



UNIVERSITÀ  
DEGLI STUDI DI BARI  
ALDO MORO

Policlinico  
di Bari



**SMBNOS – U.O. ORTOPEDIA E TRAUMATOLOGIA**

Direttore: Prof Biagio Moretti



DECIMO CONVEGNO DI TRAUMATOLOGIA CLINICA E FORENSE

17° Corso di Ortopedia, Traumatologia e Medicina Legale

LE COMPLICANZE  
IN ORTOPEDIA E TRAUMATOLOGIA

PROBLEMATICHE CLINICHE, CONSIDERAZIONI MEDICO LEGALI E  
CONTROVERSIE GIURIDICHE



Presidenti

*F.M. Donelli, M. Gabbrielli, G. Varacca*

29 - 30 Novembre 2019

Palazzo dei Congressi - Salsomaggiore Terme (PR)



# LA CHIRURGIA MININVASIVA NELLA COLONNA DELLO SPORTIVO

Davide Bizzoca, Andrea Piazzolla, Biagio Moretti

# Agenda:

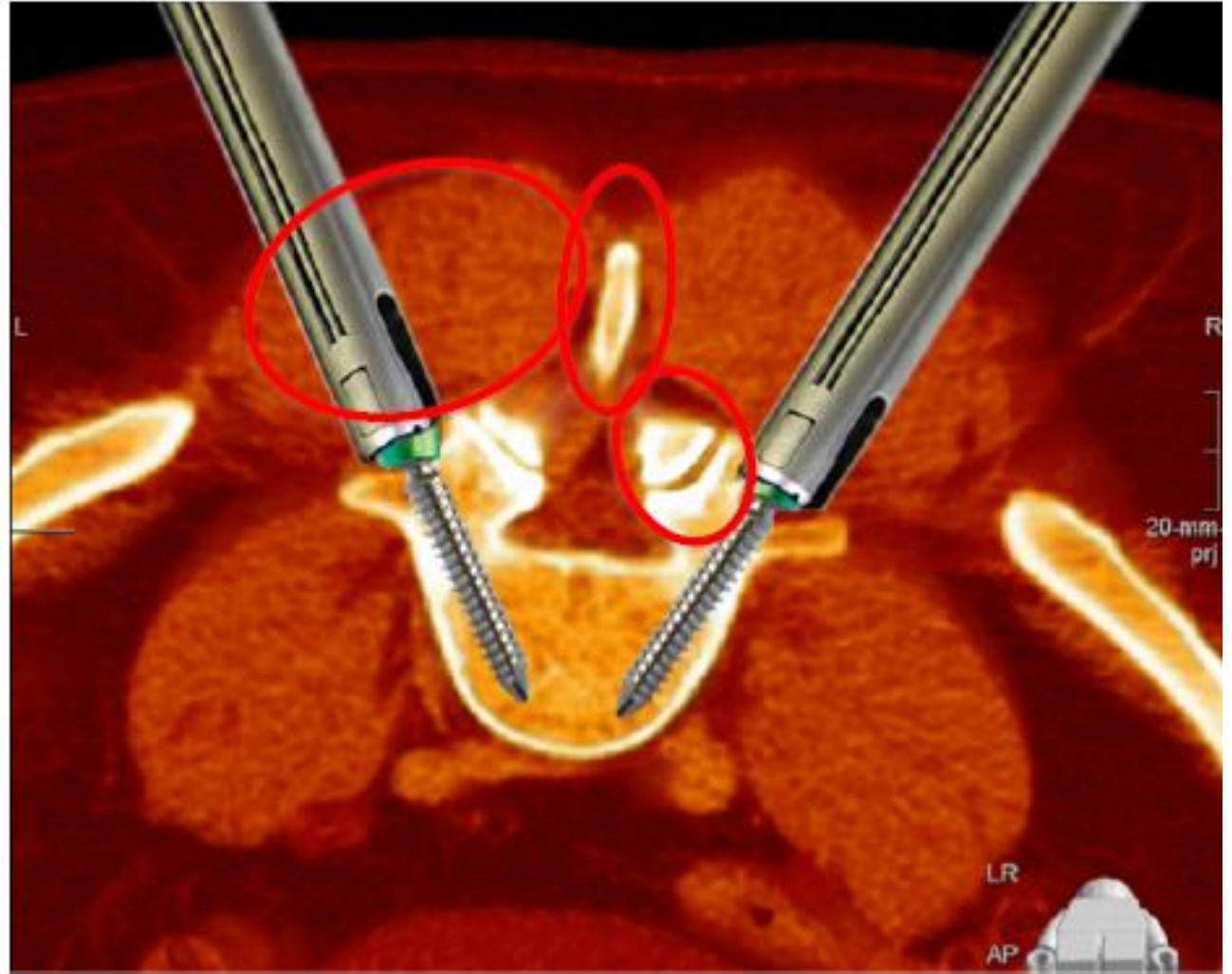
- **MIS: definition & techniques**
- **Clinical decision making**
- **Clinical, functional & radiological assessment**
- **Surgical strategy**
- **Return to play**
- **Clinical cases**
- **Take home-messages**

# Goal of Minimal Invasive Spine Techniques

“efficient target surgery” with minimum of iatrogenic trauma

## Fundamental differences:

- muscle detachment
- muscle retraction
- midline structures



# Potential Benefits of Minimally Invasive Spine Surgery

Disruption of normal anatomy ↓  
Surgical Trauma ↓  
Muscle denervation ↓



Blood loss ↓  
Scarring ↓  
Pain ↓  
Spinal destabilisation ↓



Recovery ↑  
Hospital stay ↓  
Cosmesis ↑

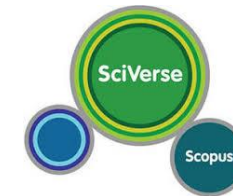
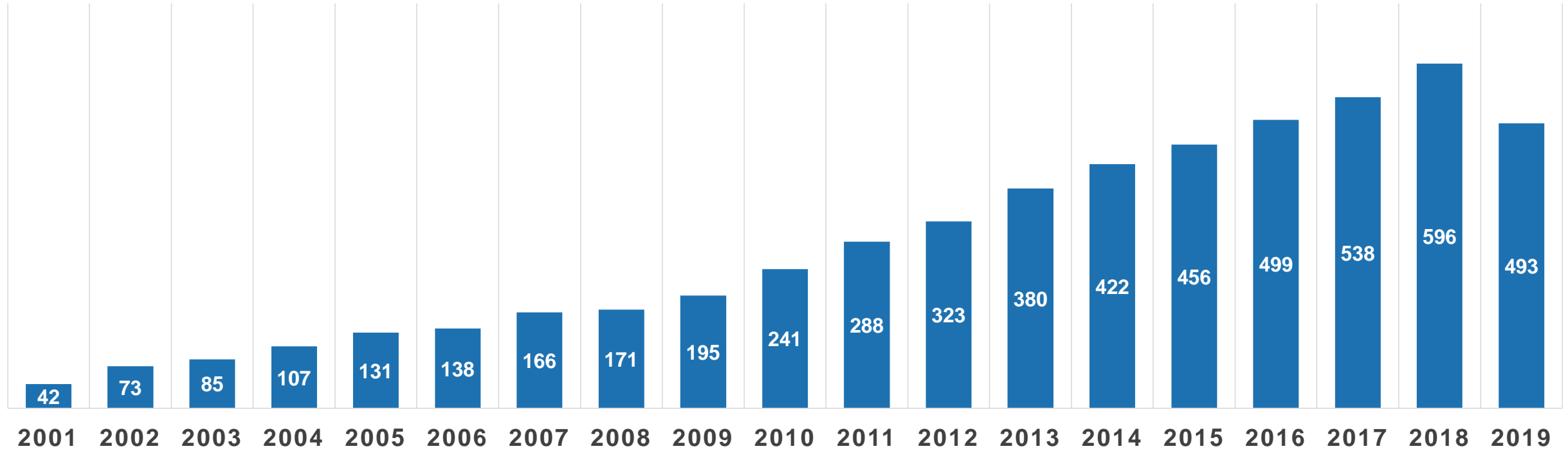


Better/equivalent outcome



# Minimally-Invasive Spine Surgery (MISS)

## PUBLISHED PAPERS (2001-2019)





# Minimally-invasive spine procedures

## **Needle based Procedures**

Spinal probing & Discography

Transforaminal Endoscopic Lumbar Decompression & Foraminoplasty

Kyphoplasty

Lumbar and Cervical Percutaneous Laser Disc Decompression

Epiduroscopic Adhesiolysis

Caudal Steroid Injection

Celiac Plexus Block

Percutaneous Disc Denervation

Epidural Steroid Injection

Facet Injections

Ganglion Impar Block

IntraDiscal Electrothermal Therapy

## **Minimal access procedures**

*AxialLIF (Axial Lumbar Interbody Fusion)*

*DLIF (Direct Lateral Interbody Fusion)*

*ELTIF (Extreme Lateral Thoracic Interbody Fusion)*

*ELLIF (Extreme Lateral Lumbar Interbody Fusion)*

*ISILDc (InterSpinous Indirect Lumbar Decompression)*

*LECIF (LumbarExtraCavitary Interbody Fusion)*

*LIDSS (Lumbar Interlaminar Dynamic Stabilization System)*

*LLIF (Lateral Lumbar Interbody Fusion)*

*LPPS (Laminectomy Preserving ParaSpinal Muscles)*

*MATIF (Microscopic Assisted Transpsoas Interbody Fusion)*

*MELD (Micro-Endoscopic Lumbar Discectomy)*

*MEPCF (Micro-Endoscopic Posterior Cervical Foraminotomy)*

*MIALIF (Minimally Invasive Anterior Lumbar Interbody Fusion)*

*MIILIF (Minimally Invasive Interlaminar Lumbar Instrumented Fusion)*

*MILATDS (Minimally Invasive Lateral Access Thoracic Disc Surgery)*

*MILD (Minimally Invasive Lumbar Discectomy)*

*MILBDc (Minimally Invasive Lumbar Bilateral Decompression)*

*MILECATS (Minimally Invasive Lateral Extracoeleomic Approach Thoracolumbar Spine)*

