

Laser Medicine

Fred Kahn, MD, FRCS(C)

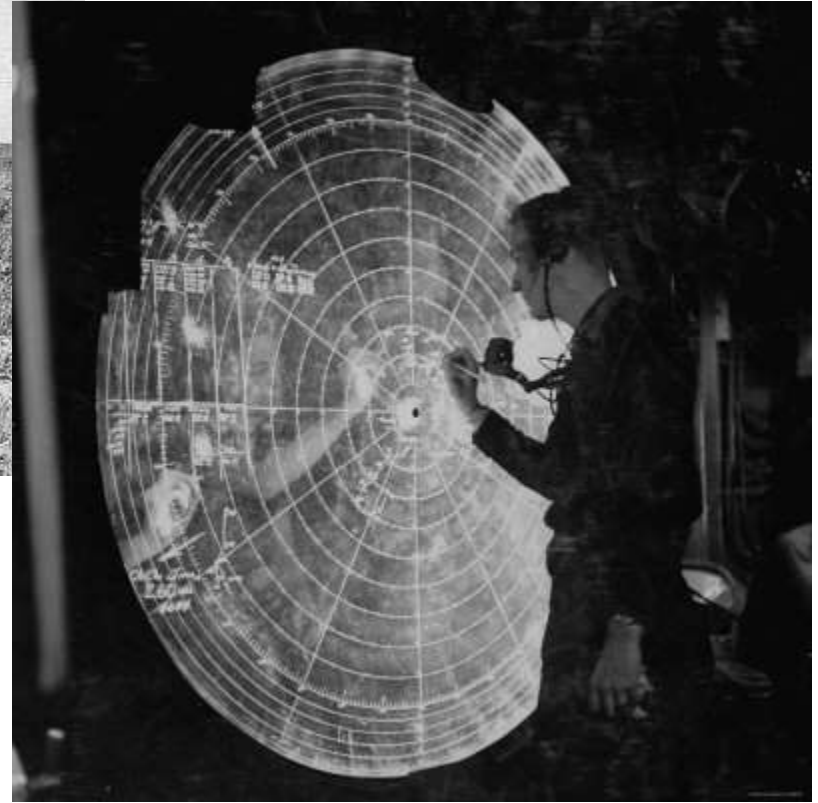
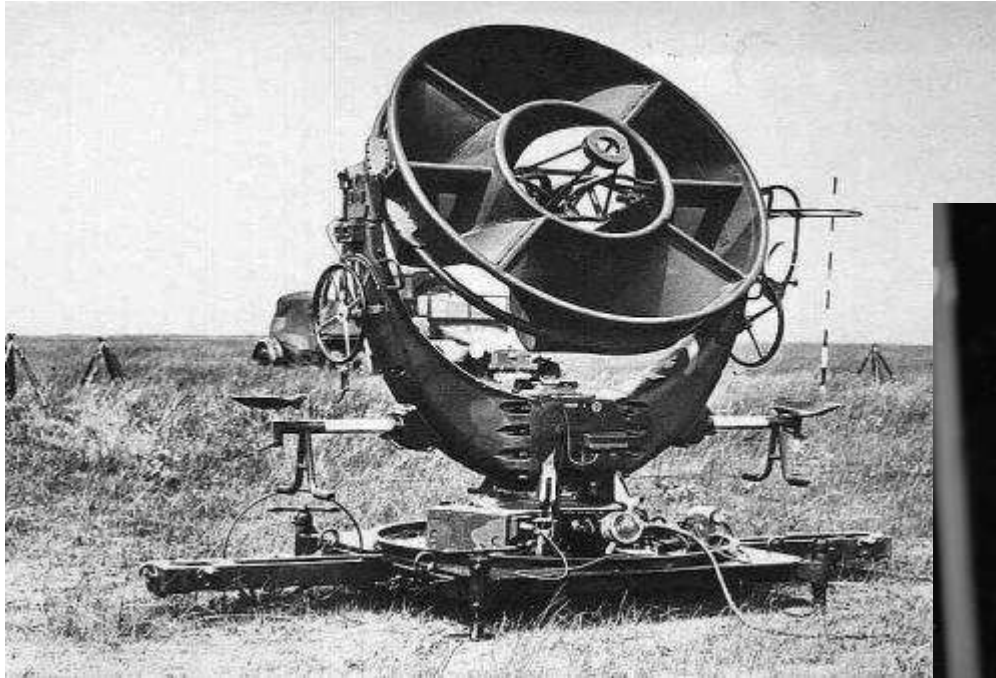
Medical Director, Meditech Laser Rehabilitation Centre
CEO, Meditech International Inc.



Light



Historical Perspective



The “Father” of Laser Therapy

Endre Mester (Budapest, Hungary) publishes the first paper on the stimulatory effects of ruby laser light on the skin of rats

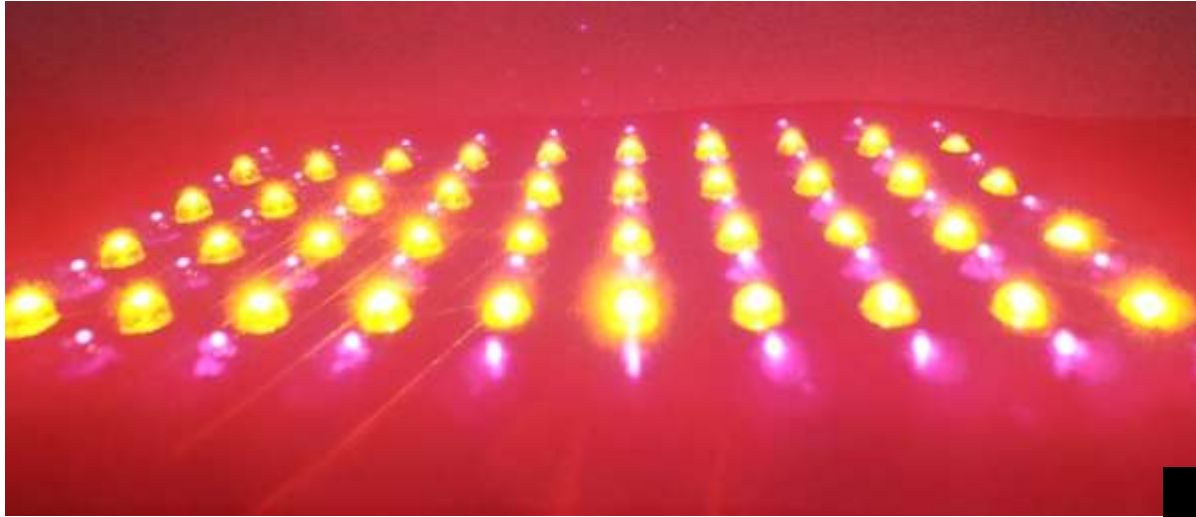


Professor Andre Mester

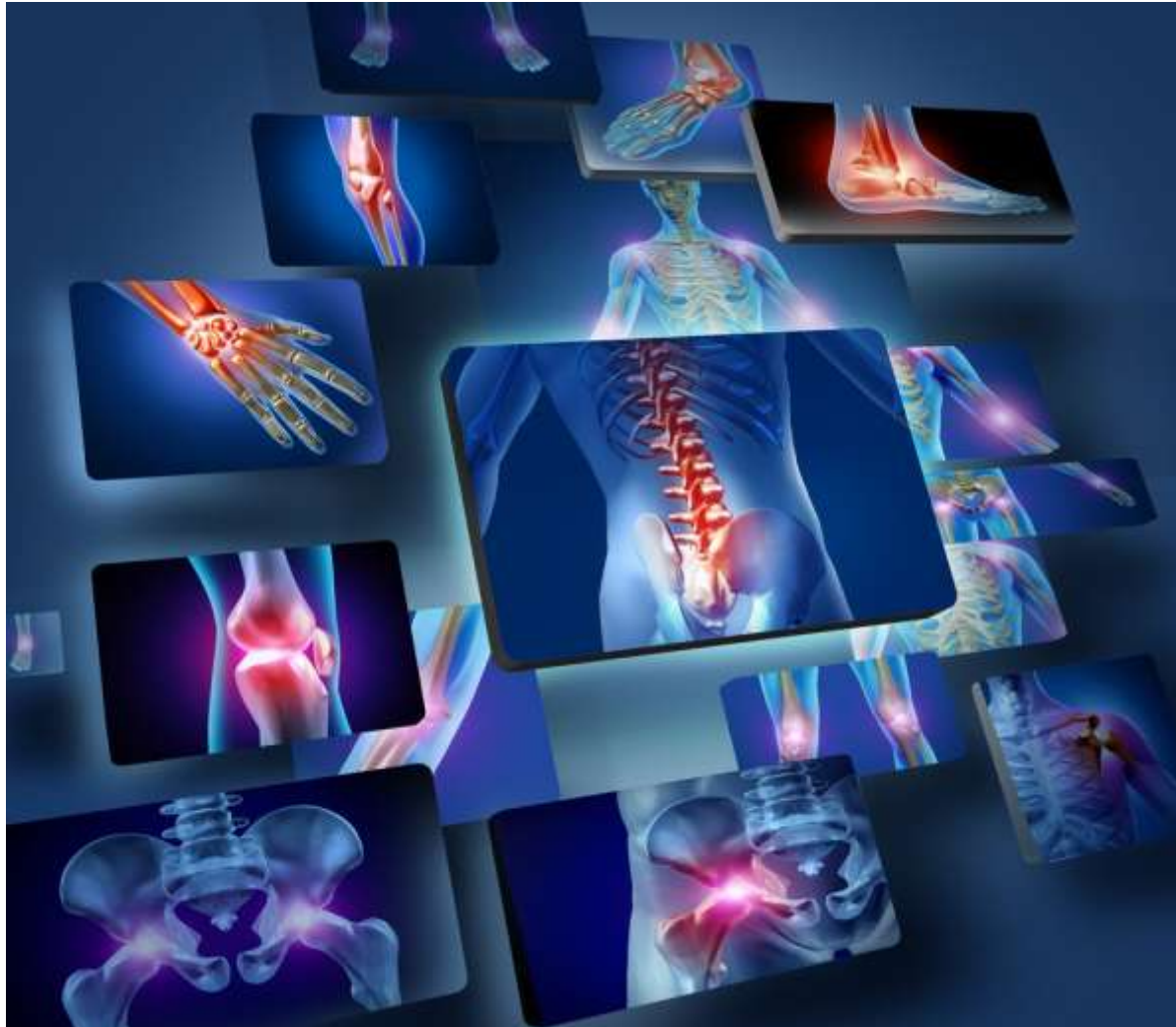
May 29, 1966



Light Sources



Protocols for Particular Conditions



Meditech International Inc.

