Wavelength or Fiber-Which One is More Important for Saphenous Laser Ablation

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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

Proebstle TM, Gul D, et al. Infrequent early recanalization of greater saphenous vein after endovenous laser treatment. J Vasc Surg 2003;38:511–516.

Goldman MP, Mauricio M, et al. Intravascular 1320-nm laser closure of the great saphenous vein: a 6- to 12-month follow-up study. Dermatol Surg. 2004;30:1380-1385.

Mundy L, Merlin TL, et al. Systematic review of endovenous laser treatment for varicose veins. Br J Surg 2005;92:1189–1194.

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 a1320 nm Nd:YAG laser causes fewer side effects than using a 940 nm diode laser. Dermatol Surg. 2005 Dec;31(12):1678-83.

EVLT: So What Else Do We Know?

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

CrossMark

From the American Venous Forum

Journal of Vascular Surgery
Venous and Lymphatic Disorders

Fiber type as compared to wavelength may contribute more to improving postoperative recovery following endovenous laser ablation

2016

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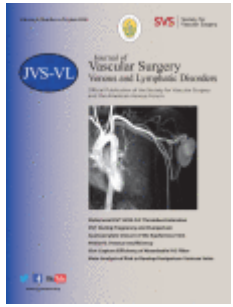
Objective: To define the relative importance of fiber type as compared to laser wavelength on tissue injury depth, postoperative pain, and bruising during endovenous laser ablation. *Methods:* This study included 213 limbs that were treated with an 810-, 980-, or 1470-nm laser, with bare-tip (BT) or jacket-tip (JT) fibers. Pain scores (10-point scale) and bruising scores (5-point scale) were recorded. Tissue thermal injury depth (mm) was evaluated in vitro for the 810- and 1470-nm wavelengths with BT and JT fibers.

fiber showed less bruising as compared to the 810-nm JT fiber (0.89 ± 1.06 vs 1.42 ± 1.19; $P = .019$). Similarly, the 1470-nm JT fiber showed less bruising as compared to the 810-nm JT fiber (0.94 ± 1.02 vs 1.42 ± 1.19; $P = .038$). The in vitro study showed thermal injury depths that were less for 1470 nm as compared to 810 nm, with JT fibers (0.20 ± 0.16 mm vs 0.36 ± 0.26 mm; $P = .013$) or with BT fibers (0.71 ± 0.31 mm vs 1.05 ± 0.34 mm; $P = .001$). All mean differences between JT and BT fibers were greater than between differing



NYU Pilot Studies

Objective: (2006-2012)

Observational pilot study -Non randomized, prospective, single center study comparing

810nm, 980nm, 1470nm

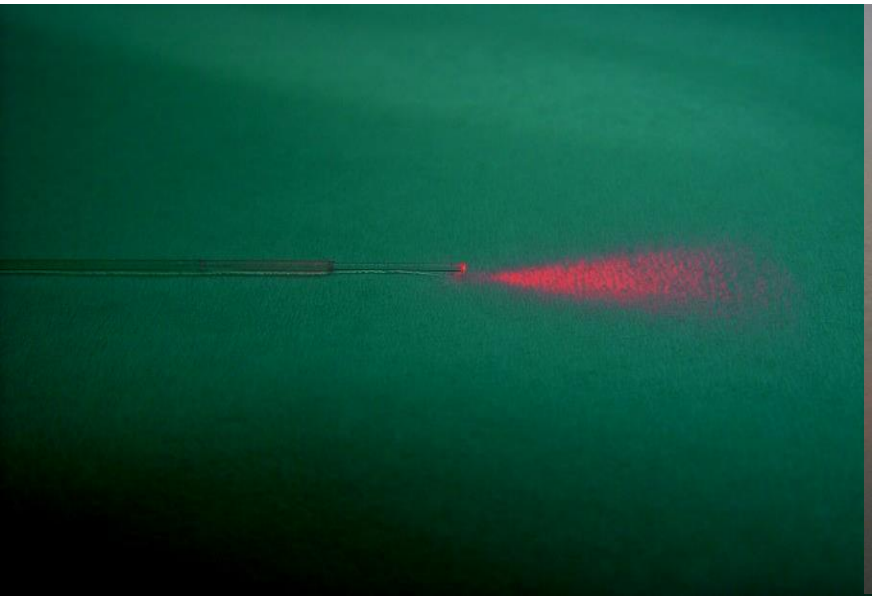
(AngioDynamics, Latham, NY)