*MILISDD (Minimally Invasive Lumbar InterSpinous Distraction Device)*

*MIPCMF (Minimally Invasive Posterior Cervical Microforaminotomy)*

*MIPLIF (Minimally Invasive Posterior Lumbar Interbody Fusion)*

*MIPSF (Minimally Invasive Pedicle Screw Fixation)*

*MITCTA (Minimally Invasive Trans Corporeal Tunnel Approach)*

*MITLIF (Minimally Invasive Transforaminal Lumbar Interbody Fusion)*

*MITSA (Minimally Invasive Trans-Sacral Approach)*

*MISSJA (Minimally Invasive Surgical Sacroiliac Joint Arthrodesis)*

*MOLTA (Mini-Open Lateral Thoracic Approach)*

*MOLLA (Mini-Open Lateral Lumbar Approach)*

*MOTLIF (Mini-Open Transforaminal Lumbar Interbody Fusion)*

*MSNRS (Modular Structural Nucleous Replacement System)*

*PCMEL (Posterior Cervical Microendoscopic Laminoplasty)*

*PCTSLF (Percutaneous Cervical Transfacet Screws with Limited Fluoroscopy)*

*PDAAS (PostDiscectomy Annular Augmentation and Stabilization)*

*PIPIPP (Percutaneous Interspinous Process Implanted in Prone Position)*

*PLSAIF (Percutaneous LumboSacral Axial Interbody Fusion)*

*SALICIS (StandAlone Lumbar Interbody Cage with Integrated Screws)*

*PPSFIS (Percutaneous Pedicle Screw Fixation for Isthmic Spondylolisthesis)*

*TPALIF (TransPsoas Anterior Lumbar Interbody Fusion)*

*XLIF (eXtreme Lateral Interbody Fusion)*

July 2017, Vol 25, No 7

Review Article

Wellington K. Hsu, MD  
Tyler James Jenkins, MD

## Management of Lumbar Conditions in the Elite Athlete



- In elite athletes, **most lumbar conditions** can be **managed nonsurgically** with excellent outcomes
- **Surgical treatment** is a viable option for **athletes** in whom **nonsurgical treatment has failed**

# Minimally Invasive Spine Surgery: WHEN?

1. It is recommended **only** when a period of nonsurgical treatment has **NOT relieved** the painful symptoms
2. It is only considered if **the exact source of LBP** is depictable
3. **Correspondance** between **clinical and radiological findings**



# Clinical assessment

1. Patient history
2. Gait pattern evaluation
3. Spine physical examination
4. Hip & lower limbs evaluation
5. Sensory & motor examination (+EMG)



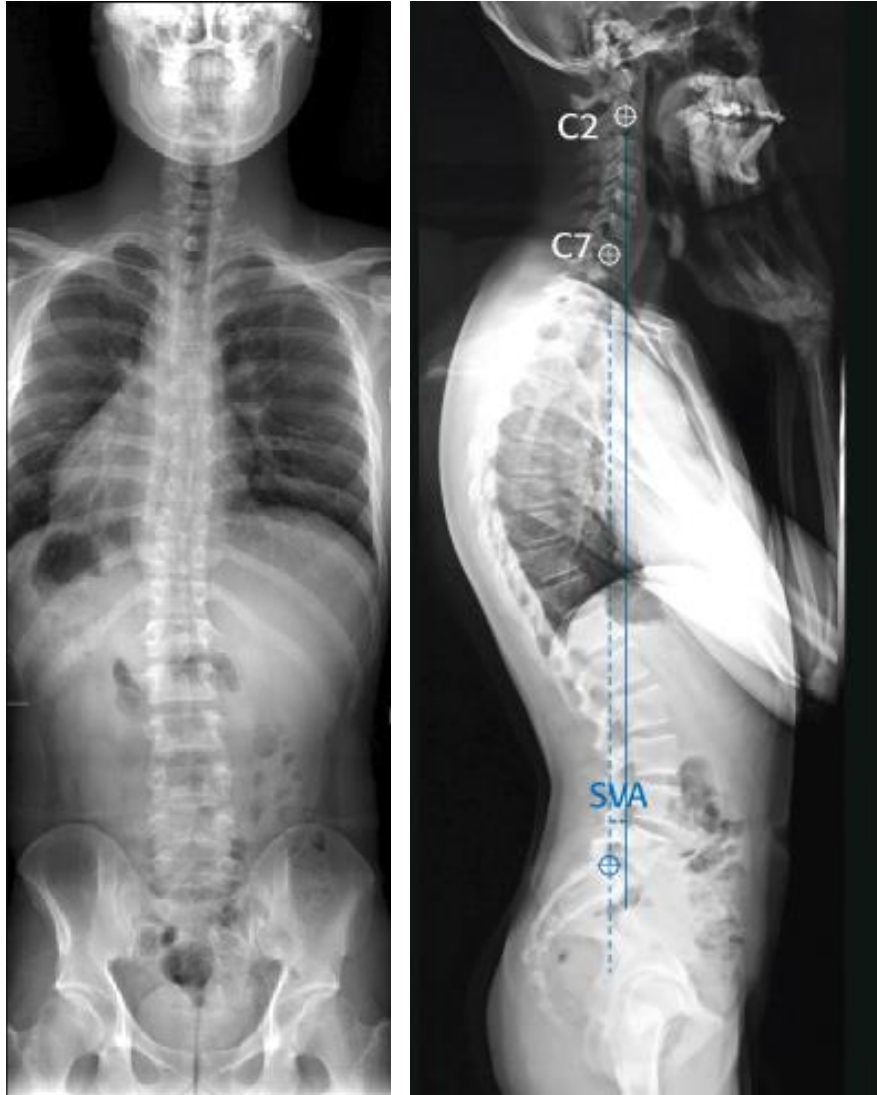
(spine-hip relationship)

# Functional & psychological assessment

1. Visual Analogue Scale (VAS) back & leg
2. Oswestry Disability Index (ODI)
3. Short Form-36 (SF-36)
4. Tegner Activity Scale (TAS)
5. Tampa Scale of Kinesiophobia (TSK)

# Radiological assessment

## FULLSPINE X-RAY



- Spinal alignment & balance
- Pelvic morphology
- PI morphologic parameter  
(BUT spinopelvic fusion & laxity in >75 y.o.)
- $PI = SS + PT$
- $LL = 0.54PI + 27.6$  (LeHuec-Hasegawa)

# Radiological assessment

LS SPINE AP/LL VIEWS



OBLIQUE 30° VIEW



FLEXION/EXTENSION FILMS



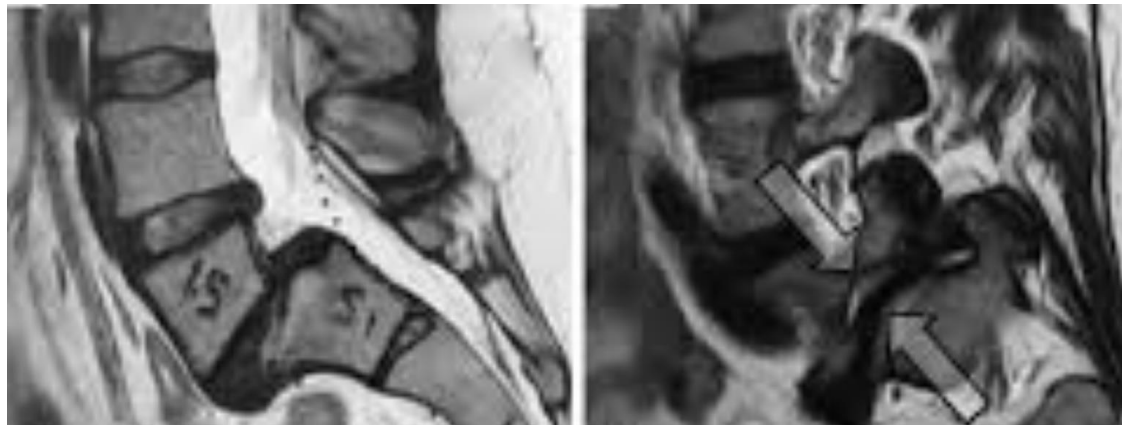
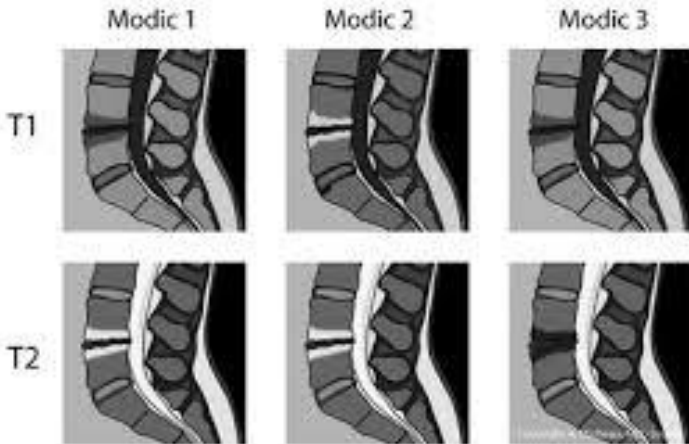


