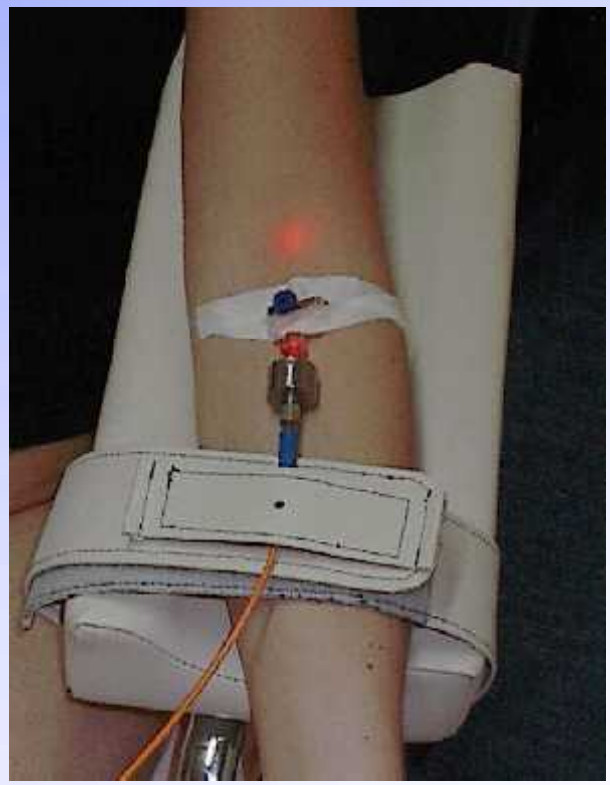
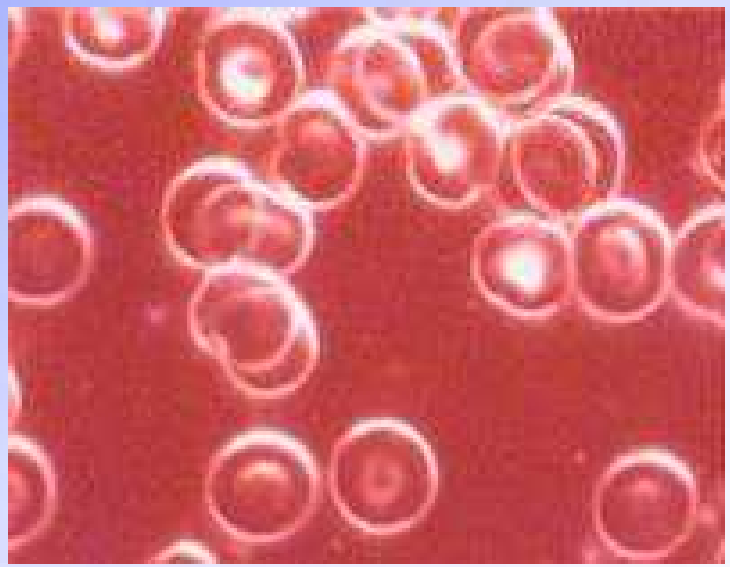
The method of intravenous laser blood irradiation and clinical applications

IV Laser Blood Irradiation

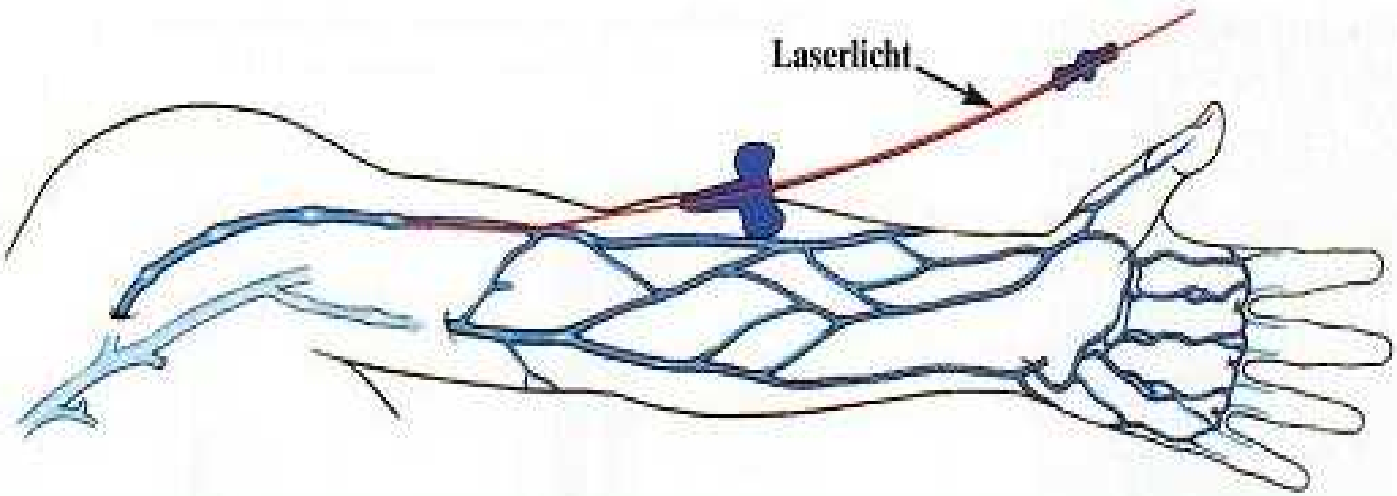


UV-radiation of blood



Applied of the catheter in the blood stream

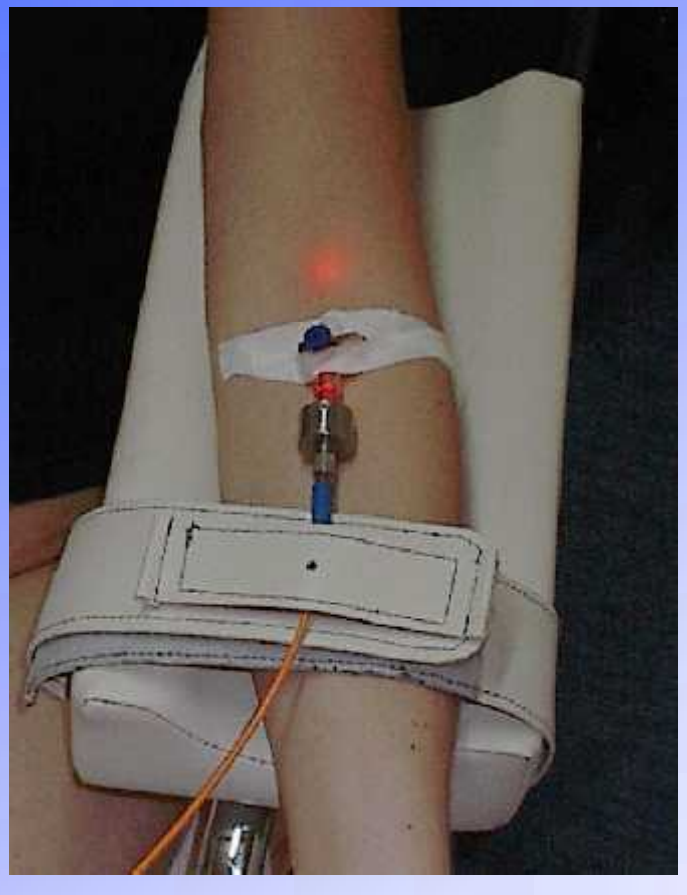
-

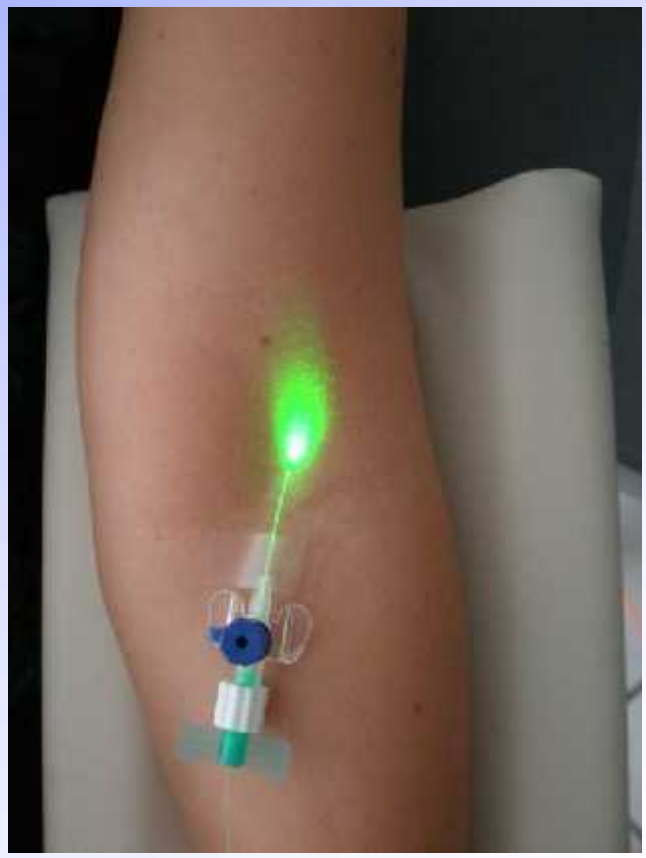


Bei der intravenösen Laserbehandlung wird ein Lichtleiter (Quarzfaser) in die Ellenbogenvene eingeführt.

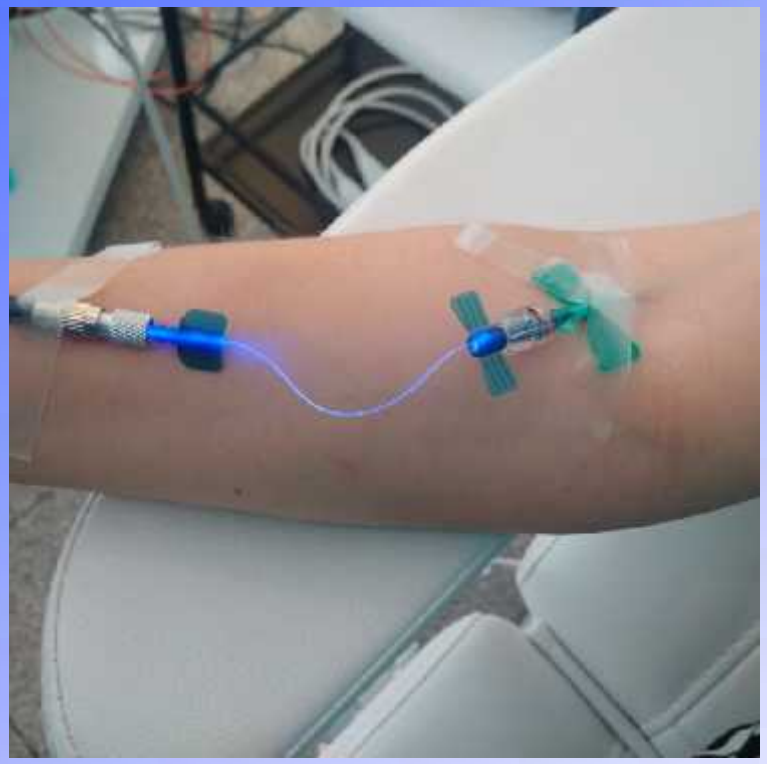
IV Lasertreatment with

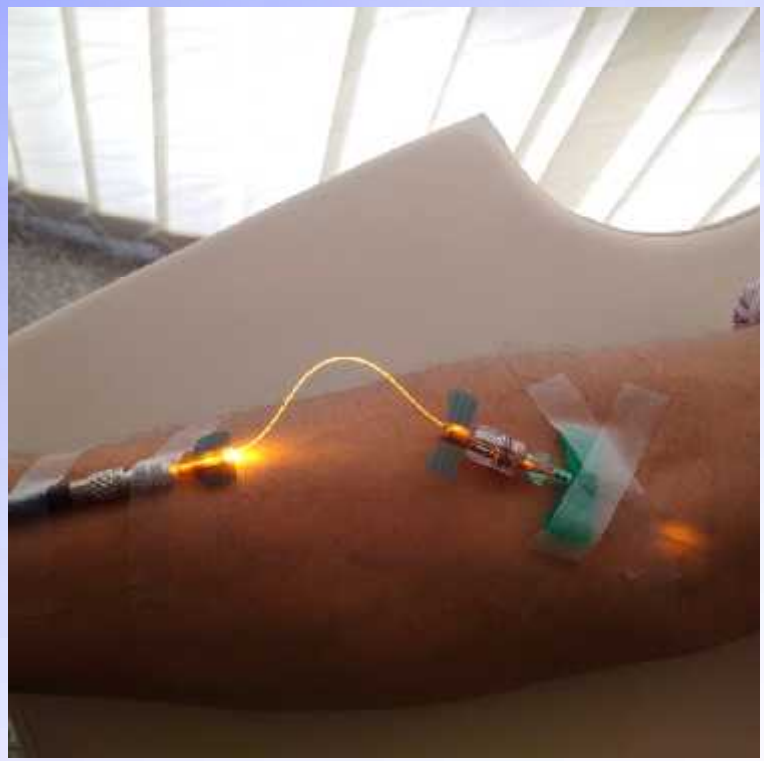
Red and green laser



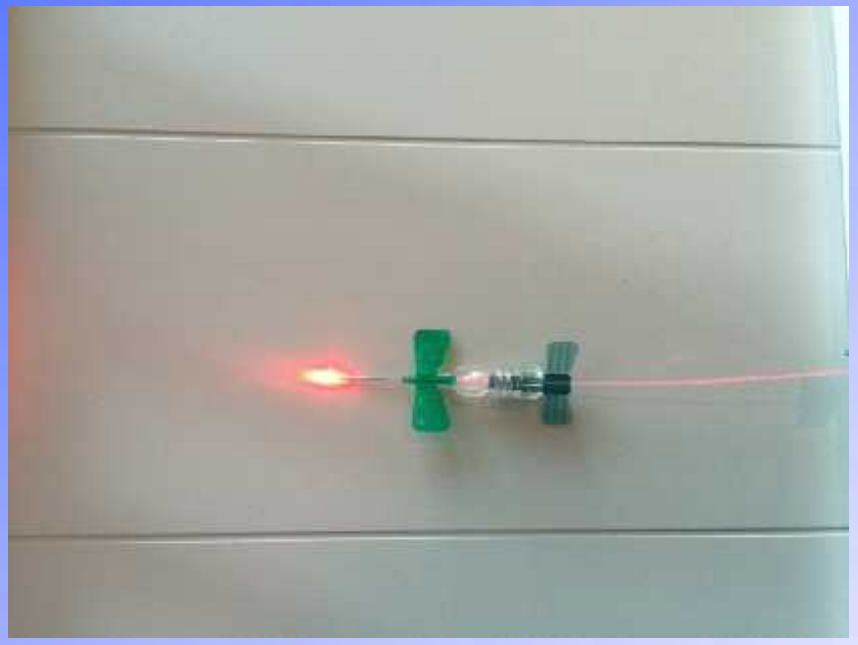


Iv-laser treatment with blue and yellow laser



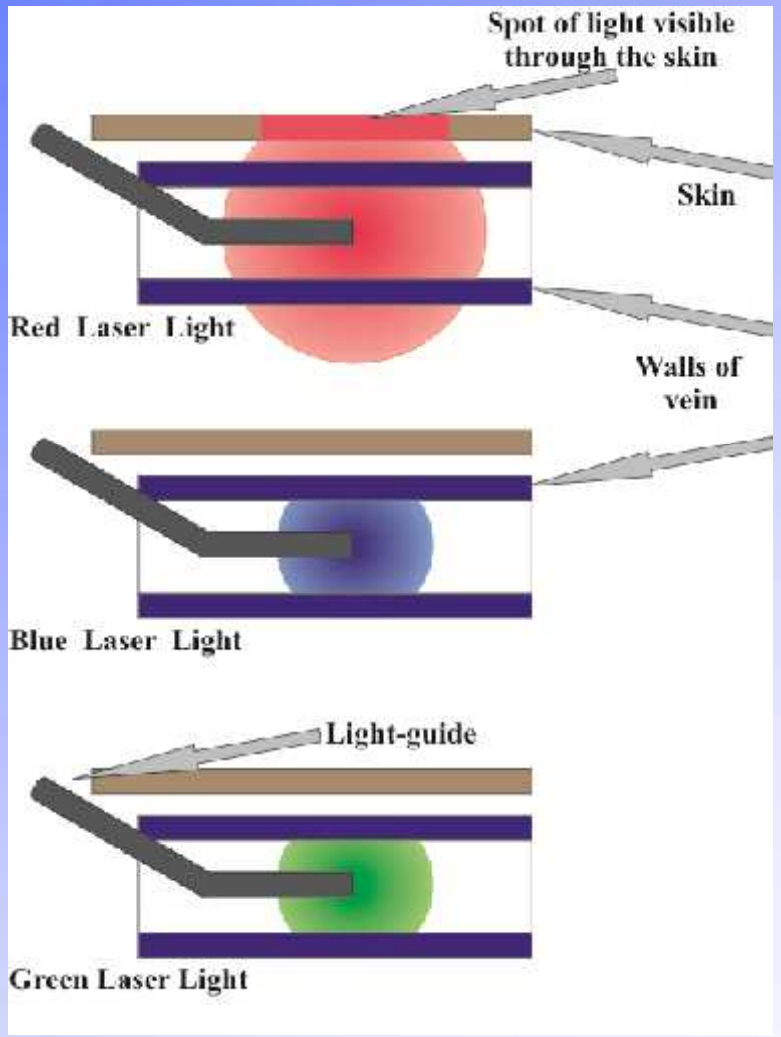


Puncture needles for intravenous laser therapy

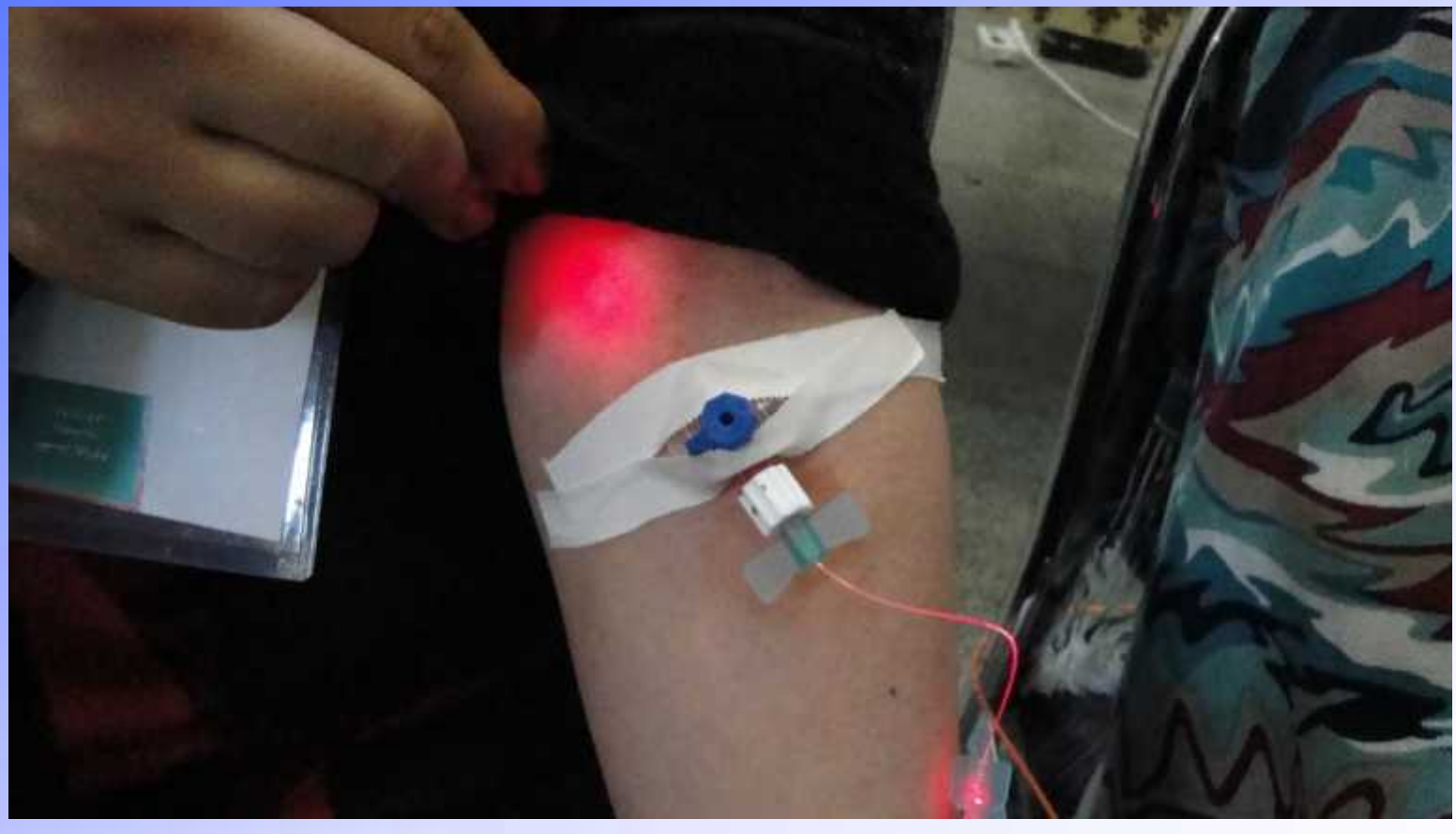


Y-needle with 3 x Luer-lock for simultaneous infusion therapy

Intravenöse Laserblutbehandlung mit verschiedenen Wellenlängen:



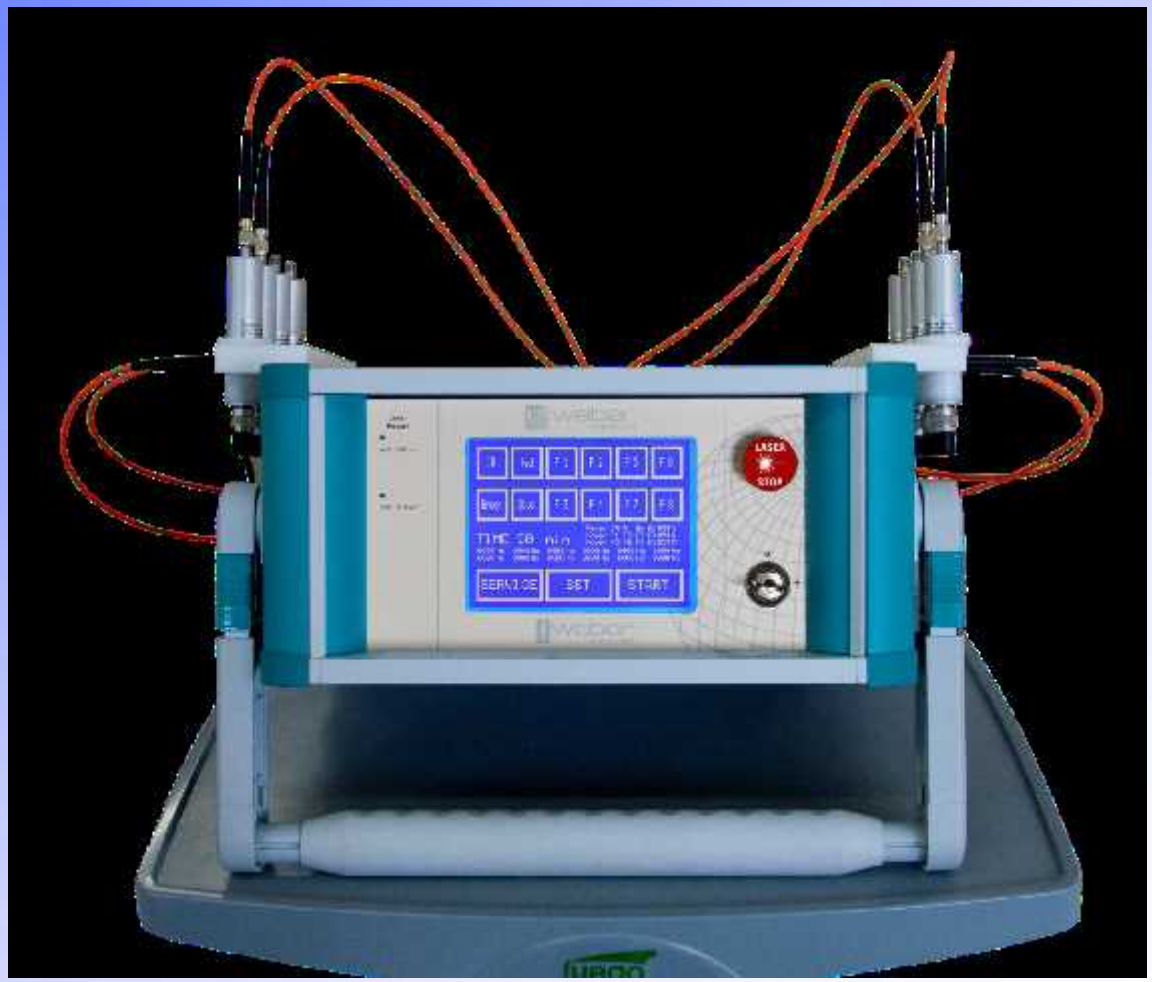
Red laser intravenous therapy



The laser-needle mouth shower

The laser-needle mouth shower for systemic sublingual laser energy application

Weberneedle 12-channel modular
Endolaser system



The intravenous laser blood irradiation for diabetes (blood acupuncture)

Diabetes mellitus with leg ulcer

The intravenous laser blood irradiation for allergy (blood acupuncture)

Treatment of severe allergie with combined laser therapy

Effects of intravenous laser light irradiation

Red laser

Stimulation of the immune system, improvement of blood viscosity

Green laser

Increased oxygen supply

Blue laser:

Increased NO, bactericidal effects

Ultraviolett laser:

Kills viruses and bacteria

Yellow laser:

Detoxification, antidepressive

Effects of intravenous laser blood irradiation on mitochondria

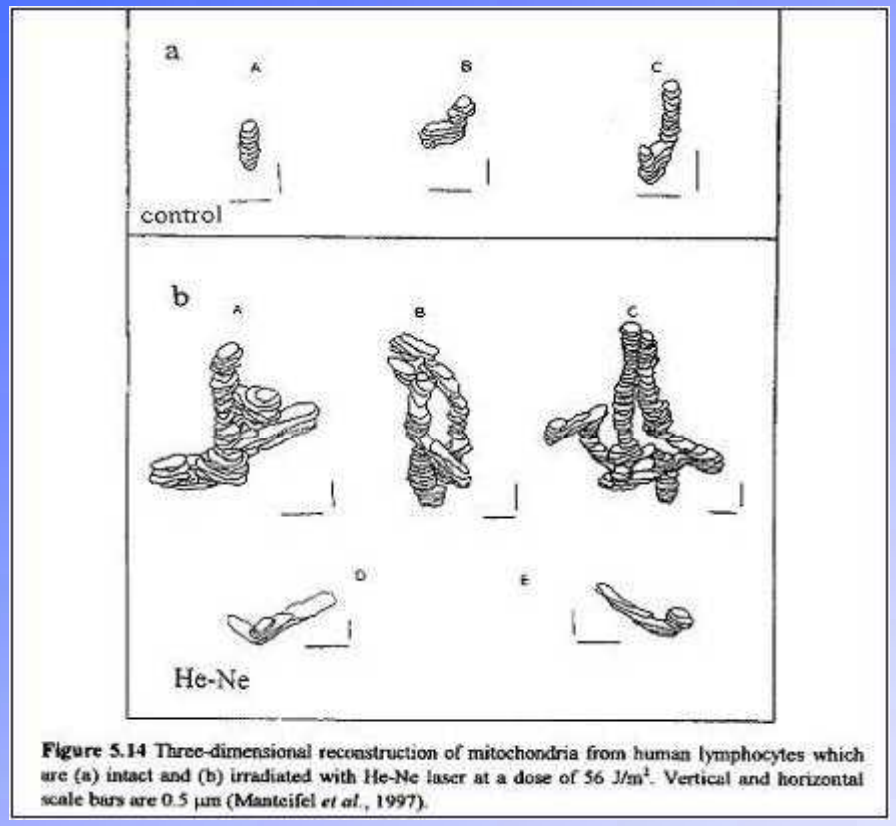


Figure 5.14 Three-dimensional reconstruction of mitochondria from human lymphocytes which are (a) intact and (b) irradiated with He-Ne laser at a dose of 56 J/m^2. Vertical and horizontal scale bars are 0.5 µm (Manteifel *et al.*, 1997).

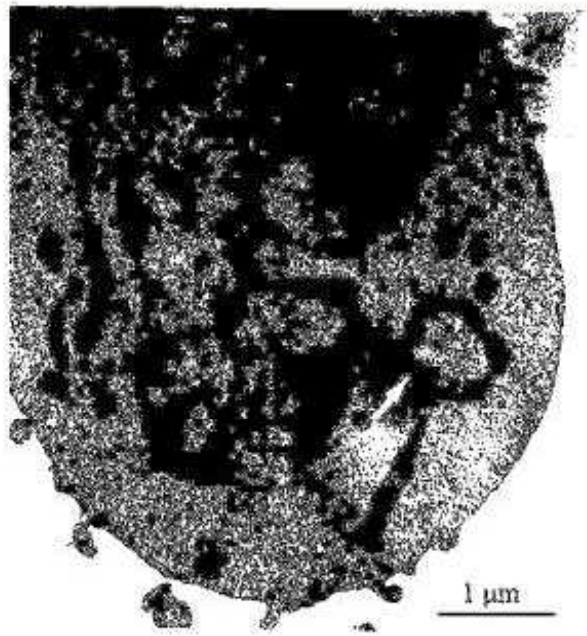


Figure 5.15 Electron micrograph of a section through an irradiated (632.8 nm, 56 J/m^2) human lymphocyte. The experimental details are described by Manteifel *et al.*, 1997. The arrow points to the ring-shaped mitochondrial profile that belongs to the giant mitochondrion (B) presented in Fig. 5.14b.

„Giant-mitochondria“ in human lymphocytes after laser irradiation (632 nm)

Ring-shaped mitochondria in human lymphocytes after laser irradiation (632nm)

Increased ATP production

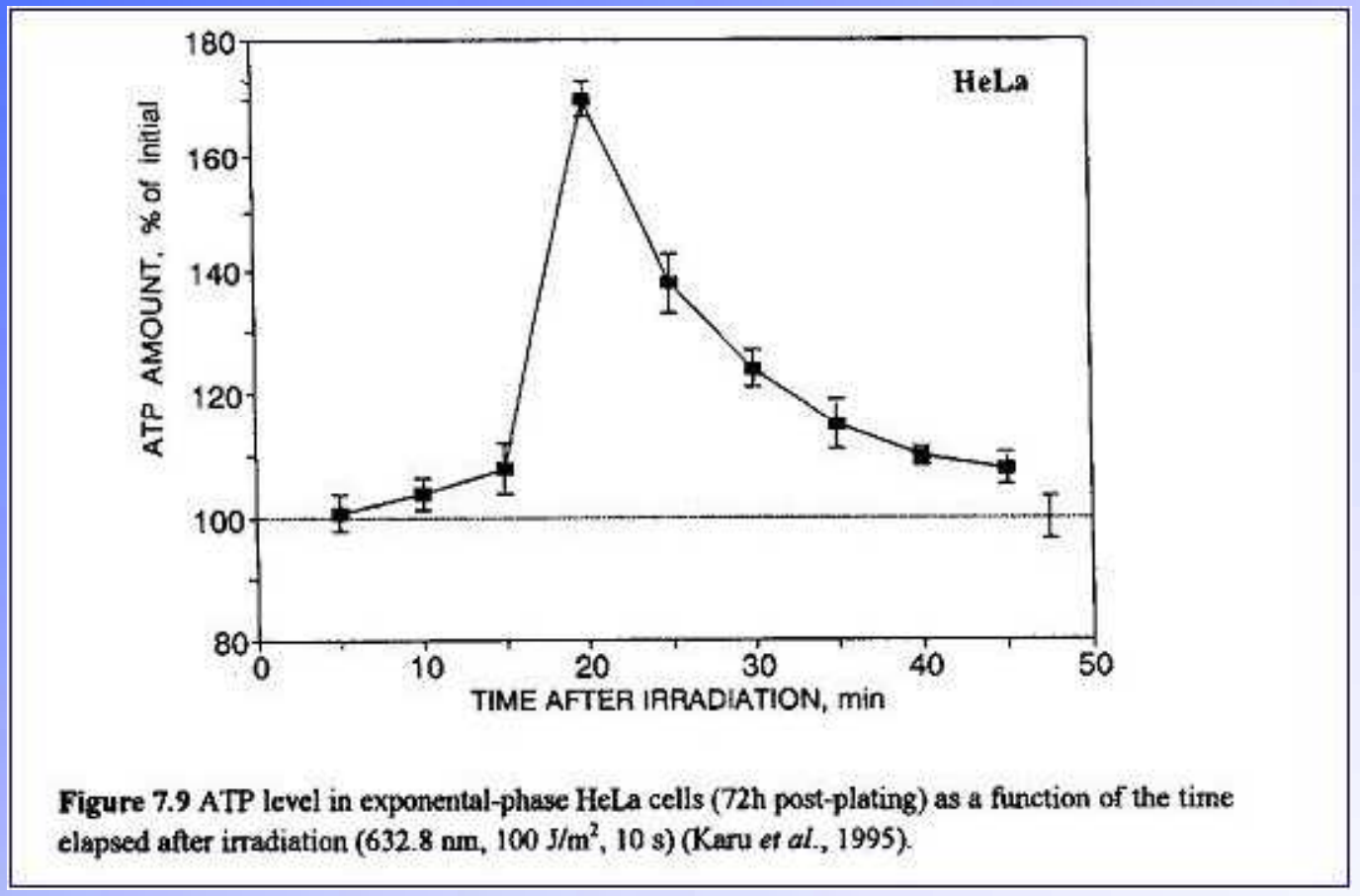
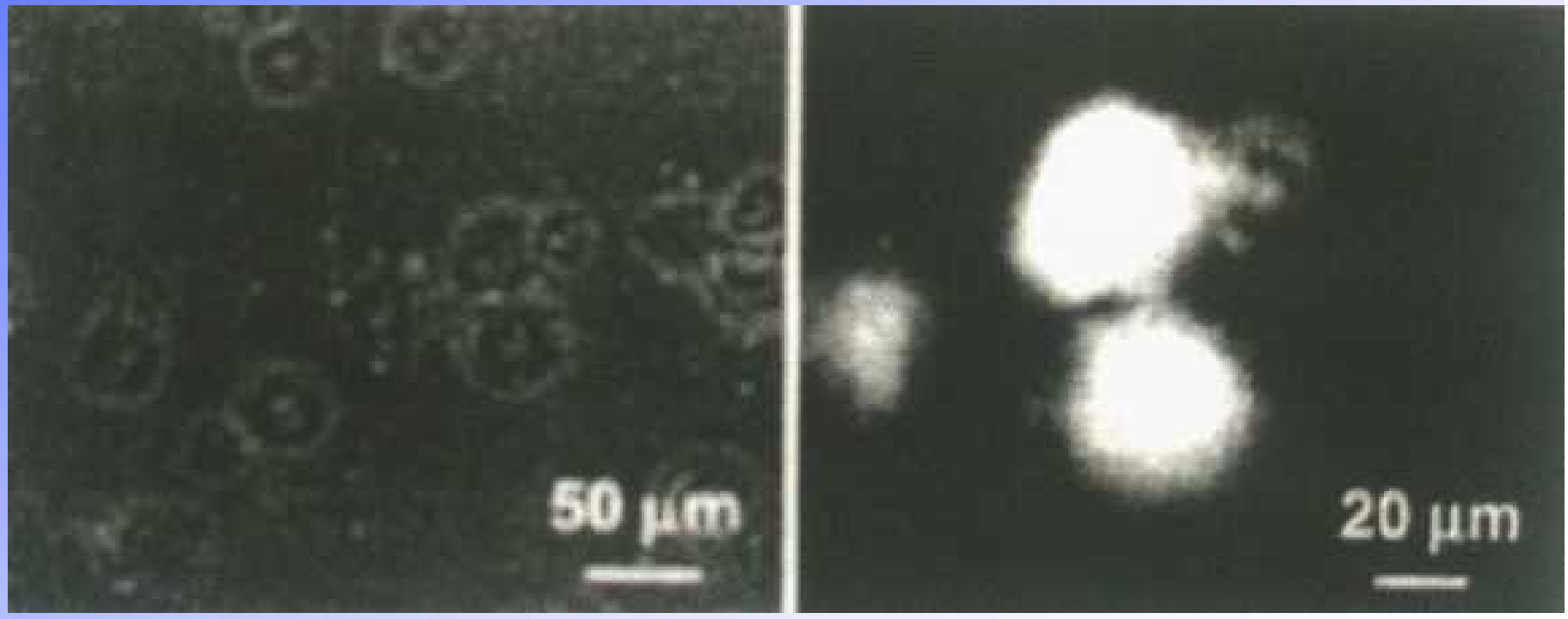


Figure 7.9 ATP level in exponental-phase HeLa cells (72h post-plating) as a function of the time elapsed after irradiation (632.8 nm, 100 J/m^2, 10 s) (Karu *et al.*, 1995).

ATP-Increase under laser irradiation (632 nm, red light) of a HeLa cell-culture

Immunological effects of iv-Laser

Activation of macrophages in fluorescent light



Immunological effects of iv-Laser

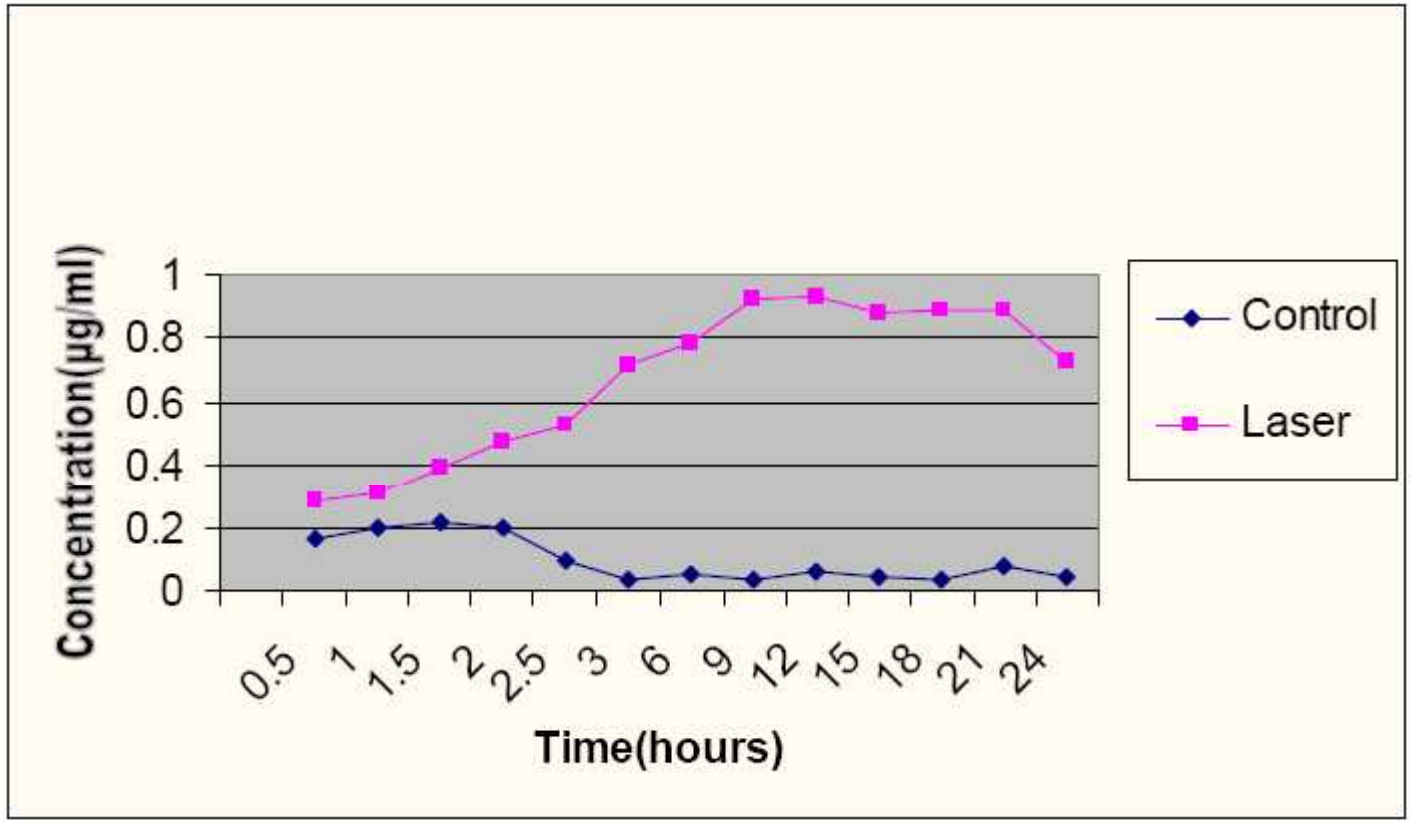


Figure (1) Concentration / Time relationship of IgM of both groups

Mouayed A. Hasan et al., Estimation of IgM & IgG values in the serum after intravenous irradiation of blood with diode laser

Immunological effects of iv-Laser

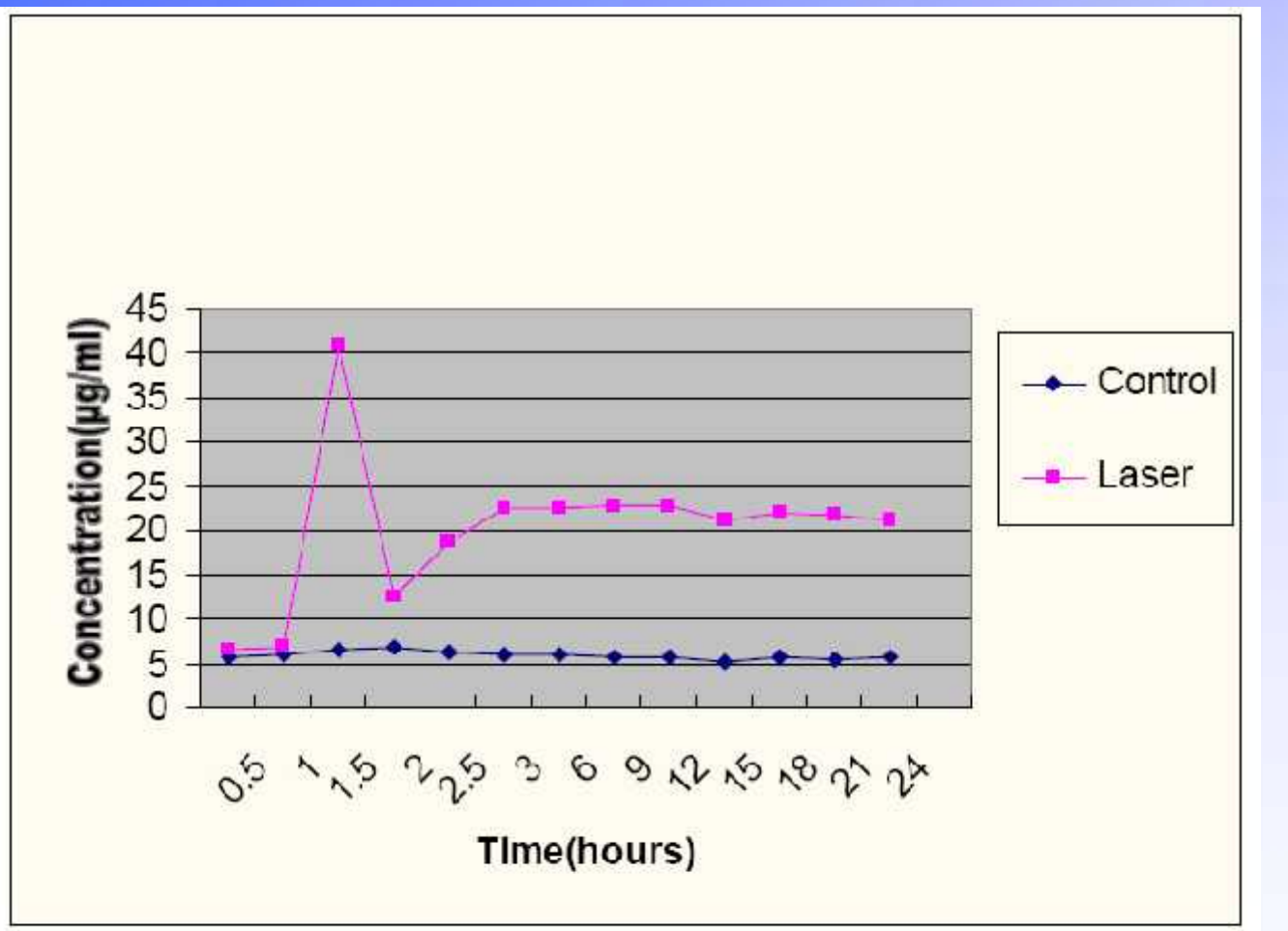
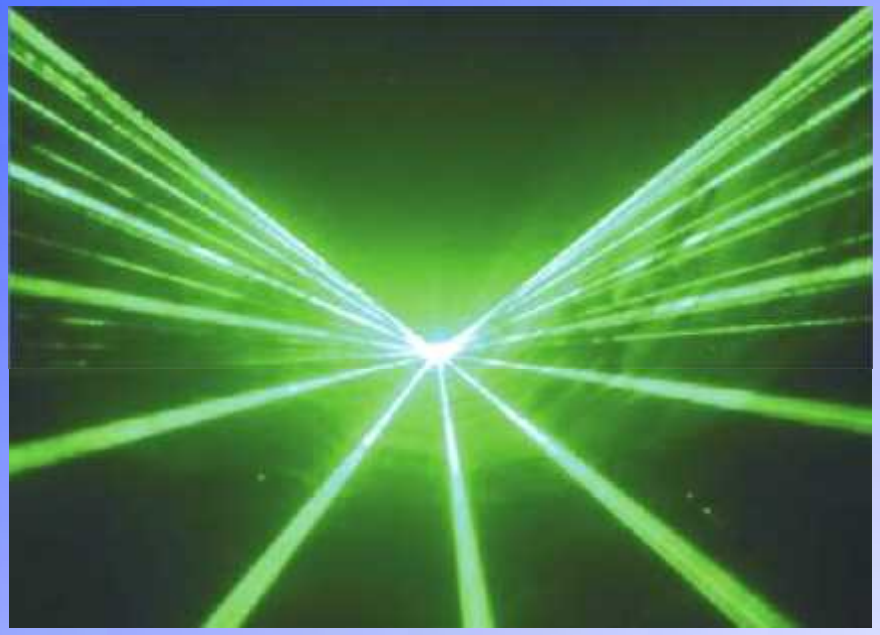
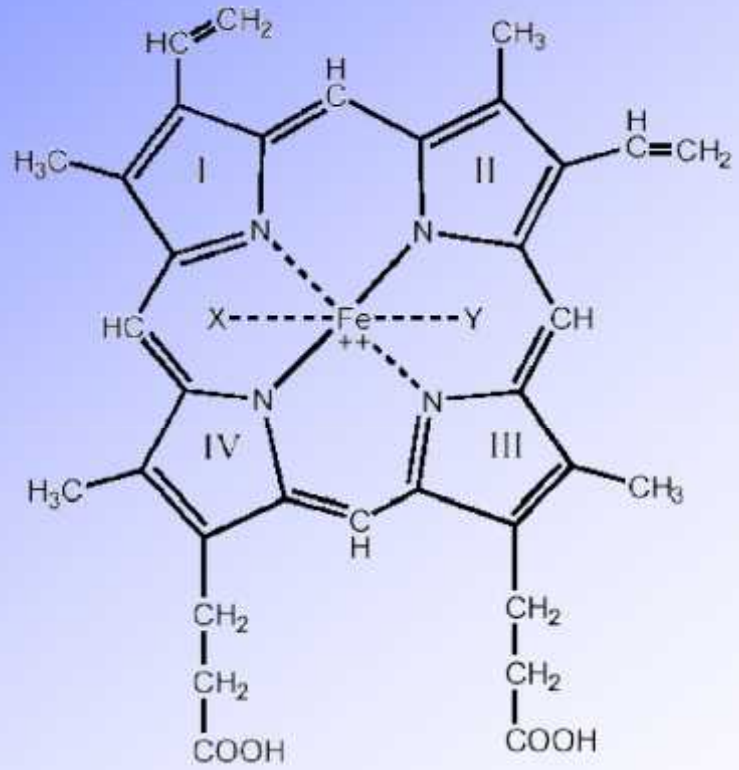


Figure (2) Concentration / Time relationship of IgG of both groups

Mouayed A. Hasan et al., Estimation of IgM & IgG values in the serum after intravenous irradiation of blood with diode laser

Intravenous green laser





Green laserlight binds to haemoglobin

Effects of the green Laser on mitochondria

Gen Physiol Biophys. 2005 Jun;24(2):209-20.

