

What might bring a new wavelength for endovenous laser?

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Faculty disclosure

Lowell Kabnick, MD

NOTHING TO DISCLOSE

IS 1950nm WAVELENGTH THE FUTURE OF **THERMAL** VENOUS ABLATION?



So what is the Holy Grail?



So What Do We Know



Laser side effects

- Most likely caused by laser induced **vein wall perforation** with extravasation of blood into the surrounding tissue
- Perforations are more common with;
 - **HSLW, higher power (watts), greater LEEDs**

Hemoglobin based wavelengths produce more short term side effects than longer wavelengths

Less side effects (pain, bruising) with 980nm than 810nm at the same watts

Less side effects (pain, bruising) with 1320nm at 5 watts than at 8 watts

Kabnick L. Outcome of different endovenous laser wavelengths for great saphenous vein ablation. J Vasc Surg. 2006 Jan;43(1):88-93.

Proebstle TM, Moehler T, et al. Endovenous treatment of the great saphenous vein using a 1320 nm Nd:YAG laser causes fewer side effects than using a 940 nm diode laser. Dermatol Surg. 2005 Dec;31(12):1678-83.

EVL

- **Efficacy and Safety Profile:**
 - **Benchmark** 97-99% efficacy
 - **Randomized Control Trials:**
 - VCSS scores improved
 - QOL improved
-
- *Murad et al; J Vasc Surg 2010*
 - *Shepherd et al, Br J Surg 2010*

WHICH IS MORE IMPORTANT FOR POSTOPERATIVE RECOVERY?

LASER WAVELENGTH

FIBERS

NYU
SCHOOL OF
MEDICINE



NYU Pilot Studies

- Objective: (2006-2012)
 - Observational pilot study -Non randomized, prospective, single center study comparing
 - **810nm, 980nm, 1470nm**
(AngioDynamics, Latham, NY)
 - With **bare-tip Vs NeverTouch**
 - (AngioDynamics, Latham, NY)

What Do We Know About Fibers?

Bare

NeverTouch



Power density

Toggle full screen.



7 – day Average Pain Score (1-10)

