

# ORBIT AND OPTIC NERVE DECOMPRESSION

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# ORBIT/OPTIC NERVE DECOMPRESSION HISTORICAL PERSPECTIVE

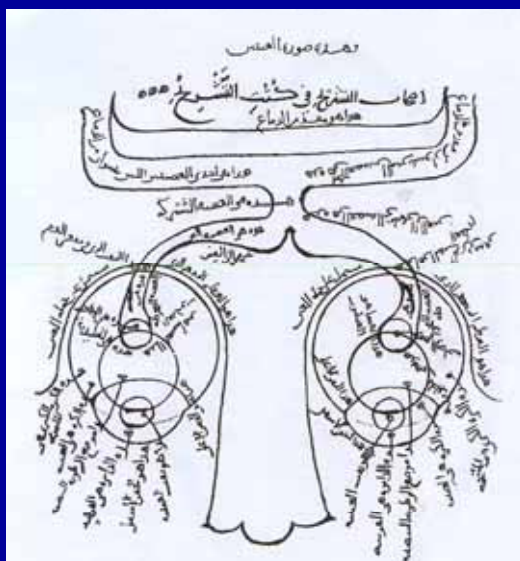
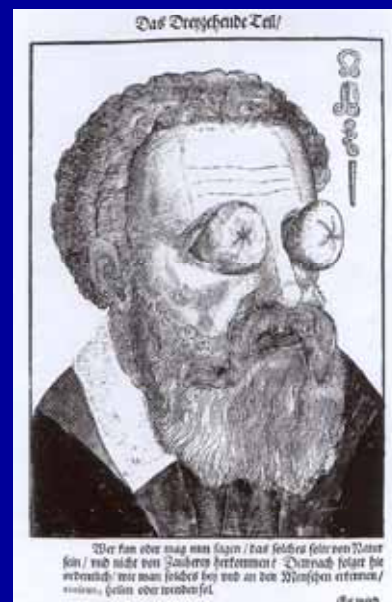


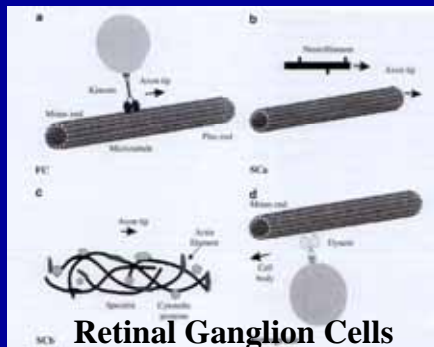
Figure 2 Diagram from *Kitāb al-manāzīr* (Book of Optics) by Ibn al-Haitham (Alhazen, c.965–1038), showing a chiasm—'the joining nerve'. The Sulimaniye Library (Fatih Collection), Istanbul, with kind permission. Professor MS and Dr M Ogüt kindly obtained this image.



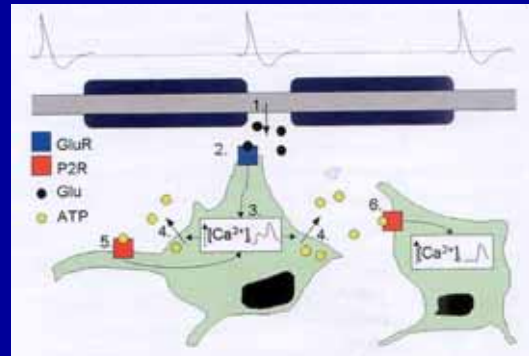
Wer kan oder mag man sagen / das selbes selbes Netz  
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 verweilt / wie man selbes bey und an den Menschen nitzen /  
 nitzen / gelien oder werden sol.



