MAKÜLER LASER UYGULAMALARI

Dr. Şengül Özdek

GAZİ ÜNİVERSİTESİ TIP FAKÜLTESİ

MAKÜLAYA LASER

- DMÖ
- VEN TIKANIKLIKLARI
- MAKÜLANIN ANEVRİZMAL HASTALIKLARI
  - Leber, Coats
  - Juxtafoveal telanjiektazi
  - Makroanevrizma
- EXTRAFOVEAL KNV
- SSKR

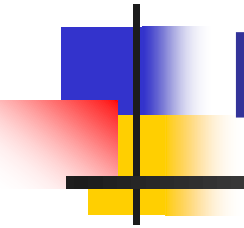
Amaç

- Direkt olarak sızıntı yapan anormal damar yapılarını koagüle etmek
  - Mikroanevrizma, makroanevrizma
  - Neovaskülerizasyon (Retinal NV, KNV)

- İndirekt etki ile sızıntının azalması

Laser ödemi nasıl azaltır?

- Retinada ısı artışı
- Fotorec. Hasarı
- İç retinal katmanlarda O2 tüketimi↓
- Metabolik aktivite ↓
- Otoregülasyon: Ret kapiller akım ↓
- Kapiller hidrostatik basınç ↓
- Kapiller endotel tamiri
- VEGF ↓

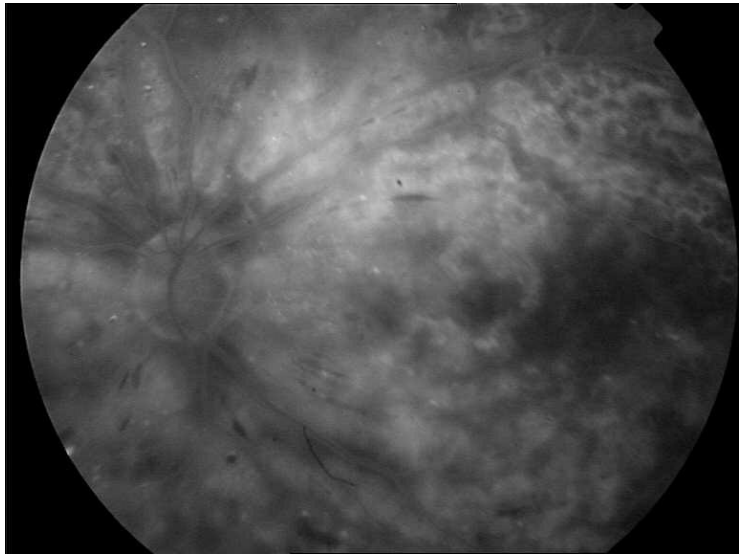


DMÖ

DMÖ

- Fokal Ödem:

  mikroanevrizmal sızıntılar
  - Sert exudalar (sirsine)
- Diffüz Ödem:
  - FFA da kaynağı belirsiz geç sızıntı (yaygın KRB bozukluğu)



Klinik Olarak Anlamlı Maküla Ödemi

- CSME; ETDRS grubu

  1-Makula merkezinin 500 mikron içerisinde veya kenarında ret. kalınlaşma

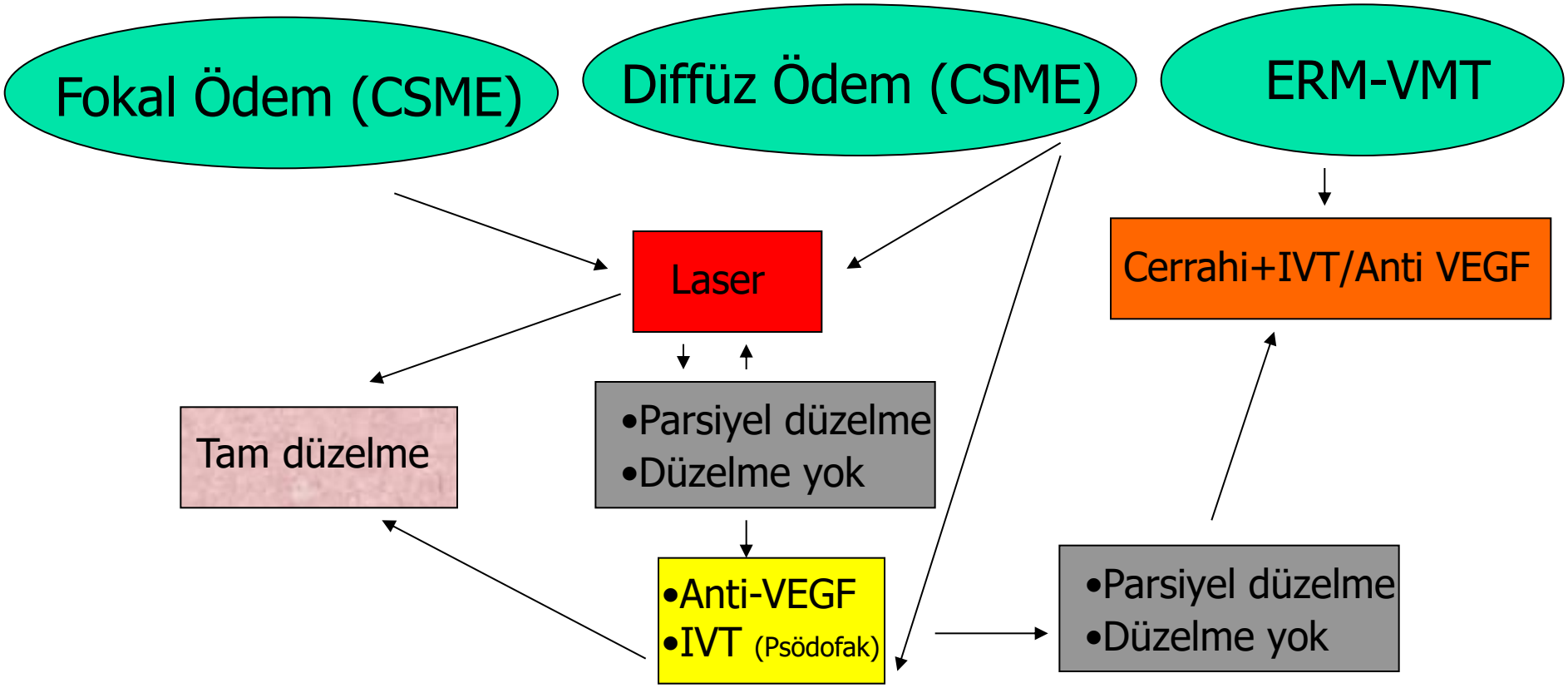
  2-Makula merkezinin 500 mikron içerisinde veya kenarında sert eksudalar ve komşuluğunda ret kalınlaşma

  3-Makula merkezinden 1 disk çapı mesafeyi kısmen içeren 1 disk çapından geniş kalınlaşma

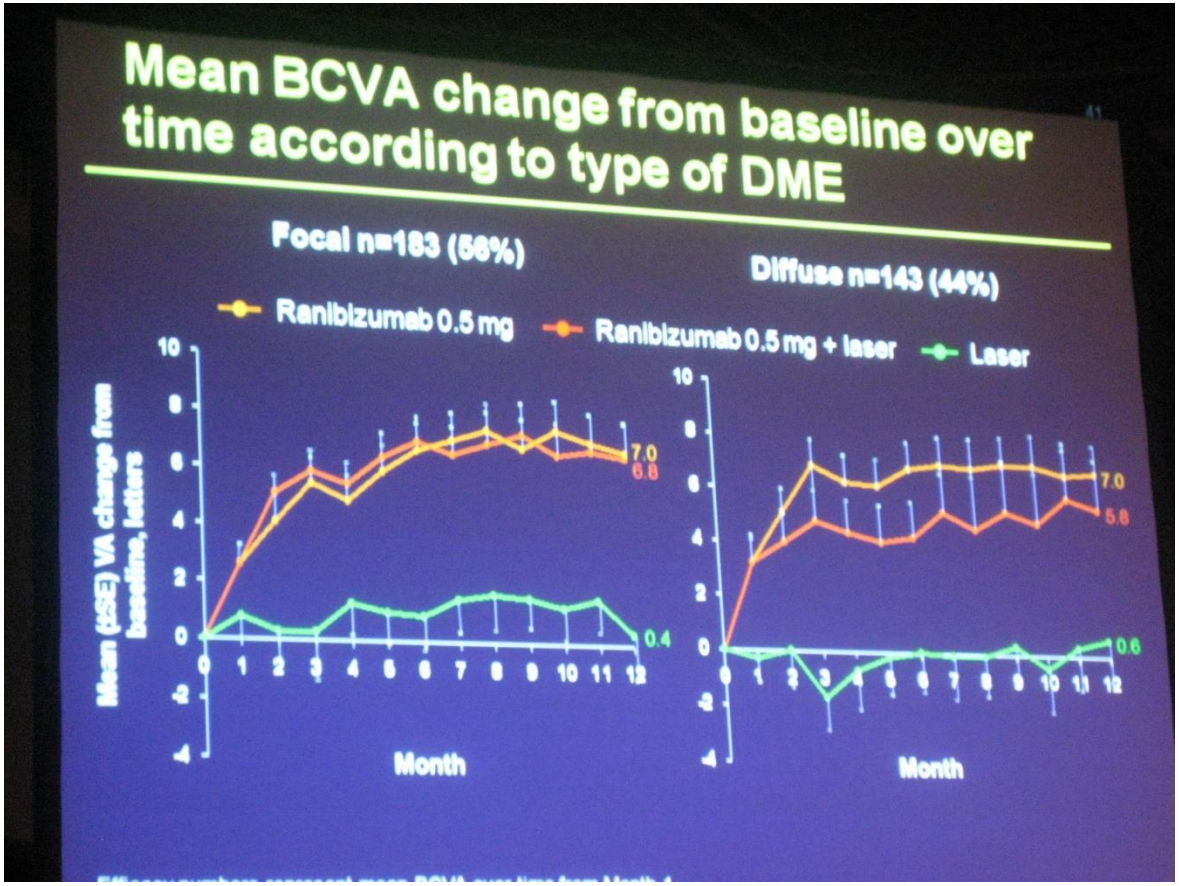
- FFA sızıntı kaynakları ve iskemiyi belirlemek ve lazer tedavisi planlamak için

DMÖ-Tedavi algoritması

Önce HbA1C….. Metabolik kontrol



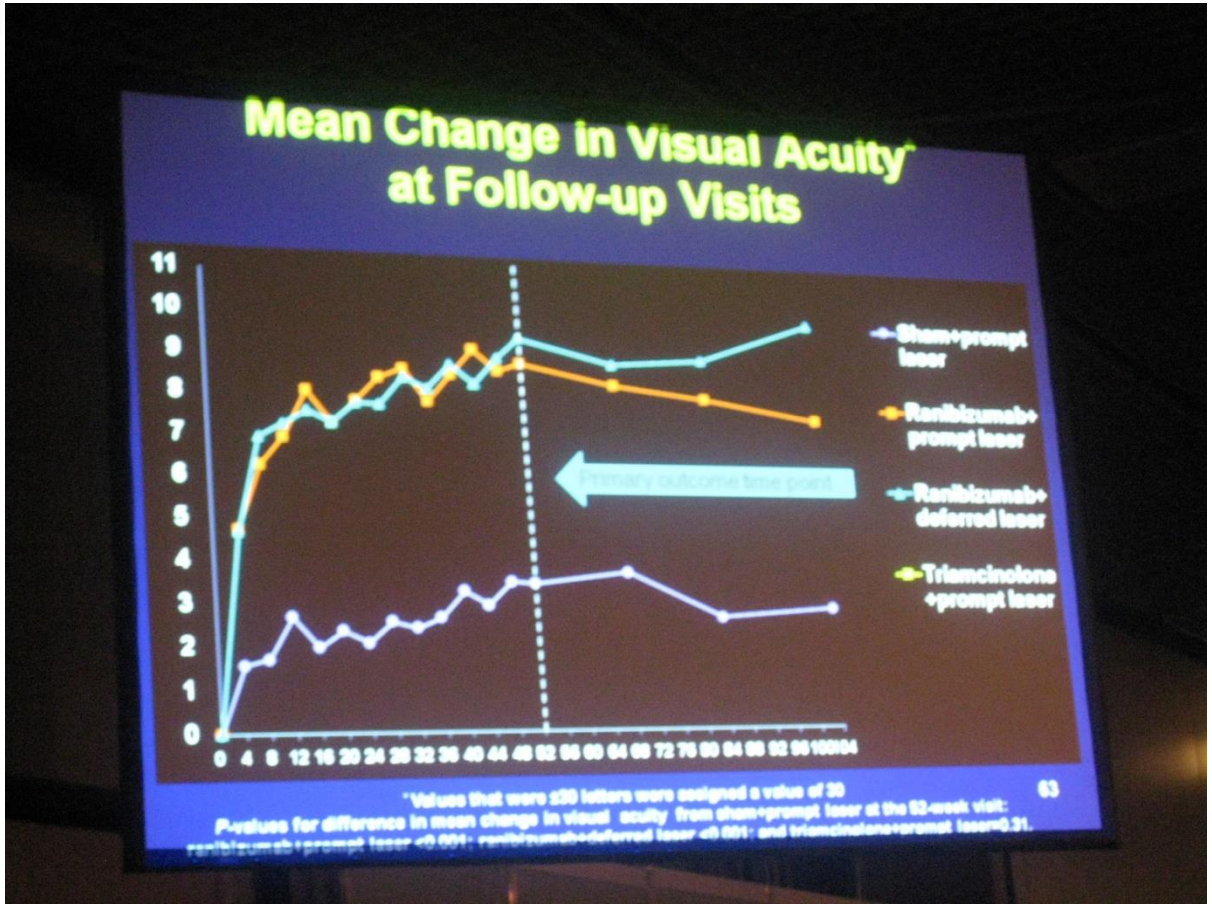
RESTORE Çalışması



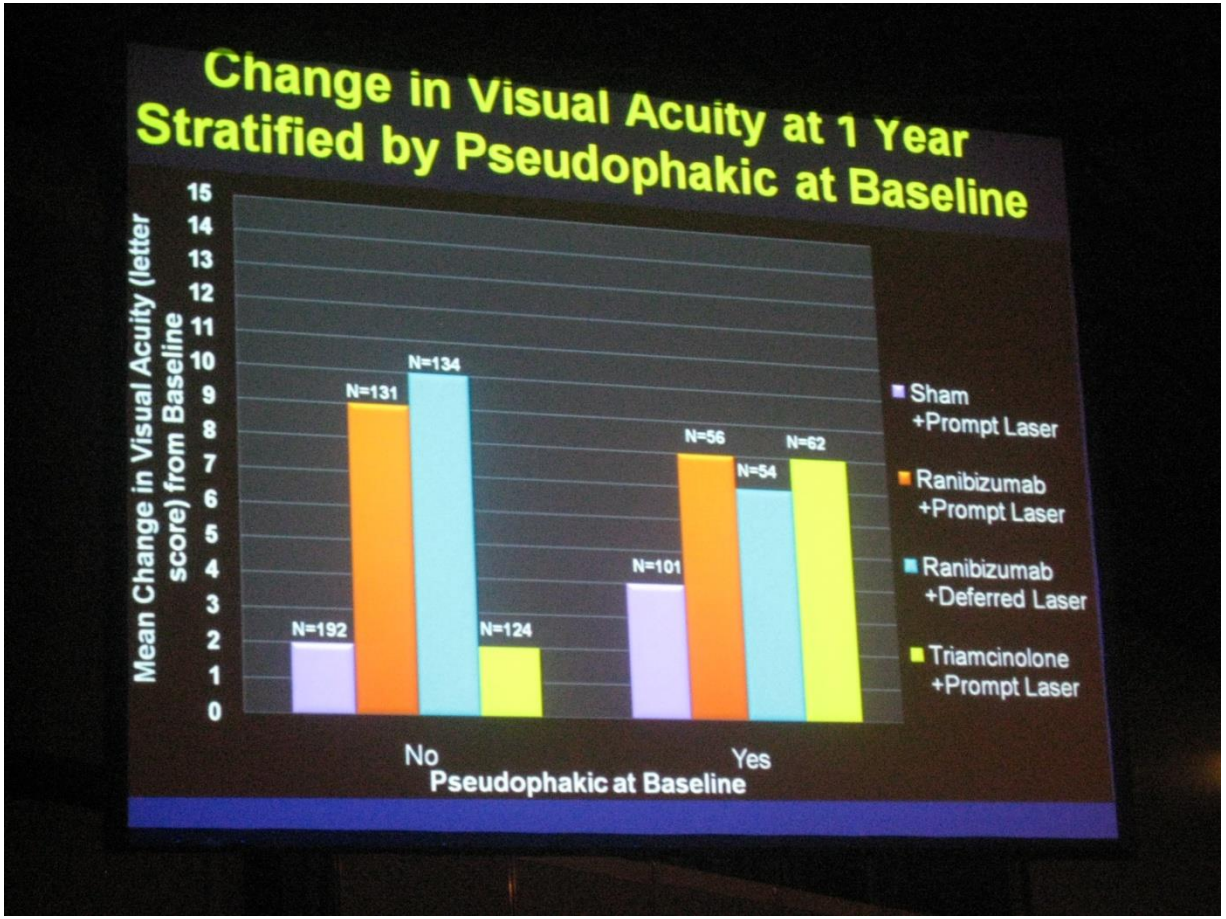
DRCR-net çalışması (Ophthalmology, 2010, Nisan)

- Lucentis + Laser (1 hafta içinde)
- Lucentis + sonradan laser (6 ay sonra)
- IVT + Laser (1 hafta içinde)
- Sham + Laser

- En iyi sonuç Lucentis + Laser
  - (2 yıl: +10 harf)


Mean Change in Visual Acuity at Follow-up Visits
11
10
9
8
7
6
5
4
3
2
1
0
Sham+prompt laser
Ranibizumab+ prompt laser
Ranibizumab+ deferred laser
Triamcinolone +prompt laser
Primary outcome time point
63

Psödofaklarda: IVT=IVL



Fokal Laser

- Sızdıran tüm ma
- Merkezden 500-3000 mikron mesafede
  - Spot büyüklüğü: 50(ETDRS)-100 mikron
  - Süre: 0.1 sn
  - Önce düşük güç (100mW), giderek arttır
  - Ma'nın beyazlaşma veya kararması (Supratreshold, grade 2-3 yanık)
  - Önce maküla dışında dene.

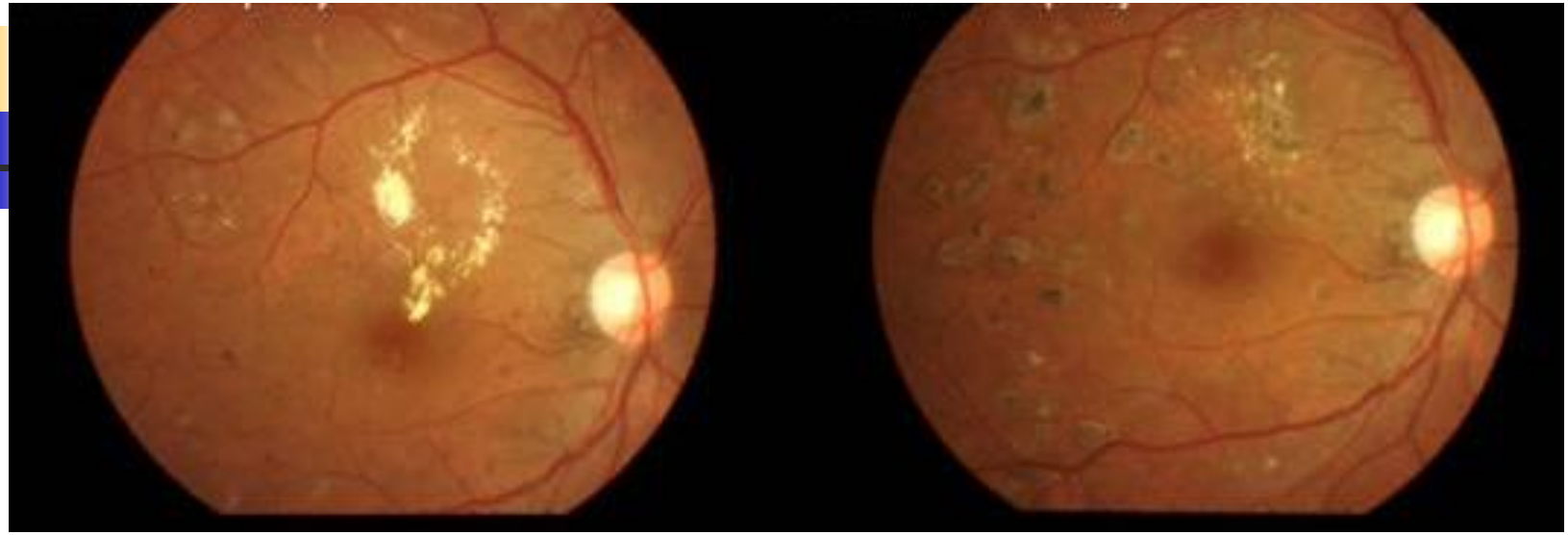
Retina hasarını azaltmak için Altın Kurallar!...

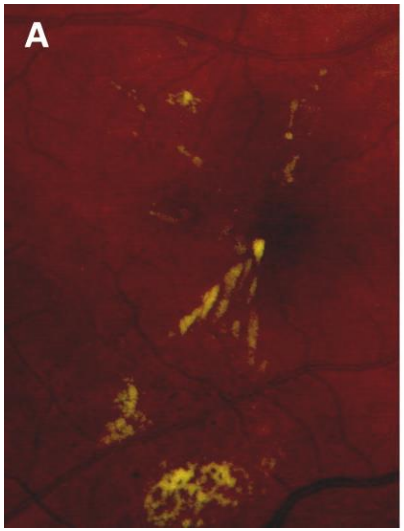
- Düşük dalga boylu laser (Argon yeşil)
- Küçük spot
- Kısa süre
- Düşük güç
- Subtreshold, treshold laser

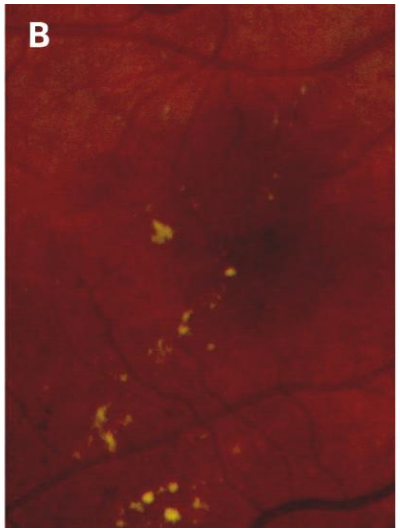
Martin A. Mainster. Decreasing Retinal Photocoagulation Damage: Principles and Techniques. Seminars in Ophthalmol, 1999.

