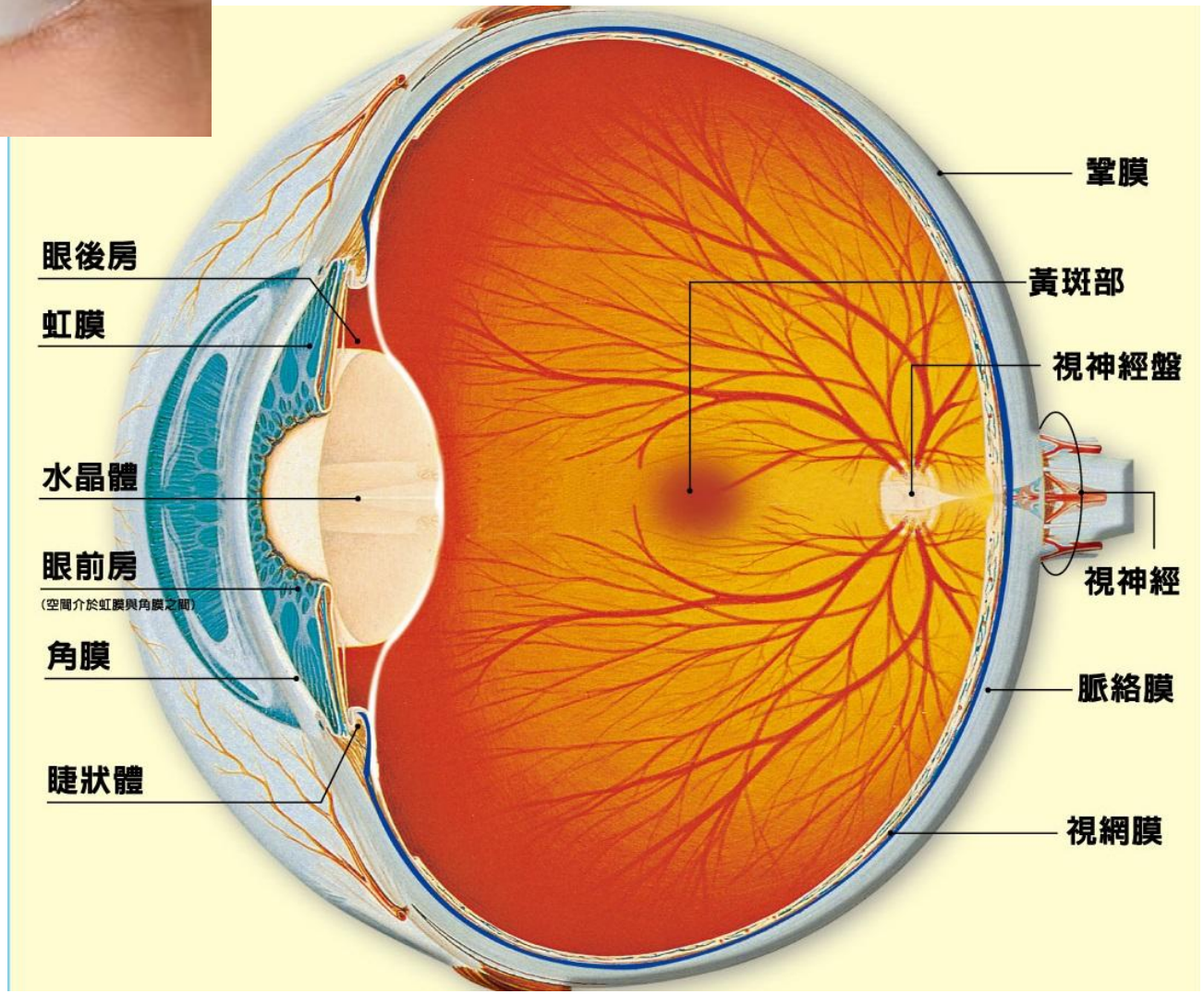
常見眼科疾病之症狀與治療

嘉義基督教醫院眼科
蔡忠斌醫師

眼球構造

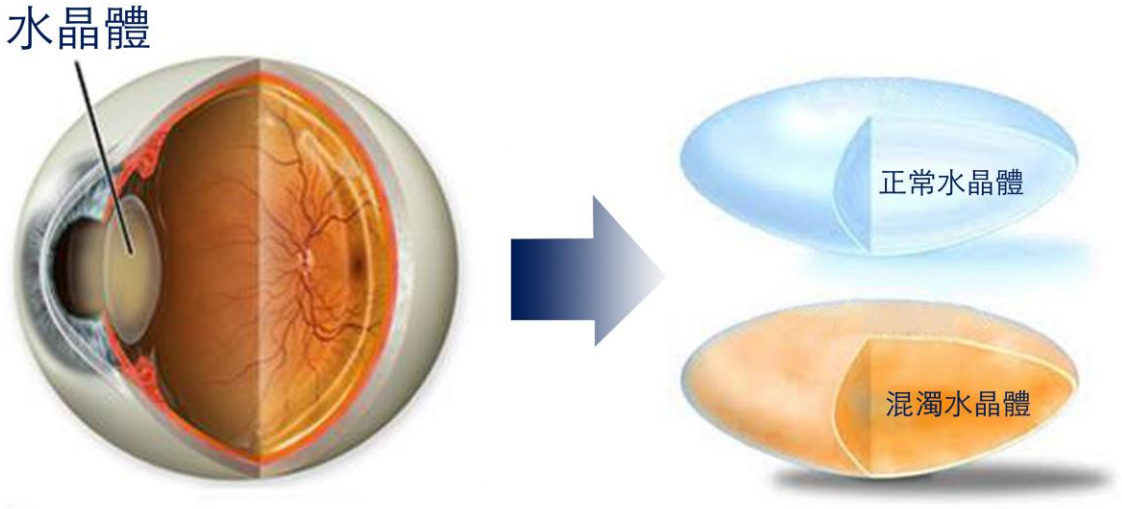
- 眼角膜（黑仁）
- 眼結膜（白仁）
- 瞳孔
- 水晶體
- 玻璃體
- 視網膜
- 視神經

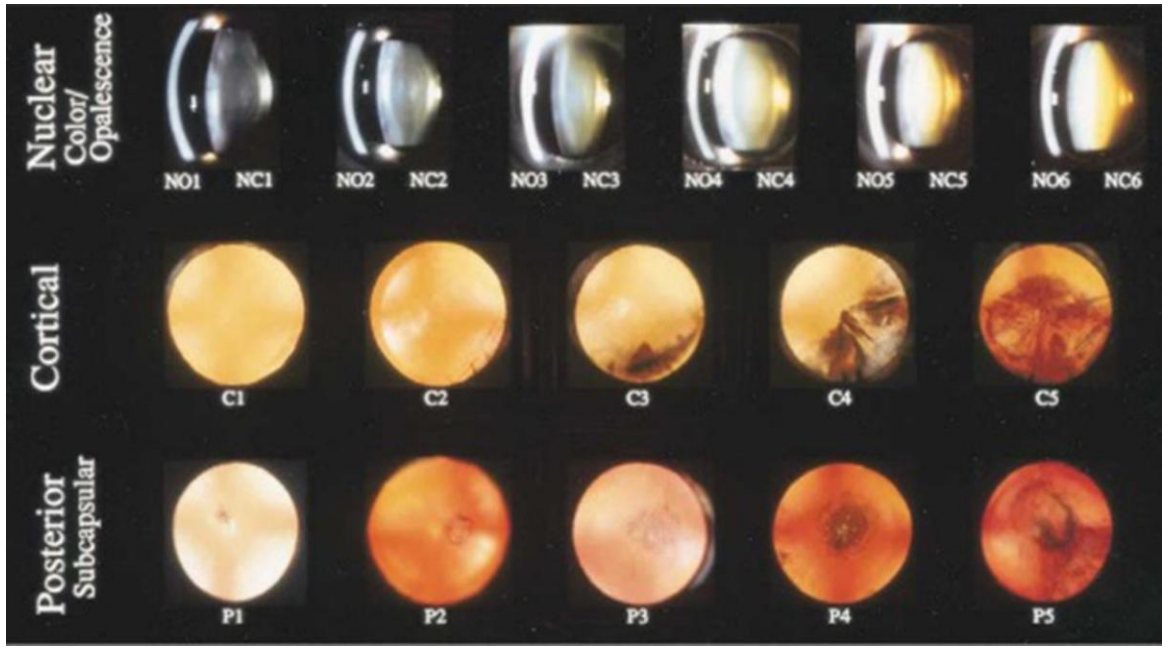


白內障

白內障

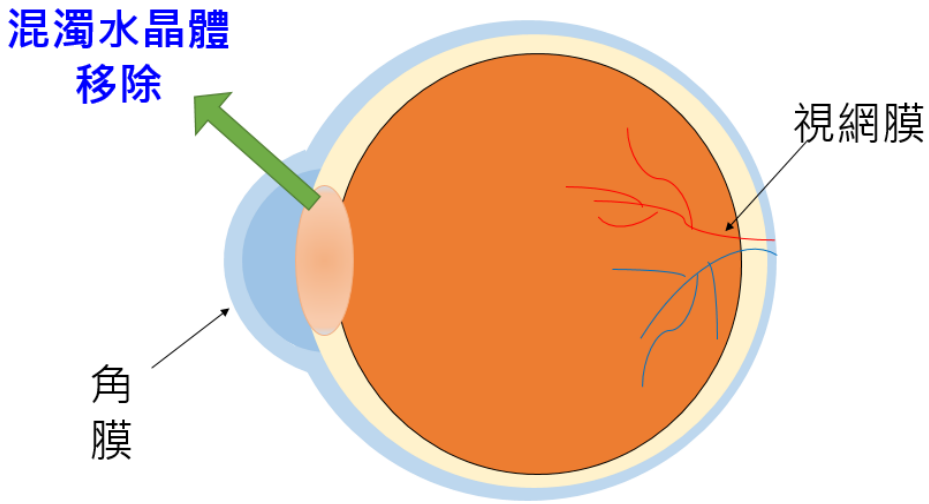
- 水晶體混濁， 造成視力下降
- 白內障成熟度可分成5級
- 在 2.5 至 3.5 級之間手術，效果很好
- 若到4級，白內障太硬，手術時間拉長，會造成角膜內皮細胞損傷
- 若到5級，白內障太熟，囊袋與小帶退化，手術中併發症多

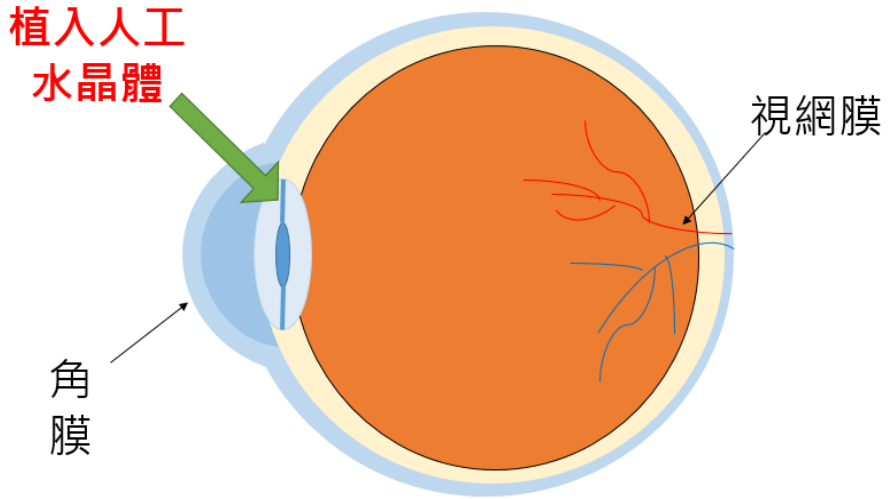




白內障手術

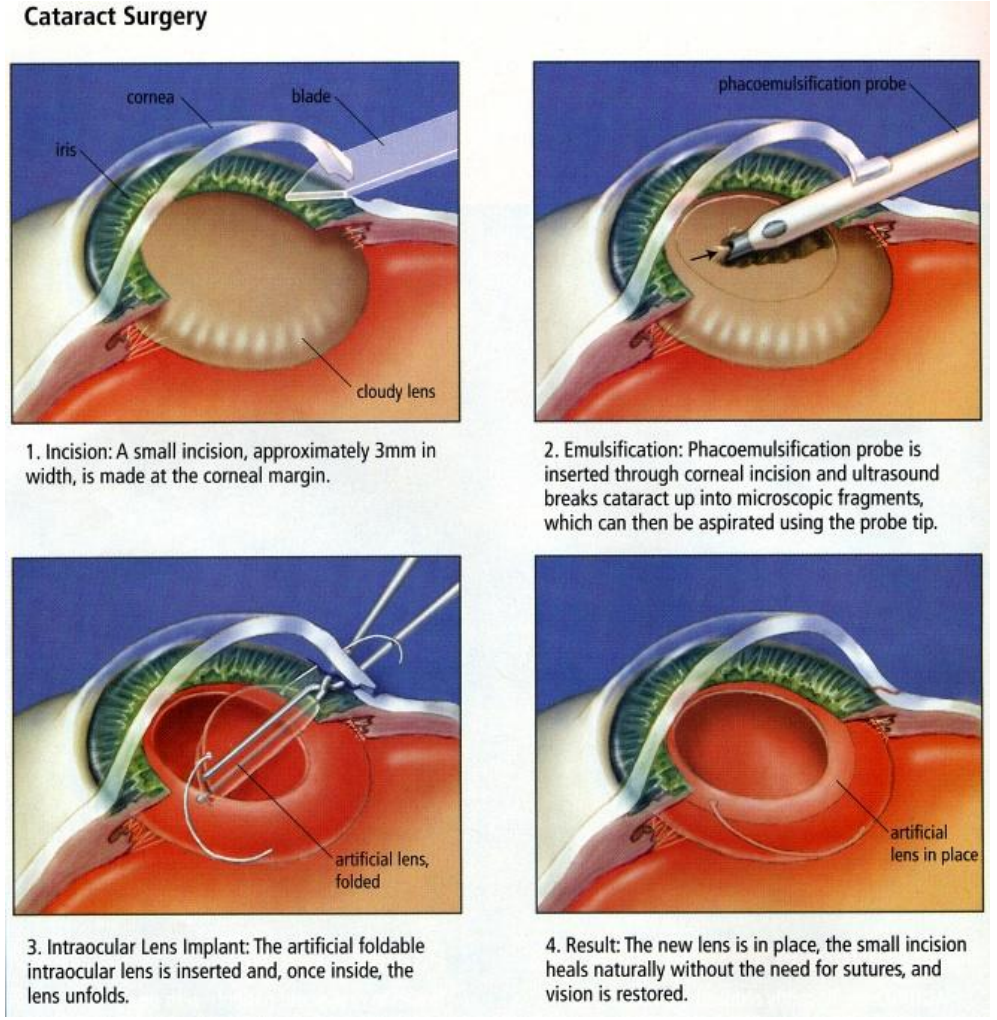
- 要改善白內障造成的視力模糊，必須以手術方式將白內障摘除，再將人工水晶體植入，以改善視力。
- 手術中所要植入的人工水晶體，功能上就像日常配戴的眼鏡鏡片一樣，可以矯正眼睛的近視、遠視或散光度數。





