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How Laser Therapy Enhances Manual Therapy Clinics - Tendinopathies, Joint Rehabilitation and Pain Management

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Academy of PHYSICAL MEDICINE

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Laser Therapy Terminology

LASER = Light Amplification by Stimulated Emission of Radiation

PHOTOBIOSTIMULATION = the photochemical effects activated in tissues irradiated by specific wavelengths of light, improving cellular and physiological functions.

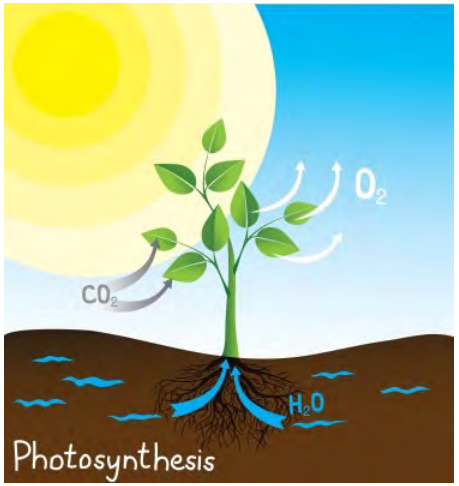
LLLT = Low Level Laser Therapy

HILT = High Intensity Laser Therapy

LT = Laser Therapy

Acronym for LASER

Light
Amplification by
Stimulated
Emission of
Radiation



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Current Medical K-Laser Therapy Use

- **REHABILITATION:** Veterinary, Physiotherapy, Chiropractic, Osteopathy, Sport & Massage Therapy, Podiatry.
- **PAIN MANAGEMENT**: both acute and chronic pain/neuropathic clinics – NHS and Private Healthcare.
- **WOUND HEALING**: non-healing ulcers (diabetics and vascular), surgical incision sites.
- **SPORT TEAMS**: Premiership Football and Rugby Clubs, USA and European Sporting Franchises, Olympic Athletes and teams
- **UK HOSPITALS**: NHS and Private Hospitals. Many international renowned hospitals in US and Europe.
- **DENTAL**: Dental Wounds, Implantology and Pain Management.
- **POST CANCER HEALING**: Post-oncological treatment wound management (NICE Guidelines)
- **UNIVERSITIES**: Guys and St Thomas Hospital, Kingston NHS Hospital, North Tees University, Glasgow University Vet School, Royal Vet School, and many more internationally and within UK.
- **INTERNATIONAL RESEARCH INSTITUTIONS**: ICGEB: International Centre for Genetic Engineering and Biotechnology.

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Therapeutic Medical Lasers Clinical Use

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Clinical Therapeutic Laser Effects

1. **INCREASED METABOLIC ACTIVITY**.
   - Stimulating chromophores (melanin, haemoglobin, water, cytochrome c)
   - Improves tissue oxygenation, ATP synthesis and intercellular exchanges
   - Activating a cascade of photo-chemical reactions that speeds up the healing, regenerative process.

2. **IMPROVED VASCULAR ACTIVITY**.
   - Creates vasodilation enhancing perfusion of tissues
   - Promotes angiogenesis, thus improving blood circulation
   - Optimizing tissue nutrition and removal of cell waste and inflammatory factors.
   - Boosts lymphatic drainage and reduces local swelling and inflammation.

3. **ACCELERATED TISSUE REPAIR AND CELL GROWTH**.
   - Enhanced perfusion, oxygenation and cell metabolism.
   - Results in faster healing of skin, tendons, ligaments, muscles and bones
   - Less scar formation, more Type I collagen formation.
   - Increased growth factor release locally

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Clinical Therapeutic Laser Effects

4. **ANTI-INFLAMMATION**.
   - Reduction in inflammatory cytokines: Interleukin-1, TNFά cytokine and other pro-inflammatory molecules
   - Reduction in local swelling
   - Stimulation of WBC activity
   - Increased antioxidant Super Oxide Dismutase (SOD), helping reduce damaging free-radical activity.

5. **ANALGESIC EFFECT**.
   - Central nerve cell pain relief
   - Reduced localised inflammation and swelling, and reduce inflammatory cytokines to stimulate nerve receptors
   - Alterations in nerve signal transmission

6. **IMPROVED NERVE FUNCTION**.
   - Normalisation of nerve signal transmission in the autonomic, sensory, and motor neural pathways.
   - Stimulation of CNS nerve cell bodies and dendritic sprouting
   - Reduction in swelling around areas of nerve impingement
   - Prevention of nerve cell apoptosis

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Clinical Therapeutic Laser Effects

7. **REDUCED FIBROUS TISSUE FORMATION**.
   - Early intervention prevents large scar tissue following trauma or surgery.
   - Chronic scars will be modulated over time through laser stimulation

8. **IMMUNOREGULATION.**
   - Stimulation of local Leukocytic activity
   - Enhanced Lymphocytic system response
   - Potential of direct anti-microbial action

9. **FASTER WOUND HEALING.**
   - Stimulates keratinocyte and basal cell metabolism
   - Optimises Type I collagen and elastin deposition
   - Enhanced tissue perfusion and drainage
   - Recruitment of WBCs to wound for debridement and reduction in infectious agents.

10. **ACUPUNCTURE POINTS**.
   - Photon laser energy stimulates acupuncture points allowing needleless acupuncture therapy

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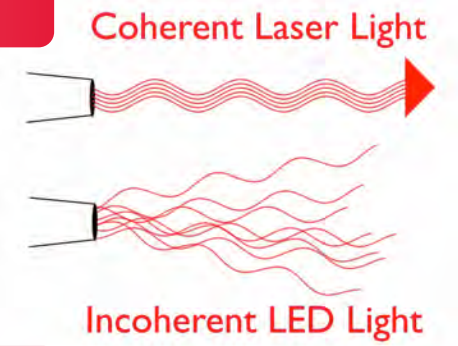
MYTH ONE – LEDs and LASERS are the SAME

LASER vs. LED (light-emitting diode)

Both are monochromatic; but LED is incoherent & Divergent.



"Whenever LED and Lasers have been compared in studies (13 studies found) Laser has come out on top."

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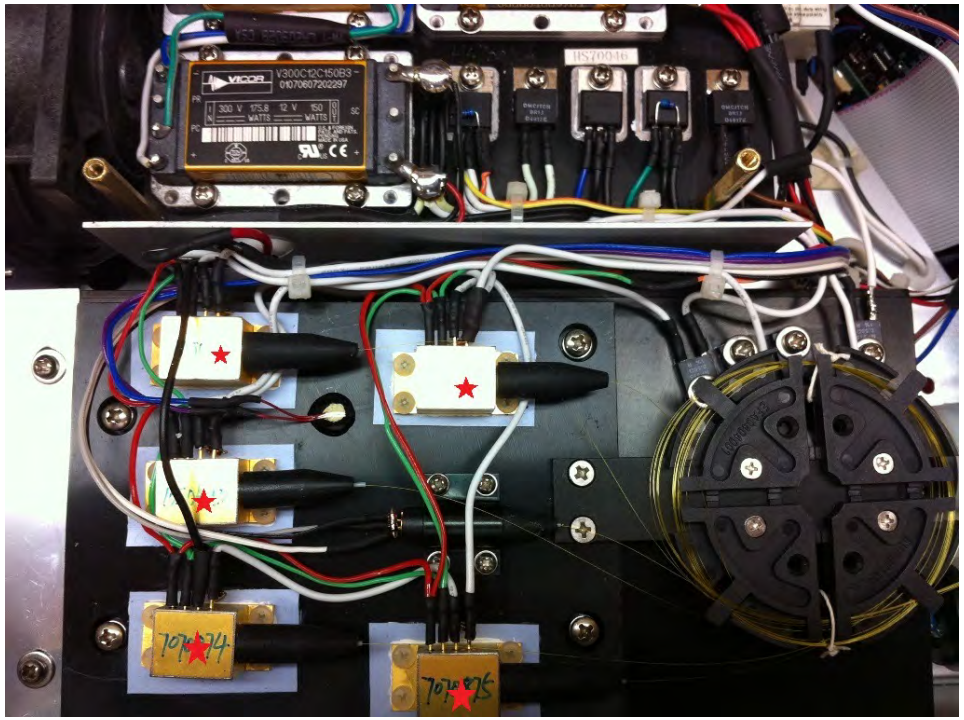
MYTH TWO – SIZE MATTERS

Therapy Laser Diodes => Create the Laser Beam



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MYTH THREE – Class IV Lasers are DANGEROUS

ANSI Laser Standard Classifications

- Class 1: 0-0.4 microwatts (Laser Printer, CD)
- Class 2: 0.4-1.0 milliwatts (mW) (pointer, range finder)
- Class 3A: 1-5 mW (firearm sights, pointers, therapy)
- Class 3B: 5-500 mW (light shows, spectrometry, therapy)
- Class 4: > 500mW (surgery, industry, therapy)

These lasers are all Class IV Lasers

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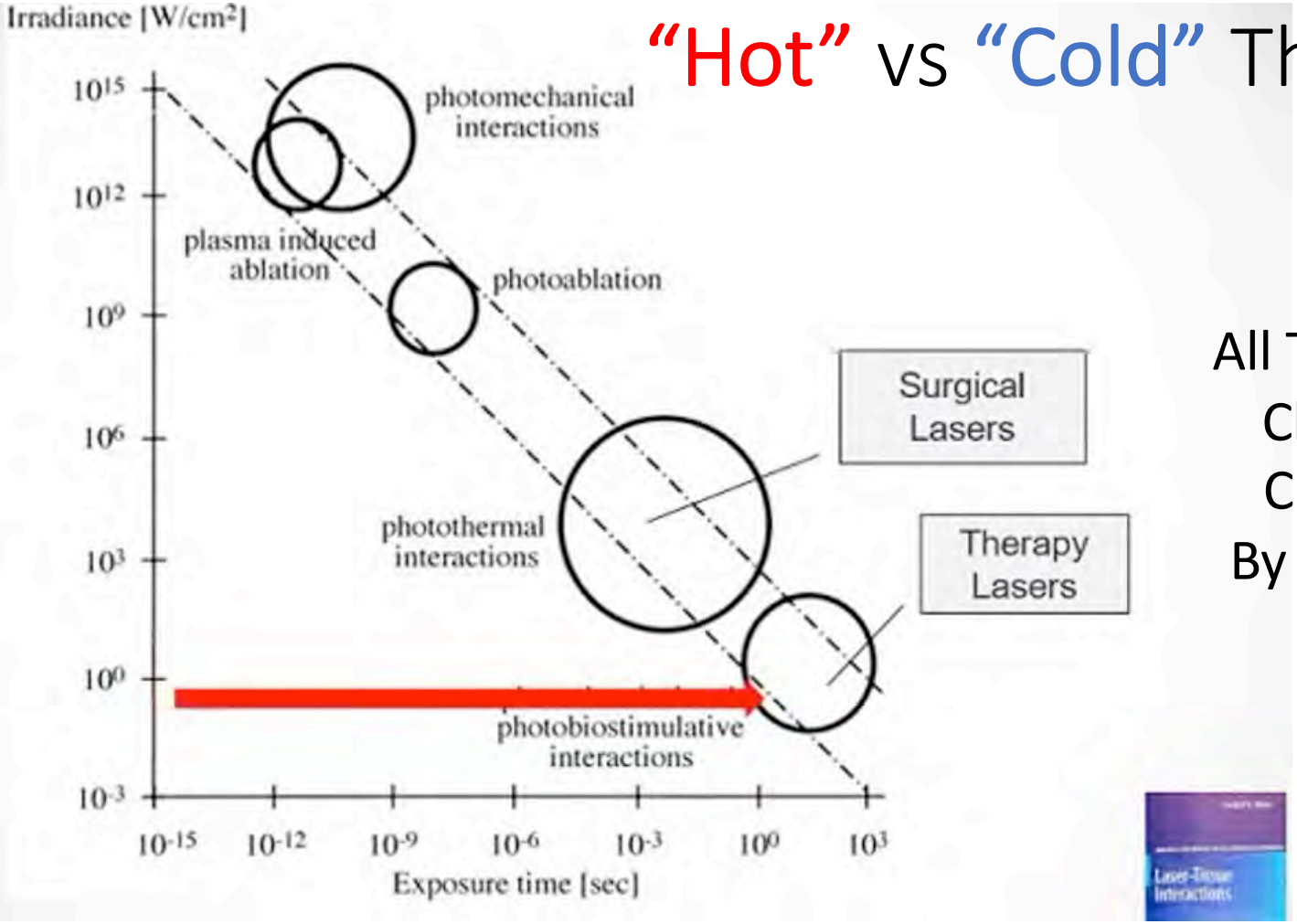
Power Density



"Hot" vs "Cold" Therapy Laser??