T - Test Analysis

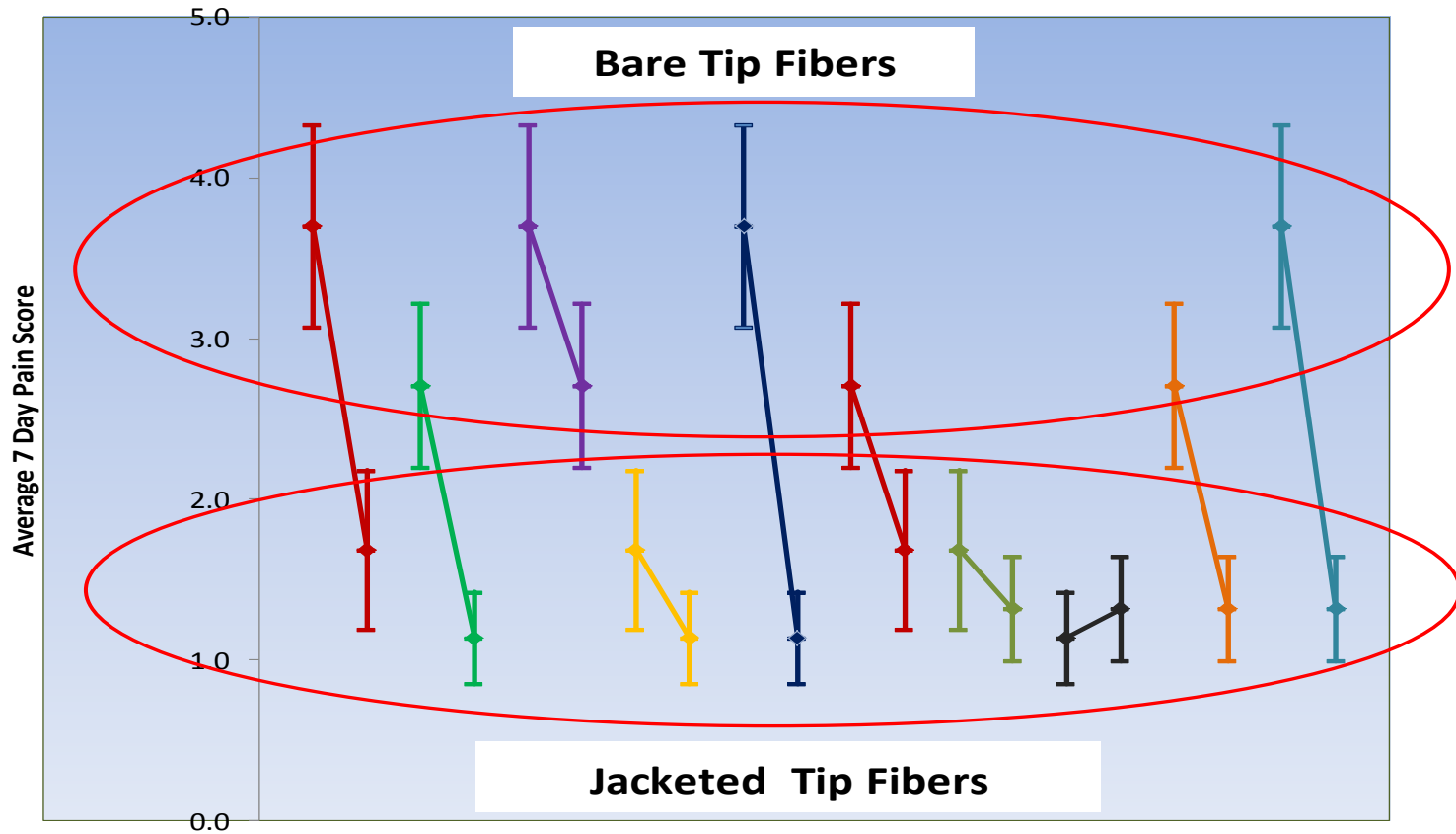
Comparison Groups	Mean Difference	95% CI for Difference	P - Value
810/BT vs. 810nm/JT	2.013	(1.232, 2.794)	< 0.0005
980/BT vs. 980/JT	1.568	(0.988, 2.148)	< 0.0005
810/BT vs. 980/BT	0.993	(0.202, 1.784)	0.015
810/JT vs. 980/JT	0.548	(-0.017, 1.113)	0.057
810/BT vs. 980/JT	2.561	(1.881, 3.242)	< 0.0005
980/BT vs. 810/JT	1.020	(0.319, 1.721)	0.005
810/JT vs. 1470/JT	0.369	(-0.216, 0.954)	0.213
980/JT vs. 1470/JT	-0.179	(-0.607, 0.248)	0.407
980/BT vs. 1470/JT	1.389	(0.790, 1.987)	< 0.0005
810/BT vs. 1470/JT	2.382	(1.687, 3.078)	< 0.0005

Bruising Scores (1-5)

