Light Amplification by Stimulated Emission of Radiation…

Ocular Tumors

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The story started long time ago…….

1945

Gerhard Meyer-Schwickerath,
a German ophthalmologist

Solar eclipse

has a damaging effect on patients' retinas,

"resembled the sort of scar resulting from surface diathermy."

Dr. Meyer
carbon arc lamp

as a more reliable artificial light source;

however, a short filament life span, and unpredictable retinal burns limited its usefulness

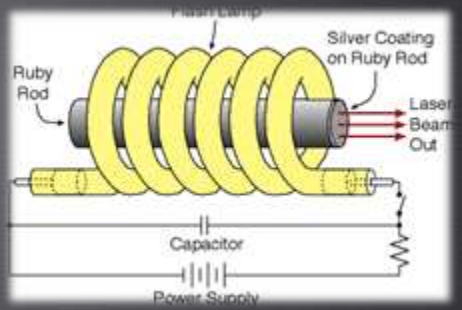
1950s,

Carl Zeiss Laboratories

xenon arc lamp

It emitted a light spectrum
similar to sunlight, with
a relatively high, uniform power output.

Ruby Laser was introduced…



Offering a range of wavelengths and pulse durations, and more precisely targeted treatments.

Launching the Laser era
Revolution the treatment of retinal disease.

1952 …

First malignant choroidal melanoma to be treated with laser instead of enucleation

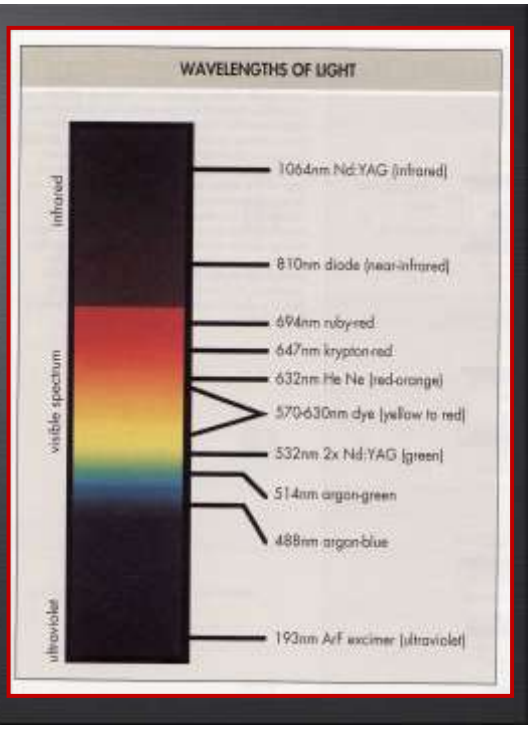
paving the way for laser treatments in ocular oncology

pioneering the use of globe-salvage techniques

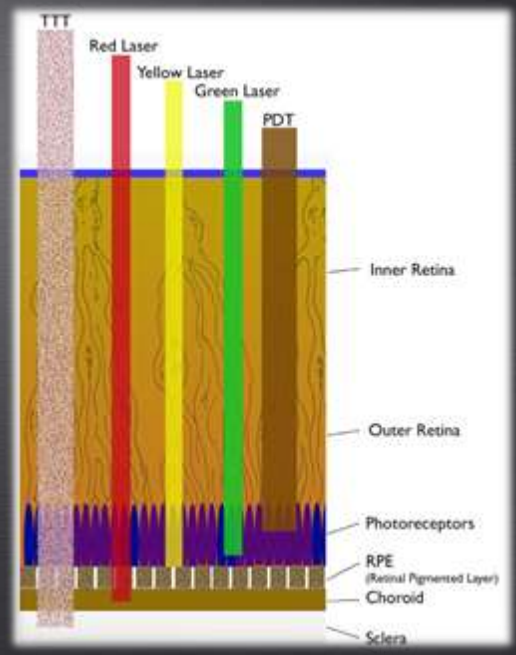
The most commonly used:

- Green argon (532 nm),
- Yellow (577 nm)
- Red krypton (660 nm, 670 nm)
- Infrared diode (810 nm)

Longer the wavelength
the less scattering
the deeper penetration



- **Infrared diode** penetrate to the choroid and sclera.
- krypton-red reach the choroid
- yellow-diode and argon-green absorbed by RPE shielding the underlying choroid.



