Adipose cell-derived stem cells in a rat posterolateral spine fusion model

Ralf D. Rothoerl ¹, Christopher Alt ², Michael Coleman³, Rudy Martinez³, Tara Karimi⁴, Eckhard Alt²

¹ Department for Neurosurgery, ² Center for Regenerative Medicine and Sports Medicine Isarklinikum Munich, Germany, ³ InGeneron Houston Texas, ⁴ Alliance of Cardiovascular Research Tulane University
Content

• Spinal fusion: indications, surgical treatment

• Stromal Vascular Fraction SVF

• Spinal fusion model: methods, results

• Conclusion
Content

• Spinal fusion: indications, surgical treatment

• Stromal Vascular Fraction SVF

• Spinal fusion model: methods, results

• Conclusion
Spinal fusion

• Spondylolisthesis

Back pain

Neurological deficit
Spinal fusion

• Posterolateral fusion via autologous bone vs. Rods and screws
Spinal fusion

- No evidence of one method superior to the other

  Ekman P 2007

- Pseudarthrosis rate of up to 22% in posterolateral fusion

  Cheng 2009
Bone matrix protein

- rhBMP
- Expensive
- Ectopic ossification
Content

• Spinal fusion: indications, surgical treatment

• Stromal Vascular Fraction SVF

• Spinal fusion model: methods, results

• Conclusion
Treatment process

- **Liposuction**: approx. 20 min
- **Separation**: 45 min
- **Injection**: 15 min
Content

• Spinal fusion: indications, surgical treatment

• Stramoal Vascular Fraction

• Spinal fusion model: methods, results

• Conclusion
Fusionmodel

- 30 Sprague Dawley rats,
- 12-16 weeks of age
- weight 300-350g
- inguinal fat harvest approximal 2g
- Separation of cells InGeneron Transpose System®
- Dorsal midline approach
- Transverse process L3-4 on both sides.
- Drilling of the cortical bone
Fusionmodel

Group 1 Sham collagen Carrier (Matrystypt® Dr. Suewelack)
Group 2 Collagen Carrier SVF
Group 3 Collagen Carrier SVF + rhBMP-2

Medtronic Infuse® (1 μg/mL rhBMP-2)

• 6 weeks postoperative scarification
• X-Ray,
• Palpation Test 36 Grauer JN, Patel TC, Erulkar JS et al. 2000
• Micro CT, Histology
Fusion Model Palpation Test

• 3 Observer

• Scale 0–2 Flexion and Extension
  • 0 motion between vertebrae, with no bone mass formation;
  • 1 indicates motion with a unilateral bony mass;
  • 2 indicates no motion between vertebrae,

• Addition 3 Observer (max. 6 points)
Fusionmodel Results X-Ray

- Group II and III complete fusion in all individuals
- Group I no fusion
Results Palpation Test

• post hoc Tukey’s test analysis p<0.05 *
Content

• Spinal fusion: indications, surgical treatment

• Adipose driven stem cells ADSCs

• Spinal fusion model: methods, results

• Conclusion
Conclusion

• Spinal fusion is feasible with fresh SVF
• BMP offers no additional benefit
• No side effects
• Micro CT and Histology
• No human data are available
• Human study is necessary
THANK YOU
Future

50 patients

Spinal canal stenosis
Spondylolisthesis
Meyerding Grade I

Decompression and ADSCs vs. Decompression

Ethical vote
Fusionmodel Mikro CT

- Solid fusion group II and III
- New bone formation
- Respects the collagen matrix
Fusionmodel Histology

- Solid fusion group II and III
- New bone formation
- Respects the collagen matrix