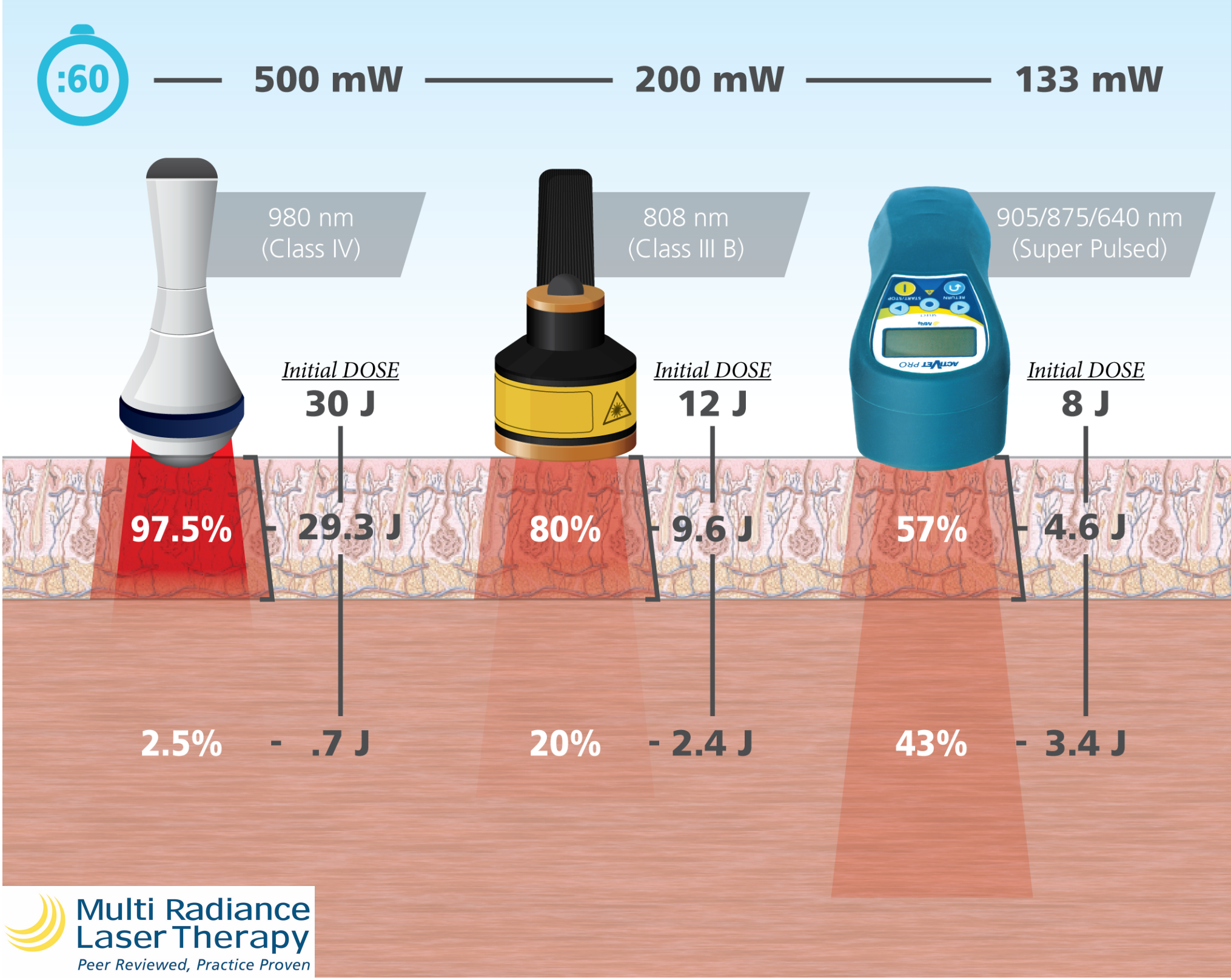
:60
500 mW
200 mW
133 mW
980 nm
(Class IV)
808 nm
(Class III B)
905/875/640 nm
(Super Pulsed)
Initial DOSE
30 J
Initial DOSE
12 J
Initial DOSE
8 J
97.5%
- 29.3 J
80%
- 9.6 J
57%
- 4.6 J
2.5%
- .7 J
20%
- 2.4 J
43%
- 3.4 J
Multi Radiance
Laser Therapy
Peer Reviewed, Practice Proven

Phototherapy in skeletal muscle performance and recovery after exercise: Comparison between three different devices commercially available

