Journal of Orthopaedic Translation 24 (2020) A1–A2

Contents lists available at ScienceDirect

Journal of Orthopaedic Translation

journal homepage: www.journals.elsevier.com/journal-of-orthopaedic-translation

EDITORIAL

Innovative designs and procedures for fracture fixation and soft tissue repair

Centuries ago, a fracture meant death for many or a lifetime of pain and disability for those who survived while just decades ago, damage to skeletal tissue would lead to pain, prolonged healing, and often disability. Now, complete fracture healing time is reduced and soft tissue repair is enhanced thanks to advancement in surgical techniques and biomaterials developed for fracture fixation. Patients often receive a promising prognosis with minimal morbidity. This progress is attributed to significant achievements in both basic and clinical scientific research to assess the macro- and micro-pathophysiology of fractures and soft tissue damage. Repair is accelerated with the application of known endogenous growth factors, innovative biomaterials or implants, and novel surgical techniques in orthopaedics.

Several articles in the September 2020 issue of the Journal of Orthopaedic Translation highlight various advancements that are improving fracture and soft tissue repair.

Animal models, while controversial, play a valuable role in medical research, and progress in medical sciences is largely due to the improvement of animal models established and validated for simulating the relevant diseases. Dreyer et al. [1] conducted a systematic review on vascular endothelial growth factor as a potential therapeutic agent in bone repair. The results of the review suggest that vascular endothelial growth factor could be a promising therapeutic peptide for fracture repair, which would join the fast-growing field of peptide pharmacology. Hu et al. [2] investigated pharmacological agents in animal models to test a possible treatment for osteoarthritis that influences mesenchymal stem cells. This investigation utilised several sensitive assessment techniques such as ELISA, RT-PCR, and micro-CT, to investigate the influence of defactinib on osteoarthritis, demonstrating the importance of such sensitive and advanced techniques developed for both laboratory and clinical applications. MicroRNA pharmaceuticals are also joining peptide pharmacology as an emerging market, but with these drugs come complications, such as the need for complex drug delivery systems. Sun et al. [3] demonstrate a novel microRNA therapeutic agent, combined with a nanocapsule system to treat osteoarthritis in a rat model.

Schopper et al. [4] demonstrate in their article that the combination of imaging systems, optical tracking, cyclic load bearing, and mechanical engineering can be used to assess the efficacy of fixation systems for femoral neck fracture repair. This study may advise surgeons on fixation techniques that provide the most stable angles to support the fixation. In turn, this could potentially prevent implant-associated complications or refractures. Two similar studies in this issue report biomechanical comparisons of fixation systems, the first reported by Wu et al. [5] for meniscal root repairs and the second by Wähnert et al. [6] for femoral shaft fractures. Animal models have also been used extensively to assess novel surgical techniques before applying them to patients. Michel et al. [7] demonstrate a novel Achilles tendon reconstruction method that involves using microsurgical techniques that protect the sciatic nerve and improve short- and long-term healing.

Stem cell therapy has been a popular scientific field for many years; however, its clinical use and applications have not been extensively approved for use in medicine. Even so, we are edging ever closer to stem cell treatments being widely used for regenerative purposes. As such, Song et al. [8] conducted a systematic review to assess the safety of stem cell treatments in treating osteoarthritis and determine the adverse effects associated with their use.

The Journal of Orthopaedic Translation has published numerous studies and reviews on the benefits and potential applications of 3D printing techniques in various medical conditions or indications [9]. Indeed, Yin et al. [10] further demonstrate its value in their publication on 3D printing's ability to aid scaphoid nonunion fixation making the fixation more accurate and less invasive.

Although the days of mortal fractures and soft tissue damage are long behind us, they can still cause significant pain and morbidity in patients. The articles in this issue provide hope that these injuries may soon become easy to treat with no lasting complications.

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