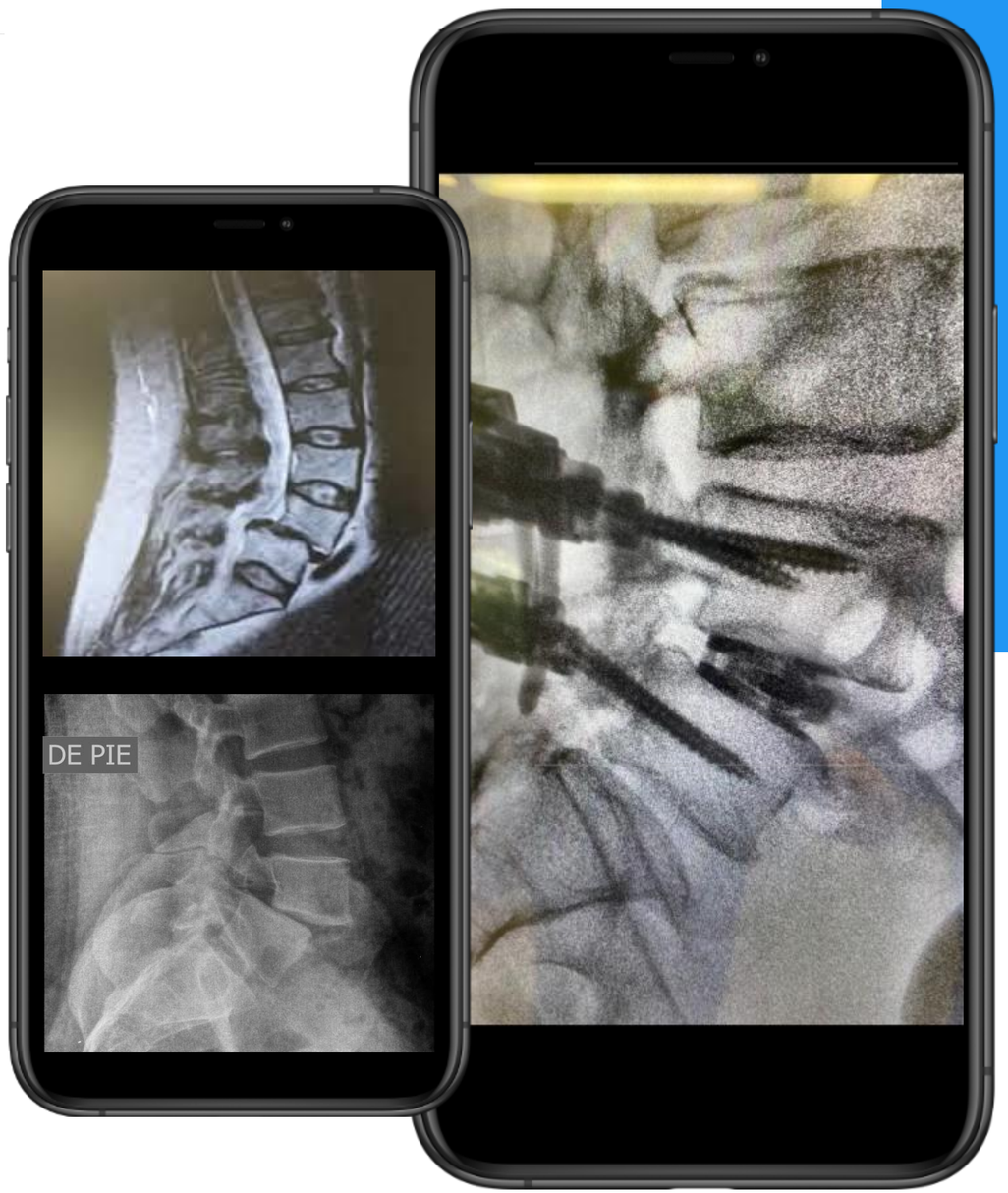
# STUDY TITLE:

A proof-of-concept study with NVDX3, an osteogenic implant of human allogenic origin, in the treatment of low grade degenerative lumbar spondylolisthesis by interbody fusion in adults.