1986

1990

1992

1994



Shoulder
Injury



Ryerson
University
Research



Ryerson
University
Clinical Trials



First BioFlex Laser
Clinic
Downtown
Toronto

Meditech International Inc.

1993

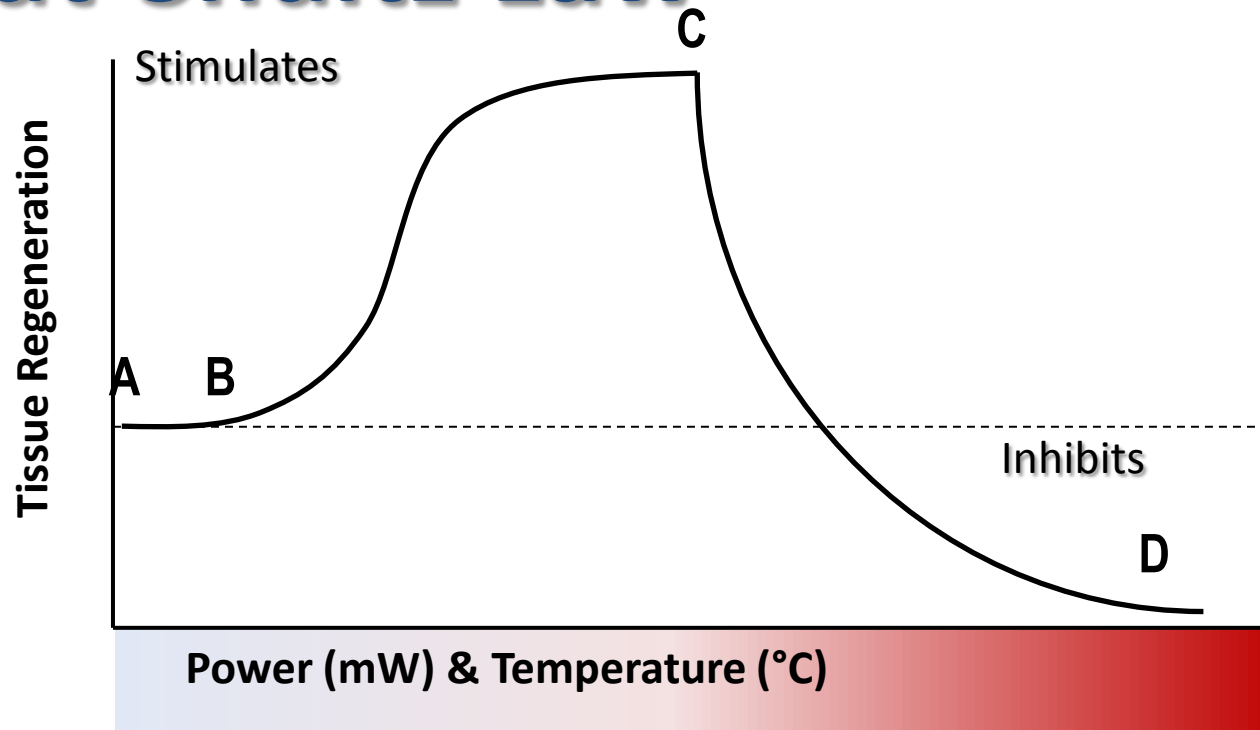
2000

2014



BioFlex Laser
Therapy Systems

Arndt-Shultz Law



- A. No light gives no effect
- B. Small amount of light also has no effect
- C. Maximal effect at the apex of the curve
- D. Too high a power may inhibit healing and heat the tissue

Parameters of Protocols

Create Prescription

Number of steps in treatment:

Now viewing step: **1**

Pause automatically after this step

Step Details

Head type
DUO+ Red

Parameters of Operation

| | | |
|-----------------|-------------------------------------|--------------------|
| Average Power: | <input type="text" value="100.0"/> | mW |
| Peak Power: | <input type="text" value="1000.0"/> | mW |
| Percent Power: | <input type="text" value="100"/> | % max |
| Spot Size/Area: | <input type="text" value="100.00"/> | cm ² |
| Power Density: | <input type="text" value="1.0"/> | mW/cm ² |
| Duration: | <input type="text" value="6:00"/> | min |
| Energy Density: | <input type="text" value="0.360"/> | J/cm ² |
| Frequency: | <input type="text" value="10.00"/> | Hz |
| Duty Cycle: | <input type="text" value="50"/> | % |

Display Mode

- Basic
- Advanced
- Time On/Time Off
- Frequency/Duty Cycle
- Pulse Width/Rep. Rate

Mode of Operation

- Continuous Wave
- Modulation
- Pulsed

Waveform

- Sine Wave
- Square Wave
- Triangle Wave

Accept **Reject** **Help**

BIOFLEX hardware:

Pharmaceuticals



Interactions

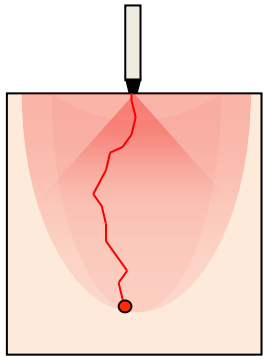
Complications

Addictions

Side Effects

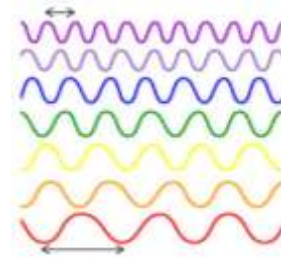
Over Medication

Key Parameters of Light

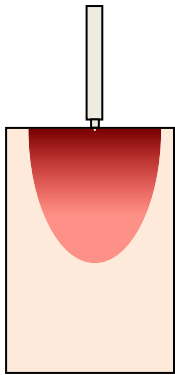
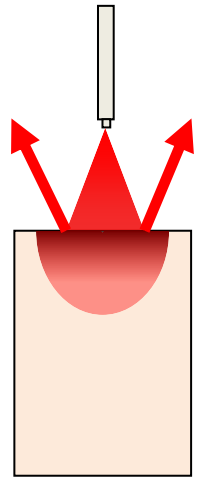
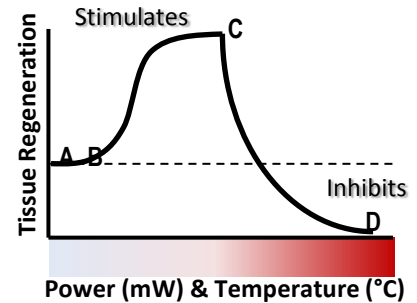


Total Dosage (J)

Wavelength (nm)

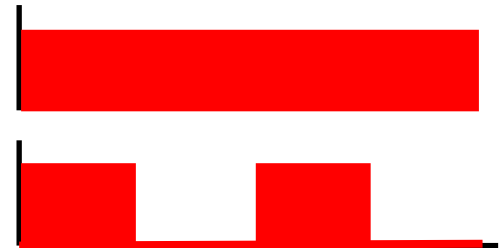


Power (mW)