Mitochondrial alterations induced by 532 nm laser irradiation.

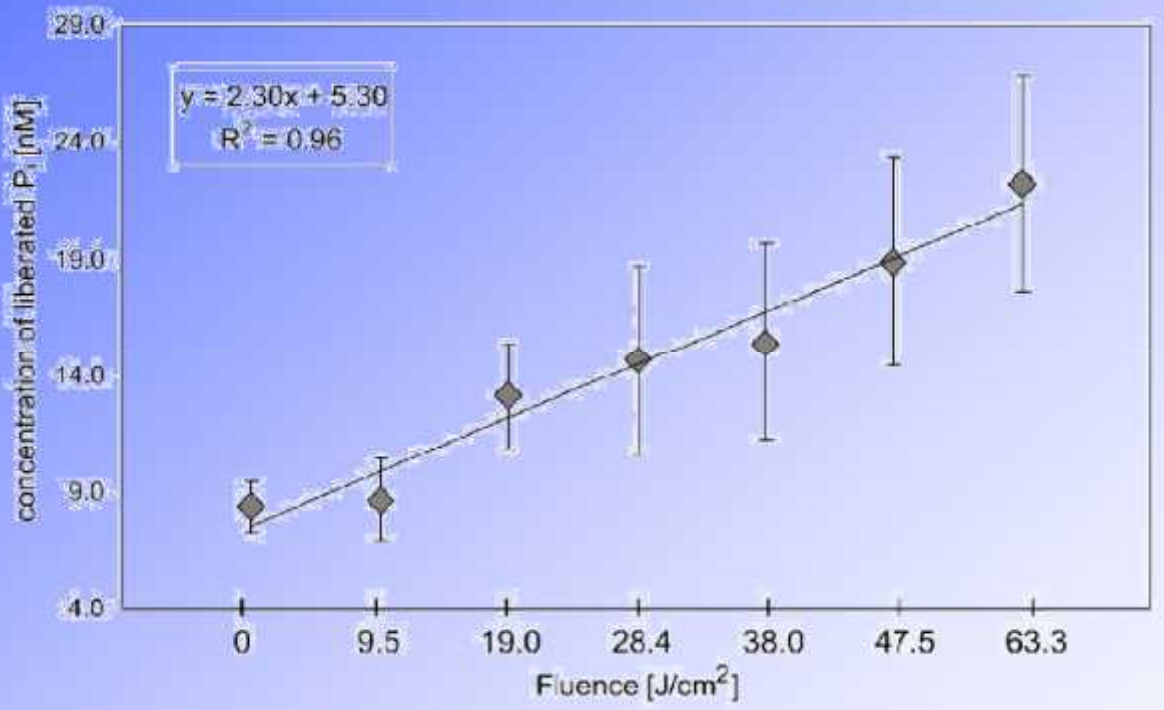
Kassak P, Przygodzki T, Habodaszova D, Bryszewska M, Sikurova L.

Division of Biomedical Physics, Faculty of Mathematics, Physics and Informatics, Comenius University, Mlynska Dolina F1, 842 48 Bratislava 4, Slovakia.

Another MTT assay was used for isolated mitochondria suspensions in order to examine the effect of green laser irradiation on stimulation of processes related to oxidative phosphorylation. It revealed *31.3%*-increase in MTT assay products in irradiated mitochondria as compared to controls

Green laserlight increases the production of ATP in the irradiated mitochondria for more than 30%.

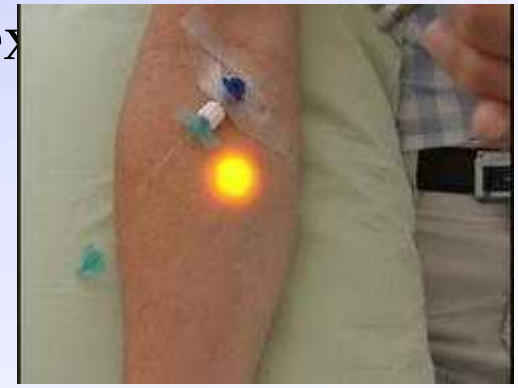
Stimulation of sodium-potassium-ATP-ase of human erythrocytes with green laser irradiation



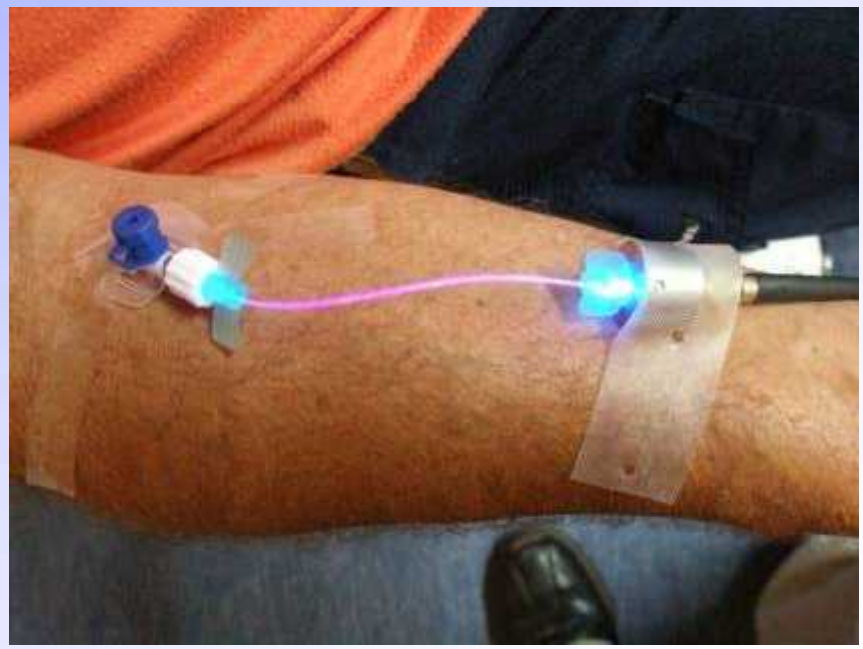
Kassak et al, Univ. Bratislava und Lodz, die Reaktion der Na + / K + - ATPase menschlicher Erythrozyten zu grünem Laserlicht Behandlung; Phys. Res. 5 / 2005

First yellow laser worldwide:

- after the development of red, infrared, green and blue lasers, yellow was the last missing prismatic color
- yellow additionally stimulates the mitochondrial respiratory chain at complex III (cytochromes)
- yellow has an detoxifying effect
- yellow has an anti- depressive effect
- The yellow laser stimulates the strongest natural photosensitizer – Hypericin out of St. Johns wort – and is therefore one of the most efficient laser in photodynamic cancer therapy.



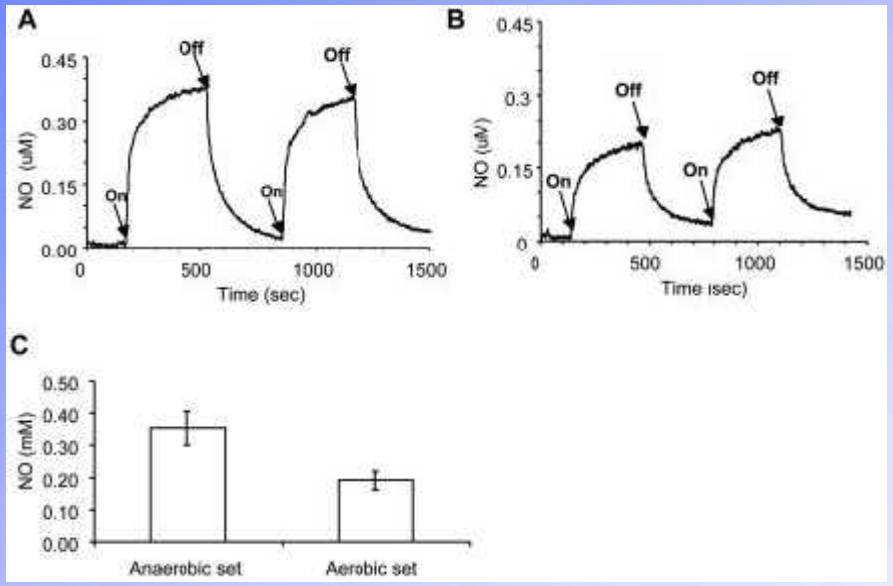
Application of blue laser light



The new 447nm Blue Laser

The blue Laser

Irradiation with blue laser leads to ***increase of the release of nitric oxide*** *(NO) from haemoglobin*

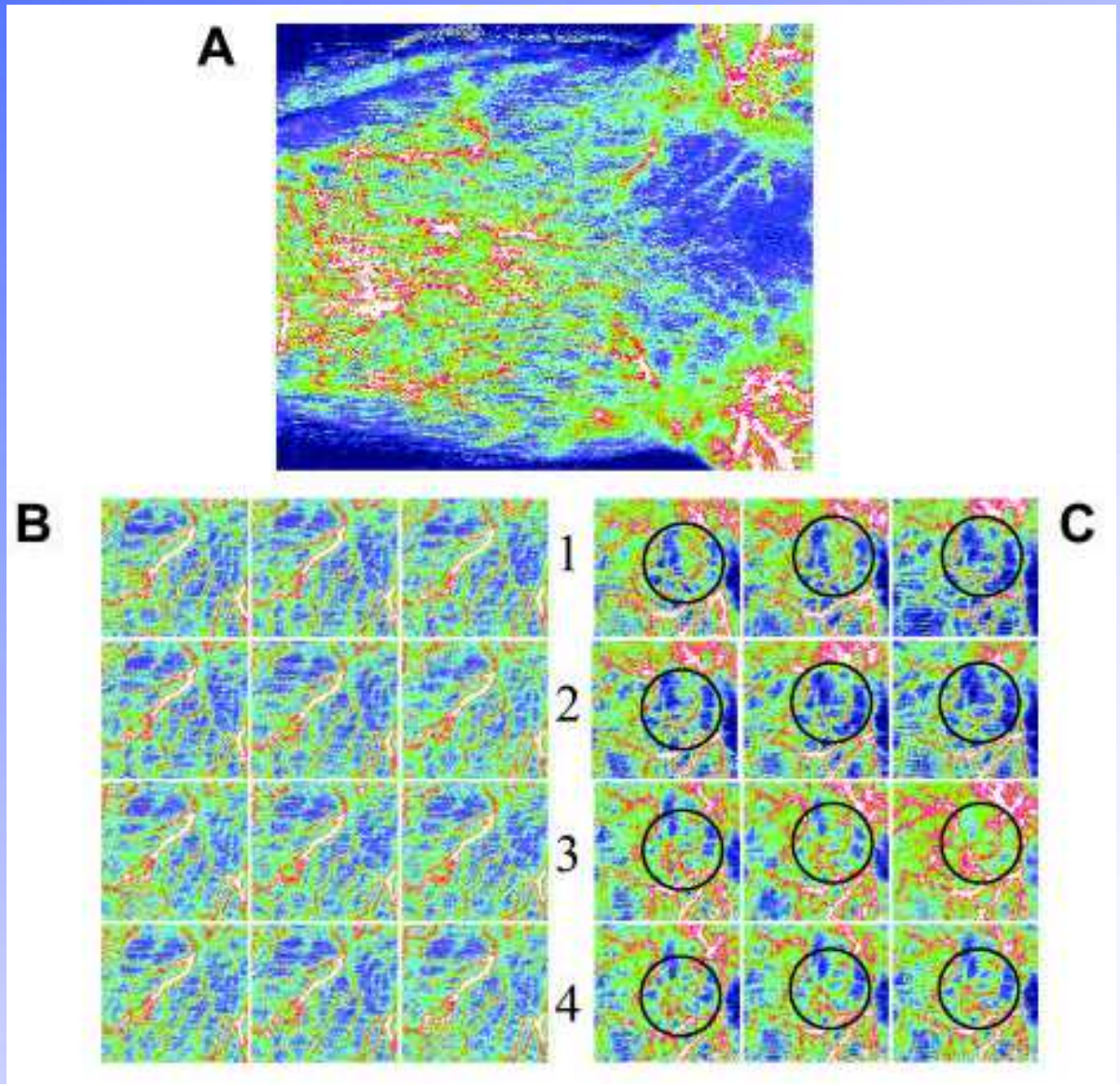


Kinetics of NO release and reabsorption triggered by He-Cd laser (40 mW) irradiation in erythrocytes enriched with NO-Hb.

(A) Anaerobic irradiation; (B) Aerobic irradiation; (C) Difference in NO concentration in solution due to switching the laser ON and OFF.

Mittermayr et al., Ludwig Boltzmann Institut Wien in Zusammenarbeit mit der Russian State Medical University in Moskau
Mol Med. 2007 Jan-Feb; 13 (1-2): 22-29

Blue laser increases nitric oxide (NO)



Blue laser increases nitric oxide (NO)

- Emerging evidence suggests that increasing nitric oxide (NO) bioavailability or endothelial NO synthase (eNOS) activity activates telomerase and delays endothelial cell senescence.

J Cell Sci. 2006 Jul 15;119(Pt 14):2855-62.

Blue laser increases nitric oxide (NO)

- J Cell Sci. 2006 Jul 15;119(Pt 14):2855-62.

  Nitric oxide and mitochondrial biogenesis.

Chronic, smaller increases in NO levels stimulate mitochondrial biogenesis in diverse cell types

The Blue laser

Mikrocirculation problems in

- Macroangiopathy, Microangiopathy
- Diabetes mellitus
- coronary heart disease
- Fat metabolism disturbances
- Hypertension
- Kidney failure
- Old humans
- After transplantations

NO is in the view of today the main physiolocical regulator of the microcirculation and is infuencing the cGMP-metabolism.

In the blood NO is not free but will bind immediately to haemoglobin.

Der HbNO-complex is photosensitive and reacts on laser irradiation.

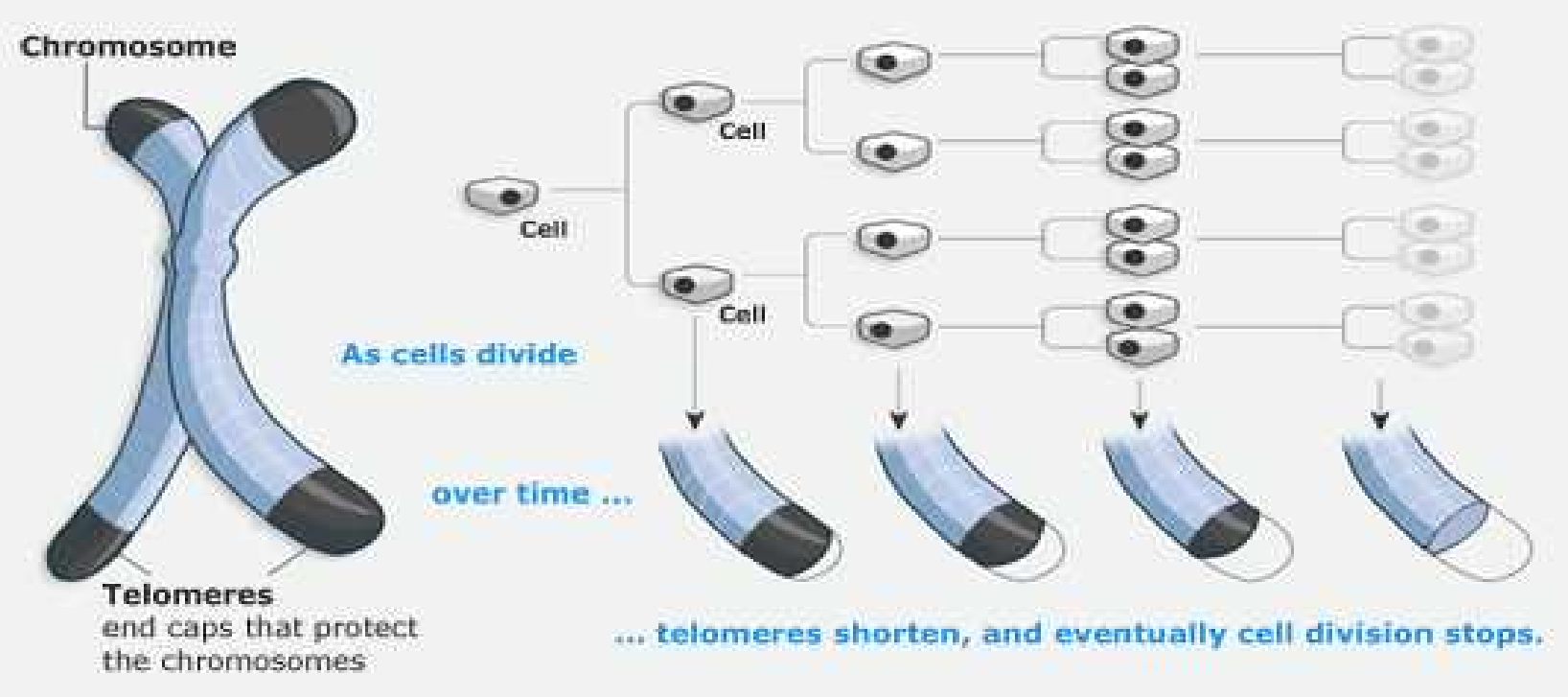
Laserclinic Dr. med. Dipl. chem.
Michael Weber, Germany

The blue laser in ENT

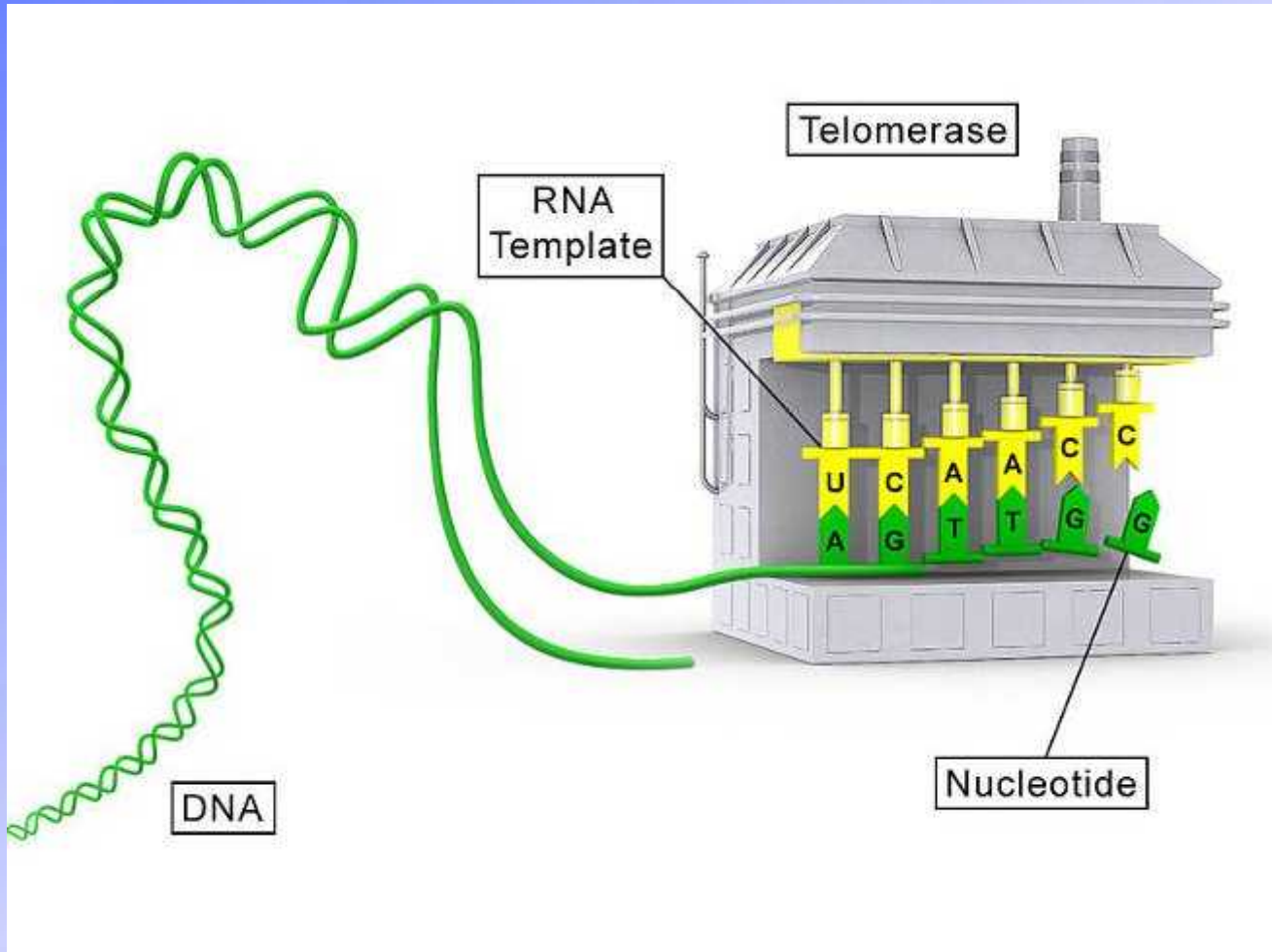
Patient, 45 y., acute hearing loss, medication without effect

Improvement ca. 50 % after 4 sessions

Effects on Telomeres



Effects on Telomeres




Nitric Oxide
Increases energy production
Increases blood flow to vital organs
Boosts exercise perform-ance & endurance
Manages diabetes by regulating insulin
Prevents diabetic complica-tions
Lowers blood pressure & LDL (bad) cholesterol
Reverses atherosder otic plaque formation
Reverses kidney disease/ failure
Improves sexual perform-ance
Offsets damage from tobacco use
Enhances memory & cognitive function
Anti-ageing effects

Typical diseases to treat with laser blood irradiation

- Diabetes mellitus
- Chronic liver diseases
- Lipometabolism disorders
- Chronic pain syndromes
- Rheumatoid Arthritis
- Polyneuropathy
- Chronic inflammatory diseases
- Cancer (photodynamic therapy)
- Fibromyalgia
- Hypertension
- Tinnitus
- Macula degeneration
- Multiple Sclerosis
- Chronic fatigue syndrome
- allergies and eczemas

The intravenous laser blood irradiation

General effects:

- Improvement of the general performance

- Improved Sleep

- Positive effect on depression

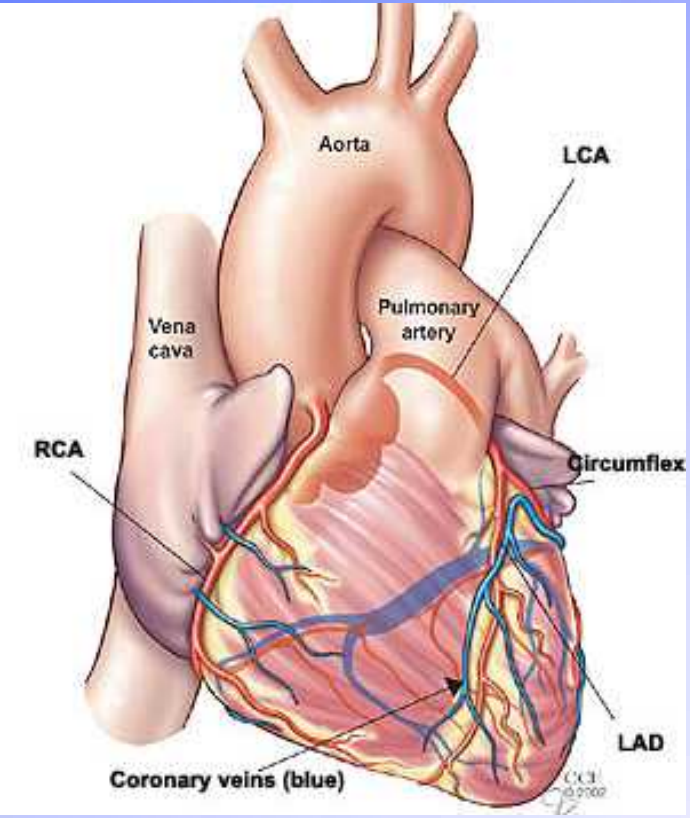
- improvement of the immune system

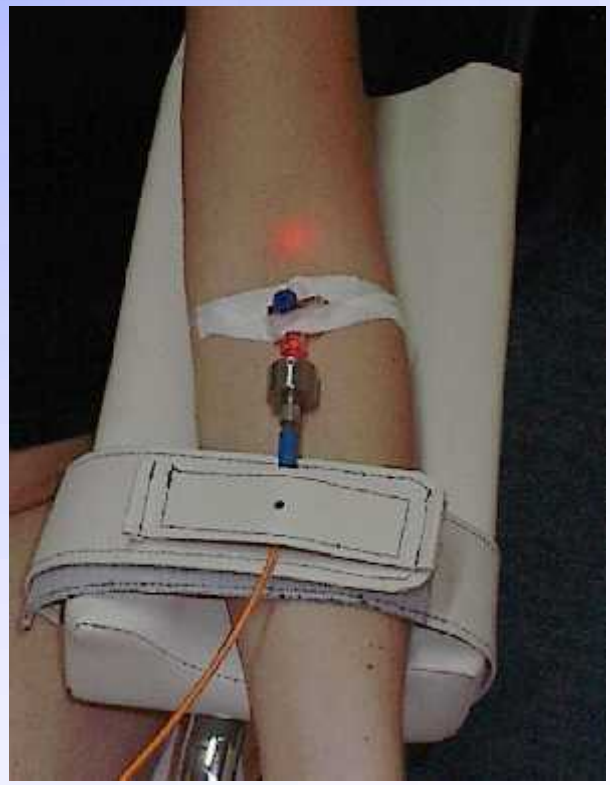
Regenerative effects of intravenous laser therapy

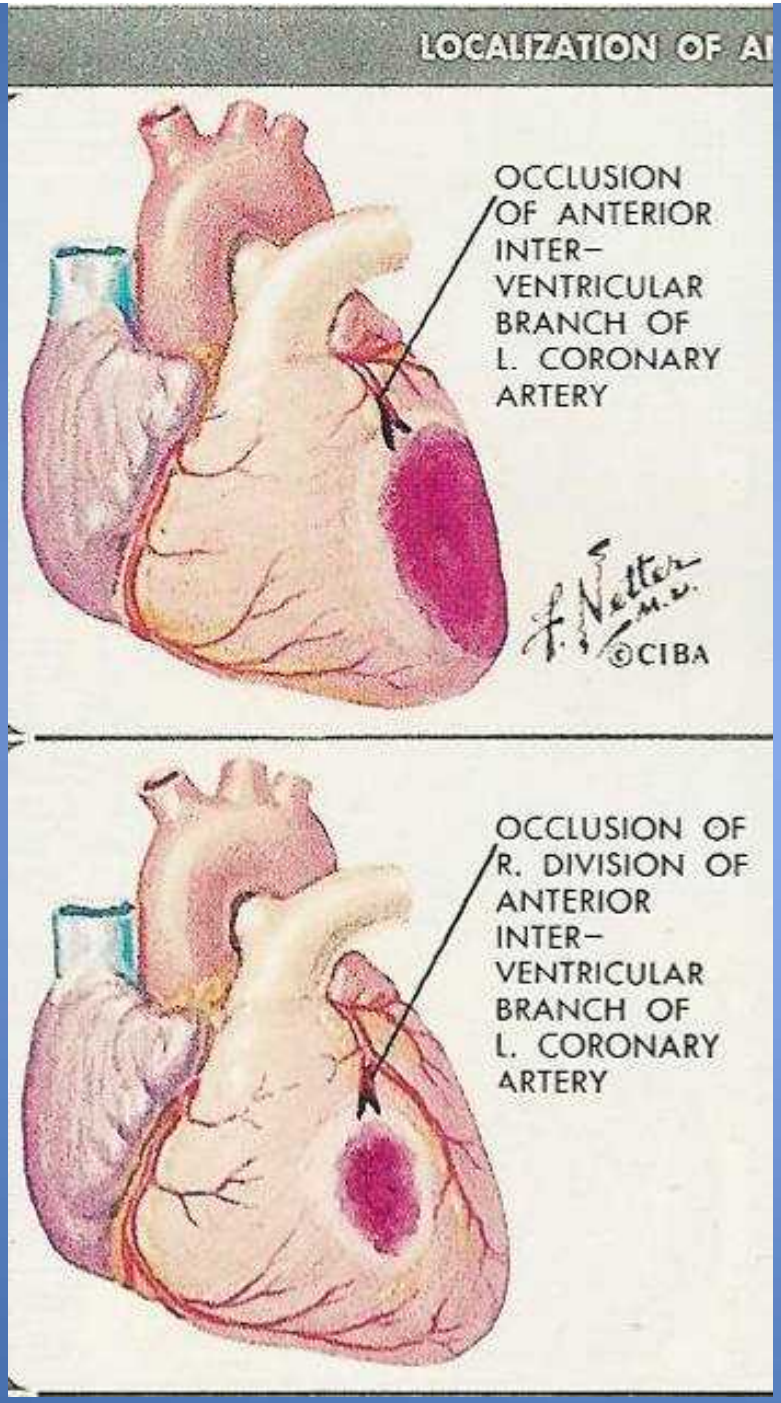
- There is strong evidence that the regenerative effects of intravenous laser therapy are induced by stimulation of the body‘s own stem cells released from the bone marrow in the blood stream

Studies

Application in cardiology and angiology







Before Lasertherapy

After Lasertherapy

Cardiovascular Disease

- Includes **anything** adversely affecting heart and blood vessels such as:

- Angina / Ischemic Heart Disease
- Atherosclerosis
- Dysrhythmia
- Hypertension
- Hyperlipidemia
- Myocardial Infarction
- Stroke
- …and more

1) Rosamond W, et al. *Heart disease and stroke statistics 2007 update. A report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee*. Circulation 2006; DOI: 10.1161/ circulationaha.106.179918.

Widespread effects on Blood & Blood Vessels

- Reduced aggregation of platelets.
- Increased elasticity/deformability of red cells.
- Reduced viscosity / improved microcirculation.
- Reduced coagulability.
- Increased antioxidant levels.
- Increased oxygen binding to red blood cells.
- Prevention, even regression of plaque.
- Immune activation.
- Increase of kidney function

Study about the efficacy of laser therapy on patients with coronary heart disease

F. Noohi, MD. FACC , M. Javdani, MD*, M. kiavar, MD
Shaheed Rajaei Cardiovascular Medical & Research Center. IRAN
University of Medical Science, Tehran, IRAN, Nov.2008

16th Congress of

Iranian Heart Association

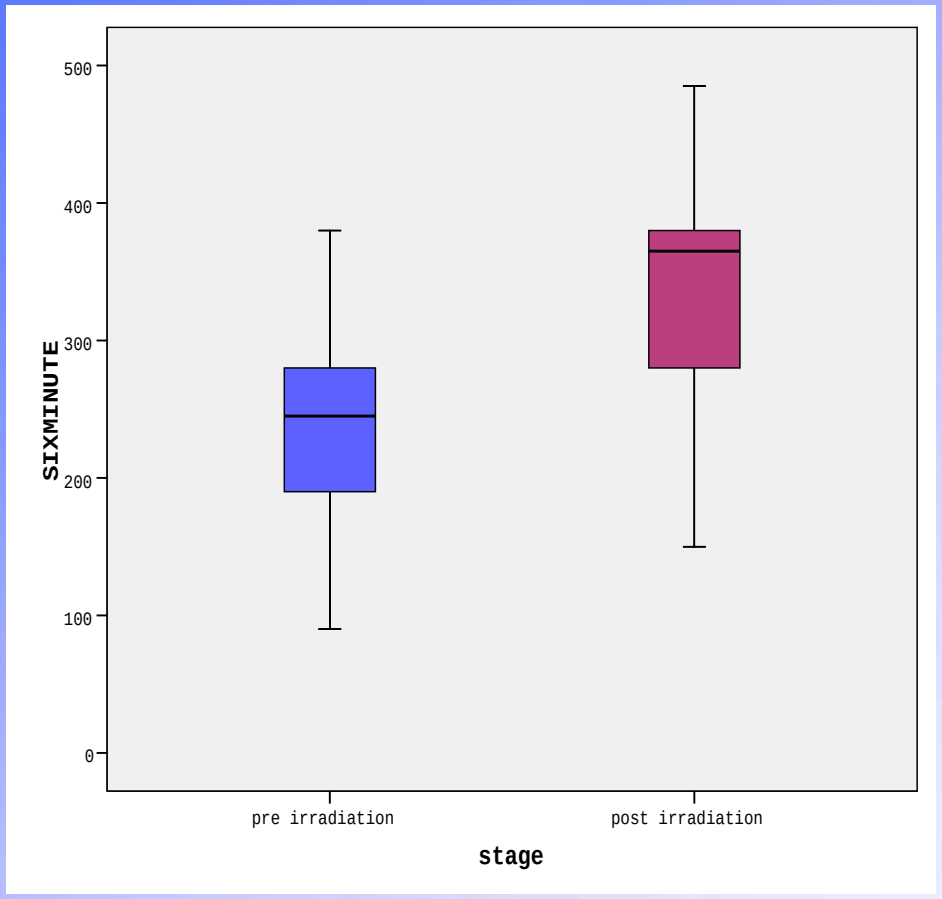
In Collaboration with

American College of Cardiology

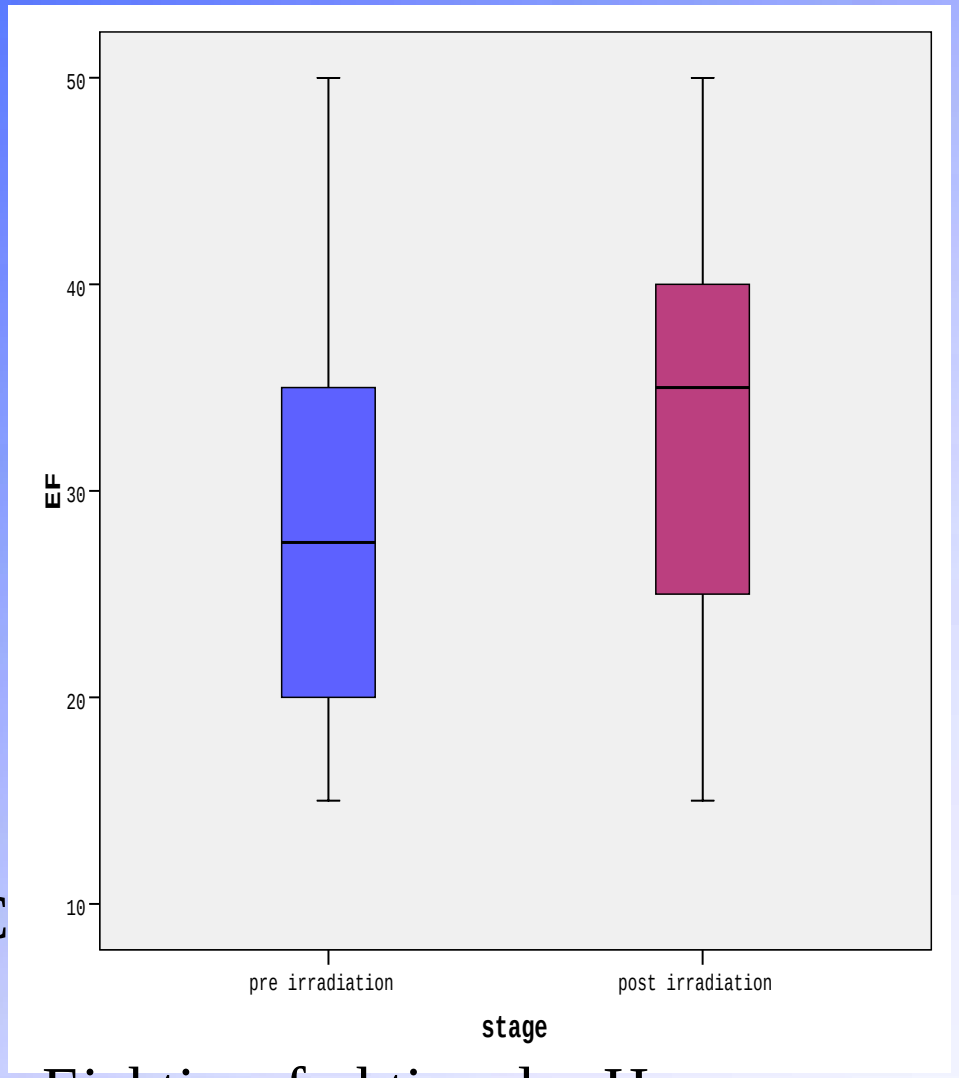
Nov. 18-21 , 2008

Aban 28- Azar 1 , 1387

B

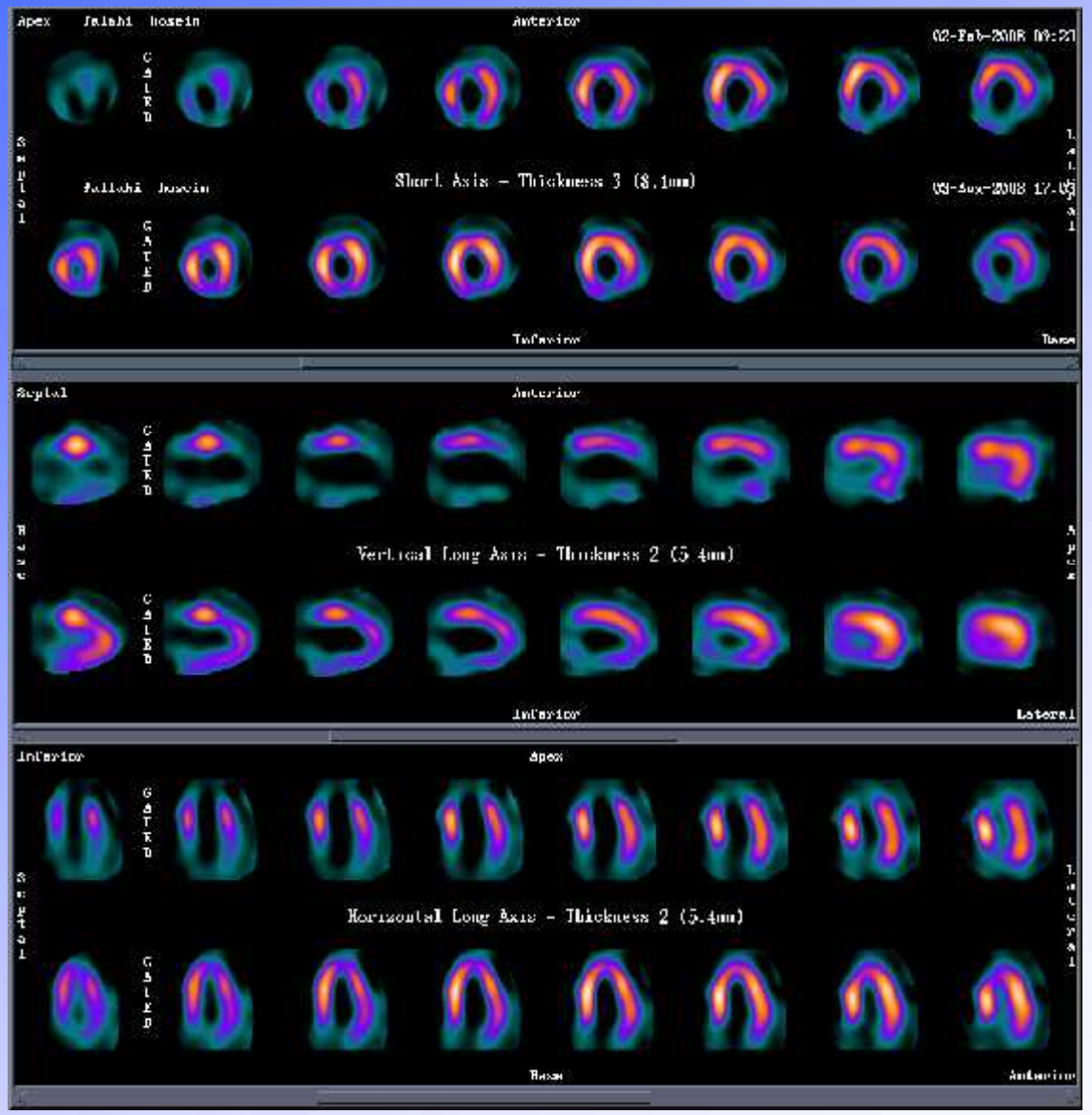


6 Minuten Lauftest



C

Ejektionsfraktion des Herzens


Apex
Anterior
Short Axis - Thickness 3 (8.1mm)
Vertical Long Axis - Thickness 2 (5.4mm)
Horizontal Long Axis - Thickness 2 (5.4mm)
Inferior
Lateral
Base

Diabetes

Used by permission of the Czech Society for the Use of Laser in Medicine, www.laserpartner.org

Ambulatory Application of Combined Laser Therapy in Patients with Diabetes Mellitus and Dyslipidemia

Laser Partner, 17.5.2002
T.V. Kovalyova, Out-Patient Department of the 2-nd Municipal Clinical Hospital, Izhevsk, Russia
e-mail: laser@udm.ru

Abstract

This study sought to evaluate the dynamics of lipid metabolism in blood plasma and clinical efficiency of combined laser therapy (CLT) in patients with diabetes mellitus.

The effect of intravenous laser on metabolism and diabetes

Die Dynamik des Lipidprofils (mmol/l bei Patienten mit Diabetes mellitus ($M \pm m$)

Zeitliche Einleitung der Untersuchung	Patientengruppen	TG (0,40 - 1,53)	TC (3,9 - 5,2)	LDL-c (3,0 - 4,5)	HDL-c (1,5 - 3,3)	AR (2,5 - 3,5)	LDL/HDL-c ratio (up to 5,0)
Zu Beginn	I	2,11 ± 0,12	7,92 ± 0,44	7,80 ± 0,43	0,91 ± 0,05	7,70 ± 0,43	8,57 ± 0,48
	II (I)	2,14 ± 0,10	8,20 ± 0,38	7,87 ± 0,37	0,99 ± 0,04	7,28 ± 0,27	7,94 ± 0,30
Nach der Therapie	II (2)	2,51 ± 0,11	7,98 ± 0,37	7,90 ± 0,37	1,14 ± 0,05	6,00 ± 0,23	6,92 ± 0,26
Während 3 Wochen	II (3)	1,69 ± 0,07	5,31 ± 0,25	6,63 ± 0,31	1,42 ± 0,06	2,73 ± 0,10	4,66 ± 0,18
	I	2,10 ± 0,12	7,91 ± 0,44	7,79 ± 0,44	0,92 ± 0,05	7,59 ± 0,42	8,46 ± 0,47
Veränderung Zeitbezug	(?)	**1,3**	**1,54**	**1,2**	**1,4 (?)**	**3,3**	**2,0**
	p (1 - 2)	> 0,05	> 0,05	> 0,05	> 0,05	> 0,05	> 0,05
	p (2 - 3)	> 0,05	> 0,05	> 0,05	> 0,05	> 0,05	> 0,05
	p (1 - 3)	> 0,05	> 0,05	> 0,05	> 0,05	> 0,05	> 0,05
Während 3 Monaten:	II	1,72 ± 0,08	5,42 ± 0,25	6,21 ± 0,29	1,61 ± 0,07	2,37 ± 0,09	3,85 ± 0,18
Vor der Therapie	II	1,51 ± 0,07	5,27 ± 0,24	5,42 ± 0,25	1,67 ± 0,07	2,15 ± 0,10	3,24 ± 0,15
während 3 Wochen	I	2,12 ± 0,12	7,94 ± 0,44	7,84 ± 0,44	7,90 ± 0,05	7,82 ± 0,44	8,71 ± 0,49
Während 6 Monaten:	II	1,62 ± 0,07	6,01 ± 0,28	5,82 ± 0,27	1,39 ± 0,06	3,30 ± 0,15	4,18 ± 0,19
Vor der Therapie	II	1,54 ± 0,07	5,28 ± 0,24	5,70 ± 0,26	1,42 ± 0,06	2,70 ± 0,12	4,00 ± 0,18
während 3 Wochen	i	2,12 ± 0,12	7,89 ± 0,44	7,80 ± 0,44	0,91 ± 0,05	7,67 ± 0,43	8,57± 0,48

I= Kontrollgruppe (n=22) ohne CLT- Behandlung

II= Hauptgruppe (n=37) mit Behandlung

Blutzuckerwerte ($M \pm m$)

Beobachtungsperioden	Patientengruppen	Glukose, mmol/I	
		NIDDM	IDDM
Zu Beginn	I	14,43 ± 0,86	9,97 ± 1,02
Nach der Therapie	II (1)	14,21 ± 0,85	10,46 ± 1,46
	II (2)	11,27 ± 0,67	11,82 ± 1,65
Während 3 Wochen	II (3)	6,01 ± 0,35	7,45 ± 1,04
	I	14,32 ± 0,86	10,12 ± 1,04
	p (1-2)	> 0,05	> 0,05
	p (2-3)	< 0,05	< 0,05
	p (1-3)	< 0,05	< 0,05
Während 3 Monaten:	II	7,98 ± 0,47	6,38 ± 0,89
Vor der Therapie	II	6,03 ± 0,36	5,72 ± 0,79
während 3 Wochen	I	14,41 ± 0,86	10,24 ± 1,05
In 6 Monaten:	II	6,81 ± 0,40	5,89 ± 0,82
Vor der Therapie	II	6,02 ± 0,36	5,54 ± 0,77
während 3 Wochen	i	14,37 ± 0,86	10,31 ± 1,06

I= Kontrollgruppe (n=30) ohne CLT- Behandlung

II= Hauptgruppe (n=37) mit Behandlung

Evaluating the Efficiency of Low Level Laser Therapy (LLLT) in Combination With Intravenous Laser Therapy (IVL) on Diabetic Foot Ulcer, Added to Conventional Therapy

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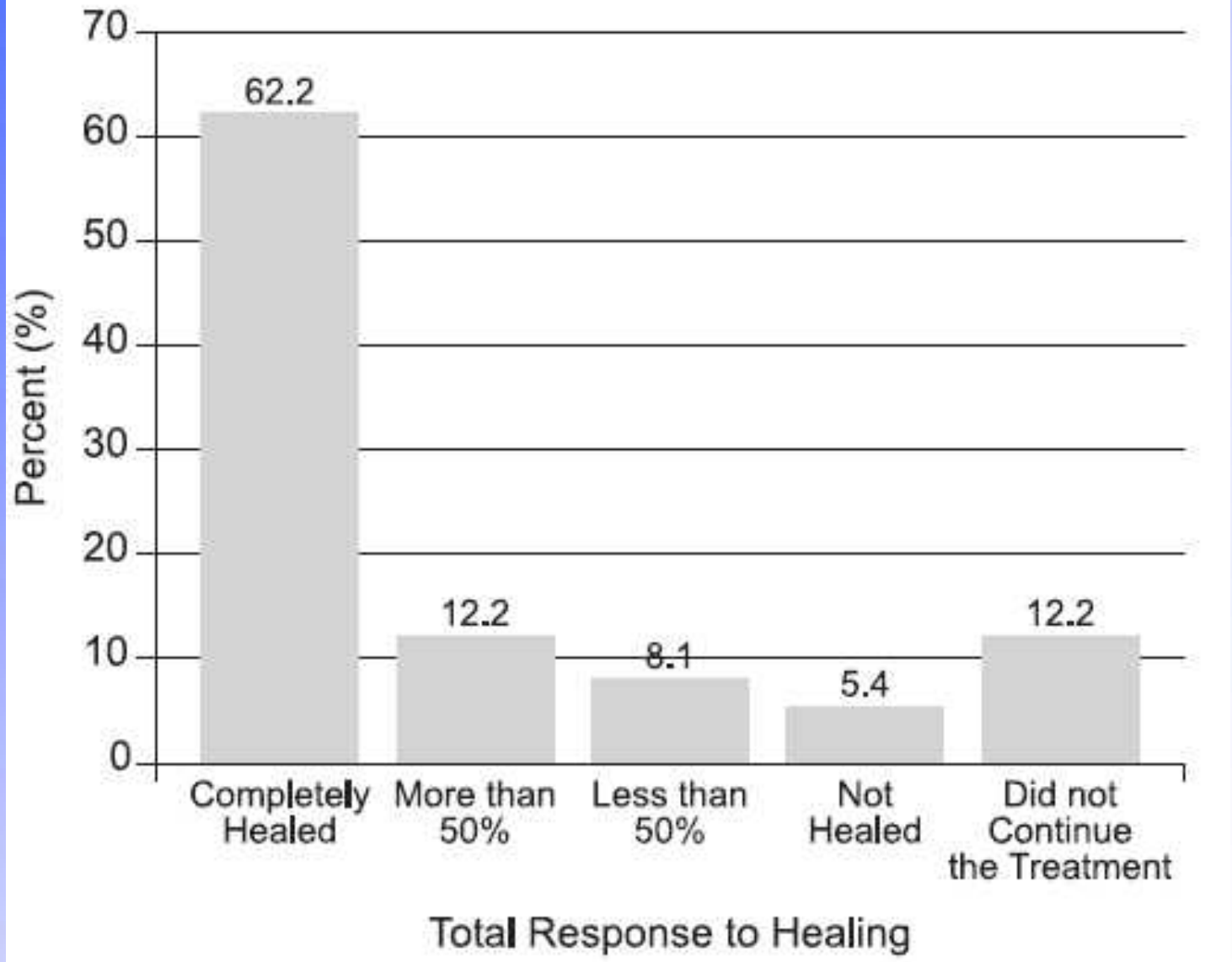
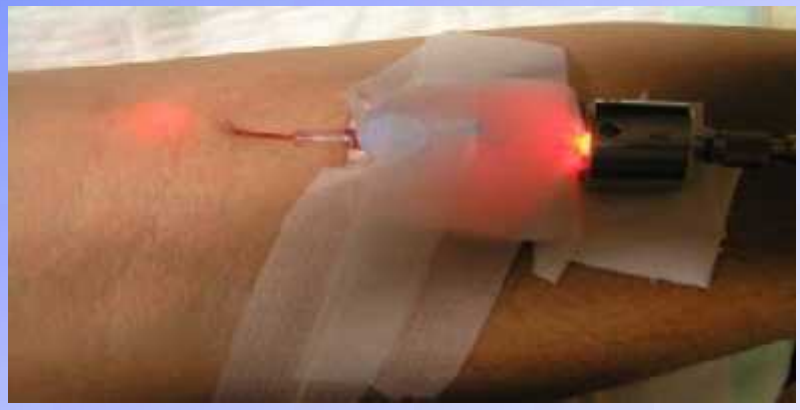
Fatemah Ayatollahzadeh Shirazi PhD3, Mitra Hajizadeh MD4

