

## Inferior oblique muscle operations

Dr Elina Landa  
Fellow  
Ocular Motility Clinic, RVEEH,  
Melbourne

- Duane – tenotomy/myectomy at origin
- Dunnington – IO weakening at its insertion
- White – IO recession
- 1980-1990 Gobin, A Scott, Apt, Call - IOAT

## 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 for 3-6 m

## M. Parks

### IO weakening procedures

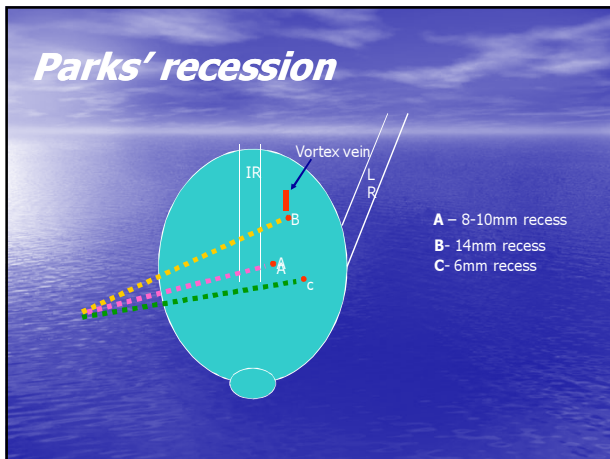
- 370 pts with bilateral IOOA
- 4 groups
- 1gr 150pts with bilateral recession
- 2gr 100pts – LE recess; RE disinsertion
- 3gr 20pts – LE recess; RE nasal myectomy
- 4gr 100pts – LE recess; RE myectomy

## Results

	Myectomy at insertion	Disinsertion	Myectomy at origin	Recession
Underaction	8%	3%	0%	4%
Overaction	30%	53%	79%	15%

## 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



### 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

<u>61 children after IOAT</u>	<u>60 children without IOAT</u>
<ul style="list-style-type: none"> <li>• 1 recurrent IOOA</li> <li>• 1 need for DVD surgery</li> </ul>	<ul style="list-style-type: none"> <li>• 9 need for DVD surgery</li> </ul>

**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

<u>36 pts- bilateral IOAT</u>	<u>14 pts- bilateral IO recession</u>
<ul style="list-style-type: none"> <li>• IO function -25* (n- 35-40*)</li> </ul>	<ul style="list-style-type: none"> <li>• 10mm- IO function is 31*</li> <li>• 14mm- IO function is 38*</li> </ul>

- 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

<u>5 pts - IOAT</u>	<u>4 pts- 14mm recess</u>
<ul style="list-style-type: none"> <li>• Mean reduction of HT in PP - 12 pd</li> <li>• Mean deviation in the field of IO - 2 pd <b>hypo</b> (change 23 pd)</li> <li>• 4 units reduction in ductions (+2.5 to -1.5)</li> </ul>	<ul style="list-style-type: none"> <li>• Mean reduction of HT in PP - 11 pd</li> <li>• Mean deviation in the field of IO - 3 pd <b>hyper</b> (change 22 pd)</li> <li>• 3 units reduction in ductions ( +3 to +0.5)</li> </ul>

- Both procedures are effective
- Both did not show overcorrection in PP

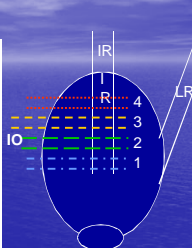
### A. Guemes, K. Wright Graded IOAT

**21 pts:** 14- bilateral IOOA  
(37eyes) 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: **20** pd for 1mm  
**18** pd for 2mm  
**15** pd for 3mm

2 pts with DVD- no DVD (6-10pd improv)  
2pts with DVD- small DVD(7-10pd improv)



*Graded IOAT is effective and allows to avoid limited elevation*

### 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  
4-10 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  
23- DVD and IOOA  
31- only IOOA  
1- only DVD

**Results**

IOOA	DVD
+4 (42pt)- 86% no IOOA 14% mild	<b>8-12pd</b> (9)-89% no DVD
+3 (34pt)- 91% no IOOA 9% mild	<b>13-16pd</b> (16)- 75% no DVD
+2 (14pt)- 93% no IOOA 7% mild	<b>17-20pd</b> (7) 71% no DVD
+1(2pt)- 100% no IOOA	22% residual DVDs -12-14pd

- 82/92 IOOA showed no IOOA
- 25/32 DVDs showed no DVD
- DVD decrease from **14.5pd to 1.9pd**
- Nil complications

### 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= $\leq$ 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

**Results**

	D&E	IOAT
Residual Overaction	67%	13%
Underaction	0%	40%

### Carlos Souza- Dias Unilateral IOAT

- **10 pts** with idiopathic unilateral IOOA; HT > than 10pd in PP; IOOA  $\geq$  +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
- 33% reduction if IOAT near or anterior to IR insertion  
8% reduction if IOAT posterior to IR insertion  
Residual fundus extorsion – recurrent IOOA

### Stager Anterior and nasal IOT

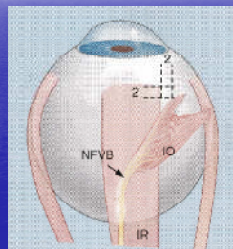
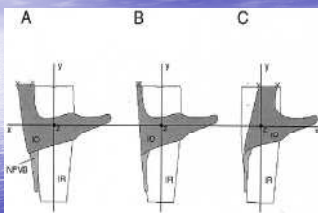


FIG 1. A, Schematic representation (inferior view) of the traditional anterior transposition of the IO muscle. B, Placing the new IO muscle insertion close to the temporal border of the IR muscle decreases the risk of AES. C, Placing the new insertion even further nasally should decrease the risk of AES even more. The axes x, y, and z are the axes of Fick and correspond to the directions of rotation of the globe.

### Stager Anterior and nasal IOT

- **20 pts** with severe IOOA (+4; absent SO; failed IO weakening)
- 10 pts – unilateral ANT      10pts- 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 IOweak      1 with absent SO  
All had improvement  
2 pts limitation of elevation

### Stager Anterior and nasal IOT

- 4 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 LR 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**

<i>unilateral</i>	<i>bilateral</i>
- Ortho in all gazes	- 6 – no IOOA
- 1 - 5* tilt	- 1 – no effect in both eyes
- 1 – mild overcorrection	- 1 – overcorrection
	- 2eyes – SO underaction appeared worse
	- 2 pts had additional operations

**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?