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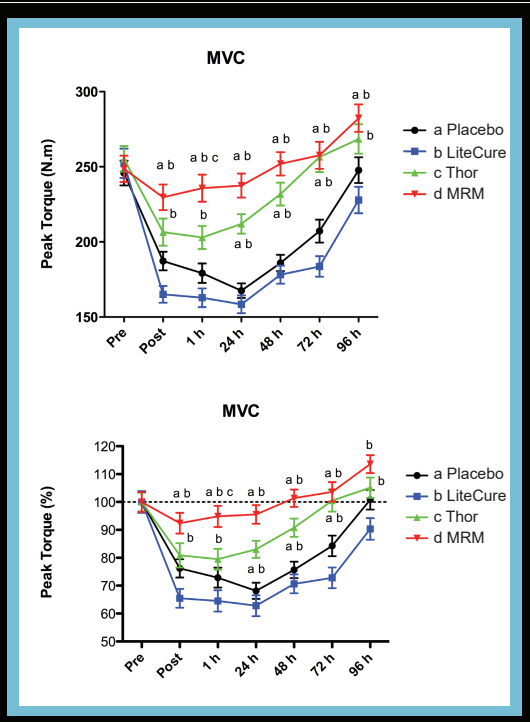
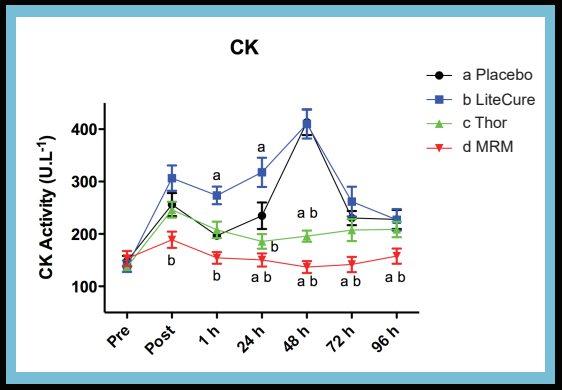
Background and objectives

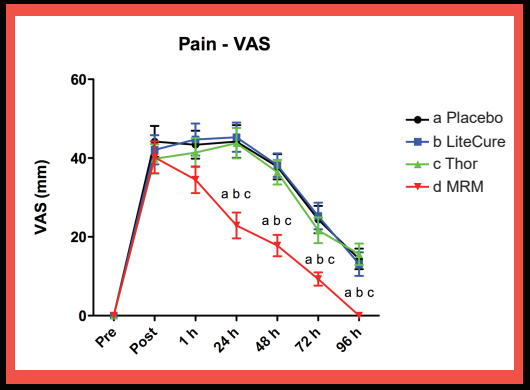
The enhancement of athletic performance and post-exercise recovery with non-invasive low level lasers and light emitting diodes (LEDs) are fast becoming a promising and useful tool for athletes. However, a direct comparison on the effect and effect size between devices of different parameters does not exist. Therefore the aim of this study is to evaluate the observed effects on skeletal muscle performance and post-exercise recovery by three different, readily available phototherapy devices to establish a clear understanding of the parameters necessary for optimal use of phototherapy in sports performance and recovery.

Materials and methods

Forty healthy untrained male volunteers were recruited for a randomized, double-blinded, placebo-controlled trial where a single phototherapy intervention was administered immediately after pre-exercise (baseline) measurement of maximum voluntary contraction (MVC). The 180 J dose or placebo was applied to the quadriceps of volunteers with one of three different devices: a Class 4 device (manufactured by LiteCure - USA), a class 3B device (manufactured by Thor - UK) and a class 1M device (manufactured by Multi Radiance Medical – USA). MVC, delayed onset muscle soreness (DOMS), and creatine kinase (CK) activity were analyzed at assessment times of before, 1 minute, 1, 24, 48, 72 and 96 hours after the eccentric exercise protocol employed to induce fatigue.







Results

Of the three tested, the Class 1M device comprised of Super Pulsed Lasers and LEDs delivered the greatest enhancement of MVC compared to all devices, and was statistically significant($p<0.05$) to both placebo and Class 4 groups in all time points. Regarding DOMS only the Class 1M device showed decreased pain ($p<0.05$) compared to the placebo, Class 3B and Class 4 devices at all time points. The Class 3B device enhanced MVC ($p<0.05$) compared to placebo but only in the period between 24 and 72 hours but significantly ($p<0.05$) better than the Class 4 device at all times points. The Class 4 device did not demonstrate any positive effects on MVC compared to placebo or other tested devices at any time points. CK activity was decreased by the Class 1M device compared to placebo ($p<0.05$) and Class IV device ($p<0.05$) at all time-points tested. Class 3B device decreased CK ($p<0.05$) compared to placebo only at 48 hours and to Class 4 between 24 to 48 hours. As with MVC and pain, the Class 4 device failed to produce positive effects on CK activity. In fact the use of the Class 4 device had a significant ($p<0.05$) negative effect greater than the placebo from 1 hour to 24 hours after the intervention.

