Case 1: RH

An unusual cause for “V” pattern exotropia

RH

- 12yo
- Bilateral asymmetric astigmatism
- POHx: XT first presented in 2005.
- OU LR Rc 5.00mm and IO Rc in 2006
- C/o progressive residual / recurrent XT with persistent “V” pattern despite IO weakening.
- No diplopia

Preop II (June 2011)

- Gls: R -3.00x180 L+0.50-1.50x165
- VA R+L 6/9cgl N3
- Stereo: Titmus 400”
- Fundus torsion was not detected.

O/E in 2005, before Sx I: Bil LRc+IOrec

- C-T (cc+sc)
  - N: X'T 20pd
  - D: XT 25

Dg: "V" pattern XT with Bil IO OA,
Asymmetric astigmatism

O/E: Before the 2nd Sx in 2011

- C-T (cc)
  - C-T: N: X’ 35pd, minimal fusion reserve
  - D: X(T)

30

25

20

“V” Pattern intermittent exotropia

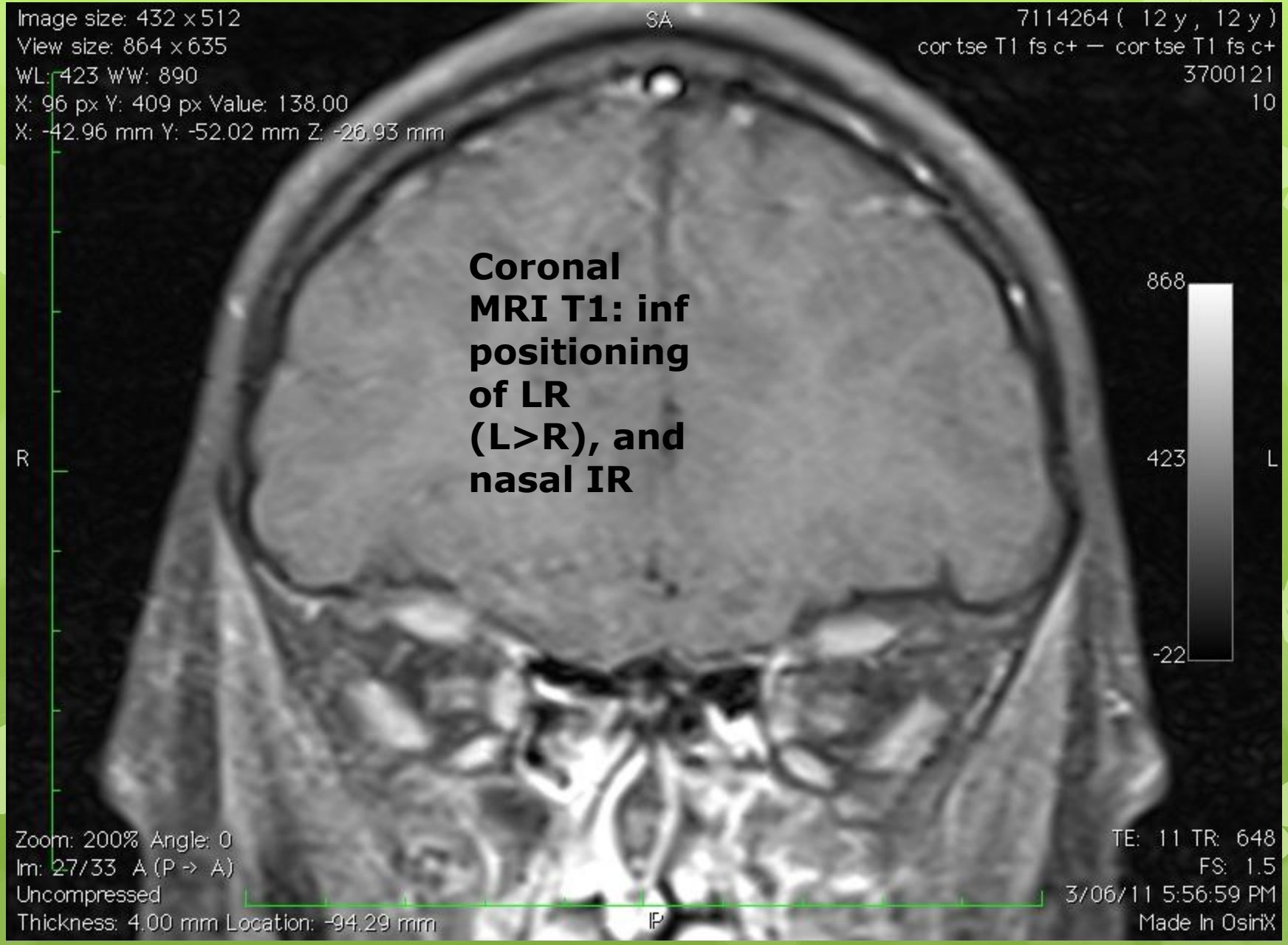
Full correction with prism did not cause diplopia
Overcorrection with prism did cause diplopia [patient had never been ET therefore had no sensory wiring to cope with being ET unlike a pt with consec XT]

The challenge is:

How to manage the V pattern in pt with previous IO weakening and no fundus torsion