Physical Contact with Tissue

Continuous vs. Modulated Light



Leaders in Laser Research



**Tiina
Karu**



**Chukuka
Enwemeka**



**Shimon
Rochkind**



**Mary
Dyson**

Light is the Language we Use to Speak to the Cells

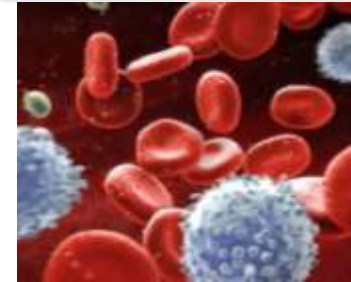
Reduced Pain & Inflammation



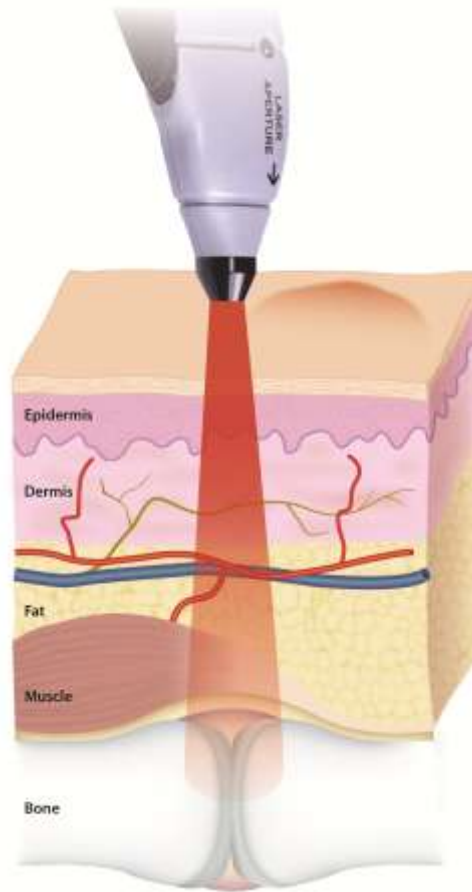
Repaired Nerve Function



Increased Blood Flow



Improved Cartilage Health



Meditech Rehabilitation Clinics

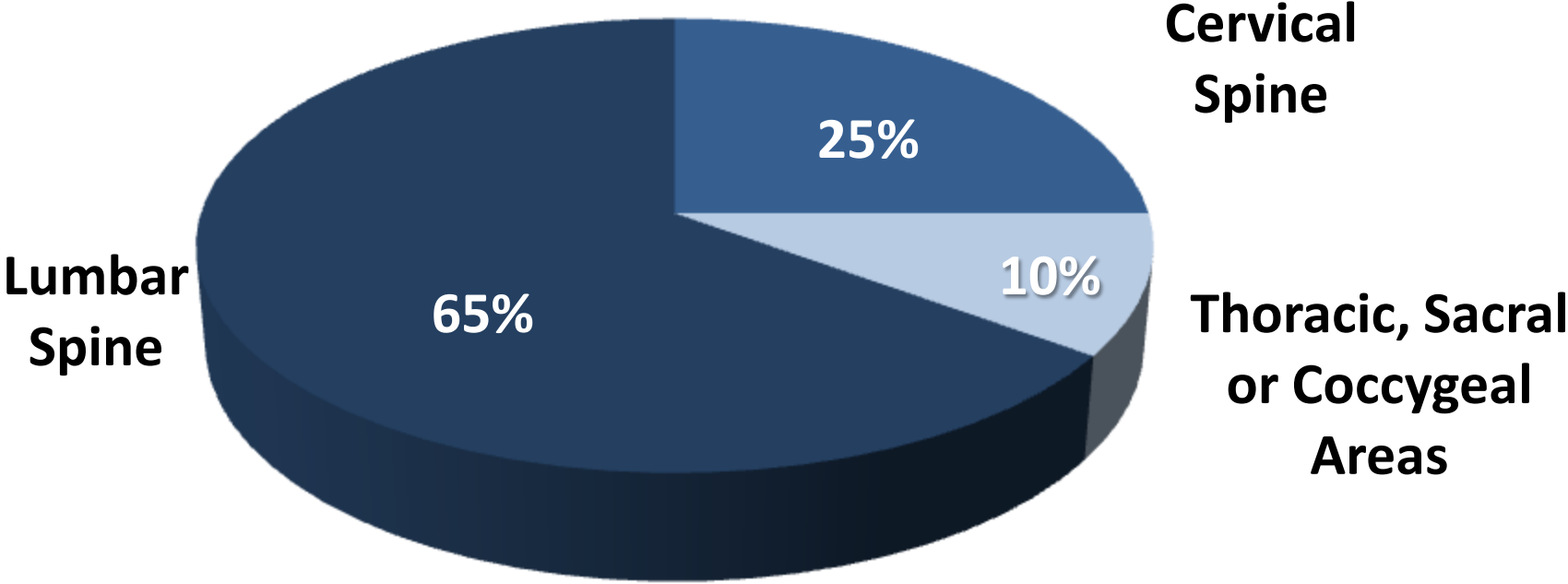


West Toronto Clinic



Downtown Toronto Clinic

Spinal Conditions

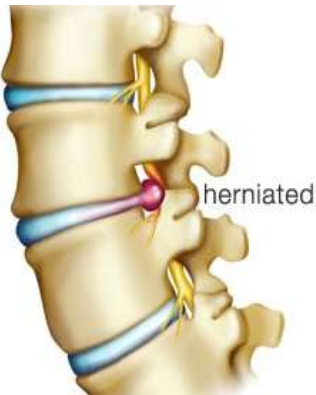


Spinal Conditions

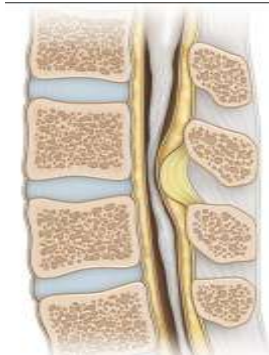
Disc Degeneration



Disc Herniation



Spinal Stenosis



Patient: 9947

Age: 70 M

Diagnosis: Myofasciitis/Degenerative Osteoarthritis- Thoraco-Lumbar Spine with Bilateral Nerve Root Compression

Confidential

For medical record use

Initial



Pre Laser Therapy
•Acute Pain
•Unable to be Active

Final



Post Laser Therapy
•Zero Pain
•Full Mobility

Patient: 7920

Age: 15 M

Diagnosis: Rotator Cuff Injury – Severe Acute Inflammation

Confidential

For medical record use

Initial



01/09/2010

Intermediate



01/18/2010

Final



02/05/2010

Patient: 7810 SE

Age: 51 F

Diagnosis: Reflex Sympathetic Dystrophy - Lesion

Confidential

For medical record use

Initial

After 4 Treatments

After 10 Treatments



09/24/2010

10/04/2010

11/01/2010

Patient: RC908 NW

Age: 60 F

Diagnosis: Reflex Sympathetic Dystrophy (Sudeck's Atrophy)

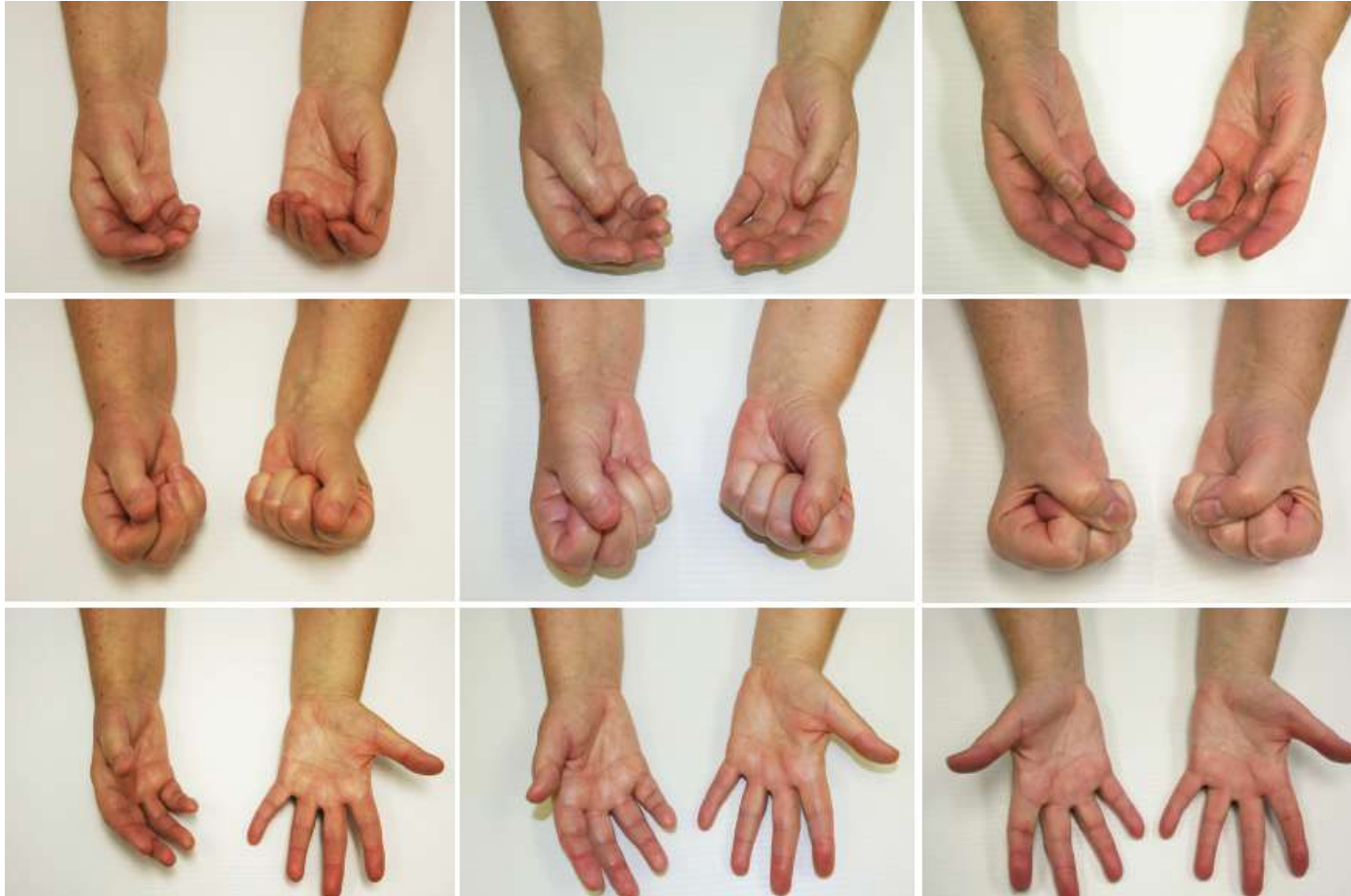
Confidential

For medical record use

Initial

Intermediate

Most Recent



08/12/2009

08/14/2009

11/04/2009

Patient: 6559 TR
Age: 12 M
Diagnosis: Torticollis

Confidential
For medical record use

Initial

After 1 Treatment

After 2 Treatments



01/14/2009

01/15/2009

01/16/2009

Patient: 6505 TB

Age: 58 M

Diagnosis: Bells Palsy

Confidential

For medical record use

Initial

Intermediate

Most Recent

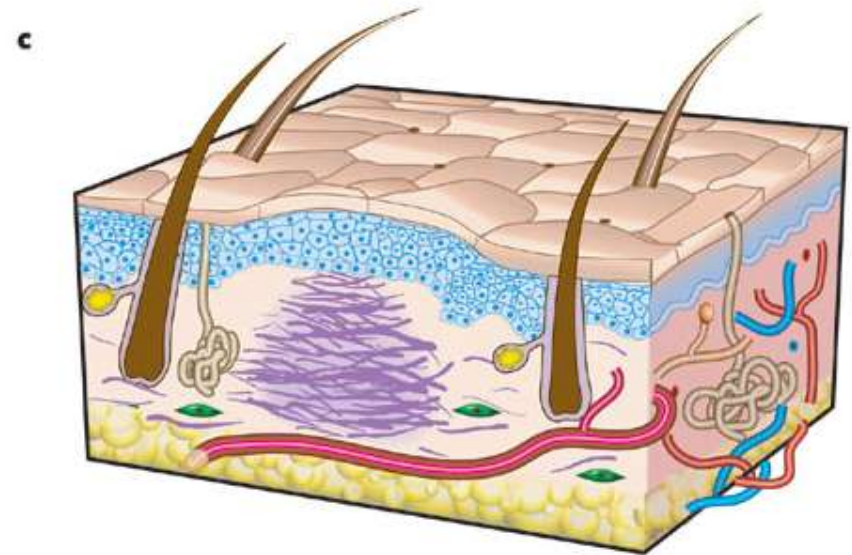
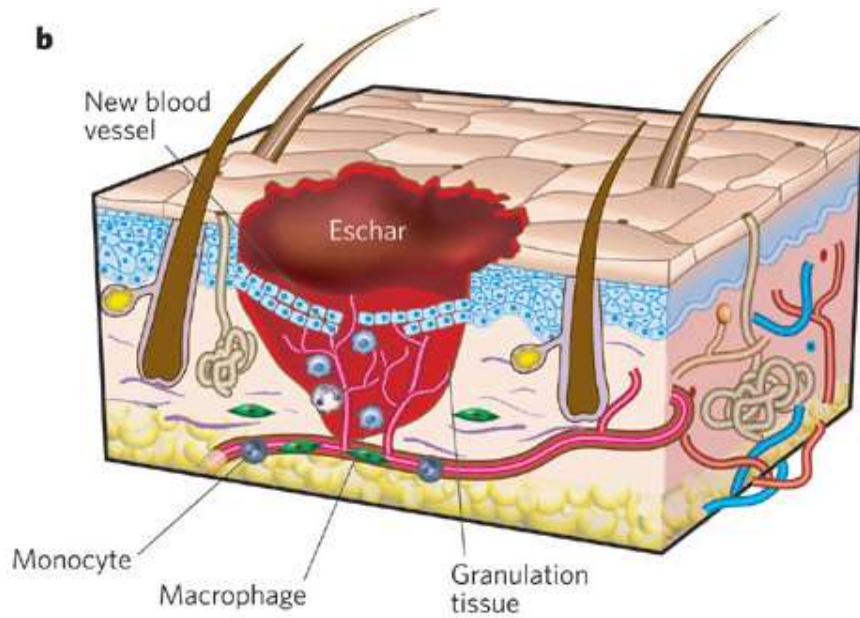
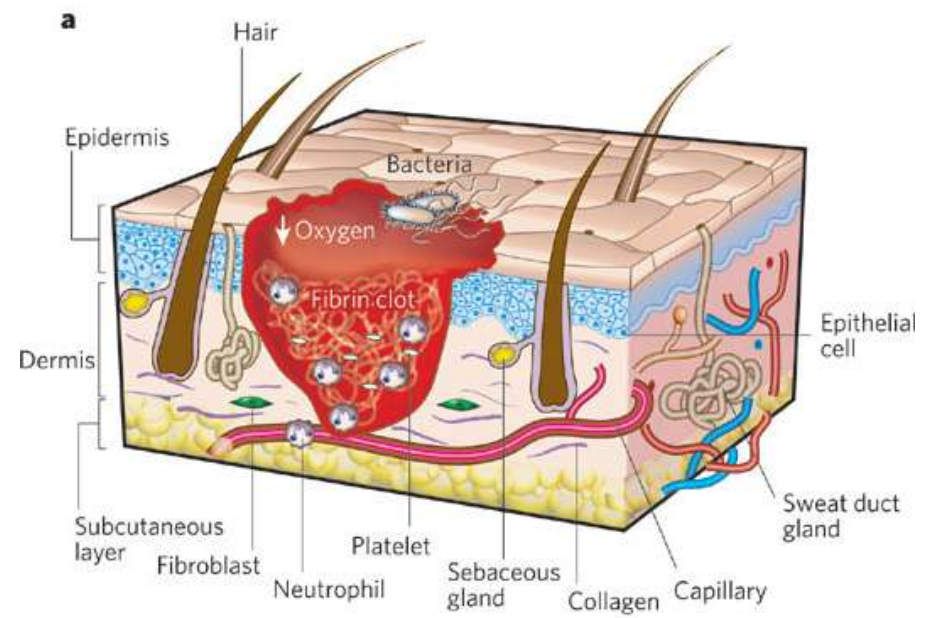