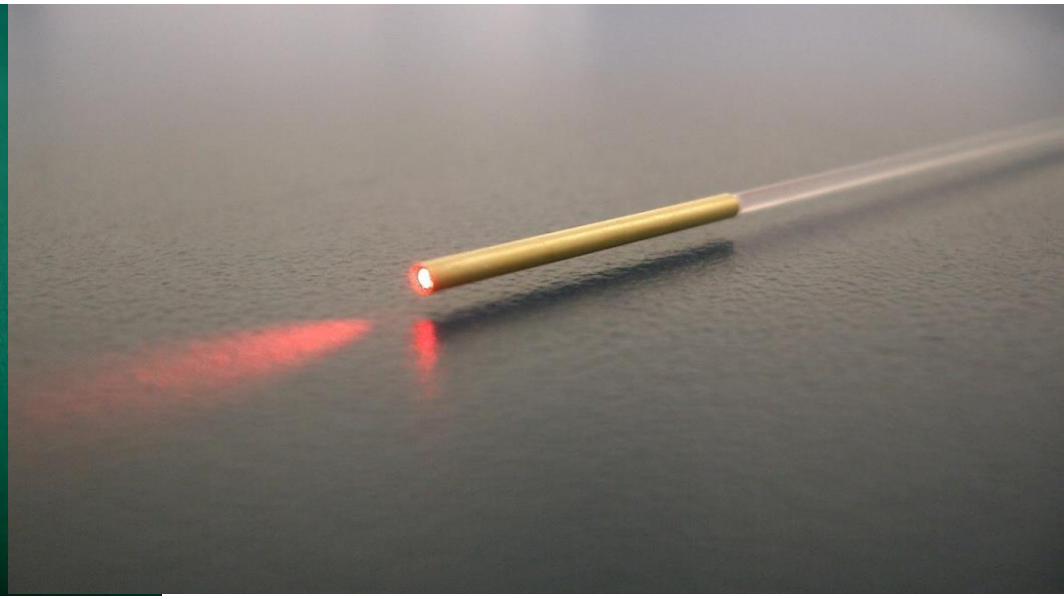
With **bare-tip Vs NeverTouch**

(AngioDynamics, Latham, NY)

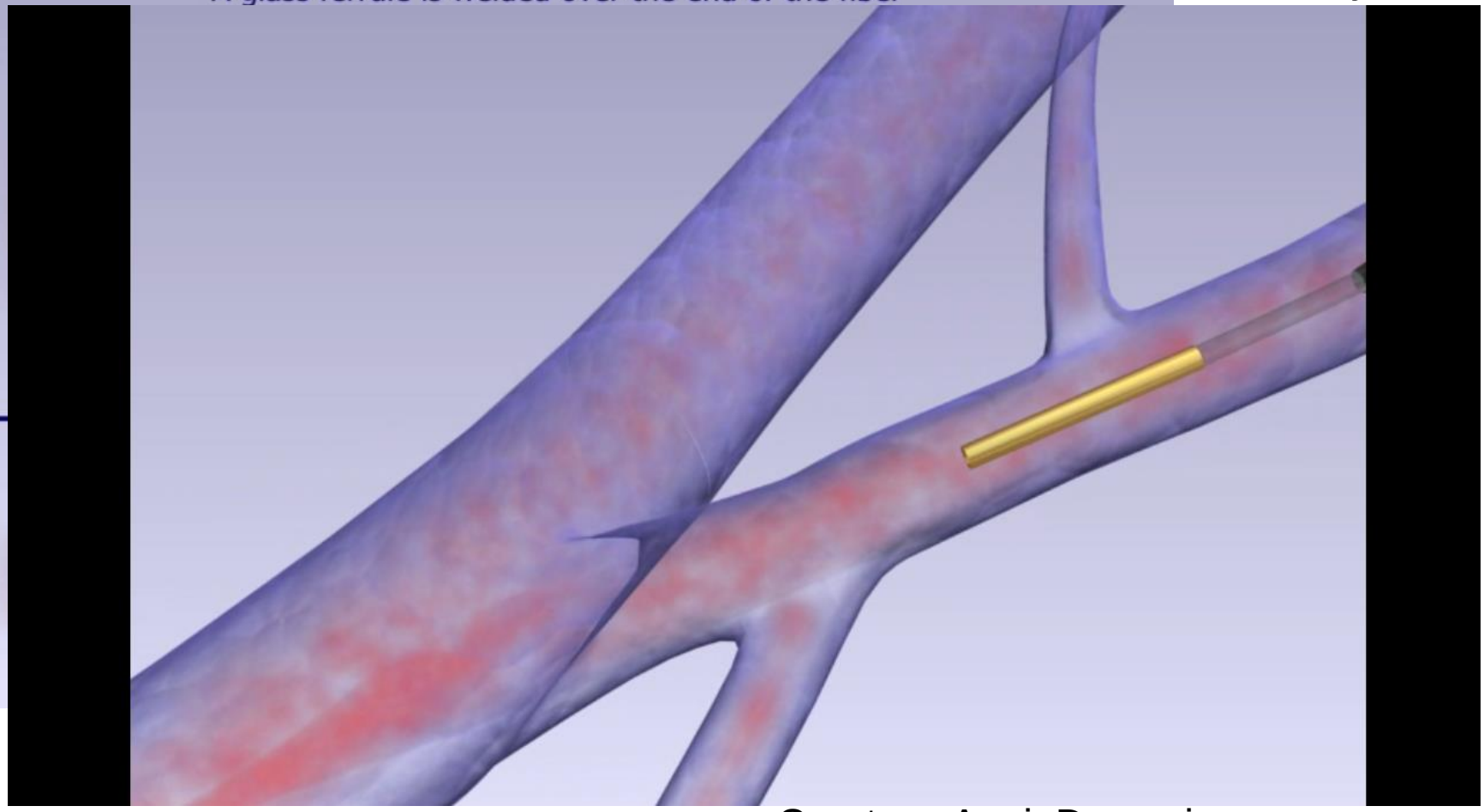
What Do We Know About Fibers?

