Inferior oblique muscle operations
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Surgical options

M. Parks

**Goal: to weaken or to change function**
- **Myotomy**
  - **Advantage:** simple
  - **Disadvantage:** high recurrence rate
- **Myectomy**
  - **Advantage:** swiftness
  - **Disadvantage:** recurrence
- **Disinsertion**
  - **Advantage:** simple
  - **Disadvantage:** recurrence; better when combined with myectomy
- **Recession**
  - **Advantage:** lower recurrence rate; good for reoperations
  - **Disadvantage:** more time consuming; more complicated for performance
- **Denervation**
  - **Advantage:** for extremely overacted IO
  - **Disadvantage:** difficult; postop mydriasis 3-6 m; IOUA

IO weakening procedures

- 370 pts with bilateral IOOA
- 4 groups
  1gr 150 pts with bilateral recession
  2gr 100 pts – LE recess; RE disinsertion
  3gr 20 pts – LE recess; RE nasal myectomy
  4gr 100 pts – LE recess; RE myectomy

Results

<table>
<thead>
<tr>
<th></th>
<th>Underaction</th>
<th>Overaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Myectomy</strong></td>
<td>8%</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Disinsertion</strong></td>
<td>3%</td>
<td>53%</td>
</tr>
<tr>
<td><strong>Myectomy</strong></td>
<td>0%</td>
<td>79%</td>
</tr>
<tr>
<td><strong>Recession</strong></td>
<td>4%</td>
<td>15%</td>
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</tbody>
</table>

Results

- IO is superior to other surgeries
  +2 +3 IOOA- 83% perfect result
  +4 IOOA- 78% perfect; 21% undercorrection
- Recession should be titrated
- Identical recess on eyes with asymmetrical IOOA produces symmetrical results
Parks’ recession

IO anterior transposition

- Suturing IO with 1 suture augments recession and decrease torsion
- Neurovascular bundle acts as an origin and functional tether

IOAT
- Park’s recession 8-10mm (c)
- Alan Scott IOAT (B)
- Mims and Wood IOAT (A)

Bilateral IOAT by Mims and Wood
- 61 children after IOAT
- 60 children without IOAT
- 1 recurrent IOOA
- 1 need for DVD surgery

Conclusion: - IOAT is effective for IOOA with low incidence of need for reoperation
- IOAT is effective in reduction or prevention of DVD

A.Ziffer, S. Isenberg...
The comparison of bilateral IOAT and recession
- 36 pts - bilateral IOAT
  - IO function -25* (n=35-40*)
- 14 pts - bilateral IO recession
  - 10mm- IO function is 31*
  - 14mm- IO function is 38*
- IOAT - significant weakening effect for IO
  - reduces upgaze
- 10mm recess more powerful than 14mm recession

R Muchnick, D.McCullough...
Unilateral IOAT vs unilateral 14mm IO recession
- 5 pts – IOAT
  - Mean reduction of HT in PP – 12 pd
  - Mean deviation in the field of IO – 2 pd
  - hypo (change 23 pd)
  - 4 units reduction in ductions (+2.5 to -1.5)
- 4 pts - 14mm recession
  - Mean reduction of HT in PP – 11 pd
  - Mean deviation in the field of IO – 3 pd
  - hyper (change 22 pd)
  - 3 units reduction in ductions (+3 to +0.5)

Both procedures are effective
- Both did not show overcorrection in PP
A. Guemes, K. Wright
Graded IOAT

- **2 pts**: 14- bilateral IOOA
- **6 pts**: 4- DVD
- **3**: unilateral IOOA
- 89% normal versions, 11% +/- 1 IO
- 9/11 (post 2mm IOAT)- N versions
- 0% limited elevations
- V-pattern resolved in 100%
- Change in PP: V-pattern resolved in 100%
- 9/11
- 7% mild IOOA
- 14% mild IOOA
- 9% mild IOOA
- 15 pd for 3mm
- 2 pts with DVD- no DVD (6-10pd improv)
- 2pts with DVD- small DVD (7-10pd improv)

Wright K.
The system of graded IOAT

- **Primary IOOA**
  - Versions:
    - +4 - full IOAT (to the IR insertion)
    - +3 - 1mm posterior
    - +2 - 3-4mm posterior
    - +1 - 4mm post and 2mm temp
  - For bilateral asymmetric IOOA- 2mm difference
- **DVD with IOOA**
  - 10:15 pd - full IOAT
  - +10 pd - 1-2mm posterior
- **Unilateral SOP**
  - 15:20 pd HT in PP with +3IOOA - unilateral IOAT 1-2 mm posterior

D. Bacal, L. Nelson
IOAT for DVD and/or IOOA

- **55 patients**: 39 bilateral
  - 29- DVD and IOOA
  - 31- only IOOA
  - 1- only DVD

