**Spinal Stabilization and Tissue Engineering for Spinal Cord Injury: Opportunities & Challenges**

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Most patients with spinal cord injury have a fracture or dislocation of the spinal column. However, not all fractures or dislocations of the spine produce injury to the cord. Spinal cord trauma associated with fractures or dislocations the spine can be a devastating injury. Of the 14,000 cord injuries per year in the USA, 8,000 to 10,000 are left paralyzed. The anatomical level of the injury is critical for determining neural deficit prognosis. In general cervical and thoracic spinal cord injuries generally have a poor prognosis, while lumbar spinal cord injuries have a better prognosis. In incomplete traumatic lesions of the spine, the general rule of thumb is that the greater sparing of motor and sensory function distal to the injury, the greater the recovery; the more rapid the recovery, the greater amount of improvement is seen; and when new recovery ceases, no further recovery is expected. The management goals in these devastating injuries is to re-align the spine, prevent loss of function of undamaged neural tissue, improve neurological recovery, obtain and maintain spinal stability and early functional recovery. The indications for surgical treatment include unstable injuries with or without neurological deficit, and increase neurological deficit. Surgical decompression and spinal stabilization are the gold standard procedures for optimal results. Anatomical restoration of the spinal canal does not heal the neural deficit, but increases the changes of spinal cord recovery. Surgery should be done as soon as possible, patient’s condition after accident is usually better than for the rest of his life. The aim of surgery remains early mobilization and rehabilitation. Anterior and posterior procedures or combination may be used. Segmental instrumentation using transpedicular screws is helpful in achieving and maintaining stability. The number of instrumented and fused vertebrae must be limited, and maintaining elasticity of spine is important. Post-operative bracing or casting is not longer needed. For spinal stabilization to be effective in managing spinal cord injury associated with fractures or dislocation of the spine, the surgeon must be well-schooled in modern spinal instrumentation techniques. Within the tissue engineering conceptual framework, osteoinductive stimulants and the osteoconductive matrix scaffolds have gained a lot of attention. However, a mandatory factor for optimisation of the bone fracture repair environment using engineered material or factors is the mechanical stability in the micro-environment of implanted grafts, scaffolds or graft-carriers. It is of paramount importance therefore to include the mechanical environment of the fracture site to promote tissue engineering (osteogenic cell, osteo-conductive scaffold and osteo-inductive stimulus).