Bone Replacement by 3-D Printing

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Abstract

Human bone is one of the most vulnerable tissues in human bodies. In the lifetime of a lot of people, bone tissue is commonly experienced with bone fracture and other consistent bone pain. Bone disease surgery, pharmacotherapy and cutting-edge technology utility are main choices of bone disease treatments in the clinic.

Keywords: Human Bone; Bone Replacement; 3-D Printing

Instruction

Human bone is one of the most vulnerable tissues in human bodies. In the lifetime of a lot of people, bone tissue is commonly experienced with bone fracture and other pain symptoms especially after sports activity, constant hard labors and arthritis [1-8]. Bone-induced human morbidity and mortality are serious healthcare problems in orthopaedic scientific investigations. More recently, it has been greatly improved by new biomedical advances in bone disease treatments.

Methods

Bone disease commonly need a long term of physiological recovery. In search for new orthopaedic solutions for bone diseases, surgery, pharmacotherapy and cutting-edge technology utility is the main choices for bone disease treatments. Among these modern technology, 3-D prints for different tissues is very promising [9-14].

Suitable for different patients

Different origin and types for bone replacement [1-8]:

- Intense sports activity and bone injury
- Constant hard labors
- Bone cancer
- Frailty fracture
- Bacteria or other types of infection
- Osteoarthritis and other complications

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Bone Replacement by 3-D Printing

Results

In many bone disease treatments, some bones are greatly damaged (break to a lot of small pieces or bone deaths), artificial bones will be replaced. There are many new attempts in clinical bone disease treatments. However, the artificial bones are difficult to make, very expensive to personalize and uncommon in clinical settings until now.

Major artificial bone matrix [11]:

- Inorganic compounds (calcium phosphate, calcium sulfate)
- Synthetic compounds (cellulose)
- Bioactive materials (bioactive glass)

Discussion

Presently, a systematic approach has been made for replacing broken bones with artificial bones. At present, many small pieces of bones or joint can be easily replaced by these artificial bones or joints. This process may treat a lot of patients in the future.

![Diagram of 3D-print bone treatments](image)

*Figure 1: Outlook of 3D-print bone treatments.*

Patients with bone diseases are greatly different in physiological characters (human size, height and bone locations). Each bone is different in anatomic patterns. The artificial bone producers may be difficult to provide all these different products. As a result, 3-D bone printers can improve this situation [12].

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Conclusion

In the future, image-based 3-D printers will be replaced with artificial bones. From these orthopaedic efforts, a great anatomical study and artificial intelligence capability will be provided [15,16].

Conflict of Interests

None.

Bibliography