All Therapy Lasers are
Classified as SAFE
Class II, 3b and IV
By FDA and CE Mark

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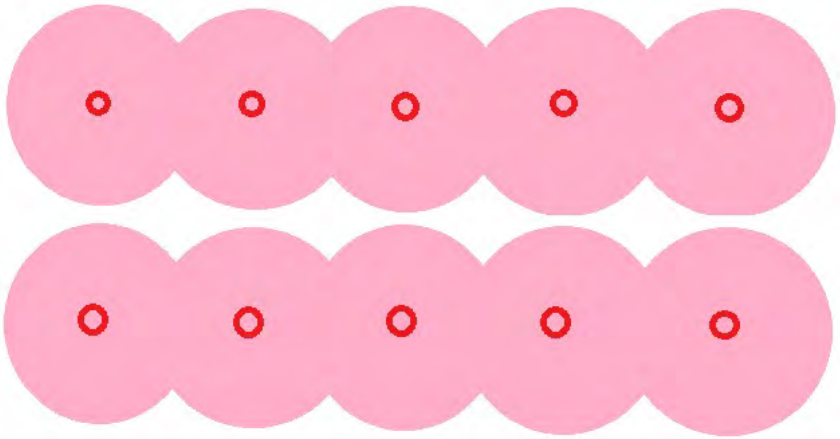
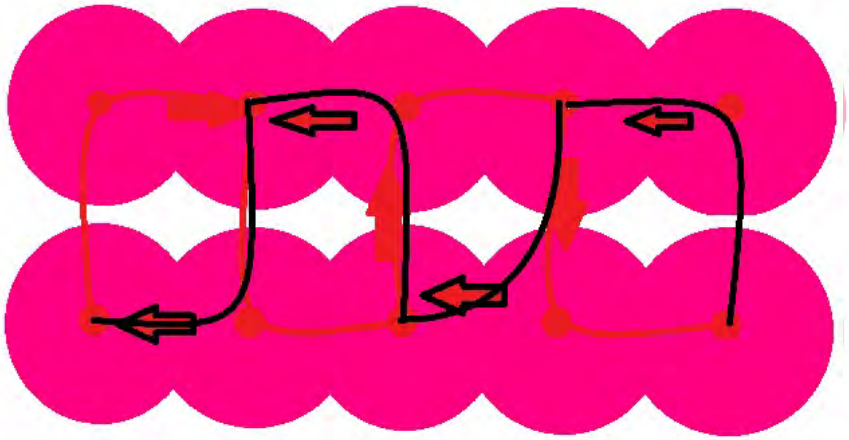
Class 3b or Weak Powered Lasers discrete points for 45-90s at each location covering area



Low Power requires discrete laser points with some scatter of the photon beams to wider area:
Low Energy and Low Power Density
=> Long Treatment Times – Superficial tissues

Class IV Therapy Lasers Continual scanning motion over entire area



Higher Power Laser require continuous hand motion with significantly more energy produced:
Higher Energy and Higher Power Density
=> Short Treatment Times – Deeper tissues

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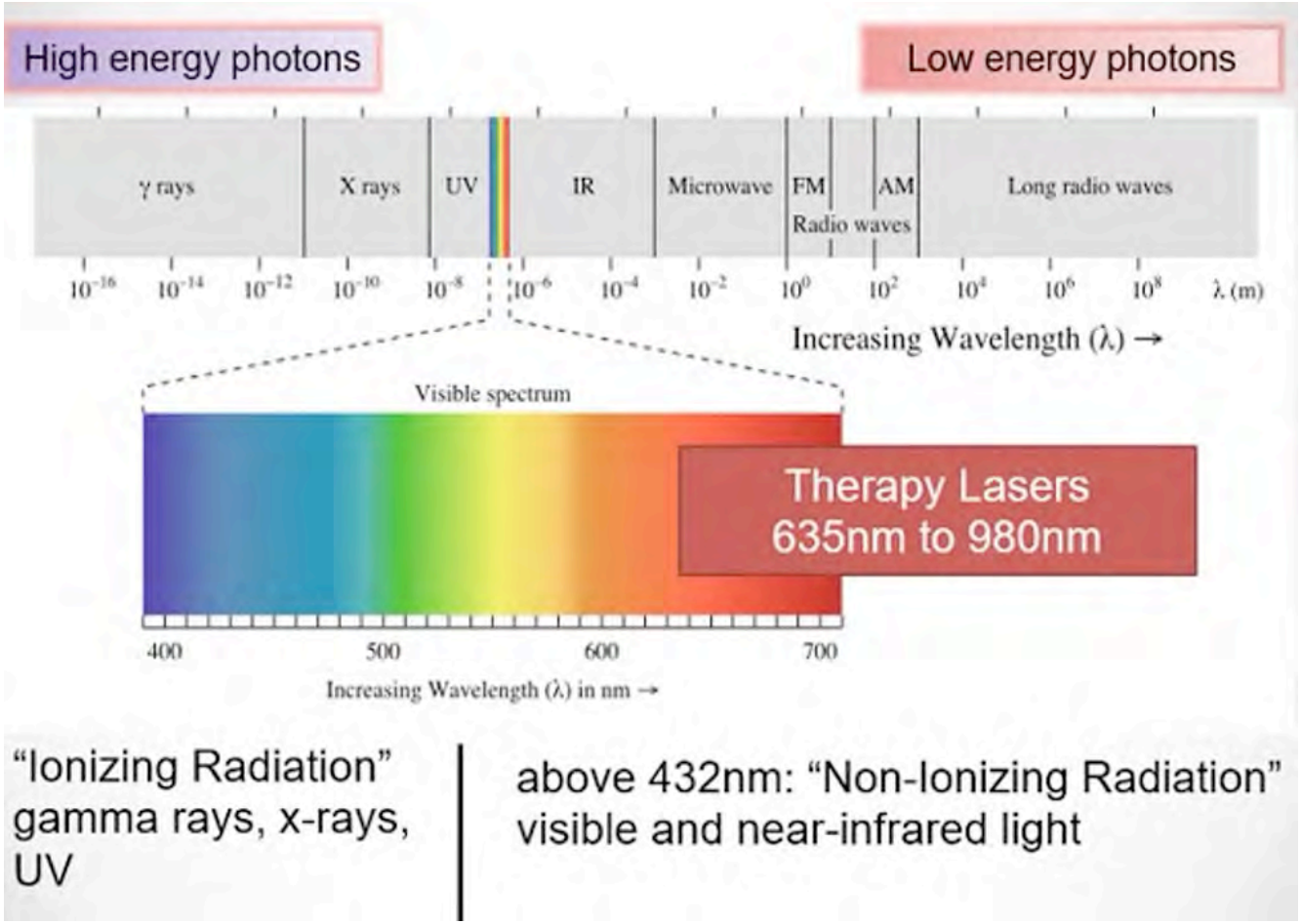
PHOTOBIOSTIMULATION



The Electromagnetic Spectrum

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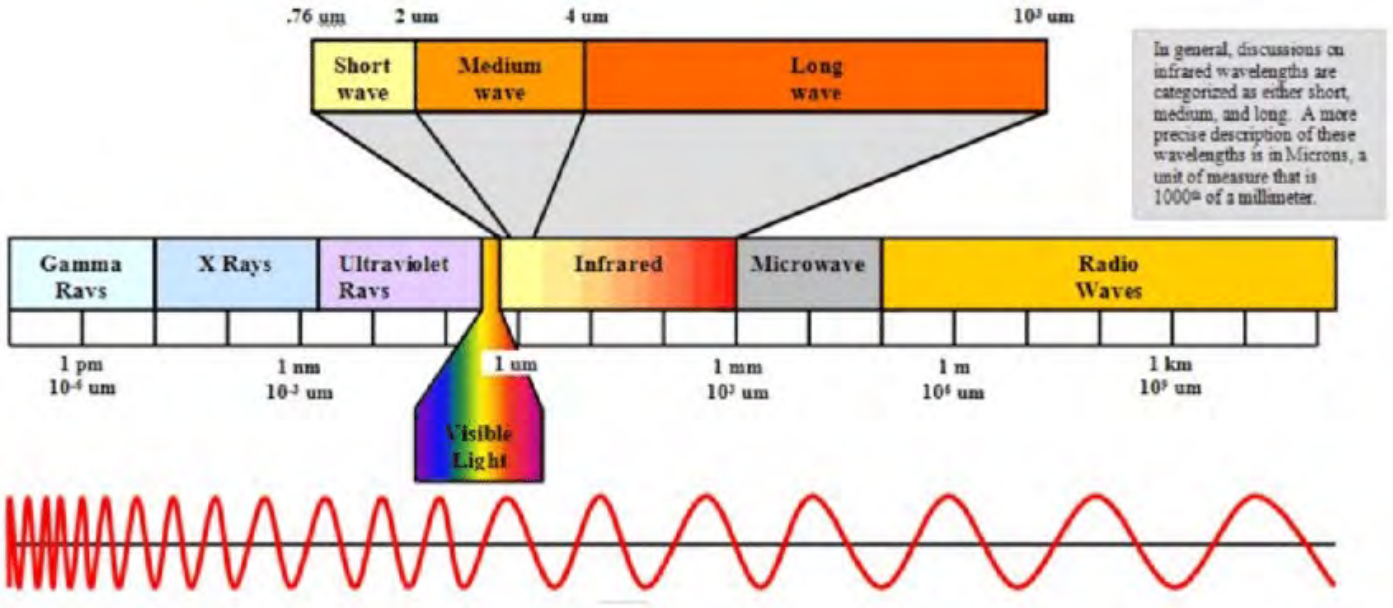
Electromagnetic Spectrum



Increasing Wavelength
Distance (nm)

Increasing Wavelength
Pulse Frequency
(Hz)

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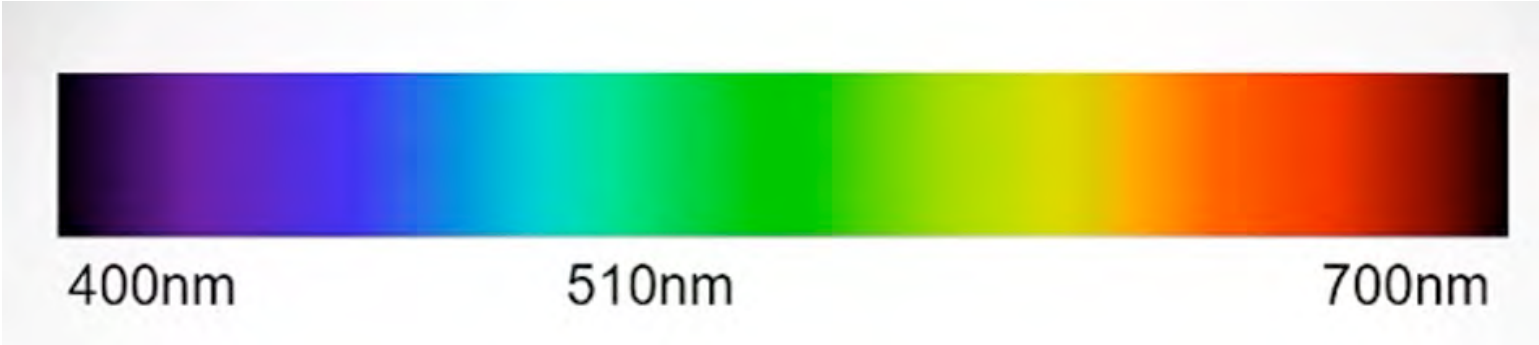
PHOTOBIOSTIMULATION – THERAPY LASERS



Wavelength = colour of the light, nanometers (nm)

1. Depth of penetration into biological tissues
2. Cellular molecule targets (chromophores)

Power = brightness of the light (W or mW)

1. Dosage delivered to depth (Joules)
2. Rate of energy delivery (Watts J/s)
3. Length of treatment time (s)

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PHOTOBIOSTIMULATION

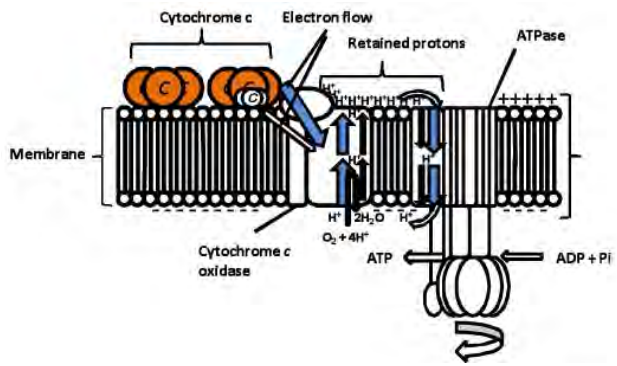
Chromophore: Any component of tissue that absorbs light photons

- The most absorbent *chromophores* in biological tissue are:
- Water, Melanin, Cytochrome C and Haemoglobin.

