



"SME Supply Chain Integration for Enhanced Fully Customisable Medical Implants, using New Biomaterials and Rapid Manufacturing Technologies, to Enhance the Quality of Life for EU Citizens"

Integrated Project for SME's, coordinated by

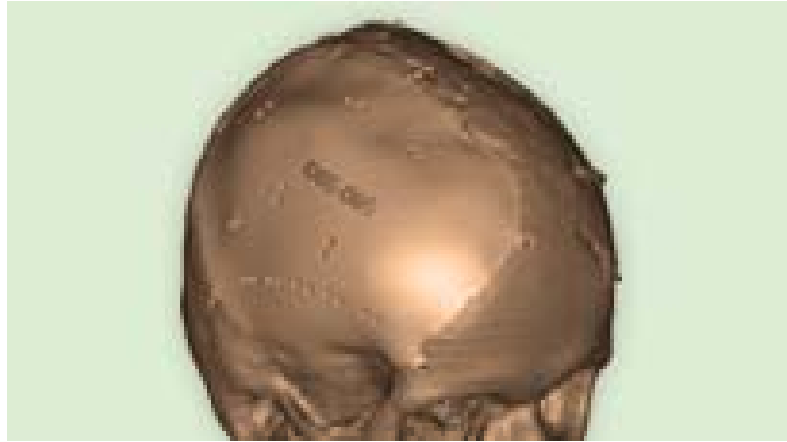


The Spinal Prosthesis in CustomIMD

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Barcelona
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The Spinal Case within CustomIMD



Neosurgery, Ascamm, IBV, Aimplas, Rapra, LasMed, UDIAT

Low Back Pain



80% of population will suffer it **at least once** in their life.

It has strong **economic and social consequences.**

There are many causes for back pain being **degeneration of the intervertebral disc** the main one.

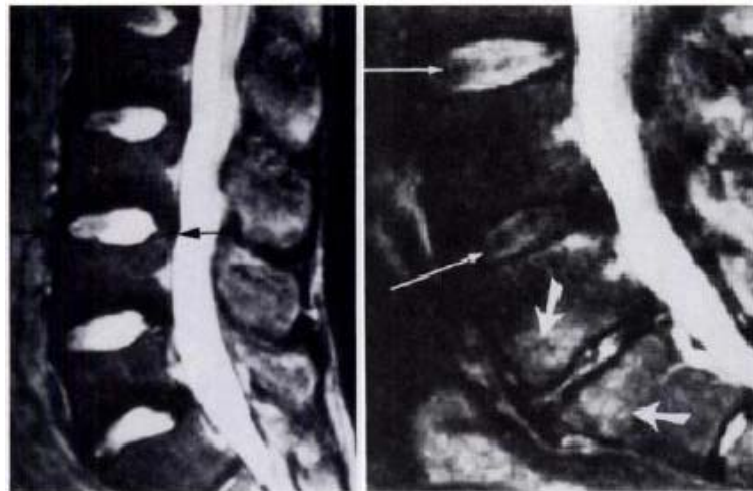
Degenerative Disc Disease

Intervertebral discs give the spine its mobility.



In degeneration, the metabolism of the **nucleus pulposus** (NP) is altered.

The consequent **loss of water** (MR images) affects the spine mechanics and causes pain.



Project Objectives

Our objective has been to develop a

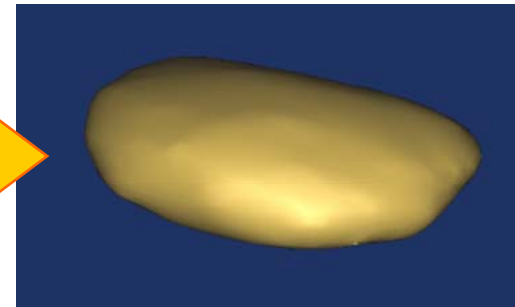
Nucleus Pulposus prosthesis

- ✓ customised thus fitting the patient's specific needs
- ✓ minimally invasive surgical techniques
- ✓ natural mechanical behaviour (“mimics the nucleus”)

Prosthesis Design and Validation

Design is based on **T2 MR images** of each patient.