Sponsor : Novadip Biosciences




**Principle Invistigator:**
**Dr. Anas Dyab**

**Subinvistigator:**
**Dr. Stefanos Apallas**

# DEGENERATIVE LUMBAR SPONDYLOLISTHESIS (DLS)

NVDX3-CLN02 / 16 october 2024  Centre Hospitalier de Luxembourg

**01**

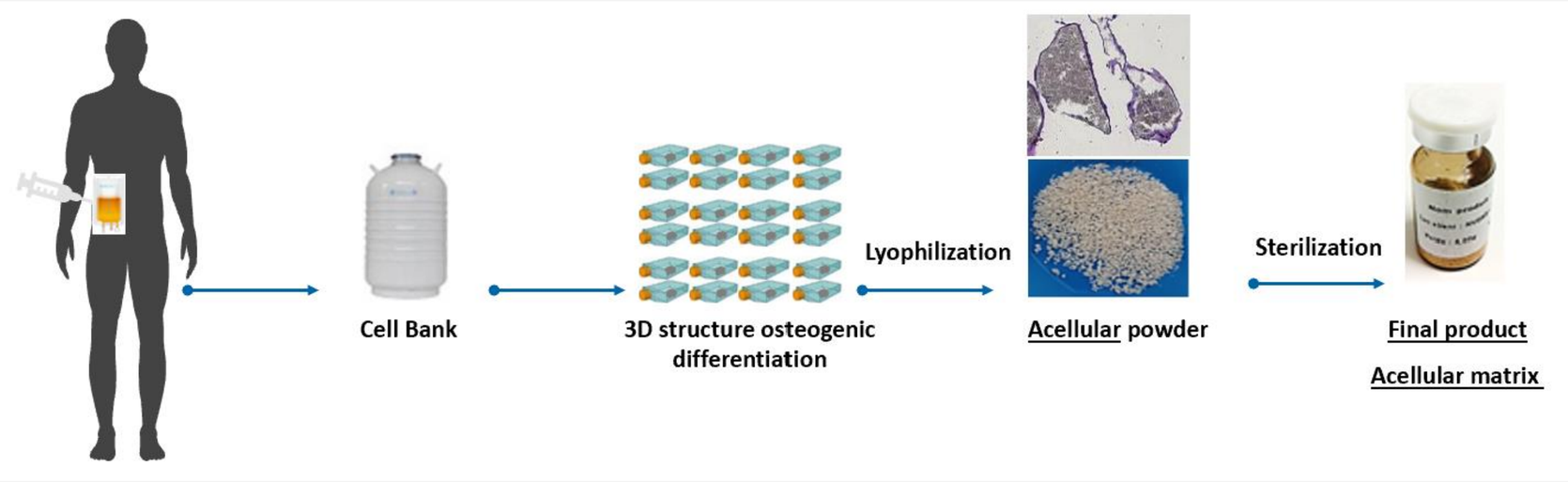
### Common Causes of Low Back Pain

One of the most common causes of low back pain.

### Multifaceted Causes of Pain

**02** The cause of pain in degenerative spondylolisthesis is multifaceted, ranging from mechanical low back pain secondary to degenerative changes, to neurogenic claudication from spinal stenosis, and radicular pain due to nerve root compression in the lateral recess or neural foramen.

# NVDX3-CLN02




**01 NVDX3** is an osteogenic implant of human allogenic origin.

**02 Composition** This tissue-engineered product is composed of extracellular matrix, biologically active growth factors and biomolecules, non-viable osteogenic cells associated with hydroxyapatite/beta-tricalcium phosphate (HA/TCP) particles.

