LASER ABLATION
LESSONS LEARNED

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Conflict of Interest
NO for this presentation

Lessons learned
- Wavelength
- Fiber
- Energy

GUIDELINES
for varicose vein
- US (SVS AVF 2011 May): thermal ablation 1B (TS2B)
- UK (2013 July): offer endothermal ablation in first (TS3rd)
- EVF (2014) : thermal ablation 1A (TS2B)

Endovenous laser ablation (EVLA)
- Different wavelengths
- Different fibers
- Energy

WAVELENGTHS
- 810nm
- 940nm
- 980nm
- 1320nm (2005)
- 1470nm (April 2006)

More absorption in water
Does the wavelength matter?
Comparison between:
- 810 vs 980nm Kabnick (2006)
- 940 vs 1320nm Proebstle (2005)
- 980 vs 1500nm Vuylsteke (2009)

Same results
Few differences in side effects: pain and bruising

Electromagnetic Spectrum

Spectrum absorption
water

WHAT THAT MEANS BETTER ABSORPTION?

Mathematical modeling of 980 and 1320nm

Serge MORISON

κₑ (mm⁻¹) effective attenuation coefficient

Serge MORISON
« New » Wavelength

Same efficacy
Less power needed : ≤ 10 watts

Investigations on the acute effects of circumferential laser light energy application for endovenous laser treatment. Sroka R. (controversies 2009)

- Fiber damaged: power 15 watts for more than 20 seconds
- No damage: power 10 watts for more than 30 seconds

DOES THE FIBER MATTER?

Bare tip fiber : sharp tip

Fiber 600µ: frontal emission

Contact of the bare-tip fiber on the vein wall
**HISTOLOGIC MODIFICATIONS IN VITRO** (Dr. VUONG)

Contact of the fiber with the vein wall leads to perforations:
- Ecchymosis
- White blood cell extravasation which starts the inflammatory cascade → Pain

(Advantage: destruction of the different layers of the vein wall)

Frontal emission

Radial emission

Carbonization of the vein wall

Never touch fiber (Angiodynamics® 2008)

Radial Fiber (Biolitec® 2007)

Radial Fiber: smooth tip

Never touch direct fiber (Angiodynamics® 2012)
IRRADIATION OF THE VEIN WALL
HISTOLOGIC MODIFICATIONS OF THE GSV TREATED IN VIVO
by LASER 980nm
(Dr Spreafico)

Delamination and fissuration of the media at the point of contact with the fiber and from a distance
vacularisation intima and media

Pain score for the first 10 days following endovenous ablation
L. Rasmussen controversies 2011

Pain score VAS (scale 0 to 10) during 30 days
Bare-tip fiber (50p) vs Radial Fiber (50p)
1470 nm in both group

IN TOTAL: best combination

- 1470 nm:
  - Less power: ≤ 10 watts

- Protected Radial Fiber (radial emission)
  - No contact on the vein wall
  - Homogeneous irradiation of the vein

WHICH PARAMETERS

Power
Energy
Energy

Energy = power \times time

\[ E(\text{joule}) = P(\text{watt}) \times t(\text{second}) \]

- 2001: power 12 watts and pulse mode
- 2004: joules/cm Minimum 40 J/cm
- 2006: Joules/cm/each millimeter diameter of treated vein: Leeds (Linear Endovenous Energy Density) Minimum 60 J/cm (rather continuous mode)

Lasers:

Energy depending on the diameter of the vein

\[ E(\text{joule}) = P(\text{watt}) \times t(\text{second}) \]

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

Laser treatment

Conclusions

- Wavelength: 1470 nm
- Fiber: protected fibers
- Energy: minimum 60 J/cm (10 J/cm/mm of vein to be treated)

Lessons learned

- Personal gain:
  - some good friends
THANK YOU FOR YOUR ATTENTION