1Department of Medical Laser, Milad Hospital, Social Security Organization, Tehran, Iran
2Department of Surgery, Sina Hospital,Tehran University of Medical Sciences, Tehran, Iran

The total response to healing (*Diagram* 2)



Diabetes mellitus, metabolic syndrome



New Diabetes study 2008
(Dr. Andreas Wirz, Basel, Switzerland)

- **Protocol**: 100 diabetic patients were treated with 10 sessions red and green lasers intravenously with the new insuline frequency of 3023 Hz
- **Results**: positive effects in 75 %

  Reduction of HbA1c of 1,5 %

(this study was presented at the international congress for acupuncture in Davos, Switzerland, February 2008, will be published soon)

The Hypoglycemic Effect of Intravenous Laser Therapy in Diabetic Mellitus Type 2 Patients; A Systematic Review and Meta-analyses

Kazemikhoo N1, 2, Ansari F2 and Nilforoushzadeh2
1 1Skin Diseases and Leshmaniasis Research Center, Isfahan University of Medical Sciences, Isfahan, Iran 2 Skin and Stem Cell Research Center, Tehran University of Medical Sciences, Tehran, Iran
12/2015

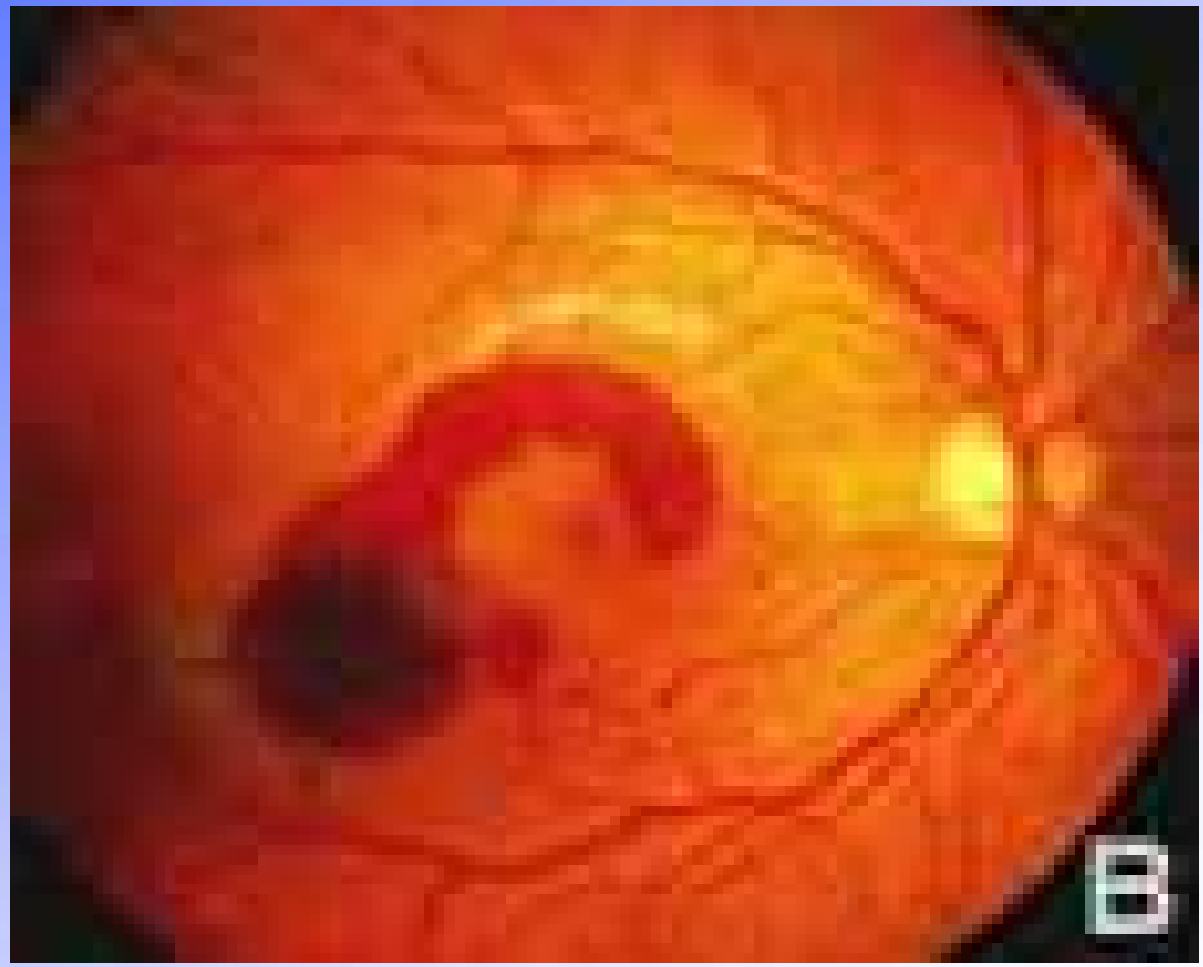
Studies

R. Chen, 2000 (Chen, Chen, Xie, Chen, & Zhang, 2000) 10 67.3 93.3
He-Ne laser extravacular irradiation therapy instrument, O—4Omw, 632.8nm, 60 min
197.1±73.8 106.2±540

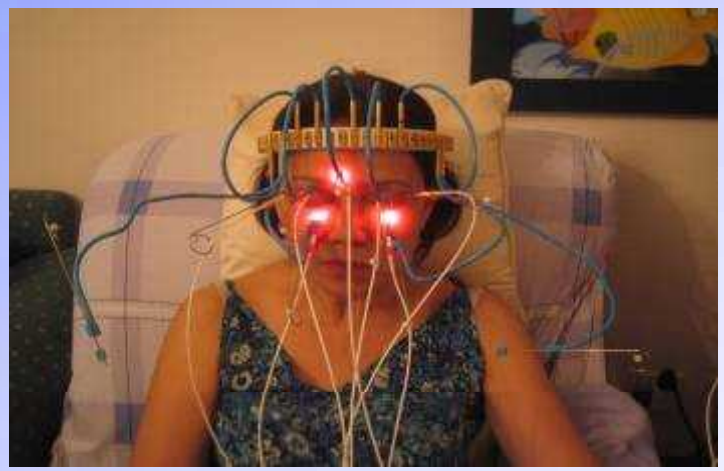
T.V. Kovalyova, 2002 (Kovalyava, 2002) 27 57.3 13
ILBI intravenously 2 mW,l =0,63 mm 405-nm 15-30 min
259.74±15.48 255.78±15.3

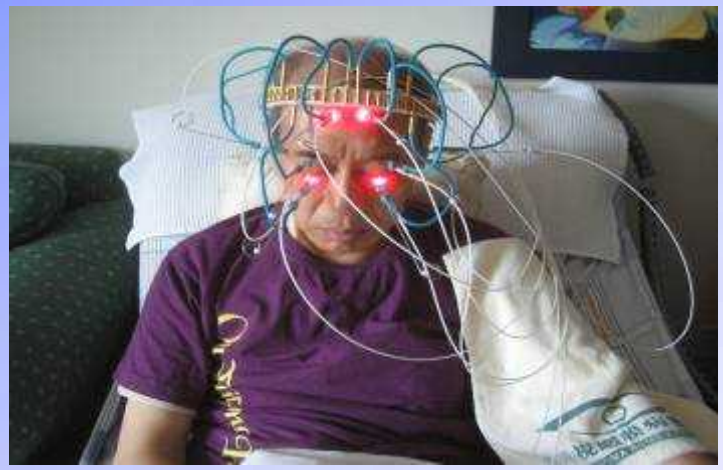
N. KazemiKhoo, 2013 (N Kazemi Khoo et al., 2013) 9 60.63 55
ILBI intravenously 1.5 mW, continuous, 405-nm 30 min
190±17 165±20

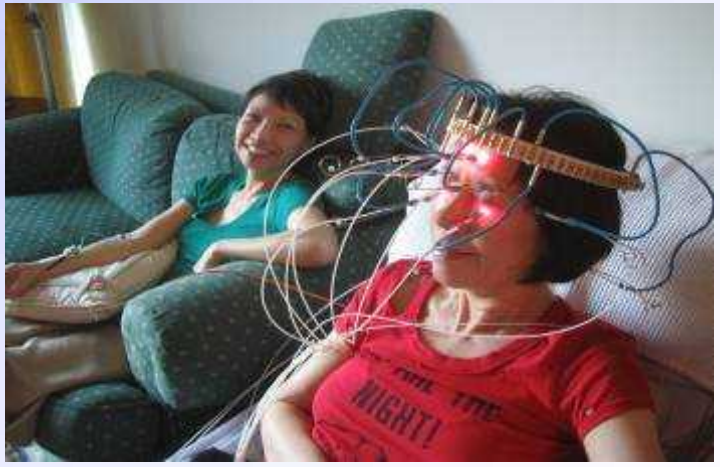
Macular degeneration



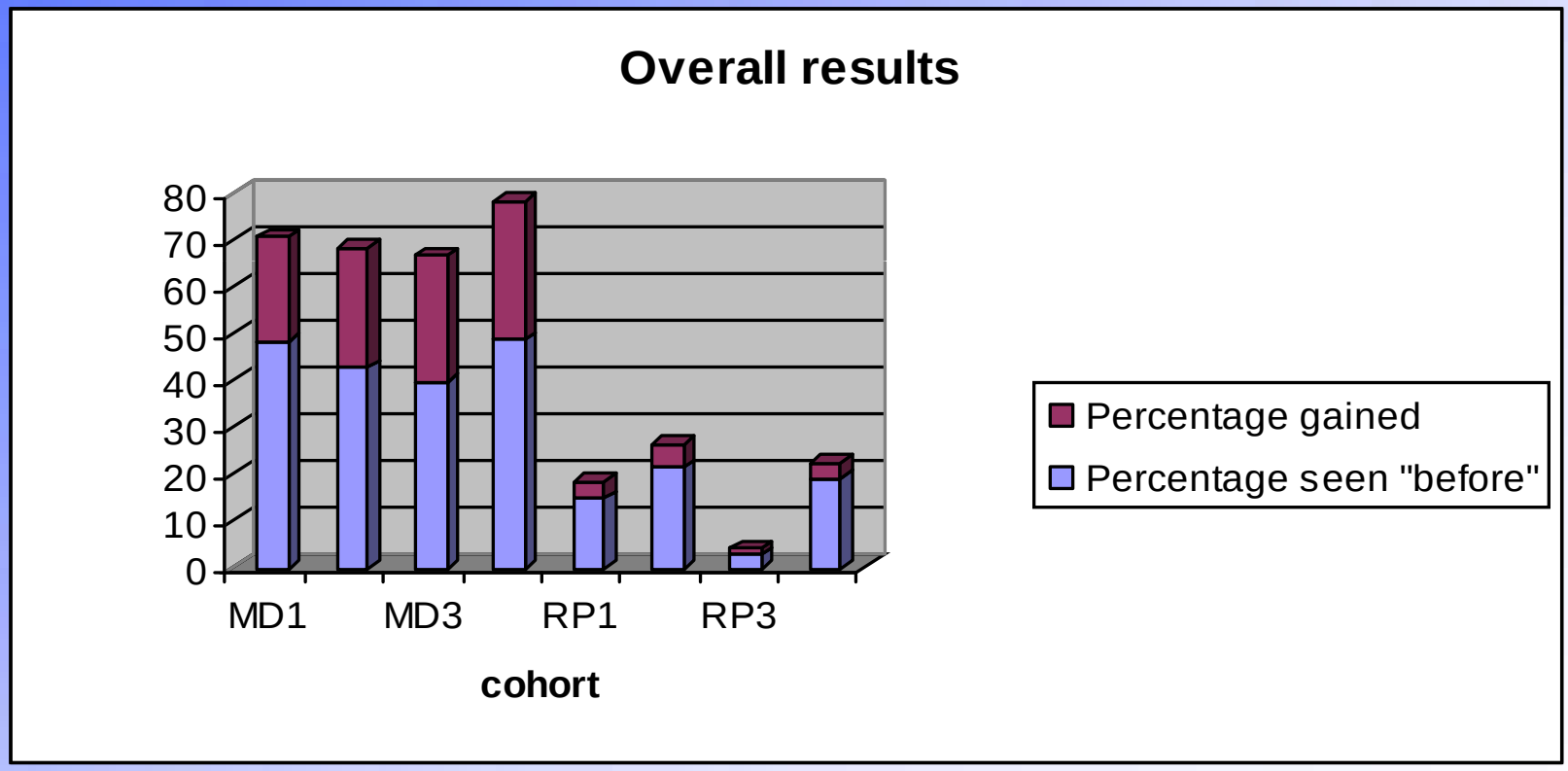
Application in macular degeneration







Results


Overall results
80
70
60
50
40
30
20
10
0
MD1
MD3
RP1
RP3
cohort
Percentage gained
Percentage seen "before"

INTRAVENOUS LASER BLOOD IRRADIATION IN SPORTS MEDICINE

MEDICALFUTURE

Materials and Methods

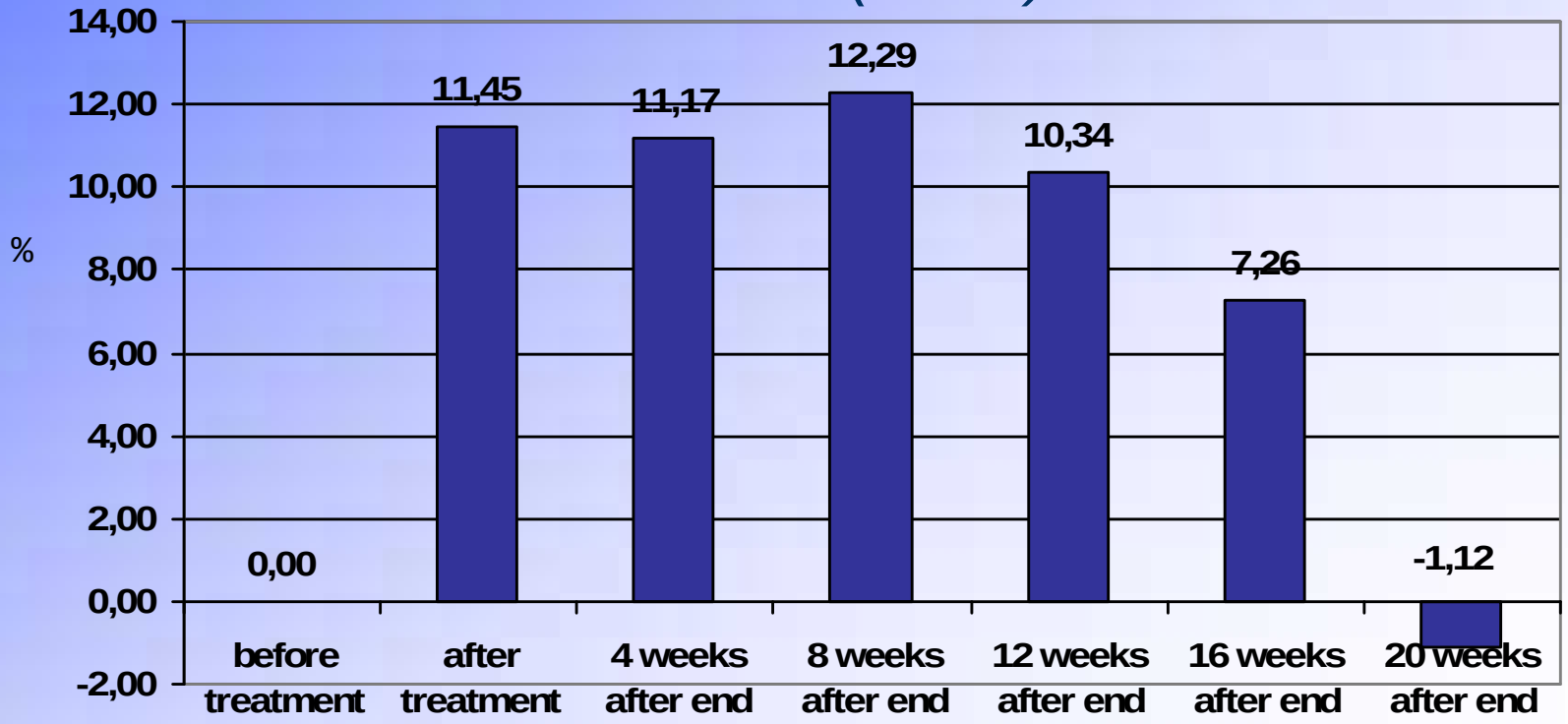
- **Definitions**
  - Maximum strength tests:
    1. Pectoral muscle maximum lifting power
       - » Weight is lift in supine position, while athlete lies on the bench
       - » Maximum weight has to be confirmed by 8 following lifting of sub-maximal weight (80% of maximum)

Results

Maximum strength tests:

Pectoral muscle maximum lifting power

% variation (mean)



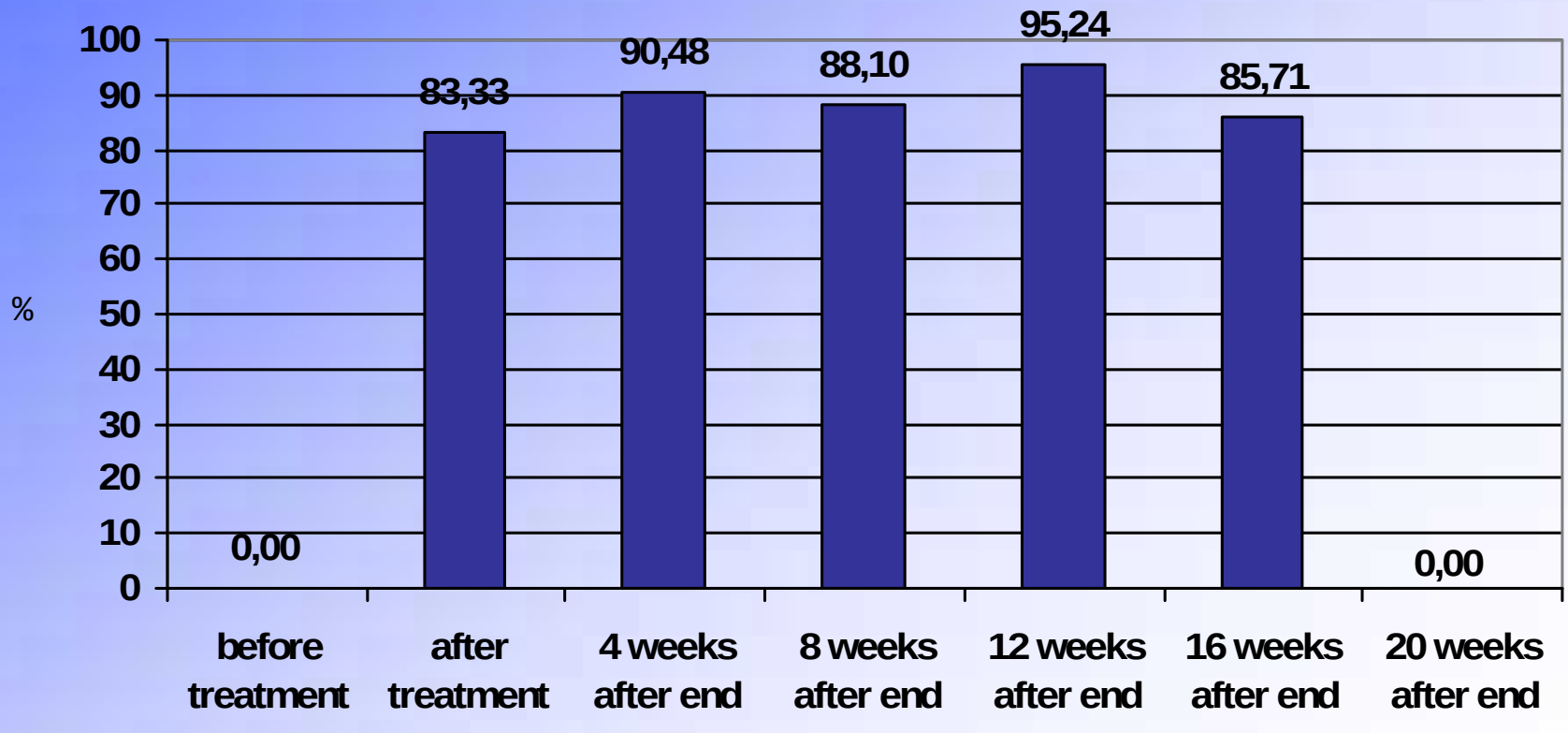
Materials and Methods

- **Definitions**
  - Endurance tests:
    1. Cord jumping time
       - » Is the maximum time that athlete could perform in cord jumping until he felt tired

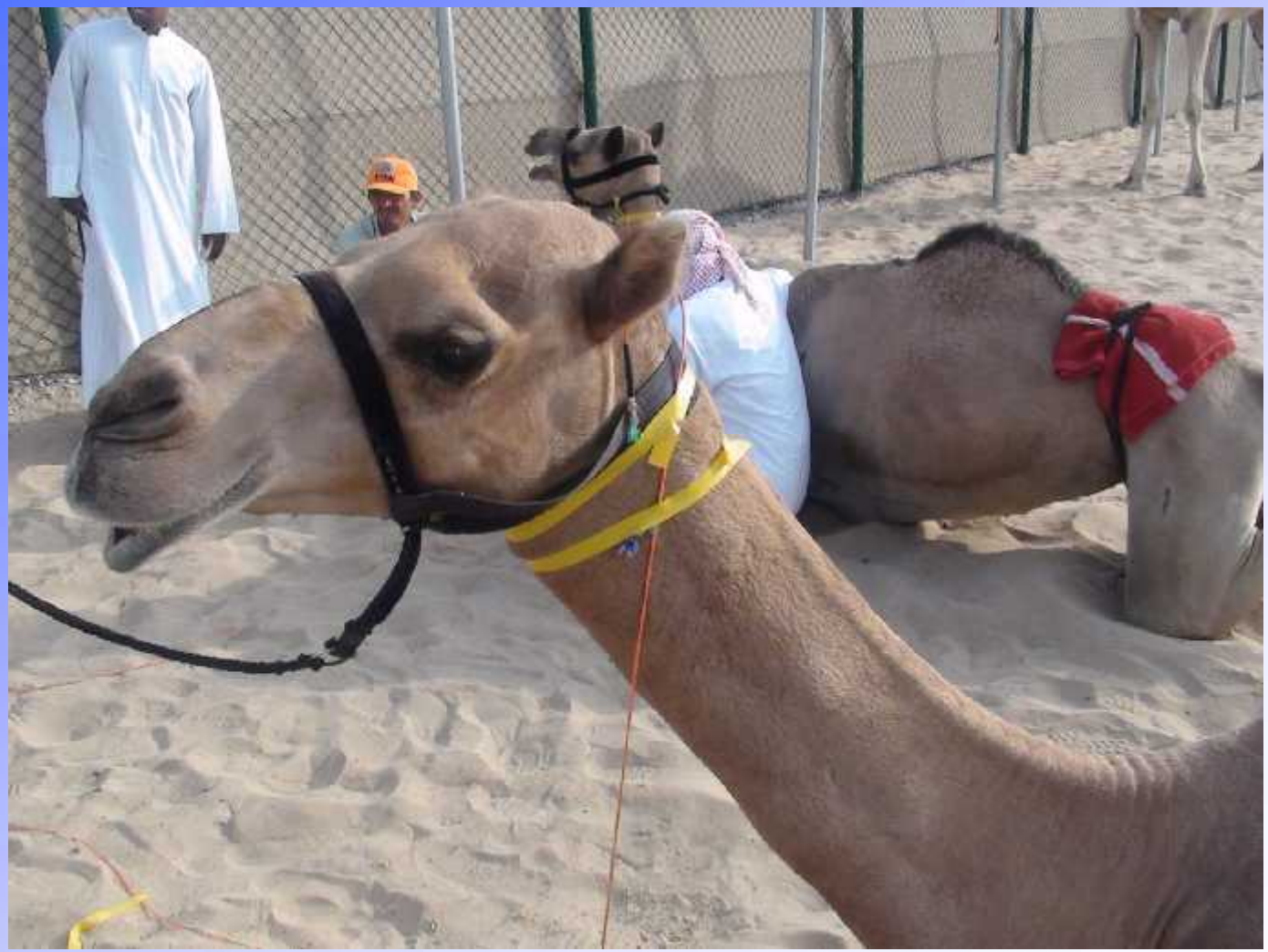
Results

Endurance tests:

Cord Jumping time % variation (mean)



Race camels in Dubai



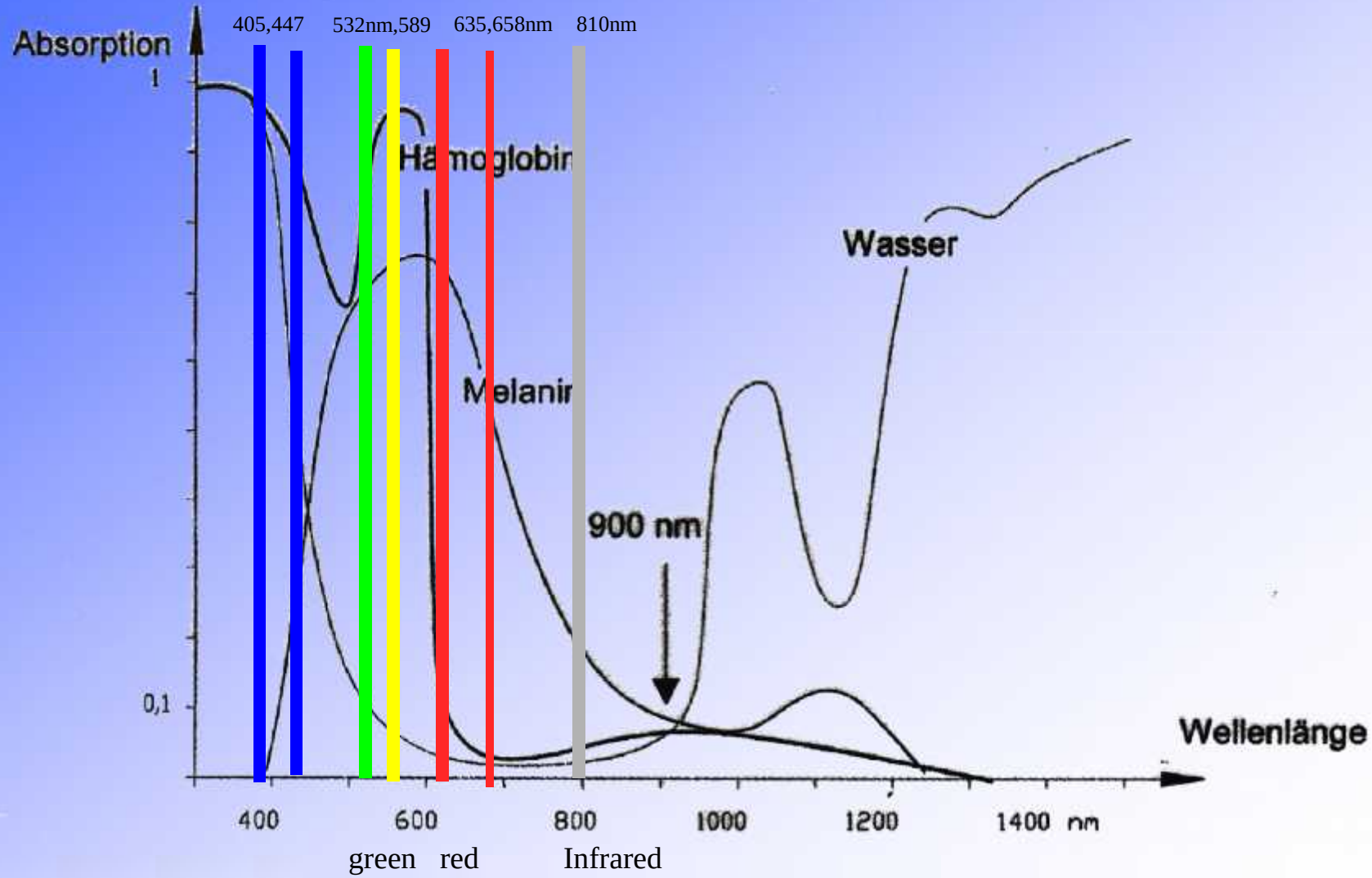
Endurance sport

Sheik Nasser, Prince of Bahrain

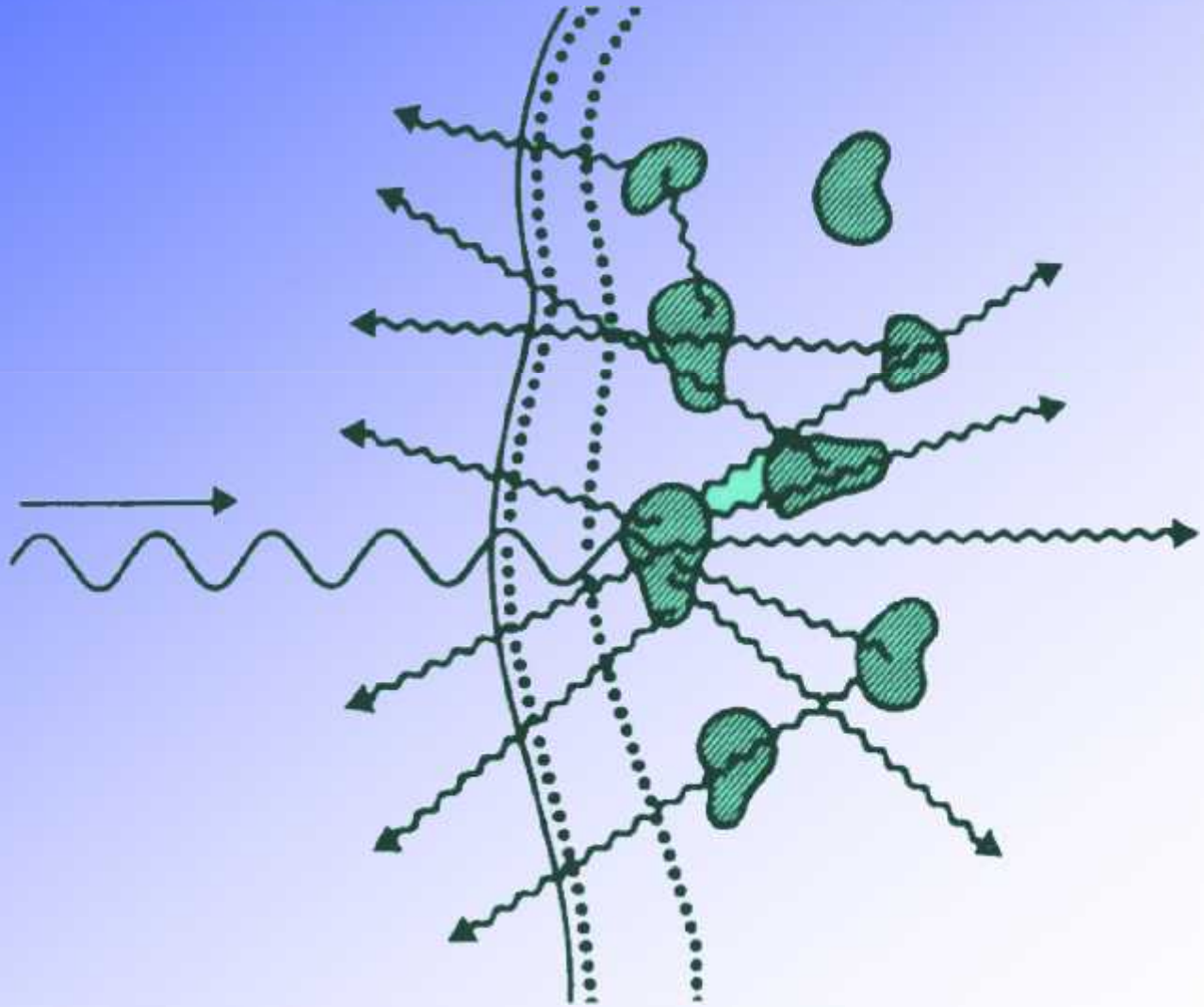
New Developments in Regenerative Medicine:

Interstitial laser therapy, PRP, Stem cells, intravenous laser and cosmetic laser therapy

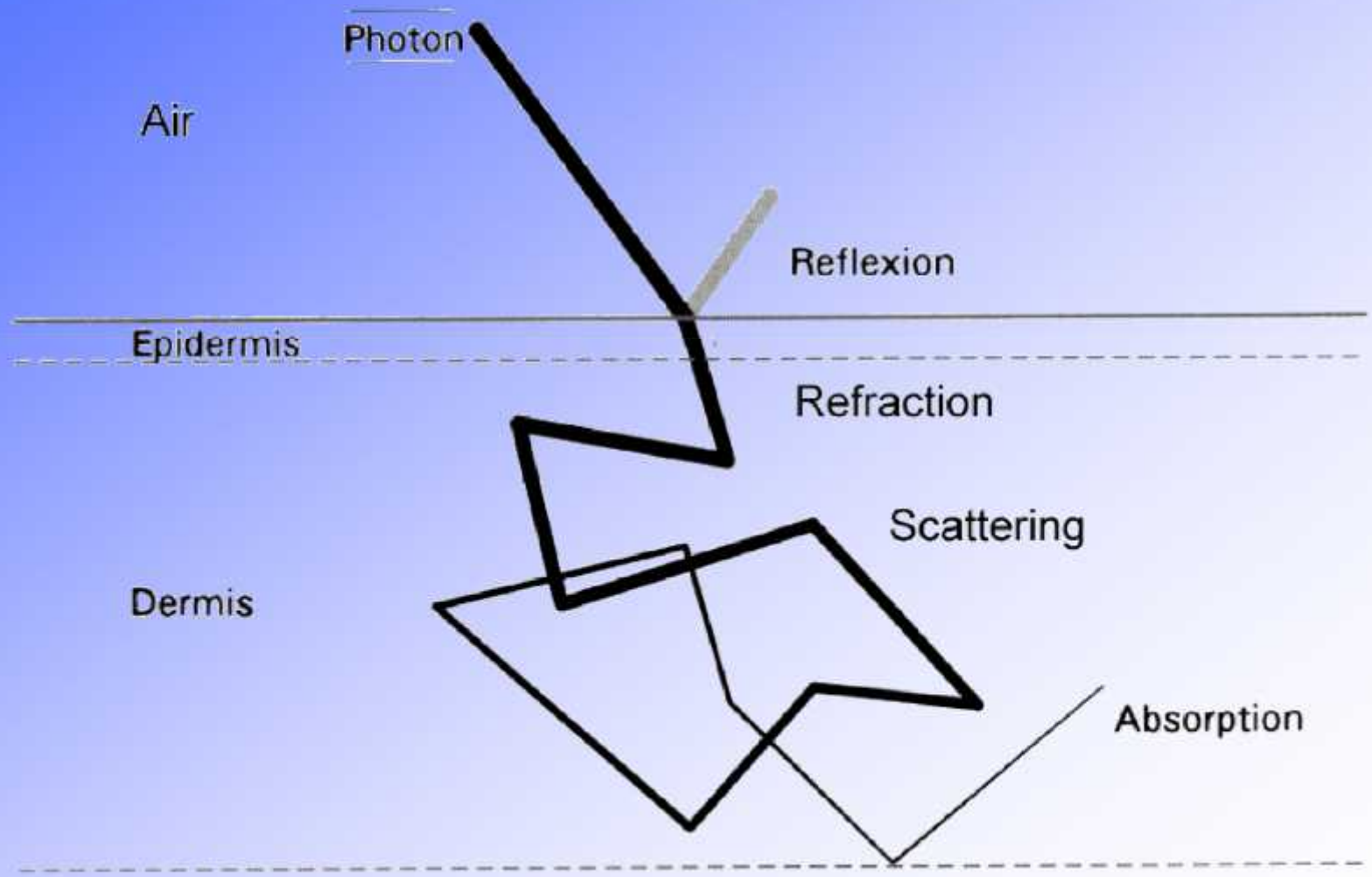
Absorption of laser light in biological tissue



The skin barrier

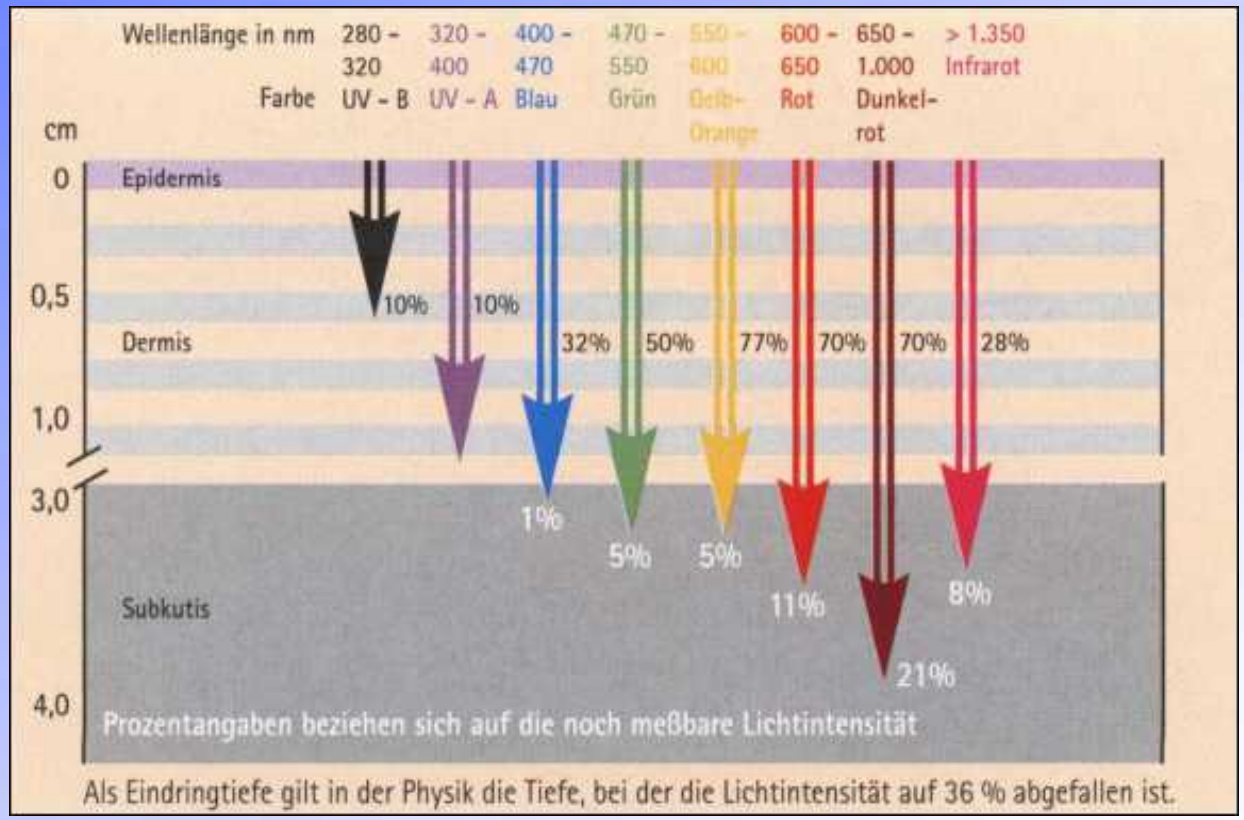


Disturbing effects of laser penetration in biological tissue

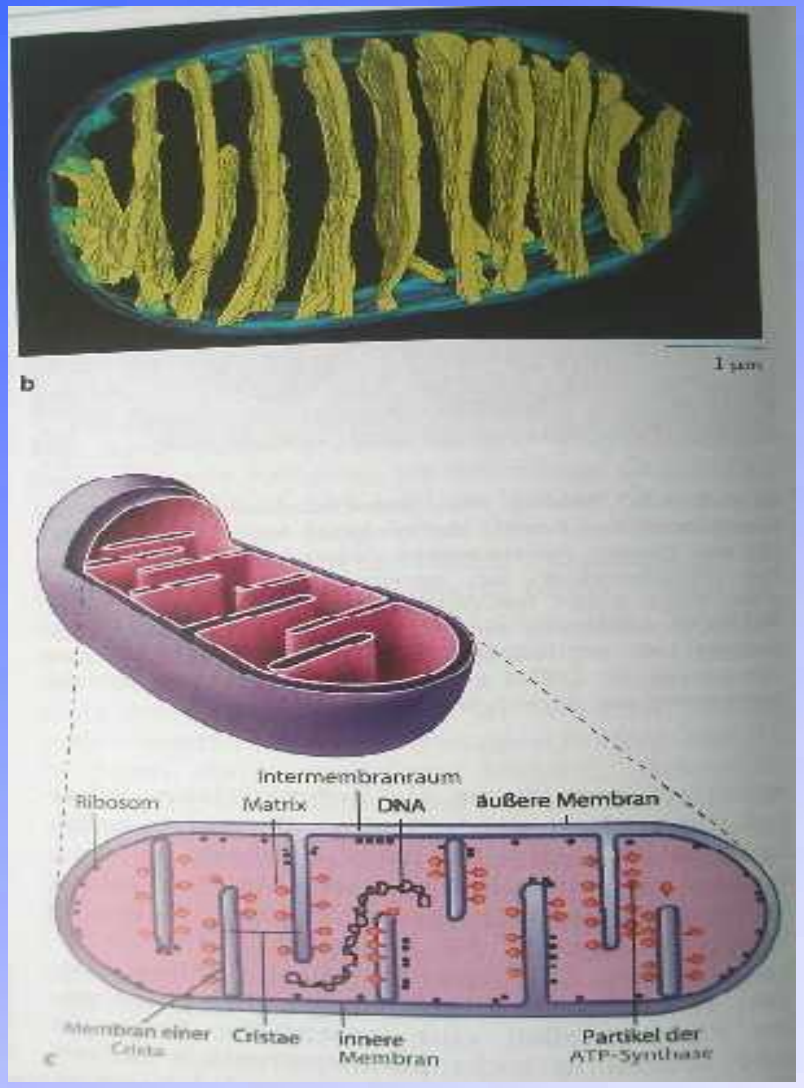


Optical penetration depth of different wavelengths

- *depends upon the wavelength*
- *Tissue penetration of blue laser very low, green laser ca. 5mm, red 3 cm, infrared 6 cm*



The structure of the mitochondria



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The structure of the mitochondria can be different in the special types of tissue cells.

In living cells mitochondria have a dynamic structure; this means that they can vary their structure and size. They are able to merge or to divide themselves.

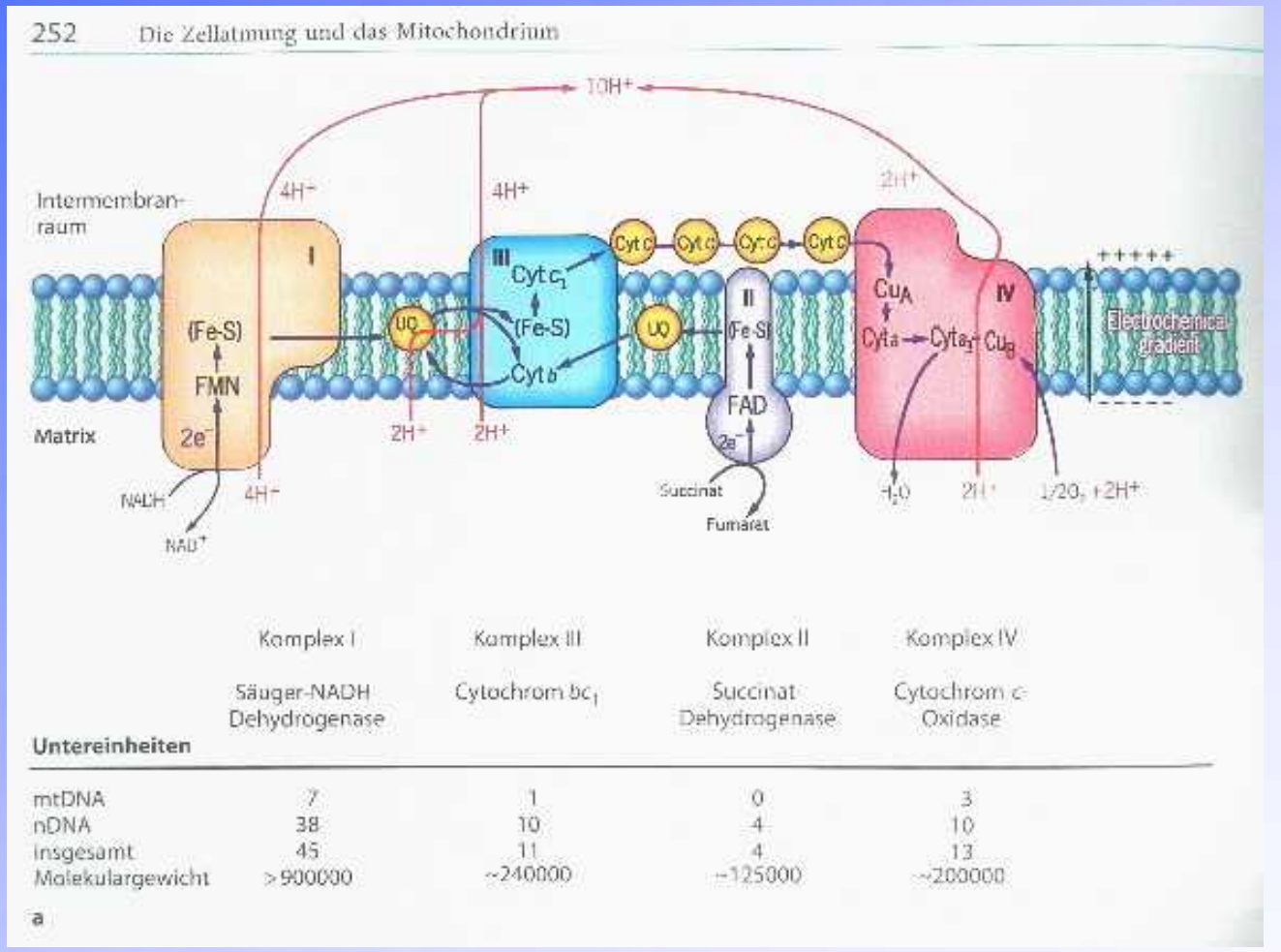
The mitochondria are making out about 10 – 15 % of the volume of a living cell.

Their main task is the production of ATP

The mitochondria have an inner and outer membrane.

In the inner room of the mitochondria we can find the christae, formed by double layer membranes, where the respiratory chain is located and the production of ATP.

