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EDITORIAL

Clinical translation and application in orthopaedics

Translational medicine seeks to unify science-based research with clinical applications to benefit the community and its individual members. The three pillars—science-based research, clinical applications, community—each rely on one another; science-based research relies on the community and clinical applications to determine current medical problems and what clinicians and patients require to resolve these problems. Clinical applications that rely on science-based research to ensure resolutions to current medical problems are evidence-based and specific to the problem, and it relies on the community to ensure that the applications benefit the community as a whole and reduce the medical burden. Finally, the community relies on clinical applications to reduce the burden of disease of its members, and it relies on science-based research to ensure these applications are specific to the problem.

This special issue in Journal of Orthopaedic Translation focuses in particular on the pillar of clinical applications. The articles published in this special issue demonstrate the importance of translational clinical applications in the orthopaedic field and how they relate to the other pillars of translational orthopaedics.

Osteoporosis is a highly prevalent disorder in the elderly, and as the population continues to age, the prevalence of osteoporosis is increasing. Not only does osteoporosis leads to significant morbidity and disability, preventing patients from performing normal everyday tasks, but it also leads to significant mortality particularly due to osteoporotic fractures. There is a great need for translational practice for osteoporosis, including prevention, treatment and management. In this special issue, Chow et al [1] discuss how Tai Chi may be a viable osteoporosis prevention exercise for the elderly due to its low-stress nature and its potential to minimise falls. Yang et al [2] further discuss in their article how the measurement of bone mineral density and serum bone biochemical indices may serve to demonstrate how osteoporotic fractures are healing and remodelling, as well as serving as a marker to determine the risk of a secondary osteoporotic fracture.

Joint degeneration develops during ageing leading to osteoarthritis. Osteoarthritis results in significant morbidity and disability in a large portion of the elderly. Predicting the future development of osteoarthritis may allow for interventions to be implemented earlier to prevent or at least delay the symptoms and effects of osteoarthritis. Anterior cruciate ligament (ALC) reconstruction is performed regularly with good clinical outcomes, but it has been linked to the development of knee degeneration. Kim et al [3] discuss in their recently published article how magnetic resonance imaging (MRI) of the patellofemoral joint (PFJ) may be able to determine how ACL reconstruction affects the PFJ and the possible development of osteoarthritis. However, the aetiopathogenesis of osteoarthritis has not been fully elucidated and there are numerous proposed theories and implicated pathways. For example, transforming growth factor beta (TGF-β) and bone morphogenetic protein (BMP) signalling pathways may influence the progression of osteoarthritis. O'Keefe et al [4] describe the role of these factors and their associated pathways in human articular chondrocytes in their recently published article.

The symptoms of severe osteoarthritis, such as pain and stiffness of the joints and muscle weakness, are serious risk factors for mobility limitation and lead to impaired quality of life for the affected population. Total joint arthroplasty is necessary to return the joint to its function and improve patients' overall well-being and quality of life. Total hip

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arthroplasty is a common surgery in the elderly; however, it is not without its own complications. Common radiological techniques can be utilised to evaluate the clinical outcome of total hip arthroplasty, but both classic computed tomography and MRI are limited in their ability to produce quality images to properly assess surgical outcomes. Ma et al [5] propose the use of a novel slice-encoding metal correction and view-angle tilting to improve radiological imaging to better assess clinical outcomes. A less common procedure but one that is gaining popularity is total ankle arthroplasty. However, there are numerous difficulties that must be overcome in order for this procedure to be successful because of the complexity of the ankle joint and the functions it possesses. These challenges and possible benefits of the procedure are explored by Zhang et al [6].

Novel and improved imaging methods have been essential for the field of orthopaedics. Relatively recent technologies have allowed researchers and clinicians to investigate the 3-D microarchitecture of bone to help determine the stages the tissue goes through during development and healing. Few studies have been able to demonstrate possible differences between adolescent and adult bone, but with novel imaging techniques and software, Ding et al [7] were able to compare these two bone types to determine the key differences between them.

Similarly, if any of the tissue in a joint (musculoskeletal or otherwise) is disturbed, this may lead to dysfunction of the joint. In particular, when this occurs in the knee, it can affect gait, which in turn may lead to falls, increased morbidity and slow walking due to fear of falling. Current treatment modalities involve physical therapy, which is often not performed consistently and effectively to produce faster and better improvement. Singh et al [8] propose a novel robotic design to assist gait training in the elderly to resolve gait disorders.

Interdisciplinary research is essential for successful translational clinical applications. Dysfunction of one system may have serious ramifications for other systems, which requires holistic clinical applications and treatments, rather than isolated treatments. Traumatic brain injuries lead to numerous physiological changes, which contribute to the development of heterotopic ossification. Huang et al [9] discuss how traumatic brain injury contributes to the development of heterotopic ossification and advocate for more specific treatments that promote bone formation and healing, without enhancing heterotopic ossification.

Corticosteroid therapy is a common, yet fairly controversial treatment in the orthopaedic field. One contraindication of corticosteroid use is osteonecrosis of the femoral head, leading to joint impairment and disability that commonly requires total hip replacement. However, early diagnosis using MRI and prevention strategies can prevent the need for surgical intervention. One such proposed preventative treatment is Xian Ling Gu Bao Fufang, a Traditional Chinese Medicine that has been approved by the Chinese Food and Drug Administration and has demonstrated promising results in animal models. Qin et al [10] describe in this issue the safety and preventative efficacy of Xian Ling Gu Bao for corticosteroid induced osteonecrosis of the femoral head in their multicentre, randomised, double-blind, placebo-controlled prospective clinical trial.

The future of orthopaedic medicine must be based on sound scientific research to provide targeted and cutting-edge medical care to patients. This is strongly reliant on researchers and clinicians working closely together, sharing their experiences and working in sync for the betterment of patients and the community as a whole. We are proud to present this special issue of clinical translation and applications in orthopaedics, and we hope that the future of orthopaedic research and medicine remain closely intertwined.

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