Rationale

Laser energy is converted to thermal energy:

- 60 C …. denatures tissue protein … coagulative necrosis
- 45-60 … tissue necrosis without coagulation

TRANSPUPILLARY THERMOTHERAPY

PHOTODYNAMIC THERAPY

PHOTOCOAGULATION

TRANSPUPILLARY THERMOTHERAPY

NEAR-INFRARED DIODE LASER (810 NM)

TRANSPUPILLARY THERMOTHERAPY
NEAR-INFRARED DIODE LASER (810 NM)

- ***Duration: Long*** (1 min) … thermal effect 45-60C

- ***Power*** : the energy has been adjusted until gray discoloration of tumor (typically after 30–40 seconds) has been obtained.

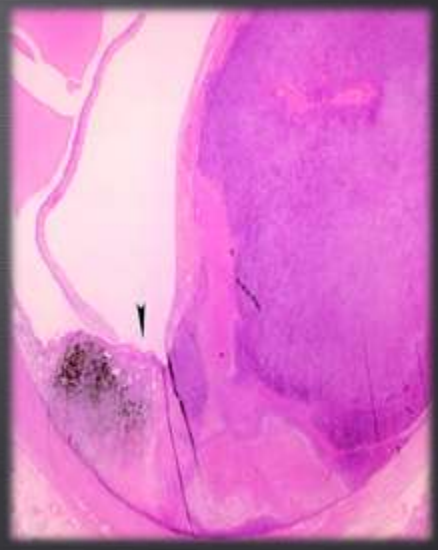
TRANSPUPILLARY THERMOTHERAPY
NEAR-INFRARED DIODE LASER (810 NM)

- ***Size***: up to ***2.5 mm*** in depth,

- ***Application***: the entire surface of the tumor and 1.5 mm margins of normal appearing tissue around the tumor

HISTOPATHOLOGICALLY

- ***Cells*** with shrunken nuclei without nucleoli, and loss of cytoplasm.
- ***Blood vessels*** are typically both dilated and occluded by thrombi.
- Bleaching of erythrocytes, tumor nuclear debris with no cytoplasm.



CHOROIDAL MELANOMA

RETINOBLASTOMA

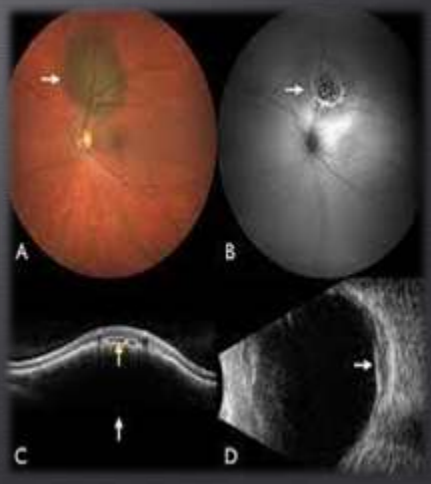
Uveal Melanoma Management

- Small tumors…..observe/ TTT
- Medium sized tumor….Brachytherapy
- Large sized tumor….Enculeation

CHOROIDAL MELANOMA

Indications

- Primary therapy for small tumors
  -Less than 10 mm in basal diameter
  -Less than 2.5 mm in thickness



CHOROIDAL MELANOMA
Indications

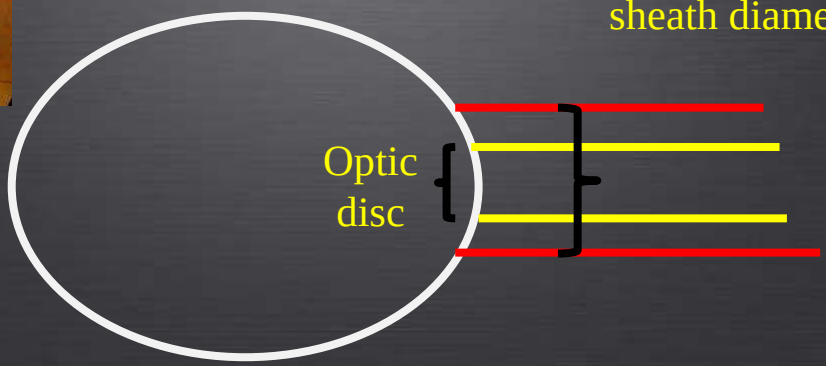
- Treatment of marginal tumor recurrence
- Treatment of residual tumor

