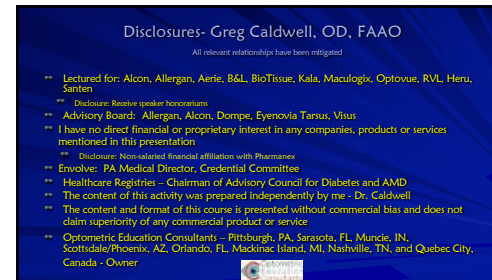


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11

Thyroid Disease and Thyroid Eye Disease

12

Questions

- ~ Everyone on Synthroid is at risk for TED?
- ~ What type of disease is TED?

13

Thyroid

- ~ Thyroid is an endocrine gland
 - ~ Two types of glands
 - * Endocrine
 - * Exocrine
 - ~ Endocrine system is a control system of ductless endocrine glands that secrete hormones (chemical messenger) that circulate within the body via the bloodstream or lymph system to affect distant organs
- | | |
|----------------------|-------------------------------|
| * Hypothalamus | * Pancreas |
| * Pituitary gland | * Adrenal glands |
| * Thyroid | * Gonads (testes and ovaries) |
| * Parathyroid glands | * Pineal gland |

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Thyroid

- ~ Exocrine glands contain **ducts**. Ducts are tubes leading from a gland to its target organ
- * Digestive glands have ducts for releasing the digestive enzymes
- * Salivary glands, sweat glands and glands within the gastrointestinal tract
- ~ Pancreas is both endocrine and exocrine
- * Exocrine (ductless gland) secreting digestive enzymes into the small intestine.
- * Endocrine (ductless gland) in that the islets of Langerhans secrete insulin and glucagon to regulate the blood sugar level.

15

Thyroid



- ~ Largest endocrine gland in the body
- ~ Butterfly shaped
- ~ Two lobes located on either side of the trachea in the lower portion of the neck
- ~ Lies just below skin and muscle layer surface
- ~ The thyroid is controlled by the hypothalamus and pituitary
- ~ The primary function of the thyroid is production of the hormones thyroxine (T4), triiodothyronine (T3), and calcitonin

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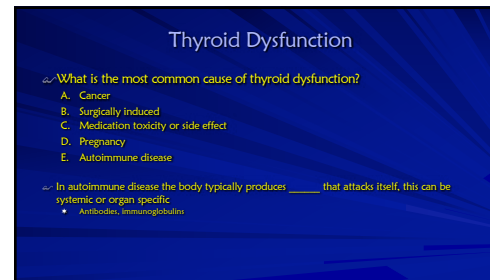
Normal Thyroid Function



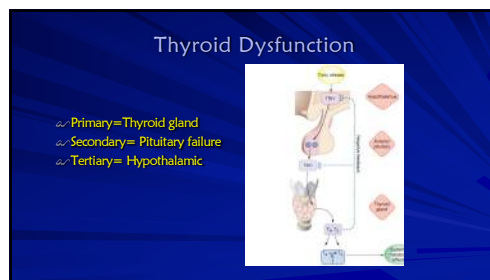
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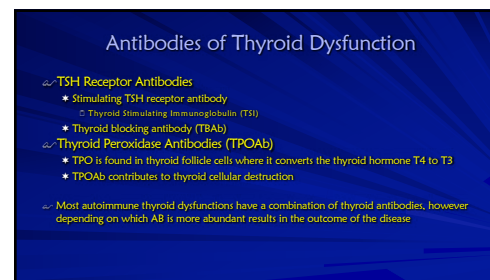
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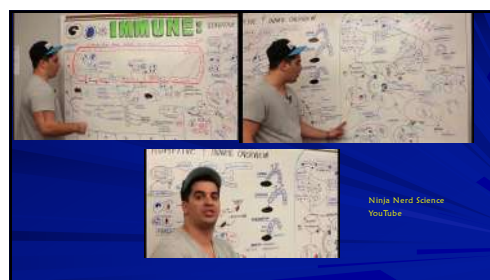
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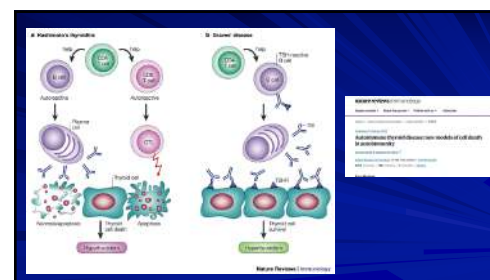
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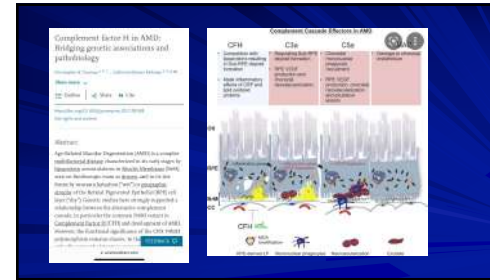
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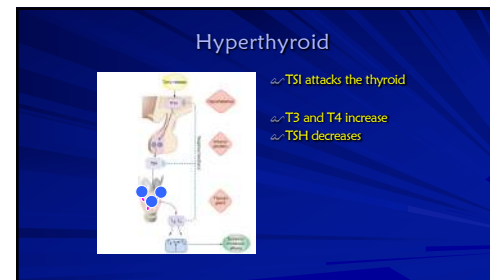
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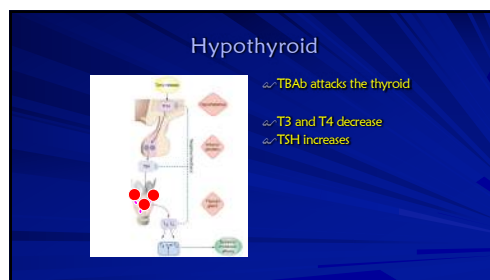
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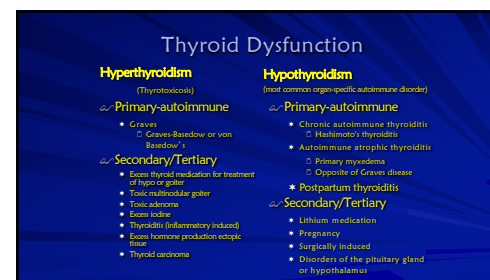
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GRAVE'S (Hyperthyroidism)

