RECONSTRUCTIVE UROLOGY

Neuroanatomy of the male urethra and perineum

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Objective: To describe the topography of the perineal nerves from their pudendal origin to their course into the male genitalia, with specific attention on the course of the perineal nerve along the ventral penis, including branches into bulbospongiosus muscle and corpus spongiosum.

Materials and Methods: The study comprised 18 normal human fetal penile specimens at 17.5 - 38 weeks of gestation (determined by fetal heel-to-toe length). Specimens were fixed in formalin, embedded in paraffin wax and serially sectioned at 6 micro m. The penile specimens contained the whole penis from the glans to the crural bodies, beneath the pubic arch and the perineum up to the anal verge. Immunocytochemistry was assessed on selected sections with antibodies against the neuronal markers S-100 and nitric oxide synthase (nNOS). Three-dimensional computer reconstruction of serial sections allowed an in-depth analysis of the neuroanatomy of the fetal penis, perineum and surrounding structures.

Results: After the pudendal nerve leaves the pudendal canal it gives rise to the perineal nerve branches in the ischiorectal fossa. Perineal nerves travel alongside the ischiocavernous and bulbospongiosus muscles and before reaching the latter, nerve branches course into the bulbospongiosus muscle. During its pathway within this muscle, fine nerve fibres course into the corpus spongiosum by piercing through the junction of the muscle. At the penoscrotal area, the perineal nerves give branches to the scrotum, funnelling into the interscrotal septum. Perineal nerves continue their pathway over the ventral side of penis covering the ventral surface of corpus spongiosum. Branches of the dorsal nerve of the penis at the junction of corpus cavernosum and corpus spongiosum assemble into a network with the perineal nerves. All perineal nerves from their main trunk at the ischiorectal fossa until their interaction with dorsal nerve of penis at the base of penis were nNOS negative. After the interaction with the dorsal nerve of penis, they become nNOS positive.

Conclusion: Integrating neuroanatomical knowledge about the perineal nerves and their communication with the dorsal nerve of penis should facilitate a strategic approach to reconstructive procedures on the penis. Special care should be taken at the junction between the corpora cavernosa and spongiosa, where the dorsal nerve joins the perineal nerve, and at the proximal bulbospongiosus muscle, thereby protecting the fine nerves piercing into the cavernosa spongiosa.

Editorial Comment

The authors in this paper describe nicely the topography of the pudendal branches supplying the external male genitalia. Although the anatomy of the pudendal nerves have been the subject of reports for almost 2 centuries newly developed surgical techniques and diagnostic procedures as well as findings regarding the pathophysiology of diseases of the external male genitalia and external sphincter have led to new studies looking at the topography of nerve ramifications such as the pudendal nerve and its interaction with the vegetative neural system. Recent papers have specifically looked at the role of pudendal nerve branches both in the male and female external sphincter (1,2). In this manuscript the authors nicely outlined how the perineal branches of the pudendal nerve travel alongside the musculus ischiocavernosus and bulbospongiosus before penetrating the corpus spongiosum. There is also an apparent strong communication between the perineal pudendal nerve branches and the dorsal nerve of the penis at the junction of the corpus cavernosum and the corpus spongiosum.

These findings are not only important for elucidation of penile diseases or application of local anaesthesia in case of penile surgery, it may also be relevant for the discussion whether afferent sensory nerves from the membranous urethra and the proximal bulbous urethra go alongside the same pathways. According to recent literature (3) sensory afferent nerves from these urethral segments are probably mainly responsible for prevention of the “first drop” incontinence after radical prostatectomy or cystectomy.

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Urinary tract biomaterials

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Purpose: As a result of endourological advances, biomaterials have become increasingly used within the urinary tract. This review article provides an update on the current status of urinary tract biomaterials, discussing issues of biocompatibility, biomaterials available for use, clinical applications and biomaterial related complications. Perspectives on future materials for use in the urinary tract are also provided.

Materials and Methods: We performed a comprehensive search of the peer reviewed literature on all aspects of biomaterials in the urinary tract using PubMed and MEDLINE. All pertinent articles were reviewed in detail.

Results: Any potential biomaterial must undergo rigorous physical and biocompatibility testing prior to its commercialization and use in humans. There are currently many different bulk materials and coatings available for the manufacturing of biomaterials, although the ideal material has yet to be discovered. For use in the urinary tract, biomaterials may be formed into devices, including ureteral and urethral stents, urethral catheters and percutaneous nephrostomy tubes. Despite significant advances in basic science research involving biocompatibility issues and biofilm formation, infection and encrustation remain associated with the use of biomaterials in the urinary tract and, therefore, limit their long-term indwelling time.

Conclusions: Prosthetic devices formed from biomaterials will continue to be an essential tool in the practicing urologist’s armamentarium. Ongoing research is essential to optimize biocompatibility and decrease biomaterial related complications such as infection and encrustation within the urinary tract. Future advances include biodegradables, novel coatings and tissue engineering.

Editorial Comment

This is a nice overview of the increasing number of biomaterials which can be used for and around the urinary tract. However, ongoing research is an absolute must because biocompatibility, interactions with body tissues and subsequent scaring are far from ideal with the current materials.

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UROLOGICAL ONCOLOGY

Tumor seeding in urological laparoscopy: an international survey

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Purpose: During the last 10 years laparoscopy has been applied to treat most urological pathology including malignancies. There has been concern regarding peritoneal dissemination and port site metastases. We undertook a survey to assess the incidence of this occurrence.

Materials and Methods: A total of 50 international urology departments with experts in laparoscopic urological surgery were contacted for this study. Each site was asked to complete a 2-page survey regarding the volume of laparoscopic urological procedures and port site recurrences.

Results: Nineteen sites elected to participate. A total of 18750 laparoscopic procedures were performed, of which 10912 were for cancer. These included 2604 radical nephrectomies, 559 nephroureterectomies, 555 partial nephrectomies, 27 segmental ureterectomies, 3665 radical prostatectomies, 1869 pelvic lymph node dissections, 479 retroperitoneal lymph node dissections, 336 adrenalectomies and 108 procedures listed as other. Tumor seeding was reported in 13 cases (0.1%), including 3 nephroureterectomies for transitional cell carcinoma, 4 nephrectomies (incidental transitional cell carcinoma), 4 adrenalectomies for metastases, 1 retroperitoneal lymph node dissection for testicular cancer and 1 pelvic lymph node dissection for cancer of the penis. Port seeding occurred in 10 cases (0.09%) and peritoneal spread in 3 cases (0.03%).

Conclusions: The incidence of tumor seeding after laparoscopic oncological surgery is rare and does not appear greater than what has been historically reported for open surgery. Tumor seeding seems to be most commonly related to the removal of high grade tumors and deviation from oncological surgical principles.

Editorial Comment

Laparoscopic surgery has evolved to a reliable and safe procedure in urology – if indicated correctly. This paper shows the safety of the procedure in regard to oncological procedures.

Two facts however deserve emphasis and should be kept in mind. First, patients with port metastases might not return to the surgeon or the center where the initial procedure was undertaken, so a certain number of non-reporting is certain. Second, the majority of implantation metastases (n = 7) stems from transitional cancer. This tumor entity therefore might be considered hazardous for laparoscopic procedures and open surgery might be preferable here.

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