CHOROIDAL MELANOMA
Indications

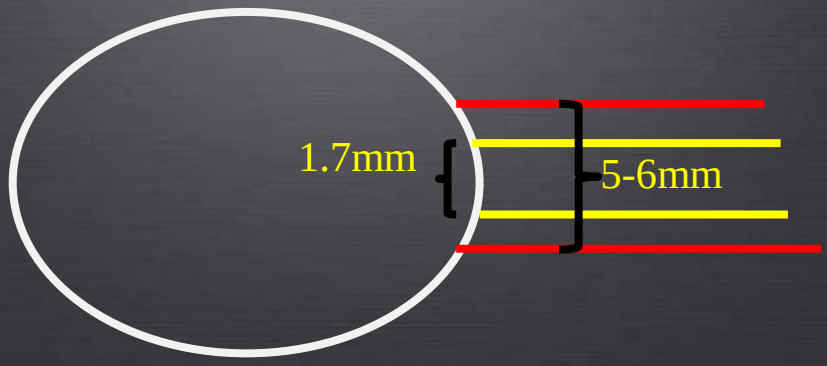
- ➢ Combined with plaque radiotherapy ("sandwich procedure")
- ❑ Medium sized tumors beyond brachytherapy

Juxtapupillary tumors:

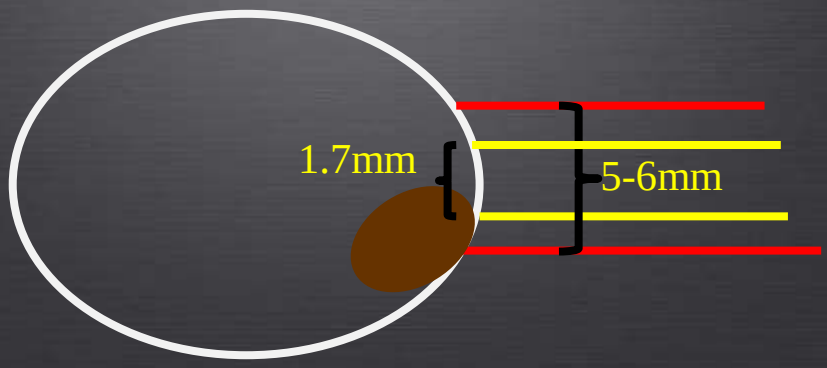
Juxtapupillary tumors:



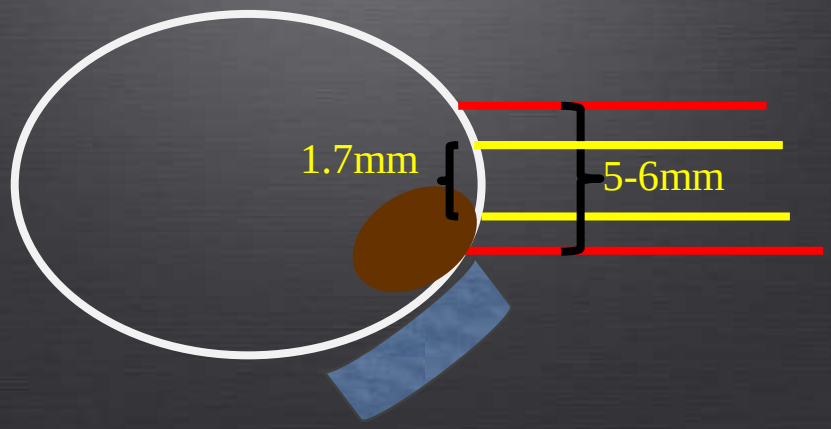
Juxtapupillary tumors:



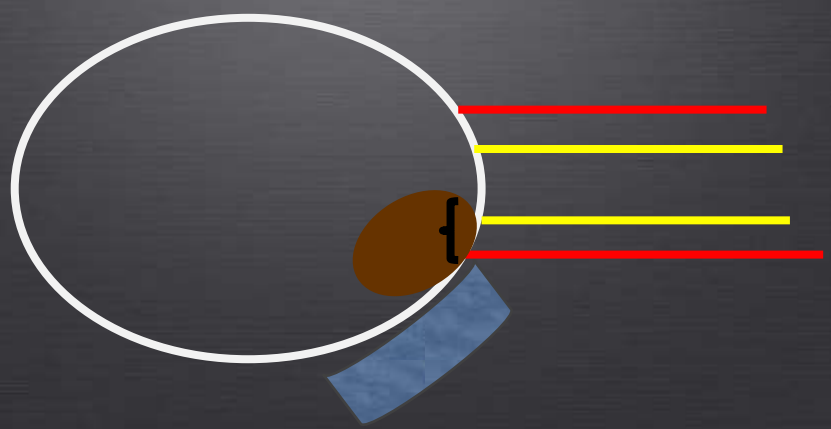
Juxtapupillary tumors:



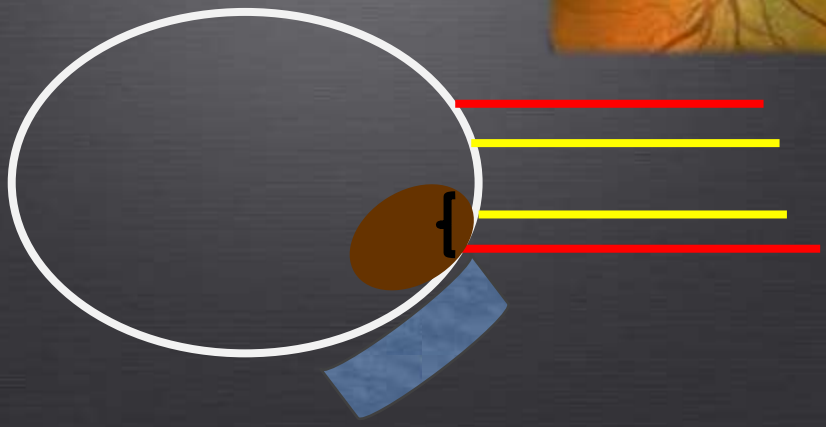
Juxtapupillary tumors:



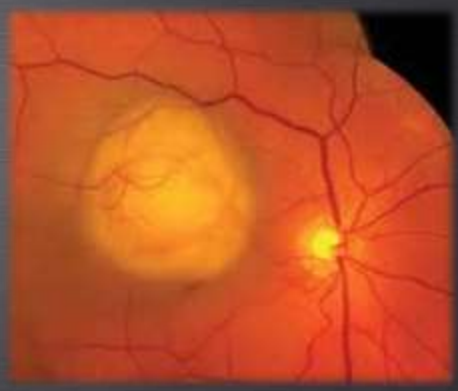
Juxtapupillary tumors:



Juxtapupillary tumors:
We add adjuvant TTT



CHOROIDAL MELANOMA



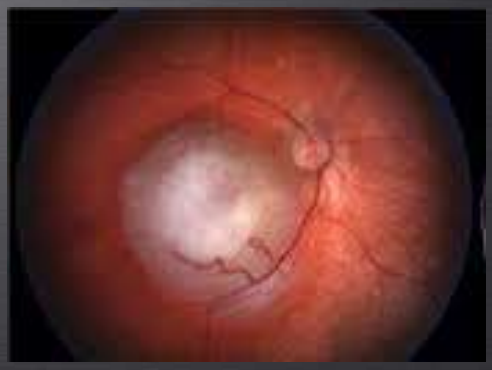
Contraindications

- Significant media opacities: corneal opacities, cataract, or hge
- Poor pupillary dilation or difficulty positioning patient
- Amelanotic tumors tend to have poor response