**03 Formulation** NVDX3 is formulated as a lyophilized powder, sterilized by gamma radiation.

# UNIQUENESS OF NVD-X3

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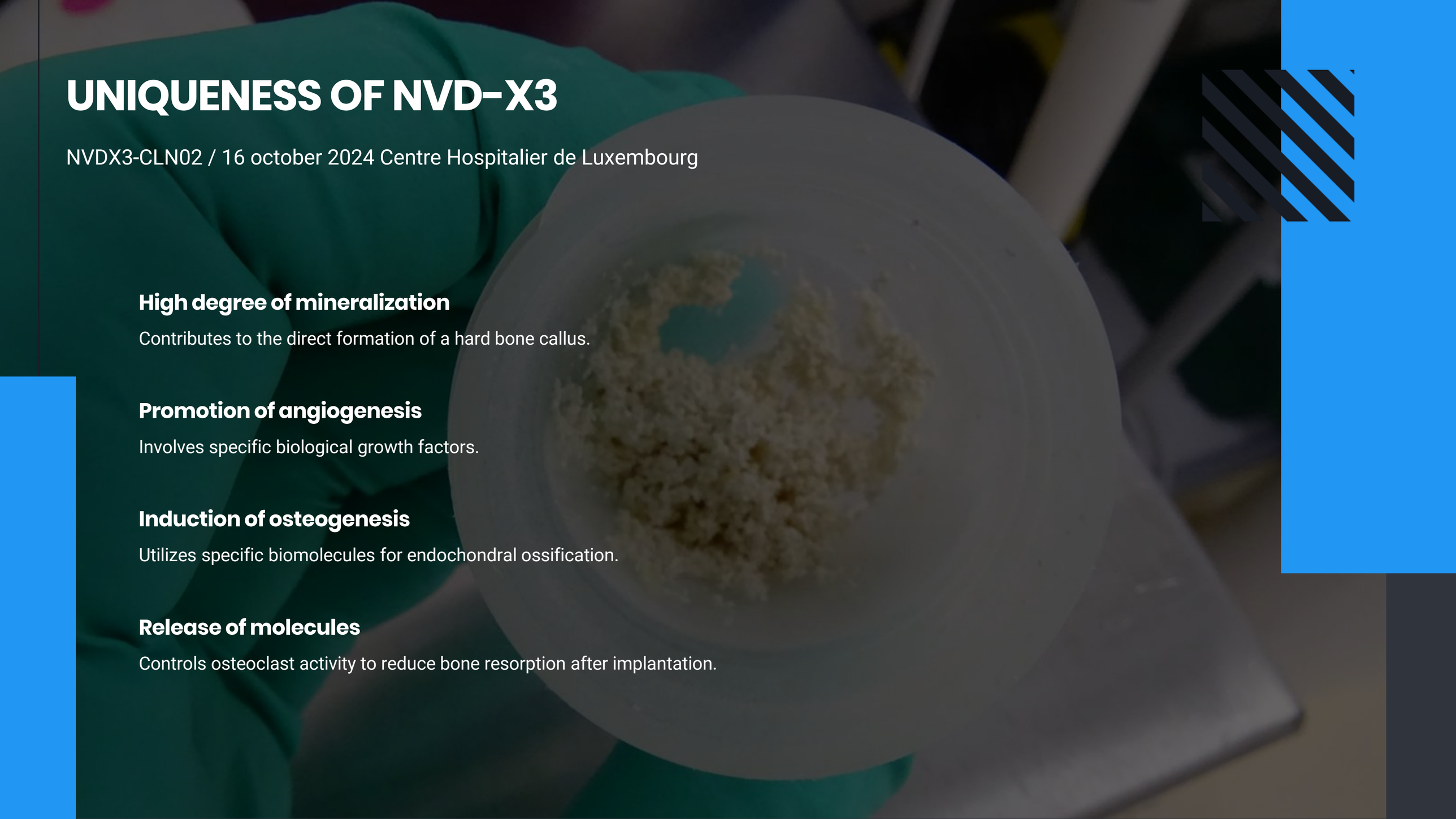

### High degree of mineralization

Contributes to the direct formation of a hard bone callus.

### Promotion of angiogenesis

Involves specific biological growth factors.

### Induction of osteogenesis

Utilizes specific biomolecules for endochondral ossification.

### Release of molecules

Controls osteoclast activity to reduce bone resorption after implantation.