Teknik

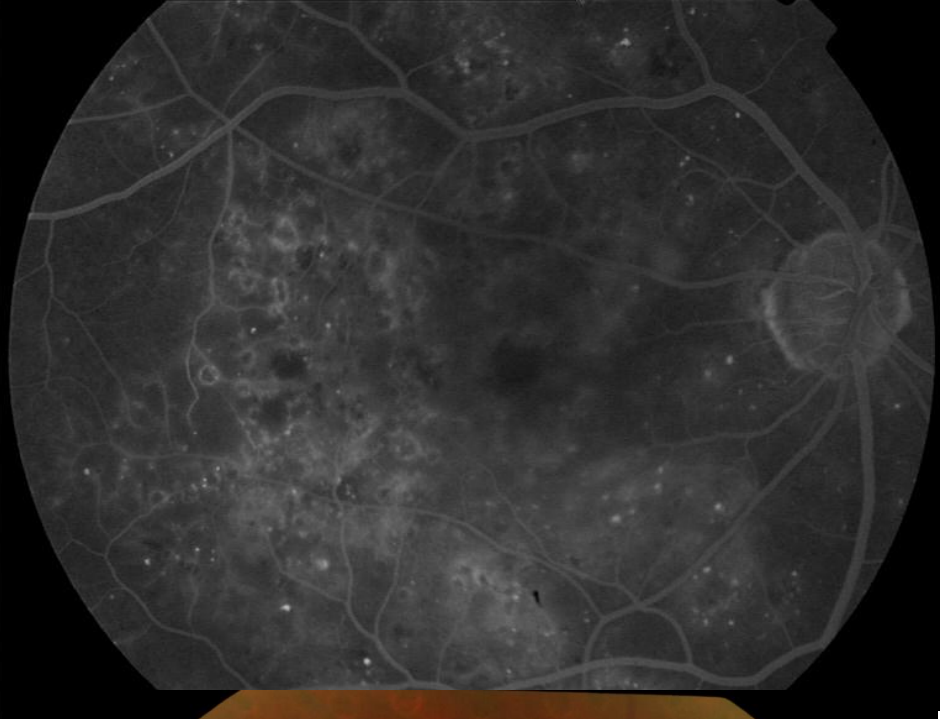
- Hasta bilgilendirme ve onam
- Goldman 3 aynalı lens
- Mainster fokal/grid lens
- Topikal anestezi
- Suni gözyaşı jel

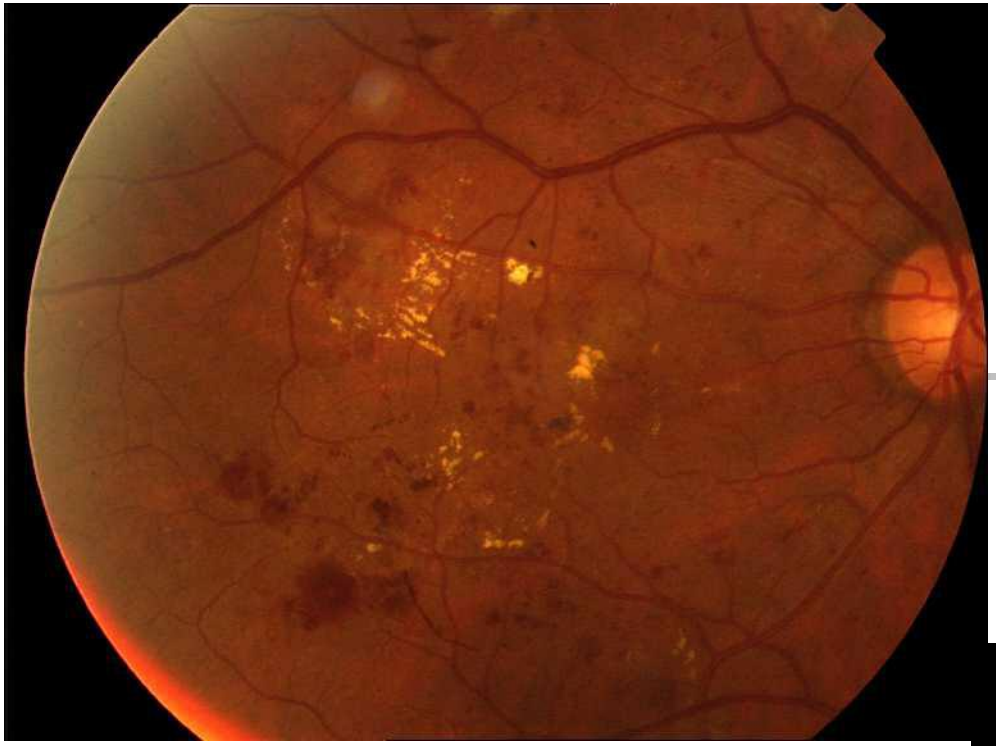


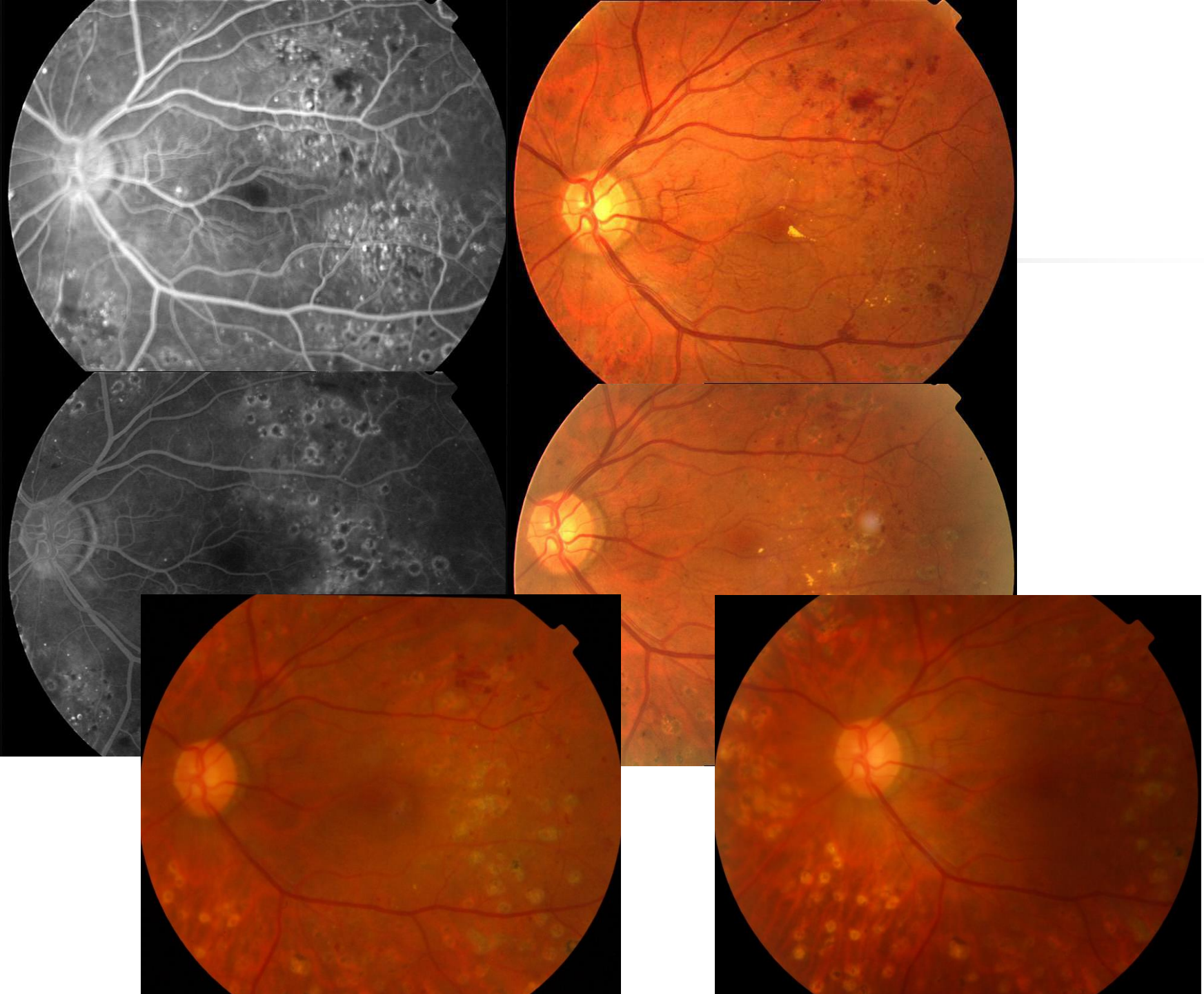

A

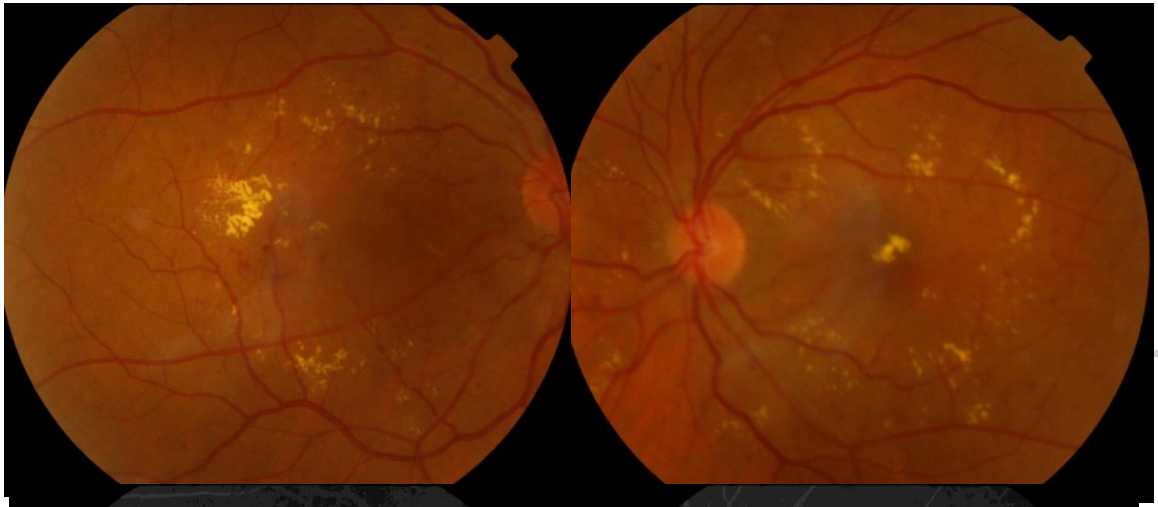

B

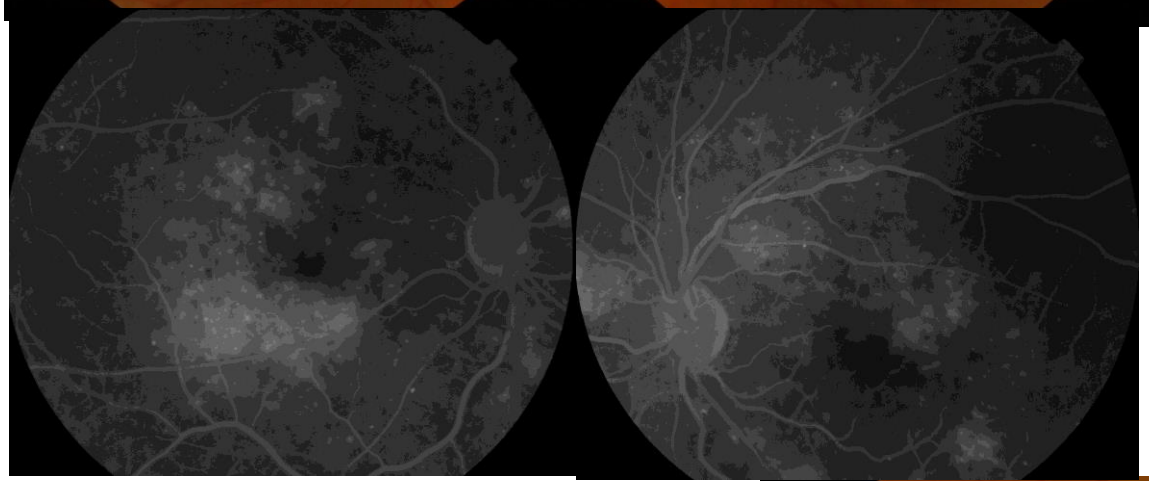

C

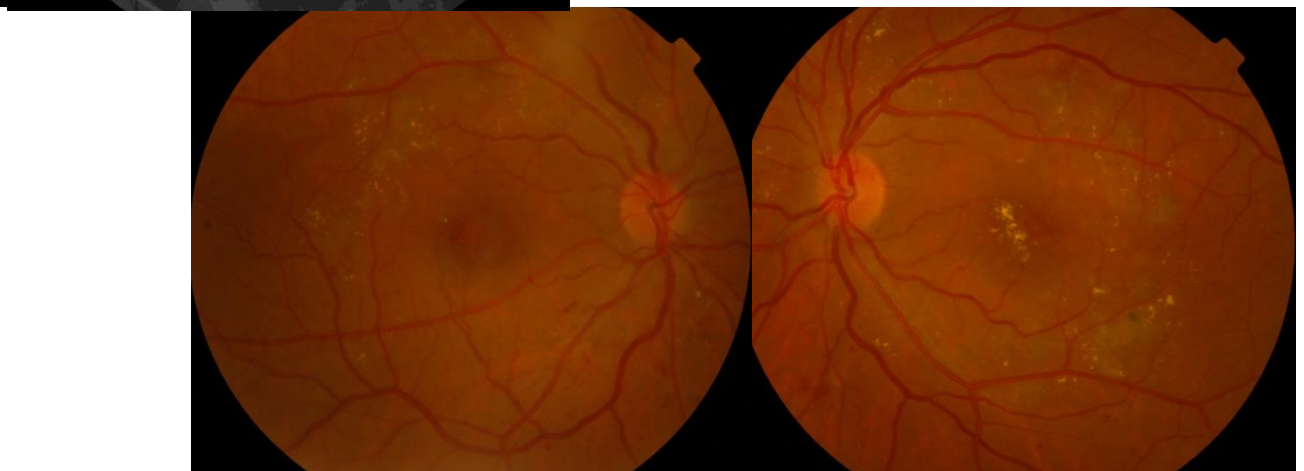



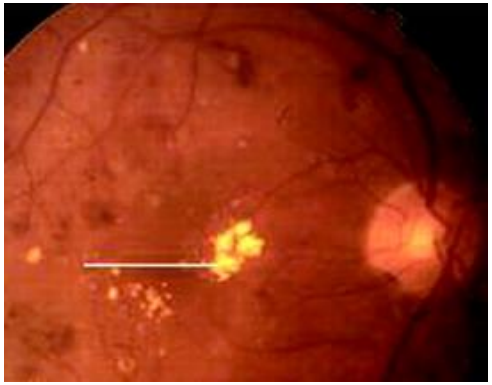


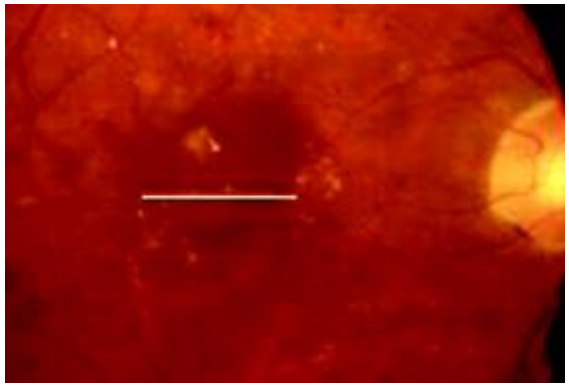


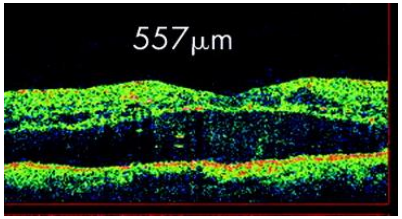


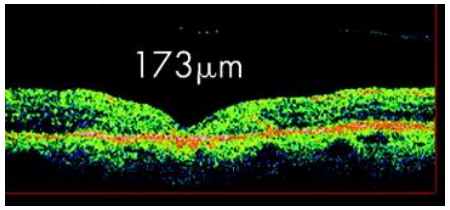


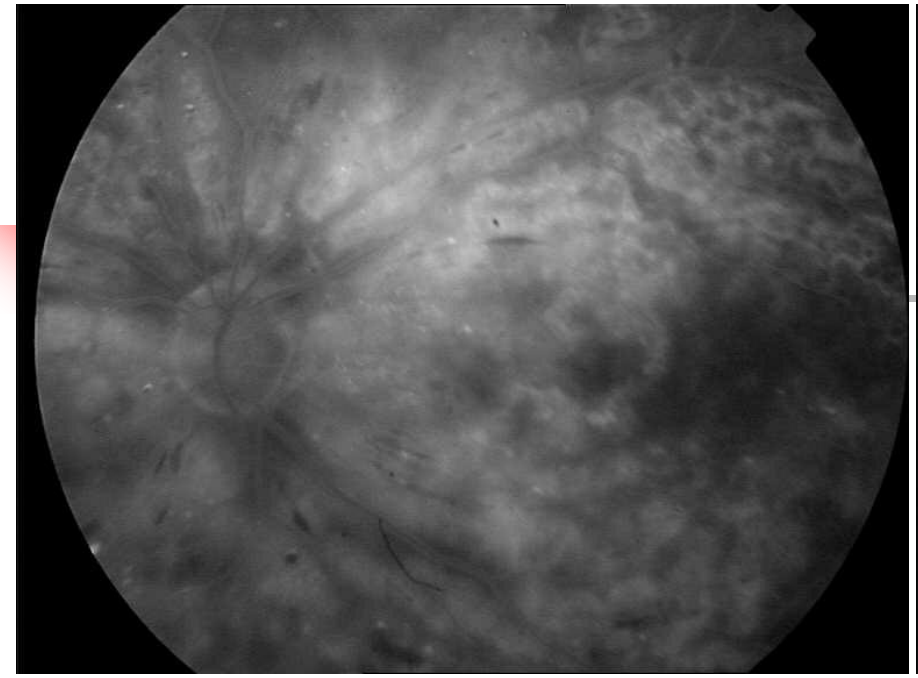


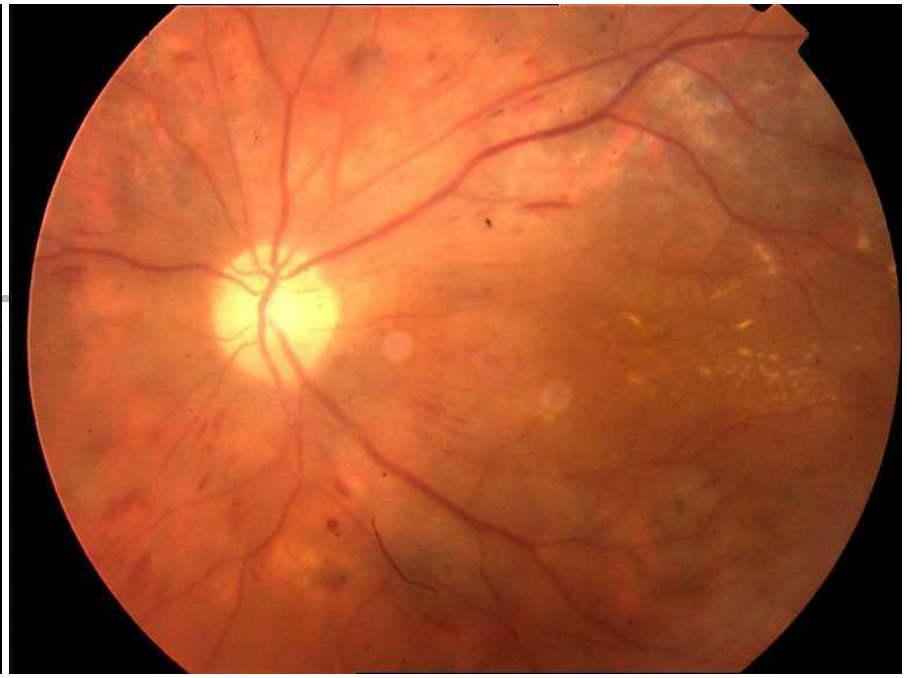


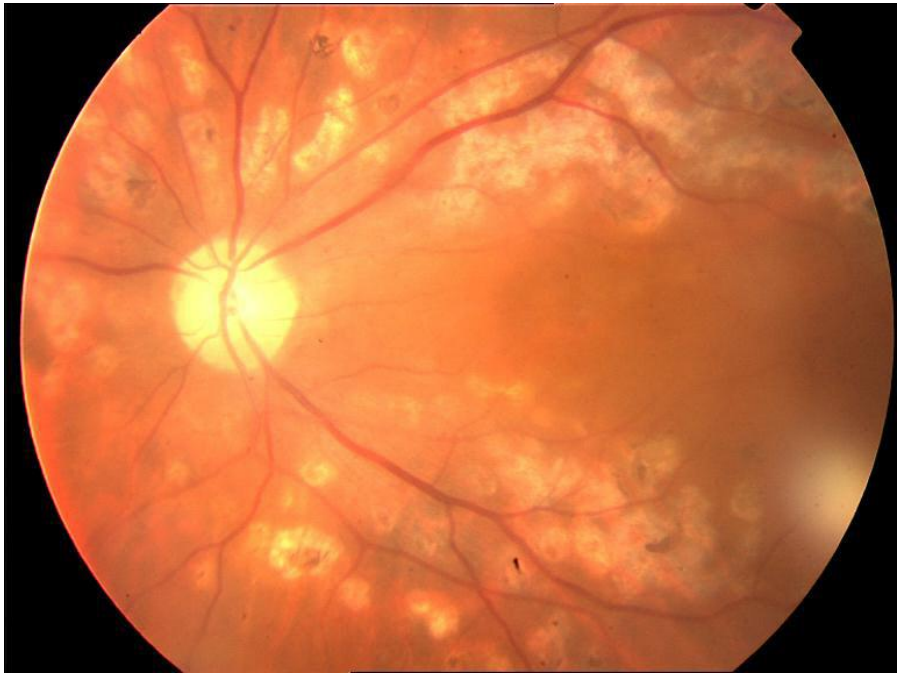



557μm

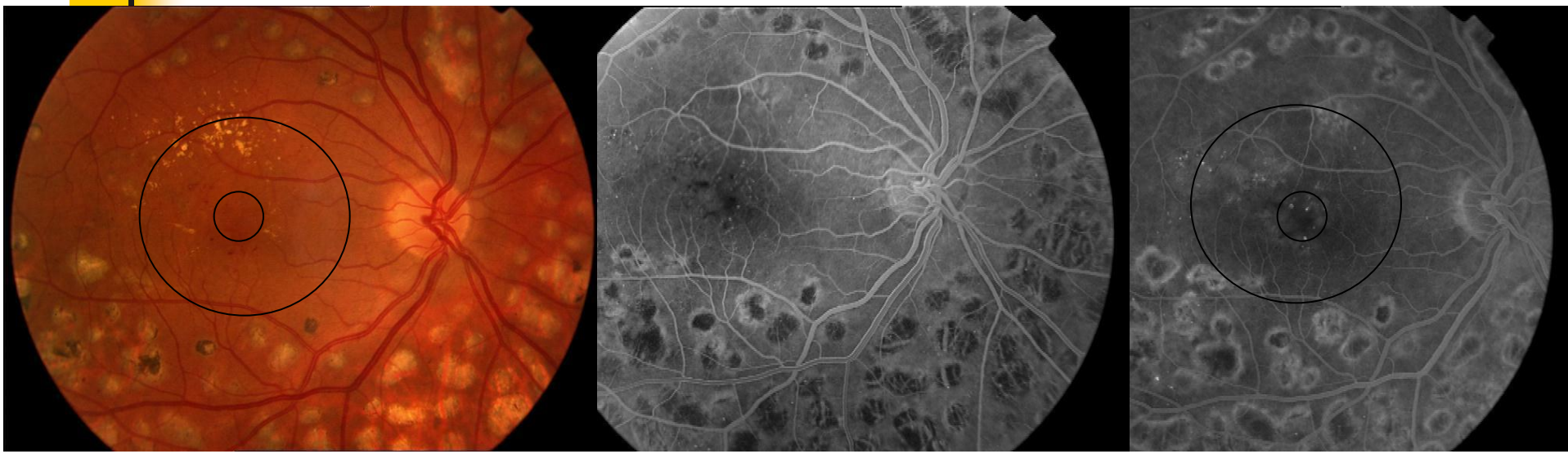

173μm

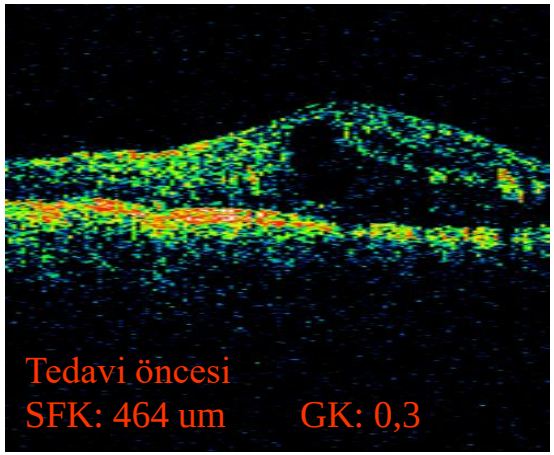


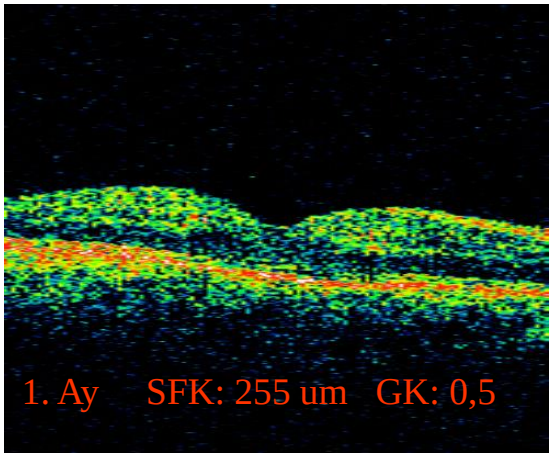




FOVEAL MA





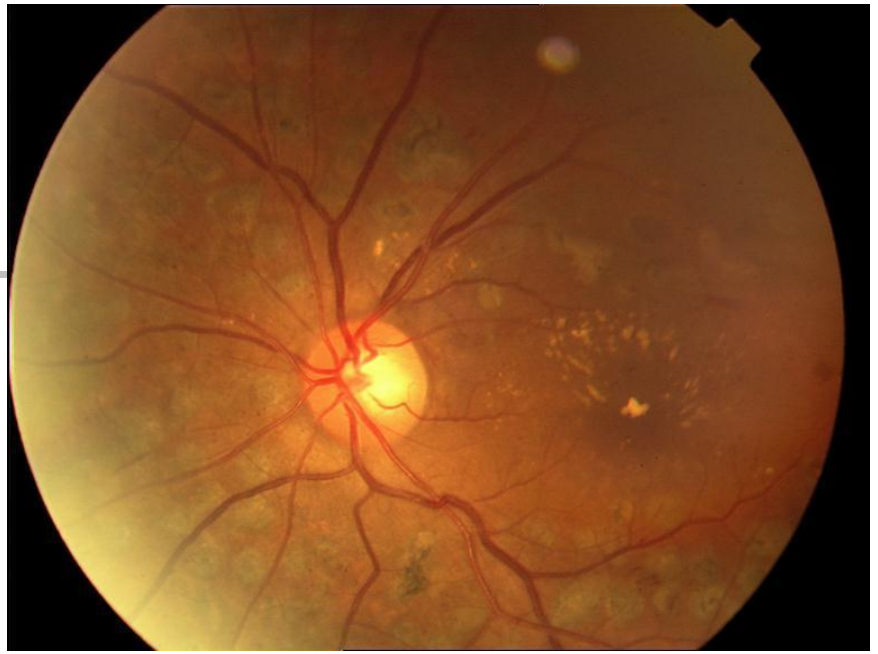
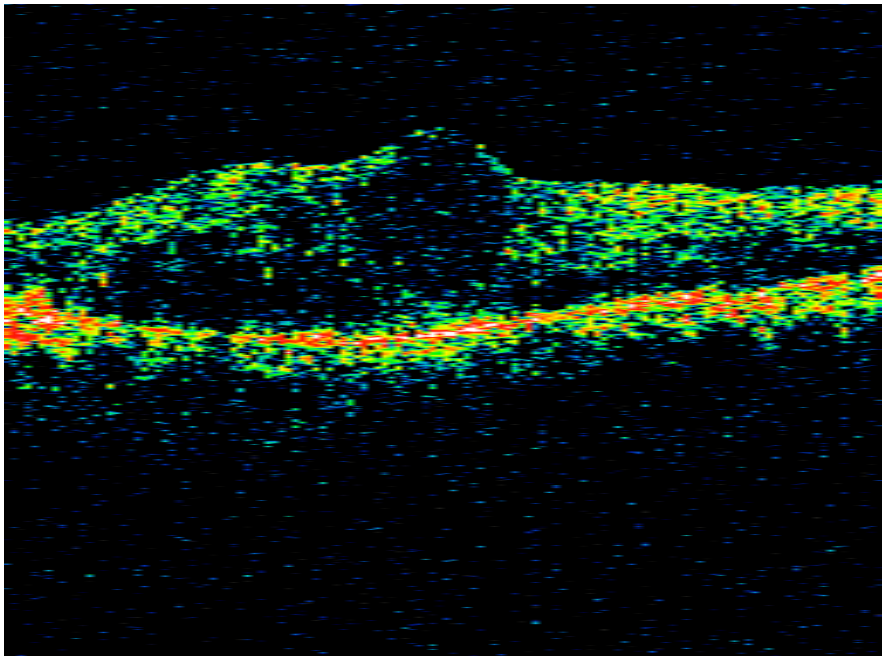
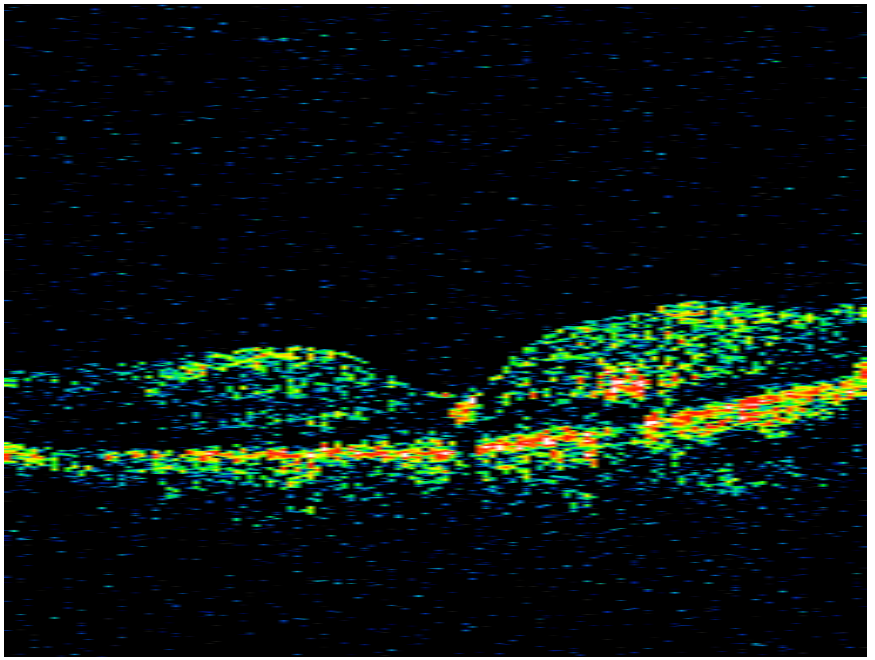


