

OR1

Online Resource 1: TEMPLATE OF THE PATIENT DATA SHEET

Article title: “In vivo” validation of 3D-printed innovative surgical template for lumbar spinal arthrodesis

Journal name: Medical & Biological Engineering & Computing

Author names: Alessandro Naddeo, Emilio Cataldo, Nicola Narciso, Francesco Naddeo, Nicola Cappetti

Affiliation and e-mail address of the corresponding author:

Corresponding Author: Francesco Naddeo

Department of Industrial Engineering, University of Salerno, Via Giovanni Paolo II, 132, 84084 Fisciano, SA,
Italy

Email: frnaddeo@unisa.it

DATA SHEET FOR SPINAL CUSTOM MADE TEMPLATE TRIAL “SPINE SOLUTIONS”

PATIENT CODE: XXXXXXXXXXXXX

NUMBER OF TREATED VERTEBRAES: x LEVELS

VETERBRAES ENUMERATION: T_x-L_x-L_x

SURGERY DURATION FOR EACH VERTEBRA	Vertebra 1: L _x → XX min Vertebra 2: L _x → XX min
TOTAL IMPLANTOLOGY TIME	XX min
TOTAL SURGERY TIME	XX min
X-Ray SHOOTS	Vertebra X= X Vertebra X= X
KIRSHNER REPOSITIONING	Vertebra X = X Vertebra X = X
SCREWS REPOSITIONING	Vertebra X = X Vertebra X = X

VERTEBRA 1

Sign the score attributable to each single section

Passage of the screw for the pedicle center	1	2	3	4	5
Screws alignment with the vertebral plate	1	1	3	4	5
Screw axis convergence in the sagittal plane	1	2	3	4	5
Screw interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (between 3mm and 4mm)	MODERATE (between 2mm and 3mm)	SLIGHT (<2mm)	ABSENT

VERTEBRA 2

Sign the score attributable to each single section

Passage of the screw for the pedicle center	1	2	3	4	5
Screws alignment with the vertebral plate	1	1	3	4	5
Screw axis convergence in the sagittal plane	1	2	3	4	5
Screw interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (between 3mm and 4mm)	MODERATE (between 2mm and 3mm)	SLIGHT (<2mm)	ABSENT

VERTEBRA XXX

.....

.....

***) SCORE "1" for "WORST RESULT" and SCORE "5" for "BEST RESULT"**

OR2

Online Resource 2: PATIENT DATA SHEETS

Article title: “In vivo” validation of 3D-printed innovative surgical template for lumbar spinal arthrodesis

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SURGERY DATA SHEETS OF PATIENTS THAT HAVE TAKEN PART TO THE CLINICAL TRIAL

Patient code n. 1AZL4L500

Pathology

- Vertebral stenosis L4-L5
- Median Discal hernia L5-S1 with II degree Modic

Surgery

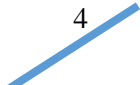
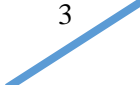
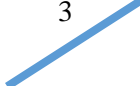

Decompression e Stabilization L4-L5-S1

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

1AZL4L500
2 segments
No Template L4
No Template L5

Surgery duration for each vertebra	Vertebra 1: L4→ 20 min Vertebra 2: L5→ 80 min
Surgery duration for implantology	100 min
Total surgery duration	120 min
X-Ray shots	Vertebra 1= 7 Vertebra 2= 7
Kirschner repositioning	Vertebra 1 = 4 Vertebra 2 = 3
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3	4 	5
Screws alignment with vertebral plate	1	1	3 	4	5
Screws axis convergence in the sagittal plane	1	2	3 	4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 2

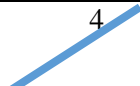
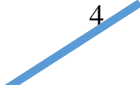
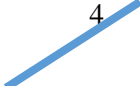

Passage of the screw for the pedicle centre	1	2	3	4 	5
Screws alignment with vertebral plate	1	1	3	4 	5
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 



Fig. 1 *Post-operative coronal X-ray* (n. 1AZL4L500)

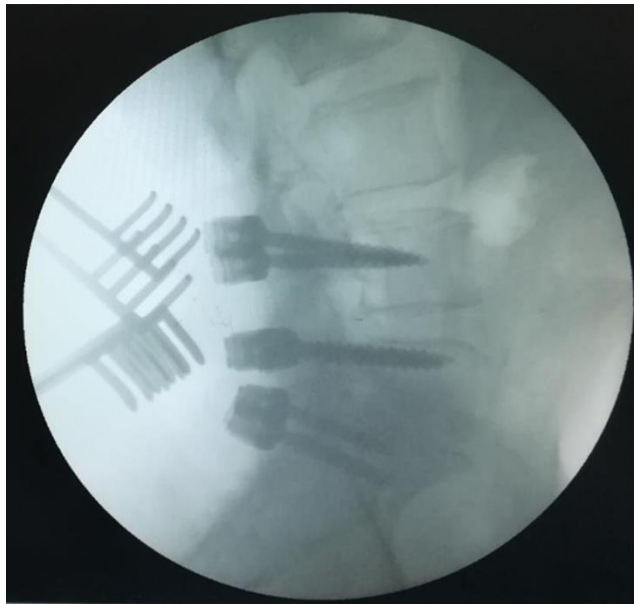


Fig. 2 *Post-operative sagittal X-ray* (n. 1AZL4L500)

Patient code n. 2ATL3L4L5110

Pathology

- Vertebral stenosis L4-L5
- Medial Discal hernia L3

Surgery

DECOMPRESSION AND STABILIZATION L3-L4-L5

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

2ATL3L4L5110

3 segments

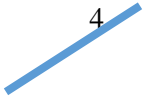
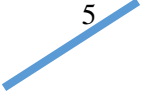
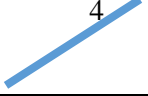

Template L3

Template L4

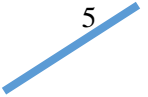
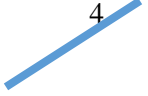
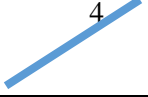

No Template L5

Surgery duration for each vertebra	Vertebra 1: L3→ 18 min Vertebra 2: L4→ 15 min Vertebra 3: L5→ 129min
Surgery duration for implantology	162 min
Total surgery duration	185 min
X-Ray shots	Vertebra 1= 4 Vertebra 2= 2 Vertebra 3= 16
Kirschner repositioning	Vertebra 1 = 1 Vertebra 2 = 0 Vertebra 3 = 12
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 0

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3	4	
Screws alignment with vertebral plate	1	1	3		5
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3	4	5
Screws alignment with vertebral plate	1	1	3	4	5
Screws axis convergence in the sagittal plane	1	2	3	4	5
Screws interpenetration in vertebral surface	CRITICALS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT

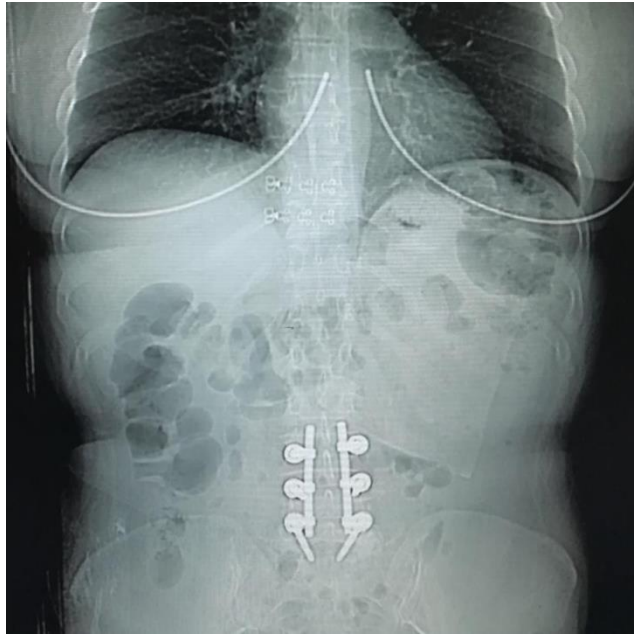


Fig. 3 Post-operative coronal X-ray (n. 2ATL3L4L5110)

