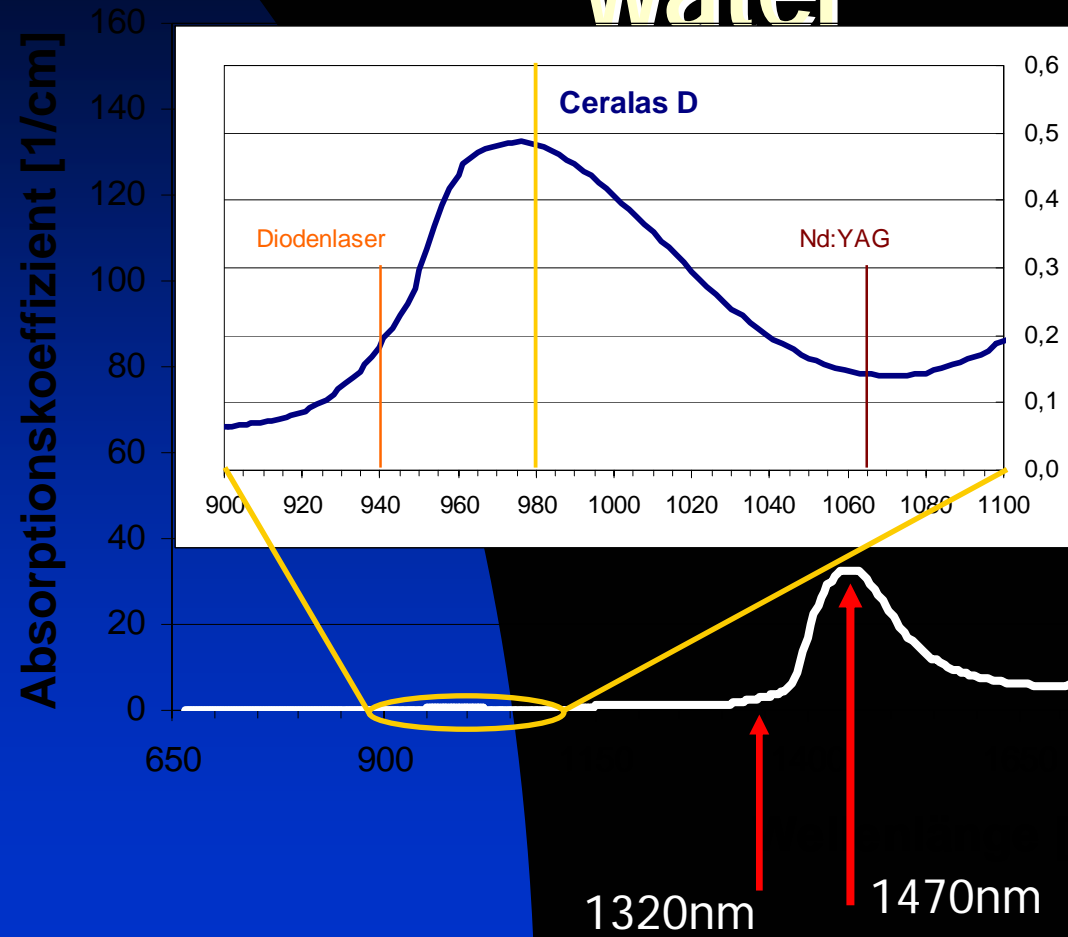
Photobiology research has identified 980nm as the optimal wavelength for absorption in water and hemoglobin. Compared to 810nm it is eight times higher and up to four times higher than 1064nm.

This enables the operator to achieve better results with lower energy settings during medical laser treatments.

Electromagnetic Spectrum



Spectrum absorption water





- **CoolTouch 1320 nm**
- **Flash lamp pumped Nd :YAG**
(*neodymium-doped yttrium aluminium garnet*)
- **Impulse pulses :**
 - ◆ 1.2ms pulse duration and 135w peak power
- **Power 5w, 6.5w and 8watts**



Diode laser 980nm

Diode laser 1470nm

Different fibres in Laser ablation

DOES THE FIBRES MATTER



Optical fibre 600 μ

JACKET-TIP` FIBER VS BARE-TIP FIBER FOR GSV LASER ABLATION

Lowell S. Kabnick, MD, FACS,
FACPh

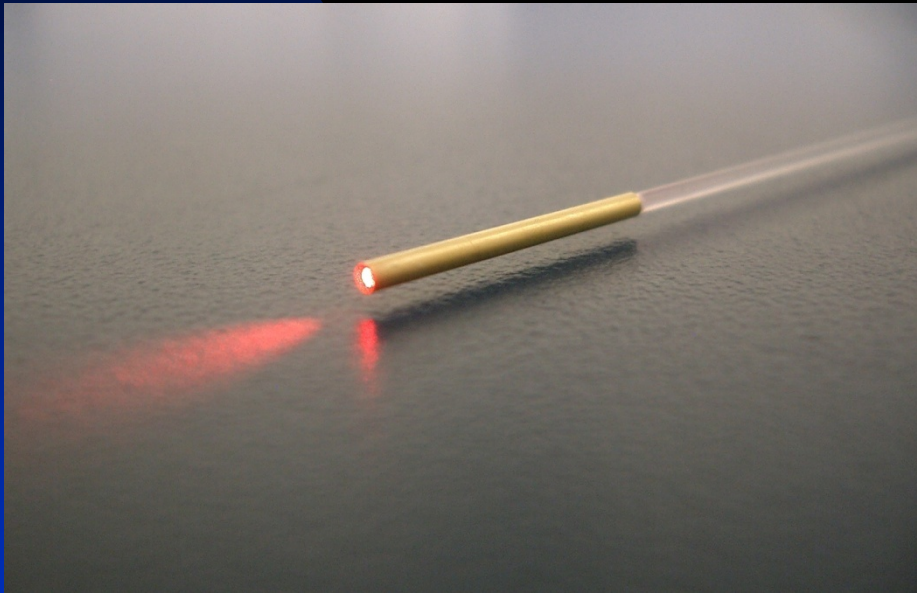
New York University Medical Center
Division of Vasular Surgery
Paris January 18, 2008

laser ablation contact with the wall

- led to perforations at standard settings

Leading to increased ecchymosis and possible pain related to wbc extravasation which starts the inflammatory cascade

Jacket-tip fiber



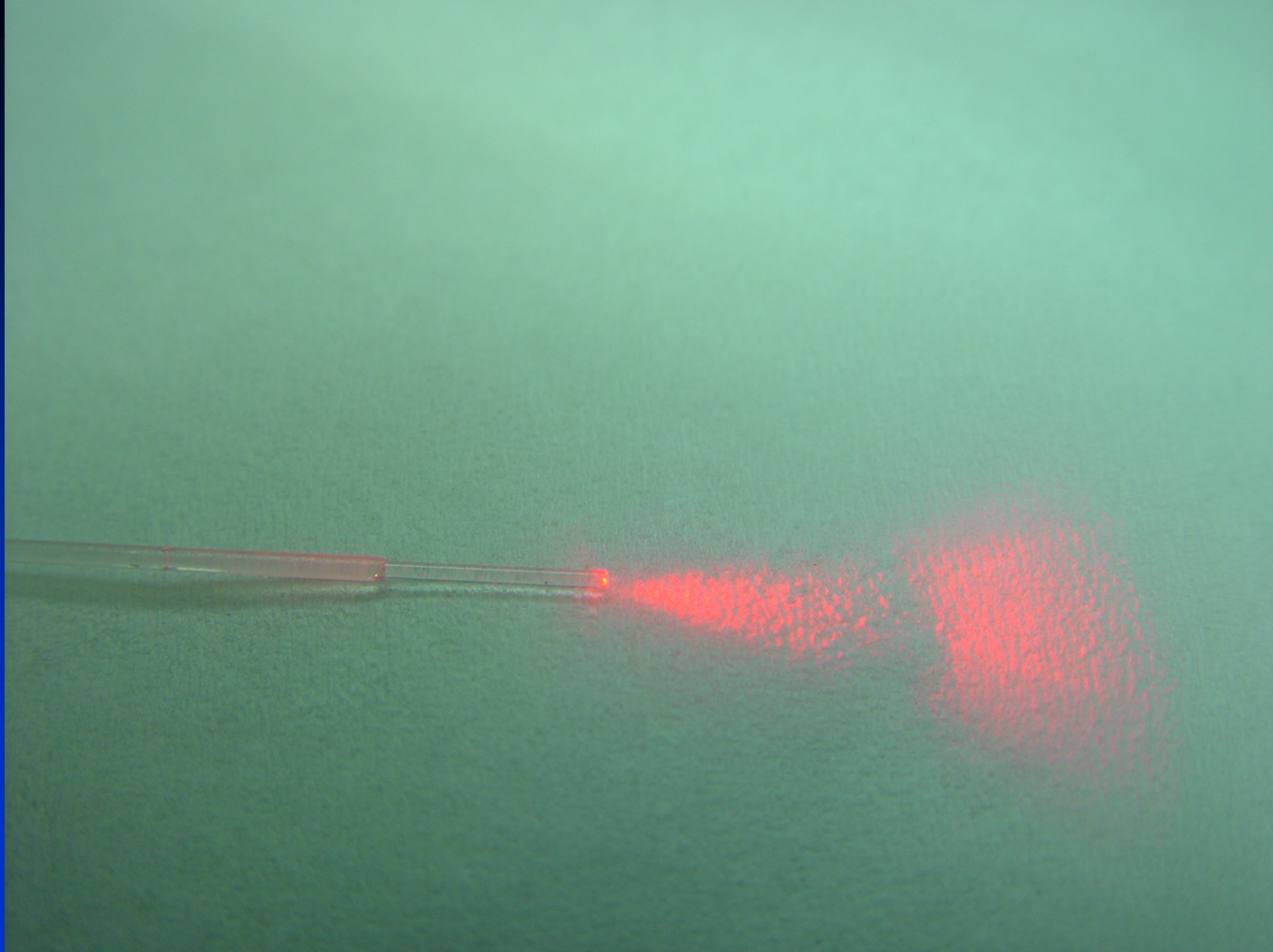
Laser	Number of Patients	Average Age	Females/Males %	Average Length Treated	Average Total J/cm	Average Pain	Average Bruise	Total GSV Closed
980 NT	10	56.50 ±14.2	F=90% M=10%	36.25cm	71.57 ±10.4	0.757	1.05	10
980 Bare Tip	10	51.70 ±11.1	F=90% M=10%	34.35cm	86.19 ±8.1	1.87	1.45	10

Pain Scores

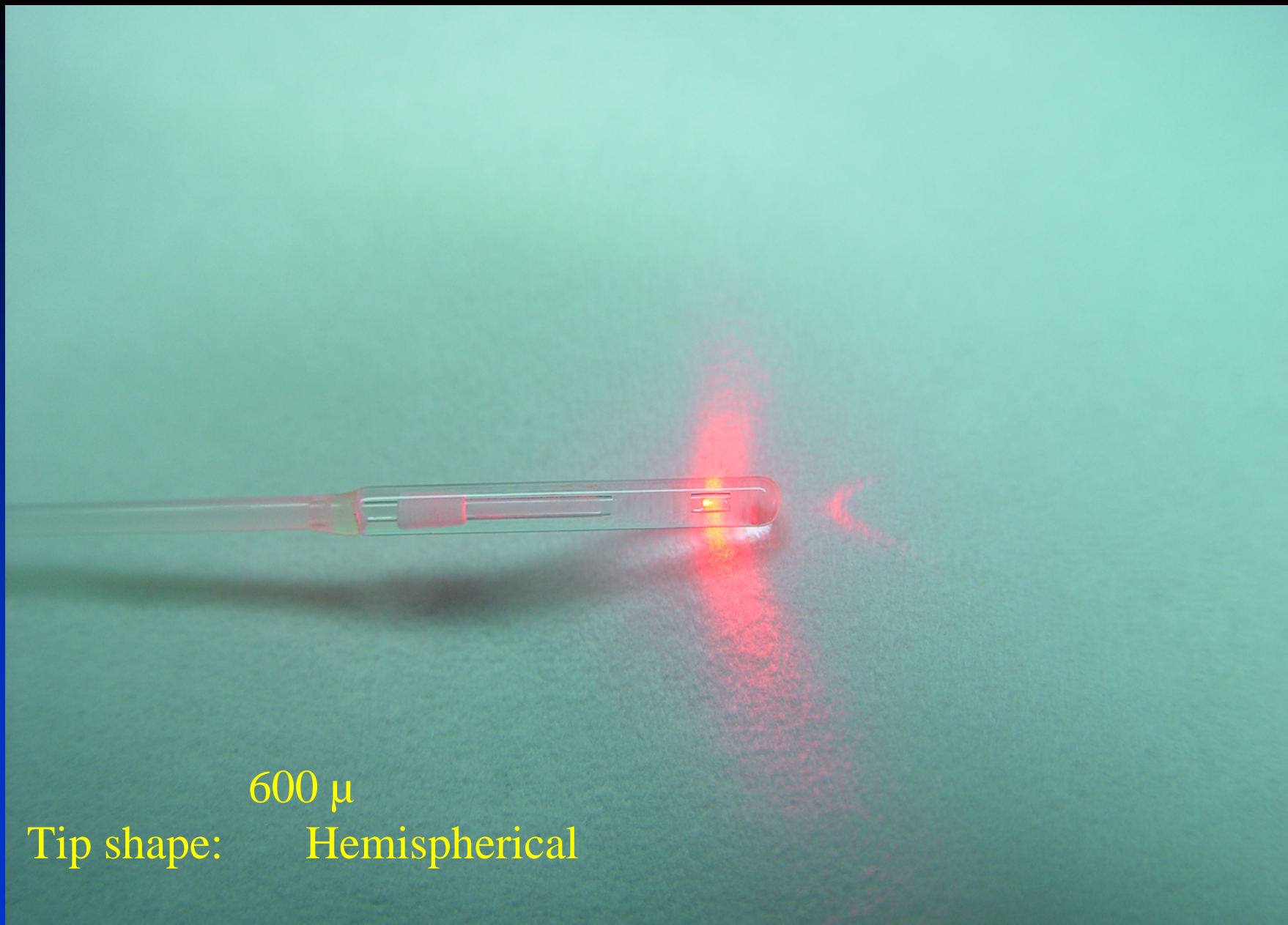
	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	TOTAL AVG
Bare- tip fiber	2.7	2.35	2.1	1.4	1.65	1.4	1.5	1.87
Jacket-tip fiber	1.3	1.1	0.7	0.3	0.8	0.6	0.5	0.757

