

# Case :FF

82 y o

8 y history of intermittent horizontal  
diplopia

- 82 y o
- c/o: Intermittent Horizontal diplopia, mainly on left gaze, started 8 y ago
- POHx: BE cataract op (4 y ago)
- PHx: IHD  
Hypercholesterolemia  
AF  
Pernicious anemia  
Hip # op 9/2010

# Examination

- VA cc RE 6/9 LE 6/6
- IOP: 17/18
- Slit Lamp - normal

BE elevate  
incompletely.



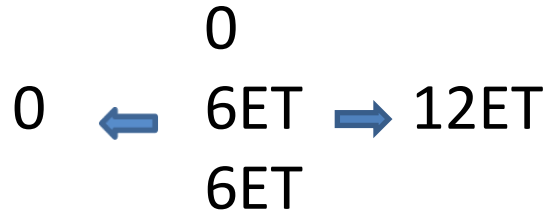
L gaze – L  
depression  
reduced.

R gaze – L  
elevation  
reduced

No obvious aBduction deficit  
No LT gaze paresis

# FF, 85yo

- Horizontal Deviation:



- Normal saccades [horizontal & oblique]
- Prescribed glasses:
  - 8pd BO, 2pd BU LE (single vision).

Sent for an MRI...

Image size: 512 x 512

S

072571 ( 84 y , 83 y )

View size: 635 x 635

Orbits - Exclude Patholo - Cor T1 (Thin)

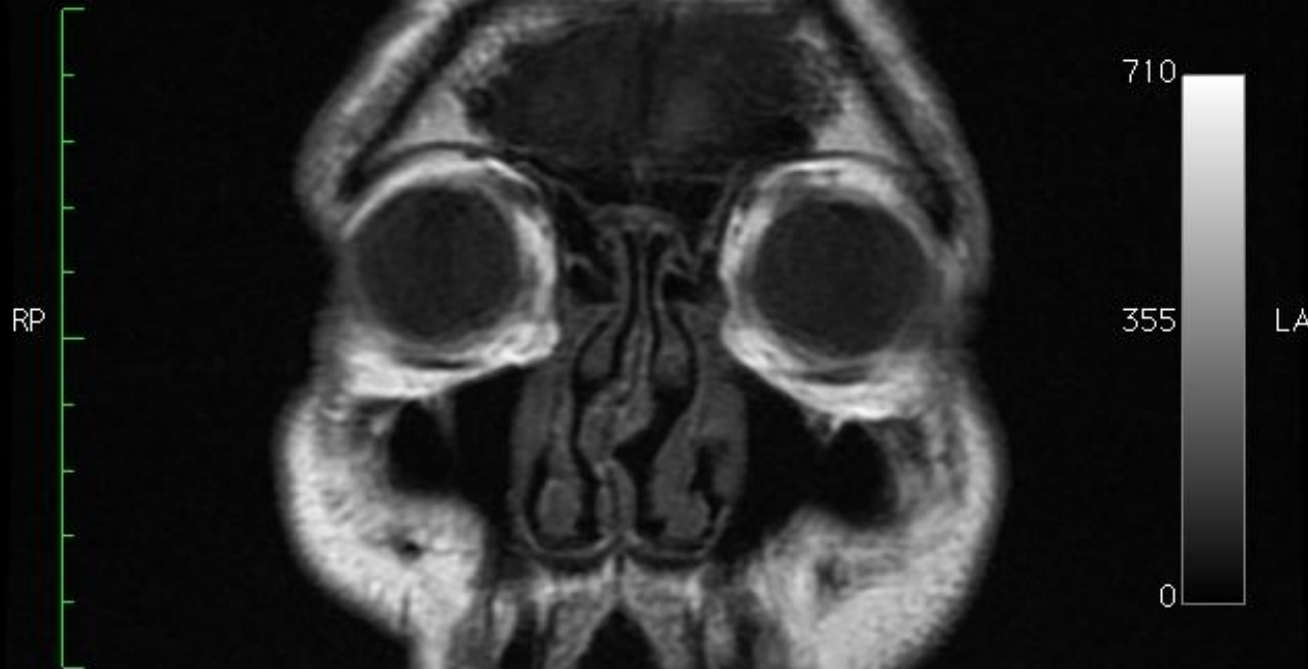
WL: 355 WW: 710

27408

X: 71 px Y: 506 px Value: 49.00

8

X: -79.68 mm Y: -74.43 mm Z: -121.17 mm



Zoom: 124% Angle: 0

TE: 14.512 TR: 440

Im: 1/24 A (A -> P)

FS: 1.5

Uncompressed

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Thickness: 3.00 mm Location: -70.74 mm

Made In OsiriX

Image size: 512 x 512

S

072571 ( 84 y , 83 y )

View size: 635 x 634

Orbits - Exclude Patholo - Cor T1 (Thin)

WL: 355 WW: 710

27408

X: 275 px Y: 506 px Value: 85.00

8

X: -1.16 mm Y: -87.88 mm Z: -117.26 mm

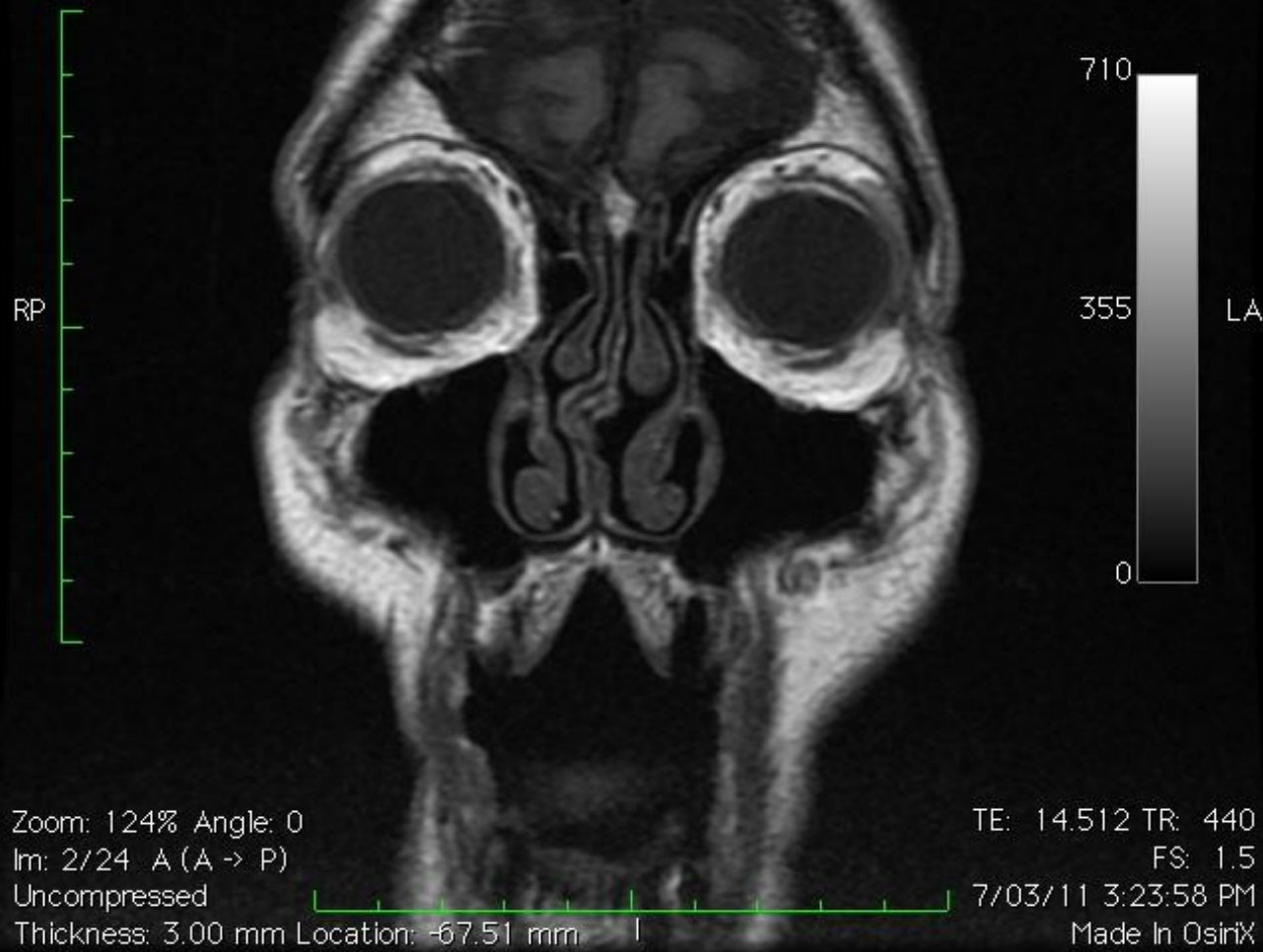


Image size: 512 x 512

S

072571 ( 84 y , 83 y )

View size: 635 x 635

Orbits - Exclude Patholo - Cor T1 (Thin)

