Is regenerative medicine the future of urology?

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Tissue engineering has shown itself to be essential in advancing the field of urology. While this aspect of medicine is central to reconstructive urology, it transcends all aspects of the specialty. As is shown in this topic issue, innovations in urologic tissue engineering can be found in the kidneys, bladder urethra and penis. As primarily urethral surgeons, the editors have been most excited to see the advances in urethral reconstruction, which have the potential to offer patients less morbid and invasive options for the correction of urethral diseases. However, compared to the urethra, which is simply a mucosal lined tube, renal complexity and the advances in renal tissue engineering are as astounding as they are complex.

This collection of articles combines state-of-the-art review as well as original research manuscripts on various applications of tissue engineering in urology from around the globe. Dr. Yang and colleagues provide an in-depth review of advanced kidney regeneration, including cell-based approaches and in situ tissue regeneration using cell-free approaches [1]. A systematic review of clinical studies on bladder tissue engineering was provided by Chua et al. [2]. The studies reviewed in this manuscript include bladder substitution techniques by biological and synthetic materials as well as cell-seeded scaffolds. These technical advances continue to approach a stage where bladder substitution will not require intestine and all the associated morbidity.

Moving distally along urinary tract, Professor Melissa Kaufmann provides a state-of-the-art review on current research advances in autologous therapies for stress urinary incontinence and sphincter regeneration with a specific

focus on autologous muscle-derived stem cell therapies [3]. Professor Christopher Chapple reviews contemporary approaches to tissue engineering for urethral reconstruction [4]. The existing translational studies reviewed in this manuscript involve techniques utilizing acellular matrix (i.e. intestinal submucosa) as well as cell-seeded scaffolds, such as autologous buccal mucosal epithelial cells. Chouhan et al. review erectile tissue regeneration, specifically those therapies with the potential for erectile tissue functional restoration [5].

Original research manuscripts in this topical issue concentrate predominantly on animal research and preclinical studies on urethral reconstruction. A preclinical study by Sceberas et al. focuses on the feasibility of utilizing autologous buccal mucosa epithelial cells to create sheaths of epithelium for use in hypospadias repairs [6]. Professor Karl-Dietrich Sievert builds on work previously published in this journal with results of a study where autologous urothelium seeded on collagen was used to reconstruct urethral strictures in a minipig model [7, 8]. With a similar aim of developing a better mucosal replacement for urethral reconstruction, Pusateri and colleagues performed a pilot study with placental membrane grafts for rabbit urethral reconstruction with impressive results [9]. Finally, Scott and associates shared results of a validation study in a rabbit stricture model utilizing liquid buccal mucosal graft for endoscopic treatment of anterior urethral strictures [10].

The authors and editors of this topic issue sincerely hope the submissions will be informative and inspire future translational and clinical research in regenerative urology. We hope that the perpetual “future of medicine” will soon become routine treatment of the present and that this issue takes one more step in that direction.

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