P100 Evaluation of ureteral stent resistance to extrinsic compression: The role of designs and materials

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Introduction & Objectives: Extrinsic ureteral compression can cause ureteral stent failure by material kinking. We evaluated the resistance of several ureteral stents when solicited by extrinsic compression.

Materials & Methods: Bard Tumorstent 7F and 8F, Coloplast Tumorstent 7F and 8F, Coloplast Vortek 7F and 8F, Coloplast Silicone 7F and 8F and Coloplast Stenostent 12/8F were tested in vitro. Flow rate at the distal end of stents was measured with either 20 cm or 100 cm of water pressure (cm H20) applied at the proximal end (entry pressure). A 5kg load was applied on 40, 30, 20,10 and 5 mm of straight portion of stents successively during evaluation of flow rate. This allowed to determine required compression force (kg/cm) to induce stent failure, which was defined as a flow rate ≤10 ml/s. Experiments were repeated 3 times on two set of samples for each stent model.

Results: Under 20 cm H20 entry pressure and native conditions (without any load on the straight portion of stents), lowest flow rates were found for Coloplast Tumorstent 7F (mean 13.9 ml/min) and highest flow rates for Coloplast Vortek 8F (mean 44.3 ml/min). When 100 cm H20 entry pressure was applied, lowest and highest flow rates were found for Coloplast Silicone 7F (mean 36.8 ml/min) and Coloplast Vortek 8F (mean 124.7 ml/min), respectively. Stent failure occurred at a compression force of 10 kg/cm for Bard Tumorstent 7F and 8F, at 5 kg/cm for Coloplast Tumorstent 7F and 8F, Vortek 7F and Stenostent 12/8F, at 2.5 kg/cm for Coloplast Vortek 8F and Silicone 8F, as well as at 1.66 kg/cm for Coloplast Silicone 8F.

Conclusions: Tumorstent and Stenostent designs are more resistant to extrinsic compression than conventional ureteral stent designs. Bard Tumorstents were found to be particularly resistant. The least resistant material seems to be silicone. Determinants of highest flow rate through stents seem to be multifactorial: cross sectional stent size, stent design, stent material, entry pressure and extrinsic compression force.