MRI Brain and Orbits

3-6-2011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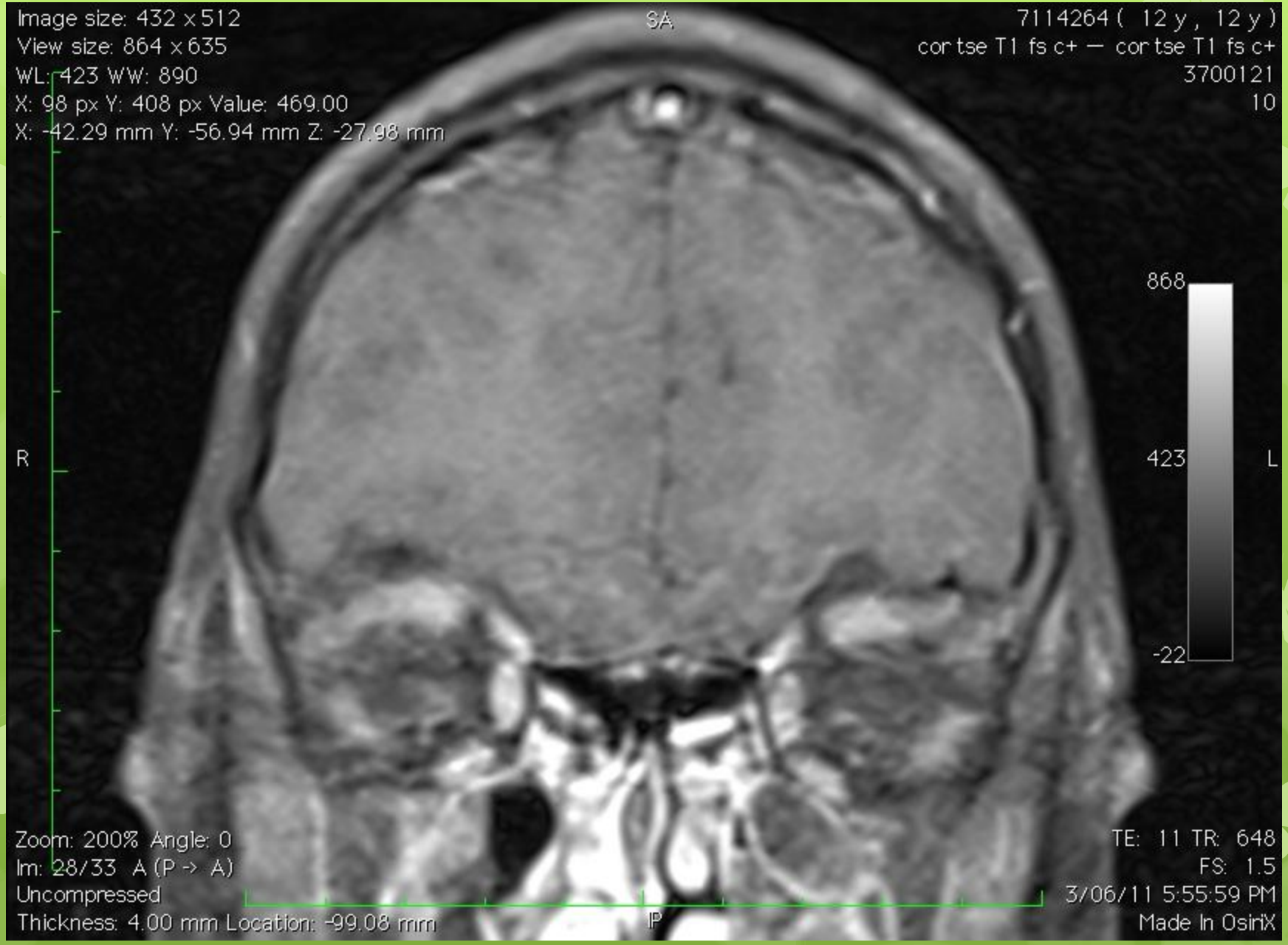
X: -42.96 mm Y: -52.02 mm Z: -26.93 mm
SA
7114264 (12 y , 12 y)
cor tse T1 fs c+ — cor tse T1 fs c+
3700121
10
Coronal MRI T1: inf positioning of LR (L>R), and nasal IR
868
423
-22
R
L
Zoom: 200% Angle: 0
Im: 27/33 A (P -> A)
Uncompressed
Thickness: 4.00 mm Location: -94.29 mm
IP
TE: 11 TR: 648
FS: 1.5
3/06/11 5:56:59 PM
Made In OsiriX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SA
7114264 (12 y , 12 y)
cor tse T1 fs c+ — cor tse T1 fs c+
3700121
10
868
423
-22
R
L
Zoom: 200% Angle: 0
Im: 28/33 A (P -> A)
Uncompressed
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P
TE: 11 TR: 648
FS: 1.5
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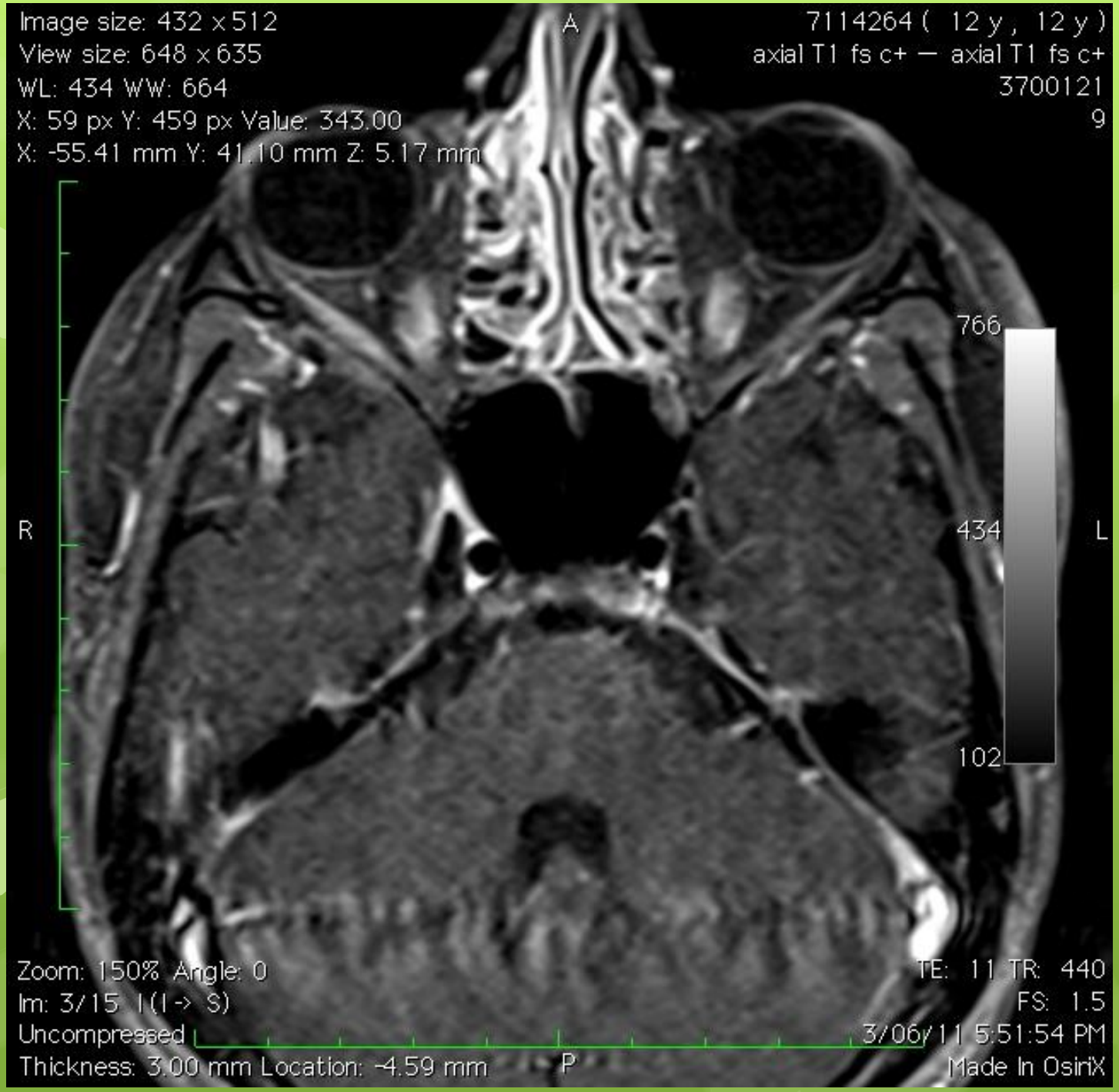
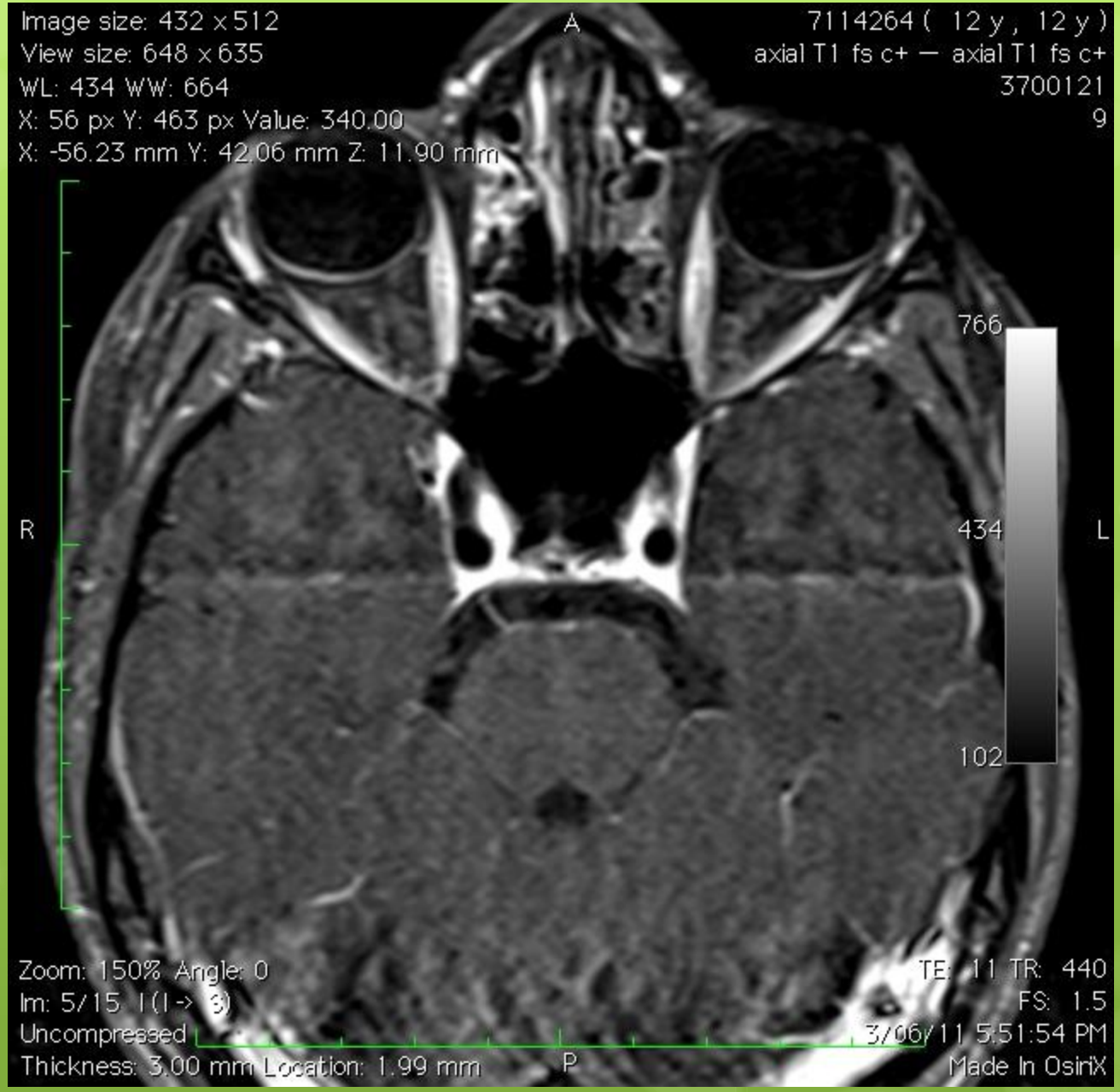