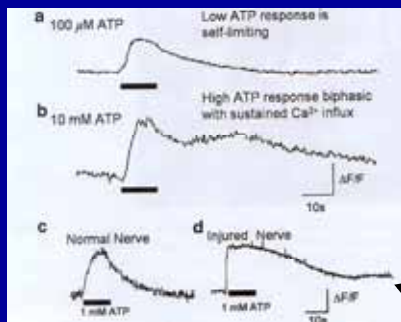
# ORBIT/OPTIC NERVE DECOMPRESSION NORMAL AND PATHOLOGIC OPTIC NERVE FUNCTION



**Retinal Ganglion Cells**



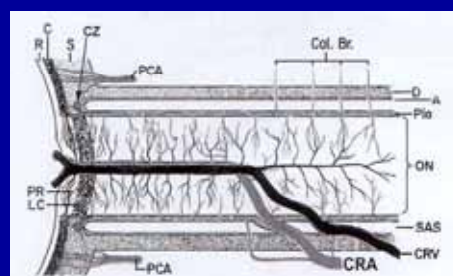
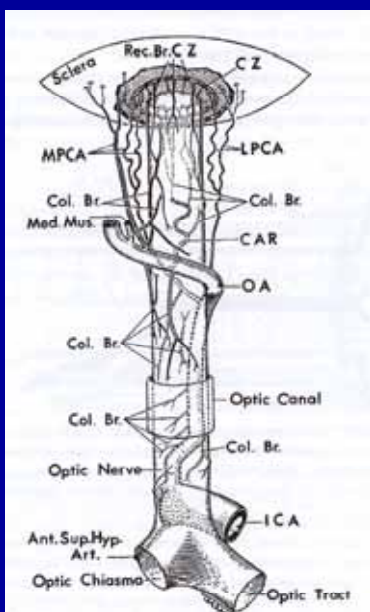
**Glutamate-and ATP-mediated signalling at optic nerve nodes of Ranvier. Process involves axons or astrocytes. Glutamate activates perinodal astrocytes which support axon activity (Butt, Eye, 2004).**



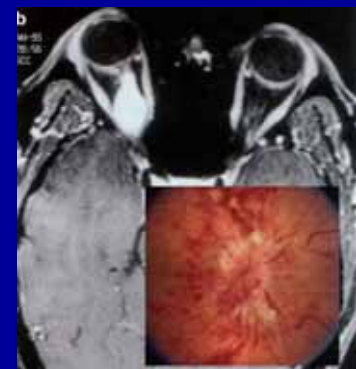
**ATP-Ca<sup>2+</sup>-signalling in nerve injury**



# ORBIT/OPTIC NERVE DECOMPRESSION NORMAL AND PATHOLOGIC VASCULAR FUNCTION



**Figure 7** Schematic representation of blood supply of the optic nerve. (Modified from Hayreh, SS Trans Am Acad Ophthalmol Otolaryngol 1974;78:OP240-OP254.) Abbreviations: A = arachnoid; Ant. Sup. Hyp. Art. = anterior superior hypophysial artery; C = choroid; CRA = central retinal artery; Col. Br. = col-lateral branches supplying the optic nerve pial plexus; CRV = central retinal vein; CZ = circle of Zinn and Haller; D = dura; ICA = internal carotid artery; LC = lamina cribrosa; LPCA = lateral posterior ciliary artery; Med. Mus. = medial muscular artery; MPCA = medial posterior ciliary artery; OA = ophthalmic artery; ON = optic nerve; P = pia; PCA = posterior ciliary artery; PR = prelaminar region; R = retina; Rec. Br. CZ = recurrent pial branches from peripapillary choroid/CZ; S = sclera; SAS = subarachnoid space.

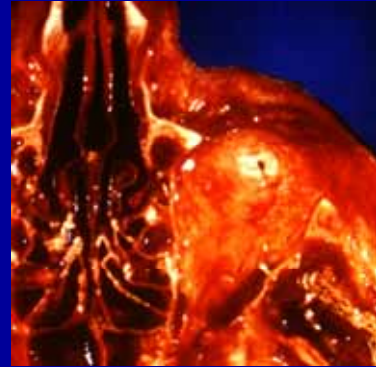


# ORBIT/OPTIC NERVE DECOMPRESSION

## PATHOGENESIS

### Orbitopathy

- Thyroid Eye Disease
- Increased Intra-orbital Pressure
  - Hemorrhage
  - Infection
  - Mass Lesion