- A multisystem disorder consisting of a triad
 - Hyperthyroidism with diffuse hyperplasia of the thyroid gland
 - Infiltrative dermopathy
 - Infiltrative ophthalmopathy
- Prevalence:
 - 20-40 year old female (F:M = 7:1)
 - Genetic link
- Etiology:
 - Autoimmune disease: hypersensitivity reaction with thyroid stimulation by the circulation of abnormal thyroid-stimulating immunoglobulins (TSI)

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Hashimoto's Thyroiditis (Hypothyroidism)

- The most common cause of hypothyroidism in the United States
- It is named after the first doctor who described this condition, Dr. Hakaru Hashimoto, in 1912
- Autoimmune disease
- Goiter formation
- 5-10 times more common in women than in men
- The underlying cause of the autoimmune process still is unknown
 - Anti-TPO ab and Anti-TB resp ab present

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Autoimmune atrophic thyroiditis (Hypothyroidism)

- Atrophic thyroiditis is similar to Hashimoto's thyroiditis
- A goiter is not present

32

Postpartum Thyroiditis (Hypothyroidism)

- These women develop antibodies to their own thyroid during pregnancy, causing an inflammation of the thyroid after delivery

33

Systemic Manifestations of Hyperthyroid (Primary or Secondary)

• Symptoms	• Signs
• Nervousness	• Sweating
• Heat intolerance	• Muscle Weakness
• Sweating	• Emotionally labile
• Fatigue	• Tremor
• Palpitation	• Tachycardia
• Insomnia	• Arrhythmia
• Early waking	• Hypertension
• Alopecia	• Risk tendon reflex
• Vitiligo	• Diabetes
• Brittle nails	• Triglycerides & Cholesterol
	• Microcytic anemia
	• Possible goiter
	• Myxedema

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Systemic Manifestations of Hypothyroid (Primary or Secondary)

• Symptoms	• Signs
• Cold intolerance	• Cool, scaling skin
• Weakness	• Puffy hands and face
• Reduced energy	• Deep voice
• Lethargy	• Myotonia
• Muscle cramps	• Delirium
• Constipation	• Bradycardia
• Increased sleeping	• Slow reflexes
• Weight gain	• Obesity
• Reduced appetite	• Hypothermia
• Joint stiffness	• Myxedema

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Thyroid Eye Disease (TED)

- Other names used
 - Grave's disease
 - Grave's ophthalmopathy
 - Grave's orbitopathy
 - Exophthalmos in Graves Disease
 - Thyroid Associated Orbitopathy (TAO)
 - Thyroid Orbitopathy
 - Ophthalmic Graves Disease
 - Inflammatory Eye Disease
 - Endocrine Orbitopathy

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Why is this so confusing?

- Thyroid Eye Disease
 - It often seen in conjunction with Graves' Disease (hyperthyroid)
 - Is seen in people with no other evidence of thyroid dysfunction
 - Is seen in patients who have Hashimoto's Disease (hypothyroid)
- Most thyroid patients, however, will not develop thyroid eye disease

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Why is this so confusing?

- The eye symptoms usually occur at the same time as the thyroid disease
 - However they may precede or follow the obvious symptoms of the thyroid abnormality
- The incidence of thyroid eye disease associated with thyroid dysfunction is higher and more severe in smokers
 - There is no way to predict which thyroid patients will be affected

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Why is this so confusing?

