Management of Thyroid Orbitopathy

(Thyroid Eye Disease TED)

(Autoimmune Orbitopathy)

(Endocrine Orbitopathy)

(Graves‘ Ophthalmopathy)

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IAȘI, 2020

二、甲状腺相关性免疫眼眶病（Thyroid-Related Immune Orbitopathy, TRIO）

（一）发病情况

甲状腺相关性免疫眼眶病（TRIO）以往称为 Graves 病，多发于中老年，无性别差异，发病率在成年人眼眶疾病中占第一位，为 20%。临床检查发现 60% 的 Graves 病患者眼外肌受累，经证实 93% 有眼外肌肥大。

Classification of TED

(Werner, 1969)

Stage	Symptoms
0	No sign or symptoms
1	Only signs, no symptoms
2	Soft tissue involvement (symptoms and signs)
3	Proptosis
4	Extraocular muscle involvement
5	Corneal involvement
6	Sight loss (optic nerve involvement)

NO SPECS Classification of ocular changes in TED

Class	Grade	Change
0		No Signs or Symptoms
1		Only signs
2		Soft-tissue involvement, with symptoms and signs
	o	Absent
	a	Minimal
	b	Moderate
	c	Marked
3		Proptosis
	o	< 23 mm
	a	23 - 24 mm
	b	25 - 27 mm
	c	28 mm
4		Extraocular-muscle involvement
	o	Absent
	a	Limitation of motion at extremes of gaze
	b	Evident restriction of motion
	c	Fixation of a globe or globes
5		Corneal involvement
	o	Absent
	a	Stippling of cornea
	b	Ulceration
	c	Clouding, necrosis, perforation
6		Sight loss (ø visual acuity)
	o	< 0.67
	a	0.67 - 0.33
	b	0.32 - 0.10
	c	< 0.10

Symptoms in TED and its causes

Symptom	Cause	Examination
Photophobia	Conjunctivitis Corneal com- plications	Slitlamp
"Orbital" fullness and pressure sensation	Exophthalmos Elevated IOP	Hertel, US, CT Tonometry
Ocular dryness	Reduced tear production	Schirmer test
Drop in visual acuity	Extrafoveal fixation Corneal changes Optic nerve complications	Motility Slitlamp Colour vision, Funduscopy, Visual field, VEP, US, CT
Double vision Monocular Binocular	Corneal changes (incl. astgmatism) Disturbed motility	Slitlamp, Motility, Refraction Orthoptics, IOP, US, CT

Classification of TED

(K.-P. Boergen, C.R. Pickardt, Med Welt 42: 72-76; 1991)

L	Lid changes	0	absent
		1	edema only
		2	retraction only
		3	retraction + upper lid edema
		4	retraction + upper + lower lid edema
E	Exophthalmus	0	absent
		1	without defect of lid closure
		2	conjunctival irritation in the morning only
		3	permanent conjunctival irritation
		4	corneal complications
M	Muscular changes	0	absent
		1	only visible on ultrasound/CT/MRI
		2	pseudoparesis
		3	pseudoparalysis
O	Optic nerve involvement	0	absent
		1	on colour sensitivity and VECP only
		2	peripheral visual field defects
		3	central visual field defects

Eye changes in TED

1. Lid changes
2. Exophthalmos
3. Muscle changes
4. Optic nerve complications

Eye changes in TED

3. Muscle changes

   3.1. Without muscle involvement
   (only US-CT-MRI-changes)

   3.2. With muscle involvement

      3.2.1. Symmetrical

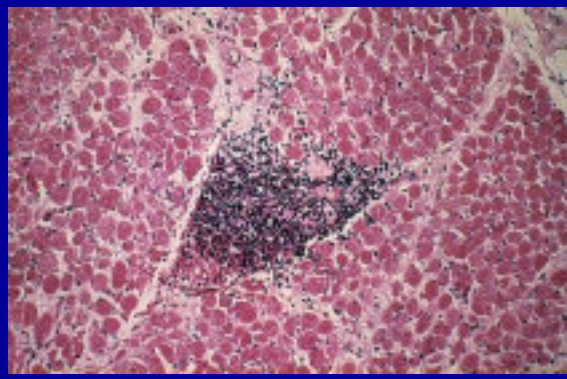
         - without abnormal head posture
         - with abnormal head posture

      3.2.2. Asymmetrical with diplopia

         - only in up-gaze
         - also in primary position
         - in all gaze directions

Eye muscle changes in acute TED

Morphology



- increase of muscle volume
- increase of interstitial tissue
- increase of interstitial fibroblasts
- interstitial round cell infiltration (lymphocytes, histiocytes, plasma cells)
- interstitial edema due to glycosaminoglycans within the endomysium
- no damage to muscle cells

Eye muscle changes in acute TED

Function

- decrease of elasticity
- increase of muscle tension
- increase of muscle force
- raised contractility
- increase of active contraction
- transition of slow into fast muscle fiber types (hypothesis)

Eye muscle changes in chronic TED

Morphology

- further proliferation of fibroblasts
- increase of collagen
- increase of connective tissue (fibrosis)
- fatty infiltrations (lipomatosis)
- decrease of muscle cells
- reduction of formerly increased muscle volume

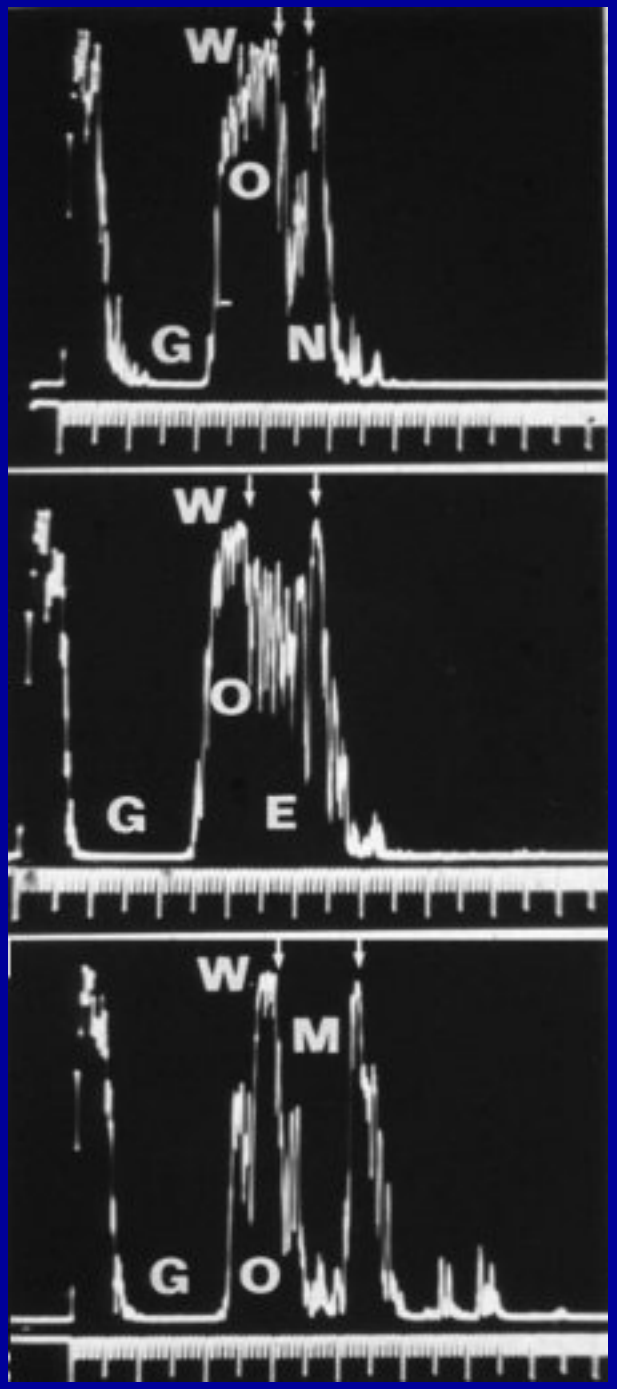
Eye muscle changes in chronic TED

Function

- motility restriction
- loss of elasticity
- mechanical motility restriction
- decrease of muscle force (hypothesis)