Fokal Lazer

- GK de azalma oranını %50 azaltır, %15'inde GK↑ (ETDRS)
- Görmeyi arttırmaktan ziyade görme kaybı oranını azaltmak veya stabilize etmek için yapıldığı anlatılmalı

Takip

- Etkinlik: 3-4 ay sonra değerlendir.
- Kontrole daha önce çağrılabilir (Anti-VEGF?).
- Mutlaka RFF ve OCT ile karşılaştırma yapılmalı!...
- Eksudalar aylarca kalabilir, ödem çekilirken exuda bırakabilir!
- Tekrar tedavi düşünmeden önce eksudalara kalınlaşma eşlik ediyor mu?

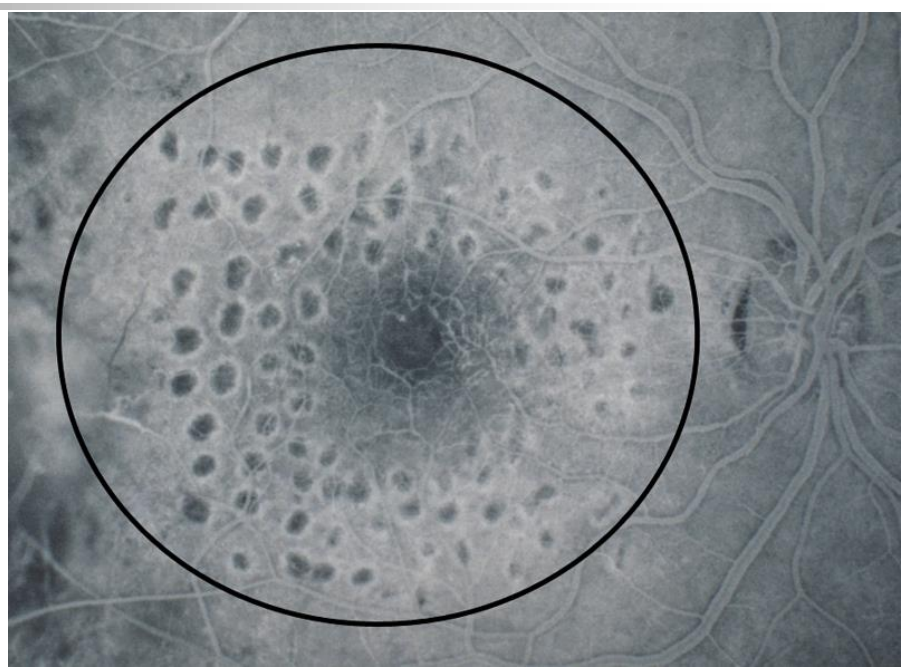
Grid laser

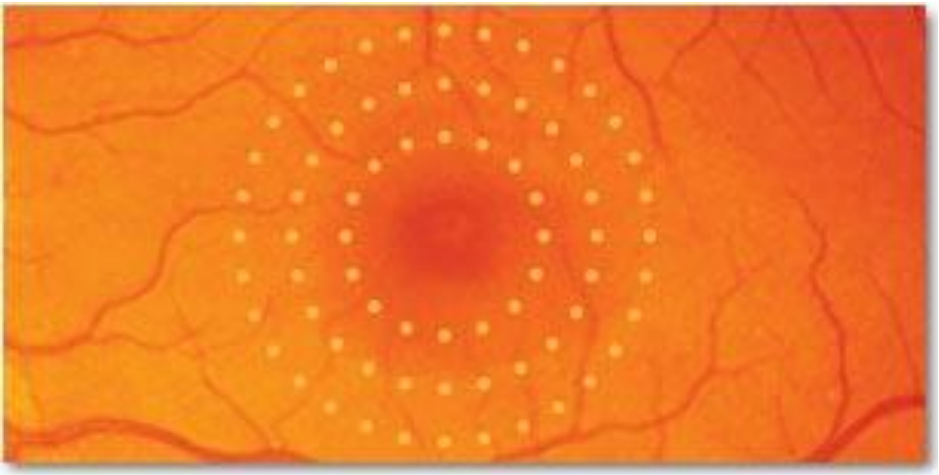
- Fokal sızıntı alanı belirlenemeyen yaygın sızıntılar için
- Diffüz ödem (exuda -)
- Merkezden 500-3000 mikron mesafede
  - Spot büyüklüğü: 50-100 mikron, 1.5 spot aralıklı
  - Süre: 0.1 sn
  - Önce düşük güç (100mW), giderek arttır
    - Hafif grade 2 yanıklar
  - Önce maküla dışında dene

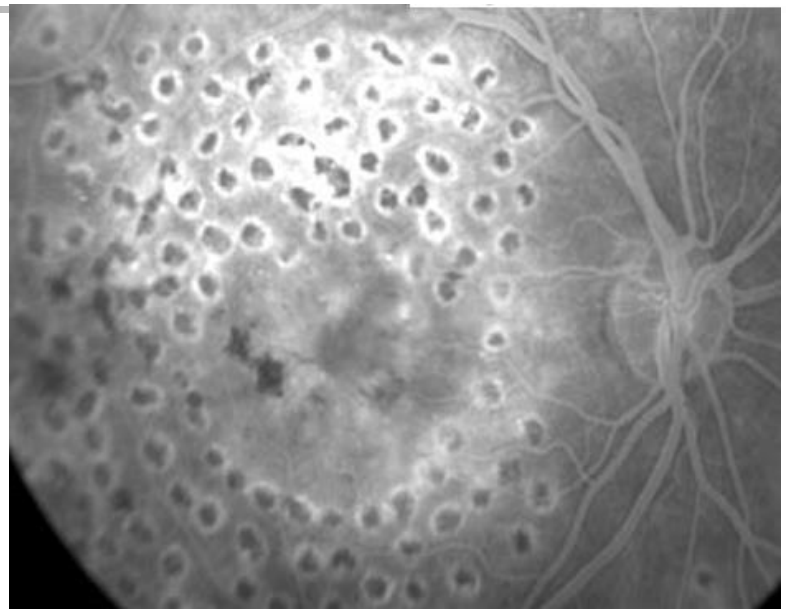
Grid laser

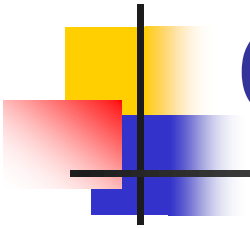
- Izgara şeklinde
- FAZ'a girmeden
- Damarlara atmadan
- Mümkünse ma lara direkt
- "Fokalize grid"

Grid laser



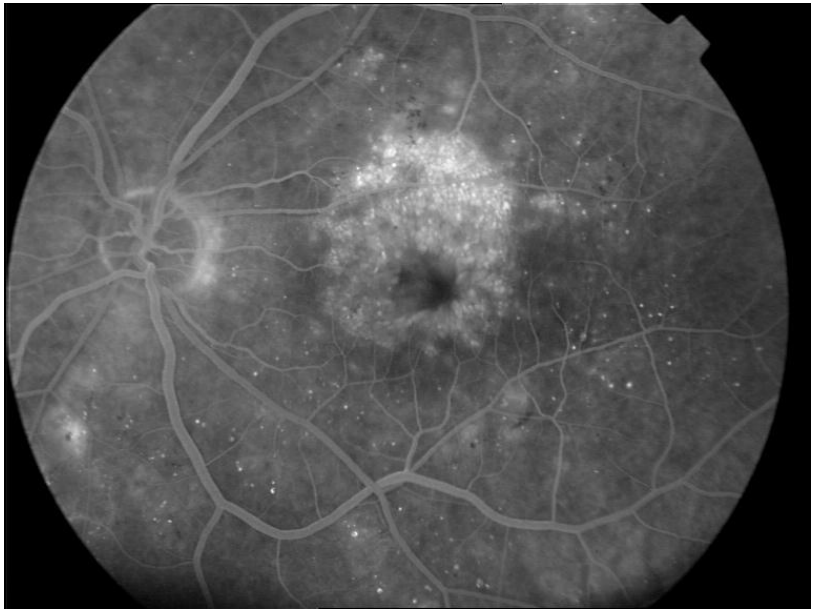


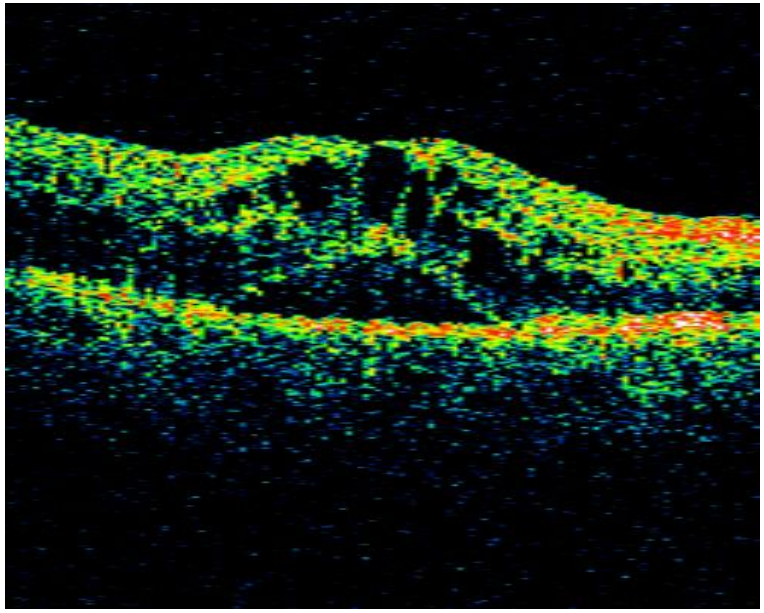


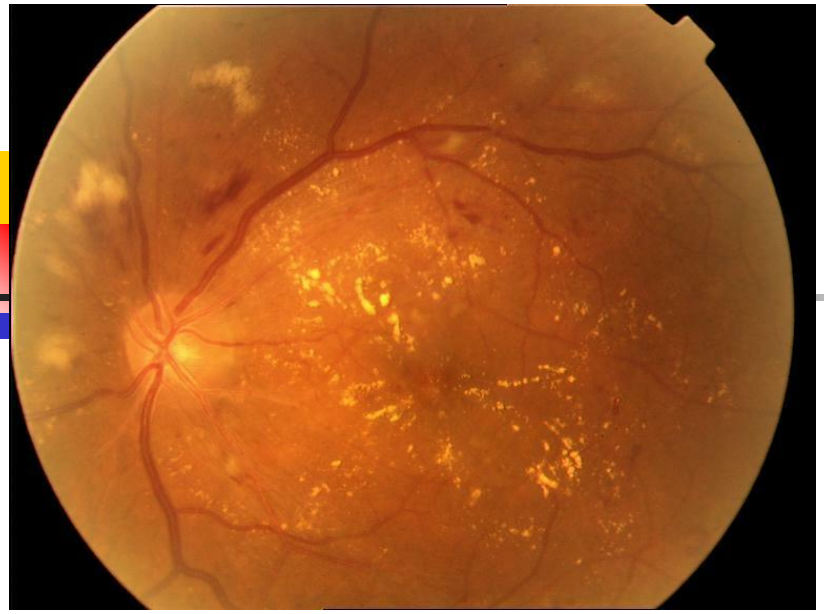


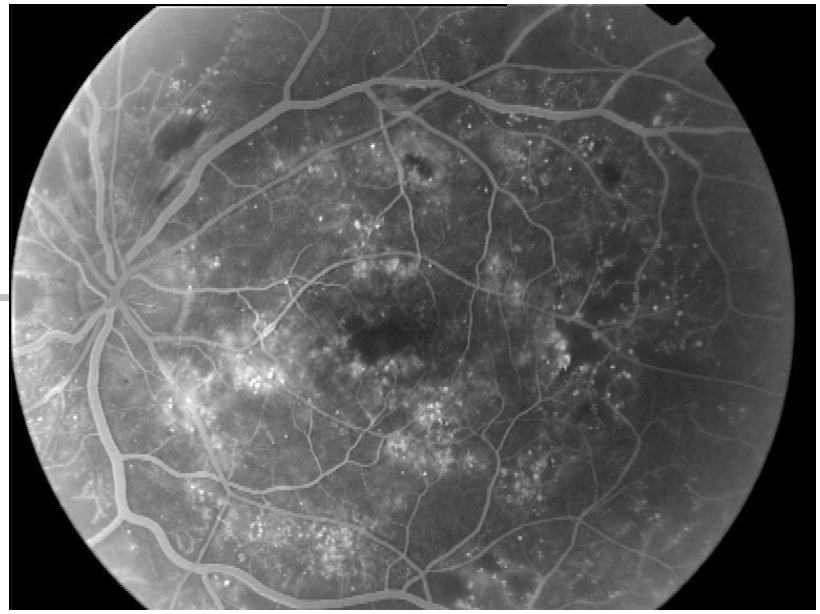
Örnekler

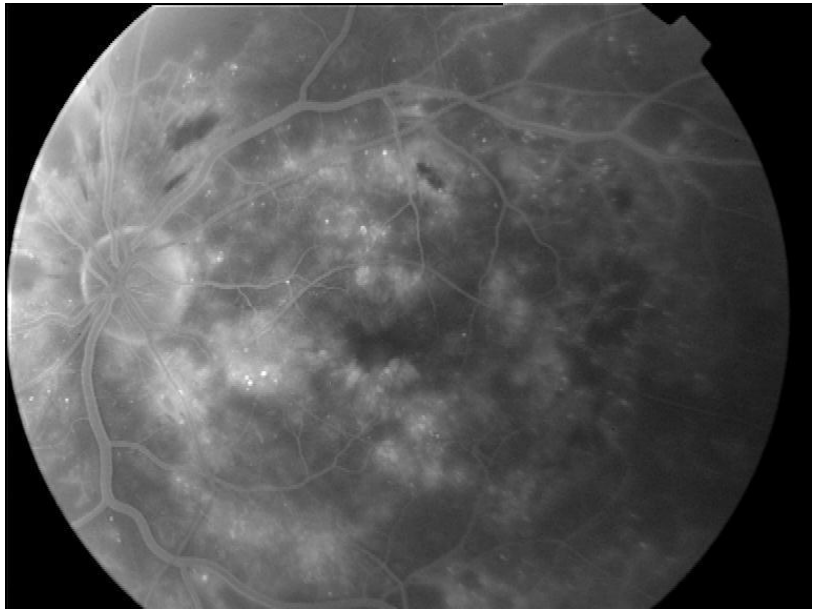
- Ne yapmalı?

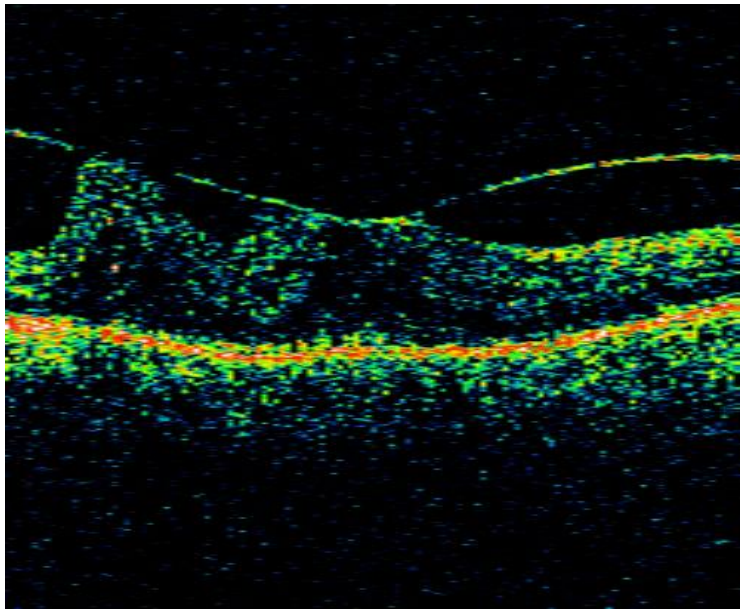


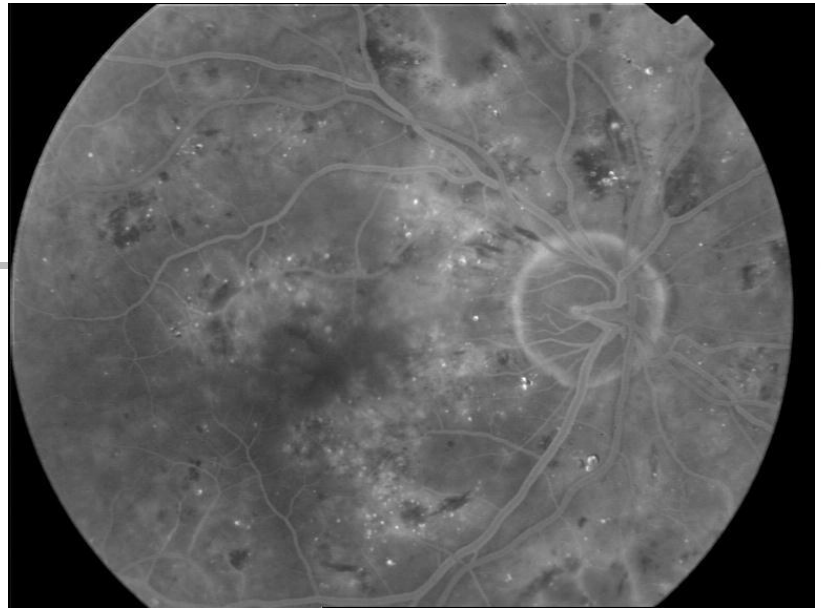


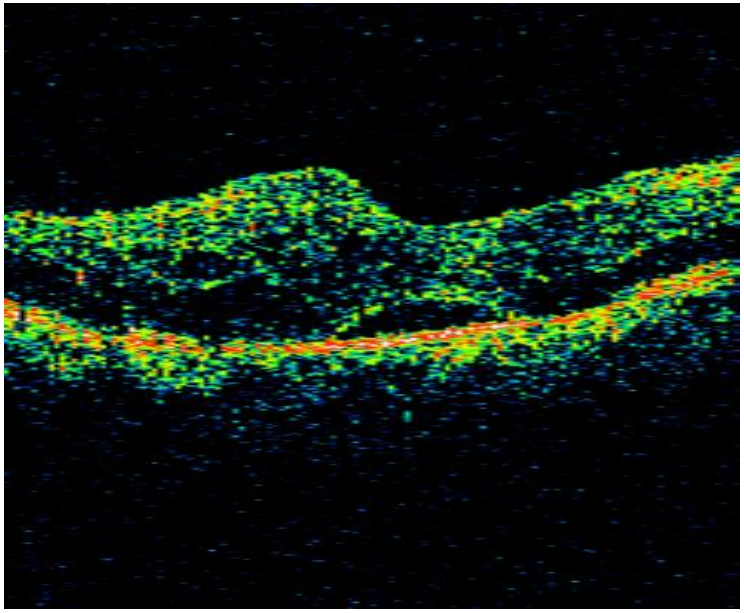


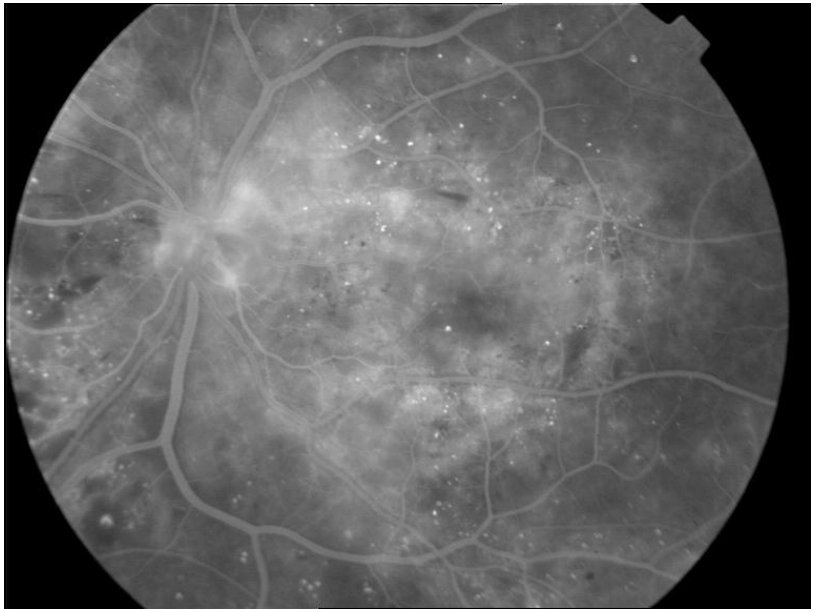


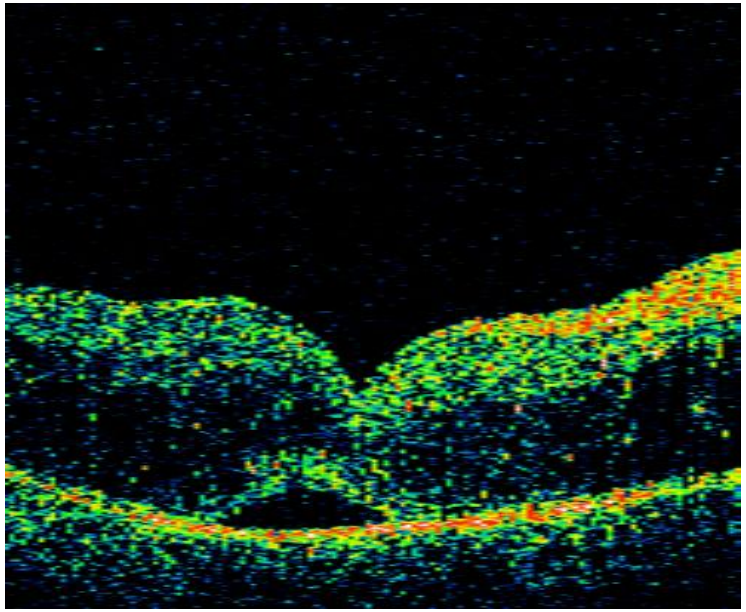












Ven tıkanıklığı

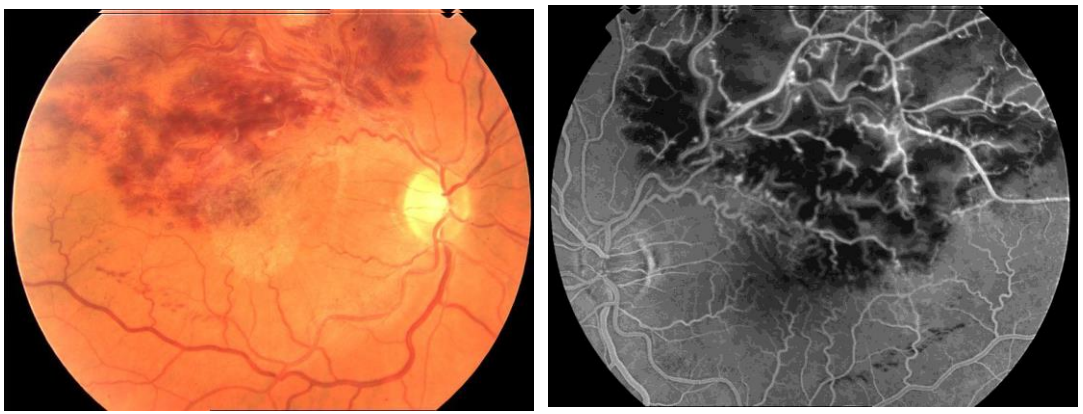
Ven tıkanıklığı

- SRVT: Grid Laser etkisiz (CRVO study)
- VDT: BRVO study (etkili)
  - Argon Laser
  - Grid şeklinde
  - FFA da Sızıntı bölgesine
  - 0.1 sn, 100 mikron,
  - FAZ içine girme
  - Arkuat dışına çıkma
  - Hemoraji üzerine atma…
  - Grade 2-3 yanık

