



## Advances in Spinal Surgery: A Biomaterials Approach

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### Introduction

Spinal Surgery is witnessing a fast-paced evolution due to the collaboration with material scientists. This is becoming particularly evident in the definition of novel strategies for biomechanically-efficient spinal stabilization and spinal cord injury repair. For this process to be even more fruitful a mutual understanding of the clinical needs and available or forthcoming solutions is warranted.

### Methods

To shed light on the areas of most growing research interest for biomaterials in spinal surgery a review of the relevant literature from the last 5 years has been conducted.

### Results

This review allowed to indentify the most noticeable research trials regarding the adoption of biomaterials in spinal surgery, and to highlight the most promising investigational perspectives.

a) Two main trends can be outlined:

- Spinal arthodesis:

Several biomaterials (including nanoscaffolds, demineralized bone matrix, and ceramics) with propensity to incorporate mesenchymal stem cells, recombinant human bone morphogenetic protein, endogenous/exogenous growth factors showed to be promising to achieve enhanced arthrodesis.

- Spinal Cord Repair:

Cell-based and biomolecule delivery strategies as well as scaffold-based therapeutic strategies have failed when used alone, though a combinatorial approach of all of them has preliminary showed to be effective in laboratory models.

b) Translation from labs to bedside is being limited by the fact that many biomaterials investigated so far had been plagued by wide range of adverse effects (especially in early

### Learning Objectives

By the end of this section, participants should be able to discuss in small groups:

- 1) the current research trends in the application of biomaterials in spinal surgery
- 2) the most noticeable research trials conducted so far
- 3) the most promising biomaterials in advanced stages of investigation

### References