

treatment. During years, technology progressed very rapidly and our concern as spine surgeons was to get a hold on spine deformity and obtain a solid fusion. The race for hardware improvement and its techniques has been extremely productive however it came at the expense of physiology. Technology made spine fusions more successful; indications for spine fusions were extended to treatment of adult deformity and low back pain. After 20 years of practice starting in the eighties I was confronted with problems following spine fusions. It became progressively clear that ALIGNMENT was the key and malalignment the cause of late complications of spine fusions.

What place did the disc hold in this rhetoric? Neither a joint nor a ligament, the disc is not fully understood. Research discovered and analyzed all discs properties and it became clear that a process of degeneration was taking place creating pain, nerve root compression, instability and deformity. Deformity develops in the sagittal plane and is very often related to sagittal malalignment. The intervertebral disc is essential in spine alignment and even while degenerated the disc still provides a better function than a fusion. The desire to preserve this element as a guarantee to preserve physiology drove research to conceive a disc replacement. Short of agreeing on a consensus adventurous surgeons refused to stay with fusion for disc pathology and arthroplasty was created. Disc arthroplasty has improved over the last 15 years thanks to dedicated research. Mobility for spine pathology and with it balance is gaining speed over immobilization and here is where ArgoSpine shows how the artificial disc prosthesis stands in the armamentarium of disc surgery. ●

## ORAL PRESENTATION

Day 2/14:45>14:55

### ELIF through a muscle sparing unilateral approach: biological and radiological follow-up

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#### PURPOSE AND DESIGN

Assessment of the muscular lesions after an ELIF by radiological and biological studies.

#### BACKGROUND CONTEXT

After lumbar surgeries, muscular lesions can be explored by biological and radiological means.

Specific muscular biological tests analyze the immediate muscular lesions and MRI analyzes postoperative anatomy of the spinal muscles.

This study has been undertaken after a lumbar interbody fusion surgery through an extraforaminal approach [1-2]. The results have been compared with other lumbar surgeries.

The extraforaminal approach using a 45° angle reaches the disc through a natural cleavage plane between the Longissimus and the Multifidus. The interbody fusion is obtained by insertion of 2 special shaped cages filled with cancellous bone and secured by unilateral instrumentation. (Fig. 1)

#### PATIENT SAMPLE, OUTCOME MEASURES AND METHOD

Posterior lumbar muscles of 6 ELIF and 2 PLIF patients have been studied with MRI 6 months after surgery.

Assessments have been made with 2 parameters, the muscular atrophy index and the fatty degeneration index [3].

Biological tests, i.e., serum CPK and myoglobin, have been made by blood samples before the surgery and at the 1<sup>st</sup>, 2<sup>nd</sup> and 4<sup>th</sup> days after surgery. The surgeries were 43 ELIFs, 23 discectomies, 14 decompressive surgeries for 1 level stenosis and 4 PLIFs.

#### RESULTS

After ELIF, muscles modifications assessed by MRI (Fig. 2):

- are unilateral
- involve just a limited zone along the fibrotic track of the approach, 45° oblique, between the Longissimus and the Multifidus. Just one fascicle of the Longissimus, that has to be cut during surgery, appears fibrotic.

After PLIF, muscular modifications assessed by MRI:

- are bilateral
- involve many levels
- span towards the 3 posterior muscles, in width.

The results of CPK and myoglobin measurements are reported in 2 charts. (Fig. 3 & 4)

#### CONCLUSIONS

Our series proves that ELIF lead to less enzymatic troubles than a simple discectomy and especially PLIF. The first post-operative day, the CPK level is only double the normal level. These figures are to be compared to the CPK of other fusion techniques reported in literature.

ELIF, with its anatomical approach in a natural cleavage plane, emerges as a true "minimally invasive" technique, which respects muscles, and results in less muscle damage, as compared to PLIF. (Fig. 5) ●

#### // References

- ① Recoules-Arche D, Alcaix D (2006) Fusion lombaire intersomatique par voie extraforaminale unilatérale (ELIF unilatérale). A propos de 75 cas. *Rachis* 2(9):4
- ② Recoules-Arche D, Alcaix D (2004) Extraforaminal Lumbar Interbody Fusion (ELIF) 30 degenerative lumbar dislocations: 1-year follow-up. *Rachisc*16(3)
- ③ Goutallier et al. (1994) Fatty muscle degeneration in cuff ruptures. Pre and postoperative evaluation by CT scan. *Clin Orthop Relat Res* 304:78-73