# Radiological assessment: MRI

Radiology  
Volume 166, Issue 11, 1988, Pages 193-199

## Degenerative disk disease: Assessment of changes in vertebral body marrow with MR imaging (Article)

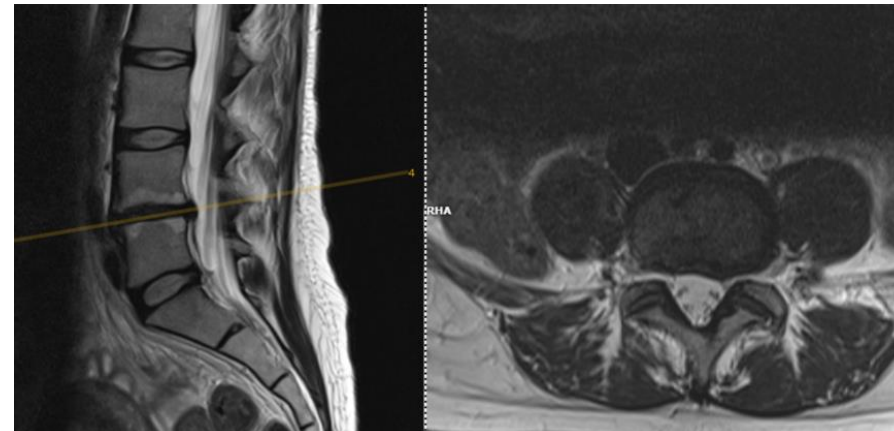
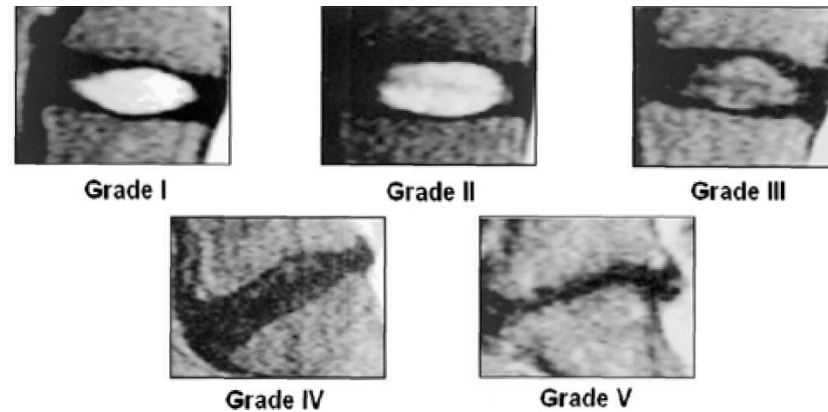
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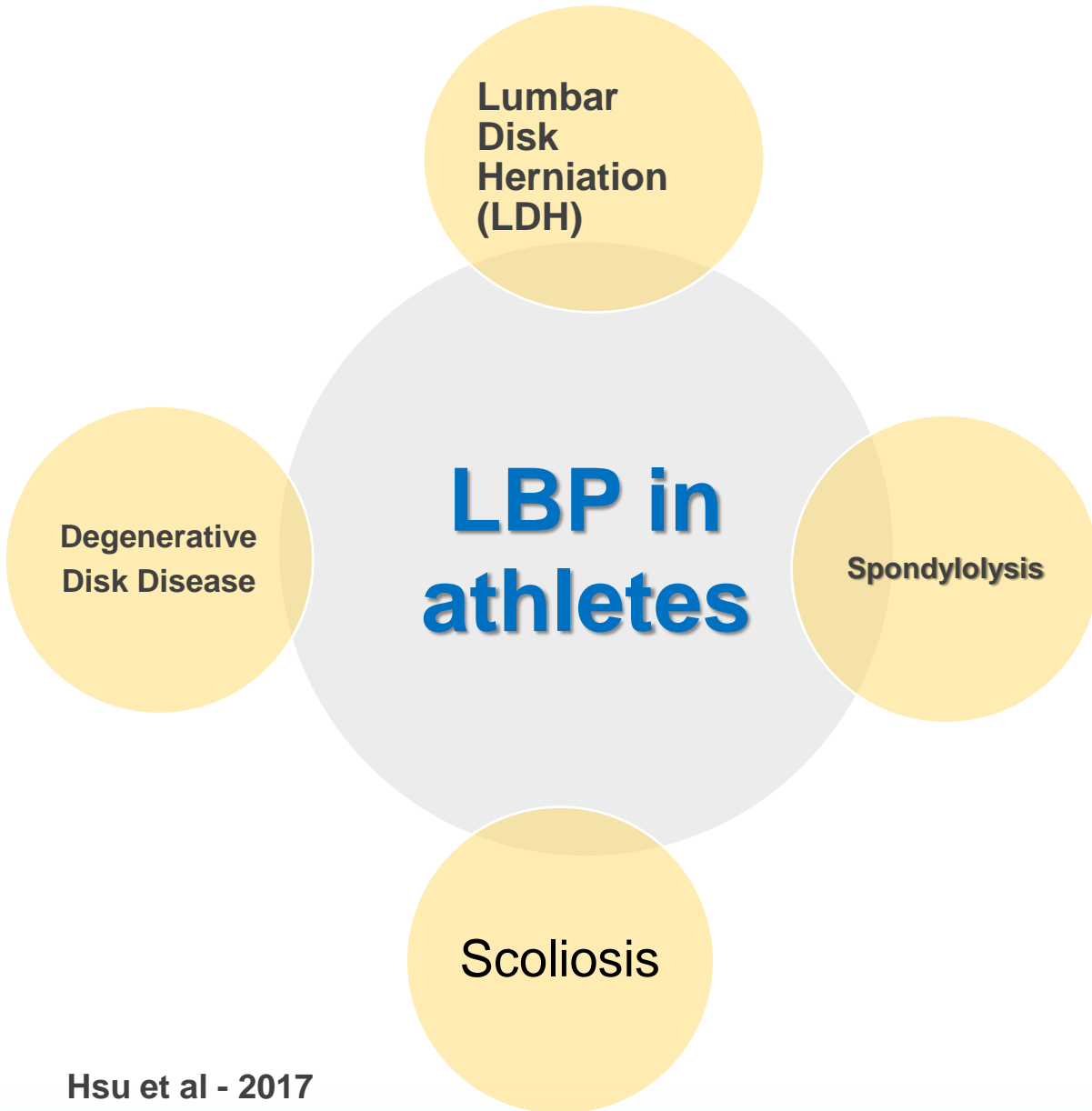
SPINE Volume 26, Number 17, pp 1873-1878  
©2001, Lippincott Williams & Wilkins, Inc.

## Magnetic Resonance Classification of Lumbar Intervertebral Disc Degeneration

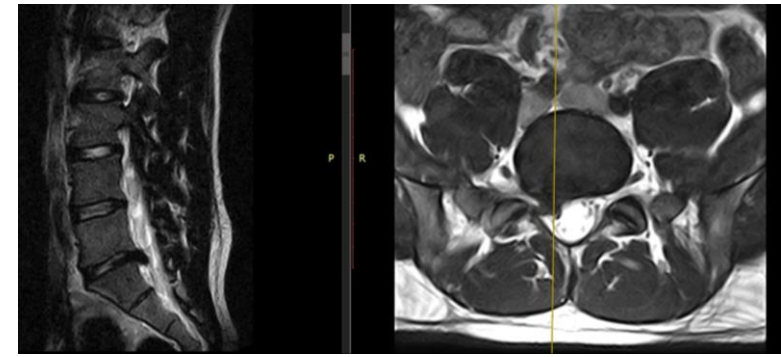
Christian W. A. Pfirrmann, MD,\* Alexander Metzdorf, MD,† Marco Zanetti, MD,\* Juerg Hodler, MD,\* and Norbert Boos, MD†



# LBP in athletes



# Lumbar Disk Herniation (LDH)



- Indication: **failure of 6-weeks** of nonsurgical management
- Treatment of choice: **laminotomy with discectomy**
- Controversies: **High-level evidence** to support specific treatment options for LDH in elite athletes **is currently lacking**

# Lumbar Disk Herniation (LDH)

Spine

SPINE Volume 41, Number 8, pp 713–718  
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## LITERATURE REVIEW

### Return to Play in Elite Athletes After Lumbar Microdiscectomy

*A Meta-analysis*

Samuel C. Overley, MD,\* Steven J. McAnany, MD,\* Steve Andelman, MD,\* Diana C. Patterson, MD,\*  
Samuel K. Cho, MD,\* Sheeraz A. Qureshi, MBA, MD,\* Wellington K. Hsu, MD,<sup>†</sup> and Andrew C. Hecht, MD\*

- **Level of Evidence: III**
- **9 studies** (538 patients) single-level microdiscectomy vs nonsurgical treatment
- **RTS 83.5%**
- **Microdiscectomy VS nonoperative treatment: no difference in RTP rates**
- **Microdiscectomy is a viable option for athletes wishing to RTP**



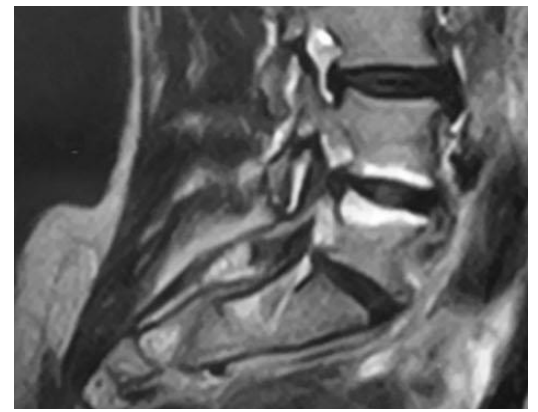
# Discectomy: Return to Play (RTP)

Table 1

Recommendations for RTP after discectomy and microdiscectomy

Treatment	Type of Sport	RTP Recommendation	Author, Year
Percutaneous discectomy	All sports	2–3 mo <sup>28</sup>	Eck & Riley, <sup>28</sup> 2004
Microdiscectomy (adult)	Golf	4–8 wk <sup>41</sup>	Abla et al, <sup>41</sup> 2011
	Noncontact sports	6–8 wk <sup>28</sup>	Eck & Riley, <sup>28</sup> 2004
	Contact sports	4–6 mo <sup>28</sup>	Eck & Riley, <sup>28</sup> 2004
	Contact sports	2–6 mo <sup>11</sup>	Huang et al, <sup>11</sup> 2016
Microdiscectomy (pediatric)	All sports	8–12 wk <sup>27</sup>	Cahill et al, <sup>27</sup> 2010

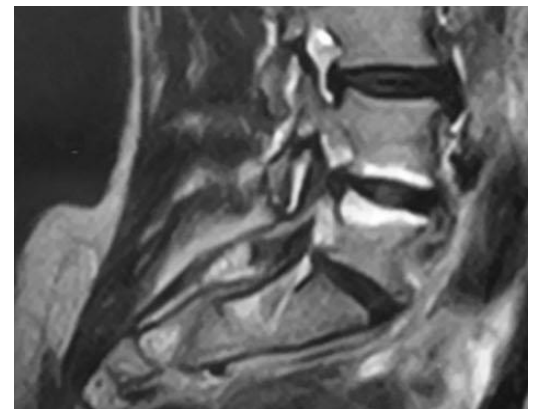
# Degenerative Disk Disease (DDD)



## Indications:

1. mechanical LBP correlated with **positive findings on imaging**
2. evidence of a **single-level degenerative disk** on imaging studies
3. continuous symptoms **for at least 6 months**
4. localized **midline spinal tenderness** that corresponds to **the radiographic level of disease**

# Degenerative Disk Disease (DDD)



**Standard treatment:** lumbar fusion

(but symptomatic adjacent segment disease prevalence: 36% at 10y)

**Alternative treatment:** Total Disk Arthroplasty (NO significant advantages)

**Evidence:** there are few published series focusing on DDD treatment in athletes

# Degenerative Disk Disease: RTP

Table 3

Summary of recommendations for RTP after treatment of DDD

Treatment	RTP
Lumbar fusion/lumbar TDR	Allow contact sports but no defined (Burnett & Sonntag <sup>28</sup> ) timeframe
Lumbar TDR	3 months for noncontact sports (Siepe et al <sup>41</sup> ) 4–6 months for contact sports
Lumbar TDR	3 months for nonimpact training (Tumialan et al <sup>42</sup> ) 4–5 months for light impact and weight-training 6 months for unrestricted full military duty



# Spondylolysis

## Indications:

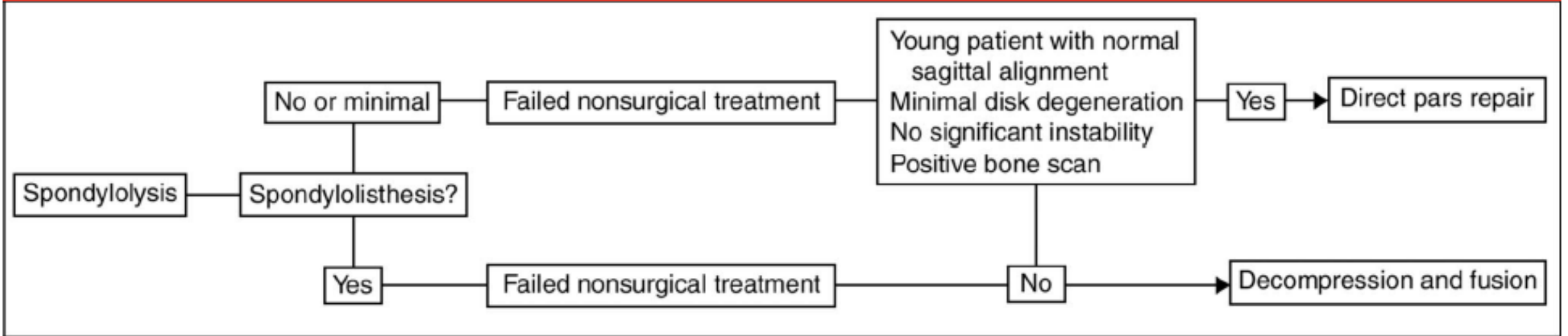
- **failure of a 6-month course of nonsurgical management**
- **with persistent neurologic symptoms or progressive spondylolisthesis**

## Surgical techniques:

- **direct pars repair** (young patients with minimal spondylolisthesis, no neurologic symptoms, and minimal degenerative changes)
- **Decompression with/without fusion**

# Spondylolysis: surgical algorithm

Figure 6



Algorithm depicting the surgical treatment of athletes with symptomatic spondylolysis.