12/05/2008

04/01/2009

07/15/2009

Wound Care



Patient: 9847

Age: 88 M

Diagnosis: Ulcer- Left Lower Extremity, Secondary to Atherosclerosis/Diabetes

Confidential

For medical record use

Initial

Latest



10/04/2013

10/25/2013

58.106cm²

0.00cm²

Patient: 10063

Age: 63 M

Diagnosis: Peripheral Arterial Occlusive Disease

Confidential

For medical record use

Initial

After One Month



03/01/2014

03/25/2014

3.018cm²

0.90cm²

- Foot Cold
- Limited Range of Motion
- Marked Erythema / Edema / Pain
- Cyanosis Forefoot

- Zero Pain
- Foot Warm
- No Erythema / Edema
- Normal range of motion

Patient: 4782

Age: 90 M

Diagnosis: Dermal Ulcers; Hemochromatosis; Arterial Occlusive Disease

Confidential

For medical record use

Initial



11/03/2006

Intermediate



01/04/2007

Final



01/26/2007

Patient: 8592 HP

Age: 72 M

Diagnosis: Lymphedema / Peripheral Arterial Occlusive Disease

Confidential

For medical record use

Initial

Intermediate

Most Recent



06/15/2012

07/30/2012

09/10/2012

4.47 cm²

3.56 cm²

Ulcer Healed

Patient: 10017

Age: 72 F

Diagnosis: Compression Ulcer – 6 Months Duration

Confidential

For medical record use

Initial



04/05/2014
2.687cm²

After One Month



05/07/2014
0.271cm²
12 Treatments With Home Unit

Patient: 10057

Age: 68 M

Diagnosis: Venous Stasis Ulcer

Confidential

For medical record use

Initial



02/28/2014

0.371cm²



05/14/2014

0.11cm²

- Long Standing Ulcer post 70 Hyperbaric Chamber Treatments
- Chronic Drainage

- No Drainage
- Zero Symptoms

Patient: 9089 JD

Age: 45 F

Diagnosis: Gangrene – Left Forefoot

Confidential

For medical record use

Initial



08/25/2012

Most Recent



10/22/2012

Patient: 4840 AH

Age: 72 F

Diagnosis: Infected Ulcer, Bilateral Femoral Artery Occlusion

Confidential

For medical record use

Initial

Intermediate

Most Recent



Measurement: **111 cm²**



Measurement: **25.9 cm²**



Measurement: **7.87 cm²**

Patient: 5230 RB

Age: 50 F

Diagnosis: Pre-gangrenous, multiple ulcers secondary to Diabetes Mellitus

Confidential

For medical record use

Initial

Intermediate

Most Recent



06/08/2007

04/01/2008

09/20/2008

Trauma / Post Surgical

Patient: 8780 SC

Age: 65 F

Diagnosis: Compound Fracture Calcaneum with Extensive Soft Tissue Injuries

Confidential

For medical record use

Initial

Intermediate

Final



03/13/2012



03/19/2012



04/09/2012

Patient: 3643

Age: 72 M

Diagnosis: Dermal Lesion – Traumatic Origin

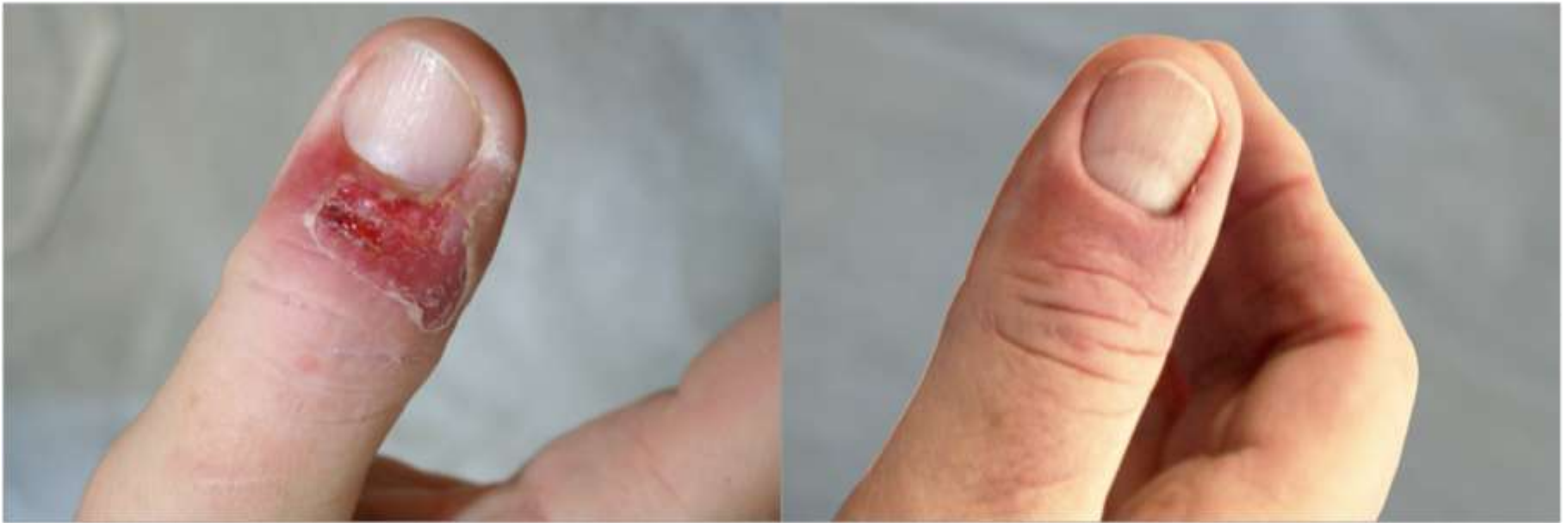
(Present for two months without evidence of healing)

Confidential

For medical record use

Initial

Final



03/19/2014

03/26/2014

- Treatment of ulceration on thumb

- Complete Healing After 2 Laser Therapy Sessions

Patient: 5118

Age: 58 F

Diagnosis: Ulcerations / Abrasions – Contusion Injury

Confidential

For medical record use

Initial



03/11/2014

Final



03/21/2014

Patient: 9938

Age: 44 M

Diagnosis: Fracture of Nose & Blunt Facial Trauma

Confidential

For medical record use

Initial



02/26/2014

Undisplaced Fracture of Nose
Marked Facial Edema and Pain

After 7 Treatments



03/07/2014

Zero Pain / Edema

Patient: 10123

Age: 39 M

Diagnosis: Contusion Injury (Hockey)

Confidential

For medical record use

Initial



04/02/2014

- Acute Tenderness and Pain
- Zero Mobility of Ankle

Final



05/09/2014

- Zero Edema, Pain and Tenderness
- Range of Motion of Ankle Normal

Patient: 9657

Age: 24 F

Diagnosis: Post-Traumatic Scars, Right Arm, Lacerations, 2 Cosmetic Surgical Revisions

Confidential

For medical record use

Initial

Final

Posterior View

Lateral View



07/08/2013



01/29/2014



07/08/2013



01/29/2014

- Utilizing Home Unit
- 70% Improvement

Patient: 6407

Age: 41 M

Diagnosis: Post Surgical Scar – Non-Healing of Incision – 6 Months

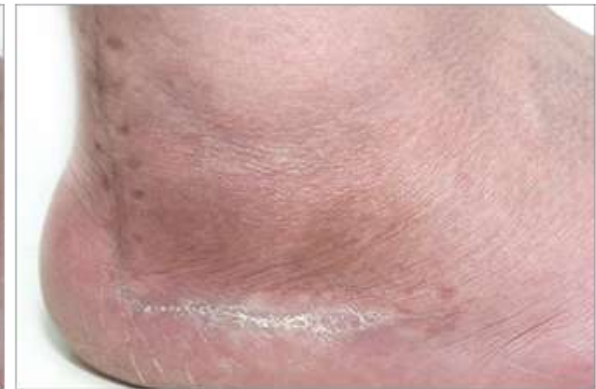
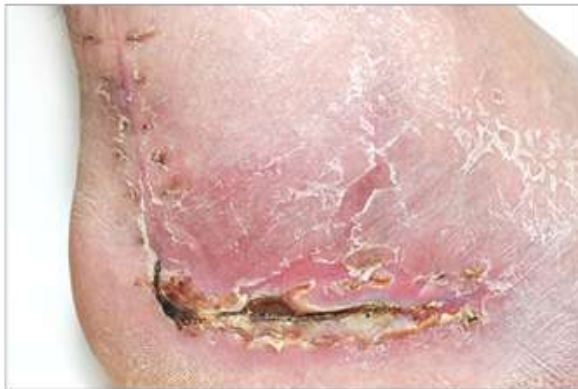
Confidential

