## University Of South Florida

# MIS Lateral Approaches for Adult Spinal Deformity: A Novel Classification Scheme



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# Disclosures

## Deukmedjian

-None

## Ahmadian

- None

### Bach

-None

## Uribe

-NuVasive



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# Introduction



- Curvature >10° w/ derangement of spinopelvic alignment
- Deformity of coronal & sagittal plane
- Sagittal balance is more directly correlated with outcomes (HRQOL)

## ASD classification

#### Table 1. SRS Adult Deformity Classification

#### Primary curve types

Single thoracic (ST) Double thoracic (DT) Double major (DM) Triple major (TM) Thoracolumbar (TL)

Lumbar "de novo"/idiopathic Primary sagittal plane deformi

#### Adult spinal deformity modifiers

Regional sagittal modifier (includ (PT) Proximal thoracic (T2-

- (MT) Main thoracic (T5–T12)
- (TL) Thoracolumbar (T10–L2)
- (L) Lumbar (T12–S1): ≥−40<sup>c</sup>

#### Lumbar degenerative modifier (i

- (DDD) ↓ disc height and fa lowest involved level betwe
- (LIS) listhesis (rotational, lat lowest level between L1 an
- (JCT) junctional L5–S1 curve endplates L5 and S1)

#### Global balance modifier (include

- (SB) sagittal C7 plumb ≥5 c promontory
- (CB) coronal C7 plumb ≥3 (

#### SRS definition of regions

- Thoracic: apex T2-T11-T12
- Thoracolumbar: apex T12-L
- Lumbar: apex L1–L2 disc–L4

#### Criteria for specific major curve

- 1. Thoracic curves
- Curve ≥40°
- Apical vertebral body latera
- T1 rib or clavicle angle ≥10
- Thoracolumbar and lumbar cu
- Curve ≥30°
- Apical vertebral body latera
- 3. Primary sagittal plane deformi
- No major coronal curve
- One or more regional sagittal measurements (PT, MT, TL, L) outside normal range

## 4 Curves Type

#### Thoracic only

with lumbar curve < 30°

#### L TL / Lumbar only

with thoracic curve <30°

#### **Double Curve**

with at least one T and one TL/L, both > 30°

#### S Sagittal Deformity

for coronal curve <30 ° AND moderate to severe modifier(s)

#### Lumbar Spine

Modifier

Type 1 (Main Thoracic)

Type 2 (Double Thoracic)

Type 3 (Double Major)

Curve Type (1-6)

Type 4 (Triple Major)

Type 5

Type 6 (TL/L - MT)

## 3 Modifiers

#### PI minus LL

A: within 10°

**B**: moderate 10-20°

C: marked >20°

based decision making

#### **Pelvic Tilt**

L: PT<20°

M: PT 20-30°

**H**: PT>30°

#### Global Balance

**N**: SVA < 4cm

**P**: SVA 4 to 9.5cm

**VP**: SVA > 9.5cm

Level V Level VI + (stiff/ + (flexible) fused)

criptions of levels of treatment.

+: >40°

# Objective

- 1. To present and attempt to validate our surgical method for utilization of L-MIS approach for ASD
  - Institutional classification a 5 yr experience
  - Allow all surgeons to address adult spinal deformity
- 2. Analyze construct-specific clinical outcomes and complications
- 3. Determine the limitation of L-MIS for ASD.



Early outcomes and safety of the minimally invasive, lateral retroperitoneal transpsoas approach for adult degenerative scoliosis

**Neurosurg Focus 28 (3):**E8, 2010

ELIAS DAKWAR, M.D., RAFAEL F. CARDONA, M.D., DONALD A. SMITH, M.D., AND JUAN S. URIBE, M.D.

