The Treatment of Cartilage Defects of the Knee with Microfracture augmented with a Biodegradable Scaffold: Clinical Outcome

CLN-004-00

Authors:
Novel solution for cartilage repair

**SYNTHETIC**
Polyethylene Glycol (PEG) Diacrylate

Cross-linked network of polymer and protein chains

Implanted as liquid and cured to soft solid under UV light

Dense matrix providing sustainable support to defect wall

**NATURAL**
Denatured Fibrinogen
Mode of Action

Chondral Defect: GelrinC Implant and Empty Defect

The dense matrix provides sustainable mechanical support to defect walls preventing collapse into the sub-chondral bone.
GelrinC application procedure

1. Micro-fracture
2. Delivery device
3. GelrinC injection
4. Curing
5. Implant assessment
Benefit of GelrinC

• Gelrin offers orthopedic surgeons:
  – Simple, one-step procedure
  – Ready to use injectable liquid
  – Completely fills lesion
  – Applicable to all lesion geometries
  – Suitable for both shallow and deep lesions
  – Tight implant retention

• Improved clinical outcome as compared to microfracture alone
Pilot Study

- Single arm, multi-center, 23 patients

- **Primary objectives**
  - Safety at 12 months (AE, SAE)

- **Secondary objectives**
  - Performance Procedure technical success
  - Long term safety (AE, SAE) at 24 months
  - Efficacy
    - (KOOS, IKDC, VAS, SF-36, MRI)
## Safety Outcome

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adverse Events</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not related to Implant or procedure</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Related to Procedure</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Related to Implant</td>
<td>3</td>
<td>Infection (unknown cause), persistent swelling, redness and synovitis, increased CRP</td>
</tr>
<tr>
<td><strong>Serious Adverse Events</strong></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Related to Implant or Procedure</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Not Related to Implant or Procedure</td>
<td>3</td>
<td>Clinical depression, fever and hemarthrosis</td>
</tr>
</tbody>
</table>
## Patient Demographics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Average</th>
<th>Range</th>
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<tbody>
<tr>
<td>Gender</td>
<td>16 Male / 5 Female</td>
<td></td>
</tr>
<tr>
<td>Age (y.o.)</td>
<td>36.6</td>
<td>18-52</td>
</tr>
<tr>
<td># of lesions per patient</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Defect size (post debridement)</td>
<td>2.64 cm²</td>
<td>1-5 cm²</td>
</tr>
<tr>
<td>BMI</td>
<td>26.7</td>
<td>19-32</td>
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<tr>
<td>Lesion Grades</td>
<td>IIIA-IVA</td>
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</tbody>
</table>
Clinical Outcome

GelrinC was successfully implanted in 21 patients.

KOOS changes from baseline

$P_{12 \text{ months}} < 0.001$

$P_{18 \text{ months}} = 0.001$

$P_{24 \text{ months}} = 0.016$
Clinical Outcome

GelrinC was successfully implanted in 21 patients

KOOS subscales changes from baseline

Overall KOOS

$P_{12\ months} < 0.001$

$P_{18\ months} = 0.001$

$P_{24\ months} = 0.016$
Clinical Outcome

IKDC changes from baseline

IKDC
P_{12\text{mo}}<0.001
P_{18\text{mo}}=0.001
P_{24\text{mo}}=0.016

Average VAS score over time

SF-36 PCS changes from baseline

SF-36 PCS
P_{12\text{mo}}=0.002
P_{18\text{mo}}=0.002
P_{24\text{mo}}=0.031

VAS
P_{12\text{mo}}<0.001
P_{18\text{mo}}<0.001
P_{24\text{mo}}=0.016
Radiological Outcome

**T2 mapping ratio (12 subjects)**

- **Deep**
- **Superficial**
- **Global**

<table>
<thead>
<tr>
<th>Visit</th>
<th>Mean</th>
<th>Std</th>
<th>N</th>
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</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>0.95</td>
<td>2.0</td>
<td>21</td>
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<tr>
<td>4 weeks</td>
<td>1.7</td>
<td>2.6</td>
<td>6</td>
</tr>
<tr>
<td>6 months</td>
<td>9.7</td>
<td>5.1</td>
<td>19</td>
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<tr>
<td>12 months</td>
<td>11.9</td>
<td>5.2</td>
<td>18</td>
</tr>
<tr>
<td>18 months</td>
<td>13.8</td>
<td>3.5</td>
<td>8</td>
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<tr>
<td>24 months</td>
<td>15.0</td>
<td>0.0</td>
<td>7</td>
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</table>

**MOCART score**

- Baseline: 0
- 6 months: 72
- 12 months: 75
- 18 months: 65
- 24 months: 88

**Signal intensity score**

- Baseline: Mean 0.95, Std 2.0, N 21
- 4 weeks: Mean 1.7, Std 2.6, N 6
- 6 months: Mean 9.7, Std 5.1, N 19
- 12 months: Mean 11.9, Std 5.2, N 18
- 18 months: Mean 13.8, Std 3.5, N 8
- 24 months: Mean 15.0, Std 0.0, N 7
MRI - Chondral lesion

1 week post surgery
The GelrinC implant in cartilage defect post procedure

6 months post surgery
regenerated tissue has very similar contrast behavior as the native healthy cartilage.

12 months post surgery
GelrinC implant has been replaced by full-thickness, newly developed cartilage which is completely integrated into the surrounding tissue. The surface is intact and joint effusion is completely gone.
MRI – Deep Chondral Lesion

1 week

1 month

3 months

6 months

12 months

24 months
Conclusion

The incidence and severity of adverse events appears to be limited and comparable to those reported in the literature for similar studies.

The study supports the intended use of GelrinC as a treatment for cartilage lesions with patients demonstrating significant and sustained improvement over time.

The pilot study supports the claim that GelrinC is a safe and effective treatment for the repair of cartilage defects.