For medical record use

Initial

Intermediate

Final



10/22/2008

7.27cm²

11/21/2008

1.85cm²

02/06/2009

Patient: 8837

Age: 50 F

Diagnosis: Post Surgical Capsulitis – Breast Implants with 2 Revision Procedures

Confidential

For medical record use

Initial

Final



04/13/2012

05/02/2012

Breasts painful and extremely firm

Tissue soft, no tenderness, complete mobility

Patient: 1234

Age: 53 M

Diagnosis: Hamstring Tear

Confidential
For medical record use

Initial

Final



04/12/2007

04/19/2007

Patient: 1234

Age: 59 F

Diagnosis: Post Surgical Scar

Confidential

For medical record use

Initial



03/21/2009

After 5 Treatments



04/12/2009

Patient: 5364 ID

Age: 62 F

Diagnosis: Infected Ulcer with impending Gangrene, left heel; IDDM

Confidential

For medical record use

Initial

Intermediate

Most Recent



07/11/2007

10/09/2008

06/15/2009

Measurement: **13.57 cm²**

Measurement: **5.71 cm²**

Measurement: **3.39 cm²**

Patient: 10024

Age: 21 M

Diagnosis: Pilonidal Cyst With Draining Sinuses – Acute Inflammation

Confidential

For medical record use

Initial



02/07/2014 5.657cm²

Final



05/01/2014 0.00cm²

Complete Healing

Patient: 7108 CP

Age: 32 M

Diagnosis: Chronic Wound (Osteomyelitis, Post-Surgery) Surgical Reduction and Internal Fixation of Fractures

Confidential

For medical record use

After 4 Treatments

Intermediate

Final



10/14/2009

Measurement: **8.47 cm²**

11/16/2009

Measurement: **2.30 cm²**

12/30/2009

Measurement: **1.07 cm²**

Patient: 557

Age: 80 F

Diagnosis: Ulcer of Ankle – Aging Prima Ballerina – 6 Month Duration

Confidential

For medical record use

Initial

After Five Treatments



04/23/2014

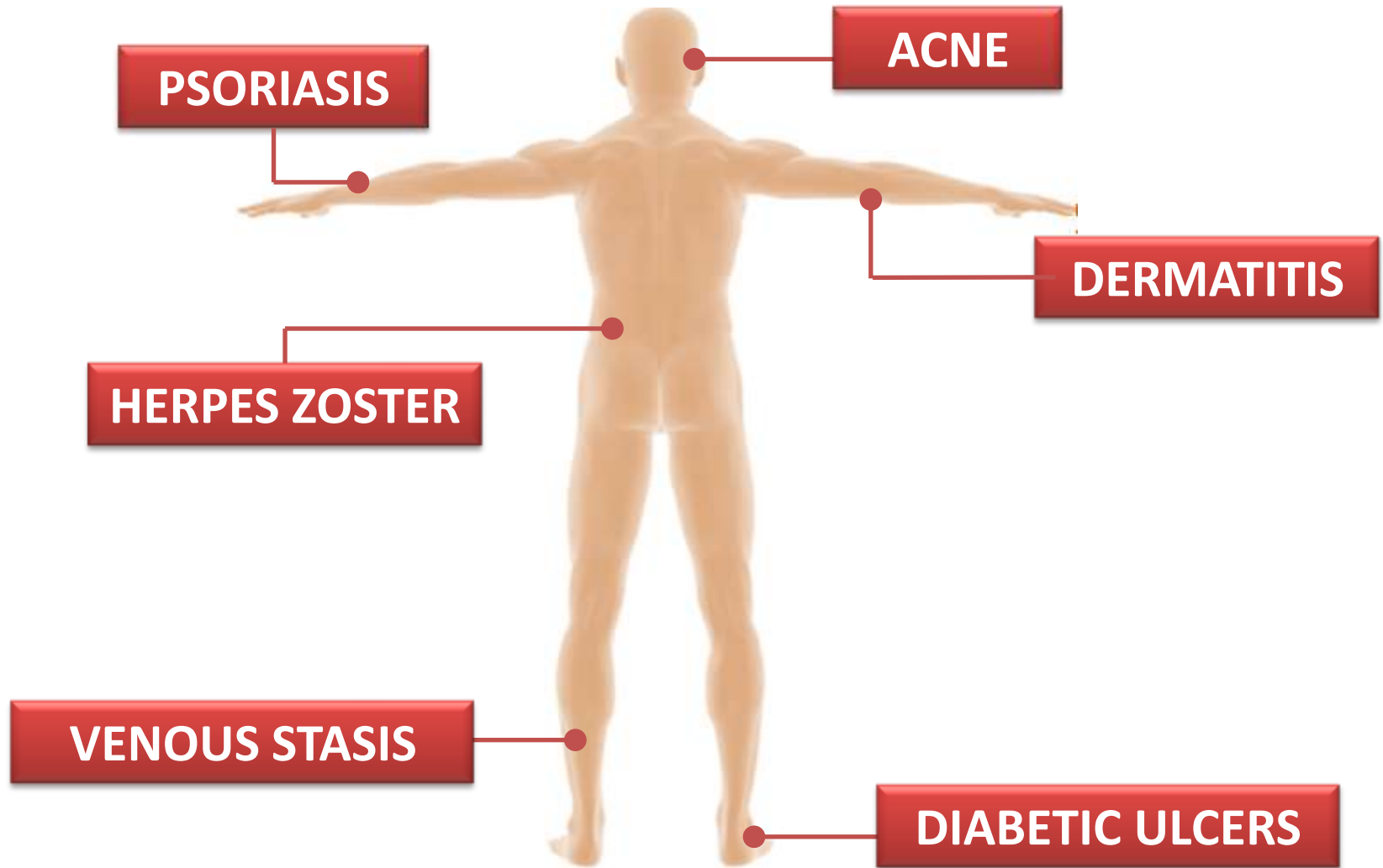
0.7cm²



05/07/2014

0.00cm²

Dermatological Conditions



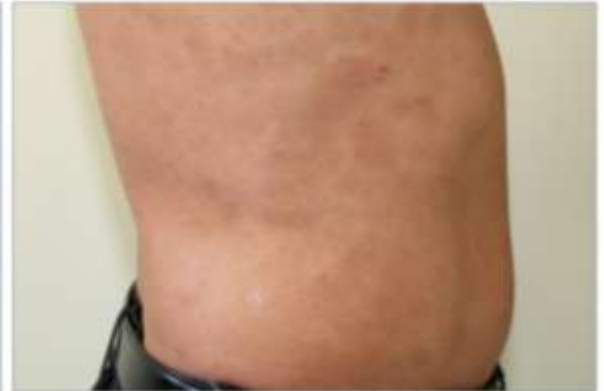
Patient: 5244 VK
Age: 54 M
Diagnosis: Psoriasis

Confidential
For medical record use

Initial

Intermediate

Final



05/11/2009

06/03/2009

07/14/2009

Patient: 4821
Age: 62 M
Diagnosis: Psoriasis

Confidential
For medical record use

Initial

Intermediate

Final



11/19/2006

12/22/2006

02/28/2007

Patient: 9132 SA
Age: 20 F
Diagnosis: Psoriasis

Confidential
For medical record use

Initial



09/19/2012

Most Recent



10/26/2012

Patient: 7233

Age: 51 F

Diagnosis: Herpes Zoster - Acute

Confidential

For medical record use

Initial



Intermediate



Final



12/14/2009



12/19/2009



01/16/2010

Patient: 369

Age: 25 F

Diagnosis: Verruca Vulgaris – Post Lung Transplant Surgery

Confidential

For medical record use

Initial



03/01/2007

After 3 Treatments



03/14/2007

After 8 Treatments



03/28/2007

Patient: 369

Age: 26 M

**Diagnosis: Verruca Vulgaris – Post Lung Transplant – Immune Deficiency –
Vulnerable to Infections**

Confidential

For medical record use

Initial



03/21/2007

Final



05/09/2007

Patient: 992

Age: 71 M

Diagnosis: Eczema – Allergy

Confidential

For medical record use

Initial



04/28/2014

Final



05/09/2014

Patient: 4880

Age: 50 M

Diagnosis: Eczema – Allergy – Environmental

Confidential

For medical record use

Initial

Final



12/15/2006



01/31/2007

Patient: 365

Age: 77 M

Diagnosis: Herpes Zoster

Confidential

For medical record use

Initial



01/07/2011

After 4 Treatments



01/12/2011

After 6 Treatments



01/17/2011

Patient: 365

Age: 77 M

Diagnosis: Herpes Zoster

Confidential

For medical record use

Initial

After 2 Treatments

After 7 Treatments



Patient: 3040
Age: 28 F
Diagnosis: Acne

Confidential
For medical record use

Initial



02/23/2007

After 3 Treatments



02/28/2007

Patient: 9086

Age: 79 M

Diagnosis: Psoriatic Arthritis – Knees and Ankles / Lymphedema Lower Extremities With Multiple Ulcerated Areas

