OCULAR ALBINISM

EyeToday

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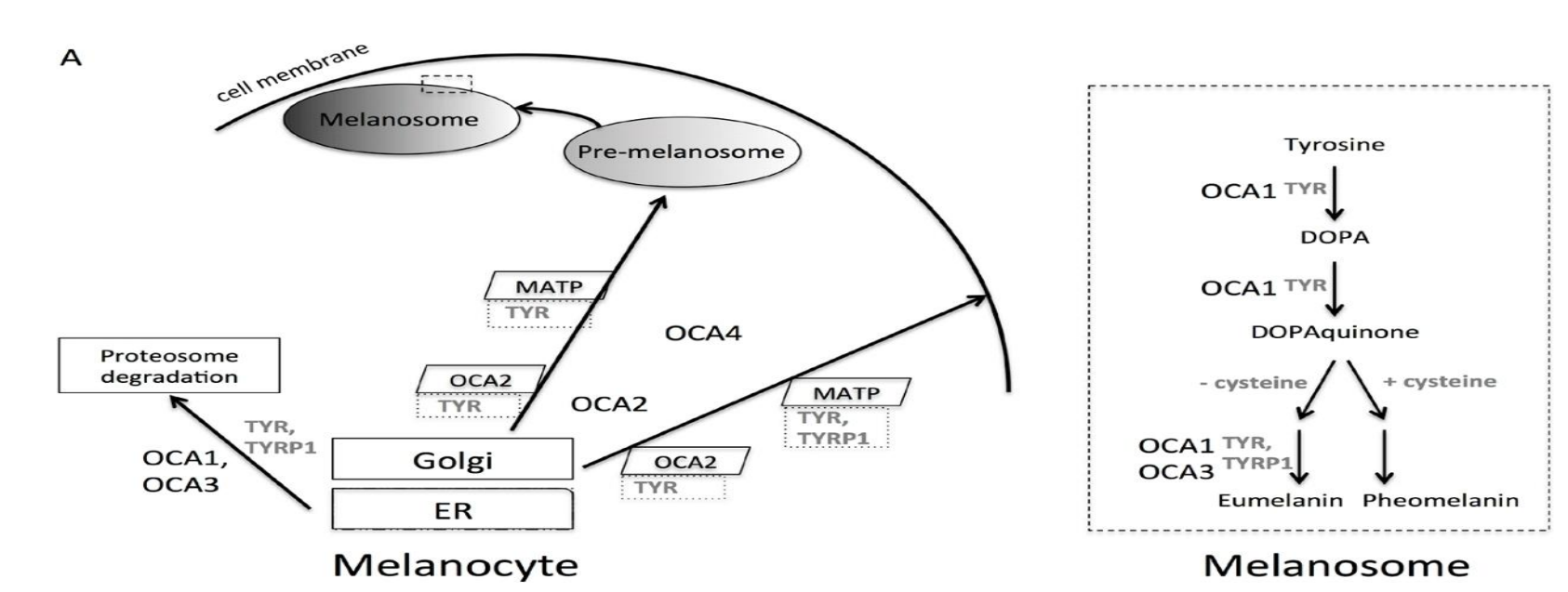
Albinism

It is an inherited condition with defective melanin synthesis.

Embryology of melanocytes:

- Basal layer of epidermis, hair bulb, uveal tract- melanocytes are derived from neural crest precursors (melanogenesis continue even after birth)
- Retinal pigment epithelium- melanocytes are from outer layer of optic vesicle.

Melanogenesis:



Ocular Albinism(OA)

- X linked recessive form (M/c) - mutation of OA1 gene in chromosome Xp22.2 coding for melanosome transmembrane glycoprotein
- Rarely Autosomal recessive forms- mutation of Pgene on chromosomes 15q
- Defective melanin synthesis resulting in hypopigmented uveal tract and RPE are predominant features but hypo pigmented skin macules may also be present occasionally
- RPE melanogenesis which gets completed before or just after birth is very much important for proper development of foveal photoreceptors and chiasmal routing of optic nerve fibres.

Oculocutaneous Albinism(OCA)

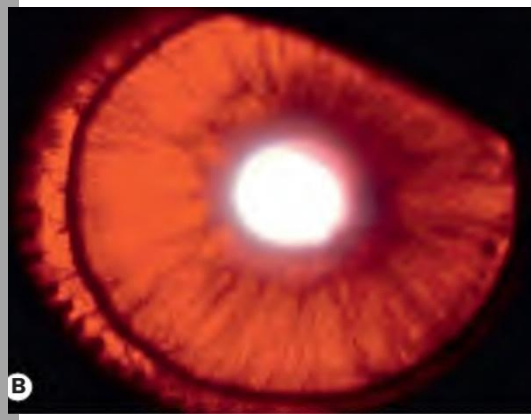
- A group of autosomal recessive disorder with specific gene defects but much of phenotypic variations.