Fig. 1: ELIF approach: 45°, between Longissimus and Multifidus muscles

	Muscular atrophy <sup>(1)</sup>	FDI operated side <sup>(2)</sup>	FDI healthy side
<b>ELIF</b>			
Patient 1	Stage 1	Stage 1	Stage 1
Patient 2	Stage 1	Stage 1	Stage 1
Patient 3	Stage 1	Stage 1	Stage 1
Patient 4	Stage 1	Stage 1	Stage 1
Patient 5	Stage 2	Stage 2	Stage 2
Patient 6	Stage 1	Stage 2	Stage 1
<b>PLIF</b>			
Patient 1	Stage 4 – Bilateral	Stage 4	Stage 4
Patient 2	Stage 4 – Bilateral	Stage 4	Stage 4
<sup>(1)</sup> Muscular atrophy index: Percentage of atrophy compared to the healthy side Stage I : <25% atrophy Stage II : Between 25 and 50% atrophy Stage III : Between 50 and 75% atrophy Stage IV : >75% atrophy <sup>(2)</sup> Fatty degeneration index Stage I : some hyperintensity linear pictures within the muscle Stage II : presence of fat between 25 and 50% of muscle Stage III : as much fat as muscle Stage IV : complete fatty involution of muscle			

Fig. 2: Muscular atrophy index and fatty degeneration index (FDI). Compared 6 months following ELIF and PLIF

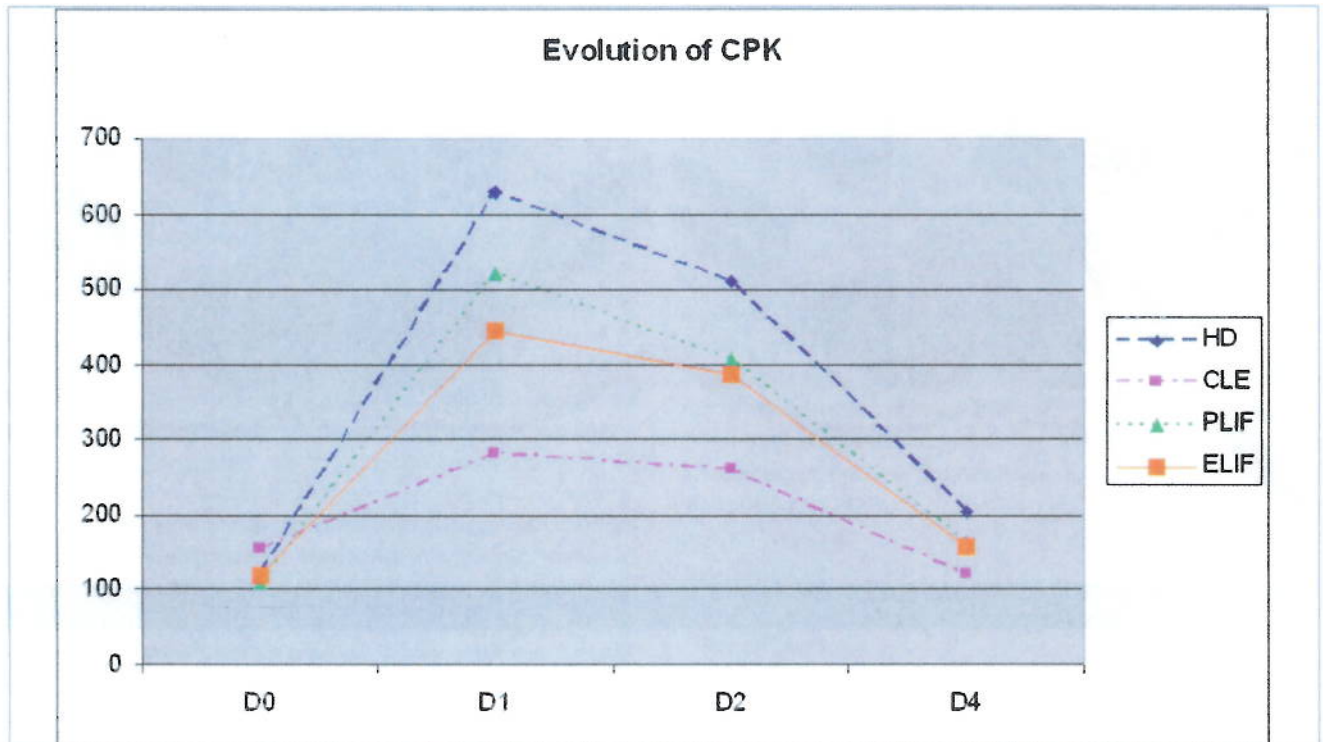


Fig. 3: CPK levels between 1. and 4. postoperative day following surgery for herniation of the disc (HD), spinal canal stenosis (1 level "CLE"), PLIF and ELIF.

