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Journal of Bone Research

Opinion Article

A Brief Overview on the Healing Process of Bone Fractures

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DESCRIPTION

Nonunion bone is a bone-articular disease brought on by unstable bone consolidation following a significant bone tissue lesion and the ensuing osteogenesis. This pathology can develop as a result of the healing of a bone fracture and is characterised by the absence of new bone formation throughout the period of bone healing. Segmental bone loss, infections, the kind of fracture, deformity, or failure of internal fixation can exacerbate this pathology.

One of the following characteristics, which are frequently determined by radiographic evidence, indicates that the healing process has not progressed: Sclerosis at the fracture's end, a hiatus, an absence or hypertrophy of the callus, and persistence or widening of the fracture line. When there are significant bone losses or bone infections (osteomyelitis) that lead to non-bone consolidation in segmental fractures or severe fractures in long bones (the femur, tibia, and humerus), the Ilizarov method is thought to be a good procedure (nonunion). The external fixator is mechanically attached to the bone, which causes it to puncture the skin in multiple places. The biofilm that forms in these areas will contribute spread contamination and infection, slowing the healing process. Patients typically receive antibiotics for extended periods of time in order to reduce this condition.

The most common causes of tibia fractures are catastrophic car accidents with high energy trauma, posing a difficult challenge for orthopedists worldwide. Surgical procedures of radical debridement of bone ends are frequently used in the applications of trauma and bone reconstruction. The External Circular Fixation Ilizarov Method (ECFIM) uses small, percutaneously inserted wires and/or pins that are secured and tensioned to provide a sturdy framework that allows for internal bone fixation to encourage bone healing.

The typical recovery period for bone fractures without complications is six months; however, with high-energy bone trauma, depending on the severity of the fracture, surgical treatment may be necessary, which could increase the recovery time time to eight months or beyond. The time of therapy and medical follow-up, however, might persist for several years depending on the degree of segmental bone loss in fractures because surgical treatment comprises the processes of lengthening bone and bone transfer. The length of the therapeutic treatment may also depend on the unique healing response each patient exhibits, nutritional status, and other related conditions.

The well-known Ilizarov's technique, when used in conjunction with an osteotomy treatment, encourages local blood flow and, as a result, bones healing, but it also makes bone infections more likely because of pin/cable linkages. Bone grafting, on the other hand, can offer soft tissue healing for patients who exhibit localized soft tissue loss in the wounded area since the bone is dragged to the right length for each patient. The traction force used to move the bone prompts the regeneration of soft tissues, blood vessels, and nearby peripheral nerves within a few days, helping to restore the tissues in the area. According to skin perfusion at the fracture site, bone transport, and bone elongation processes, the healing process, bone production, and remodelling, are intimately related to metabolic and circulatory activity at the fracture site, arranging warmer and cooler zones.

In order to ensure the delivery of nutrients and oxygen as well as the elimination of metabolites, successful bone repair strongly depends on the development of new blood vessels. In order to produce healthy bone tissue, Bone Morphogenetic Proteins (BMPs) and Vascular Endothelial Growth Factor (VEGF) are engaged in cell differentiation and bone vascularization. An adequate vascular network is crucial for the healing of bone abnormalities. Decrease in temperature at the fracture site indicates that the healing process is being interrupted when no new blood vessels are forming. The International Consensus and International Guidelines for Medical Thermography state that a bone fracture with a temperature below 23°C suggests that bone healing has been interrupted. As a result, the evaluation of the temperature during the time period associated with the bone consolidation phase can aid the doctor in making clinical follow-up decisions.

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Received: 30-Nov-2022; Manuscript No. BMRJ-22-21066; **Editor assigned**: 02-Dec-2022; PreQC. No. BMRJ-22-21066 (PQ); **Reviewed:** 16-Dec-2022; QC. No. BMRJ-22-21066; **Revised:** 23-Dec-2022; Manuscript No. BMRJ-22-21066 (R); **Published:** 30-Dec-2022, DOI: 10.35248/2572-4916.22.10.203.

Citation: Calcaterra NB (2022) A Brief Overview on the Healing Process of Bone Fractures. J Bone Res. 10:203.