Axial T1: LR appears inferiorly to the MR


Image size: 432 x 512
View size: 648 x 635
WL: 434 WW: 664
X: 62 px Y: 458 px Value: 373.00
X: -54.30 mm Y: 40.42 mm Z: 8.38 mm
A
7114264 (12 y , 12 y)
axial T1 fs c+ — axial T1 fs c+
3700121
9
766
434
102
R
L
P
Zoom: 150% Angle: 0
Im: 4/15 1 (I -> S)
Uncompressed
Thickness: 3.00 mm Location: -1.30 mm
TE: 11 TR: 440
FS: 1.5
3/06/11 5:53:44 PM
Made In OsiriX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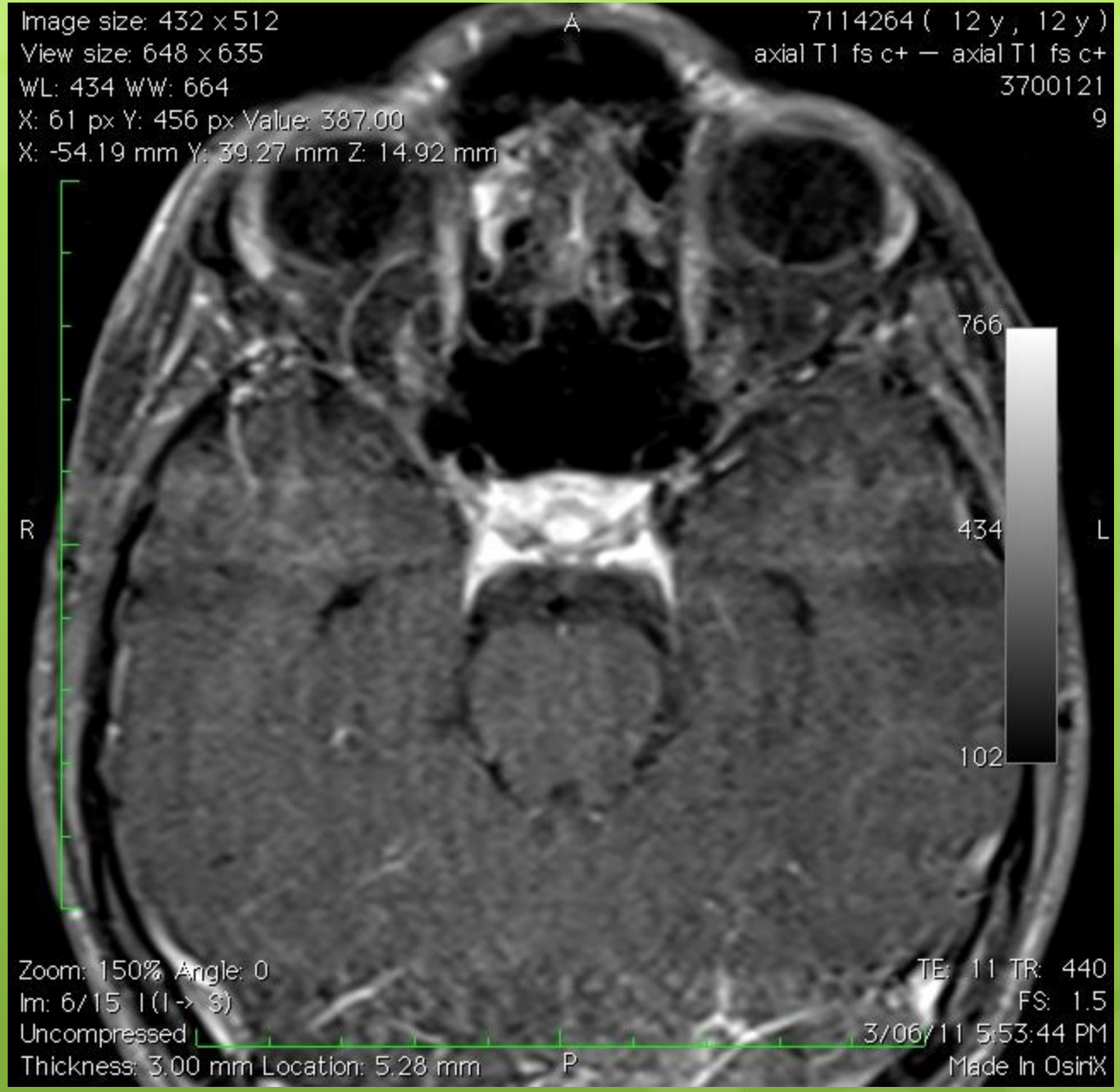
X: 56 px Y: 463 px Value: 340.00
X: -56.23 mm Y: 42.06 mm Z: 11.90 mm
A
7114264 (12 y , 12 y)
axial T1 fs c+ — axial T1 fs c+
3700121
9
766
434
102
R
L
P
Zoom: 150% Angle: 0
Im: 5/15 1 (1 -> 3)
Uncompressed
Thickness: 3.00 mm Location: 1.99 mm
TE: 11 TR: 440
FS: 1.5
3/06/11 5:51:54 PM
Made In OsiriX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A
7114264 (12 y , 12 y)
axial T1 fs c+ — axial T1 fs c+
3700121
9
766
434
102
R
L
P
Zoom: 150% Angle: 0
Im: 6/15 1 (1 -> 3)
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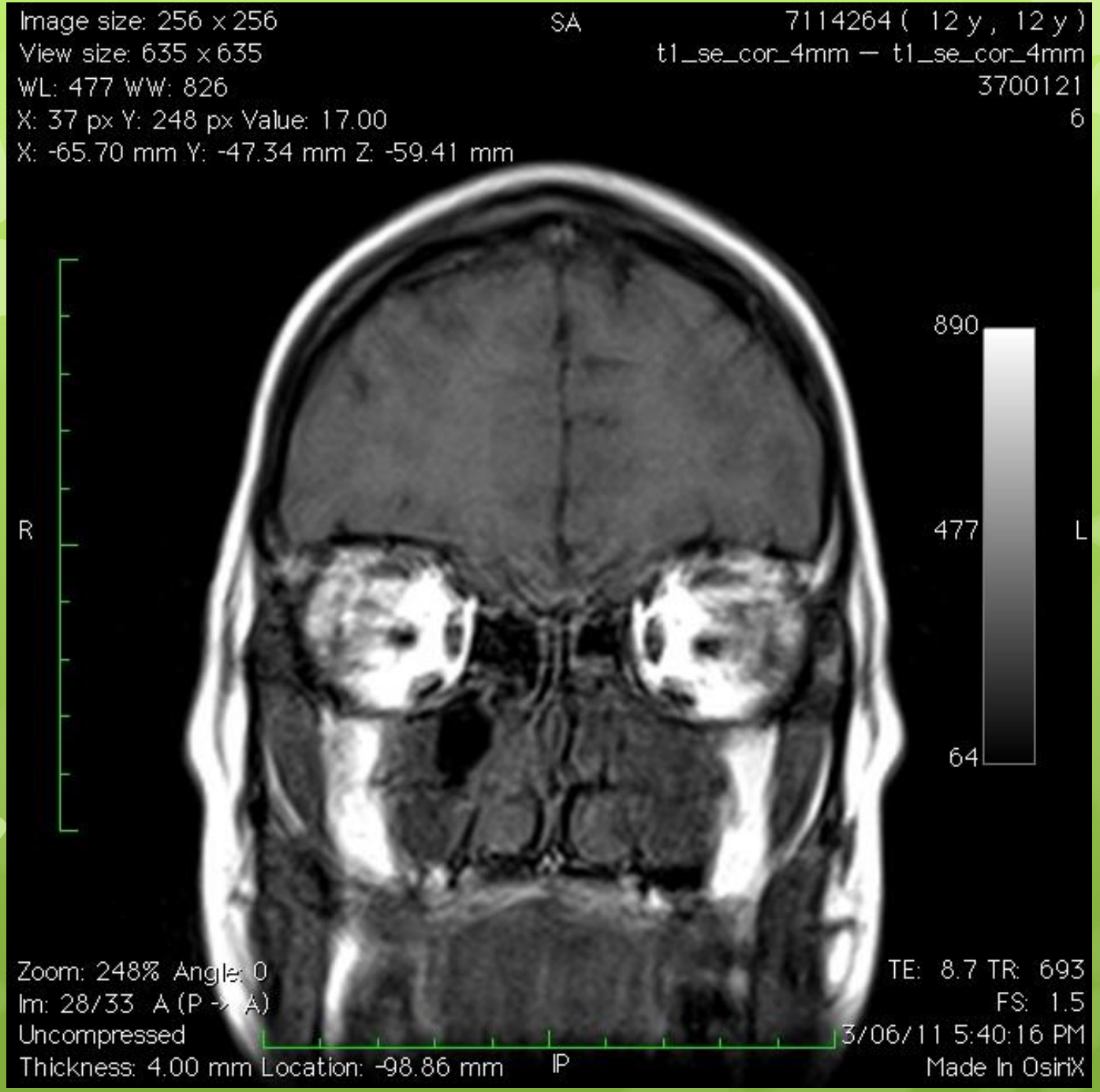
Made In OsiriX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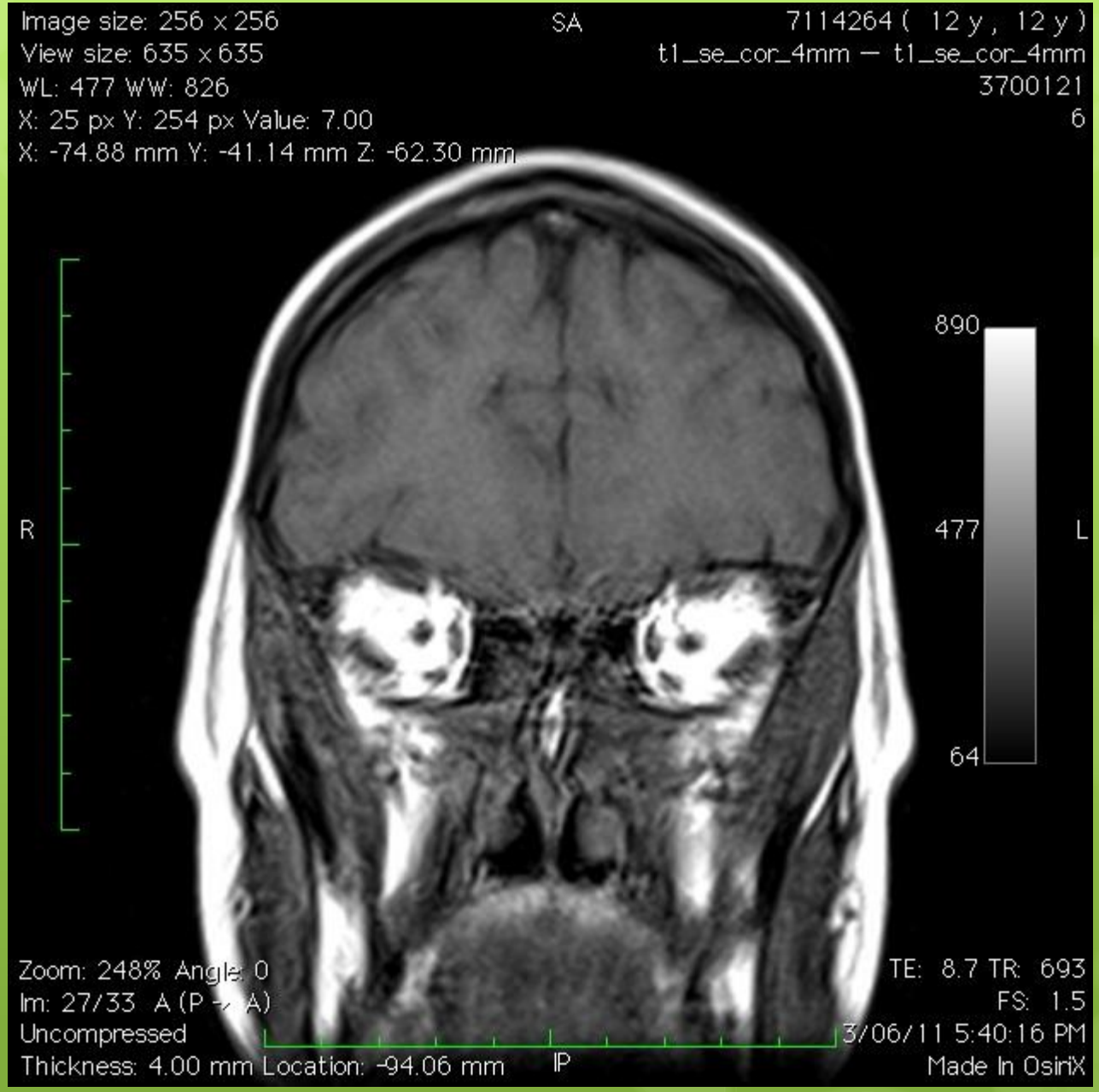