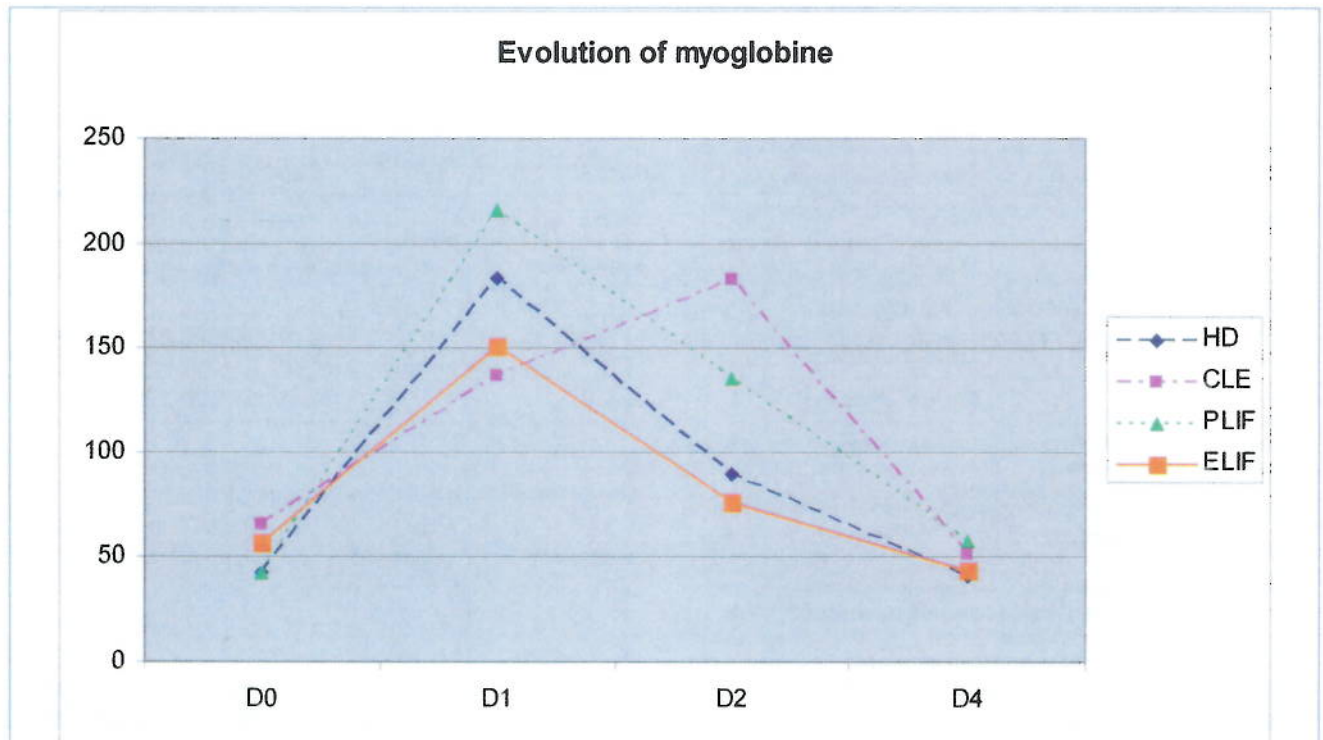


Fig. 4: Postoperative Myoglobine levels following disc surgery (blue), one level decompression (pink), PLIF (green) and ELIF (orange).