# Spondylolysis: RTP

Table 2

Summary of recommendations for RTP after treatment of spondylolysis and spondylolisthesis with fusion

	Type of Sport	RTP
Abla et al <sup>30</sup>	Golf	6 mo
Rubery and Bradford <sup>39</sup>	Non-contact	6 mo
	Contact	1 y
	Collision	Not recommended
Eck and Riley <sup>16</sup>	Non-contact	1 y
	Contact	Not recommended
Burnett and Sonntag <sup>28</sup>	Contact	Allowed but no defined time-frame
Radcliff et al <sup>38</sup>	All	6–12 mo
Herman et al <sup>40</sup>	All	1 y

# Return to play

## YESTERDAY

**TIME**-BASED  
PROGRESSION

VS

## TODAY

**CRITERIA**-BASED  
PROGRESSION



# Return to play

## YESTERDAY

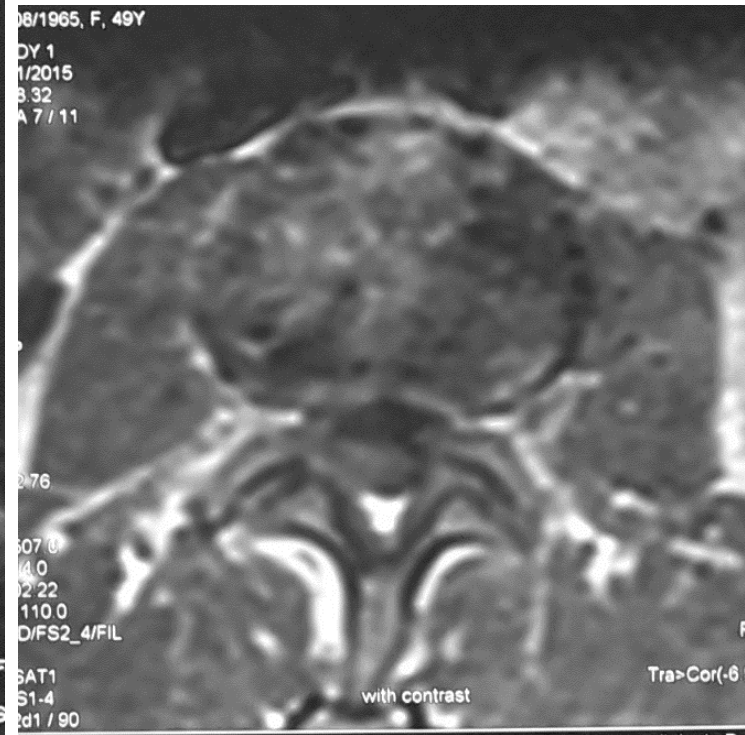
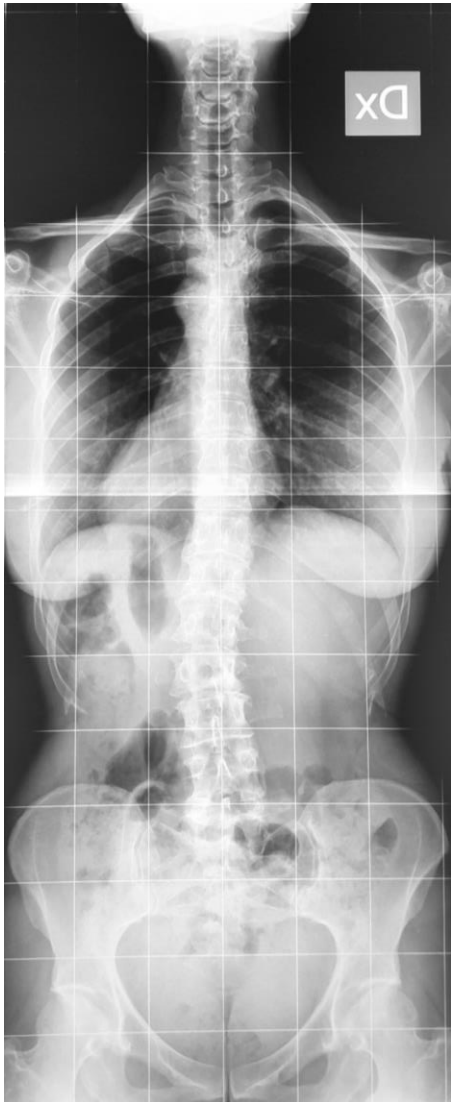


## TODAY



- RTP is **assessed on an individual basis**, with consideration of the **athlete**, the **injury**, and the **sport**
- Athletes should **complete a rehabilitation program** and **demonstrate resolution of symptoms** before medical clearance

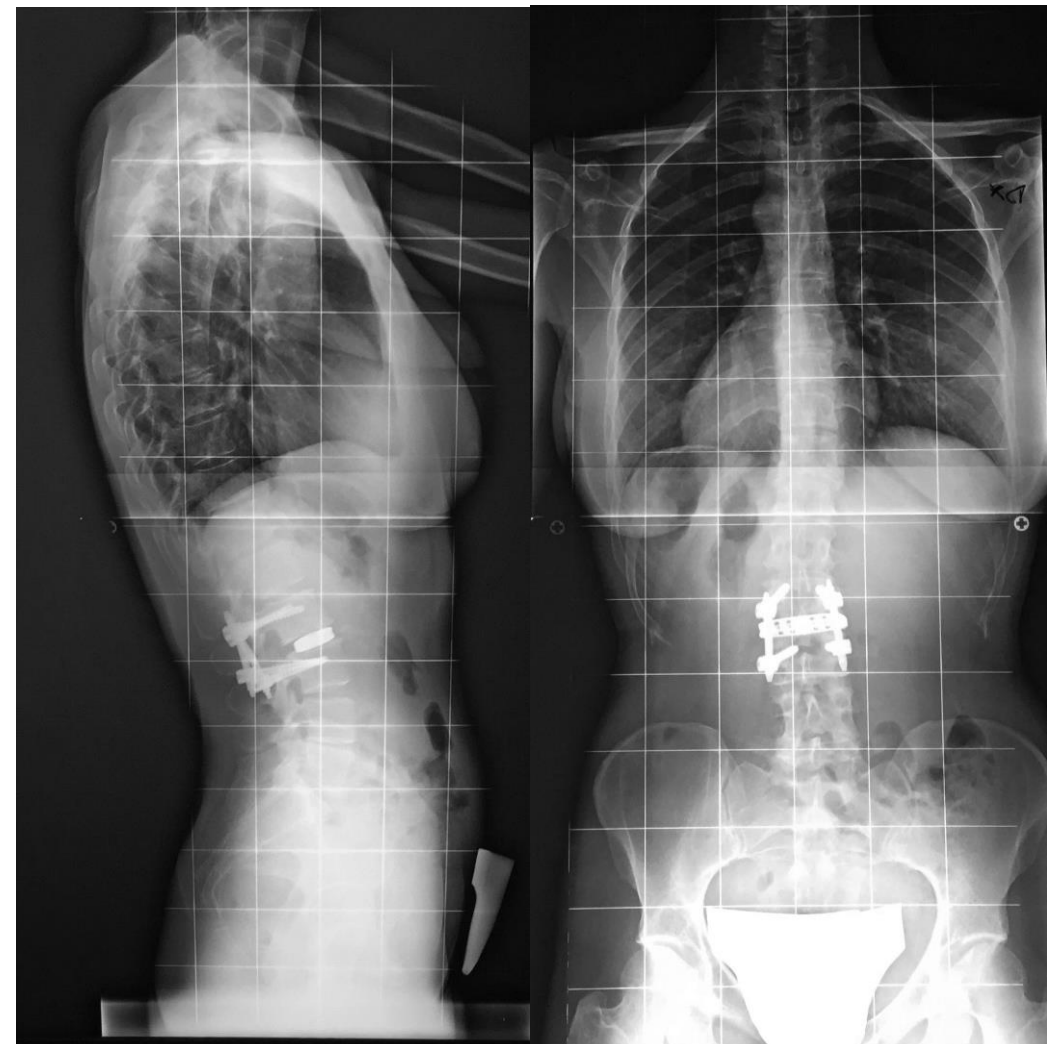
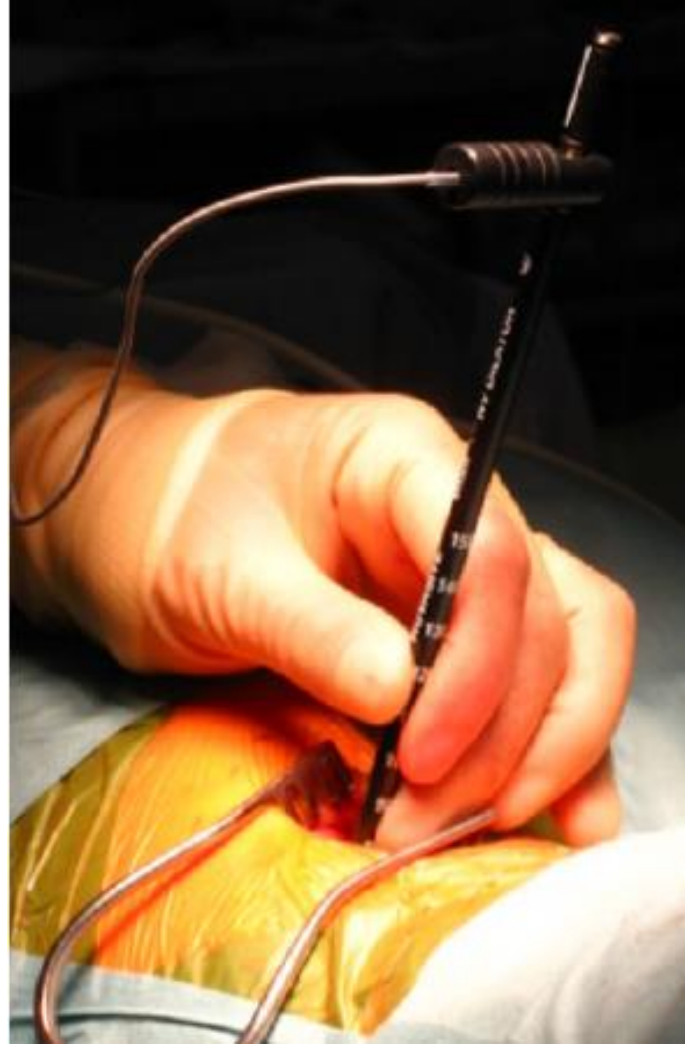
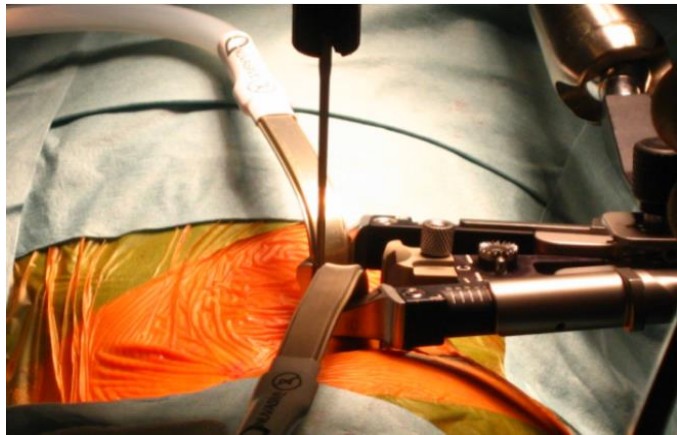
# Swimmer, ♀ 50 y.o.: L2-L3 DDD