### Optic Neuropathy

- Compressive Neuropathy
- Trauma
- Neuropathy Secondary to ICP↑



# ORBIT/OPTIC NERVE DECOMPRESSION

## PATHOGENESIS

### Orbitopathy

- **Thyroid Eye Disease**
  - Autoimmune
- Increased Intra-orbital Pressure
  - Hemorrhage
  - Infection
  - Mass Lesion

#### Anterior Orbit

- Cosmetic deformity, Corneal Ulceration, Lid Retraction

#### Posterior Orbit

- Optic Nerve Compression, Mixed Orbitopathy
- Results

### Optic Neuropathy

- **Compressive Neuropathy**
- Trauma
- Neuropathy Secondary to ICP↑





# ORBIT/OPTIC NERVE DECOMPRESSION

## SURGICAL INDICATIONS

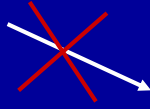
### Orbital Decompression

#### • Thyroid Eye Disease

- Failure of Medical Management and Disease Course (chemosis, diplopia, motility ↓, lid retraction, proptosis, vision ↓)

#### • Increased Intra-orbital Pressure

- Hemorrhage
- Infection
- Mass Lesion

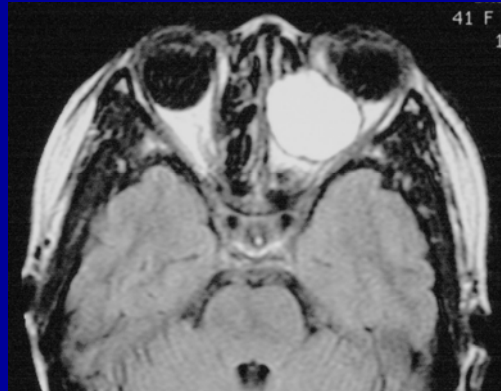


#### Anterior Orbit

- Cosmetic deformity, Corneal Ulceration, Lid Retraction

#### Posterior Orbit

- Optic Nerve Compression, Mixed Orbitopathy



# ORBIT/OPTIC NERVE DECOMPRESSION

## SURGICAL INDICATIONS

### Orbital Decompression

#### • Thyroid Eye Disease

- Failure of Medical Management



#### Anterior Orbit

- Cosmetic deformity, Corneal Ulceration, Lid Retraction

#### Posterior Orbit

- Optic Nerve Compression, Mixed Orbitopathy

#### • Results



# ORBIT/OPTIC NERVE DECOMPRESSION

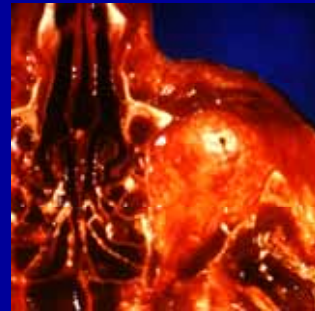
## SURGICAL INDICATIONS

### Optic Nerve Decompression

- **Compressive Neuropathy**
- **Trauma**

- Neuropathy Secondary to ICP↑

- Orbital Apex, Annulus of Zinn, Optic Canal
- Timing, Failure of Medical Therapy, Controversial
- Results



# ORBIT/OPTIC NERVE DECOMPRESSION

## SURGICAL APPROACH

### Orbital Decompression

- **Thyroid Eye Disease**

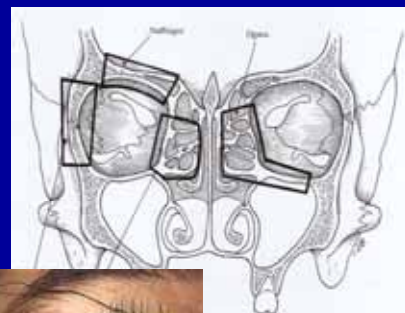
#### Anterior Orbit

- Cosmetic deformity, Corneal Ulceration, Lid Retraction

#### Posterior Orbit

- Optic Nerve Compression, Mixed Orbitopathy

- Superior Approach (*Naffziger*)
- Lateral Approach (*Kronlein*)
- Infero-medial (transantral)
- Medial/inferior (*Lynch*, Endoscopic combined)
- Transorbital (transcaruncular, orbital debulking)