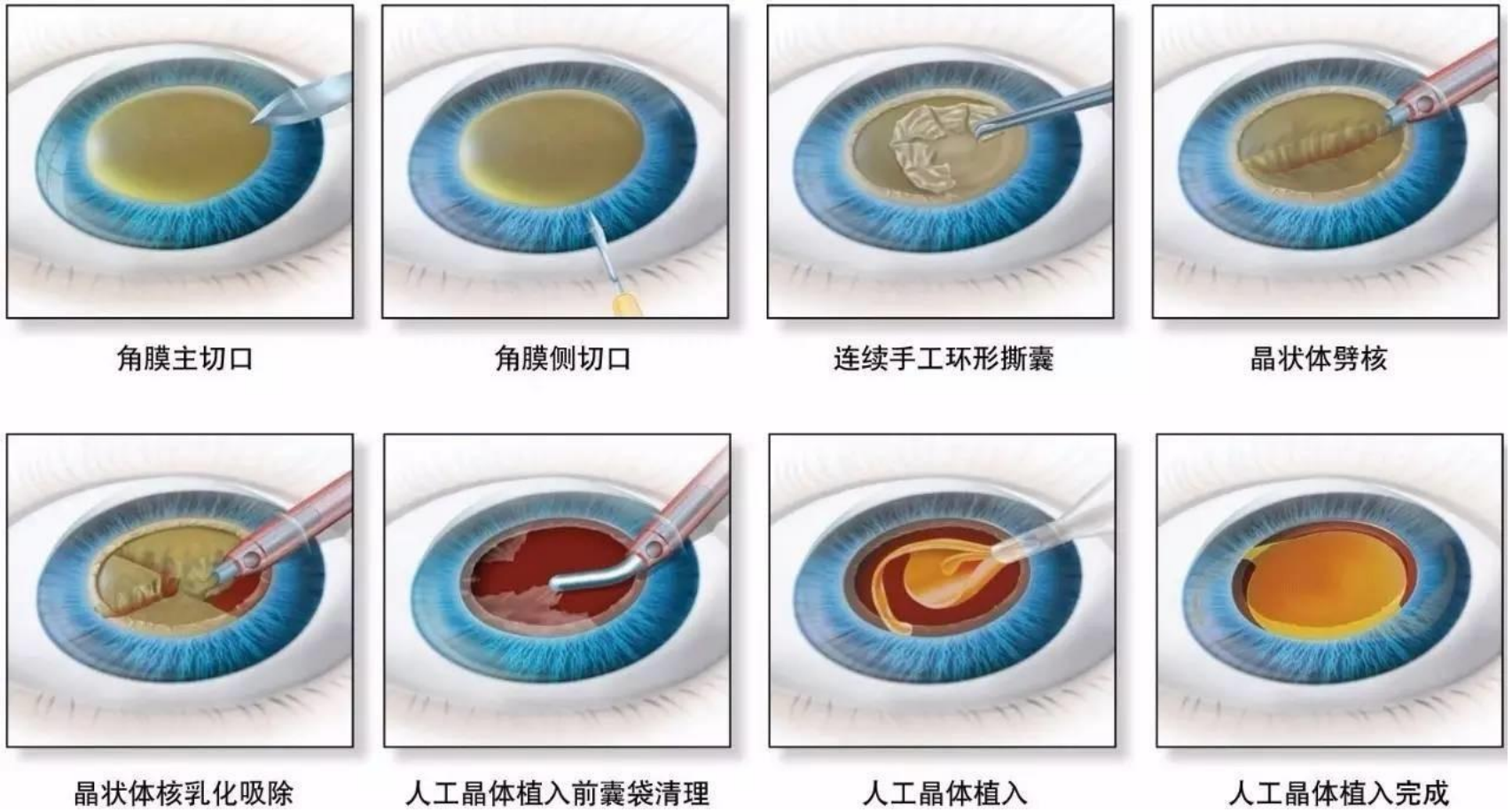
現代的超音波晶體乳化手術效果很好

- 免打麻醉針
- 微創傷口(2.2 mm)
- 免縫線
- 可選擇有調整散光、老花眼功能的人工水晶體

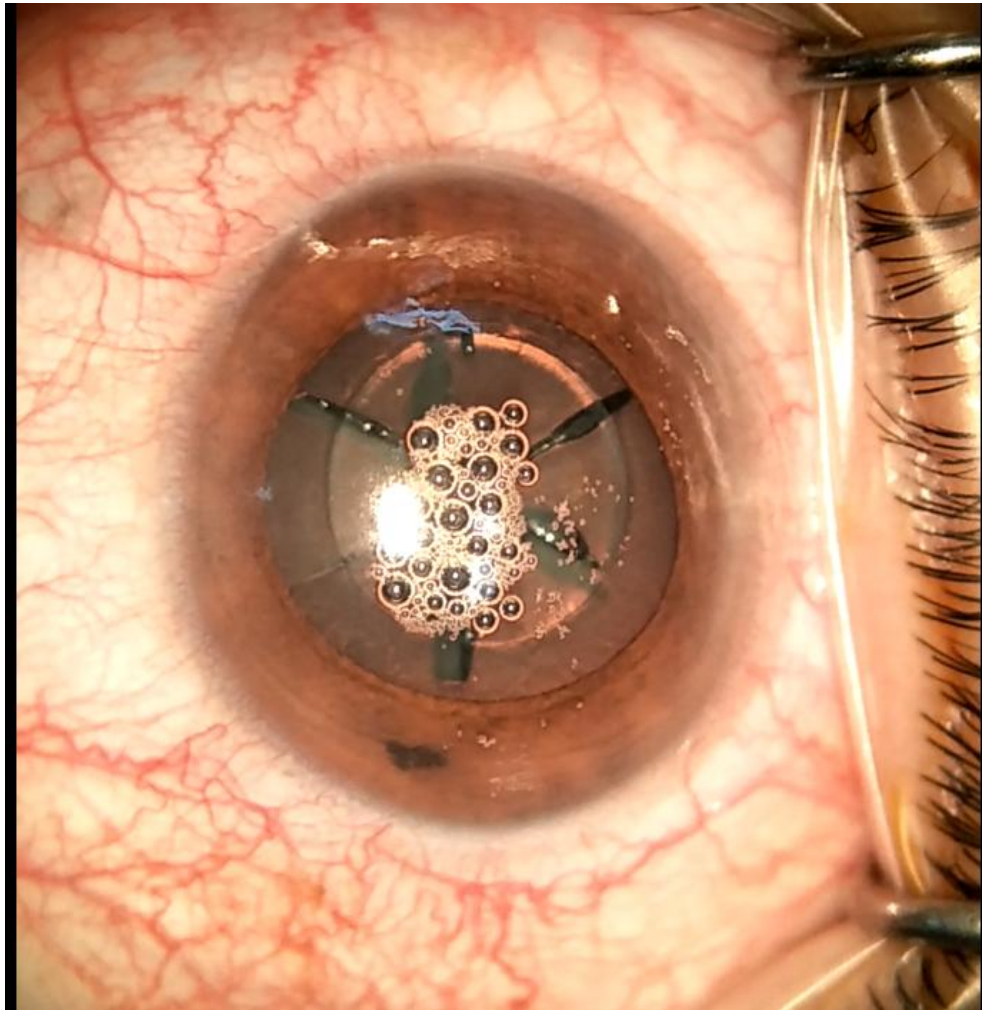


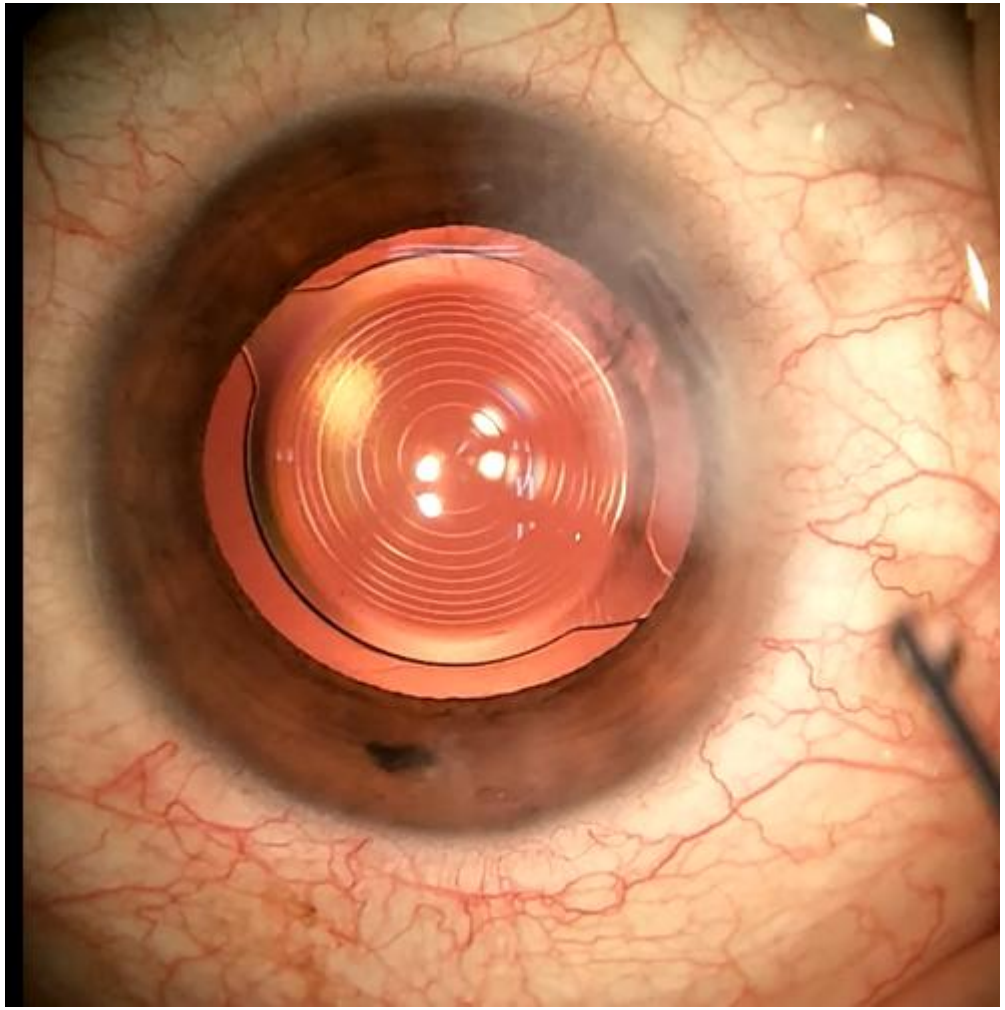
https://www.corkeyeclinic.ie/cataract-removal-surgery

