Foot and ankle surgery: new frontiers for translational advancements

Foot and ankle surgery represents one of the fastest growing and most actively developing fields within orthopaedics. Rapidly expanding indications for intervention in areas such as multidirectional instability, posttraumatic ankle osteoarthritis, and progressive collapsing foot deformity have revolutionized the traditional thinking regarding the management of these conditions. At the junction between basic science and clinical research, translational research within foot and ankle exemplifies the tremendous advancements across our field over the past several decades.

Improved cadaveric modeling techniques have allowed researchers to more appropriately investigate ligamentous and bony repair techniques prior to widespread adoption in live patients (1). Richter *et al.* have utilized industrial robotic technology guided via computational navigation systems capable of detecting load bearing motion to the foot and ankle to compare total ankle arthroplasty (TAA) systems (2). These authors found no differences with respect to shifting or dislocation of the tibial or talar components or forces, torques, or motions between the two tested TAA prosthesis designs. In the present special series of *Annals of Translational Medicine*, Wixted *et al.* present a systematic review and metanalysis comparing cadaveric studies which evaluate differing suture endo-button configurations to assess their relative effect on the stability of the syndesmotic reduction and functional movement of the ankle (3). Despite substantial emphasis throughout the literature on use of two suture endo-button constructs and divergent endo-button configurations, these authors find no significant differences in biomechanical parameters when comparing single and double suture endo-button constructs.

As the use of TAA worldwide continues to grow yearly (4), continued investigation into improved designs to reduce aseptic loosening and improve survivorship rates of the procedure is of paramount importance. In a narrative review outlining modern advancements in TAA, Shaffrey *et al.* summarize the history of the evolution of TAA, and discuss outcomes and innovations related to TAA (5). These authors highlight emerging areas of particular interest, including the advent of patient specific instrumentation (PSI) for TAA, and the use of additive manufacturing to produce anatomically-specific implants such as total talus replacements, which can be used in conjunction with TAA in the setting of talar collapse and concomitant end-stage ankle arthritis. This same research team has published extensively in TAA, particularly with regards to cadaveric modeling of gait simulation both before and after TAA. Recently, Henry *et al.* demonstrated altered kinematics of the ankle and talonavicular joint in TAA performed either with or without concomitant subtalar arthrodesis (6). These important findings may portend implant failure due to aberrant contact mechanics at the bone-implant interface when TAA is performed with subtalar arthrodesis, and may help elucidate rates of progression of adjacent joint degenerative change.

In the realm of foot and ankle trauma, a rising percentage of geriatric patients necessitates a change in our understanding of optimal management strategies, including a more tailored approach for specific patient scenarios. Mair *et al.* outline the current strategies for complex ankle fracture, asserting that while open reduction and internal fixation remains the treatment of choice for the majority of complex ankle fractures, tibiotalocalcaneal nailing or conservative options can also be used in the select patient (7).

This series of *Annals of Translational Medicine* presents a collection of reviews and original articles on the current state-of-the-art in foot and ankle surgery, with a particular focus on translational advancements. We are grateful to the authors who have already contributed to the series, and look forward to ongoing submissions. As the past several decades have shown and the coming years are sure to continue to prove, we are living in an exciting time for foot and ankle surgeons. We hope this special series will continue to illuminate advancements within the field, and will provide further didactically strong and motivational articles.

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