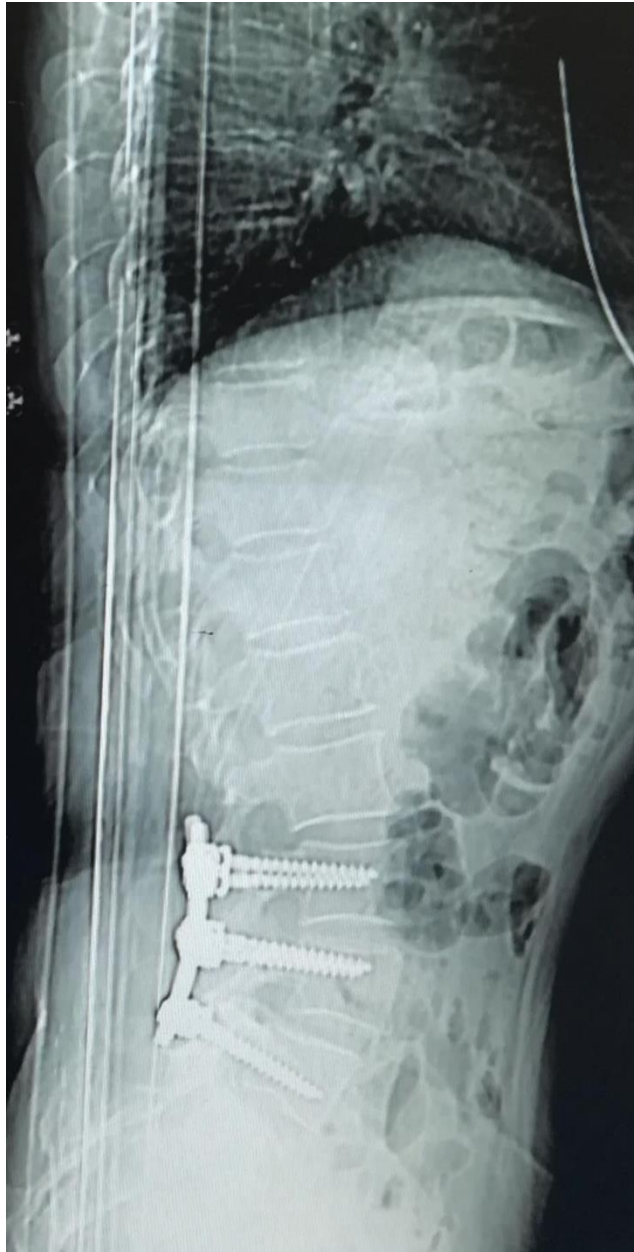


Fig. 4 Post-operative sagittal X-ray (n. 2ATL3L4L5110)



Fig. 5 Post-operative sagittal RMN (n. 2ATL3L4L5110)

Patient code n. 3ANT10T11L1L20110

Pathology

Vertebral Trauma

- Left pedicle Fracture T12
- costal multiple Fractures
- post-trauma pleural effusion

Surgery

VERTEBRAL ARTRHODESIS T10-L2

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

3ANT10T11L1L20110

4 segments

No Template T10

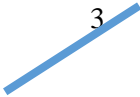
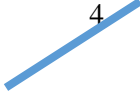
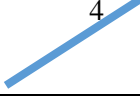

Template T11

Template L1

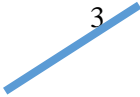
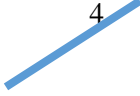
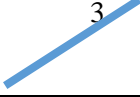

No Template L2

Surgery duration for each vertebra	Vertebra 1: T10→ 45 min Vertebra 2: T11→ 10 min Vertebra 3: L1→ 15min Vertebra 4: L2→ 70 min
Surgery duration for implantology	140 min
Total surgery duration	165 min
X-Ray shots	Vertebra 1 = 6 Vertebra 2 = 2 Vertebra 3 = 4 Vertebra 4 = 9
Kirschner repositioning	Vertebra 1 = 4 Vertebra 2 = 0 Vertebra 3 = 1 Vertebra 4 = 8
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 0 Vertebra 4 = 1

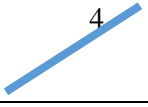
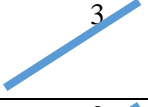
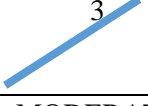

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3 	4	5
Screws alignment with vertebral plate	1	1	3	4 	5
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

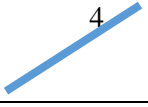
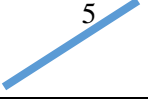
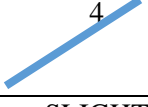

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3 	4	5
Screws alignment with vertebral plate	1	1	3	4 	5
Screws axis convergence in the sagittal plane	1	2	3 	4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1		4	5
Screws axis convergence in the sagittal plane	1	2		4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

VERTEBRA 4

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

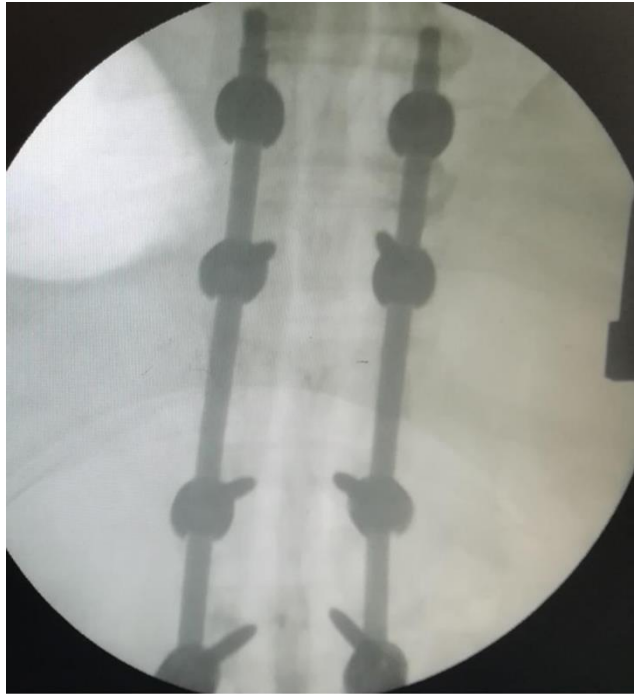


Fig. 6 Post-operative coronal X-ray (n. 3ANT10T11L1L20110)