0...1...2...3...4...5...6...7...8...9...10

Current fibre : 600μ



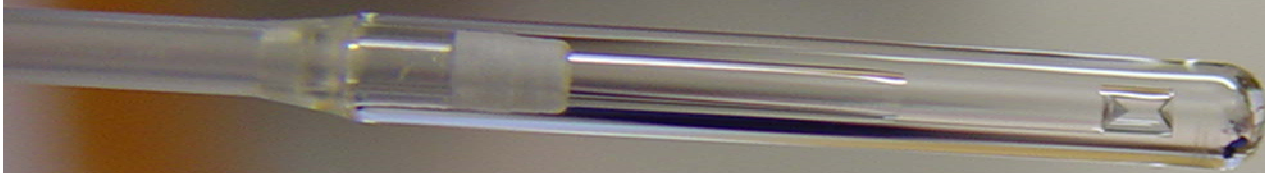
New fibre : 360 fibre



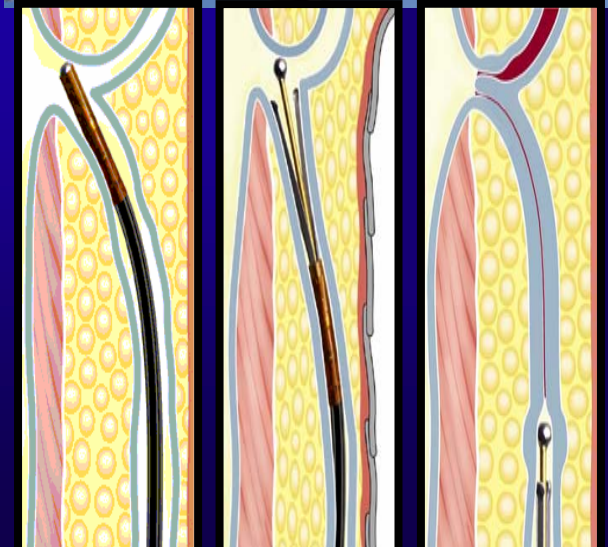
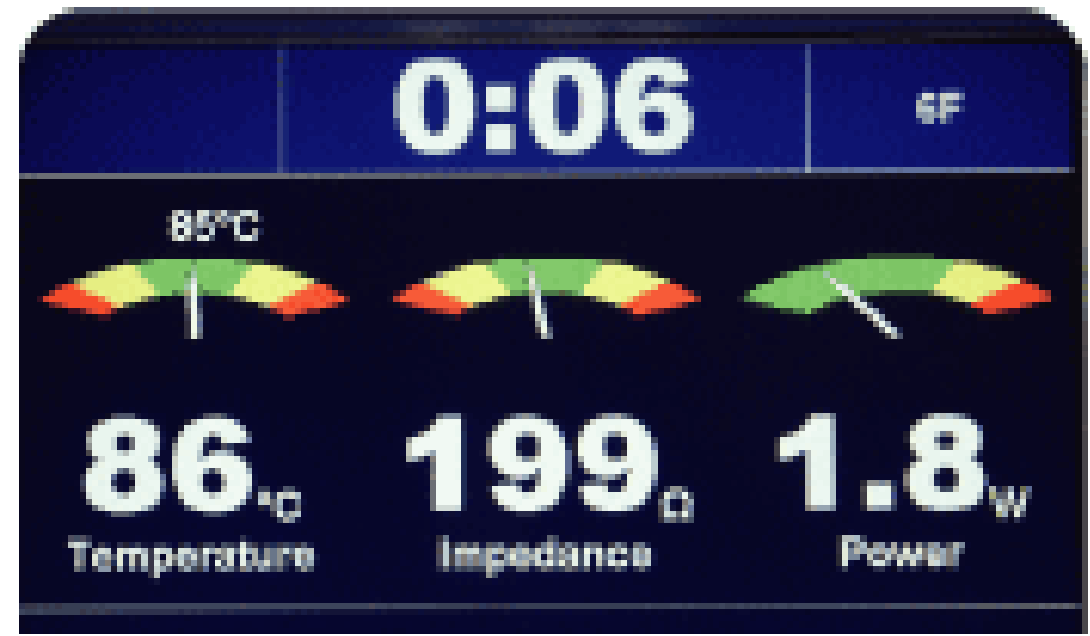
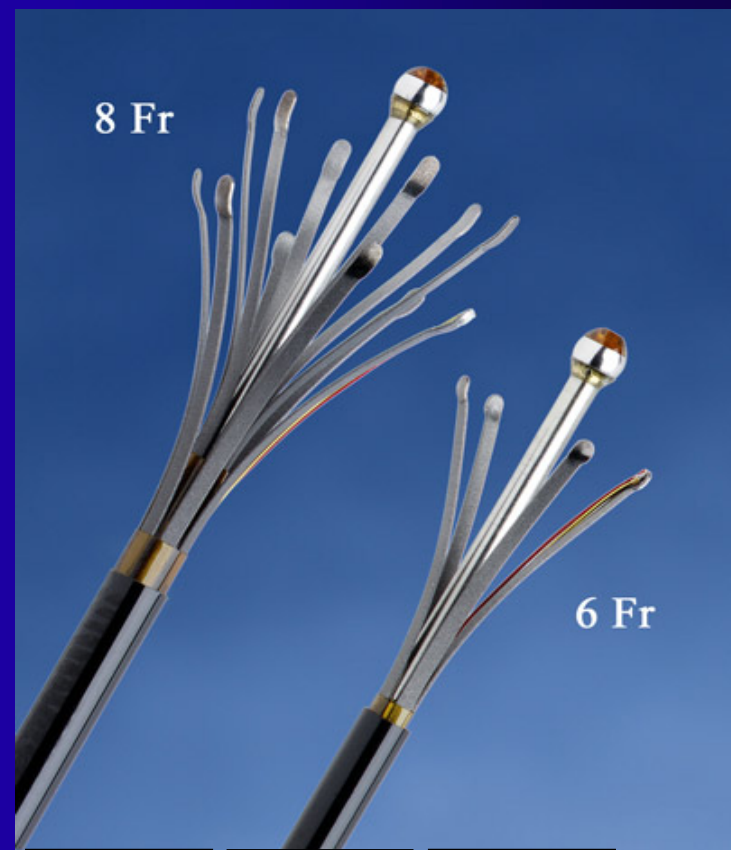
600 μ