微創超音波晶體乳化術


角膜主切口
角膜侧切口
连续手工环形撕囊
晶状体劈核
晶状体核乳化吸除
人工晶体植入前囊袋清理
人工晶体植入
人工晶体植入完成

飛秒雷射輔助白內障手術（實際手術案例）





白內障手術後的
重要課題

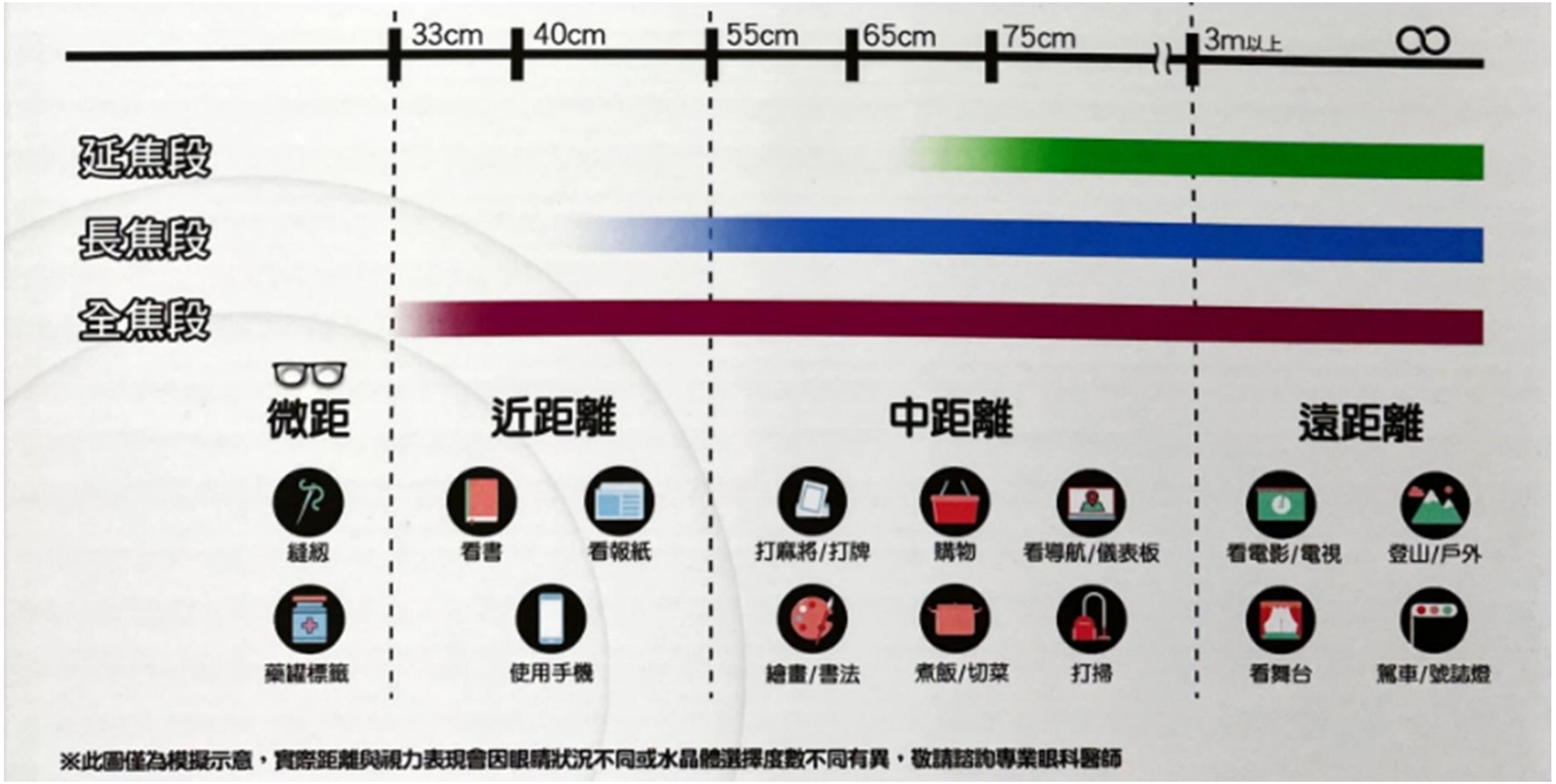
如何處理老花眼？

矯正老花眼：眼鏡與人工水晶體的差異

- 眼鏡：上方看遠、下方看近
- 看遠或看近時，都接受**100%**光線能量

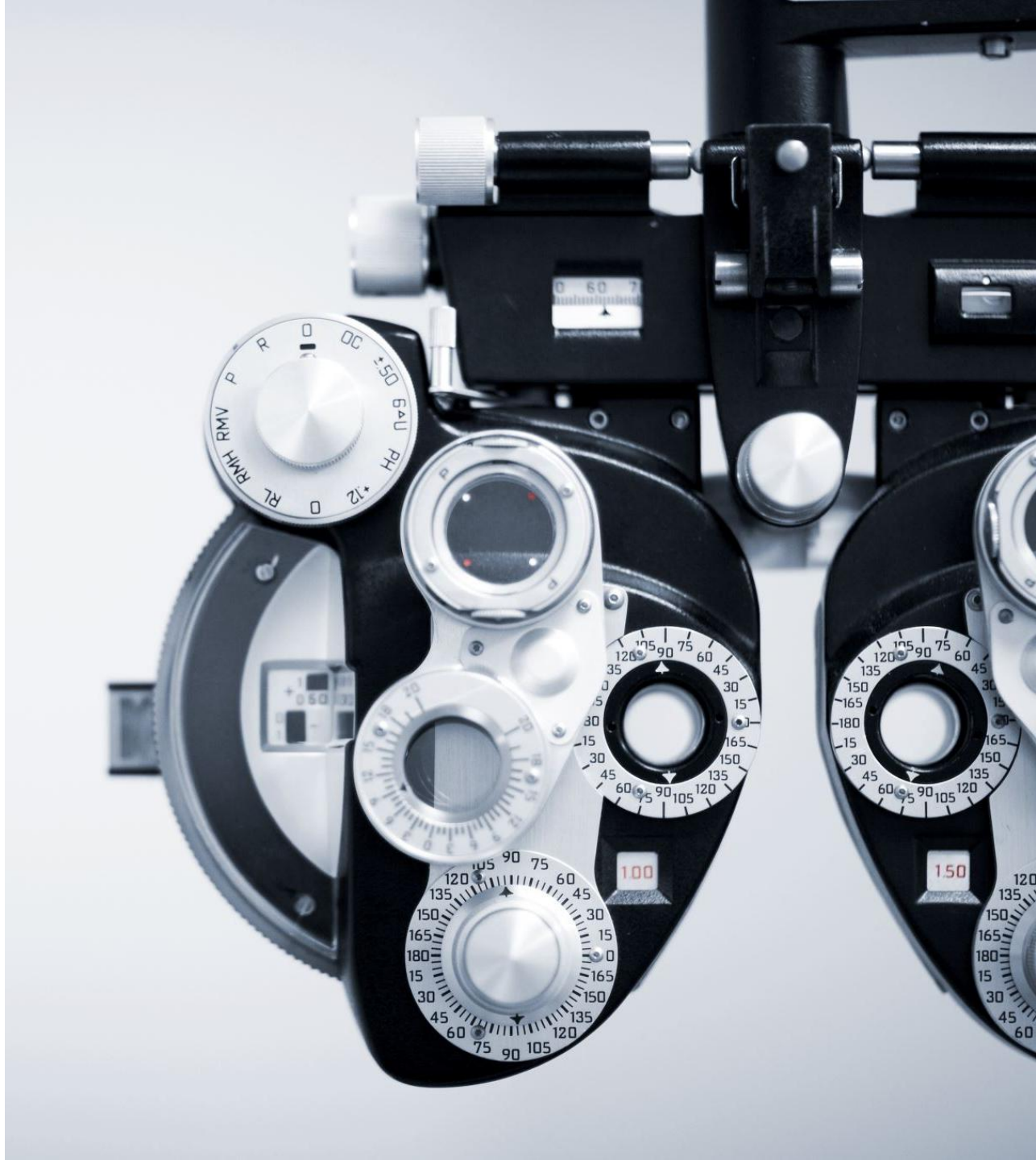
- 人工水晶體：以同心圓繞射分光以看遠與看近
- 看遠或看近時，都沒有**100%**光線能量

高階人工水晶體


33cm
40cm
55cm
65cm
75cm
3m以上
∞
延焦段
長焦段
全焦段
微距
近距離
中距離
遠距離
縫紉
藥罐標籤
看書
看報紙
使用手機
打麻將/打牌
購物
看導航/儀表板
繪畫/書法
煮飯/切菜
打掃
看電影/電視
登山/戶外
看舞台
駕車/號誌燈
※此圖僅為模擬示意，實際距離與視力表現會因眼睛狀況不同或水晶體選擇度數不同有異，敬請諮詢專業眼科醫師

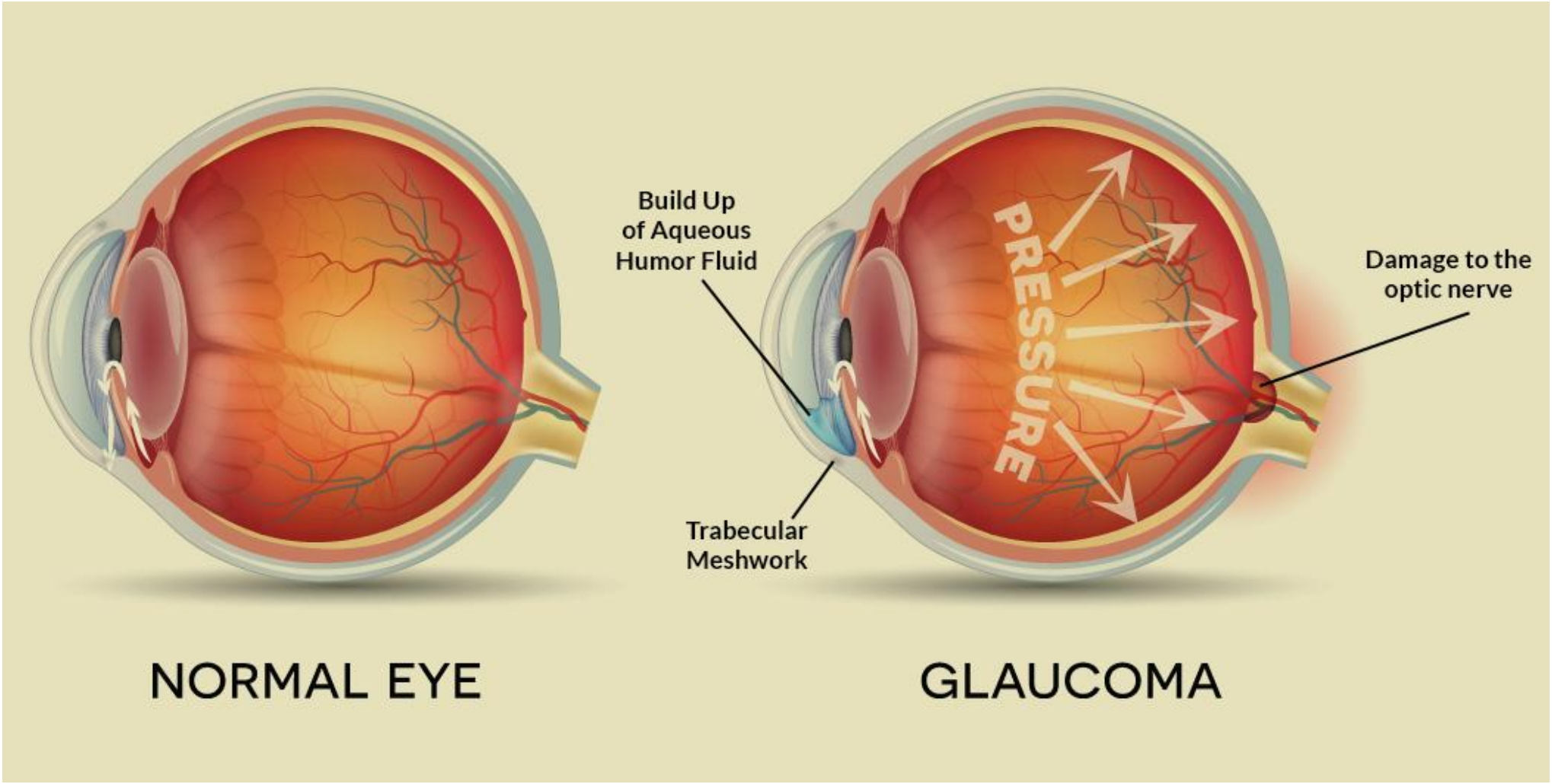
植入多焦點人工水晶體，是不是就不用戴老花眼鏡？

- 只能減少戴老花眼鏡的需要
- 很近距離的活動、閱讀小字體、或光線不足環境下，仍然會需要眼鏡的輔助

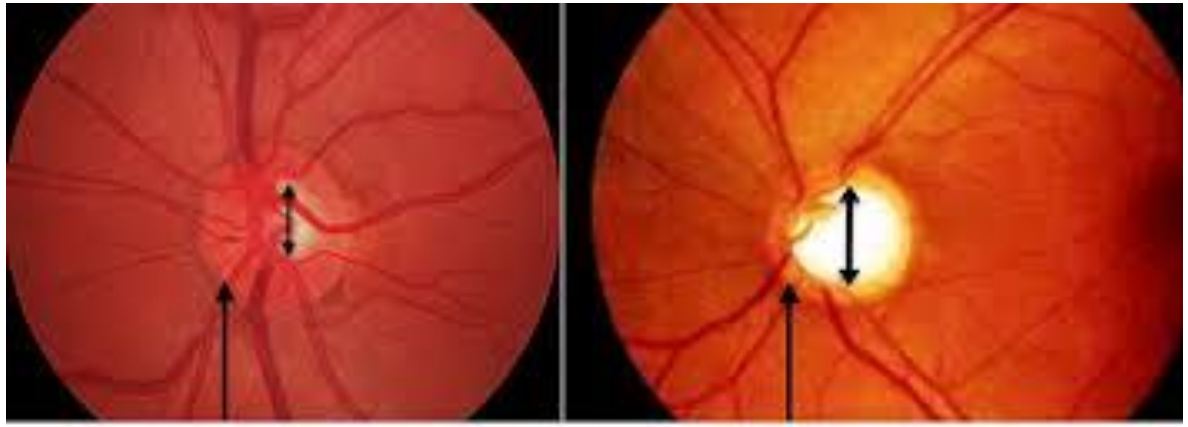


青光眼

青光眼

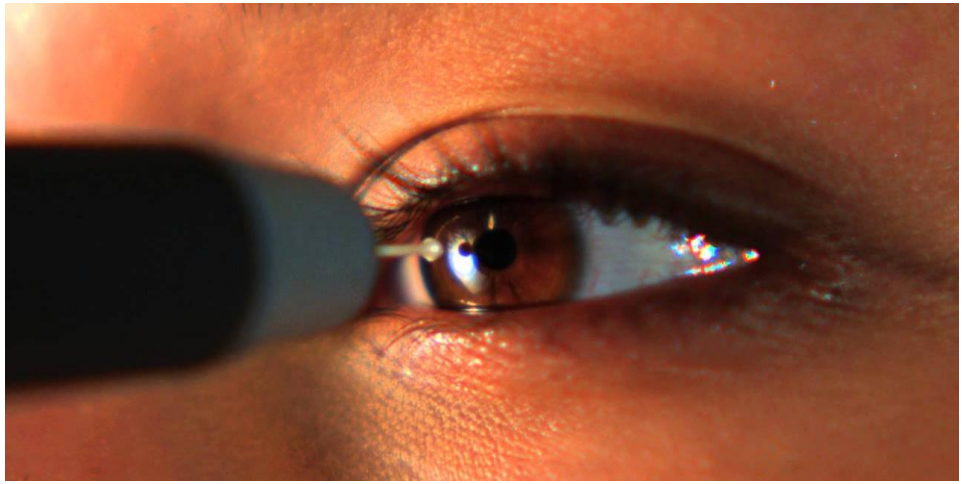

Build Up
of Aqueous
Humor Fluid
PRESSURE
Damage to the
optic nerve
Trabecular
Meshwork
NORMAL EYE
GLAUCOMA