BVOS-Grid Laser

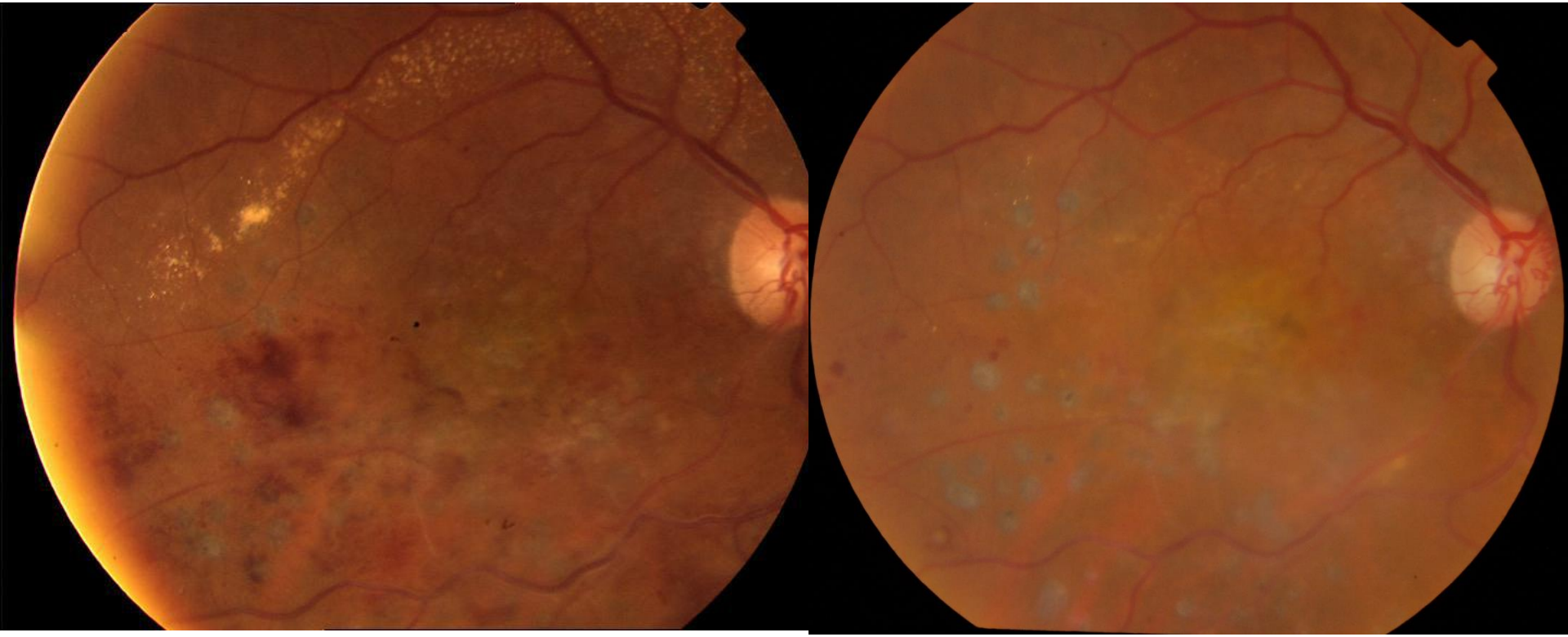
- BVOS: 3 yıl sonunda laser uygulanan gözlerin %65 inde kontrollerin %37 sinde ≥2 sıra GK artış*

- Güncel Yaklaşım:
- I.V. Anti-VEGF'ler / Grid laser

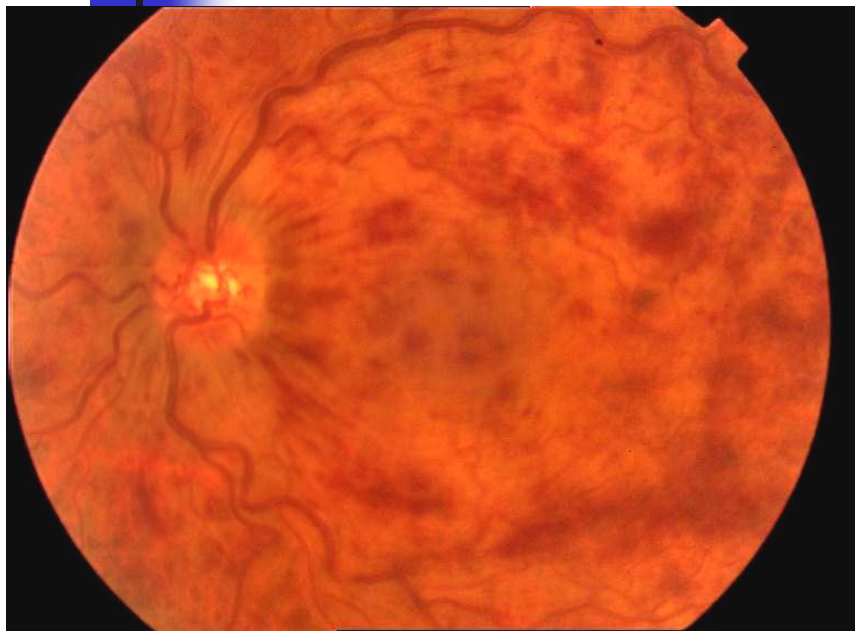


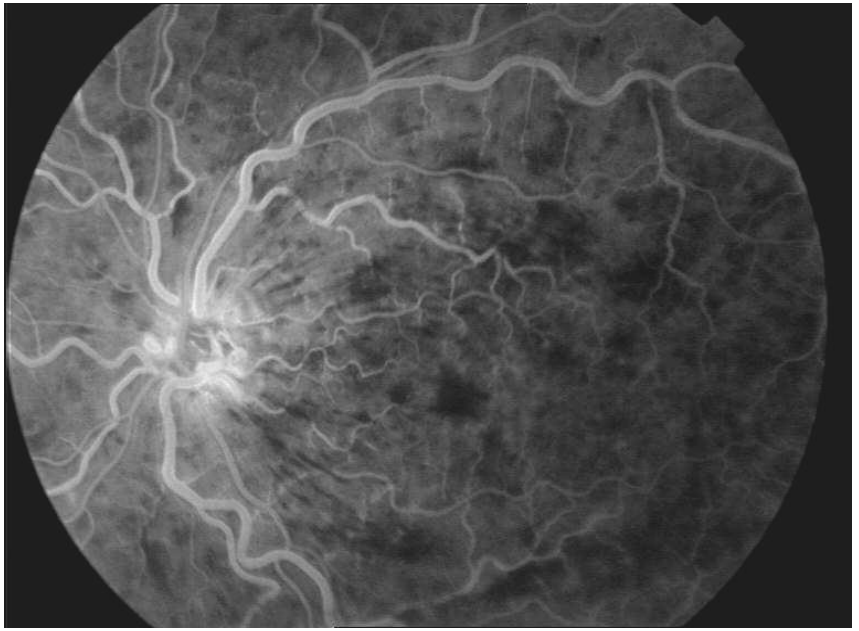
*Branch Vein Occlusion Study Group: Argon laser photocoagulation for macular edema in branch vein occlusion. Am J Ophthalmol 1984 Sep 15; 98(3): 271-82

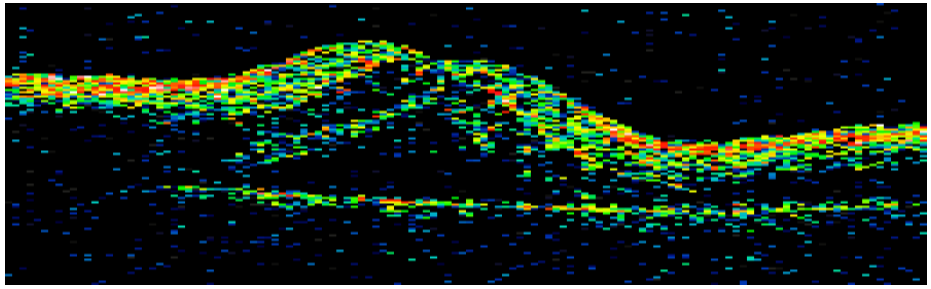
MA, ATVDT



SRVT: Maküler laser'in yeri yok!



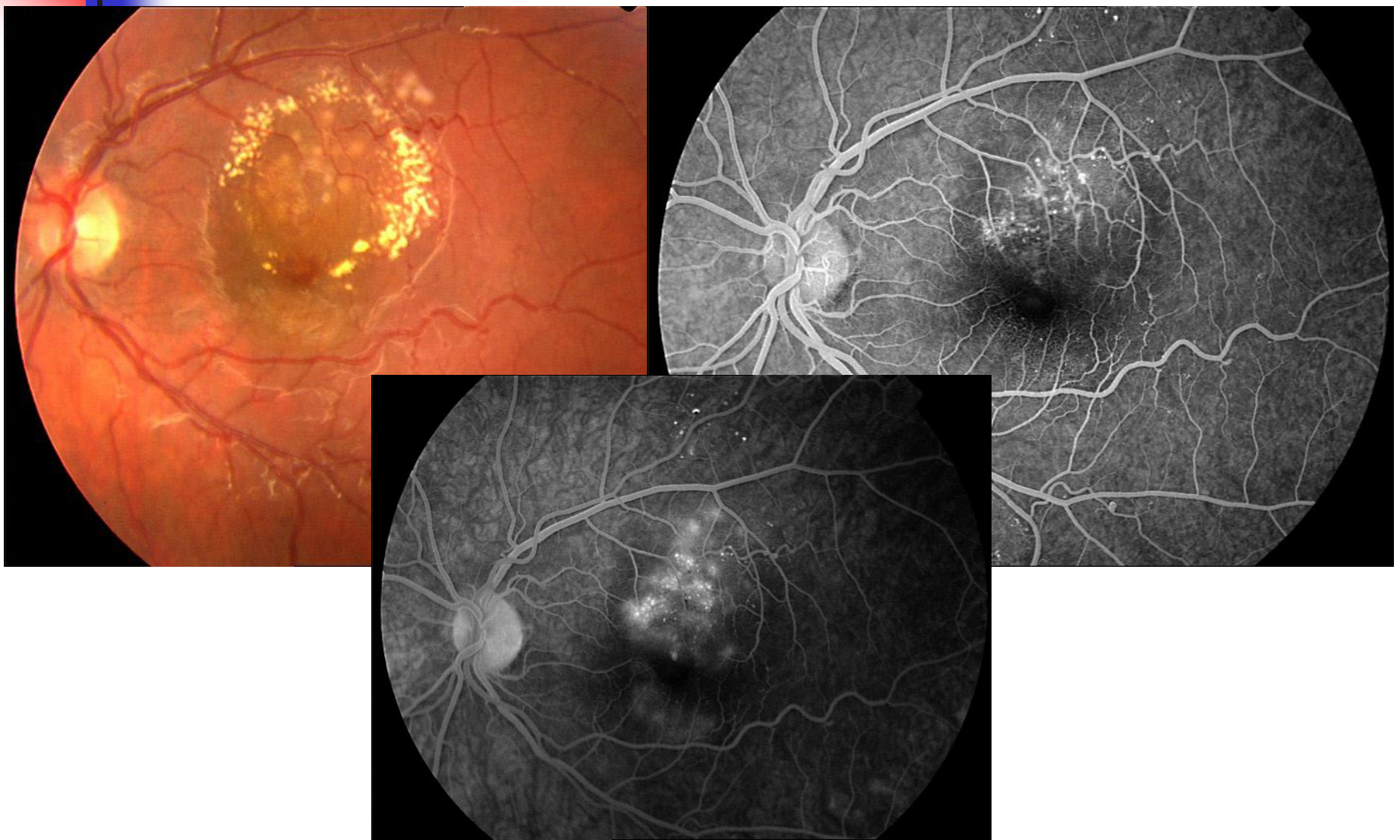


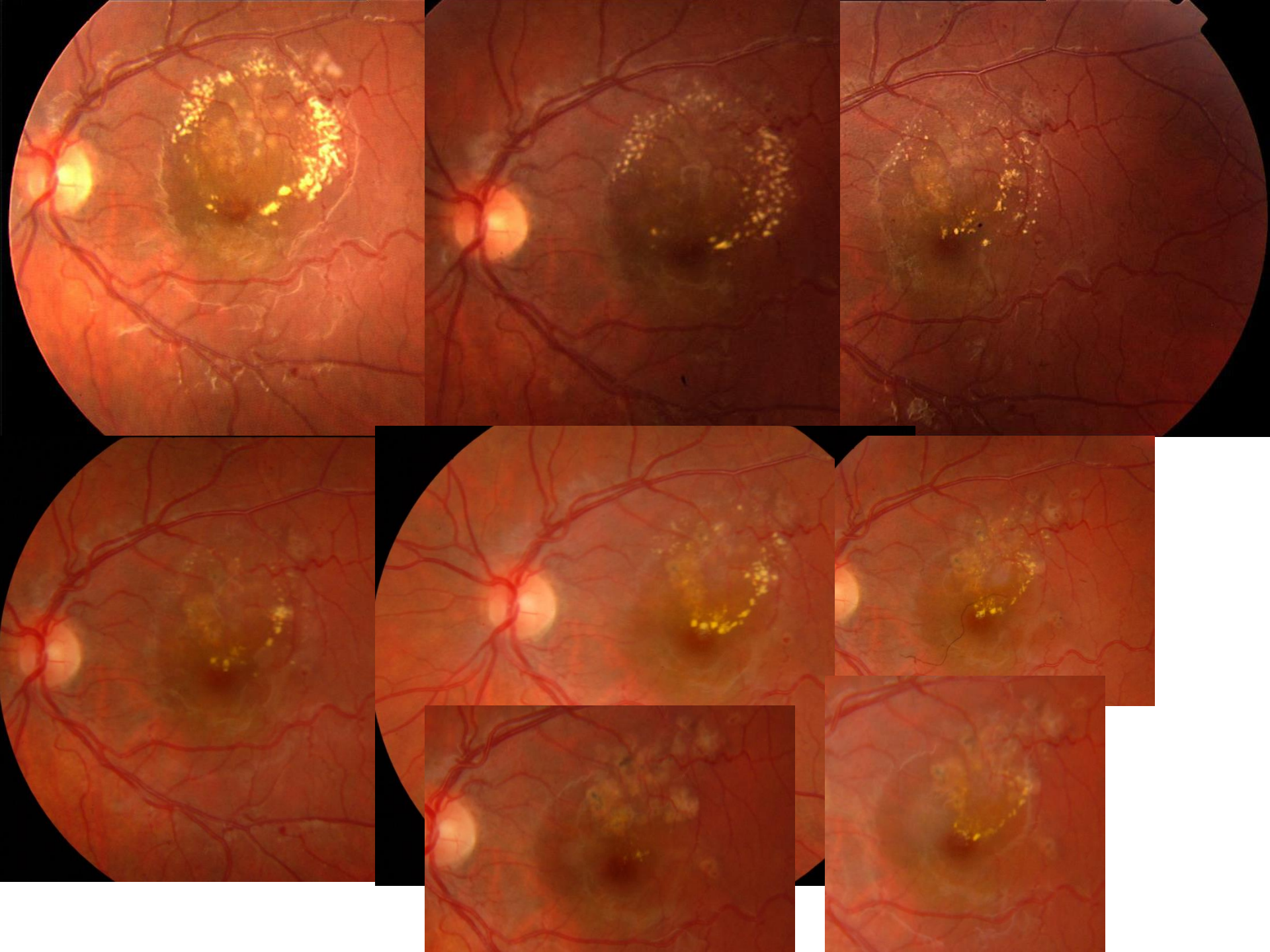


MAKÜLANIN ANEVRİZMAL HASTALIKLARI

Leber’in milier anevrizması

EDB, 14y, K, Solda GK azalma: 0.3

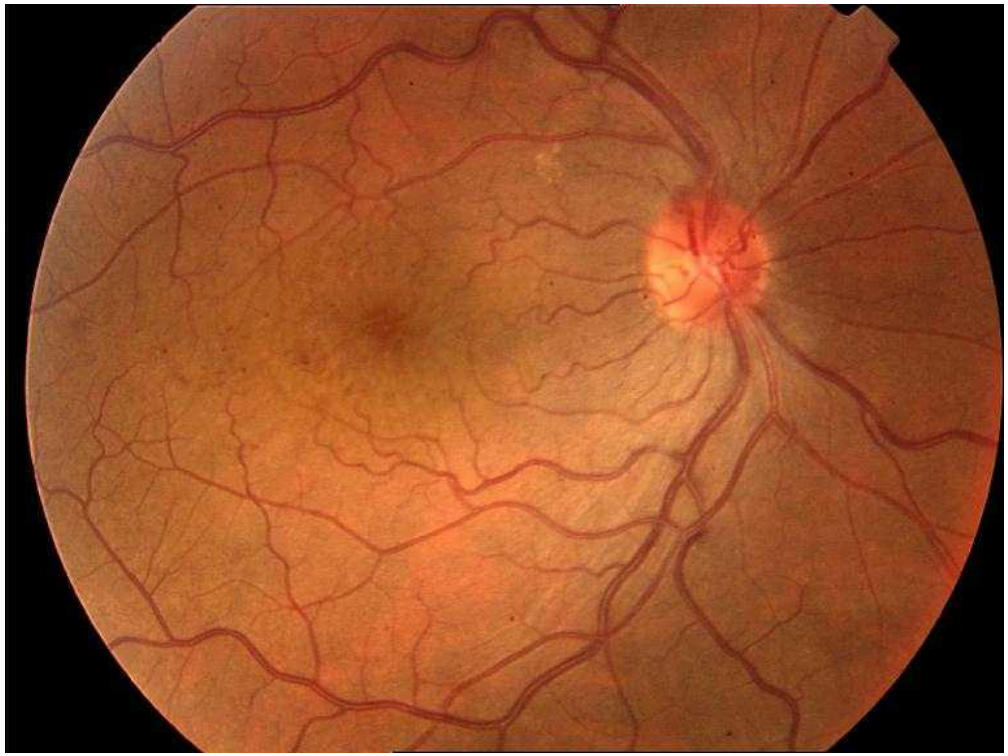


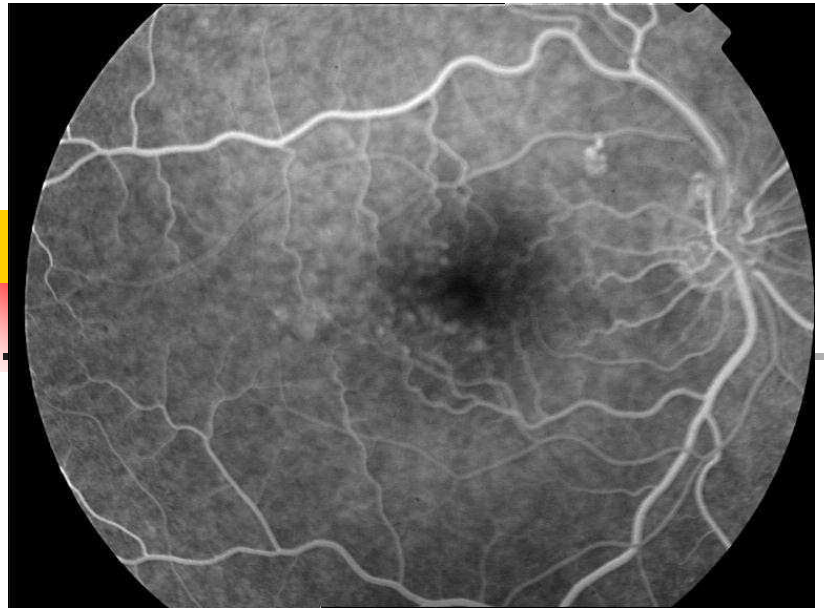
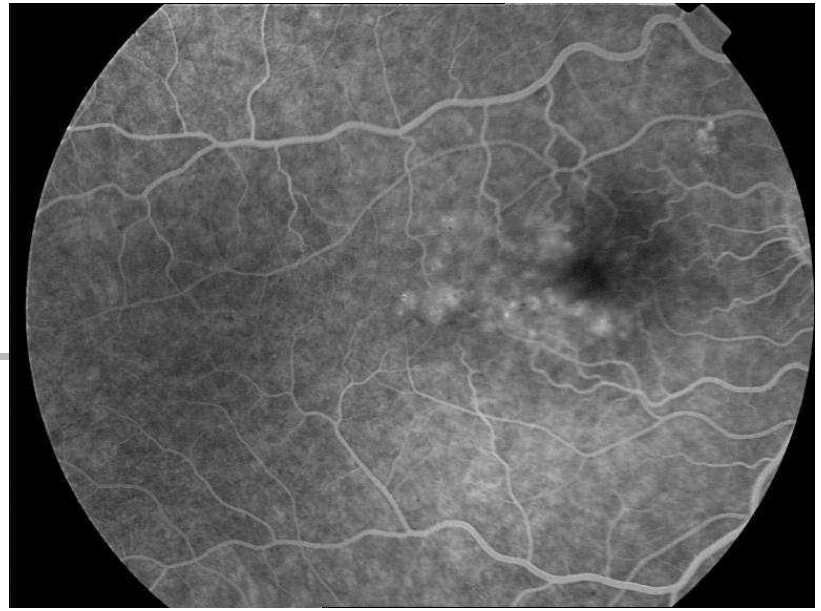
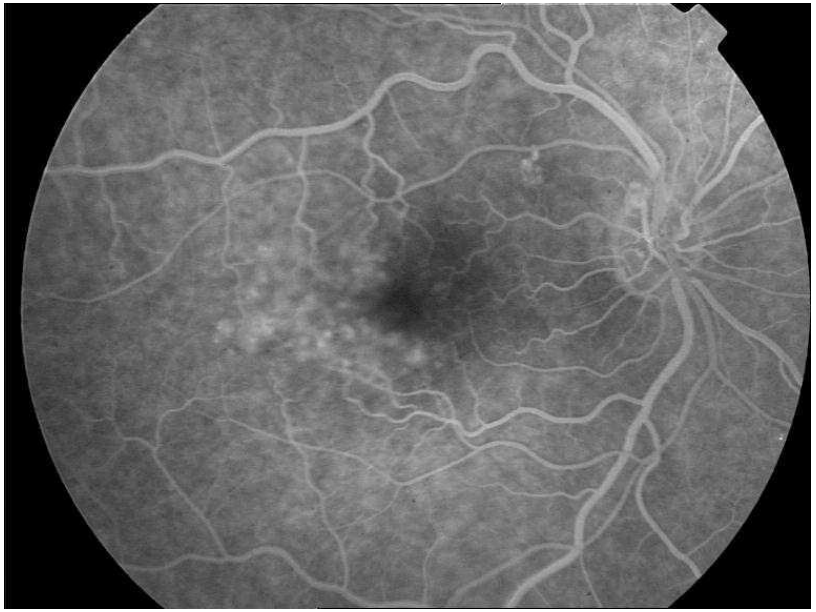