# KEY PROPERTIES OF NVD-X3:

Uniqueness of NVD-X3: Allogenic Matrix-based Scaffold with reproducible Bioactive Content  NVDX3-CLN02 / 16 october 2024

01

### IGF-1

Insulin-like growth factor 1 is positively associated with maintenance of bone mineral density and osteoblastic bone formation.

02

### OPG

Osteoprogeterin inhibits osteoclastic bone resorption by binding to RANKL.

03

### miR 210-3p

Regulates the sclerostin protein levels for the promotion of osteogenesis and the inhibition of osteoclasts maturation.

04

### β-catenin

Promotes bone formation and suppresses bone resorption.

05

### VEGF

Is one of the most important growth factors for regulation of vascular development involved in the osteogenesis.

06

### Mineral content

Promotes direct mechanical loading to modulate the osteocytes network to promote osteogenesis and inhibition of osteoclastogenesis.

# Treatment

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Decompression with fusion is the most frequently used procedure for surgical treatment of spondylolisthesis, including posterior instrumentation, interbody cage, and autograft (mostly harvested from iliac crest).

01

### Relieve Pain

Associated with an irritated nerve.

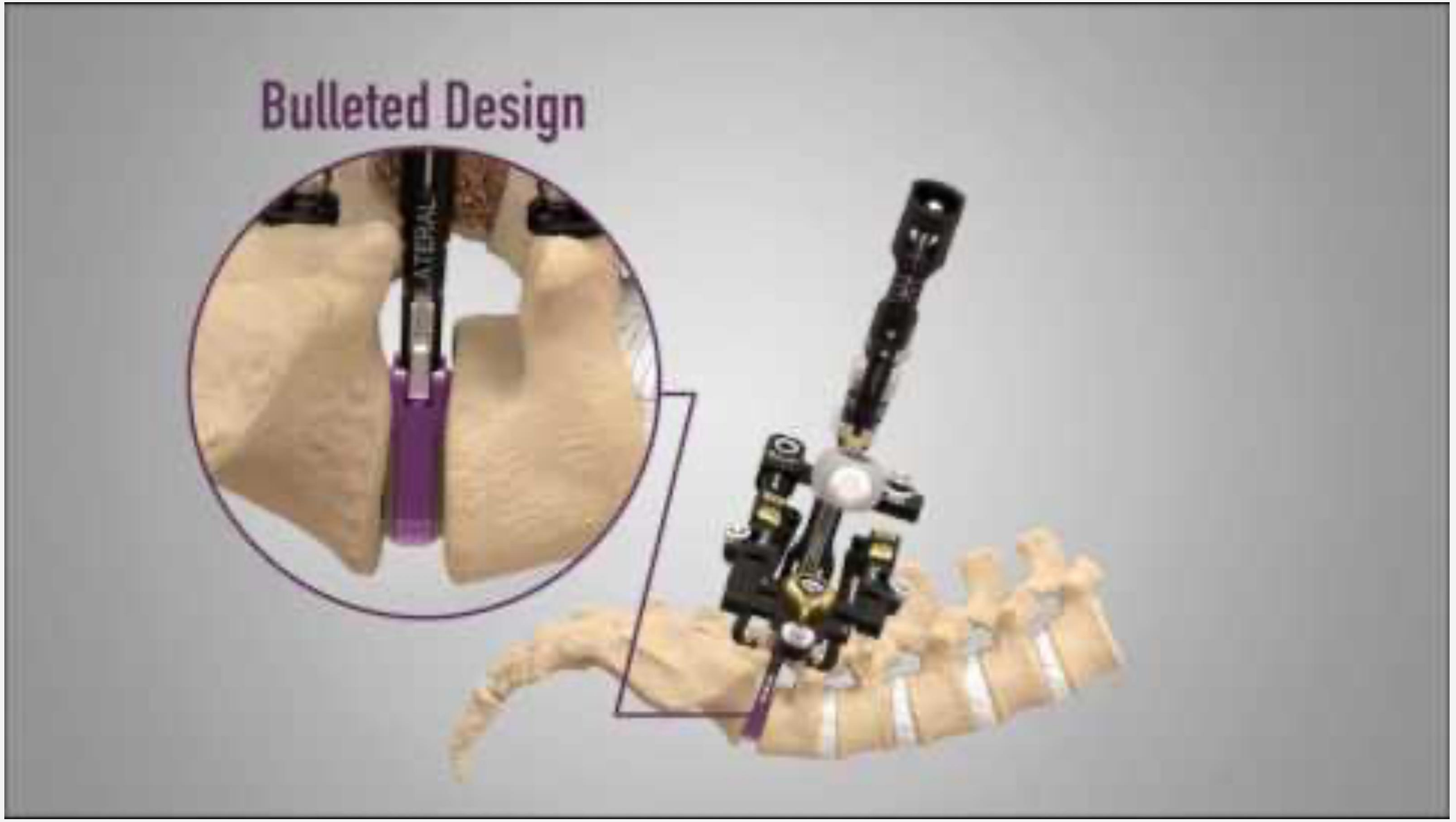
02

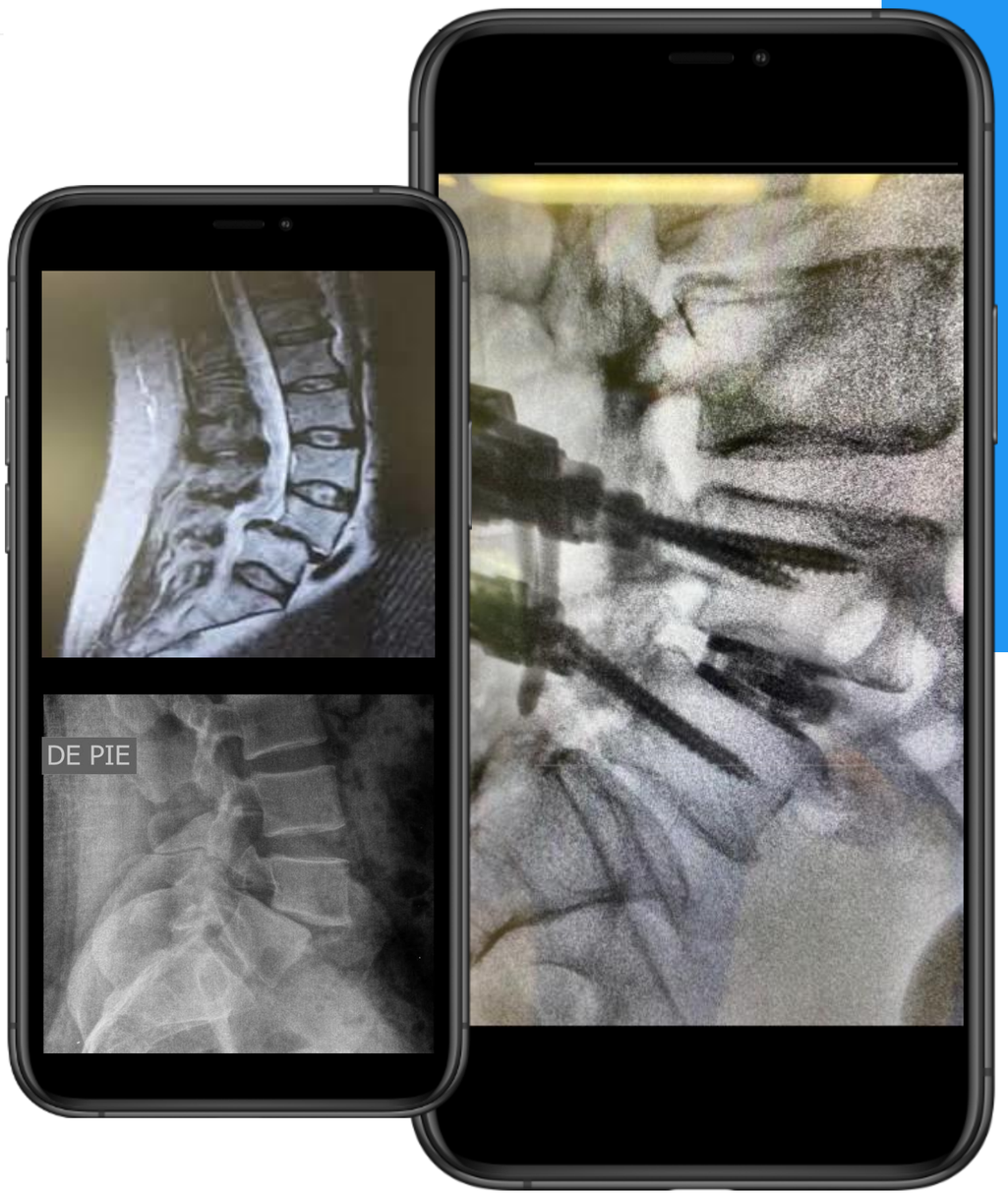
### Stabilize Spine

Where the vertebra has slipped out of place.

03

### Improve Functional Abilities


Bulleted Design
LATERAL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# NDVX3-CLN02 STUDY

NVDX3-CLN02 / 16 october 2024 Centre: Hospitalier de Luxembourg