視神經缺損

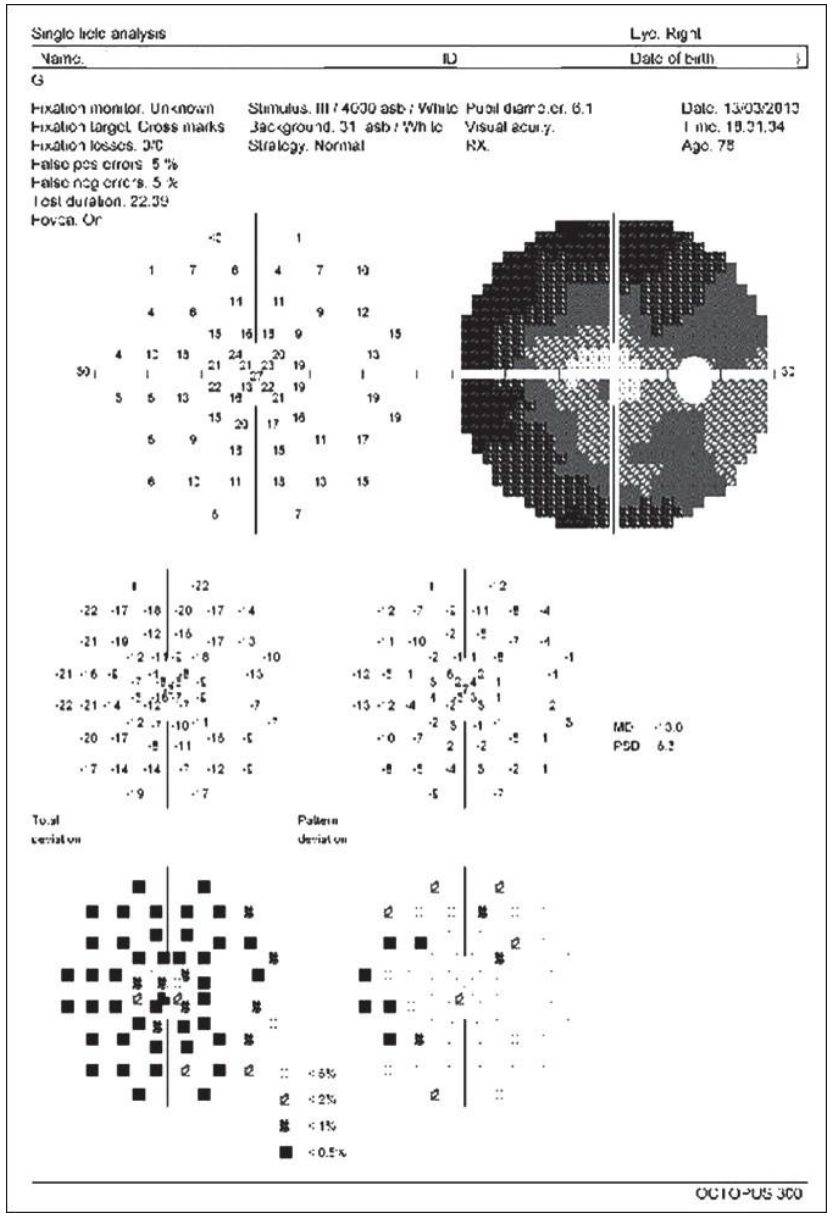

Normal optic nerve head
Glaucomatous cupping

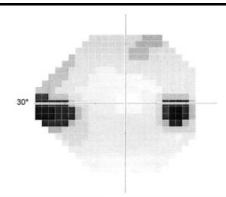
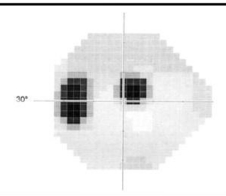
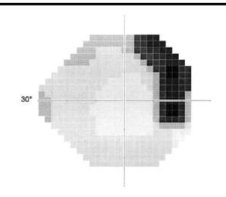
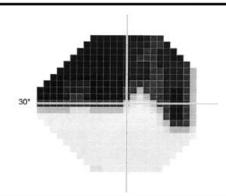
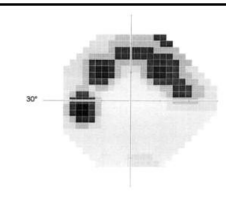
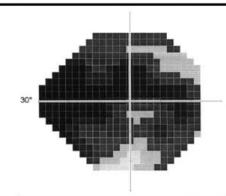

NORMAL VISION
EARLY GLAUCOMA
ADVANCED GLAUCOMA
EXTREME GLAUCOMA

眼壓測量

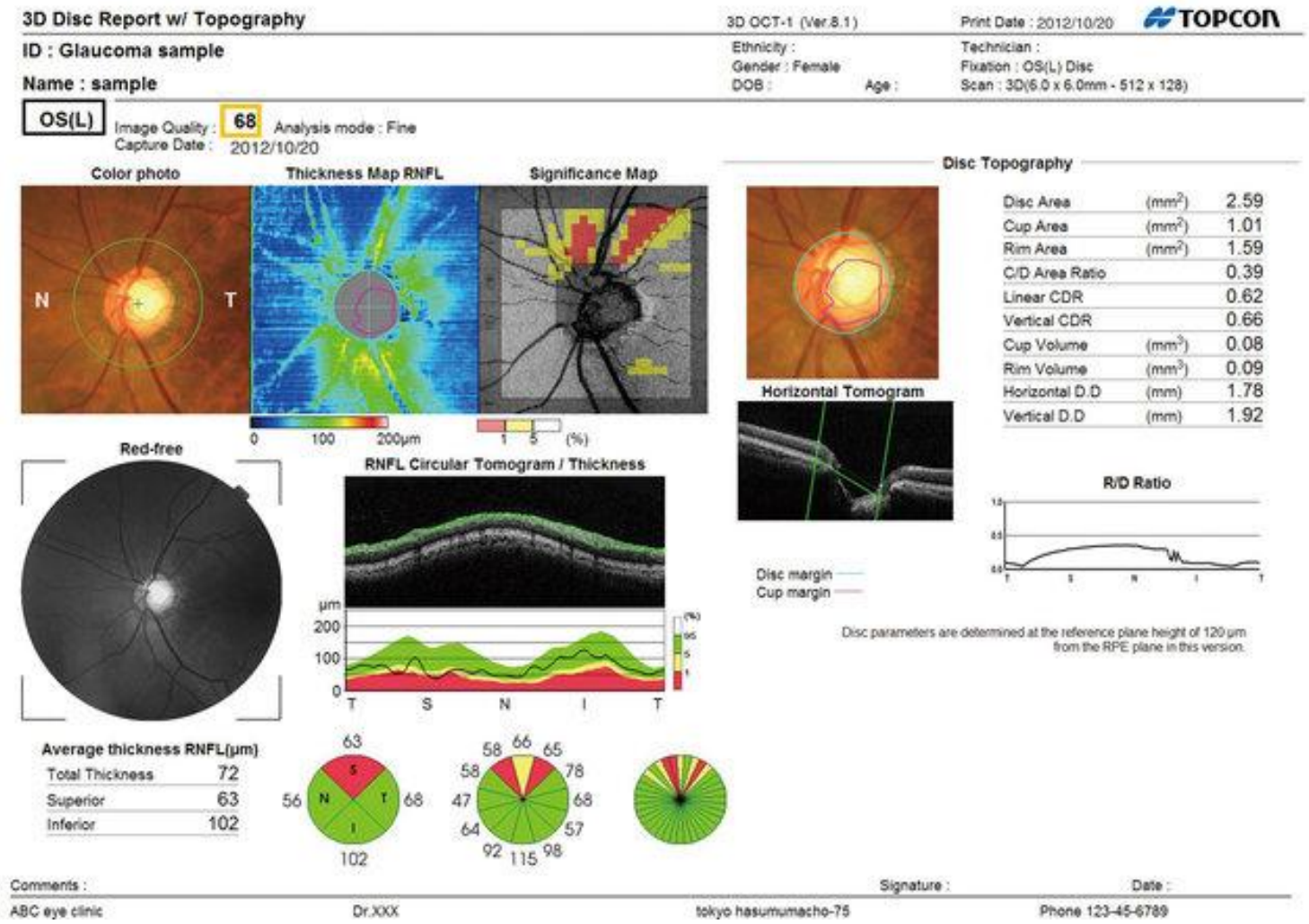


視野檢查



Nasal Step	
Paracentral	
Temporal Wedge	
Altitudinal	
Arcuate	
Advanced	

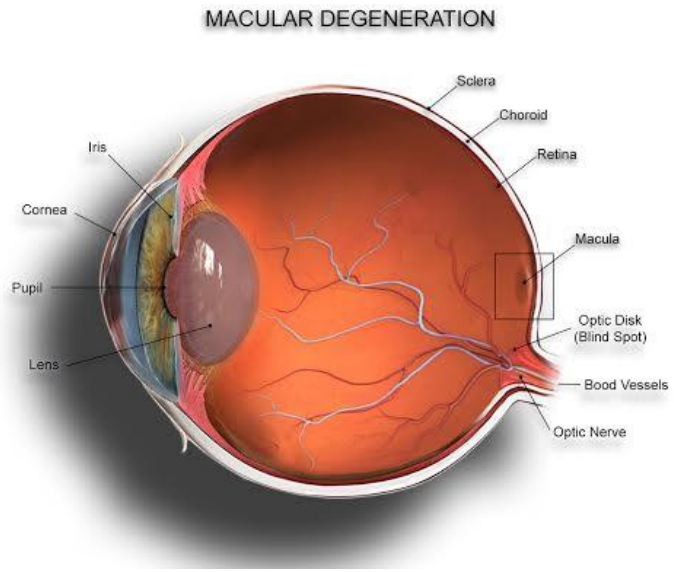
視神經斷層掃描

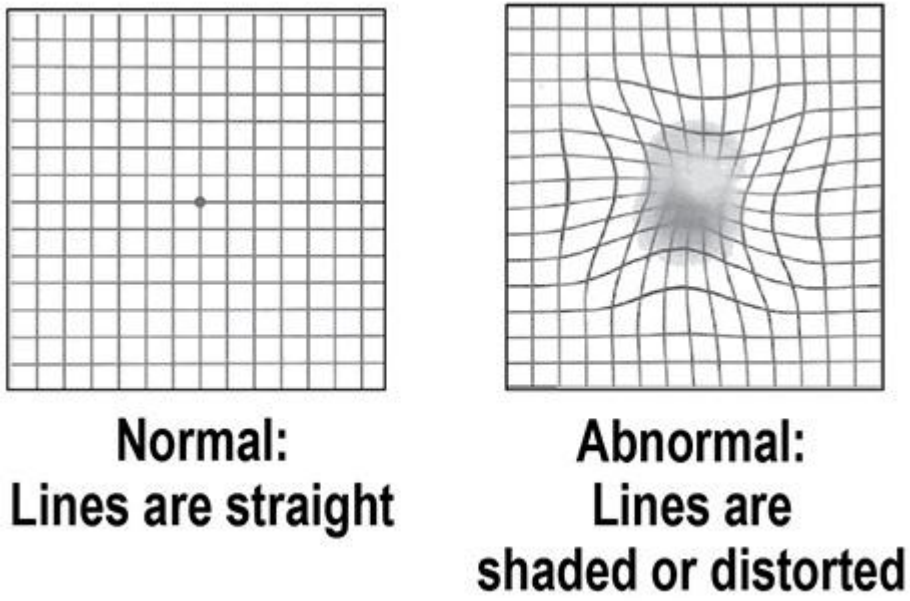

3D Disc Report w/ Topography
3D OCT-1 (Ver.8.1)
Print Date : 2012/10/20
TOPCON
ID : Glaucoma sample
Ethnicity :
Technician :
Name : sample
Gender : Female
Fixation : OS(L) Disc
DOB :
Age :
Scan : 3D(6.0 x 6.0mm - 512 x 128)
OS(L)
Image Quality : 68
Analysis mode : Fine
Capture Date : 2012/10/20
Color photo
Thickness Map RNFL
Significance Map
N
T
0
100
200μm
1
5
(%)
Disc Topography
Horizontal Tomogram
Disc Area (mm²) 2.59
Cup Area (mm²) 1.01
Rim Area (mm²) 1.59
C/D Area Ratio 0.39
Linear CDR 0.62
Vertical CDR 0.66
Cup Volume (mm³) 0.08
Rim Volume (mm³) 0.09
Horizontal D.D (mm) 1.78
Vertical D.D (mm) 1.92
Red-free
RNFL Circular Tomogram / Thickness
R/D Ratio
μm
200
100
0
T S N I T
Disc margin
Cup margin
Disc parameters are determined at the reference plane height of 120 μm from the RPE plane in this version.
Average thickness RNFL(μm)
Total Thickness 72
Superior 63
Inferior 102
63
S
56
N
T
68
I
102
58 66 65
58
78
47
68
64
57
92 115 98
Comments :
Signature :
Date :
ABC eye clinic
Dr.XXX
tokyo hasumumacho-75
Phone 123-45-6789

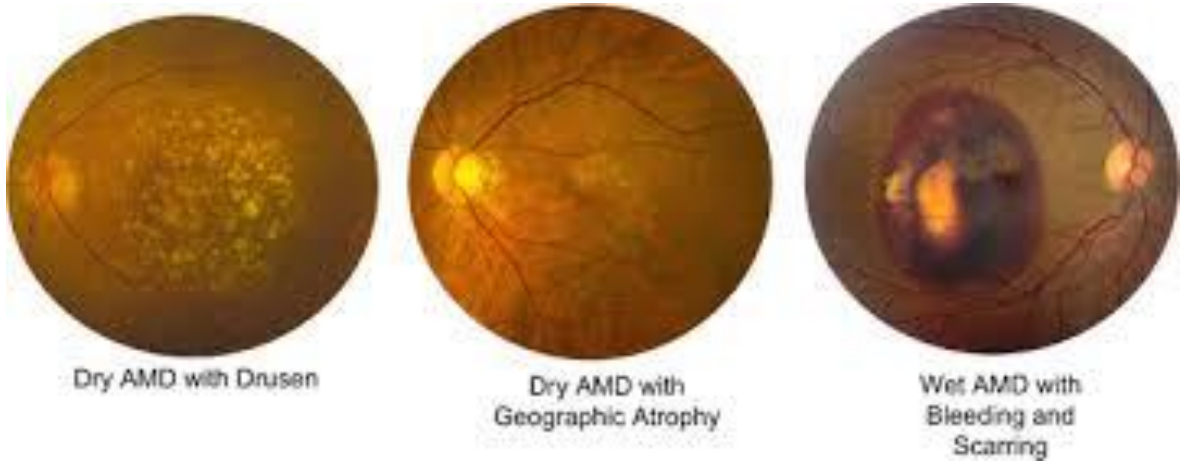
黃斑部病變

老年性黃斑部病變(AMD)