The respiratory chain in the mitochondria

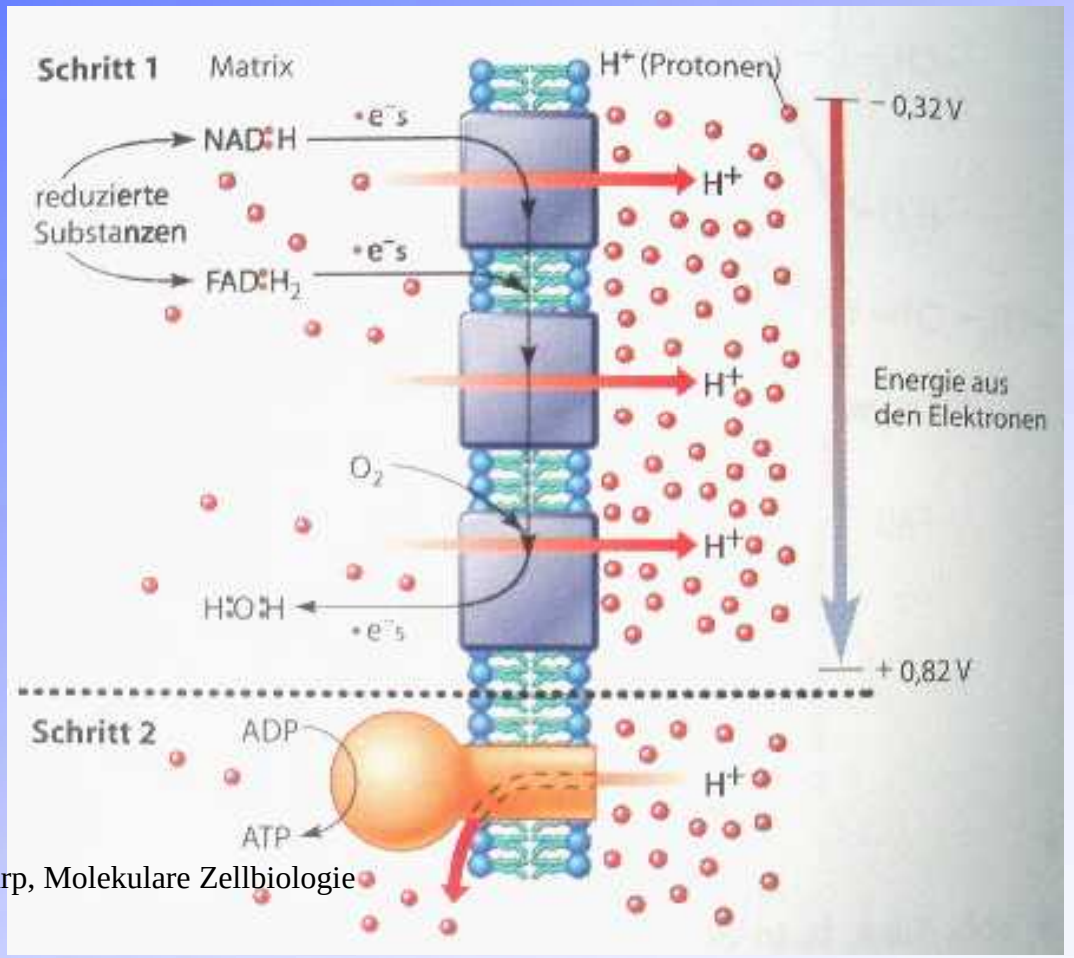


	Komplex I	Komplex III	Komplex II	Komplex IV
	Säuger-NADH Dehydrogenase	Cytochrom bc_1	Succinat Dehydrogenase	Cytochrom c-Oxidase
Untereinheiten				
mtDNA	7	1	0	3
nDNA	38	10	4	10
insgesamt	45	11	4	13
Molekulargewicht	>900000	~240000	~125000	~200000

a

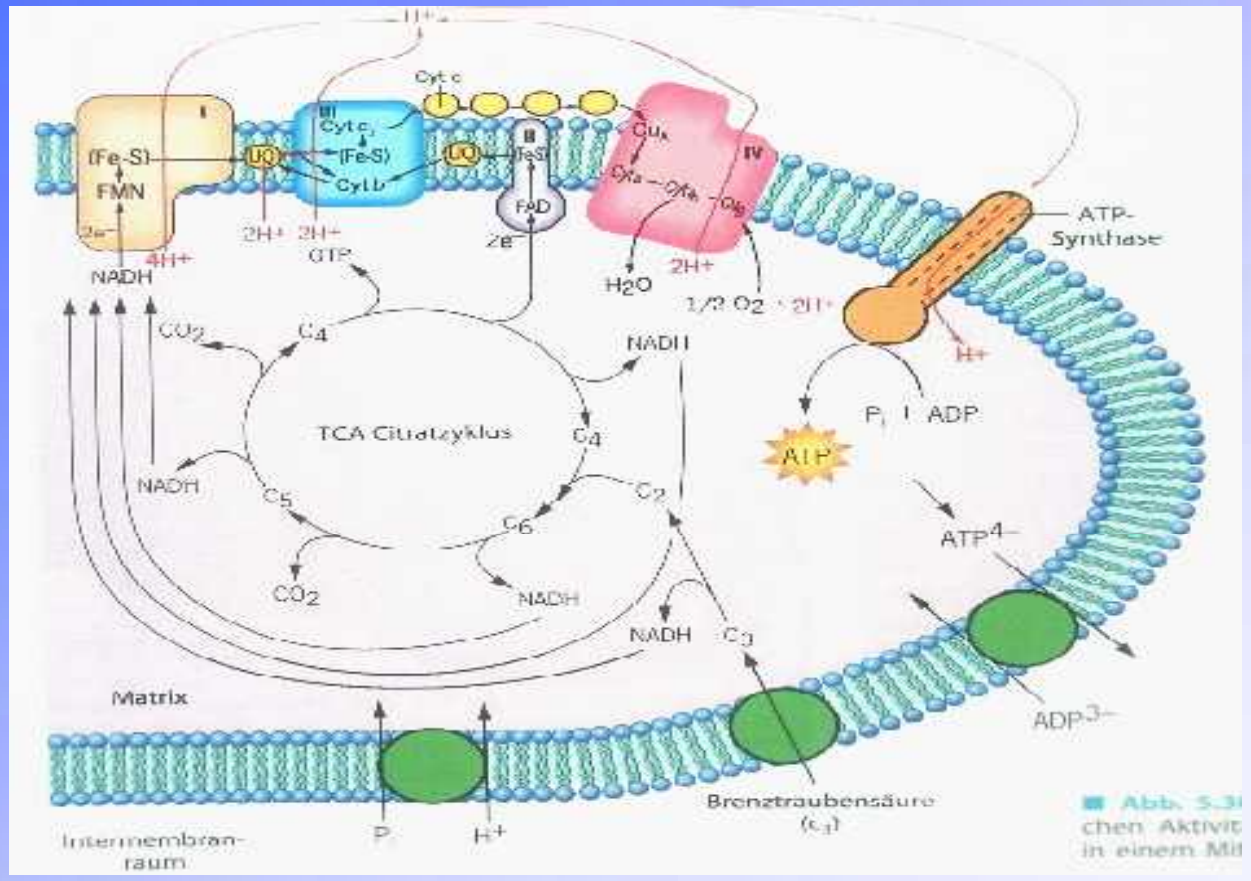
Karp, Molekulare Zellbiologie

The respiratory chain in the mitochondria



Karp, Molekulare Zellbiologie

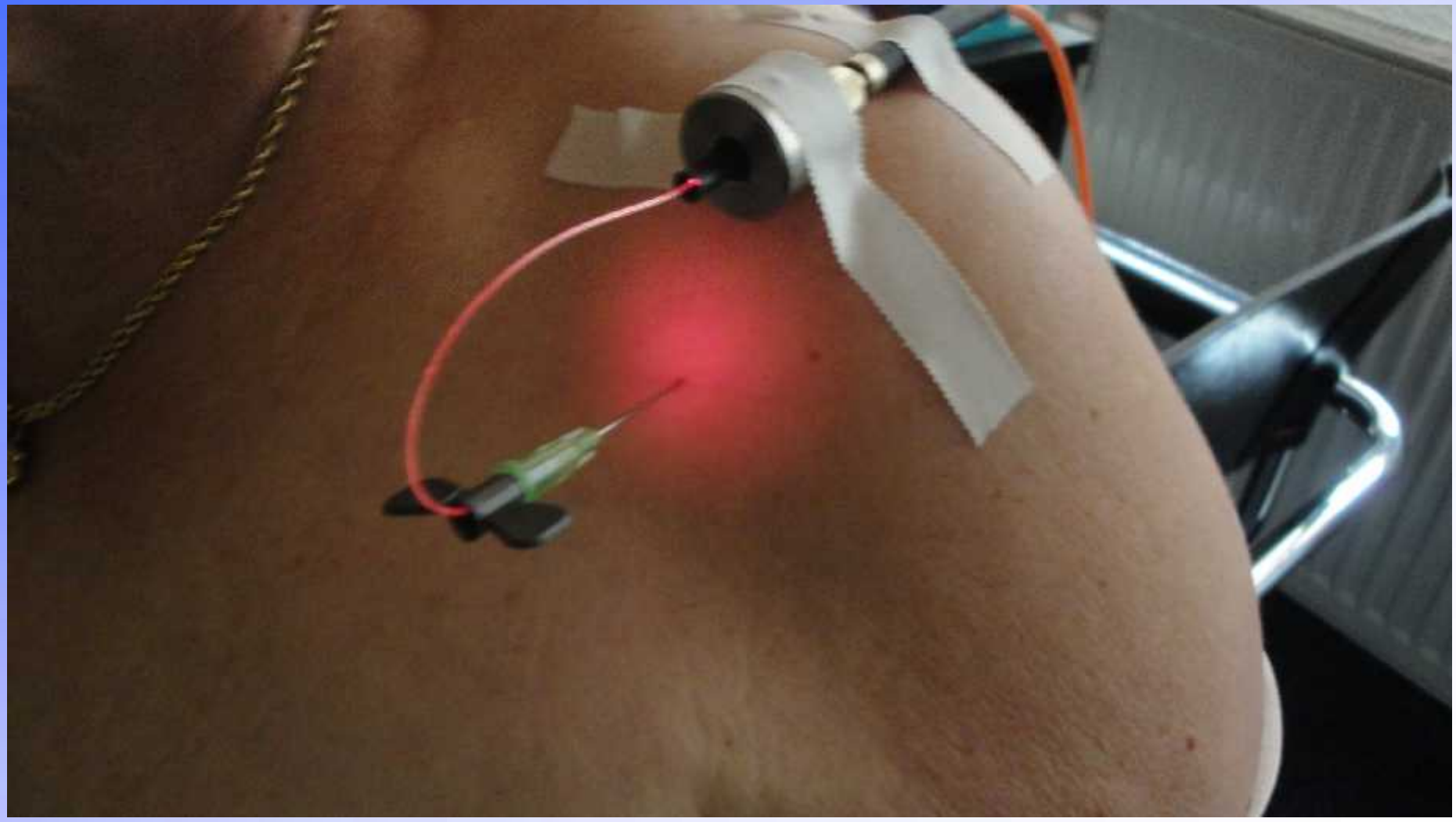
The respiratory chain in the mitochondria



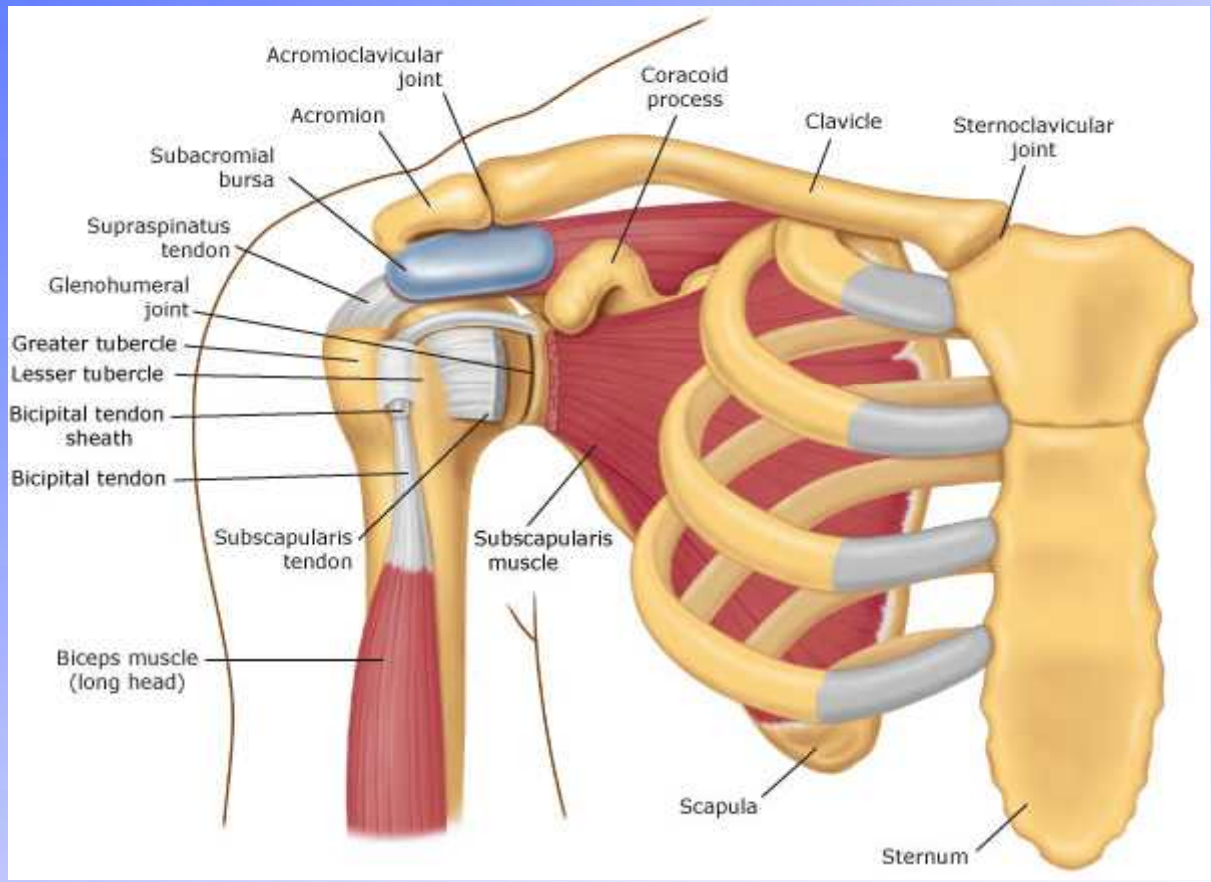
In figure 13 we find the processes of energy production in the mitochondria.

We should remember again that with the blue laser we will stimulate the starter complex NADH-dehydrogenase and with the red and infrared laser the end-complex cytochrome-c-oxydase.

The intraarticular laser therapy



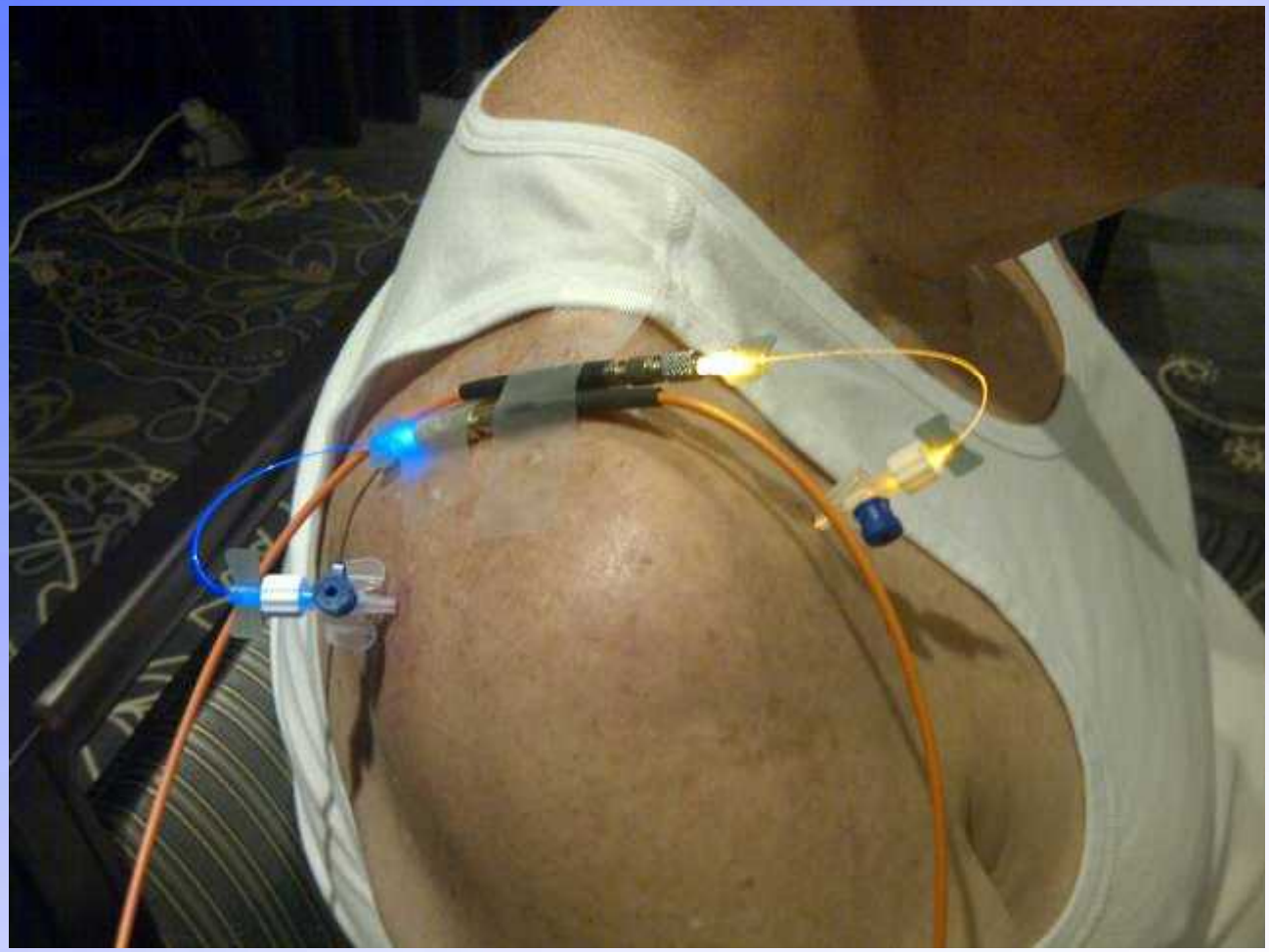
The anatomy of the shoulder



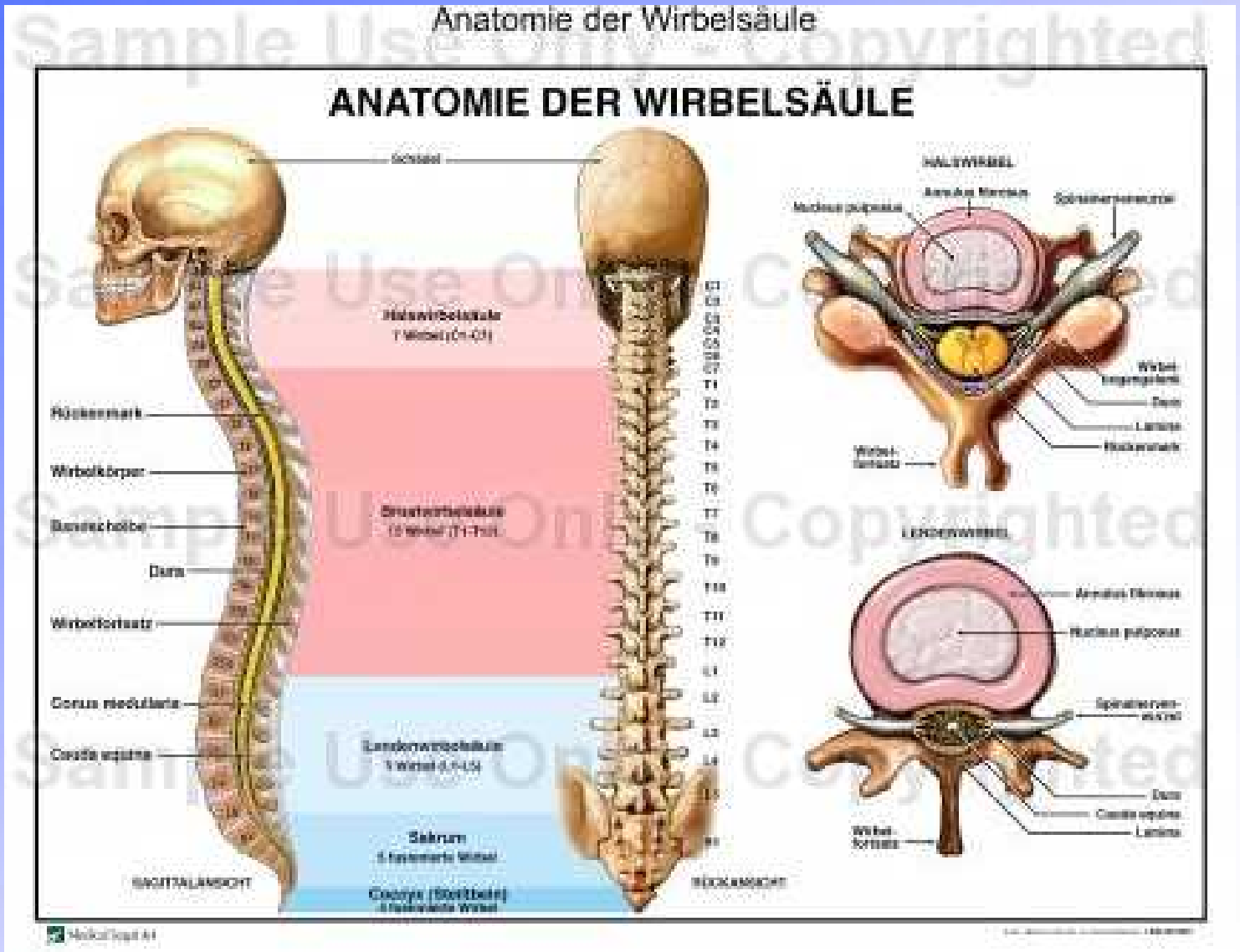
Shoulder syndrome

Shoulder syndrome

Intraarticular laser therapy



Interstital laser therapy for spine syndromes



Interstitial laser therapy for spine syndromes

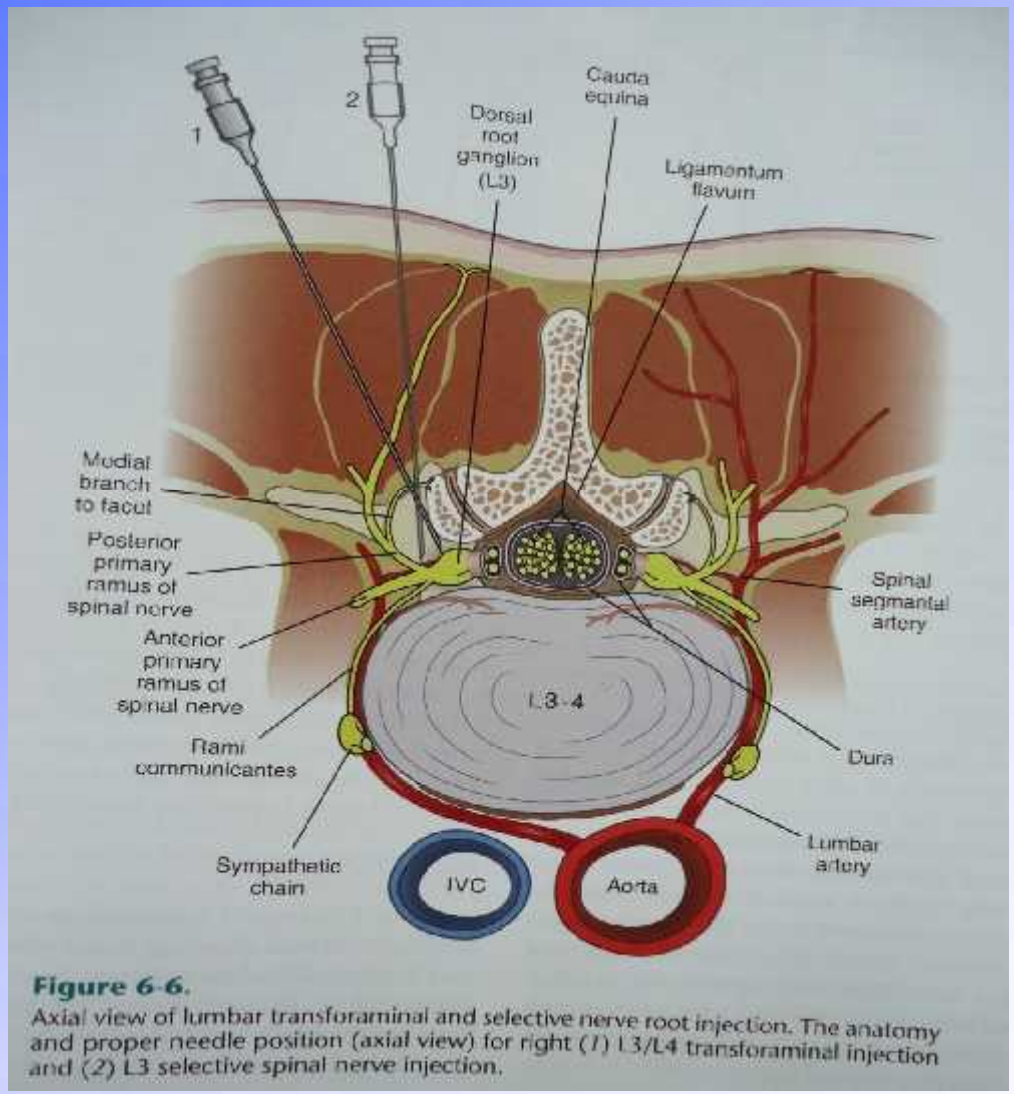


Figure 6-6.
Axial view of lumbar transforaminal and selective nerve root injection. The anatomy and proper needle position (axial view) for right (*1*) L3/L4 transforaminal injection and (*2*) L3 selective spinal nerve injection.

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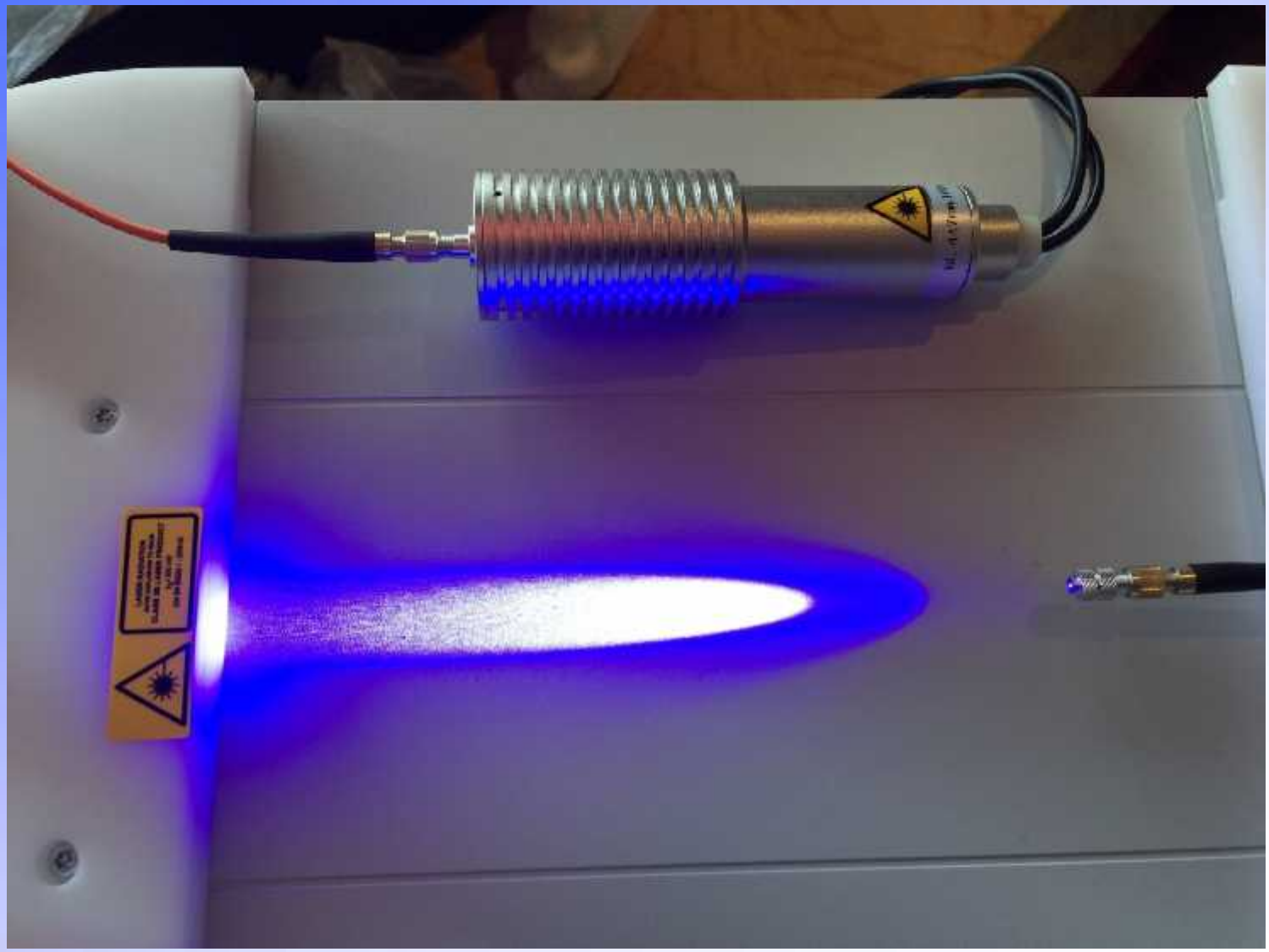
Step 1:
Local anaesthesia

NaCl for improvement of beam spreading

Interstitial fiberoptic canula (4,5,8,10,12 cm)

New blue laser 447 nm



Blue laser increases nitric oxide (NO)

- J Cell Sci. 2006 Jul 15;119(Pt 14):2855-62.

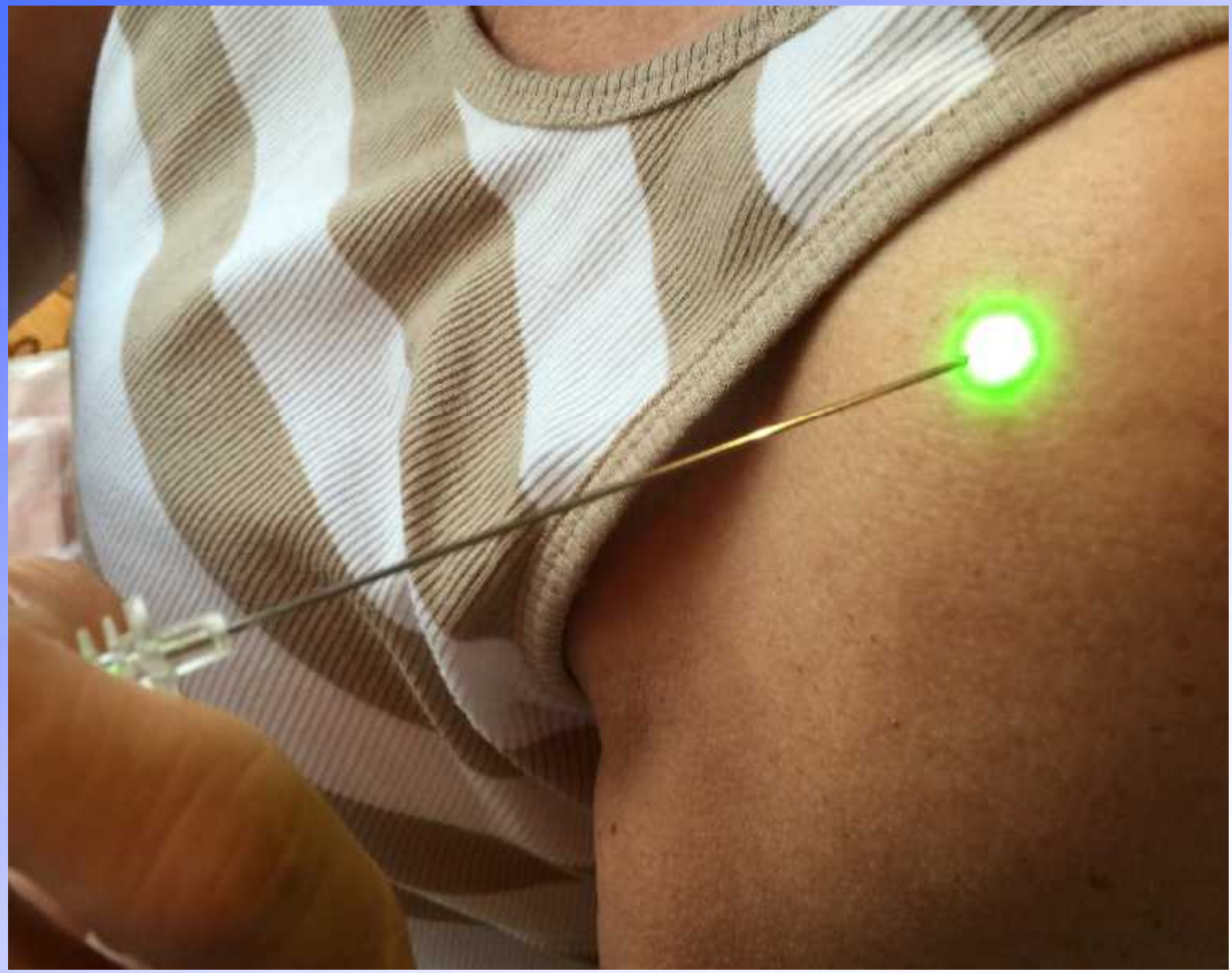
  Nitric oxide and mitochondrial biogenesis.

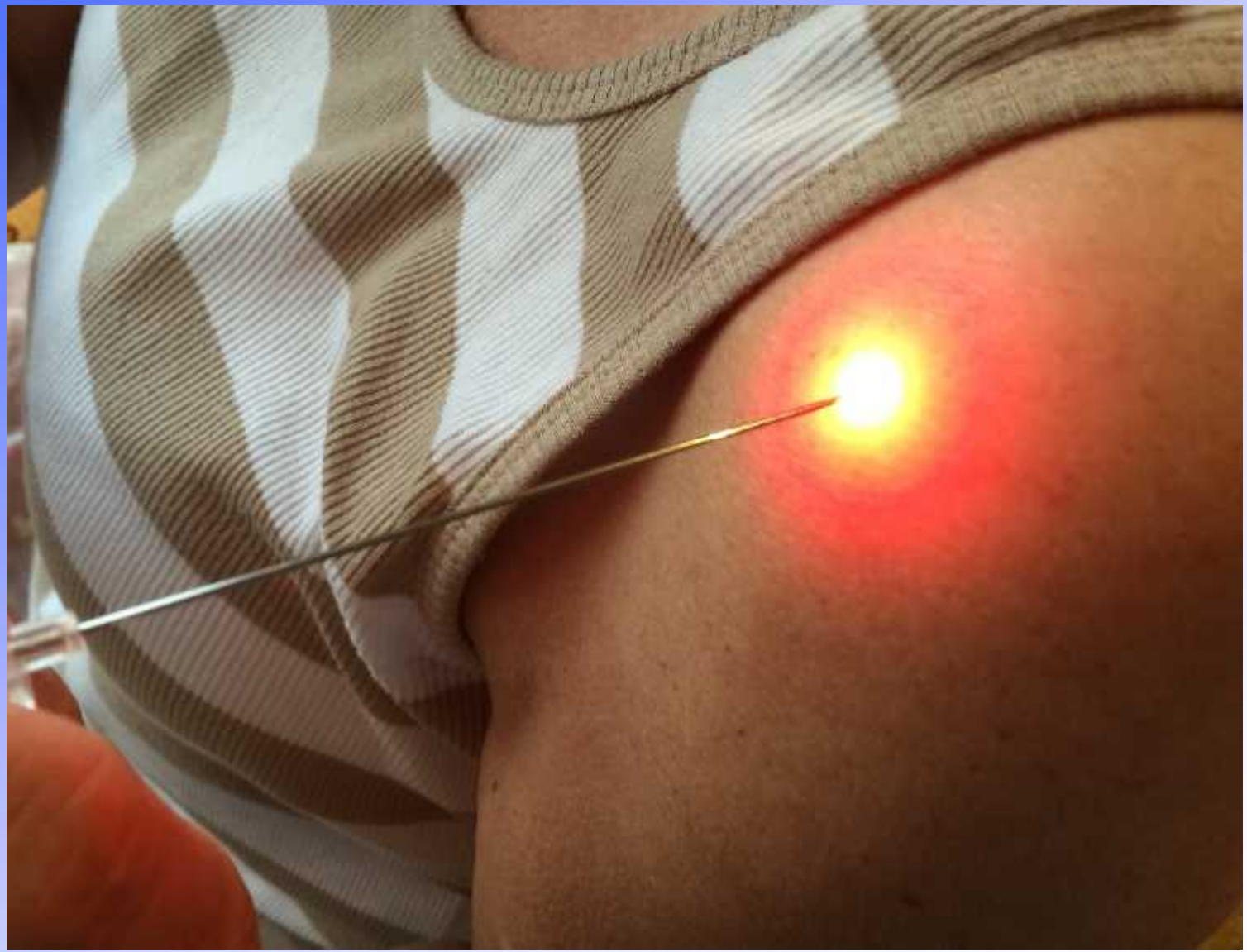
Chronic, smaller increases in NO levels stimulate mitochondrial biogenesis in diverse cell types

Blue laser increases nitric oxide (NO)

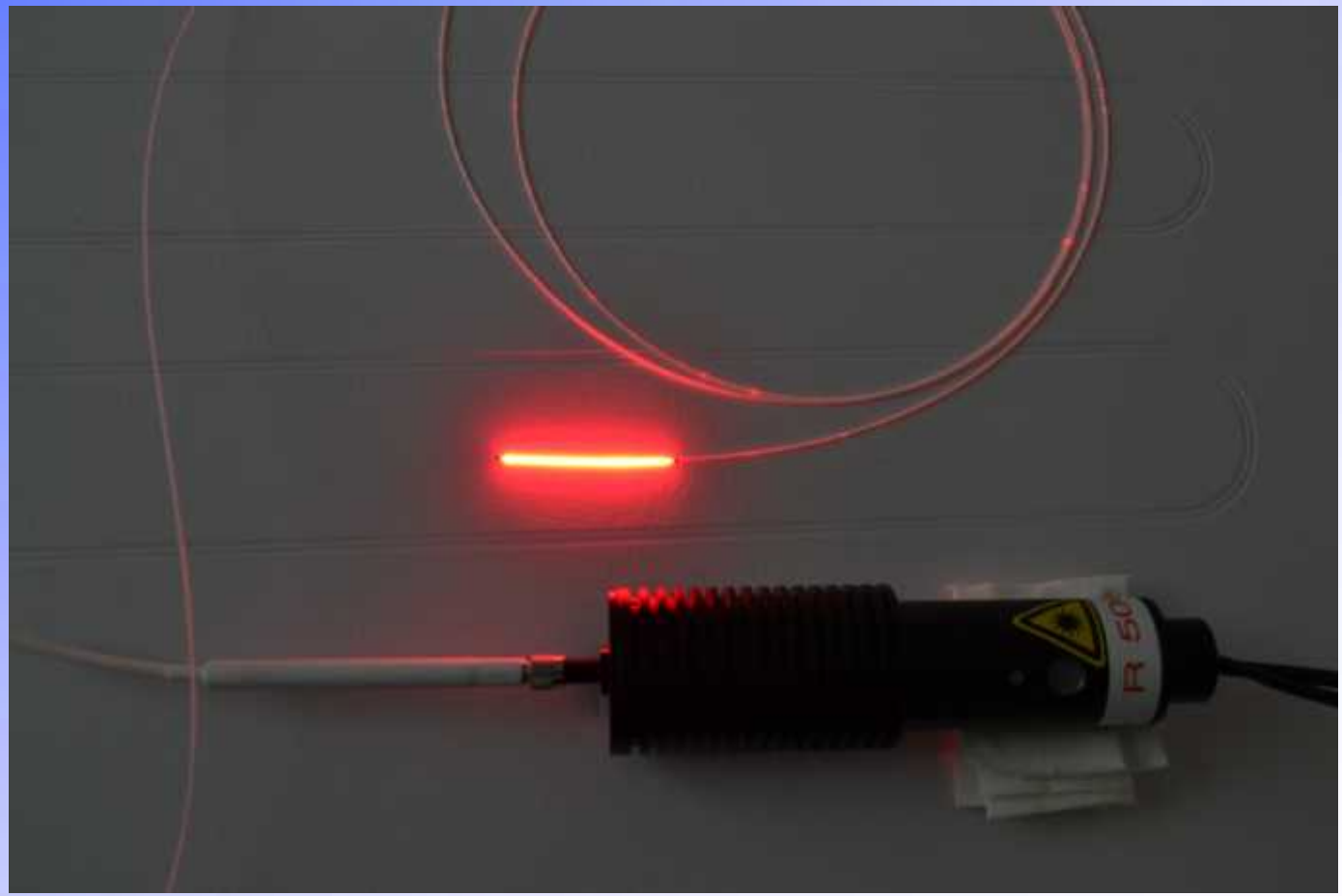
- Emerging evidence suggests that increasing nitric oxide (NO) bioavailability or endothelial NO synthase (eNOS) activity activates telomerase and delays endothelial cell senescence.

J Cell Sc. 2006 Jul 15;119(Pt 14):2855-62.

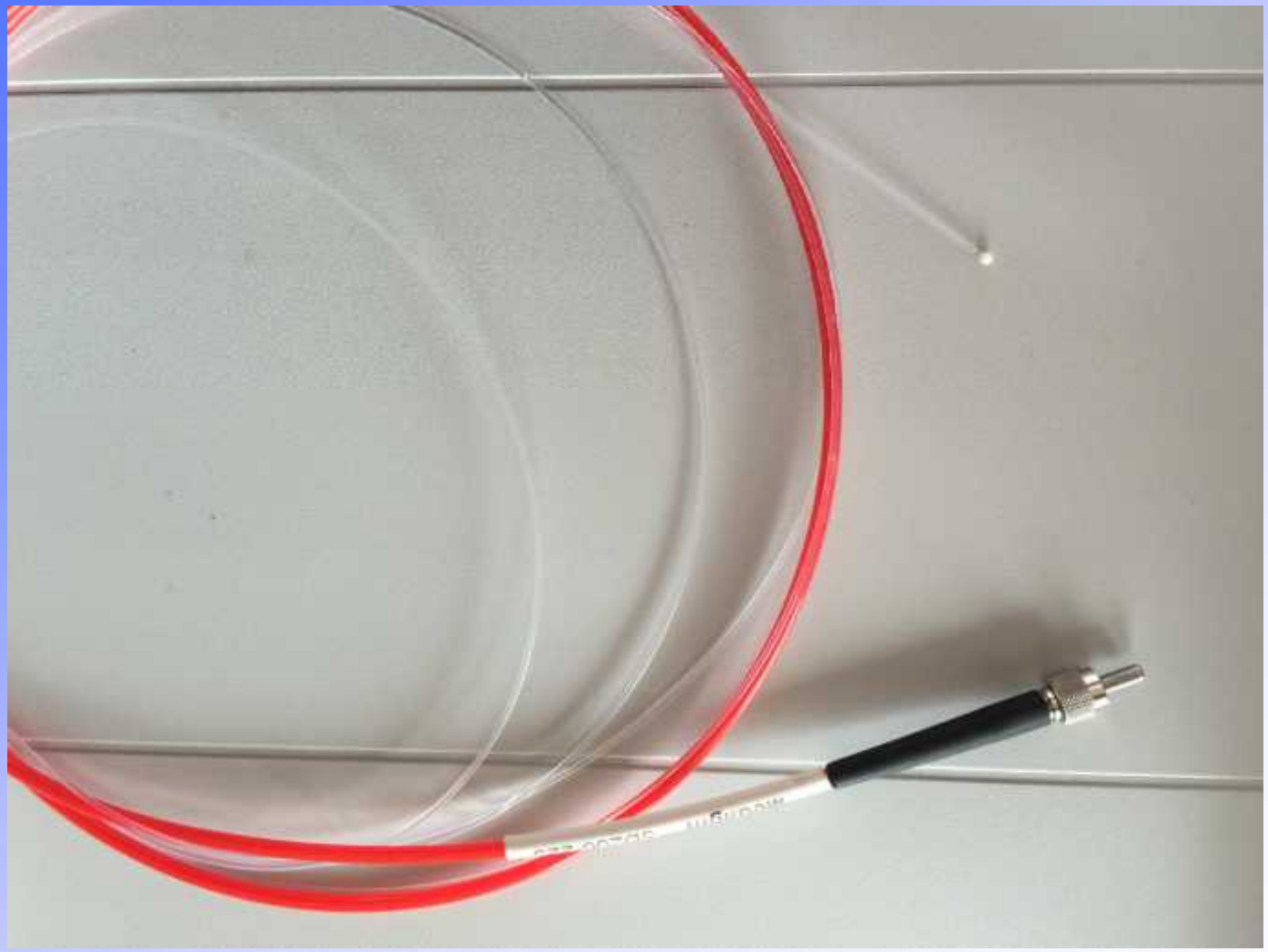


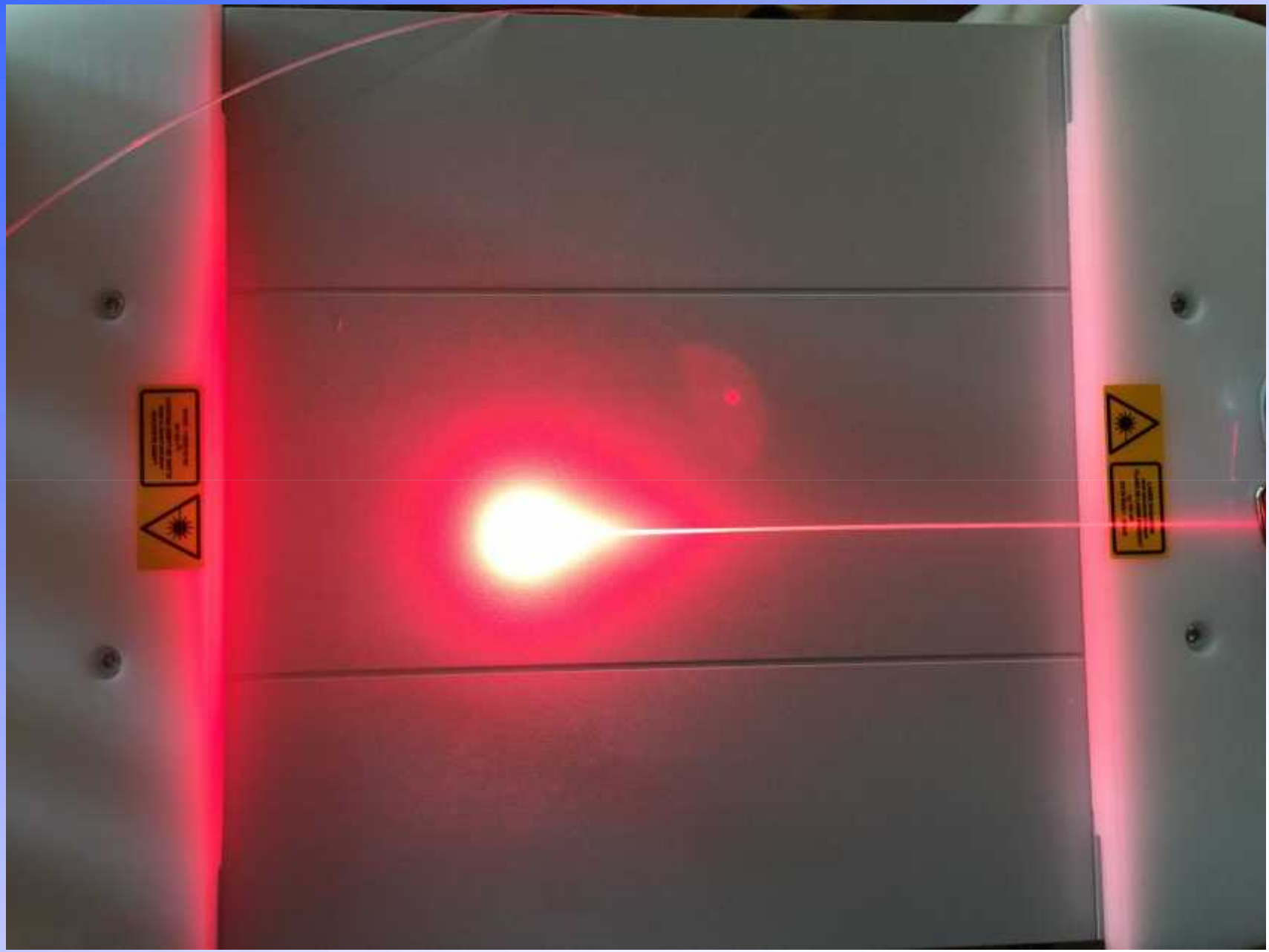


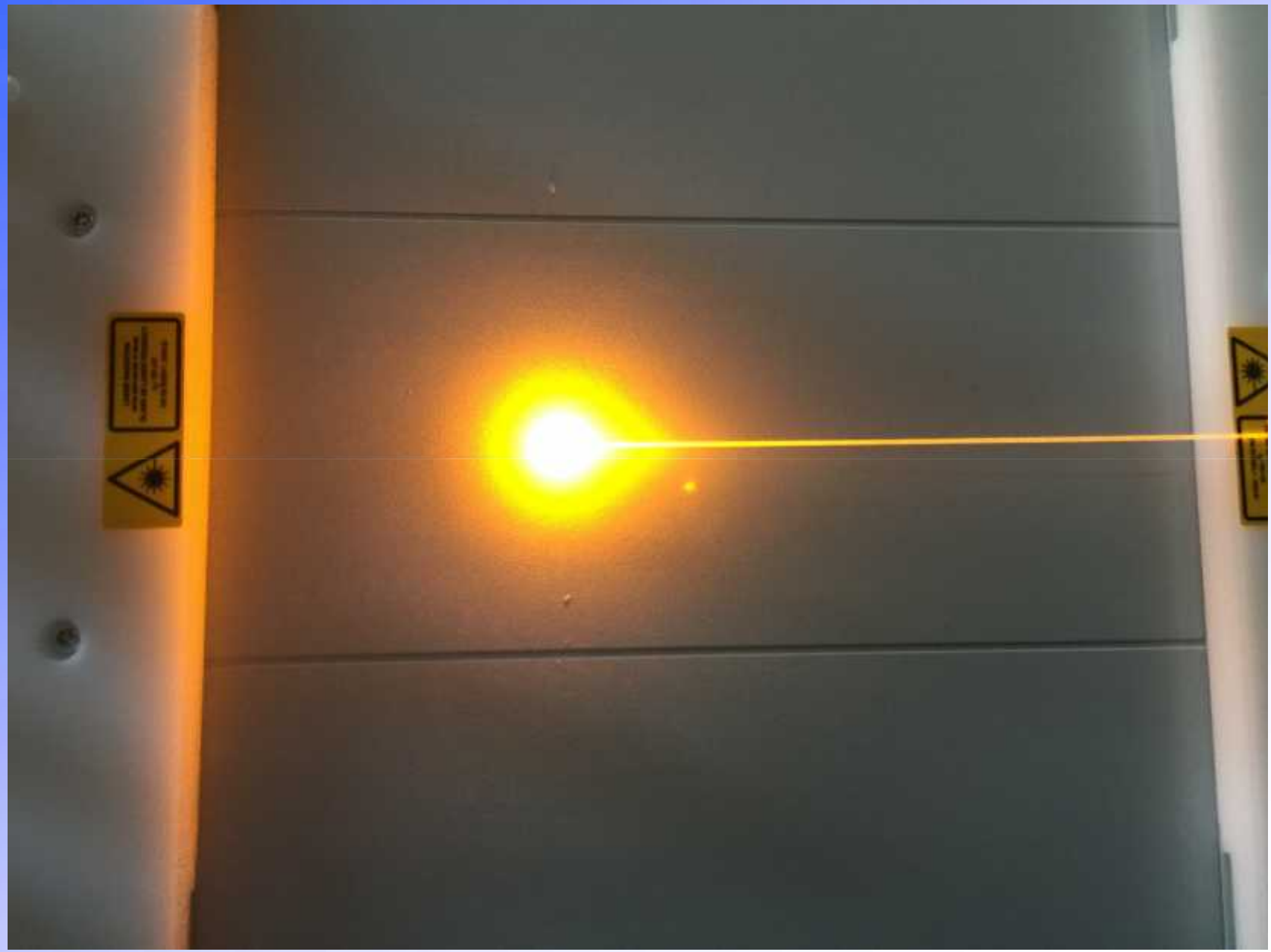
Sterile fiberoptics with circualr irradiation