01

## Study Type

A single arm, single-center study

02

## Population

Adult patients suffering from low grade degenerative lumbar (L1 – S1) spondylolisthesis by transforaminal lumbar interbody fusion (TLIF)

03

## Study Design

Proof of concept Safety Study investigating the potential of NVDX3 to promote bone formation in spinal interbody fusion.

04

## Safety Follow-up Stages

Three distinct stages after Implant Surgery (IS):

4.1

## Stage 1

Acute safety phase up to 6 weeks post-IS

4.2

## Stage 2

Short-term safety follow-up from W6 up to 12 months post-IS

4.3

## Stage 3

Long-term safety follow-up from M12 up to 24 months post-IS

# STUDY OBJECTIVES:

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5 adult patients with symptomatic low-grade degenerative spondylolisthesis grade I or II undergoing surgery for intervertebral fusion of one

01

### Safety and Efficacy Assessment

This PoC study will assess the safety and the efficacy of NVDX3 supporting heterotopic bone formation in adult patients suffering from a Degenerative

02

### Safety of NVDX3 Implant

To assess safety of the NVDX3 implant.

03

### Short and Long-term Safety

To assess the acute-, short-, and long-term safety of the NVDX3 implant.

04

### Efficacy Assessment

To assess efficacy of NVDX3 treatment radiologically and clinically.

# STUDY PROCEDURES

| | | Screening | Acute safety FU | | | | Short-term safety FU | | Long-term safety FU | | Early Termination |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | V1 | V2 [1] | V3 | V4 | V5 | V6 | V7 | V8 | V9 | ETV |