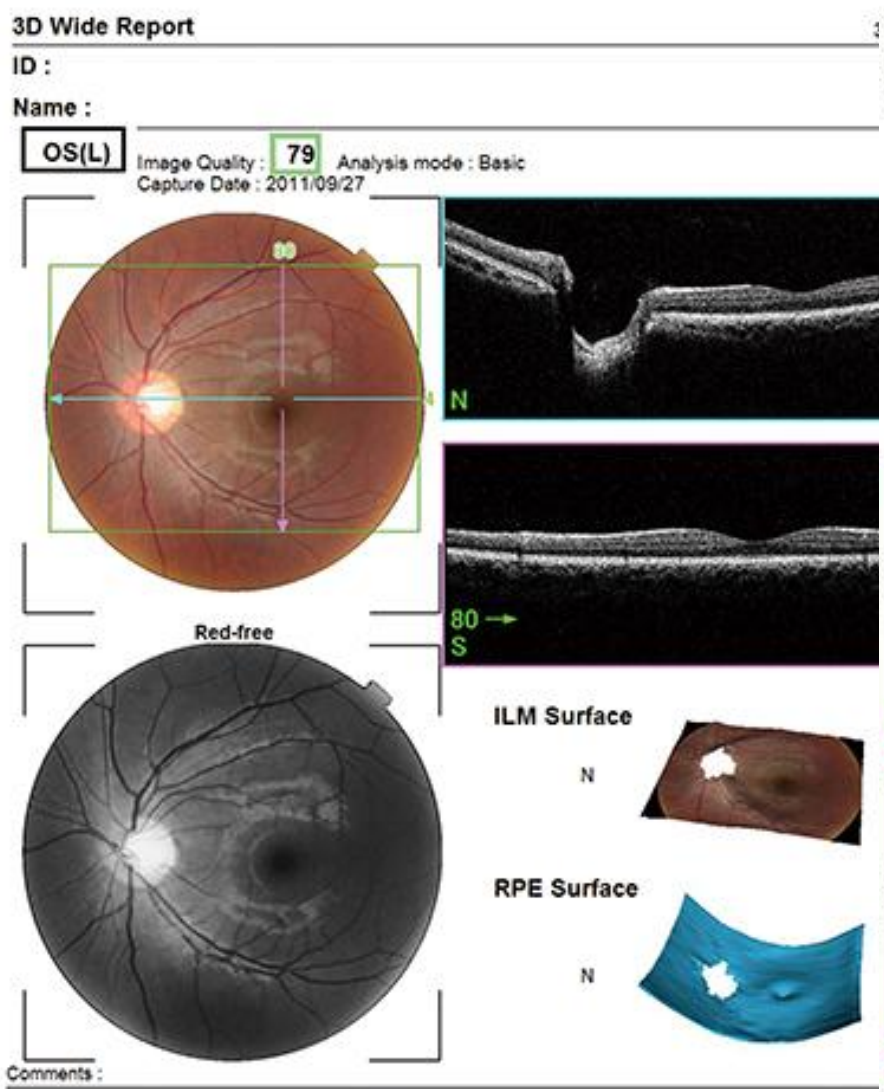
- 65歲以上台灣人，10-15%會有早期病變，2-7%會有晚期病變
- 症狀：視力模糊、物體扭曲

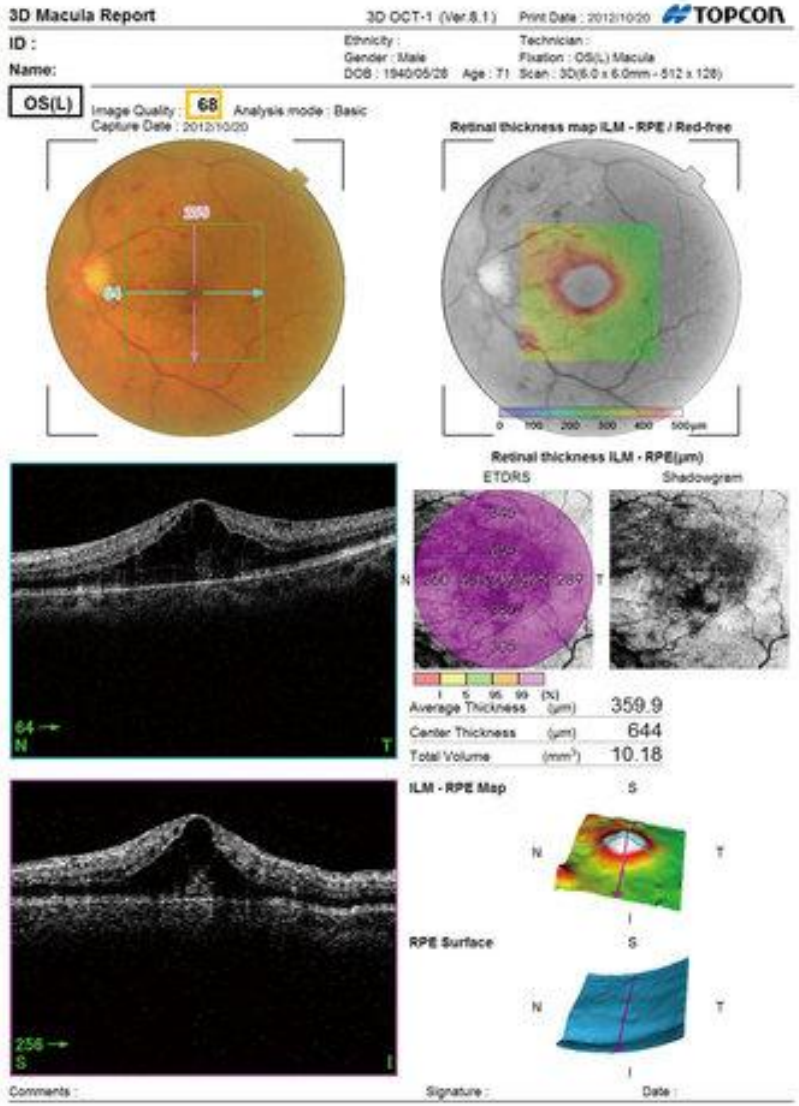






視網膜斷層掃描


3D Wide Report
ID :
Name :
OS(L)
Image Quality : 79
Analysis mode : Basic
Capture Date : 2011/09/27
Red-free
ILM Surface
RPE Surface
Comments :

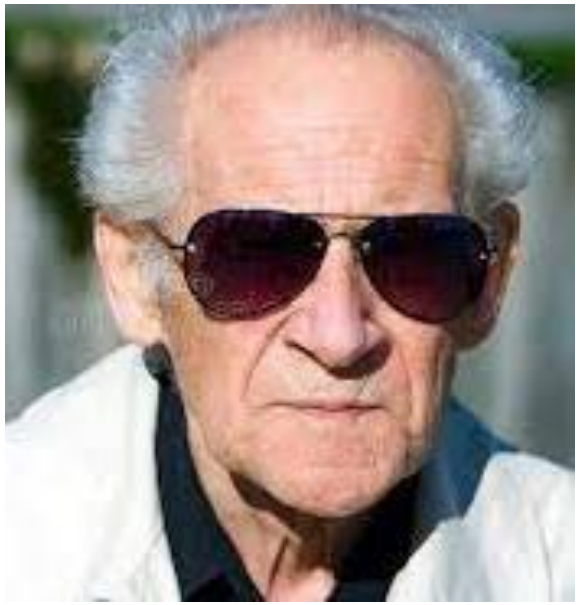

3D Macula Report
3D OCT-1 (Ver.8.1)
TOPCON
ID :
Name:
OS(L)
Image Quality : 68
Analysis mode : Basic
Retinal thickness map ILM - RPE / Red-free
Retinal thickness ILM - RPE(μm)
ETDRS
Shadowgram
Average Thickness (μm) 359.9
Center Thickness (μm) 644
Total Volume (mm³) 10.18
ILM - RPE Map
RPE Surface
Comments :
Signature :
Date :

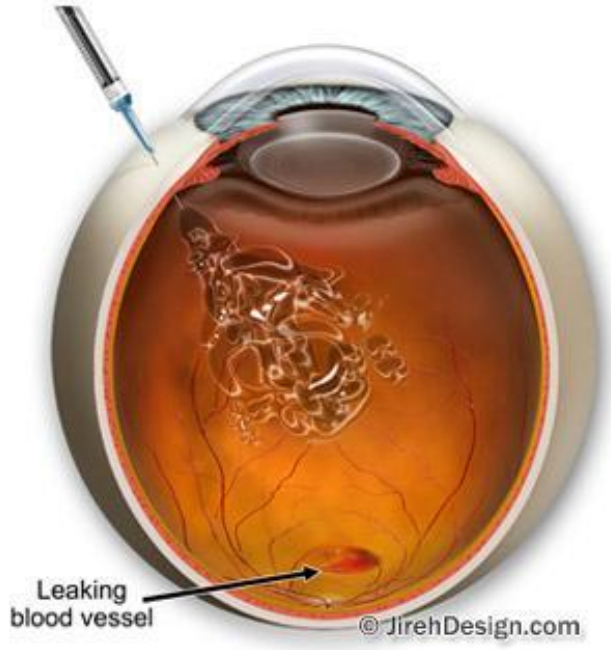
老年性黃斑部病變

- 致病的危險因子
  - 高齡老化、家族遺傳因素、抽煙、長時間強光照射
- 老年性黃斑部病變的預防
  - 避免強光直接照射眼睛，外出時要配戴防紫外線的太陽眼鏡
  - 食用富含維生素A、C、E、鋅和葉黃素素等抗氧化功能的食物
    - 深色綠葉蔬菜：甘藍菜、菠菜、芥藍菜、綠花椰菜、豌豆等等
    - 黃色蔬菜：玉米、南瓜、胡蘿蔔、彩椒等等
    - 水果：奇異果、葡萄、柳橙汁等等
  - 控制血壓、血脂，不要抽煙。

老年性黃斑部病變治療

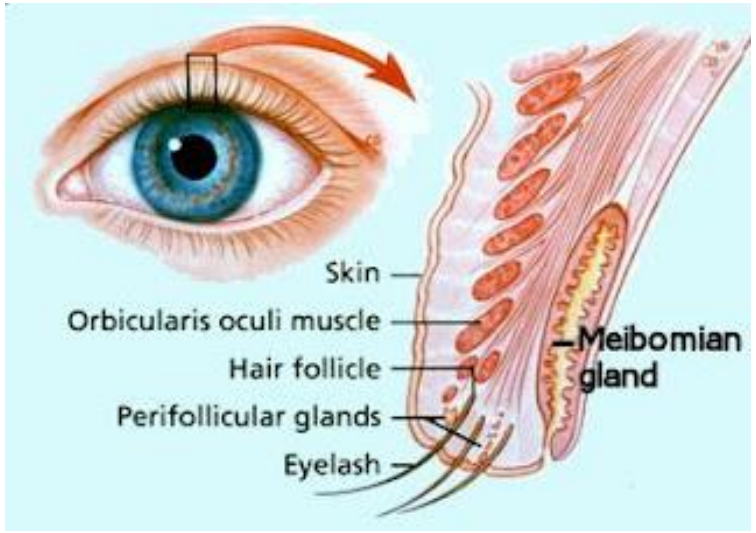
- 乾式：陽光下帶墨鏡、補充葉黃素、定期追蹤
- 溼式(新生血管型)：玻璃體內注射抗血管增生因子