Water

Melanin

Cytochrome C



Haemoglobin

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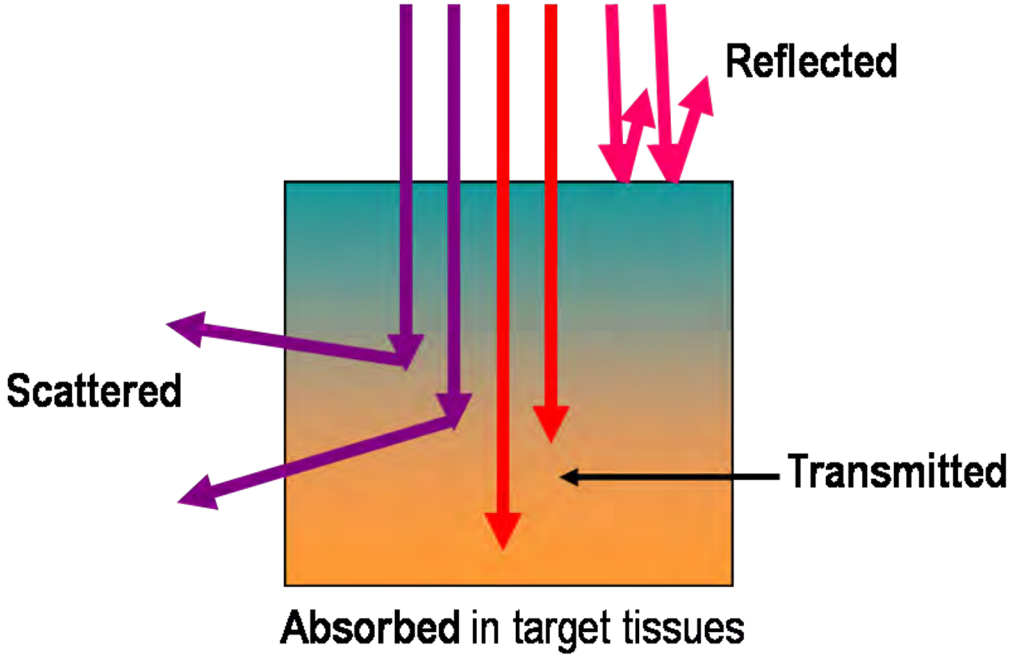
PHOTOBIOSTIMULATION

Laser Tissue Interaction



Biological tissue is a highly turbid medium, it strongly (exponentially) attenuates radiation through a combination of scattering and absorption.

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Therapeutic Medical Laser Dosages

Condition – Depth of Tissue	Dosage J/cm^2
Superficial wound	**1 - 2**
Superficial tissue injury	**2 - 4**
Acute deep tissue injury	**4 - 6**
Chronic deep tissue injury	**6 – 10**
High Pain Deep Tissue	**>10 - 185**

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Therapeutic Medical Laser Dosages

Clinical Application= Time x Power and Wavelength

Therapeutic effects from the Laser Therapy can only be realized if the
Following three factors are present:

- The photons must penetrate deep enough to reach the target tissues (wavelength dependent).

- There must be enough energy present at the desired tissue depth to stimulate a physiological effect and promote healing (power dependent).

- The Wavelengths used are stimulating the full range of Chromophores to maximise effect

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Why is Class IV Laser Therapy Necessary in Modern Manual Therapy Practices?

- To deliver a **therapeutic dosage**
- To a **larger volume** of tissue
- With sufficient photon energy to **deeper targets**
- in a **shorter period** of time.

Quicker response | More consistent results | More satisfied patients

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Benefits of Class IV vs Class 3b Lasers

"Class 4 Lasers can emit greater photonic energy in a shorter time than Class 3B laser without producing an appreciable rise in tissue temperature. This higher power becomes important when treating injuries to deeper tissues such as ligaments, muscles, tendons and cartilage."

Journal of Athletic Training 2012

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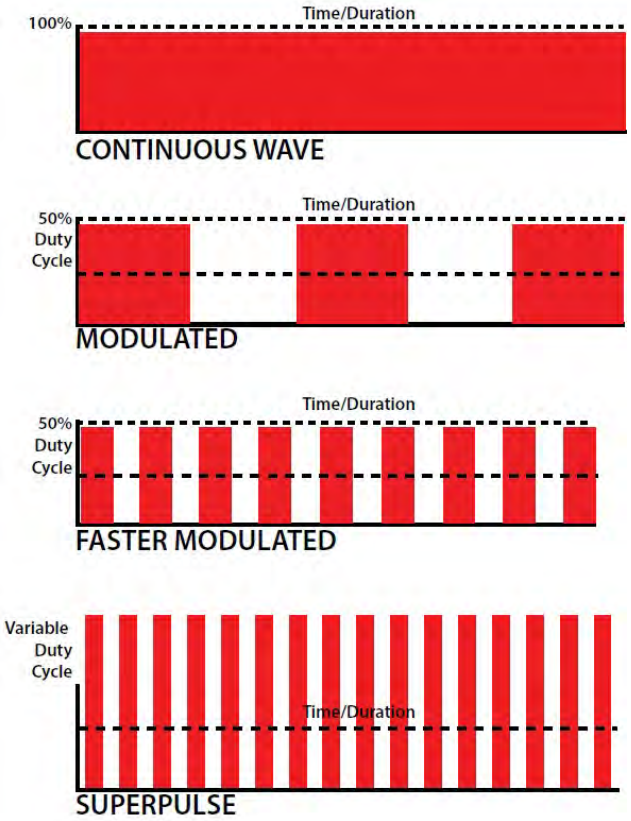
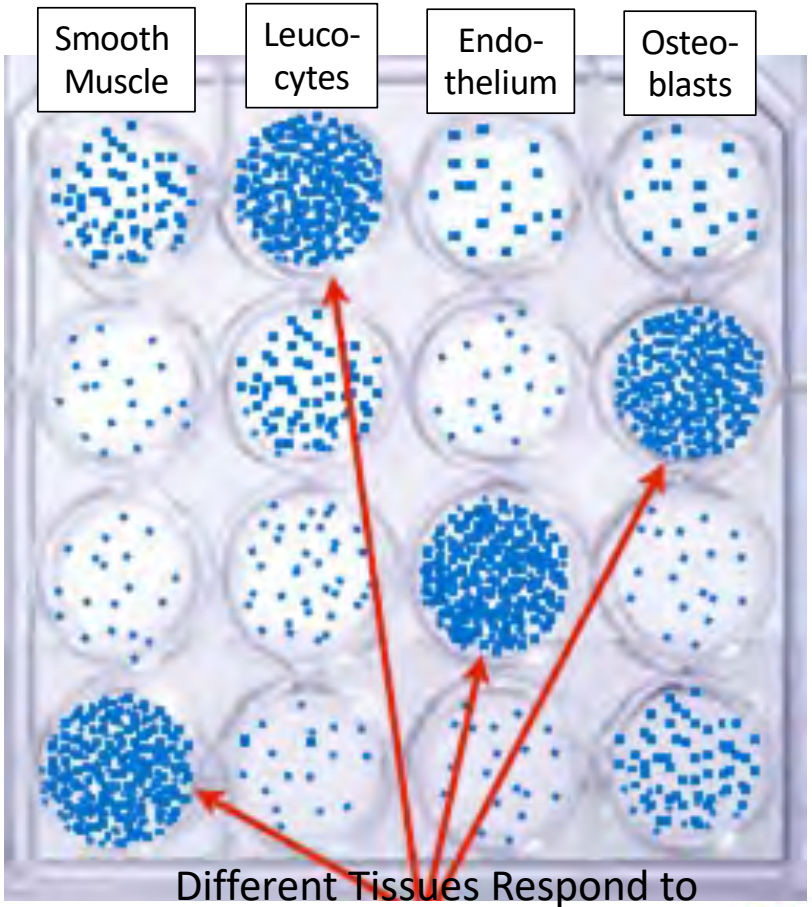
Optimisation of Medical Lasers Pulse Frequencies





Different Tissues Respond to Different Pulse Frequencies

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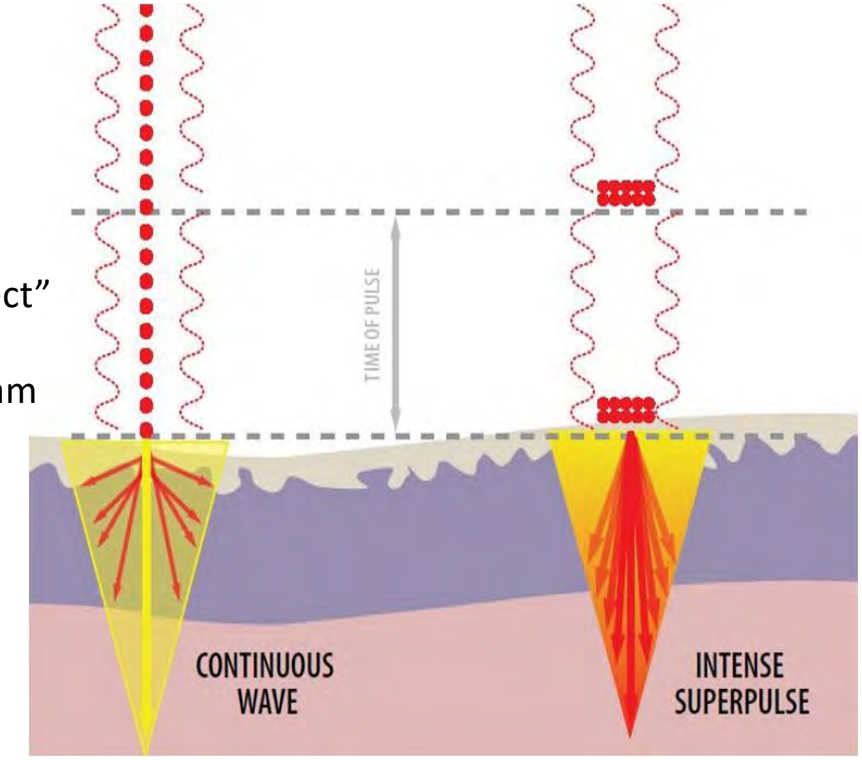
Intense Super Pulse – ISP
Deeper Tissues – Faster Tissue Healing at Depth

Intense Super Pulse creates
Less Superficial “thermal effect”
Less Scatter of Laser Beam
Compared to Continuous beam