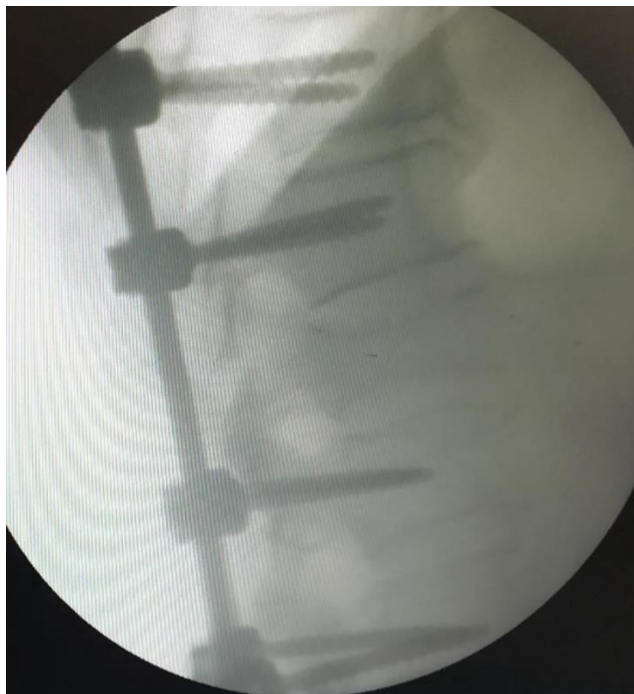


Fig. 7: Post-operative sagittal X-ray (n. 3ANT10T11L1L20110)

Patient code n. 4ASL3L4L5010

Pathology

- lumbar Vertebral stenosis
- Spondylosis L4-L5

Surgery

LUMBAR AND LUMBO – SACRAL POSTERIOR ARTRHODESIS AND CANAL DECOMPRESSION

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

4ASL3L4L5010

3 segments

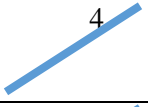
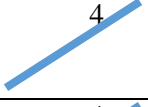
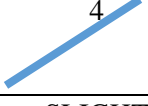

No Template L3

Template l4

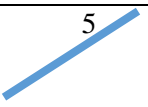
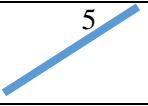
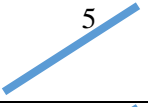
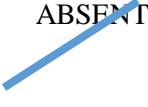
No Template l5

Surgery duration for each vertebra	Vertebra 1: L3→ 60min Vertebra 2: L4→ 16 min Vertebra 3: L5→ 44 min
Surgery duration for implantology	120 min
Total surgery duration	150 min
X-Ray shots	Vertebra 1 = 13 Vertebra 2 = 4 Vertebra 3 = 7
Kirschner repositioning	Vertebra 1 = 10 Vertebra 2 = 0 Vertebra 3 = 4
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 0

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3	4 	5
Screws alignment with vertebral plate	1	1	3	4 	5
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3	4	5 
Screws alignment with vertebral plate	1	1	3	4	5 
Screws axis convergence in the sagittal plane	1	2	3	4	5 
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3	4	5
Screws alignment with vertebral plate	1	1	3	4	5
Screws axis convergence in the sagittal plane	1	2	3	4	5
Screws interpenetration in vertebral surface	CRITICALS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT



Fig. 8 Post-operative coronal X-ray (n. 4ASL3L4L5010)

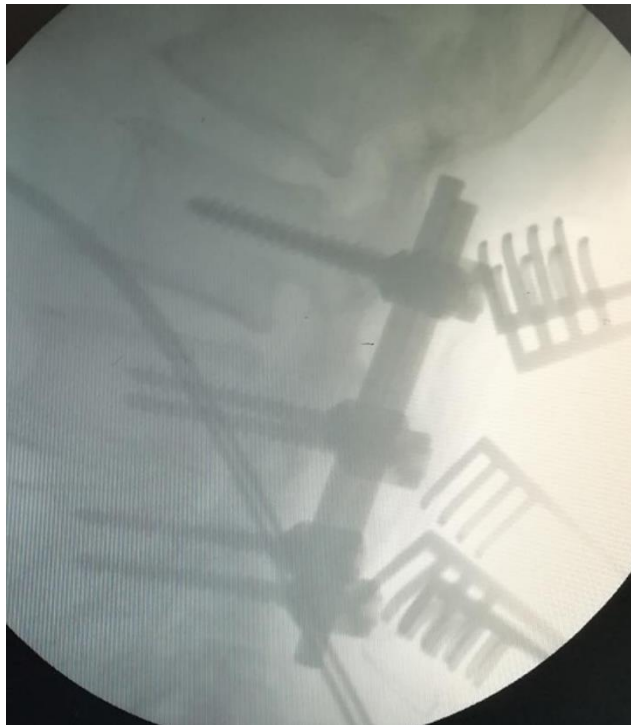


Fig. 9 Post-operative sagittal X-ray (n. 4ASL3L4L5010)

Patient code n. 5BML4L501

Pathology

Back pain with left sciatica radiation

Surgery

RECALIBRAGE AND BILATERAL LUMBAR ARTRHODESIS IN L4 E L5

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

5BML4L501
2 segments
 No Template L4
 Template L5

Surgery duration for each vertebra	Vertebra 1: L4→ 70 min Vertebra 2: L5→ 10 min Vertebra 3: No
Surgery duration for implantology	80 min
Total surgery duration	110 min
X-Ray shots	Vertebra 1 = 12 Vertebra 2 = 3 Vertebra 3 = No
Kirschner repositioning	Vertebra 1 = 8 Vertebra 2 = 2 Vertebra 3 = No
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = No

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3	4	5
Screws alignment with vertebral plate	1	1	3	4	5
Screws axis convergence in the sagittal plane	1	2	3	4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3	4	5
Screws alignment with vertebral plate	1	1	3	4	5
Screws axis convergence in the sagittal plane	1	2	3	4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT

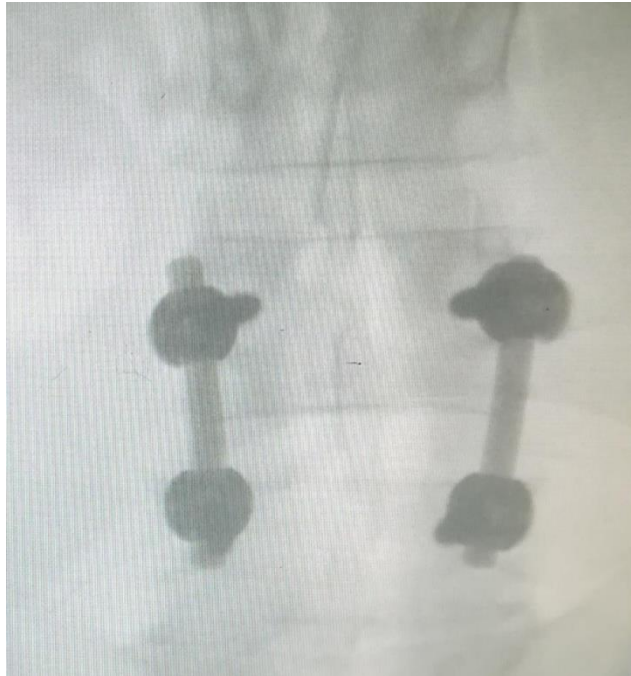


Fig. 10 Post-operative coronal X-ray (n. 5BML4L501)

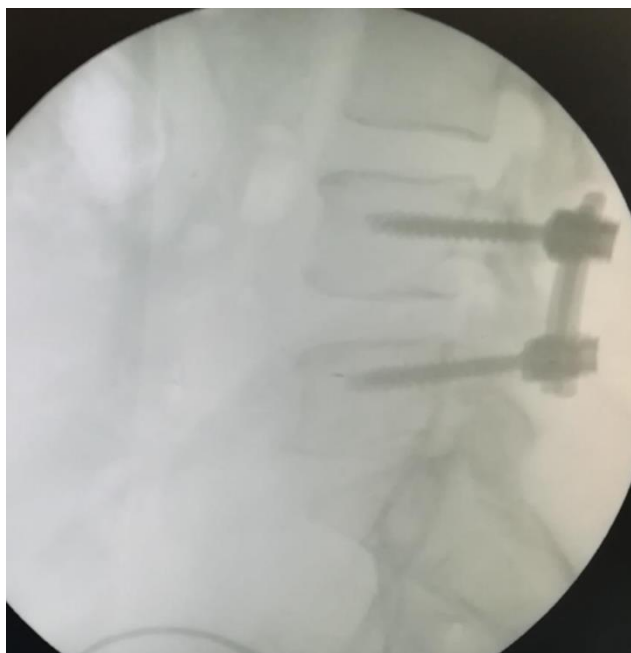


Fig. 11 Post-operative sagittal X-ray (n. 5BML4L501)