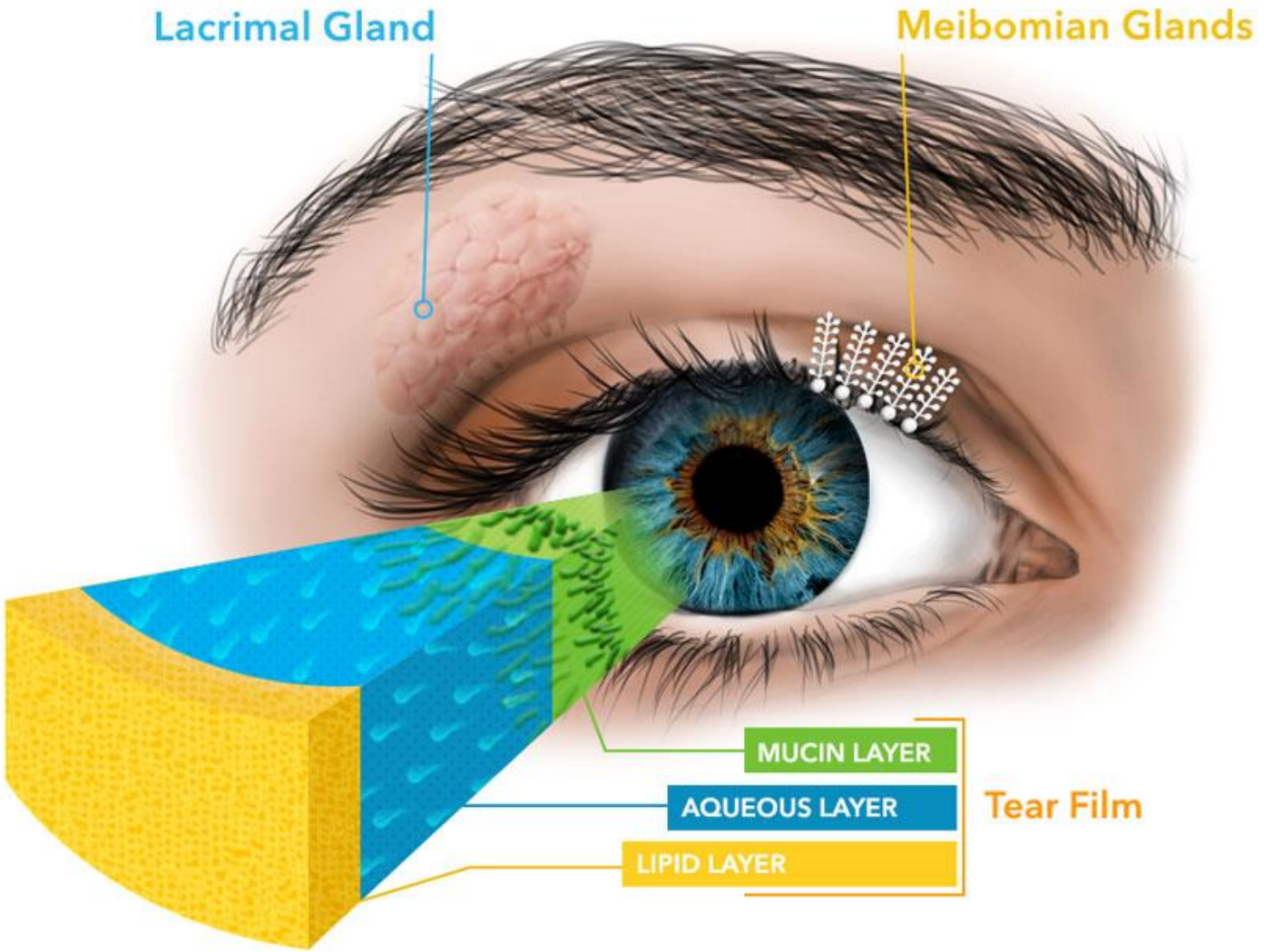


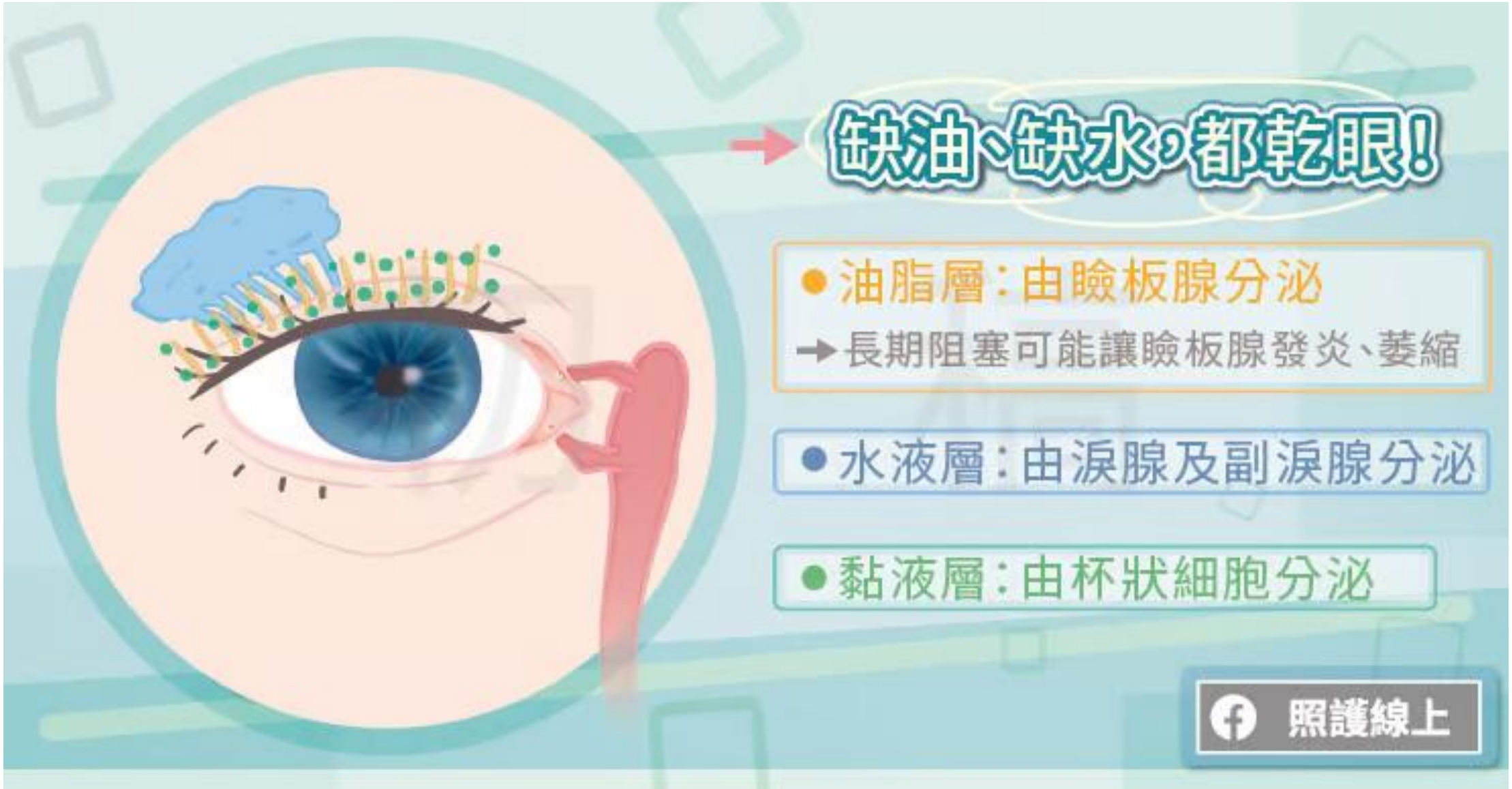


乾眼症

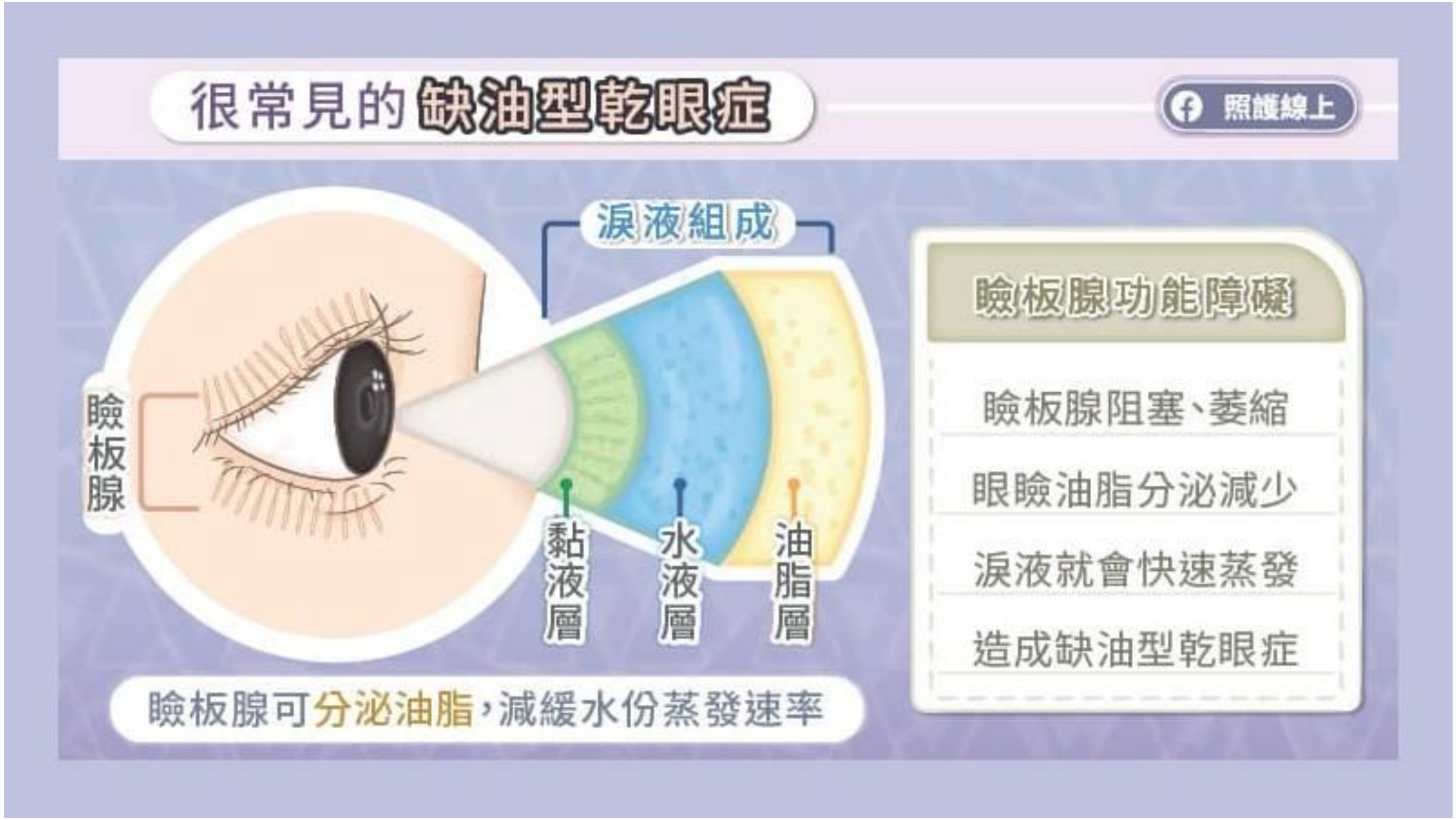
淚液的組成


Skin
Orbicularis oculi muscle
Hair follicle
Perifollicular glands
Eyelash
Meibomian gland


Lacrimal Gland
Meibomian Glands
MUCIN LAYER
AQUEOUS LAYER
LIPID LAYER
Tear Film



資料來源 https://www.healthnews.com.tw/article/53267



資料來源 https://www.healthnews.com.tw/article/53267

人工淚液

一般人工淚液

無防腐劑之人工淚液

人工淚液 Artificial Tears

- **含高分子聚合物保濕劑**
  - 如HPMC, CMC類產品
- **含油脂類的乳劑**
  - 針對蒸發型乾眼症所設計

- **含玻尿酸(Hyaluronic Acid)**
  - 黏稠性較高, 能提供良好的修復環境

瞼板腺功能障礙（MGD）治療

熱敷按摩

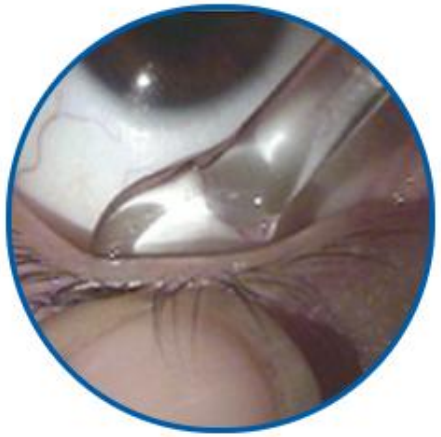
早晚一天2次，每次5分鐘，如果太忙碌無法有效地配合。

眼瞼緣清潔

可清潔眼瞼板開口，避免阻塞，如果太忙碌無法有效地配合。

滴眼藥水、藥膏
人工淚液

只能疏緩短時間的不舒服症狀，無法持續久，仍會有防腐劑存留問題於5mm，或是過度濕潤，疑為淚水問題之乾眼症。



醫生手動擠壓
瞼板腺開口

會有疼痛感，需多次往返回診，重覆治療，屬短效型於5mm，或是過度濕潤，疑為淚水問題之乾眼症。

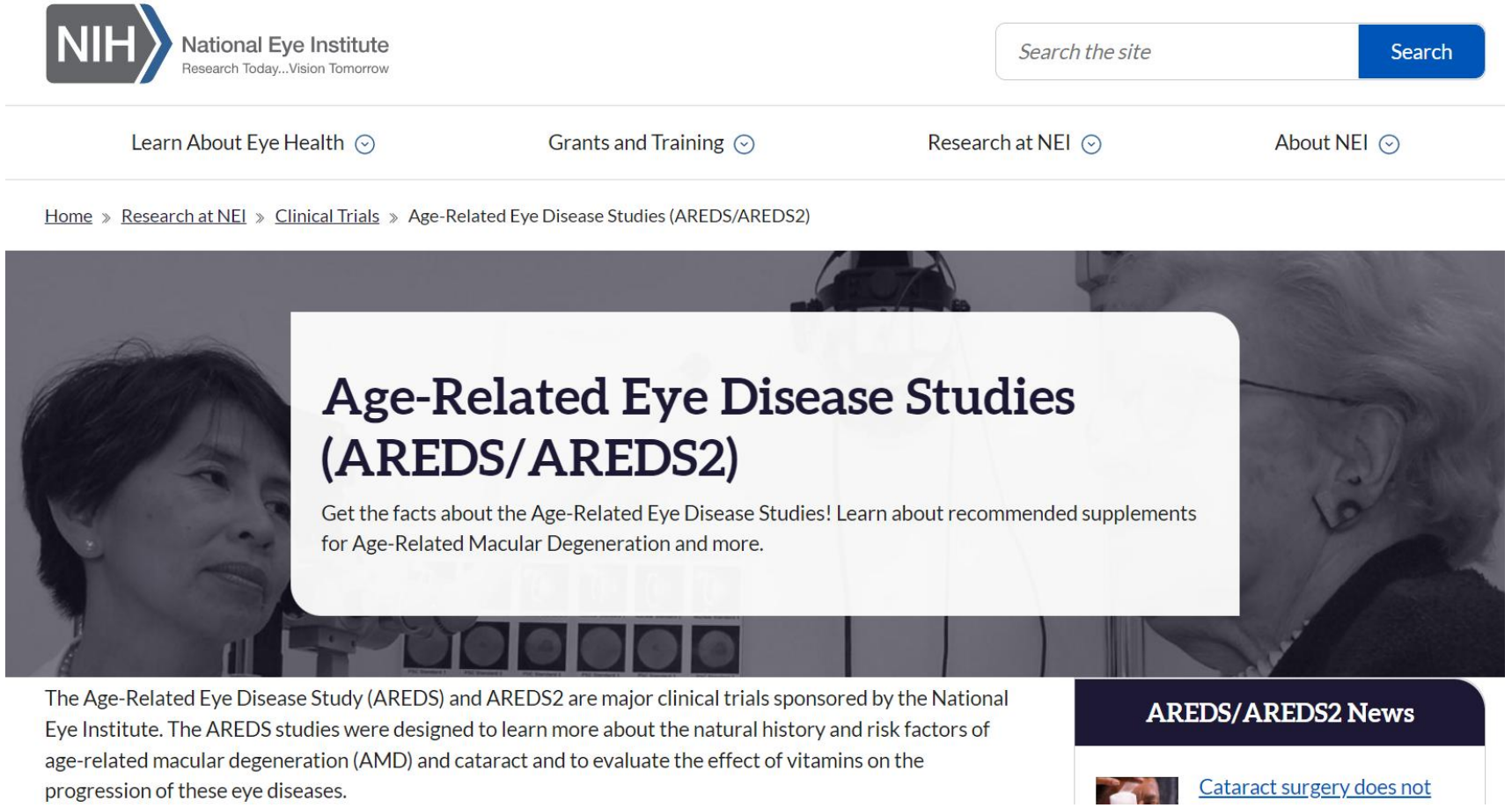
日常眼睛保健

日常眼睛保健

- 陽光下要戴墨鏡
- 日常補充葉黃素或抗氧化功能的食物
- 補充 Omega-3（魚油、亞麻仁油）
- 定期檢查視力、眼壓
- 適當用眼、睡眠充足
- 戒菸（一手、二手…）