RETINOBLASTOMA

- Mainstay is chemotherapy

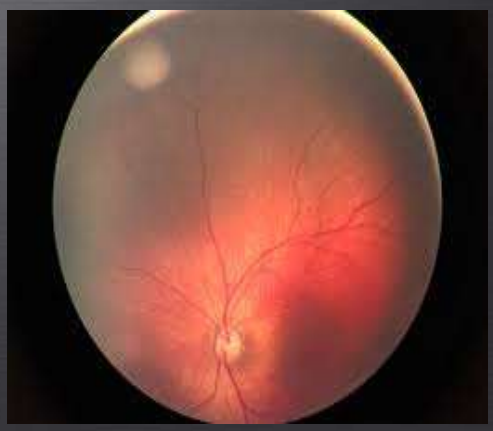
Intravenous
Intra arterial
Intravitreal



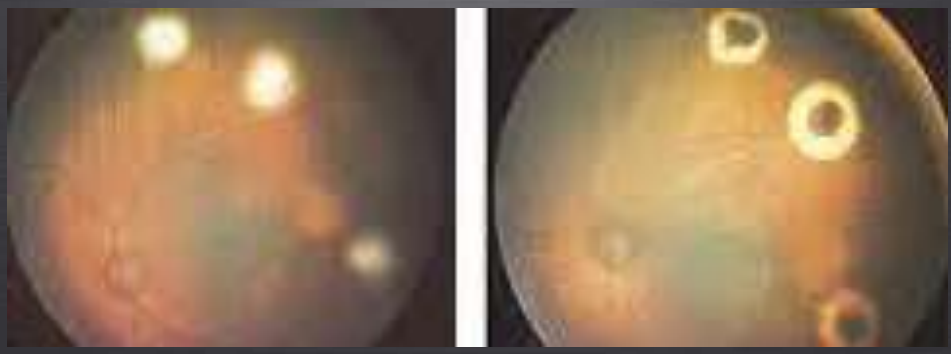
RETINOBLASTOMA
Indications

- Primary laser therapy for (Grade A tumors)

-Small tumors greater than 3 mm from the fovea and greater than 1.5 mm from optic disk
-Less than 3 mm in basal diameter and height

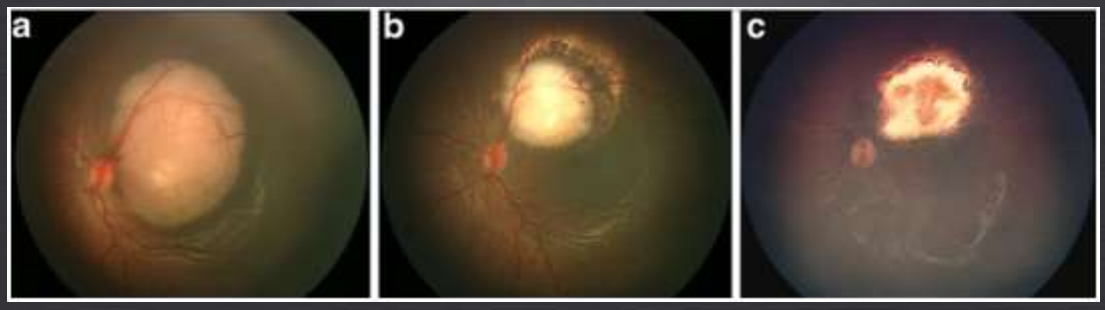


RETINOBLASTOMA
Indications



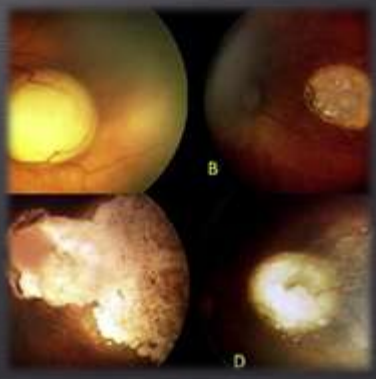
RETINOBLASTOMA
Indications

- Combined with chemotherapy (Grade A–D tumors)



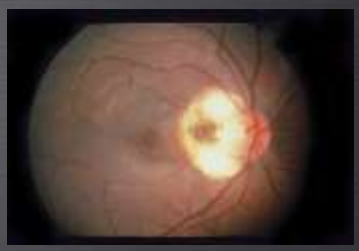
RETINOBLASTOMA
Indications

- Treatment of marginal tumor recurrence
- Treatment of residual tumor



RETINOBLASTOMA
Contraindications

- Extraocular extension
- Tumor involving the optic nerve
- Grade E tumors-destined for enucleation



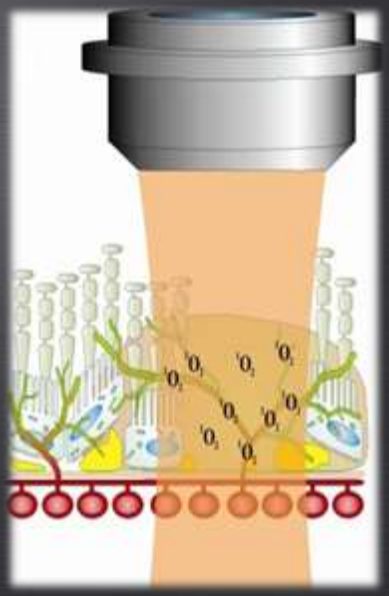
PHOTODYNAMIC THERAPY

PDT

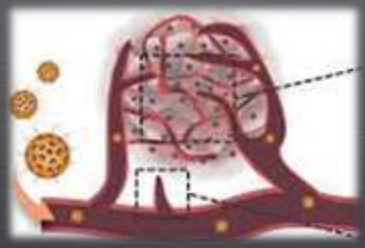
Non-thermal, dye-activating laser light

photosensitizing agent is activated by PDT laser light.