ODI= 45%

TAS= level 3

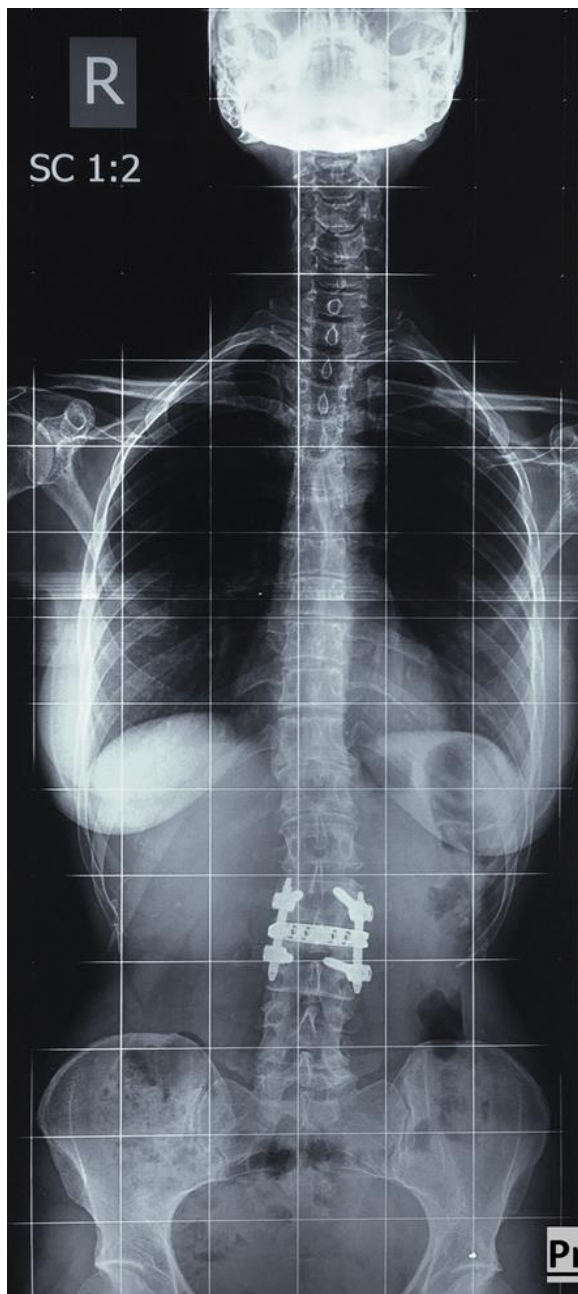
# Swimmer, ♀ 50 y.o. : L2-L3 XLIF





# Swimmer, ♀ 50 y.o.



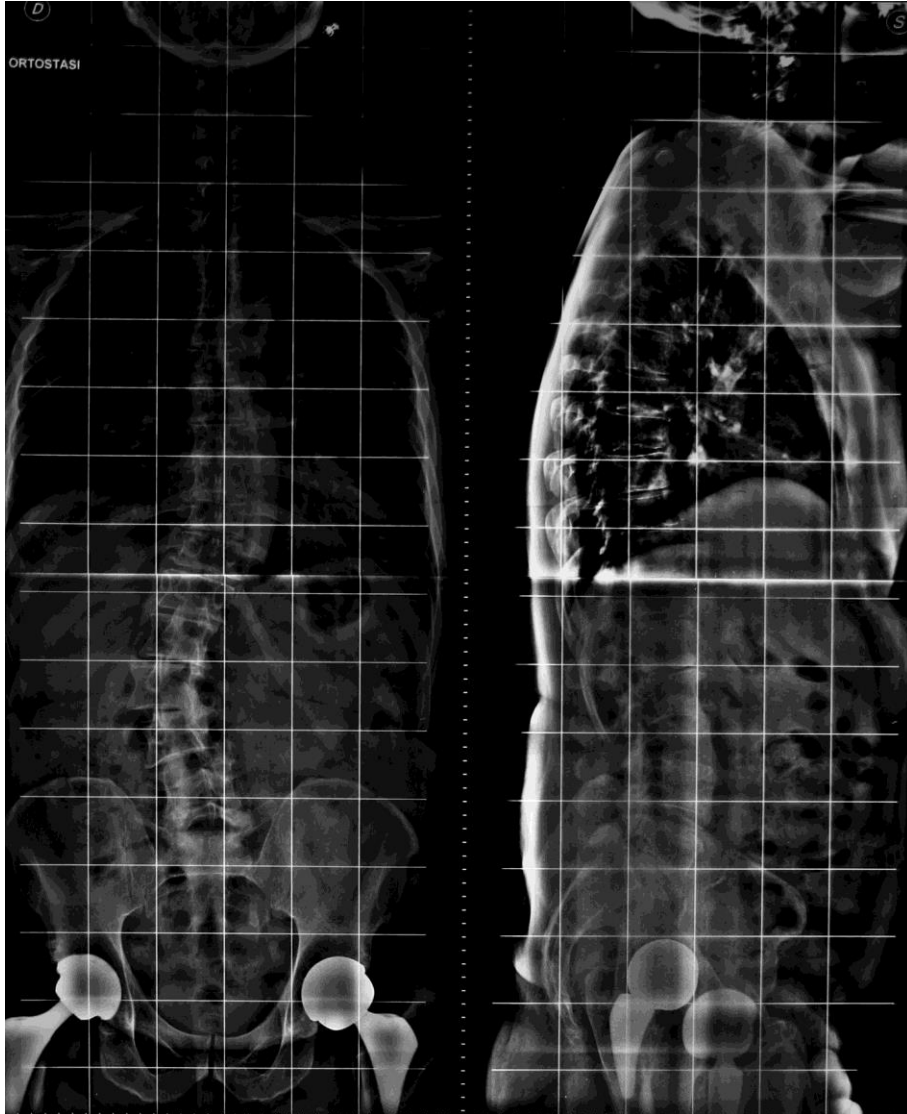


**Prima Classificata Master 50 femminile**



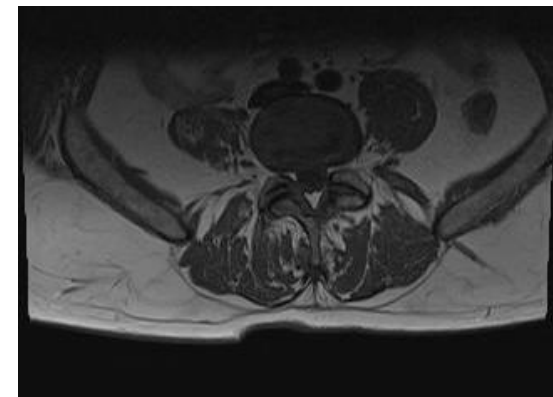
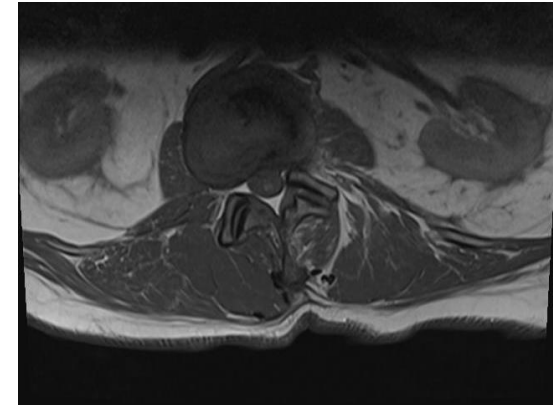