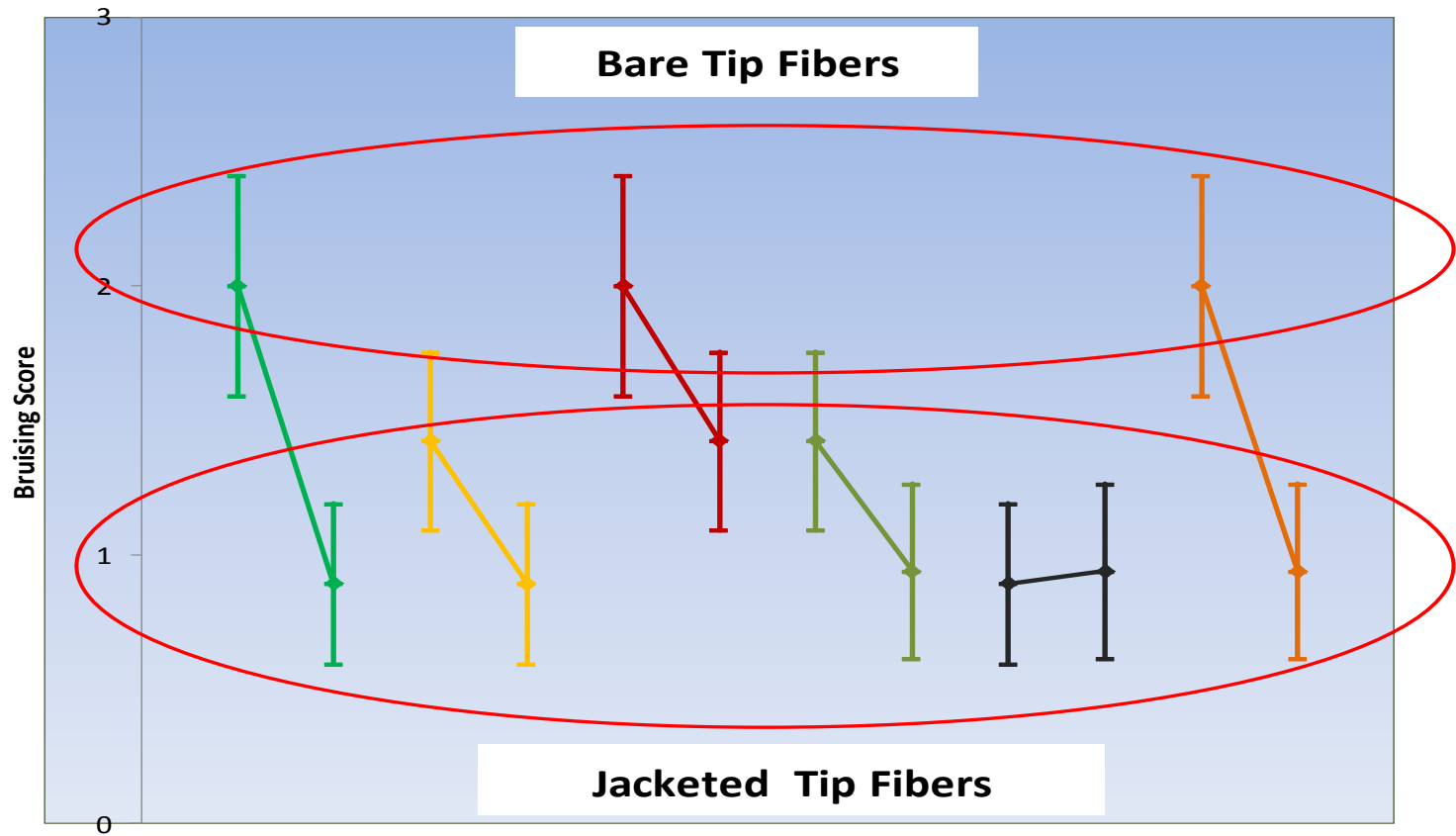
T - Test Analysis

Comparison Groups	Mean Difference	95% CI for Difference	P - Value
980/BT vs. 980/JT	1.108	(0.607, 1.609)	< 0.0005
810/JT vs. 980/JT	0.531	(0.090, 0.972)	0.019
980/BT vs. 810/JT	0.577	(0.055, 1.099)	0.031
810/JT vs. 1470/JT	0.484	(0.026, 0.942)	0.038
980/JT vs. 1470/JT	-0.047	(-0.481, 0.387)	0.831
980/BT vs. 1470/JT	1.061	(0.545, 1.577)	< 0.0005
810/BT vs. 1470/JT	2.382	(1.687, 3.078)	< 0.0005

Pain Scores by Fiber Type



Bruising Scores by Fiber Type



Laser Covered-tip Vs RF

85 patients completed treatment and follow-up examination

Modality	# Patients	Average Age	Female/ Male %	Average Length Treated (cm)	Average Total J/cm	Average Pain	Average Bruise	Total GSV Closed
980-nm	35	51.57 ± 13.7	F=86% M=14%	27.67	82.34 ± 14.7	0.906	1.21	35
RF	50	56.36 ± 15.4	F=80% M=20%	35.90	N/A	0.804	1.34	50

Tissue Perforation Experiment 2012



– Factors:

- **810nm vs. 1470nm diode laser**

- 810nm – AngioDynamics[®] Delta Laser at 14 watts, 80 J/cm
- 1470nm – AngioDynamics[®] VenaCure[®] 1470 Laser at 6 watts, 42 J/cm