Bare **NeverTouch**





Power density



Courtesy AngioDynamics

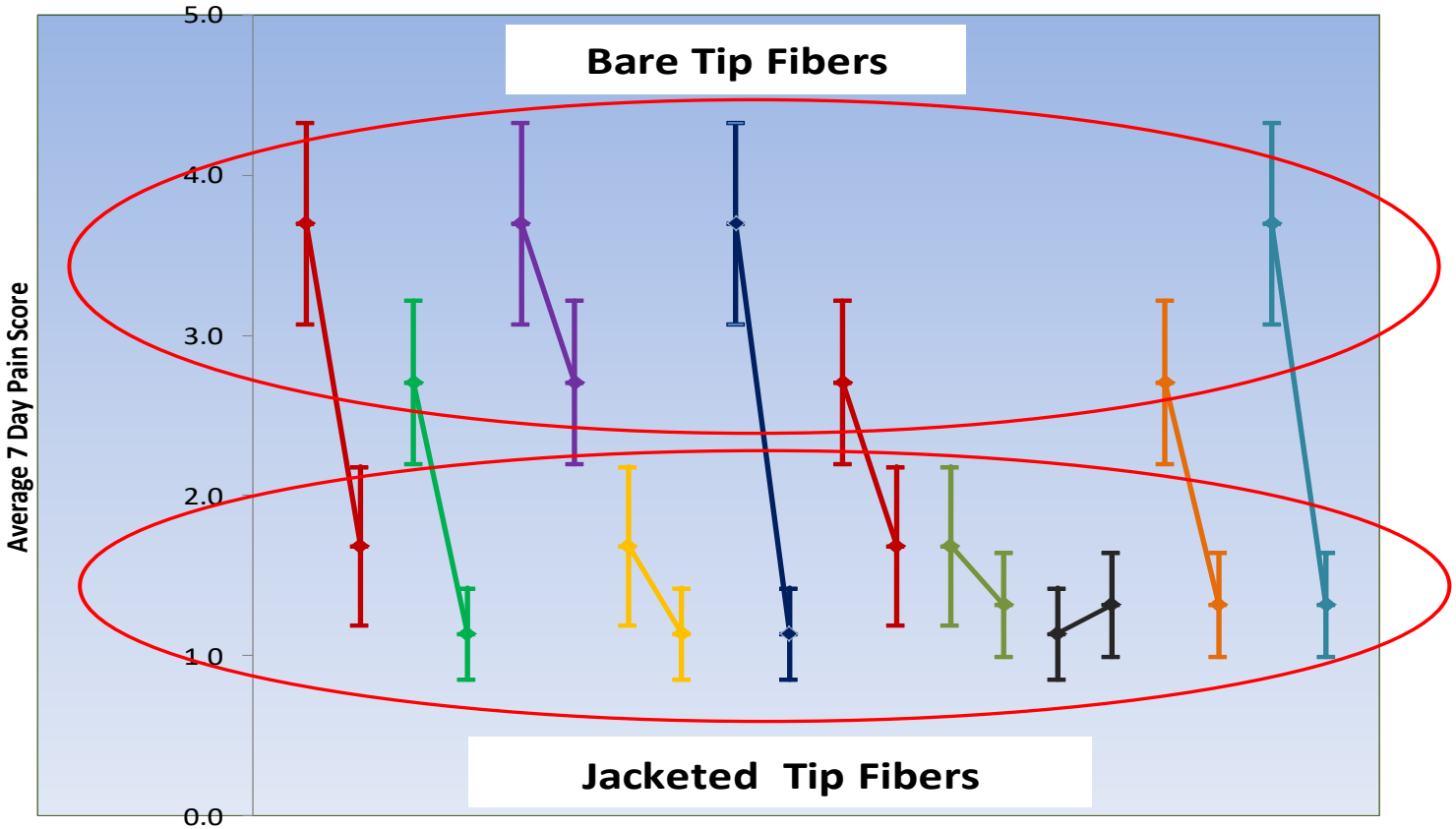
7 – day Average Pain Score (1-10)