- **Results**
  - IOOA:
    - +4 (42pt) - 86% no IOOA
    - 14% mild
    - +3 (34pt): 91 no IOOA
    - 9% mild
    - +3 (1-4pt): 93 no IOOA
    - 7% mild
    - +3 (2pt): 100% no IOOA
  - DVD:
    - 0-12pd (9) - 89% no DVD
    - 13-16pd (16) - 75% no DVD
    - 17-20pd (7): 71% no DVD
    - 22% residual DVDs - 12-14pd

Bothun and Summers
Unilateral IOOA for manifest DVD

- **10 pts**: IOAT to the IR insertion in a bunched fashion
- 90% (9pts): excellent result (DVD 0-4pd)
- 10% (1pt): good result (DVD=/<9pd)
- 3 pts: ipsi hypo 4-5 pd
- Mean decrease in DVD from 20pd to 3.2 pd
- Recommended for unilateral/markedly asymmetric DVD from 17 to 33pd with contralateral fixation and poor binocularity

A. Seawright, G. Gole
IOAT, results

- **21pts with cong ET or XT, IOOA and DVD**
- **Follow up 2 years**
  - Results:
    - +2 IOOA- 84% no or mild IOOA postop; 43%
      - no IOOA;
    - +2 IOOA- 89% no IOOA
      - 3 pts - transient IO underaction
      - 68% improvement in DVD; 2 showed no change; one developed Y-pattern
    - 18 pts with V-pattern 45% no V-pattern postop
      - 45% mild V-pattern
    - 6 pts with HT in PP - 5/6 no HT in PP

M. Parks, R. Elliot
IOAT vs denervation-extirpation

- **15 pts c +4 IOOA**: 1eye- D&E
  - 1eye- IOAT

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<thead>
<tr>
<th>Residual Overaction</th>
<th>D&amp;E</th>
<th>IOAT</th>
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<tbody>
<tr>
<td>Nil complications</td>
<td>67%</td>
<td>13%</td>
</tr>
<tr>
<td>Underaction</td>
<td>0%</td>
<td>40%</td>
</tr>
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</table>
Carlos Souza- Dias
Unilateral IOAT

- **10 pts** with idiopathic unilateral IOOA; HT> than 10pd in PP; IOOA >/= +3
- **Results**
  - no hypo in PP
  - 4 pts – overcorrection without diplopia
  - 9/10 – residual HT < 6 pd; one- 8pd
  - Mean correction – 20pd for PP HT

Santiago, Isenberg
IOAT effect on torsion

- **24 eyes of 13 pts**
- Fundus photos 1 week before and 6 w after the surgery
- **Results**
  - 6 w postop -29% reduction of torsion
  - 10 w postop – 13% reduction of original torsion

Stager
Anterior and nasal IOT

- **20 pts** with severe IOOA ( +4; absent SO; failed IO weakening)
- 10 pts – unilateral ANT
- 10 pts – bilateral ANT
- 9 pts – a secondary procedure

- **Results**
  - 10 pts with SOP
  - 5 pts cong SOP
  - 5 pts acquired (post RD, Harada-Ito, tumor)
  - 4 pts only ANT
  - 1 after IO weak
  - 1 with absent SO
  - All had improvement
  - 2 pts limitation of elevation

Stager
Anterior and nasal IOT

- **20 pts** with primary IOOA (3 had previous IO recess) improved extorsion and IO function. All showed limitation of elevation
- 2 pts with AES after IOAT – improvement
- 2 pts with Duane: 1 eliminated increase in adduction
  - 1 no effect (abnormal IR pulleys)
- 1 pt with Y pattern – no effect (abnormal IR)

**Results of ANT**
- decrease in elevation in adduction
- decreased extorsion
- tonic depression
- improvement of head posture in severe SOP
- improvement of V-pattern

Stager
Anterior and nasal IOT

- **Limitations of ANT**
  - limits elevation
  - may induce intorsion
  - could make downshoot worse in Duane
  - may not be successful after multiple surgeries

Recommended for severe or recurrent IOOA when other techniques have failed
Stager

ANT in pts with missing SO tendon

- 9 pts were included
  - 2 unilateral
  - 7 bilateral

Results

<table>
<thead>
<tr>
<th>unilateral</th>
<th>bilateral</th>
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<tbody>
<tr>
<td>Ortho in all gazes</td>
<td>- 6 - no IOOA</td>
</tr>
<tr>
<td>1 - 5° tilt</td>
<td>- 1 - no effect in both eyes</td>
</tr>
<tr>
<td>1 - mild overcorrection</td>
<td>- 1 - overcorrection</td>
</tr>
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<td>- 2eyes – SO underaction appeared worse</td>
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<td>- 2 pts had additional operations</td>
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Other surgical procedures

- **Gonzales, Klein** 4mm distal myectomy + IOAT for primary IOOA and IOOA+DVD: 86% – n IO function
  - 85% improvement of DVD

- **Stager, Weakly** 5mm proximal (nasal) myectomy + IOAT of the distal part for recurrent IOOA, DVD:
  - IOOA was eliminated in all cases
  - DVD reduced in 4/17; unchanged
  - 10/17; increased in 3/17

How should we proceed?