Patient code n. 6CVL3L4L5011

Pathology

- Back pain
- Bilateral sciatica

Surgery

POSTERIOR LUMBAR ARTRHODESIS AND LATERAL DECOMPRESSION L4-L5 E L5-S1

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

6CVL3L4L5011

3 segments

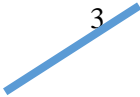
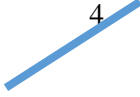
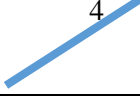

No Template L3

Template L4

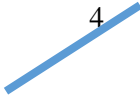
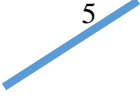
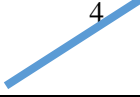

Template L5

Surgery duration for each vertebra	Vertebra 1: L3→ 57 min Vertebra 2: L4→ 15 min Vertebra 3: L5→ 18min
Surgery duration for implantology	90 min
Total surgery duration	115 min
X-Ray shots	Vertebra 1= 10 Vertebra 2= 2 Vertebra 3= 3
Kirschner repositioning	Vertebra 1 = 1 Vertebra 2 = 0 Vertebra 3 = 1
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 0

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3 	4	5
Screws alignment with vertebral plate	1	1	3	4 	5
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3	4 	5
Screws alignment with vertebral plate	1	1	3	4	5 
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3	4	5
Screws alignment with vertebral plate	1	1	3	4	5
Screws axis convergence in the sagittal plane	1	2	3	4	5
Screws interpenetration in vertebral surface	CRITICALS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT



Fig. 12 Post-operative coronal X-ray (n. 6CVL3L4L5011)

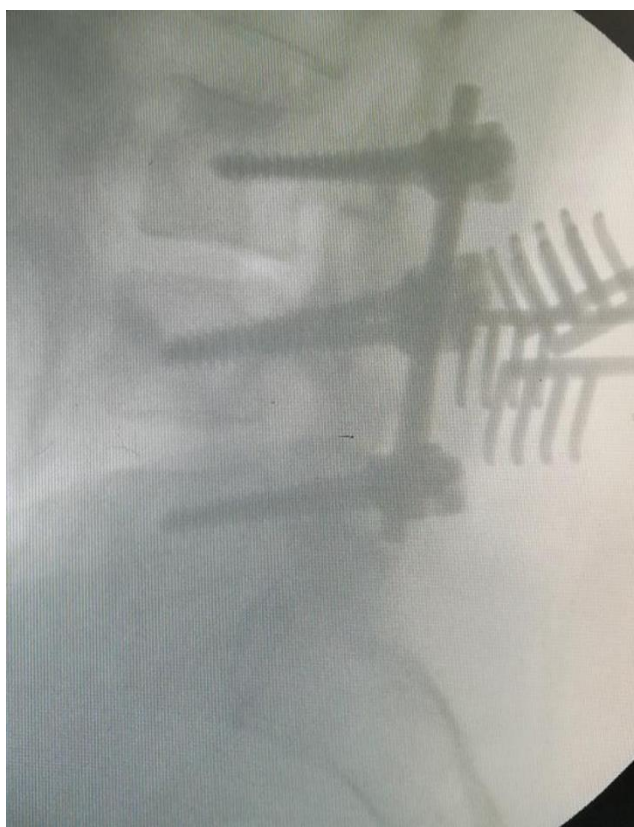


Fig. 13 Post-operative sagittal X-ray (n. 6CVL3L4L5011)

Patient code n. 7CPL1L200

Pathology

- Vertebral stenosis L1-L2
- Spondilosi and medial discal hernia with II degree Modic
- vertebral neoplasy
- vertebroplasty

Surgery

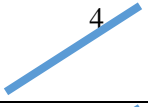
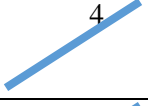
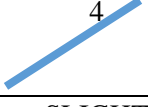

DECOMPRESSION AND STABILIZATION L1-L2

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

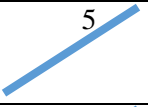
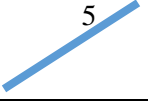
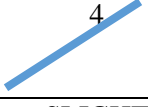

7CPL1L200
2 segments
 No Template L1
 No Template L2

Surgery duration for each vertebra	Vertebra 1: L1→ 40 min Vertebra 2: L2→ 60 min Vertebra 3: No
Surgery duration for implantology	100 min
Total surgery duration	120 min
X-Ray shots	Vertebra 1= 8 Vertebra 2= 4 Vertebra 3= No
Kirschner repositioning	Vertebra 1 = 3 Vertebra 2 = 2 Vertebra 3 = No
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = No

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3		5
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3	4	
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	

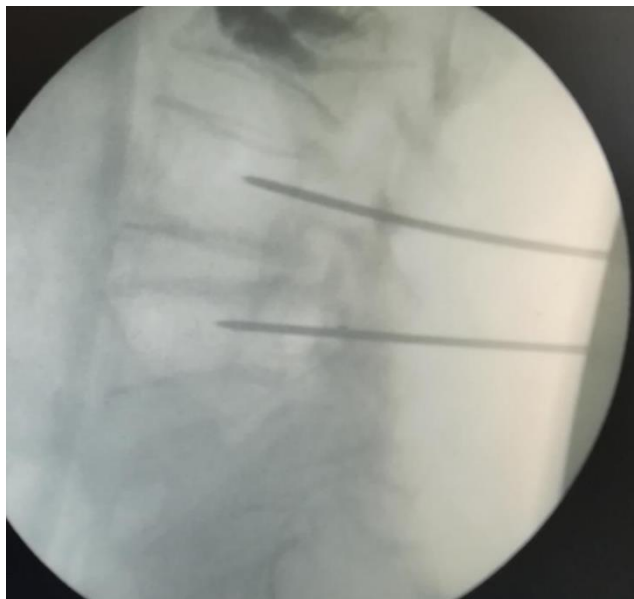


Fig. 14 Post-operative sagittal X-ray (n. 7CPL1L200)

Patient code n. 8FLL1L2L3L41001

Pathology

- lumbar Spondylolisthesis with L1 collapse
- Vertebral stenosis L3-L4

Surgery

DECOMPRESSION AND STABILIZATION L1-L5

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

8FLL1L2L3L41001

4 segments

Template L1

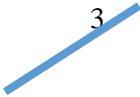
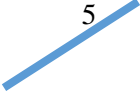
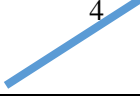

No Template L2

No Template L3

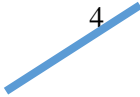
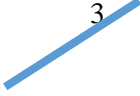
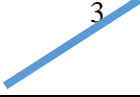
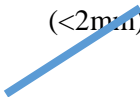
Template L4

Surgery duration for each vertebra	Vertebra 1: L1→ 10 min Vertebra 2: L2→ 80 min Vertebra 3: L3→ 3 min Vertebra 4: L4→ 17 min
Surgery duration for implantology	150 min
Total surgery duration	165 min
X-Ray shots	Vertebra 1= 2 Vertebra 2= 12 Vertebra 3= 6 Vertebra 4= 3
Kirschner repositioning	Vertebra 1 = 1 Vertebra 2 = 2 Vertebra 3 = 4 Vertebra 4= 0
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 0 Vertebra 4= 0