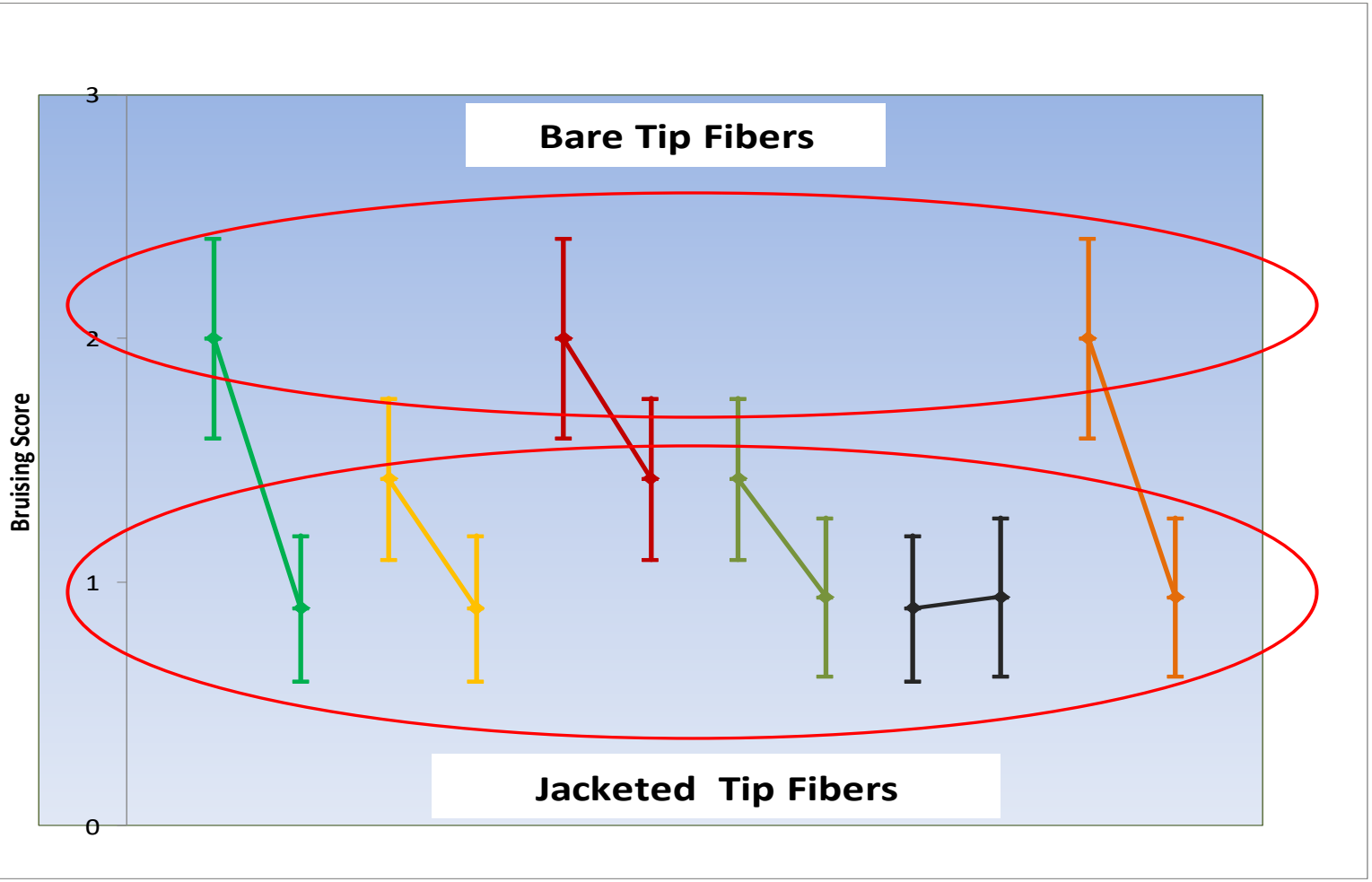
T - Test Analysis

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

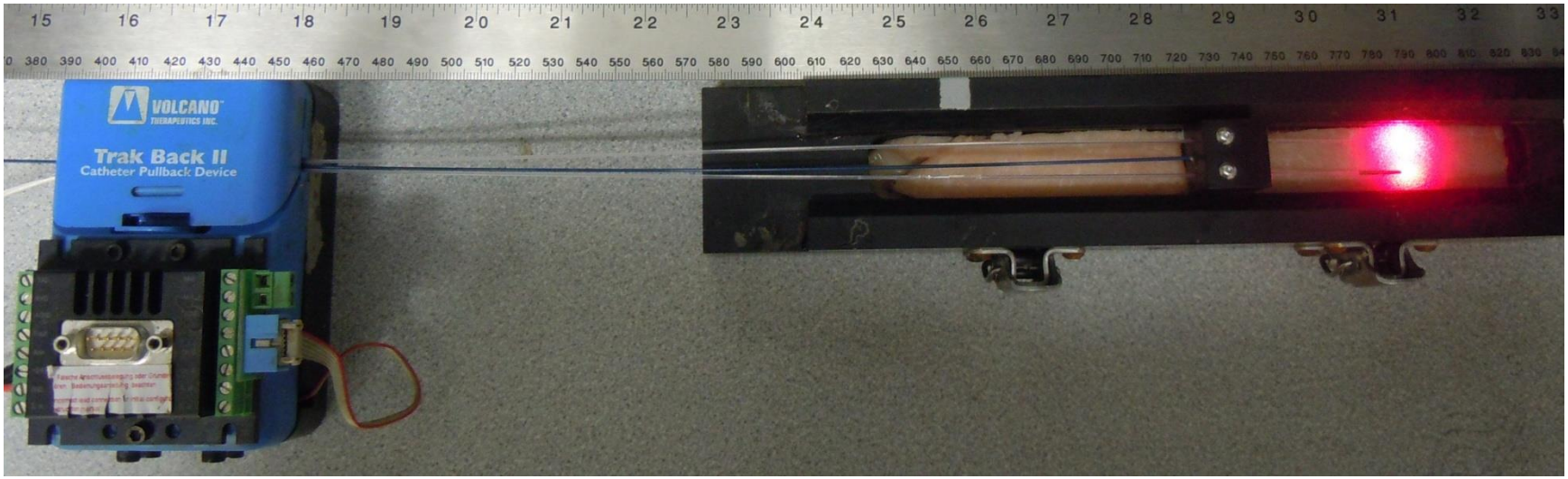
Bruising Scores (1-5) T - Test Analysis

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**


Bare Tip Fibers
Jacketed Tip Fibers
Average 7 Day Pain Score
5.0
4.0
3.0
2.0
1.0
0.0


Bare Tip Fibers
Jacketed Tip Fibers
Bruising Score
3
2
1
0

Tissue Perforation Experiment 2012



Factors:

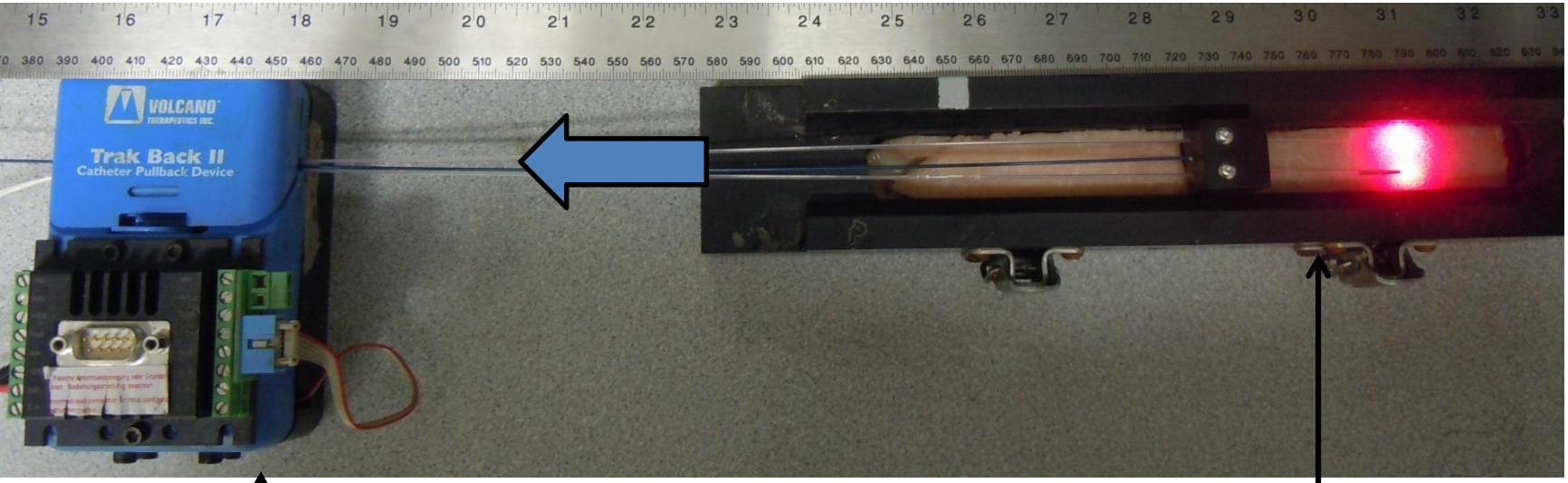
810nm vs. 1470nm diode laser

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

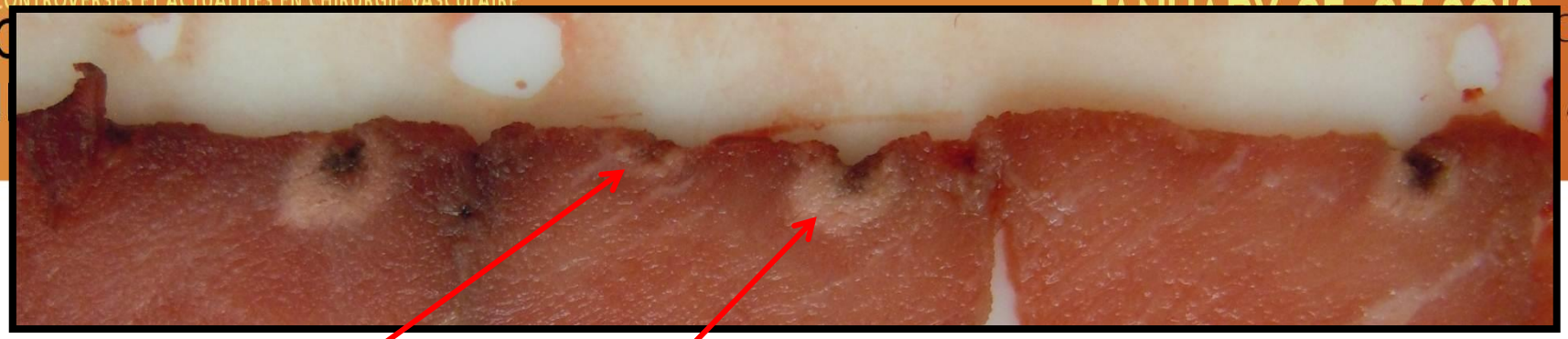
Jacketed Tip (JT) fibers – AngioDynamics ® NeverTouch® Fiber



Programmable Pull-back Device.

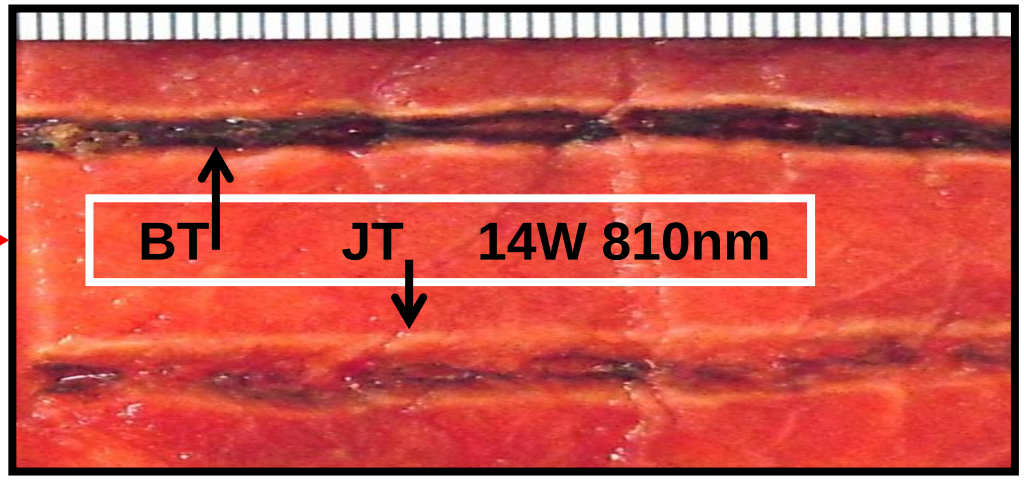
Fiber Holder Slide ensures correct orientation of fiber with tissue.

