Where is the sphincter? Pelvic Surgical Anatomy and Imaging;
W1, 29 August 2011 09:00 - 10:30

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<td>Introduction</td>
<td>Liaqat Chowoo</td>
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<td>Gynecologists perspective</td>
<td>Joe Olutayo Daniels</td>
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<td>Radiologists perspective</td>
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**Aims of course/workshop**

This 90 minute workshop is aimed at reinforcing the three dimensional pure and applied anatomy of the urinary sphincter and pelvic floor. Clinical management of incontinence will be correlated. We present a multidisciplinary approach involving a urologist, gynecologist, colorectal surgeon and a radiologist's view of pelvis. We introduce multidimensional models to facilitate the understanding of the anatomical basis of pelvic floor reconstruction. Cross-sectional Radiology and functional anatomy will be tied in to the endoscopic and laparoscopic approach for each discipline with special reference to incontinence surgery. This will take the form of a capsule of brief didactic lectures, multimedia presentations, case discussions, and questions.

**Educational Objectives**

Description of the Urinary Sphincter mechanism in the literature is inadequate. To facilitate the understanding of this complex anatomical structure we propose an innovative alternative to traditional anatomical teaching. Laparoscopic/robotic views of the sphincter will be combined with open pelvic, cystoscopic, hysteroscopic and rectoscopic views using state of the art imaging technology. Blending this image cohort with cross-sectional images of the region will enable the learner to register a unique impression of the Sphincter mechanism. This should instill extra confidence in approaching the sphincter, surgically or otherwise. Importance of physiotherapy, urethral bulking, suspensions, tapes and artificial Sphincters will be woven into context. Our new capsule has potential as a teaching tool and has room for improvement to optimize its effectiveness. The interactive format will improve perceived educational value and enhance confidence. It may help to standardize the profiling of surgical training.
Where is the Sphincter???
Multimodal Pelvic Anatomy
Chowoo/Kamath/Farara/

Obturator internus and arcus tendineus

- Obturator internus muscle
  - inner part of the pelvic sidewall through lesser sciatic foramen to femur
- Tendinous arc
  - tense fibrous band on obturator internus muscle extending between pubis and ischial spine
  - lateral attachments of pelvic floor muscles and ligaments
Obturator internus muscle

Pelvic floor muscles

Stomach muscles
Small bowel
Uterus
Bladder
Pubic bone
Urethra
"Cystocele"
Rectum

Tail bone

Cut pelvic diaphragm
Coccygeus m.
levator ani m.

Tendinous arch
Muscular supports

- Pelvic diaphragm
- Urogenital diaphragm (perineal membrane)
- Perineal body

Pelvic Diaphragm

- Closes the pelvic outlet
- Major support of the urethra, vagina, rectum
- Composed of levator ani and coccygeus
  - Levator ani composed of pubococcygeus medially and ilio coccygeus laterally
  - Subdivision of pubococcygeus are pubourethralis, pubovaginalis, pubosanalis, puborectalis
  - From pubis and tendinous arc, and to coccyx
  - Coccygeus from ischial spine to coccyx and sacrum (sits on sacrospinous ligament)

Levator ani

- Inner part forms margin of the urogenital (levator) hiatus
- Fibres to urethra, vagina, and rectum
- At level of external urethral sphincter
- Posterior part
  - Levator plate
    - Horizontal in the standing position
    - From rectum to coccyx
    - Supports upper 2/3 vagina and rectum

3-D MR Scan of Pelvic Diaphragm

Fielding et al. AJR 2000; 174:657
Perineal Membrane
(Urogenital Diaphragm)

- Anterior pelvic support where levators are deficient
- Controversy as to exact structure
- Bridges gap between inferior pubic rami bilaterally and perineal body
- Closes genital hiatus, supports and has a sphincter like effect on the distal vagina
- Contributes to continence because it is attached to periurethral striated muscles
- Structural support for the distal urethra

Key points
- The levator ani and coccygeus form the pelvic diaphragm.
- The pubococcygeus and iliococcygeus, from medial to lateral, are the 2 muscle groups of the levator ani.
- The arcus tendineus levator and the arcus tendineus fasciae pelvis are the white fascial bands extending from the ischial spine to the pubis and are the lateral supports of the pelvic structures.
- Anterior wall defects can be central, lateral, or combined
- The anatomic classification of pelvic organ prolapse is based on the part of the vaginal wall that is protruding.

Conclusions
- Anatomy is key to understanding pathophysiology of incontinence and prolapse
- Frequently related problems
- Treatment largely determined by history and physical findings

Source:
Sunday, May 15, 2011 10:30 AM - 12:30 PM
Badder and Urine: Anatomy, Physiology and Pharmacology

I N T R O D U C T I O N  A N D  O B J E C T I V E S : The exact characterization of the fiber types as well as the functional properties of the rhabdosphincter have been a subject of controversy so far. However, it is generally accepted that contractions of the rhabdosphincter play a prominent part in actively maintaining continence. In the present study the physical properties of the rhabdosphincter were investigated.

METHODS: Histological, functional, as well as histochemical studies of the striated muscle fibers of the rhabdosphincter were investigated in 23 specimens obtained from male and female patients undergoing radical prostatectomy or cystectomy. Tissue samples were rapidly frozen, then prepared with a cryostat and finally processed for routine histology and histochemical fiber typing (acid and alkaline myosin ATPase, succinate dehydrogenase, NADHdehydrogenase, phosphorylase).

RESULTS: The histochemical findings of the rhabdosphincter concurred with the urethral, ventrally and laterally. Omnipresent, a strong orientation is evident. Thus, both tissues are composed of uniform, small and dense packed striated muscle cells. The rhabdosphincter consists of uniformly, small and dense packed striated muscle cells. The distribution of myosin ATPase in the rhabdosphincter was demonstrated in homogenous population of small diameter, type I (slow twitch) fibres arranged in an omega-shaped collar around the urethra. Following acid pre-incubation, each muscle fiber was rich in myosin reaction product, indicating that the rhabdosphincter was composed of slow twitch fibers. Furthermore, the fibers possessed a high content of succinate dehydrogenase. These fibers almost exclusively corresponded to those of the slow twitch type I fibres. Therefore, the muscle fibers are ideally suited for tonic closure of the urethra.

REFERENCES: The present study shows that the rhabdosphincter consists of highly specialized muscle fibers that are functionally capable of maintaining tone over prolonged time periods without fatigue. The striated fibers of the rhabdosphincter are likely the most important fibers for continence preservation and their close proximity to the urethra is vital for effective sphincter function.
ANATOMY OF THE PELVIS

Dr SADASHIV H KAMATH

DEPARTMENT OF RADIOLOGY
NLG NHS TRUST