View size: 635 x 635
WL: 477 WW: 826
X: 37 px Y: 248 px Value: 17.00
X: -65.70 mm Y: -47.34 mm Z: -59.41 mm
SA
7114264 (12 y , 12 y)
t1_se_cor_4mm — t1_se_cor_4mm
3700121
6
R
890
477
64
L
Zoom: 248% Angle: 0
Im: 28/33 A (P -> A)
Uncompressed
Thickness: 4.00 mm Location: -98.86 mm
IP
TE: 8.7 TR: 693
FS: 1.5
3/06/11 5:40:16 PM
Made In OsiriX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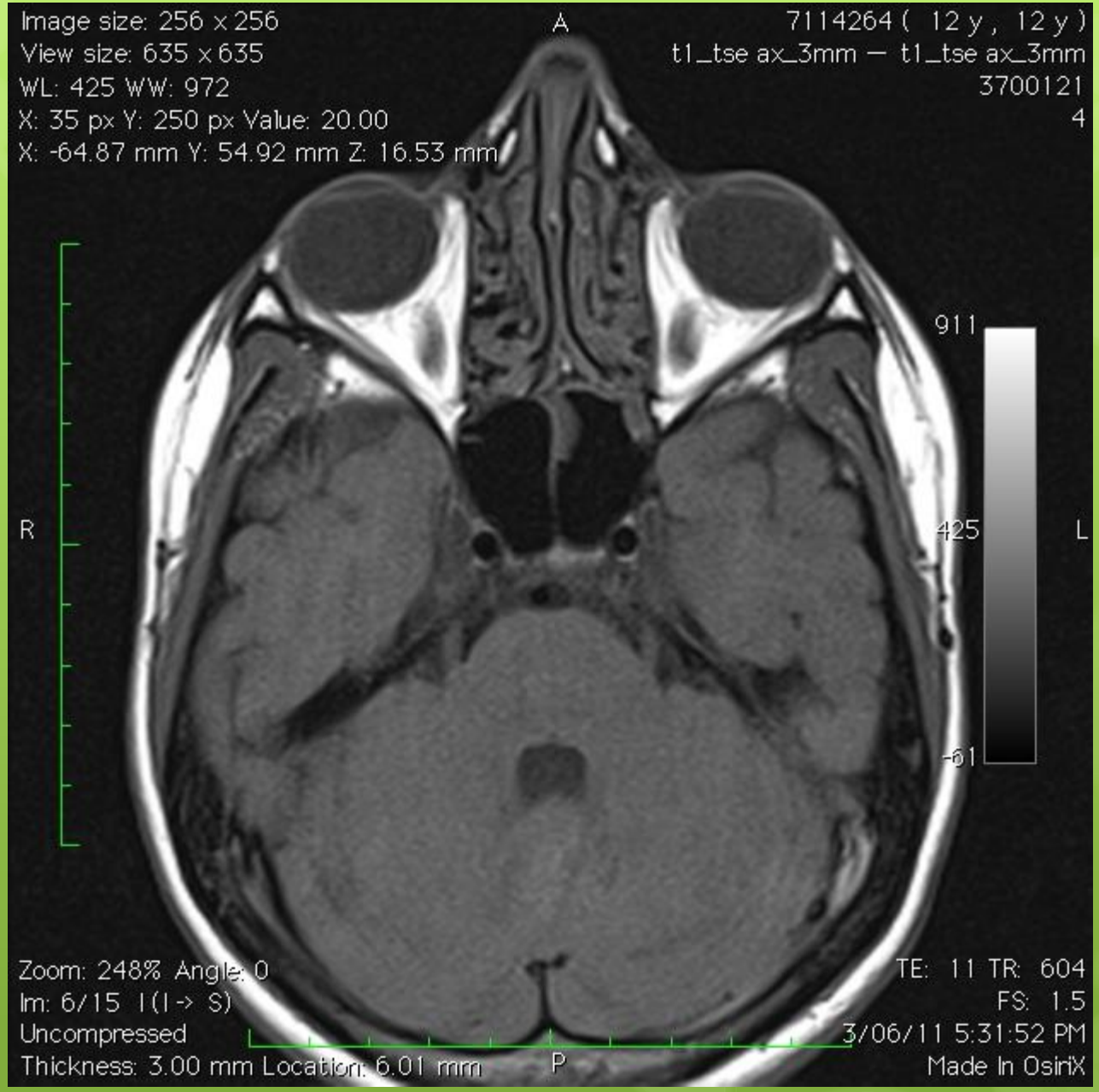
X: -74.88 mm Y: -41.14 mm Z: -62.30 mm
SA
7114264 (12 y , 12 y)
t1_se_cor_4mm — t1_se_cor_4mm
3700121
6
R
890
477
64
L
Zoom: 248% Angle: 0
Im: 27/33 A (P -> A)
Uncompressed
Thickness: 4.00 mm Location: -94.06 mm
IP
TE: 8.7 TR: 693
FS: 1.5
3/06/11 5:40:16 PM
Made In OsiriX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WL: 425 WW: 972
X: 35 px Y: 250 px Value: 20.00
X: -64.87 mm Y: 54.92 mm Z: 16.53 mm
A
7114264 (12 y , 12 y)
t1_tse ax_3mm — t1_tse ax_3mm
3700121
4
911
425
-61
R
L
P
Zoom: 248% Angle: 0
Im: 6/15 I (I -> S)
Uncompressed
Thickness: 3.00 mm Location: 6.01 mm
TE: 11 TR: 604
FS: 1.5
3/06/11 5:31:52 PM
Made In OsiriX

