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Editorial

Tissue Engineering in Urology

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Tissue engineering is a multidisciplinary field that focuses on the development of biological substitutes that can restore, maintain, or improve the function of damaged tissues or organs. It combines principles from biology, materials science, genetics, and engineering to design and create structures that support the growth and regeneration of tissues. (ChatGPT). In the case of pediatric urology, there are several congenital conditions, such as hypospadias and neurogenic bladder, which affect, respectively, the urethra and the urinary bladder. What is needed is urethroplasty procedure in the case of urethral malformations and enterocystoplasty in the case of urinary bladder disorders [1,2]. ypospadias, characterized by misplacement of the urinary meatus in the lower side of the penis, is a frequent birth defect in male children. No single urethroplasty procedure is suitable for all situations. The rate of postoperative complications of currently available surgical procedures reaches up to one-fourth of the patients having severe hypospadias. The situation has encouraged the development of novel tissue engineering techniques that aim to simplify the surgical procedures and to reduce the rate of complications. Several types of biomaterials have been considered for urethral repair, including synthetic and natural polymers, which in some cases have been seeded with cells prior to implantation [3]. Tissue engineering, a key component of regenerative medicine, aims to restore the structure and function of damaged organs using combinations of cells, scaffolds, and bioactive factors. In urology, the integration of stem cell biology has stimulated significant progress in preclinical models for kidney, bladder, and urethral regeneration. Meanwhile, multipotent stem cells—especially mesenchymal stem cells and urine- derived stem cells-have shown promise in bladder and urethral repair due to their immunomodulatory properties and relative ease of use.

It is essential for urologists to remain informed and actively engage in collaborative research. By integrating clinical expertise with basic science. urologists can play a crucial role in guiding regenerative strategies toward effective, patient- specific therapies [4]. Advanced techniques of reconstructive urology are gradually reaching their limits in terms of the ability to restore urinary tract function and patients' quality of life. A tissue engineering-based approach to urinary tract reconstruction, utilizing cells and biomaterials, offers an opportunity to overcome current limitations [5]. Graphene is a single layer of carbon atoms arranged in a two-dimensional honeycomb lattice. It is known for its remarkable properties, including exceptional electrical and thermal conductivity, high mechanical strength, and flexibility. Graphene is considered a promising material for various applications(ChatGPT). Due to its unique structure, it has many unique properties used in tissue engineering of the nervous system, such as high strength, flexibility, adequate softness, electrical conductivity, antibacterial effect, and the ability to penetrate the Blood–Brain Barrier (BBB). It is also characterized by the possibility of modifications that allow for even wider application and adaptation to cell cultures of specific cells and tissues, both in vitro and in vivo [6]. Moreover, by using the patient's own cells for cell culture, it will be possible to produce tissues and organs that can be re-transplanted without transplant rejection, the negative effects of taking immunosuppressive drugs, and waiting for an appropriate organ donor [6].

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