İdiopatik Juxtafoveal telanjiektazi

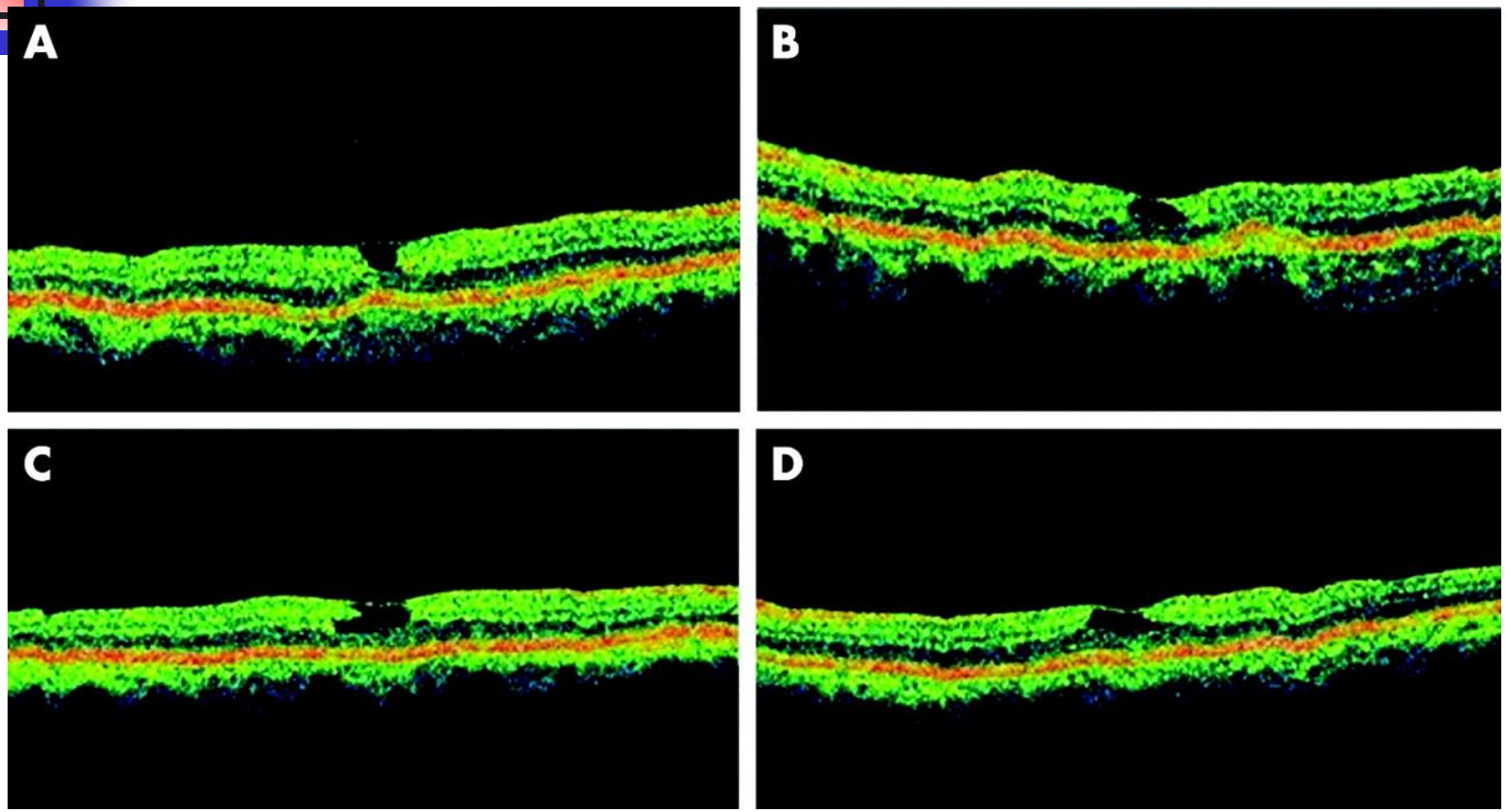
Olgu

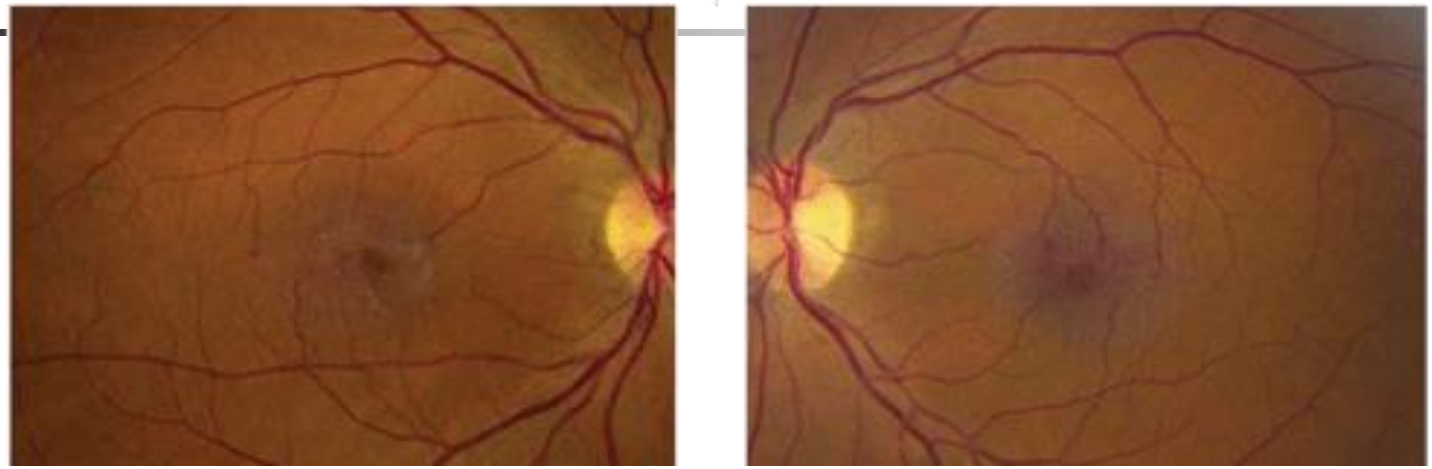
- 48 yaşında erkek
- 5 aydır sağ gözde
- görme azalması
- DM ø, HT ø
- G: 0,2 / tam
- ÖS: Doğal
- TO: 16 / 13

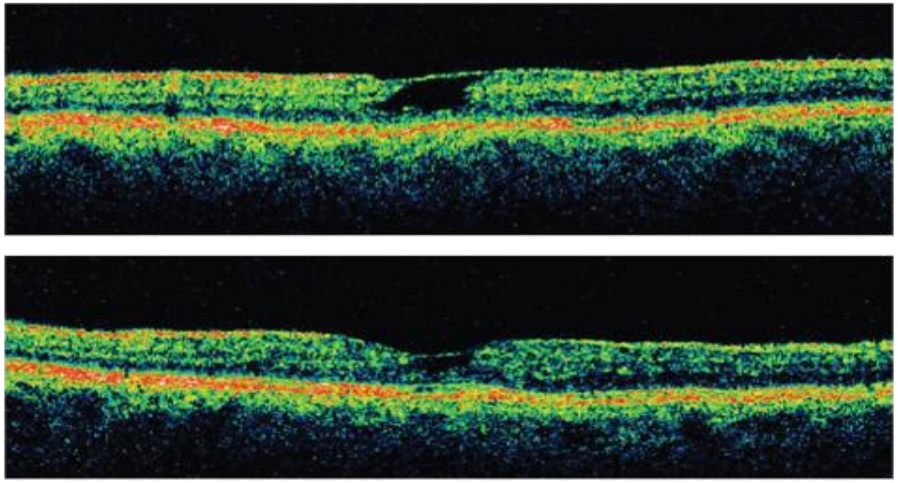



Tipik OCT

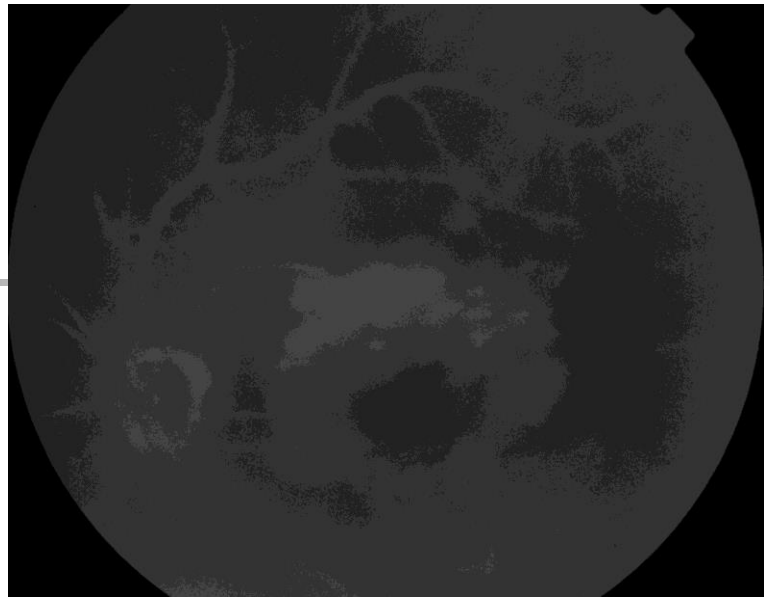


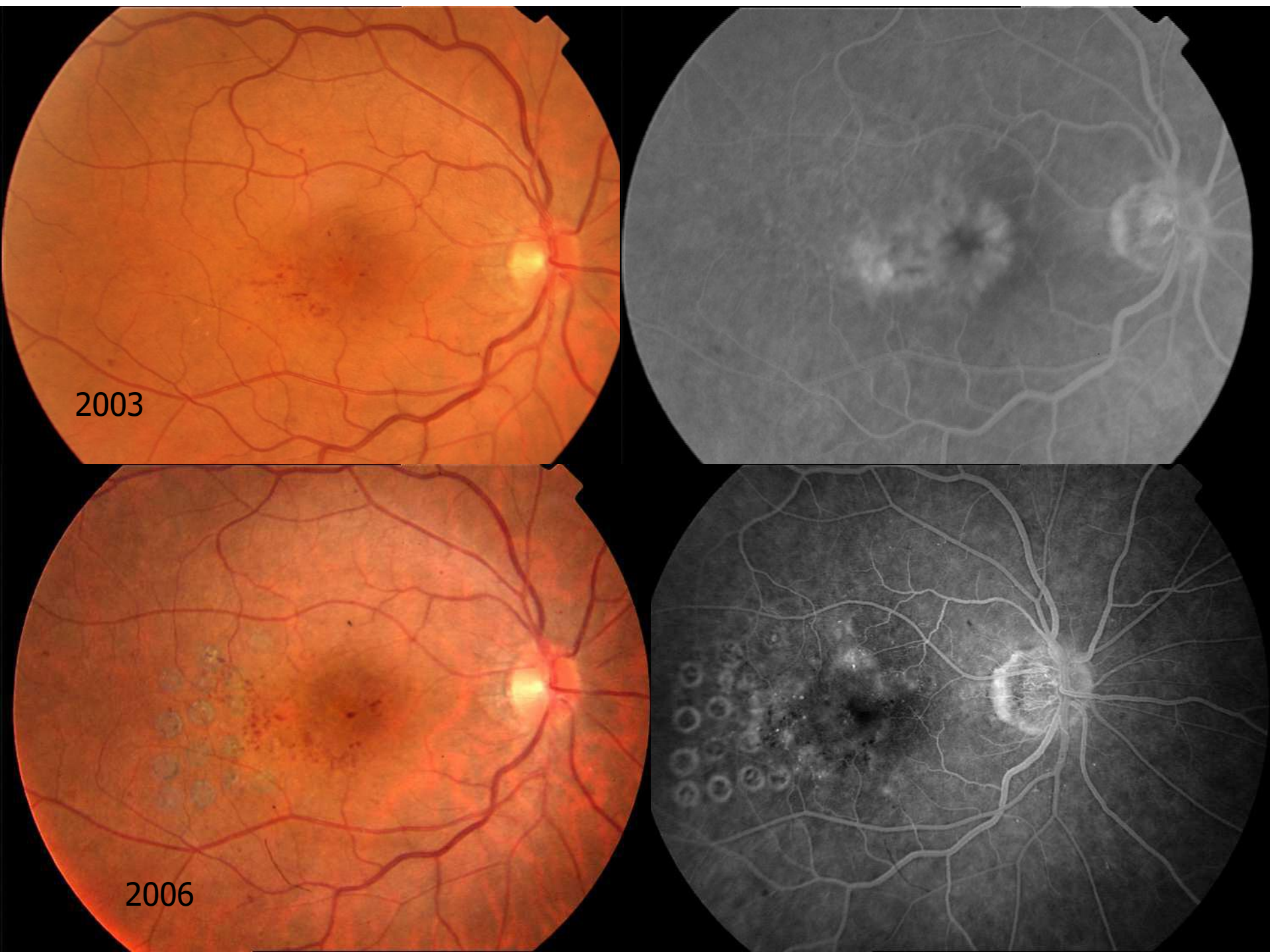




Grup 1A, Tek Taraflı Konjenital IJRT

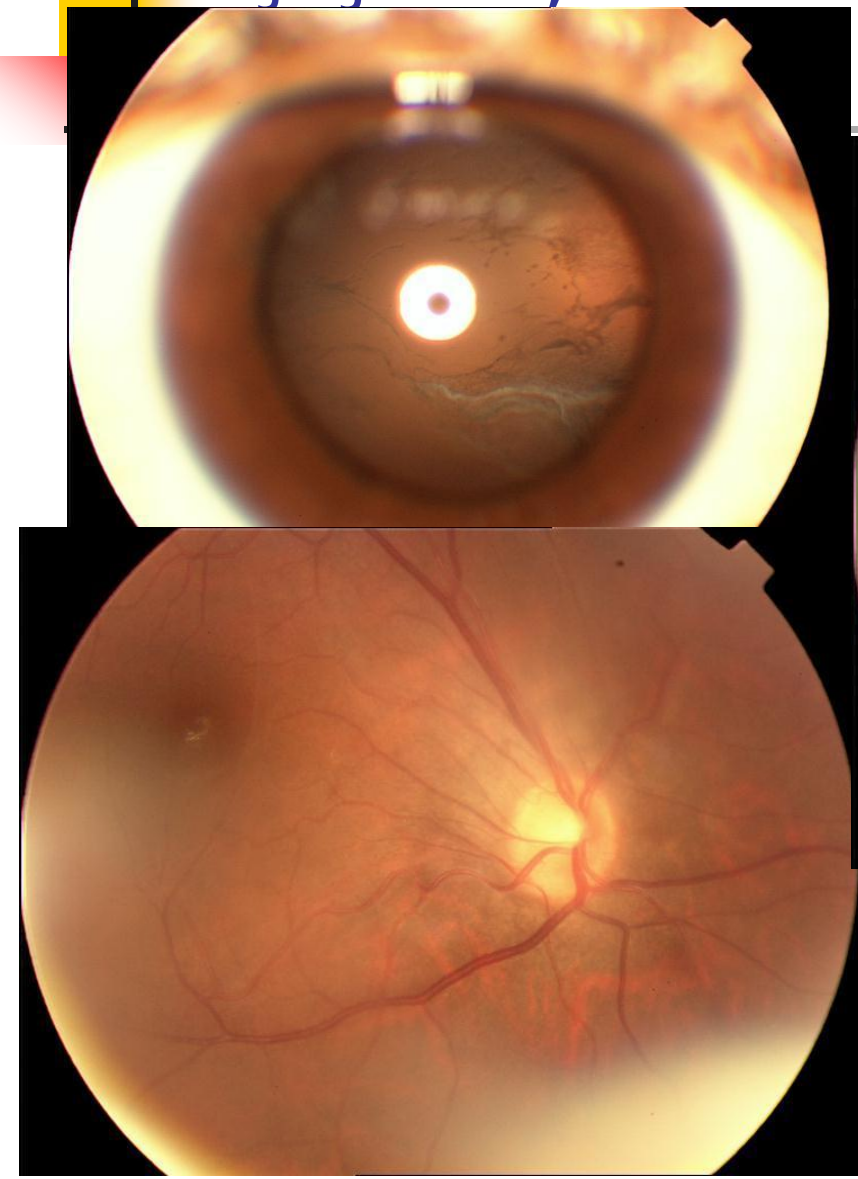
- Genellikle (% 90) erkeklerde, 30-40 yaşlarında başlar
- % 90 tek taraflı, çoğunlukla makülanın temporal yarısını etkiler ve 2DD dan geniştir
- Kapiller tıkanıklık görülmez
- Coats hastalığının hafif bir varyantı olduğuna inanılmaktadır
- Yıllarca asemptomatik olabilir ve spontan remisyonlar görülebilir
- Lazer faydalı olabilir?