WL: 355 WW: 710

27408

X: 275 px Y: 505 px Value: 108.00

8

X: -0.48 mm Y: -84.65 mm Z: -117.03 mm

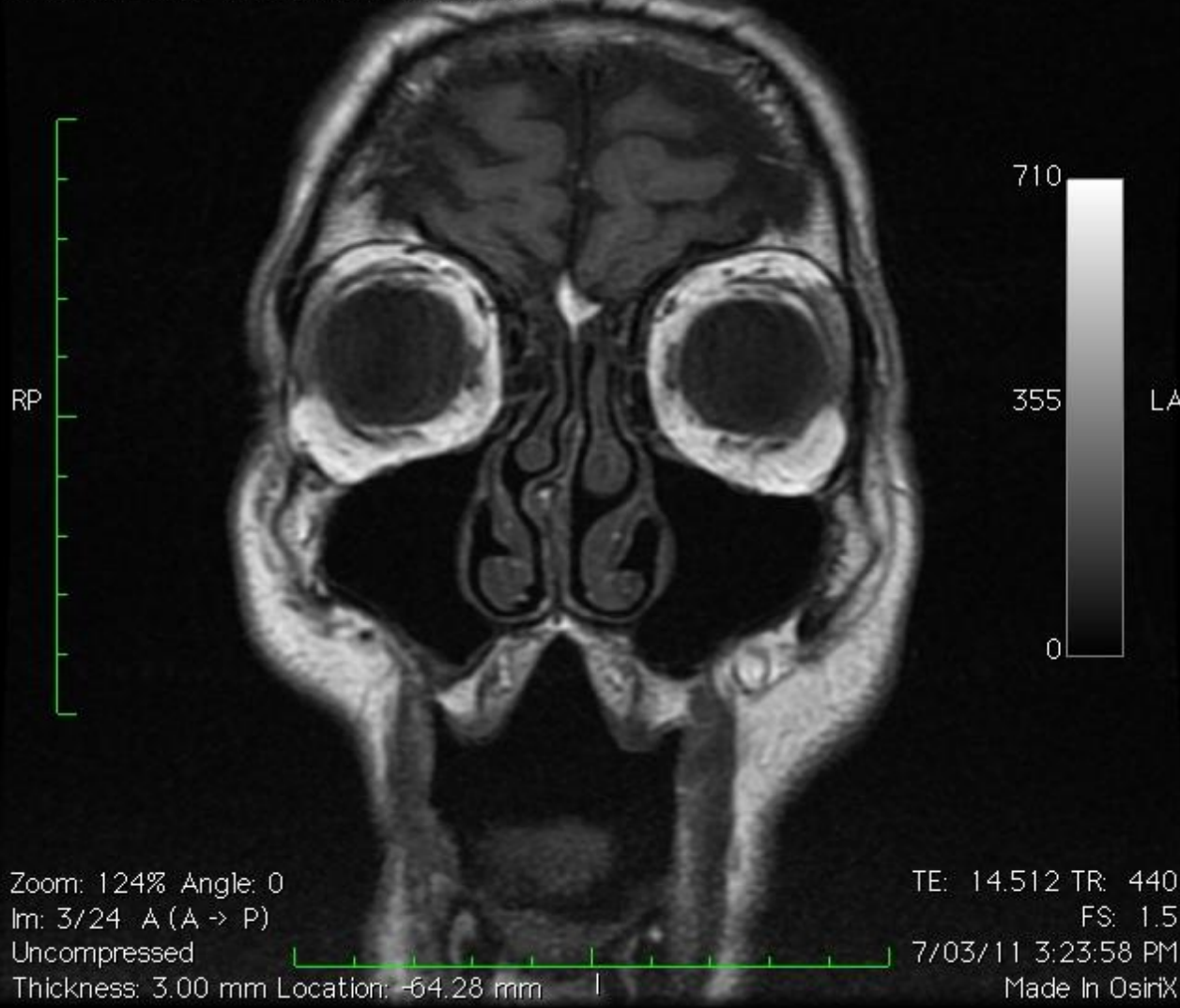


Image size: 512 x 512

S

072571 ( 84 y , 83 y )

View size: 635 x 635

Orbits - Exclude Patholo - Cor T1 (Thin)

WL: 355 WW: 710

27408

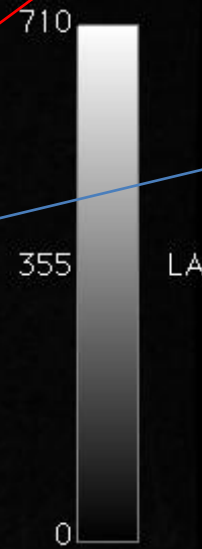
X: 275 px Y: 506 px Value: 95.00

8

X: 0.21 mm Y: -81.42 mm Z: -117.12 mm

Atrophy of Inter-muscular septum (LSR-LLR)

Lower & tilted position of LLR



Zoom: 124% Angle: 0

TE: 14.512 TR: 440

Im: 4/24 A (A -> P)

FS: 1.5

Uncompressed

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Thickness: 3.00 mm Location: -61.06 mm

Made In OsiriX

Image size: 512 x 512

S

072571 ( 84 y , 83 y )

View size: 635 x 635

Orbits - Exclude Patholo - Cor T1 (Thin)

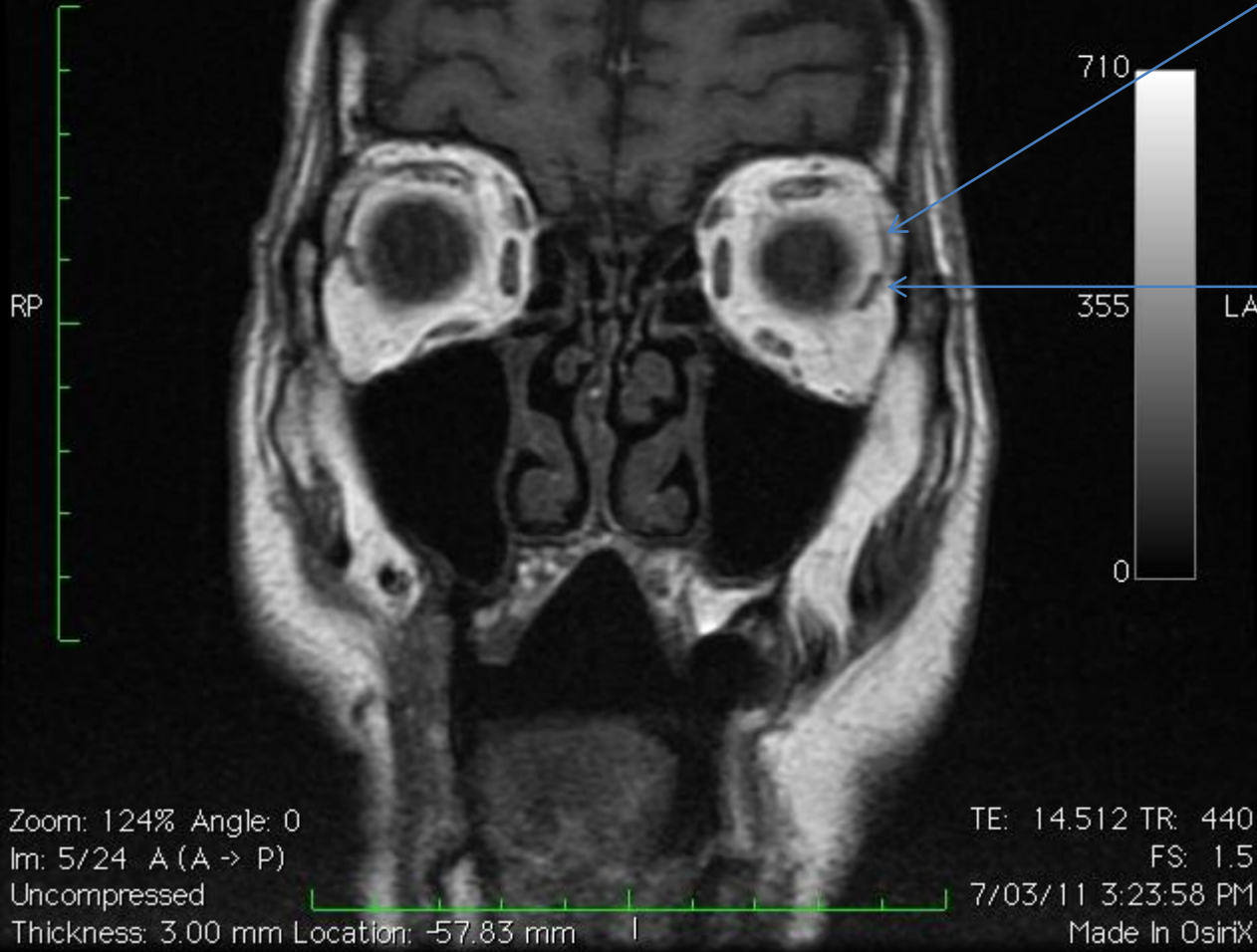
WL: 355 WW: 710

27408

X: 275 px Y: 506 px Value: 65.00

8

X: 0.90 mm Y: -78.20 mm Z: -117.05 mm



Atrophy of Inter-muscular septum (LSR-LLR)

Lower & tilted position of LLR

Image size: 512 x 512

View size: 635 x 634

WL: 355 WW: 710

X: 275 px Y: 506 px Value: 125.00

X: 1.59 mm Y: -74.97 mm Z: -116.98 mm

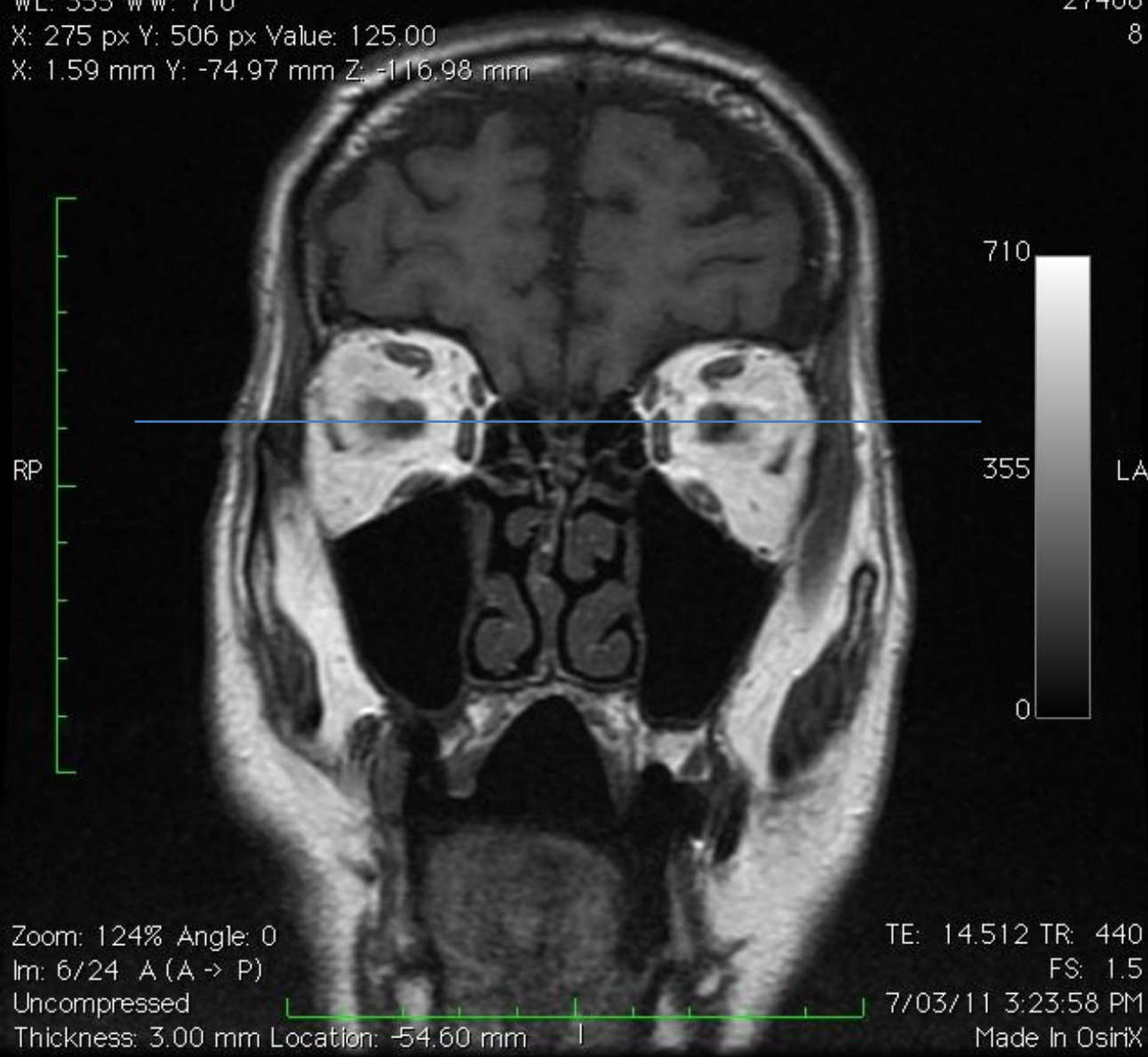
S

072571 ( 84 y , 83 y )