BEWARE OF FALSE
Intense Super Pulse Lasers

POWER x TIME = JOULES

50W x 0.001 seconds
= 0.05 Joules
= Class II power levels on average

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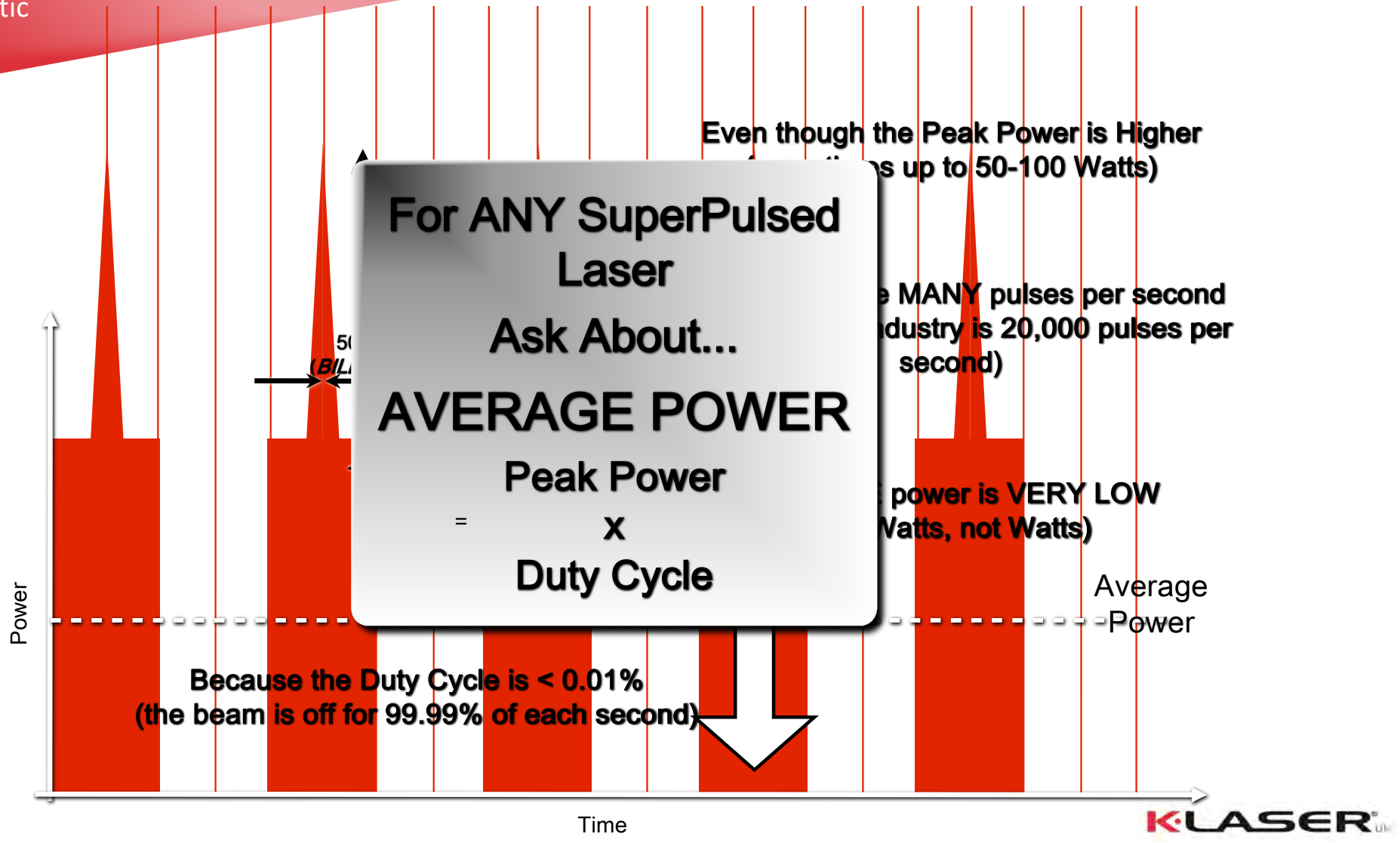
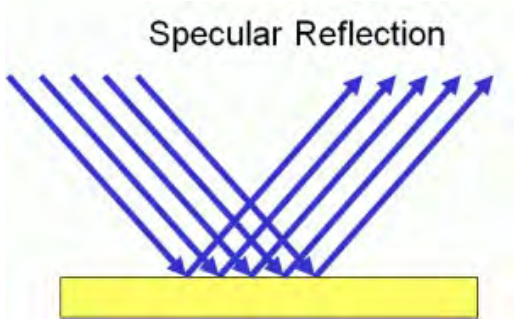
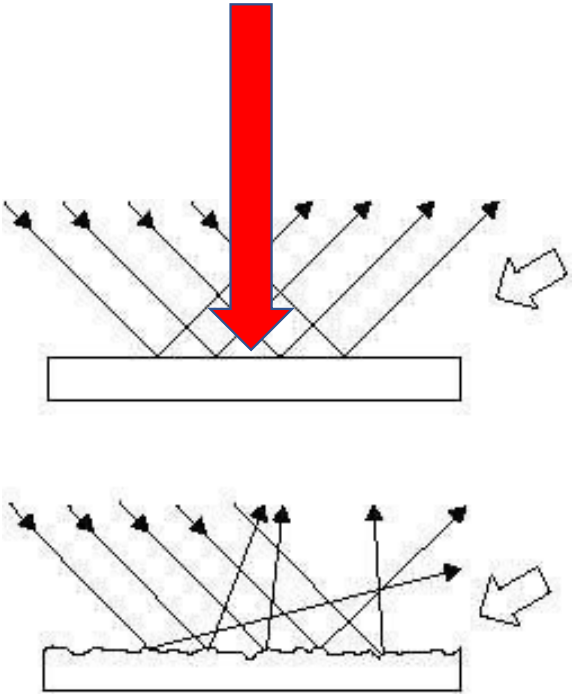
Not So Intense Super Pulsing (NSISP)



Reflections

- Specular vs Diffuse Reflection





Scattering

- Scattering occurs when different kinds of materials are mixed e.g. water droplet
- Causes rays of light to be –re-directed and broken up – if laser not shown perpendicular to skin surface

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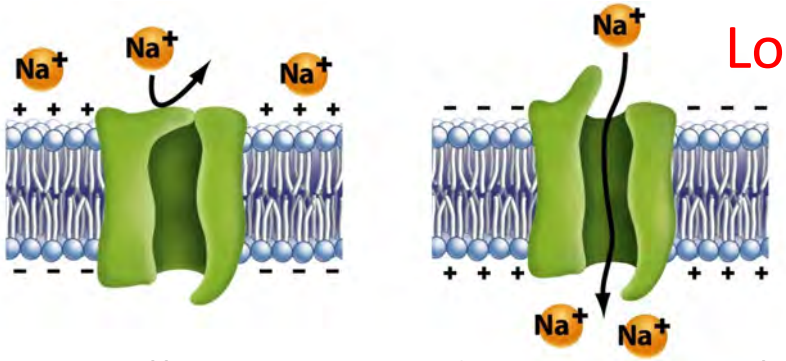
Laser Therapy – Pain Management & Anti-inflammatory Effects

- Local anti-inflammatory effect – oedema and swelling – enhanced perfusion
- Rapid Reduction in Swelling



Local Tendon or Joint

- More Profound

Pain Reduction

- Pain Transmission - alters cell proton gradient across the cell trans-membrane proteins = changes Action Potentials along the neurons.
- Central Nerve Cell Body Stimulation – dendritic changes/apoptosis
  - Ability to alter perception of chronic or neuropathic pain
    - neural plasticity, changes in dendritic out-sprouting
  - Reduce nerve cell apoptosis

Takac and Stojanovic 1998

- Potential to Rehabilitate Motor and Sensory Nerve Damage

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Clinical Publications to Validate Modern Laser Therapy use on Medical/Manual and Post-Surgical Rehabilitation of Sporting Patients

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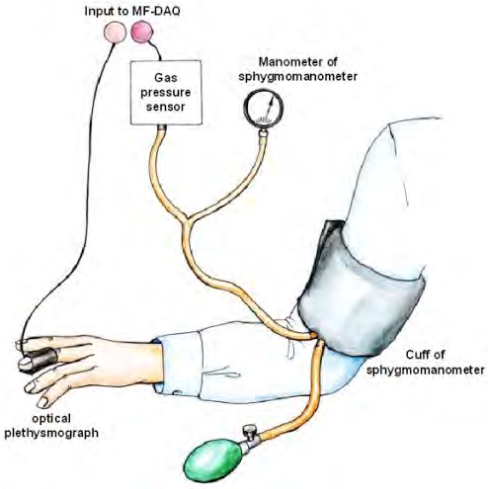
Effect of K·Laser Therapy on Perfusion of Deep Tissue

- K·Laser therapy modulating circulation would promote healing by:
  - Controlling post-injury ischemia hypoxia
  - Reducing oedema and inflammation
  - Preventing secondary tissue damage
  - Accelerating healing and tissue regeneration
- Randomised, Double-blinded, Crossover, Placebo controlled study
- Healthy Physiotherapy Students, average age 20.80 years
- No cardio-vasculature or other history of illness
- Each participant received Sham, 1W, 3W and 6W average power over 4 minutes
- Plethysmography measures blood flow changes in young healthy men



Journal of Athletic Training 2012

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Effect of K·Laser Therapy on Deep Tissue Perfusion to Soft Tissues

- "Class 4 Lasers can emit greater photonic energy in a shorter time than Class 3B laser within producing an appreciable rise in tissue temperature. This higher power becomes important when treating injuries to deeper tissues such as ligaments, muscles, tendons and cartilage."

- "Improved circulation is considered one of the laser therapy's greatest contributions to soft tissue healing after injury."

- "Our results show a dose-dependent effect of K·Laser therapy in a human clinical model….effective, non-invasive treatment modality to improve blow flow to soft tissues and promote tissue healing."

Journal of Athletic Training 2012

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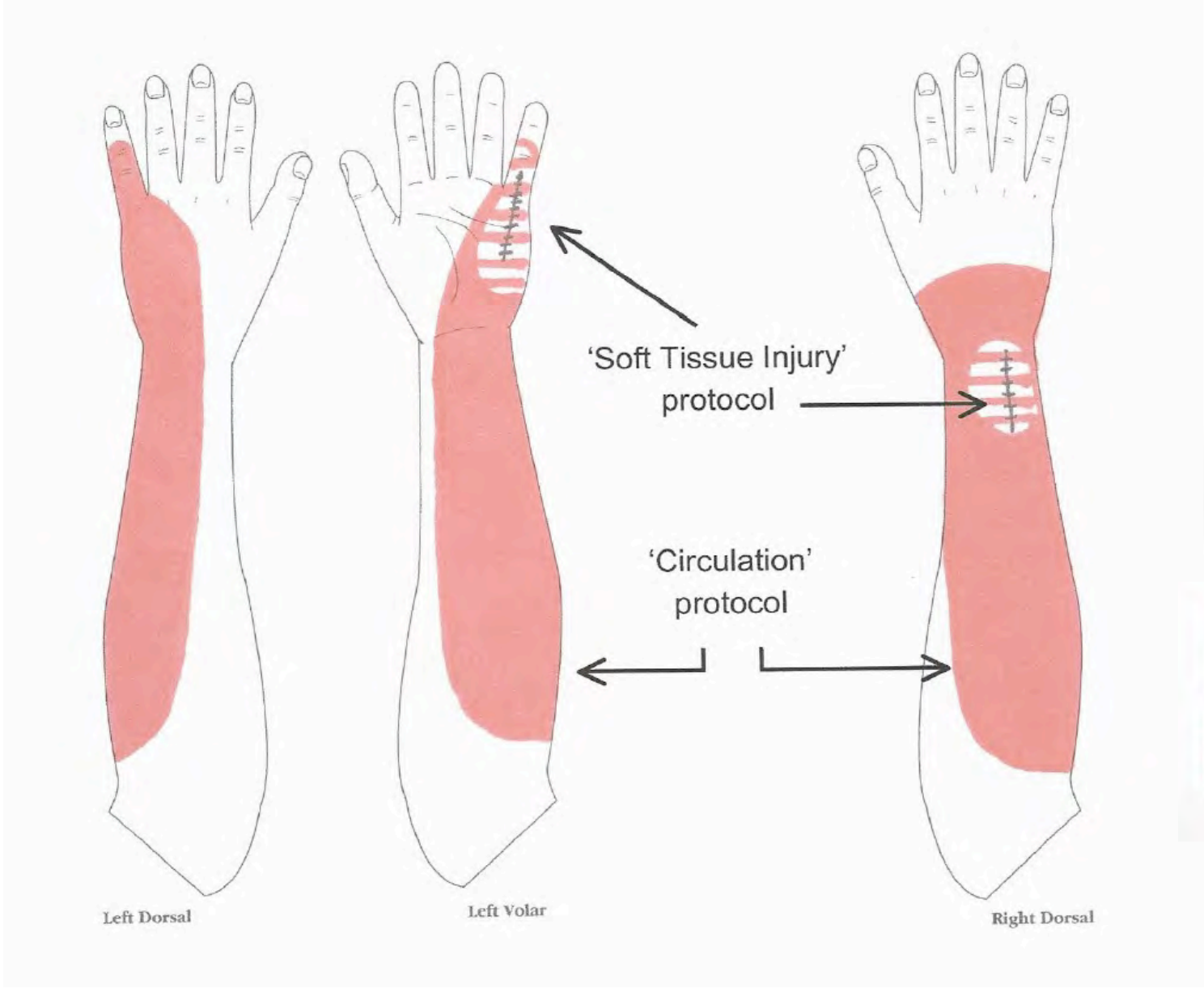

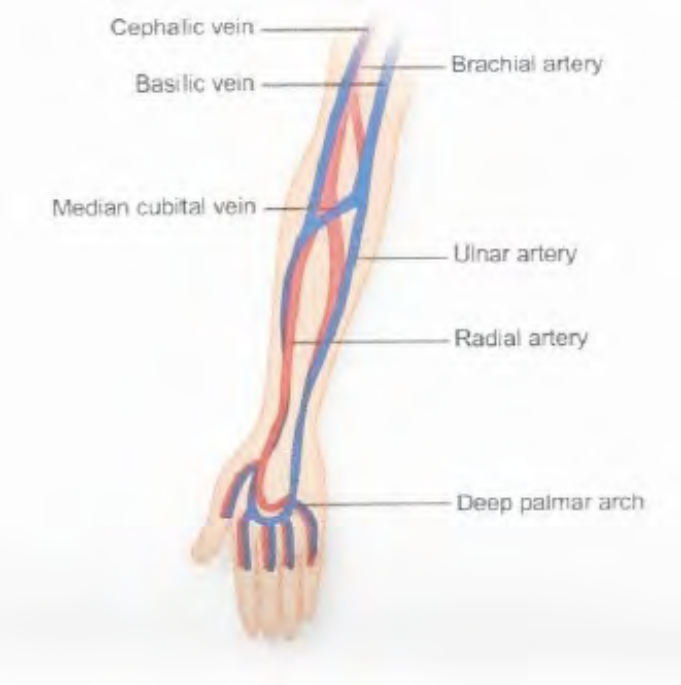

CW = CONTINOUS WAVE
The red spot is constantly on

Hz = PULSED PHASES
The red spot flickers

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Laser Therapy Repair on Partial Calcaneus Tendon Injury

Methodology

- Controlled, randomised, blinded study, 8 day study
- 12 control, 42 study rats with systematic Achilles tendon damage
- Group 1 = control; Group 2= no laser;
- Group 3, 4 and 5 had 3, 5 and 7 day of consecutive laser therapy respectively
- Day 8 sacrificed and collagen microscopic analysis

Results:

- Significant difference between Group II and IV
- No significant difference between Group I and Group IV ($p<0.999$)
- No significant difference between all three laser rat groups in healing of the tendon

Conclusion:

- LLLT was effective in the improvement of collagen fibres organisation of calcaneous tendon after undergoing a partial lesion.