Tip shape: Hemispherical

360 fibre after procedure



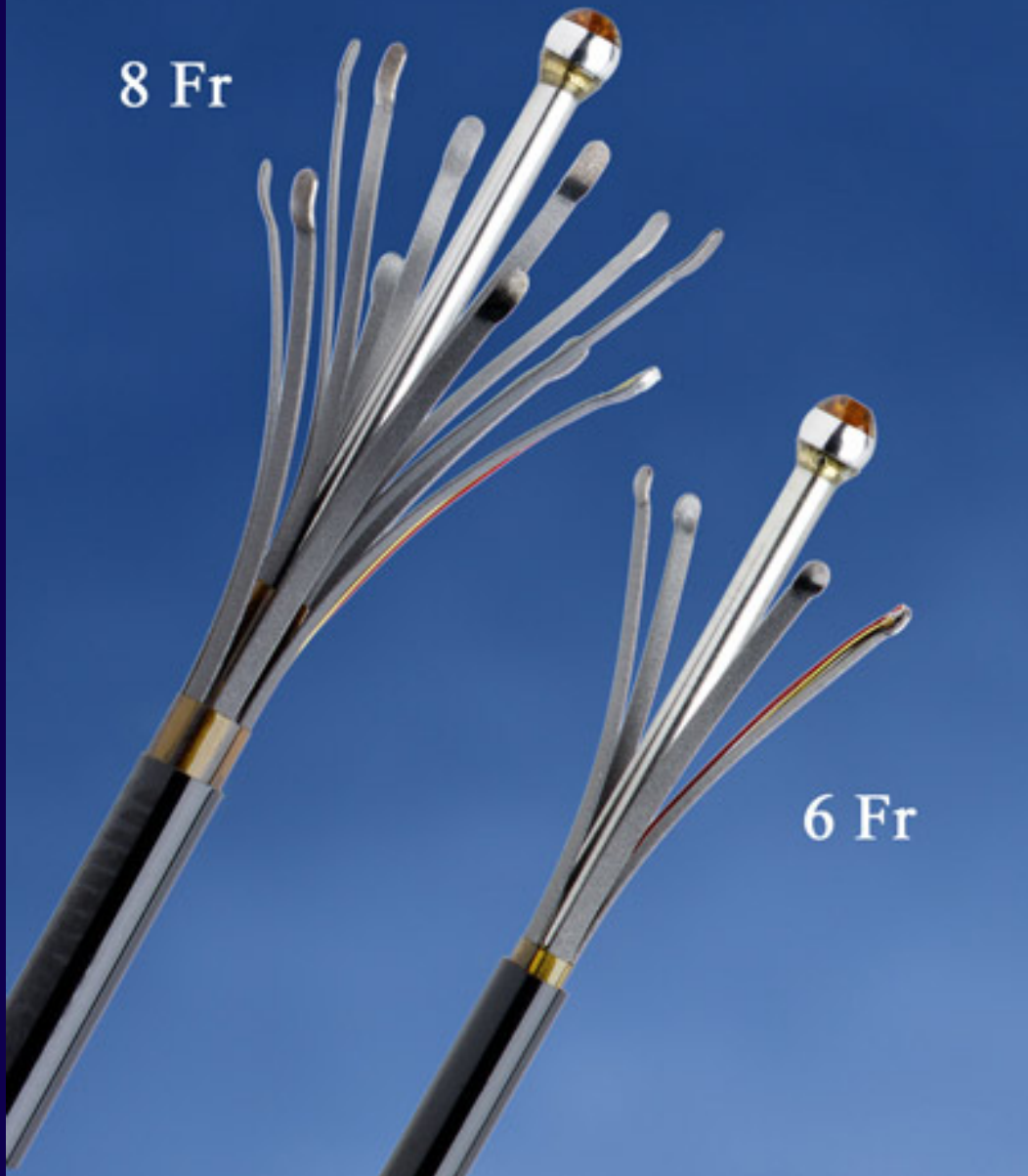
Different catheters in RF ablation



8 Fr

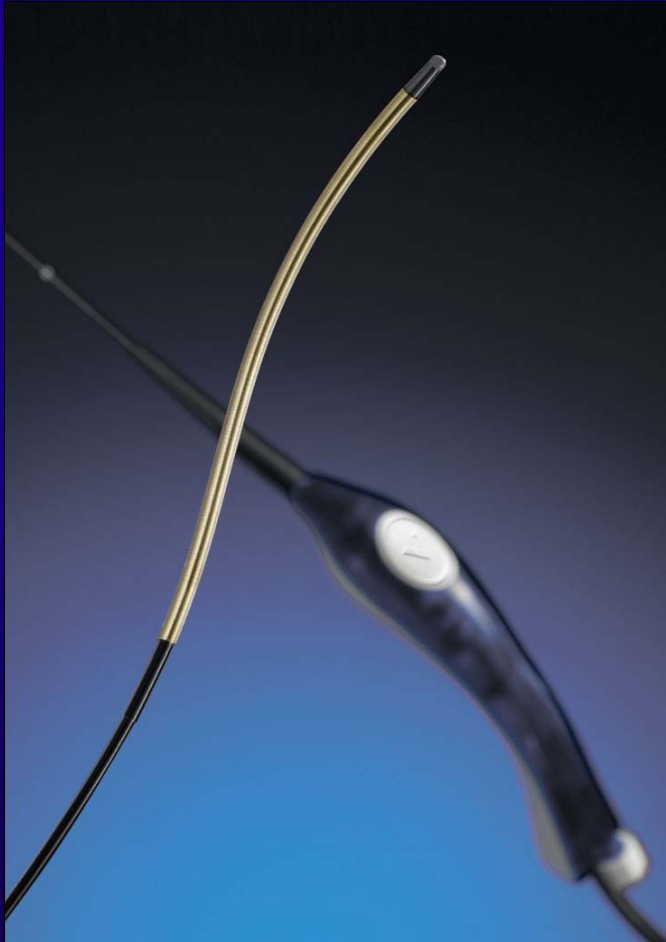
6 Fr

Closure fast



ClosureFAST System

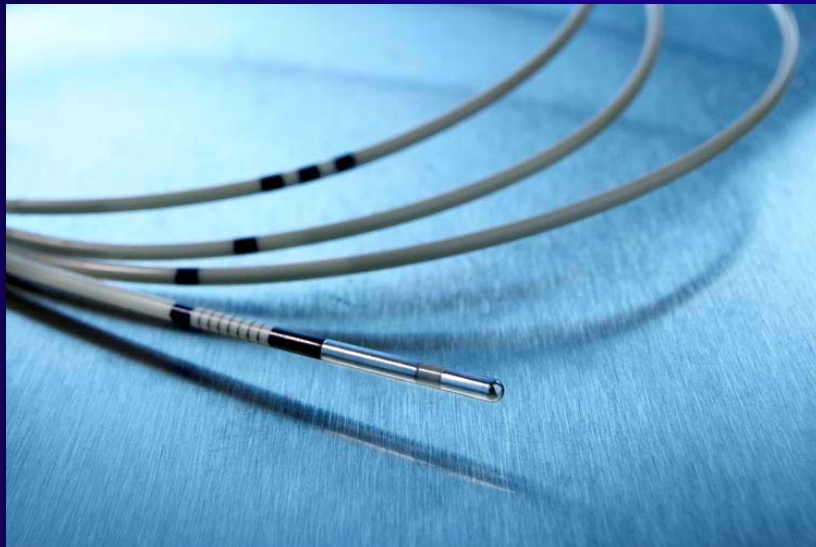
- 7F with a 7cm heating coil
 - 7cm vein length treated at once
 - 6.5 cm index pullback between treatments



Bipolar Radiofrequency-induced Thermotherapy (RFITT)



PRODUCTS APPLICATOR



CELON*ProCurve* 1200-S15

Diameter: 1.8
mm

Electrode length: 15 mm

Shaft length: 1.200 mm

Tip shape: Hemispherical





TECHNOLOGY

The endovenous laser principle is based on a thermal process:

- A conversion of light into heat
 - ★ Light energy is targeted, absorbed by the Hemoglobin and water and transformed into heat.
- A transfer of heat
 - ★ Firstly: the blood
 - ★ Secondly: the vein wall
- Result: An alteration of the proteins constructing the entire vein wall (3 layers)

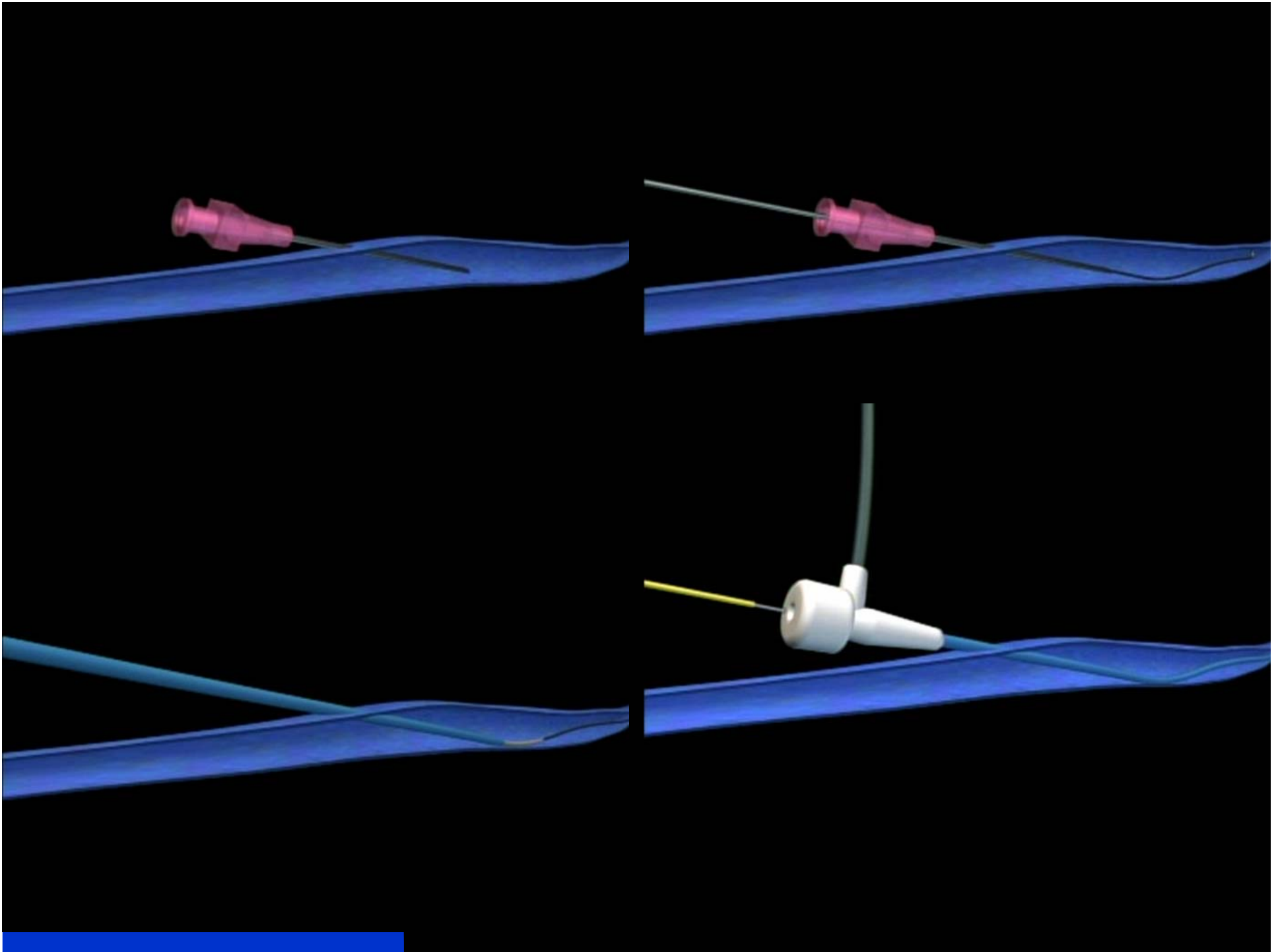
Closure[®] System Technology

Closure system delivers radio-frequency (RF) energy via bipolar electrodes to the vein wall

RF energy creates resistive heating that contracts the vein wall collagen, thereby occluding the vein

TREATMENT

- Using a catheter-based approach
- LASER :
 - ◆ 5Fr with current fibre
 - ◆ 6Fr with 360 fibre
- RF
 - ◆ 7Fr sheath with RF
 - ◆ 6 Fr with RFITT



PERIVENOUS ANESTHETIC (tumescent anesthesia) why we need it ?

- Not only for anesthetic reason but :
 - ◆ To protect surrounding tissue
 - ◆ To have a spasm of the vein

WHATEVER THE SIZE OF THE VEIN
AFTER THE SPASME THE INNER VOLUME
HAS TO BE THE SAME

ENERGY

ENERGY (E) in joules

POWER (P) in Watt

Energy = power x time($E = P \times t$)

Energy /cm

Energy /cm²= Fluence

Minimum Energy /cm =
10 joules /cm /diameter in mm of vein to
be treated

(Padova november 2006)

(Controversies in varicose disease Paris january 2007)

Calculate the energy before beginning

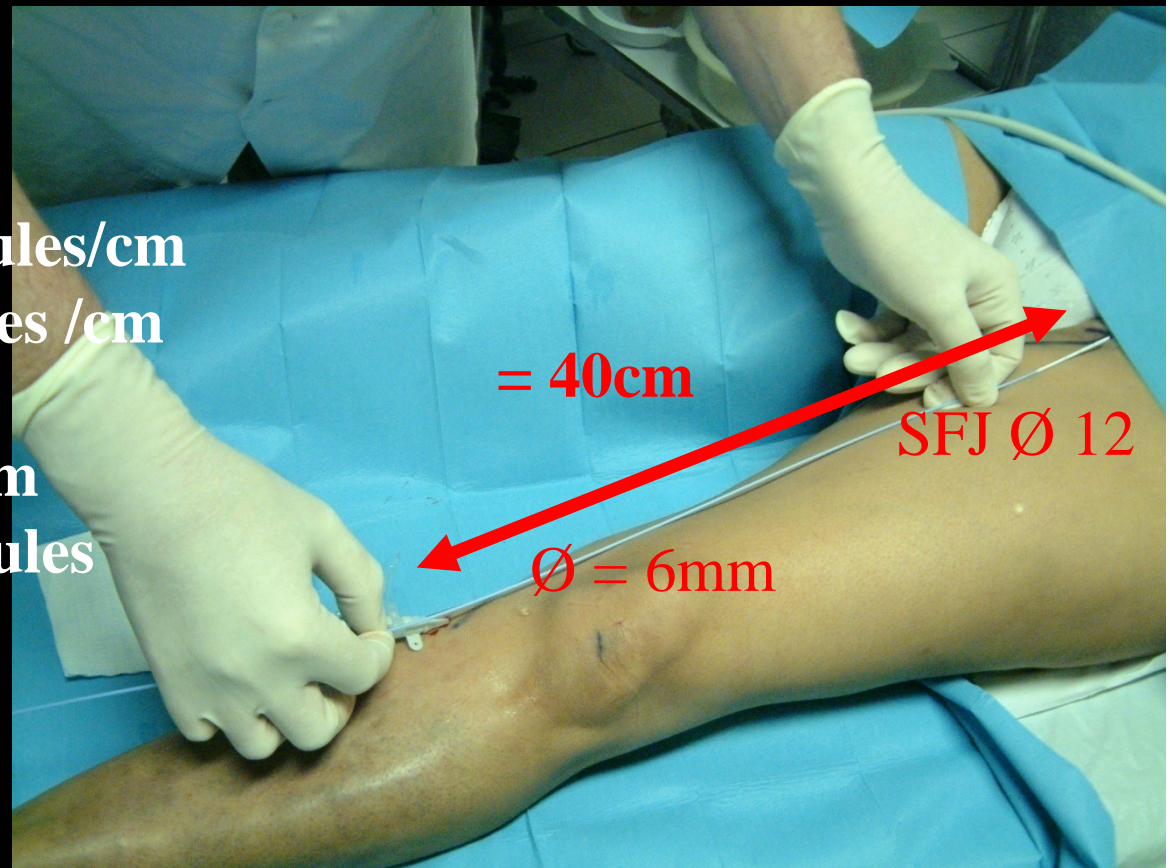
Minimum energy :