Echographic findings in TED

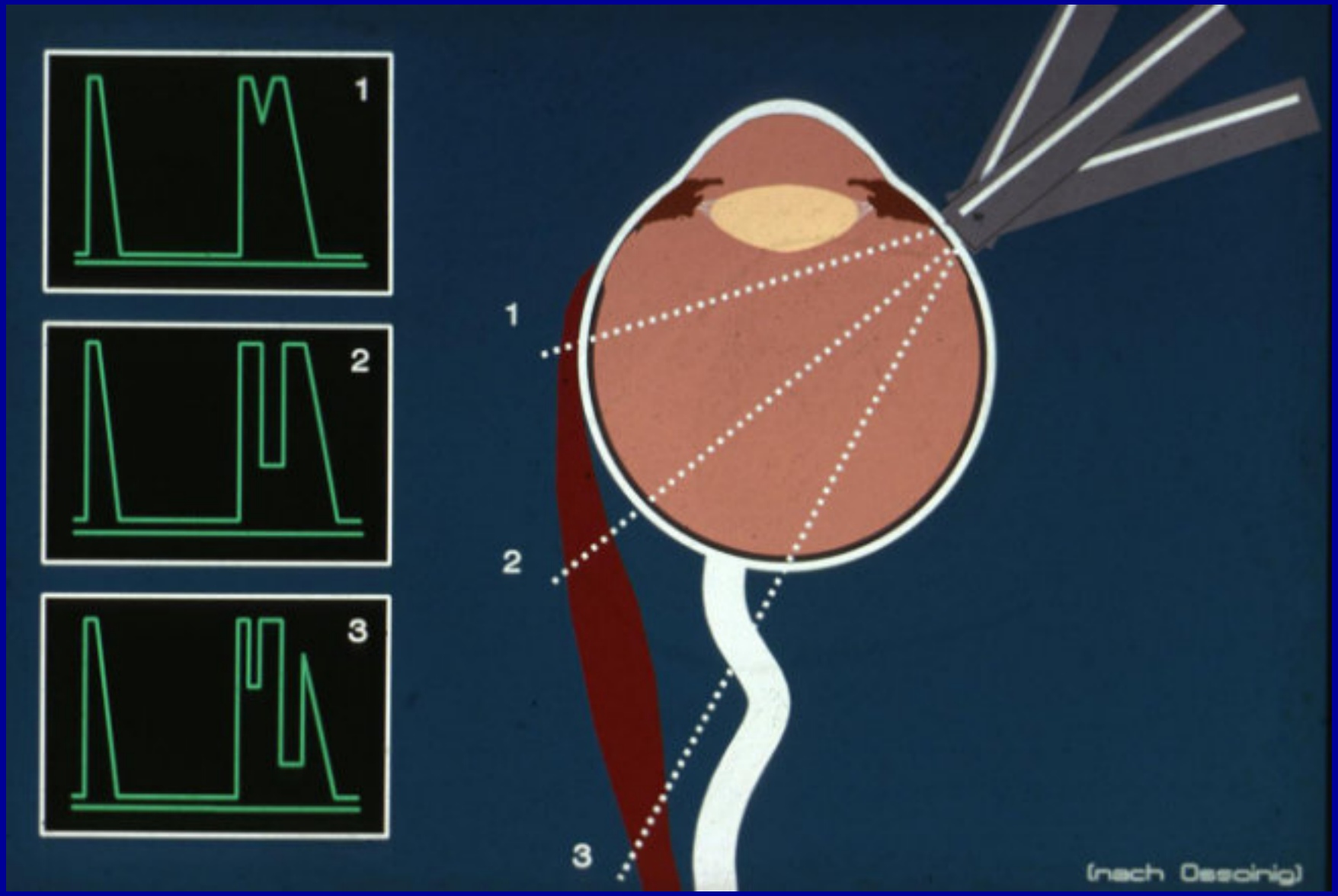
Eye muscles	enlargement changes in structure and reflectivity
Optic nerve	thickened nerve sheaths
Orbit	enhanced widening and coarseness of orbital echos