Retrospective study

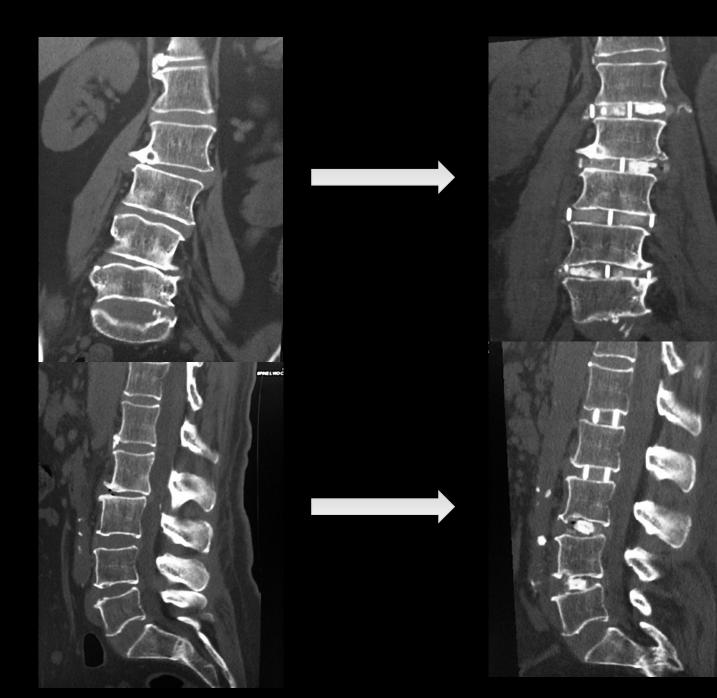
Cobb angle:

25 nationte 12-8 lavale

- Showed inadequately restored sagittal balance on 1/3 of
- cases.
- MIS techniques:
  - Lateral (XLIF™)
  - Presacral (AxiaLIF™)
  - Mini-open TLIF
  - Perc. pedicle screw
  - Lat plate

- Preop
- Post op 2.4
- ODI impr 23.7%
- No pseudoarthrosis
- Sagittal balance





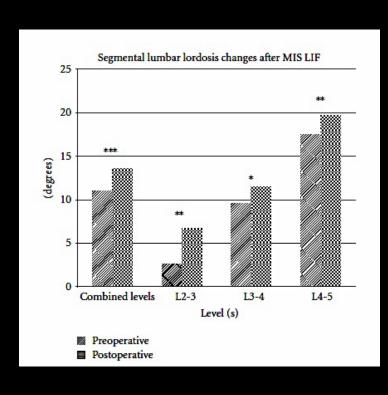
Stand Alone

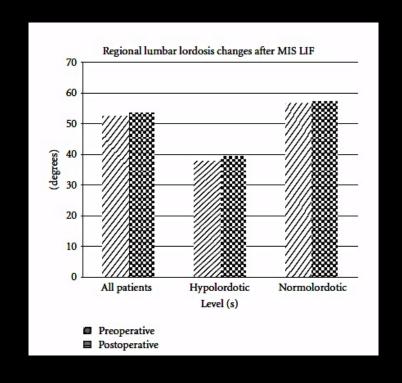
#### Clinical Study

# The Effect of the Retroperitoneal Transpsoas Minimally Invasive Lateral Interbody Fusion on Segmental and Regional Lumbar Lordosis The Scientific Volume 2012

The Scientific World Journal Volume 2012, Article ID 516706, 7 pages doi:10.1100/2012/516706

Tien V. Le, Andrew C. Vivas, Elias Dakwar, Ali A. Baaj, and Juan S. Uribe



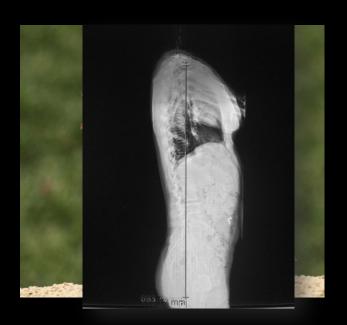


# Key to success is patient selection









# Methods

- 1. Retrospective review of patients undergoing L-MIS correction of ASD at a single institution (2007 2012)
- 1. Pre & post Spino-pelvic parameters were defined
- 1. Patients were <u>classified based on degree on deformity</u> and type of surgery (red/yellow/green)
- 1. Outcomes: ODI & VAS
- 1. Follow-up: 4 weeks, 3 months, 6 months, 1 year & 2 years