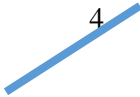
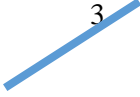
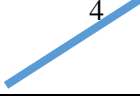

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3 	4	5
Screws alignment with vertebral plate	1	1	3	4	5 
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

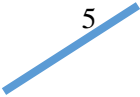
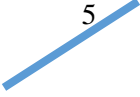
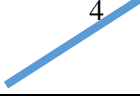

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3	4 	5
Screws alignment with vertebral plate	1	1	3 	4	5
Screws axis convergence in the sagittal plane	1	2	3 	4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm) 	ABSENT

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1		4	5
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

VERTEBRA 4

Passage of the screw for the pedicle centre	1	2	3	4	
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

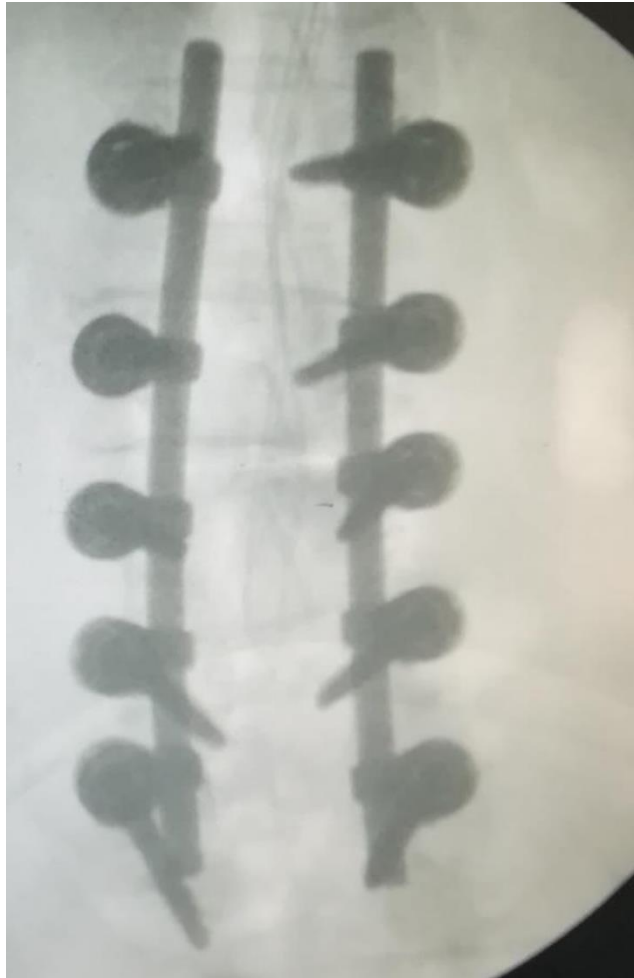


Fig. 15 Post-operative coronal X-ray (n. 8FLL1L2L3L41001)

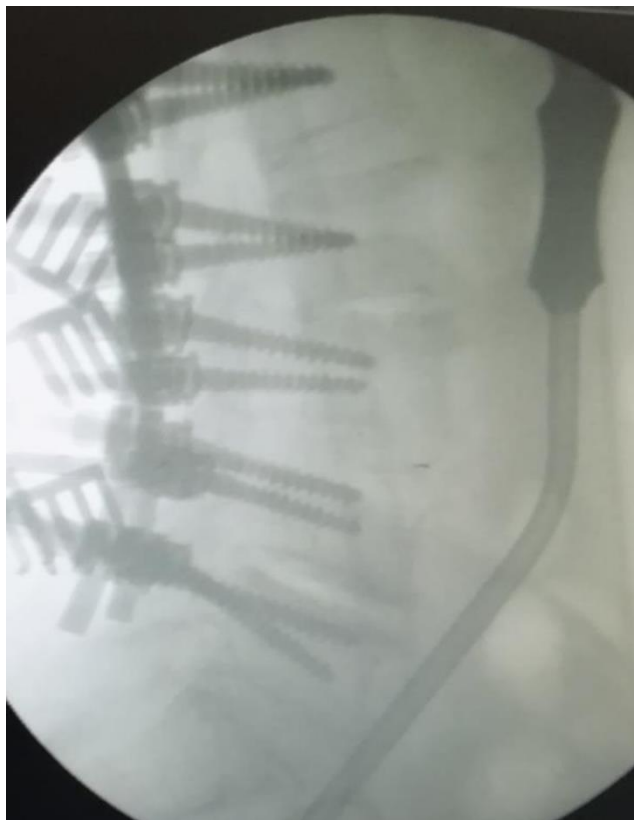


Fig. 16 Post-operative sagittal X-ray (n. 8FLL1L2L3L41001)

Patient code n. 9LVL2L3L4L51100

Pathology

- Lumbar Stenosis from L2 to S1
- Right L2-L3 discal hernia L2-L3 and medial left discal hernia L4-L5 and median S1

Surgery

BILATERAL DECOMPRESSION AND STABILIZATION WITH PEDICLE SCREWS AND LATERAL RODS IMPLANTOLOGY (L5 CANNOT BE TRHEATED FOR SERIOUS OSTEOPOROSIS)

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

9LVL2L3L4L51100

4 segments

Template L2

Template L3

No Template L4

No Template L5

Surgery duration for each vertebra	Vertebra 1: L2→ 15 min Vertebra 2: L3→ 11 min Vertebra 3: L4→ 39 min Vertebra 4: L5→ 25 min
Surgery duration for implantology	90 min
Total surgery duration	110 min
X-Ray shots	Vertebra 1= 2 Vertebra 2= 1 Vertebra 3= 10 Vertebra 4= 5
Kirschner repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 7 Vertebra 4= 3
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 0 Vertebra 4= 0

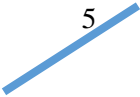
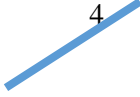
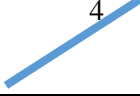

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3	4	5
Screws alignment with vertebral plate	1	1	3	4	5
Screws axis convergence in the sagittal plane	1	2	3	4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT

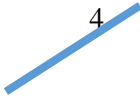
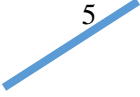
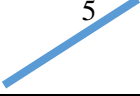

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3	4	5
Screws alignment with vertebral plate	1	1	3	4	5
Screws axis convergence in the sagittal plane	1	2	3	4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3	4	5 
Screws alignment with vertebral plate	1	1	3	4 	5
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 4

Passage of the screw for the pedicle centre	1	2	3	4 	5
Screws alignment with vertebral plate	1	1	3	4	5 
Screws axis convergence in the sagittal plane	1	2	3	4	5 
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