SFJ : $12 \text{ mm} \times 10 = 120 \text{ joules/cm}$

Thigh: $6 \text{ mm} \times 10 = 60 \text{ joules /cm}$

Length to be treated 40 cm

$60 \text{ joules} \times 40 \text{ cm} = 2400 \text{ joules}$

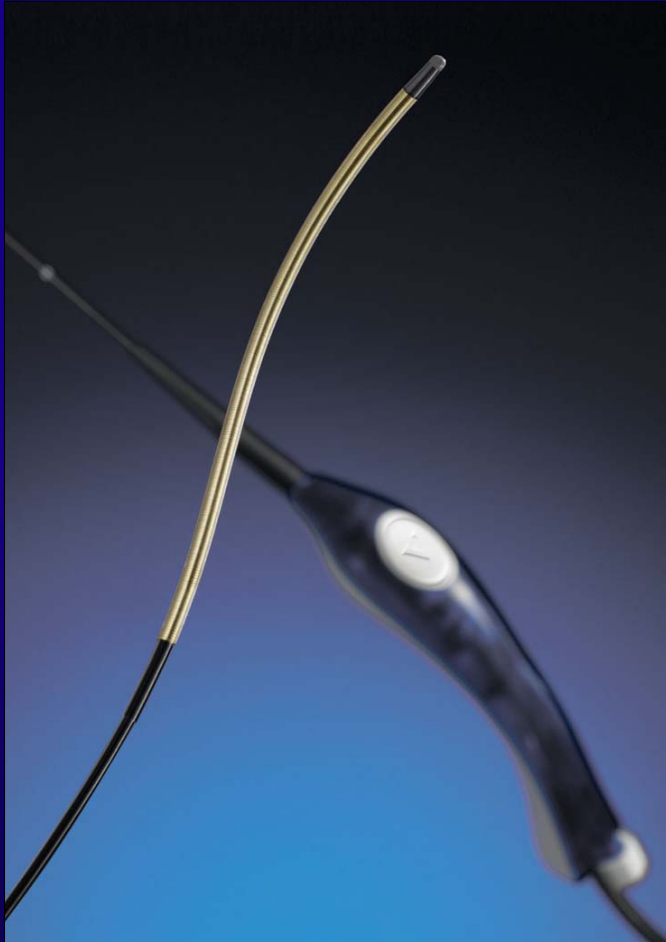


1470nm

Power : 8 watts

Continuous mode

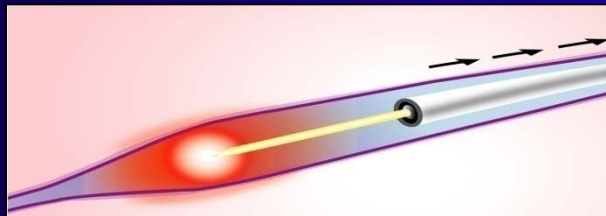
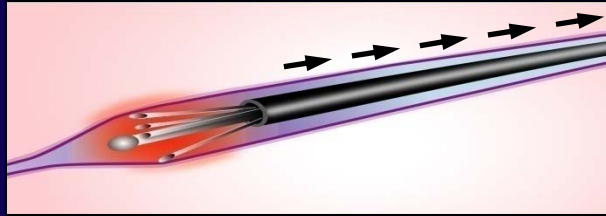
ClosureFAST System



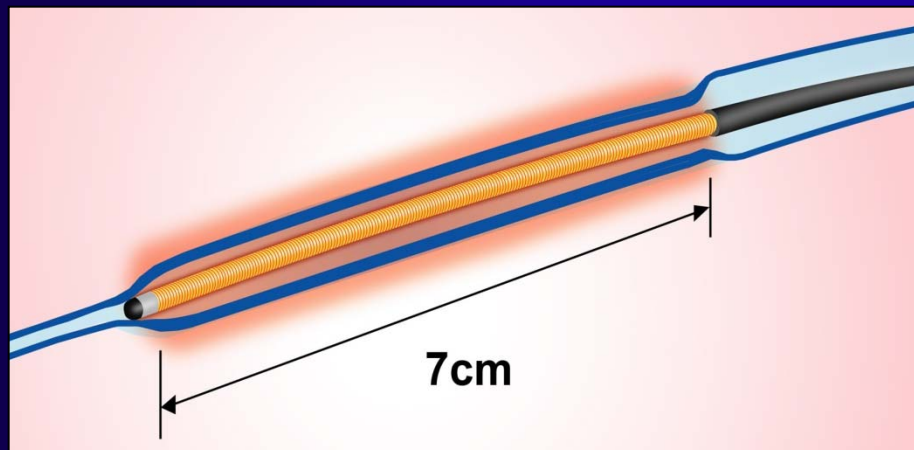
- 7F with a 7cm heating coil
 - 7cm vein length treated at once
 - 6.5 cm index pullback between treatments
- Temperature controlled energy delivery
- Power on/off switch on handle



Segmental Ablation replace Old Continuous Pullback Concept

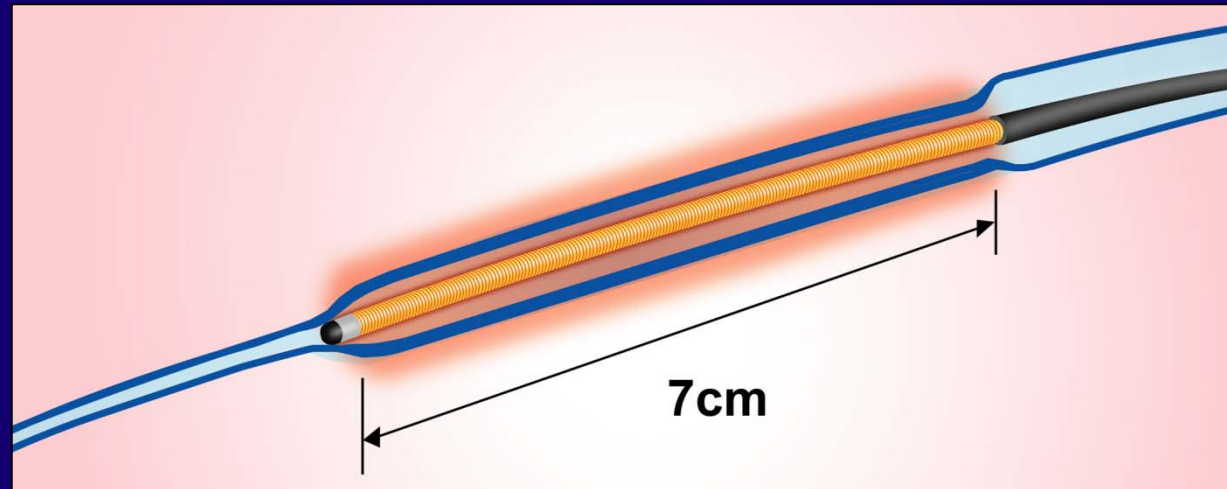


- Used by both *ClosurePlus* and laser
- Amount of energy delivered is dependent on speed of pullback.
- Small area is being treated at any given time.



- 7 cm length treated all at once in 20 sec.
- Energy delivery does not vary by pullback speed.
- Treatment Device (set) temperature: 120°C.

ClosureFAST Segmental Ablation



- 7 cm length treated all at once in 20 seconds
 - Device (set) temperature: 120° C
 - Tissue temperature: 100 - 110° C
- No energy delivery during repositioning
- Uniform energy dose not dependant on pullback speed

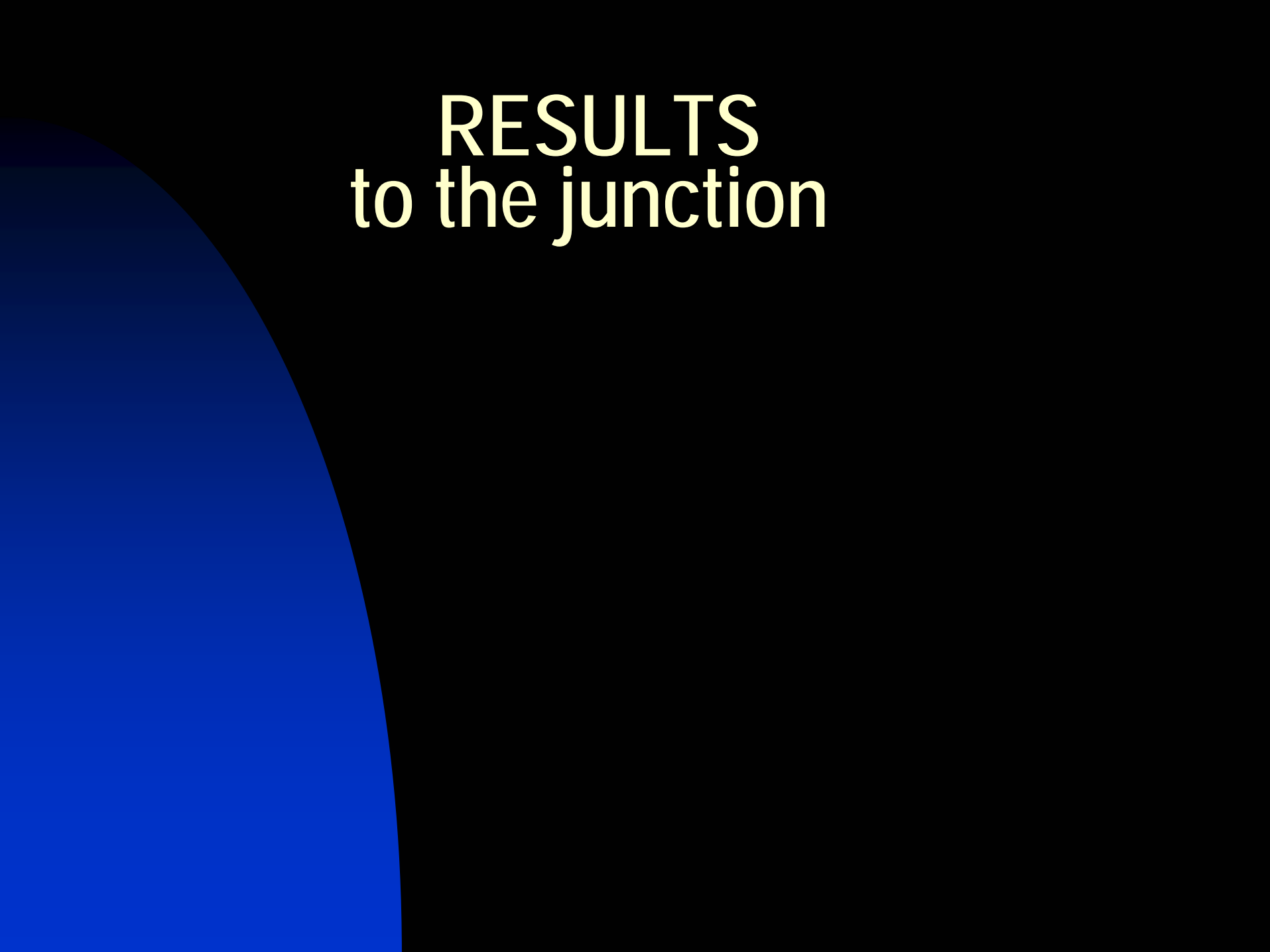
Ablation Time Comparison (45cm GSV Segment)

Current Closure - 85°C	18 - 24 mins
Current Closure - 90°C	10 - 12 mins
ClosureFAST	3 - 5 mins
810nm laser 10 -14 W	3 – 5 mins ¹
1320nm laser 6 - 10 W	>7.5 mins ²

References:

1 - EVLT® – Compare Alternatives; Diomed website 8/14/06

2 - Proebstle; ACP2004 abstract

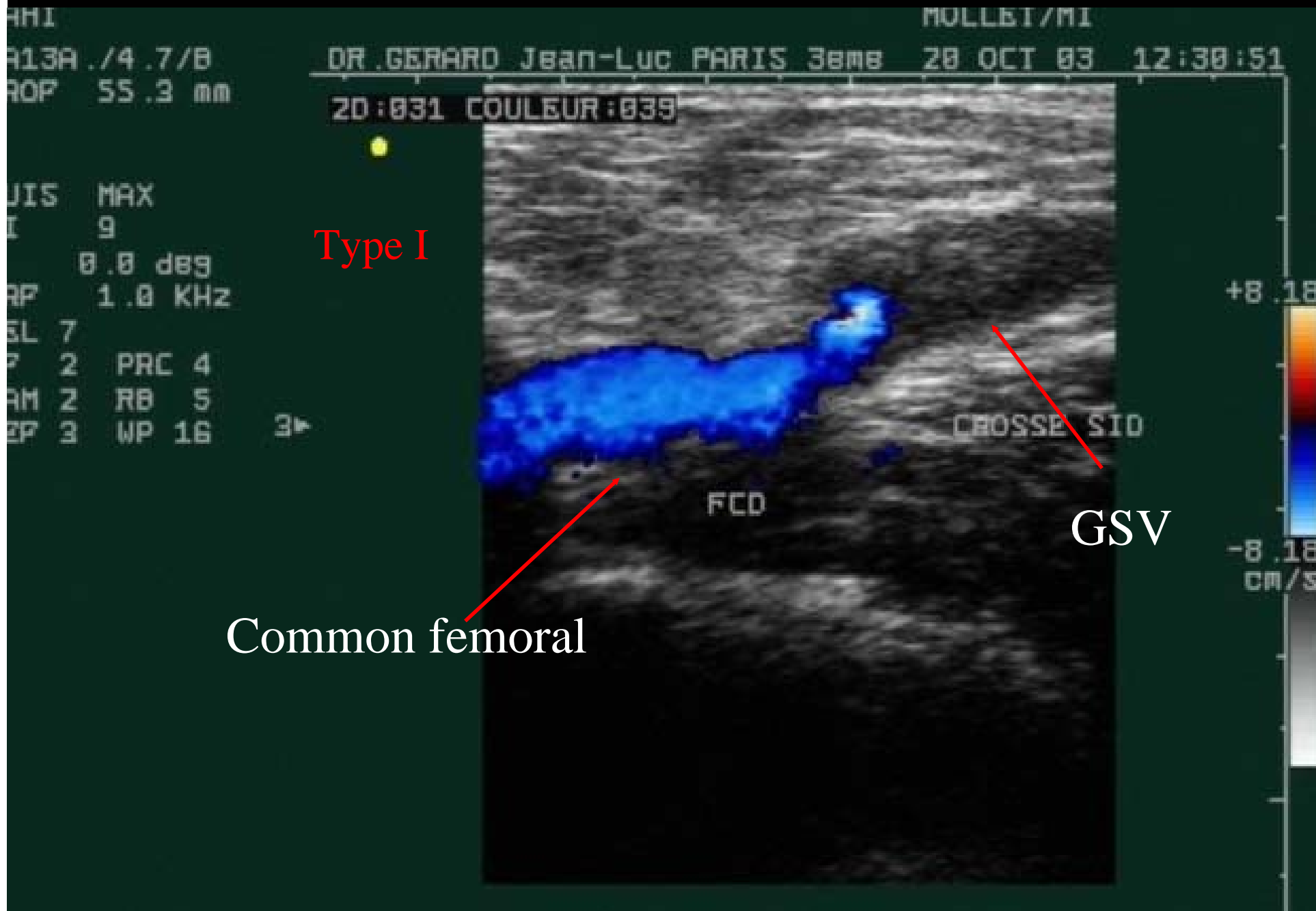
A blue curved shape, resembling a quarter-circle or a portion of a larger circle, is positioned on the left side of a black background. The shape is solid blue and curves from the bottom-left towards the top-left.

