

FETAL DEVELOPMENT OF THE PEDICLES AND THE SUPPORT OF THE URETHRA AND THE RHABDOSPHINCTER

Aims of Study

Fixation of the urethra and the rhabdosphincter to the pubic bone is thought to be imperative to the maintenance of continence in adult patients. Almost all surgical procedures –with the exception of implantation of artificial urinary sphincters and injection of bulking agents- are aimed at restoring this ligamentous fixation of the urethra to the pubic bone. To gain a better understanding of the tissue support and pedicles of the male and female urethra, serial sections in fetuses were studied.

Methods

In 42 male and female fetuses, ranging in gestational age from 9 to 37 weeks, the topography around the urethra and the rhabdosphincter was examined. The pelvis of each specimen was impregnated with epoxy resin and cut with a diamond wire in either the transverse, sagittal or coronal plane. The sections were then stained and viewed at magnifications from 4x to 80x.

Results

The striated fibers of the rhabdosphincter form an omega-shaped loop, both ends of which insert at a dorsal median connective tissue raphe. This dorsal raphe fixes the urethra and the rhabdosphincter-loop to the perineal body in males and the ventral wall of the vagina in females. Furthermore, the connective tissue layers covering the rhabdosphincter and the levator ani muscle are in close contact ventrolaterally and provide additional support for the rhabdosphincter and the urethra.

Examining the tissue surrounding the urethra and the rhabdosphincter, no ligamentous structure fixing the urethra and the rhabdosphincter to the pubic bone could be found. The ventral aspects of the rhabdosphincter and the urethra remain free of the pubis throughout their entire course in all stages of fetal development. Contrary to standard anatomical, urological and gynecological descriptions, there is neither a pubourethral nor a pubovesical ligament that would hinder the normal mobility of the urethra.

Conclusions

Our study demonstrates that the urethra as well as the rhabdosphincter have no ligamentous fixation to the pubic bone during fetal development. Supported only by the anterior fibers of the levator ani muscle and its dorsal connective tissue raphe, the rhabdosphincter and its function may be compromised during pelvic operations or childbirth when the hiatus is widened too much, resulting in the separation of the connective tissue of the rhabdosphincter from the connective tissue encasing the levator ani muscle and the ventral wall of the vagina. Further studies will have to be performed in the future to investigate the exact reasons for descensus of the pelvic organs as well as urinary stress incontinence to provide basic pathophysiologic data for improved therapeutic procedures.