Normal muscle

TED

Myositis


1
2
3
1
2
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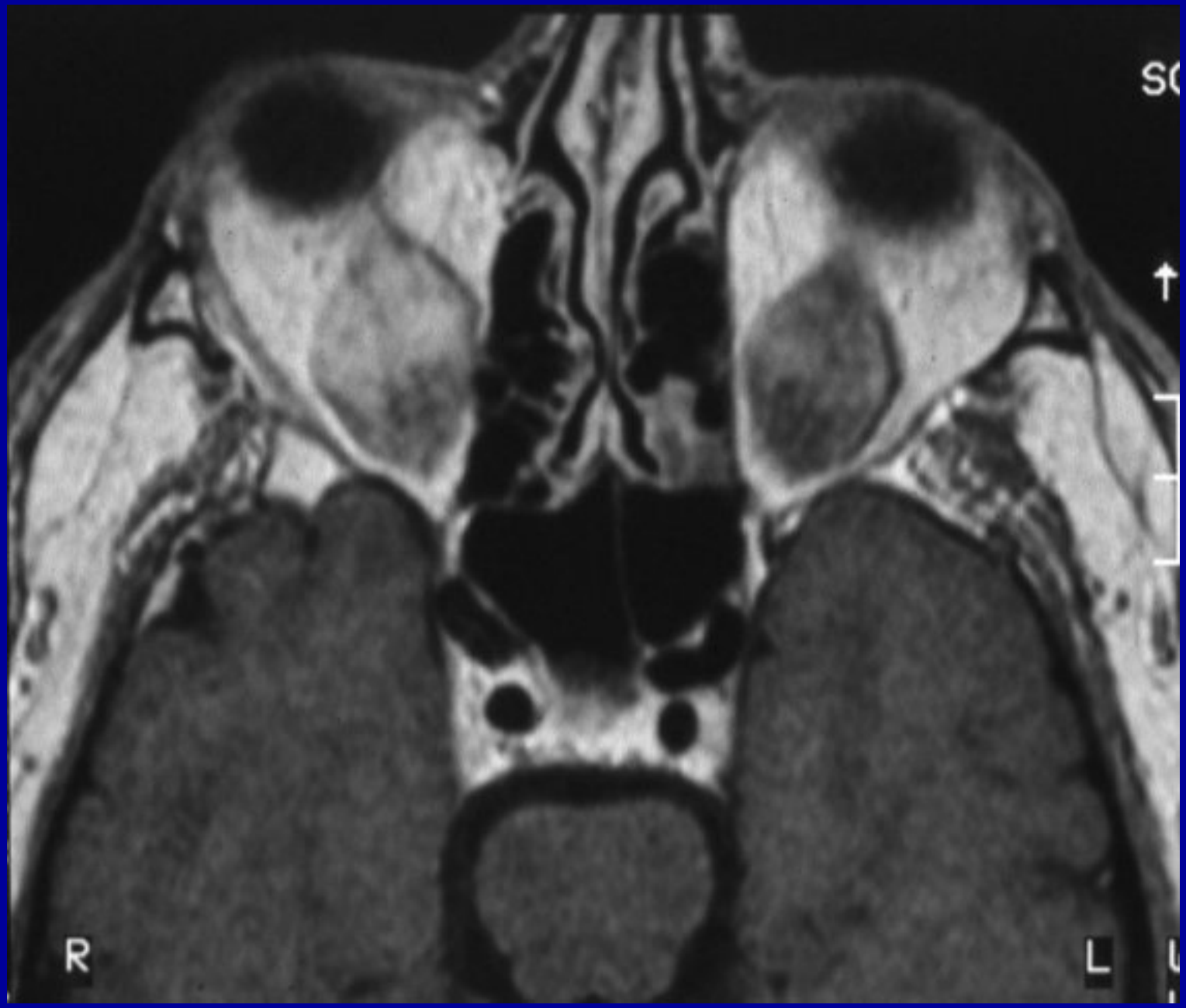
(nach Ossoinig)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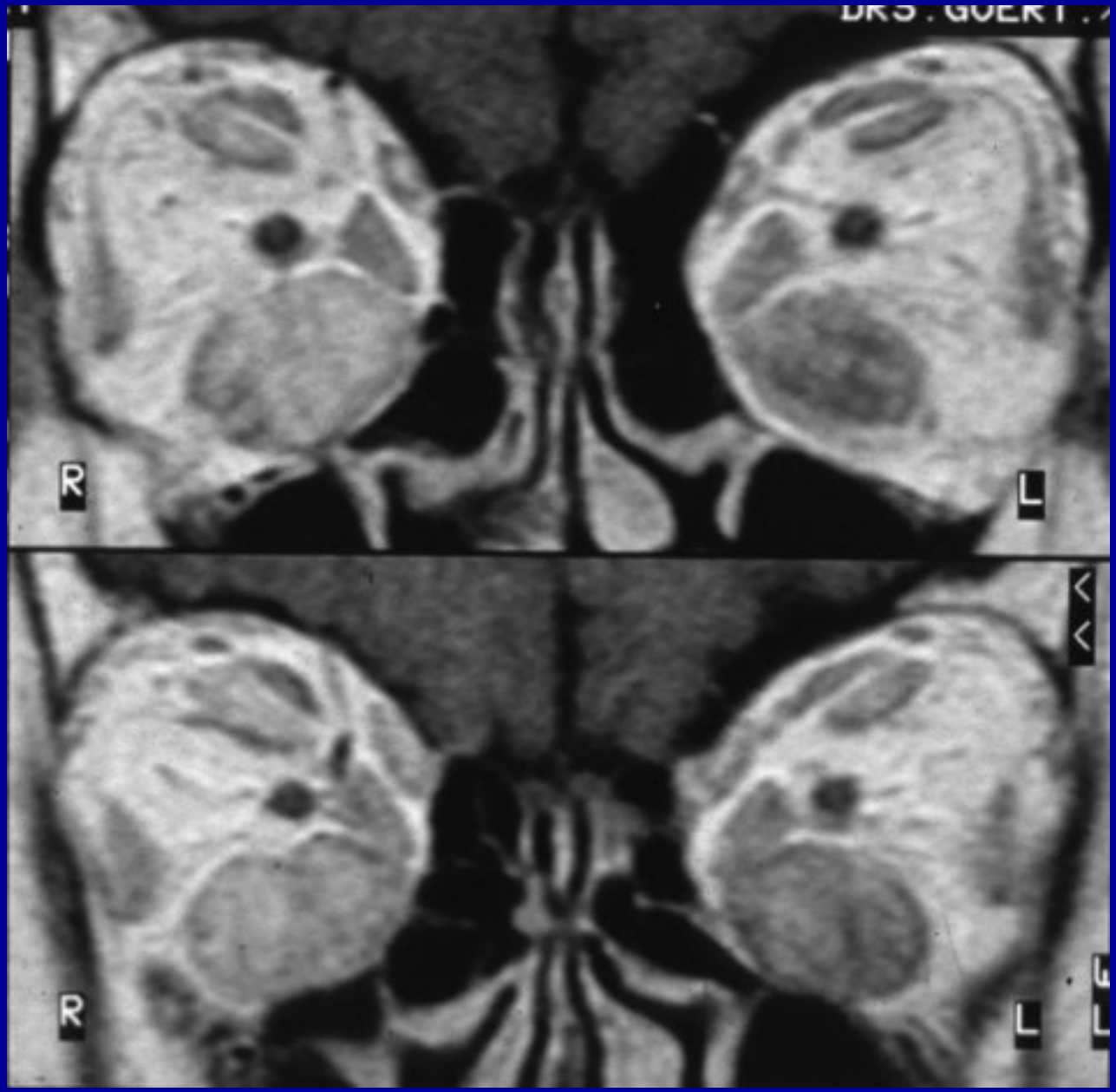
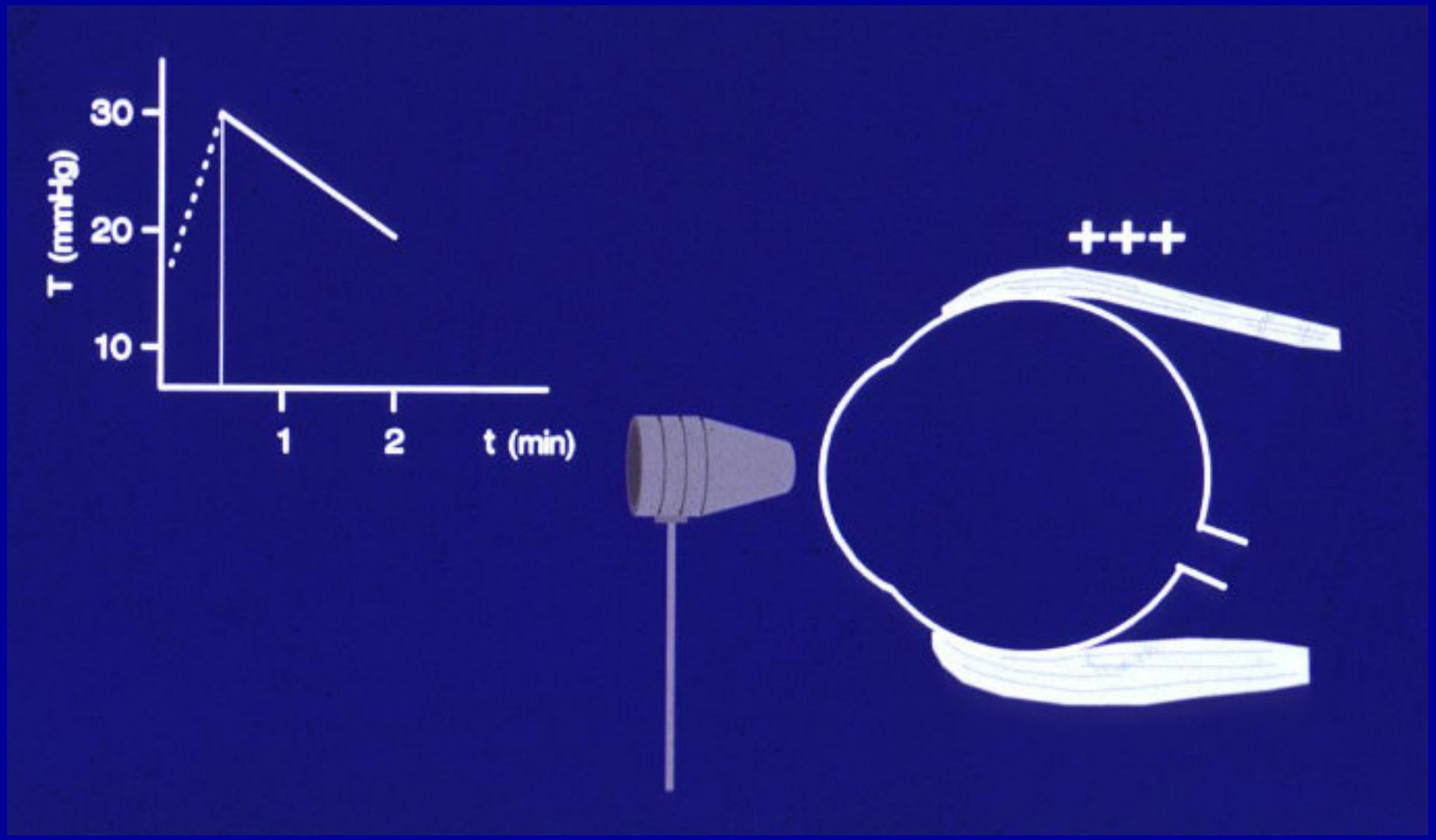

R
L
R
L

Sequalae of eye muscle involvement in e.o.

