PP-162

Non-intestinal conduit for urinary diversion in rat model – on the way of finding proper scaffold

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Introduction

Patients suffering from muscle invasive bladder cancer require radical cystectomy and urinary diversion. One of the most common technique for urinary diversion is ileal conduit, however this technique is associated with several complications. The aim of the present study was to compare two types of scaffolds used for construction of urinary conduit: natural and synthetic.

Materials and Methods

Naturally derived acellular aortic arch (AAM) and tubular scaffold made of electrospun nanofibers of synthetic poly(L-lactide-*co*-caprolactone) (PLC) were used for construction of artificial conduit in twelve Wistar rats for urinary diversion. Follow-up period was 4 weeks. Intravenous pyelography, histological and immunohistochemical analysis were performed.

Results

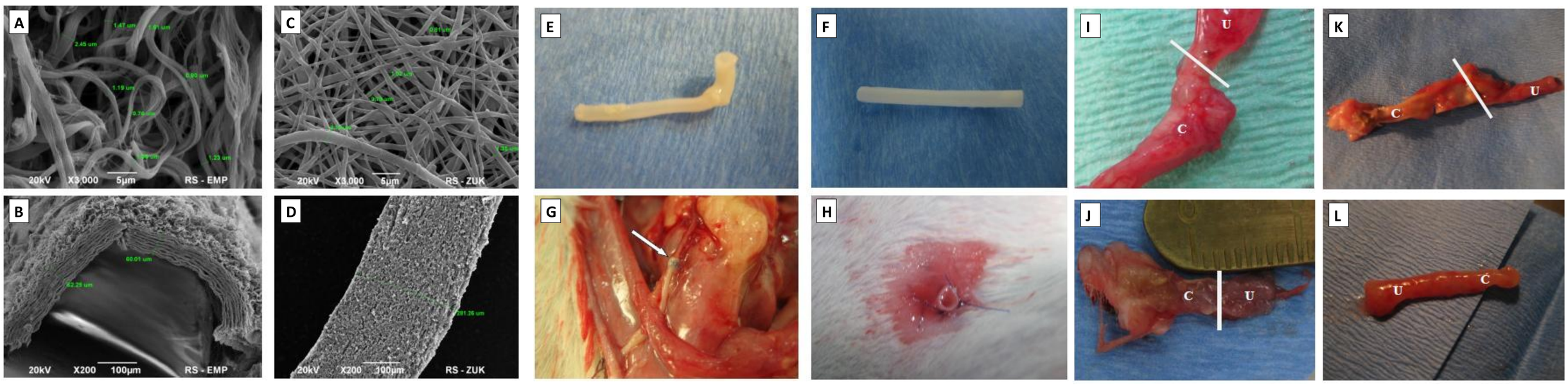

Fig. 1. Scaning electron microscopy analysis showed highly porous structure of AAM (A,B) and PLC (C,D) scaffolds; Macroscopic pictures of AAM (E), and PLC (F) scaffolds; Effect of surgical procedure, arrow marked place of end-to-end anastomosis (G), urine flow outside the conduit directly after end of surgical procedure (H); Integration of AAM (I,J) and PLC (K,L) scaffolds with native ureter, c – conduit, u – ureter.

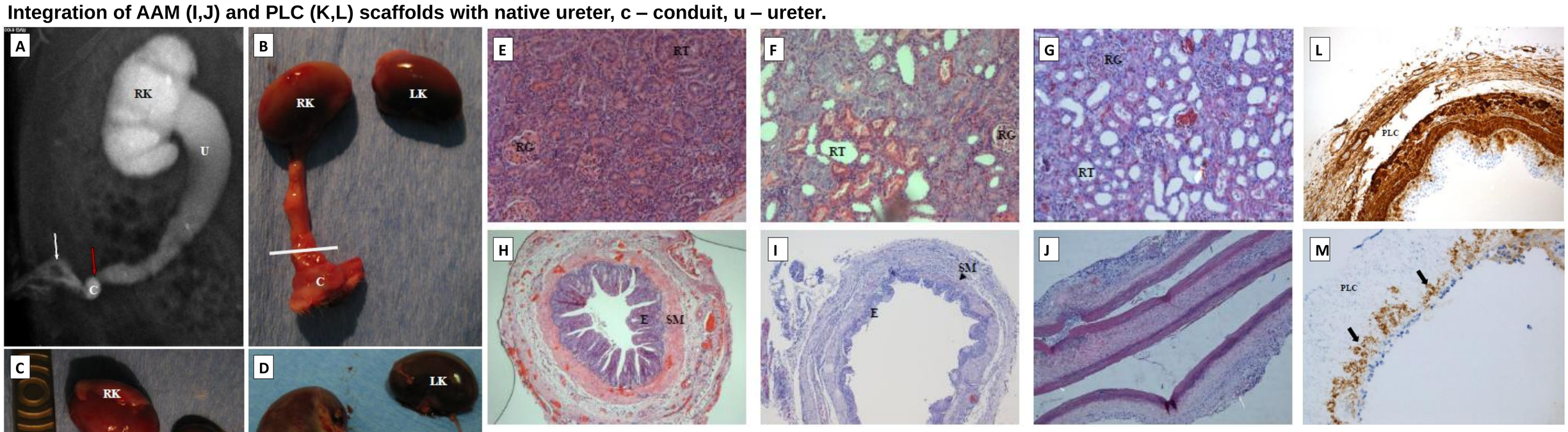

Fig. 2. Intravenous pyelography analysis of successful urinary conduit construction using PLC scaffold (n=1), Macroscopic analysis of successful urinary conduit construction using PLC scaffold (B, n=1); Macroscopic analysis of unsuccessful urinary conduit construction using PLC (C, n=5) and AAM (D, n=6) scaffolds; Histological analysis of renal failure, normal kidney (E), extension of renal tubules after use of PLC (F) and AAM (G) scaffolds; Histological analysis of constructed urinary conduit, normal ureter (H), constructed conduit using PLC (I) and AAM (J) scaffolds; Confirmation of smooth muscle layer regeneration (anti-smooth muscle α-myosin heavy chain) on PLC (L,M) scaffold, immunohistochemical staining. RK-right kidney, LK-left kidney, C-conduit, RG-renal glomeruli, RT-renal tubules, E-epithelium layer, SM-smooth muscle layer.

Conclusions

Tubular scaffold made of electrospun nanofibers showed better properties for urinary conduit construction than naturally derived aortic arch. Additional experiments are necessary to confirm efficiency of this method.

world conference on regenerative medicine
Leipzig, Germany | October 23–25, 2013