Orbits - Exclude Patholo - Cor T1 (Thin)

27408

8



RP

710

355

0

LA

Zoom: 124% Angle: 0

Im: 6/24 A (A -> P)

Uncompressed

Thickness: 3.00 mm Location: -54.60 mm

TE: 14.512 TR: 440

FS: 1.5

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Made In OsiriX

Lower & tilted position of LLR

Image size: 512 x 512

S

072571 ( 84 y , 83 y )

View size: 635 x 635

Orbits - Exclude Patholo - Cor T1 (Thin)

WL: 355 WW: 710

27408

X: 275 px Y: 505 px Value: 116.00

8

X: 2.27 mm Y: -71.75 mm Z: -116.75 mm

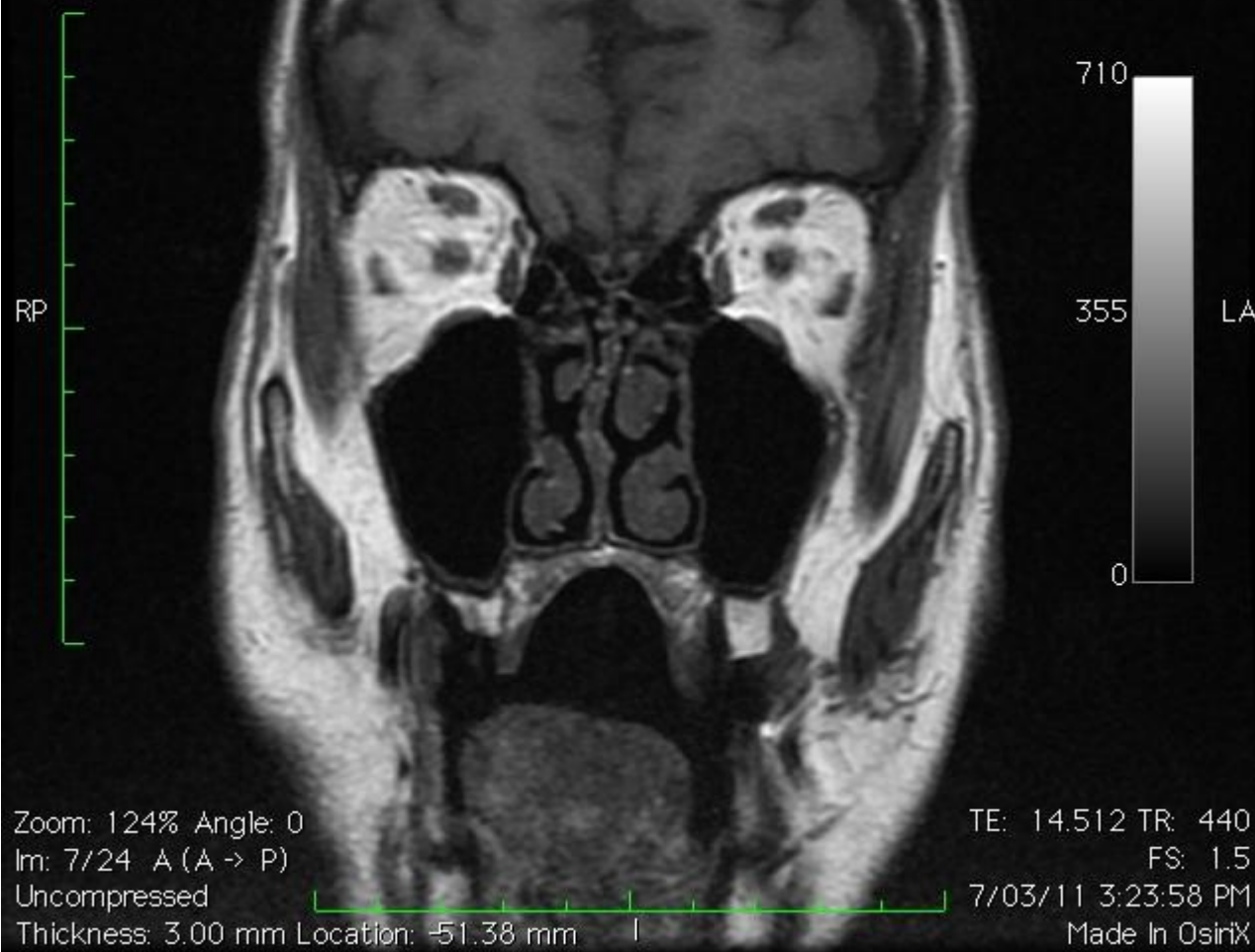


Image size: 512 x 512

S

072571 ( 84 y , 83 y )

View size: 635 x 635

Orbits - Exclude Patholo - Cor T1 (Thin)

WL: 355 WW: 710

27408

X: 275 px Y: 506 px Value: 96.00

8

X: 2.96 mm Y: -68.52 mm Z: -116.84 mm

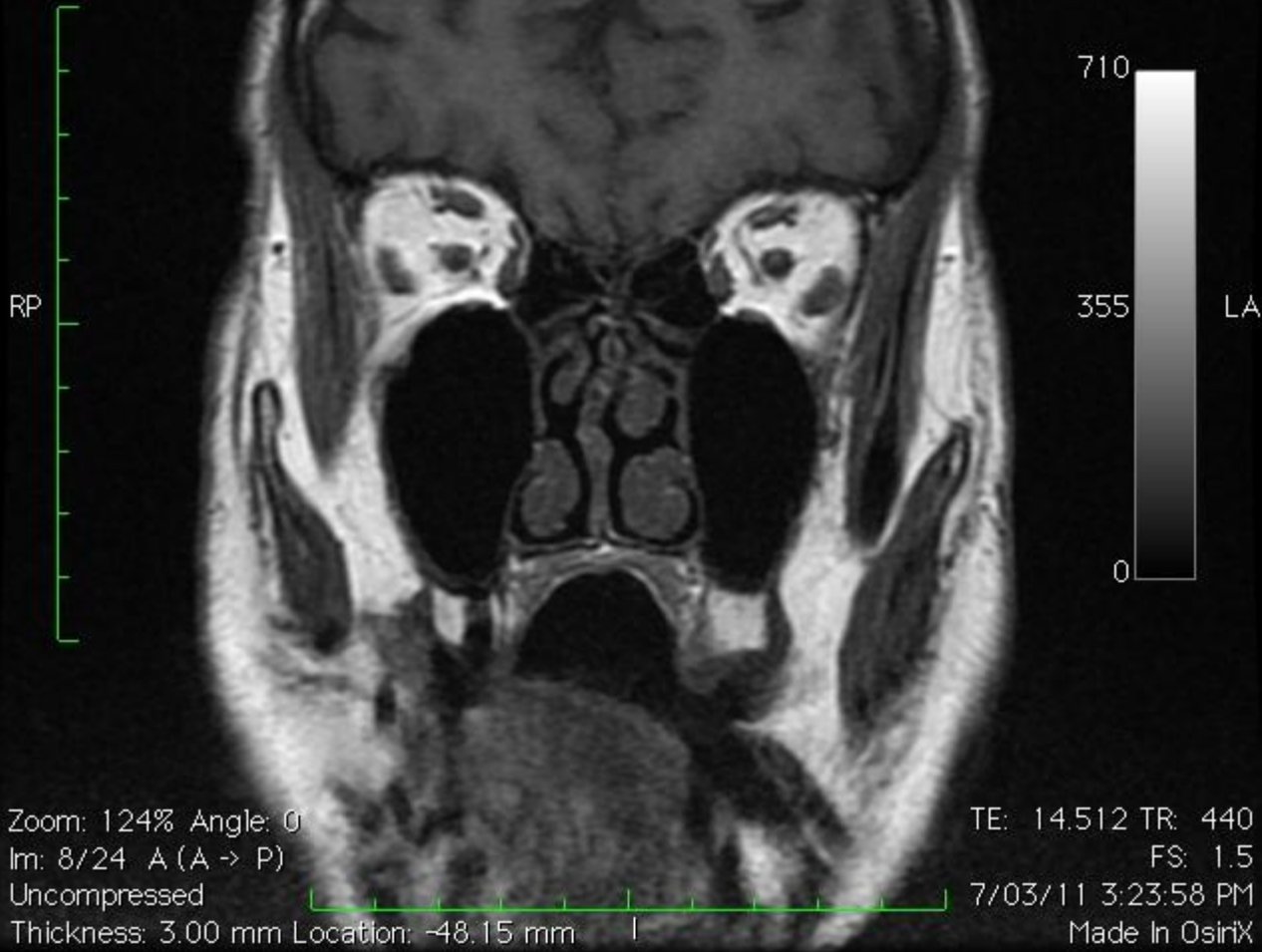


Image size: 512 x 512

S

072571 ( 84 y , 83 y )

View size: 635 x 635

Orbits - Exclude Patholo - Cor T1 (Thin)