Oliveria et al. 2009 Lasers in Surg. Med..

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Effect of Laser Therapy and Eccentric Exercises in Athletes with Chronic Achilles Tendinopathy

- 52 recreational athletes with chronic Achilles tendinopathy
- Randomised into three groups:
  - Eccentric Exercises and Placebo Laser
  - Eccentric Exercises and Laser Therapy
- 820nm delivered over Achilles tendon in 12 sessions
- Recorded:
  - Visual Analogue Scale – pain intensity during physical activity
  - Morning Stiffness, Active Dorsiflexion, Palpation tenderness, Crepitus
- Significant difference in favour of Laser therapy and eccentric exercises
  - 4 weeks ($p < 0.0003$)
  - 8 weeks ($p < 0.0002$) and 12 weeks ($p < 0.007$)

Stergioulas et al Am. J. Sport Med.2008

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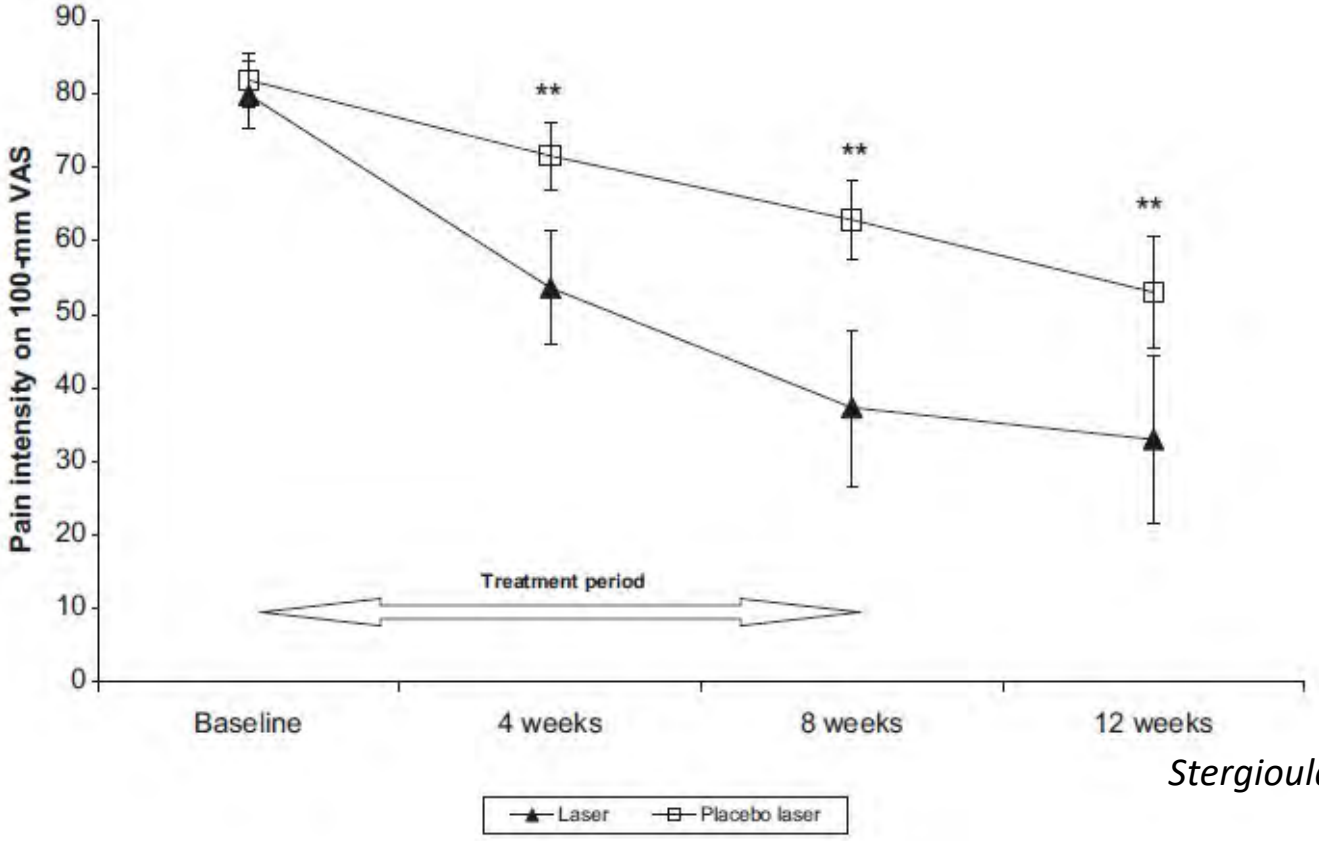
Effect of Laser Therapy and Eccentric Exercises in Athletes with Chronic Achilles Tendinopathy



Stergioulas et al Am. J. Sport Med.2008

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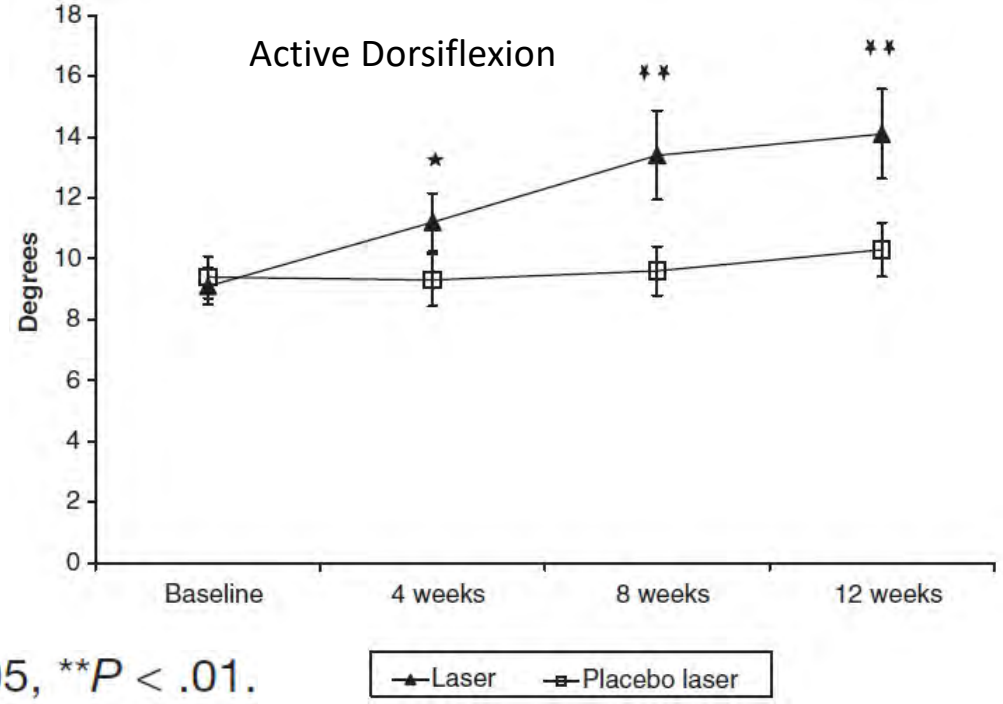
Effect of Laser Therapy and Eccentric Exercises in Athletes with Chronic Achilles Tendinopathy



*$P < .05$, **$P < .01$.

Stergioulas et al Am. J. Sport Med.2008

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Low Level Laser Treatment of Tendinopathy: A Systematic Review with Meta-analysis

- Twenty-five controlled clinical trials met the inclusion criteria.
- There were conflicting findings from multiple trials: 12 showed positive effects and 13 were inconclusive or showed no effect.
- Dosages used in the 12 positive studies would support the existence of an effective dosage window that closely resembled current recommended guidelines.
- In studies of lateral epicondylitis that scored >6 on the PEDro scale, participants' grip strength was 9.59kg higher than that of the control group;
- For participants with Achilles tendinopathy, the effect was 13.6mm less pain on a 100mm visual analogue scale.
- Conclusion: LLLT can potentially be effective in treating tendinopathy when recommended dosages are used with suitable pulse frequencies

S. Tumilty et al 2010

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Laser Therapy vs. Ultrasound

Physiological Effect	Laser Therapy	Ultrasound Therapy
Increased Cell Metabolism	YES	YES
Vasodilation	YES	YES
Increased Pain Threshold	YES	YES
Increased Enzymatic Activity	YES	Limited
Increased Membrane Permeability	YES	YES
Increased Calcium Flow	YES	NO
Angiogenesis	YES	YES
Increased Lymphocytes	YES	NO
Increased Collagen Synthesis	YES	NO
Improved Nerve Regeneration	YES	NO
Improve Motor Nerve Conduction	YES	NO
Osteogenesis	YES	NO
Increased Fibroblasts	YES	YES

Ultrasound Contraindications:

1. Immediate post injury
2. Over metal implants, screws or ortho. wire
3. Over broken skin
4. Irregular body parts
5. Needs contact gel

No Contraindications For Laser Therapy to Any of above clinical presentations

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Effects of Laser Therapy on Pain and Scar Formation

6 months after Herniation surgery: a Randomized Controlled Blinded

72% Smaller Scar

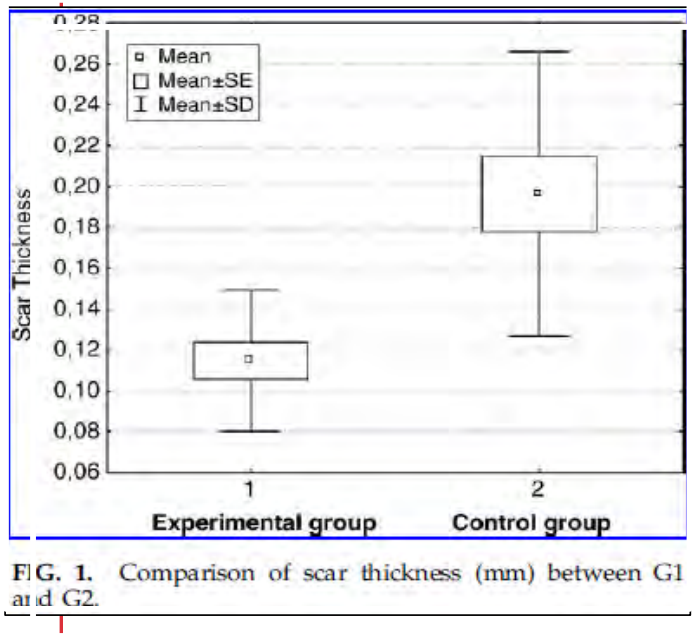

FIG. 1. Comparison of scar thickness (mm) between G1 and G2.

1266% Lower Vancouver
Scar Scale Score

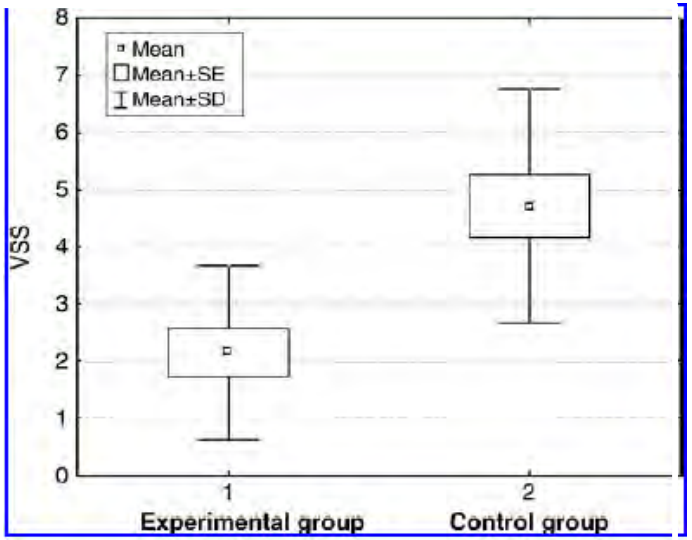

FIG. 2. Comparison of total VSS scores between G1 and G2.