# Competitive beach tennis player, ♂ 54 y.o.

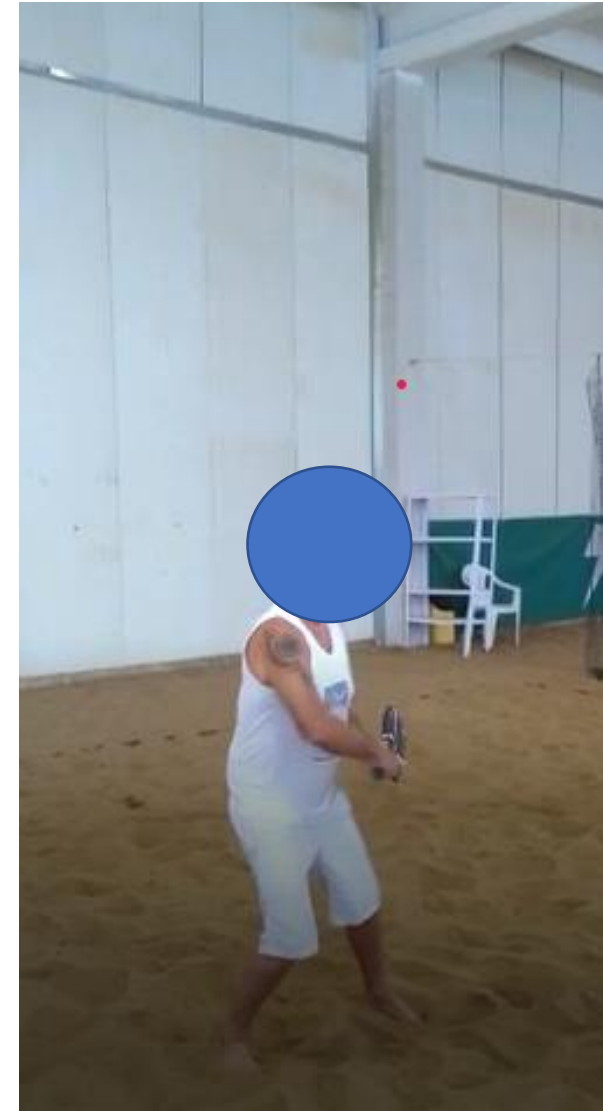


ODI= 51%

TAS= level 7

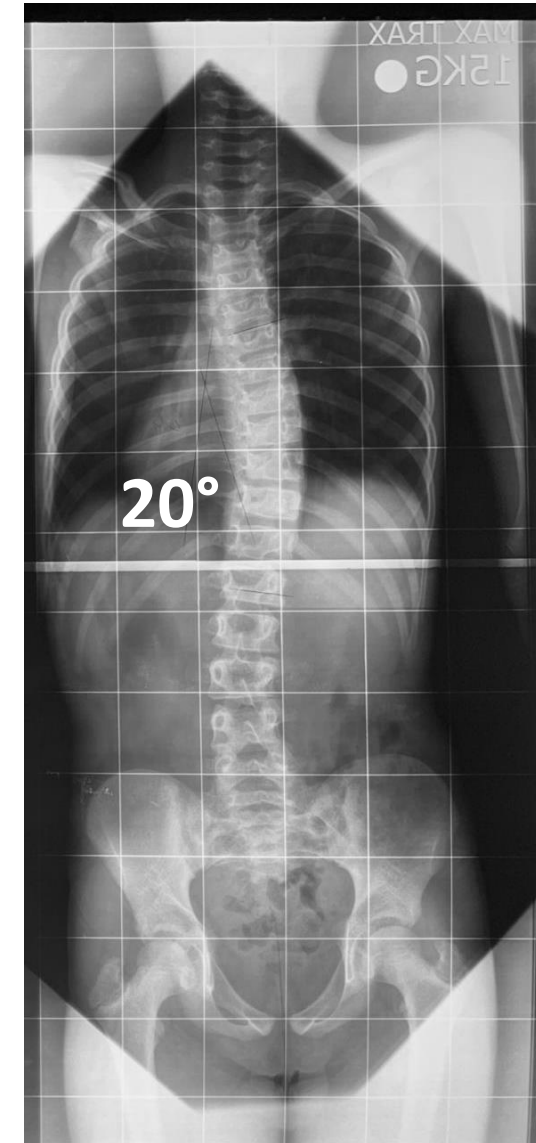
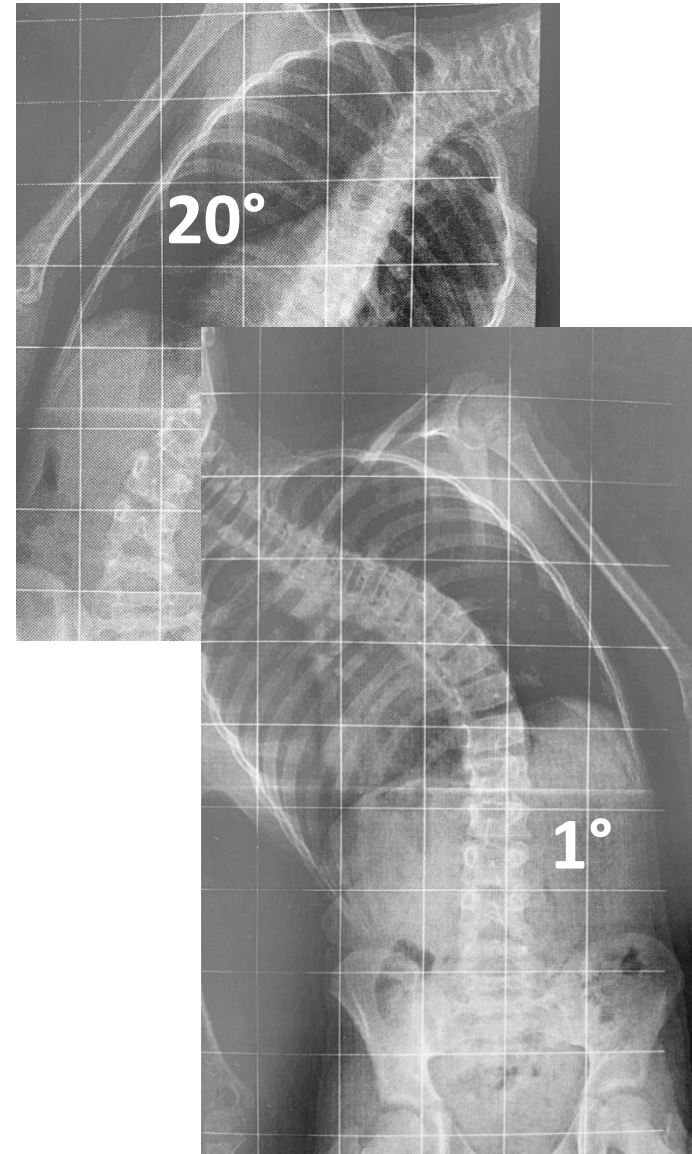
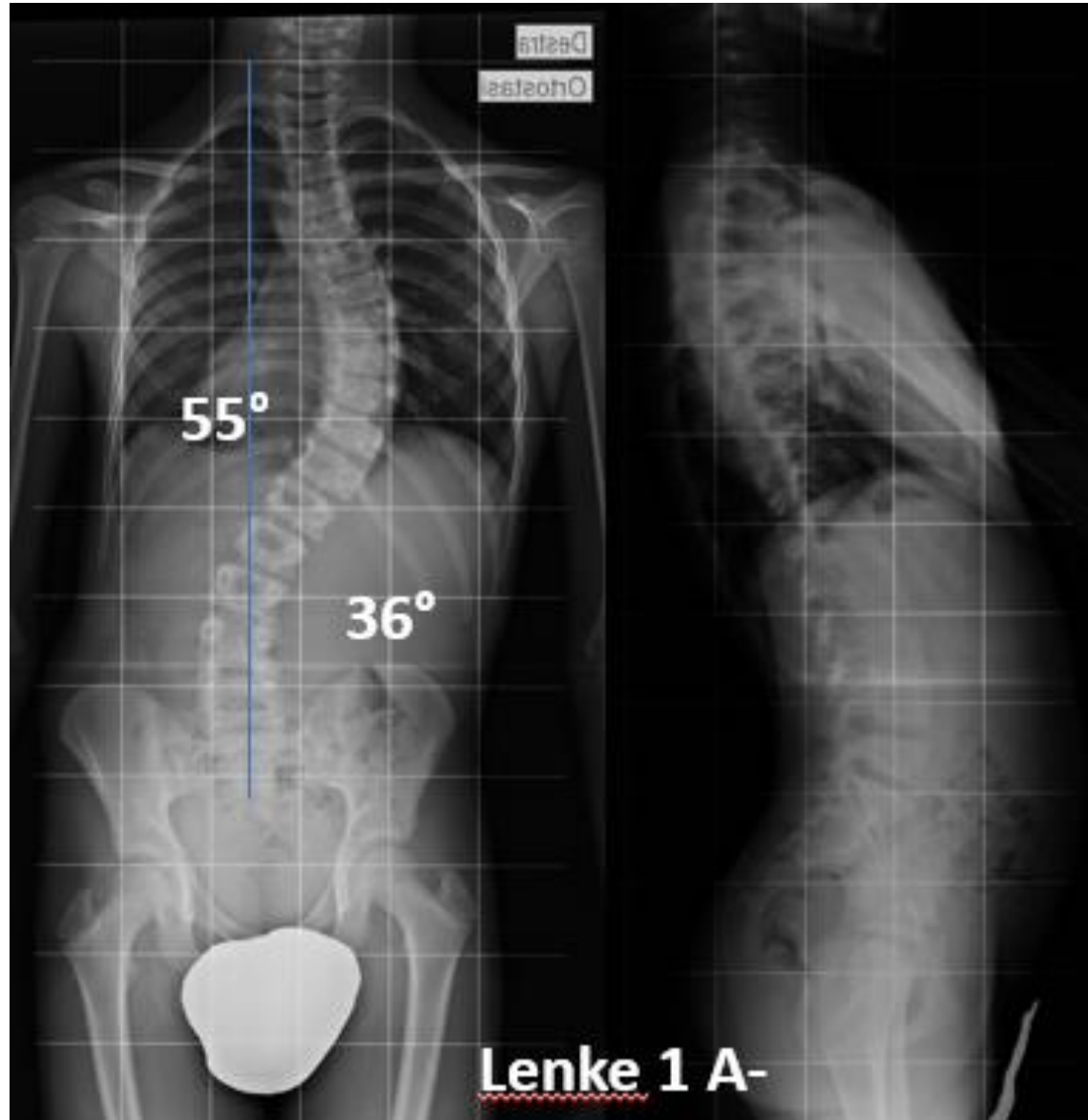