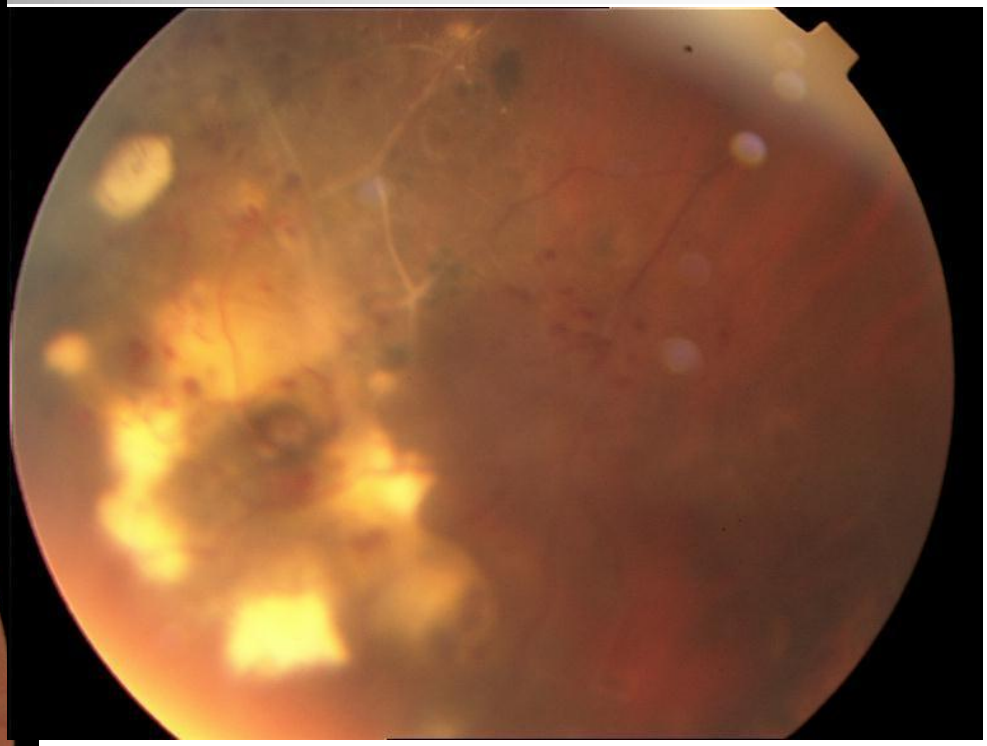


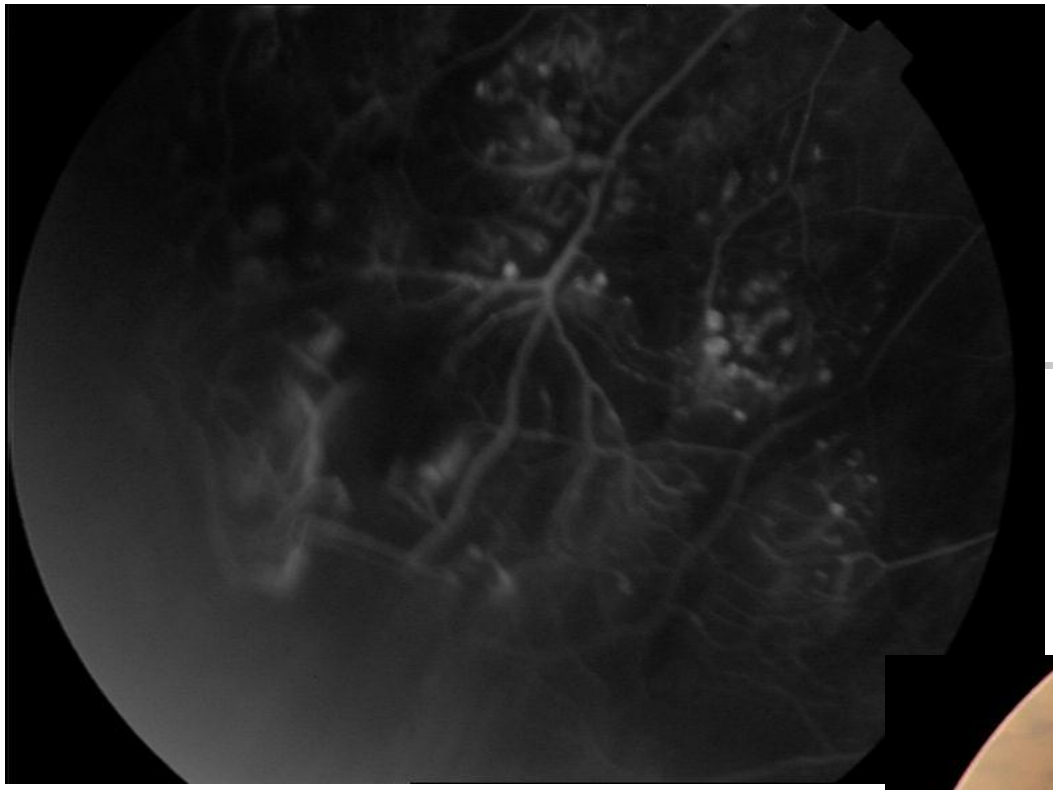

2003
2006

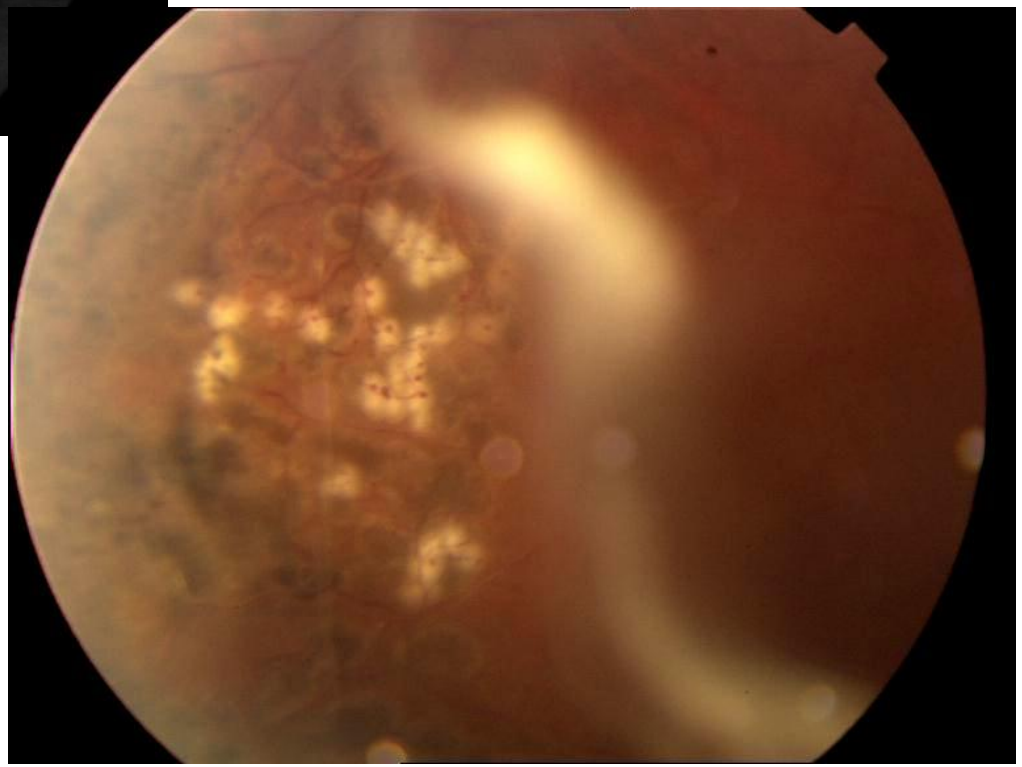
Coats’ Hastalığı

19 yaş, bayan, R: 1,5 aydır sinek uçuşması, kanlanma, GK: R-L: Tam



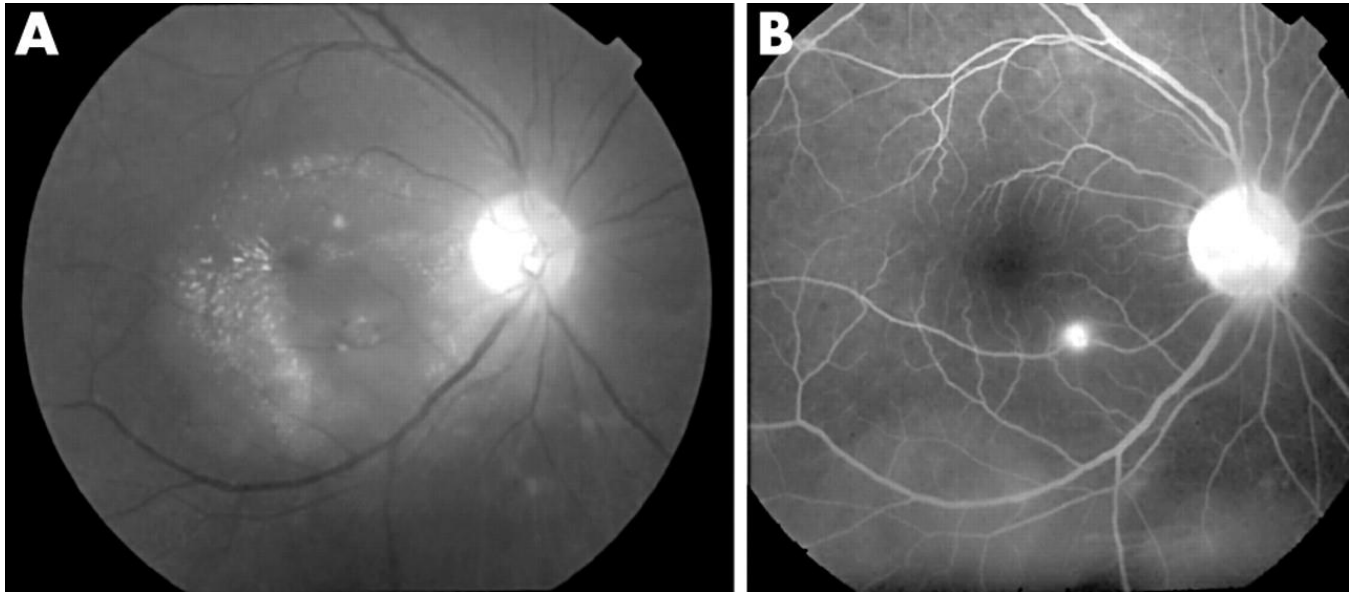


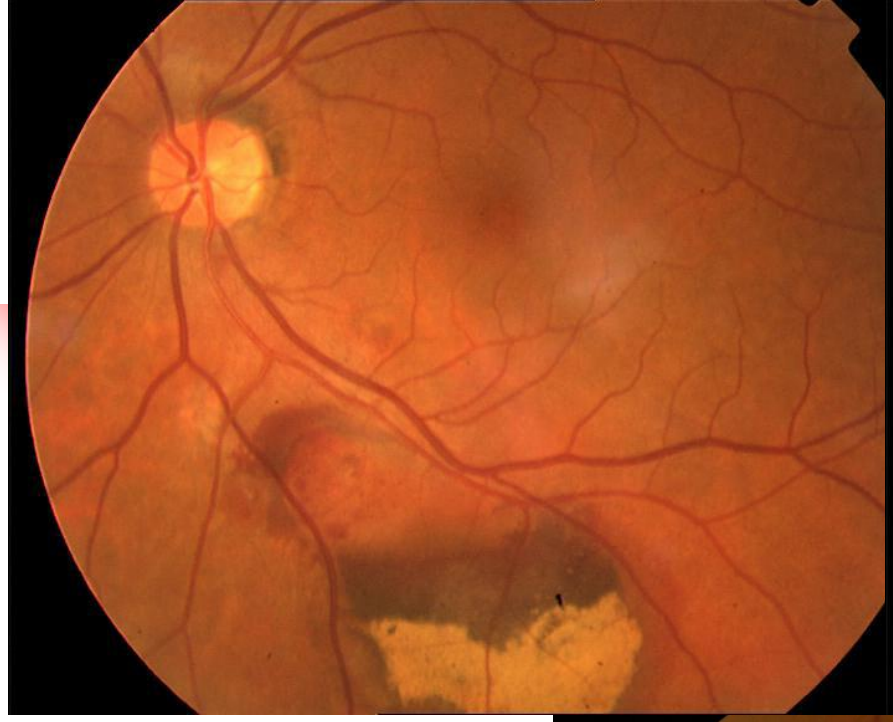


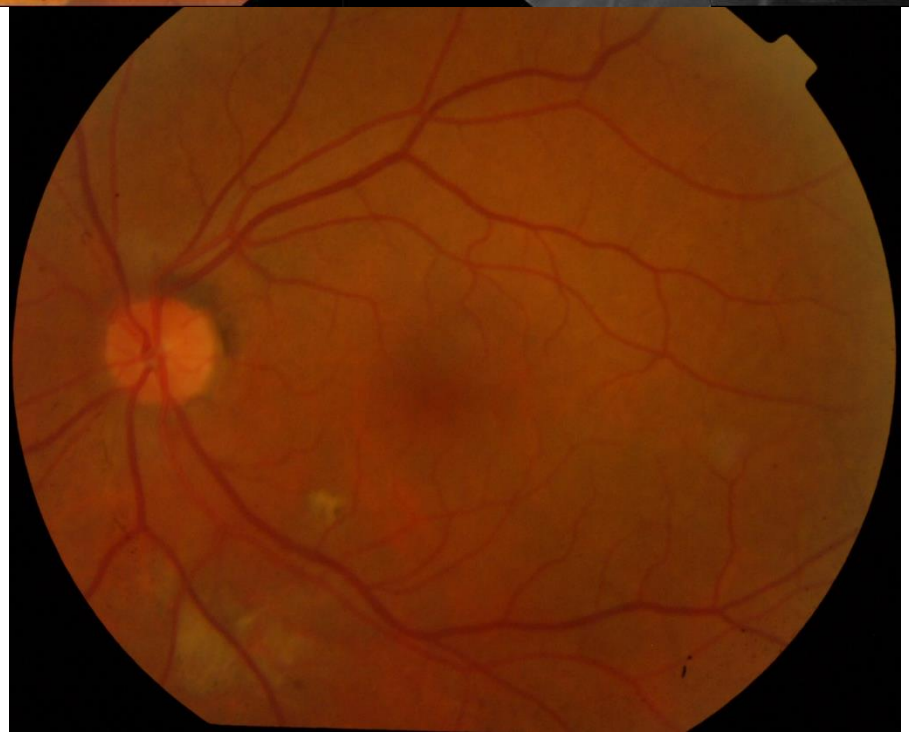


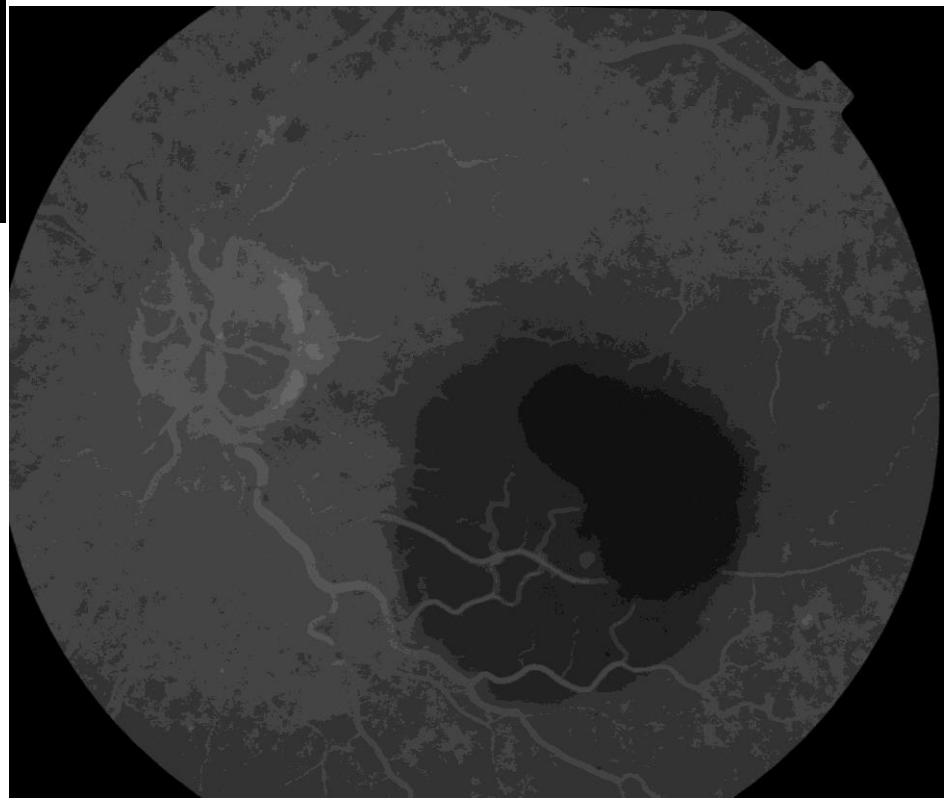
Makroanevrizma

- Laser?
- Spontan düzelme
- Direkt fotokoagülasyon
- 500 mikron, uzun süre (0.2-0.5sn)

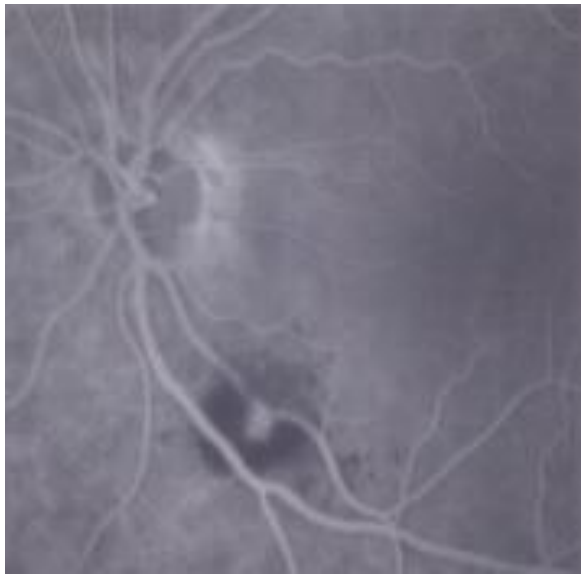
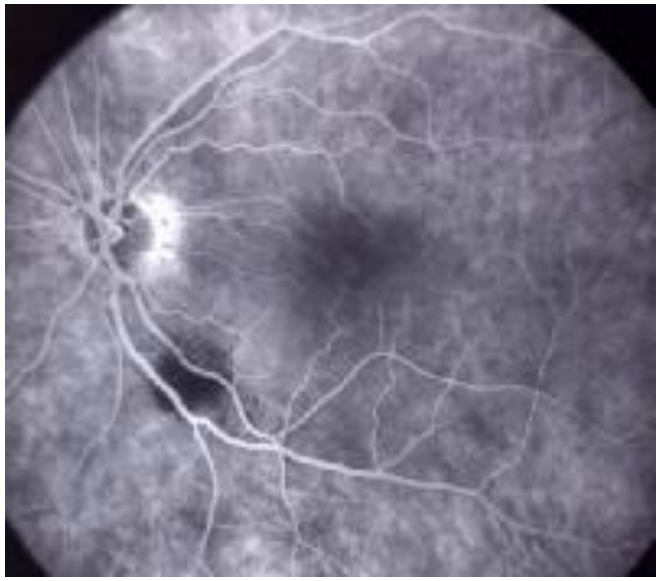






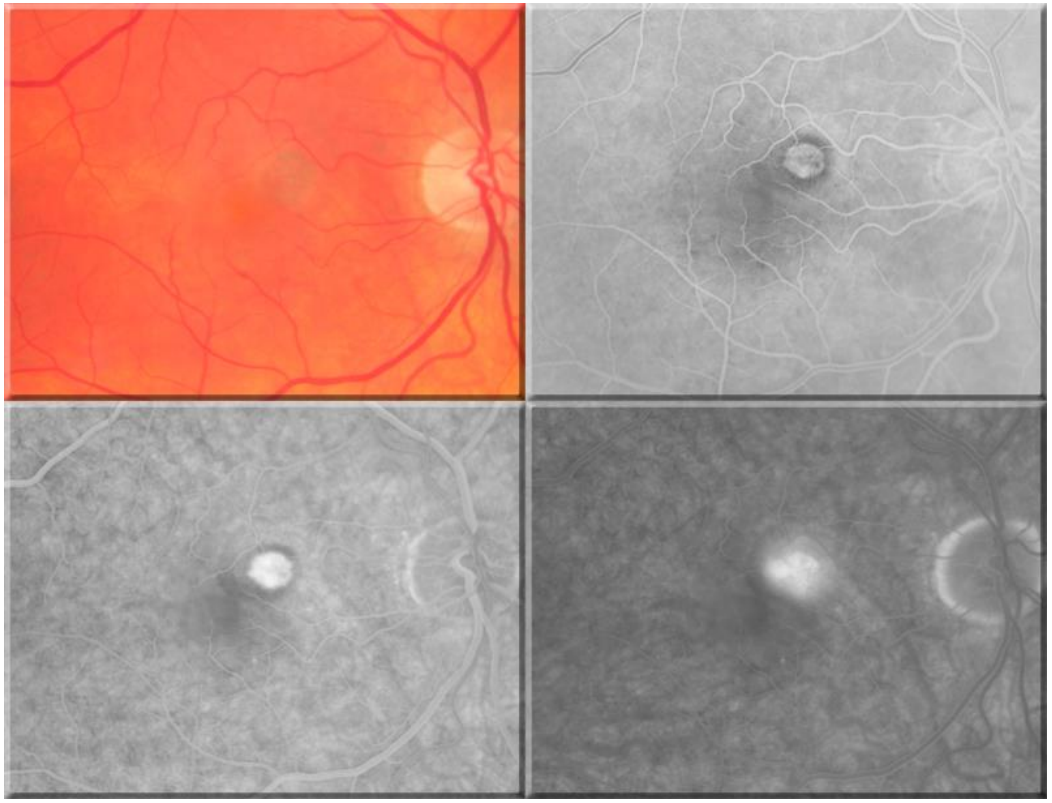


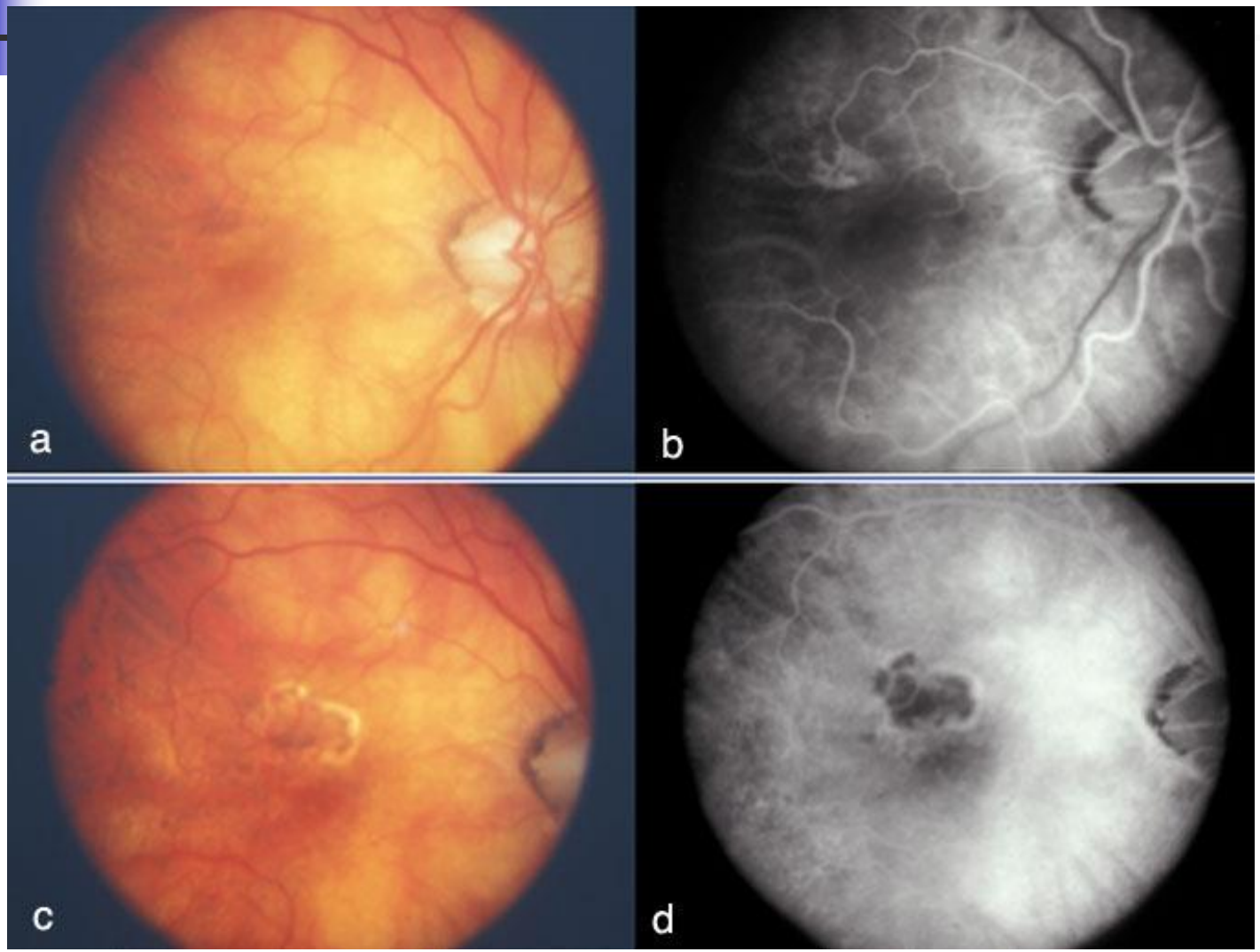
Makroanevrizma

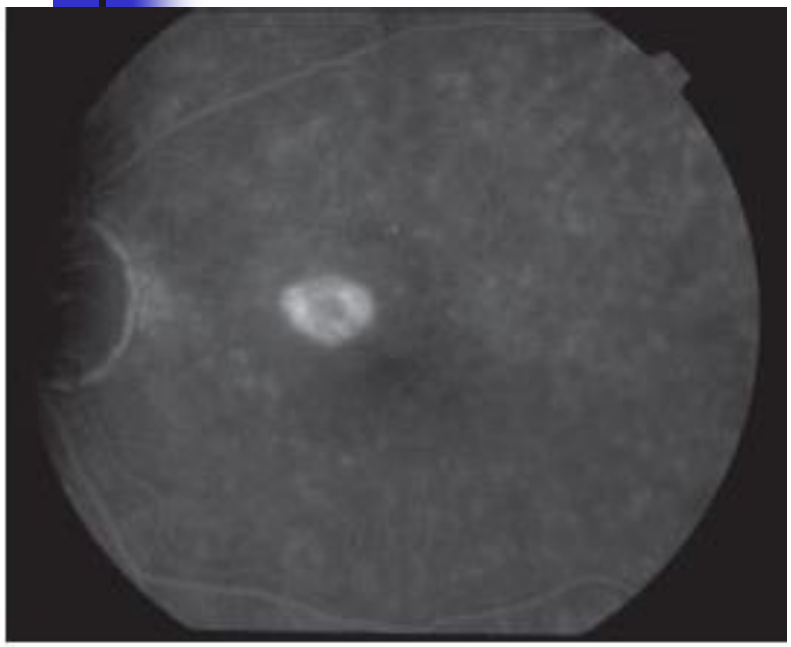
EXTRAFOVEAL KNVM

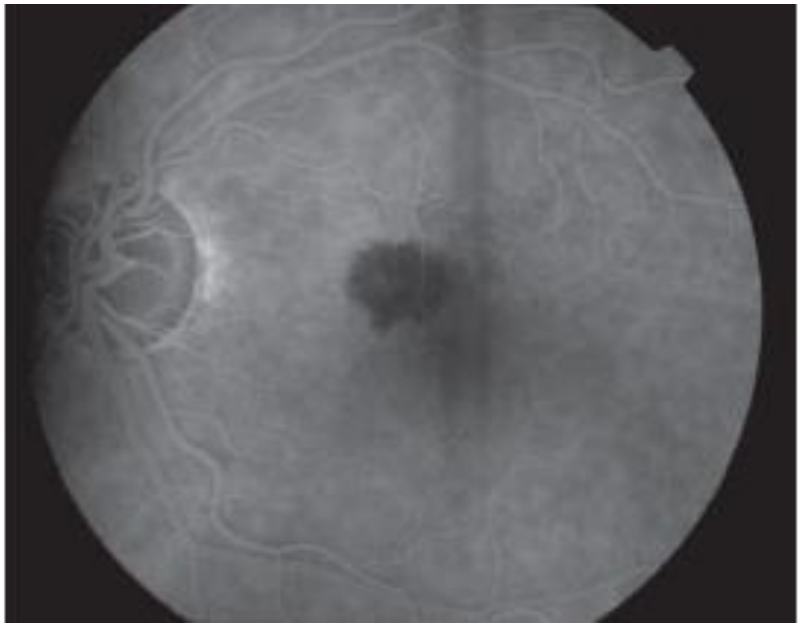
- Klasik KNV
- Hemorajileri de içine almalı
- Argon laser, 0.2sn
- Önce 50-100 mikron spotlarla sınırlar belirlenir
- Sonra içi doldurulur
- Grade 4 yanık!

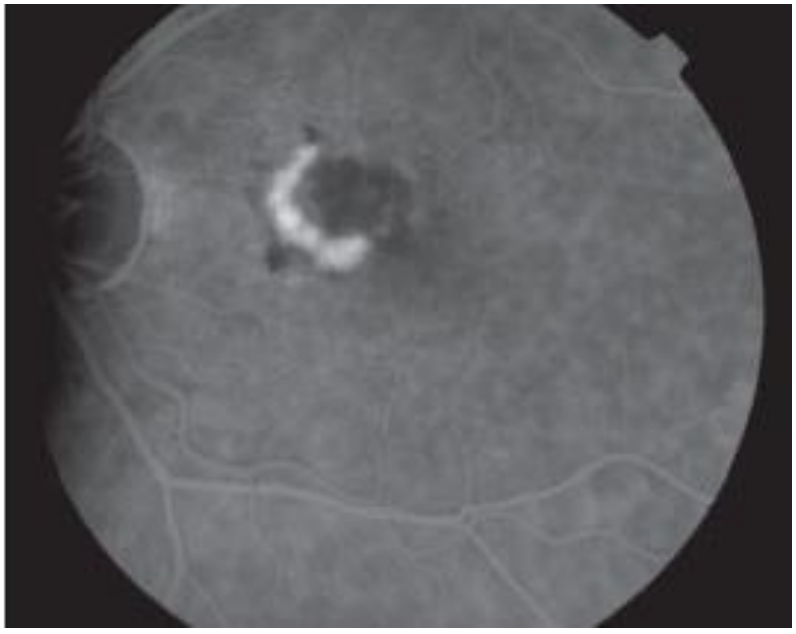



a
b
c
d

Nüksler sık!...