- Mild (Balanced)
  - Neurogenic claudication/ Radiculopathy
  - Coronal Cobb 10 30°
  - Global balance (SVA < 5cm)</li>
- Moderate (Compensated)
  - Coronal cobb +/-
  - Global imbalance (SVA > 5-9cm)
  - PT >25

- Severe (Unbalanced)
  - Global imbalance (SVA >10)
  - Fixed curves



# Institutional Classification Red / Yellow / Green

	Mild	Moderate	Severe	
CCA	<30°	>30	>30	
PI-LL	<20°	20°- 30°	>30°	
SVA	<5cm	5 - 9cm	>10cm	
PT	<25°	25-30°	>30°	
Anterior arthrodesis	Limited MIS-LIF consider standalone if PT<20°	MIS-LIF to neutral vertebrae + ALLR	MIS-LIF to neutral vertebrae ± ALLR	
Posterior fixation	Percutaneous fixation	Percutaneous fixation ± facetectomy	Pedicle screw fixation + osteotomy	

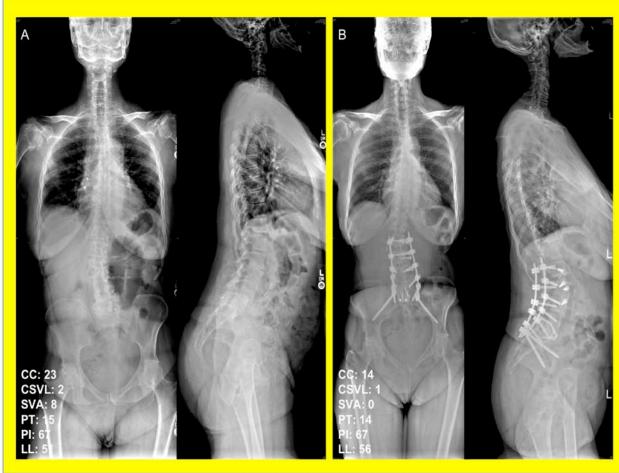
# Example Green

	Mild		
CCA	<30°		
PI-LL	<20°		
SVA	<5cm		
PT	<25°		
Anterior arthrodesis	Limited MIS-LIF consider standalone if PT<20°		
Posterior fixation	Percutaneous fixation		