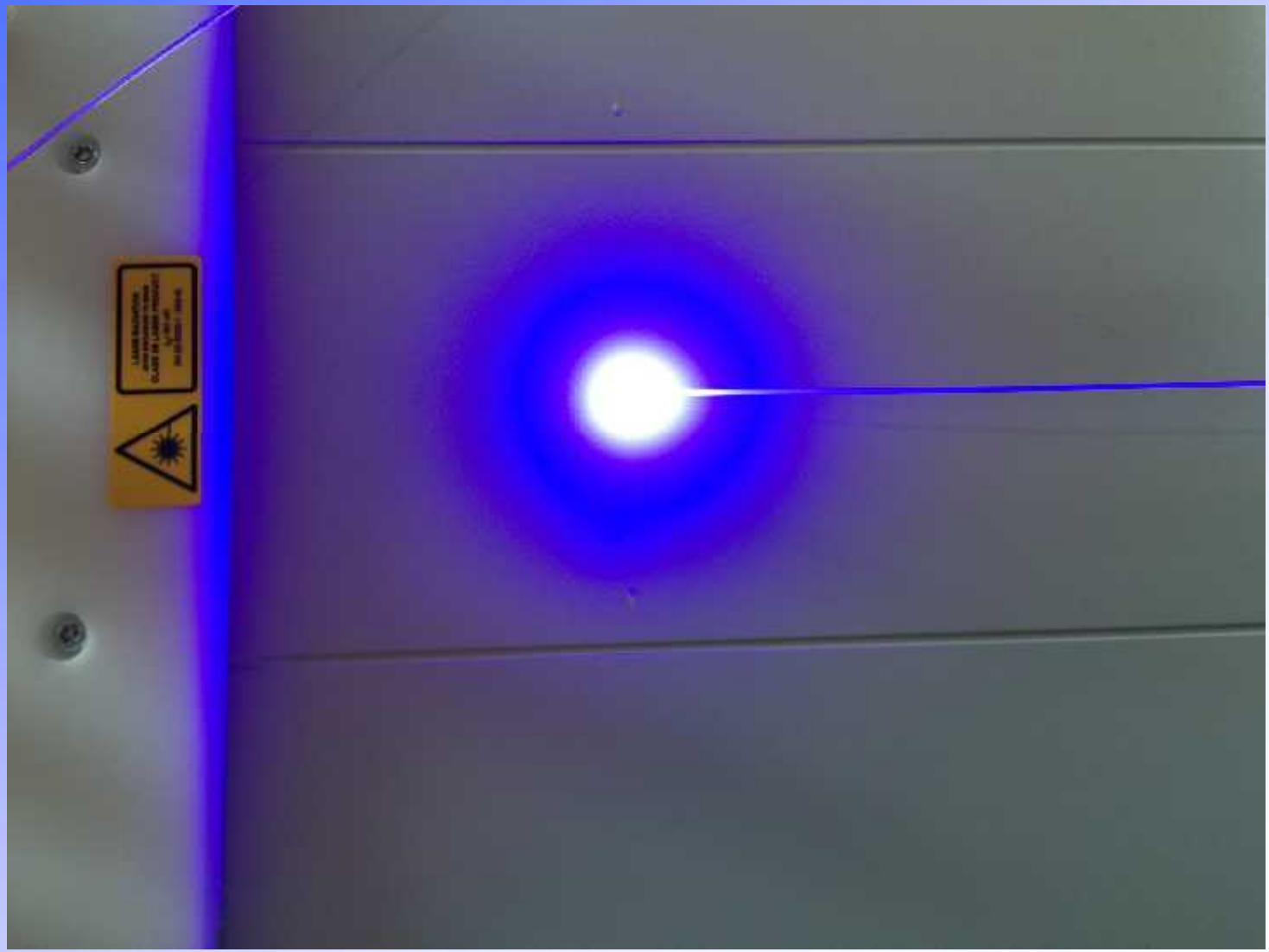


Sterile fiberoptics with spheric irradiation

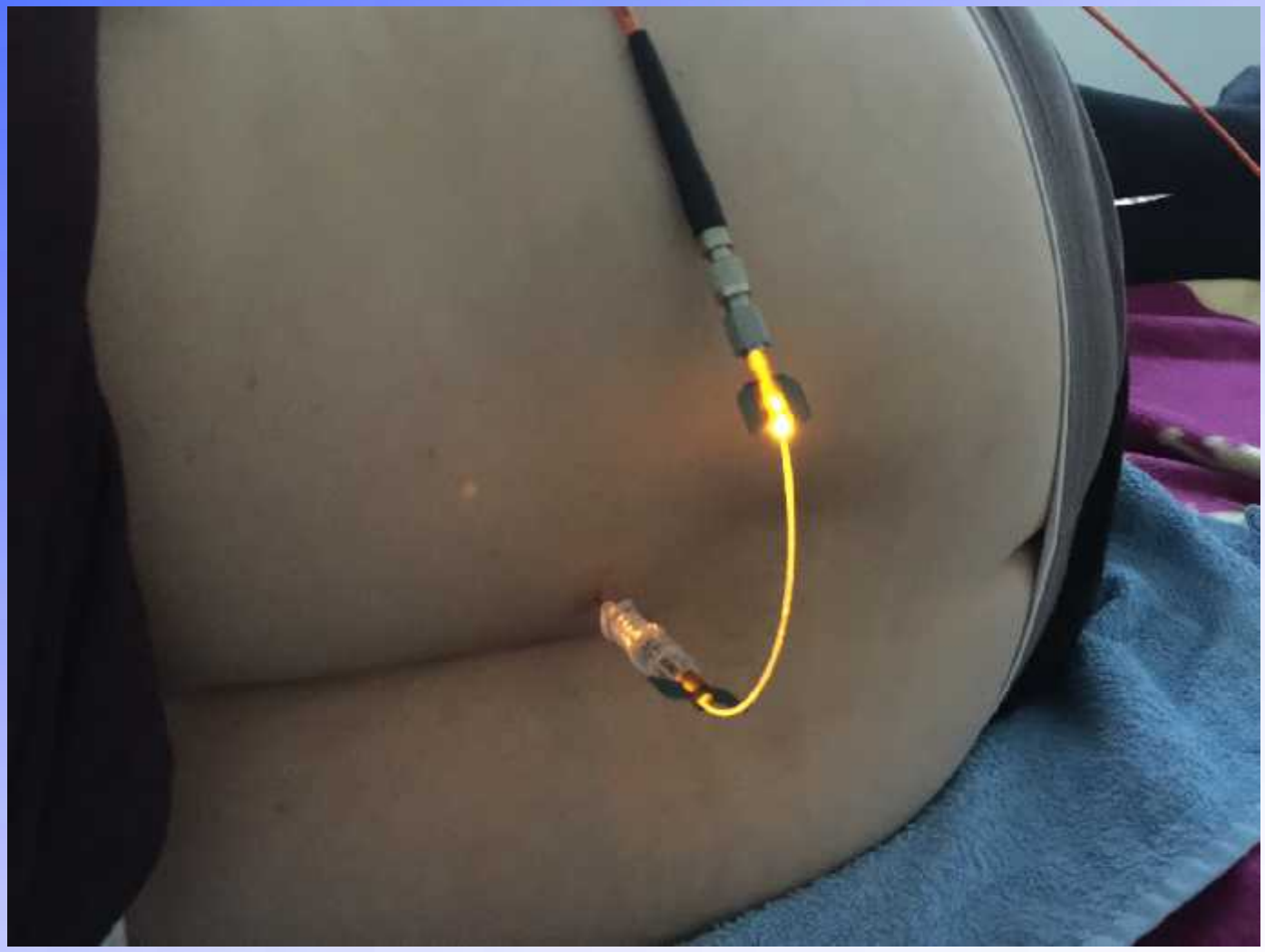






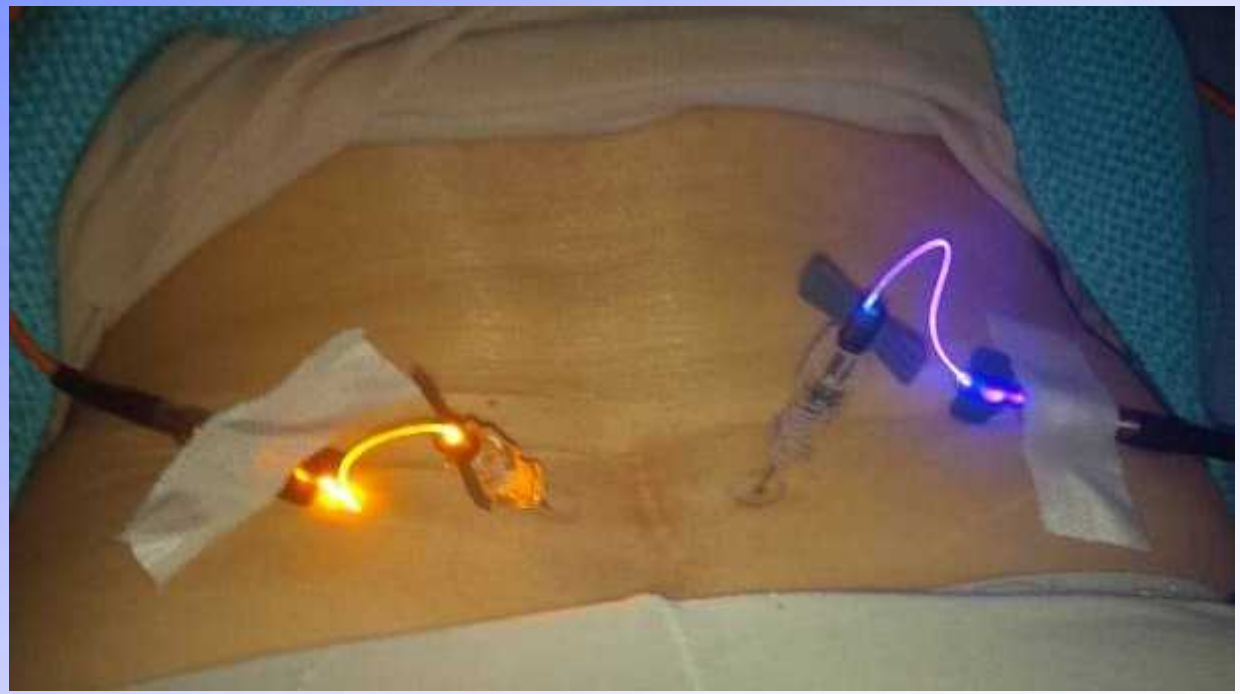


Step 3:
Inserted catheter for interstitial laser therapy



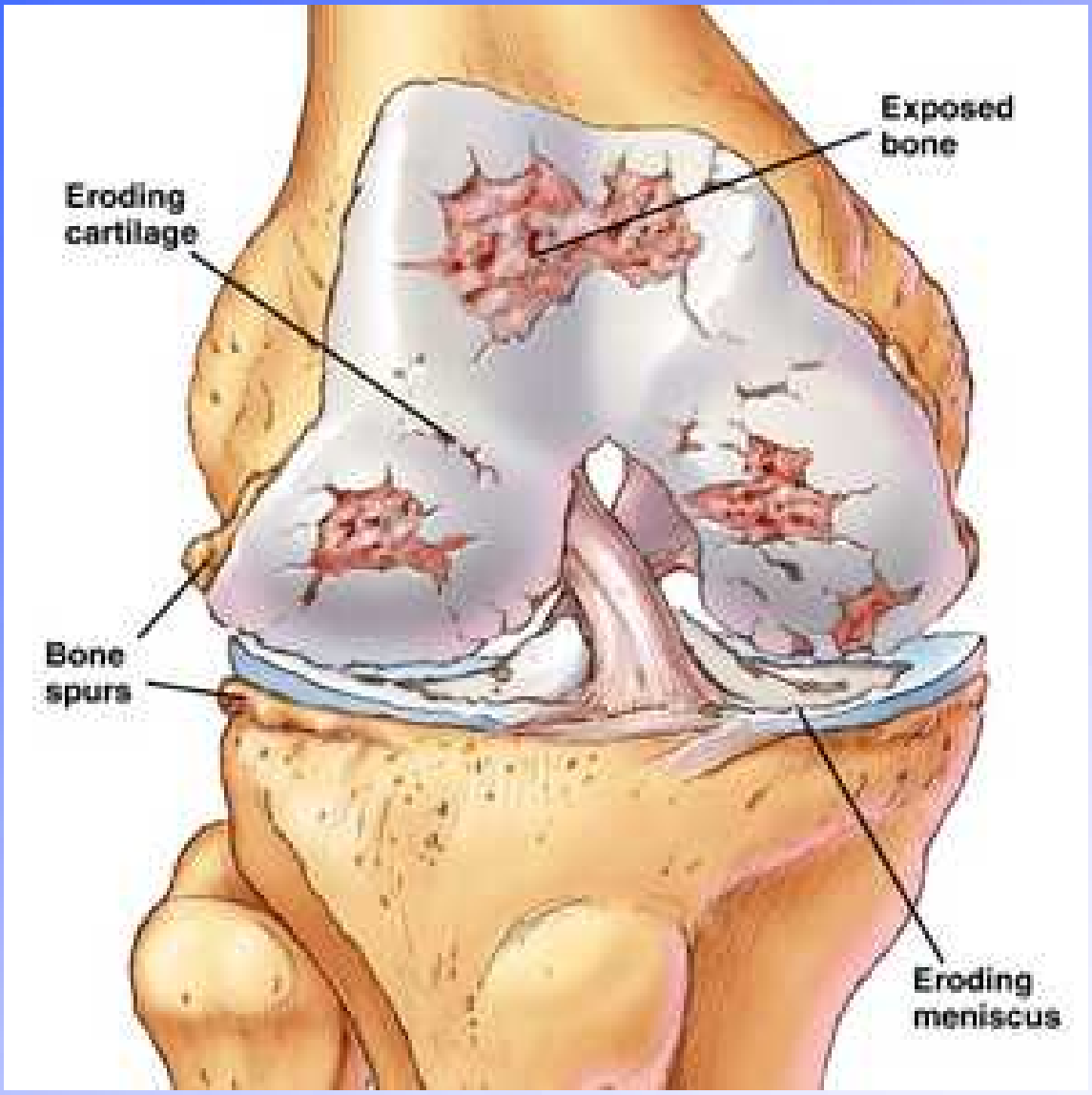
Interstitial laser application

- Blue and yellow laser
- Cooling effect
- Antiinflammatory effect



Spinal interstitial laser therapy

The intraarticular laser therapy for knee osteoartrits



OA is a disease of joints that affects all of the weight-bearing components of the joint:

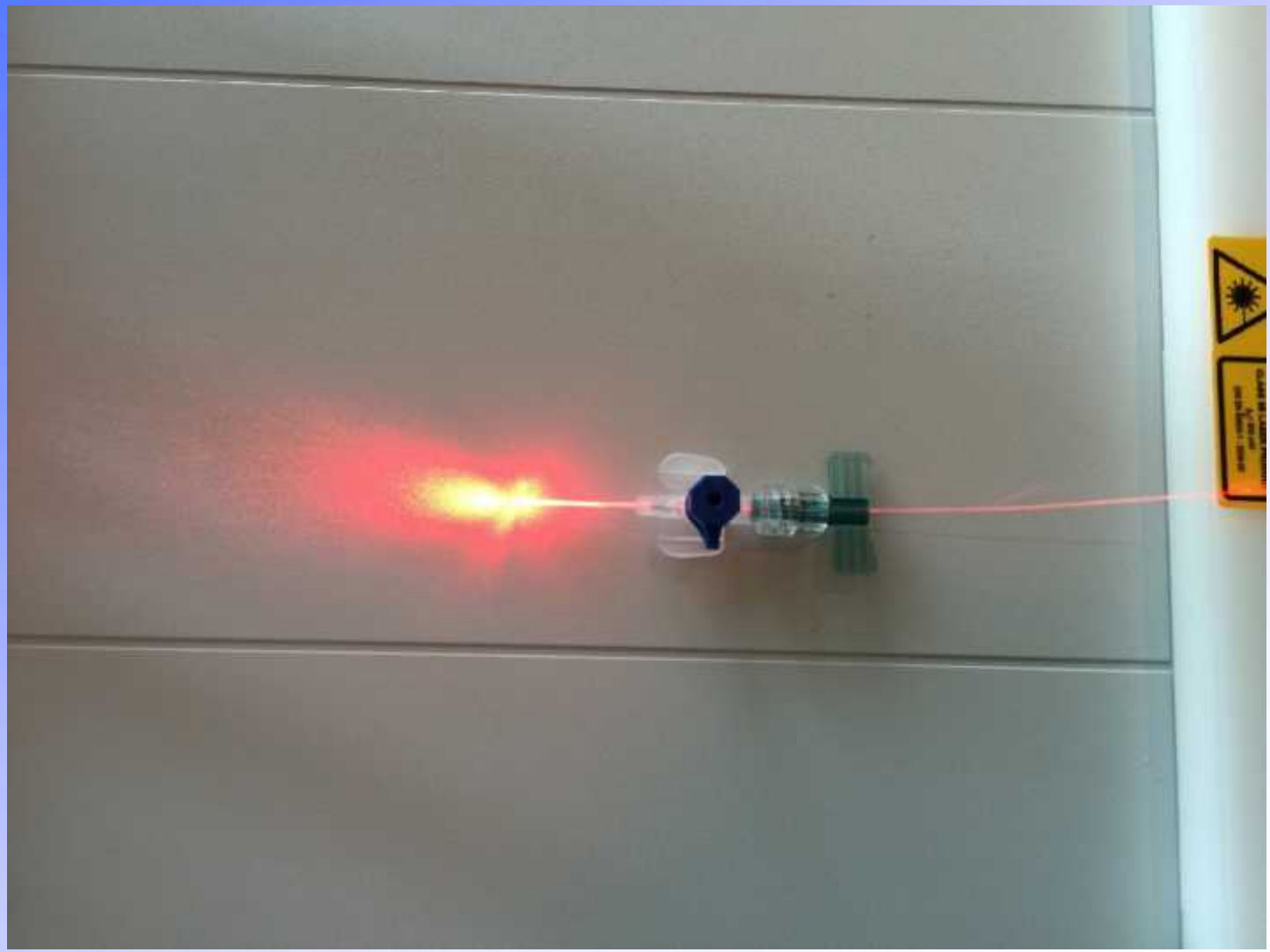
- Articular cartilage
- Menisci
- Bone

Advanced knee osteoarthrits

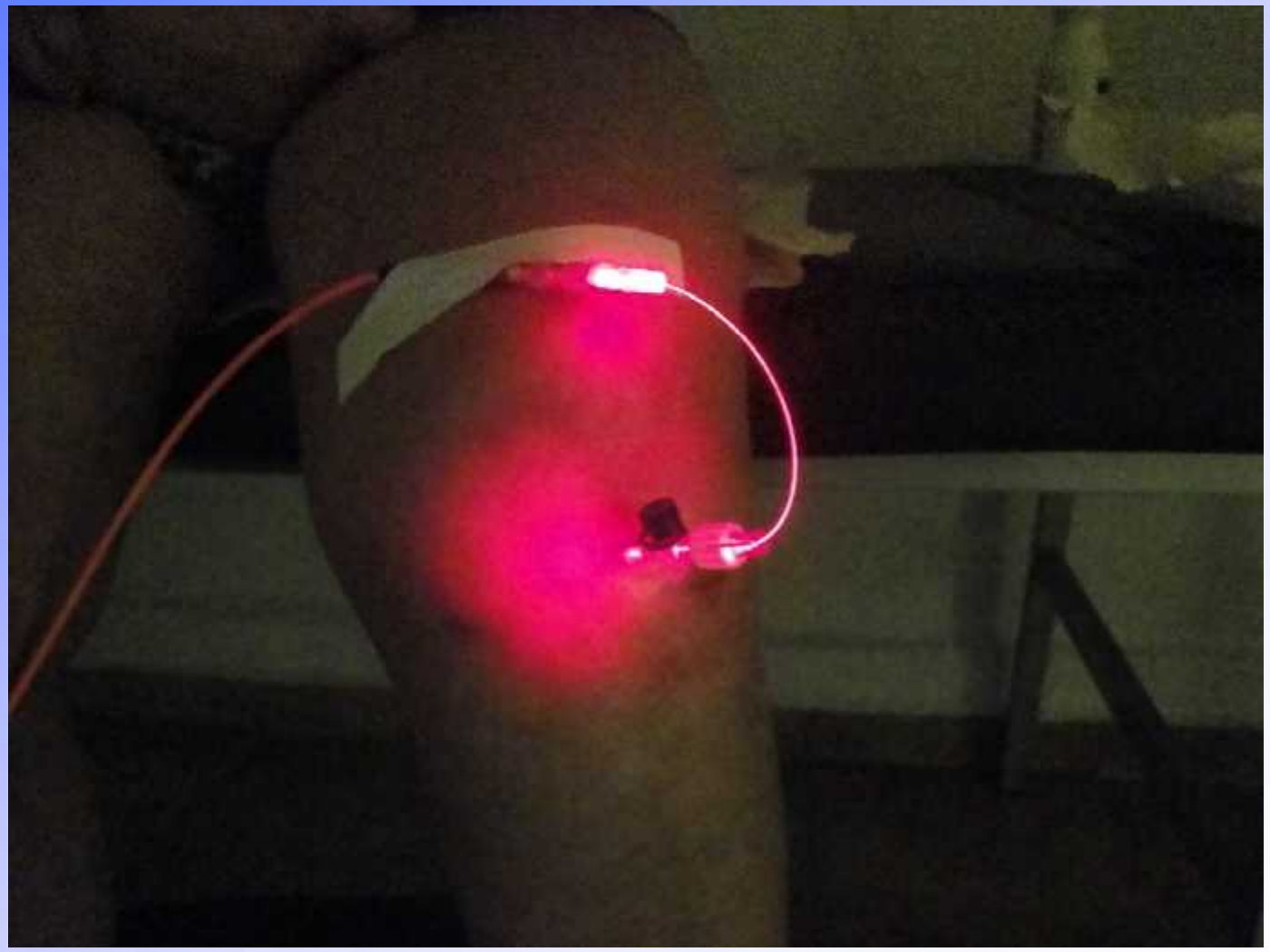
- Periarticular sclerosis
- Osteophytes
- Sub-chrondral bone cysts

Fiberoptic cannulas for intraarticular laser therapy

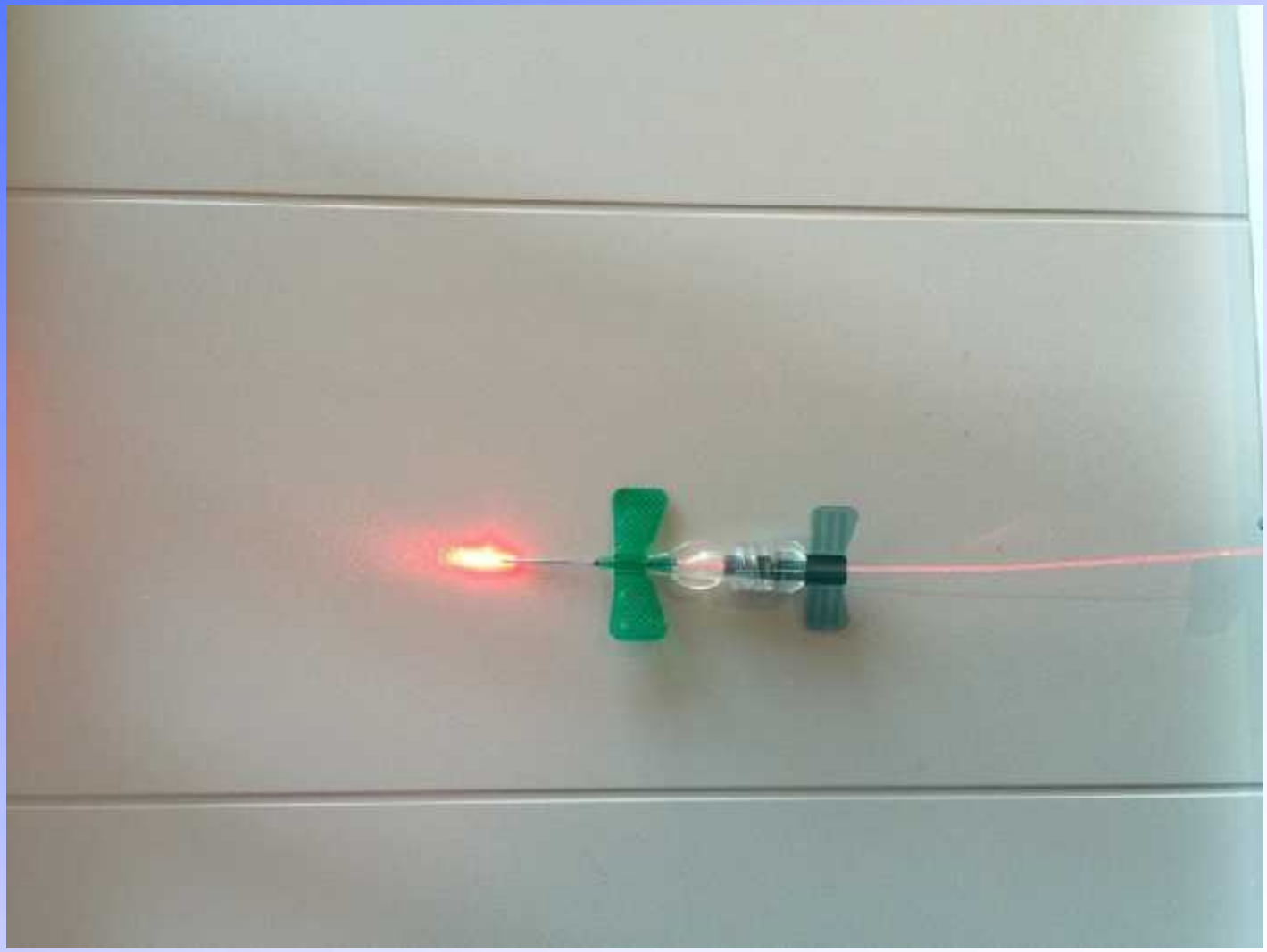
Fiberoptic plastic cannula



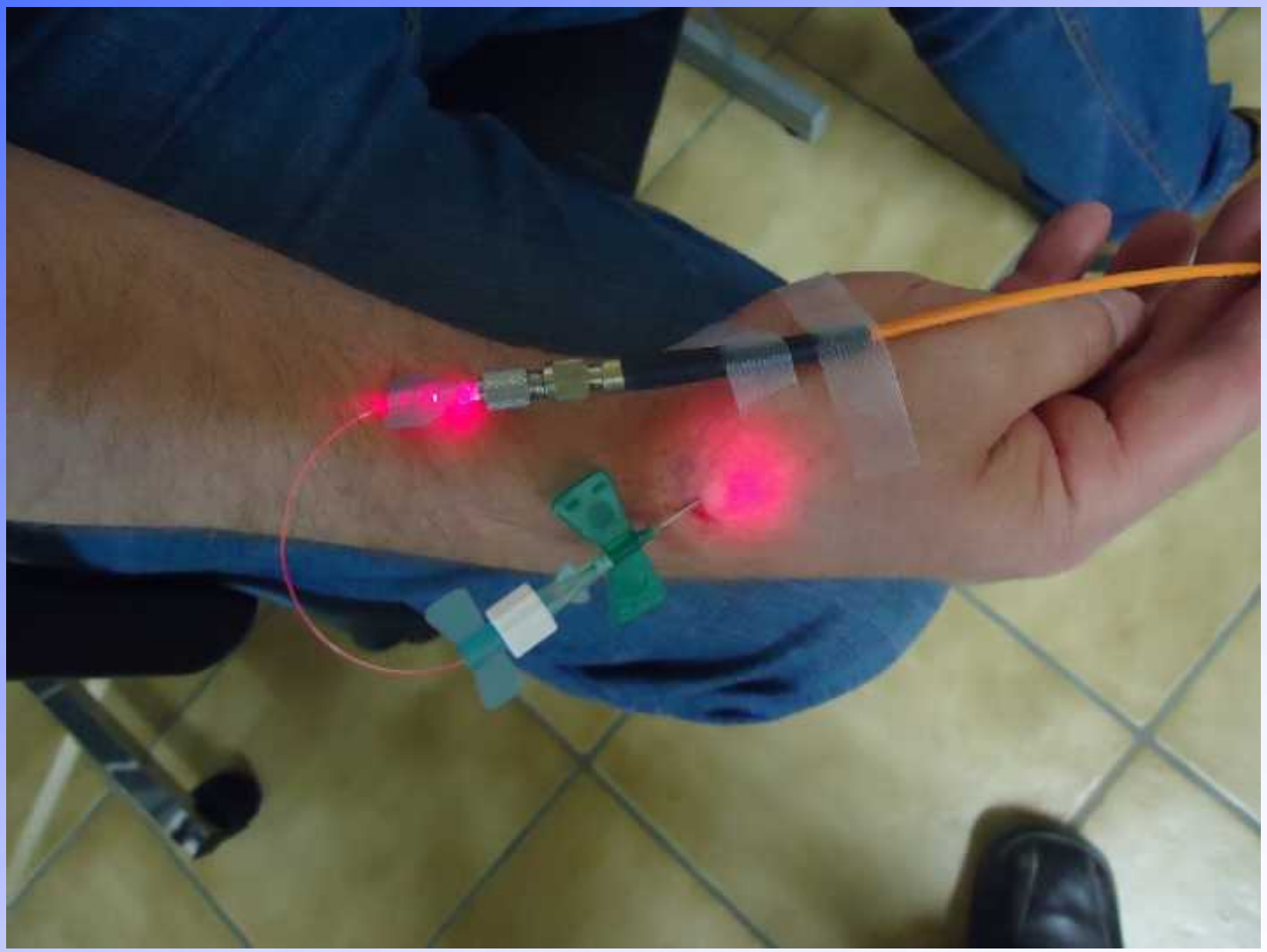
The intraarticular laser therapy



Fiberoptic butterfly for small joints



The intraarticular laser therapy



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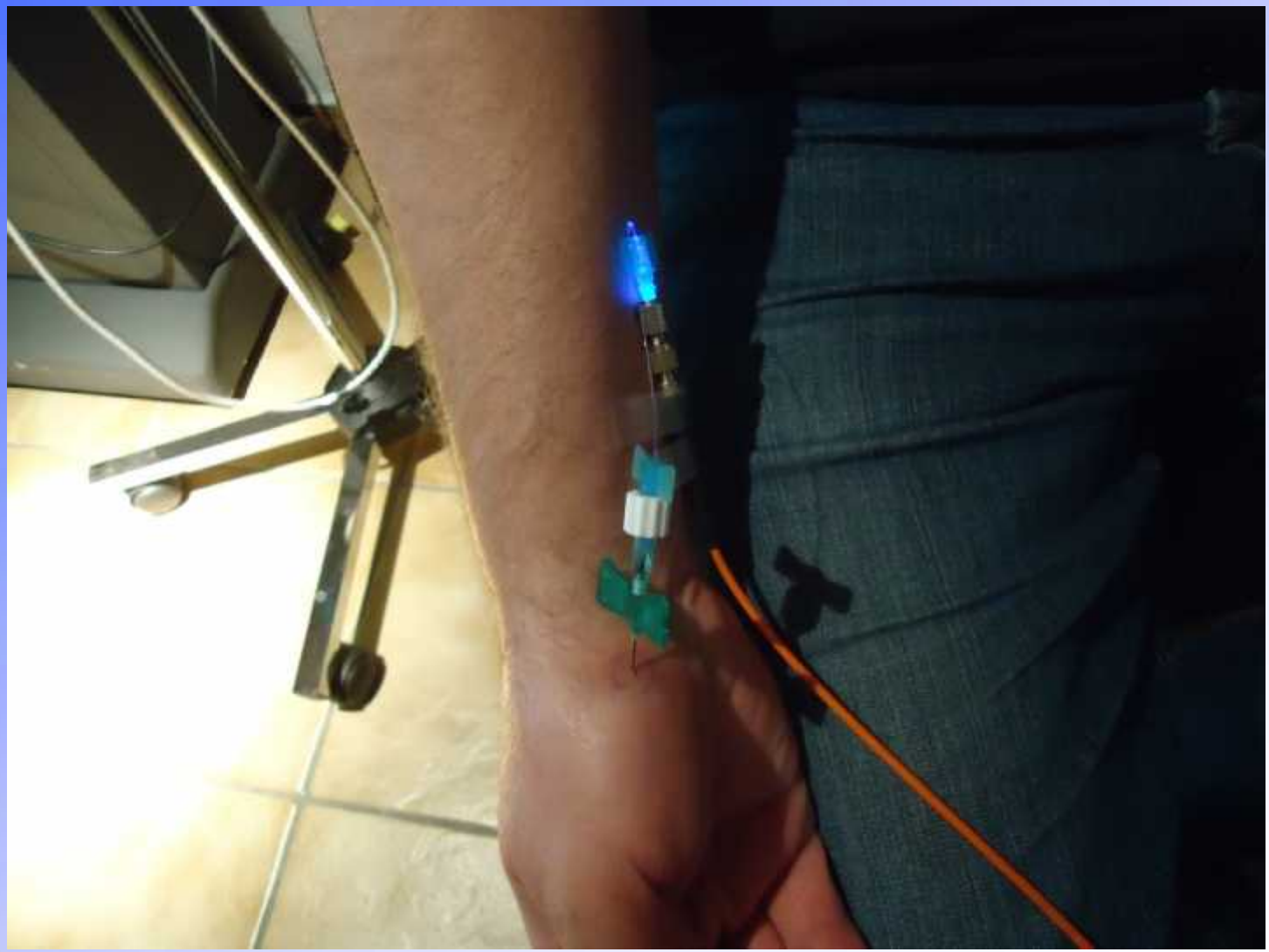
Michael Weber, Germany

The intraarticular laser therapy

Laserclinic Dr. med. Dipl. chem.
Michael Weber, Germany

The intraarticular laser therapy



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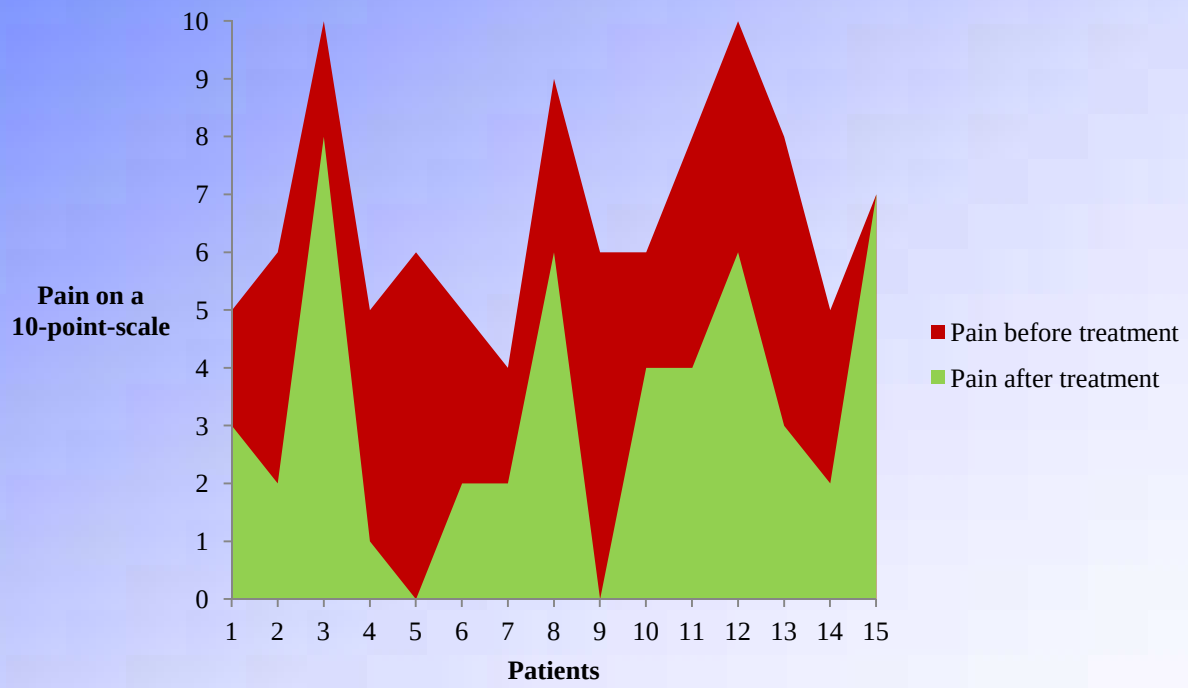
Michael Weber, Germany

Intraarticular laser in Shoulder syndromes

presented on World of Pain conference, Miami 2012

- Number of patients = 15
- Number of treatments mean value 9,40
  - VAS before 6,67
  - VAS after 3,33

(dose about 1 J)

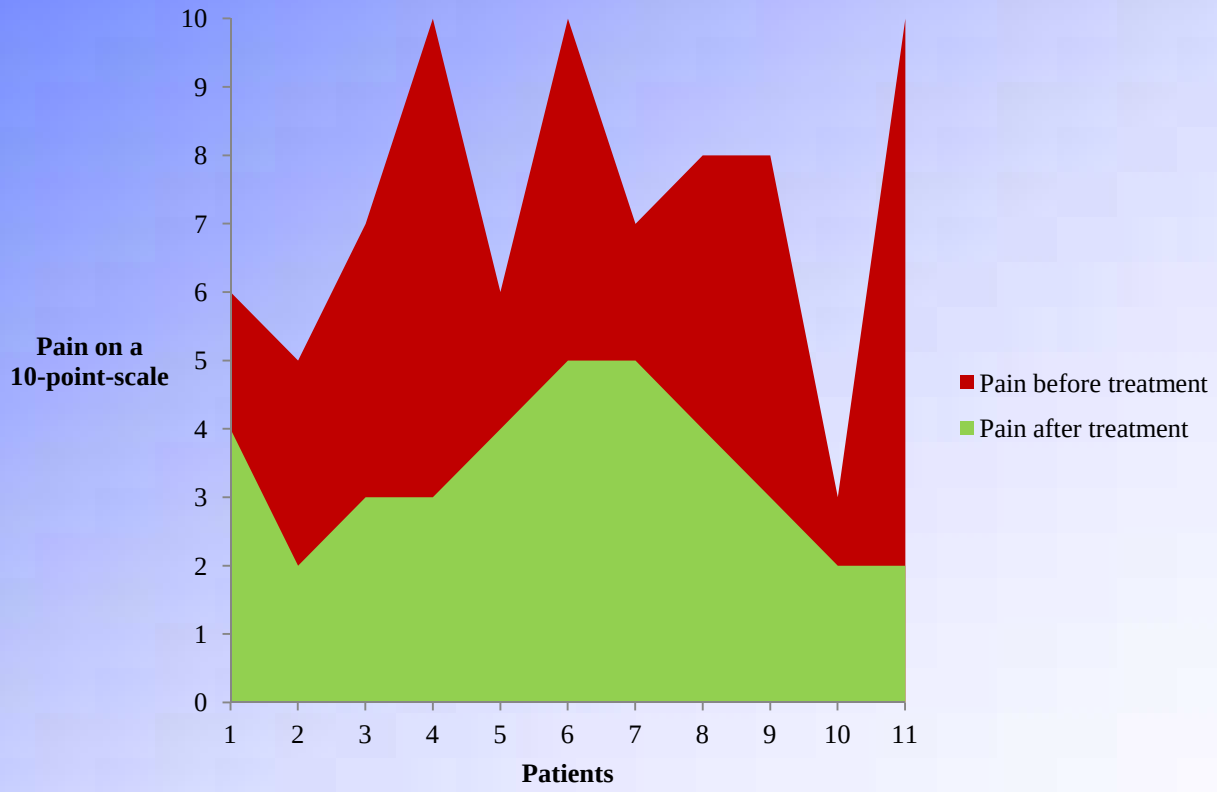


Intraarticular laser in knee syndromes

presented on wold of Pain conference, Miami 2012

- Number of patients = 11
- Number of treatments mean value 6
  - VAS before 7,27
  - VAS after 3,36

(dose about 10 J)

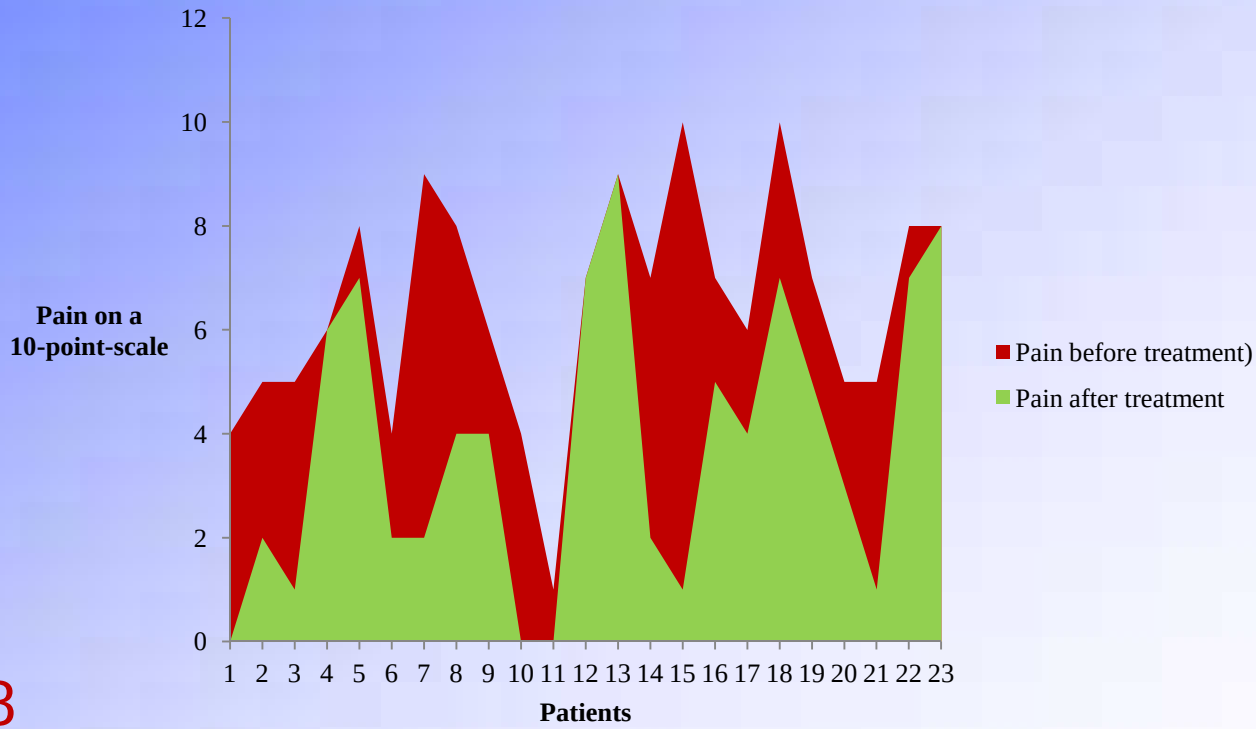


Interstitial laser in spine syndromes

presented on world of Pain conference Miami 2012

- Number of patients = 23
- Number of treatments mean value 8,13
  - VAS before 6,48
  - VAS after 3,78

(dose about 10 J)



Dr. med. Volkmar Kreisel, Germany: (2015)

Neuraxial Low-Level- Laser Therapy for Lumbar Disc Herniation

Patient	Diagnose	VAS initial	Neuroaxiale LLLT	VAS final
BH	NPP L2/3	5	3	3
BM	NPP L4/5/S1	8-9	2	4
GG	NPP L4/5/S1	3-4	3	4
KH	NPP L4/5/S1	4-5	3	2-3
MH	NPP L5/S1	4-5	3	3
NN	NPP L4/5	2-3	3	1
SG	NPP L4/5	5-6	2	2
VR	NPP L3/4/5	8	7	2-3
WH	NPP L4/5/S1	7	3	2-3
WR	NPP L5/S1	6-7	4	3
Summe		**55,5**	**33**	**27,5**

3) Henry B.H. and Sherry N. Fanous, Spine Care Center, Cairo, Egypt (2015):

Knee Pain Management using Ultrasound-Guided Weberneedle Endolaser in Comparison to Fluoroscopy- Guided Continuous Radio-Frequency

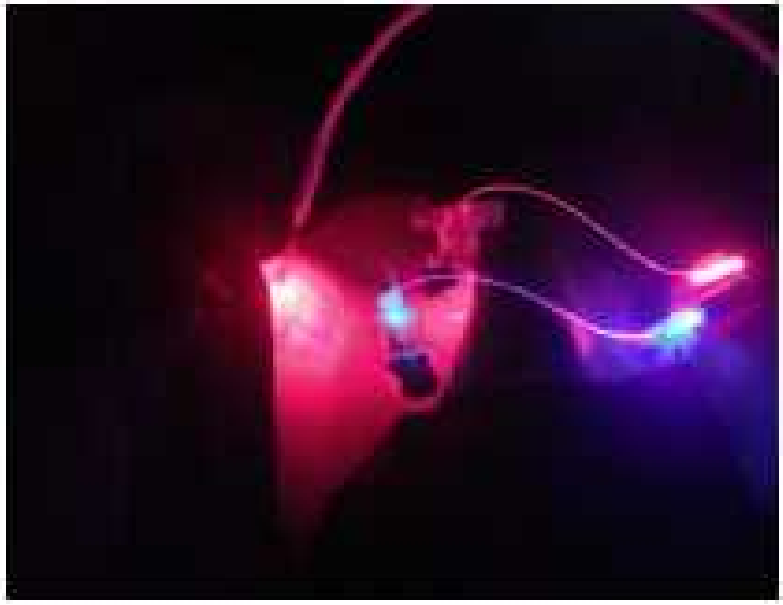
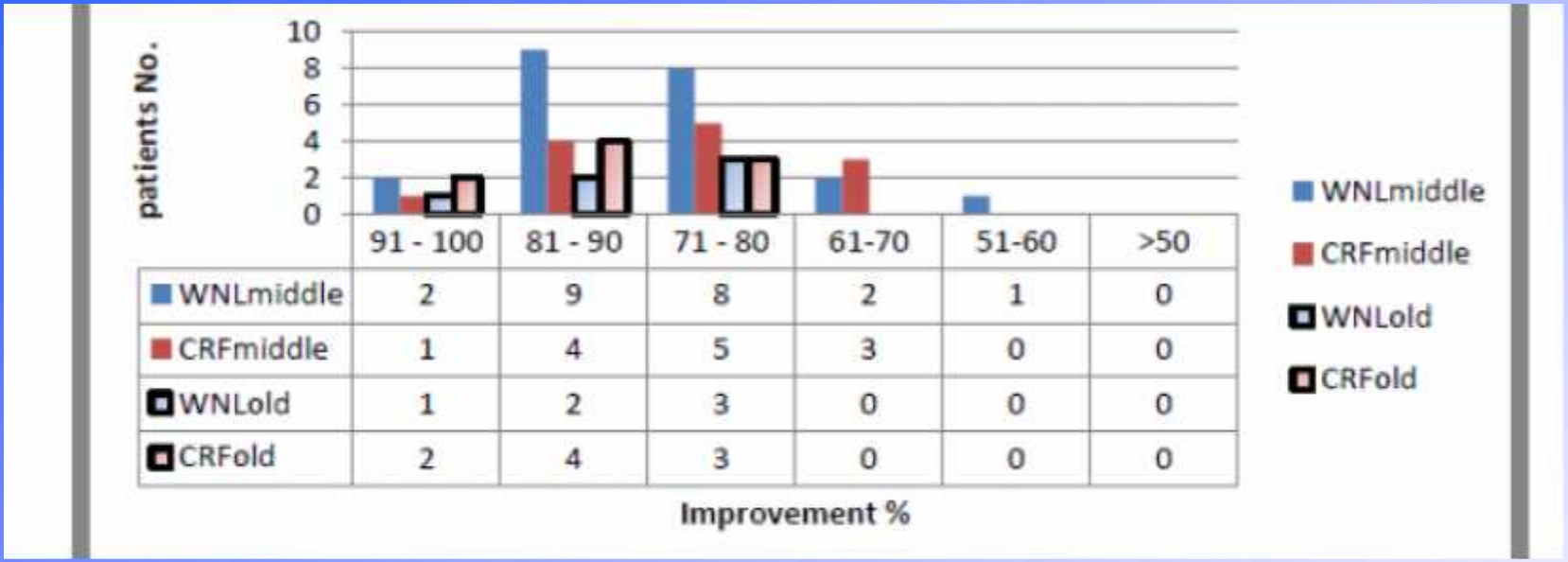


Abb. 20: Ultrasound Guidance

Abb. 21: Intra-articular use of two red lasers and one blue laser



Results Middle-age and old-age population

- 8 of 22 middle-age patients (36%) treated with laser therapy achieved 71-80 % pain relief after 6 months
- 9 of 22 middle-age patients (41%) treated with laser therapy achieved 81-90 % pain relief after 6 months
- 2 of 22 middle-age patients (9%) treated with laser therapy achieved 91-100 % pain relief after 6 months
- 3 of 6 old-age patients (50%) treated with laser therapy achieved 71-80 % pain relief after 6 months
- 2 of 6 old-age patients (33%) treated with laser therapy achieved 81-90 % pain relief after 6 months
- 1 of 6 old-age patients (17%) treated with laser therapy achieved 91-100 % pain relief after 6 months

The interstial and intraarticular laser therapy

- The laser can be applied in the depth of the tissue close to the spot of injury
- One or more interstitial needles can be added to superficially applied laserneedles
- Pain relief is quicker and more effective
- Combination of metal needle with fiberoptics (true laserneedle)

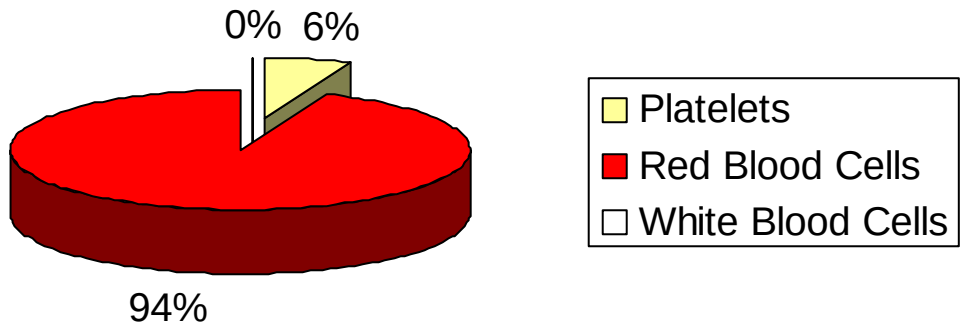
The interstial and intraarticular laser therapy

- Important in patients with dark skin
- Blue and green laser with anti-inflammatory effects can be applied as well
- Better effect on tissue regeneration

Combination of laser with platelet rich plasma (PRP)

- Serum from patient‘s own blood, enriched with cytokines and growth factors
- Injected intraarticulary or interstitially
- Intraarticular and interstitial laser irradiation

Peripheral blood (6% platelets)



Preparation of PRP

10ml Blut aseptisch aus der Armvene des Patienten entnehmen, z. B. mit einem Butterfly oder einer Kanüle.