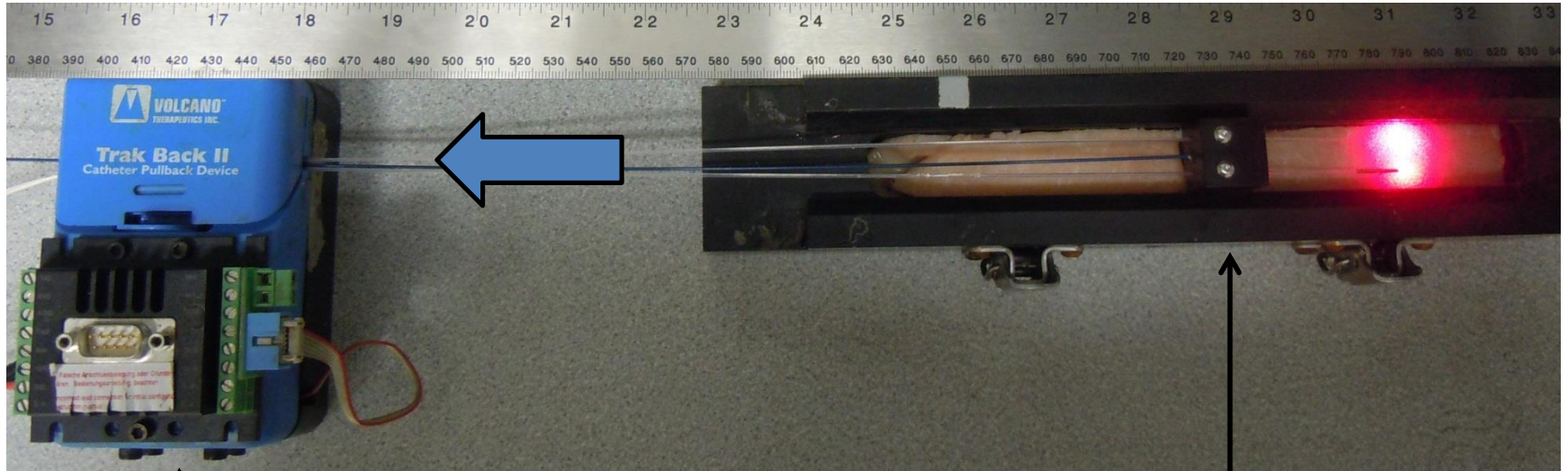
Bare Tip (BT) vs. NeverTouch(JT) Fibers

- Jacketed Tip (JT) fibers – AngioDynamics[®] NeverTouch[®] Fiber

Kabnick 2012

- Methods:
 - Setup
 - Porcine tissue bathed in CPDA-preserved sheep's blood 8 mm deep, immersed in water bath at body temperature
 - Tissue Orientation - flat horizontal sheet with fibers parallel in contact with tissue, all immersed in blood
 - Fiber Pullback— Modified Volcano pullback device for the targeted speeds

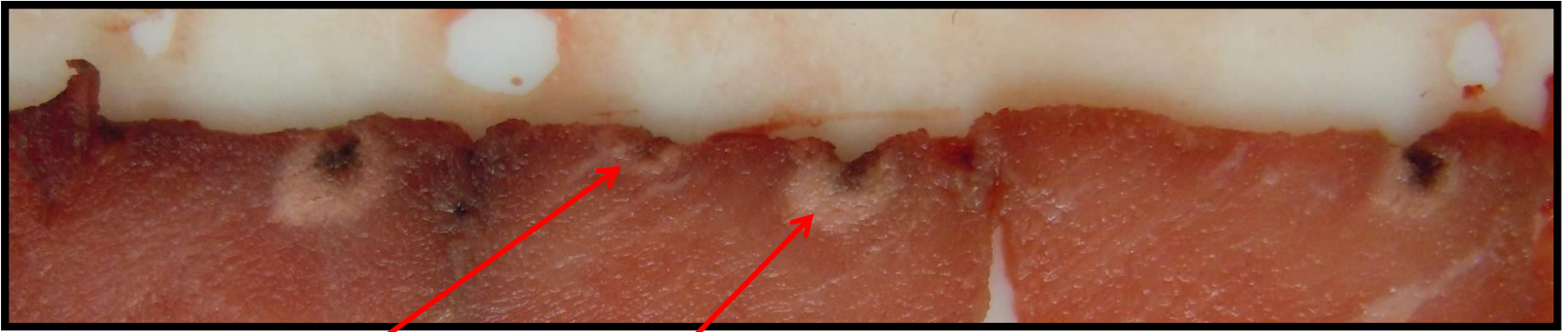
Perforation Test Apparatus



Programmable
Pull-back Device.