- Exophthalmos
- Pseudoparesis
- Pseudoglaucoma
- Pseudoretraction
- Abnormal head posture
- Diplopia
- Reduction of visual acuity

Eye muscle involvement in e.o.

1. Pseudoparesis of elevation
2. Pseudoparesis of abduction
3. Combination of 1 and 2
4. Pseudoparesis of depression


30
20
10
T (mmHg)
1
2
t (min)
+++

Management of TED

Acute stage:

Inflammatory infiltration ⟶

anti-inflammatory treatment

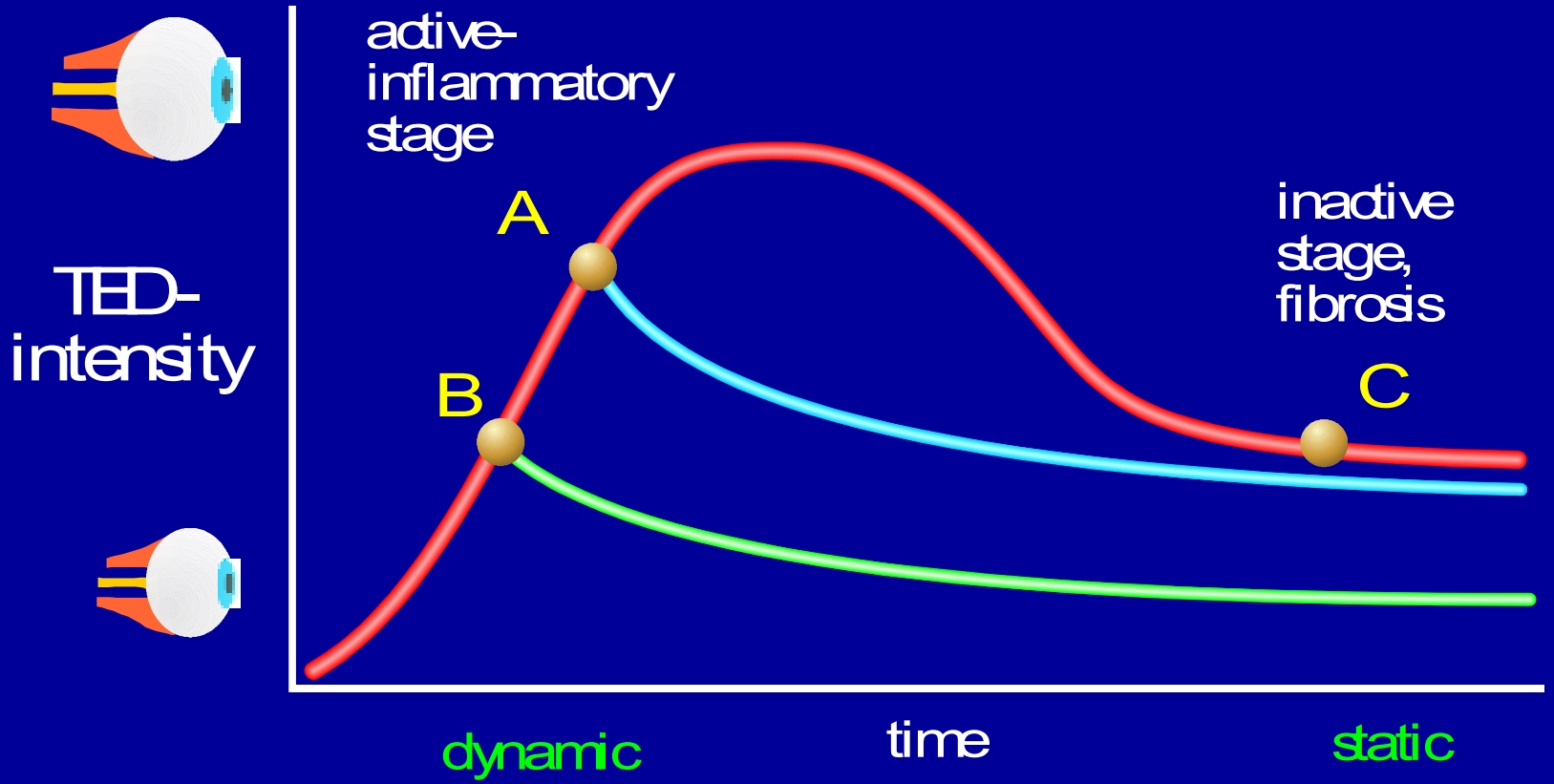
Chronic stage: ⟶

Lipomatosis and/ or fibrosis

conservative or surgical rehabilitation

Spontaneous course of TED

(Rundle's curve)



Management of TED

Inactive disease

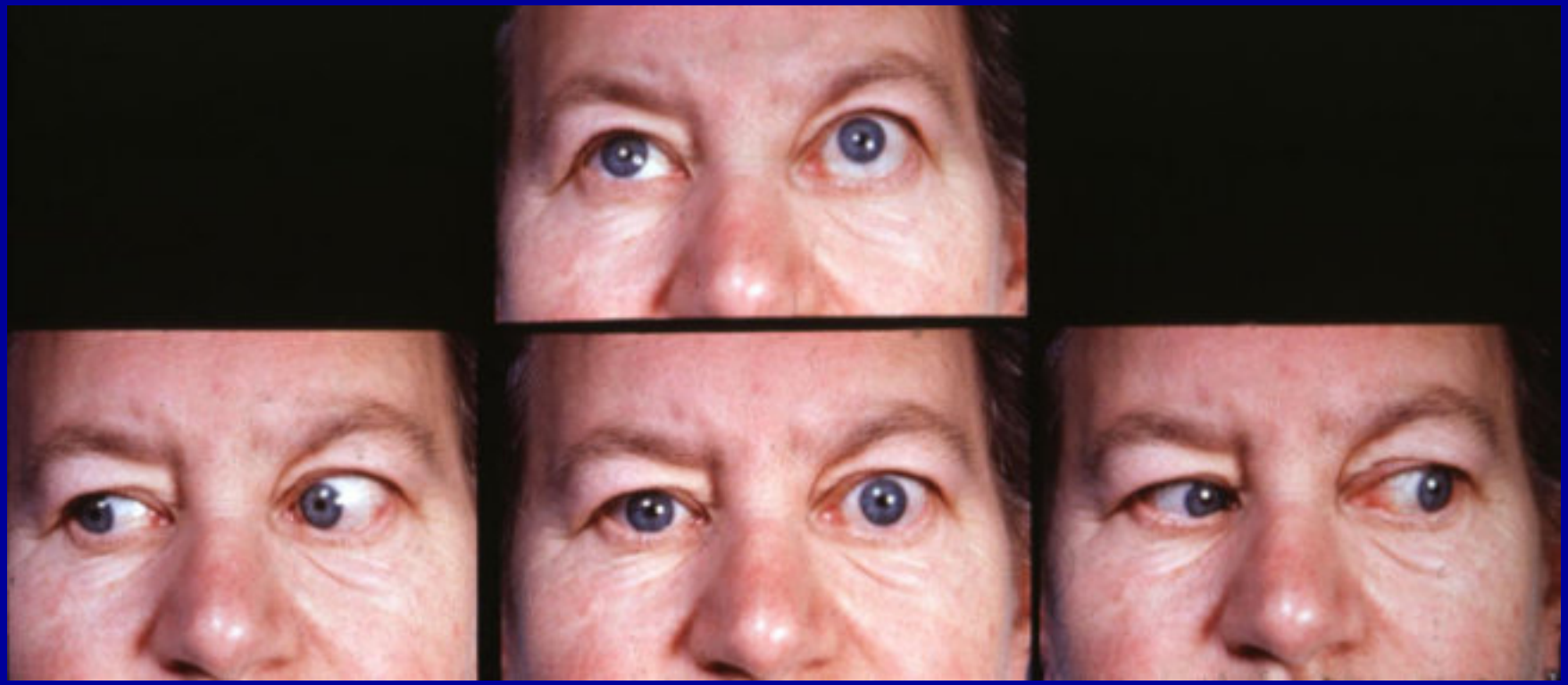
1. surgery for exophthalmos
2. surgery for motility restriction
3. surgery for lid changes