RESULTS to the junction

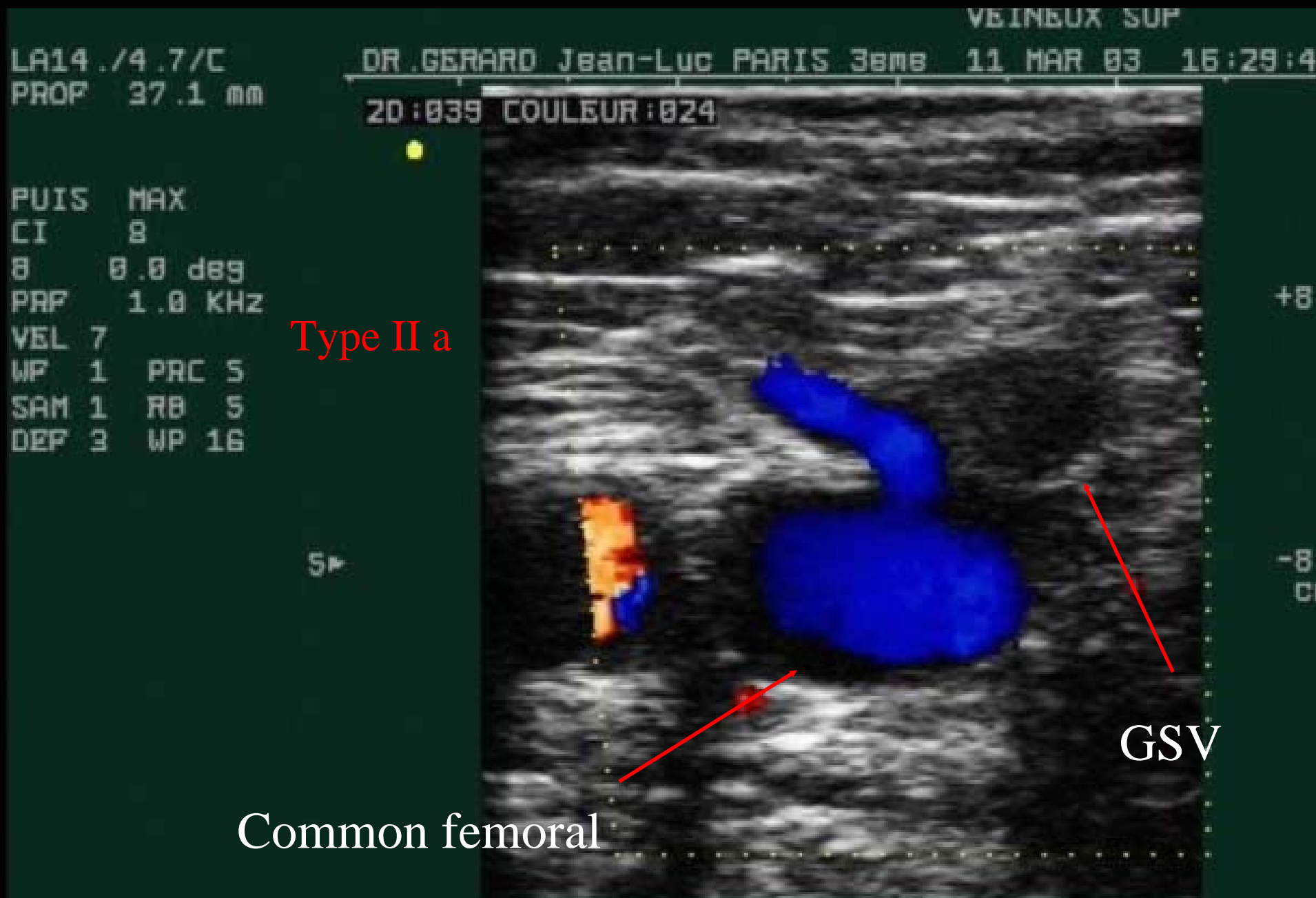
Sapheno-femoral junction duplex scan patterns after endovenous laser

- Pichot O, Kabnick L, Perrin M
- Aspects échographiques de la jonction saphéno-fémoral après oblitération de la grande veine saphène par Radiofréquence (Closure)
(phlébologie 2002,55,N°4,329-334)

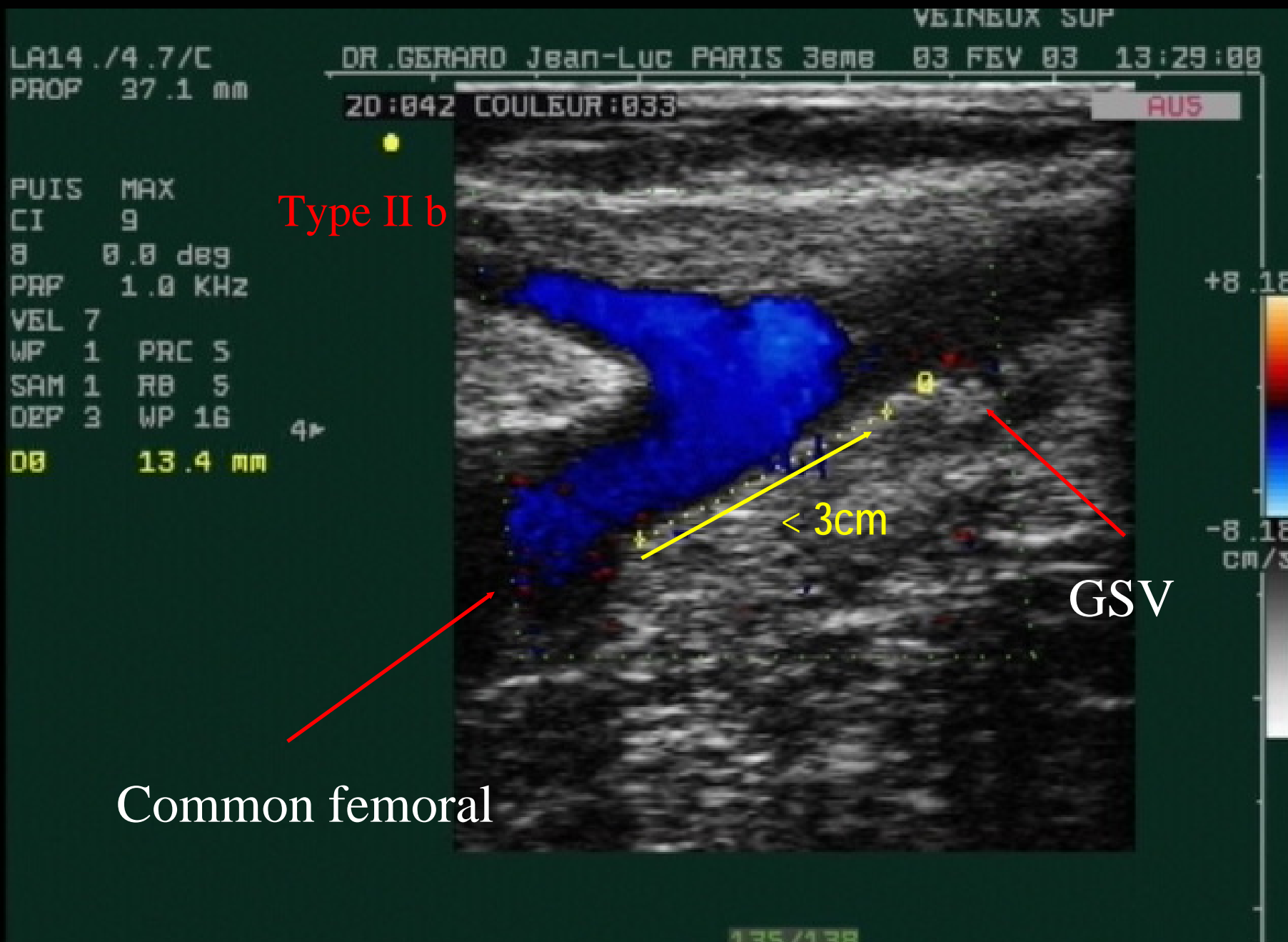
Distance between sapheno femoral junction and occlusion



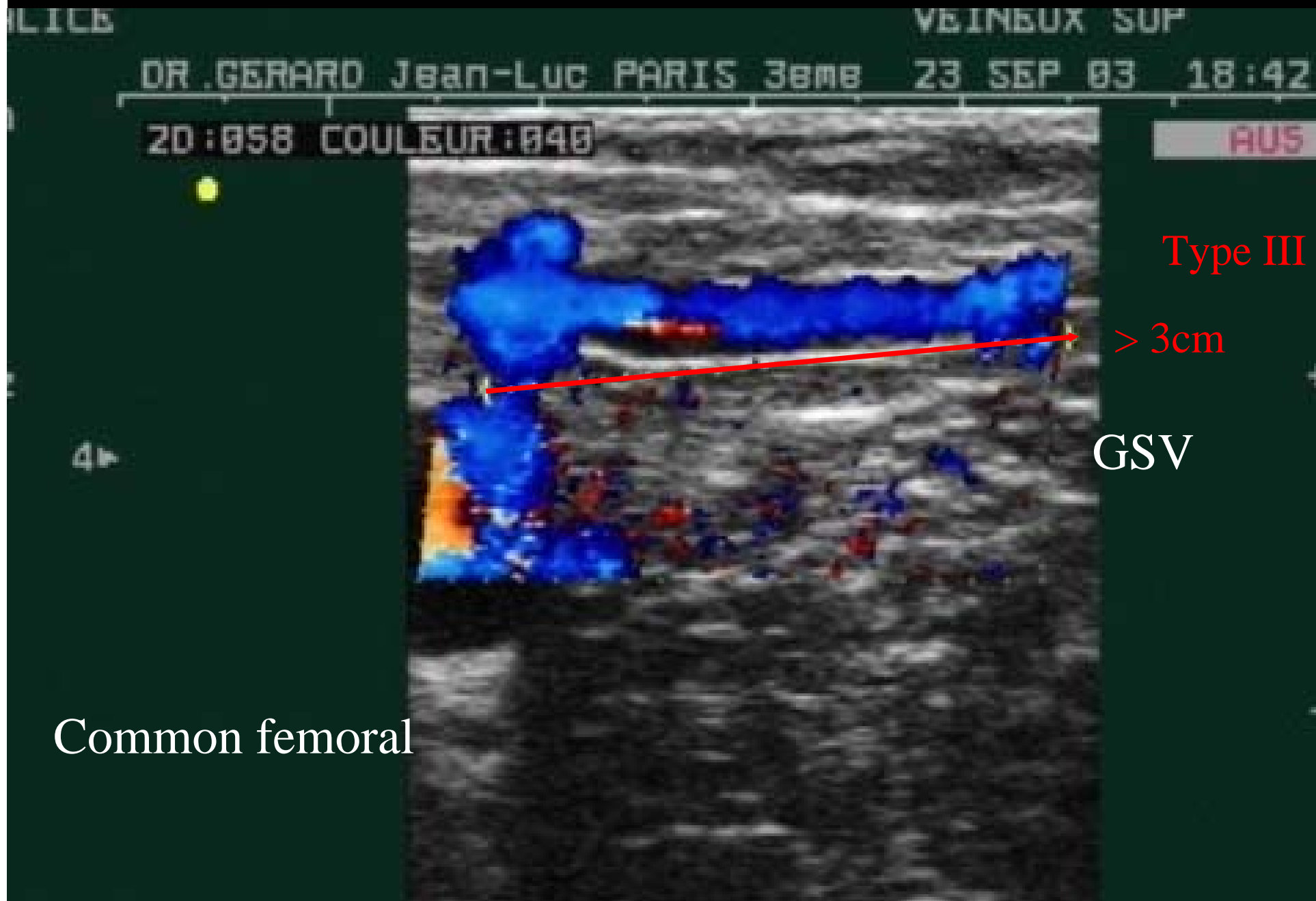
Distance between sapheno femoral junction and occlusion