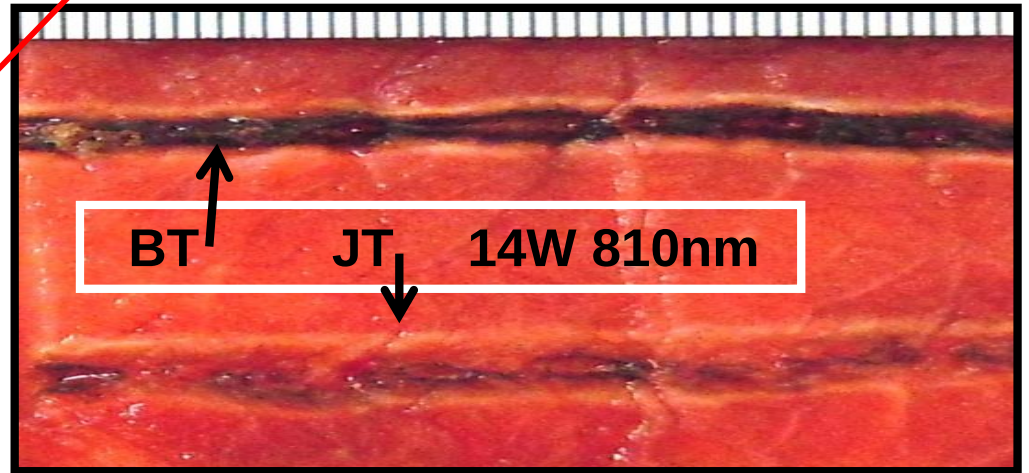
Fiber Holder Slide ensures
correct orientation of fiber with
tissue.

Note: Laser aiming beam is shown above without blood so porcine tissue can be seen.



Top photo - 6W 1470nm
JT on left, BT on right

Samples were frozen &
cut in 2cm sections.