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

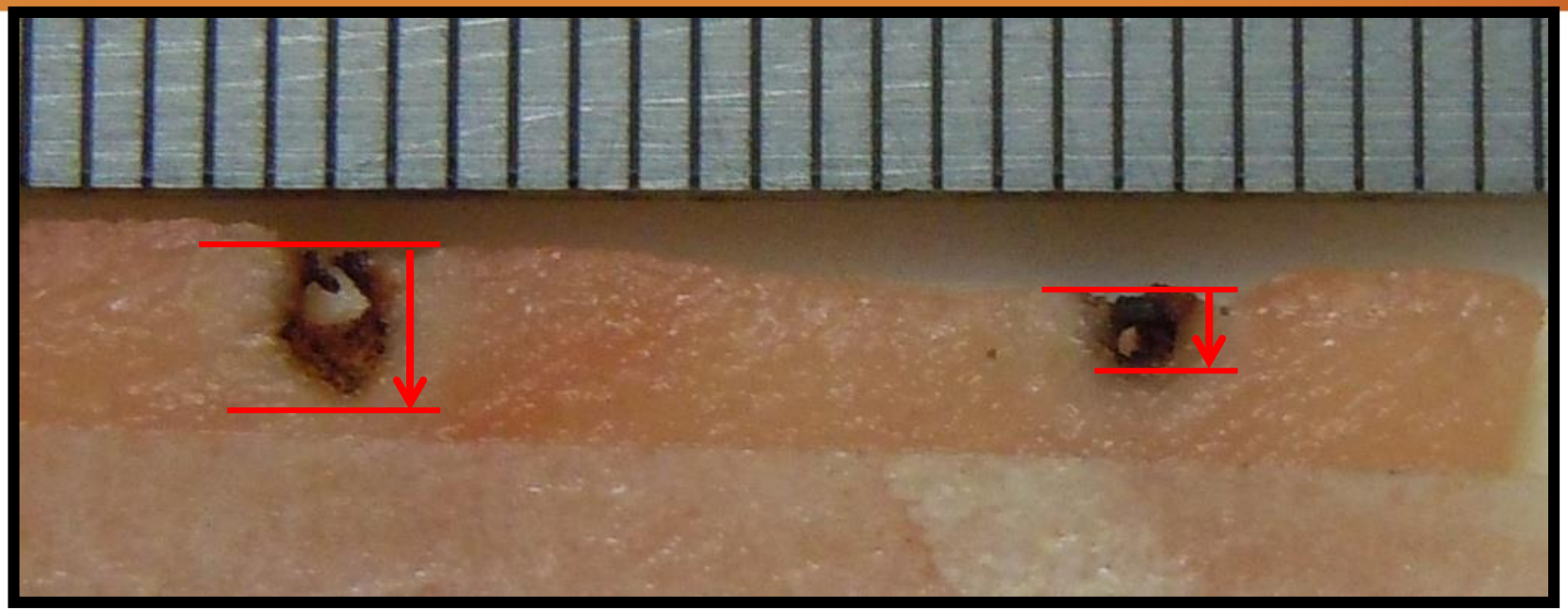


Top photo - 6W 1470nm
JT on left, BT on right

Samples were frozen & cut in 2cm sections.



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



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.

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