# ORBIT/OPTIC NERVE DECOMPRESSION

## SURGICAL APPROACH SELECTION

### Orbital Decompression

#### • Thyroid Eye Disease

#### Indications/Evaluation

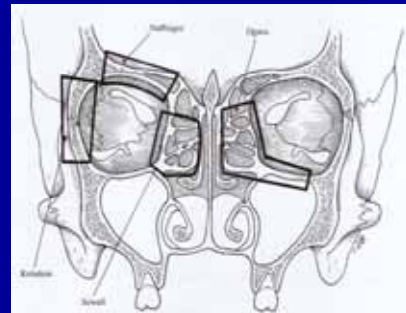
- Failure of Medical Management
- Time Course of Disease
- Corneal Ulceration
- Diplopia
- Hertel Exophthalmometry
- **Red Vision**
- Visual Acuity
- **Pupillary Response** (afferent pupillary defect)

#### Anterior Orbit

- Cosmetic deformity, Corneal Ulceration, Lid Retraction

#### Posterior Orbit

- Optic Nerve Compression, Mixed Orbitopathy



# ORBIT/OPTIC NERVE DECOMPRESSION

## SURGICAL TECHNIQUE

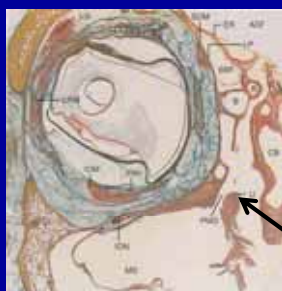
### Orbital Decompression

#### • Thyroid Eye Disease

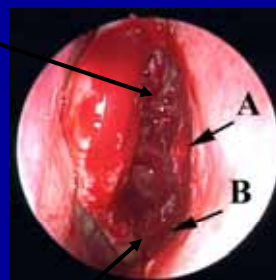
1

#### Antrostomy

- Complete Uncinectomy
- Large Antrostomy



Avoid herniation of orbit obstructing maxillary ostium



2

#### Ethmoidectomy

- Total Ethmoidectomy
- Avoid Frontal Recess



# ORBIT/OPTIC NERVE DECOMPRESSION

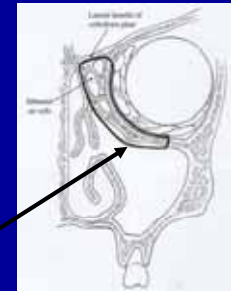
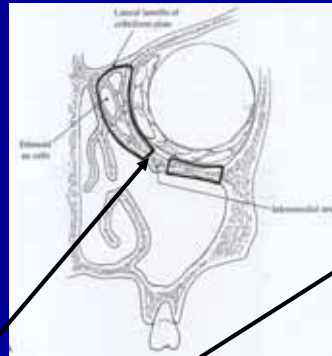
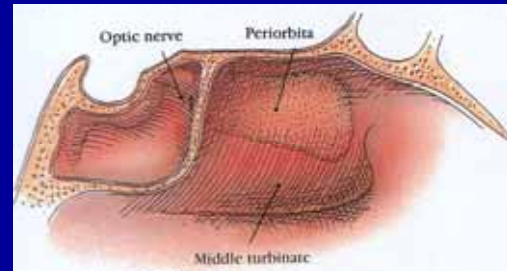
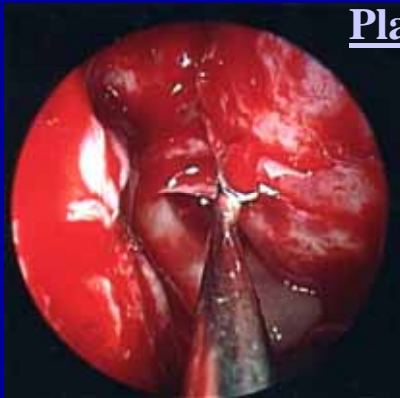
## SURGICAL TECHNIQUE