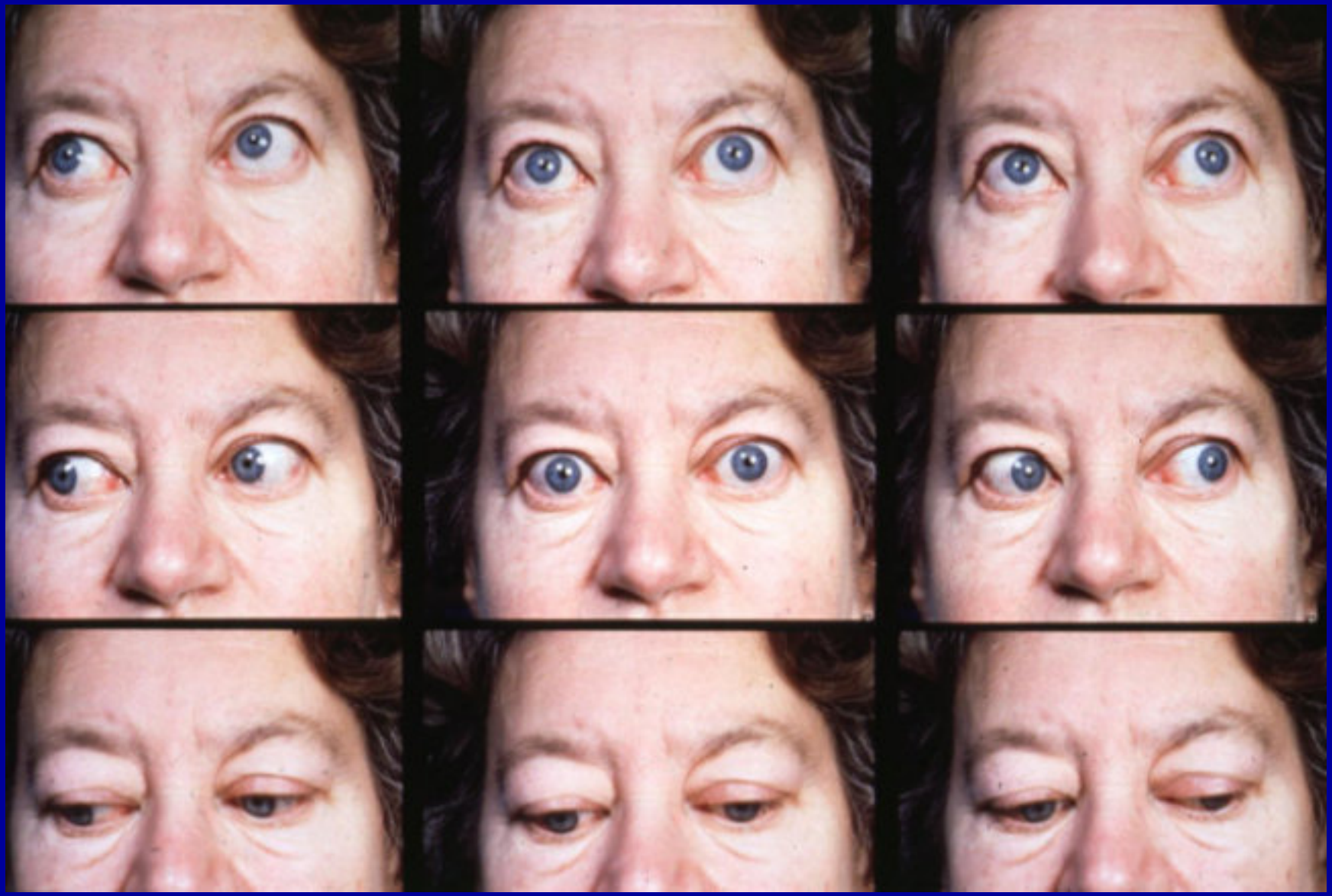
Management of strabismus in TED

- prisms (angle < 5°)
- surgery
- occlusion

Time of strabismus surgery in TED

- Stable endocrine situation for 6 months
- Stable orthoptic findings for 6 months
- Decompression not necessary or already performed





Aim of surgical treatment:

Primarily: Normalization of motility (as much as possible)

leading to

- Angle reduction (full correction often not necessary
- Restoration of a useful field of BSV
- Reduction of anomalous head posture

Limiting factor: Changes of the orbital tissue!

Surgical options:

1. Recessions of the most involved eye muscles

   → Improvement of eye motility

2. Combined muscle operations

   → Angle correction

Problem of resections:

Shortening of muscles with reduced elastic properties creates new mechanical restriction opposite the field of action.

Preference of recess procedures in TED

- Nature of motility disorder
- Involvement of all muscles (antagonists !)
- Reversibility

Problems of recessions in TED

- Tight muscle □
  rotation difficult
- Danger of perforation
- Depression of the lower lid
  (incomplete mobilization)
- Dosage (overcorrection!)

Dosage of recessions:

1. Preoperative: Dosage rules derived from

experience

2. Intraoperative: Active motility

Passive motility

3. Postoperative: Adjustable sutures

Management of eye muscle involvement in TED

Operate on the most involved muscle first !

Squint operations under topical anesthesia

- Thorson et al. 1966: not in e.o.
- Harper 1978: applied to e.o.
- Boergen 1981, 1984: 3 (15) cases
- Fells 1983: 6 cases
- Diamond 1989: not in e.o.

Preparation of patients

- pre-op.: mild analgetics
  0.5 mg atropine i.m.
- intra-op.: Tetracainhydrochloride

N.B. Ocular cardiac reflex blocked in TED

Eye muscle surgery in TED

Surgery in topical anesthesia

- Active and passive motility

Eye muscle surgery in TED

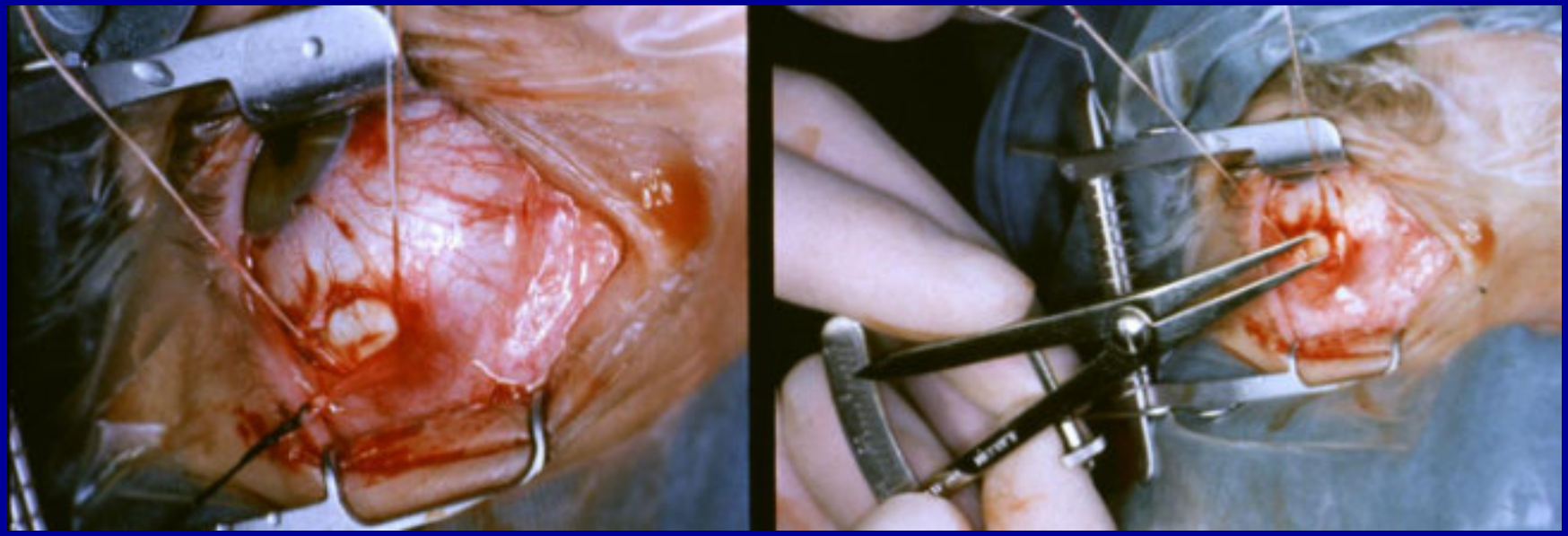
Surgery in topical anesthesia

- Hooking and detaching the muscle

Eye muscle surgery in e.o.