# Competitive beach tennis player, ♂ 54 y.o : multilevel XLIF (L2-L5)

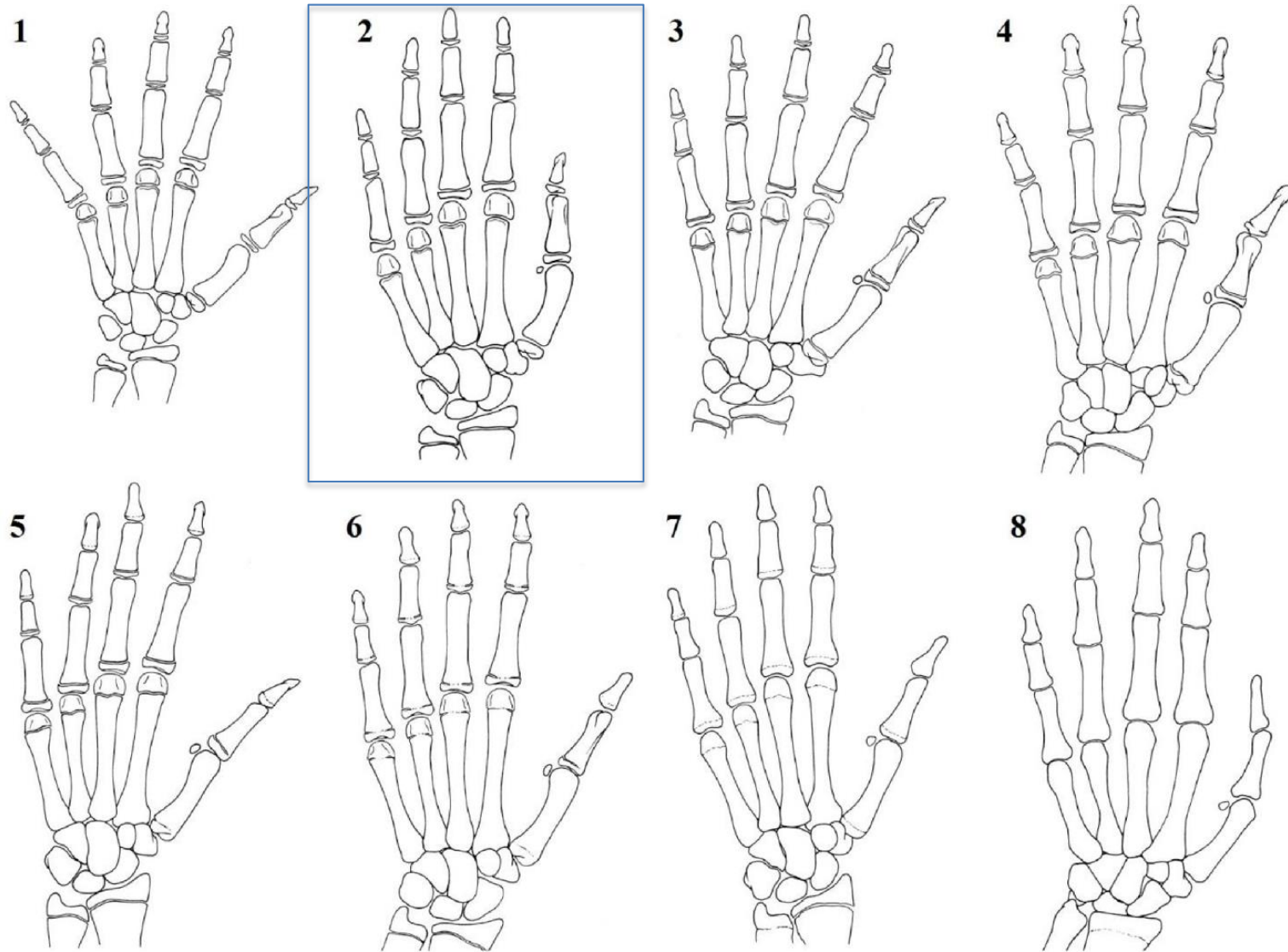




# Competitive tennis player under-12, ♂ 11 y.o.



# Competitive beach tennis player, ♂ 54 y.o



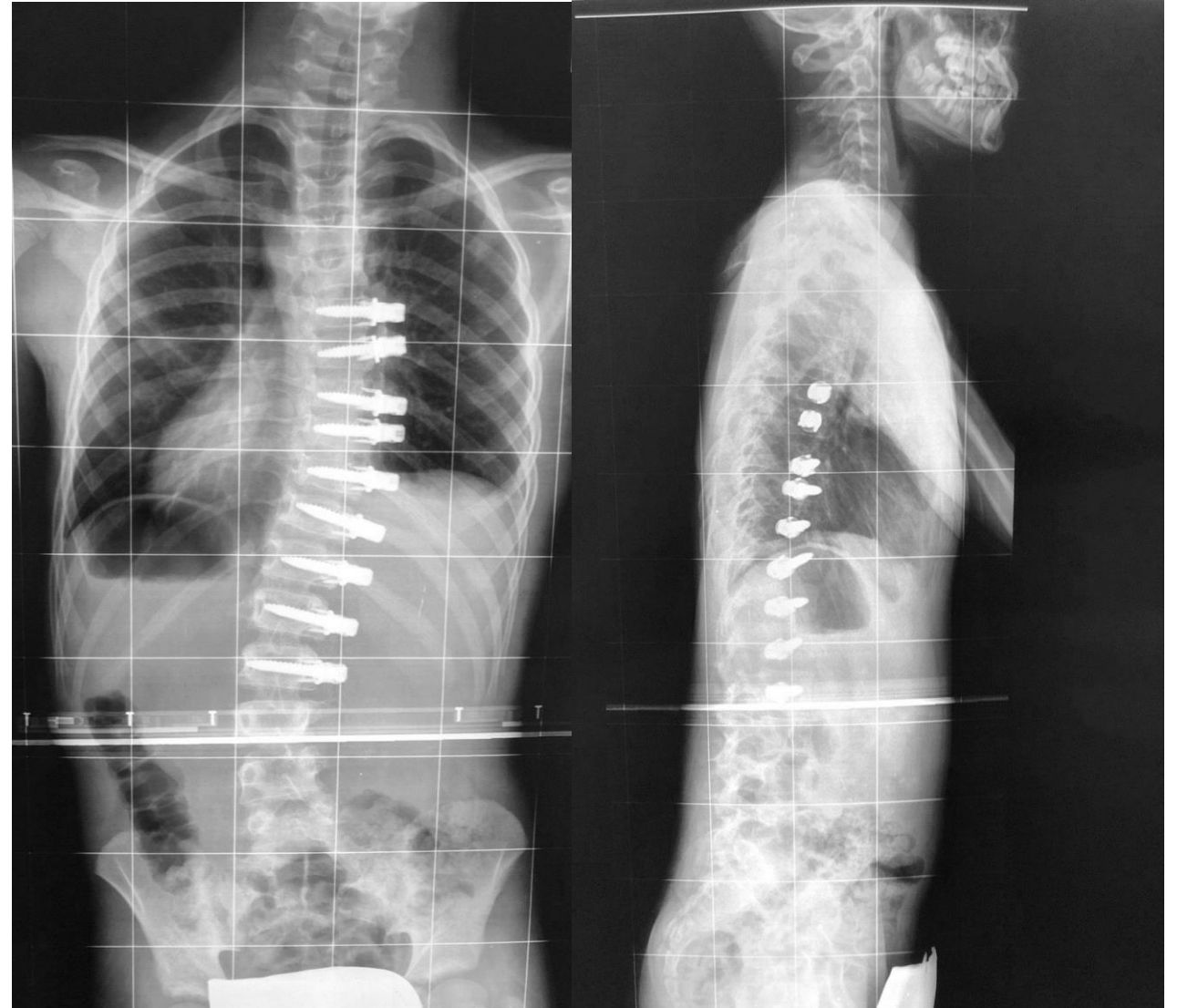
**Fig. 4** Sanders hand scores. Reprinted with permission from Sanders et al.<sup>13</sup> Stage 1 – all of the binary epiphysis of the hand are not



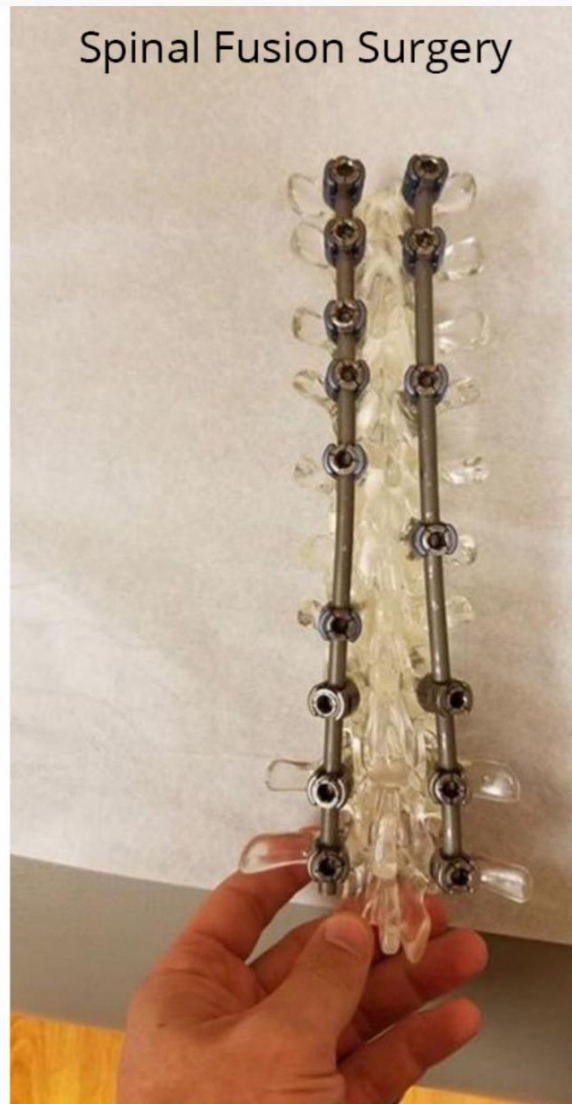
# Competitive tennis player, ♂ 11 y.o. - Vertebral Body Tethering (VBT)



28<sup>th</sup> Oct 2019



# Vertebral Body Tethering:



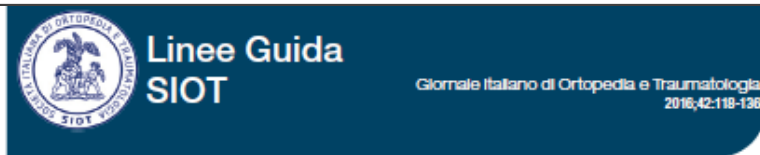
- Titanium pedicle screws
- white **polyethylene-terephthalate** flexible cord
- When the cord is tightened, it compresses the adjacent screws to help straighten the spine
- **immediate improvement after surgery,** and **continued improvement over time** as the spine grows
- Ligament and disc "releases" (surgically cut) may be utilized if curve flexibility is poor



# TAKE HOME MESSAGES:

- Clinical, functional & radiological assessment is mandatory
- Conservative management: 1<sup>st</sup> line treatment
- Consider MISS if nonsurgical management fails
- MISS is a **viable option for athletes (experienced surgeons!!!)**
- **RTP** following a **criteria-based progression**

# Guidelines:



## Linea guida per la diagnosi ed il trattamento dell'ernia del disco lombare con radicolopatia

A cura di:  
Consiglio Direttivo  
SICV&GIS 2014-2016

Presidente  
Prof. Vincenzo Denaro

Estensori  
Vincenzo Denaro  
Guido Bameschi  
Marco Crostelli  
Mauro Dobran  
Alberto Di Martino  
Cesare Faldini  
Gaetano Gulino  
Matteo Palmisani  
Nicola Papapietro  
Paolo Viganò

- |                            |                              |
|----------------------------|------------------------------|
| 1. Introduzione            | 6. Trattamento               |
| 2. Definizione             | 6.1 Trattamento conservativo |
| 3. Epidemiologia           | 6.2 Trattamenti percutanei   |
| 4. Storia naturale         | 6.3 Trattamento chirurgico   |
| 5. Diagnosi                | 7. Conclusioni               |
| 5.1 Esame clinico          | 8. Appendice                 |
| 5.2 Esami strumentali      | 9. Bibliografia              |
| 5.3 Diagnosi differenziale |                              |

### 1. Introduzione

Secondo la definizione suggerita dalla Società Italiana di Ortopedia e Traumatologia (SIOT) <sup>1</sup> le linee guida sono raccomandazioni di comportamento clinico, elaborate mediante un processo di revisione sistematica della letteratura e delle opinioni di esperti, con lo scopo di aiutare i medici e i pazienti a decidere le modalità assistenziali più appropriate in specifiche situazioni cliniche. Le linee guida non rappresentano un protocollo rigido di diagnosi e di trattamento. Alcuni pazienti possono richiedere indicazioni e risorse, diagnostiche e terapeutiche, superiori o inferiori alla media. Il trattamento deve essere comunque personalizzato in ciascun paziente in base alle sue caratteristiche peculiari ed al giudizio professionale del medico, la cui esperienza rappresenta una variabile insostituibile nei processi decisionali.

Questa linea guida è stata elaborata ed approvata dal consiglio direttivo della Società Italiana di Chirurgia Vertebrale SICV-GIS in gruppo ed è destinata ai professionisti sanitari di differenti discipline che si occupano di persone affette da patologie vertebrali. Si propone: a) di raccogliere e rendere disponibili le conoscenze scientifiche più aggiornate su diagnosi e trattamento dell'ernia del disco lombare, applicando i principi dell'Evidence Based Medicine (EBM); b) di formulare raccomandazioni di forza graduata, applicabili nella pratica clinica, che permettano di migliorare la gestione dei pazienti con radicolopatia da ernia discale.