Confidential

For medical record use

Initial

After 3 Treatment Sessions



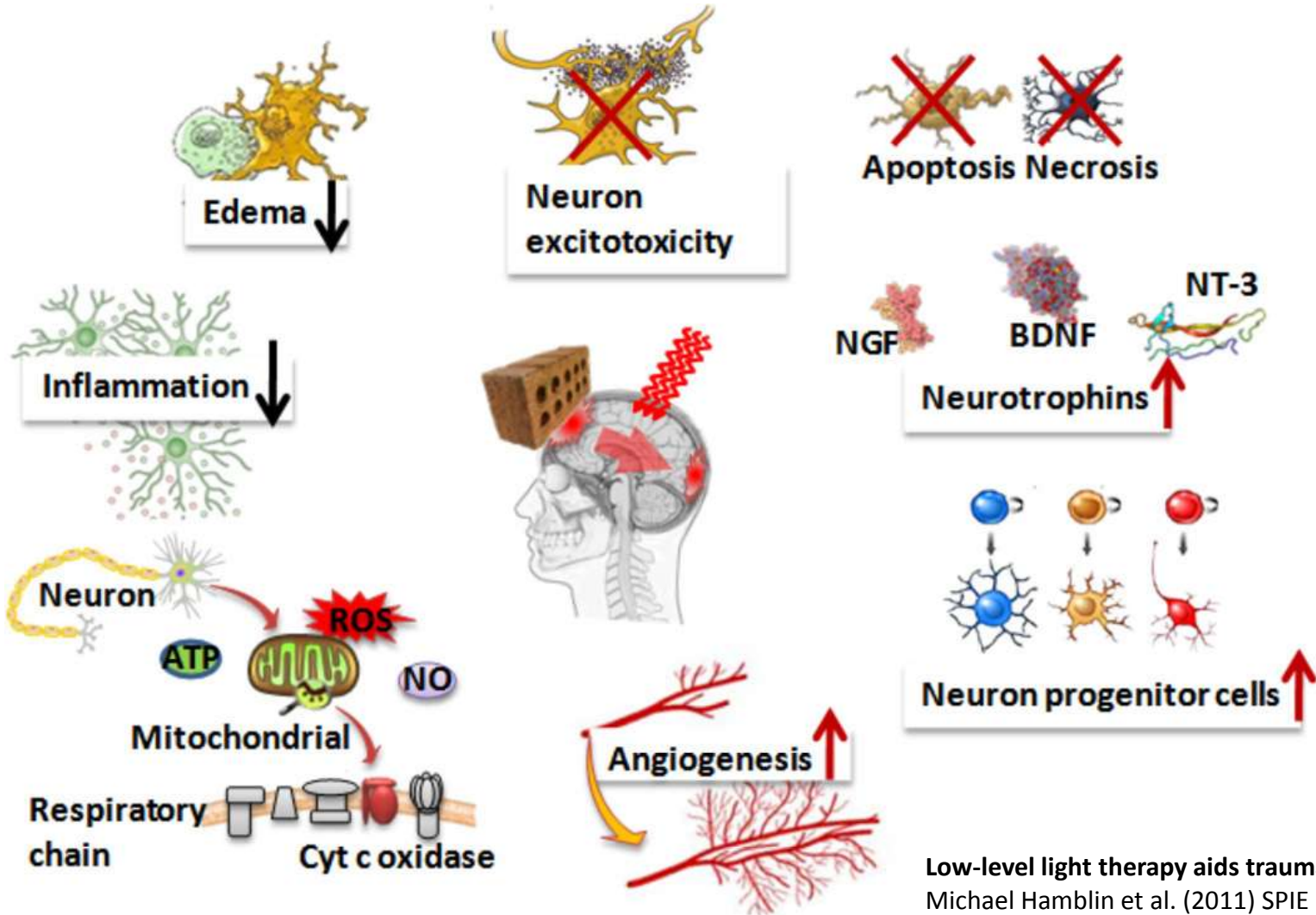
08/24/2012



09/13/2012

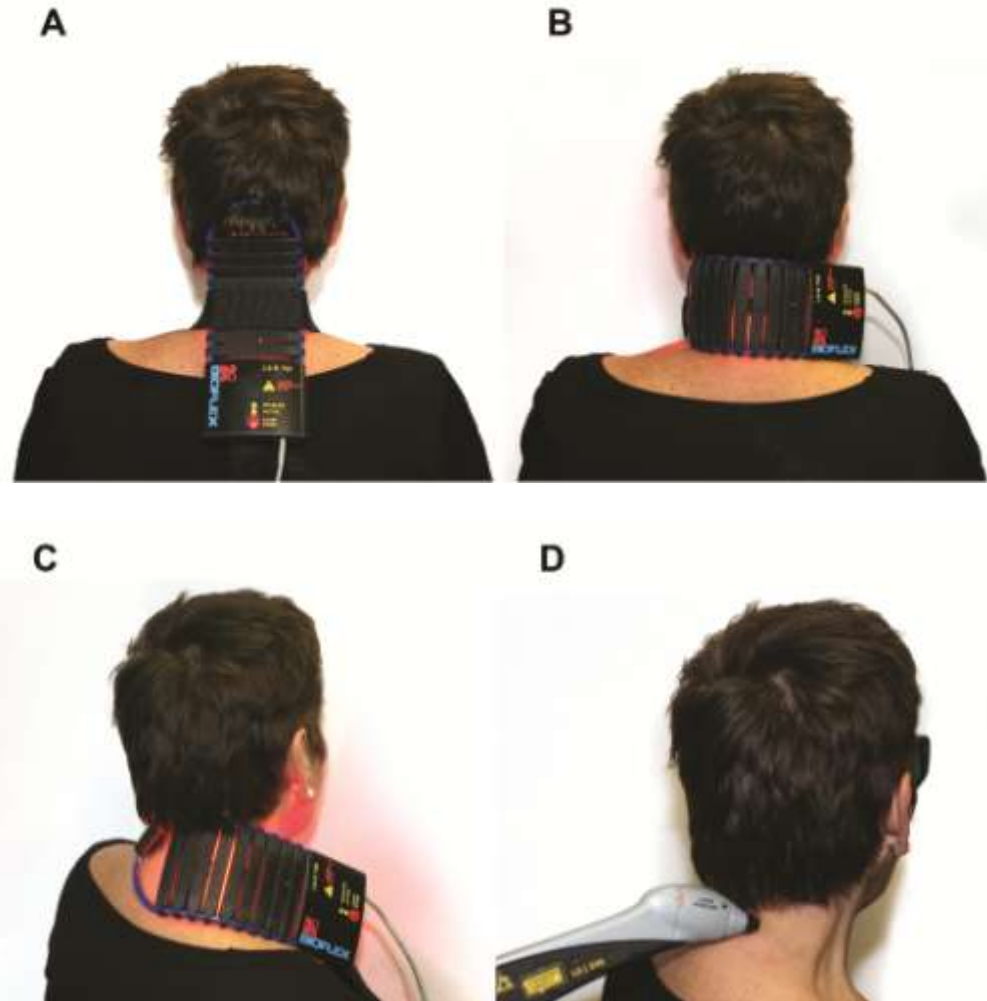
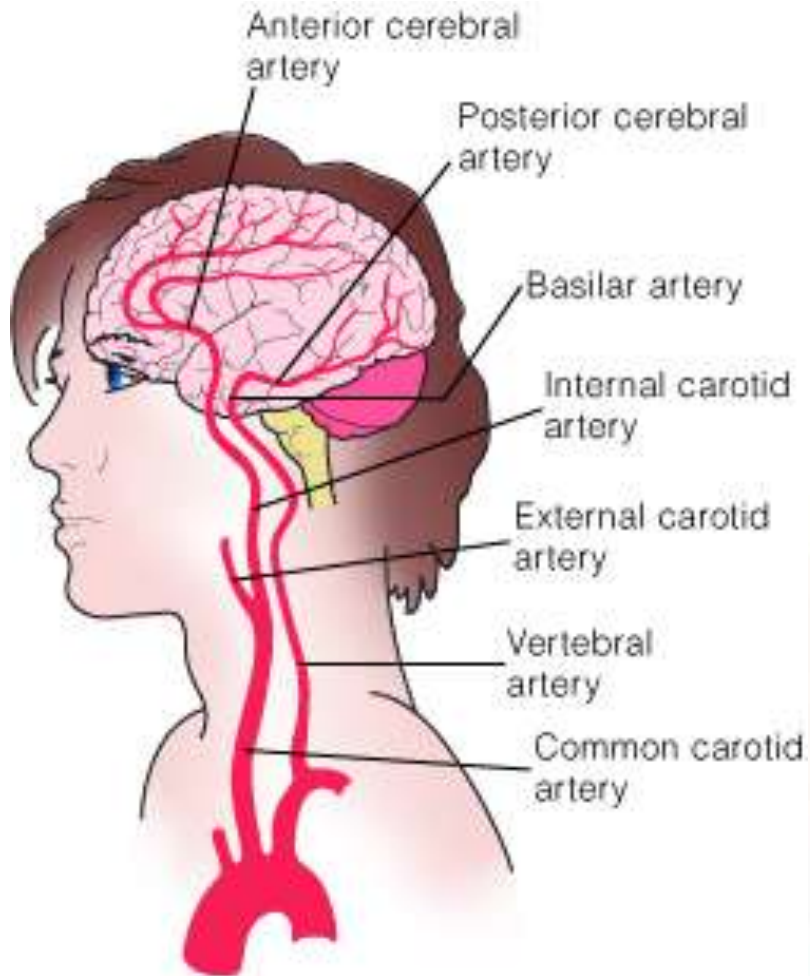
- Circumference of both calves reduced by 3cm
- Discomfort minimal
- Ulcers healing
- 0 meds

Neurological Diseases



Low-level light therapy aids traumatic brain injury
 Michael Hamblin et al. (2011) SPIE Newsroom