In the presence of oxygen, the resultant reaction destroys cells (**APOPTOSIS**) and closes blood vessels (**NECROSIS**).



PDT dye is dependent upon tumor perfusion.



LASER-BASED COMPONENT DEPENDENT UPON **TUMOR PIGMENTATION AND THICKNESS**

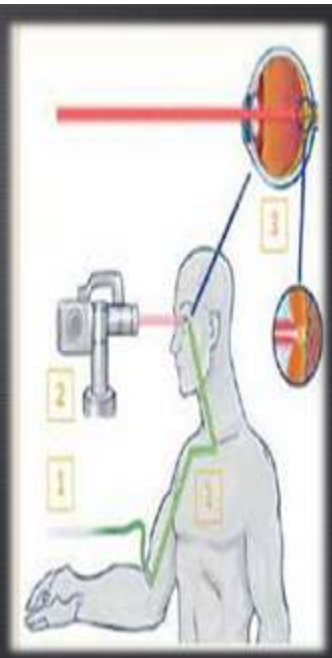
TAP PROTOCOL

IV infusion of *6 mg/m2* over *10 minutes*.

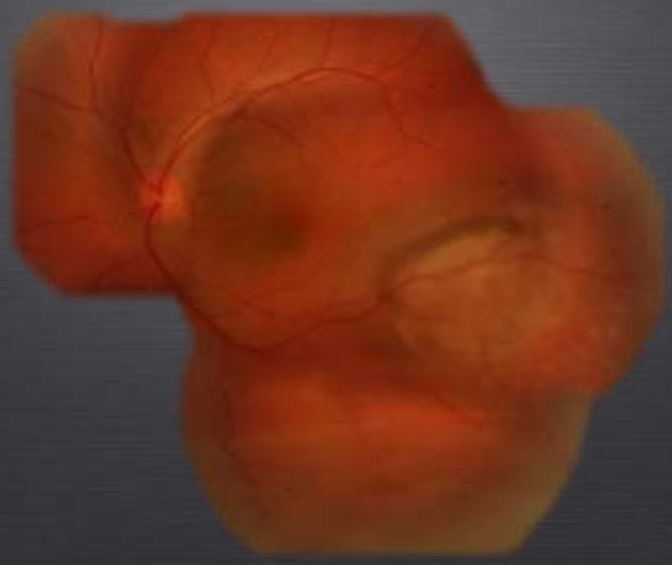
After 5 minutes

690 nm laser at an intensity of *600 mW/cm2* for *83 sec* per application.

This results in delivery of *50 J/cm2 of energy*



CIRCUMSCRIBED CHOROIDAL HEMANGIOMA



Management

- Asymptomatic … Observation
- Symptomatic … treat

CIRCUMSCRIBED CHOROIDAL HEMANGIOMA

Indications

- Subretinal fluid and serous retinal detachment threatening the fovea
- Visual symptoms associated with the lesion

Management

Transpupillary Thermotherapy

Thickness < 4mm
Shallow SRF
Extrafoveal

Management

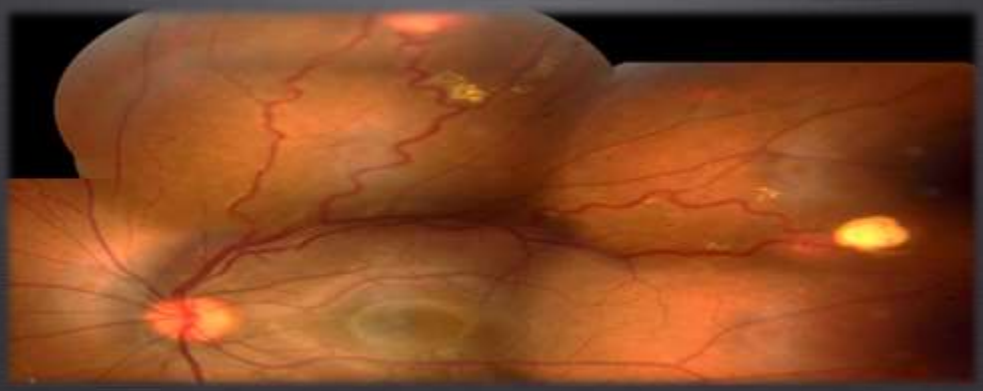
PDT

Better option with better visual outcome

Shield et al reviewed 458pts and found that patients in PDT era has better visual outcome 20/63 than in pre PDT era 20/400