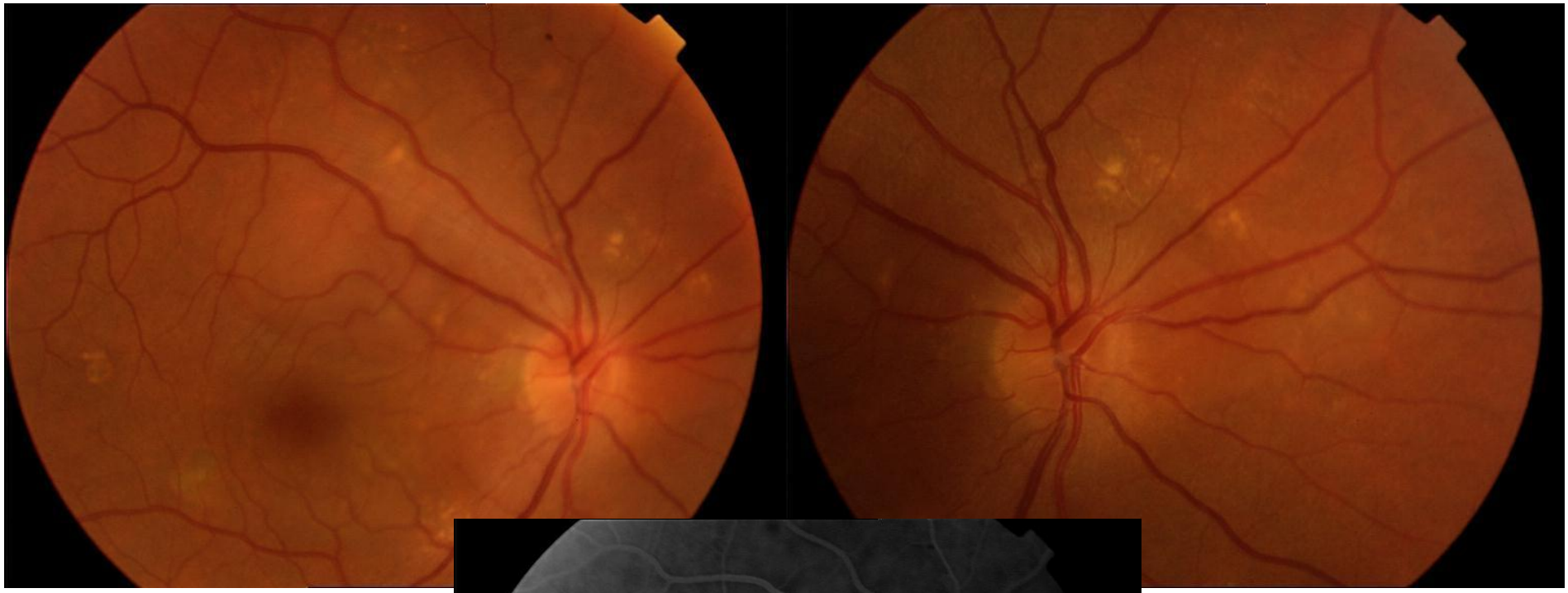


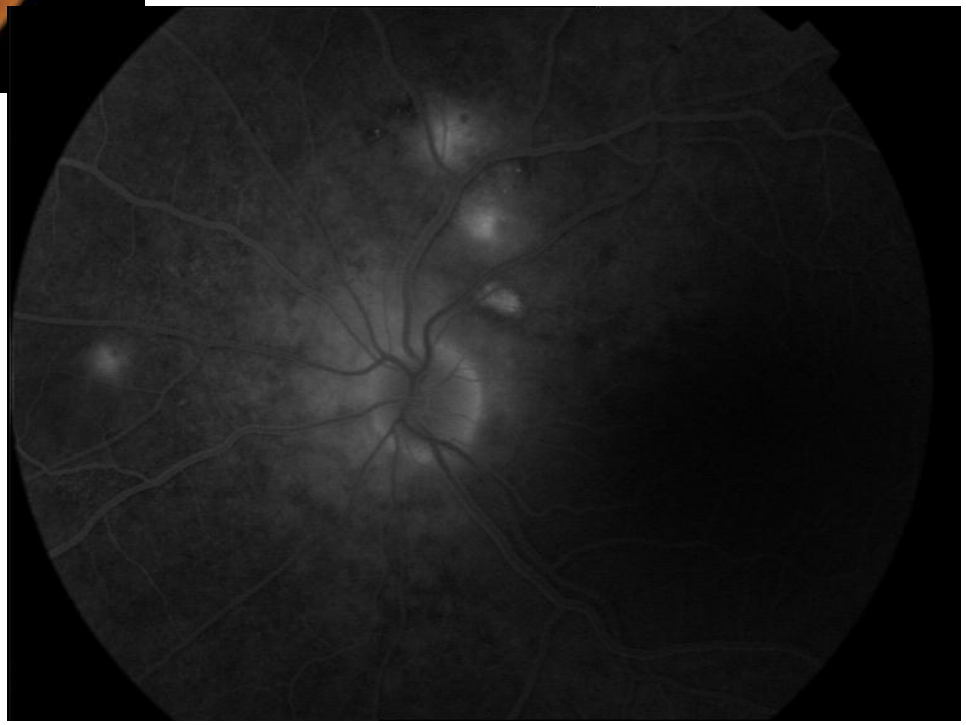


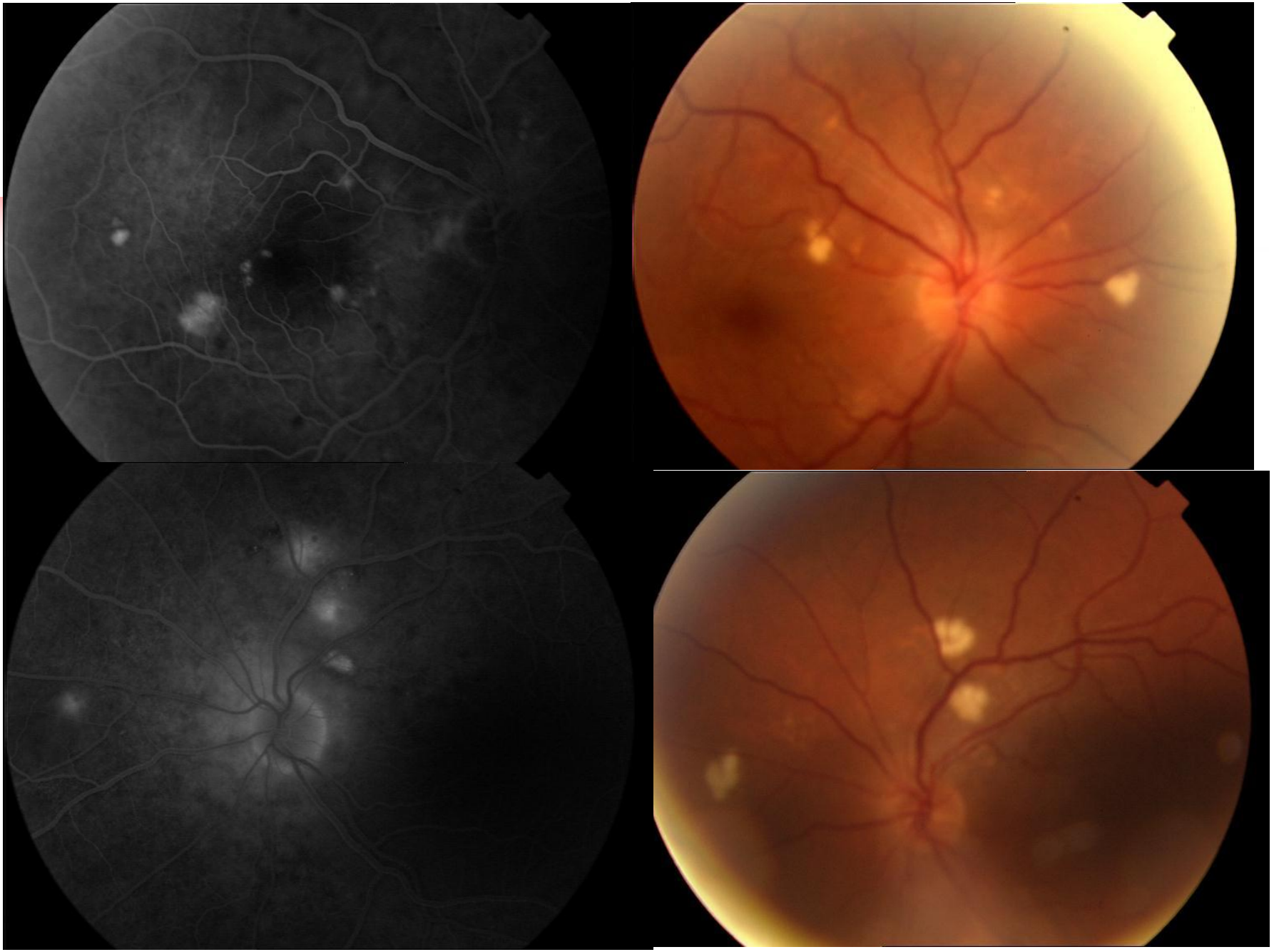
SSKR

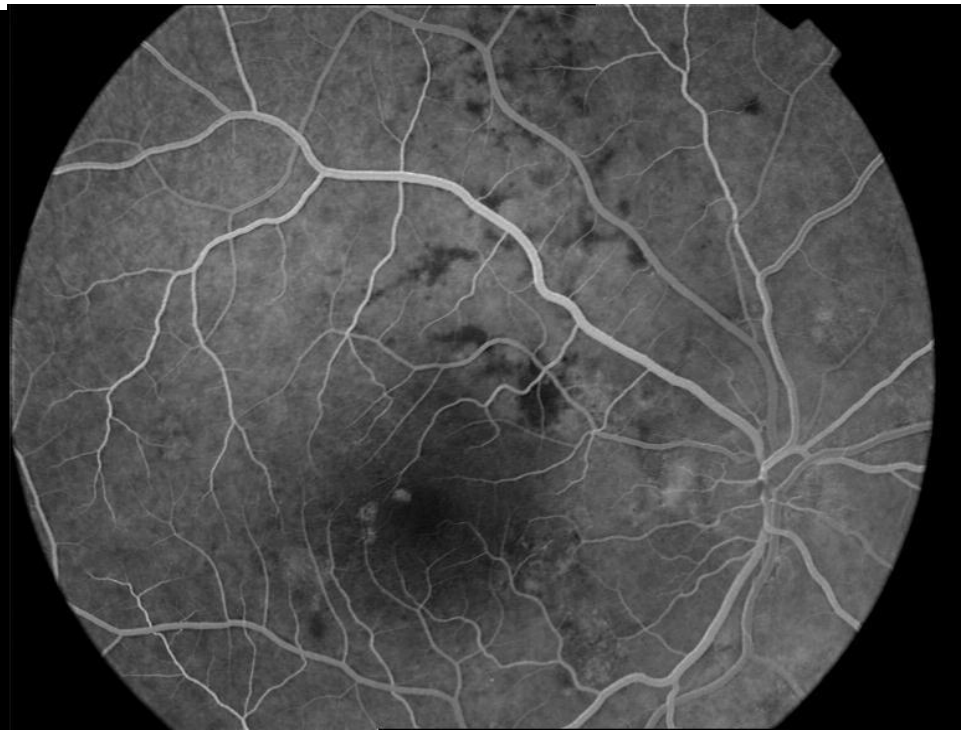
- Extrafoveal fokal sızıntı odaklarına
- Fokal laser

40 yaş, erkek, steroid kullanımı sonrası bilateral GK↓: R: L: 0.2









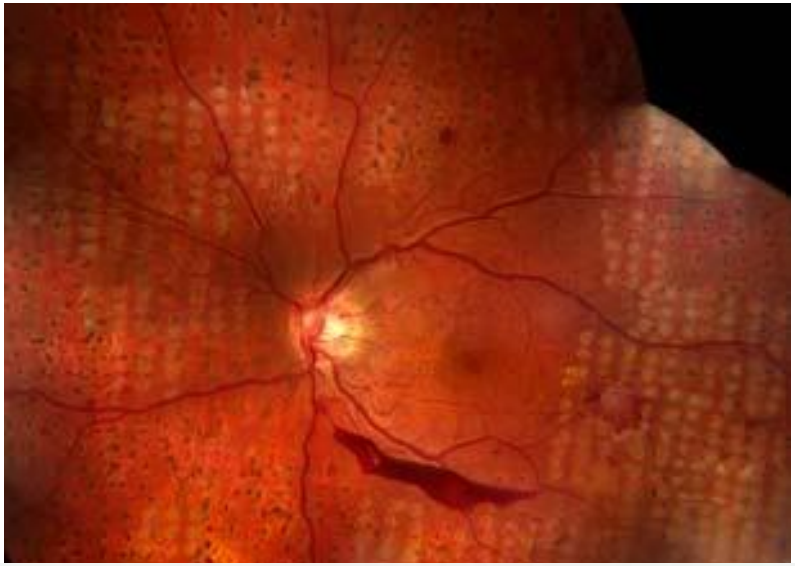
LASER TEKNOLOJİSİNDEKİ SON GELİŞMELER

Patern laser-Navigated Laser

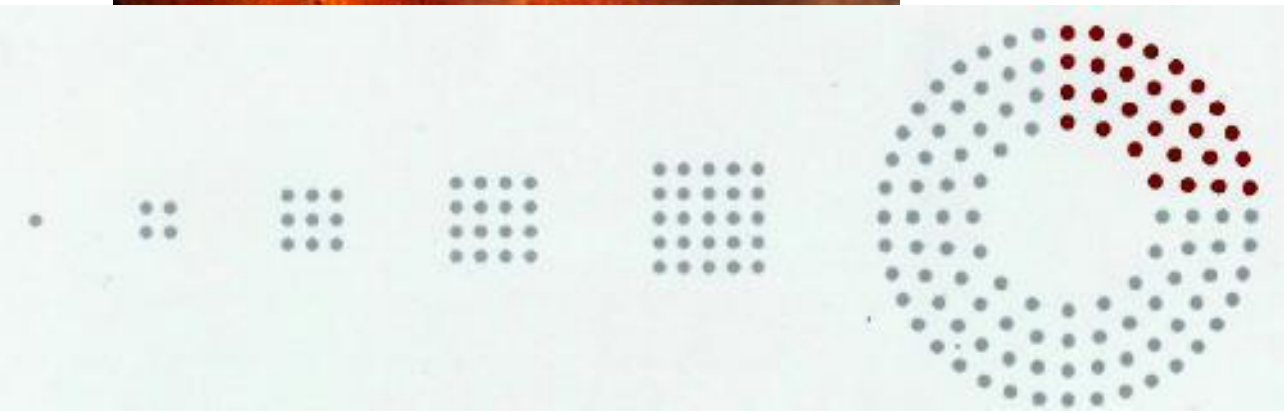
- PASCAL
- VALON
- Diğer

- NAVILAS

PASCAL

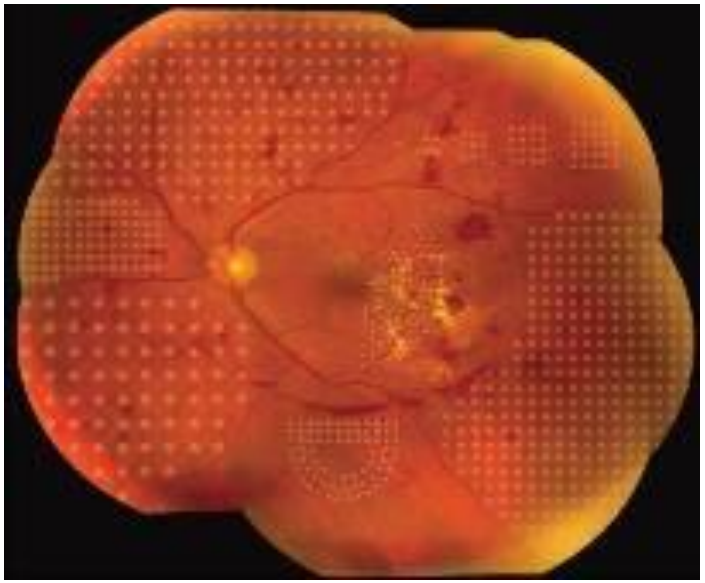


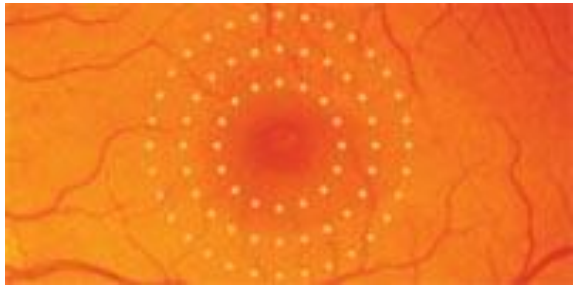
- Pattern Scan Laser
- Multispot, semiotomatik
- 532nm laser fotokoagülatör
- OptiMedica (İmir Kimya)
- 56 spota kadar (0.6sn)
- 2005: FDA onayı



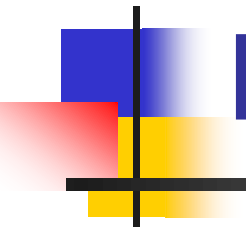
Avantajları

- Hızlı (1-2 seans)
- Ağrı daha az
- Süre: 10-20ms
- Enflamasyon ve ödem↓
- Hasta ve Dr. için hem konforlu, güvenli, hem de daha kolay!





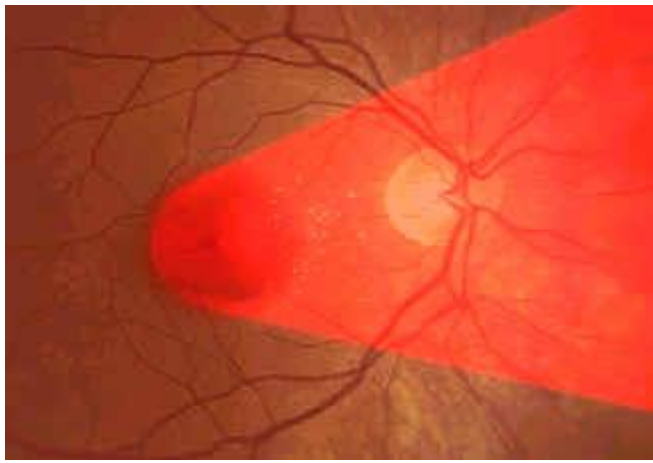
Navigated laser technolgy



PDT

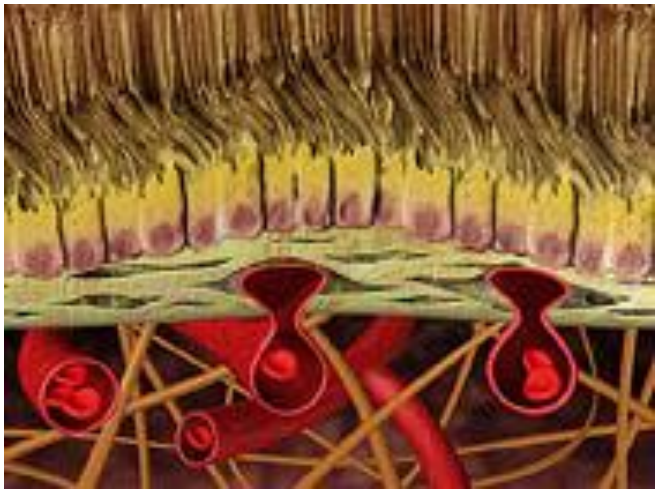
2 Unsur

- İlaç: Uygun λ-ışığa maruz bırakıldığında aktifleşip çeşitli kimyasal reaksiyonların oluşmasına neden olan ışığa duyarlı madde.
- İlacın aktivasyonunu sağlayan ışık



Işığın tedavi edici etkisi

- Fotokoagülasyon (Argon laser)
- Fotodistribisyon (YAG laser)
- Fotokimyasal etki (PDT)



Işığa duyarlı ilaç

- Porfirin türevleri:,
  - Heme (O_2 taşıma)
  - Myoglobin (O_2 depolama)
  - Klorofil (Fotosentez)
- Verteporfin, Purpurin, Porfimer Na
- Lutex, Purlitin, Optrin…vb

Verteporfin

- Lipofilik
- Tm hücreleri ve hızlı bölünen aktif hücreler tarafından hızla hücre içine alınır.
- Neovasküler endotel hücreleri de selektif olarak alır.

Laser

- λ: 689nm
- Nontermal diod laser
  - Coherent Opal photoactivator laser
  - Zeis Visulas 690s laser
- 15. dakikada
- 50J/cm, 83sn süreyle (600mW/cm2)

Mekanizma

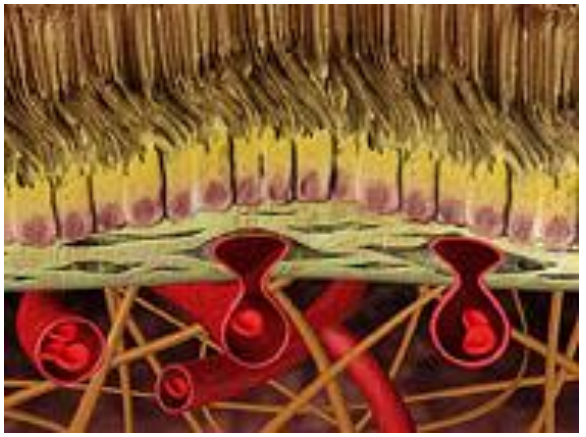
- “Fotosensitizer ışık”
- Uyarılmış ilaç
- Fotokimyasal reaksiyonlar zinciri
- Serbest radikallerin oluşumu
  - Tekil 0_2: Kısa ömürlü, çevre dokulara zarar vermez
- Anormal damarlarda endotel hasarı
- Trombosit aktivasyonu ve birikimi
- Anormal sızıntılı damarın trombozu

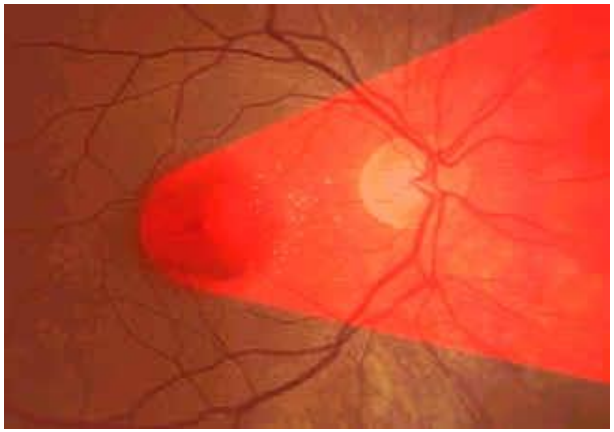
Hazırlanış

- Visudyne doz hesaplayıcısı (Cetvel)
- Hastanın kilo ve boyunun ölçümü
- Buna göre vücut yüzölçümü (m2)
- Buna uyan Verteporfin miktarı (6mg/m2)
- Bunu 30ml ye tamamlayacak dextroz.
- 30ml solüsyon pompaya yerleştirilir.
- Sağlam damar yolu
- 10 dak içinde bitecek şekilde ayarlanır.

Uygulama

- İlacın enjeksiyonu (10 dak içinde infüzyon şeklinde)
- 15. dakikada düşük enerjili laser (689nm diod)
- 83 sn süreyle
- İlaç 24 saat içinde KC den metabolize olup atılır.





Laser spot büyüklüğü

- Lezyonun bütününün en uzun doğrusal çapı (GLD)
- +1000 mikron
- OSB'dan en az 200 mikron uzak olmalı
- İki gözde de tedavi endikasyonu varsa önce beklentinin daha yüksek olduğu göze uygulanmalı

- Sırt ağrısı: infüzyon sırasında %2
  - Hızla geçer, hasta yürütülür, hareket ettirilir.

İlaç damar dışına kaçarsa: STOP

- >1/2 doz verilmişse: plana devam
- <1/2 doz verilmişse: Yeni bir venöz yoldan kalanı verilip bu infüzyonun 15. dak ted başlar.
- Kaçak bölgesi soğuk kompres ve renk değişimi geçene kadar ışıktan koruma

Tedavi sonrası önlemler

- 48 saat gün ışığı veya güçlü oda ışığından korunma
- Koruyucu gözlük kullanımı
- Şapka, kol ve bacakları tam kapatmadan dışarı çıkmamalı
- Işık altında tedavi (Örn:Diş) ertelenmeli
- Geçici görme azlığı olabileceğinden bahsedilmeli.

Takip ve tedavi sıklığı

- 3 ayda bir gerektiğinde tekrar tedavi
- FFA ile takip

PDT-Komplikasyonlar

- Görme azalması
  - Ciddi kayıp: ilk haftada ≥4 sıra kayıp (%1.8)….2. tedavi önerilmez
  - Geçici görme azalması:
    - En sık komplikasyon (%17)
    - 2. tedaviden sonra azalır
    - Lokal enflamasyona bağlı ödem
    - Birkaç günde düzelir
- Koryokapillaris hasarı: Koroid iskemisi
- RPE hasarı: RPE Yırtığı
- Subret hemoraji (%3.1 yeni hem, %8.6 mevcut hem artışı)

PDT-Kullanım alanları

- Oküler Tümörler
  - Koroidal Hemanjiom
- Oküler NV
  - SMD – KNVM (Baskın klasik lezyon)
    - PCV
- Diğer
  - SSKR
  - Juxtafoveal telanjiektazi

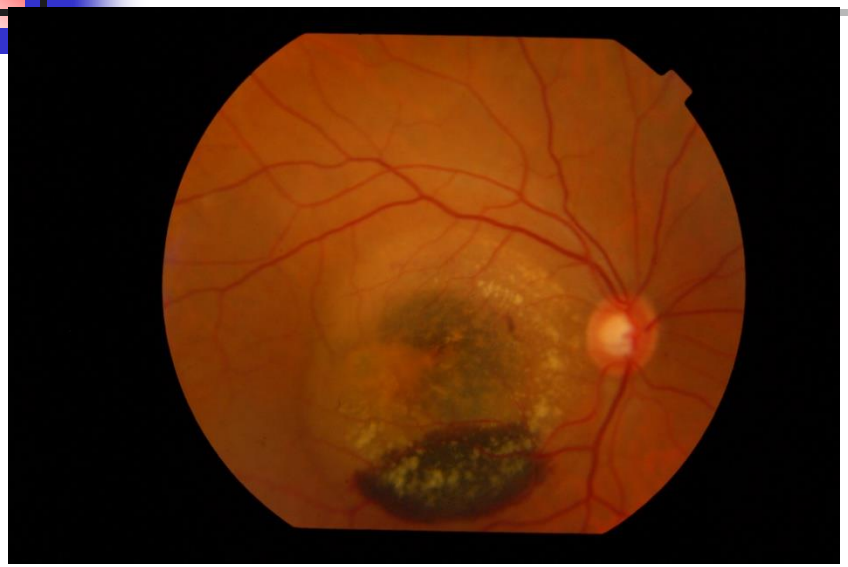
PDT- Klinik çalışmalar

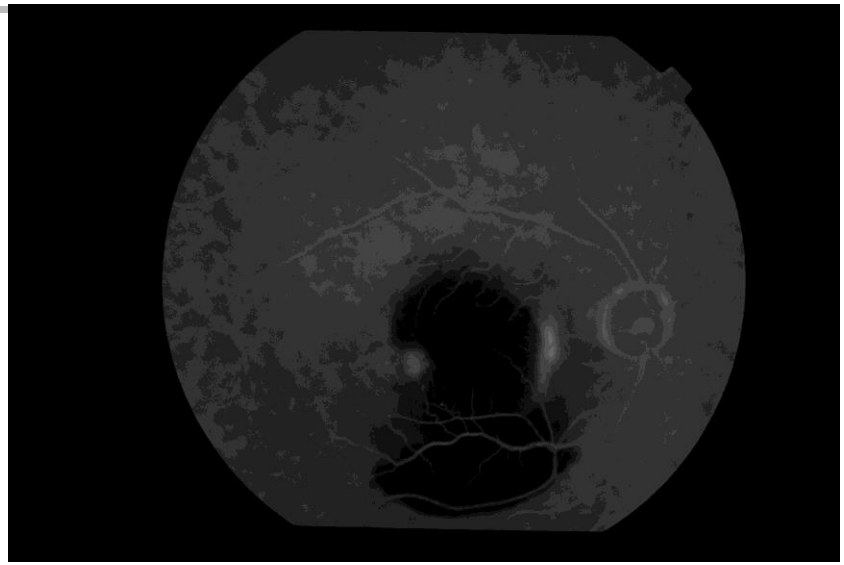
- TAP study: Klasik + Gizli KNV
- VIP study: Dej. myopi grubu ve SMD grubu
- Ciddi görme kaybı oranlarında plaseboya oranla belirgin azalma (+)

PCV

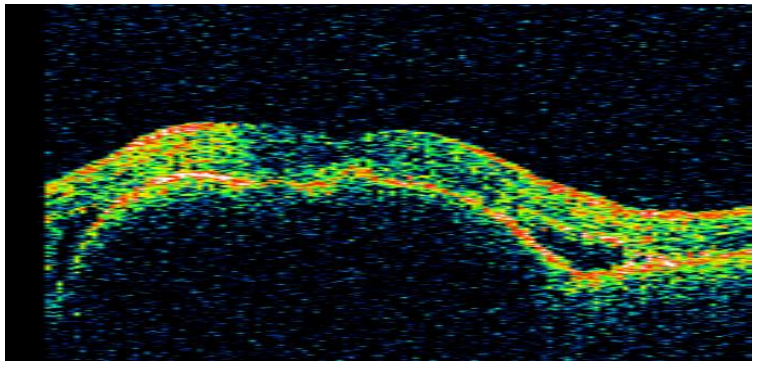
- SUMMIT
- Asya (EVEREST)
- PCV
- PDT monoterapi ≥ Lucentis

OLGU: KNV (PCV)

