

LASER treatment in DR

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Goals

- Approach to management
- Mechanism of action
- Indications for ttt
- Application
- Side effects
- New devices



Approach to management in DR

Primary level

- Prevention
- Retard onset
- Target high risk group
- Educate patient

Secondary level

- Early diagnosis
- **Early treatment**
- Control risk factors

Tertiary level

- Vitreous surgery
- Visual rehabilitation



Fundus Examination



1st exam.

IDDM

- 5 years after onset
- At puberty

NIDDM

- Immediately after diagnosis

If Normal ...



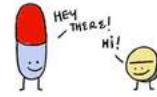
Minimal follow up

- Annually

- Annually



Fundus Examination



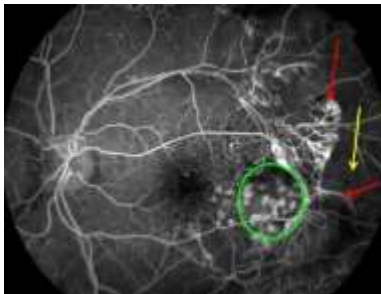
If Abnormal ...



- NPDR without maculopathy
 - Mild 8 - 12 months
 - Moderate... 6 - 8 months
 - Severe..... 4 - 6 months
- NPDR with maculopathy
 - 3 - 4 months

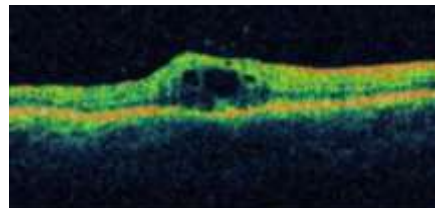
FFA

Capillary non perfusion
Areas of NV



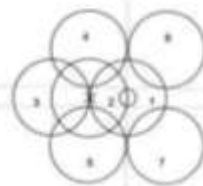
OCT

Macular edema



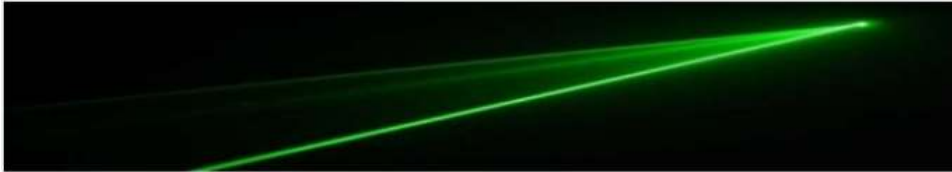
MODIFIED AIRIE CLASSIFICATION uses 7 standard photographic fields to detect neovascularisation.

- RIGHT EYE**
- Field 1 - Disc
 - Field 2 - Macula
 - Field 3 - Temporal to macula
 - Field 4 - Superior-temporal
 - Field 5 - Inferior-temporal
 - Field 6 - Superior-nasal
 - Field 7 - Inferior-nasal



LASER PHOTOCOAGULATION

- The history of retinal photocoagulation dates to 400 BC, when **Plato** described the dangers of direct sun gazing during an eclipse.
- **Czerny** and **Deutschmann**, in 1867 and 1882, respectively, focused sunlight through the dilated pupils of rabbits and created thermal burns in the animals' retinas.
- **Meyer-Schwickerath** undertook the study of retinal photocoagulation in humans in 1946 using the xenon arc lamp.
- The first clinical ophthalmic use of a laser in humans was reported by **Campbell** et al. in 1963 and **Zweng** et al. in 1964.
- **L'Esperance** conducted the first human photocoagulation trial for ophthalmic disease using the argon laser in **1968**. He also introduced the frequency-doubled Nd:YAG and krypton lasers in 1971 and 1972, respectively.



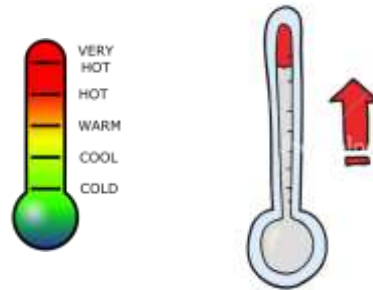
Mechanism of Action

- It may improve oxygenation of ischemic inner retinal layers by destroying some of the metabolically highly active photoreceptor cells ---- > **Relieving hypoxia**

Removing stimulus for VEGF



- Pigments of retinal tissue absorb laser energy
 - > rise of tissue temperature to about 10-20 C
 - > co-agulation of tissue proteins and enzymes.



Laser Treatment



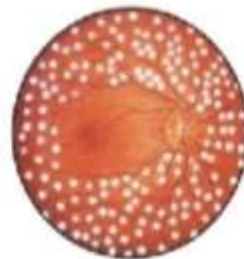
FOCAL LASER

Leaking
microaneurysms



GRID LASER

Diffuse non-
center macular
edema



PANRETINAL LASER

High riskPDR
& NPDR in certain
situations

Indications for Treatment

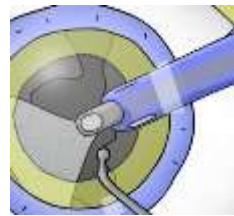
Recommendations of ETDRS :

- Focal/Grid photocoagulation CSME
- Photocoagulation

Mild/Moderate NPDR : Not indicated

Severe/Very severe/Early PDR : should be considered in certain situations

PDR with HRC : Should not be delayed



Facts regarding photocoagulation

- No post-laser restrictions are needed



- More than 1 session is necessary for complete initial tt.
- May cause initial ↓ vision for few weeks.
- After laser, life long evaluation is necessary.



