Dynamic rehabilitative ultrasound for pelvic floor disorders

Introduction in techniques and hands-on-workshop

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1. Introduction:

- Ultrasound is not only a medium for gynecologists, urologists or urogynecologists in the field of treatment of incontinence and prolapse. It is an additional tool, useful for pelvic floor rehabilitation by physiotherapists and other health care professionals treating women with pelvic floor disorders with several advantages. It provides an innovative tool that gives women more insight into their individual pathophysiology (patient-education) and for a better understanding of their symptoms (teaching) [1].

- Dynamic rehabilitative ultrasound (DRUS) is used to image physiological and pathophysiological activations of the pelvic floor muscles which can be seen on the ultrasound screen for diagnosis (assessment), teaching and also for re-assessment. This is important for research [2, 3] and for clinical intervention.

- DRUS can also be used for the treatment of other muscles related to PF-function (co-contraction, pre-contraction), such as abdominal muscles (transverse abdominal, oblique abdominal muscles) and back muscles (relationship between lumbar back pain and incontinence) [4, 5].

1.1. Pre-contraction of pelvic floor muscles and ultrason as a biofeedback medium:

Ultrasound can be used as an instrument for evaluation of physiological and pathophysiological movements of the bladder [6]. It can also be used as a biofeedback instrument, for example via perineal ultrasound, to enhance the understanding of normal pelvic floor function during coughing e.g [6]. The physiological pre-contraction of the pelvic floor can be taught, known as the “Knack”, a pelvic floor contraction that is generated before coughing or sneezing e.g. to prevent urinary leakage [7, 8]. The Knack has been confirmed to improve the stability of the bladder neck during coughing. A loss of pre-contraction has been shown in incontinent women during rapid arm movement [9]. In conjunction with abdominal ultrasound, perineal ultrasound is a valuable instrument to assess the synergy of the pelvic floor and deep abdominal muscles. It can be used for pelvic floor re-education especially for retraining of functional tasks that result in urinary leakage in the individual subject [1, 10, 11].

Some studies have shown that performing selective muscle contraction for motor learning under US-guidance leads to faster and better outcomes (performance, strength, repeatability). In a study of Van et. al [12] patients increased their strength during 2 weeks after teaching selective multifidus muscle with US. To this early stage an increase in strength is a sign for better coordination and better performance of the exercise because “real muscle strength” cannot occur. In the field of PFM rehabilitation with US biofeedback are published [13-15]. In a physiotherapy lecture, held at the physiotherapy day at the Annual IUGA meeting in Dublin (2013), the importance of visualization of a correct PFM contraction, especially in the initial learning phase, was highlighted by showing research in other fields of motor learning, neurology therapy (http://www.physiotherapie-junginger.de/#!vortrge/c1hqg).
1.2. Equipment
- Ultrasound machine – simple, no colour or Doppler or 3/D facilities required
- Abdominal ultrasound probe (curved array)
- (endovaginal ultrasound probe)

1.3. Indications of pelvic floor ultrasound

<table>
<thead>
<tr>
<th>Pelvic floor ultrasound Indications</th>
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<tr>
<td>Anatomy and function</td>
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<tr>
<td>Pathophysiology</td>
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<td>Evaluation of pelvic pain</td>
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<td>Pelvic floor disorder diagnosis</td>
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<td>Biofeedback –pelvic floor contraction, coughing, straining</td>
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1.4. Perineal ultrasound: application and normal anatomy and function

**Evaluation of a correct PFM contraction**

2. Perineal ultrasound to evaluate position and movement of
   - pubo-rectalis sling/ ano-rectal angle
   - bladder neck position

**PFM contraction resulting in a bladder neck elevation**

*mod. nach Baessler*
1.5. Application of introital ultrasound

1.6. Pelvic floor ultrasound: pathology

- Cystocele, cystourethrocele
- Bladder neck descent, funnelling
- Enterocele
- Rectocele
- Anal sphincter defect
- Diverticulum - urethral, vesical
- Urethral and vesical tumors
- Foreign bodies
1.7. Measurement of bladder neck position
- For pre-post assessment e.g.
- Mainly for scientific evaluation

1.8. Aims of dynamic rehabilitative ultrasound
- Evaluation of the effect of pelvic floor muscle contraction and relaxation
  o bladder neck elevation
  o bladder neck descent.
  o Movement of the puborectalis muscle and rectum
- To directly evaluate the changes in abdominal muscle thickness and muscle sliding

2. Techniques used in pelvic floor rehabilitation

2.1. Technique of ultrasound application for assessment of transverse, external and internal abdominal oblique muscles
2.2. **Suprapubic/ Supra-symphysal ultrasound (females and males).**
- Evaluation of movement of the bladder.
- Because no gold-standard and other circumstances not topic in this workshop.