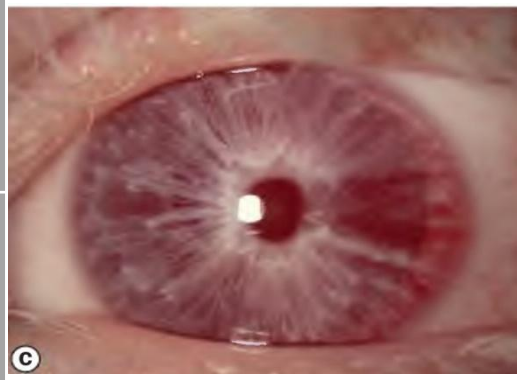
Types	Gene/ chrom	Features
OCA1A(Tyrosinase negative OCA)	Tyrosinase(TYR) on chrom 11q14.3	No melanin-White hair, very pale skin,pink eyes
OCA1B(Tyrosinase partially active)	Tyrosinase(TYR) on chrom 11q14.3	Some melanin+. Yellow pigment in skin, hair
OCA2(Tyrosinase positive OCA)	P- protein(P gene)on chrom 15q11.2	Same as OCA1B
OCA3(Rufous Albinism)	Tyrosine related protein 1(TYRP1) on chrom9p23	Red hair, reddish brown skin, hazel/ brown irides
OCA4	Membrane associated transporter protein (MATP)defect on chrom 5p13.3	Same as OCA 2

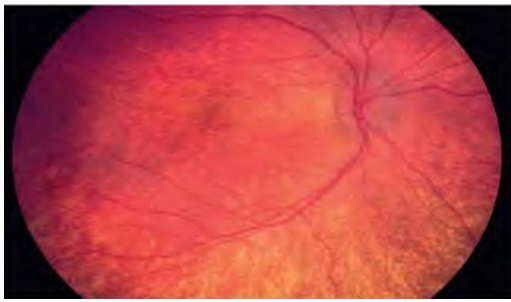
Features of ocular albinism

VISUAL ACUITY	**DV** - varies between 20/20 to 20/400 Reasons for poor visual acuity: Foveal hypoplasia Strabismus Refractive errors **NV**- usually better.
STRABISMUS & NYSTAGMUS	Bilateral , horizontal , pendular and usually symmetrical nystagmus. Strabismus with marked head posture is common.
VISUAL ACUITY TESTING IN CHILDREN	Teller acuity cards preferably in vertical presentation can be used (to overcome poor acuity due to horizontal nystagmus) Binocular acuity> Monocular acuity

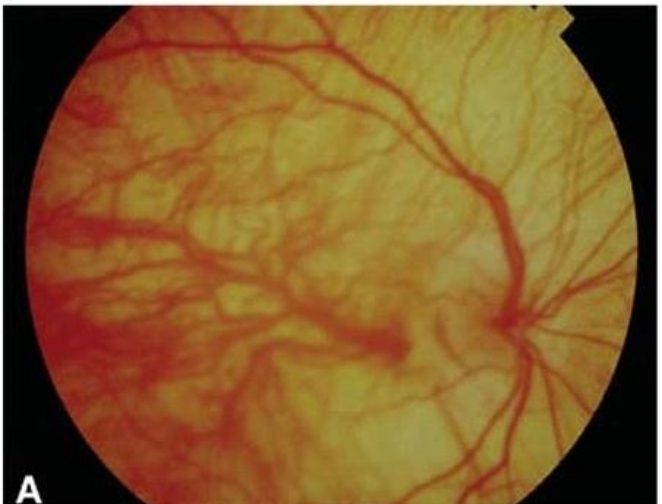
REFRACTIVE ERROR	• High ametropia is common.Ref error correction guidelines: <u>Children below 2yrs of age:</u> Myopia > -3.5 D Hyperopia> 3D Astigmatism> 3D <u>Children above 2yrs of age:</u> Myopia>-2.5D Hyperopia >2D Astigmatism >2D • Tinted glasses given to reduce glare
IRIS	Various grades of hypopigmented irides seen . In total absence of pigmentation, full transillumination defect of iris seen (pink eyes)
FUNDUS APPEARANCE	**Carrier females-** typical mosaic pattern in retinal periphery **Albinotic male-** hypopigmented fundus of various grades with foveal hypoplasia

