Bioabsorbable stents in urology

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INTRODUCTION

In the urinary tract it is often necessary to keep a lumen open either temporarily following an operation to secure healing, such as pyeloureteroplasty and incision of a ureteral stricture or following laser coagulation of the prostate (VLAP), or permanently such as an alternative to surgery in the treatment of bladder outlet obstruction due to benign prostatic hyperplasia (BPH) and following urethroscopy due to a urethral stricture. Normally this is done by inserting a catheter or, in the higher urinary tract, a stent, which have to be removed. Especialy use of indwelling catheters are also associated with a high rate of infection complications and permanent metallic stents may have problems due to tissue growth through the stent.

Biodegradable materials have been used as surgical suture materials for over 20 years. They are polymers of organic acids with molecule weight up to 100 000 Daltons. The properties of these polymers depend on the basic molecule and the length of the chain. The structure and strength of the material are also important factors in degradation process, which can so be regulated. It is possible to make even self-expanding models. The biodegradable materials are metabolized to water and carbon dioxide inside normal tissue. So the organ preserves its normal function after resorption of the device, and the biocompatibility properties are relatively good.

EXPERIENCE OF BIOABSORBABLE STENTS

So far experimental and clinical experiences of different bioabsorbable materials in the urinary tract include self-reinforced poly-L-lactide (SR-PLLA) and polyglycolide (SR-PGA). They have been used in a form of spiral to keep the urethra open. PLLA has the longest strength retention time in vivo (6-12 months) of the basic molecules available and so it can be used for purposes where long-term strength properties are needed, such as after urethroscopy and some sorts of prostate therapy. SR-PLLA spirals were shown to have good biocompatibility with a minimal tissue reaction around the stent material in the rabbit anterior urethra, whereas helical spiral of stainless steel induced a remarkable inflammatory reaction due to poor implantation properties (1). Also efficacy and safety of the SR-PLLA spiral stent inserted into the prostatic urethra in securing free voiding despite edema after VLAP has been studied. It was found to prevent effectively and safely postoperative urinary retention after VLAP. In this special indication biodegradation time was found to be unnecessary long as the spiral stent was found to be in a good condition still at 6 months and was not completely degraded until at 12 months.

PGA urospiral stents degrade in 2 to 3 weeks into small fragments of polymer debris that are excreted with urine. They have been shown effectively and safely to prevent postoperative urinary retention after visual laser ablation of the prostate keeping the prostatic urethra open while edema disappears and being superior to suprapubic catheter and combination of indwelling catheter and suprapubic catheter (2,3).

FUTURE OF BIOABSORBABLE STENTS

Clinical trials are going on to test SR-PLLA urospiral stents in the treatment of recurring urethral strictures and in the treatment of urinary retention due to benign prostatic hyperplasia with the prostate size reducing drug therapy. Biodegradable ureter stents and also new materials are being tested in animal experiments. In the future bioabsorbable stents in urology will probably be of significant importance to make more conservative treatment modalities possible, to reduce postoperative complications and to improve treatment results.

REFERENCES