Anschließend wird das Blut unter Verwendung einer neuen Kanüle in das Medizinprodukt übergeleitet.

Die Kanüle befindet sich im Behandlungsset.

Nach der Inkubation muss das Medizinprodukt für 5 Min. bei 4.000 Umdrehungen zentrifugiert werden. Vorsichtige Entnahme des Medizinproduktes aus der Zentrifuge.

Das autologe konditionierte Serum sollte unter Anwendung eines Sterilfilters umgehend in das betroffene Gelenk reinjiziert werden.

Scientific BioTech

Centrifugation of PRP (low speed)

PRP in Buffy Coat

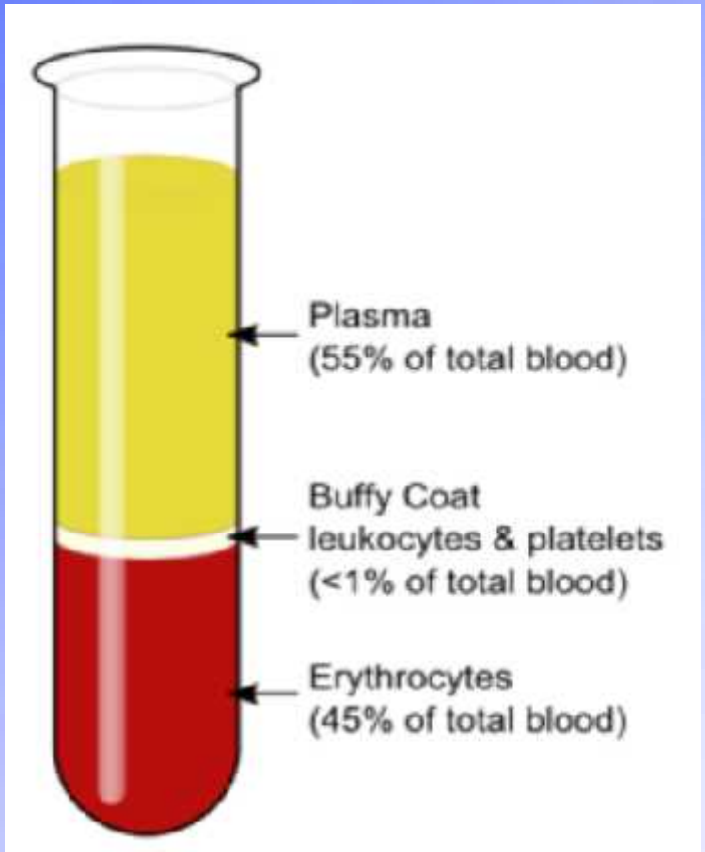
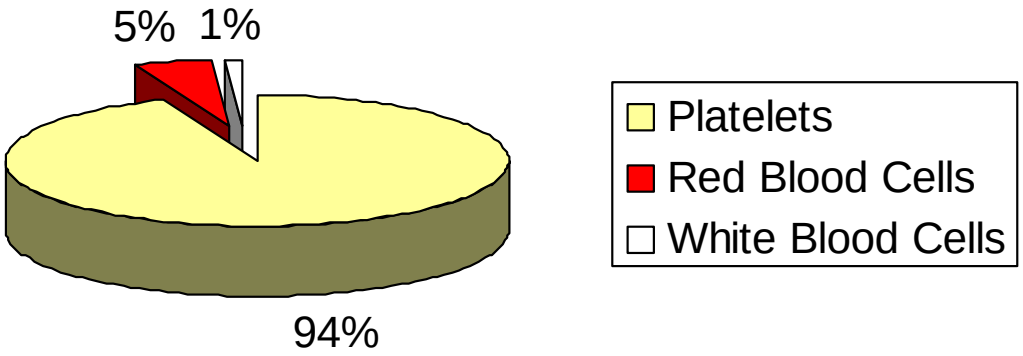


Figure 2 **The components of whole blood and their function[2]**

Platelets are crucial for tissue repair and vascular remodelling. The first stage of normal wound healing, immediately following injury or insult, is inflammation, where activated platelets adhere to the site of injury releasing growth factors including:

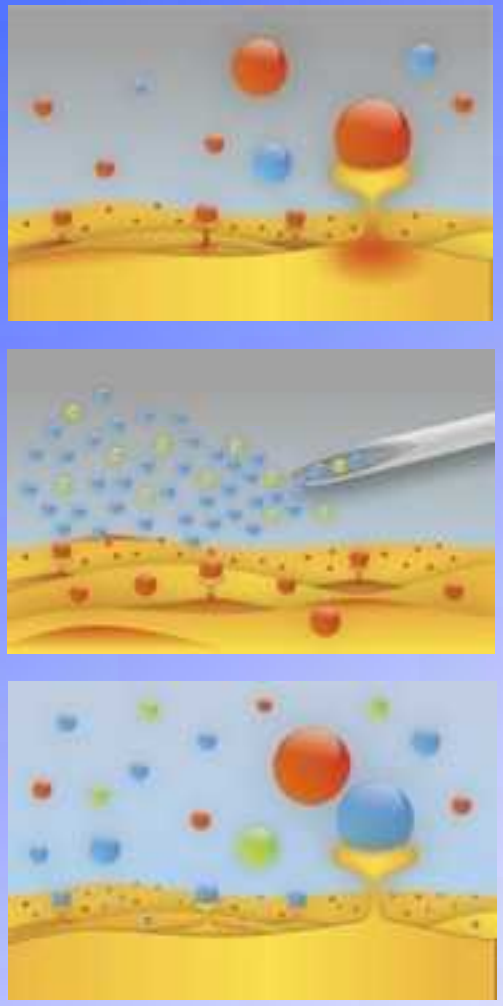
94% Platelets in PRP



PRP Composition

1. **Platelets**
   growth factors and antiinflammatory cytokines, Interleukin-1 receptor antagonist
2. **Neutrophiles**
   40-75% of circulating leukocytes
3. **Monocytes**
   2-10% highly motile and migrate to soft tissues
4. **Fibroblasts**
   produce collagen, glycosaminoglycans, glycoproteins
5. **Keratinocytes**
   Stratified, squamous epithelial cells Primary function is to act as a barrier
6. **Small number of primitive stem cells**

Chronic inflammation and osteoarthritis



- Interleukin 1 (Il-1) leads to cartilage damage
- The autologue serum contains increased amount of Il-1-receptor antagonist (Il 1 RA)
- Il 1 RA inhibits inflammation and improves regeneration

Different growth factors in PRP

- transforming growth factor (TGF-β): promotes formation of extracellular matrix and regulates bone cell metabolism;
- platelet-derived growth factor (PDGF): promotes cell replication, angiogenesis, epithelialisation and granulation tissue formation;
- basic fibroblast growth factor (bFGF): promotes proliferation of endothelial cells and fibroblasts and stimulation of angiogenesis;
- epidermal growth factor (EGF): promotes cell differentiation and stimulates re-epithelialisation, angiogenesis and collagenase activity;
- vascular endothelial growth factor: promotes angiogenesis; and
- connective tissue growth factor: promotes angiogenesis, vessel permeability, and stimulates mitogenesis for endothelial cells.[3,4]

Advantages of PRP -Therapy

1. Boosts local healing and tissue (re)growth
2. Natural procedure with patient's own blood , no side effects or toxicities
3. Individual therapy
4. Easy handling, procedure doesn't take longer than 20 min.
5. Supports the body's own potency of healing
6. Cartilage protection and anti-inflammatory effects
7. Prevention or delay of surgery
8. Improvement in quality of life
9. Cost efficiency (no other substances necessary)
10. Can be combined with other methods such as laser therapy

Indications of PRP applications:

- Wound healing
- Tendinopathies
- Fractures
- Bone regeneration
- Osteoarthritis
- Spinal syndromes
- Skin rejuvenation
- Hair loss

PRP without Laserstimulation

Indication	Pain before therapy (VAS)	Pain after therapy (VAS)	Positive Change (%)
Shoulder (n= 11)	67,5	27,5	59,26
Spine (n = 5)	60,0	22,0	63,33
Thumb (n= 10)	64,5	21,0	67,44
Knee (n= 22)	66,43	23,67	64,37
Toe (n =2)	67,5	22,50	66,67
Total	**65,9**	**22,18**	**66,34**

Fig. 17: Results for body's own serum therapy

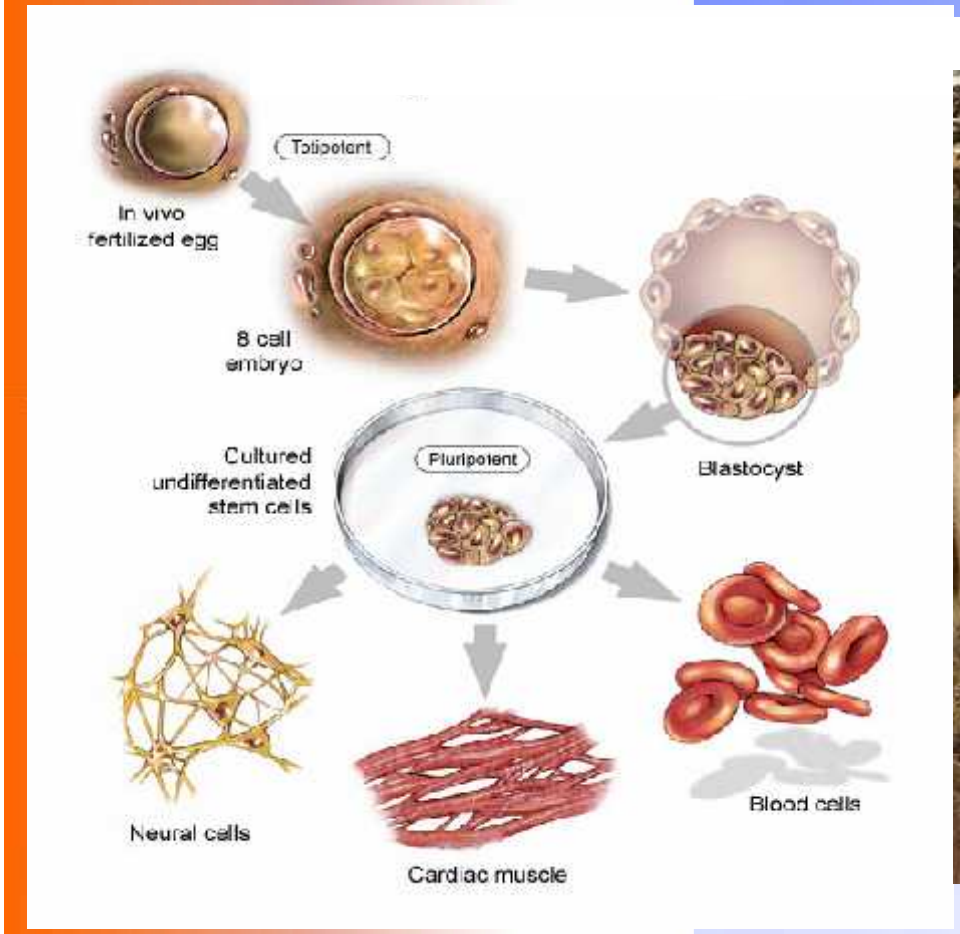
PRP with Laserstimulation

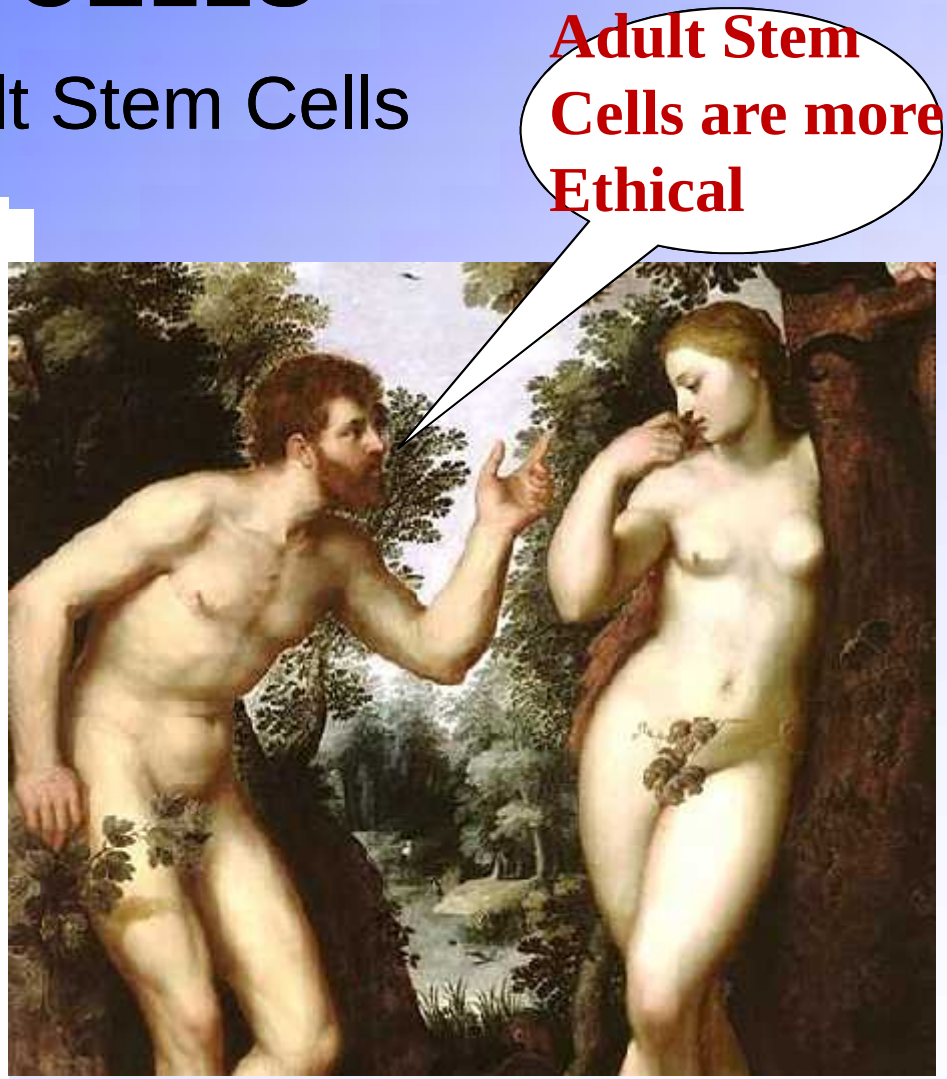
Indication	Pain before therapy (VAS)	Pain after therapy (VAS)	Positive Change (%)
Shoulder (n= 6)	80,0	18,4	77,0
Spine (n = 2)	68,5	10,0	85,4
Thumb (n= 1)	20,0	0,0	100,0
Knee (n= 22)	65,6	21,7	66,92
Achilles tendon (n=3)	55,0	1,7	96,91
Heel spur (n=2)	81,0	10,0	87,65
Total	**61,68**	**10,3**	**83,30**

Fig. 18: Results for combination therapy of body's own serum and laser therapy

STEM CELLS

- Embryonic vs Adult Stem Cells

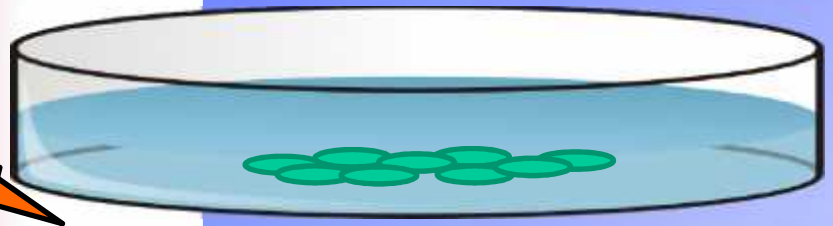




UNIVERSITY OF JOHANNESBURG

Adipose derived stem cells and low intensity laser irradiation

5-10 J/cm^2
@ 630-660nm

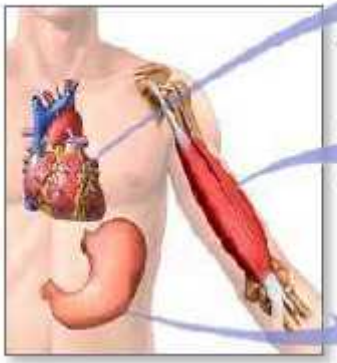


APPLICATION OF LILI TO STIMULATE ADSC PROLIFERATION AND VIABILITY

ADDITION OF GROWTH FACTORS TO INDUCE DIFFERENTIATION & APPLICATION OF LILI TO STIMULATE DIFFERENTATION AND PROLIFERATION

5-10 J/cm^2
@ 630-660nm

NEURONS



CARDIAC MUSCLE

SKELETAL MUSCLE

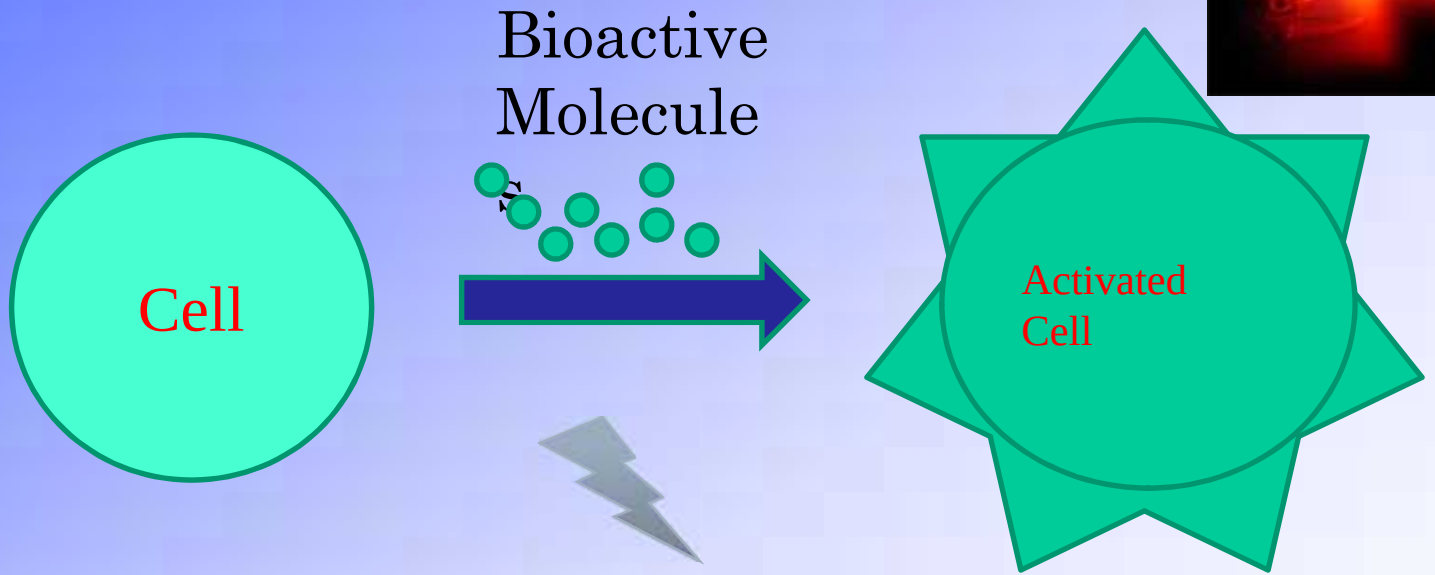
SMOOTH MUSCLE

SKIN CELLS: KERATINOCYTES

UNIVERSITY OF JOHANNESBURG

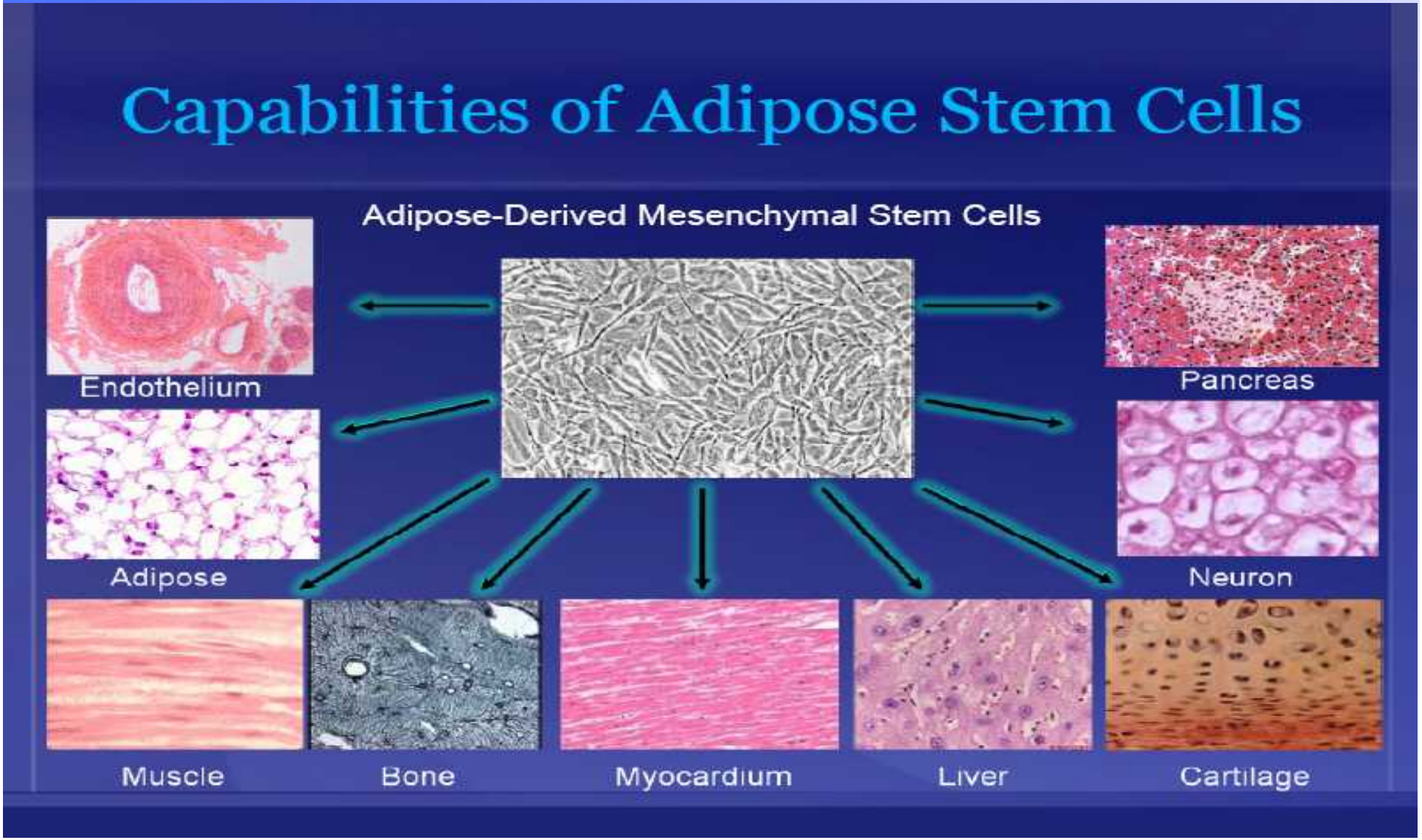
PHOTO ACTIVATION of stem cells

Laser irradiation can positively affect human stem cells by increasing cellular viability, proliferation and differentiation



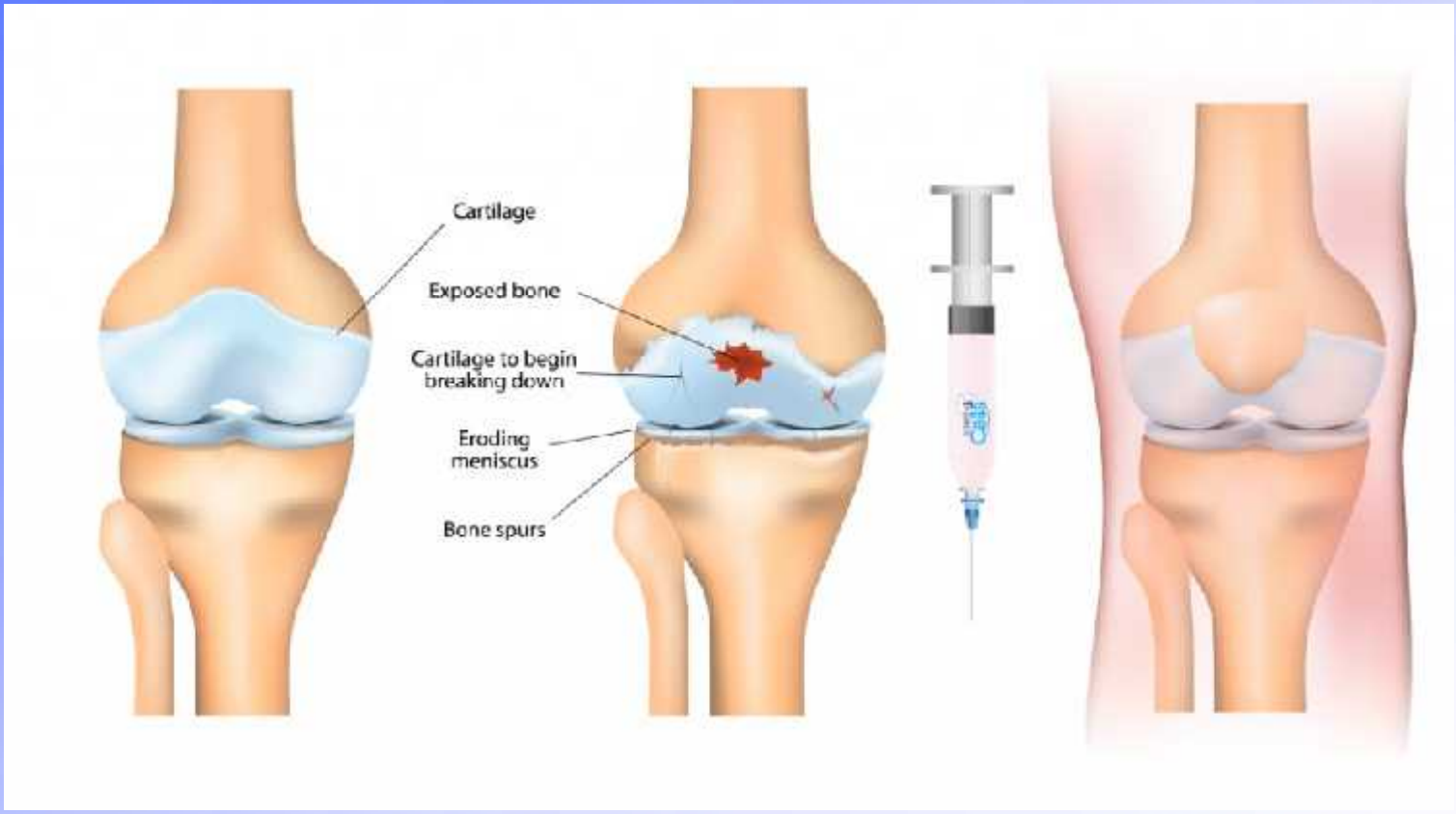
light activates cells

ADIPOSE STEM CELLS (ADSC)