- While eye disease may be brought on by thyroid dysfunction
 - Successful treatment of the thyroid gland does not guarantee that the eye disease will improve
 - No particular thyroid treatment can guarantee that the eyes will not continue to deteriorate
 - Once inflamed, the eye disease may remain active from several months to as long as three years
 - There may be a gradual or, in some cases, a complete improvement

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Thyroid Eye Disease

- Commonly known as Graves' ophthalmopathy
- About 80% of all patients with TED have the autoimmune hyperthyroid disorder known as Graves' disease
- Another 10% of all cases are seen in patients with autoimmune hypothyroidism, either Hashimoto's thyroiditis, atrophic thyroiditis or Hashimoto's
- Another 10% of all cases are seen in people with normal thyroid function
 - When thyroid function is normal, the eye condition is referred to as euthyroid Graves' disease
- Euthyroid is a term meaning that thyroid function both are normal. Most people with euthyroid Graves' disease develop a thyroid disorder within eighteen months of the emergence of the eye disorder
- But some people with euthyroid Graves' disease never develop thyroid dysfunction

40

Thyroid Eye Disease

- What causes the Thyroid Eye Disease signs and symptoms?
 - The high and low levels of T3 and T4
 - The antibodies that are attacking the thyroid gland

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Thyroid Eye Disease

- Thyroid Eye Disease has 2 phases
 - A phase secondary to abnormal thyroid hormone levels
 - Increased or decreased FT3 and FT4 levels
 - Once these levels are normalized, ocular symptoms will resolve
 - Congestive Autoimmune form of Thyroid Eye Disease
 - Active phase stimulating or blocking TRAb are causing ocular activity
 - Plateau phase reduced activity
 - Resolution phase symptoms regress and eyes return to normal

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Phase secondary to abnormal thyroid hormone levels (T₃/T₄) (Thyroid Eye Disease)

- Hyperthyroidism eye symptoms**
 - Excess hormone acting on the nerves that supply the eye
 - Usually spastic and include staring
 - Dryness
 - Eyelid retraction
- Hypothyroidism eye symptoms**
 - Deficient hormone causing venous congestion, impaired circulation and fluid regulation
 - Periorbital edema

This form of TED resolves within a few weeks after thyroid hormone levels (FT4 and FT3) are corrected and brought back into the normal range.
 The pituitary hormone TSH can stay low or suppressed for many months during the course of treatment for hyperthyroidism and doesn't mean that the patient is still hyperthyroid.
 TSH also lags at least 6 weeks behind thyroid hormone levels and often remains elevated longer in people who have been hypothyroid.
 Relying on the TSH level can be misleading and in treating TED.

43

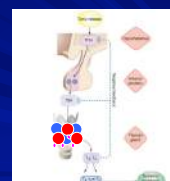
Congestive Autoimmune form of Thyroid Eye Disease (Active phase, Plateau phase, Resolution phase)

- Caused by both stimulating and blocking TSH receptor antibodies (TRAb) and also immune system chemicals known as cytokines
- Secondary targets appear to be TSH receptor antigens (epitopes) located on orbital fibroblasts as well as dermal fibroblasts
- Active "inflammatory" phase of TED varies
 - Symptoms resolve quickly although on average the active phase lasts about 12-18 months
 - TRAb levels are high; patients are smokers; nutrient deficiencies are present; or the patient continues to be exposed to environmental triggers such as excess dietary iodine, the active phase can last as long as 5 years
 - Avoid any lid, muscle or orbital surgery
- Plateau phase and Resolution "Passive" phase
 - An individual may be left with structural changes, such as eye protrusion, eyelid retraction, and in some cases, double vision
 - There are corrective procedures that can be performed to address these problems

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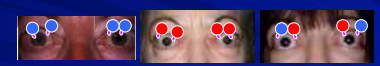
Euthyroid Graves' disease

If thyroid function is normal. How does one develop thyroid eye disease?

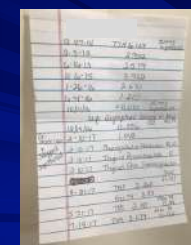


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Similar receptors are found in the skin, fat and muscle of the orbit



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You're in the Know

Normal Values
 Thyroglobulin 20 IU/ml
 Peroxidase <35 IU/ml
 TSI 1.75 IU/ml

It does work!

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General Ocular Symptoms

- ~ Prominent eyes, stare
- ~ Pain
- ~ Lacrimation
- ~ Eyelid swelling
- ~ Foreign-body sensation
- ~ Double vision
- ~ Photophobia
- ~ Decreased vision in one or both eyes

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NOSPECS: Grading System

~ 1969 by S.C. Werner

- Class 0: No signs or symptoms
- Class 1: Only signs, upper lid retraction
- Class 2: Soft tissue involvement with symptoms
- Class 3: Proptosis
- Class 4: EOM involvement
- Class 5: Corneal involvement
- Class 6: Sight loss

~ Class 2-6 document severity

- 0: absent
- A: minimal
- B: moderate
- C: marked

~ Within classes 2 to 6 the investigator has to differentiate the severity grades 0, A, B, C

~ NOSPECS, classifies severity but not the activity or stage (active/inflammatory or passive/congestive)

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NOSPECS: Grading System

- ~ 0: No symptoms or signs
- ~ 1: Only signs (upper lid retraction without lid lag or proptosis)
- ~ 2: Soft tissue involvement with symptoms (excess lacrimation, sandy sensation, retrobulbar discomfort)
 - Grade 0: absent
 - Grade A: minimal (edema of lids, injection, sandy feeling)
 - Grade B: moderate (edema of lids, injection, chemosis, FBs, pain behind eyes)
 - Grade C: marked
- ~ 3: Proptosis associated with classes 2-6 only
 - Grade 0: absent
 - Grade A: minimal: 21mm -23mm
 - Grade B: moderate: 24mm -27mm
 - Grade C: marked: 28mm or more
 - Specify if inequality of 2 mm between eyes, or if progression of 2 mm under observation