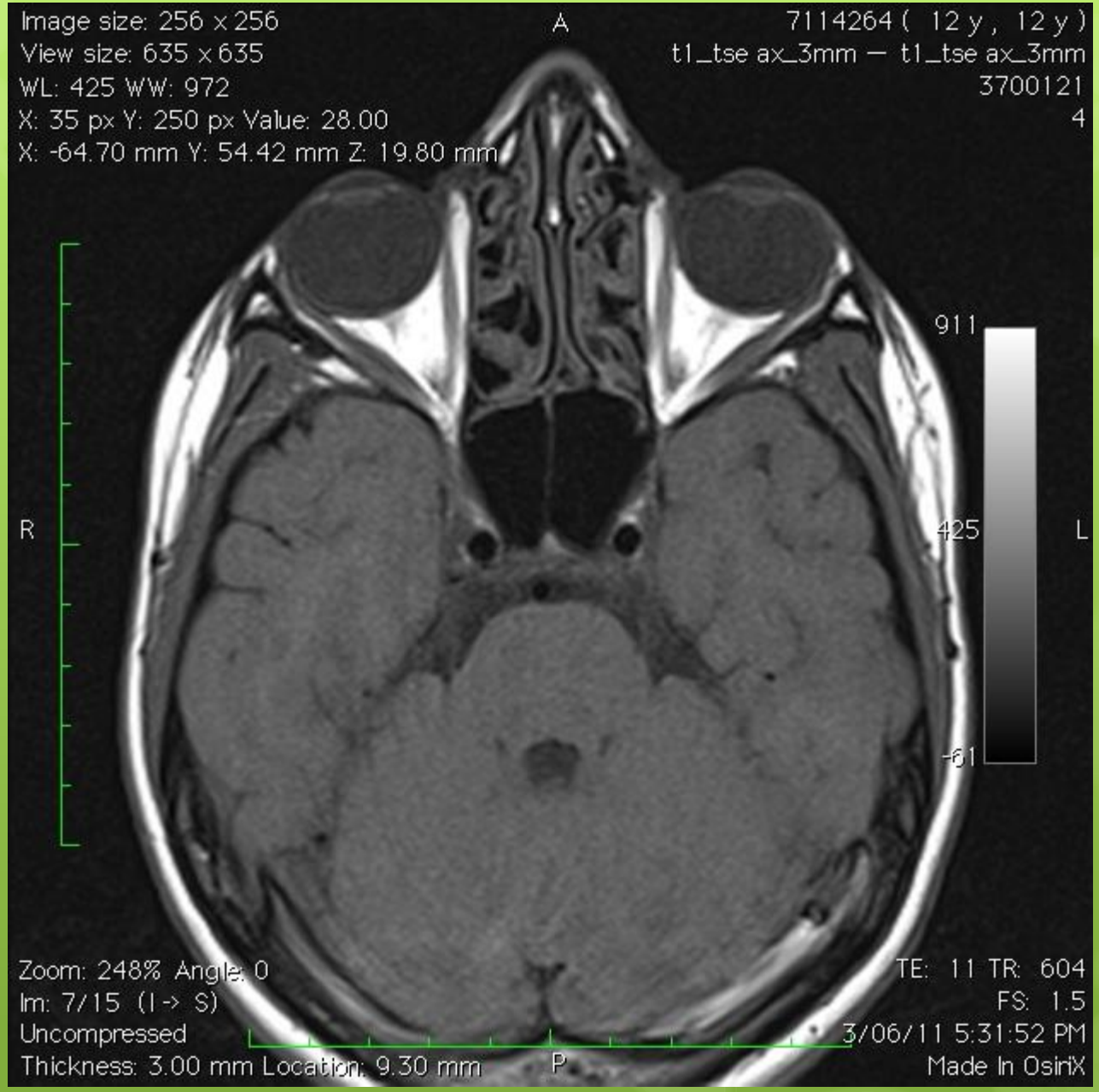
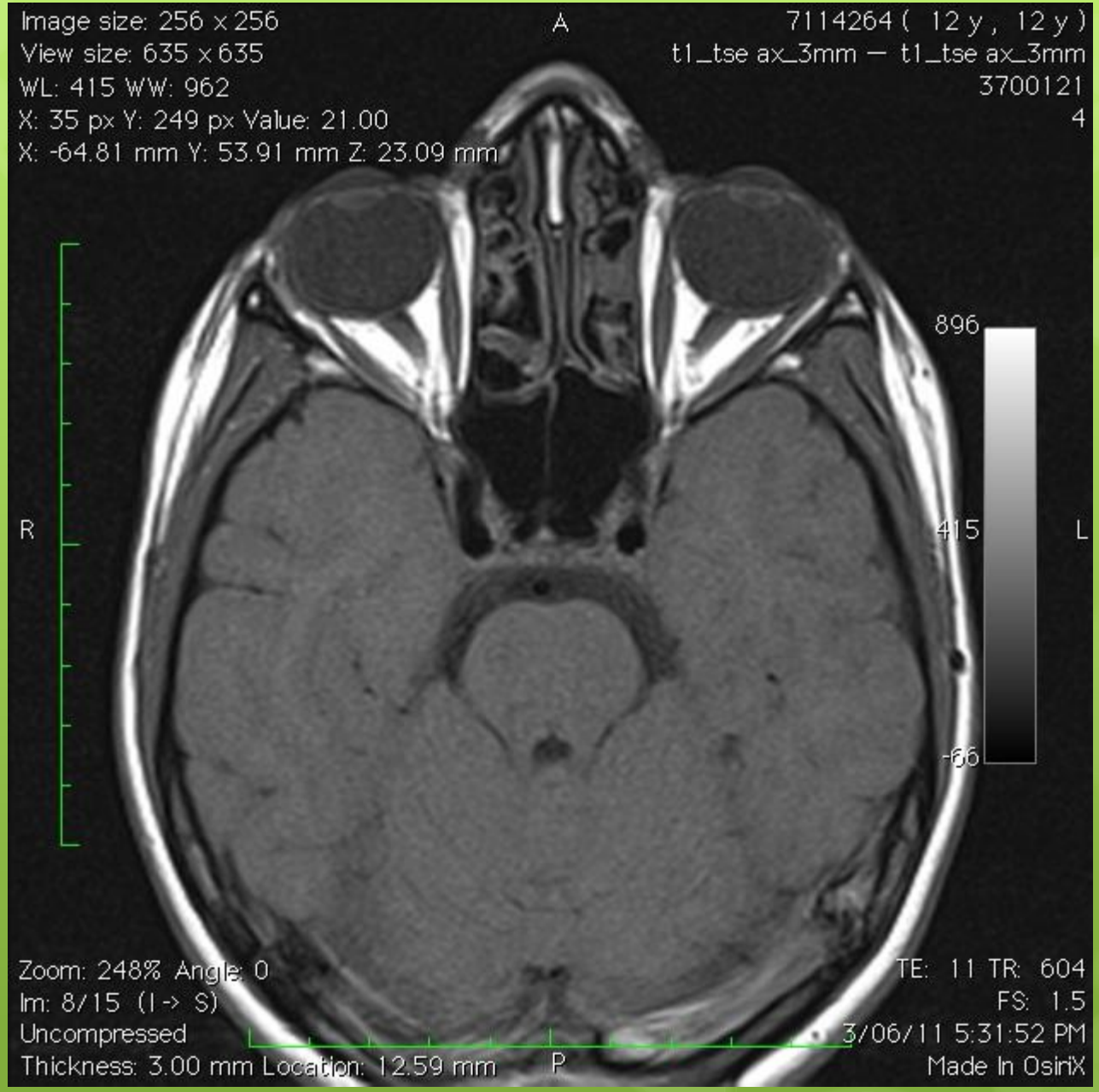