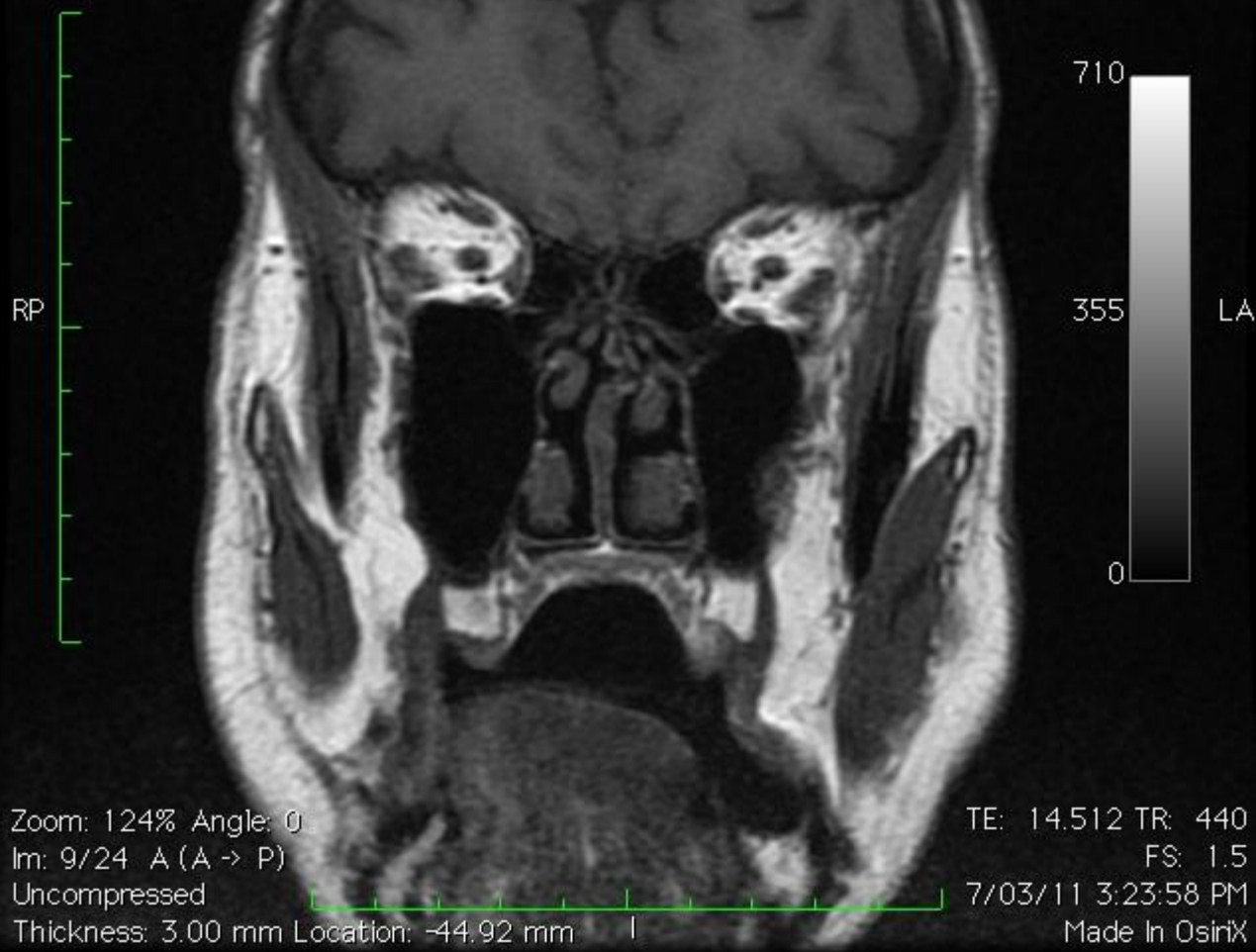
WL: 355 WW: 710

27408

X: 275 px Y: 506 px Value: 112.00

8

X: 3.65 mm Y: -65.29 mm Z: -116.77 mm



Zoom: 124% Angle: 0

Im: 9/24 A (A -> P)

Uncompressed

Thickness: 3.00 mm Location: -44.92 mm

TE: 14.512 TR: 440

FS: 1.5

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Made In OsiriX

Image size: 512 x 512  
View size: 635 x 635  
WL: 355 WW: 710  
X: 275 px Y: 506 px Value: 186.00  
X: 4.34 mm Y: -62.06 mm Z: -116.70 mm

S

072571 ( 84 y , 83 y )

Orbits -Exclude Patholo — Cor T1 (Thin)

27408

8

RP



Zoom: 124% Angle: 0  
Im: 10/24 A (A -> P)  
Uncompressed  
Thickness: 3.00 mm Location: -41.70 mm

TE: 14.512 TR: 440  
FS: 1.5  
7/03/11 3:23:58 PM  
Made In OsiriX

Image size: 512 x 512

S

072571 ( 84 y , 83 y )

View size: 635 x 635

Orbits - Exclude Patholo - Cor T1 (Thin)

WL: 355 WW: 710

27408

X: 275 px Y: 506 px Value: 152.00

8

X: 5.03 mm Y: -58.84 mm Z: -116.63 mm



Zoom: 124% Angle: 0

TE: 14.512 TR: 440

Im: 11/24 (A -> P)

FS: 1.5

Uncompressed

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Thickness: 3.00 mm Location: -38.47 mm

Made In OsiriX

Image size: 512 x 512

AR

072571 ( 84 y , 83 y )

View size: 634 x 635

Orbits - Exclude Patholo - AX T1 Thin

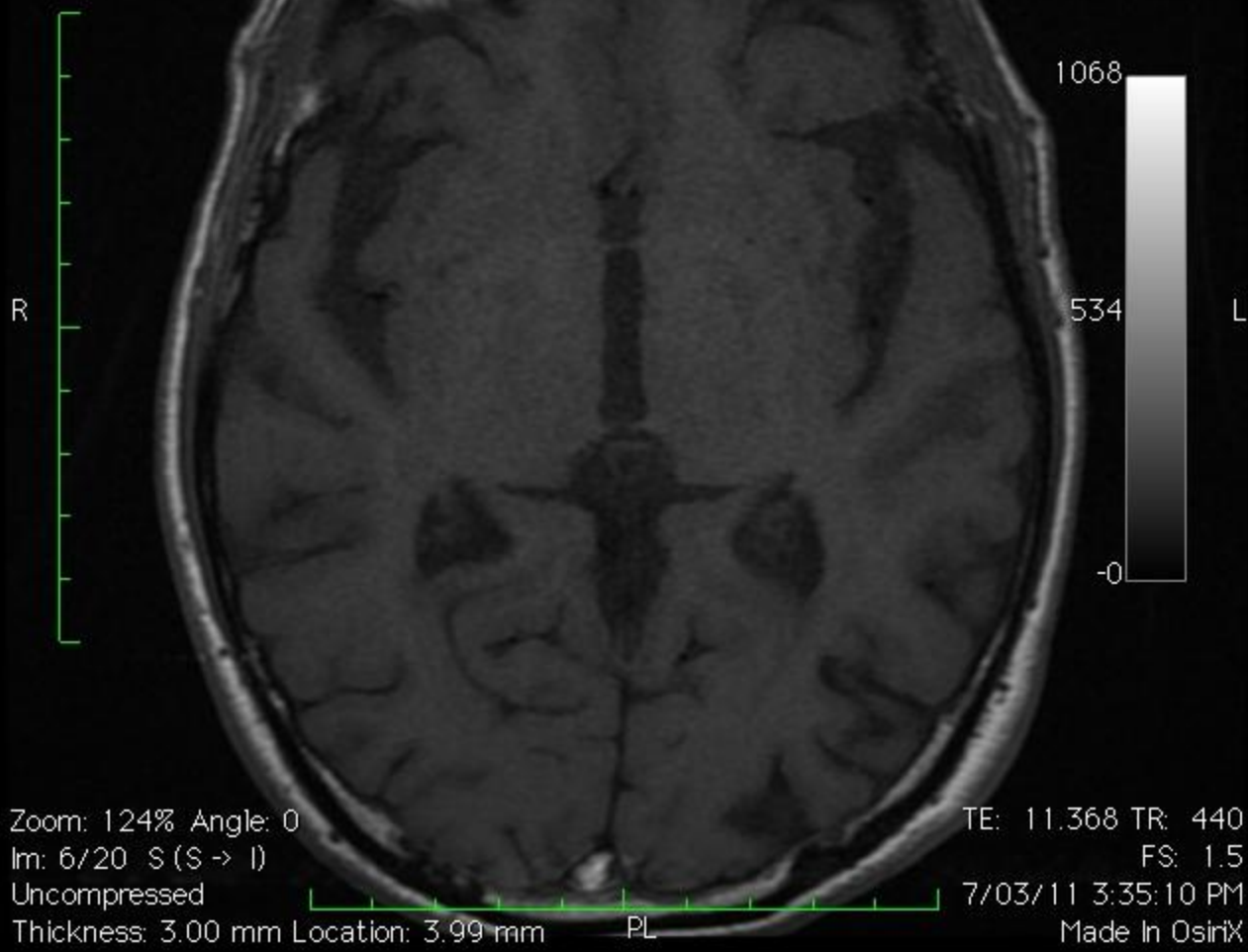
WL: 534 WW: 1069

27408

X: 272 px Y: 502 px Value: 418.00

10

X: 23.88 mm Y: 75.41 mm Z: 1.68 mm



Zoom: 124% Angle: 0

Im: 6/20 S (S -> I)

Uncompressed

Thickness: 3.00 mm Location: 3.99 mm

PL

TE: 11.368 TR: 440

FS: 1.5

7/03/11 3:35:10 PM

Made In OsiriX

Image size: 512 x 512

AR

072571 ( 84 y , 83 y )