82% Better Malleability

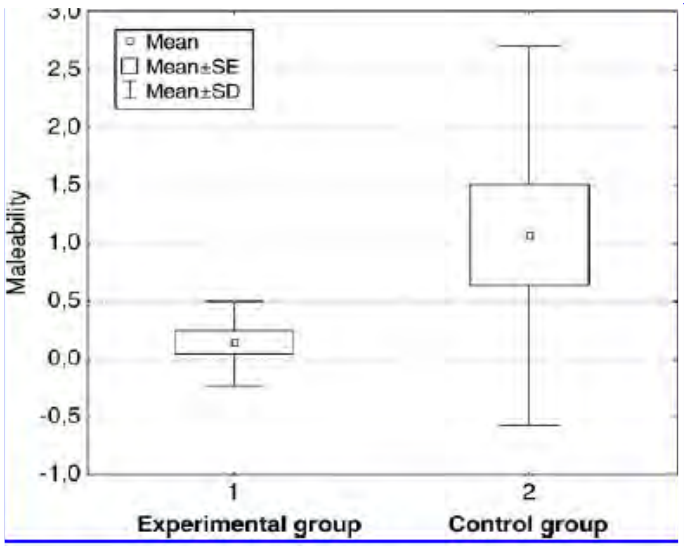

FIG. 3. Comparison of pliability scores between G1 and G2.

Dose: 13J/cm^2 n=28 4 treatments post surgery

Photomedicine and Laser Surgery 2010

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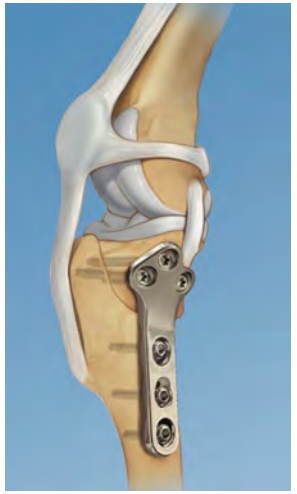
Cranial Cruciate Surgery K·Laser Trial



- 27 Canine Cranial Cruciate tears at Oregon State University
- K·Laser group = Knee setting pre-surgery
- Placebo group = No K·Laser pre-surgery
- Double-Blinded, placebo-controlled trial
- **NO** post operative K·Laser treatments
- Post-op Care: NSAID, Tramadol and Cryotherapy

VCOT 2017 *Baltzer et al*

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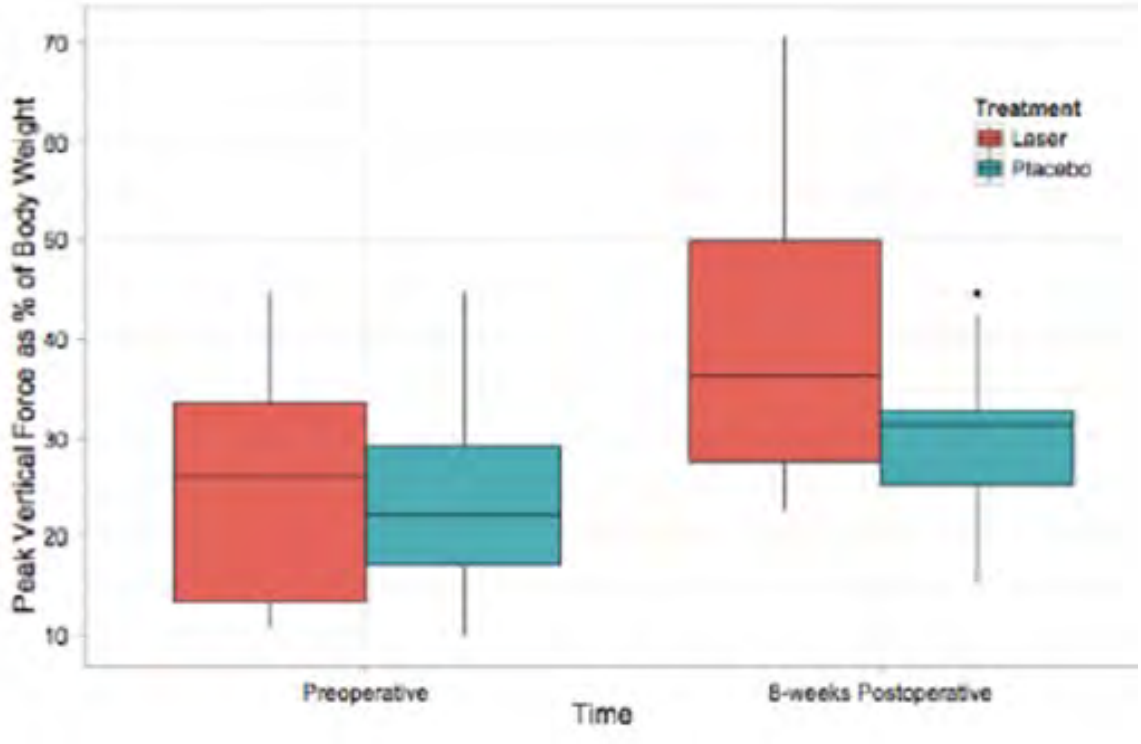
K·Laser Force Plate Analysis – Pressure Study Results

- Peak Vertical Force (% B Wt)
- Pre-operative
  - 23.8% +/- 3.6% Control
  - 26.3% +/- 3.7% K·Laser
- 8 weeks post-operative:
  - 28.9% +/-2.6% Control
  - 39.6% +/- 4.7% K·Laser

P<0.01 K·Laser Treatment



- 26% improvement in Control group
- 51% improvement in K·Laser group

VCOT 2017 *Baltzer et al*

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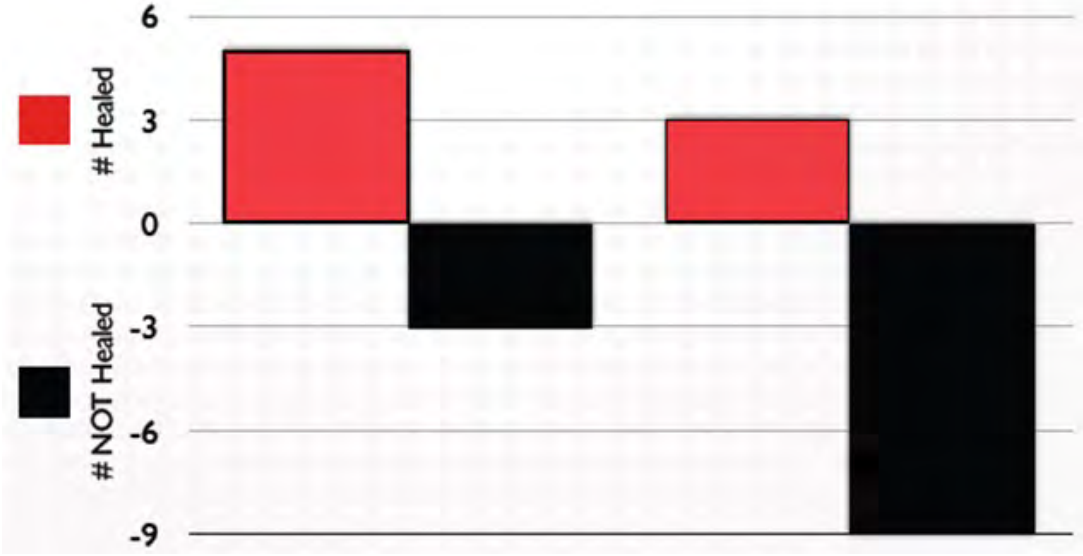
K·Laser Radiographic Analysis

- Double-blinded radiographic assessment 8 weeks post-operative
- Statistics: Two-sided Fisher's test
- Assess remodelled fracture callus with smooth edges
- No lucency at osteotomy site for K·Laser vs. Non-lasered



P<0.05 K·Laser Treatment

VCOT 2017 *Baltzer et al*

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Laser Therapy in meniscal pathology: a double-blinded placebo controlled trial

- 64 humans with MRI diagnosis of meniscal damage were recruited
- 32 – give 904nm laser twice a week for three weeks
  - Pulsed 210s at 2,400 Hz and 210s at 700 Hz (100.8J per knee)
- 32 – given a placebo laser
- Laser therapy group was significantly improved vs placebo group
  - VAS score $p<0.0001$
  - Lysholm score $p=0.0002$
- At 3 week, 6 months and 1 year post Laser Therapy the patients had significantly better scores compared to the entry baseline
- No MRI or arthroscopy was done at the end of the study period

Malliaropoulos et al Laser Med Sci. 2013

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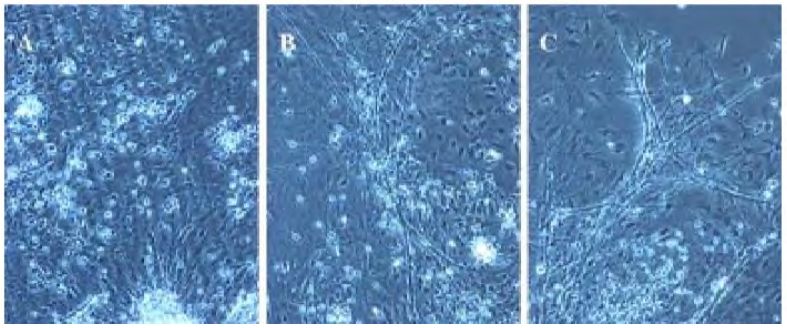
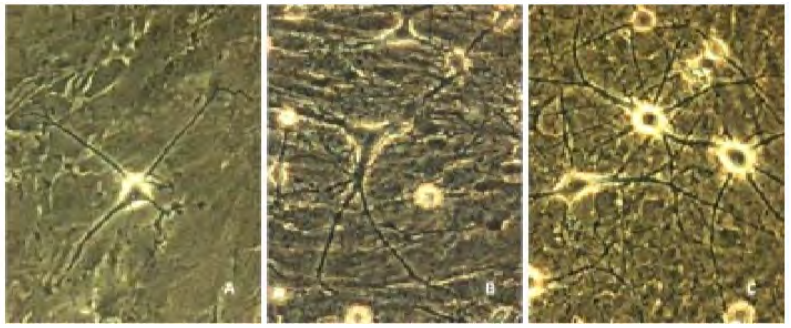
Laser Therapy:
Improved Motor and Sensory Function



Placebo Group



Laser Group

- “Laser phototherapy irradiation accelerated neuron fibre sprouting and neuronal cell migration. Laser cultures contained much higher numbers of large sized neurons when irradiated with infra-red LT
- Laser Therapy formed densely branched, interconnected networks of thick neuronal fibres.” ($P<0.01$)

Rochland et al. (2009) Laser Surgery and Medicine

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Immediate Pain Relief
Effect of Laser Therapy for Sports Injuries: double-blinded, placebo

- 32 College Athletes
- Range of injuries – upper, lower and trunk injuries
- Modified Numerical Rating Scale
- Calculated Pain Relief Rate
- Immediate analysis post LT
  - 75% pain relief in Laser
  - 0% pain relief in placebo
  - Significant diff. p<0.0001

810nm Continuous
51.4W/cm^2
1542J/cm^2

Takenori et al J. Sci Med in Sport 2016

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Plantar fasciitis treated with Laser Therapy Double-blinded placebo controlled studies

Kiritsi et al 2010 unilateral plantar fasciitis study in 25 adults

- 6 weeks study with patients either 904nm or placebo – 3x per week
- No change in ultrasonographic changes over the study period, significant improvements in VAS morning and daytime pain p=0.001

Ordahan et al 2018 compared LLLT 904nm vs HILT 1064nm – 3x per week over a 3 week study period on 70 individuals

- Both groups wore silicon insoles and had stretching exercises
- VAS, Heel Tenderness Index and Foot and Ankle Outcome scores
- Both groups improved significantly over 3 weeks
- HILT across all the parameters performed significantly better than LLLT

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Effect of HILT versus LLLT on Plantar fasciitis Patients

Table 3 Comparison of the Foot and Ankle Outcome Score (FAOS)

	HILT (n:35) Mean ± SD	LLLT (n:35) Mean ± SD	HILT vs. LLLT p
FAOS pain			
Baseline	46.84 ± 16.22	45.93 ± 18.45	0.811
After treatment	54.7 ± 10.22	49.9 ± 10.77	0.023
p	0.019 †	0.038 †	
FAOS symp			
Baseline	56.50 ± 23.72	56.89 ± 23.87	0.921
After treatment	68.30 ± 25.04	60.75 ± 21.25	0.023
p	0.014 †	0.037 †	
FAOS ADL			
Baseline	45.6 ± 18.10	46.51 ± 18.26	0.630
After treatment	58.8 ± 20.5	51.63 ± 20.24	0.033
p	0.010 †	0.028 †	
FAOS SPORT			
Baseline	42.34 ± 21.1	42.82 ± 20.51	0.641
After treatment	56.93 ± 25.9	49.17 ± 25.14	0.022
p	0.011 †	0.022 †	
FAOS QOL			
Baseline	45.53 ± 9.4	45.77 ± 11	0.856
After treatment	57.62 ± 14.6	52.79 ± 22	0.034
p	0.018 †	0.020 †	

