

OTA 2018 Basic Science Focus Forum

Osteoimmunology & Fracture Healing – Prism S. Schneider, MD, PhD, FRCSC

Learning Objectives:

1. Be able to define Osteoimmunology
2. Understand the local and systemic factors that affect early fracture healing
3. Understand effects of routine orthopaedic interventions on the inflammatory response to injury and early fracture healing

Osteoimmunology is an interdisciplinary field in which the molecular interplay between the immune system and the skeletal system is studied.

Local Factors that affect the inflammatory phase of fracture healing include:

1. Soft tissue injury
2. Fracture hematoma
3. Biomechanical stability

Systemic Factors that affect the inflammatory phase of fracture healing include:

1. Acute systemic inflammation (i.e. Multiple injuries or sepsis)
2. Chronic inflammatory conditions (i.e. diabetes and rheumatoid arthritis)
3. Non-steroidal anti-inflammatory drugs (NSAIDs)

Routine Orthopaedic Interventions that can contribute to optimal fracture healing include:

1. Early fracture stabilization
2. Meticulous débridement of devitalized soft tissues
3. Early soft tissue coverage for open wounds
4. Maintaining fracture hematoma
5. Appropriate fracture fixation
6. Biologically respectful surgical techniques

Summary:

- Osteoimmunology is important to consider for all fracture management.
- Local and systemic factors play a significant role in early fracture healing.
- Systemic inflammation affects the local inflammatory phase of fracture healing.
- Common orthopaedic interventions can enhance or impair early fracture healing.

Helpful References:

1. Arron JR, Choi Y: Bone versus immune system. *Nature* 2000;408(6812):535-536.
2. Bastian O, Pillay J, Alblas J, Leenen L, Koenderman L, Blokhuis T: Systemic inflammation and fracture healing. *J Leukoc Biol* 2011;89(5):669-673.
3. Bunn RJ, Burke G, Connelly C, Li G, Marsh D: Inflammation: A double edged sword in high-energy fractures? *J Bone Joint Surg Br* 2005;87(suppl 3):265-266.
4. Claes LE, Heigele CA, Neidlinger-Wilke C, et al: Effects of mechanical factors on the fracture healing process. *Clin Orthop Relat Res* 1998;355(suppl):S132-S147.
5. Giannoudis PV, Einhorn TA, Marsh D: Fracture healing: The diamond concept. *Injury* 2007;38(suppl 4):S3-S6.
6. Schneider PS, Sandman E, Martineau PA (2018). Osteoimmunology: Effects of Standard Orthopaedic Interventions on Inflammatory Response and Early Fracture Healing. *J Am Acad Orthop Surg*. 2018;0:1-10.