

AN EXPERIMENTAL HYPOSPADIA REPAIR IN RABBITS: A BIOMECHANICAL STUDY OF THE URETHRA

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Aim: To investigate the biomechanical properties of urethra in a rabbit hypospadias model.

Material and methods: 38 NZ white rabbits underwent experimental creation of hypospadias-like defect and acute repair. In the first group the ventral urethral wall and the dorsal plate were longitudinally incised, the half of the ventral urethral wall was excised creating hypospadias-like defect and the incised urethra was tubularized. In the second group the urethra was mobilized from the corpora cavernosa, excised in its distal end mimicking hypospadias and advanced to glanular tip. Other two groups were sham operated and controls. After 23 weeks the animals were sacrificed. One-mm high urethral ring samples were mechanically tested and collagen content was determined.

Results: Data from 32 rabbits were analysed. The maximal strength and maximal stiffness of urethra and the percent collagen were not significantly different among the groups. In the advancement group, the urethral diameter was larger and the total collagen was higher ($p < 0.05$), partly due to more collagen in the dorsal part of urethra. The mechanical quality of the urethral collagen (maximal load and maximal stiffness normalized with mg collagen per mm) was reduced in the advancement group ($p < 0.05$) compared to controls and shams. In the tubularized incised urethra the mechanical quality of the collagen was non-significantly reduced.

Conclusions: Six months after the hypospadias repair, no indication of fibrosis was present. As urethra functionally works as a conduit subject mostly to circular stresses, the preservation of urethral plate, even if incised, seems to give better results than urethral mobilization from corpora and its advancement, which shows more collagen of lower mechanical quality when tested in circular direction, indicating an increased collagen formation with fibrillar re-orientation to resist the longitudinal stress. This method may be used on a hypospadias animal model to test functional results after a hypospadias repair technique before its clinical use.

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