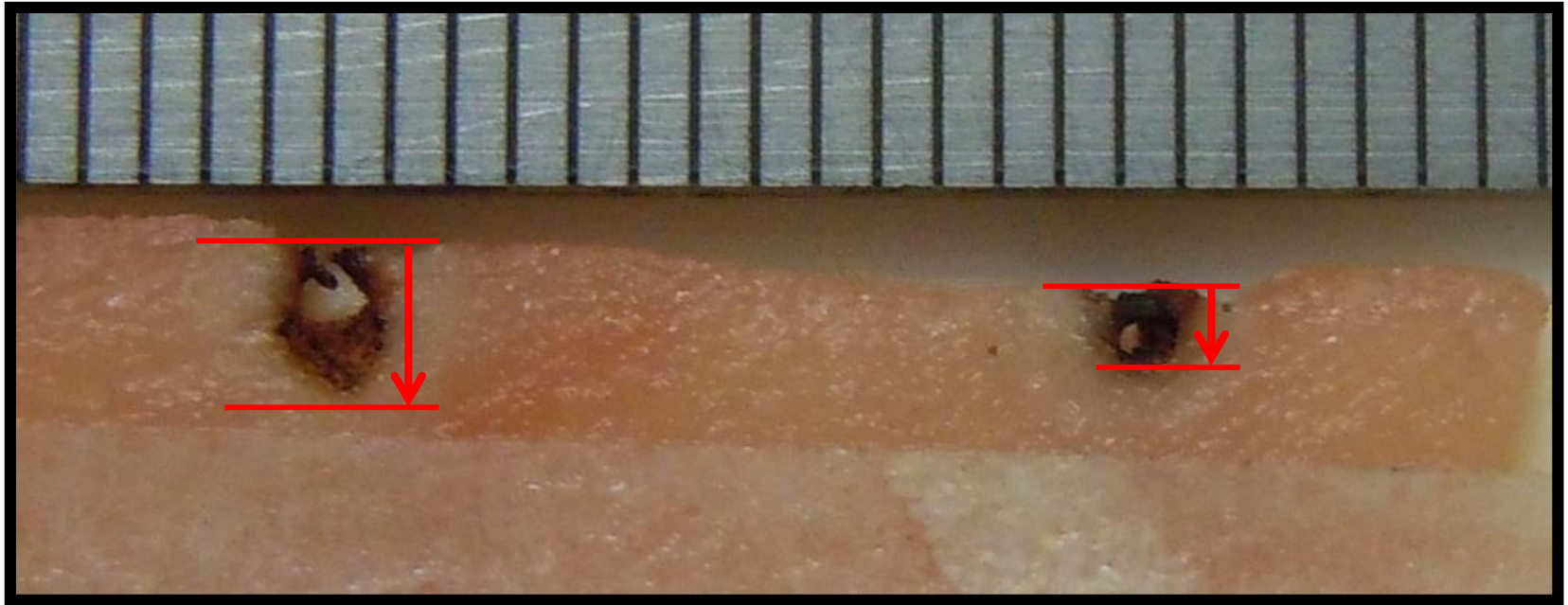


Each cross-section
was put under a
microscope &
Depth of perforation
was measured.



Depth

Perforation Depth



Bare Fiber

80J/cm @ 810nm

Average Depth = 1.05mm

Jacketed Fiber

80J/cm @ 810nm

Average Depth = 0.36mm

Measurement taken with Micro Vu Vertex 210 Measuring Center at 21x magnification.

Descriptive Statistics

Wavelength	810 nm		1470 nm	
Fiber	Bare (BT)	NeverTouch Tip (JT)	Bare (BT)	NeverTouch (JT)
Power	14W		6W	
LEED	80J/cm		42J/cm	
Average Perforation Depth	1.054 mm (± 0.342)	0.364 mm (± 0.255)	0.707 mm (± 0.306)	0.197 mm (± 0.162)
Sample Size	25	24	20	19