Distance between sapheno femoral junction and occlusion



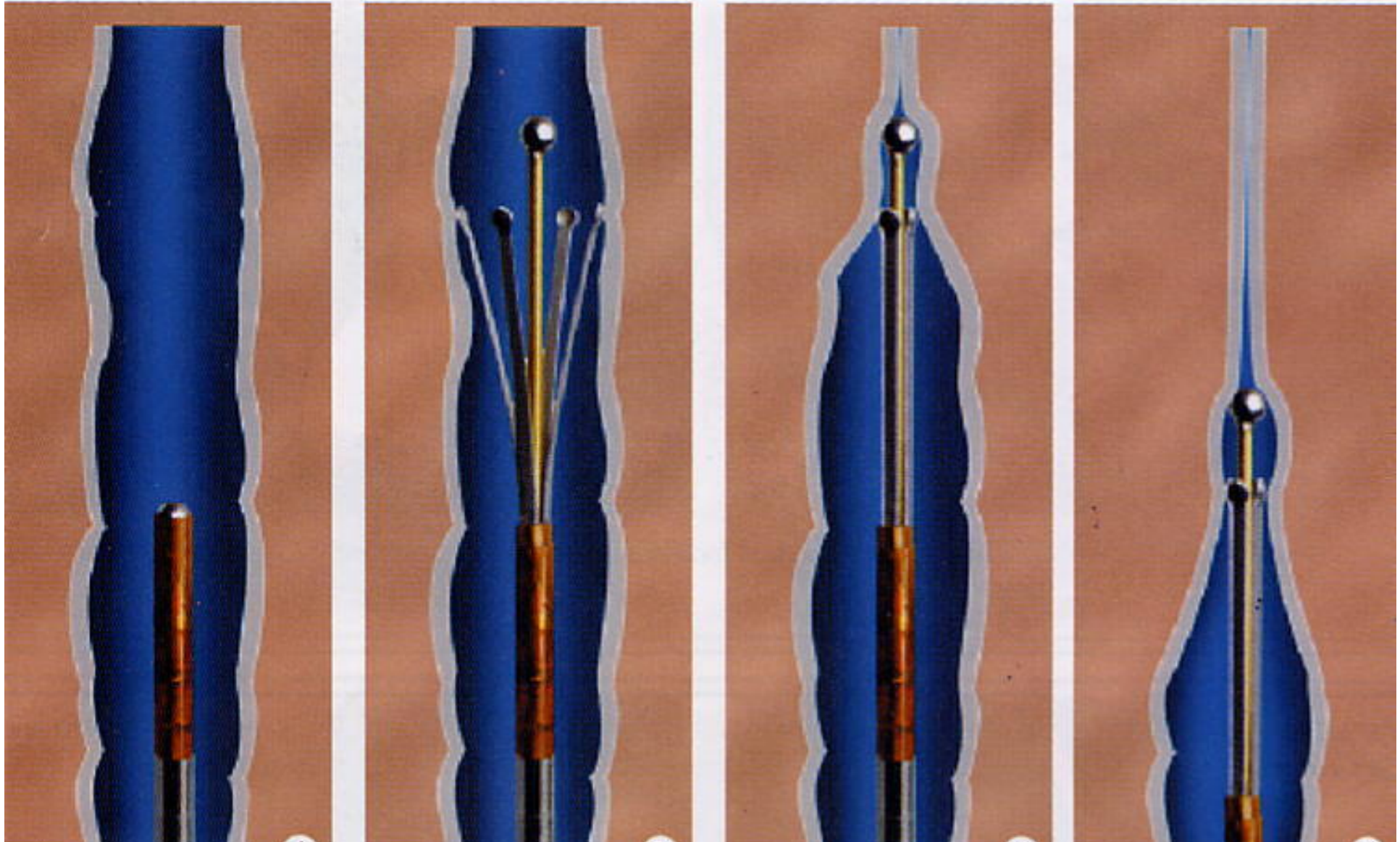
Distance between sapheno femoral junction and occlusion