Image size: 256 x 256
View size: 635 x 635
WL: 425 WW: 972
X: 35 px Y: 250 px Value: 28.00
X: -64.70 mm Y: 54.42 mm Z: 19.80 mm
A
7114264 (12 y , 12 y)
t1_tse ax_3mm — t1_tse ax_3mm
3700121
4
911
425
-61
R
L
P
Zoom: 248% Angle: 0
Im: 7/15 (I -> S)
Uncompressed
Thickness: 3.00 mm Location: 9.30 mm
TE: 11 TR: 604
FS: 1.5
3/06/11 5:31:52 PM
Made In OsiriX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WL: 415 WW: 962
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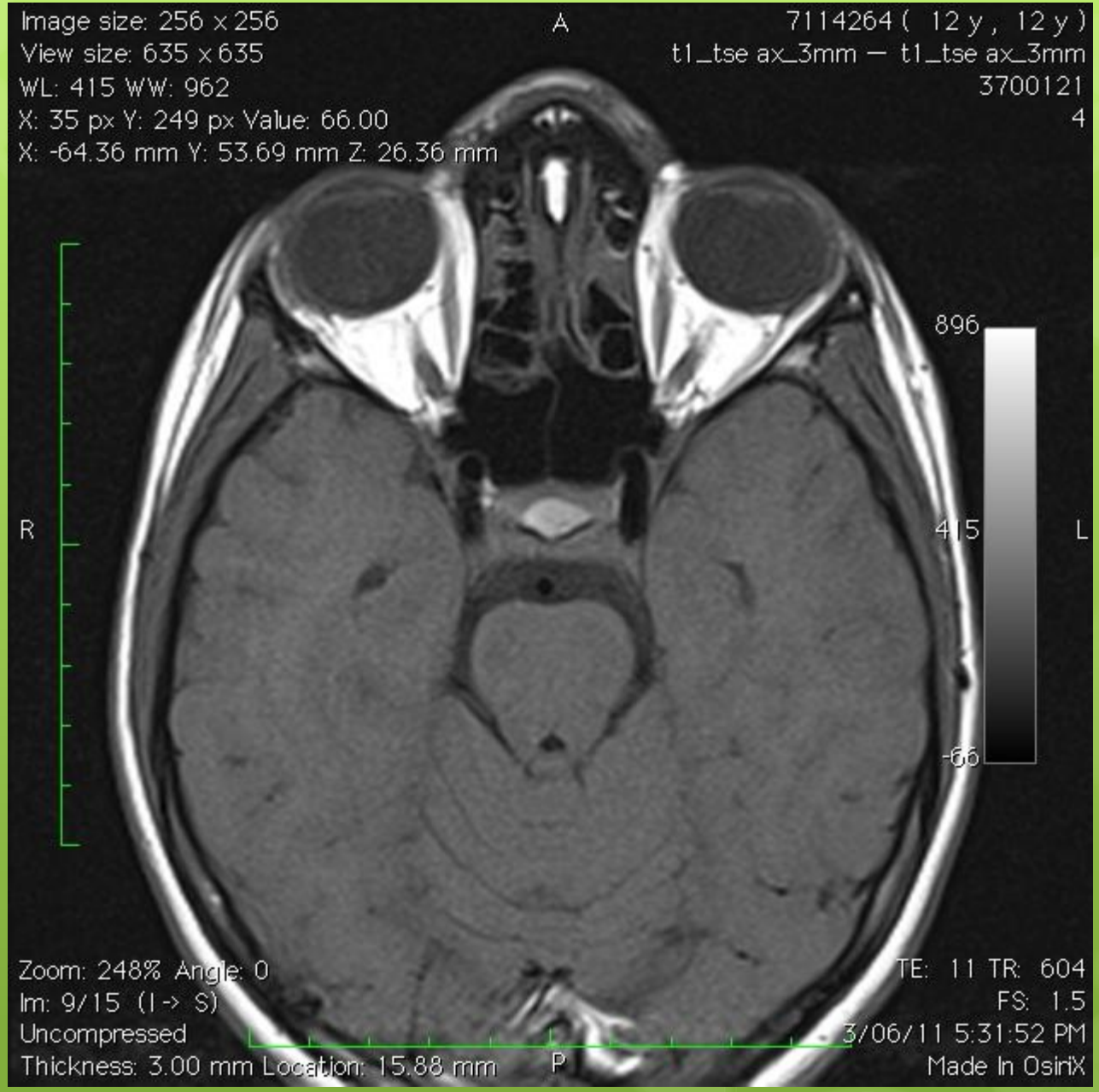
X: -64.81 mm Y: 53.91 mm Z: 23.09 mm
A
7114264 (12 y , 12 y)
t1_tse ax_3mm — t1_tse ax_3mm
3700121
4
896
415
-66
R
L
P
Zoom: 248% Angle: 0
Im: 8/15 (I -> S)
Uncompressed
Thickness: 3.00 mm Location: 12.59 mm
TE: 11 TR: 604
FS: 1.5
3/06/11 5:31:52 PM
Made In OsiriX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WL: 415 WW: 962
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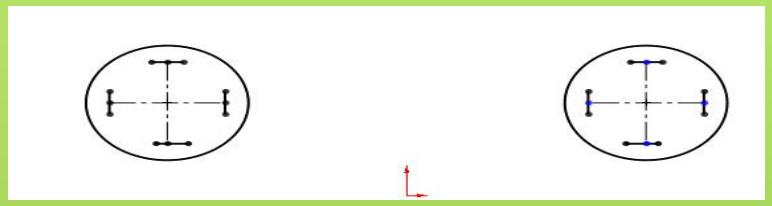
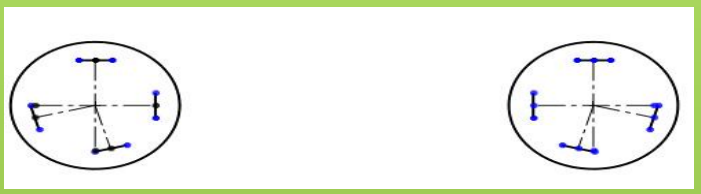
X: -64.36 mm Y: 53.69 mm Z: 26.36 mm
A
7114264 (12 y , 12 y)
t1_tse ax_3mm — t1_tse ax_3mm
3700121
4
896
415
-66
R
L
P
Zoom: 248% Angle: 0
Im: 9/15 (I -> S)
Uncompressed
Thickness: 3.00 mm Location: 15.88 mm
TE: 11 TR: 604
FS: 1.5
3/06/11 5:31:52 PM
Made In OsiriX