Conclusions

Class 1M device comprised of Super Pulsed Lasers and LEDs demonstrated superior and more consistent results than either the Class 3B or 4 devices in all outcome measures when compared to placebo. The significant increasing in CK levels compared to placebo with the use of the Class 4 device appears to have a damaging effect on the irradiated skeletal muscle and warrants further research to investigate this negative effect. This study identifies the device and parameters best suited for optimal performance enhancement and post-exercise recovery.

Keywords

Skeletal muscle performance, exercise recovery, low-level laser therapy, light emitting diodes therapy, high-intensity laser therapy.

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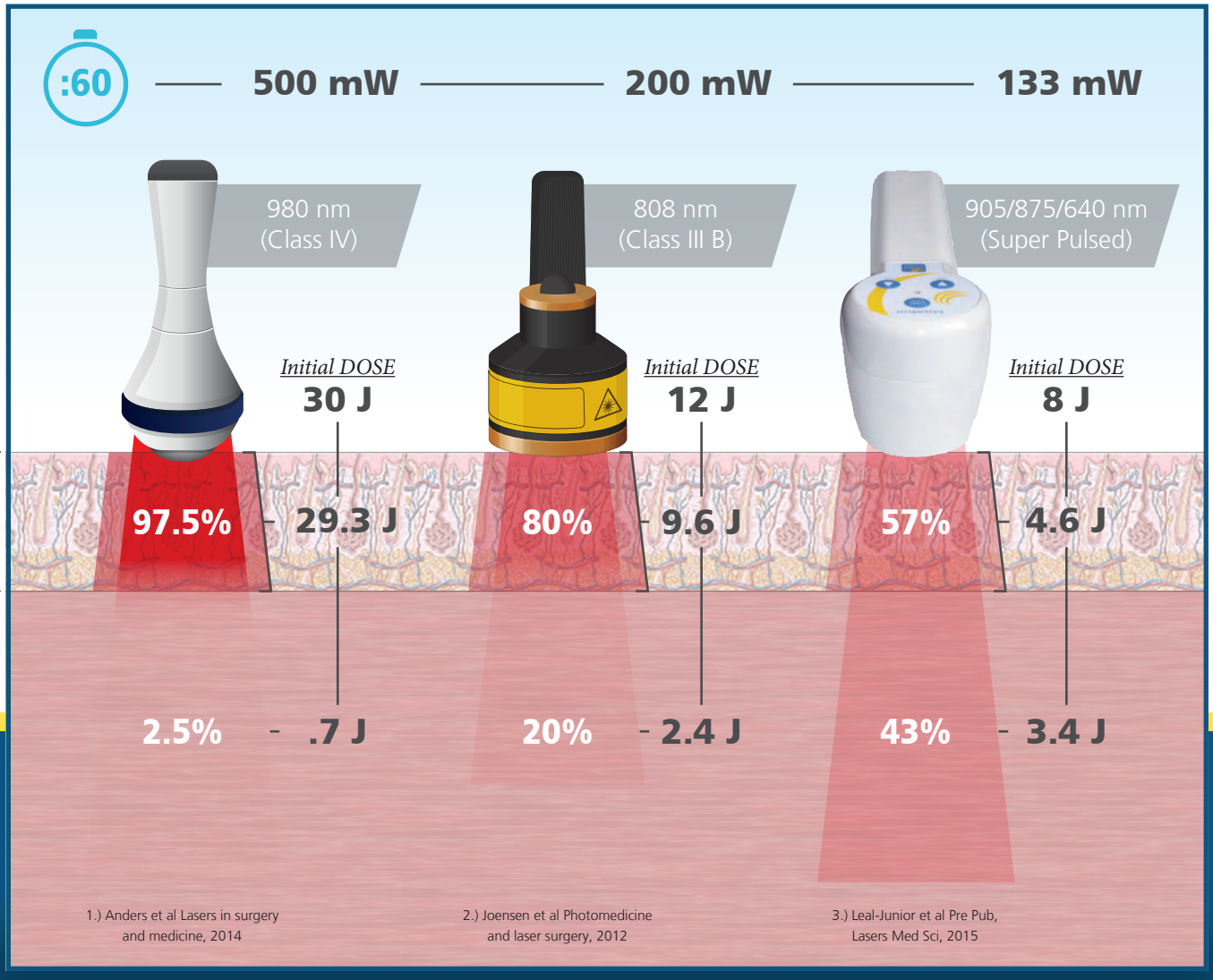