Surgery in topical anesthesia

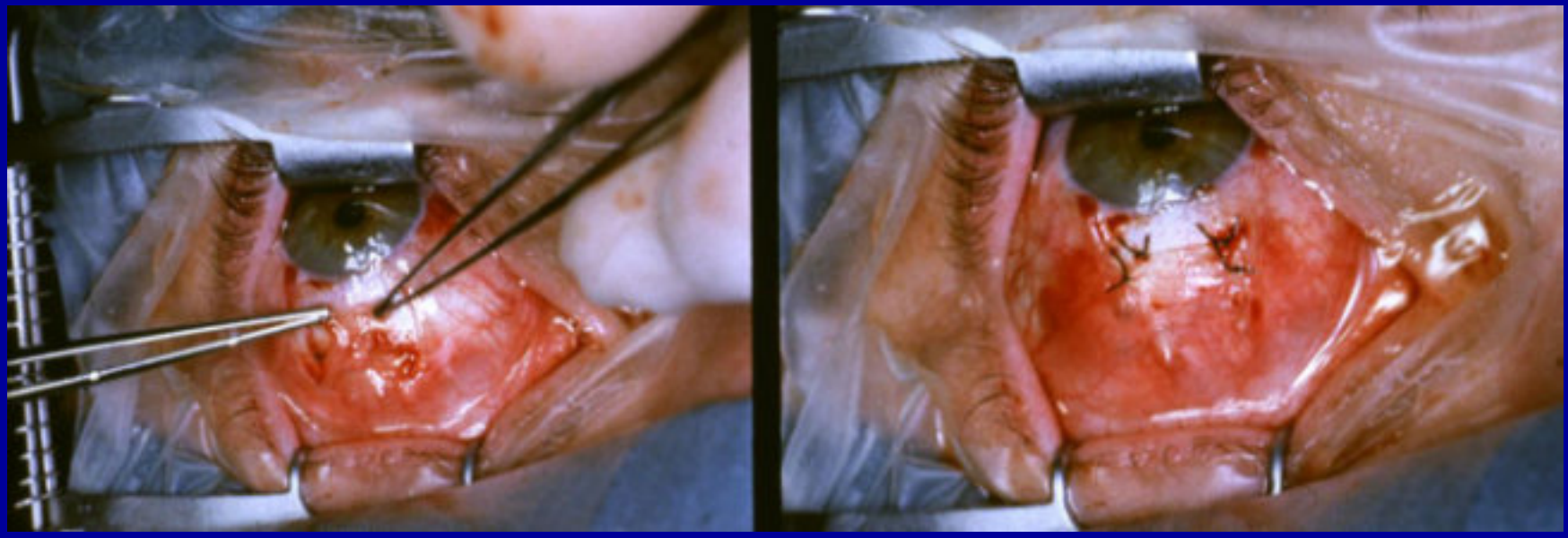
- Recession according to functional needs



Eye muscle surgery in TED

Surgery in topical anesthesia

- Closure of conjunctiva



Immediately postoperative:

Patients:

From 1982 – 1999: 64 patients operated on 1 inf.rect

103 patients operated on > 1 e.m.

Total: 167 patients

Questions:

1. How are the functional results?
2. Does a dose-effect-correlation exist?
3. Is there a learning curve?

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Thyroid eye disease








Thyroid eye disease (postop)

Slight elevation deficit RE

Abduction markedly

No AHP

- Pat. A.F.,* 7.2.51

2x decompression

- Pat. A.F. * 7.02.51

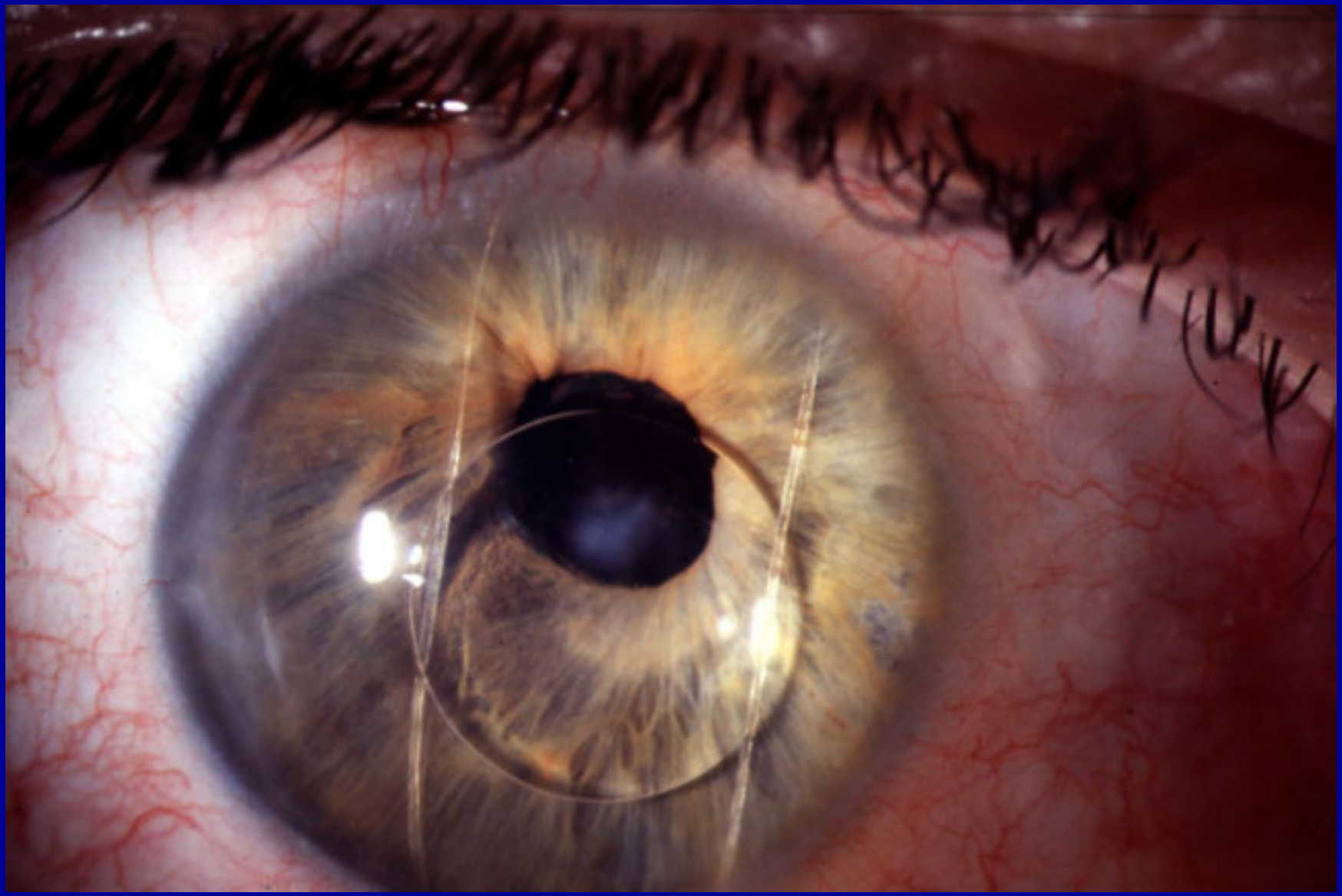
Recession of:

RE: Med. rect.: 4 mm

Inf. rect. : 5 mm

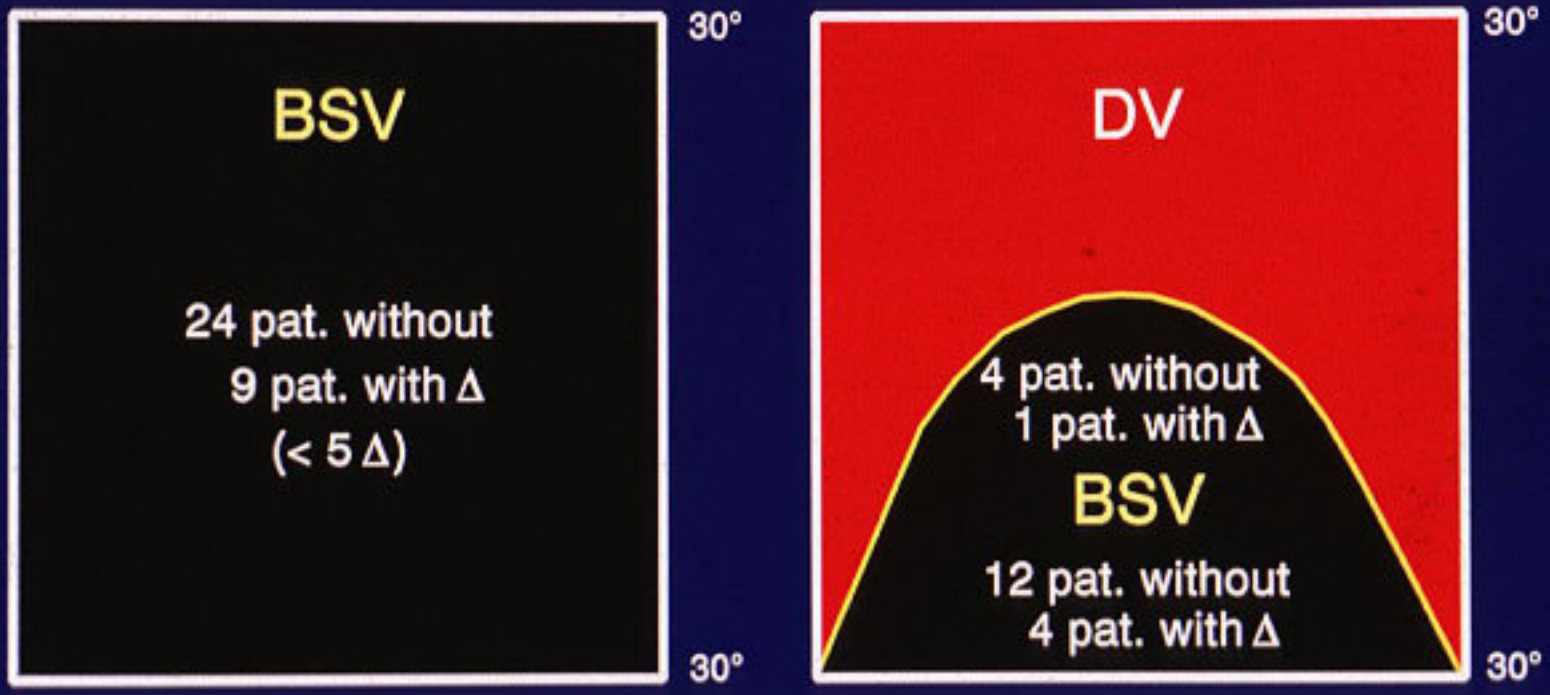
LE: Med.rect./Inf.rect.:

4/5 mm



Functional results

BSV = binocular single vision
DV = double vision



Exclusion 6 pat.
Double vision: 1 pat.

Results: Binocular single vision (BSV)

- BSV around primary position: 94.6 %
- BSV in 10° up-/ lateral and 20° down-gaze: 83.9 %
- BSV in 20° in all directions of gaze : 75.0 %
- BSV in 30° in all directions of gaze: 60.7 %

Questions:

1. How are the functional results?
2. Does a dose-effect-correlation exist?
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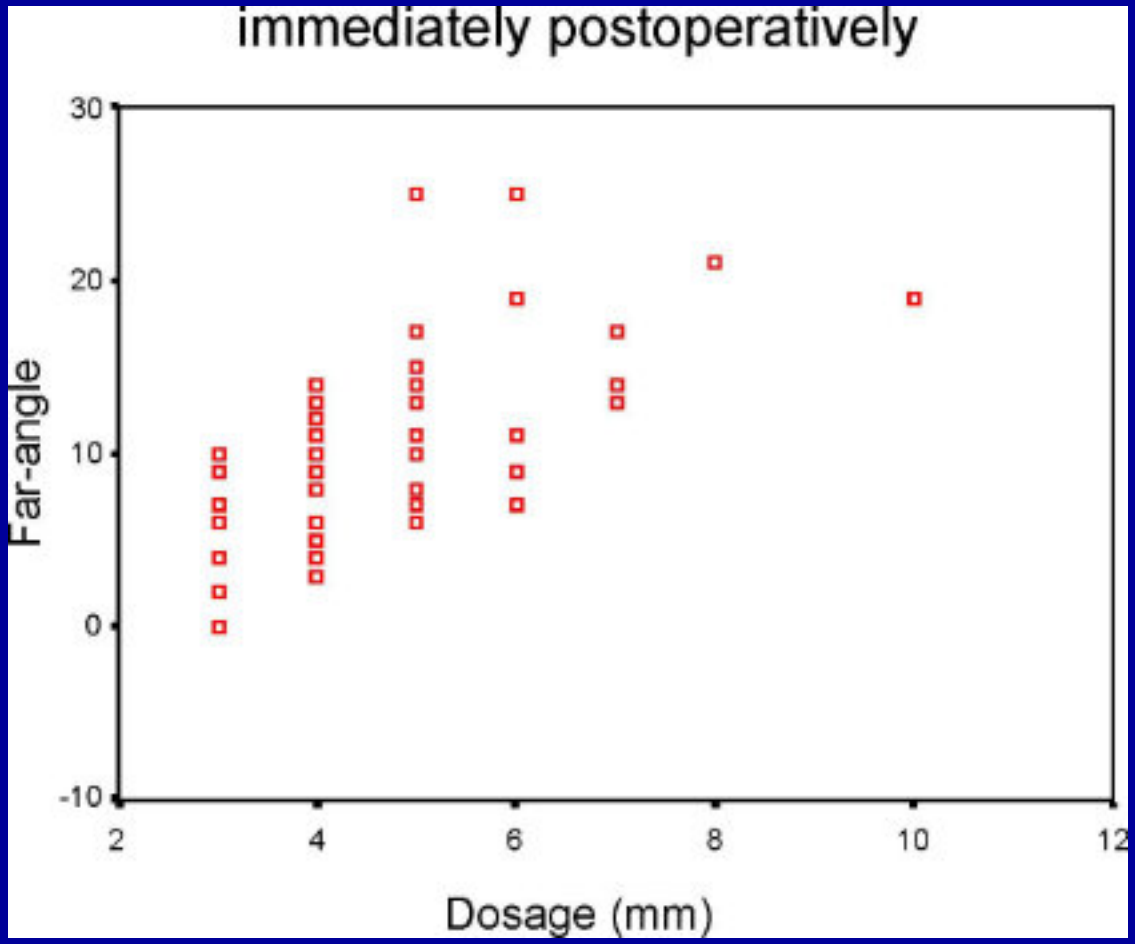
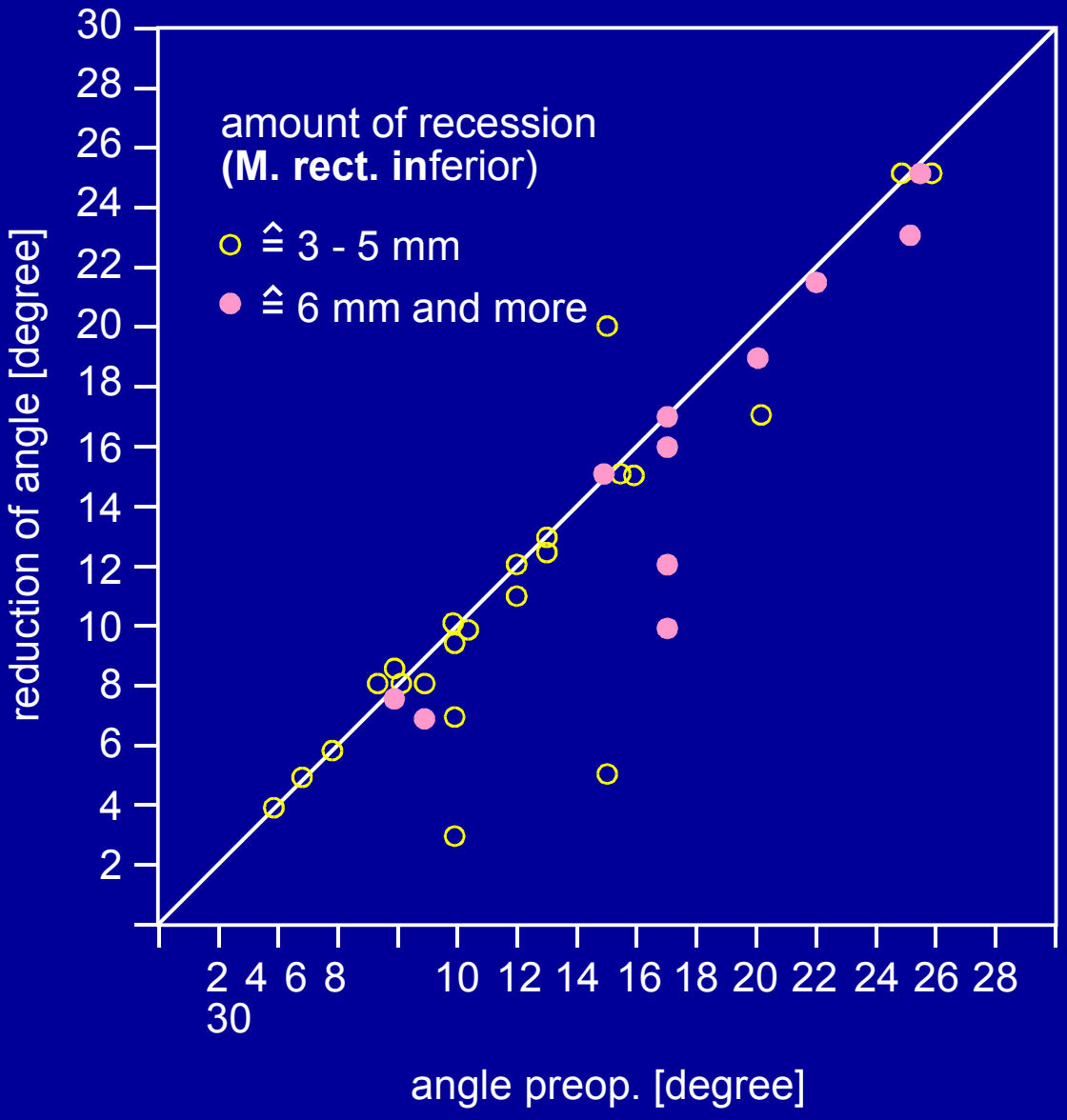
Results: Dose-effect correlation