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NOSPECS: Grading System

- ~ 4: EOM involvement (usually with diplopia)
 - 0: absent
 - A: minimal (limitation of motion, patient reports diplopia but no obvious restriction)
 - B: moderate (evident restriction of motion)
 - C: marked (position of globe is fixed)
- ~ 5: Corneal involvement (due to proptosis, incomplete closure, lagophthalmos)
 - 0: absent
 - A: minimal (staining)
 - B: moderate (lacration)
 - C: marked (clouding, necrosis, perforation)
- ~ 6: Sight loss (due to optic nerve involvement)
 - 0: absent
 - A: minimal (disc pallor or edema, or VF defect, vision 20/20-20/60)
 - B: moderate (same as A but VA 20/70-20/200)
 - C: marked (blindness, VA < 20/200)

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LEMO Classification

- ~ 1991-Boergen and Pickardt
- ~ Complements NOSPECS
- ~ 4 finding-categories
 - Lid
 - Exophthalmos
 - Muscular
 - Optic nerve
- ~ Grade between 0 and 4 depending on severity
- ~ LEMO, classifies severity but not the activity or stage (active/inflammatory or passive/congestive)

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LEMO Classification

Lid (L)

- ~ 0: missing
- ~ 1: lid edema only
- ~ 2: real retraction (impaired lid closing)
- ~ 3: retraction and upper lid edema
- ~ 4: retraction and global lid edema

Exophthalmos (E)

- ~ 0: missing
- ~ 1: eye closing not impaired
- ~ 2: conjunctival injection in the morning
- ~ 3: persistent conjunctival injection
- ~ 4: corneal complications

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LEMO Classification

Muscular (M)

- 0: missing
- 1: detectable in imaging only
- 2: Pseudoparesis
- 3: Pseudoparesis

Optic Nerve (O)

- 0: missing
- 1: regarding color vision only or detected via VEP
- 2: peripheral scotoma
- 3: central scotoma

LIEIM200

Endocrine ophthalmopathy with lid edema, exophthalmos, pseudoparesis of external eye muscles, and no optic nerve involvement

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Clinical Activity Score (CAS)


Thyroid disease characterized by:

- Severity
- Activity – want 3 or above
- CAS (1-7)

Studies for Tepezza

Payers using CAS for approval

- Due to wide open label
- Those infusing are charting the CAS



CAS	Clinical Activity Score
1	Presence of pain, redness, tearing, photophobia, or conjunctivitis
2	Presence of eyelid swelling, redness, or conjunctivitis
3	Presence of eyelid swelling, redness, or conjunctivitis, or presence of conjunctival injection
4	Presence of eyelid swelling, redness, or conjunctivitis, or presence of conjunctival injection, or presence of corneal edema
5	Presence of eyelid swelling, redness, or conjunctivitis, or presence of conjunctival injection, or presence of corneal edema, or presence of corneal ulceration
6	Presence of eyelid swelling, redness, or conjunctivitis, or presence of conjunctival injection, or presence of corneal edema, or presence of corneal ulceration, or presence of corneal perforation
7	Presence of eyelid swelling, redness, or conjunctivitis, or presence of conjunctival injection, or presence of corneal edema, or presence of corneal ulceration, or presence of corneal perforation, or presence of corneal infection

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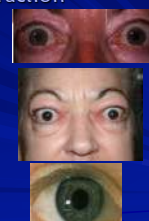
Lid Involvement

- Lid Retraction
- Lid Lag
- Lagophthalmus

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Lid Retraction

- Scleral show in primary gaze
- Most commonly seen complication
- Occurs in ~90% of Grave's patients
 - Excess stimulation of Muller's muscle
 - Fibrotic inferior rectus
 - Mechanical restriction or infiltration of levator
 - Increased orbital volume causes exophthalmos
- Normal Lid Position
 - Upper lid intersects corner at the 2 and 10 o'clock positions
 - 2-3 mm below the lashes
 - Lower lid coincident or 1-2mm below the limbus



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Eyelid Lag: von Graefe's Sign

- Immobility or lagging of upper eyelid on downward gaze
- Fibrosis of the inferior rectus muscle may induce lower lid retraction

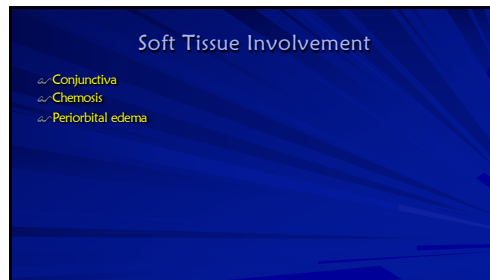


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Lagophthalmos

- Inability to form a complete lid closure with a normal blink due to Exophthalmos/ Proptosis
- Often leads to corneal exposure

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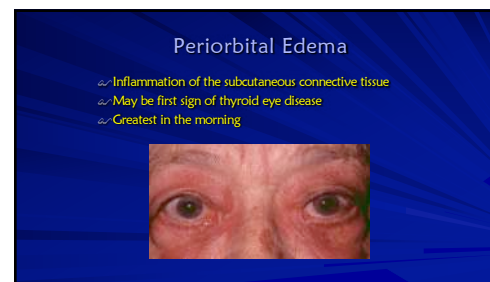
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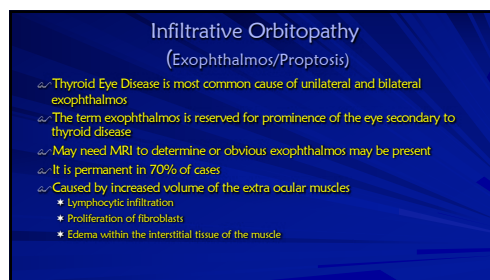
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Exophthalmometry

- Is race dependent (Asian versus Black men is statistically significant)
- Hertel or Luedde results
- Adults
 - Average reading 17 mm
 - 95% of population have readings between 13-21mm
- General concerns
 - A difference of 2 mm or more between the eyes
 - A measurement of more than 24 mm

Race	Mean Normal Value	Upper Limits
	mm	mm
White women	15.4	20.1
White men	16.5	21.7
Black women	17.8	23.1
Black men	18.5	24.7
Asians	16.0	18.0

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Restrictive Myopathy

- Secondary to edema and fibrosis of EOM's
- Inferior Rectus (IR) muscle is most commonly involved
- Occurs in 30-50% of patients
- Diplopia may be transient but in 50% it's permanent

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IOP in Thyroid Eye Disease

- A rise in IOP has been reported with TED
- I would have higher suspicion when you see
 - Periorbital edema
 - Exophthalmos, proptosis
 - Restrictive myopathy
- Some literature reports IOP in up gaze to be part of the diagnoses of thyroid dysfunction

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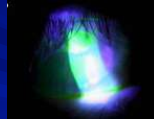
Restrictive Myopathy

Obvious restrictive myopathy but also note the periorbital edema, and conjunctival hyperemia

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Corneal Exposure

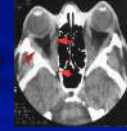

- Exposure keratopathy secondary to exophthalmos and lagophthalmos
- Significant threat to visual function



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Optic Neuropathy

- Affect 5% of patients
- Usually mild to moderate exophthalmos and shallow orbits
- Enlargement of the recti muscles compresses ONH or its blood supply at the apex of the orbit
- Compression MAY occur without significant proptosis
- Compressive and/or ischemic and/or toxic

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Treatment of Thyroid Eye Disease

- Depends on what phase of the disease we are in:
 - Phase secondary to abnormal thyroid hormone levels
 - Active "inflammatory" phase
 - Plateau phase and Resolution "Passive" phase
- Depends on what orbital tissue or structures are involved
- Depends on the risk of vision loss
- Depends if primary, secondary or tertiary thyroid dysfunction
- Management consists of:
 - Control of inflammation
 - Prevention of ocular and visual damage
 - Addressing ocular motor abnormalities
 - Improving cosmetic disfigurement
- Patient education is essential
- Communication with an endocrinologist or internist will ensure proper patient care

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Treatment of Thyroid Eye Disease

- Palliative (hormone imbalance, active, passive)
 - Lubricants
 - Topical anti-inflammatory (Lotemax/Restasis)
 - Prisms
- Steroids (active phase)
 - Orals
 - Peri-ocular injections
 - IV with oral steroid taper
- Orbital radiotherapy (active phase)
- Orbital Decompression (passive phase)
 - Fat removal orbital decompression (FROD)
 - Large orbits
 - Bone removal orbital decompression (BROD)
 - Small orbits
 - Both FROD and BROD



Smoking causes the thyroid eye disease to be more severe
Smoking causes treatments to be less effective

75


Treatment of Thyroid Eye Disease

- Paradigm shifts
 - Decrease in orbital radiotherapy
 - Waiting for passive stage but doing surgery
 - Increase usage of fat removal orbital decompression as first approach
 - Peri-orbital injection of steroids for recurrent disease after orals
- Future
 - Looking for better or different ways to treat the active phase of this disease

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Lid Retraction, Eyelid Lag, Lagophthalmos

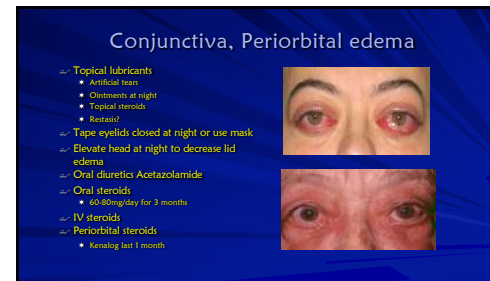
- Must treat underlying thyroid dysfunction
- Abnormal hormone level and Active phase
 - Treat the exposure keratitis with lubricants
 - Tape eyelids shut at night
 - Lid weight
 - Moisture chamber at night
 - Antibiotic ointments
- Passive Phase
 - Surgical Management
 - Infra-orbital recession
 - Müllerectomy
 - Recession of lower lid retractors

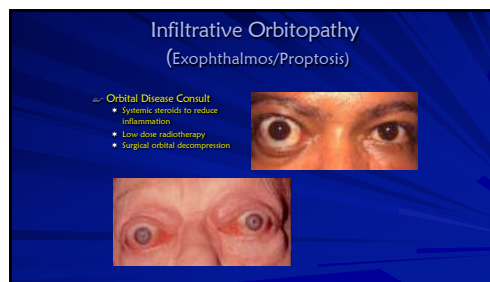
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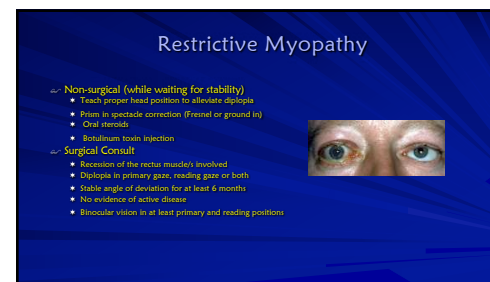
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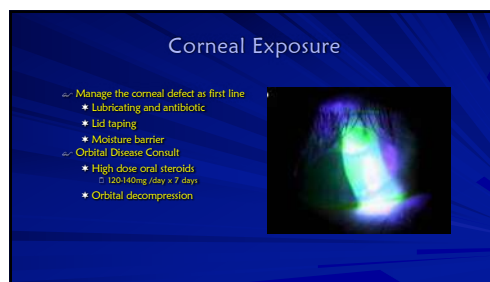
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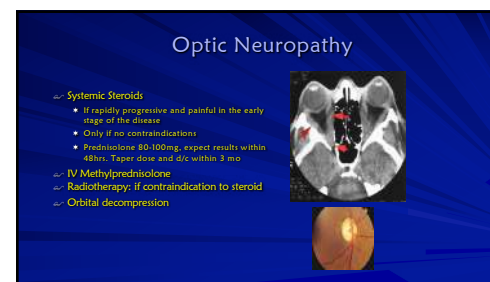
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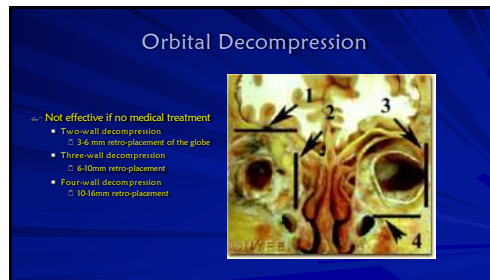
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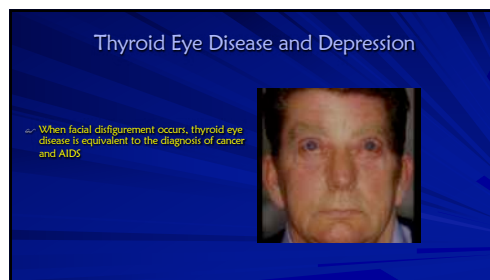
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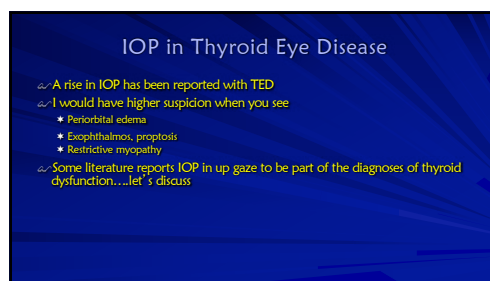
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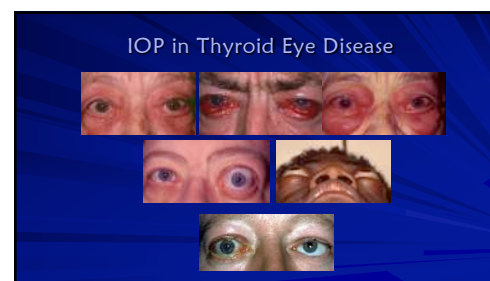
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Laboratory Testing

- Thyroid Hormone Levels
 - Serum TSH concentration Serum total T4 (Thyroxine)
 - Serum total T3 (Triiodothyronine)
 - Estimation of the serum free T4 (or T3) concentration
 - Thyroglobulin (Tg) level
- Anti-thyroid antibodies
 - Thyrotropin receptor antibodies (TRAb)
 - TSH binding inhibiting immunoglobulins (TBII)
 - Anti-TPO antibodies
 - Thyroglobulin (Tg) Antibodies (TgAb)
- Commonly used thyroid tests
 - Basal T3 uptake test
 - Sensitive serum TSH test (Thyroid stimulating hormone)
 - TRH stimulation test (Thyroid releasing hormone)
 - Thyroid (T3) suppression test
 - Immunography
 - Needle Biopsy
 - Thyroid Scan

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Laboratory Testing

- Hypothyroid
 - Low FT4, High TSH, indicates primary check antibodies
 - Low FT4, Low TSH, indicates secondary or tertiary, TRH stimulation, MRI
 - Hashimoto's (Primary disease)
 - Most common
 - Low FT4, High TSH, High Anti-TPO Ab, High levels of Thyroglobulin (Tg) Antibodies (TgAb), Anti-TB Recp Ab (approx 10% present)
 - Autoimmune atrophic thyroiditis
 - Low FT4, High TSH, Low Anti-TPO Ab, Low levels of Thyroglobulin (Tg) Antibodies (TgAb), Anti-TB Recp Ab (approx 60% present)
 - Treatment: Levothyroxine (Synthroid, Levothroid, Levoxyl, Unithroid)
- Hyperthyroid
 - High FT4, Low TSH
 - T3I present


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February 25, 2019 "Nothing Else Can Be Done"



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Clinical Activity Score (CAS)



CAS

Score	Clinical Activity Score
1	Redness of conjunctiva
2	Redness of sclera
3	Redness of eyelids
4	Redness of conjunctiva
5	Chemosis
6	Exophthalmos
7	Exophthalmos
8	Exophthalmos
9	Exophthalmos
10	Exophthalmos
11	Exophthalmos
12	Exophthalmos
13	Exophthalmos
14	Exophthalmos
15	Exophthalmos
16	Exophthalmos
17	Exophthalmos
18	Exophthalmos
19	Exophthalmos
20	Exophthalmos


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February 25, 2019 "Nothing Else Can Be Done"



94

February 25, 2019 "Nothing Else Can Be Done"



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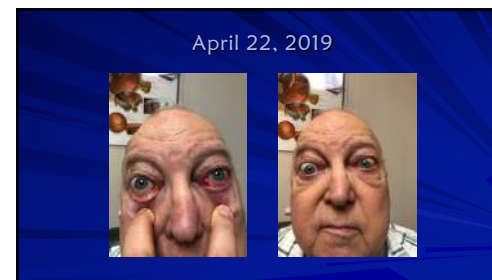
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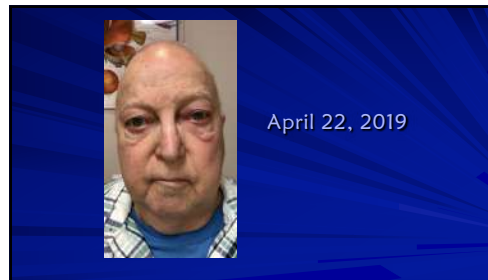
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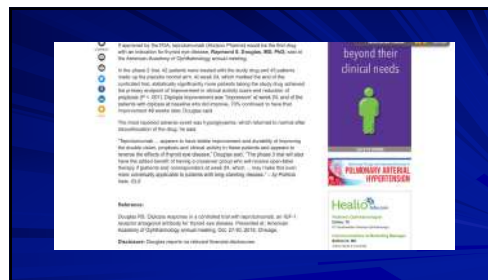
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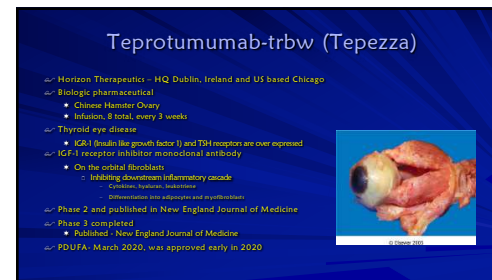
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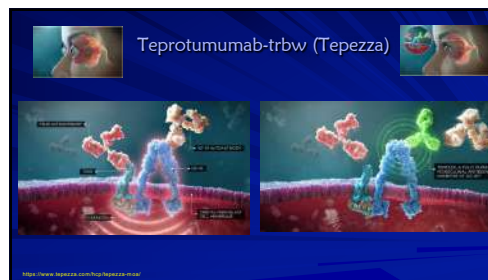
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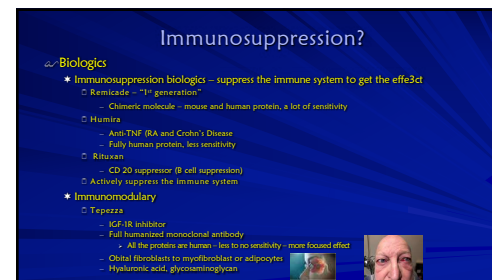
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- **Optics and Optic-X Studies**
 - Infantile, every 3 weeks, 24 weeks
 - Optic – acute, less than 9 months of disease
 - Optic X – chronic, 12-16 months disease
- **Clinical Activity Score**
 - Spontaneous pain, gaze evoked pain, eyelid erythema, chemosis, inflammation
 - Scale of 7, needed 4 to be in the study
- **Prognosis**
 - Improvement of 2 mm or better
- **Diplopia**
 - Scale of 0, 1, 2, or 3
- **Grave's Ophthalmopathy -Quality of Life Score**
 - Scale 0-100

- **Clinical Activity Score (CAS)**
 - Spontaneous pain, gaze evoked pain, eyelid erythema, chemosis, inflammation
 - Scale of 7, needed 4 or less in the study
 - 70% improved to 0 or 1, 7% improved 0 or 1 with placebo
- **Propiols**
 - Improvement of 2 mm or better
 - 83% had 2 mm or better, 10% with placebo
 - Average was 3.2 mm at week 24
- **Diplopia**
 - Scale of 0, 1, 2, or 3
 - 68% improved 1 point, 29% with placebo
- **Grave's Ophthalmopathy-Quality of Life Score**
 - Scale 0-100
 - 17.28 point improved, 1.80 with placebo

- * **Very well tolerated**
- * The most common adverse reactions (incidence $\geq 5\%$ and greater than placebo) are muscle spasm, nausea, alopecia, diarrhea, fatigue, hyperglycemia, hearing impairment, dysgeusia, headache, and dry skin.