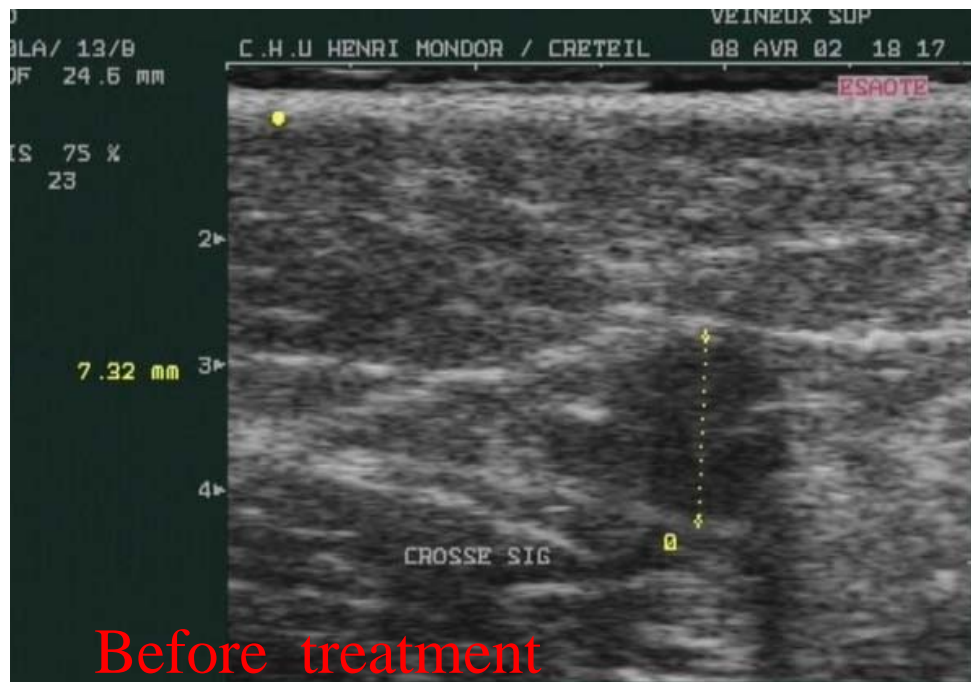


Immediate results

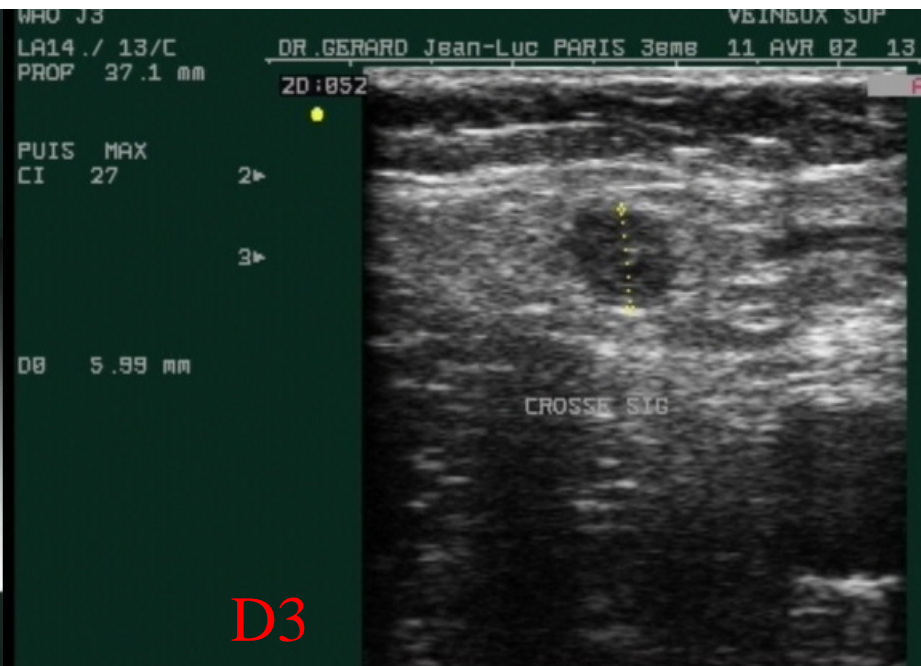
Progressive Shrinkage of the vein

Progressive shrinkage

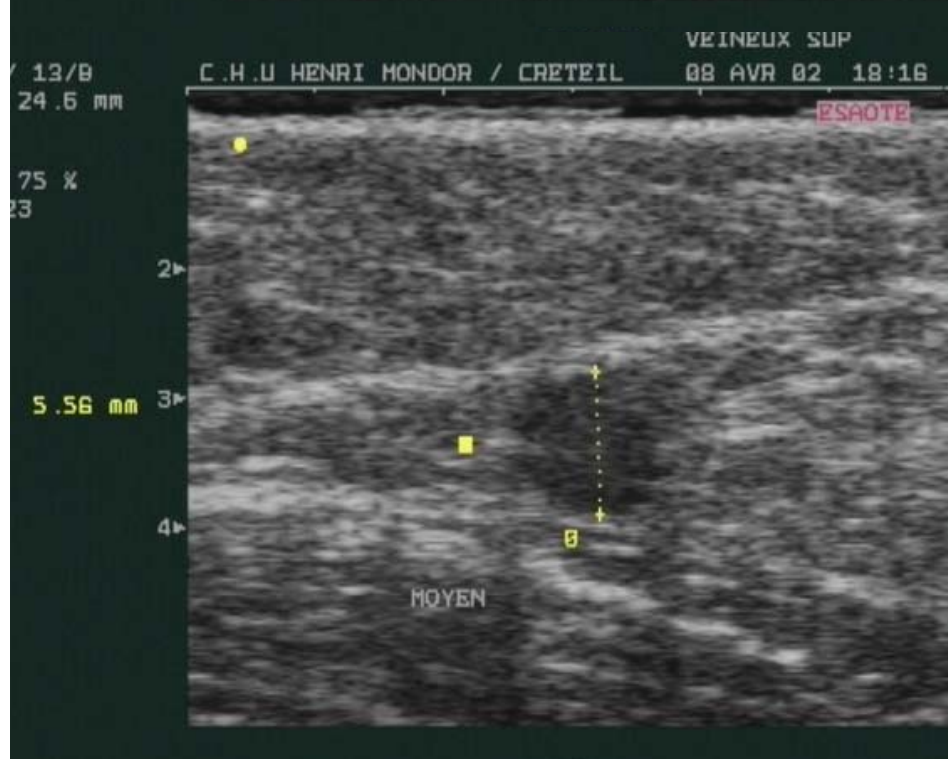


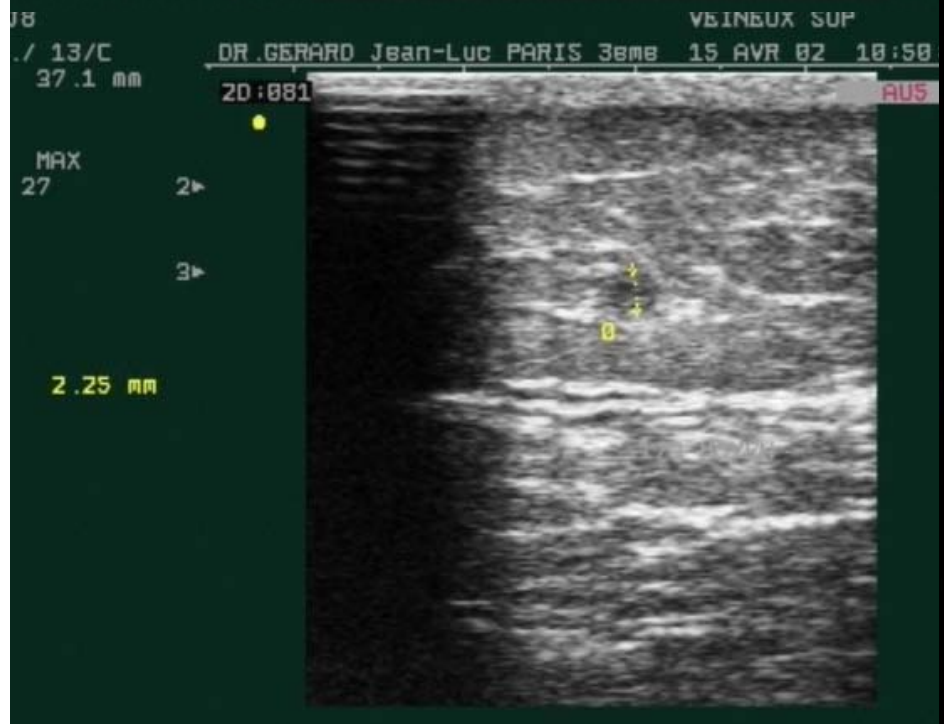
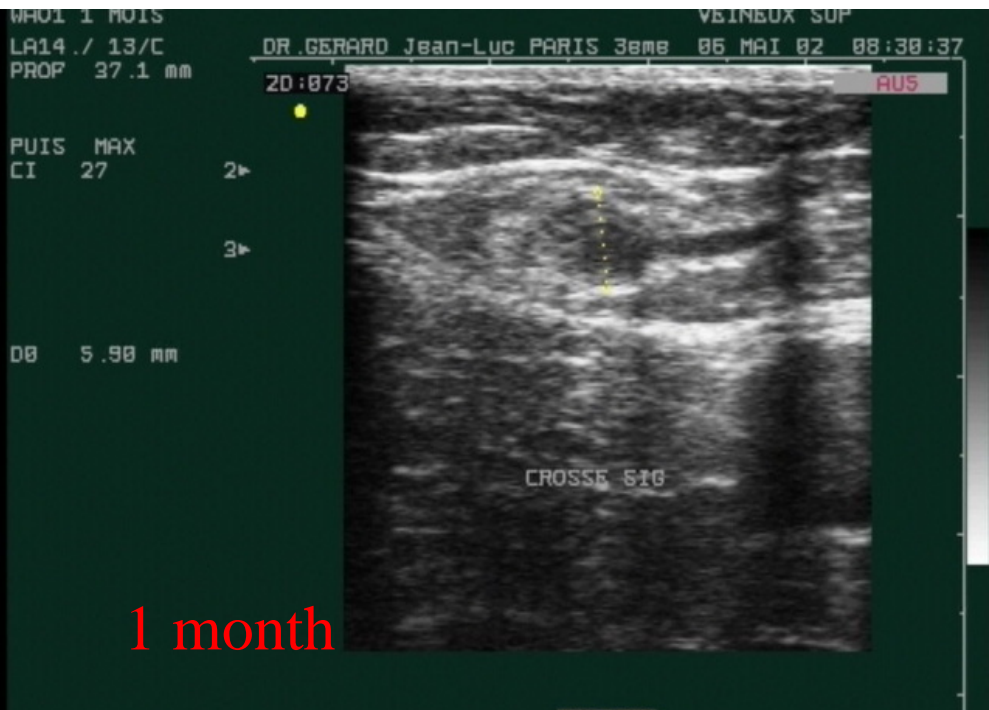
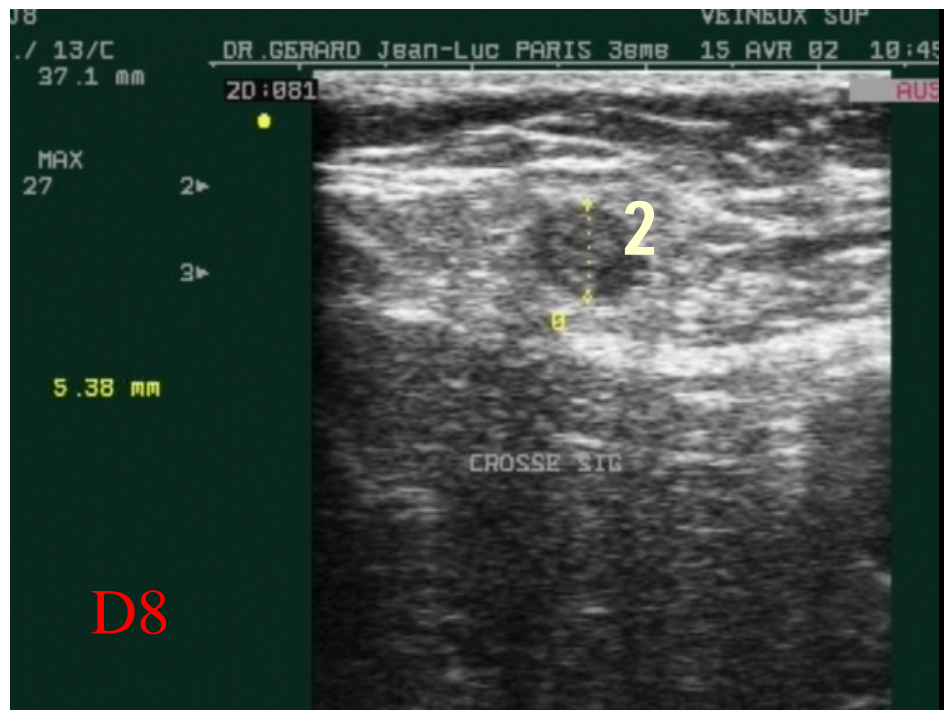


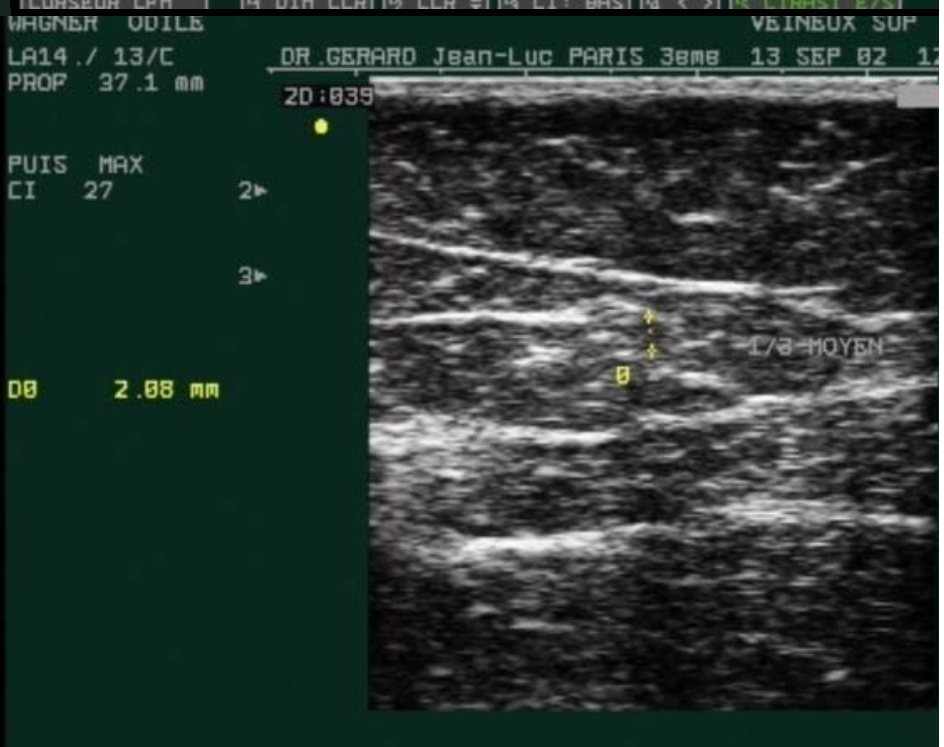
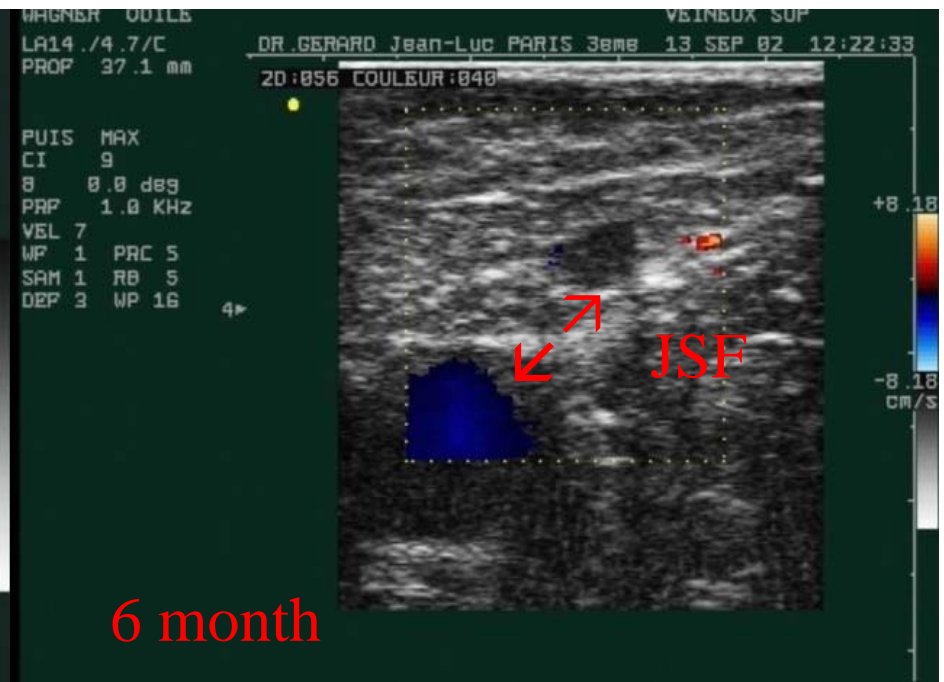
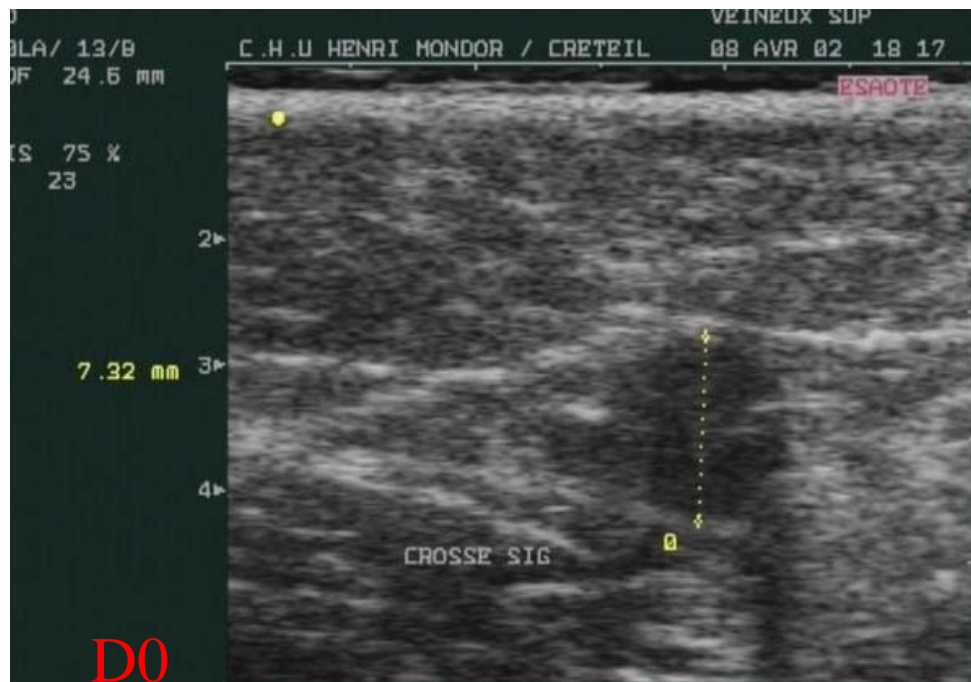
Before treatment