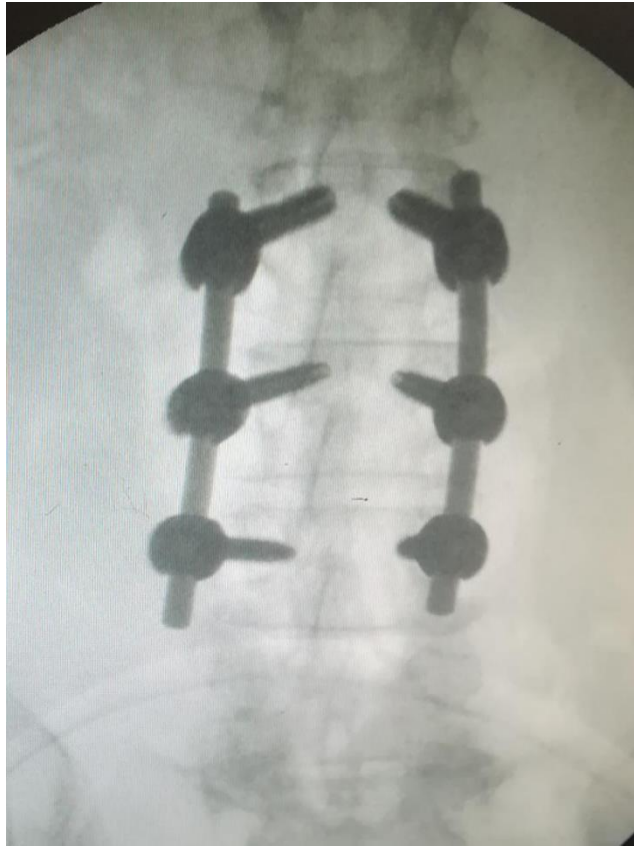


Fig. 17 Post-operative coronal X-ray (n. 9LVL2L3L4L51100)



Fig. 18 Post-operative sagittal X-ray (n. 9LVL2L3L4L51100)

Patient code n. 10PCL3L4L5001

Pathology

- Vertebral stenosis
- multiple discopathy
- plurisegmentary instability
- LUMBAR SPONDYLOSIS

Surgery

DECOMPRESSIVE LAMINECTOMY OF L5 SEGMENT AND LATERAL DECOMPRESSION OF L4-L5
AND L3-L4

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

10CPL3L4L5001

3 segments

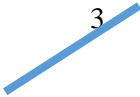
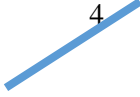
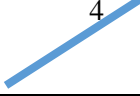

No Template L3

No Template L4

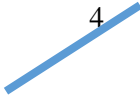
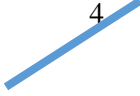
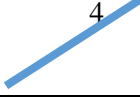

Template L5

Surgery duration for each vertebra	Vertebra 1: L3→ 22 min Vertebra 2: L4→ 38 min Vertebra 3: L5→ 48 min
Surgery duration for implantology	108 min
Total surgery duration	128 min
X-Ray shots	Vertebra 1= 3 Vertebra 2= 20 Vertebra 3= 12
Kirschner repositioning	Vertebra 1 = 1 Vertebra 2 = 4 Vertebra 3 = 2
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 1 Vertebra 3 = 0

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3 	4	5
Screws alignment with vertebral plate	1	1	3	4 	5
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3	4 	5
Screws alignment with vertebral plate	1	1	3	4 	5
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3	4	5
Screws alignment with vertebral plate	1	1	3	4	5
Screws axis convergence in the sagittal plane	1	2	3	4	5
Screws interpenetration in vertebral surface	CRITICALS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT



Fig. 19 Post-operative coronal X-ray (n. 10PCL3L4L5001)



Fig. 20 Post-operative sagittal X-ray (n. 10PCL3L4L5001)

Patient code n. 11SAL4L510

Pathology

- LEFT lumbosciatica
- LEFT radiculitis

Surgery

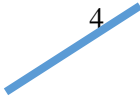
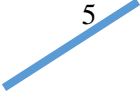
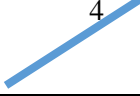

LATERAL L4- L5DECOMPRESSION AND POSTERIOR ARTHRODESIS

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

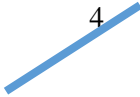
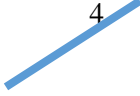
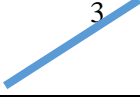

11SAL4L510
2 segments
 Template L4
 No Template L5

Surgery duration for each vertebra	Vertebra 1: L4→ 8 min Vertebra 2: L4→ 52 min Vertebra 3: No
Surgery duration for implantology	60 min
Total surgery duration	80 min
X-Ray shots	Vertebra 1= 4 Vertebra 2= 12 Vertebra 3= No
Kirschner repositioning	Vertebra 1 = 0 Vertebra 2 = 6 Vertebra 3 = No
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = No

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3		5
Screws axis convergence in the sagittal plane	1	2		4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

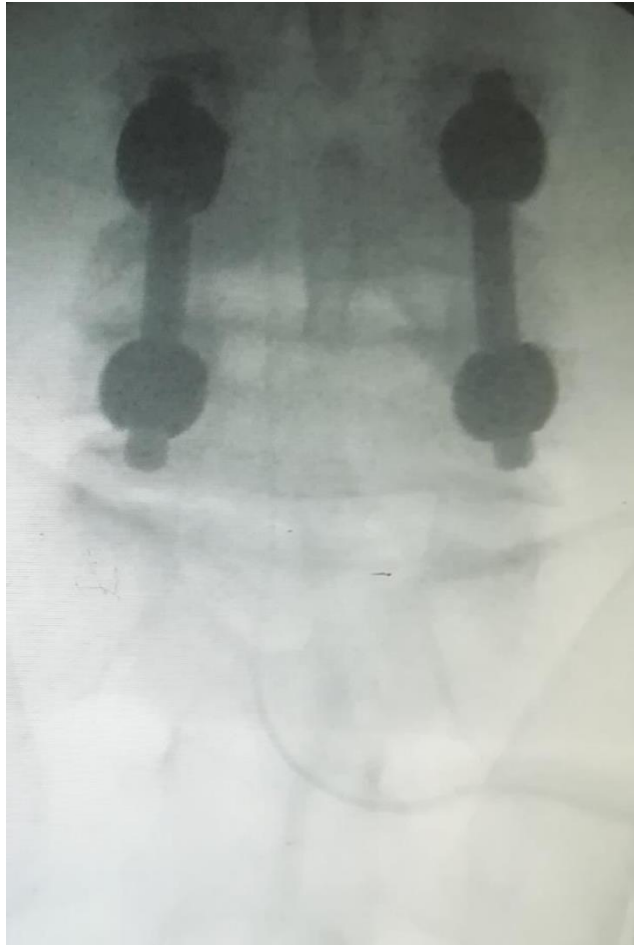


Fig. 21 Post-operative coronal X-ray (n. 11SAL4L510)

Patient code n. 12VNL50

Pathology

- LEFT L5 Radiculitis

Surgery

L4-L5 DECOMPRESSION AND POSTERIOR LUMBAR ARTRHODESIS FROM L4 TO S1

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

12VNL50

1 livello (tratto sacrale - no trial)

NO Template L5

NO Template S1

Surgery duration for each vertebra	Vertebra 1: L5→ 20 min
Surgery duration for implantology	35 min
Total surgery duration	40 min
X-Ray shots	Vertebra 1= 6
Kirschner repositioning	Vertebra 1 = 1
Pedicle screws repositioning	Vertebra 1 = 0

Patient code n. 13LDL3L4L5110

Pathology

- Vertebral stenosis L3-L4
- Radiculitis

Surgery

DECOMPRESSIVE LAMINECTOMY AND PEDICLE ARTHRODESIS OF L3- L4- L5

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

13LDL3L4L5110

3 segments

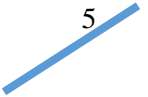
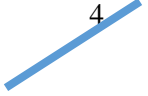
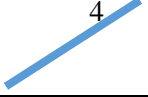

Template L3

Template L4

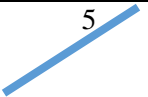
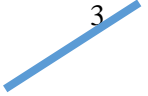
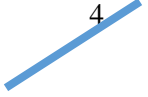