### Orbital Decompression

- Thyroid Eye Disease

3

### Removal of Orbital Plate



With and Without Preservation of Inferomedial Strut



# ORBIT/OPTIC NERVE DECOMPRESSION

## SURGICAL TECHNIQUE

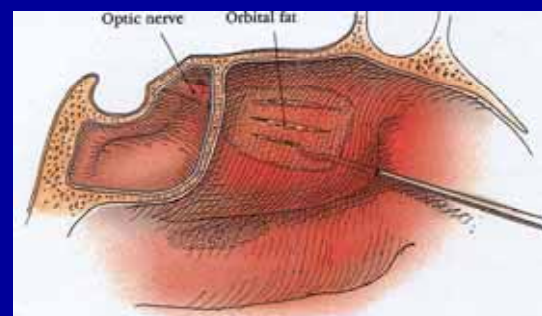
### Orbital Decompression

- Thyroid Eye Disease

4

### Incision Periorbital

- Performed After Optic Nerve Decompression





# ORBIT/OPTIC NERVE DECOMPRESSION

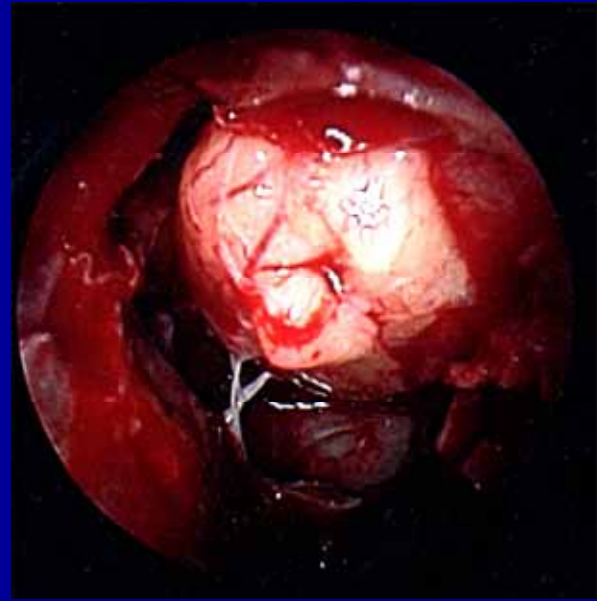
## SURGICAL TECHNIQUE

### Orbital Decompression

- Thyroid Eye Disease

5

Decompression Orbit  
[Play](#)



# ORBIT/OPTIC NERVE DECOMPRESSION

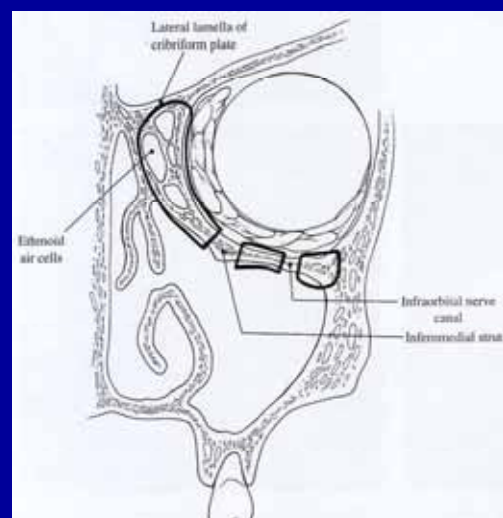
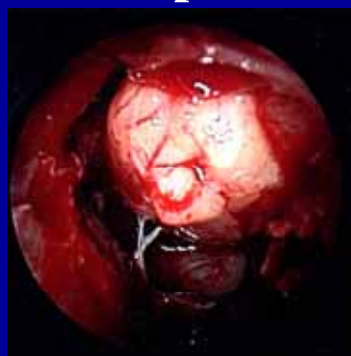
## SURGICAL TECHNIQUE