Irradiating the Cervical Spine



Headaches

Sinus:
pain is usually behind the forehead and/or cheekbones



Cluster:
pain is in and around one eye



Tension:
pain is like a band squeezing the head

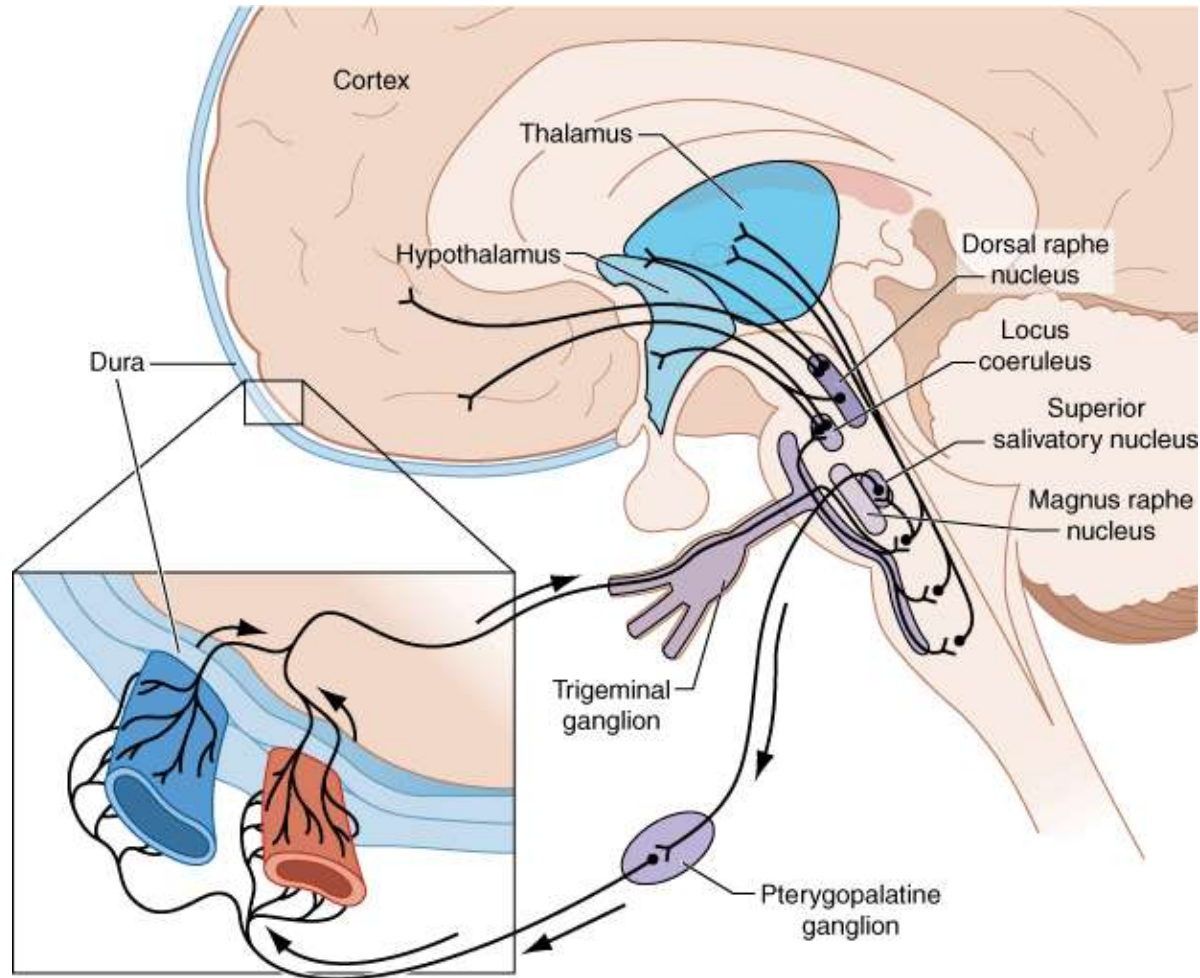


Migraine:
pain, nausea and visual changes are typical of classic form



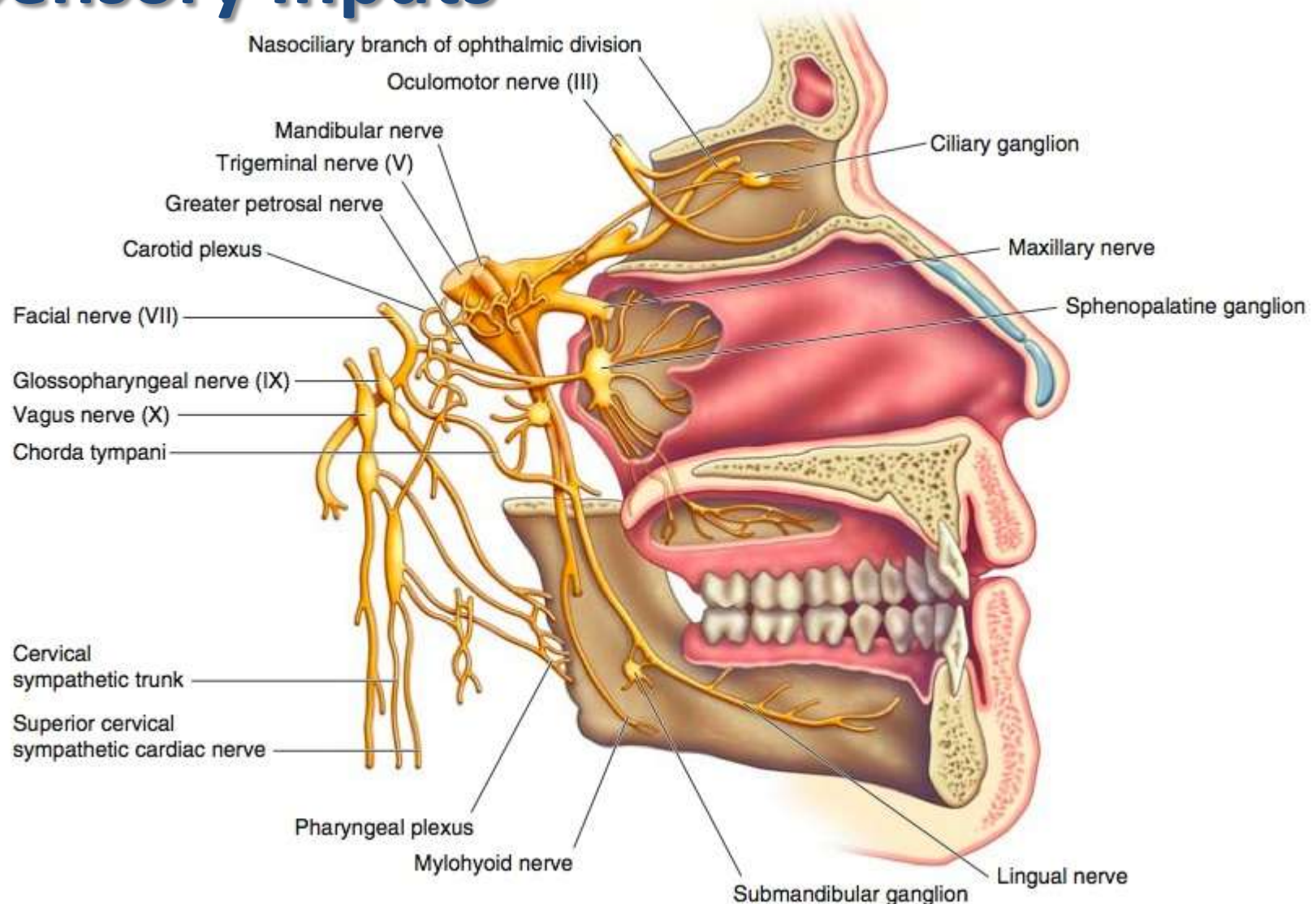
 ADAM.

Trigemino-cervical Pain System



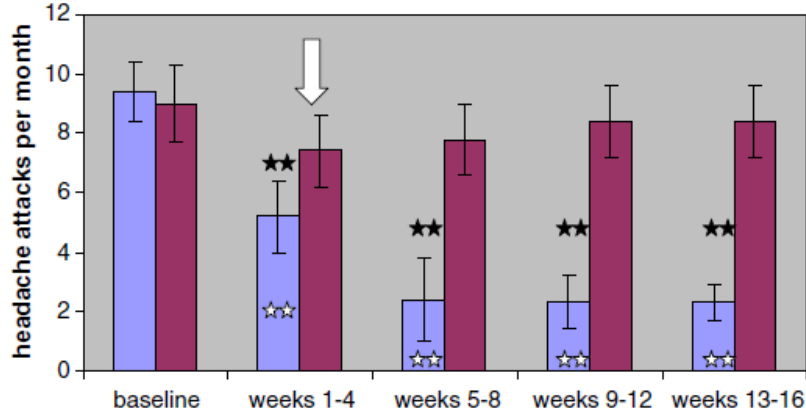
Source: Fauci AS, Kasper DL, Braunwald E, Hauser SL, Longo DL, Jameson JL, Loscalzo J: *Harrison's Principles of Internal Medicine*. 17th Edition: <http://www.accessmedicine.com>

Sensory Inputs

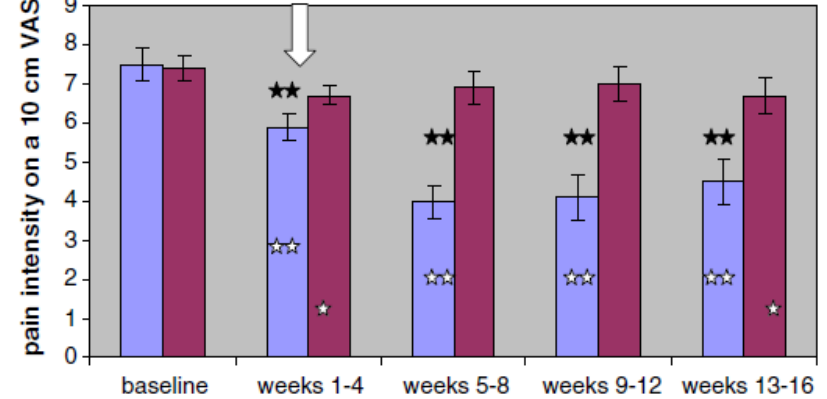


Laser Research for Headaches

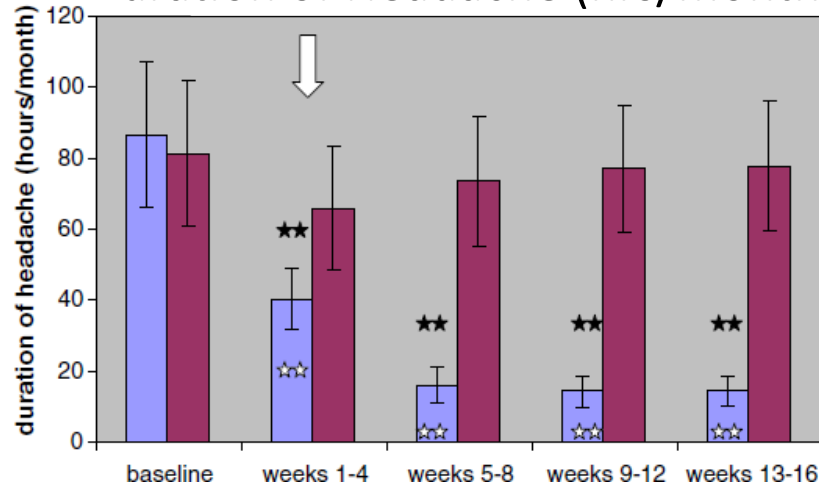
Headache Attacks per Month



Pain Intensity on a 10 cm VAS



Duration of Headache (hrs/month)