View size: 634 x 635

Orbits - Exclude Patholo - AX T1 Thin

WL: 534 WW: 1069

27408

X: 272 px Y: 502 px Value: 155.00

10

X: 23.97 mm Y: 75.29 mm Z: -1.62 mm

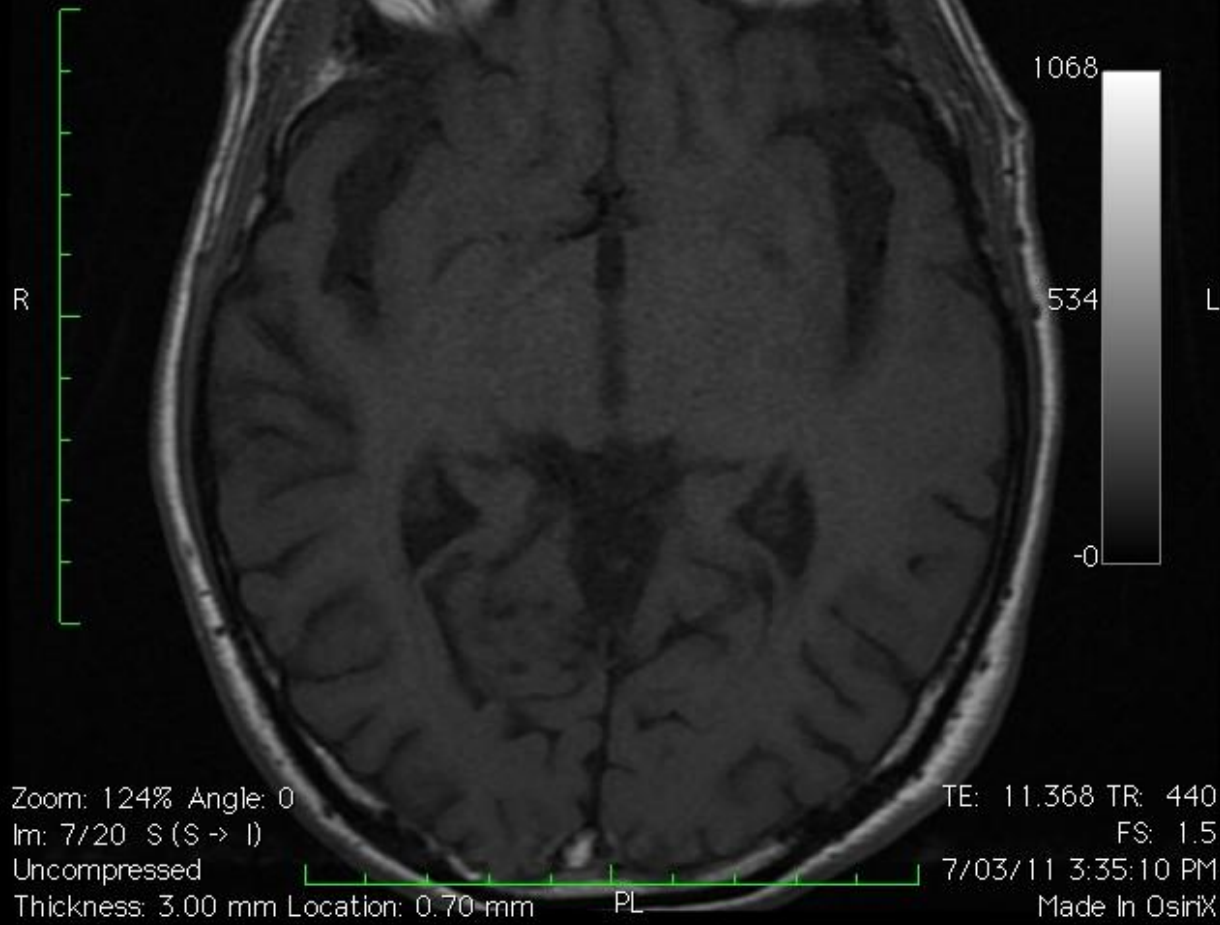


Image size: 512 x 512

View size: 634 x 635

WL: 534 WW: 1069

X: 272 px Y: 502 px Value: 1.00

X: 24.07 mm Y: 75.16 mm Z: -4.91 mm

AR

072571 ( 84 y , 83 y )

Orbits -Exclude Patholo — AX T1 Thin

27408

10

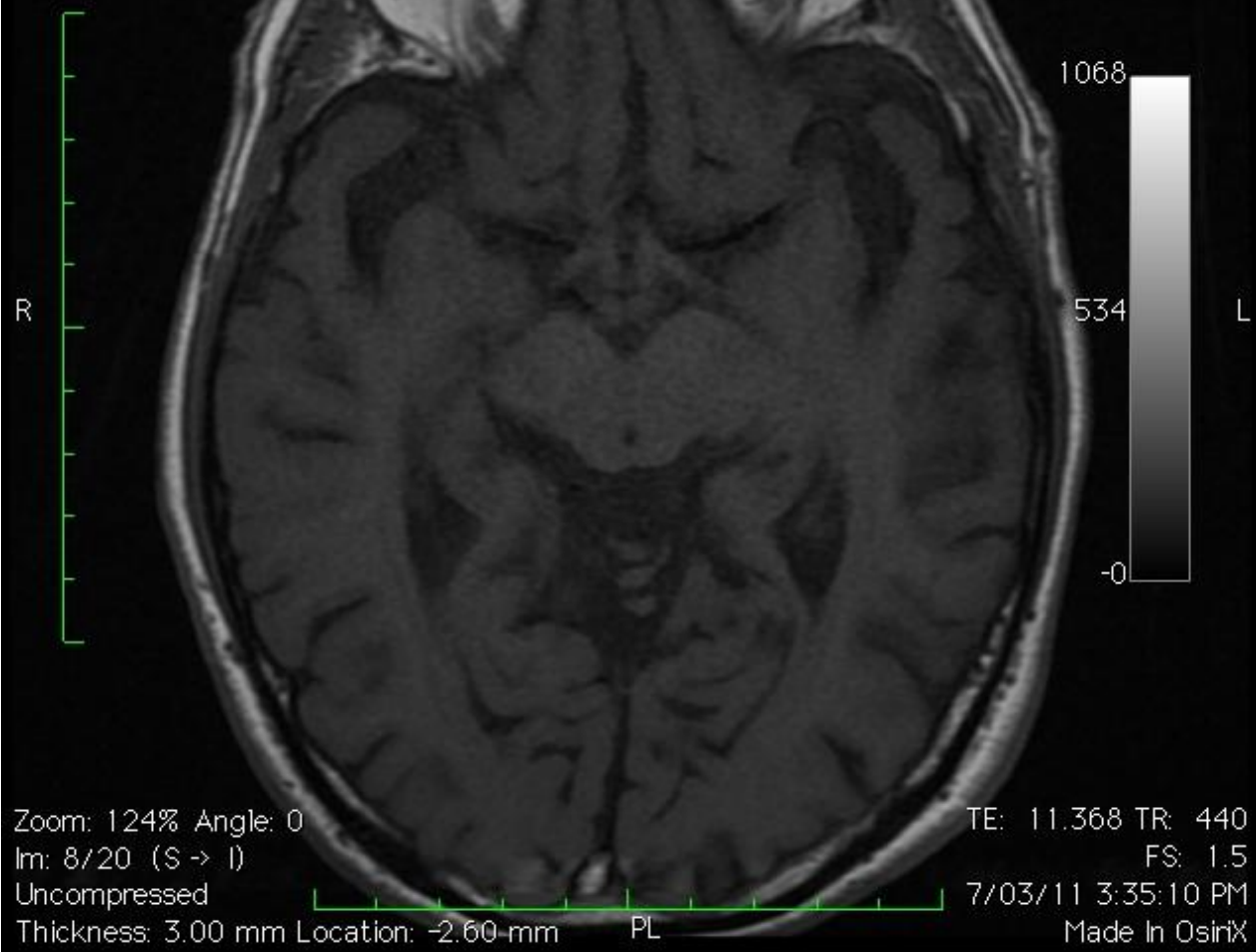


Image size: 512 x 512

AR

072571 ( 84 y , 83 y )

View size: 634 x 635

Orbits -Exclude Patholo - AX T1 Thin

WL: 534 WW: 1069

27408

X: 272 px Y: 502 px Value: 20.00

10

X: 24.17 mm Y: 75.03 mm Z: -8.21 mm

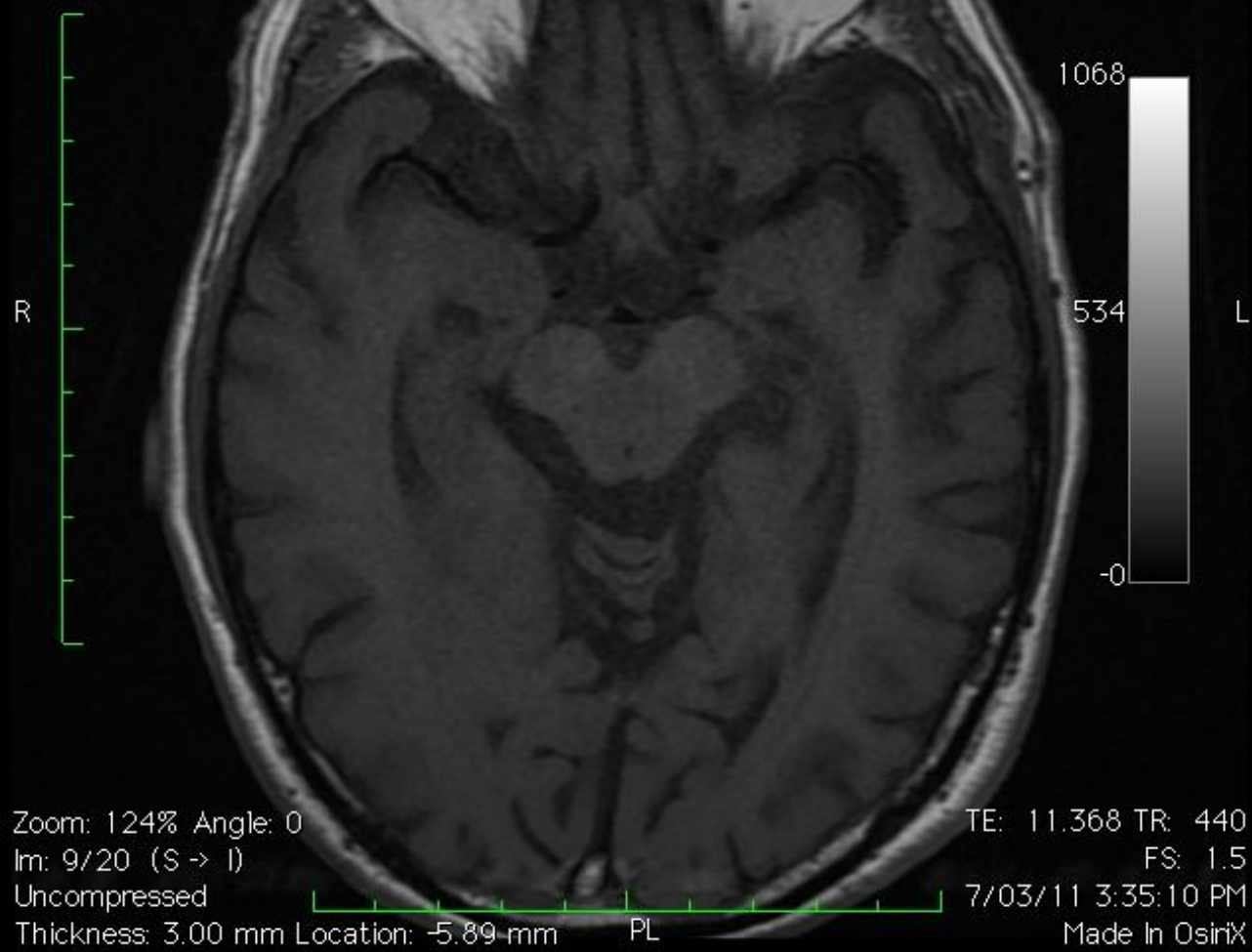


Image size: 512 x 512 AR 072571 ( 84 y , 83 y )  
View size: 634 x 635 Orbits - Exclude Patholo - AX T1 Thin  
WL: 534 WW: 1069 27408  
X: 272 px Y: 502 px Value: 12.00 10  
X: 24.27 mm Y: 74.91 mm Z: -11.51 mm