### Orbital Decompression

- Thyroid Eye Disease

6

Combined Endoscopic  
And Transconjunctival Orbital  
Decompression





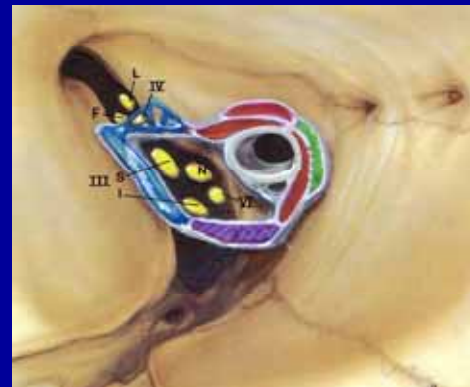
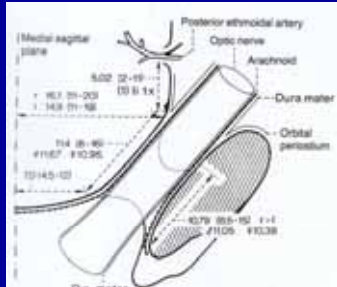
# ORBIT/OPTIC NERVE DECOMPRESSION

## SURGICAL CONSIDERATIONS

### Optic Nerve Decompression

- Compressive Neuropathy
- Trauma

- Orbital Apex, Annulus of Zinn, Optic Canal
- Timing, Failure of Medical Therapy, Controversial



1

Identification  
Orbital Apex

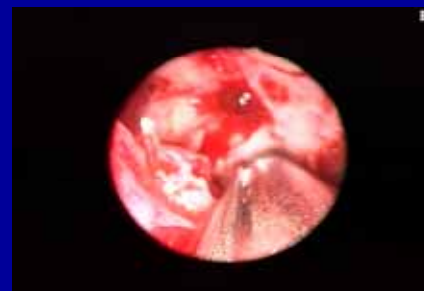


# ORBIT/OPTIC NERVE DECOMPRESSION

## SURGICAL TECHNIQUE

### Optic Nerve Decompression

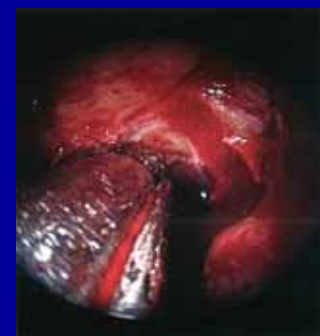
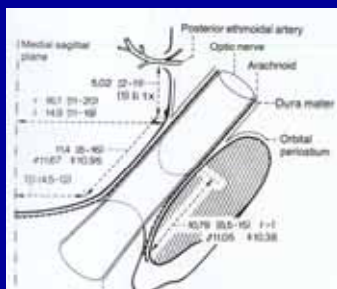
- Compressive Neuropathy
- Trauma



[Play](#)

2

Removal of Medial Optic  
Canal with Burr



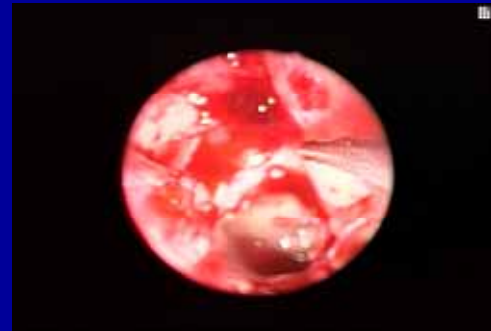
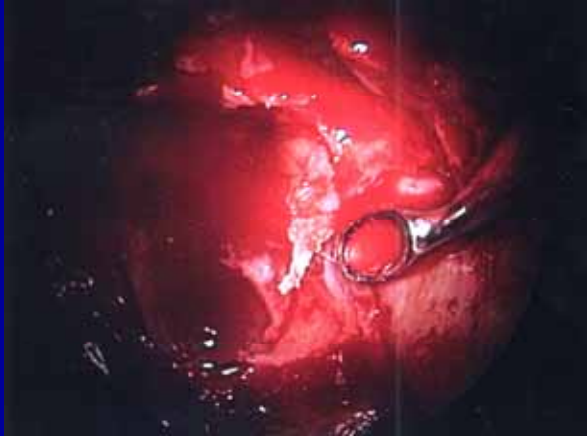
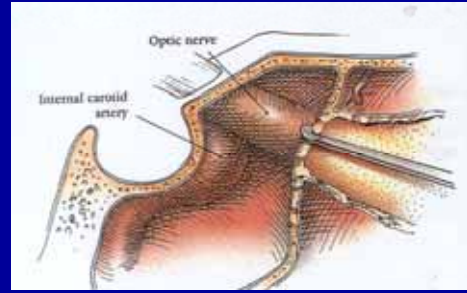
# ORBIT/OPTIC NERVE DECOMPRESSION