Wavelength/Fiber Comparisons

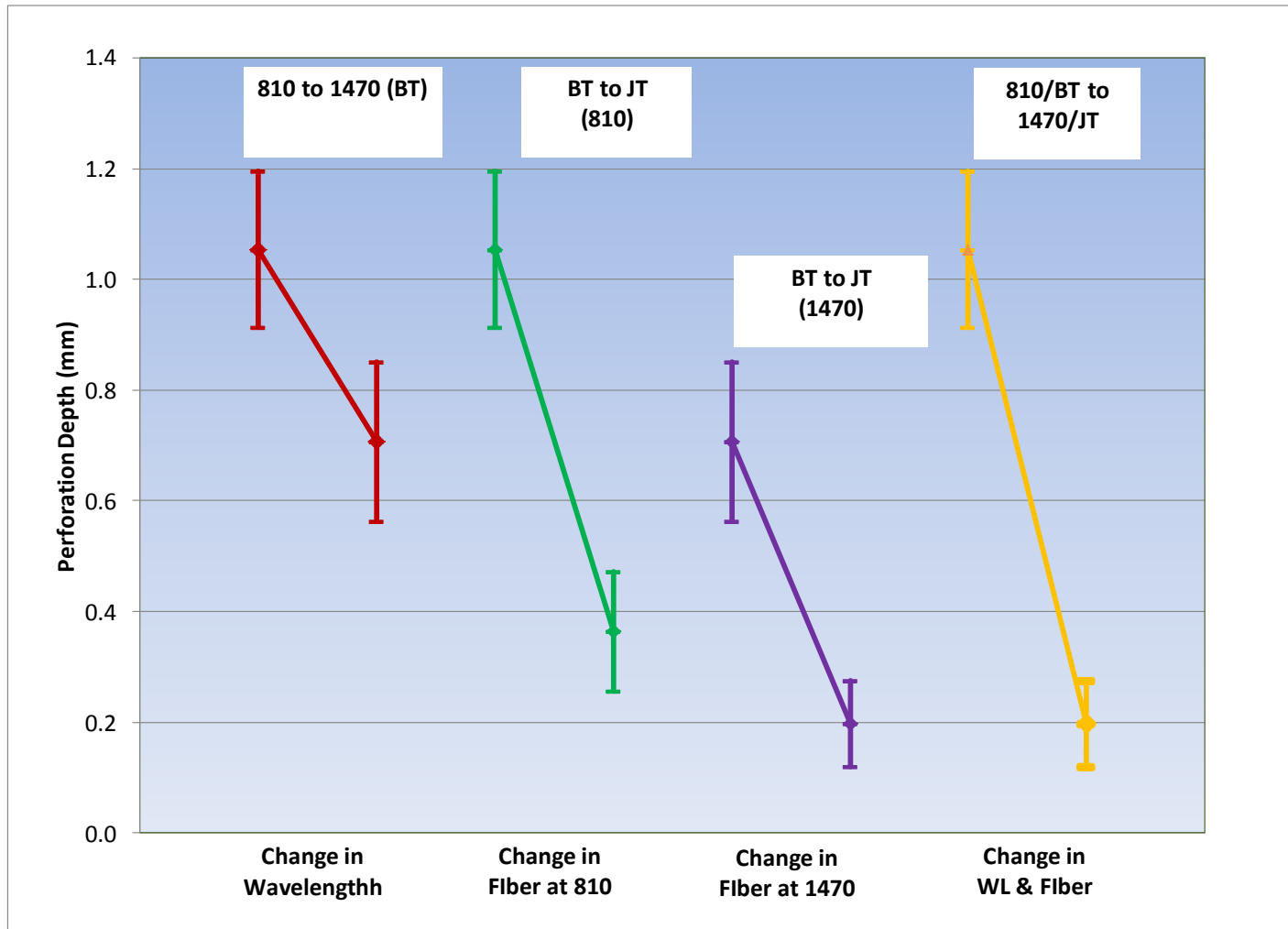
Perforations T - Test Analysis

Comparison Groups	Mean Difference	95% CI for Difference	P - Value
BT vs. JT (810nm)	0.690	(0.517, 0.863)	< 0.0005
BT vs. JT (1470nm)	0.510	(0.351, 0.669)	< 0.0005
810 vs. 1470 (BT)	0.347	(0.152, 0.542)	0.001
810 vs. 1470 (JT)	0.167	(0.038, 0.296)	0.013
810/BT vs. 1470/JT	0.857	(0.699, 1.015)	< 0.0005

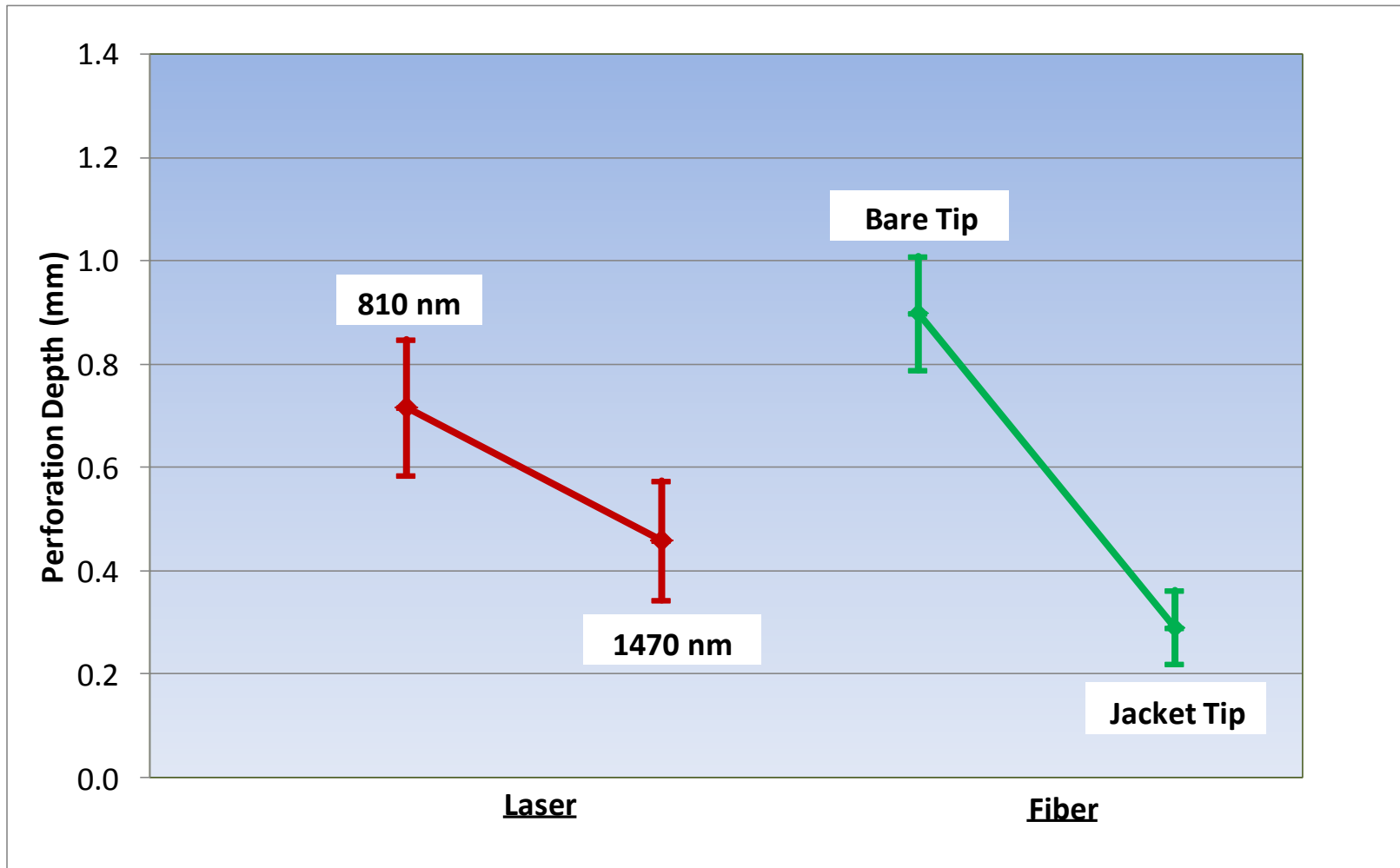
Wavelengths and Fibers Perforations Multivariate Analysis