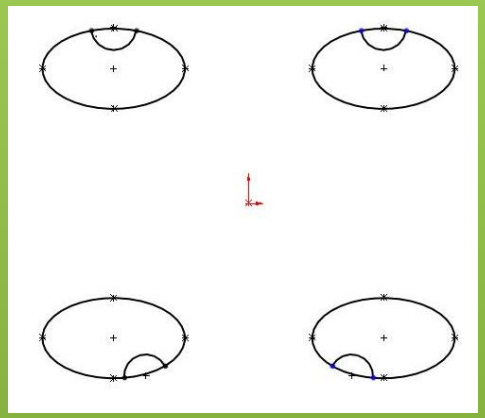
Re Le

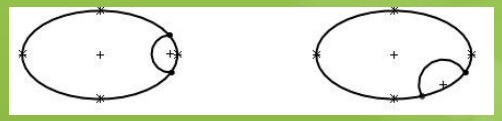
Normal



Inf displ of LR
Nasal disp of IR







Heterotopy of extraocular muscle pulleys causes incomitant strabismus

- Muscle pulley: connective tissue sleeves in the post tenon's fascia, that act as functional origins of the muscles. MRI analysis shows that the location of the pulleys are highly uniform (<1mm H&V coordinates).

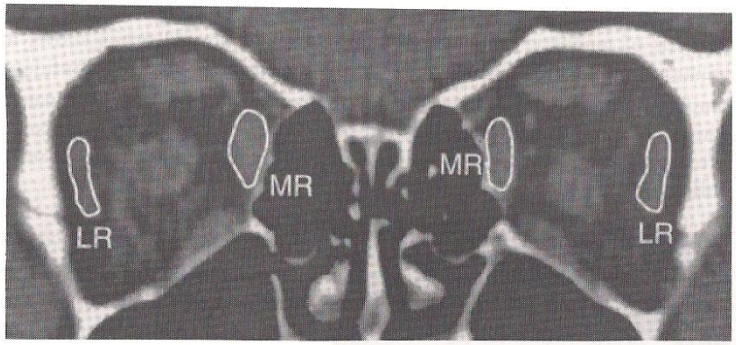


Fig. 2. 211 µm resolution, 1 mm thick coronal CT scan of the orbits of a 5 year old girl with large "V" esotropia and marked overelevation and underdepression of the right eye in adduction. Note inferior displacement of right LR more than left LR.