LLR

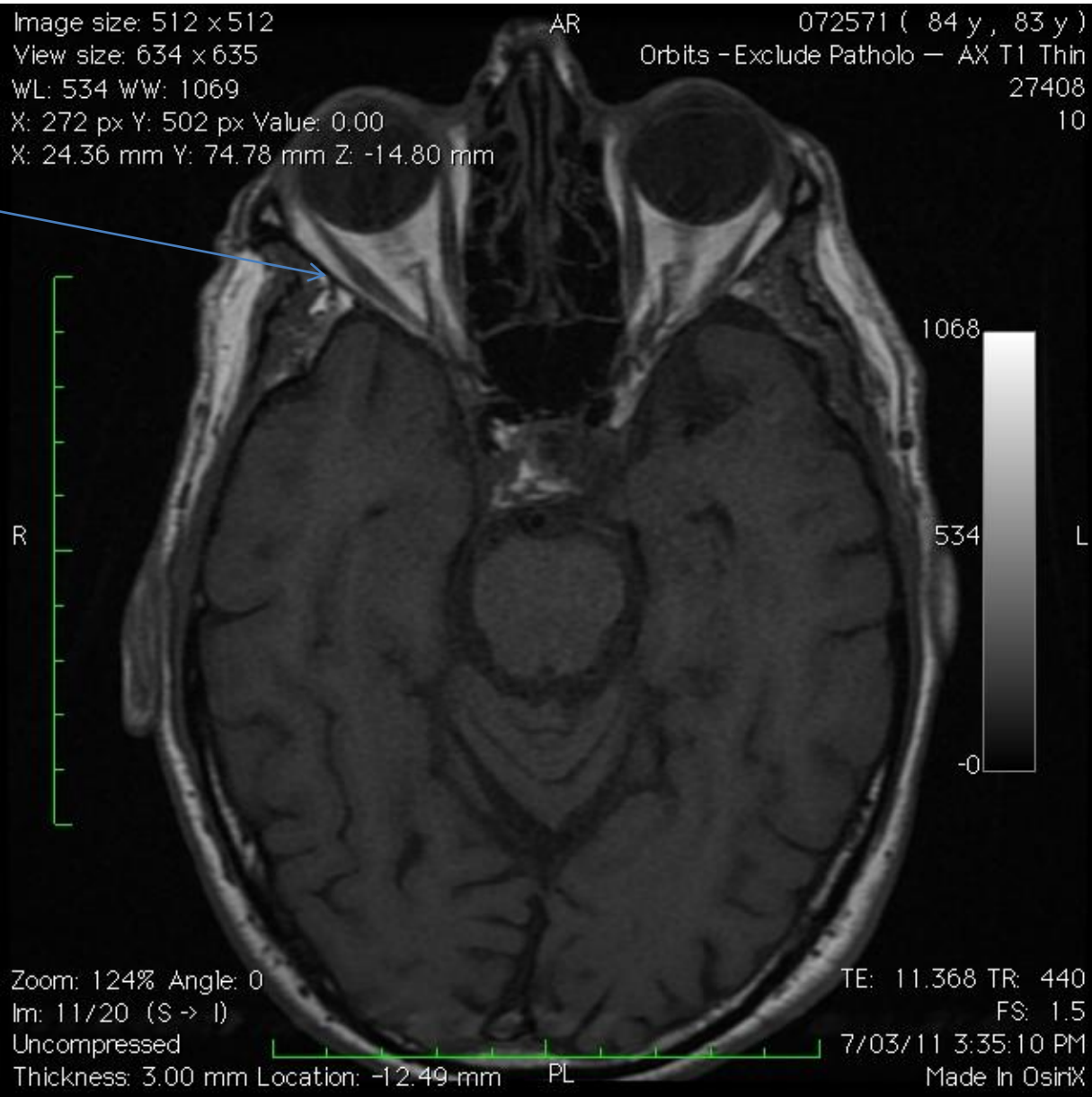


Image size: 512 x 512

AR

072571 ( 84 y , 83 y )

View size: 634 x 635

Orbits - Exclude Patholo - AX T1 Thin

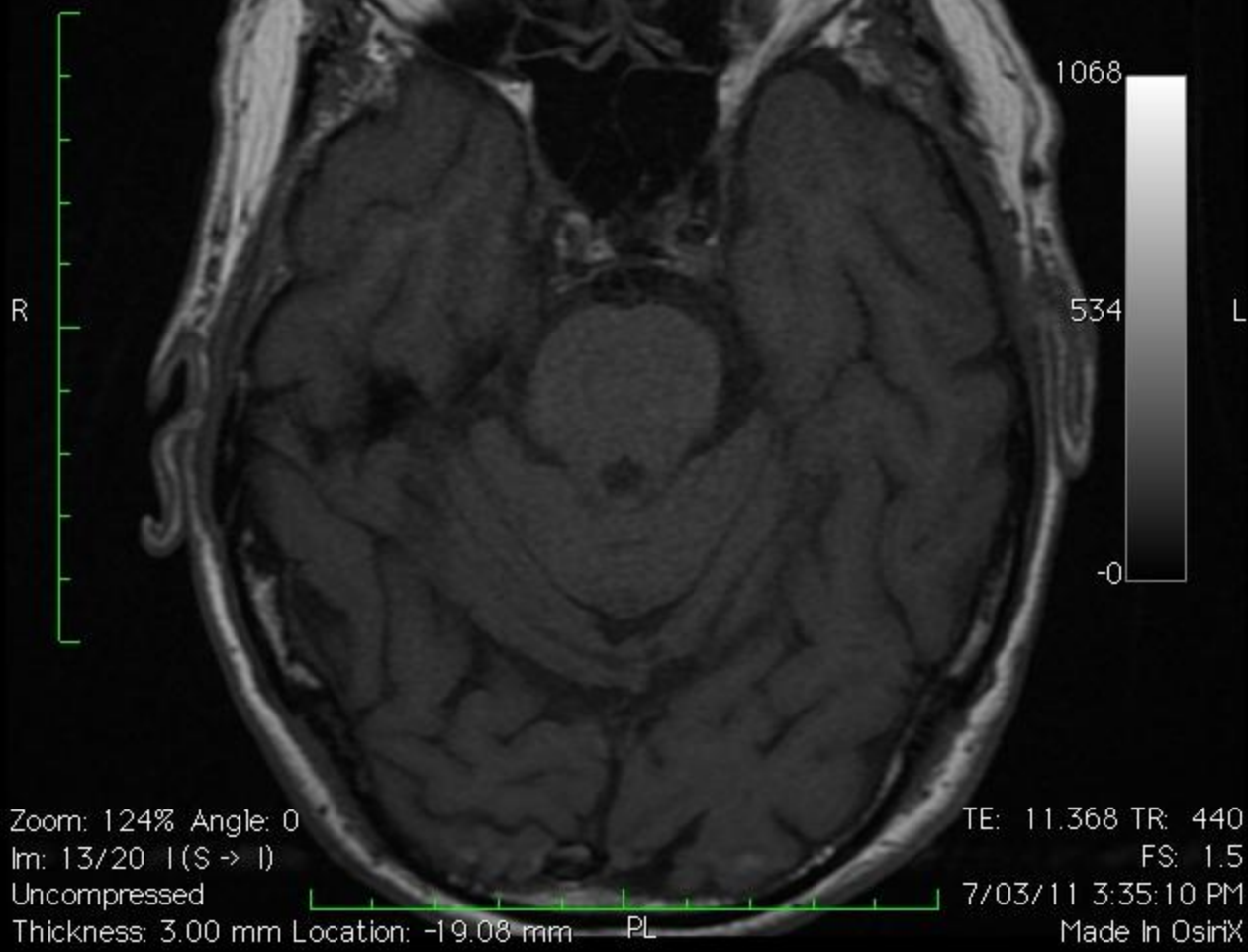
WL: 534 WW: 1069

27408

X: 272 px Y: 502 px Value: 420.00

10

X: 24.56 mm Y: 74.53 mm Z: -21.40 mm



Zoom: 124% Angle: 0

TE: 11.368 TR: 440

Im: 13/20 1(S -> I)

FS: 1.5

Uncompressed

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Thickness: 3.00 mm Location: -19.08 mm PL

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Image size: 512 x 512  
View size: 634 x 635  
WL: 534 WW: 1069  
X: 272 px Y: 502 px Value: 374.00  
X: 24.66 mm Y: 74.40 mm Z: -24.69 mm

AR

072571 ( 84 y , 83 y )  
Orbits - Exclude Patholo - AX T1 Thin  
27408  
10

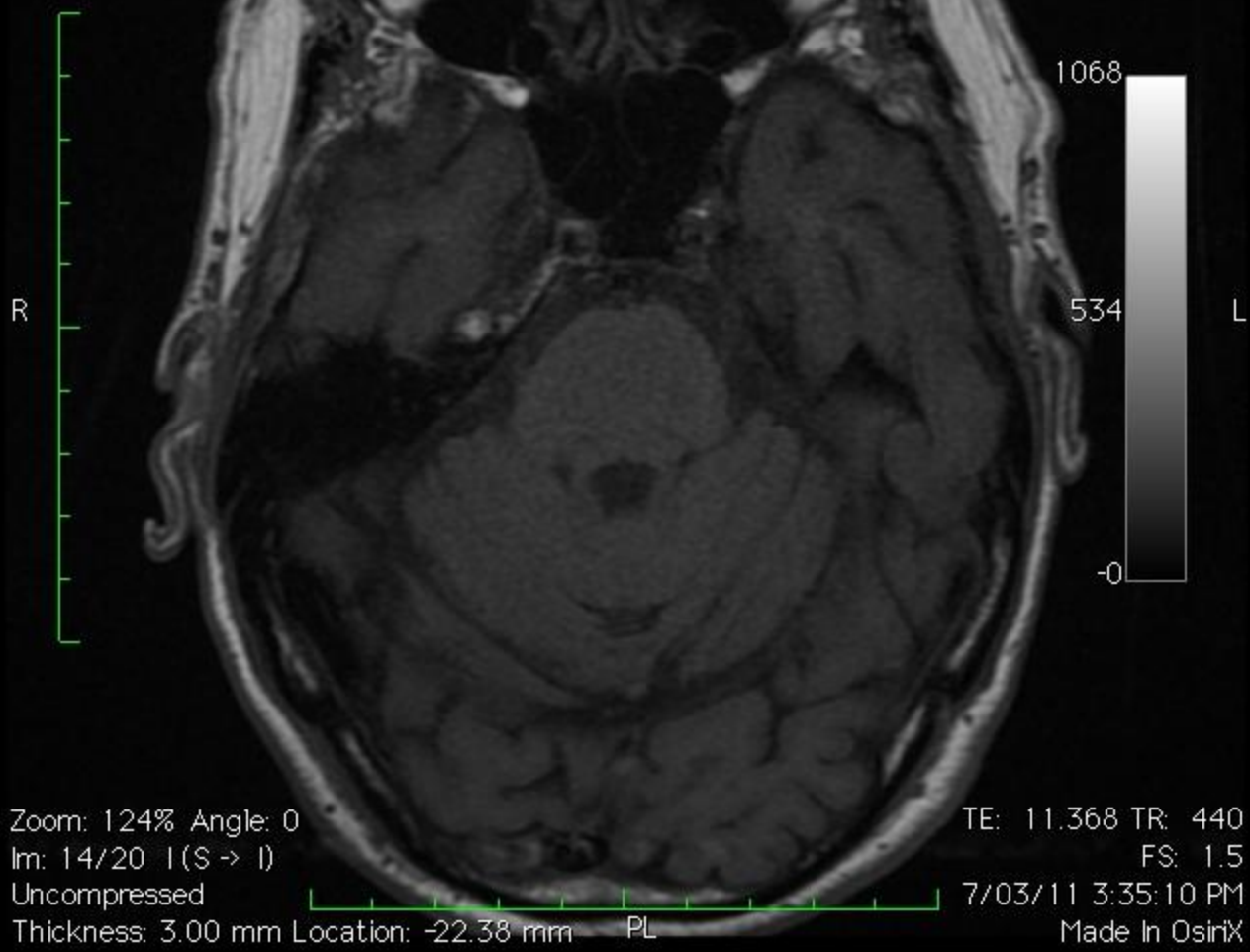


Image size: 512 x 512

View size: 634 x 635

WL: 534 WW: 1069

X: 272 px Y: 502 px Value: 278.00

X: 24.75 mm Y: 74.27 mm Z: -27.99 mm

AR

072571 ( 84 y , 83 y )

Orbits - Exclude Patholo - AX T1 Thin

27408

10



Zoom: 124% Angle: 0

Im: 15/20 (S -> I)

Uncompressed

Thickness: 3.00 mm Location: -25.67 mm PL

TE: 11.368 TR: 440

FS: 1.5

7/03/11 3:35:10 PM

Made In Osirix

# Discussion

# 'Saggy Eye' Syndrome

## 2 forms of presentation

### 1. Asymmetric and causes diplopia

“Heavy Eye” Syndrome in the Absence of High Myopia: A Connective Tissue Degeneration in Elderly Strabismic Patients.