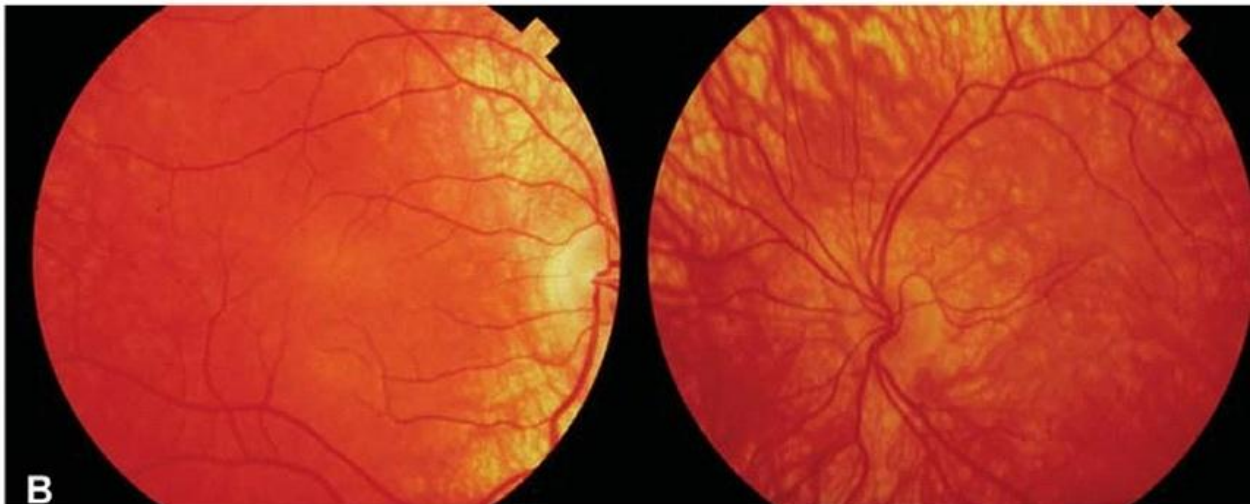






GRADING OF MACULAR APPEARANCE	• **Grade1:** choroidal vessels seen easily(minimal/no RPE pigmentation) • **Grade2:** less distinct choroidal vessels(translucent RPE with minimal pigmentation) • **Grade 3:** no visible choroidal vessels (opaque macula)
FOVEA	• **Macroscopic:** shallow/absent foveal pit,absent foveal avascular zone,loss of annular foveolar reflex • **Microscopic:** decreased outer segment length of central cones,increased spacing of central cone receptors,reduced no. of foveal retinal ganglion cells.





OPTIC CHIASM	Most of the optic nerve fibres decussate resulting in paucity of I/L temporal fibres because of chiasmal misrouting -detected by VEP
VISUAL CORTEX REPRESENTATION	Anomalous retinocortical visual projections with reduced volume of macular representation -detected by fMRI

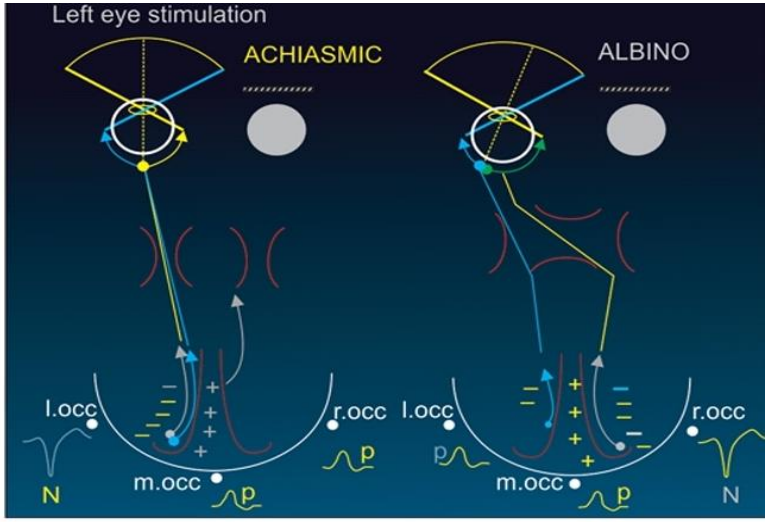


Fig. 15.2.5: VER in an albinotic patient. Note the anomalous crossing at the chiasma [l.occ = left occiput; r.occ = right occiput] (*Courtesy:* Professor David Taylor)

Syndromic Albinism

- It is attributed to defective formation and transport of melanosomes. Has following life threatening systemic components.

Diseases	Gene	Symptoms	Investigations
Chediak Higashi syndrome	LYST	OCA with recurrent skin & mucosal pyogenic infection(Staph)	Peripheral blood smear - neutropenia
Hermansky Pudlak syndrome	HPS1-6	OCA with bleeding abnormalities, granulomatous colitis, pulmonary fibrosis and immune defeciency	Bleeding time, while mount platelet electron microscopy
Griscelli syndrome GS1-3	MYO5A1 RAB27A MLPH	OCA with neurologic symp in GS1 & hemophagocytic syndrome in GS2	Light microscopy of hair shaft- abnormal aggregation of pigment.

Systemic concerns for ophthalmologists

- Melanin pigment gives protection from harmful effects of UVradiation. Long term exposure to sunlight increases the risk of actinic keratosis, squamous cell and basal cell carcinoma in patients with albinism.

- Hair bulb incubation test can be used to differentiate between tyrosinase negative and tyrosinase positive OCA.But this is reliable only after 5yrs of age.

- Patients with albinism always have proper neural development. Any neurodevelopmental delay or asymmetrical nystagmus should raise suspicion of associated Prader-Willi or Angelman syndrome due to large deletion of Pgene on chrom 15.

- Syndromic Albinism with detrimental features should be diagnosed as early as possible with proper investigations. Further genetic testing by RT-PCR and genomic sequencing help not only in diagnosis but also for carrier detection and prenatal testing