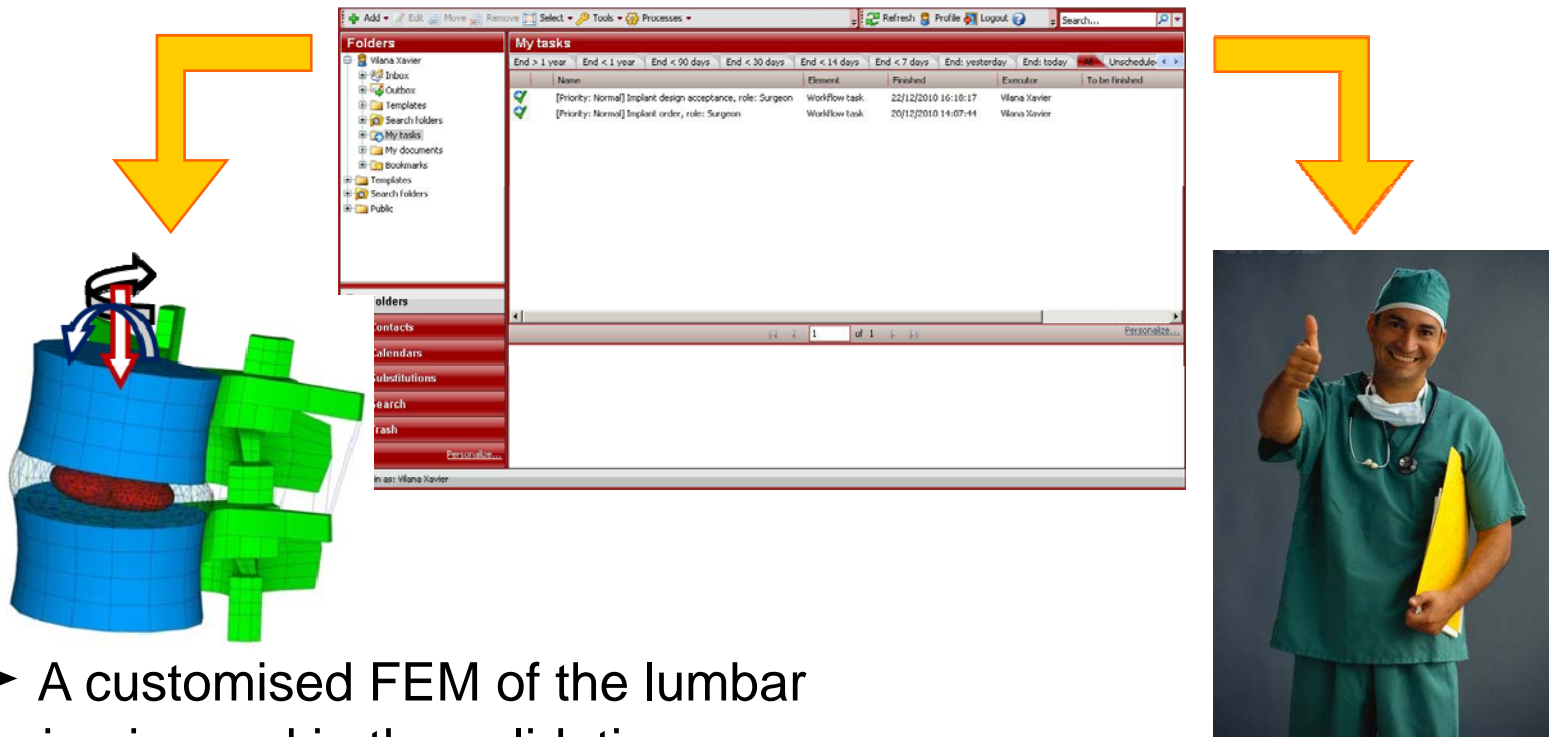
Partner Materialise's software Mimics[®] is used to create **3D reconstructions** of the Nucleus.



▶ This reconstruction is then used for the final design.

Prosthesis Design and Validation

The *e-supply chain* platform (developed within the project) makes **biomechanical validation** and **surgeon approval** possible before manufacturing.



► A customised FEM of the lumbar spine is used in the validation

Results of the Project

We have developed a **new nucleus prosthesis**, made of thermoplastic polycarbonate **polyurethane**.

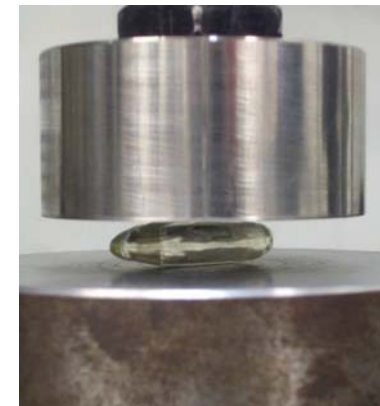


This implant is manufactured with **injection moulding** techniques, using a customised mould based upon the patient's specific design.

Results of the Project

Our implant shows good **mechanical performance**:

- ▶ Proper stiffness
 - ▶ Good fatigue resistance
 - ▶ Small deformation
 - ▶ Correct wear behaviour
- ▶ NO extrusion or subsidence



Results of the Project

We have also been working on the surgical tools that make **minimally invasive implantation** possible using a **posterolateral approach**.



Summary - Main Innovations

- ❖ The implant is **customised** to fit each patient
- ❖ Design is improved and time before surgery is reduced with the **e-supply chain**
- ❖ Our prosthesis shows satisfying **mechanical performance**
- ❖ Implantation can be performed with **minimally invasive** surgical procedures

Thank you!