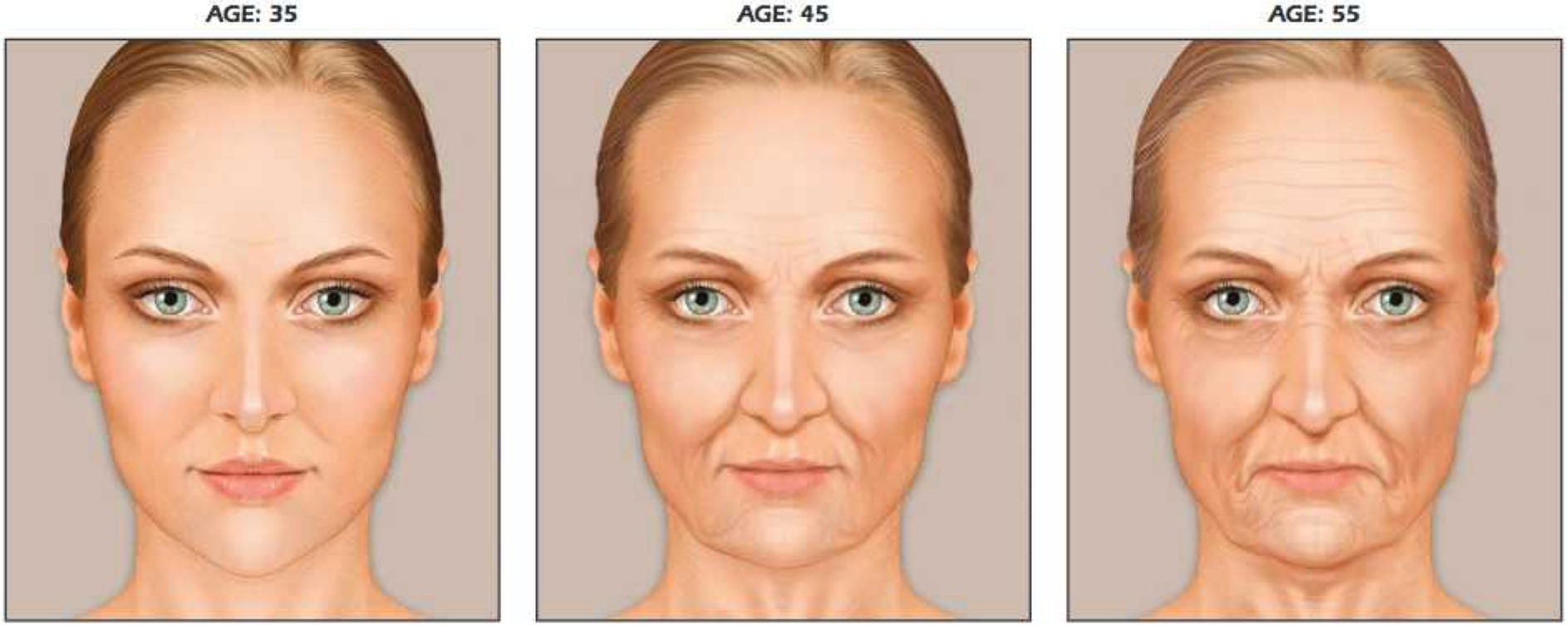


Stem cells for Osteoarthritis

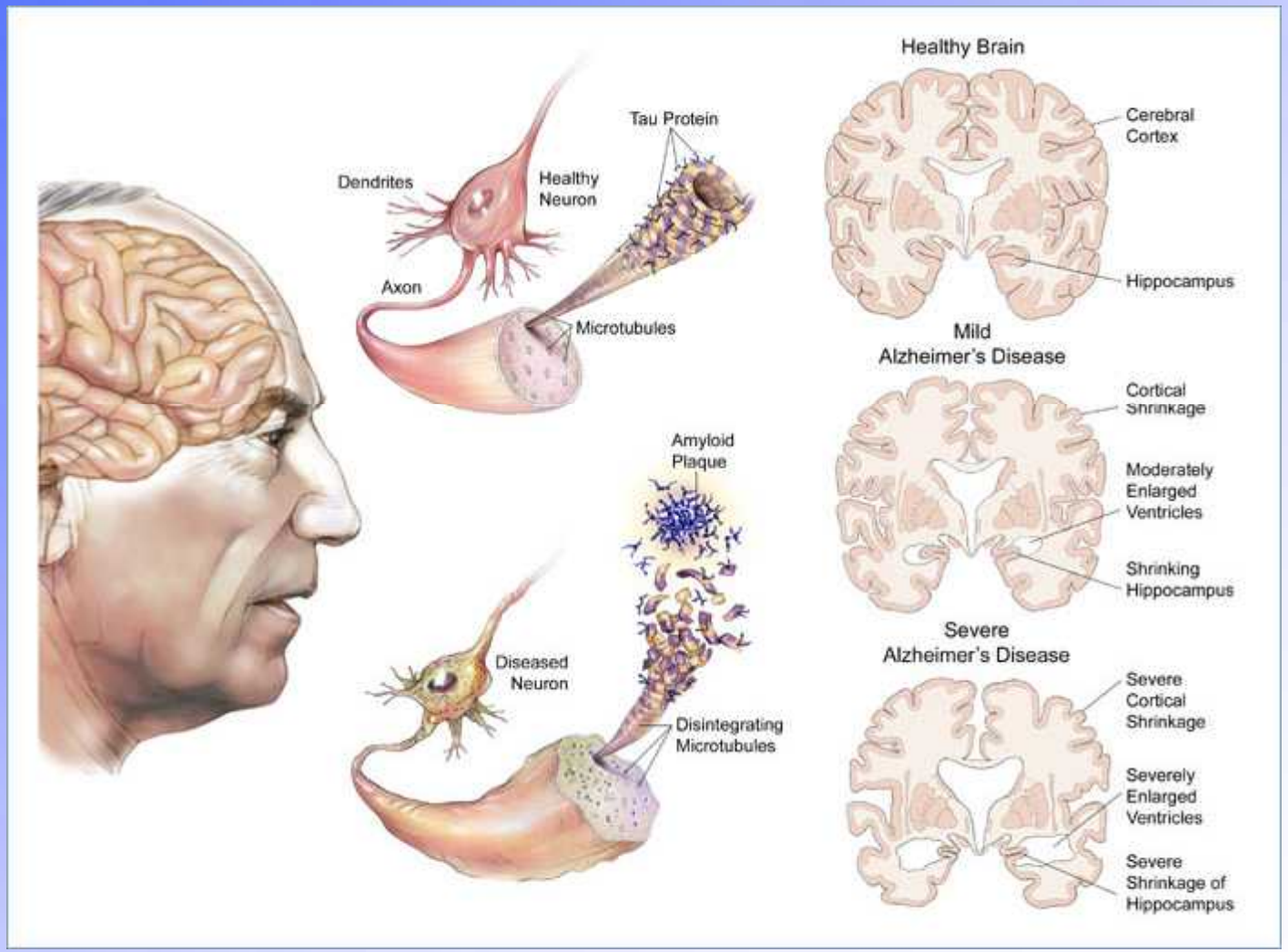
Stem cells for Osteoarthritis



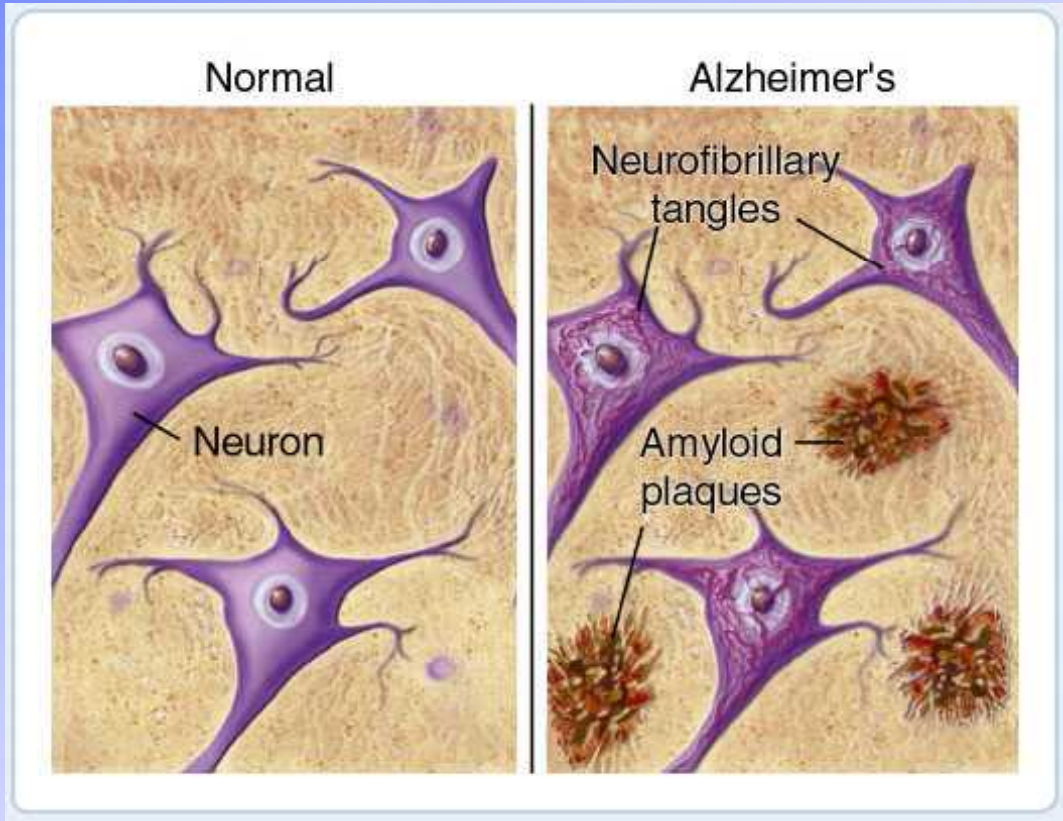
Stem cells for skin rejuvenation



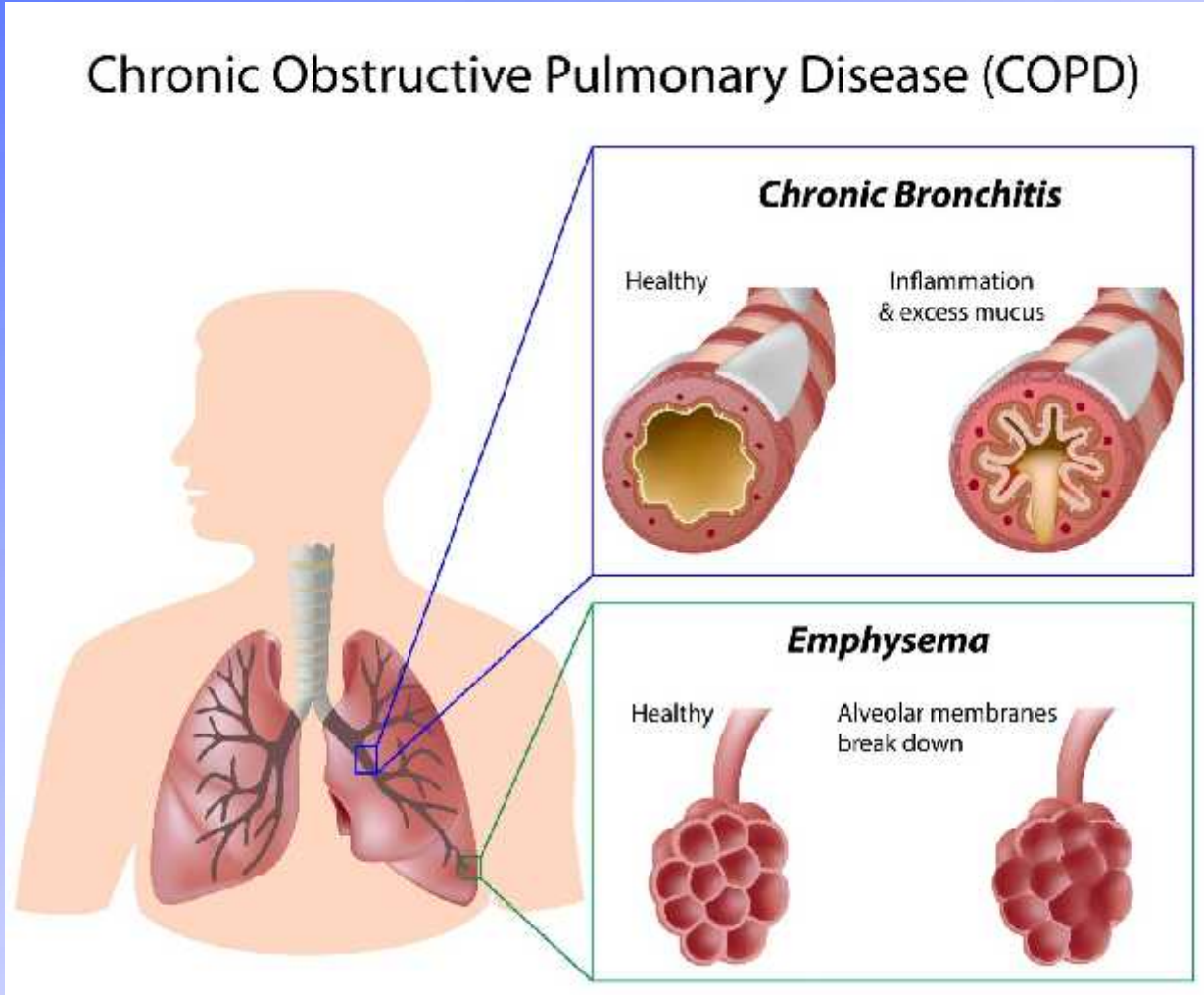
Stem cells for brain



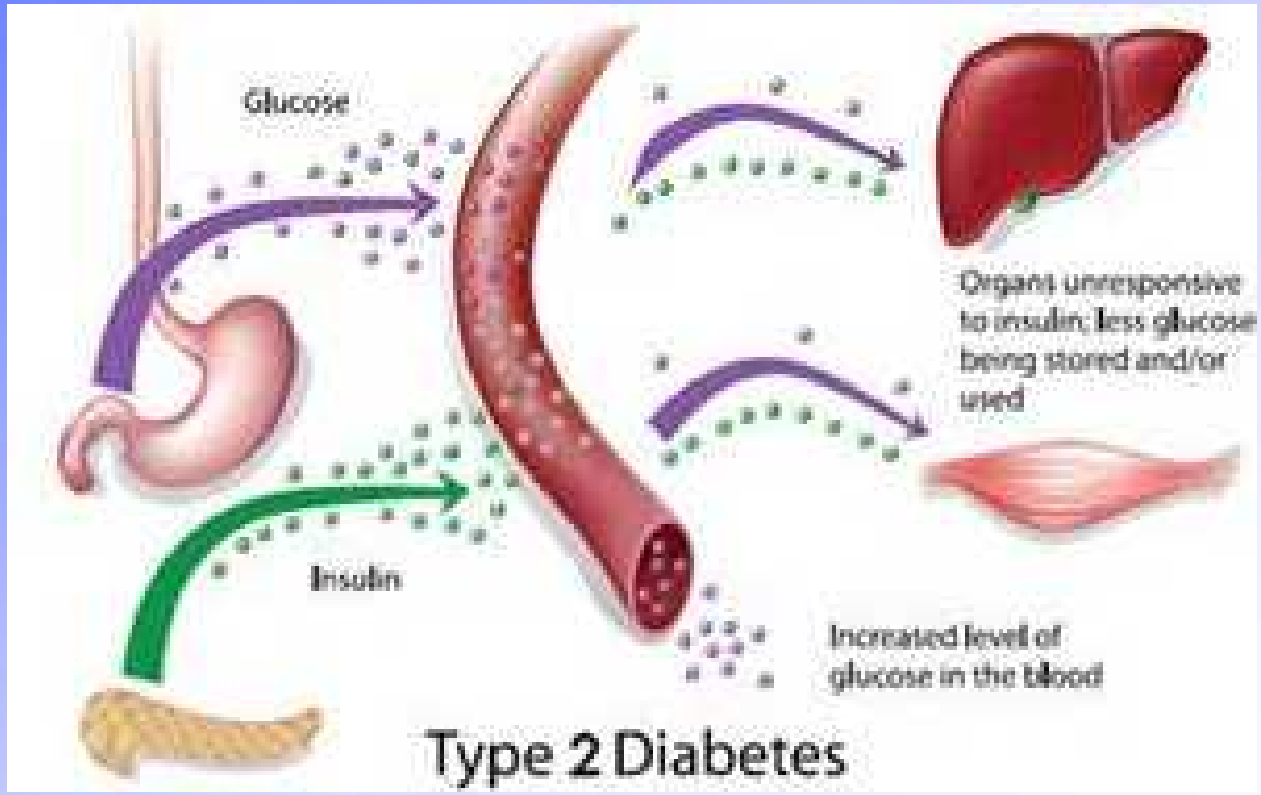
Stem cells for brain



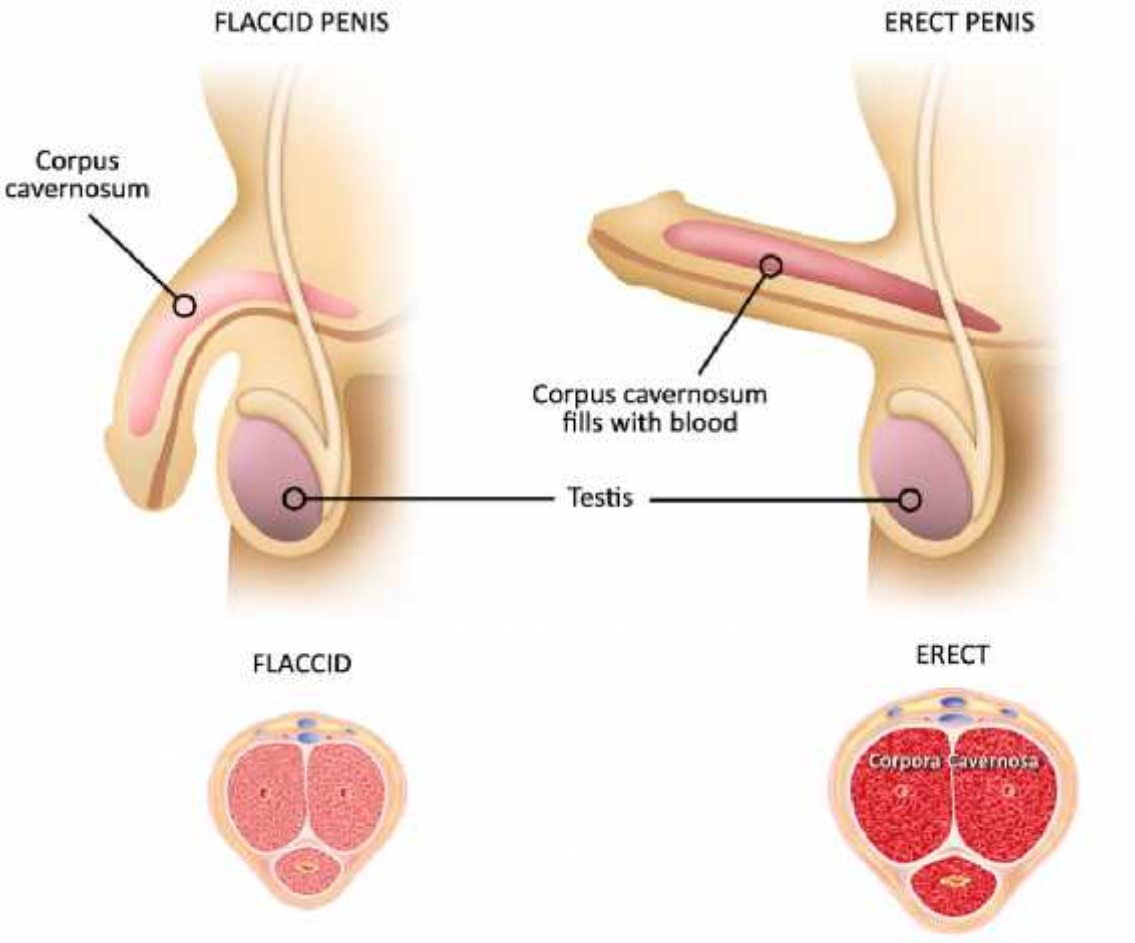
Stem cells for COPD



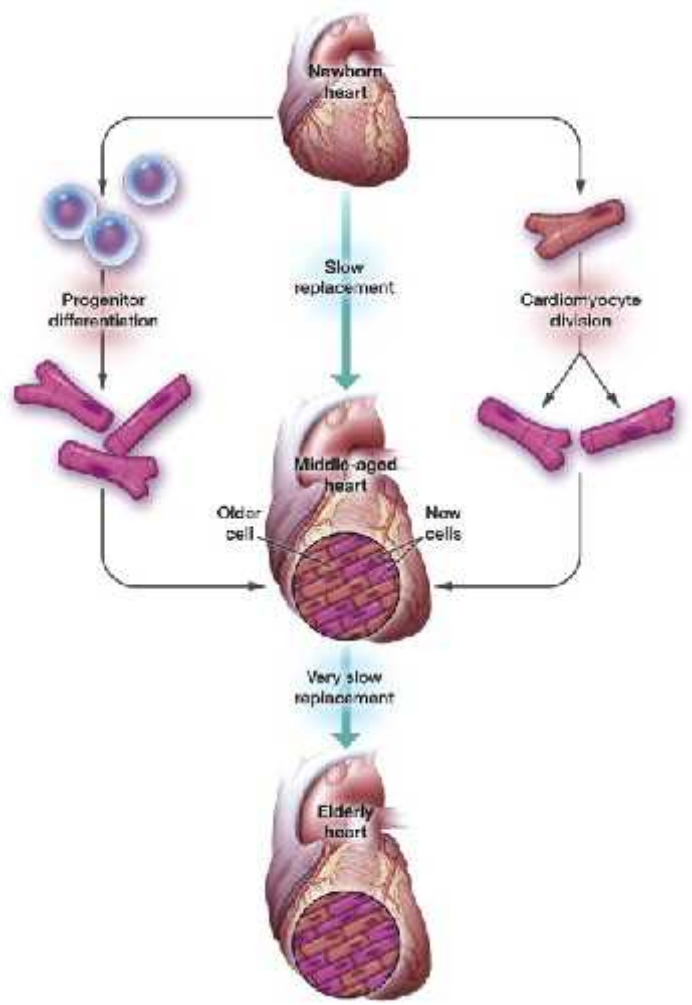
Stem cells for diabetes



Stem cells ED



Stem cells for heart failure



Lasers stimulate stem cells for heart repair (

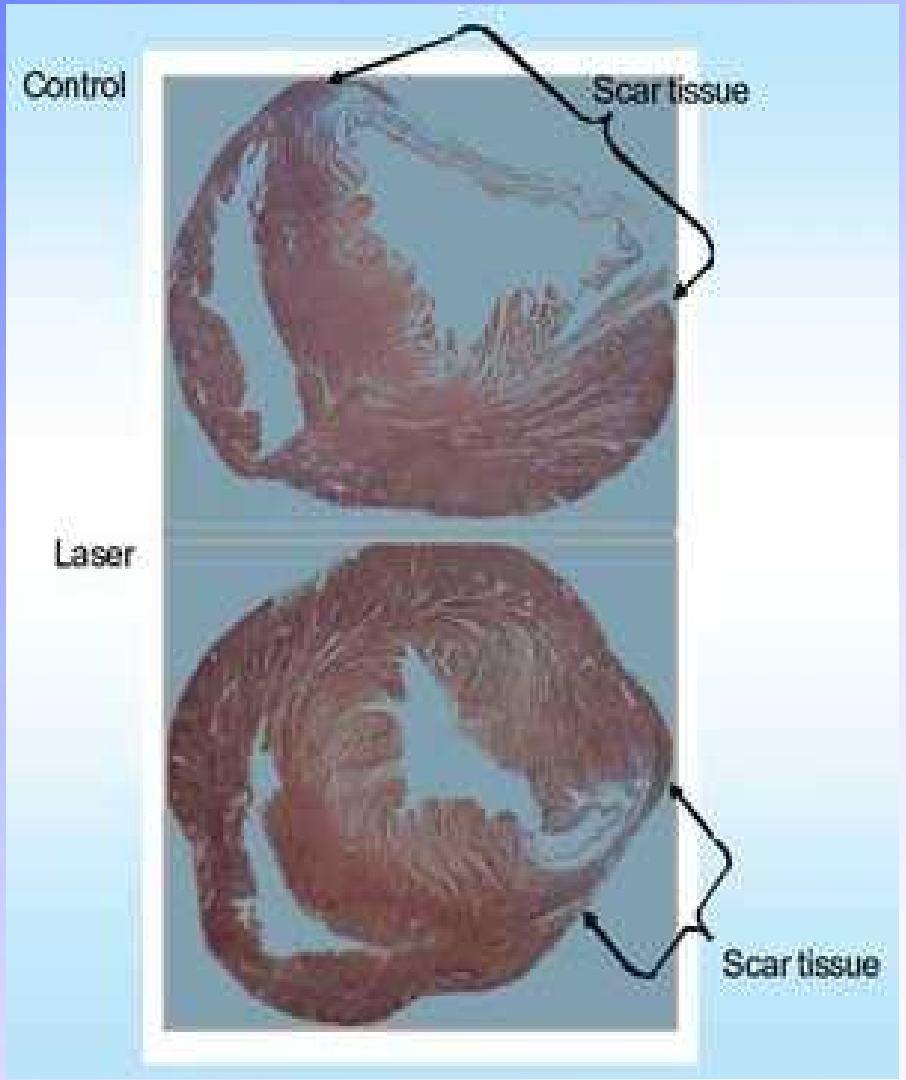
Prof. Uri Oron, Tel Aviv)

(WALT-Laserconference, Washington DC, September 2014)

- A simple new process significantly reduces heart scarring after an ischemic event.
- Discovered by professor Uri Oron at Tel Aviv University, the method, called shining, consists of applying low-level laser energy to living bone marrow stem cells a few hours after a heart attack.
- This procedure reduces scarring by up to 80 percent.

Lasers stimulate stem cells for heart repair

(Uri Oron, Tel Aviv)



Lasers stimulate stem cells for kidney repair

(Uri Oron, Tel Aviv)

Induction of Autologous Bone-Marrow Stem Cells by Low-Level Laser Therapy Has Beneficial Effects on the Kidneys Post-Ischemia-Reperfusion Injury in the Rat

Ilana Tuby, Lidya Maltz, Uri Oron*

Department of Zoology, The George S. Wise Faculty of Life Sciences, Tel Aviv University, Tel-Aviv, Israel
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Received 7 April 2014; revised 21 May 2014; accepted 1 June 2014

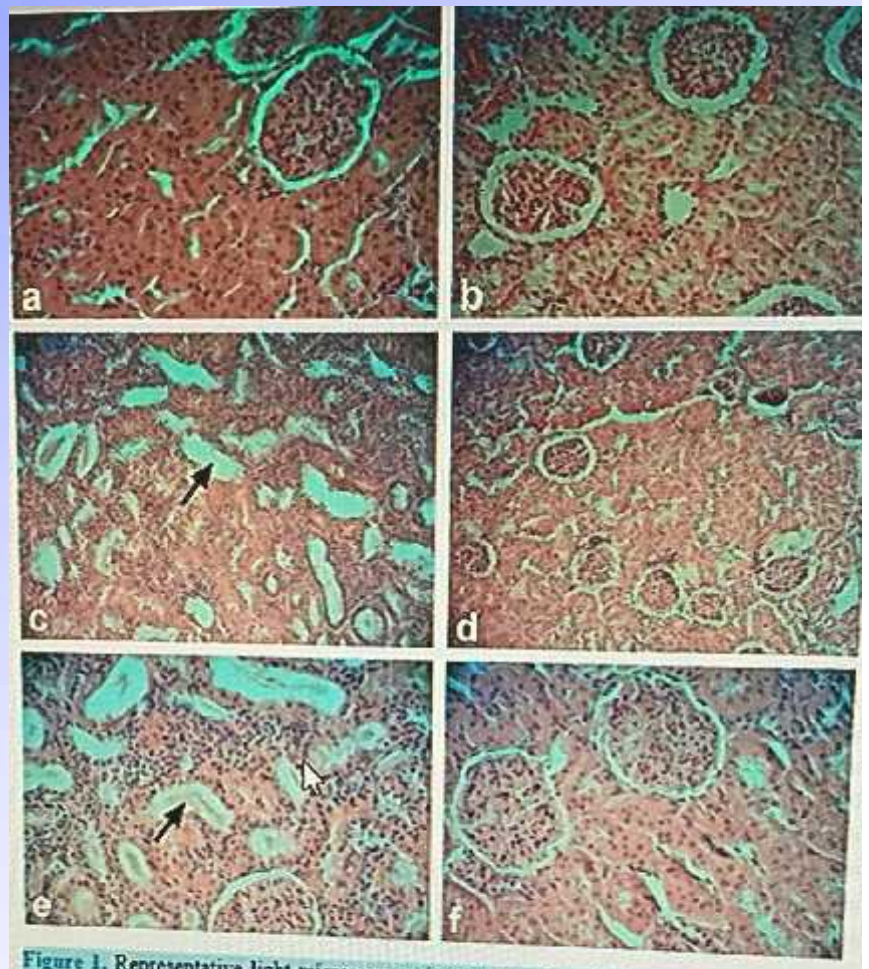


Figure 1. Representative light microscope micrographs of renal tissue in intact (a) laser-treated (b, d, f) and non laser-treated to the bone marrow (c, e) rats, 14 days post-30 min ischemic injury and reperfusion. Note a marked dilatation (arrows) of the renal tubules and necrotic areas with infiltration of mononucleated cells in control microscopic slides as compared to a minor dilatation of the renal tubules in the laser-treated rats. (

Lasers stimulate stem cells for kidney repair

(Uri Oron, Tel Aviv)

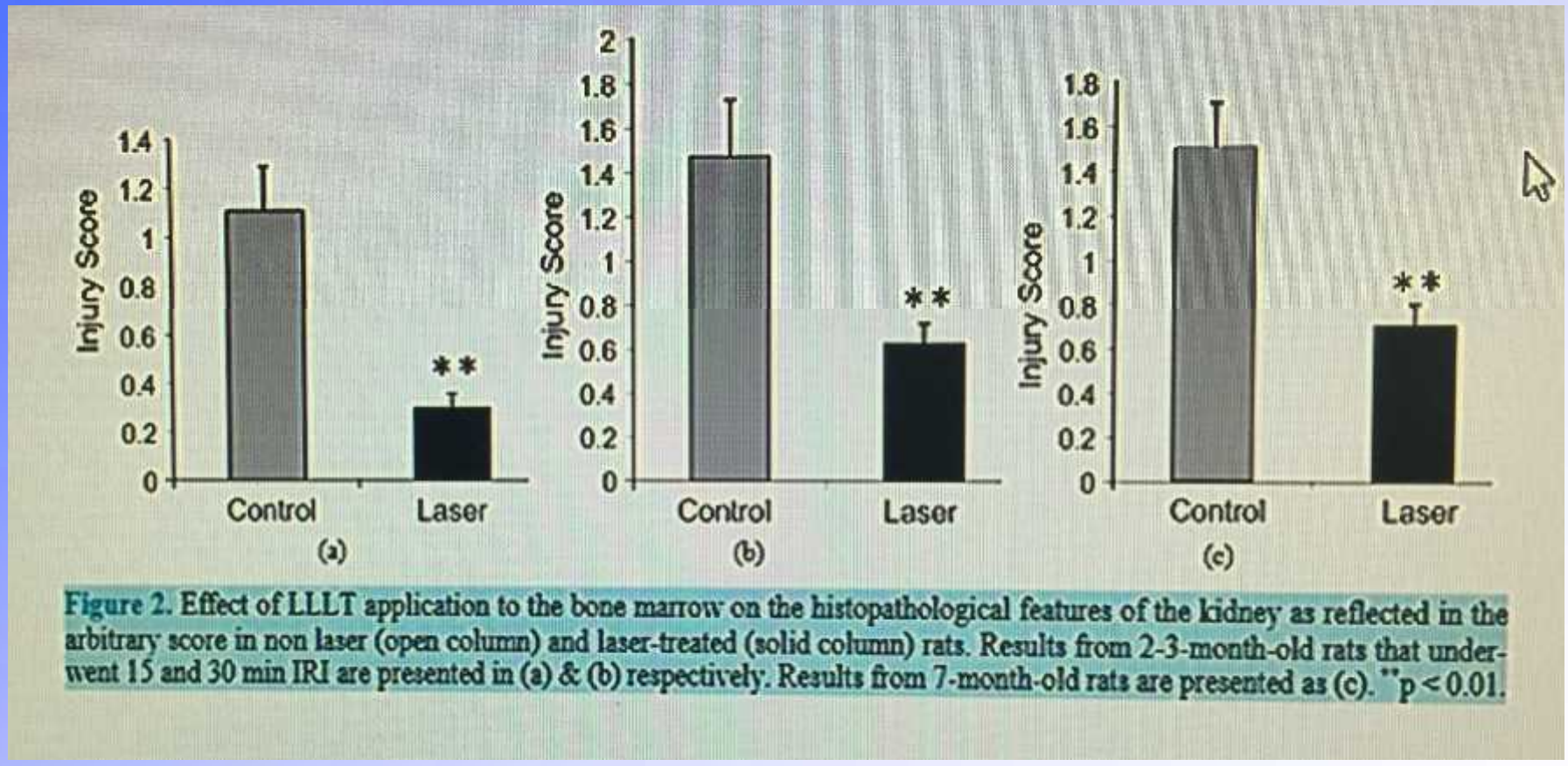


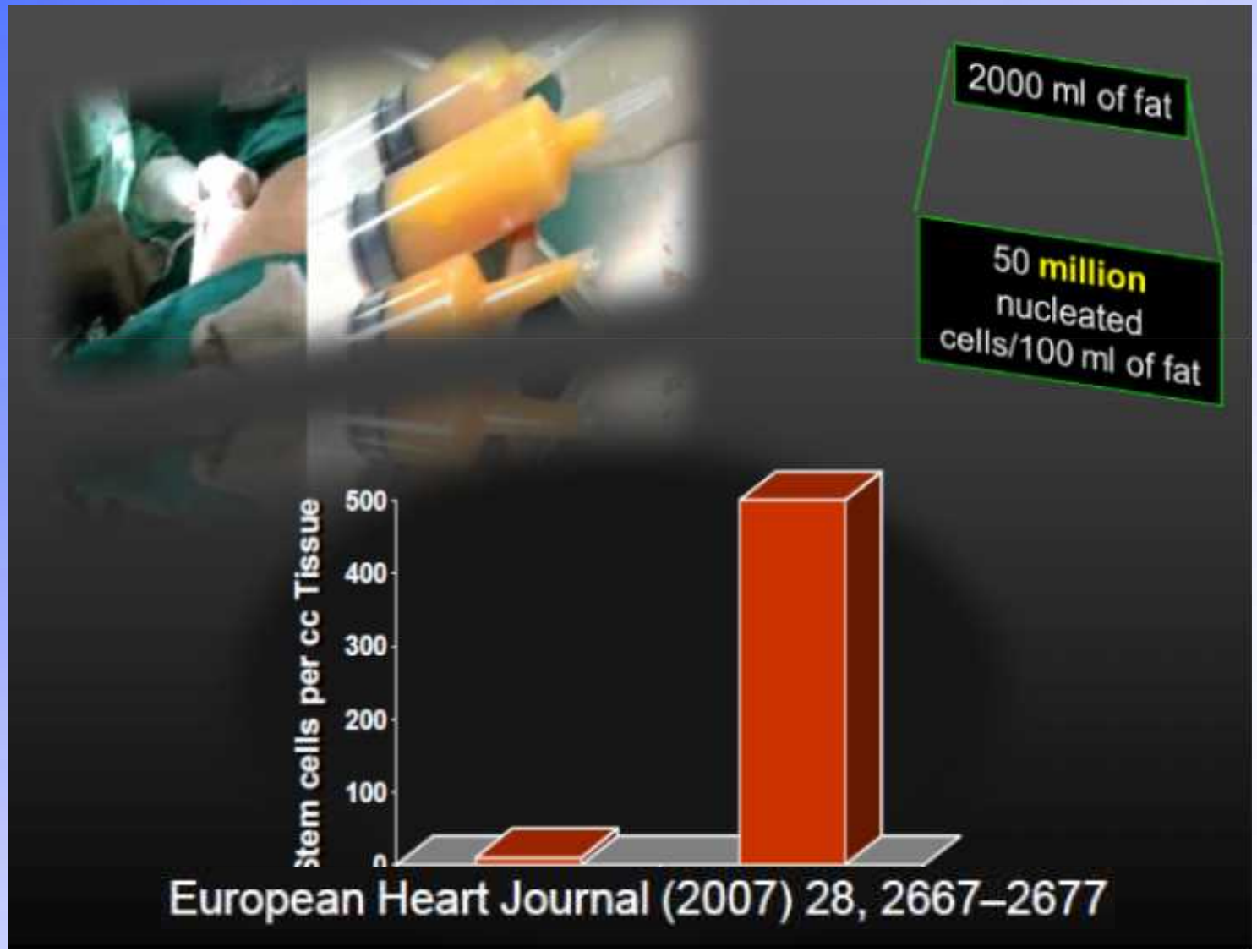
Figure 2. Effect of LLLT application to the bone marrow on the histopathological features of the kidney as reflected in the arbitrary score in non laser (open column) and laser-treated (solid column) rats. Results from 2-3-month-old rats that underwent 15 and 30 min IRI are presented in (a) & (b) respectively. Results from 7-month-old rats are presented as (c). $^{**}p < 0.01$.

Fat is a "High Density" Source of Stem Cells

Tissue/Source of SCs	Stem Cell Density
Bone marrow	**1 out of 100,000 cells**
Adipose tissue	**1 out of 100 cells**

* In old age

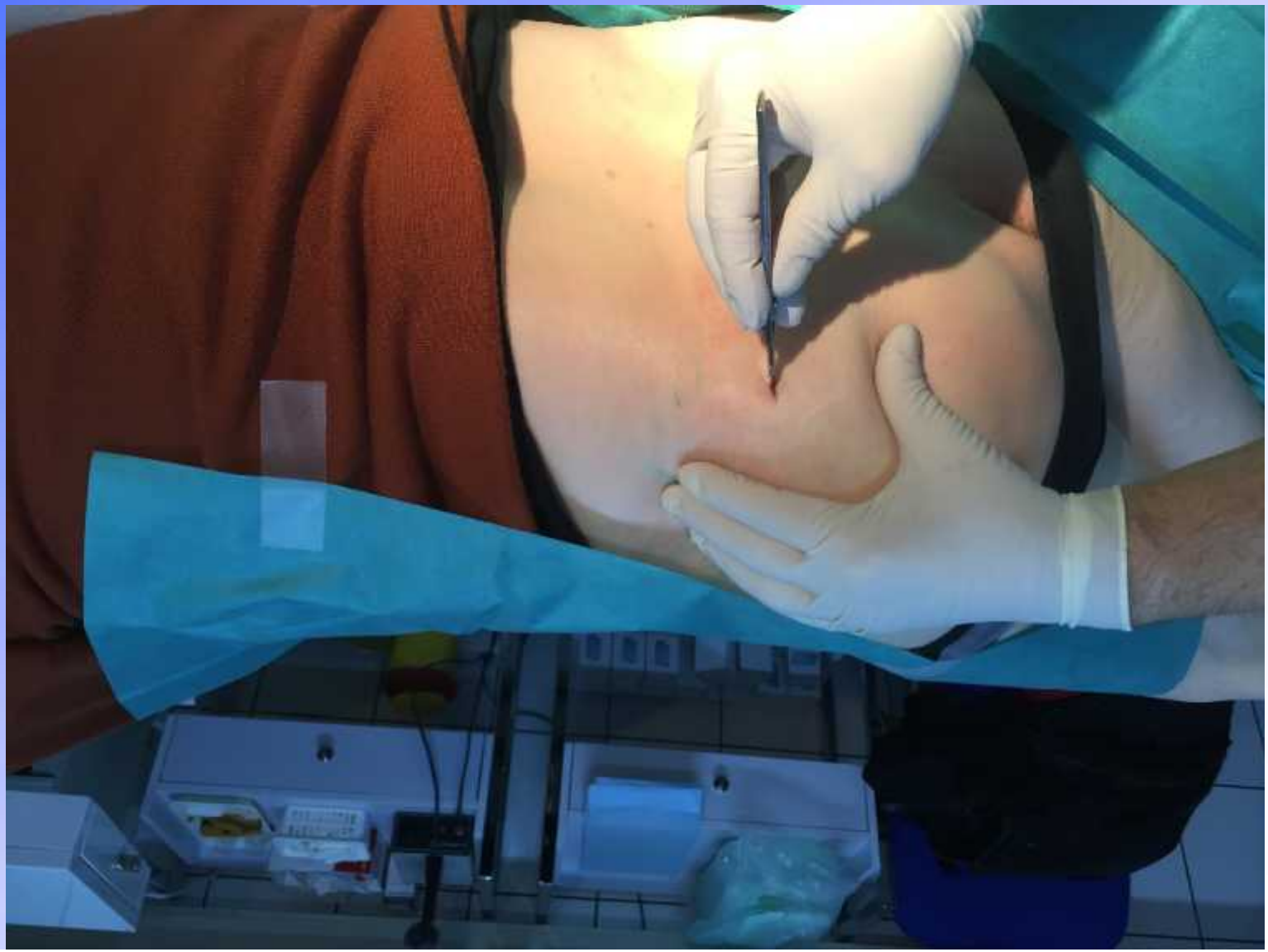
Comparison of the amount of stem cells in fat and bone marrow (1000:1)



Adipose derived mesenchymal stem cellls

Liposuction

Small incision



Infiltration cannula

Tuminescense solution

Tabelle

Zusammensetzung der TLA-Lösung nach Sattler (18)

Wirkstoff	Wirkstoffmenge	Handelspräparat*	Menge
Prilocain (nach Klein: Lidocain)	500 mg	Xylonest 1% (nach Klein: Xylocain 1%)	50 ml
Epinephrin	1 mg	Suprarenin 1:1 000	1 Ampulle = 1 ml
Natriumhydro-gencarbonat	500 mg	Natriumhydrogencarbonat Fresenius 8,4%	6 ml
Natriumchlorid	9 000 mg	Isotone Kochsalzlösung Braun	1 000 ml

Es ergibt sich eine Konzentration des Lokalanästhetikums von 0,049 % LA.
* Beispiel

Infiltration, 150 – 200 ml

Liposuction with harvesting cannula

2 phases, fat on top

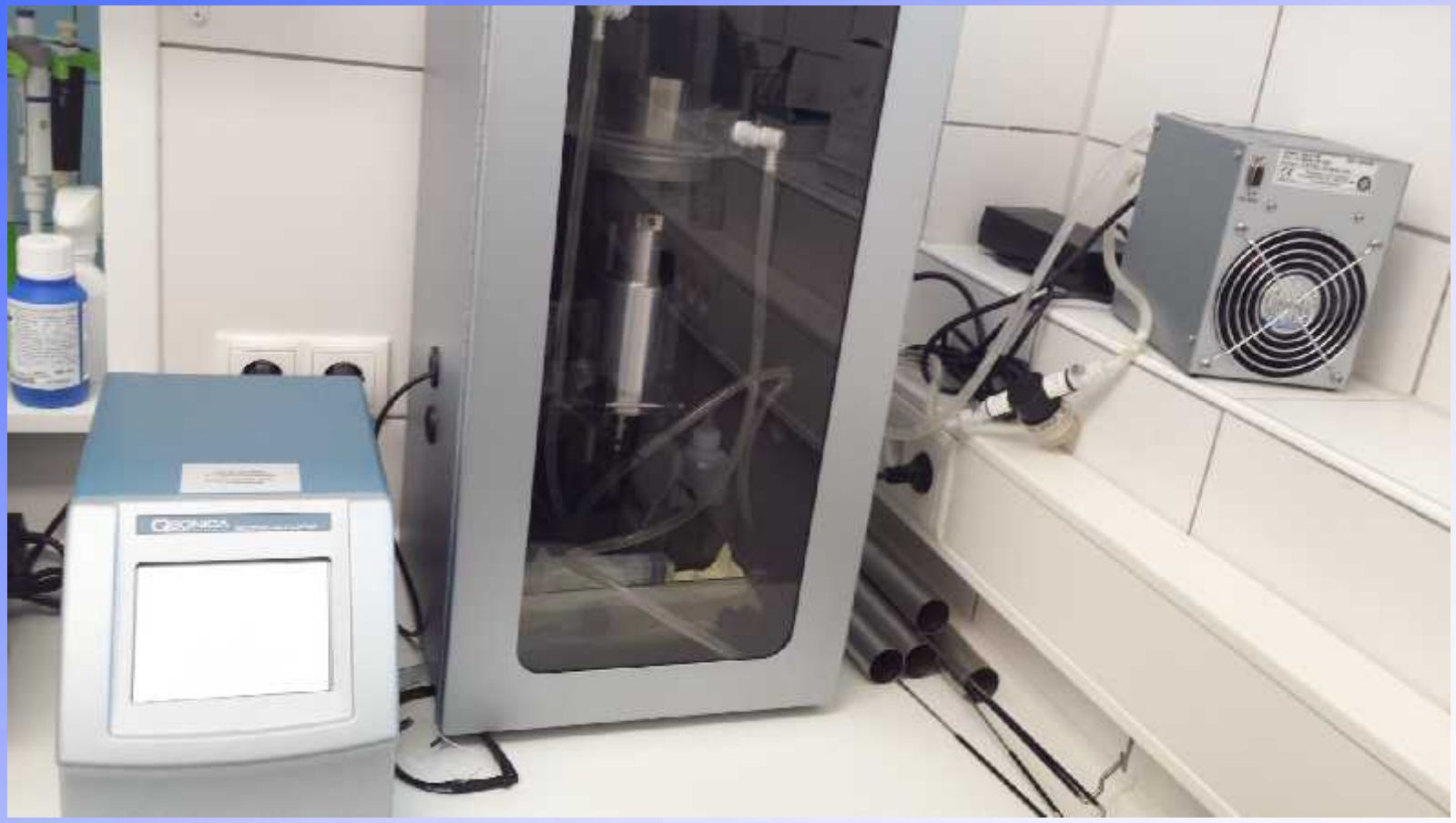

acer

Processing of fat and stem cells

- Indirect sonication
- Centrifugation
- Separation of fat
- Filtration
- Washing
- Freezing (stem cell banking)

Laminar Flow

Ultrasonic system



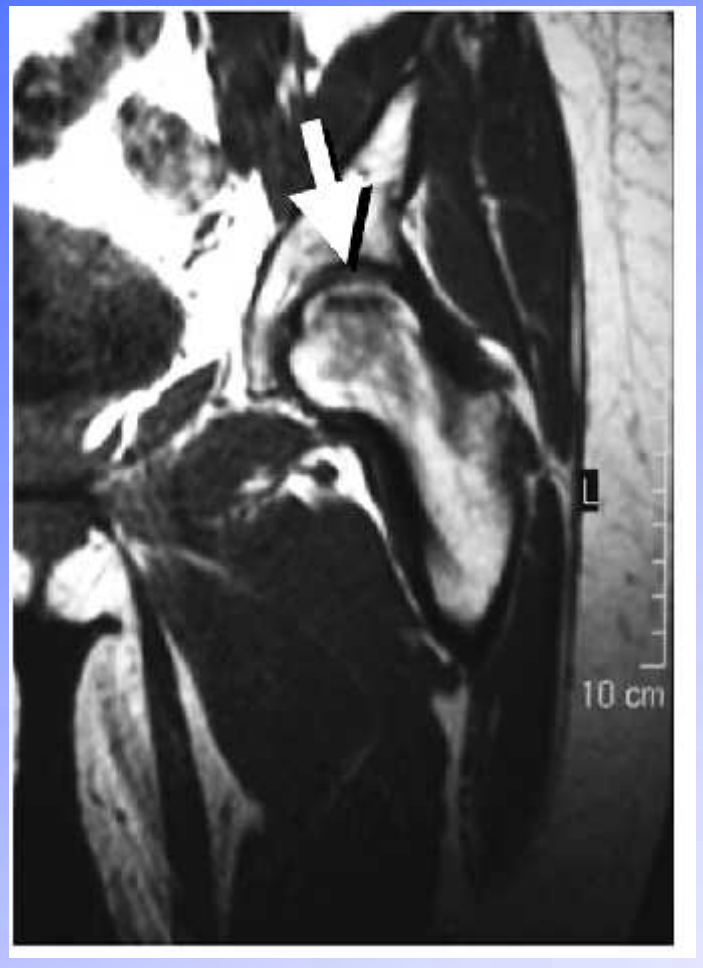
Counting of viable stem cells (Flow cytometry)

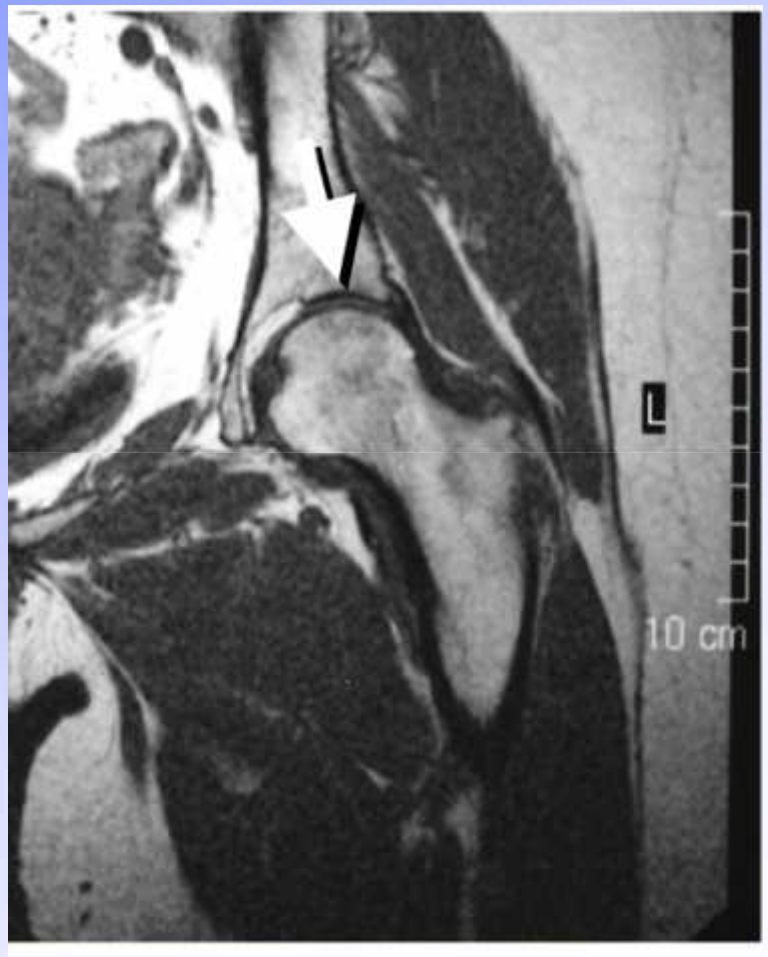
Stem cells can be used for:

- intrarticular injection
- interstitial injection
- intravenous infusion

followed by laser irradiation
with all spectral colors

Before and 1 year after stem cell therapy





Before and 1 year after stem cell therapy

Post cell therapy at 12 months improvement of 0.3 mm at posterior condyle

Ultrasound schock waves for targeting of stem cells

Evidence-Based Complementary and Alternative Medicine
Volume 2013 (2013), Article ID 594906, 12 pages
http://dx.doi.org/10.1155/2013/594906

Research Article

Low-Level Laser Stimulation on Adipose-Tissue-Derived Stem Cell Treatments for Focal Cerebral Ischemia in Rats

Chiung-Chyi Shen,1,2,3,4 Yi-Chin Yang,1 Ming-Tsang Chiao,1 Shiuh-Chuan Chan,5 and Bai-Shuan Liu6

1Department of Neurosurgery, Taichung Veterans General Hospital, Taichung 40705, Taiwan

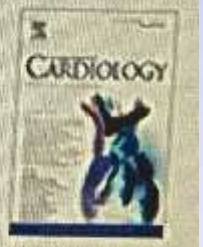
Differentiation in neuronal cells

ELSEVIER

International Journal of Cardiology

Volume 111, Issue 2, 10 August 2006, Pages 231–239

Themed Issue: Acute Cardiology

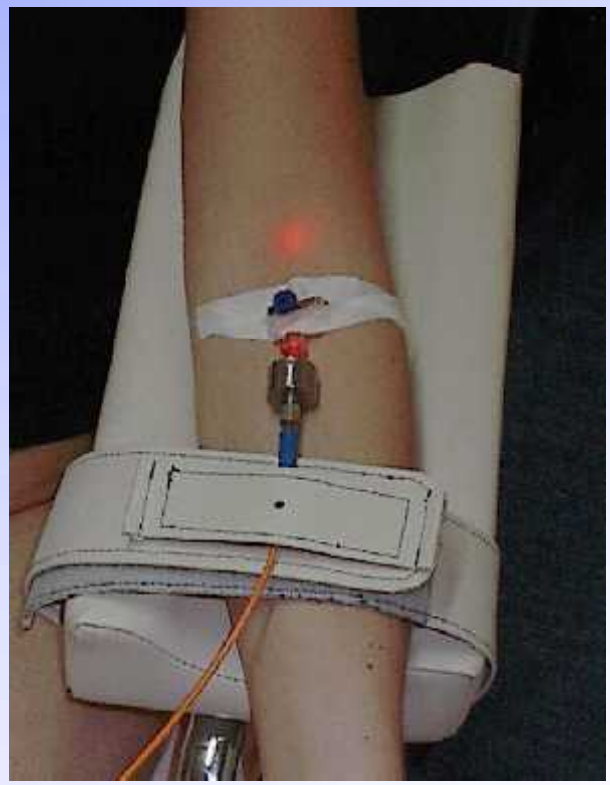


Intravenous mesenchymal stem cell therapy early after reperfused acute myocardial infarction improves left ventricular function and alters electrophysiologic properties

Matthew J. Price[a], Chung-Chuan Chou[a], Malka Frantzen[a], Takashi Miyamoto[a], Saibal Kar[a], Steve Lee[a], Prediman K. Shah[a], Bradley J. Martin[b], Michael Lill[c], James S. Forrester[a], Peng-Sheng Chen[a], Raj R. Makkar[a].

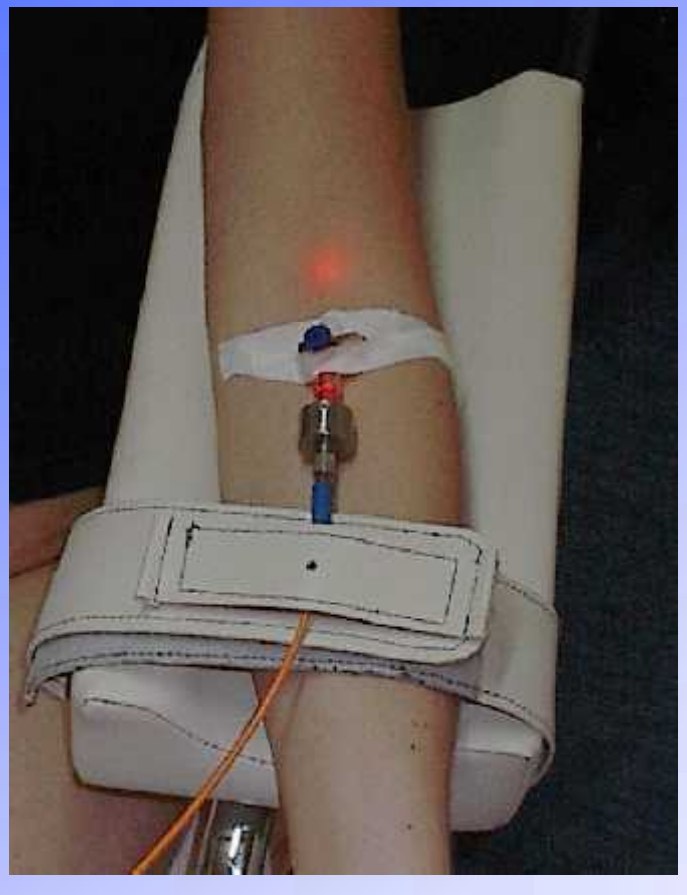
Dr. Michael H. Weber

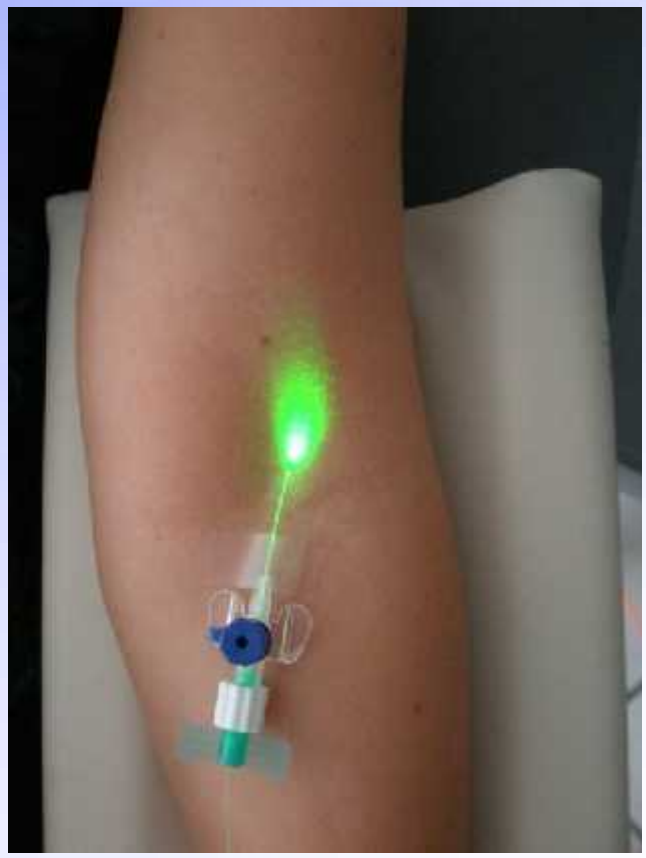
IV Laser Blood Irradiation



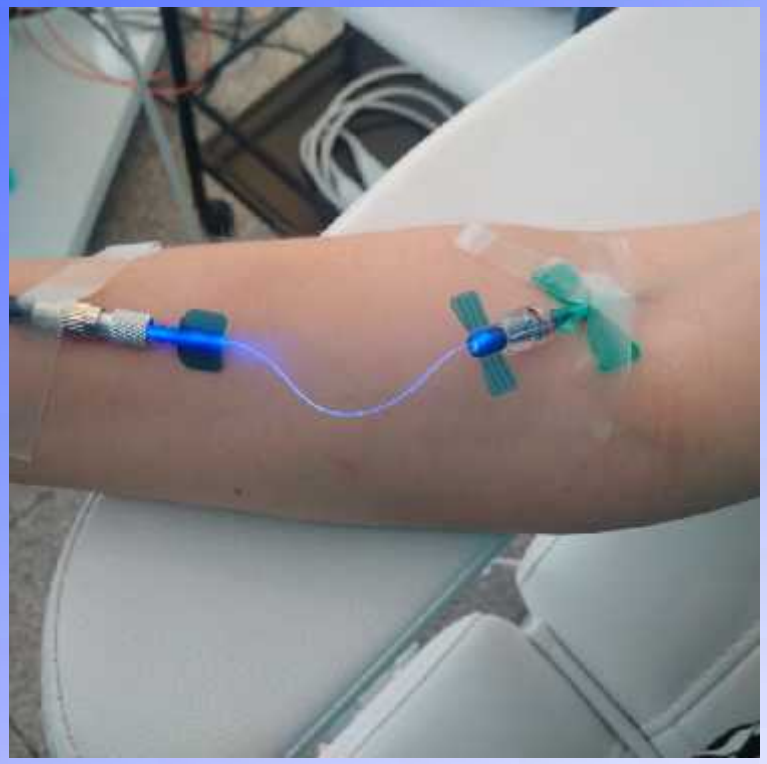
IV Lasertreatment with

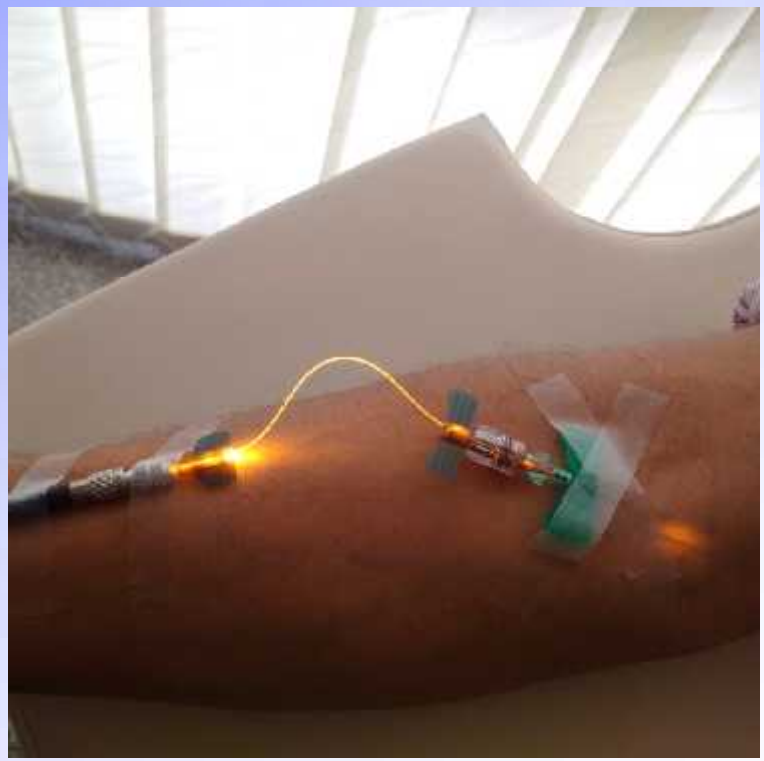
Red and green laser





Iv-laser treatment with blue and yellow laser





Y-needle with 3 luer-lock for iv-Laser with simultaneous infusion

Effects of intravenous laser light irradiation

Red laser

Stimulation of the immune system, improvement of blood viscosity

Green laser

Increased oxygen supply

Blue laser:

Increased NO, bactericidal effects

Yellow laser:

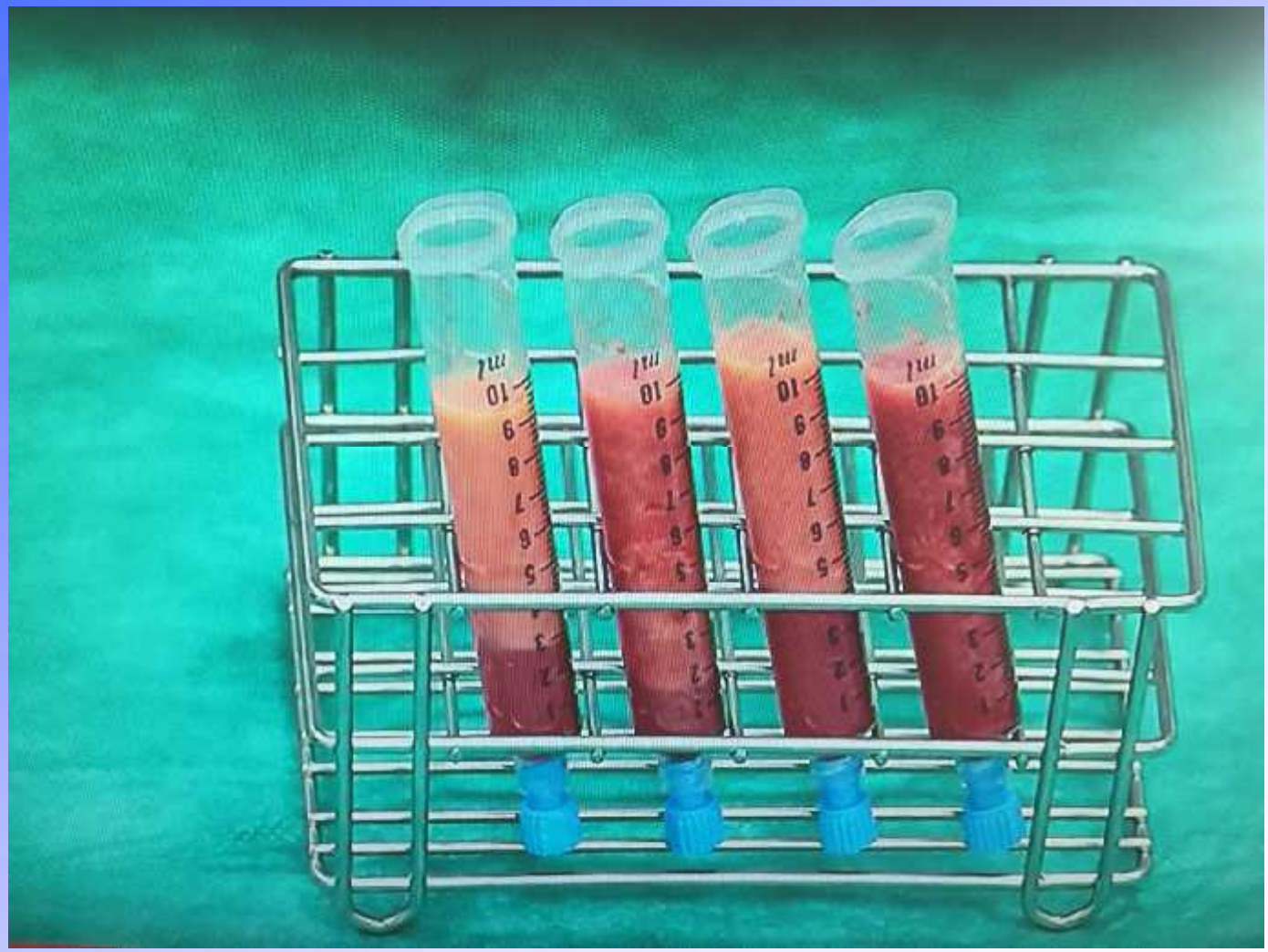
antidepressive effects and more?