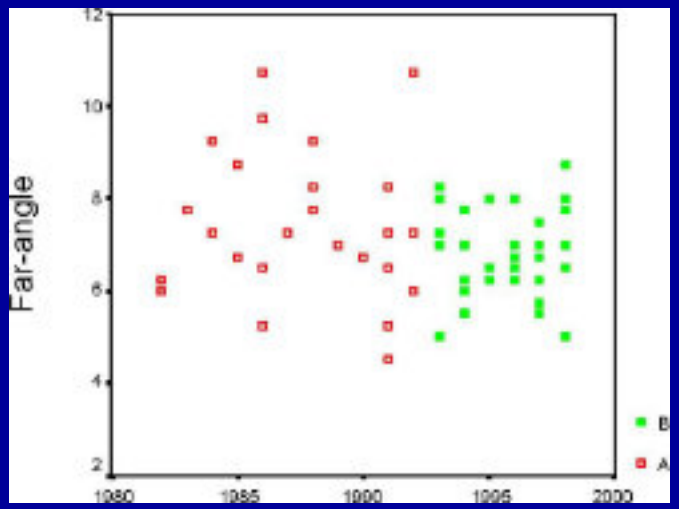


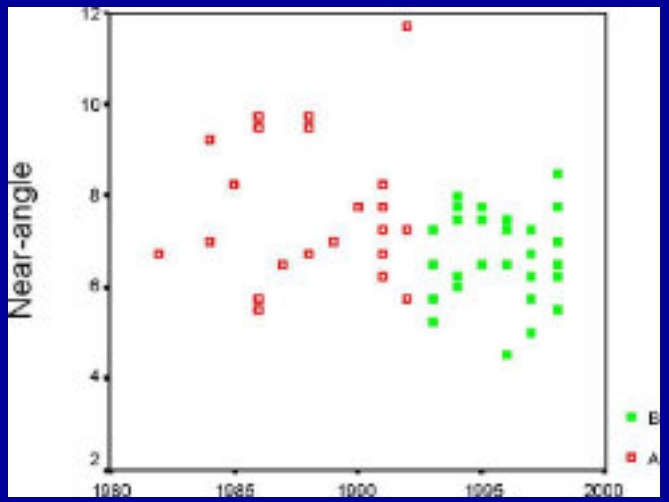

amount of recession
(M. rect. inferior)
≙ 3 - 5 mm
≙ 6 mm and more
reduction of angle [degree]
angle preop. [degree]
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

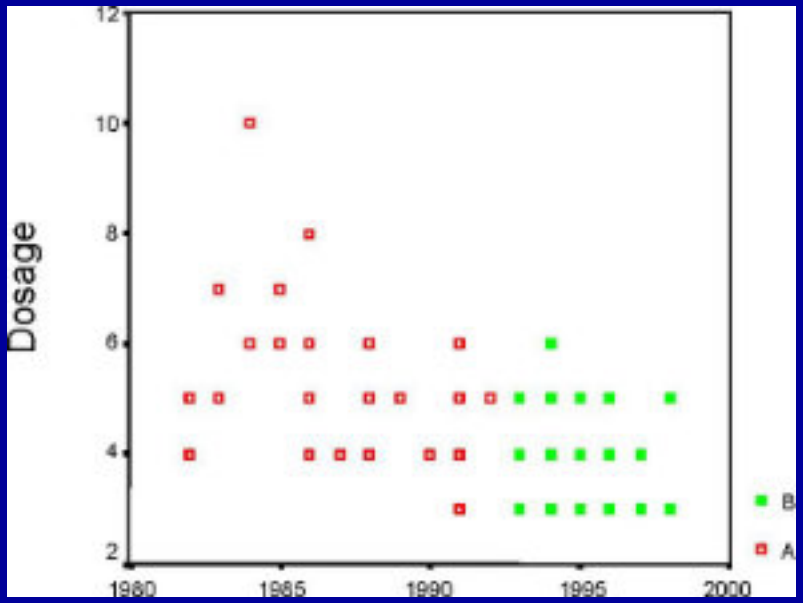
Questions:

1. How are the functional results?
2. Does a dose-effect-correlation exist?
3. Is there a learning curve?

Results: Learning curve







Conclusions:

1. Improvement of motility should be the primary aim of eye muscle surgery in e. o.
2. Recess procedures are the preferred option for this purpose.
3. The most involved eye muscles should be recessed first.
4. Intra-operative dosage under topical anesthesia is appropriate to solve the dosage problems and to prevent overcorrection.
5. Extra-muscular tissue changes are the limiting factor for a complete normalization of motility in more severe cases.