D3









Pain during the procedure

No pain

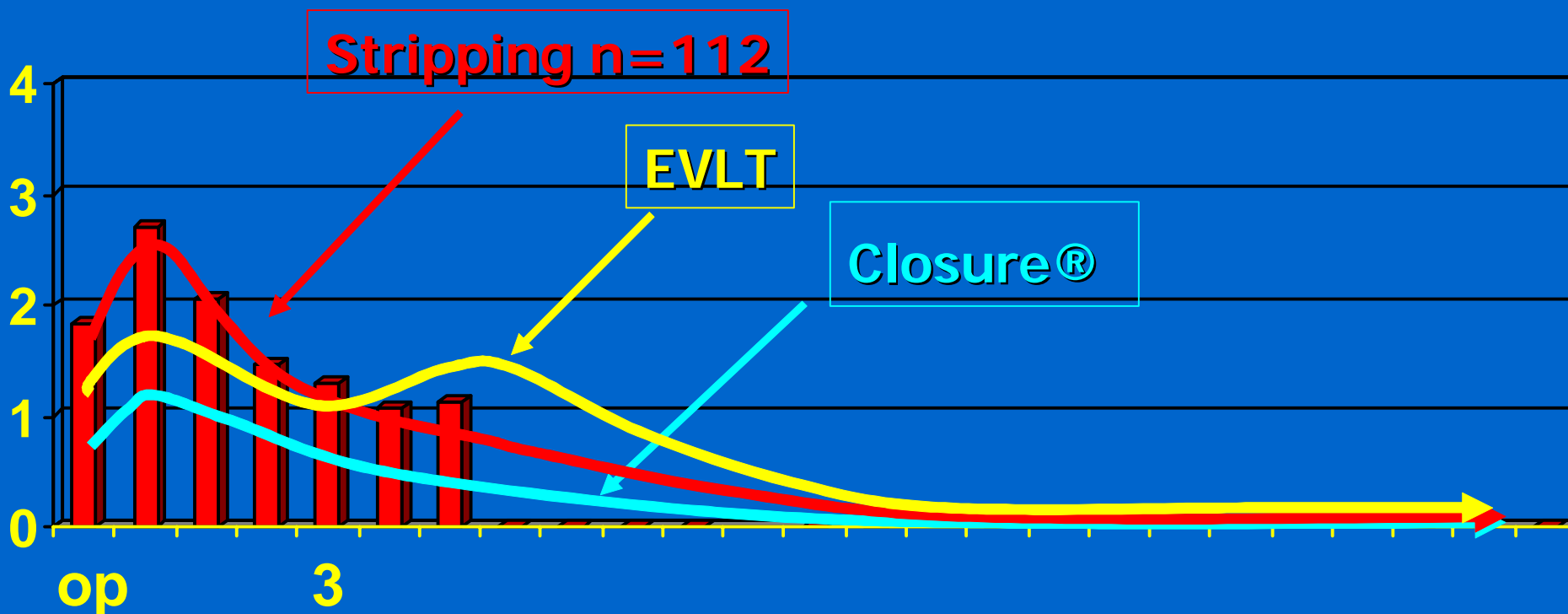
Closure®

Stripping

EVLT

Evolution of the postoperative pain

Stripping.....EVLT.....Closure®



Litterature Review

Currently **82 articles** have been published in English (68) and French (14) on RF obliteration for treating varicose veins.

Nineteen of them compared RF versus EVL but no RCT.

Seven compared RF versus HL + Stripping +/-Stab Avulsion **including 4 RCT**

One compared RF, EVL, HL+stripping

RESULTS

RAPID and MILD PATIENT RECOVERY

VERY FEW ADVERSE EFFECTS

Multi-centre retrospective study

EVLA of saphenous veins outside
operating theatre

DESIGN OF THE STUDY

Multi-centre (19 centres), retrospective study

Participants in France :

Allouche
Boitelle
Bracon
Cales
Desnos
Delafoulhouze
Galland
Gérard
Hamel-Desnos
Hévia
Landon
Magnaval
Mussard
Neaume
Thirifays

Participants in Switzerland :

Ducrey
Favre
Kern
Merminod

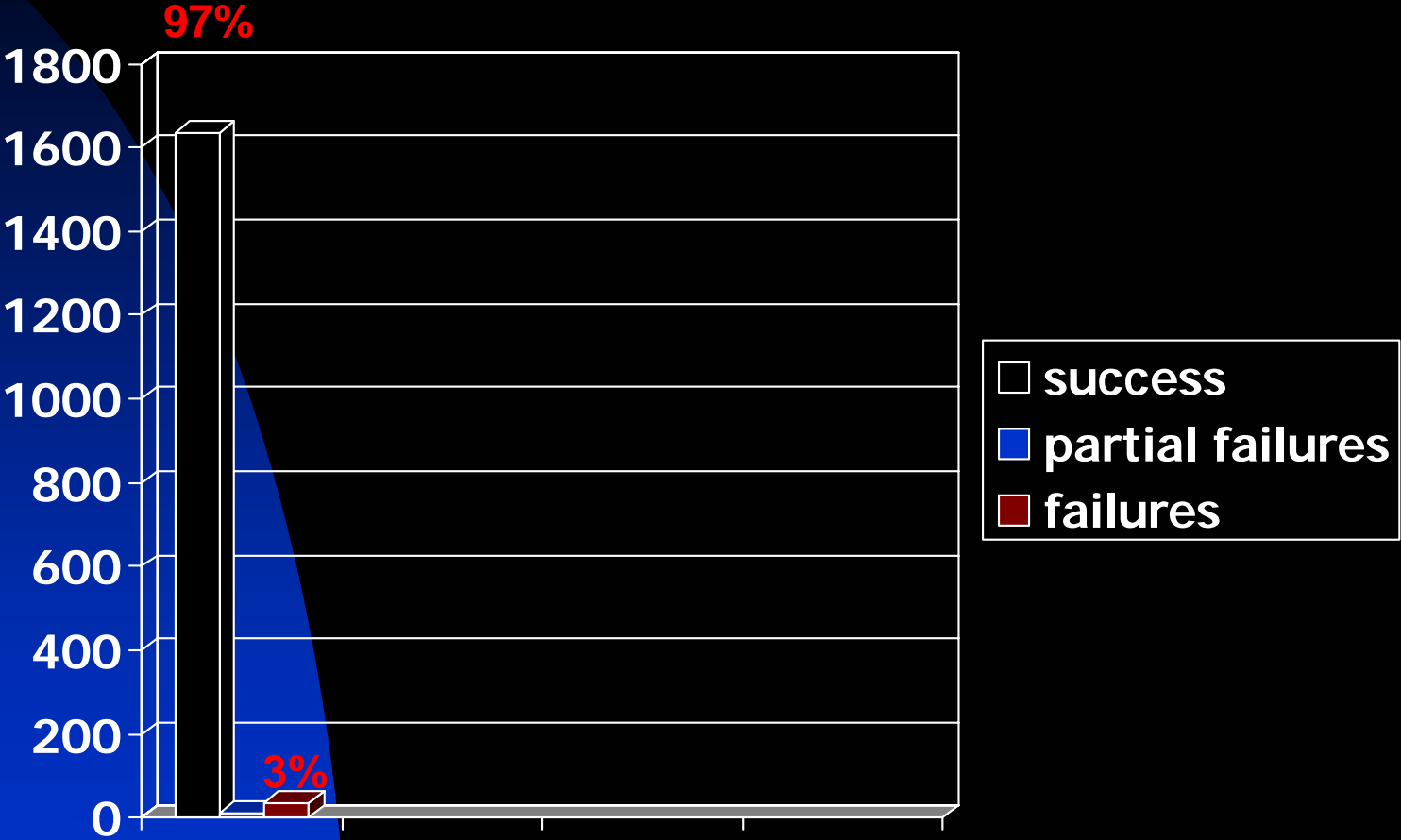
Population included : 1703 saphenous veins; 1422 patients

Gender	Female 74% (1300) Male 26% (403)
Age	Average 57 Median 57 (Extremes 15 and 92)
BMI	Average 25 Median 24 (Extremes 15 and 64)
CEAP	Average 2.8 Median 2 (Extremes 2 and 6)

Veins treated, main features of treatment

Type of vein (n)	GSV <u>1394</u>	SSV <u>309</u>
Diametre (mm) <i>Standing (large majority of cases)</i>	Average 7.21 Median 7 (Extremes 2 and 23)	Average 6.41 Median 6 (Extremes 3 and 17)
Length treated (cm)	Average 40 Median 40 (Extremes 3 and 85)	Average 21 Median 20 (Extremes 5 and 60)
Energy released (Joules / cm)	Average 64 Median 64 (Extremes 25 and 153)	Average 65 Median 64 (Extremes 38 and 100)

Effectiveness of treatment carried out



Comparative results

	■ EMC Perrin (2007) (encyclopédie médico-chirurgicale)	■ EVLT study outside operating theatre
■ Effectiveness	■ About 95 %	■ 97%
■ DVT	■ 0 to 2.7 %	■ 0.3% (n = 5) PE 0.06% (n = 1)
■ SVT	■ 1.7 to 10%	■ 0.2% (n = 4)
■ Dysesthesia	■ 0 to 36.5%	■ 0.7% (n = 12)
■ Hematoma	■ 0.8 to 46%	■ 0.3% (n = 5)
■ Infections	■ 0	■ 0.1% (n = 2)
■ Sick leave (average number of days)	■ 4 (under LA)	■ often 0 sometimes 3 or 4 depending on centre

A pair of legs is shown from the knees up, standing on a large, stylized blue flower. The flower has several large, pointed petals and smaller buds. The background is a light blue gradient. The text is overlaid on the image in a dark blue, serif font.

**Bipolar Radiofrequency induced
Thermotherapy (RFITT®)**

**A minimally invasive procedure for
applications in phlebology**

Bipolar Radiofrequency-induced Thermotherapy (RFITT) for the efficient and gentle treatment of insufficient veins -Results of the BRITTIV* Multicenter- Study –

(* **B**ipolar **R**adiofrequency-**I**nduced **T**hermotherapy (RFITT) for the **T**reatment of **I**nsufficient **V**eins)

(results presented by Dr. M. Camci at the
German Congress of Phlebology in Mainz 2007)
M Camci¹, B Harnoss², G Akkersdijk³, B Braithwaite⁴, L Hnatek⁵, E Roche⁶, P Santoro⁷, M
Sarlija⁸,
Y Sezgin², D Nio³, M Ajduk⁸, D Koios²

¹Mediapark Klinik, Cologne/Germany; ²Martin-Luther Clinic, Berlin/Germany; ³Spaarne Ziekenhuis, Hoofddorp/The Netherlands; ⁴Mapperley Park Clinic, Nottingham/UK; ⁵Atlas Hospital, Zlin/Czech Republic; ⁶Platón Clinica, Barcelona/Spain; ⁷Angiomedica, Rom/Italy; ⁸Klinicka Bolnica Dubrava, Zagreb/Croatia

Intermediate results – clinical data (06/07)

- N: 273 legs in 230 patient
 - Ø age: 53 years
- Gender ratio: 30% men; 70% women
- Treatment area: VSM = 97%, VSP = 3%
 - Anaesthesia: General = 70%,
Spinal = 23%, Local = 7%
additional Tumescence = 81%
- Ø Power setting: 24 Watt
- Ø Vein length: 42 cm
 - Ø Treatment time: 46 s
 - => Ø time per cm: 1,1 s
- Patient satisfaction*: >99%

*were satisfied with the treatment and would recommend it to friends and/or family

IN TOTAL in RF ablation

- **ADVANTAGES RF Fast**
 - Efficient : more than 95%
 - Uniform energy dose not dependant on pullback speed
 - Less painful, less ecchymosis comparing surgery and laser ablation
- **DISAVANTAGES**
 - Is it still RF with Closure Fast ?
 - Parameters are fixed (120 ° Celsius) whatever size of the vein
 - Risk of paresthesia: SSV and GSV below knee
 - Burn: superficial veins
 - Possible inefficacy
 - Lack of spasm after tumescent anesthesia (perforator between the 7cm catheter)
 - 7Fr sheath with RF

IN TOTAL in LASER ablation

■ DISADVANTAGES

- ◆ Different wavelengths
- ◆ Energy dose
 - ★ By your own
 - ★ Dependant on pullback speed

■ ADVANTAGES

- ◆ Efficient : more than 95%
- ◆ Adapt energy according size of the vein
- ◆ Adapt energy according depth of the vein
- ◆ Less painful less ecchymosis with 360 and 1470 nm

COST

- LASER : 150 to 200 euros
- RF Fast : 400 euros
- RFITT : 285 euros

CONCLUSION

RF or EVLT ablation

Ambulatory technique or mini invasive procedure

Efficient but necessitating

- Ultrasound skill (surgeon or vascular physician)
- Minimum training

Systematic review of foam sclerotherapy for varicose veins.

X. Jia^{1*}, G. Mowatt¹, J.M. Burr¹, K. Cassar², J. Cook¹, C. Fraser¹
British Journal of Surgery 2007 Août (*Br J Surg* 2007; 94: 925-36)

- Sixty-nine studies were included.
- Security
 - ◆ Serious adverse events (PE, DVT): less 1%
 - ◆ Visual disturbance : 1.4%
 - ◆ Headache: 4.2%
 - ◆ Thrombophlebitis (SVT): 4.7%
 - ◆ matting/skin staining/pigmentation: 17.8 %
 - ◆ pain at the site of injection: 25.6 %
- Efficacy
 - ◆ Complete occlusion of treated veins: 87 %
 - ◆ developpment of new veins: 8.1 %

FOAM THERAPY

■ ADVANTAGES

- ◆ Cheaper , easy
- ◆ Adapt dose according size of the vein
- ◆ Adapt dose according depth of the vein
- ◆ Best treatment for recurrency

■ DISAVANTAGES

- ◆ Less efficient big veins
- ◆ Disappearance of vein longer than RF or LASER (30% 3M, 85% 2Y)
- ◆ Adverse effects : 0,3 % neurologic complications including visual disturbance (transient and reversible)