


7:42 – 7:47 am

Overview

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I) Definition of orthobiologics
   A. Proteins, chemicals, DNA or RNA sequences/constructs, tissue extracts, and other formulations that upon delivery to a site modulate the biological behavior of local cells and tissues.

II) Role of orthobiologics
   A. Treatment of injury and repair (bone, tendon, muscle, cartilage, nerve, etc)
   B. Modification of disease process (i.e. arthritis, osteoporosis, etc)
   C. Tissue reconstruction (bone and soft tissues, etc.)

III) Tissue engineering is an important application
   A. Tissue engineering involves composite use of various combinations of:
      1. Cells
      2. Matrices
      3. Biologics
         a. growth factors, growth factor inhibitors
         b. small molecules, chemicals that modify cell signals
         c. gene therapy
d. inhibitors of gene expression (i.e. small interfering RNAs – siRNA)

IV) Regulatory considerations/FDA approval process/Use considerations
   A. Devices
   B. Biologic agents
   C. Autologous tissues (i.e. Platelet rich plasma)
   D. Cost
   E. Side effects

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A Traumatologist's Perspective:
Fractures – Any Stage from Acute Fractures to Non-Unions
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There are clearly no well defined indications for use of a specific type of bone graft substitute or use of inductive factor when dealing with complex fractures or nonunions. This is especially true when treating acute bone loss in the setting of associated severe soft tissue damage or infected nonunions. The use of all of these new resources should be based on contemporary fracture or nonunion management principles and guided by current levels of evidence for use of these materials.

1) Common biological requirements for bone regeneration
   a) Cells: Adult progenitor cells from the marrow, periosteum, and other sources
   b) Blood supply: For the delivery of nutrients, oxygen, and systemic factors required for cell survival
   c) Molecules and their receptors: Provides for the induction of cells to proliferate and differentiate into osseous tissue (osteoinduction)
   d) Extracellular matrix: To provide a scaffold for cells (osteoconduction), and storage site for growth factors

2) Extracellular matrix:
   a) Properties for function
      i) Space filler (biocompatibility)
      ii) Structural properties (mechanical)
      iii) Microstructural (biological for cell surface adhesion/healing)
   b) ECM scaffolding characteristics
      i) Substrates for bone replacement
      ii) Resorption over time
      iii) Requires cells for cytokines or potency
      iv) Dependent upon defect types or loads
      v) Clinical studies frequently compare efficacy of osteobiologics to cancellous autograft as gold standard

3) Consideration for specific anatomic locations: Metaphyseal defects
   a) For most metaphyseal defects, it has been shown experimentally that a simple cancellous void will reconstitute on its own and heal completely given a sound biologic environment without the addition of any further grafting material. The danger here is that the subchondral surface will