Factors	Levels	N	Mean Difference (mm)	P - Value
<u>Laser</u>	810 vs. 1470	88	0.2590	< 0.0005
<u>Fiber</u>	BT vs. JT	88	0.6095	< 0.0005

Wavelength/Fiber Combinations



Wavelength and Fiber Effects



What is More Important?

- Wavelength is Important
- Fiber Type is Important
- The Type of Fiber seems to be more important than the Laser Wavelength

In Conclusion

- Water based lasers (1470nm) allow decreased power and J/cm.
 - important
- Covered Fibers allow decreased power density (less vein perforations).
 - **More important**

Sneak Peak at a Trial

1470nm Vs 1920nm

Dr Daniel Mendes

IS 1920nm WAVELENGTH THE FUTURE OF **THERMAL** VENOUS ABLATION?



Demographics

Group 1 1470nm laser

- n = 42 (limbs)

Group 2 1920nm laser

- n = 48 (limbs)

No Statistical difference in AGE, CEAP, VCSS, and Saphenous Diameter

- Mean age 54.3

- Mean age 52.2

Power Settings

1470nm

**Power:
10W**

1920nm

**Power:
5W**

Operative variables

1470nm

1920nm

Operative time (min)

32.9 ± 12.1

25.0 ± 7.9

LEED (J/cm)

24.7 ± 0.8

17.8 ± 0.6

Post-operative variables

	1470nm	1920nm
Bruising (Ecchymosis)	52.4%	18.7%
Induration	38.1%	12.4%
Skin burn	0	0
DVT	0	0
Days of use of analgesics	2.4 ± 0.4	1.4 ± 0.2

	pre-op	7 day	1 month	3 months
CEAP				
1470nm	3.4 ± 0.9	3.1 ± 1.3	2.4 ± 1.5	2.3 ± 1.6
1920nm	3.3 ± 0.6	2.3 ± 1.3	2.2 ± 1.4	2.2 ± 1.4
VCSS				
1470nm	7.7 ± 2.7	2.2 ± 1.7	1.5 ± 1.4	1.2 ± 0.9
1920nm	7.7 ± 2.7	2.4 ± 1.4	1.5 ± 1.1	1.4 ± 1.0

Closure Percentage Rates of Treated Segments

	Laser 1470 nm (n = 42)	Laser 1920 nm (n = 48)	P value
1 month	96.8%	90.9%	P=.06
6 months	96.3%	87.5%	P=.03
1 year	94.7%	87.5%	P=.05

In Conclusion

- **Yes, 1920nm laser is effective for closing veins**
- **Yes, 1920nm laser has a low safety profile**
- **Yes, 1920nm laser needs to be optimized**
- **Yes, we are in the process of optimizing the energy needed to close a truncal vein**

Is 1920nm-1950nm the new wavelength



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