

# Applications of Acellular Dermal Matrix Allograft for Lower Genitourinary Tract Reconstruction Following Sophisticated Quality Control

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## ABSTRACT

**Background:** Tissue engineering and regenerative medicine has been considered as an interdisciplinary field, which opened new era for treating patients with genitourinary disorders. The field of urologic tissue engineering has been approached to maintain normal urinary/sexual function and preserve fertility. The aim of this speech is to present the results of tissue and organ decellularization techniques and focus on the applications of acellular dermal matrix allograft (ADMA) for lower genitourinary tract reconstruction following sophisticated quality control during the last two decades at our center.

**Methods and Results:** Different protocols for skin acellularization were developed from several animals (from Nude mice to sheep) as well as acellular human dermal matrix (AHDM) in order to pave the road for experimental, preclinical and clinical applications of ADM. These natural scaffolds represent a logical therapeutic option for the treatment of several urological conditions. These biological scaffolds actually allow the tissue to grow into it, and then become permanently integrated into the body without seeding relevant cells. The application of ADMA for the reconstruction of hollow organs of the urogenital tract (bladder/urethra and vaginal substitution or repair) has shown promising results. Recently, highly representative progresses have been introduced to develop our understanding of skin tissue engineering and to increase the medical safety, biocompatibility, durability and elasticity of ADM for further clinical application. Recreate an efficient urothelial lining in the urinary tract has been considered as a challenging concern in reconstructive plastic surgery within the urogenital tracts. ADM has the ability to be used as substitute material for treatment of several urological conditions such as congenital loss of part of the urethra, abdominal hernia repair, hypospadias, vaginal sling repair, and vaginal agenesis. The feasibility, efficacy and safety of decellularized dermal strip as a sling material has been also reported in the pudendal denervated

stress urinary incontinence in an animal model at our center. The application of ADMA for allowing the natural ability of the body to generate new tissue was evaluated in several experimental and few clinical studies at our institution. We are also conducting clinical studies in hypospadias as well as sex reassignment surgery and suburethral sling material using these natural scaffolds. We are also evaluating the safety and efficacy of using ADM for transvaginal slings to treat stress urinary incontinence in animal model.

**Conclusion:** There is cautious optimism that the tissue engineered skin tissue can play a crucial role in the management of refractory genitourinary diseases. Although we obtained satisfactory outcomes by using ADMA in urological area, we thought that highly sophisticated quality control of these skin scaffolds following sterilization and multicenter experimental/clinical studies could provide an early opportunity to assess the success of the repair, and evaluate the potential complications when using ADMA for surgical procedures of urological conditions. In conclusion, safety and effectiveness of engineered skin tissue scaffolds are the most critical issues which must be addressed prior to and during multicenter clinical trials.

In reconstructive surgery of lower urinary tract such as hypospadias cripple and complex urethra stricture, the ADMA may serve as an ideal replacement material from human acellular skin matrix as a safe, effective, minimally invasive and economic method in urologic plastic surgery.