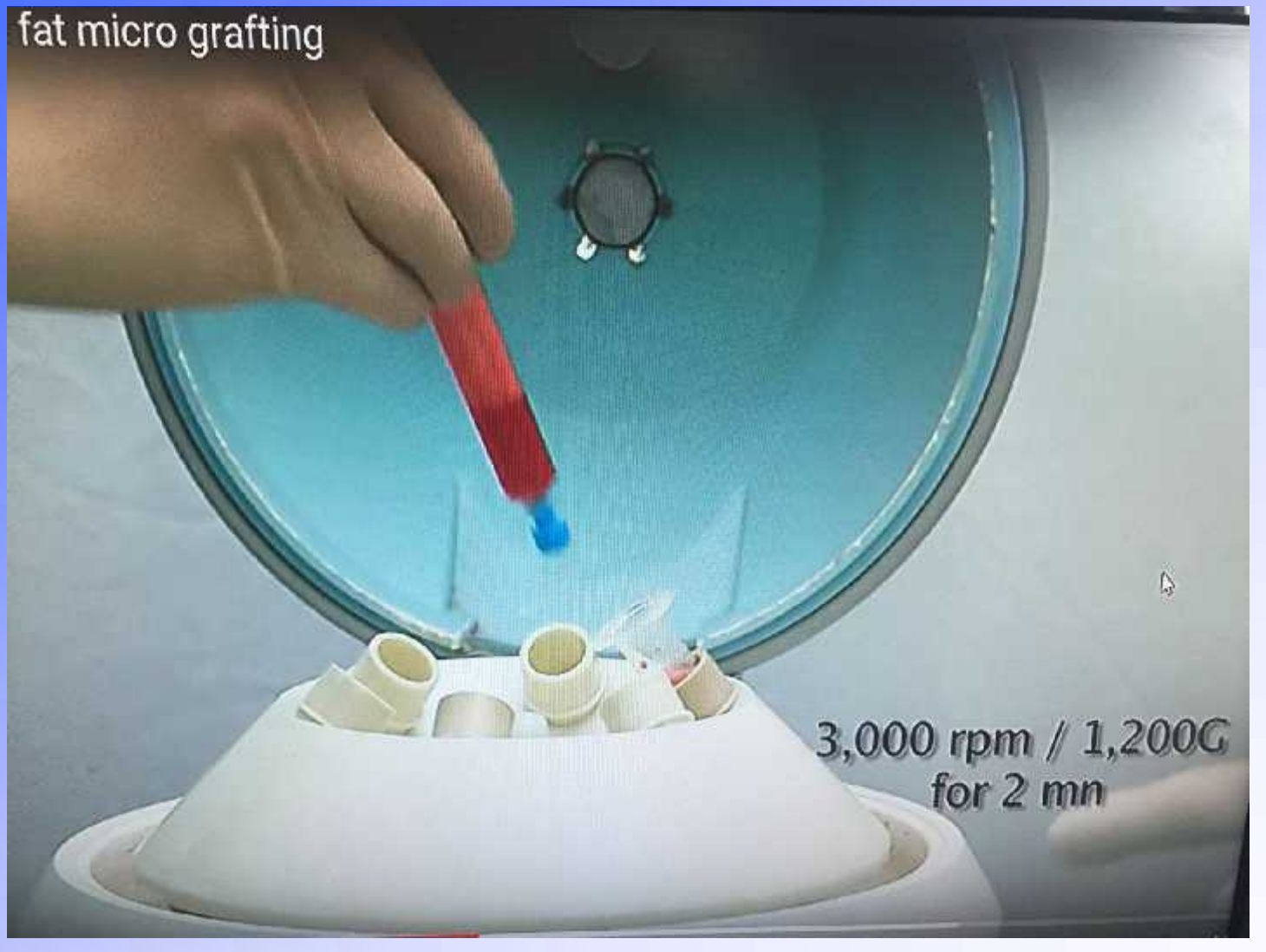
All colors stimulate the respiratory chain in the mitochondria with increased ATP production.

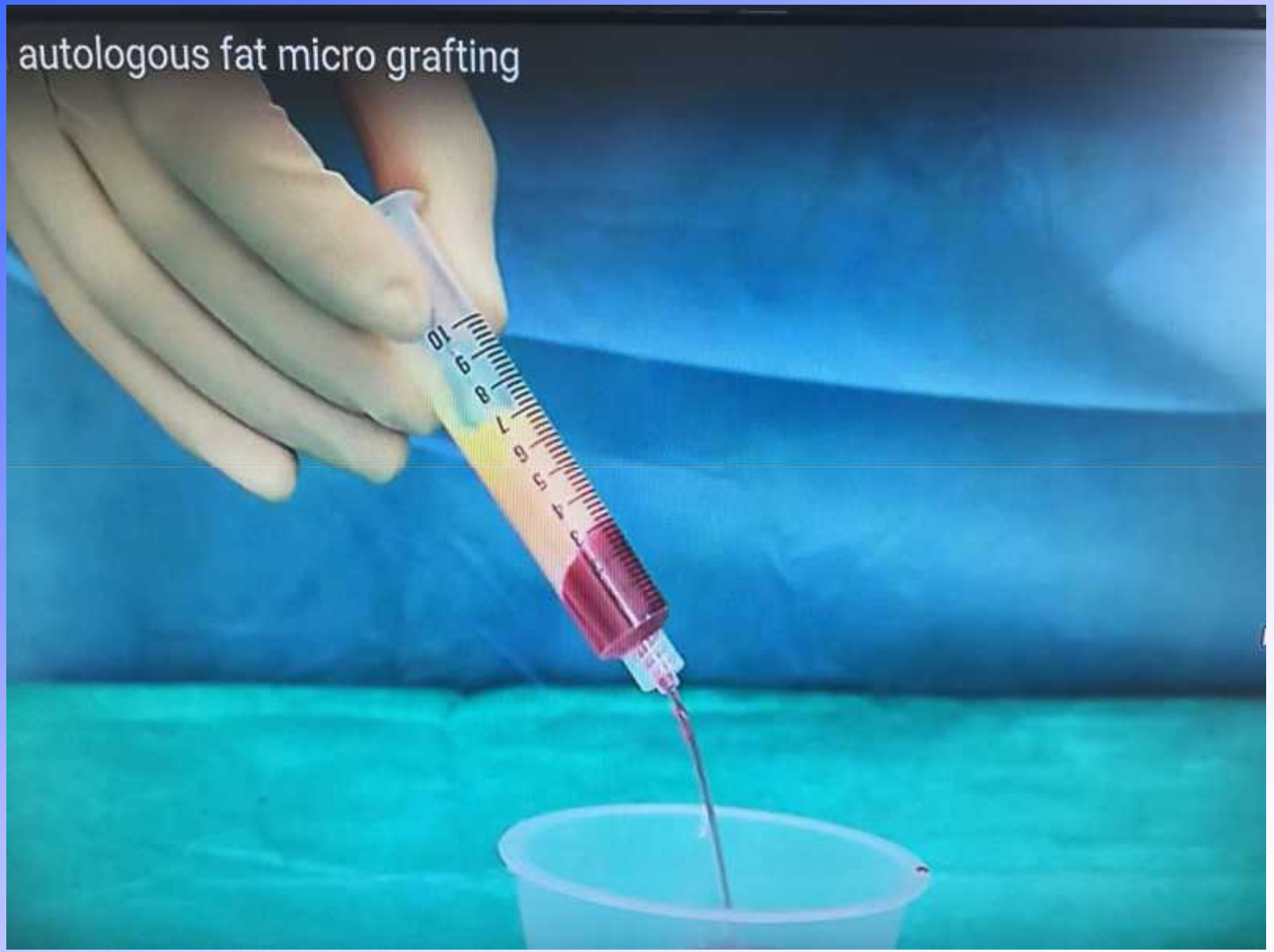
Cosmetic laser medicine with Micro- fatgrafting

- Fat preparation by small liposuction
- Separation from tuminscence solution
- Injection of fat below wrinkels for filling (Microfatgrafting)
- Laser stimulation

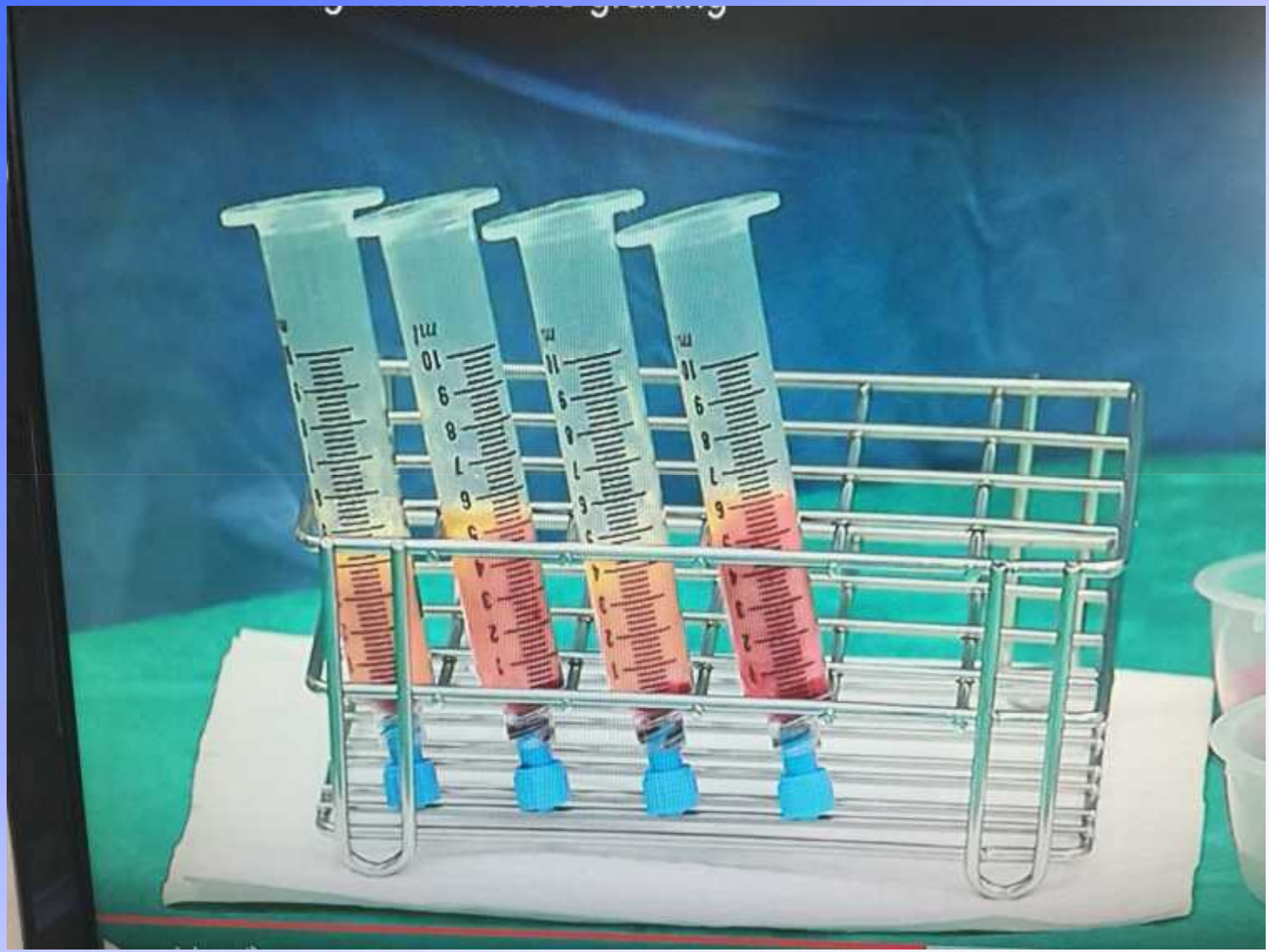
Skin aging

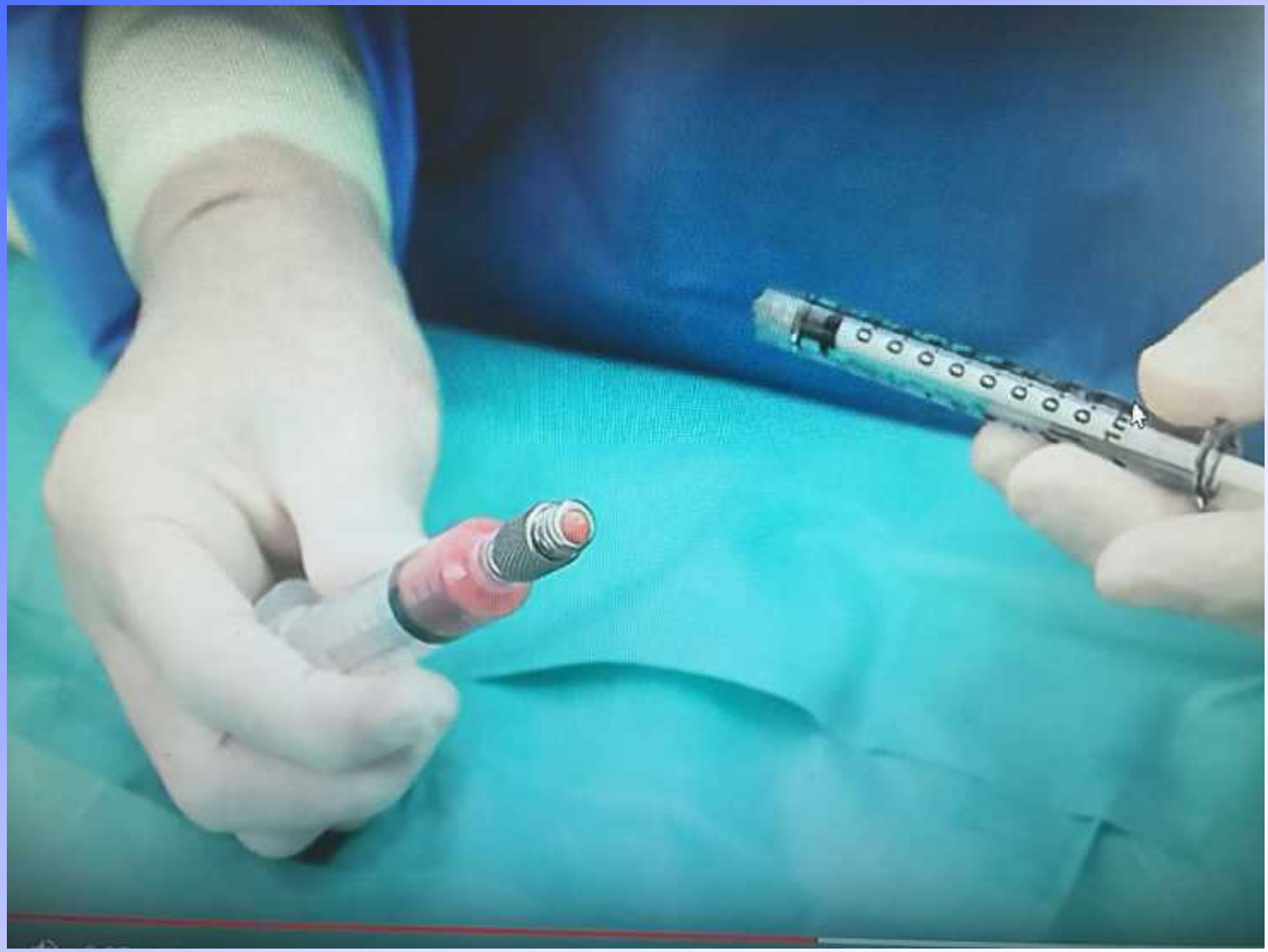


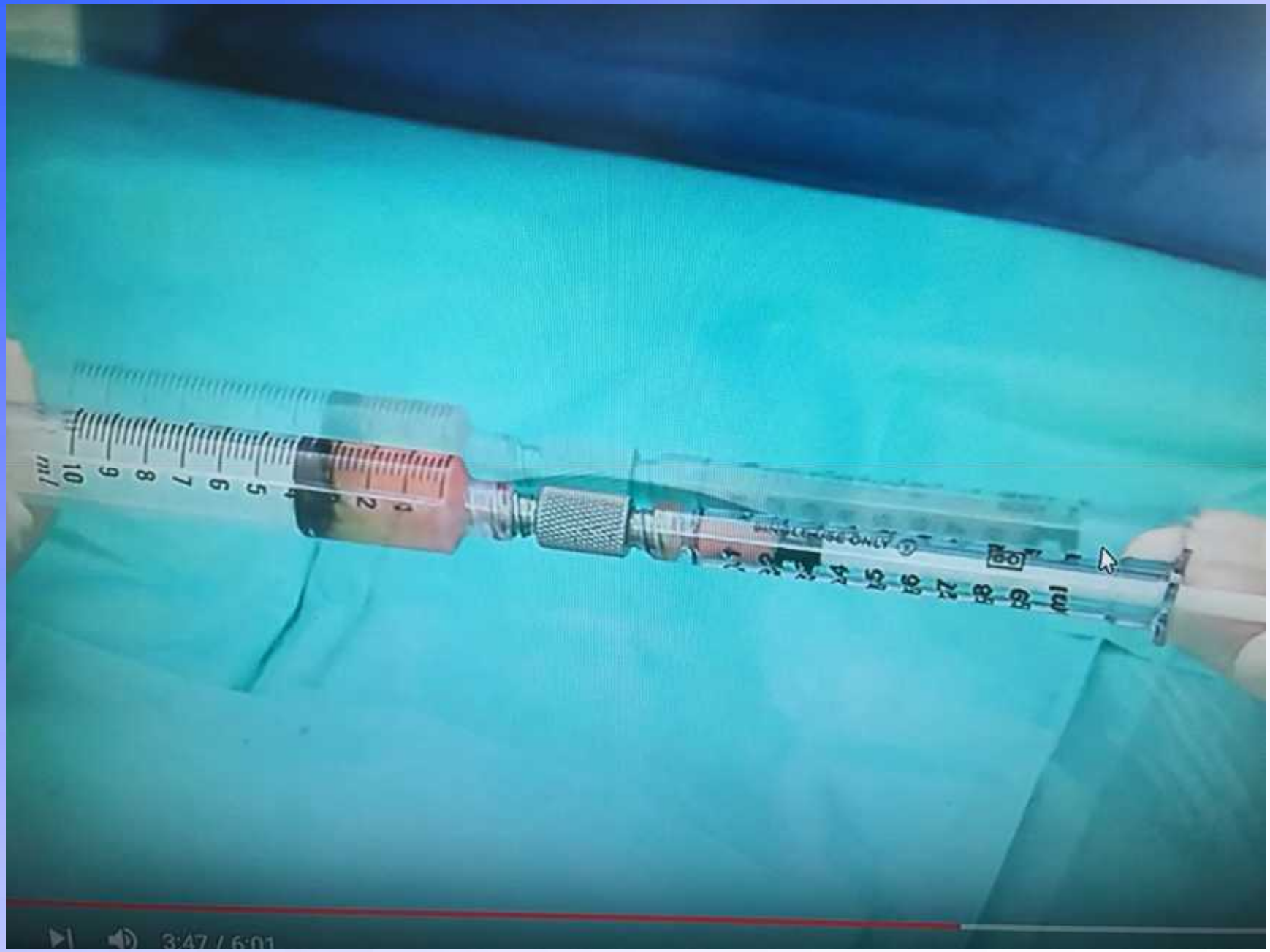

fat micro grafting
3,000 rpm / 1,200G
for 2 mn


autologous fat micro grafting

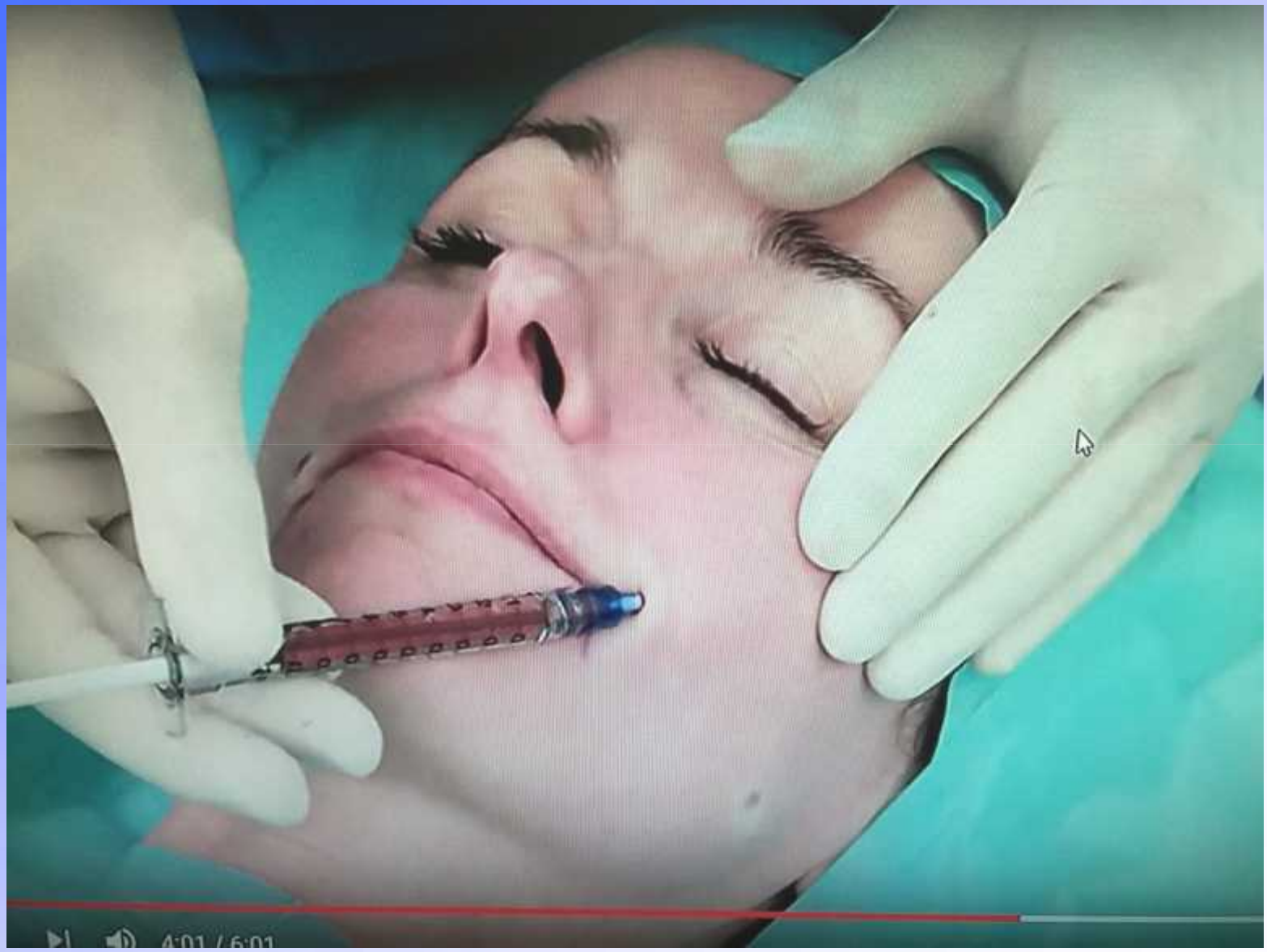

ologous fat micro grafting

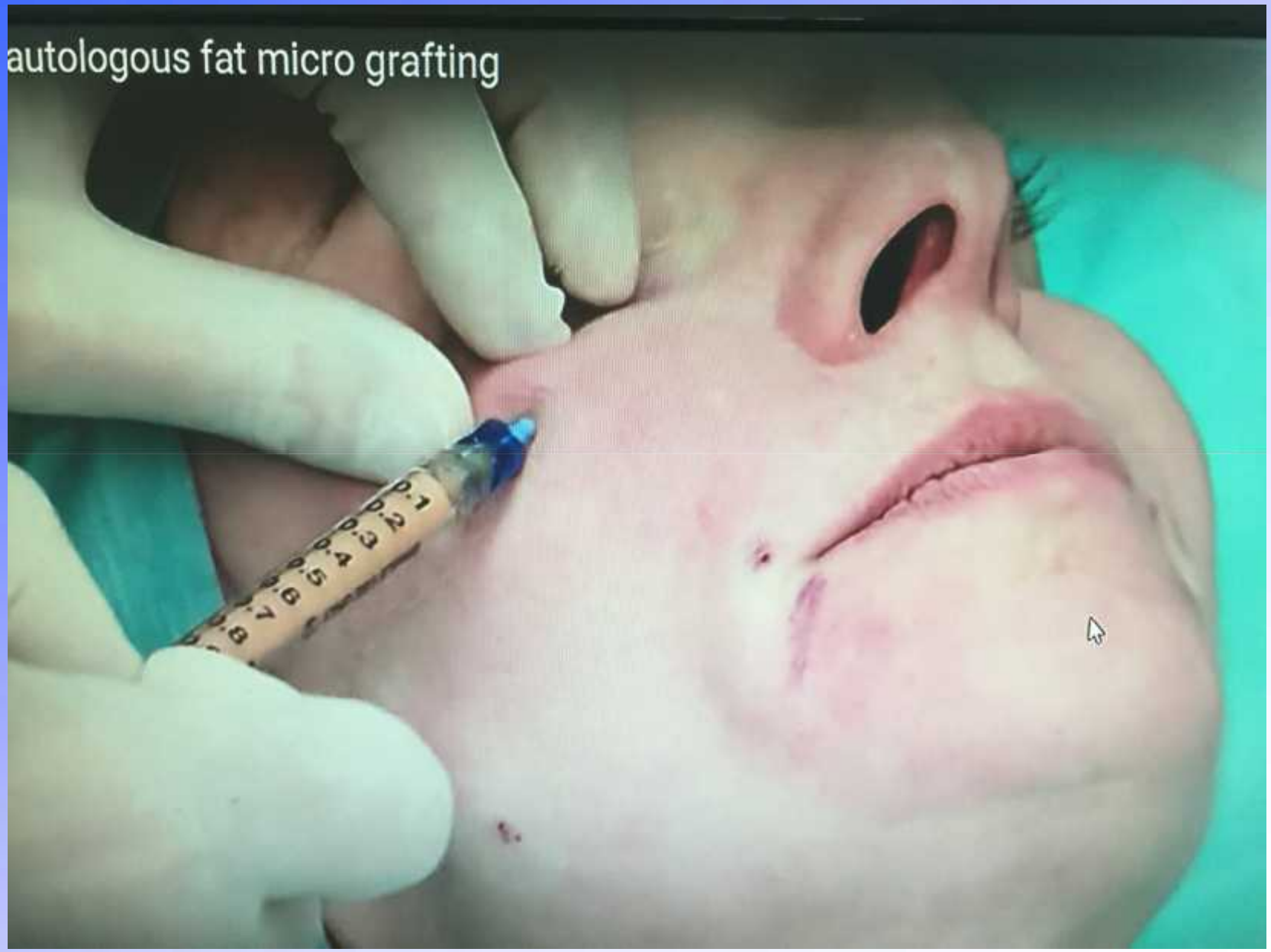


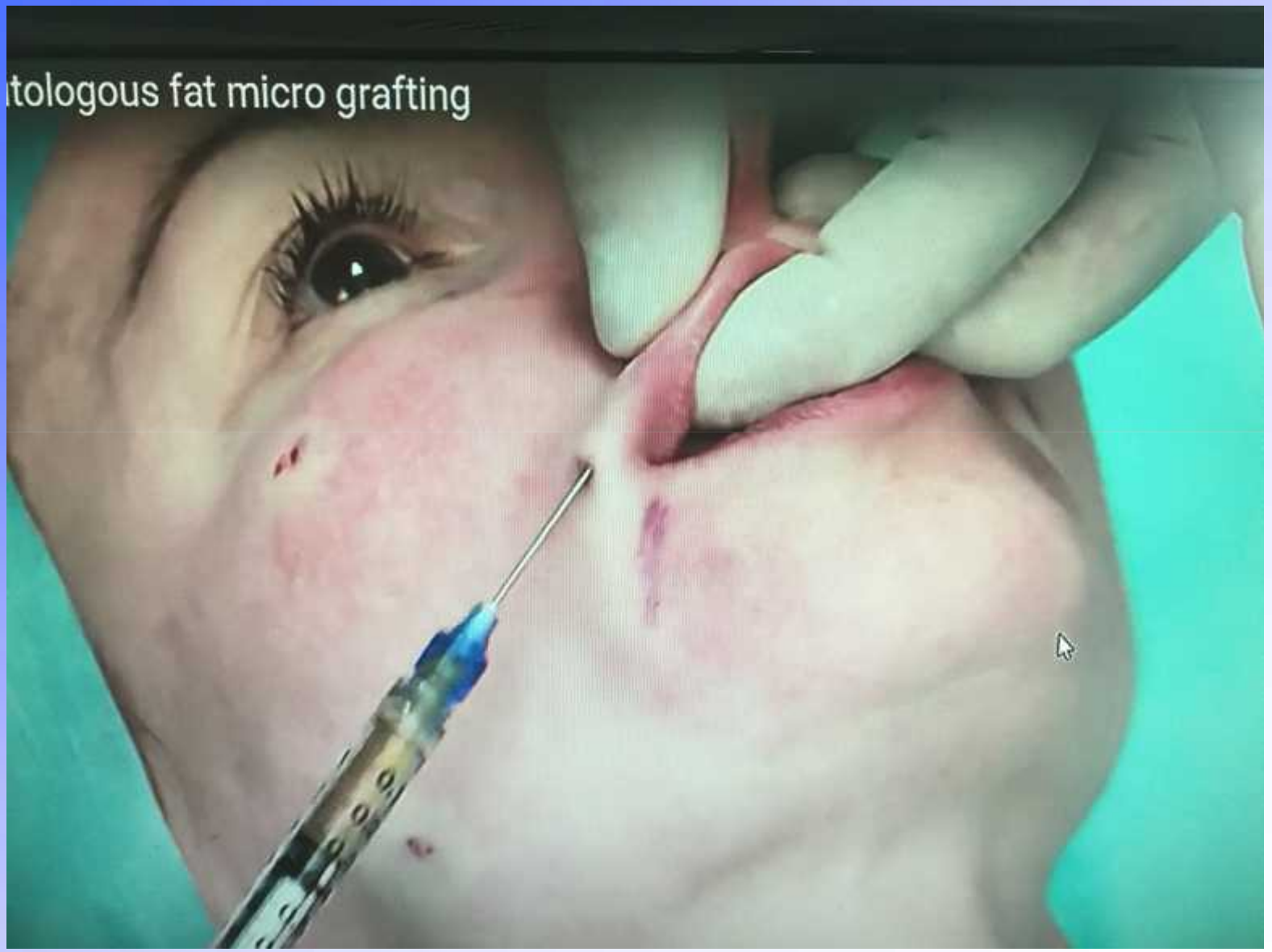



3:47 / 6:01

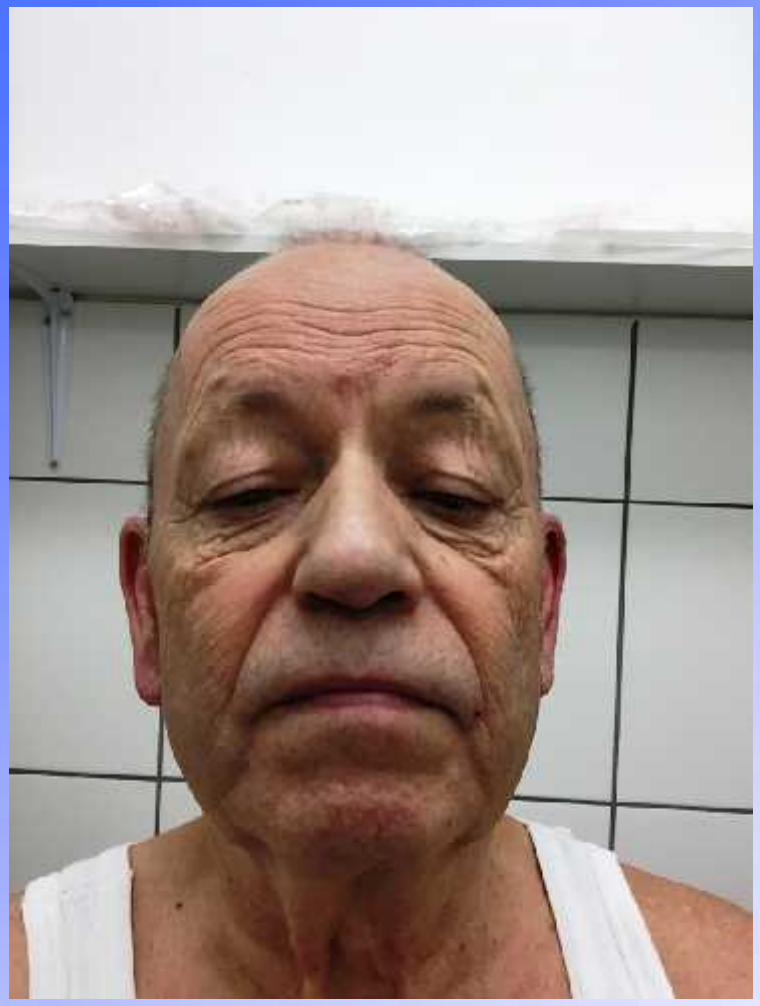

0.8 mm – 21 G – 40 mm


4:01 / 6:01


autologous fat micro grafting

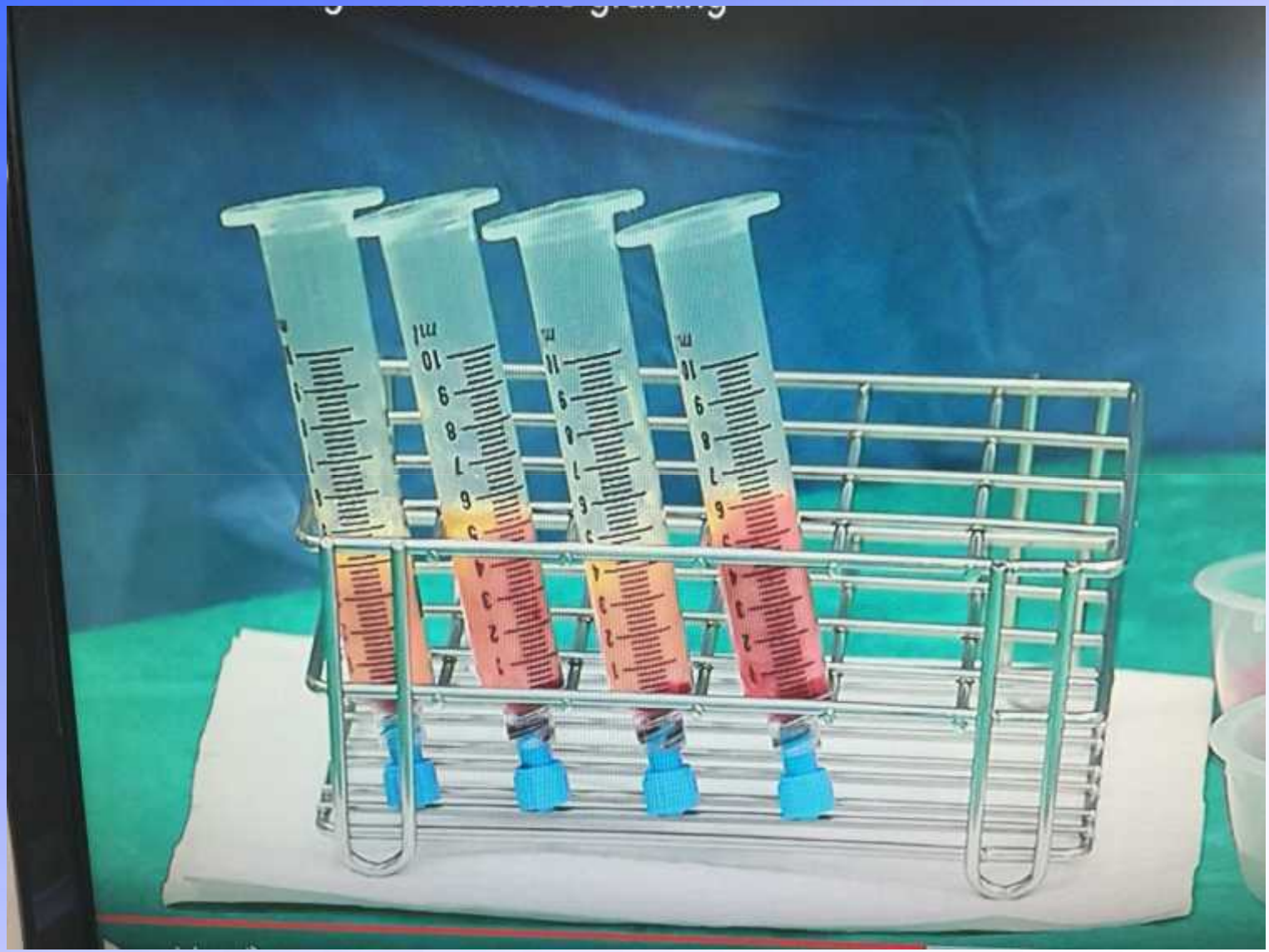

tologous fat micro grafting


0.5
0.5
2
2
1
1
2
0.5 0.5 0.5
2
0.5
0.5
0.5
0.5
1 1
Total : 16.5 cc

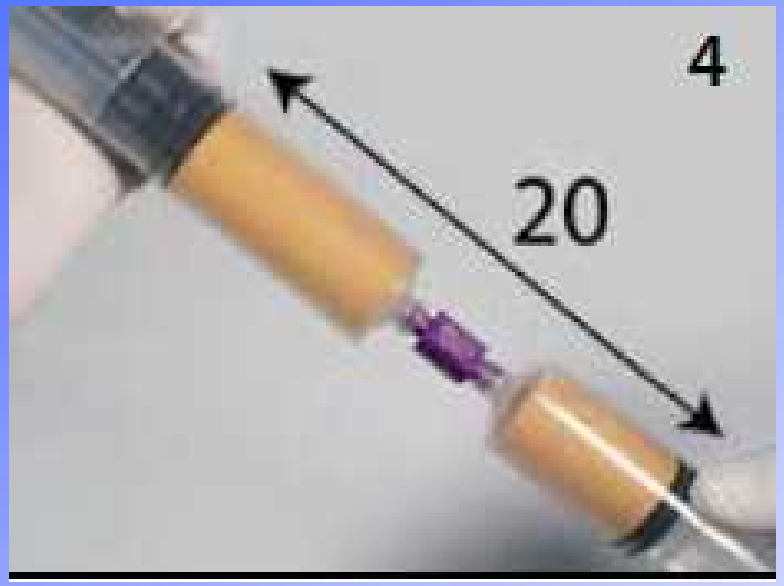


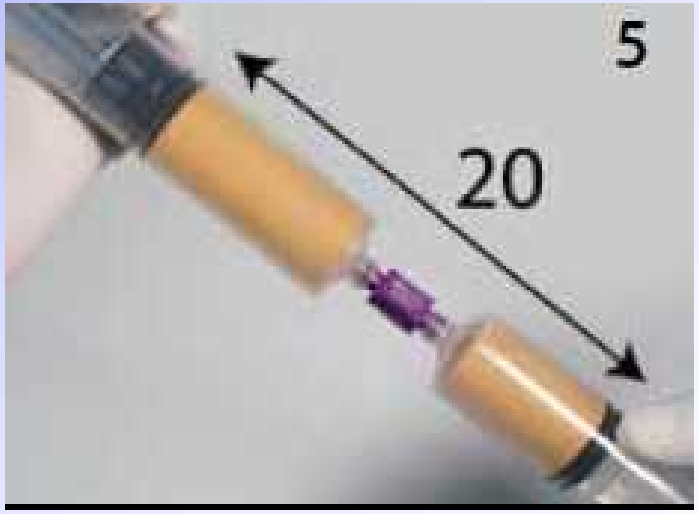
Cosmetic laser medicine
Nano-Fatgrafting

- Small liposuction
- Separation from tuminesense solution
- Emulsification of the fat
- Injectionen intracutanously with 27 G needle
- Enriched with stem cells
- Laser stimulation

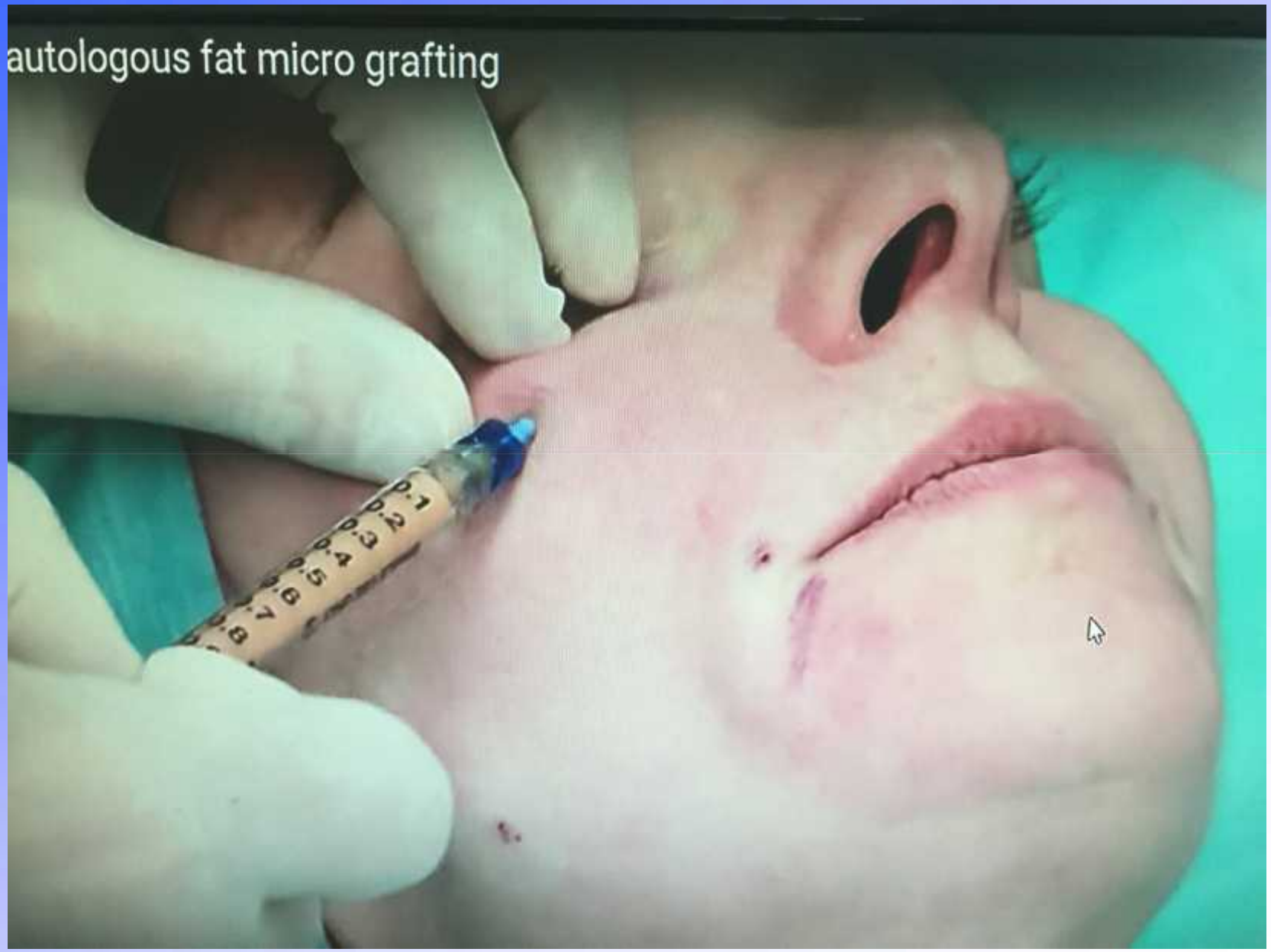


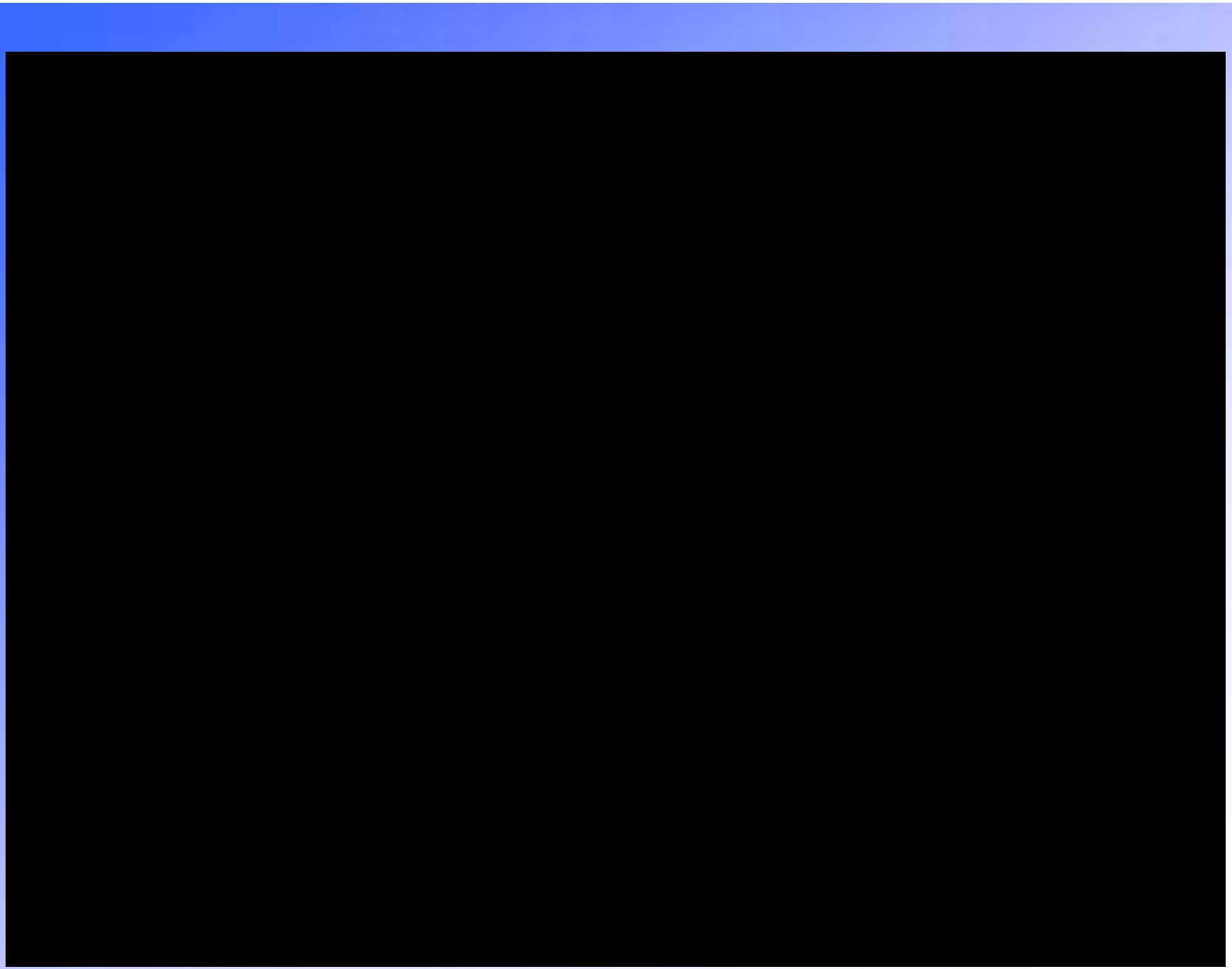
Emulsification process





Special filter system


autologous fat micro grafting



Thank you for your attention