È stato mantenuto lo stesso grading della forza delle raccomandazioni delle linee guida ministeriali (Tab. I). La forza di raccomandazione A rappresenta un'indicazione ad eseguire (o talora a non eseguire) la procedura con forte raccomandazione per tutti i pazienti. Si applica a raccomandazioni sostenute da prove di buona qualità, di tipo I, cioè prove da più studi controllati randomizzati (RCT) e/o da revi-

NICE National Institute for Health and Care Excellence



## Managing low back pain and sciatica

NICE Pathways bring together everything NICE says on a topic in an interactive flowchart. NICE Pathways are interactive and designed to be used online.

They are updated regularly as new NICE guidance is published. To view the latest version of this NICE Pathway see:

<http://pathways.nice.org.uk/pathways/low-back-pain-and-sciatica>  
NICE Pathway last updated: 20 October 2018

This document contains a single flowchart and uses numbering to link the boxes to the associated recommendations.

Low back pain and sciatica  
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Page 1 of 13

NASS Diagnosis and Treatment of Low-Back Pain Guideline—Clinical Question Protocol

North American Spine Society  
Diagnosis and Treatment of Low-Back Pain Evidence-Based Guideline  
*2016-Currently Under Development*  
Guideline Inclusion/Exclusion Criteria  
Clinical Question List

### Definition

Low-back pain is defined as pain of musculoskeletal origin extending from the lowest rib to the gluteal fold that may at times extend as somatic referred pain into the thigh (above the knee).\*

\*See next page for terminology

### Inclusion Criteria

1. Adult patients aged 18 and older
2. Patients with low back pain limited to somatic referred pain/non-radicular pain limited to above the knee only

### Exclusion Criteria

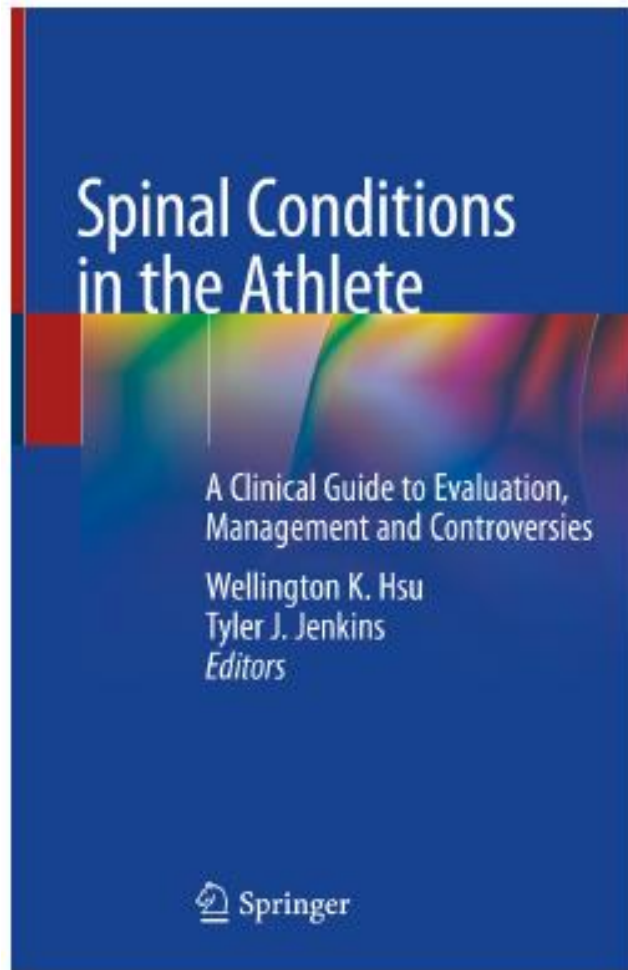
1. Patients less than 18 years of age
2. Low back pain due to:
  - a. tumor
  - b. infection
  - c. Metabolic disease
  - d. Inflammatory arthritis
  - e. Fracture
3. Patients with a diagnosed deformity, including spondylolisthesis, spondylolysis and scoliosis
4. Pain experienced below the knee
5. Extra-spinal conditions (ie, visceral, vascular, GU)
6. Patients who have undergone prior lumbar surgery
7. Presence of neurological deficit
8. Back pain that is associated with widespread multi-site pain ( $\geq 2$  sites)
9. Pregnancy

### Literature Search Parameters

1. Databases Searched: PubMed/Medline, EMBASE, Cochrane Library
2. Date Range: all literature to current date
3. Study Designs: Randomized Controlled Trials, Clinical Trials, Prospective/Retrospective Cohort and Comparative Studies, Observational Studies, Case-Control, Case-Series.
4. Humans
5. English only studies



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Asian J Sports Med. 2014 December; 5(4): e24284.  
Published online 2014 November 10.

## Spine Surgery in Athletes With Low Back Pain-Considerations for Management and Treatment

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DOI:10.5812/asjasm.24284  
Review Article

## Lumbar Spine Surgery in Athletes: Outcomes and Return-to-Play Criteria

Ying Li, MD<sup>a</sup>, M. Timothy Hresko, MD<sup>b,\*</sup>

Downloaded from <http://bjsm.bmj.com/> on October 24, 2015 - Published by group.bmj.com  
BJSM Online First, published on October 21, 2015 as 10.1136/bjsports-2015-094691

Review

## Return to sport after open and microdiscectomy surgery versus conservative treatment for lumbar disc herniation: a systematic review with meta-analysis

Michael P Reiman,<sup>1</sup> Jonathan Sylvain,<sup>2</sup> Janice K Loudon,<sup>3</sup> Adam Goode<sup>1</sup>



CORRIERE DELLA SERA

DATA ROOM

di Milena Gabanelli

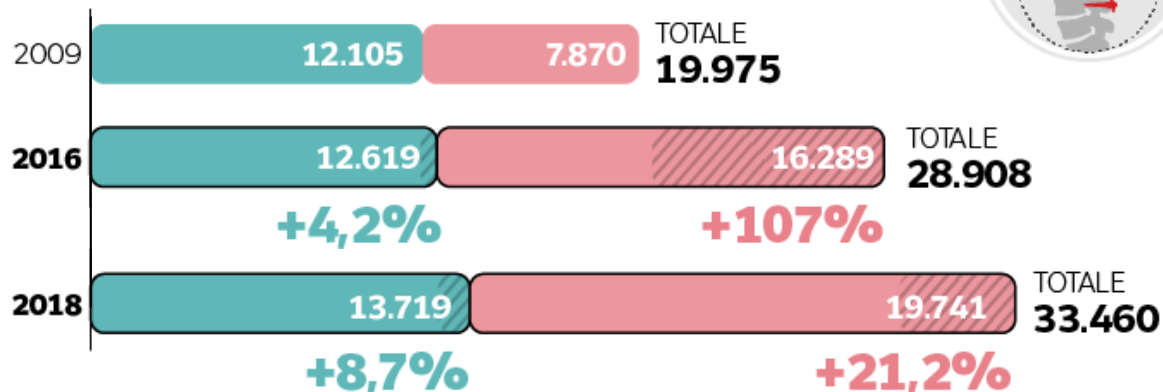
12 Novembre 2019

# Business del mal di schiena: troppi interventi inutili. Solo la Lombardia dice basta

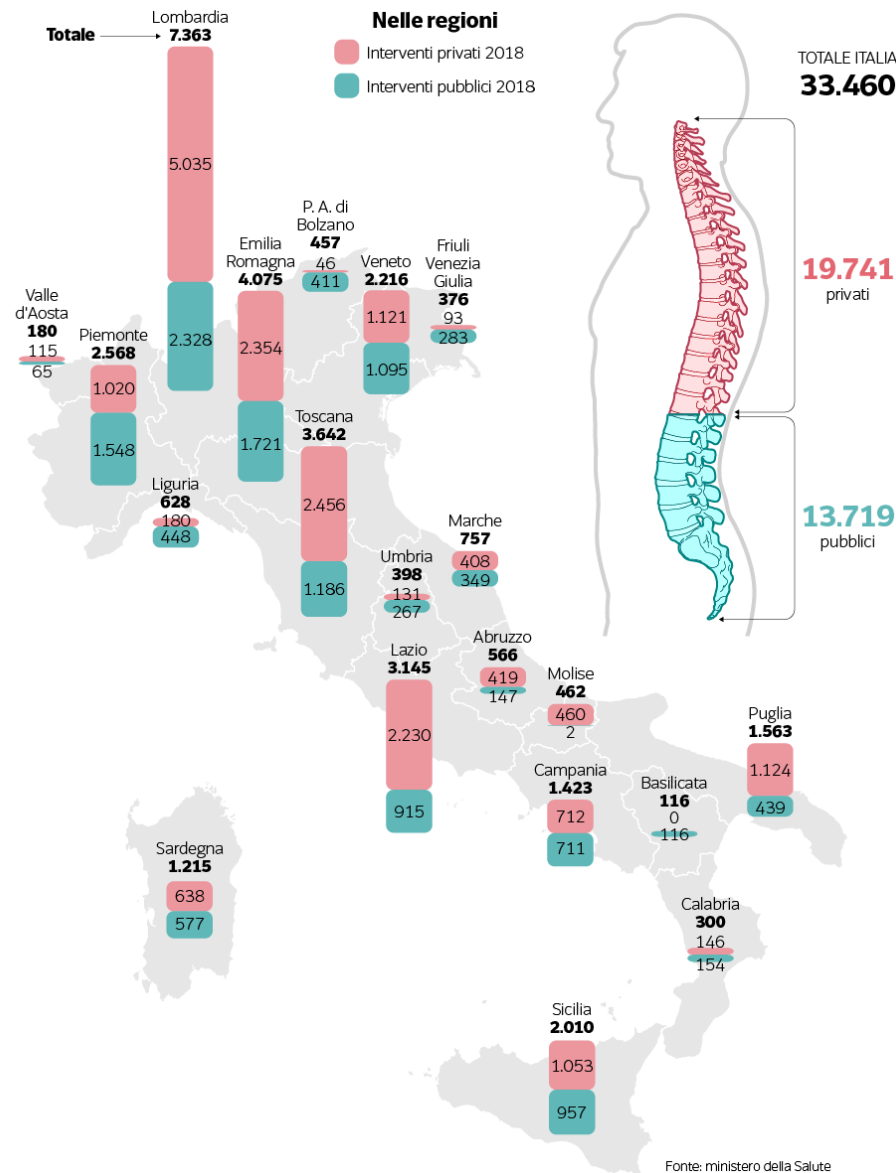
di Milena Gabanelli e Simona Ravizza

## Numero di interventi 2009-2016

■ Pubblici ■ Privati



Fonte: ministero della Salute



Fonte: ministero della Salute



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*Thanks!*

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