## SURGICAL TECHNIQUE

### Optic Nerve Decompression

- Compressive Neuropathy
- Trauma **3**

### Removal of Medial Optic Canal with Curette



[Play](#)



# ORBIT/OPTIC NERVE DECOMPRESSION

## RESULTS

### Orbital Decompression

- Thyroid Eye Disease

### Anterior Orbit

- +/- Cosmetic deformity

### Posterior Orbit

- Mixed Orbitopathy

|                  | $\Delta$ Hertel<br>mm | Visual Acuity     |
|------------------|-----------------------|-------------------|
| Garrity, N=428   |                       | 65% of < 20/20    |
| Michel, N=78     | 3.94↓                 | 0.5 to 0.75 lines |
| Metson, N=13/24* | 5.1/5.0*              |                   |

\*without periorbital fascial sling ↑29.3% diplopia



# ORBIT/OPTIC NERVE DECOMPRESSION

## RESULTS

**Orbital Decompression**  
**• Thyroid Eye Disease**

**N = 72 eyes, 41 patients**  
**from 1992-2001, 3-55 mos f/u,**  
*Laryngoscope 2003*

**Anterior Orbit**  
 • +/- Cosmetic deformity  
**Posterior Orbit**  
 • Mixed Orbitopathy  
**Optic Nerve Compression**

TABLE I.  
 Mean Percentage Change in Visual Acuity During the Postoperative Course in a Subset of Patients With Compressive Optic Neuropathy Compared With a Subset Without Preoperative Vision Loss.

| Time Periods        | Patients With Preoperative Compressive Neuropathy |                            |                                | Patients Without Preoperative Compressive Neuropathy |                            |                                |
|---------------------|---|----------------------------|--------------------------------|--|----------------------------|--------------------------------|
|                     | No.   | Visual Acuity* (mean ± SD) | Change Percentage† (mean ± SD) | No.  | Visual Acuity* (mean ± SD) | Change Percentage† (mean ± SD) |
| Preoperation        | 28  | 231.96 ± 263.52            | —                              | 44   | 54.30 ± 146.40             | —                              |
| Postoperation visit | 28  | 176.61 ± 245.94            | -4.21 ± 83.68                  | 44   | 67.48 ± 148.67             | 43.52 ± 108.03                 |
| One-month visit     | 28  | 58.93 ± 70.44              | -50.08 ± 35.50                 | 44   | 55.20 ± 146.03             | 8.26 ± 29.86                   |
| Final visit         | 28  | 51.43 ± 70.88              | -57.98 ± 32.28                 | 44   | 52.25 ± 146.40             | -0.74 ± 25.75                  |

$\chi^2$  Friedman = 58.97, df = 3, P < .001       $\chi^2$  Friedman = 18.408, df = 3, P < .001

\*Vision measured at a distance of 20 feet; eg, the upper left-hand column refers to 20/231.96 mean vision for this group of patients with a standard deviation of 263.52.  
 †The visual acuity change percentage was calculated by (following visit's visual acuity value - preoperation visual acuity value) ÷ preoperation visual acuity value × 100.  
 SD = standard deviation.