Rutar T, Demer JL. [J AAPOS. 2009 February; 13\(1\): 36–44](#)

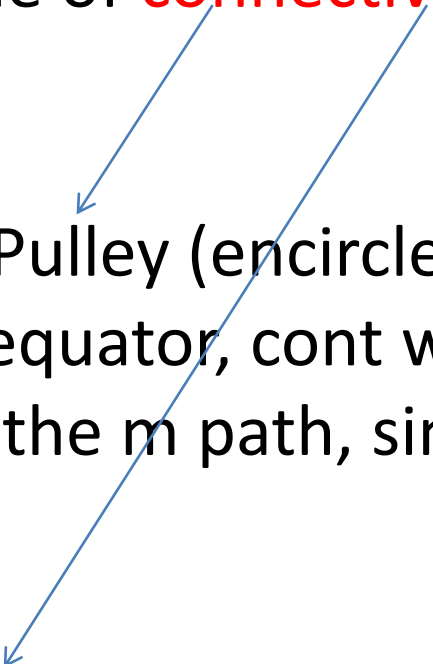
### 2. Impaired upgaze in elderly w/o diplopia

Effect of aging on human rectus extraocular muscle paths demonstrated by magnetic resonance imaging.

Clark RA, Demer JL. [Am J Ophthalmol. 2002 Dec;134\(6\):872-8.](#)

# Background

The role of **connective tissues** on Ocular Motility



Pulley (encircles the rectus m, post to globe equator, cont with tenon's fascia and inflect the m path, similar to trochlea of SOM)

Intermuscular septa (couples the pulleys to one another)

# LR-SR inter-muscular septa/ band

Degeneration of the LR-SR band may occur in elderly



Inf displacement of the LR & Pulley.



The new position of the LR changes its mechanical efficiency and induces a vertical effect as well.



ET& Hypotropia

\*Similar to “heavy eye” synd in myopic strabismus fixus

# METHODS

3 strabismic elderly pt's,  
3 strabismic high myopes,  
Compared to  
12 orthotropic elderly.

Ophthalmic exam and orbital MRI  
for the position of LR related to globe centroid &  
LR-SR band.

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“Heavy Eye” Syndrome in the Absence of High Myopia: A Connective Tissue Degeneration in Elderly Strabismic Patients. Rutar T, Demer JL.  
[J AAPOS. 2009 February; 13\(1\): 36–44](#)

# RESULTS- LRM position

2 strabismic pt's had Hypotropia,  
1 had ET (AL = 24 mm, for myopes AL=31).

LR position of elderly strabismic pt's :4.6mm  
inferior to globe centroid,  
similar to that of high myopes ( $5.1 \pm 3.2$  mm).  
For the orthotropic elderly subjects: only 2.1mm  
( $P=0.01$ ).

“Heavy Eye” Syndrome in the Absence of High Myopia: A Connective Tissue  
Degeneration in Elderly Strabismic Patients. [J AAPOS. 2009 February; 13\(1\): 36–44.](#)

# LR-SR band

- By MRI, LR-SR band thinning, discontinuity, or displacement, was seen in:
  - 100% of strabismic elderly orbits,
  - 67% of strabismic myopic orbits,
  - and 12.5% of control (ortho) elderly.

“Heavy Eye” Syndrome in the Absence of High Myopia: A Connective Tissue Degeneration in Elderly Strabismic Patients. [J AAPOS. 2009 February; 13\(1\): 36–44.](#)

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- 12 elderly (65.2 y) compared with MRI images  
12 younger subjects (28.5 y)
- **CONCLUSIONS**: The horizontal rectus EOM & pulley are displaced inf in the elderly ---> partially **converting horizontal rectus muscle force to depression.**

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Effect of aging on human rectus extraocular muscle paths demonstrated by magnetic resonance imaging.

Clark RA, Demer JL. [Am J Ophthalmol. 2002 Dec;134\(6\):872-8.](#)

# Case 1: Elderly Strabismic

- A 85 year-old woman c/o vert diplopia post RE cat op – 2 ya (retrobulbar anesthesia).
- She had ptosis repair of the RUL
- s/p radiation for RT orbital lymphoma.
- HTN.
- On examination, VA was 20/20 in BE.

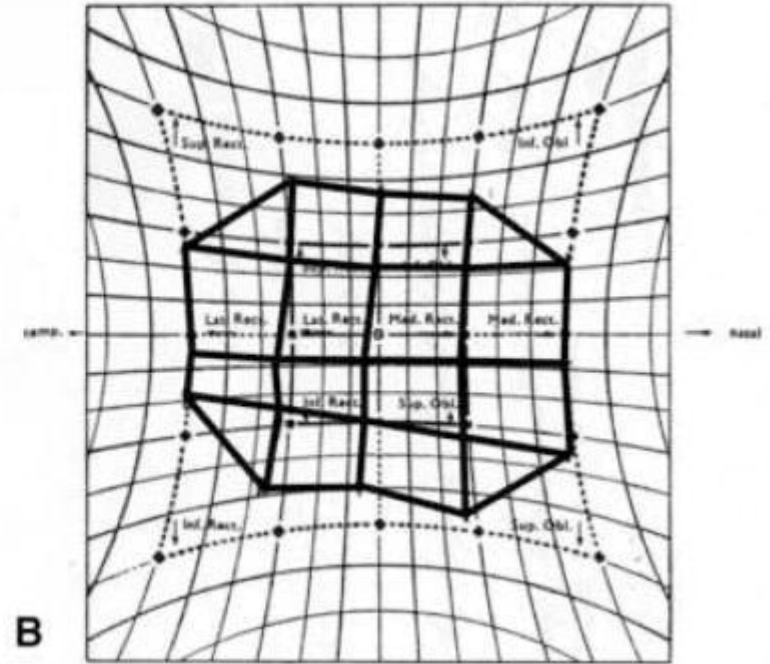
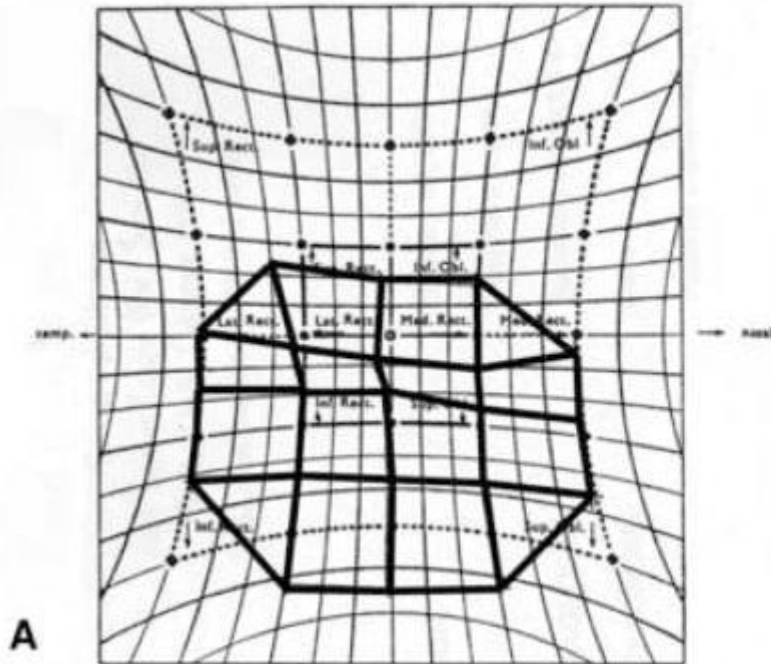
**elderly strabismic pt before and after Sx repair**  
LT hypot on primary and LT gaze, and LT reduced elevation

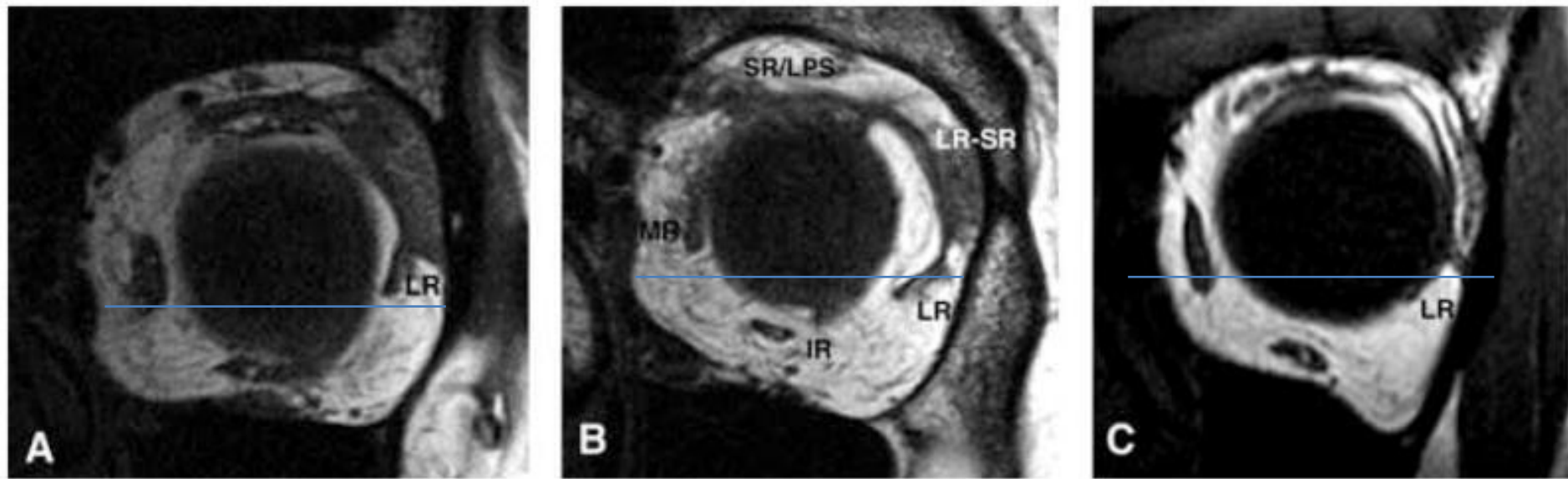


Hess screen of elderly strabismic subject 1,  
showing left eye position with right eye fixating