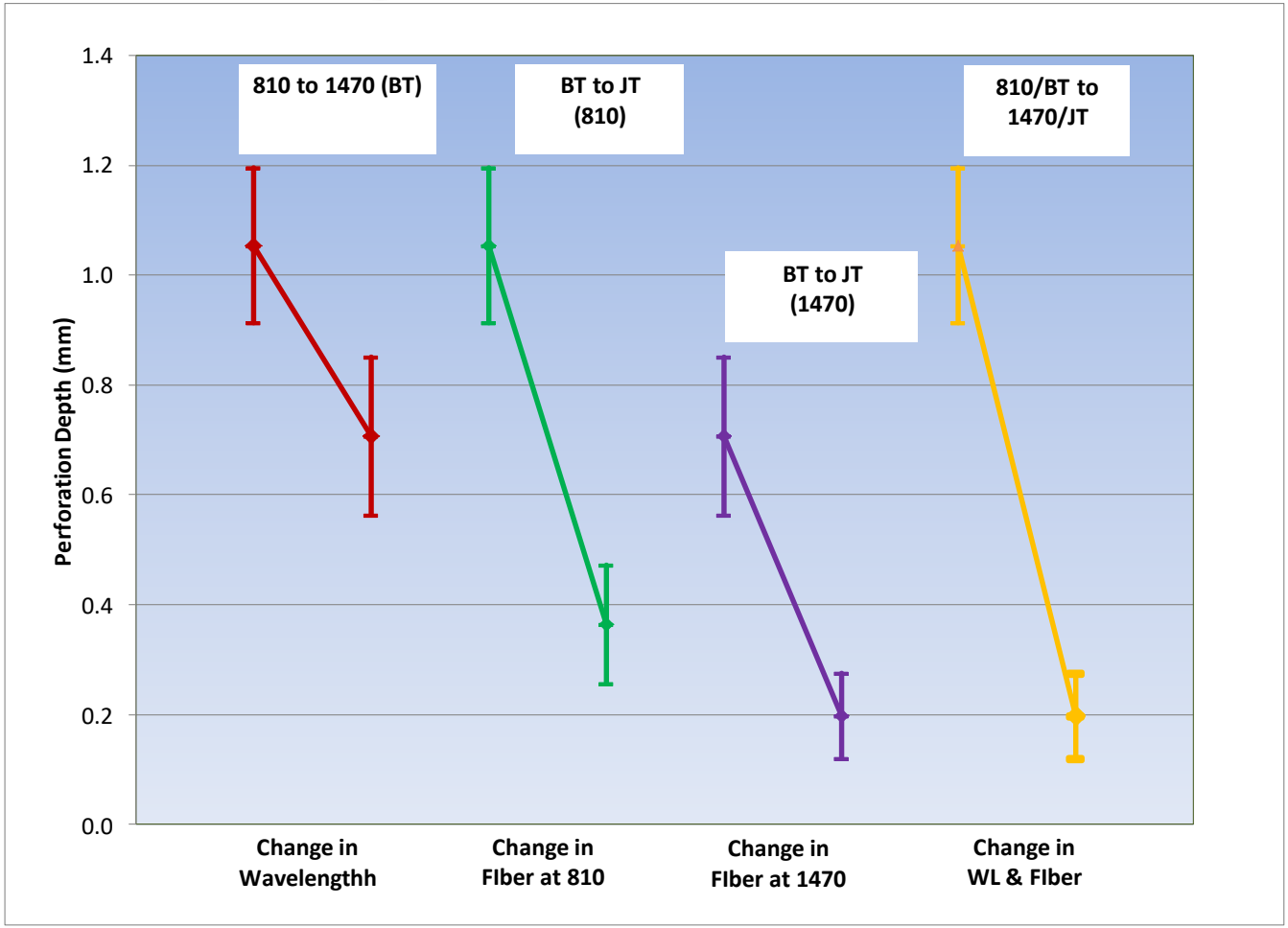
Comparison Groups	Mean Difference	95% CI for Difference	P - Value
BT vs. JT (810nm)	0.690	(0.517, 0.863)	< 0.0005
BT vs. JT (1470nm)	0.510	(0.351, 0.669)	< 0.0005
810 vs. 1470 (BT)	0.347	(0.152, 0.542)	0.001
810 vs. 1470 (JT)	0.167	(0.038, 0.296)	0.013
810/BT vs. 1470/JT	0.857	(0.699, 1.015)	< 0.0005