LASER PHOTOCOAGULATION

Retinal Capillary hemangioma



Retinal Capillary hemangioma

treatment depend on:

- Size,
- Location,
- Degree of exudation,
- Presence of retinal detachment,
- Associated epiretinal fibrosis or hemorrhage

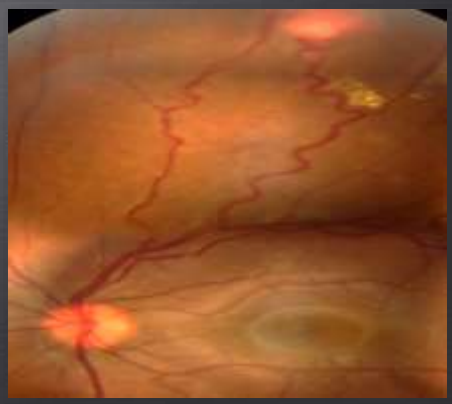
Retinal Capillary hemangioma

Size < 1.5 mm (1DD)

No Fluid

Post equatorial

LASER PHOTOCOAGULATION



Retinal Capillary hemangioma

Laser Photocoagulation

In a series of 174 RCH, successful ablation was reported for 100% tumors with diameter of 1.5 mm or less, compared with 47% larger RH

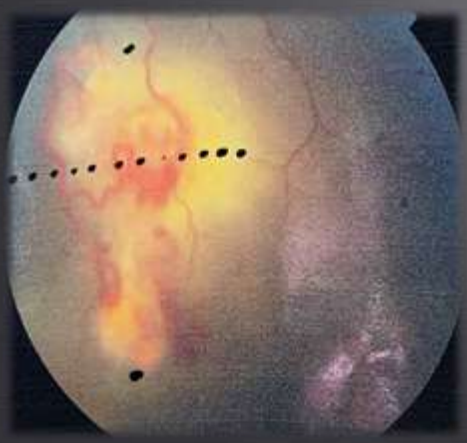
Retinal Capillary hemangioma

Laser Photocoagulation

Parameters: Argon green laser

- Duration: 0.4-0.8 sec
- Spot size: 200-500
- Power: whitening

- Surface of tumor ± feeding vessels



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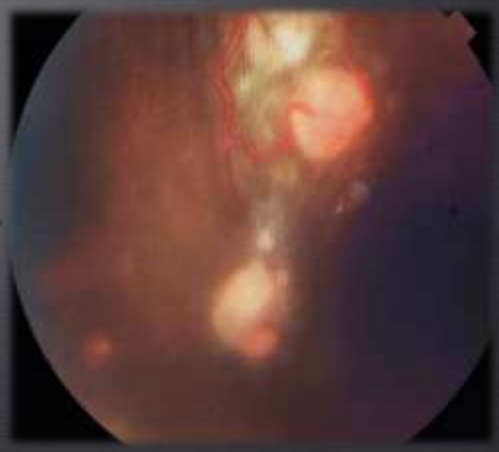
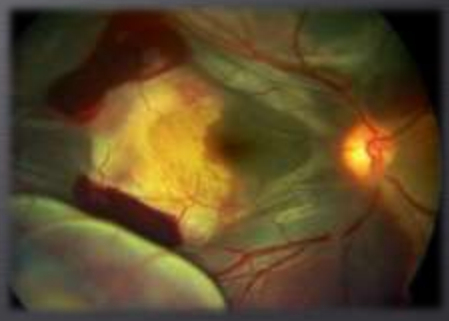


- ***More Indications***

- Treatment of radiation retinopathy
- Treatment of tumor related glaucoma
- Treatment of post radiation rise in IOP

Laser complications:

- RD 4%
- Traction 13%
- Vit hge 1.3
- CME 2%
- Vascular occlusion 29%
- CNV



TAKE HOME MESSAGE

- Laser therapy has advanced to become an important tool in the armamentarium in the management of intraocular neoplasms
- Lasers offer many advantages, serving as primary and adjuvant treatments for a variety of different tumors.
- Laser therapy is usually well tolerated and allows the practitioner to selectively target the tumor by direct visualization.

Thank you for your attention