葉黃素能保護眼睛嗎？

- 美國國家眼科研究院(NEI)進行 Age-Related Eye Disease Studies（AREDS)，探討營養補充品對白內障與老年黃斑部病變的預防效果。(AREDS, 1992; AREDS2, 2006)



AREDS/AREDS2的結果

- AREDS(1992)
  - 配方：維他命C 500mg、維他命E 400IU、紅蘿蔔素15mg、鋅80mg、銅2mg
  - 老年黃斑部病變由中度變為重度的機會降低25%
  - 對白內障無影響。
- AREDS2（2006）
  - 配方：維他命C 500mg、維他命E 400IU、鋅80mg、銅2mg、葉黃素10 mg、玉米黃素2 mg、omega-3
  - 與AREDS效果相同
  - 吸菸者服用紅蘿蔔素的肺癌機率上升

3C 產品的藍光會傷害眼睛嗎？

先說答案：美國眼科醫學會的回答「不會」

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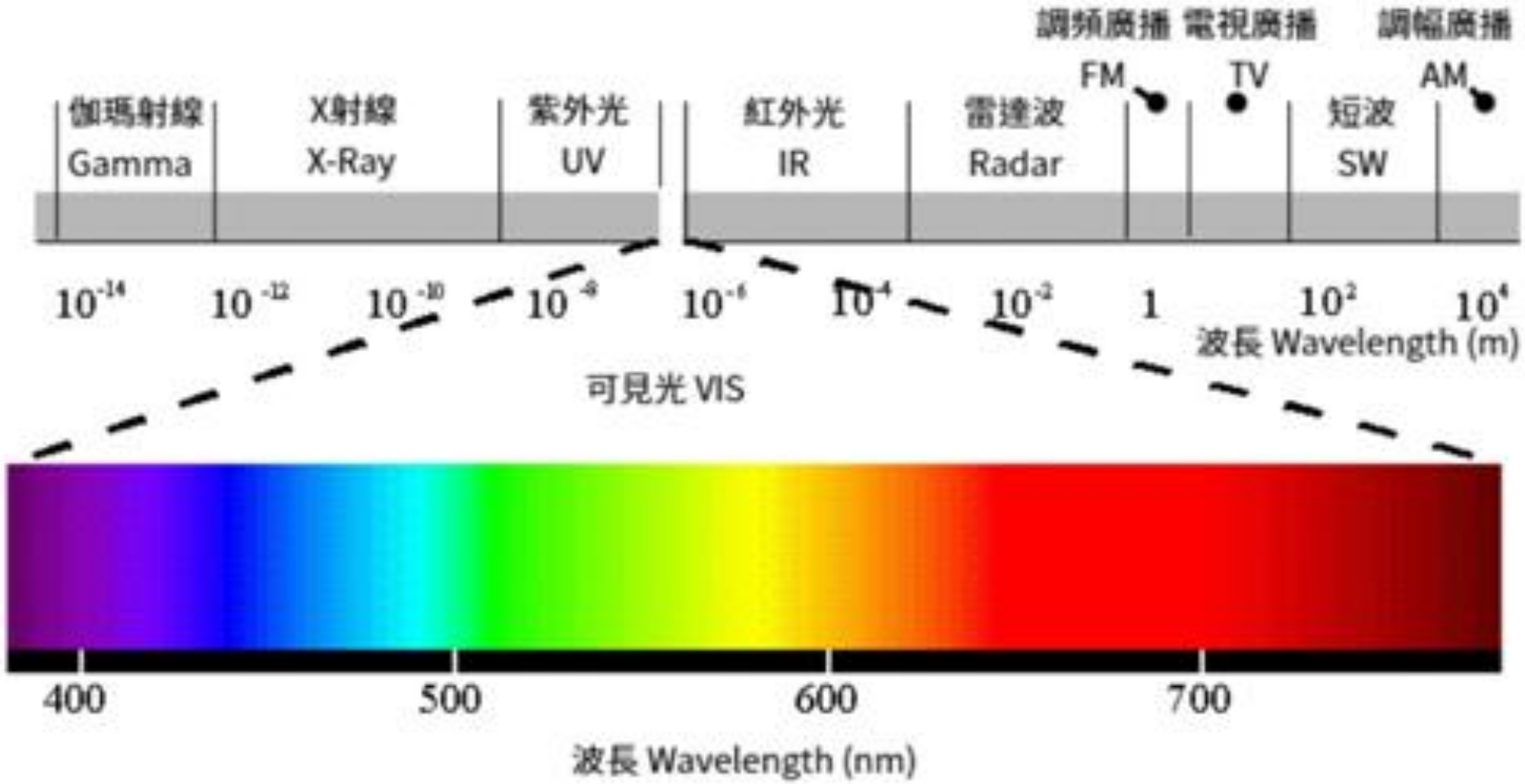
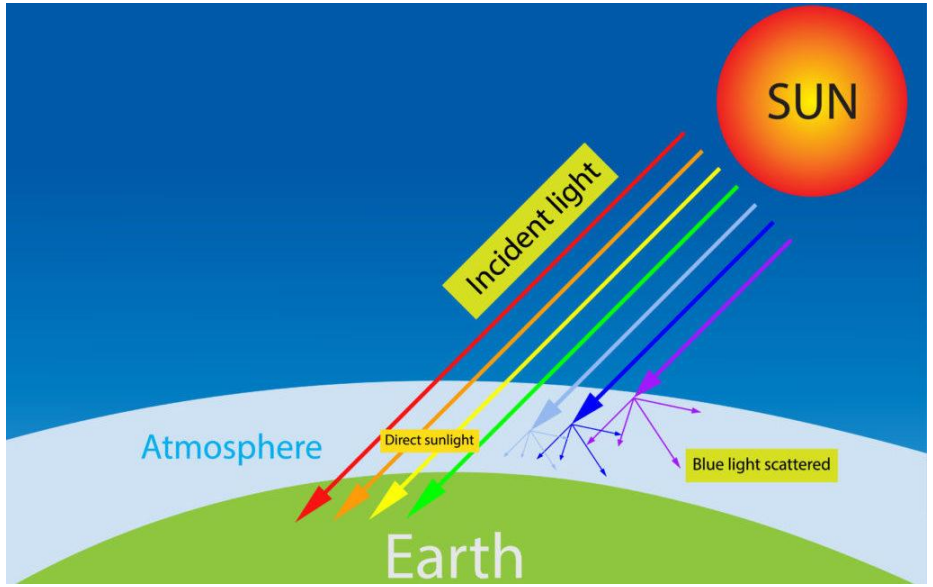
為何3C 產品會與藍光扯上關係？

光的波長


調頻廣播
電視廣播
調幅廣播
FM
TV
AM
伽瑪射線
Gamma
X射線
X-Ray
紫外光
UV
紅外光
IR
雷達波
Radar
短波
SW
10^{-14}
10^{-12}
10^{-10}
10^{-8}
10^{-6}
10^{-4}
10^{-2}
1
10^{2}
10^{4}
波長 Wavelength (m)
可見光 VIS
400
500
600
700
波長 Wavelength (nm)

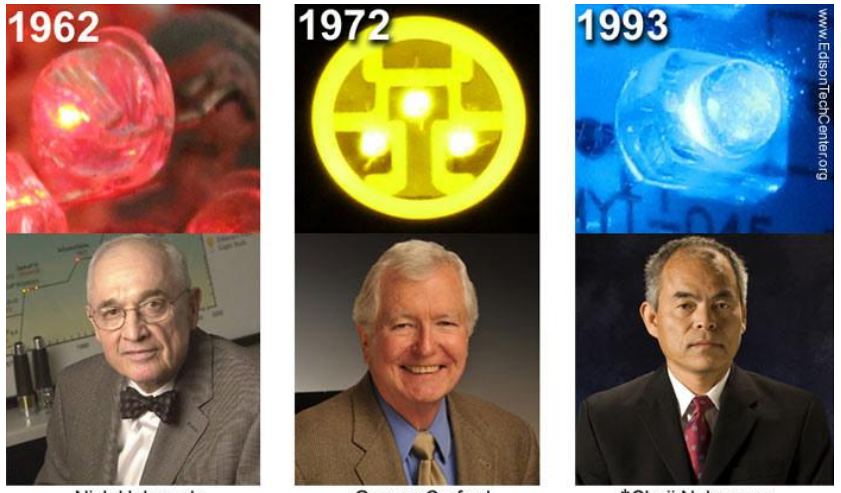
天空的顏色

- 瑞利散射（Rayleigh Scattering）
  - 半徑比光或其他電磁輻射的波長小很多的微小顆粒（例如單個原子或分子）對入射光束的散射
- 波長較短的藍光比波長較長的紅光更易產生瑞利散射
- 陽光經過的大氣距離越長，藍光被散射越多，較多的紅橙光抵達我們的眼睛



發光二極體(LED)的發展

- 1962年：紅光LED
- 1972年：黃光、綠光、橘光LED
- 1993年：藍光LED



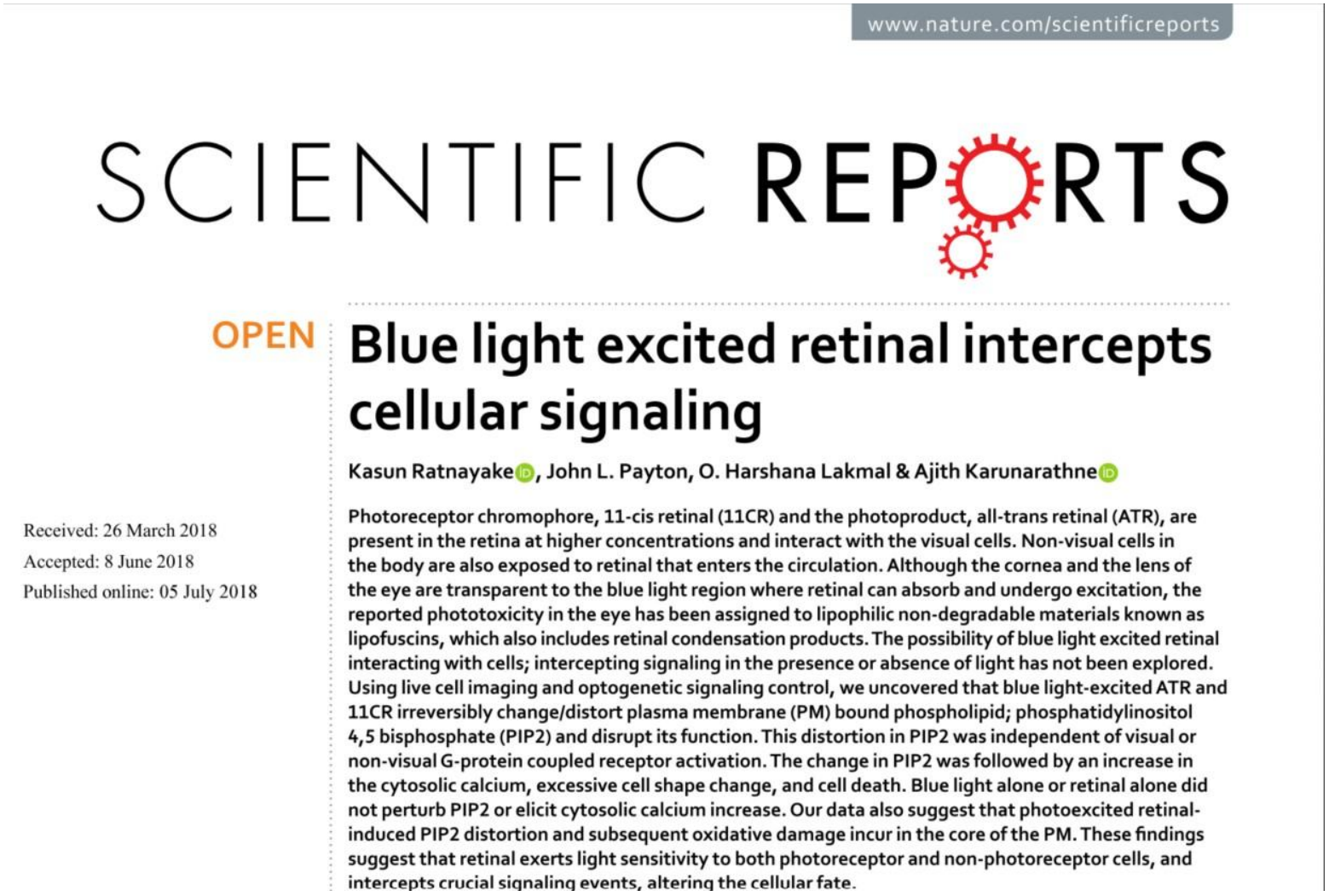
- 2014年憑藉「發明高亮度藍色發光二極體，帶來了節能明亮的白色光源」，日本工程學家天野浩與赤崎勇、中村修二共同獲得諾貝爾物理學獎