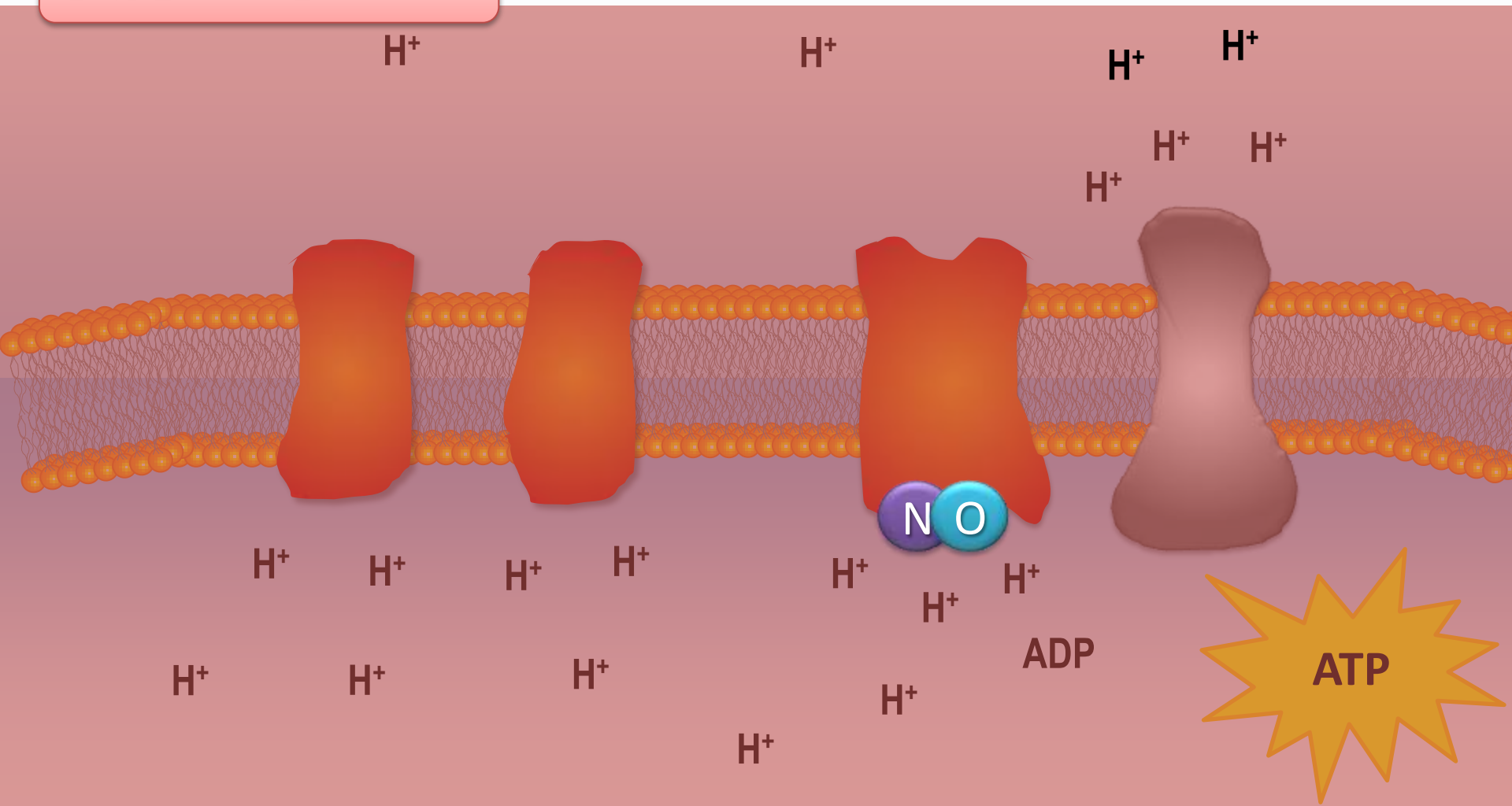


 Laser
 Placebo

Gottschling et al. Pain 137 (2008) 405-412.

Mechanism of Action: Energy Production

LASER THERAPY



Case Study - Migraine

Patient History:

- 30-year-old female
- Experienced migraine headaches since age 4
- Headaches occurred 3 per month and last up to 3 days

Trigger:

- Environmental factors
- Emotional stress

Symptoms:

- Visual disturbance – loss of vision in left eye

Case Study - Migraine

Laser Treatment:

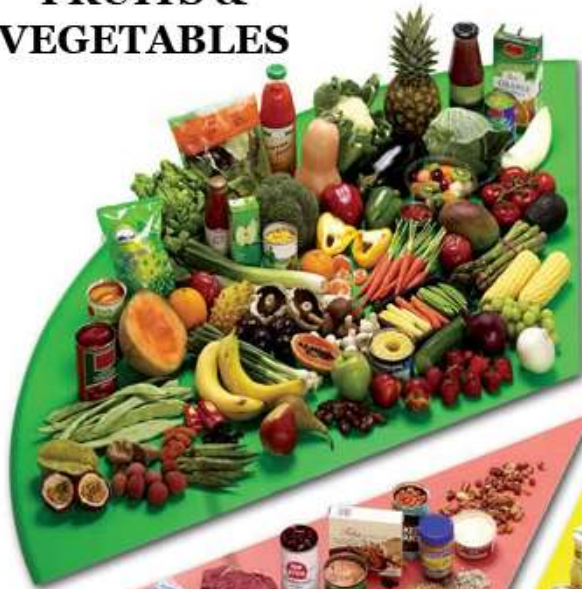
- 10 sessions over the cervical spine
- After 2 sessions, the attacks became less intense and of shorter duration
- After 5 sessions, headaches had disappeared

Discussion:

- After 3 months, some recurrence resulted
- Weekly treatments were provided for a month
- A 3 year follow-up revealed that headaches had not recurred after discontinuing treatment

Nutrition

**FRUITS &
VEGETABLES**



**BREADS, CEREALS
& POTATOES**



**MEAT, FISH
& OTHERS**



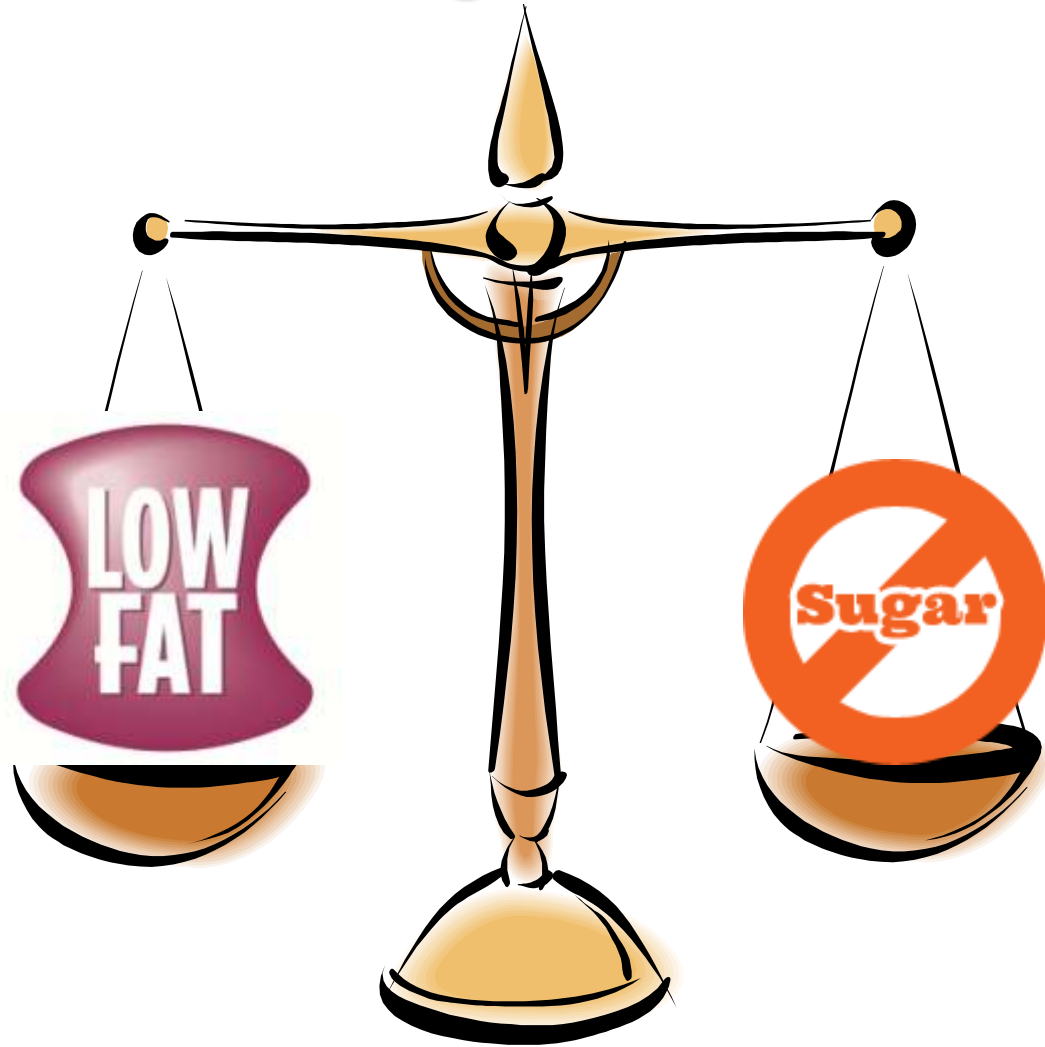
FAT & BUTTERS



MILK & DAIRY

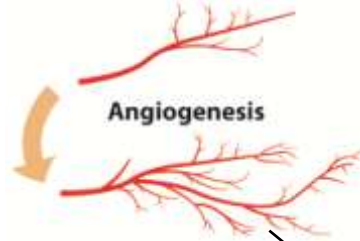


Low Fat vs. Low Sugar

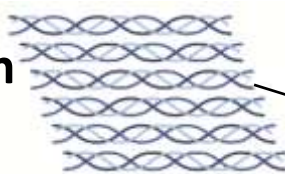


Clinical Effects of Laser Therapy

↑ **Angiogenesis & Neovascularization**



↑ **Collagen Production**



↑ **Muscle Regeneration &**

↓ **Muscle Atrophy**



↓ **Inflammation & Edema**



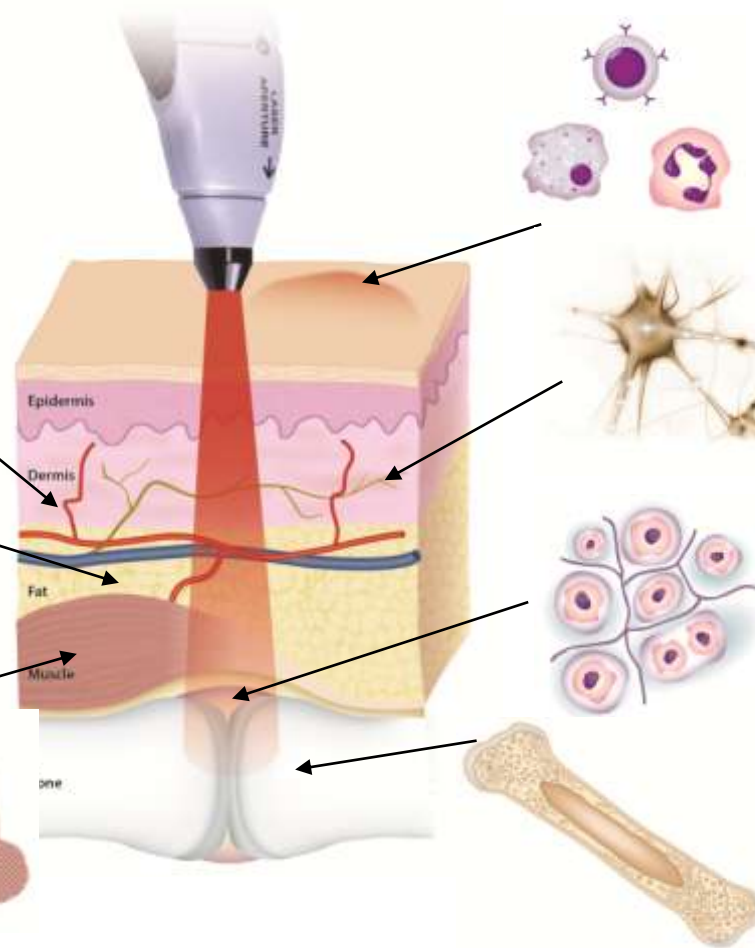
↑ **Nerve Regeneration**



↑ **Cartilage Production**



↑ **Bone Formation**



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