Wavelengths and Fibers Perforations

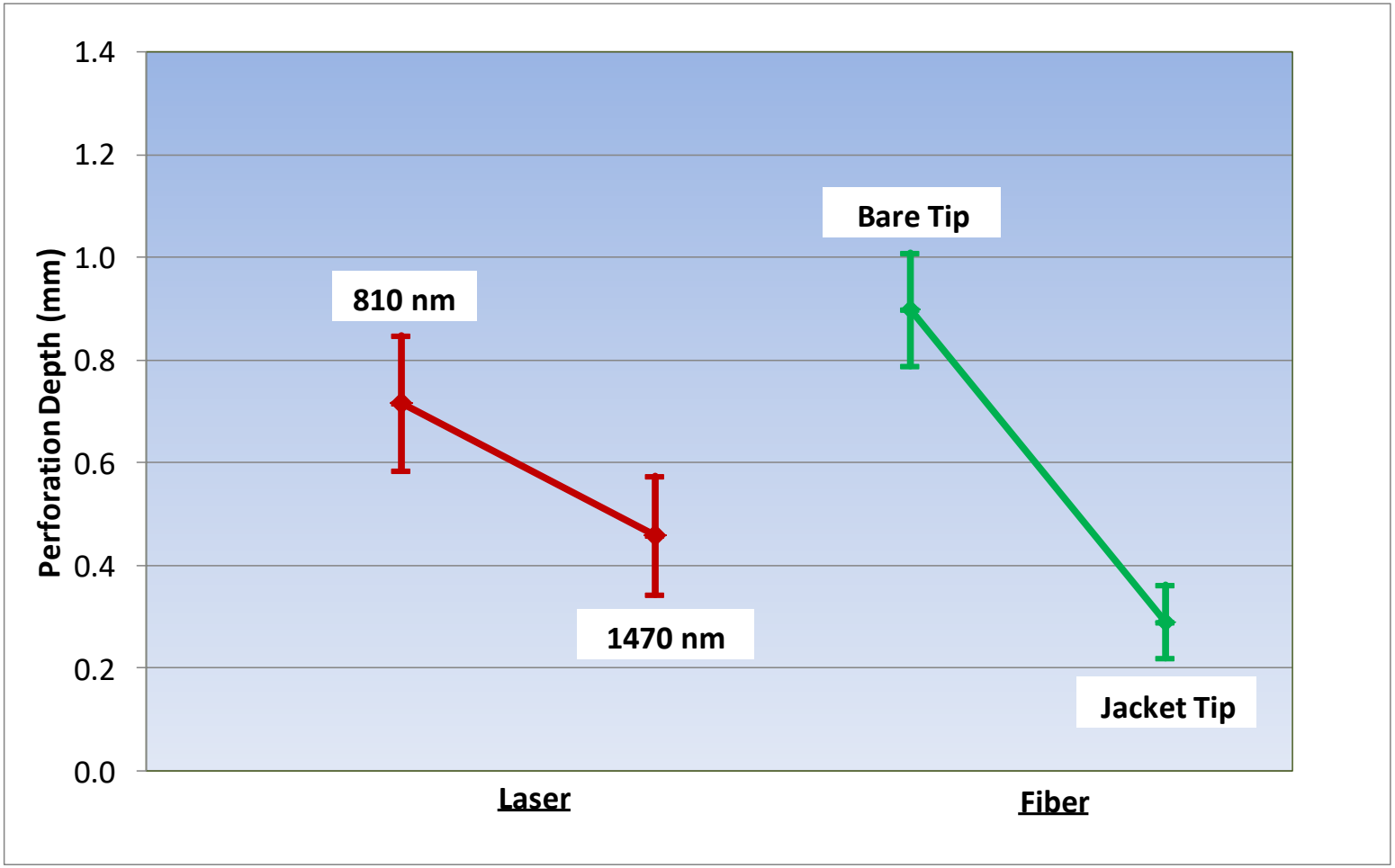
Multivariate Analysis

Factors	Levels	N	Mean Difference (mm)	P - Value
Laser	810 vs. 1470	88	0.2590	< 0.0005
Fiber	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

Together 1470nm and NeverTouch have a superior postoperative safety profile.