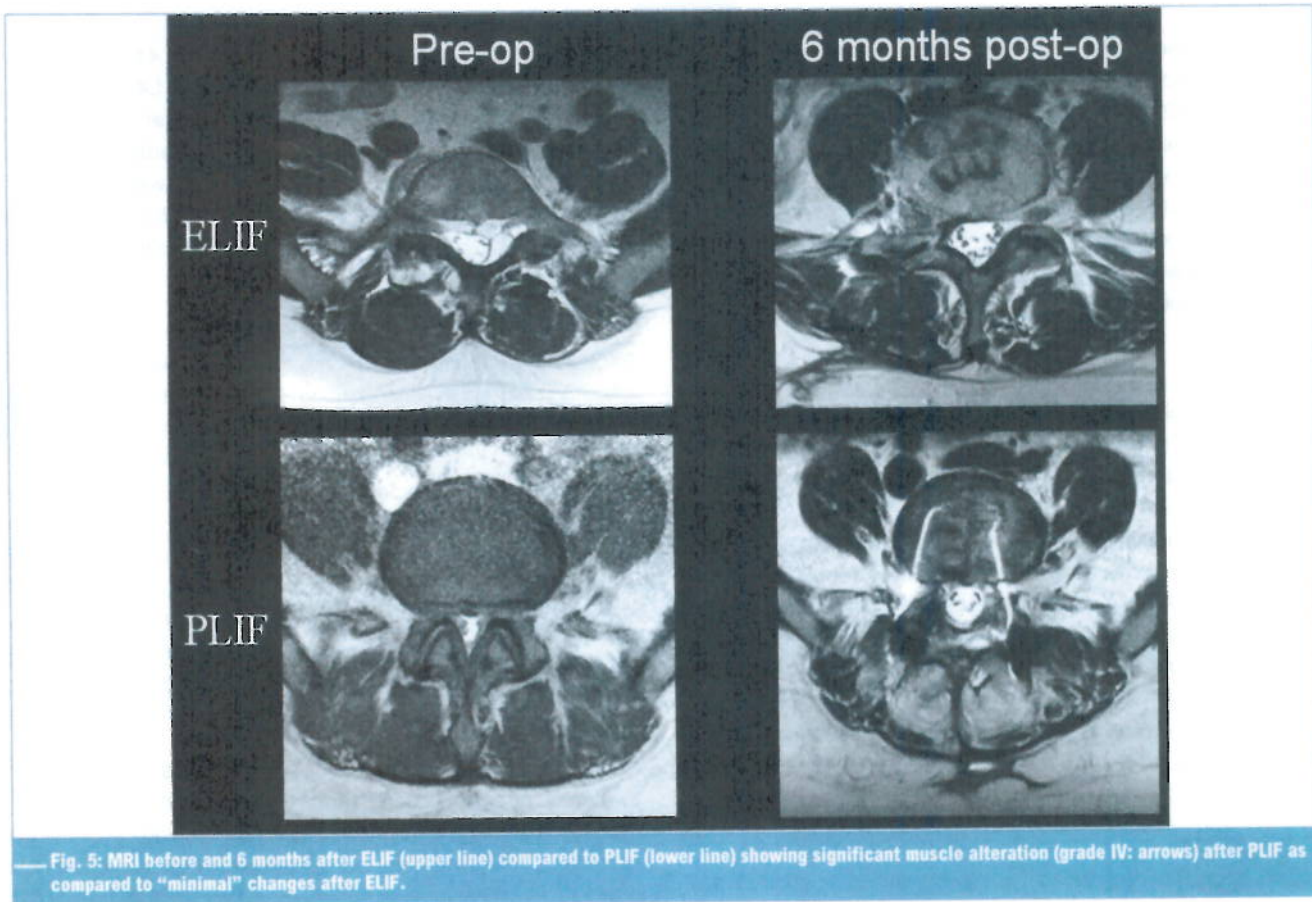


Fig. 5: MRI before and 6 months after ELIF (upper line) compared to PLIF (lower line) showing significant muscle alteration (grade IV; arrows) after PLIF as compared to "minimal" changes after ELIF.

#### CLINICAL CASE

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#### CHOSEN SOLUTION

Transpedicular stabilization and local antibiotic (Fig. 4).

#### Infection or degeneration of the intervertebral disc?

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#### OUTCOME

At 2.5 year-follow up very good clinical and radiological result. ●

#### OBJECTIVES

Does it make any difference in treatment modalities whether the source of low back pain is infection or degenerative end plate injury?

#### CLINICAL CASE

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#### Stand alone PLIF with box type intervertebral cages. Forty-one cases with two year follow up

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#### TREATMENT

Conservative treatment: corset & long term antibiotics; surgical stabilization debridement

#### INTRODUCTION

Recently various type of spinal instrumentation was applied, and they are essential in modern spinal fusion surgery. Whereas several authors reported increased possibility of complication and degeneration on adjacent segment. We tried PLIF without instrumentation with box type intervertebral cages.

#### PATIENT HISTORY AND PROPOSED DIAGNOSIS

No surgery or major illness in history, but previous gonorrhoea and chlamydia trachomatis infection. Important low back pain for 3 months non responsive to conservative treatment. On MRI, inflammation of neighbouring vertebrae (Fig. 1.); CT shows serious endplate destruction (Fig. 2, 3). Primary infection of the intervertebral disc?