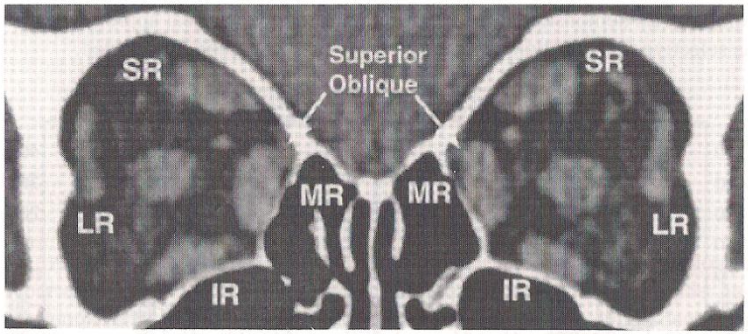


Fig. 3. CT scan of 6 year old girl with "A" pattern esotropia 60Δ greater in elevation than depression. Note LR displaced superiorly and SR displaced nasally in both eyes.

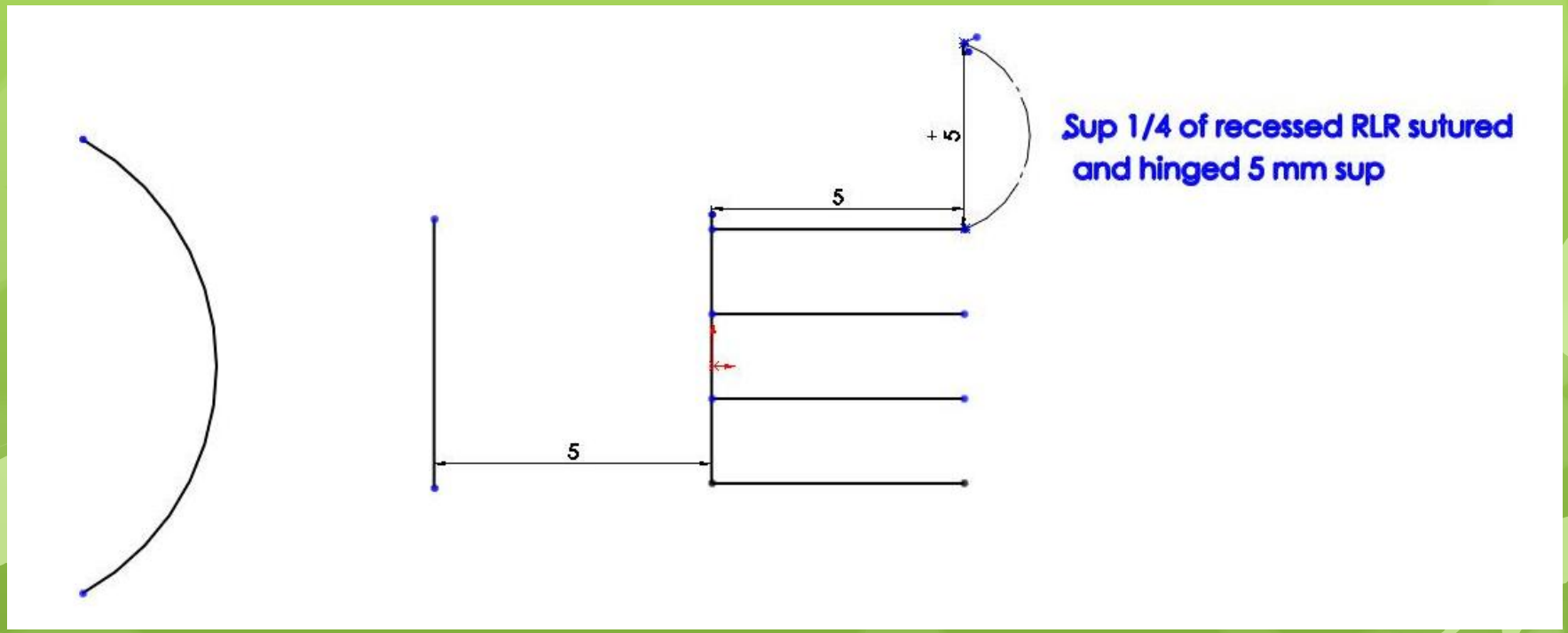
"V" pattern ET
Inf displacement of LR centroid (R>L)

"A"pattern ET
LR displaced sup to MR and
SR displaced nasal to IR

- Abnormal location of the pulleys could explain many of the cases of incomitant strabismus, that conventionally attributed to 'oblique muscle dysfunction' .

(Joseph Demer, Robert Clark, Joel Miller,- Advances in strabismology)

Sx 11-7-11 :Ou Upper ¼ width LR sutured and hitched superiorly and MR resected



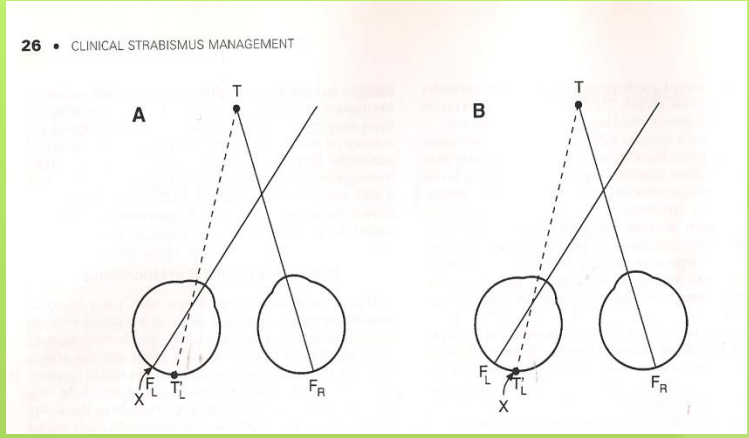
Post op measurements in D1, D7

Day		Alternate CT	Sensory-diplopia	Angle of anomaly
D1	D	ET 20	ET>40	>20
	N	EX’ 0	ET’>40	>40
W2	D	XT 2	ET 30	32
	N	XT’ 8	ET’ 16	24


Now , what is going on ?

- In this case, the pt had XT with no diplopia before Sx, then prior to Sx she had one or both [usually both] of:
  - Suppression
  - Anomalous Retinal Correspondence (ARC)

- The cortex has the ability to shift the visual direction associated with the fovea of the deviating eye (**ARC**), as well as the ability to **suppress** the image of the deviating eye



NRC ARC

X- image point

- When strabismic eyes are straightened, ARC usually poorly resolves with constant esotropes, compared to Intermittent exotropes.
- Unresolved ARC will cause (paradoxical) **diplopia despite straight eyes** .

Prevalence of ARC

- Jampolsky : ARC in 90% of ET <15Δ
- Bagolini : ARC in 90% of ET<10Δ , in 16% of ET >40Δ

Jampolsky A. Retinal correspondence in patients with small degree strabismus. Arch Ophthalmol 1951;45:18-26.

Bagolini B. Anomalous correspondence: definition and diagnostic methods. Doc Ophthalmol 1967;23:346-98.

A case series/ Dr Kowal

- Retrospective review of manifest / expected symptomatic paradoxical diplopia after surgery to straighten eyes
- Methods:
- 15 pt’s
- 13 had Sx for ET 3, XT 12 (mostly consecutive)
- Age: 8 - 62 yrs

Results

- 12/13 had paradoxical diplopia, 1/13 had suppression
- 9/12 had resolution of diplopia within 12w (resolution for near before distance).
- 3/12 patients had persistent diplopia after surgery (longest follow-up being 4 yrs)
- 8 y o was the youngest pt to c/o symptomatic diplopia

Conclusion

- **This case of paradoxical diplopia was NOT predicted with pre-operative prism simulation of surgical correction. This is very rare.**
- Most BUT NOT ALL patients with postop diplopia due to ARC resolve after Sx.
- Deferring surgery to adulthood is a risk factor for not resolved ARC.