| | | | | | 6 weeks | 4 months | 6 months | 12 months | 18 months | 24 months | |
| | | SC | IS | Hospital discharge HD | IS+42d ± 7d | IS+120d ±15d | IS+180d ±15d | IS+360d ± 30d | IS+540d ± 30d | IS+720d ± 30d | |
| Informed consent | | × | | | | | | | | | |
| Eligibility criteria | | × | | | | | | | | | |
| Demography | | × | | | | | | | | | |
| Medical and concomitant medication history | | × | | | | | | | | | |
| Index DSL evaluation/classification | | × | | | | | | | | | |
| Physical examination | | × | × | × | × | × | × | × | × | × | × |
| Weight/Height (BMI)[9] | | × | × | × | × | × | × | × | × | × | × |
| 12-Lead ECG | | | × | | | | | × | | × | |
| Vital signs | | × | × | × | × | × | × | × | × | × | × |
| Standard safety laboratory[2] | | × | | × | × | × | × | (×) | (×) | (×) | |
| Serology[8] | | × | | | | | | | | | |
| Pregnancy test [3] | | × | | | | | | × | | × | |
| Implant Surgery (IS) | | | ×[4] | | | | | | | | |
| Peri-operative IS related information | | | × | | | | | | | | |
| CGI-investigator question | | × (CGI-S) | | × (CGI-I) | | × (CGI-I) | | × (CGI-I) | | × (CGI-I) | |
| ODI Patient Questionnaire | | × | | | × | | × | × | | × | |
| NRS-Pain | | × | | | × | | × | × | | × | |
| Radiological efficacy[5] | AP/LAT X-ray | ×[6*] | | | ×* | | ×* | | × | | |
| | CT-scan | ×* | ×[7*] | | | ×* | | ×* | | ×* | |
| AE/SAE collection | | | × | × | × | × | × | × | × | × | × |
| Concomitant medication | | | × | × | × | × | × | × | × | × | × |
| Concomitant therapy | | | | × | × | × | × | × | × | × | × |