Ordahan et al Laser Med. Sci. 2018

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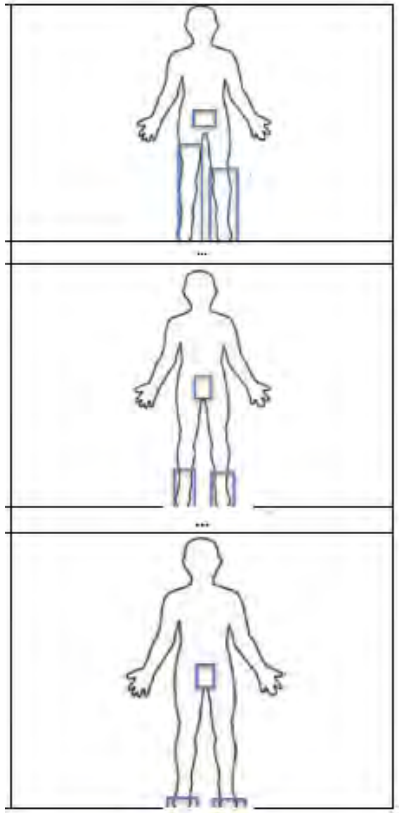
The Effect of K·Laser Therapy on Chemotherapy-Induced Peripheral Neuropathy

- Double-blinded, placebo controlled, cross over trial
- Chronic peripheral neuropathic pain study 70 females

- Class IV laser therapy using 4 wavelengths
- 10 different pulse frequency phases
- Average power 6.75 – 12.0W
- Total delivered on average 10,000 J over 1000cm^2
- Dosage average 10J/cm^2



Argenta et al Gynecologic Oncology 2012

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The Effect of K·Laser Therapy on Chemotherapy-Induced Peripheral Neuropathy

- "No observed complications amongst patients treated."
- "Our data indicate that Photobiomodulation by K·Laser is an effective, low-toxicity treatment for chemotherapeutic induced peripheral neuropathies."
- "K·Laser may improve neuropathic symptoms through a number of plausible mechanisms including prevention of neuronal apoptosis and enhancement of neurite outgrowths."

Argenta et al Gynecologic Oncology 2012

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Multi-centre Randomised, Double-blind Controlled Trial to Evaluate the Efficacy of K·Laser Therapy for Severe Oral Mucositis induced by Chemotherapy in Children: laMPO RCT

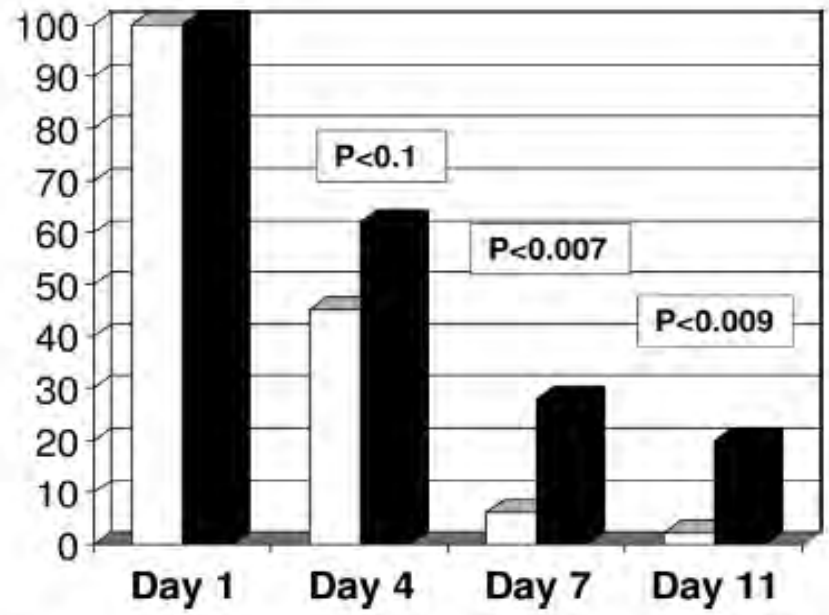

FIGURE 2 Percentage of patients with OM grade 3-4 in the PBM group (white columns) and sham group (black columns) on days +1, +4, +7, and +11

- 51 children with K·Laser group
- 50 allocated to sham group

- 93.7% OM < 3 WHO in K·Laser
- 72% OM <3 WHO in Sham

- Significant reduced pain in K·Laser group
- No side effects of K·Laser Therapy

- NICE Endorse use of K·Laser post chemotherapy induced mucositis

Paediatric Blood Cancer 2018

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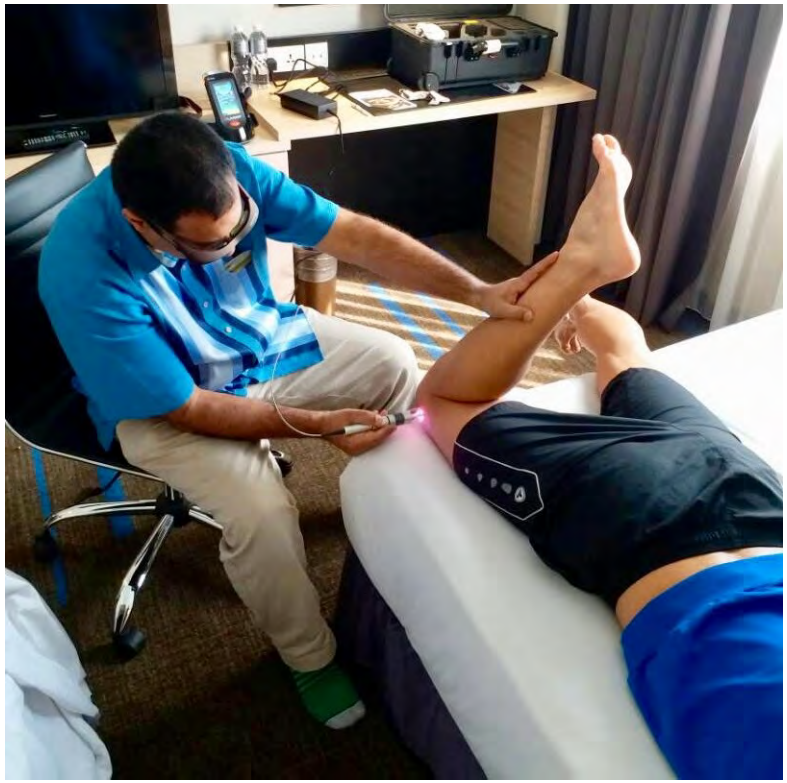
K·Laser Treatment Plans

- Chronic Musculoskeletal
  - Initial 6 Treatments
  - 3, 2, 1 or 2,2, 2 over initial 3 weeks
- Acute Injuries
  - 2 - 6 Treatments (eod or daily)
  - Daily or at least 2-3 times per week
- Pre/Post Surgery Rehab
  - 2 – 6 Treatments (eod or daily)
  - Consultation day & Pre-operation
  - Anaesthesia recovery (skin only)
  - Discharge day & 2 – 6 more sessions
- Wounds
  - Can be given daily- high frequency
  - Contaminated wound = higher power
  - Clean wound settings on surgical table



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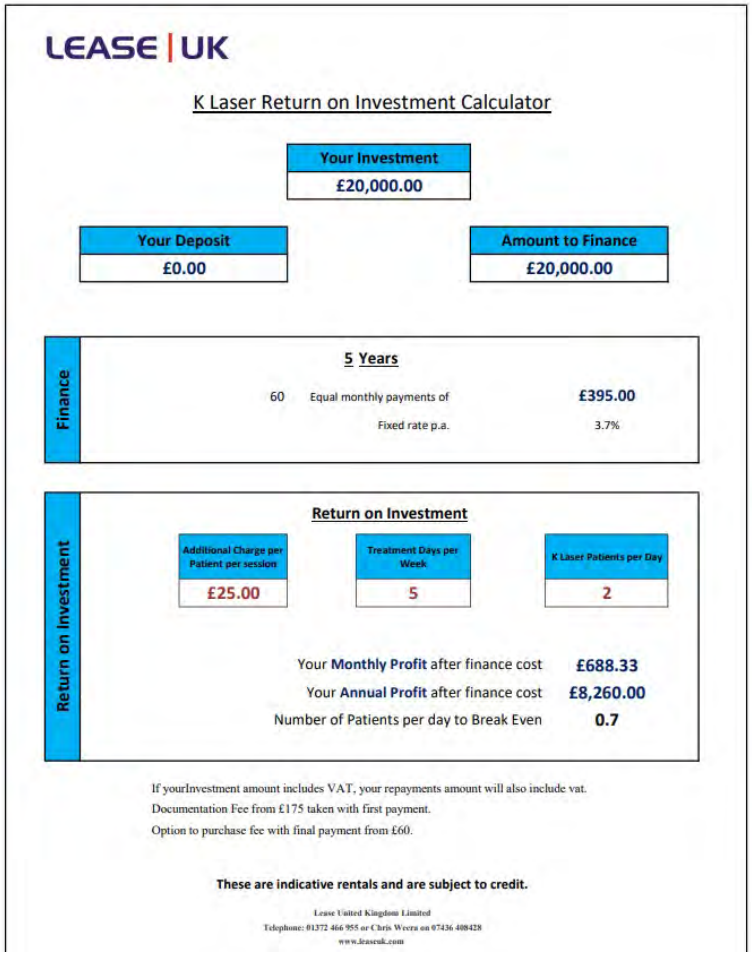
How affordable is a K Laser?



LEASE | UK

K Laser Return on Investment Calculator

Your Investment	
	£20,000.00

Your Deposit	Amount to Finance
£0.00	£20,000.00

Finance

5 Years

60	Equal monthly payments of	£395.00
	Fixed rate p.a.	3.7%

Return on Investment

Return on Investment

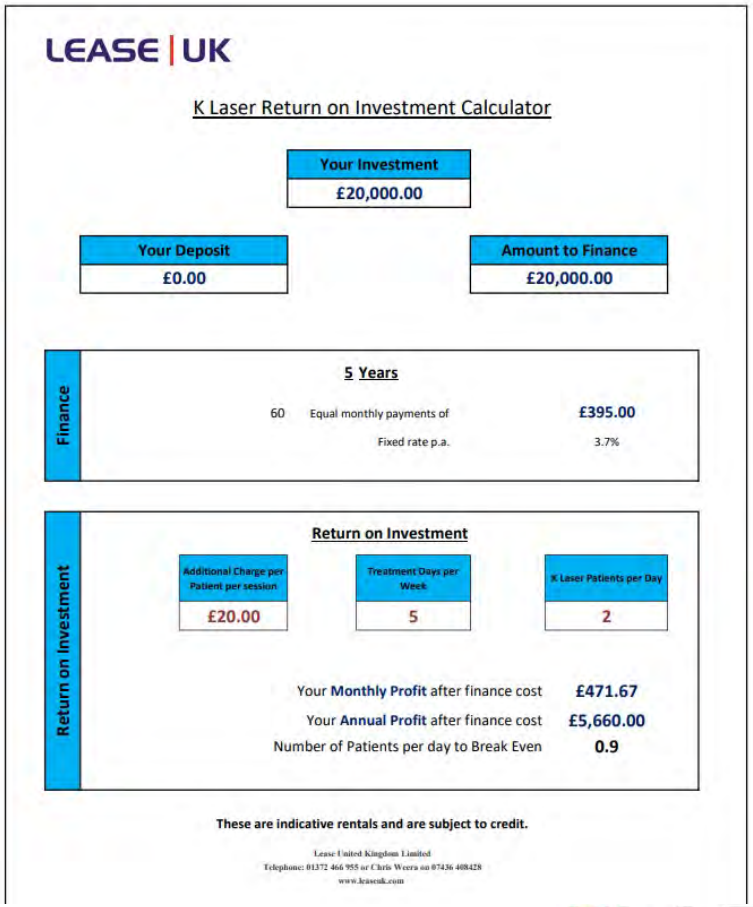
Additional Charge per Patient per session	Treatment Days per Week	K Laser Patients per Day
£25.00	5	2

Your **Monthly Profit** after finance cost	£688.33
Your **Annual Profit** after finance cost	£8,260.00
Number of Patients per day to Break Even	0.7

If yourInvestment amount includes VAT, your repayments amount will also include vat.
Documentation Fee from £175 taken with first payment.
Option to purchase fee with final payment from £60.

These are indicative rentals and are subject to credit.