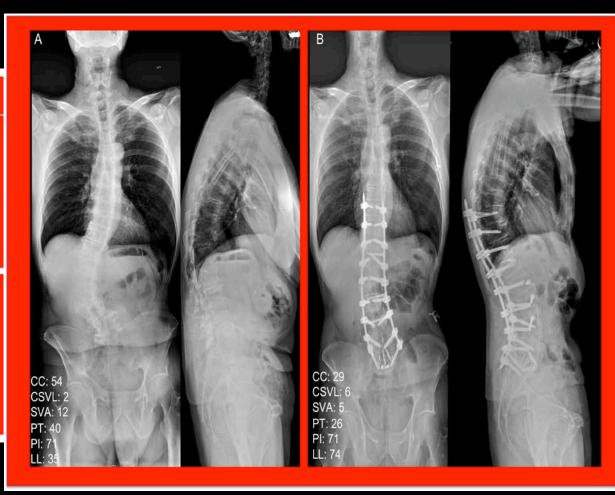
# Example Yellow

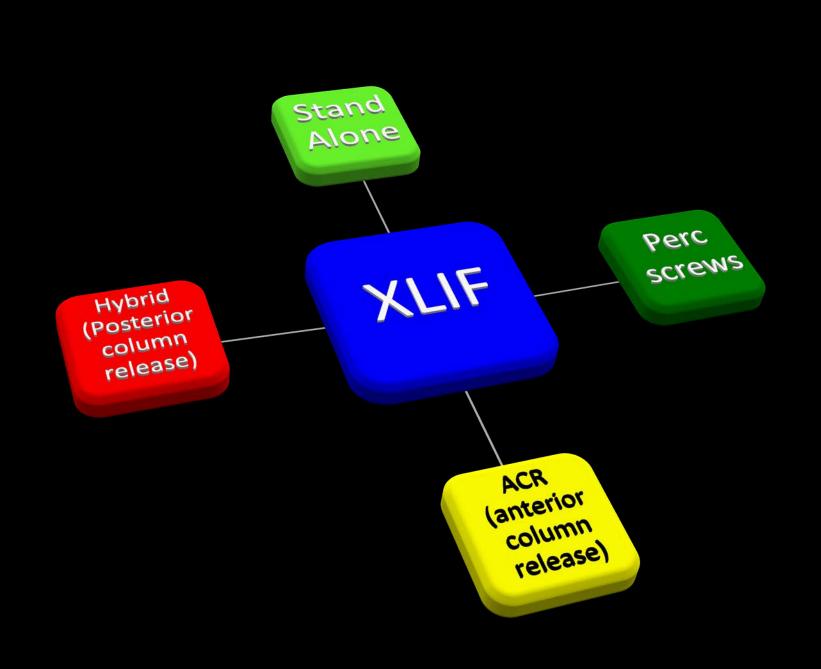
Moderate CCA >30 20°-30° PI-LL **SVA** 5 - 9cm 25-30° PT MIS-LIF to neutral **Anterior** arthrodesis vertebrae + ALLR Percutaneous fixation ± **Posterior** fixation facetectomy



# Example Red

	Severe		
CCA	>30		
PI-LL	>30°		
SVA	>10cm		
PT	>30°		
Anterior arthrodesis	MIS-LIF to neutral vertebrae ± ALLR		
Posterior fixation	Pedicle screw fixation + osteotomy		





# Results

- 256 patients with ASD, 174 underwent surgical intervention. 27 patients fit the inclusion/exclusion criteria.
- There were no statistically significant differences in the age or follow up times between the groups.
- All patients achieved adequate fusion (CT)
- Complications
  - 1 patient (4%) with a deep wound infection
  - 2 patients (8%) experienced transient postoperative anterior thigh (Zone 2)
  - 1 patient (4%) had transient groin pain (Zone 1).

# Results

Group	Number of Patients (M/F)	Age Range (Avg)	Average Follow-Up (Months)
Green	9 (4/5)	61-71 (67)	15.2
Yellow	6 (3/3)	53-66 (59)	18
Yellow Undertreated	3 (0/3)	54-74 (62)	16
Red	2 (0/2)	59-69 (65)	19
Red Undertreated	7 (4/3)	32-73 (53)	18

# Results

	ΔCCA (°)	ΔCSVL (cm)	ΔSVA (cm)	<b>ΔΡΤ</b> (°)	ΔLL (°)	ΔVAS	ΔODI
Green	-12 ( <b>&lt;0.001</b> )	0.2 (0.717)	0.6 (0.9)	1 (0.52)	1 (0.665)	(0.004)	-17 ( <b>0.006</b> )
Yellow	-11 ( <b>0.001</b> )	-0.7 (0.58)	-1.4 (0.52)	-1 (0.4)	7 ( <b>0.02</b> )	-36 (0.03)	-33 ( <b>0.002</b> )
Yellow	-17	0.3	1.3	5 (0.26)	-10	-30	-17
Undertreated	(0.19)	(0.29)	(0.6)		(0.18)	(0.26)	(0.2)
Red	-23	1.5	-0.1	-1	15	-15	-10
	(0.48)	(0.009)	(0.94)	(0.76)	(0.32)	(0.21)	(0.65)
Red	-16	-0.1	-2.8	-4	15	$\binom{-28}{(0.21)}$	-12
Undertreated	( <b>0.003</b> )	(0.94)	(0.26)	(0.24)	( <b>0.04</b> )		(0.65)

# Conclusion

- Patient selection is crucial
- Our institutional classification can serve as a roadmap L-MIS approach to ASD
  - Red/Yellow/Green can help surgeons address ASD
- Realignment objectives should be patient specific and involve attention to the following 3 parameters:
  - SVA less than 5 cm
  - PT less than 25°
  - LL proportional to the PI.