# DATA

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**Demographics**

- Age, gender, ethnic

**Alcohol intake and smoking habits**

**Medical charts**

- Medical history

**Physical examination / blood sampling**

**Imaging**

- X-Ray

**CT Scan**

**Data collected by**

CHL – Dr. Dyab

# DATA PROTECTION

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**01** **Pseudony.**

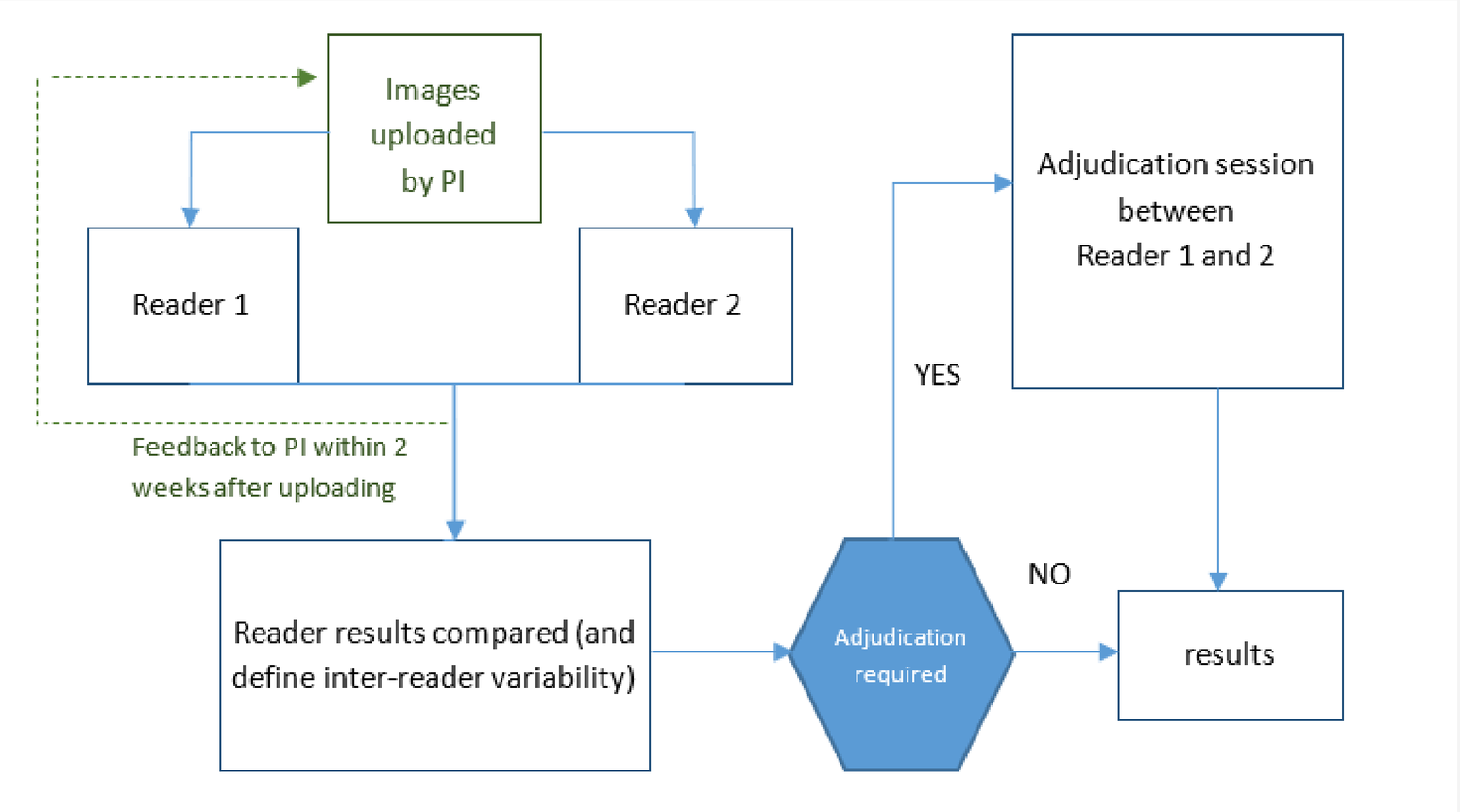
Assigning a patient code or study number