No Template L5

Surgery duration for each vertebra	Vertebra 1: L4→ 16 min Vertebra 2: L4→ 22 min Vertebra 3: L5→ 52 min
Surgery duration for implantology	87 min
Total surgery duration	120 min
X-Ray shots	Vertebra 1= 2 Vertebra 2= 2 Vertebra 3= 8
Kirschner repositioning	Vertebra 1 = 1 Vertebra 2 = 0 Vertebra 3 = 2
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 0

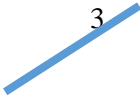
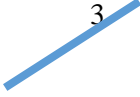
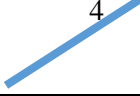

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3	4	5 
Screws alignment with vertebral plate	1	1	3	4 	5
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ASSENTE 

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3	4	5 
Screws alignment with vertebral plate	1	1	3 	4	5
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ASSENTE 

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3 	4	5
Screws alignment with vertebral plate	1	1	3 	4	5
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ASSENTE 

Patient code n. 14DDL3L4L5010

Pathology

- Vertebral collapse of L4 e L5
- Serious spondilosis
- L4 spinous process recess
- Serious osteoporosis

Note: L2 pedicle screws has been removed for serious osteoporosis

Surgery

ARTHRODESIS OF THE LUMBAR TRACT L3- L4- L5

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

14DDL3L4L5010

3 segments

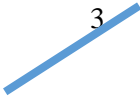
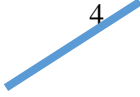
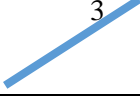

No Template L3

Template L4

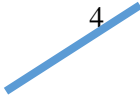
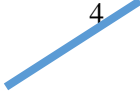
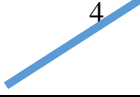

No Template L5

Surgery duration for each vertebra	Vertebra 1: L3→ 45 min Vertebra 2: L4→ 18 min Vertebra 3: L→ 67 min
Surgery duration for implantology	130 min
Total surgery duration	150 min
X-Ray shots	Vertebra 1= 9 Vertebra 2= 3 Vertebra 3= 13
Kirschner repositioning	Vertebra 1 = 5 Vertebra 2 = 0 Vertebra 3 = 7
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 0

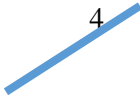
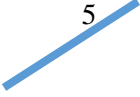
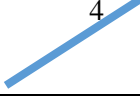

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2		4	5
Screws alignment with vertebral plate	1	1	3		5
Screws axis convergence in the sagittal plane	1	2		4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3		5
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICALS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

Patient code n. 15ADL3L4L5110

Pathology

- Vertebral stenosis L4-L5
- Hernial protusion L3
- Spondylosis L4-L5

Surgery

Decompressive Laminectomy with ernia removal and recalibrage and pedicle arthrodesis

NOTE: L5 pedicle screws has been removed for serious osteoporosis

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

15ADL3L4L5110

3 segments

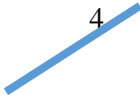
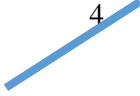
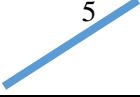

Template L3

Template L4

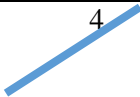
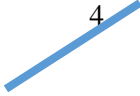
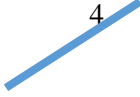

No Template L5

Surgery duration for each vertebra	Vertebra 1: L3→ 10 min Vertebra 2: L4→ 12 min Vertebra 3: L5→ 108 min
Surgery duration for implantology	130 min
Total surgery duration	145 min
X-Ray shots	Vertebra 1= 2 Vertebra 2= 4 Vertebra 3= 31
Kirschner repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 16
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 1

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3	4 	5
Screws alignment with vertebral plate	1	1	3	4 	5
Screws axis convergence in the sagittal plane	1	2	3	4	5 
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3	4 	5
Screws alignment with vertebral plate	1	1	3	4 	5
Screws axis convergence in the sagittal plane	1	2	3	4 	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3	4	5
Screws alignment with vertebral plate	1	1	3	4	5
Screws axis convergence in the sagittal plane	1	2	3	4	5
Screws interpenetration in vertebral surface	CRITICALS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT

Patient code n. 16SDL2L3L4101

Pathology

- Vertebral stenosis L4-L5
- vertebral L4-L5 fusion
- Spondilosis and medial discal hernia with II degree Modic

Surgery

Decompressive laminectomy and lumbar stabilization

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

16SDL2L3L4101

3 segments

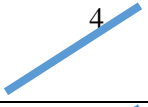
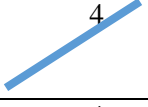
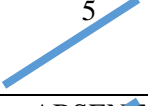

Template L2

No Template L3

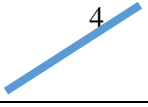
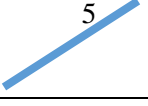
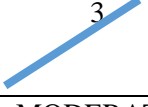

Template L4

Surgery duration for each vertebra	Vertebra 1: L2→ 10 min Vertebra 2: L3→ 55 min Vertebra 3: L4→ 15 min
Surgery duration for implantology	80 min
Total surgery duration	100 min
X-Ray shots	Vertebra 1= 3 Vertebra 2= 12 Vertebra 3= 3
Kirschner repositioning	Vertebra 1 = 1 Vertebra 2 = 3 Vertebra 3 = 0
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 0

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3		5
Screws axis convergence in the sagittal plane	1	2	3	4	
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2		4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3	4	5
Screws alignment with vertebral plate	1	1	3	4	5
Screws axis convergence in the sagittal plane	1	2	3	4	5
Screws interpenetration in vertebral surface	CRITICALS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT

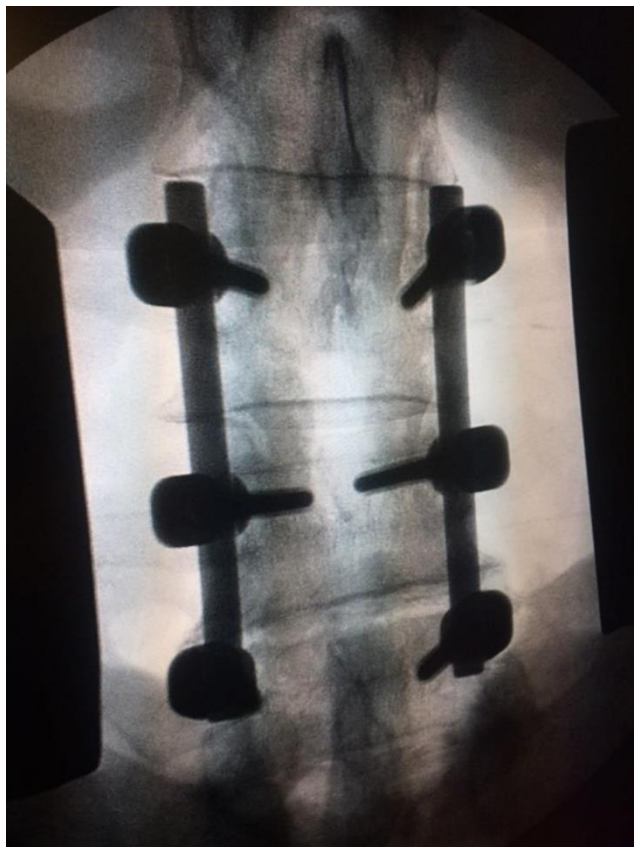


Fig. 22 Post-operative coronal X-ray (n. 16SDL2L3L4101)



Fig. 23 Post-operative sagittal X-ray (n. 16SDL2L3L4101)

Patient code n. 17DKL1L2L3L41001

Pathology

- Vertebral stenosis L2-L3 ed-L3-L4
- MODERATE radicular impairment

Surgery

Calibration and decompressive laminectomy with pedicle stabilization

Note: cause the small pedicle diameter, need very small diameter screws

DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE SOLUTION”

