The Relationship of Fracture Stability and the Development of Fracture-Related Infections

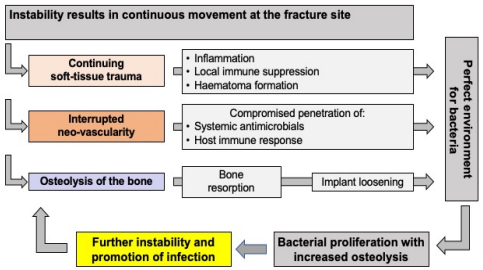
Horacio Tabares Neyra, MD, PhD[1]; Horacio Tabares Sáez, MD[2]; Roberto Morales Seife, MD[2]

1. Universidad de Ciencias Médicas de La Habana
2. Hospital Universitario "General Calixto Garcia", La Habana Cuba; Hospital Universitario "General Calixto Garcia", La Habana, Cuba

Purpose: The biomechanical stability of the fracture site represents a vital factor for bone healing. Stability influences the formation of the fracture callus, allowing for loads to be transmitted across the fracture site. Stability has also been found to influence infection following fractures, and fracture-related infection remains a challenging musculoskeletal complication in orthopedic trauma surgery.

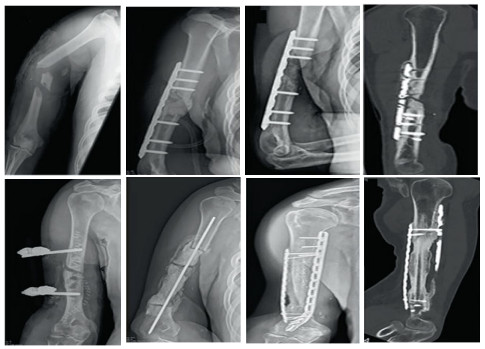
Method: A retrospective review of the literature was conducted on the relationship between biomechanical stability and infection following fracture fixation. A particular focus included the mechanistic factors that have been identified to link stability and infection.

Results: The literature consistently reports the importance of stability as a factor in influencing the occurrence of fracture related infection. However, it is unclear why stable fractures are less susceptible to infection.



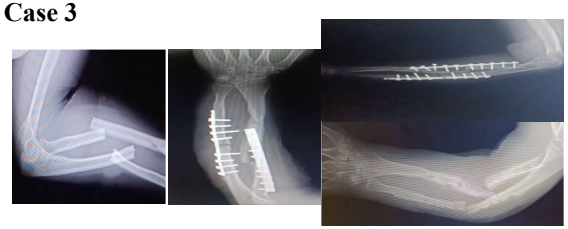
Foster, 2020

Case 1



Case 2

Case 3



Conclusion: Stability is essential for the fracture healing process, including absolute and relative stability. During indirect bone healing, callus formation requires a balance between the minimum motion required for callus induction and maximum necessary for bone bridging, which has been proposed to be between 2 to 10%. The development of an infection depends on a variety of factors, including patient health status and the virulence and quantity of bacteria present in the surgical wound. If the local conditions of the post-surgical area, (inflammatory transudate, hematoma, and remaining necrotic tissue) act as a biological incubator and favor the increase of germs that remain in the wound, the balance between successful healing and bacterial virulence can be disrupted, triggering infection.

There is consensus that stability influences infection through a vicious cycle between instability and infection, which is reflected in the processes of tissue trauma evolution, appearance of local inflammation, interrupted neovascularity, and osteolysis.