

Lecture 10

Biomaterials

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Tenth lecture

Hard Tissue Replacement

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Long Bone and Joint Replacement Repair

- Nature provides different types of mechanisms to repair fractures in order to be able to cope with different mechanical environments about a For example, incomplete fractures (cracks), which only allow micromotion between the fracture fragments, heal with a small amount of fracture-line callus, known as primary healing.
- In contrast, complete fractures which are unstable, and therefore generate macromotion, heal with a voluminous callus stemming from the sides of the bone, known as secondary healing
- The goals of fracture treatment are obtaining rapid healing, restoring function, and preserving cosmesis without general or local complications.
- Implicit in the selection of the treatment method is the need to avoid potentially deleterious conditions, for example, the presence of excessive motion between bone fragments which may delay or prevent fracture healing.

What is hard tissue replacement?

Hard Tissue Replacement, (HTR) polymer, is a **synthetic, porous, plastic material made of granular, biconcave pellets of polymethylmethacrylate coated with hydroxyethylmethacrylate and impregnated with calcium hydroxide.**

What are the types of hard tissue?

The hard tissues of humans are **bone, tooth enamel, dentin, and cementum.**

Why is bone tissue hard?

Made mostly of collagen, bone is living, growing tissue. Collagen is a protein that provides a soft framework, and **calcium phosphate is a mineral that adds strength and hardens the framework.** This combination of collagen and calcium makes bone strong and flexible enough to withstand stress.

What are the steps of bone repair in the correct order?

There are four stages in the repair of a broken bone: **1) the formation of hematoma at the break, 2) the formation of a fibrocartilaginous callus, 3) the formation of a bony callus, and 4) remodeling and addition of compact bone.**

What is tissue replacement?

Tissue Engineering is **the science of growing replacement organs and tissue in the lab to replace damaged or diseased tissue**. The process usually starts with a three-dimensional structure called a scaffold that is used to support cells as they grow and develop.

What are the different types of tissue replacement?

Tissue regeneration includes regeneration of epithelial tissue, regeneration of fibrous tissue, regeneration of cartilage tissue and bone tissue, regeneration of blood vessels, regeneration of muscle tissue, and regeneration of nerve tissue.

What is soft tissue vs. hard tissue?

Hard tissue is usually referring to bones, while soft tissue refers to muscle, ligaments, tendons, or connective tissue. Hard tissue damage can affect any bone in the body, including the head or spine.