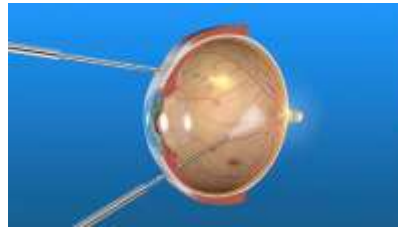
Laser Delivery Systems

- Indirect ophthalmoscope



- Slit-lamp biomicroscope

- Endo-photocoagulation



Preparation

- Surface anesthesia
- Patient co-operation
- Contact lens



Field 60-78
High resolution ttt
near the fovea



Field 120-144
Wide field ttt



Field 165
Wide field ttt

Parameters of Laser

- **Spot size :** **Focal/Grid** ...50-100mM
PRP ... 200-500mM
- **Duration :** **Focal/Grid** ... 0.05-0.1s
PRP ... 0.5-0.1s
- **Power :** **Focal/Grid**
PRP
- **Interval :**
- **Number :** **Focal/Grid** ...200-300 burns
PRP ... 2500-7000 burns (2-3 sessions)



Rules for ttt

- Only greyish reaction
- Spots are 2 burns width apart
- No burns within 500mM of the disc
- Focal/Grid ttt is between 500 and 3000mM from the center of the macula



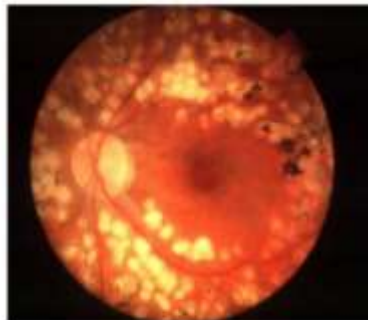
Results

- 70% of eyes achieve stable VA after laser photocoagulation
- 15% show improvement
- 15% subsequently deteriorate

DRS : photocoagulation reduced the risk for severe visual loss by 50% or more

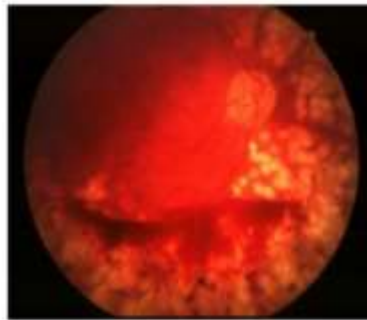
Assessment after Laser Photocoagulation

GOOD INVOLUTION



- Regression of neovascularization leaving 'ghost' vessels or fibrous tissue
- Decrease in venous changes
- Absorption of hemorrhages
- Disc pallor

POOR INVOLUTION



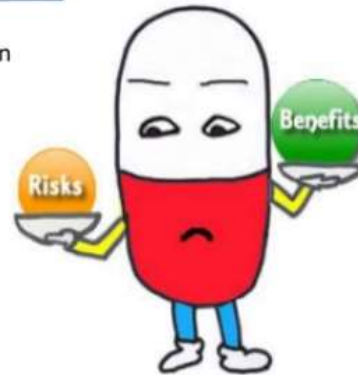
- Persistent neovascularization
- Hemorrhage

FOLLOW-UP

- After 4-6 weeks, the patients are reviewed.
- If some obvious treatable lesions are missed at the initial session, they are treated 4 months after the initial treatment confirming this with FA.
- Follow-up should be done at 4 monthly intervals.

ADVERSE EFFECTS

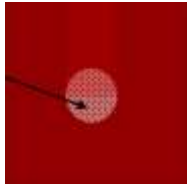
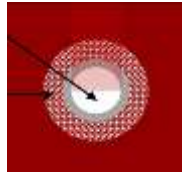
- Paracentral scotoma.
- Transient increased edema and decreased vision
- Choroidal neovascularization.
- Subretinal fibrosis.
- Scar expansion.
- Foveolar burns.



New Devices

- **Subthreshold Micropulse laser**
- **Pattern scan laser PASCAL**
- **Targeted Retinal Photocoagulation TRP**

Subthreshold Micropulse laser (780-850 nm)



Treatment Endpoint

Response of Directly Heated Tissue

Response of Indirectly Heated Tissue (stress response)

Subthreshold Micropulse laser

Pulse ON time 0.1 ms
 Pulse OFF time 1.9 ms
 Period (T) 2.0 ms
 Duty cycle (%) 5%

Mainster Focal Grid (1.05 X)

Area Centralis (1.06 X)



Pattern scan laser **PASCAL**

- Frequency doubled **Nd:YAG LASER (532nm)**
- Less destructive than Argon laser
- Single shot mode or array of up to 56 shots applied in less than a second
- Improves patient comfort



Targeted Retinal Photocoagulation

TRP

- An alternative to standard PRP is TRP
- Uses wide field angiography to detect ischemic retinal areas and to only photocoagulate those areas avoiding damage to non ischemic retina
- Non contact PRP ttt



Remember

The mainstay in ttt of diabetic maculopathy and
proliferative retinopathy is ...

Laser Photocoagulation

THANK YOU