The Relevance of BMP Antagonists for Successful Spinal Fusion

Rahel D May[1], Daniela A Frauchiger[1], Christoph E Albers[2], Lorin M Benneker[2], Sandro Kohl[2] & Benjamin Gantenbein[1]

1 Tissue and Organ Mechanobiology, Institute for Surgical Technology and Biomechanics, University of Bern, Bern, Switzerland
2 Department of Orthopaedic Surgery and Traumatology, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland

Low back pain (LBP) is an increasing global health problem, which is associated with Intervertebral disc (IVD) damage and degeneration. When the pain becomes a chronic disease and the patient cannot be treated longer with painkillers or physical therapy other strategies like spine surgery is required. Today's gold standard treatment to relief LBP is surgical intervention like discectomy followed by spinal fusion. During spinal fusion surgery, the IVD is removed and the disc space is filled with autograft, allograft or other bone substitute. Subsequently the adjacent vertebral bodies are immobilized, usually with a spinal cage, pedicle crews or rods. However, the rates of pseudarthrosis after lumbar spine surgery are still 5-35%. Clinical observations showed that a partial discectomy is often associated with failure of spinal ossification. These two contiguous tissues, bone and intervertebral disc, and their cells, seem to influence and interact with each other. Recently our group found evidence for the expression of BMP antagonists in cells of the central part of the IVD, the nucleus pulposus (NP) and also in cells of the surrounding laminated part, the annulus fibrosus (AF). These BMP antagonist, like Gremlin1 and Noggin could lead to an inhibition of osteogenesis in hMSC. However, the exact mechanism by which pseudarthrosis is formed in many of these cases is unknown. In this study we investigate the relationship of BMP antagonists and intervertebral disc cells. In form of several experiments with human primary osteoblasts and mesenchymal stromal cells, we try to bring an insight of the role of the intervertebral disc in spinal non-union.