2.3. **Perineal ultrasound (females and males).**
- Evaluation of movement of the bladder neck and the puborectalis muscle.
- Measurements should be performed during pelvic floor contraction/ relaxation, straining, coughing and other functional tasks.

2.4. **Findings of normal and pathological pelvic floor function (video examples)**
- during pelvic floor contraction
- coughing
- lifting and other activities of daily life
3. Practical Session

3.1. Abdominal muscle ultrasound:
Transversus, external and internal abdominal oblique muscles, transversus-pelvic floor co-contractions and adverse external oblique contractions [16].
Upper and middle part of the abdominal muscles [17]

3.2. Supra-pubic (abdominal) ultrasound.
Assessment of movements of the bladder base during pelvic floor contraction, straining and coughing
This method is applicable in female and in male.
3.3. Perineal (translabial) ultrasound

In females to evaluate the bladder neck and the puborectalis muscle movements during pelvic floor contraction, straining, coughing and other functional tasks.

Abdominal probe and its application:

Landmarks for perineal ultrasound

Rest position

Contraction of PFM
4. Description of a rehabilitation program employing DRUS, palpation and functional teaching:

The main goal is to teach a bladder neck-effective pelvic floor contraction in women with stress and urge incontinence. Bladder neck effectiveness means a cranio-ventral movement, an elevation of the bladder neck which can be maintained during breathing and coughing e.g. The cooperation with transverse abdominal muscle (TrA) and the handling of internal and external oblique muscle co-contraction is of further importance.

Evaluation includes bladder neck elevation, pre-contraction, voluntary pelvic floor contraction at maximal strength and with submaximal effort, maintenance of the contraction during breathing and coughing, stabilization of the urethra and bladder neck position during coughing or abdominal manoeuvres and typical physical exercises.

Ultrasound is the method to visualize the bladder neck, palpation and ultrasound are the methods to teach the contraction. Palpation of PFM leads to a better perception and awareness whereas ultrasound shows the patient that the performed contraction is sufficient, insufficient or even not effective. Both, the visual and the tactile way are important to learn how to perform a PFM contraction.

After the first step, the improvement of PFM awareness, individual dysfunctions of the PFM and the TrA will guide the second part of the program. Followed by integration into incontinence situations and daily live situations and instructions what is important for sports activities, this program leads to autonomy of the patient.

4.1. Presentation of results of a specific rehabilitation program: [1, 11] – poster of the annual meeting of IUGA in 2008 (Taiwan)

Baessler et al. found that maximal pelvic floor muscle contractions are not necessary to elevate the bladder neck, submaximal contractions are sufficient to achieve the elevation (see IUGA Toronto). Maximal contractions have the disadvantage of increasing the intra-abdominal pressure undesirably due to co-contractions of the abdominal muscles (Baessler et al. 2008). Submaximal contractions can be maintained for a longer time in order to reach the toilette e.g. (in women with urge symptoms) and breathing is not restricted [18].

In a prospective study following women after performing a PFM rehabilitation program adopting the following principles: submaximal contractions, co-contraction with transversus abdominis muscle and their integration into daily life but without any further regular exercises.

Results: Of 46 women with stress urinary incontinence symptoms, 67% and of 46 women with OAB symptoms 78% were improved or cured. Bladder, bowel and sexual function domain scales improved significantly after 1–6 sessions (median 2). Pre-contraction of PF and TrA was routinely performed by 39 of 55 women (71%) resulting in less incontinence. Self-reported improvement rates were reported at 91% (50/55) for bladder symptoms [1].
August 4, 2016, 12:45 - 1:50 PM

1:09 - 1:12 PM

**EP 143 / Screen 3 - HOW SHOULD WOMEN BREATHE DURING LIFTING? INFLUENCE OF BREATHING VARIATIONS ON BLADDER NECK AND PELVIC FLOOR POSITION IN HEALTHY AND INCONTINENT WOMEN**

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August 6, 2016, 11:00 - 12:26 PM

11:30 - 11:36 AM

**OP 53 - DOES A PELVIC FLOOR MUSCLE CONTRACTION ELEVATE THE UTERUS?**

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6. References:


