

## Thyroid Disease and the Eye: What We Must Know

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## Disclaimer

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- As a paid speaker I have been sponsored by several companies including Alcon, Allergan, ClBA, Cooper Vision, Odyssey Medical, and VSP
- I am not a consultant to nor an employee of any pharmaceutical or industry company.
- Any product superiority mentioned during this presentation will be supported by scientific studies and white papers.

What percentage of American females have thyroid disease?

1. 0.5%
2. 1.0%
3. 5.0%
4. 8.0%
5. 100%- ( some don't know it!)

## The Goal of the Endocrine System: Maintaining Homeostasis

- Organisms are exposed to constant change
- The ability to respond to change is inherent in living things
- Maintenance of homeostasis is vital to survival!
- Homeostasis is the job of the of the endocrine system

## Simple to Complex: Implications for Communication

- One celled organisms require minimal communication
- More complex organisms require limited intra-organ communication
- Very complex organisms need sophisticated communication

## Communication and Homeostasis

- Some situations require rapid, focal response
  - Speed is the critical issue
  - Resources used are of minimal importance
- Some situations require a less timely, widespread response
  - Speed is not the critical issue
  - Reaching a very large number of target tissues is crucial
  - Resources need to be conserved

### Communication and Control of Physiology and Function

- Nervous system
  - Fast, but inefficient
  - Hard wired "point-to-point"
  - Impulses travel along nerves
  - Transmission @ synapse via neurotransmitters
  - Range limited by path of nerves
- Endocrine system
  - Efficient, but not fast
  - Broadcasts hormones throughout the body
  - Potential to reach every cell
  - Effects limited to cells with receptors to a specific hormone

### Hormonal Receptor Selectivity

- To affect a target cell receptors specific for a given hormone must be present
- Cells lacking receptors to a specific hormone will not react to it, regardless of concentration
- Hormonal selectivity is crucial to proper functioning of the endocrine system

### Hormones Regulate Many of the Body's Vital Functions

- Growth
- Development
- Metabolism
- Electrolyte balances
- Reproduction
- Hypothalamus – region not gland
  - Releasing hormones
  - Inhibiting hormones
- Pituitary gland
  - Hormones reach circulation & act on:
    - Other glands
    - Target organs
- Adrenal glands-cortisol
- Gonads- sex hormones
- Thyroid
  - Hormones that can affect entire body
- Parathyroid- parathyroid hormone
- Pancreas- insulin, glucagon

### Thyroid Gland Hormones

- Thyroid produces thyroxine (T4)= 90% and triiodothyronine (T3)=10%
- The liver, kidneys convert T4 into the more biologically powerful & rapidly acting T3
- Thyroid hormones increase:
  - Heart rate
  - Body temperature
  - Mood, alertness
  - Protein production
  - Lipid metabolism
  - Overall metabolic rate

### Negative Feedback and Hormone Levels

- Negative feedback limits the duration & effects of hormone release
- When hormone levels fall too low, body detects & stimulates production
- Feedback system curtails the effects of hormones, maintains homeostasis

### Thyroid Gland Anatomy

- Butterfly shaped gland located on anterior larynx
- Follicles are the sub-unit that produces thyroid hormones
- Each follicle filled with colloid, site of thyroid hormone synthesis
- Follicles richly supplied by fenestrated capillaries
- Iodine
  - Critical to synthesis of hormones
  - Absorbed from circulation by follicles
  - The only cells in the body able to absorb iodine

### Bio-synthesis of Thyroid Hormones T3 & T4

- TSH reaches follicle via circulation- stimulates hormone biosynthesis
- Follicle epithelial cells transport iodide into colloid
- Thyroglobulin binds iodide to form T3 & T4
- T3 & T4 released into circulation – act on target organs-produce desired effects

### Functions of Thyroid Hormones

- Support growth & development, especially in the embryo & brain
- Help regulate internal thermostasis, particularly in the young
- Help maintain metabolic energy balance
  - Increases number & size of mitochondria
  - Increases enzymes - electron transport chain
  - Increases Na<sup>+</sup>/K<sup>+</sup> ATPase activity

### Effects of Thyroid Hormones

- Increase basal metabolic rate
- Stimulate fat mobilization
  - Increase concentrations of fatty acids in plasma
  - Lower cholesterol
- Stimulate carbohydrate metabolism
- Stimulate protein synthesis
- Increase heart rate, cardiac contractility and cardiac output
- Increase alertness, positive mental state
- Generally excitatory for normal cellular functions including heart muscle

### Thyroid Diseases

- Affect @ 20 million Americans; mostly females (NWHIC)
- Prevalence of approximately 1 in 13 or 7.35% of general US population
- Undiagnosed prevalence rate in USA: approx 1 in 20 (13 million people)
- Lifetime risk for thyroid disorders: 1 in 8 women during their lifetime

### Risk Factors for Developing Some Form of Thyroid Disease

- Gender:
  - Women are five to eight times more likely to suffer from a thyroid disorder than men. .
  - Women have a higher risk of developing a thyroid disorder with increasing age
- Age:
  - Individuals over 50 have the highest risk of thyroid disease
  - A man's risk of developing thyroid disease increases after passing age 60.
- Radiation exposure
  - Above the head and neck region during childhood increases the risk of thyroid disease.

### Hypothyroidism

- Second most common endocrine disorder in the United States (diabetes is #1)
- Thyroid gland produces reduced levels of thyroid hormones
- Body functions at a lower metabolic rate.
- Can contribute to heart disease
  - Increased amount of LDL (bad) cholesterol circulating in the blood

## Complications of Hypothyroidism by Frequency of Occurrence

Sign or symptom	Affected patients (%)
• Weakness	99
• Dry or coarse skin	97
• Lethargy	91
• Slow speech	91
• Eyelid edema	90
• Heat intolerance	89
• Decreased sweating	89
• Cold skin	83
• Thick tongue	82
• Facial edema	79
• Coarse hair	76

## Hypothyroidism

- Hypothyroidism occurs in about
  - 5% of the adult population of Australia
  - 4.78% million people in USA
  - Most common cause of hypothyroidism is autoimmune chronic lymphocytic thyroiditis
- Thyroid gland produces reduced levels of thyroid hormones
- Body functions at a lower metabolic rate.
- Can contribute to heart disease
  - Increased amount of LDL (bad) cholesterol circulating in the blood

## Hypothyroidism

- Epidemiology (4.1F/ 1000y & 0.6M/1000/y)
- Pathophysiology
  - Iodine deficiency disorders –rare in USA today
    - Before the 1920s, common in the Great Lakes, Appalachian, Northwest, and Canada
    - Endemic goiter- enlargement 2nd to iodine deficiency
    - Endemic cretinism- IQ reduction @ 15 points
- Surgical ablation- primarily for cancer
- Hashimoto's thyroiditis

## Hashimoto's Thyroiditis

- First described in 1912 by Dr. Hakaru Hashimoto
- Autoimmune disease
  - The immune system attacks & ultimately destroys thyroid gland
- Gender: 5-10 times more common in women
- Occurs in 3.5 females and 0.8 males per 1000 per year

## Hypothyroidism: Hashimoto's Thyroiditis

- Autoimmune disease
- Histological findings
  - Thyroid-specific lymphocytes attack & infiltrate the thyroid
    - Lymphoid cellular infiltration
    - Follicular epithelial cell destruction
    - Reduction in colloid
    - Fibrosis, scarring
    - Process eventually "burns out," but the patient has little or no functional tissue remaining

## Hashimoto's Thyroiditis

- Complement system
  - Composed of about 25 proteins that work to "complement" the activity of antibodies
  - Helps to rid the body of antigen-antibody complexes.
  - Induces an inflammatory response.
  - Destroy bacteria, either by facilitating phagocytosis or by lysing the bacterial cell
  - May attack self as well

### Signs & Symptoms Hashimoto's Disease

- Fatigue
- Depression
- Modest weight gain
- Cold intolerance
- Excessive sleepiness
- Dry, coarse hair
- Constipation
- Dry skin
- Muscle cramps
- Elevated cholesterol
- Reduced concentration
- Vague aches & pain
- Pre-tibial edema

### Hashimoto's Thyroiditis

- Lab Tests
  - Elevated thyroid stimulating hormone (TSH)
  - Low thyroid hormone (T3 & T4)
  - Anti-thyroid antibodies that act against *thyroperoxidase* (TPO)

### Thyroid Test Interpretation

Test / Name	Normal Range	Interpretation
TSH- Thyroid stimulating hormone (serum thyrotropin)	0.3 to 3.0 (as of 2003)	Under .4 can indicate possible hyperthyroidism. Over 6 is considered indicative of hypothyroidism.
Total T4 (serum thyroxine)	4.5 to 12.5	Less than 4.5 can be indicative of an underfunctioning thyroid when TSH is also elevated. Over 12.5 can indicate hyperthyroidism. Low T4 with low TSH can sometimes indicate a pituitary problem
Free T4 / (free thyroxine)	0.7 to 2.0	Less than 0.7 considered indicative of possible hypothyroidism
T3 / (serum Triiodothyronine)	80 to 220	Less than 80 can indicate hypothyroidism.

### Thyroiditis: Other Tests

- Imaging: Thyroid syntigraphy
  - Scan the thyroid & pick up images highlighted by small amounts of radioactive substances
- Fine needle biopsy
  - Rule out thyroid cancer
- MRI
  - Rule out thyroid cancer

### Protein Binding, Hormones, and Medications

- Circulating blood proteins (1° albumin) bind to some medications & hormones
- Any molecule bound to protein is INACTIVE and cannot exert an effect
- Any condition that causes a reduction in blood proteins can influence the active fraction of medication or hormone

### Management of Hypothyroidism

- Thyroid hormone replacement therapy (levothyroxine)
  - Synthroid
  - Levoxyl
  - Generics
- May cause increases in resting heart rate and blood pressure
- Dosage depends on TSH levels
  - PCP, internist titrate dosing based on levels of unbound hormone reported by the lab

### Hyperthyroidism

- Thyroid gland produces excessive T3 & T4
- Increases the rate at which cells function- accelerates metabolic rate of the body
- Symptoms & complications of hyperthyroidism
  - Nervousness
  - Decreased menstrual flow
  - Weight loss
  - Irregular heartbeat
  - Infertility and miscarriage
- Graves' Disease- autoimmune disease affecting thyroid gland metabolism

### Thyroid Diseases: Hyperthyroidism

- Hyperthyroidism
  - Incidence = 0.8F, <0.1M/1000/year
  - Grave's disease (autoimmune thyrotoxicosis)  $\geq$  prevalence of DM
    - First described 1835-Dr. Robert Graves
  - Triad of
    - Goiter- swelling of thyroid gland
    - Exophthalmos
    - Hyperthyroidism
  - Most common cause of hyperthyroid and diffuse goiter
- Thyrotoxicosis of pregnancy (5-10% of females postpartum)- self limiting

### Pathogenesis of Graves' Disease

- A thyroid-specific autoimmune disorder
- Plasma cells make antibodies to the thyroid-stimulating hormone receptor (TSHR)
- Auto-antibodies are not subject to negative feedback
- Unlimited thyroid hormones are produced, released into circulation

### Graves' Disease

- Genetic predisposition for Graves' disease
- Ocular manifestations of Graves' disease more common & severe in smokers
- Treatment = ablation of thyroid gland
  - Radioactive iodine (I-131)
  - Thyroidectomy
- Will requires supplemental T3, T4

### Thyroid Gland Neoplasms

- Thyroid neoplasia (most common endocrine neoplasms)
- Benign enlargement
- Malignancies

### Thyroid Associated Eye Disease (TAED)

- Dry eye (with hyperthyroid and hypothyroid)
- Ophthalmopathy
  - Upper lid retraction (Dalrymple sign) #1 sign
  - Proptosis
  - Compressive neuropathy
  - Visual field loss
  - Diplopia
- 20% of patients state ocular morbidity of TAED more troublesome than thyroid disease

### Thyroid Associated Eye Disease

- Due to inflammatory cells and/or increased fluid within the orbital tissues
  - Impairs function of glandular tissues
  - Causes compression, scarring of ocular structures
- Thyroid gland does not cause thyroid associated eye disease
  - Thyroid gland, eye muscles, lacrimal gland, & pretibial skin especially subject to autoimmune DZ
- Thyroid ablation with orally PO ingested radioactive iodine may actually exacerbate TAED

### Ocular Complications of Thyroid Associated Eye Disease (TAED)

- 20% of patients state ocular morbidity of TAED more troublesome than thyroid disease
- Dry eye (with hyper and hypo thyroid disease)
- Ophthalmopathy
  - Upper lid retraction (Dalrymple sign) #1 sign
  - Proptosis
  - Compressive neuropathy
  - Visual field loss
  - Diplopia

### Thyroid Associated Dry Eye

Gilbard JP, Farris RL. Ocular surface drying & tear film osmolarity in thyroid eye disease. *Acta Ophth* 1983

- Evaluated 17 patients w/ Graves' DZ
- 94% had dry eye symptoms
- 42% had increased tear film osmolarity
- Increased palpebral fissure width
  - Rose bengal staining proportional to PFW
- Increased blink rate associated w/ Rose bengal staining

### Thyroid Disease Related Dry Eye

- Eckstein AK et al. Dry eye syndrome in thyroid-associated ophthalmopathy: lacrimal expression of TSH receptor suggests involvement of TSHR-specific antibodies. *Acta Ophth* 2004
- Compared 48 patients w/ thyroid associated ophthalmopathy to 26 controls
  - Increased surface damage (Rose bengal)
  - Reduced tear secretion
  - Increased ocular surface
  - BUT 3 seconds vs. 19 seconds in controls
  - Lacrimal acinar cells expressed TSH receptor

Dias AK. *et al.* Influence of Thyroid Hormone on Thyroid Hormone Receptor -1 Expression and Lacrimal Gland and Ocular Surface Morphology *Invest Ophth. Vis Sci.* July 2007

- Induced hypothyroidism in male rats
- 10 weeks later rats were euthanized & tissues were evaluated:
- Lacrimal gland weight was significantly lower in study animal
  - ACh was significantly lower- reduced neuronal input may cause reduced production
- Schirmer test; Control 8.0 mm Study 3.2 mm
- Impression cytology: higher Thrb in study

Dias AK. *et al.* Influence of Thyroid Hormone on Thyroid Hormone Receptor -1 Expression and Lacrimal Gland and Ocular Surface Morphology *Invest Ophth. Vis Sci.* Jul 2007

- CONCLUSIONS:
  - Lacrimal gland is a target organ for TH
  - TH induces protein synthesis, cell proliferation, & lipid production
  - Chronically reduced levels of TH lead to biochemical and structural changes
    - Reduced tear production
    - Reduced lipid metabolism
  - Hypothyroidism increase oxidative stress

## Managing Thyroid-Associated Dry Eye

- Well designed artificial tears
  - Goebels & Spitzmas- NO BAK
- Blink Tears- feels good, duration may be a problem
- Soothe- contains a lipid component for reduction of evaporative dry eye
- Systane Ultra- lasts up to 90 minutes in the eye & does not contain CMC
- Restasis- Excellent front line therapy for thyroid-associated dry eye
  - Expect a three month lag between TX & improvement

## Current OTC Dry Eye Therapy

- Contain various active and inactive agents
- Patients view products as interchangeable
- Differing mechanisms of action and efficacies
- A need exists for clear sub-categories

## Qualities of an Ideal Dry Eye Product

- Minimal blur
- Comfort upon instillation\*
- Ability of product to spread evenly over the cornea quickly and efficiently
- Prolonged retention time for extended efficacy\*
- Objective and subjective improvement in patient signs and symptoms

\*Report of the Definition & Classification Subcommittee of the International Dry Eye Workshop (2007). Ocular Surface 2007;5:165.

## Cyclosporine & TAED

- Wang J, et al. Immunosuppressive therapies in patients with Graves' ophthalmopathy Chinese Journ Int Med 2004
- "a significant decrease ( $P < 0.01$ ) in the mean score of the CsA group has also been shown at the end of the course."
- Tell patients it will take 3 months or more
- Write Rx to enable patient to get two trays with one co-pay

## Restasis Case Study: Sue

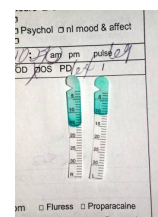
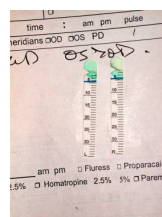
Sue, 65 yo female

- Hyperthyroidism
- Va 20/20 – OU
- Meds: Synthroid
- External
  - Lissamine green stain OU

## Restasis Case Study: Sue

Baseline Schirmer's

3 month Schirmer's





### Restasis

- Minimum time for clinical effect = 1 month
- Benefit continues to increase for up to 6 months
- Does not work on "burned out" lacrimal glands
- Can use same vial for both am and pm dosing to reduce cost
- Does not help all patient w/ OSD
  - Minimal benefit med-induced OSD
- Beneficial in some MGD cases

### TA Dry Eye & Punctal Occlusion

- Positive prognostic indicators
  - Moderate to adequate aqueous layer
  - Minimal inflammatory indicators
    - Anterior blepharitis and or posterior blepharitis
    - Meibomian gland & lid margin scarring
- Negative prognostic indicators
  - Minimal to no aqueous layer
  - Significant inflammatory indicators
    - Anterior blepharitis and or posterior blepharitis
    - Meibomian gland & lid margin scarring
    - Lid configuration issues
      - Punctal ectropion

### Traditional Therapeutic Options Punctal Occlusion

- Punctal occlusion is not perfect!
  - Tear film osmolarity may not improve
  - Some plug designs tend to rub on the conjunctiva
  - Plugs fall out 22% of time- Willis et al
  - Punctal plugs work if the patient is producing tears, but otherwise have very limited value
  - The "cesspool effect"

### Punctal Occlusion

#### Conventional wisdom

- When using collagen implants as a diagnostic test, it is only necessary to occlude the lower puncta.
- Because of the effects of gravity, the lower canaliculus is the only one that matters; occlude it and forget the upper punctum.

Lemp M. & Weller H. How do tears exit?  
Invest Ophth & Visual Science. May 1983

Tears exit in equal volumes through upper, lower puncta

- Instilled black 15um plastic spheres into tears and photographed them exiting the eye using high speed photographic techniques
- Confirmed negative pressure @ upper and lower puncta: an active mechanism
- "...in order to preserve tears in the treatment of dry eye, it is necessary to occlude both the superior and inferior puncta."

Ogut M. et al Assessment of tear drainage by fluorescein dye disappearance test after experimental canalicular obstruction. Acta Ophthalmologica 1993

- Compared tear outflow in lower and upper canaliculus
- No outflow impairment if upper or lower alone was occluded
- Marked difference if both were occluded
- Conclusion "...both upper and lower canaliculus have equal importance in tear drainage"

## Punctal Occlusion

### Temporary Collagen Implants

- *Excellent diagnostic tool*
- Available in 0.3 and 0.4 diameters
- Use the largest size possible; dilate puncta if necessary to get maximum occlusion
- Dissolve in 3-5 days
- Occlude both lowers and uppers
- Phone progress 3-5 days

## Punctal Occlusion: Our Options

- Eagle Vision (Freeman) type plugs
- Parasol (Odyssey Medical) type plug
- Intracannalicular (Herrick) type plugs
- Medennium plugs
- Flow restrictors
- Laser occlusion- 14% closure after 13 to 21 months
- Thermal occlusion- 60% of superficial occlusions open within one year
- Three month plugs

## Punctal Occlusion

### Parasol Plugs

- Available in bulk, non-sterile
- Can be loaded and disinfected prior to insertion
- Cost makes them very attractive
- Design prevents rubbing of dome against conjunctiva in most cases.
- Available in small, medium, & large

## Herrick Punctal Occluders

- Intracannalicular
- Now opaque, so presence is verifiable
- Can be irrigated out if necessary
- Great choice for patients with puncta that roll inward
- More expensive than most brands
- Reported to have increased potential for secondary canaliculitis

## Complications of punctal plugs

- Epiphoria
  - Remove one
  - Try flow restrictors
- Extrusion
- Canaliculitis
- Irritation
- Rubbing on conjunctiva

## Punctal Occlusion

### What works?

- All silicone plugs will work for some patients some of the time
- Patients with elevated puncta or "rolled in" puncta are good candidates for intracannalicular plugs
- Consider "flow restrictors" in borderline cases, second plug in eye already plugged
- Consider Parasol plugs as your primary plug
- May need to occlude top and bottom puncta, but not on the same day!!!

### Practical Stuff:

#### Advanced Punctal Plug Procedures

- When Parasol type plugs rub on conjunctiva: Patients Complain!
  - “Tamp down” (usually lasts one day)
  - Remove portion of the “cap” or “flange” rubbing on conjunctiva
    - Rotate modified rim toward eye
  - If necessary, remove and replace with Herrick type plug

### In patients with history of “rubbing plug”

- Go to Herrick type plug on second eye
- Use Medennium plugs
- Pre-trim Parasol cap to reduce likelihood of same problem on the second eye
- Last option; consider referral for cautery

### Thyroid Disease and Microbial Keratitis

Keay L, Edward K, & Stapleton, F. Signs, Symptoms, and Comorbidities in Contact Lens-Related Microbial Keratitis. Optom Vis Sci :July 2009

- ⊙ Evaluated relationship between signs, symptoms, and risk factors for CL-related MK
- ⊙ Thyroid disease associated with a > 2-fold increase in risk for MK

### TAED: Lid Lag and Retraction

- Mechanisms:
  - Proptosis
  - Sympathetic drive of Müller muscle
  - Upgaze restriction
  - Fibrosis of the levator
  - Contralateral ptosis (myasthenia)
- Increased surface area > dry

### Lid Lag and Retraction

- May change significantly over time
- Obtain (and bill for) baseline photos for future reference
- Work with a competent and conservative lid specialist
- Protect the anterior surface from dryness secondary to exposure
- Lid lag on down gaze (von Graefe sign)
  - Slowly move the fixation object from upward to downward
  - Observe whether or not eyelid lags behind the globe on down gaze

### Medical-Surgical Management

- Botulinum toxin injections
  - Duration @ 3 months-40 months
  - Complications
    - Ptosis
    - Diplopia
- Surgery
  - May use weights or relaxing procedure to reduce lid lag
  - Delay consultation until stable

### Thyroid Associated Ophthalmopathy (TAO)

- Pathogenesis
  - Lymphocytic infiltration of the orbital tissue causes release of cytokines i.e. interleukin 1
    - Cytokines activate previously quiescent fibroblasts to secrete hyaluronic acid, a glycosaminoglycan
    - Doubling of hyaluronic acid content in orbital tissue increases the tissue osmotic load 5-fold
    - Osmotic damage results in muscle edema
- May occur despite well controlled hyperthyroidism
- Usually has a self-limited course over one or more years.
- Strongly associated with smoking

### TOA: Differentials & Dx

- Differentials:
  - Orbital cellulitis
  - Cavernous sinus fistula
  - Sarcoidosis
  - Metastases
  - Lymphoma
- CT and MRI
  - Not necessary if the Dx of TAO can be established clinically
  - If these studies are required, obtain axial and coronal views.

### Thyroid Associated Ophthalmopathy (TAO)

- Goals of therapy
  - Cosmetic (disfiguring proptosis, exophthalmos, strabismus)
  - Functional (reduce dryness, diplopia)
  - Sight preservation (compressive optic neuropathy)
- Approx 5% of TAO patients require surgery

### TAO & Strabismus

- Most commonly presents as hypotropia or esotropia
  - EOMs most frequently affected are inferior rectus and medial rectus
    - Edema leads to shortening of muscle
- Surgical correction
  - Goal of surgery-to minimize diplopia in the primary and reading positions
  - Multiple strabismus surgeries and prisms may be required
  - Wait until stable if possible

### TAO & Lifestyle Changes

- Frequent use of artificial tears: NO BAK preserved products
- Smoking cessation to decrease the risk of congestive orbitopathy
- Sleeping w/ the head of the bed elevated may decrease morning lid edema

### Exophthalmopathy

- Compressive optic neuropathy
  - Blurry vision, visual loss
  - Dyschromatopsia
  - Field loss
  - Management:
    - Educate patient on possible complications
    - Monocular VA self check
    - See on regular basis and follow fields, serial photos
    - Baseline CT scan
- Optic nerve decompression
  - History and approaches
  - Current preferred technique
  - Potential complications

## Optic Nerve Decompression

- Surgery generally delayed until after the inflammatory phase
  - May be forced to operate sooner if vision loss is present
- Two orbital walls decompressed
  - Traditionally, the medial wall and floor of the orbit)
  - Decompression of the medial & lateral orbital walls is gaining popularity
- Three orbital walls decompressed

## TAO & Field Loss

- Kallmann R, Mourits M. Prevalence and management of elevated IOP in patients with Graves' orbitopathy. Br J Ophth 1998.
- Retrospective study of 482 pts with Graves's disease for
  - Use of glaucoma medication
  - IOP > 22 mm Hg
  - Glaucomatous or dysthyroid optic neuropathy VF loss
  - Glaucomatous cupping

Kallmann R, Mourits M. Prevalence and management of elevated IOP in patients with Graves' orbitopathy. Br J Ophth 1998.

- 23 (4.8%) met criteria
- 4 had Graves' orbitopathy + POAG
- 2 had DON- treatment w/ systemic steroids reversed VF defects & IOP lowered w/ topical timolol
- 1 had IOP 26-27 on timolol and VF loss that resolved w/ three wall decompression- IOP on timolol went too 14-15 mm Hg
- 2 patients showed 12 mm lowering of IOP after IR recession

Kallmann R, Mourits M. Prevalence and management of elevated IOP in patients with Graves' orbitopathy. Br J Ophth 1998.

### Conclusions

- IOP elevated in Graves' in upgaze secondary to:
  - Fibrosis and enlargement of inferior rectus
  - Resulting compression elevates episcleral venous pressure
- Compressive neuropathy leads to ON-related VF loss, but decompression is beneficial
- Pre-op VF defects in this study regressed or disappeared after decompression
- Risk for elevated IOP: Graves 3.9% Non 1.6%

## Cindy

- 38 year old female complains of recent onset:
  - Drooping eyelid OD
  - Discoloration of eyelid OS
  - Irritation OU
  - Mild weight gain
  - Hair loss
- Denies:
  - Diplopia
  - Field loss
  - Blurring of vision

## Lab Tests for Thyroid Function: "Thyroid Profile"

- T3 and T4 are highly protein-bound ; only unbound fraction is active
- Normal findings for unbound fraction
  - Free T3 = 0.3%
  - Free T4 = 0.03%
- TSH- if low, = reduced synthesis of T3 and T4
- TRAb- thyroid receptor antibodies\*

### Tentative Diagnosis

1. Hypothyroidism
2. Hyperthyroidism
3. Euthyroid Grave's disease
4. Thyroid tumor

### Cindy: Assessment

- Normal thyroid profile
- Lid lag and retraction OS
- Mild proptosis OS > OD
- EOM enlargement OS > OD
- Lid pigment changes OS
- Moderate dry eye OU

What is your diagnosis?

### Euthyroid Graves Disease

- "an autoimmune disease characterized by the signs and symptoms of thyroid eye disease in the absence of thyroid dysfunction."
- Typically have high levels of both stimulating and blocking TSH receptor antibodies (TRAb)
- Most patients with euthyroid Graves' disease develop lab-confirmed thyroid disease within 12-18 months of onset of eye symptoms

### The OD's Role

- Detection
  - High index of suspicion especially in females
  - Recent onset severe dry eye no other
  - Weight gain, loss, pretibial edema
  - Changes in mentation, personality
  - Obvious changes in lids, adnexae
- Consultation
  - Internist or endocrinologist
  - Send reports after your visits: (Forms in MS Word)
- Long-term care, reassurance, remediation

### Conclusion

- OD's may be the first health care providers with the opportunity to detect thyroid disease
- ODs may be the first health care providers to diagnose TAED
- Management of most patients with these conditions within our scope and expertise
- Have an index of suspicion for any patient who presents with the diverse signs & symptoms of TAED