# ORBIT/OPTIC NERVE DECOMPRESSION

## RESULTS

**Orbital Decompression**  
**• Thyroid Eye Disease**

TABLE II.  
 Percentage Change in Visual Acuity Lines During Postoperative Course.

|                     | Vision Loss at Preoperation |         | Not Vision Loss at Preoperation |         |
|---------------------|-----------------------------|---------|---------------------------------|---------|
|                     | No. (28)                    | Percent | No. (44)                        | Percent |
| Postoperation visit |                             |         |                                 |         |
| Visual lost         | 5                           | (17.9)  | 18                              | (40.9)  |
| No vision change    | 9                           | (32.1)  | 22                              | (50.0)  |
| 1-5 lines improved  | 13                          | (46.4)  | 4                               | (9.1)   |
| ≥6 lines improved   | 1                           | (3.6)   | 0                               | (0.0)   |
| One-month visit     |                             |         |                                 |         |
| Visual lost         | 1                           | (3.6)   | 15                              | (34.1)  |
| No vision change    | 3                           | (10.7)  | 21                              | (47.7)  |
| 1-5 lines improved  | 15                          | (53.6)  | 7                               | (15.9)  |
| ≥6 lines improved   | 9                           | (32.1)  | 1                               | (2.3)   |
| Final visit         |                             |         |                                 |         |
| Visual lost         | 1                           | (3.6)   | 8                               | (18.2)  |
| No vision change    | 2                           | (7.1)   | 23                              | (52.3)  |
| 1-5 lines improved  | 13                          | (46.4)  | 14                              | (31.8)  |
| ≥6 lines improved   | 12                          | (42.9)  | 1                               | (2.3)   |

Note: Fisher's exact test (two-tailed): Vision loss at preoperation: post-operation vs. 1-month visit: P = .00527; postoperation vs. final visit: P = .00454; 1-month visit vs. final visit: P = .857.  
 Not vision loss at preoperation: postoperation vs. 1-month visit: P = .578; postoperation vs. final visit: P = .00287; 1-month visit vs. final visit: P = .083.

**Anterior Orbit**  
 • +/- Cosmetic deformity  
**Posterior Orbit**  
 • Mixed Orbitopathy  
**Optic Nerve Compression**

**Results**

- Visual Acuity ↑ 89.3% with compressive neuropathy (p>.0005), ↑ 34.1% without
- Proptosis ↓ 3.65 mm
- 20 pt. preop diplopia, 1 pt. diplopia ↑, 4 pt. diplopia ↓
- 0 pt. sunsetting

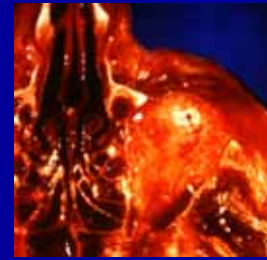


# ORBIT/OPTIC NERVE DECOMPRESSION

## RESULTS

### Optic Nerve Decompression

- Compressive Neuropathy
- **Trauma**



|   |   |
|---|---|
| Sofferman, Warner, Kountakis, Guyer, Knox, Luxenberg                          | Multiple approaches and timing, variable results  |
| Levin, Int. Optic Nerve Trauma Study Group, N=133, Multiple Variables         | 32% surgery, 57% untreated, 52% steroids ↑visual acuity, p=0.22 within 7 days of injury |
| Rajiniganth, N=44 when vision unchanged or ↓ after steroid, compression by CT | 70% ↑visual acuity with surgery < 7 days, 24% with surgery > 7 days                     |



# ORBIT/OPTIC NERVE DECOMPRESSION

## CONCLUSIONS

### Orbitopathy

- **Thyroid Eye Disease**
- Increased Intra-orbital Pressure
  - Hemorrhage
  - Infection
  - Mass Lesion

### Optic Neuropathy

- **Compressive Neuropathy**
- Trauma
- Neuropathy Secondary to ICP↑