“SPINE SOLUTIONS”

17DKL1L2L3L41001

4 segments

Template L1

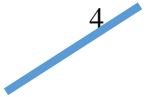
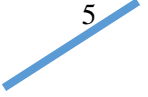
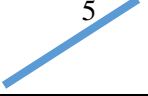

No Template L2

No Template L3

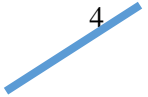
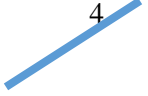
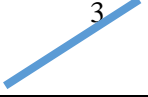

Template L4

Surgery duration for each vertebra	Vertebra 1: L1 → 14 min Vertebra 2: L2 → 57 min Vertebra 3: L3 → 100 min Vertebra 4: L4 → 18 min
Surgery duration for implantology	189 min
Total surgery duration	210 min
X-Ray shots	Vertebra 1 = 2 Vertebra 2 = 11 Vertebra 3 = 19 Vertebra 4 = 2
Kirschner repositioning	Vertebra 1 = 0 Vertebra 2 = 8 Vertebra 3 = 2 Vertebra 4 = 2
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 2 Vertebra 4 = 0

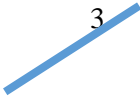
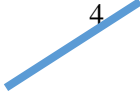
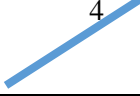

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3	4	
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

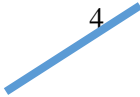
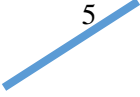
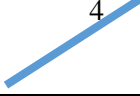

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3		5
Screws axis convergence in the sagittal plane	1	2		4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2		4	5
Screws alignment with vertebral plate	1	1	3		5
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

VERTEBRA 4

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

Patient code n. 18LGL1L2L3L41101

Pathology

- Vertebral stenosis L1-L2-L3
- Spondylosis and discal hernia with II degree Modic

Surgery

Vertebral Stabilization and pedicle arthrodesis

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

18LGL1L2L3L41101

4 segments

Template L1

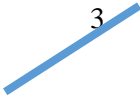
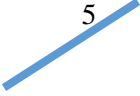
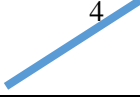

Template L2

No Template L3

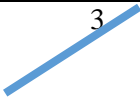
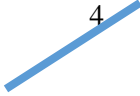
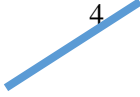
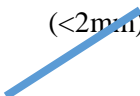
Template L4

Surgery duration for each vertebra	Vertebra 1: L1→ 16 min Vertebra 2: L2→ 18 min Vertebra 3: L3→ 154 min Vertebra 4: L4→ 12 min
Surgery duration for implantology	200min
Total surgery duration	220 min
X-Ray shots	Vertebra 1= 2 Vertebra 2= 3 Vertebra 3= 29 Vertebra 4= 5
Kirschner repositioning	Vertebra 1 = 0 Vertebra 2 = 1 Vertebra 3 = 12 Vertebra 4= 2
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 0 Vertebra 4 = 0

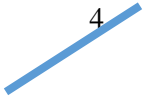
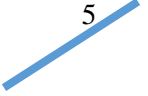
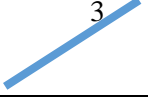

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2		4	5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	

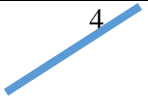
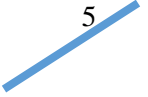
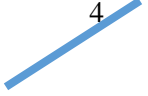

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2		4	5
Screws alignment with vertebral plate	1	1	3		5
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)		ABSENT

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2		4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

VERTEBRA 4

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT

Patient code n. 19GPL1L2L3L40101

Pathology

- Vertebral stenosis L1-L2-L3
- Discal hernia L4 with radicular impairment
- Bone neoplasia

Surgery

Lumbar Stabilization and decompressive laminectomy L2-L3

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE SOLUTION”
“SPINE SOLUTIONS”**

19GPL1L2L3L40101

4 segments

No Template L1

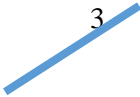
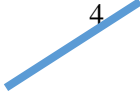
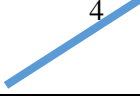

Template L2

No Template L3

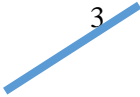
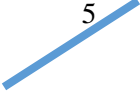
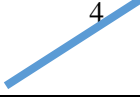

Template L4

Surgery duration for each vertebra	Vertebra 1: L1 → 75 min Vertebra 2: L2 → 9 min Vertebra 3: L → 48 min Vertebra 4: L4 → 18 min
Surgery duration for implantology	150min
Total surgery duration	180 min
X-Ray shots	Vertebra 1 = 12 Vertebra 2 = 2 Vertebra 3 = 6 Vertebra 4 = 3
Kirschner repositioning	Vertebra 1 = 4 Vertebra 2 = 0 Vertebra 3 = 2 Vertebra 4 = 0
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 0 Vertebra 4 = 0

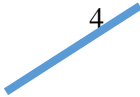
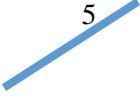
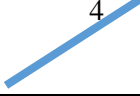

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2		4	5
Screws alignment with vertebral plate	1	1	3		5
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	

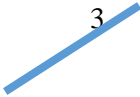
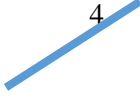
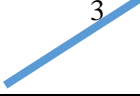

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2		4	5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

VERTEBRA 4

Passage of the screw for the pedicle centre	1	2		4	5
Screws alignment with vertebral plate	1	1	3		5
Screws axis convergence in the sagittal plane	1	2		4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT 

Patient code n. 20LVL1L2L3110

Pathology

- Vertebral stenosis L1-L2-L3
- Spondylosis and median discal hernia with II degree Modic

Surgery

Vertebral Stabilization and lumbar stenosis

Note: L2 screws has been removed for serious osteoporosis

**DATA FOR CLINICAL TRIAL OF CUSTOM MADE VERTEBRAL TEMPLATE “SPINE
SOLUTION”
“SPINE SOLUTIONS”**

20LVL1L2L3110

3 segments

Template L1

Template L2

No Template L3

Surgery duration for each vertebra	Vertebra 1: L1→ 8 min Vertebra 2: L2→ 12 min Vertebra 3: L3→ 6 min
Surgery duration for implantology	26 min
Total surgery duration	60 min
X-Ray shots	Vertebra 1= 3 Vertebra 2= 3 Vertebra 3= 9
Kirschner repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 4
Pedicle screws repositioning	Vertebra 1 = 0 Vertebra 2 = 0 Vertebra 3 = 1

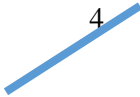
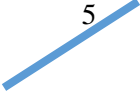
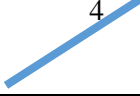

VERTEBRA 1

Passage of the screw for the pedicle centre	1	2	3	4	5
Screws alignment with vertebral plate	1	1	3	4	5
Screws axis convergence in the sagittal plane	1	2	3	4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT

VERTEBRA 2

Passage of the screw for the pedicle centre	1	2	3	4	5
Screws alignment with vertebral plate	1	1	3	4	5
Screws axis convergence in the sagittal plane	1	2	3	4	5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	ABSENT

VERTEBRA 3

Passage of the screw for the pedicle centre	1	2	3		5
Screws alignment with vertebral plate	1	1	3	4	
Screws axis convergence in the sagittal plane	1	2	3		5
Screws interpenetration in vertebral surface	CRITICS (>4mm)	RELEVANT (from 3mm to 4 mm)	MODERATE (from 2mm to 3 mm)	SLIGHT (<2mm)	 ABSENT