Unmoderated Poster Sessions: Basic Science/Physiology/Research June 19, 2011–June 21, 2011

UP-095

Tubularized Incised Urethroplasty (TIP) vs Dorsal Inlay Graft: Rabbit Model Functional and Histological Examination

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Introduction and Objective: Decreased flow rates have been reported after TIP repair and concern has been raised about the healing characteristics of the incised plate. Dorsal inlay grafts (DIGU) have been suggested to augment the urethral plate, aiming to improve flow. Although clinical reports indicate successful outcomes with both techniques there are no controlled studies to evaluate the benefit of inlay grafting. We designed an experimental study in a rabbit model to analyse the histological and functional characteristics of TIP versus DIGU.

Methods: 24 New Zealand adult male rabbits were divided in 4 groups: Sham, urethroplasty, TIP and DIGU. In the sham group the penis was degloved to expose the urethra. In the urethroplasty group the urethra was exposed, the anterior urethral wall half-excised and the remaining dorsal urethral tubularized. In the TIP group the same steps were followed, but prior to the tubularization a longitudinal mid line incision in the remaining dorsal urethra was performed. In the DIGU group the defect created by the dorsal incision was covered with a quilted inner preputial graft prior to the tubularization. The animals were sacrificed after 6 weeks and the penises were immediately harvested at the level of the pubis for functional evaluation, therefore providing a uniform urethral length. An antegrade flowmetry was immediately performed in the fresh specimens, which afterward were fixed in formalin and sent for H&E and Masson's trichromic staining.

Results: All animals survived the procedures but one in the urethroplasty group. Histological analysis demonstrated adequate graft take and integration in all animals. In the TIP group the created defect was lined by urothelium, whereas in the DIGU group the preputial graft kept its original histological characteristics (stratified squamous epithelium) in all specimens. There was a significant decrease in the average flow in the urethroplasty group (Qavg 1.6ml/s) compared to the sham (Qavg 3.4 mL/s) and to the other groups ($p<0.05$). However, no significant difference was found between the average flows of TIP (Qavg 2.4ml/s) and DIGU (Qavg 2.2ml/s) groups ($p=0.7$).

Conclusion: Preputial graft inlay is feasible with good graft taking and integration in this animal model. Simple tubularization of a reduced urethral plate leads to significant decrease in flow. Improved flow was observed with an incision of the urethral plate, with or without dorsal inlay grafting, but no significant differences were observed between the TIP and the DIGU groups.