Lease United Kingdom Limited
Telephone: 01372 466 955 or Chris Weera on 07436 408428
www.leaseuk.com



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K Laser Return on Investment Calculator

Your Investment	
	£20,000.00

Your Deposit	Amount to Finance
£0.00	£20,000.00

Finance

5 Years

60	Equal monthly payments of	£395.00
	Fixed rate p.a.	3.7%

Return on Investment

Return on Investment

Additional Charge per Patient per session	Treatment Days per Week	K Laser Patients per Day
£20.00	5	2

Your **Monthly Profit** after finance cost	£471.67
Your **Annual Profit** after finance cost	£5,660.00
Number of Patients per day to Break Even	0.9

These are indicative rentals and are subject to credit.

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Return on Investment for Podiatrist/Chiropodist

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K Laser Return on Investment Calculator

Your Investment
£24,000.00

Finance

5 Years

60	Equal monthly payments of	£469.92
	Fixed rate p.a.	3.50%

Return on Investment

Return on Investment

Additional Charge per Patient per	Treatment Days per Week	K Laser Patients per Day
£125.00	6	2

Your **Monthly Profit** after finance cost	£6,030.08
Your **Annual Profit** after finance cost	£72,360.96
Number of Patients per day to Break Even	0.1

Your Investment and Repayments exclude vat.
Documentation Fee from £175 taken with first payment.
Option to purchase fee with final payment from £60.

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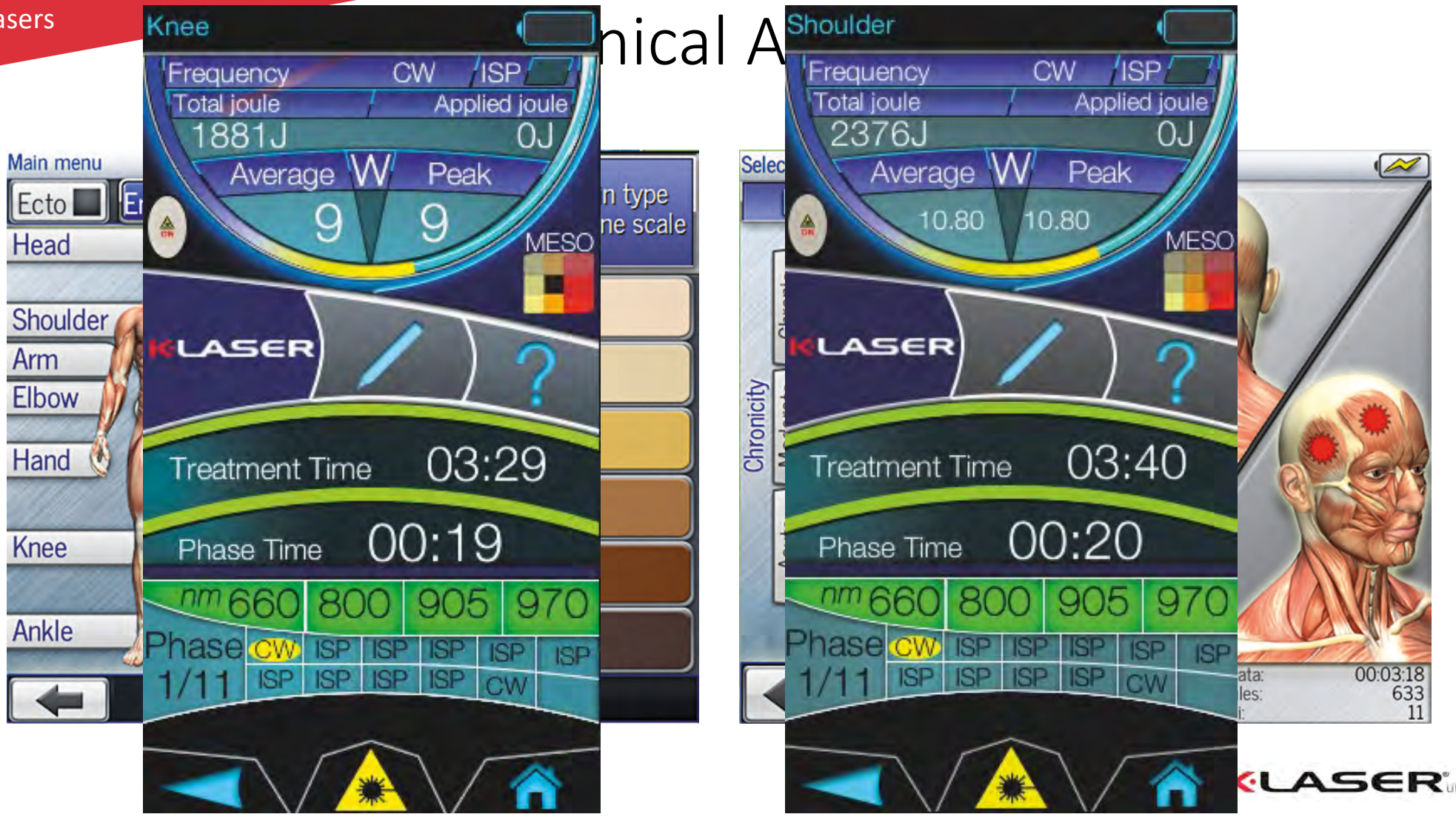

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Delivery of K-Laser Therapy

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Sporting Physicians Testimonials

- "Successful treatment of professional and Olympic athletes requires an integrated support team of healthcare practitioners as well as many different modalities of treatment," says ***Dr. John Vargo***, trainer for the Canadian Olympic Track & Field team.
- "K-Laser is the modality I choose first in high-performance athletes requiring immediate results and in patients who have conditions that have failed with several other types of treatment."
- "The addition of K-Laser to our Olympic medical team gives us the ability to provide Canada's Track & Field athletes with the best technology available during the biggest competition of their lives," continues ***Dr. Vargo***
- " I have just treated a member of the under 18 team for England and Sale. He had a long-term shoulder pain-injury that had kept him out of the squad for 6 weeks despite intense manual and medical therapies. The results of 2x K-Laser sessions were amazing, by the fourth session his physiotherapist has given him the OK to play for England again."
- ***Dr. Andrew St Clair Logan***, Consultant Anaesthetist, Countess of Chester Hospital
- "We have had good success with the K-Laser on tendinopathies, plantar fasciitis, backs and soft tissue injuries…….We have seen a rise in referrals to the clinic for conditions like scarring and hand therapy conditions we would not normally have treated."
- **Cordelia Squires,** Physiotherapist at Woodfield Physiotherapy Centre

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Laser Therapy Summary

- Power, Wavelength and Pulse Frequency – all work in unison to enhance clinical outcomes, depth of penetration, and quality and speed of healing.

- Widest Range of Clinical Applications compatible with modern medical and post-surgical rehabilitation, manual therapy and pain management

- Proven Positive Published Results:
  - ✓Wounds, including post-surgical wounds, acute and chronic
  - ✓Soft tissue musculoskeletal accelerated repair
  - ✓Bone and Cartilage accelerated healing
  - ✓Neurological cell stimulation
  - ✓Pain Management and Anti-inflammatory action
  - ✓K-Laser has NICE Guideline Post cancer rehabilitation

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- 4 therapeutic wavelengths.
- Class VI power.
- Continuous, Pulse, Intense Super Pulse Frequencies.
- Pre-set protocols.
- Short treatment times: 3.5 – 5.0 mins.
- Portability for out-of-clinic services.
- Multiple Independent International K-Laser Studies.
- Constant Research and Development.
- Wifi Updates – clinical audit.
- CE and FDA approved.
- NICE Guideline Compliance
- info@klaseruk.co.uk
- www.klaseruk.co.uk

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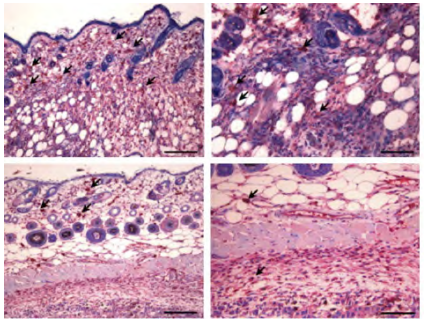
K·Laser Therapy Inhibits Tumour Growth by Promoting Immune Surveillance and Vessel Normalisation

- K-Laser tested on melanoma and oral carcinoma models
- Biostimulation of cultured cell metabolism **BUT** reduced tumour progression
- Recruitment of T-lymphocytes and dendritic cells, with Type I interferon secretion
- K·Laser reduced highly angiogenic macrophages within the tumour mass and promoted vessel normalisation
- "Striking and unexpected result….."
- "Emerging strategy to control tumour progression."



- "Set Photobiomodulation as a safety procedure in oncological patients and open the way to its innovative use for cancer therapy."

EbioMedicine 2016

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K·Laser Therapy for Treating Chemotherapy Induced Oral Mucositis: Onco-haematological Paediatric Patients

- All K·Laser patients demonstrated improvement in pain sensation, and all mucositis was resolved by day 11. No pain felt from day 1-2
- No side effects and well tolerated.

International Jo of Paediatric Dentistry 2015

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Pulmonary Interstitial Fibrosis – “Westie Lung”

COVID-19 Solution?
Pulmonary ACUTE Inflammation

Laser Therapy: Revolutionizing Pain Management and Wound Healing

By David S. Bradley, DVM, FASLMS (dbradley@k-laserusa.com)

As stated by Juanita J. Anders, PhD in the August 2010 issue of the American Society for Laser Medicine and Surgery (ASLMS) Journal, "The use of Photobiomodulation, commonly referred to as low level light therapy, to alter cellular function has come a long way since the early days." First, I may be a bit particular about terminology as there are a lot of misperceptions and misrepresentations out there. Due to years of inferior products and exaggerated claims, we need to be very specific and accurate with our statements.

So this is not a discussion on "Light" therapy. This is "Laser" therapy. More specifically we are talking mainly about "high power Laser therapy." Although "cold" lasers or "low level lasers" work on the same principles, they often do not have enough power to elicit a measurable or consistent clinical response in deep musculoskeletal conditions. Laser therapy has been used in animals for over 20 years. However the newer high-powered Class IV therapy lasers were just Federal Drug Administration (FDA) cleared in the United States in 2005. Their use has grown dramatically in the last 3-5years.

Let's start with the basics. The two most important parameters that dictate the function or capability of any Laser are its wavelength and its power. Wavelength is just the 'color' of the Laser light. Laser therapy works by a wavelength specific form of "photobiomodulation". Laser light in the red and near infrared range is absorbed by specific structures in the body (cytochrome C oxidase/hemoglobin/water) and this has a positive effect on many biological reactions. The main result of this photochemical reaction is to increase blood flow to tissue, stimulate the release of O2 from the hemoglobin delivered, and enhance the efficiency of converting the O2 to useful energy within the cell. This will lead to improved cellular function and/or an increase in cell growth, replication, repair, or production of beneficial biochemical reactions. There are other physiologic responses to Laser light as well. There is a mild photothermal effect (with Class IV Lasers only!) which helps with blood flow, muscle relaxation, and nerve conduction. There is a photoenergetic effect which can stimulate acupuncture points. The clinical results of these cellular reactions are the following:

- Accelerated tissue repair and growth
- Faster wound healing
- Pain relief
- Decreased inflammation
- Improved blood flow
- Improved lymphatic drainage
- Improved nerve function and repair
- Decreased fibrosis
- Improved health of the immune system
- Acupuncture stimulation
- Trigger Point modulation

Laser power is the rate at which the Laser energy is delivered. Using a proper Laser that delivers enough light (photons) to the appropriate area is the key to consistent and measurable effects. The classification of all Lasers is dictated by the FDA and is based on the maximum power the Laser can deliver. It is used for guidance when discussing safety and the potential to cause harm/damage especially to the eye.

Most therapeutic lasers are class IIIa, IIIb, or IV. Class IIIb lasers produce less than 500mWatts of power. Class IV Lasers are anything that produces over 500mWatts of power. Class IV therapy Lasers are extremely safe. The main benefit to the higher power is the ability to deliver enough photons at the surface (a larger total dose) to compensate for the power loss (decreased number of photons) that will reach deeper tissues due to scatter and absorption within the tissue. This allows for a more direct photochemical response on these tissues. That is why there is a much more dramatic and consistent response to class IV Laser therapy vs class III Lasers or LEDs (Light Emitting Diodes). Lower dosages are used when treating small patients or superficial wounds/lesions and for acupuncture point or trigger point stimulation. Most Class IV Lasers have the capability to reduce the power in order to deliver a lower dosage when appropriate. This makes them very versatile and can be used effectively for superficial skin lesions

(Continued on page 19)

WORLD WIDE OVER
500 PEOPLE TREATED
For CHRONIC
PULMONARY INTERSTITIAL
FIBROSIS with K-LASER

K-LASER

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Penetrating Deep to Lung Tissue