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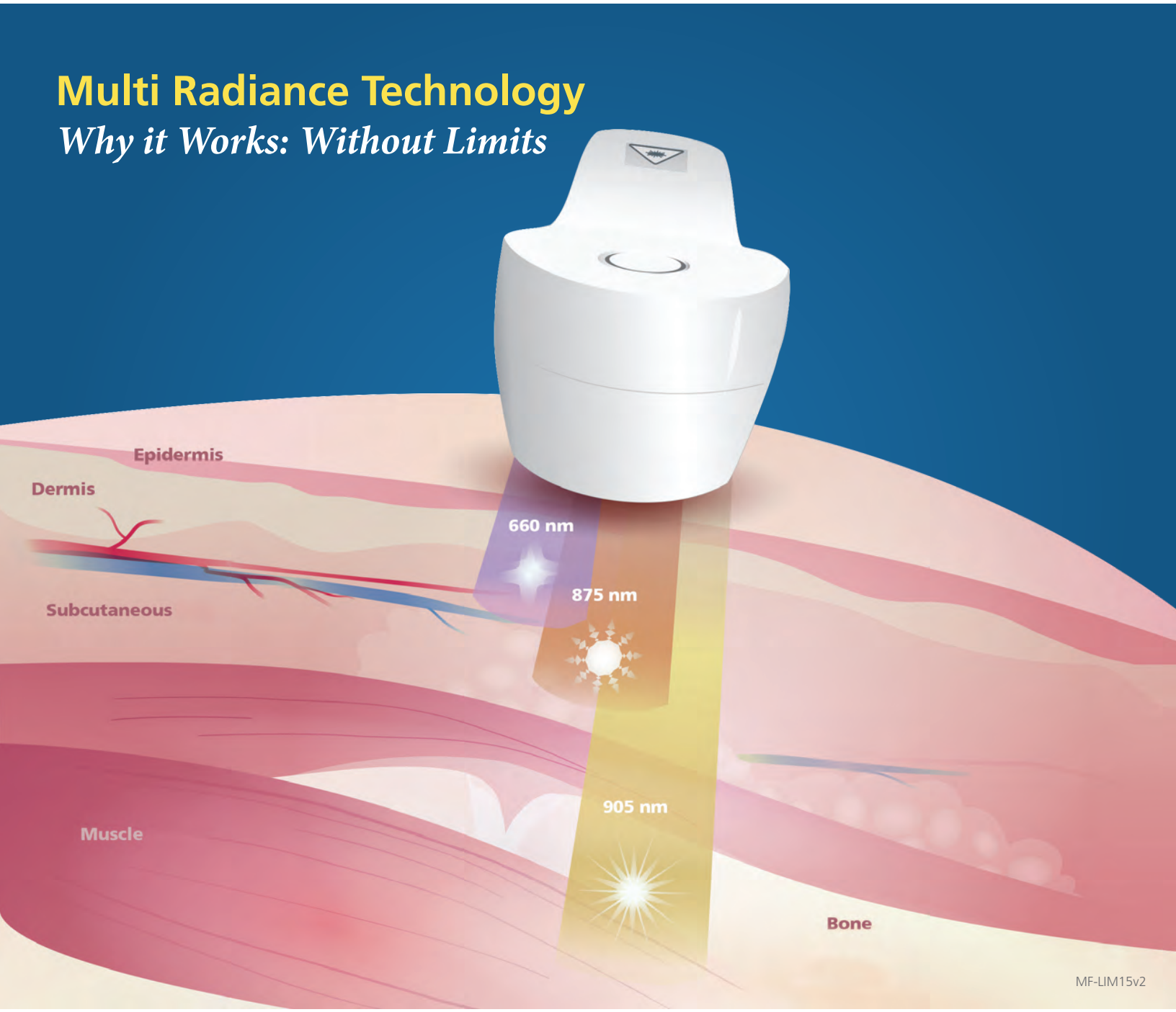

Pillars Paper (Leal et al.)

The study concludes that a combination of multiple wavelengths creates a "synergism" that enhances each individual wavelength's ability to penetrate the skin. The increase in the skin penetration time profile created by multiple wavelengths allows greater amounts of light energy to penetrate sub dermal with lower average mean power outputs of power. This reduces the amount of energy being transformed into heat, where heat can lead to a dangerous rise in tissue temperature.

Comparative Pillars Paper (Leal et al.)

Studies concluded that MR4 Technology has a favorable Thermal Time Profile (TTP) that eliminates photocytotoxic doses, versus the threat demonstrated by Class 4 Lasers, and was the only laser tested for safety on all skin pigmentation types. The synchronization of multiple wavelengths of light, provides the MR4 with a favorable Depth of Penetration Time Profile (DPTP), resulting in better absorption of light in deeper tissues, while avoiding the unwanted buildup of heat. The MR4 technology delivers less energy at the surface but more beneficial light to the target tissue, compared to Class 4 and Class 3B lasers.