Preoperative-LE

postoperative-LE





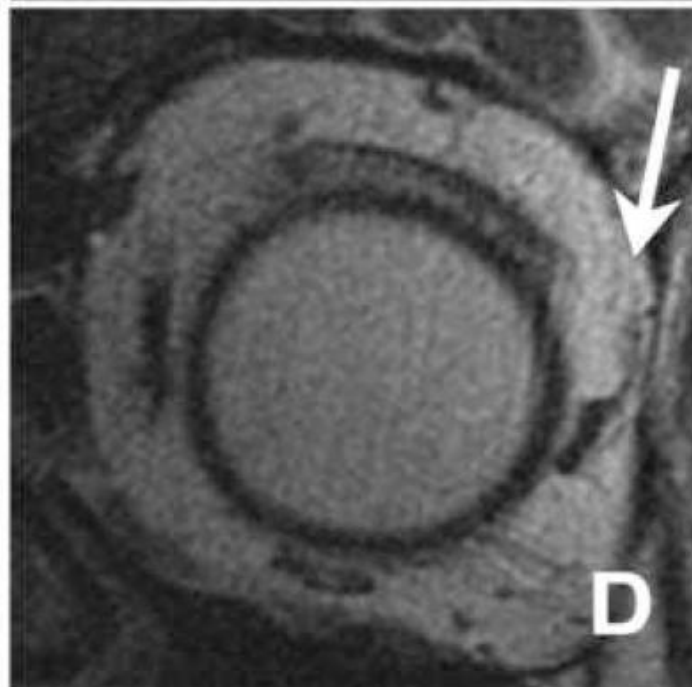
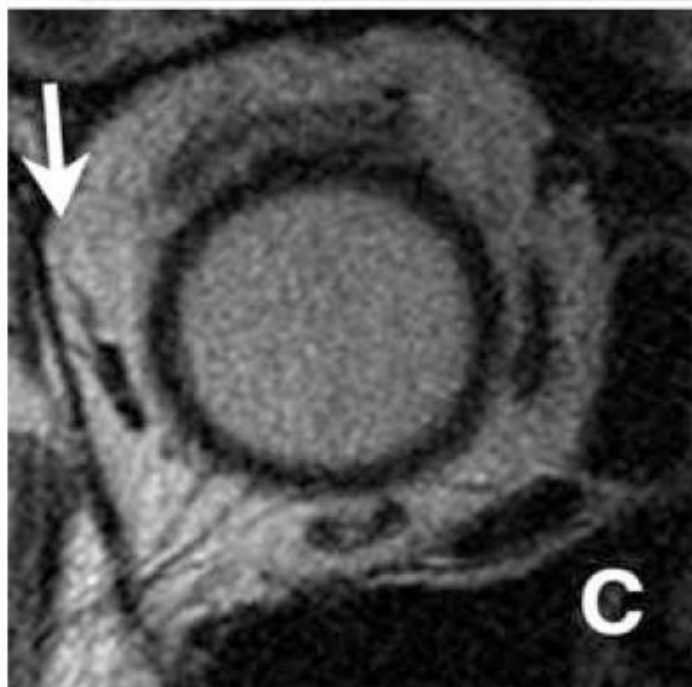
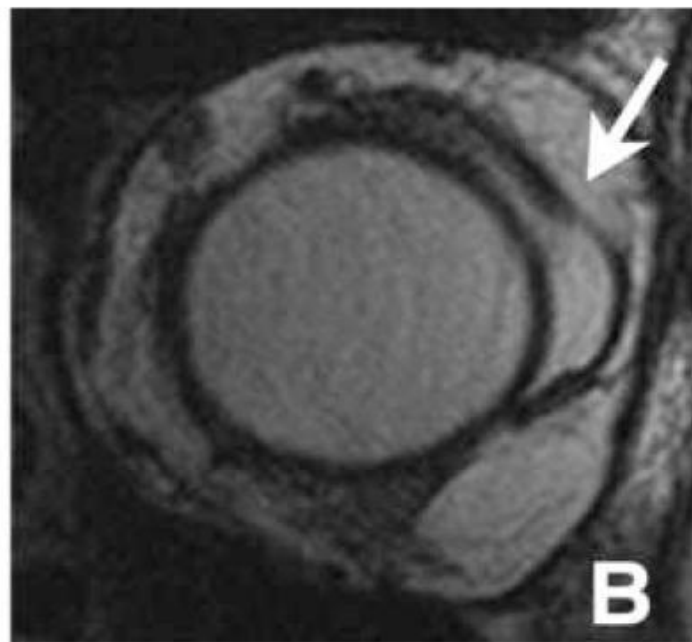
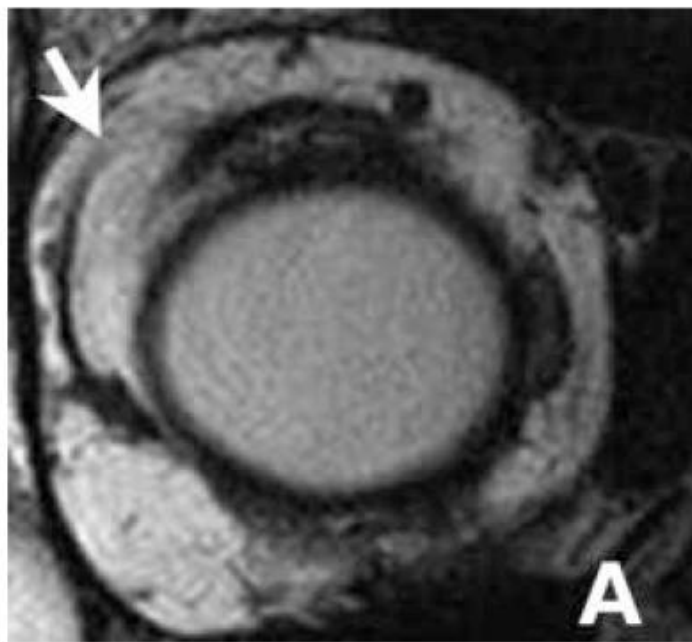
**T1-MRI of left orbits showing LR-SR bands and positions of the four rectus muscles relative to the globe**

**A** - Normal elderly control (74 , lrm 2.2 inf, vertical, LR-SR band thick, cont).

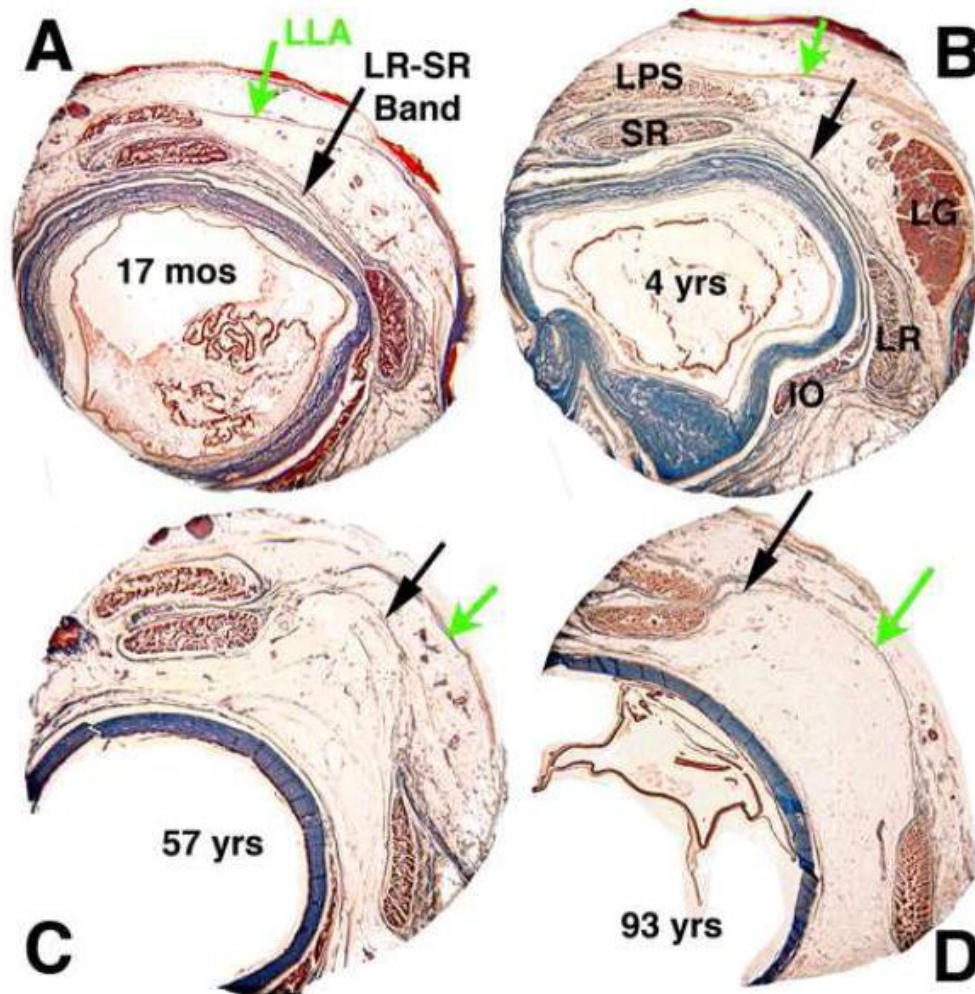
**B** - Elderly strabismic (85, LRM 7.6 inf, oblique, LR-SR band superotemporally displaced)

**C** - Strabismic myopic (63, LRM 7.4 mm inf, oblique, LR-SR band is thin and superotemporally displaced)

More  
Examples of  
LR-SR band  
degeneration  
in elderly  
strabismic  
subjects (T2-  
MRI)



Histology: with ↑ age thinning, displaced superior-temporally displacement of LR-SR band. LRM displaced ↓ (LLA- levator aponeurosis)



# surgery

- (1) superior transposition of the lateral rectus muscle insertion, and
- (2) suturing the margins of the LR-SR pulleys together (5-0 non-absorbable suture).