- **Infection Reactions (mild/moderate):** approximately 4% of patients
 - transient increases in blood pressure, feeling hot, tachycardia, dyspnea, headache, and muscular pain
 - consideration should be given to premedicating with an antihistamine, antipyretic, or corticosteroid and/or administering at a slower infusion rate.
- **Hyperglycemia:** Increased blood glucose or hyperglycemia
 - In clinical trial, 10% of patients experienced hyperglycemia
 - Monitor patients for elevated blood glucose and symptoms of hyperglycemia while on treatment with teprotumumab
 - Patients with preexisting diabetes should be euglycemic before beginning treatment


- Infusion center
 - *Go to Horizon website
 - *Contact Us
 - *Type in your question
 - Looking for infusion center

[illegible]

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Eyelash and Brow Loss

- Hypothyroidism or hyperthyroidism, hair loss can be an unfortunate side effect
- Dry, brittle hair, thinning on the scalp, and even loss of lashes and brows
- Some drugs used to treat thyroid conditions can also contribute to the loss of hair
- Left untreated, the hormonal changes associated with hypothyroidism or hyperthyroidism can completely stop new hair strands from developing



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Current Treatments

- Latisse – bimatoprost 0.03%
- Lash Boost – Rodan Fields - contain isopropyl droprstenate
 - Synthetic analog of the medication found in Latisse.
 - Highly potent prostaglandin F2-alpha receptor agonist



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New and All Natural

- Lash and Brow Serum – Nu Colour – Nu Skin
 - June 22, 2023 - Available in USA
 - Formulation of natural extracts and peptides
 - Prostaglandin free
 - BAK free
 - No Rx needed – sold in the office
 - Clinical studies performed

INCREASE EYELASH VISIBLE DENSITY




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New and All Natural

BEFORE USE

WEEK 8



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Key Tenants of Aging, Performance and Vitality

- Oxidative Stress / Inflammation
- Hormonal Balance
- Stress Hormones
- Glucose / Insulin Regulation
- GUT integrity and microbiome diversity
- Immune Balance
- Environmental Exposure/Burden
- Individuality

Credit to: James LaValle, BPh, CCM

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Thyroid Function: Factors increasing conversion of T4 to T3



Credit to: Flomena Trindade, MD

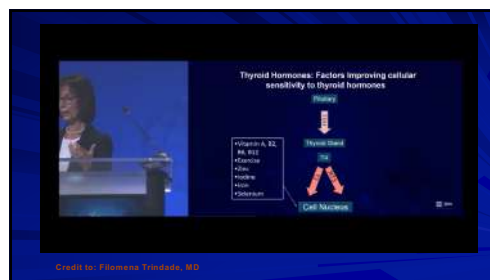
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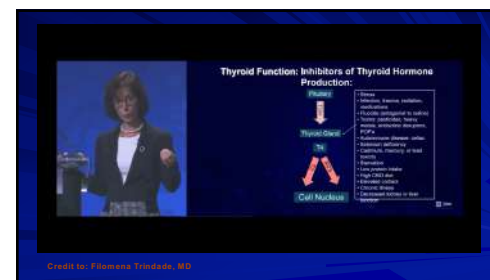
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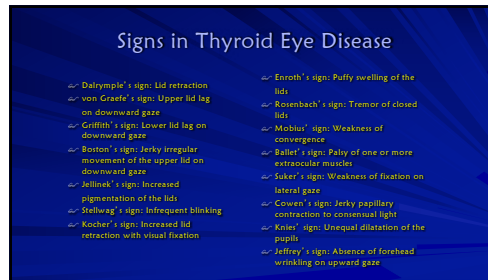


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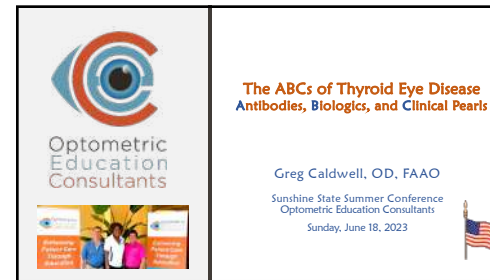


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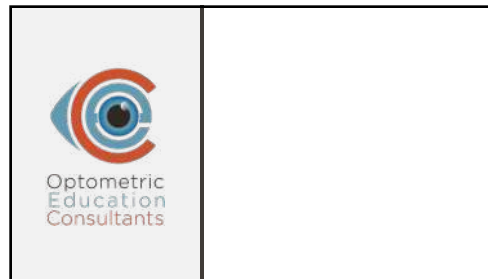




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