3C產品如何產生白光

- 方法一：藍光LED、紅光LED、綠光LED 結合(效率較高)
- 方法二：以螢光劑將藍光LED發出的單色光轉化(效率較低)

2018.7.5 美國俄亥俄州托利多大學發表的文章

www.nature.com/scientificreports



SCIENTIFIC REPORTS

OPEN

Blue light excited retinal intercepts cellular signaling

Kasun Ratnayake, John L. Payton, O. Harshana Lakmal & Ajith Karunarathne

Received: 26 March 2018
Accepted: 8 June 2018
Published online: 05 July 2018

Photoreceptor chromophore, 11-cis retinal (11CR) and the photoproduct, all-trans retinal (ATR), are present in the retina at higher concentrations and interact with the visual cells. Non-visual cells in the body are also exposed to retinal that enters the circulation. Although the cornea and the lens of the eye are transparent to the blue light region where retinal can absorb and undergo excitation, the reported phototoxicity in the eye has been assigned to lipophilic non-degradable materials known as lipofuscins, which also includes retinal condensation products. The possibility of blue light excited retinal interacting with cells; intercepting signaling in the presence or absence of light has not been explored. Using live cell imaging and optogenetic signaling control, we uncovered that blue light-excited ATR and 11CR irreversibly change/distort plasma membrane (PM) bound phospholipid; phosphatidylinositol 4,5 bisphosphate (PIP2) and disrupt its function. This distortion in PIP2 was independent of visual or non-visual G-protein coupled receptor activation. The change in PIP2 was followed by an increase in the cytosolic calcium, excessive cell shape change, and cell death. Blue light alone or retinal alone did not perturb PIP2 or elicit cytosolic calcium increase. Our data also suggest that photoexcited retinal-induced PIP2 distortion and subsequent oxidative damage incur in the core of the PM. These findings suggest that retinal exerts light sensitivity to both photoreceptor and non-photoreceptor cells, and intercepts crucial signaling events, altering the cellular fate.

2018.8.8 該校網站標題
「托利多大學化學家發現藍光如何加速失明」

UT chemists discover how blue light speeds blindness

August 8, 2018 | News, Research, UToday, Natural Sciences and Mathematics
By Christine Billau

Blue light from digital devices and the sun transforms vital molecules in the eye's retina into cell killers, according to optical chemistry research at The University of Toledo.

The process outlined in the study, which was recently published in the journal Scientific Reports, leads to age-related macular degeneration, a leading cause of blindness in the United States.

2018.8.13 USA TODAY 標題

Blue-Light Hysteria

2018.8.18文章作者 Dr Ajith Karunarathne 親自澄清

SCIENCE | HEALTH

Be careful what you believe about screen time making you blind

18

The science behind the latest screen-time scaremongering

By Rachel Becker | Aug 17, 2018, 5:27pm EDT

SHARE

So I asked the paper's senior author, chemist Ajith Karunarathne at the University of Toledo in Ohio, whether his results mean that staring at my tablet or iPhone will make me go blind. His answer was simple: "Absolutely not."

絕對不會

Dr Ajith Karunarathne 說明他們的研究

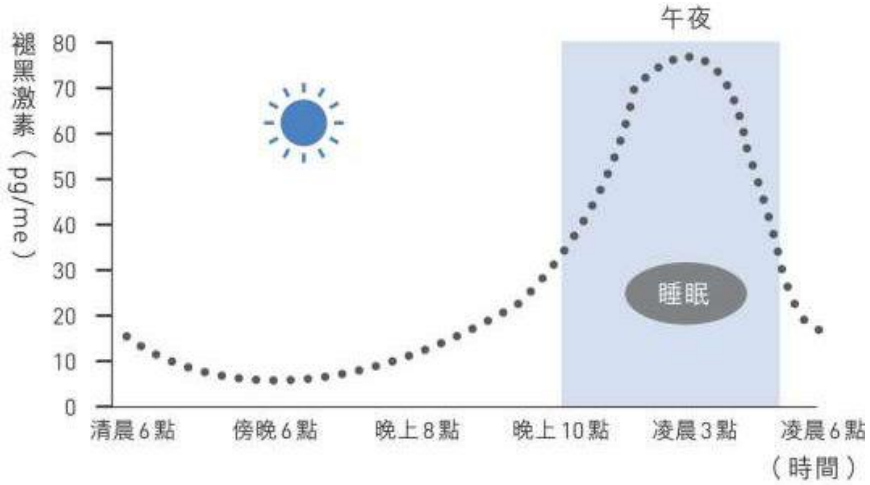
- 科學家已經可以用「化學物質」，影響細胞的移動。因此他們希望能發明用「光」來影響細胞的移動
- 他們嘗試在「非」眼睛細胞(例如：癌細胞、免疫細胞)中，加入眼睛感光細胞特有的蛋白質，以及視網醛(retinal)，然後用藍光照射。結果發現藍光反而殺死了這些細胞。

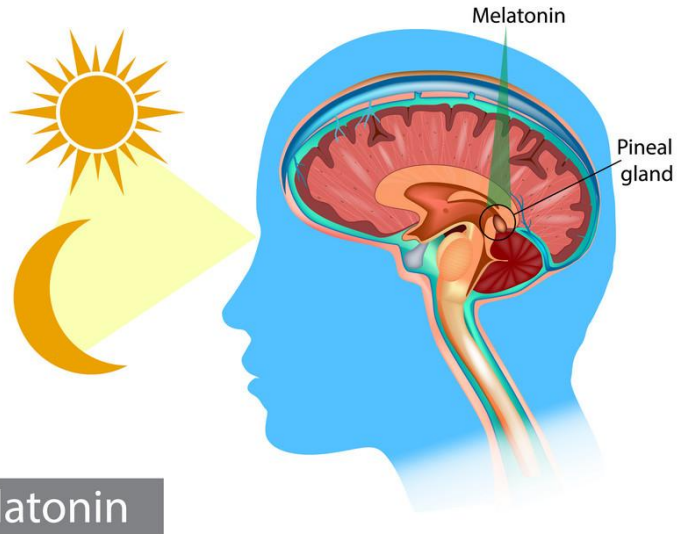
- 實驗中並非使用來自3C產品的藍光，也不是在眼睛測試。

那麼藍光對人體有甚麼影響？

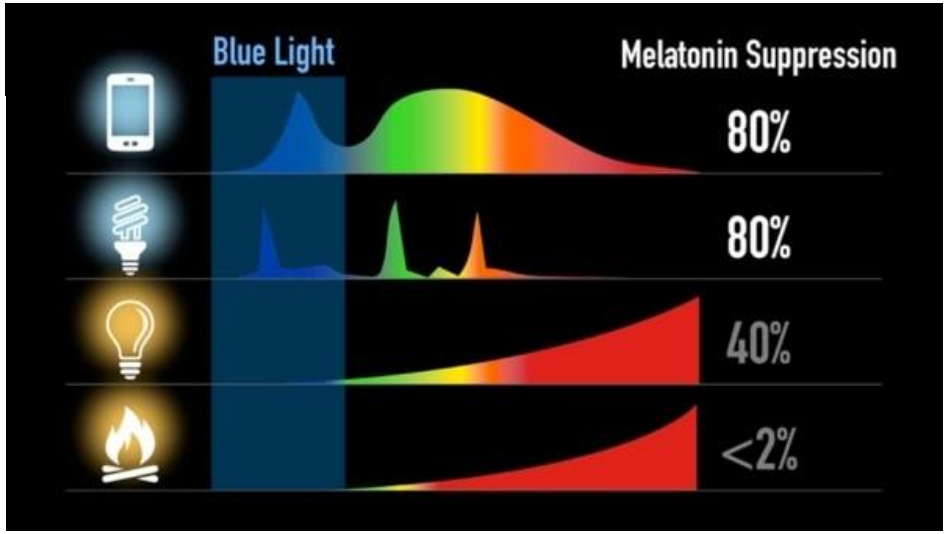
藍光對睡眠的影響

- 人體的生理時鐘，主要依照陽光來運作
- 夜晚時，大腦松果體分泌的褪黑激素濃度增高，會幫助入睡
- 藍光會抑制褪黑激素分泌，影響睡眠



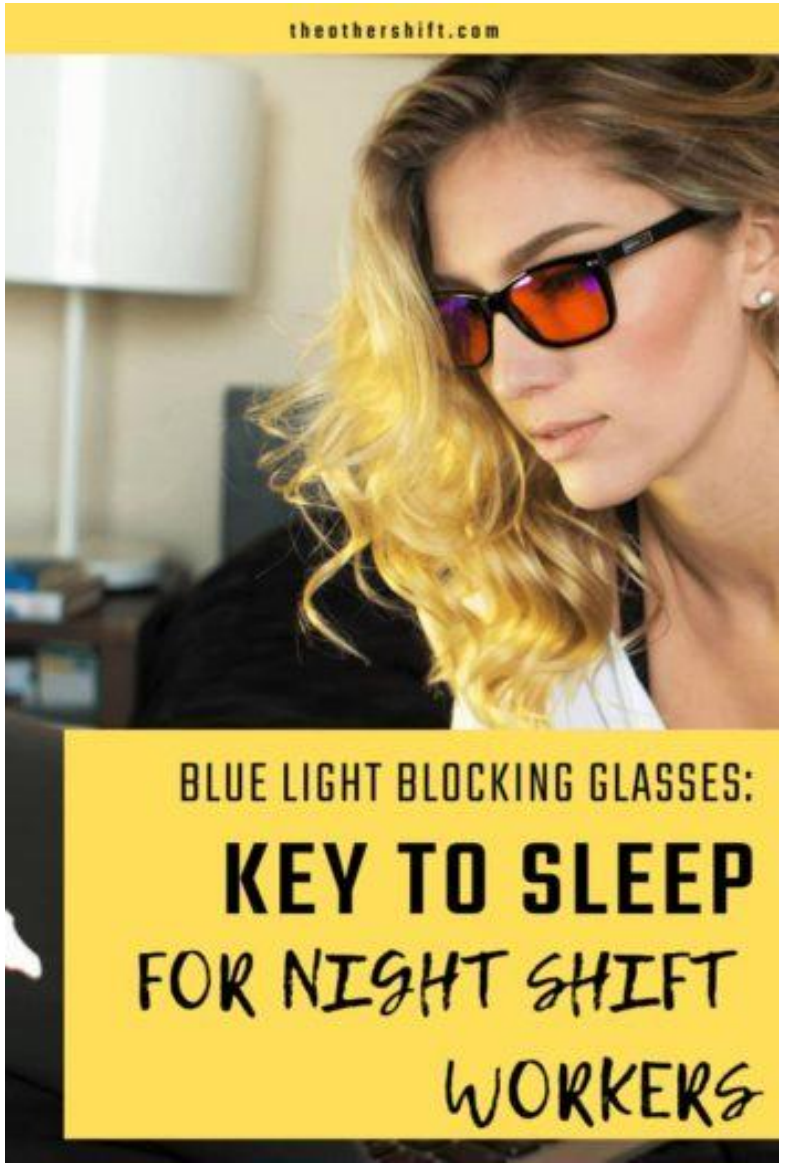


Melatonin



需要用抗藍光眼鏡嗎？

- 如果是要防止失明 → 不需要
- 如果想要睡得好些 → 可以參考



iPhone的夜覽模式可以幫助睡眠嗎？

- 夜覽模式（Night Shift）是在夜間將螢幕調整成偏暖的色調，減少藍光對於睡眠品質的影響
- 根據一項以經常滑手機的 18 至 24 歲的族群的研究
  - 夜晚在開啟 iPhone 夜覽模式的狀態下滑手機
  - 夜晚在不開啟 iPhone 夜覽模式的狀態下滑手機
  - 睡前完全不滑手機
- 實驗結果三組睡眠品質沒有差異
- 研究團隊表示：是否開啟 iPhone 夜覽模式不是影響睡眠品質的主要原因，也要考量到睡前傳訊息、使用社群媒體等帶來的心理層面的刺激。

Duraccio et al. Does iPhone night shift mitigate negative effects of smartphone use on sleep outcomes in emerging adults? Sleep Health. 2021 Aug;7(4):478-484.

需要戴太陽眼鏡嗎？

- 太陽光包含可見光與紫外線，其中紫外線對水晶體與視網膜有破壞作用
- 晴朗天氣太陽光的照度是室內的100倍
- 只要覺得會將皮膚曬黑的環境下，就**一定要戴**太陽眼鏡
- 要選擇具有UV400防護的太陽眼鏡

環境	照度（lux）
烈日	100,000
陰天	500~6,000
繪圖	600
閱讀	500
夜間棒球場	400
辦公室/教室	300
路燈	5
滿月	0.2
星光	0.0003

Mahendra etal.. Detrimental Effects of UVB on Retinal Pigment Epithelial Cells and Its Role in Age-Related Macular Degeneration. Oxid Med Cell Longev. 2020 Aug 12;2020:1904178

預防數位眼疲乏（Digital Eye Strain）

1. 多眨眼：正常人每分鐘眨眼15次，使用3C時只有每分鐘5-7次
2. 保持潤滑：使用人工淚液，避免乾燥環境
3. 20-20-20原則：每20分鐘，注視20呎(約6公尺)遠，至少20秒
4. 配戴中距離眼鏡：聚焦在50-60公分
5. 調整螢幕參數：螢幕亮度與環境相稱，增加螢幕對比可方便閱讀
6. 減少反光：調整螢幕位置，貼抗反光膜
7. 調整坐姿：螢幕距離眼睛大約手臂長度，略低於眼睛高度

譯自美國眼科醫學會官網 https://www.aao.org/eye-health/tips-prevention/computer-usage