**02** **Example**

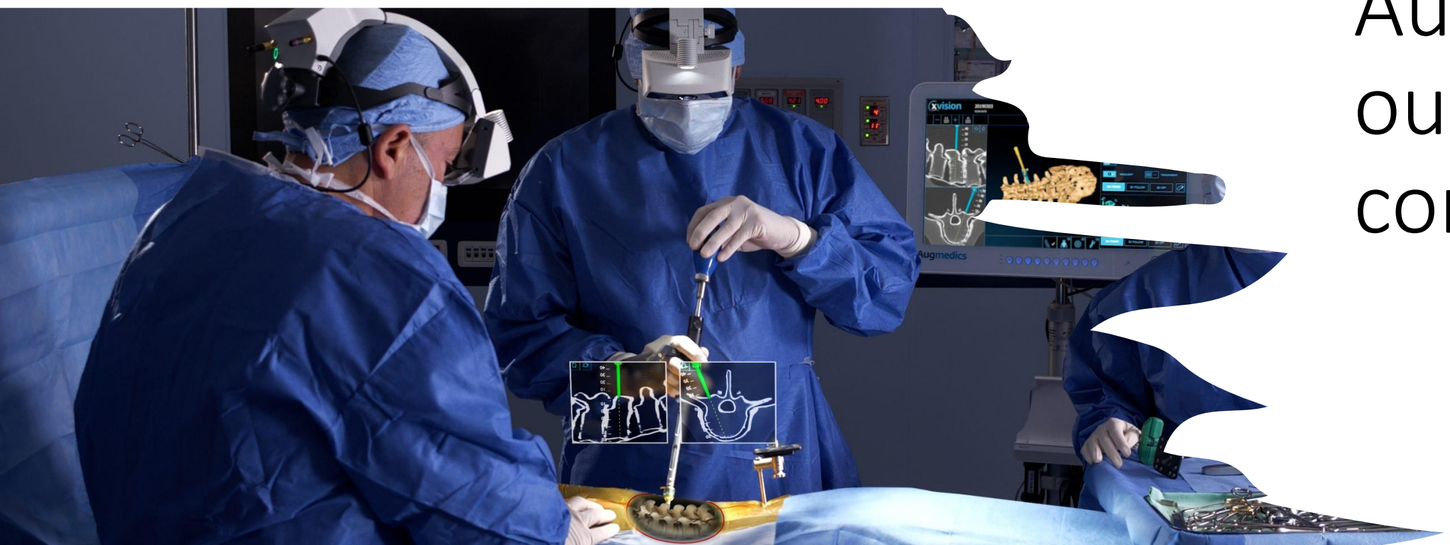
Acronym-001, possible link between data and patient

**03** **Data encoding**

Encoded in the database by: CHL – Dr Dyab




# CENTRAL READING BY THE CENTRAL RADIOLOGISTS:


Augmented reality is becoming our living future and a complimentary 8th sense


LA TRANSFORMATION DIGITALE AU CŒUR
DE LA NEUROCHIRURGIE MODERNE
DÉCOUVREZ CE DOSSIER SUR WWW.CHL.LU
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# Thank you

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