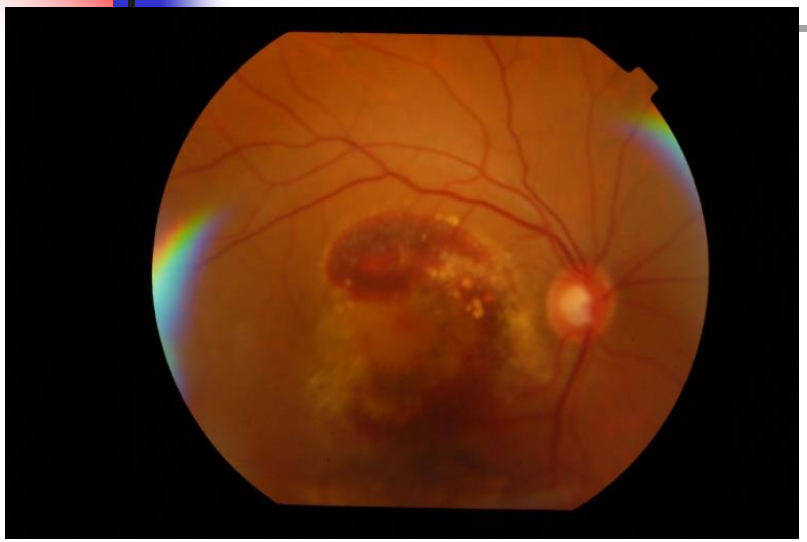


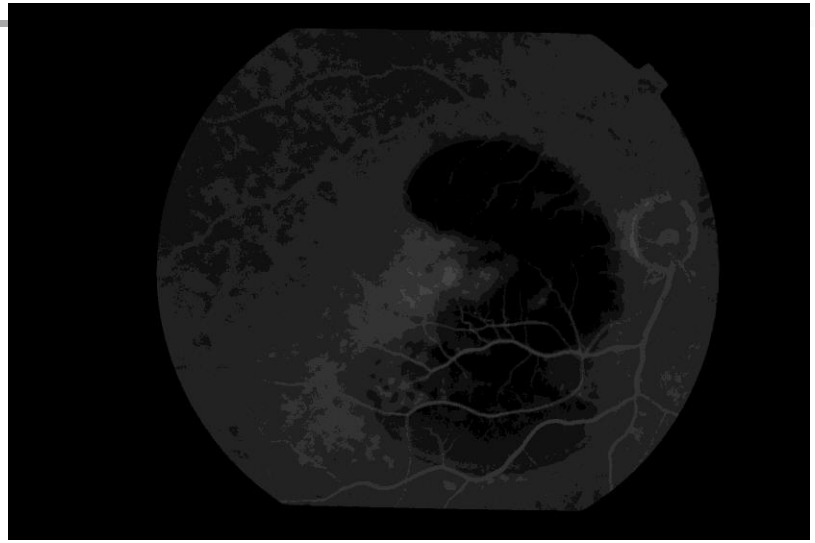


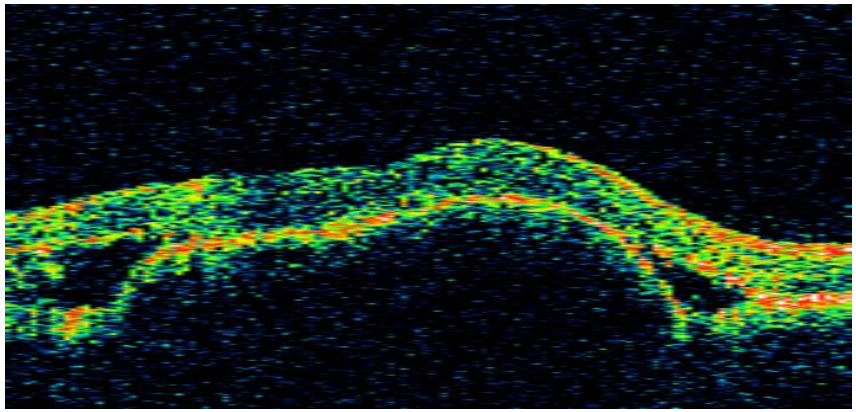
GK:0.1



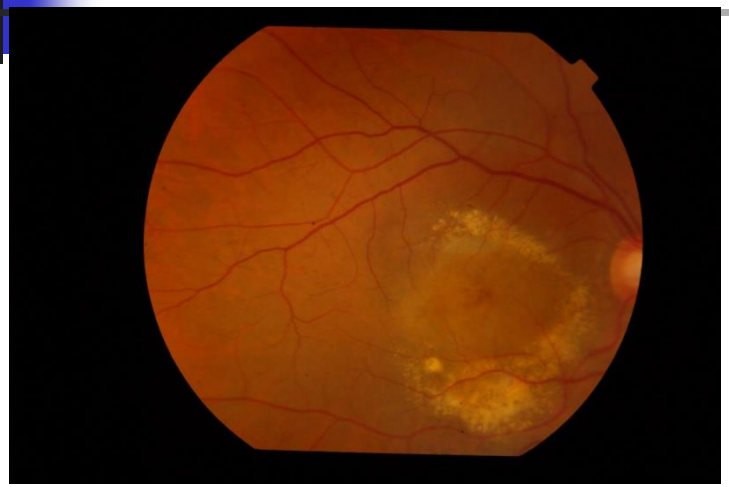
3X LUCENTİS: Progresyon
GK:0.16

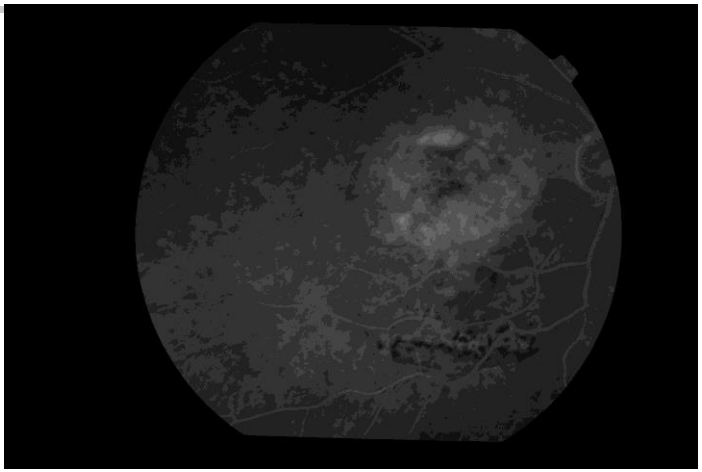


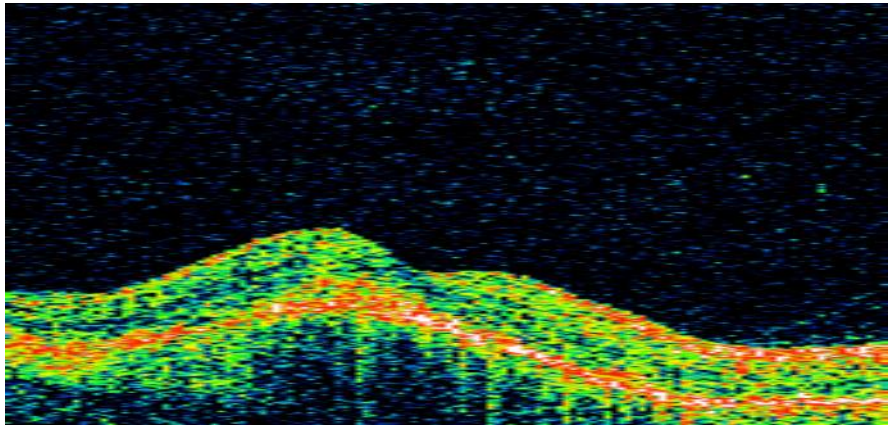




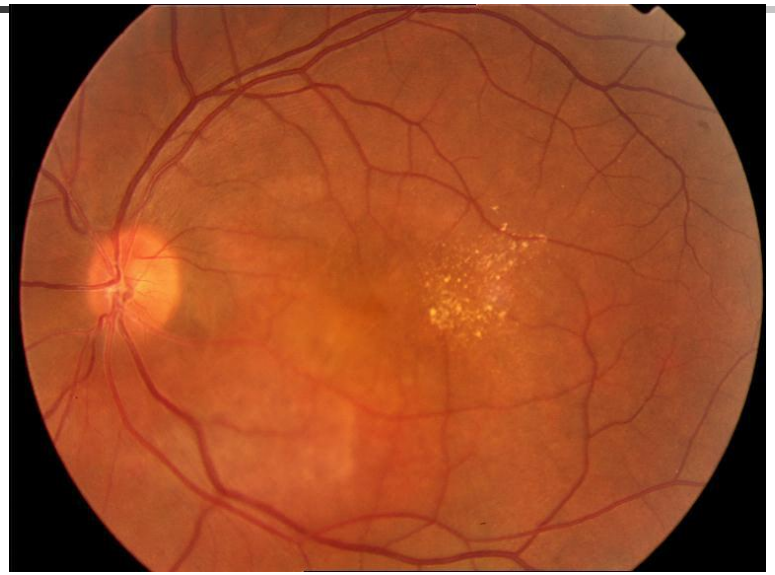
4. DOZ LUCENTİS +PDT
GK: 0.25

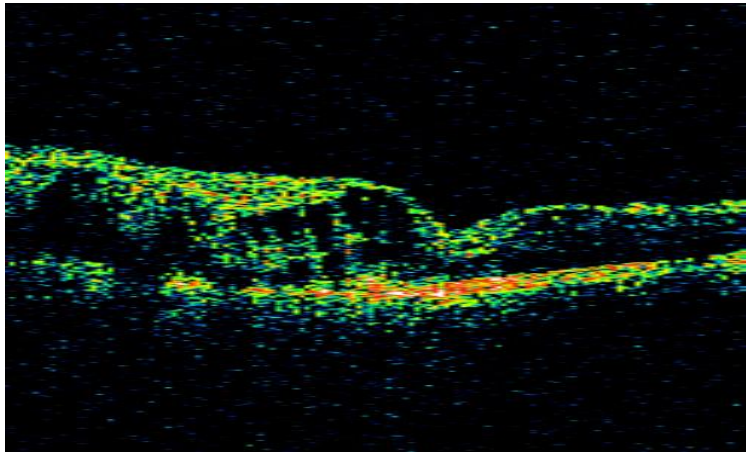


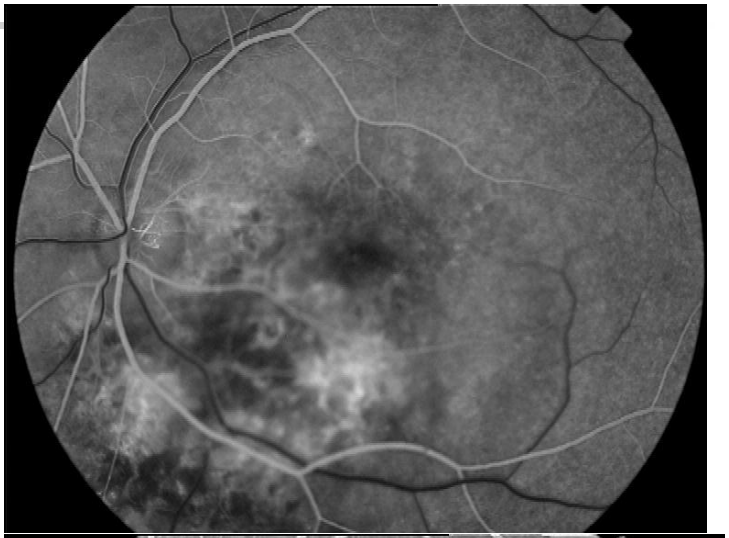


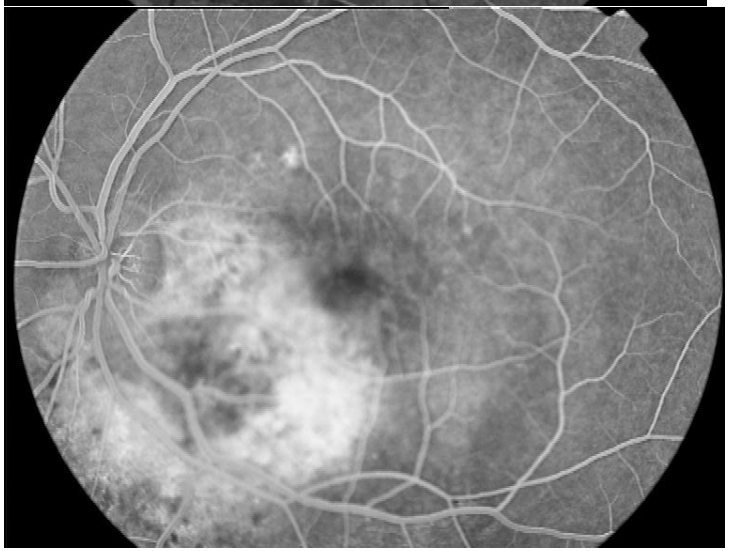


Olgu: Koroidal hemanjiom
47,E, GK: 0.1

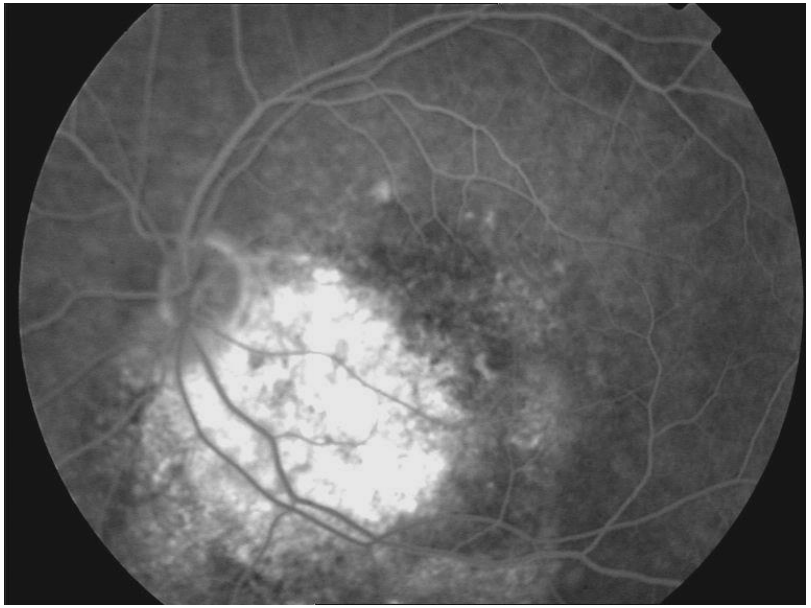


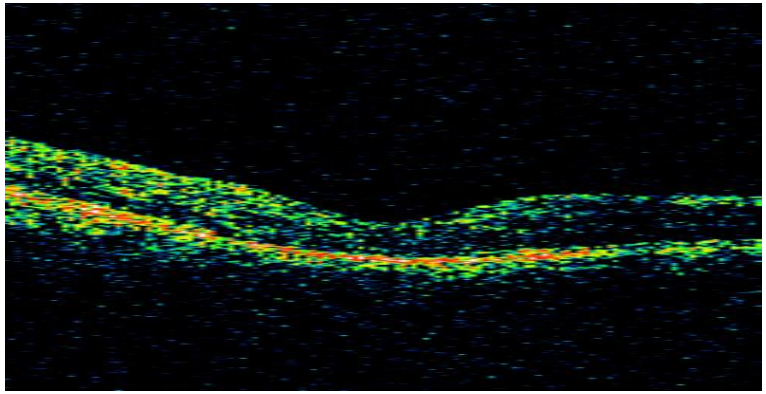




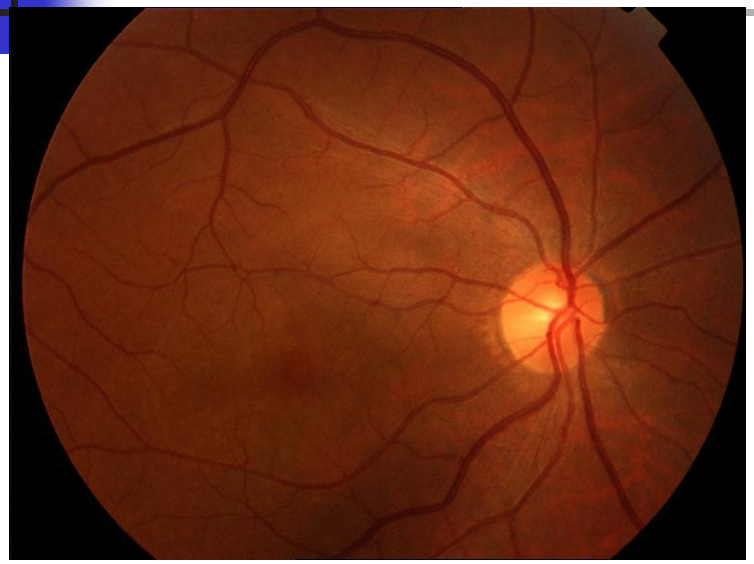


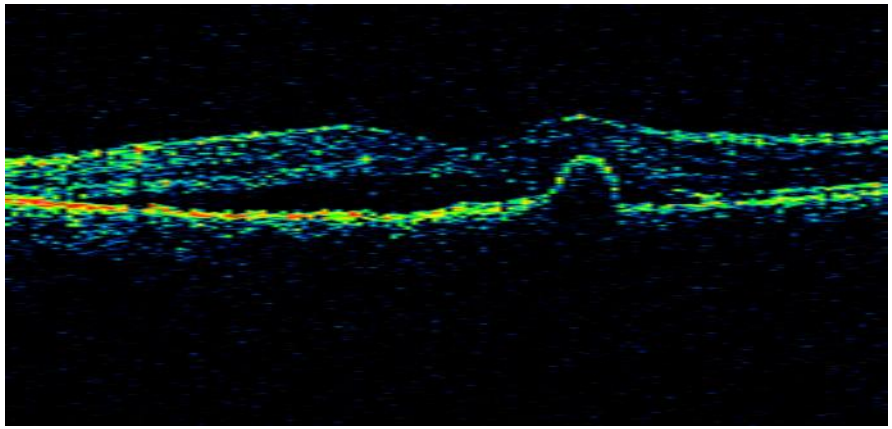
PDT sonrası 6.ay, GK: 0.4



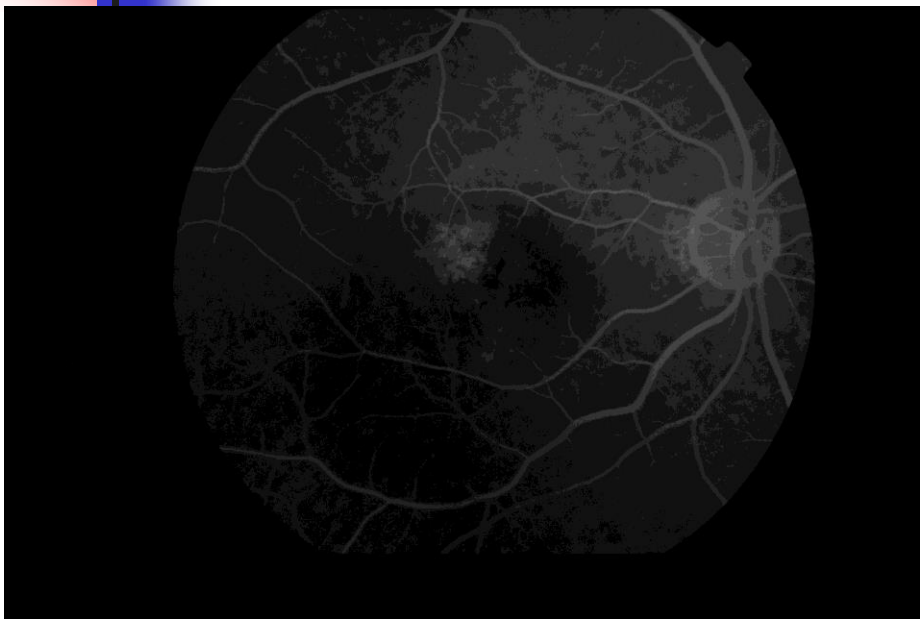


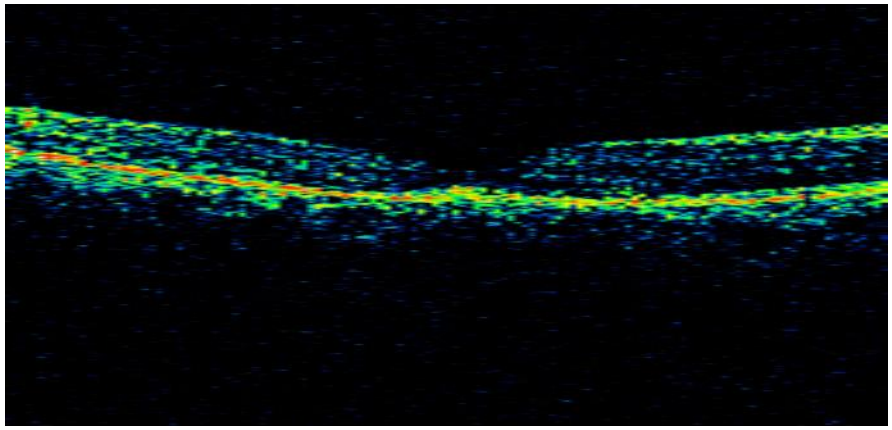
Olgu: SSKR, 47y, K, GK:0.5



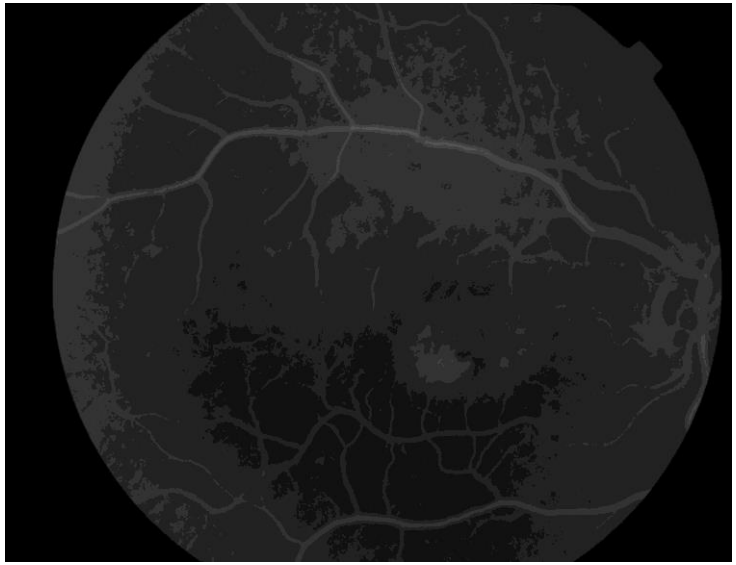


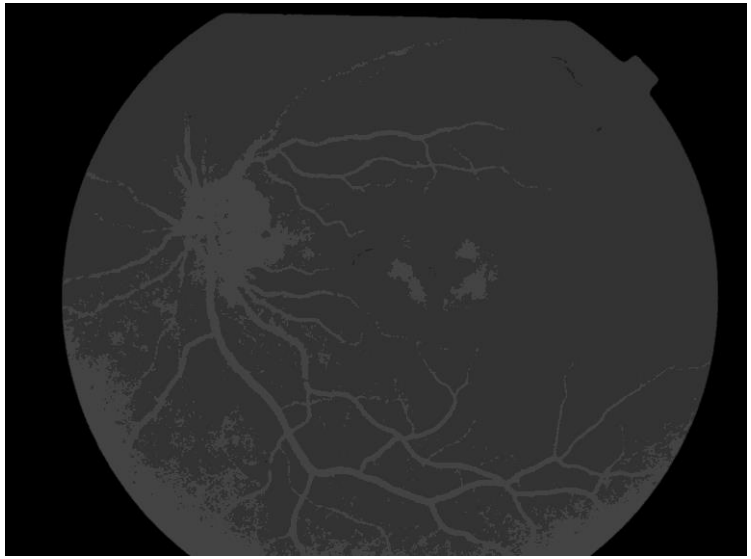
PDT SONRASI 3.AY, GK: 0.7

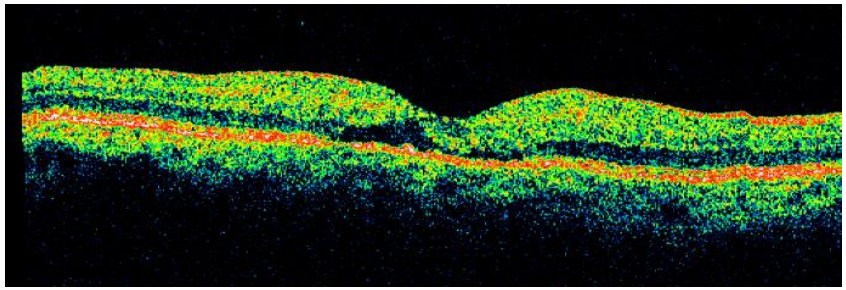


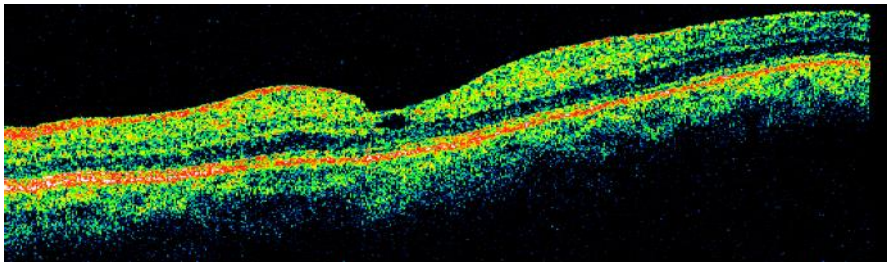


0LGU: 52y, E,
JUKSTAFOVEAL TELENJEKTAZİ









PDT SONRASI