



# Ultrasound for diagnosis bladder neck motility in men with lower urinary tract symptoms - pilot prospective study

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## Abstract

### Objectives.

Lower urinary tract symptoms (LUTS) is a widespread problem in men affecting life quality. Benign Prostatic Hyperplasia (BPH) might be overestimated as the only cause of LUTS. Functional ultrasound (US) has strong potential for to evaluate pelvic floor disorders.

**The aim** was to evaluate the feasibility and reliability of transabdominal US bladder neck motility in men.

### Materials and methods.

We included 112 male patients (38–92 years) with LUTS; healthy subjects of group 2 (n = 30) were controls. All individuals underwent general examination, pelvic US with transabdominal evaluation of proximal urethra (prostate / bladder neck) motility measuring postero-inferior rotation at rest and on maximal Valsalva and prostate volume. Among group 1 we distinguished group 1a patients with increasing deviation at maximal Valsalva >45 mm (empirically established threshold; n=33); the rest were included to 1b group.

### Results.

The bladder neck postero-inferior rotation at maximal Valsalva on transabdominal US was  $86 \pm 17$  mm (65-120 mm) in group 1a vs  $37 \pm 12$  mm and  $27 \pm 8$  mm in group 1b and controls respectively ( $p < 0.05$  for both). In 40% of group 1a patients (12/30) no signs of BPH were diagnosed. The prostate volume in group 1a was  $49.6 \pm 25$  cm<sup>3</sup> (12-130 mm) vs  $67.6 \pm 21$  cm<sup>3</sup> (47-190 mm) in group 1b ( $p < 0.05$ ) and had no insignificant difference vs controls ( $p > 0.05$ ). Functional US data had poor negative correlation with prostate volume ( $r = -0.1$ ). Chronic prostatitis detected in 8 patients of group 1a, in 27 and 7 patients in groups 1b and 2 respectively. In 18 patients of group 1a the myofascial trigger points in pelvic and spine muscles were detected.

### Conclusions.

Transabdominal functional US is feasible and reliable method to measure bladder neck motility in men. The bladder neck hypermotility in men is associated with LUTS, often irrelevant to BPH.

## Introduction

### Hypothesis / aims of study

Lower urinary tract symptoms (LUTS) is a functional unit with the multifactorial aetiology is a widespread problem in men with a major impact on quality of life (QoL) [1].

Benign prostatic hyperplasia (BPH) might not play a crucial role in particular group of patients.

Myofascial trigger points might associated with generalized pelvic pain and LUTS.

Bladder neck hypermotility and pelvic floor dysfunction is well studied in female, but rather underestimated in adult men.

Ultrasound (US) has strong potential for diagnosis of pelvic floor disorders and treatment of pelvic muscles dysfunction [2,3], however many methodological differences and limitations still exist that induce confounders in the studies.

Development of valid screening and diagnostic method is highly recommended for holistic management of LUTS and suggesting treatment options [3].

### Hypothesis:

**Transabdominal ultrasound is effective for diagnosis bladder neck motility in men with lower urinary tract symptoms irrelevant to prostate hyperplasia.**

**The aim** was to evaluate the feasibility and reliability of transabdominal US for screening of bladder neck motility in men with LUTS in association with BPH.

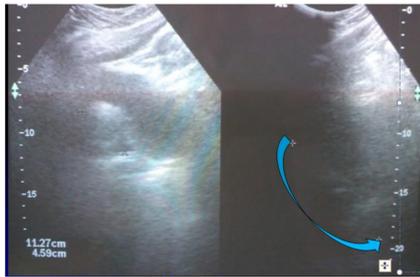
## Methods and Materials

### Study design, materials and methods

We included 112 patients, males (38–92 years,  $65 \pm 8$  yo), suffering from LUTS. Male patients of group 2 (n = 30) had no LUTS were the controls. All patients underwent general examination, transabdominal pelvic ultrasound for evaluation bladder neck motility and prostate volume.

**Transabdominal US** measurements of bladder neck rotation in a **postero-inferior direction** at rest and on maximal Valsalva was performed to all patients. Measurements were **taken at rest and on maximal Valsalva**, and the difference yields a numerical value for bladder neck (prostate) descent (probe position over the pubic bone in vertical / sagittal orientation using M-mode, figure 1). Among patients with LUTS we distinguished patients, who demonstrated increasing deviation at maximal Valsalva over the threshold (empirically considered at **level of 45 mm**) - group 1a (n = 30); rest was included to 1b group.

All patients were also assessed for central and peripheral myofascial trigger points in pelvic and low back muscles physically and on extensive neuromuscular US using M-mode to evaluate muscles thickness, structure and motion in intervertebral spaces, pelvis, gluteal region.



Transabdominal US measurements (sagittal ultrasound scan) of bladder neck rotation in a postero-inferior direction at rest and on maximal Valsalva

## Results

On transabdominal US on maximal Valsalva, the proximal urethra (prostate) was visualized to rotate in a postero-inferior direction and was measured in group 1a as high as  $86 \pm 17$  mm (65-120 mm), significantly higher vs group 1b and controls ( $37 \pm 12$  mm and  $27 \pm 8$  mm respectively,  $p < 0.05$  for both).

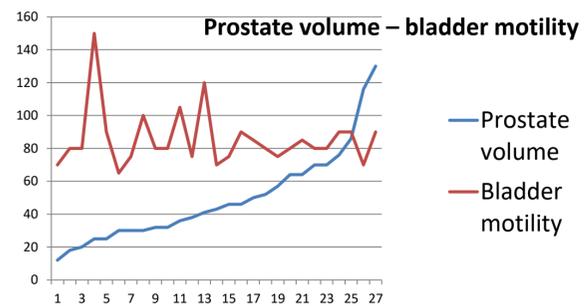
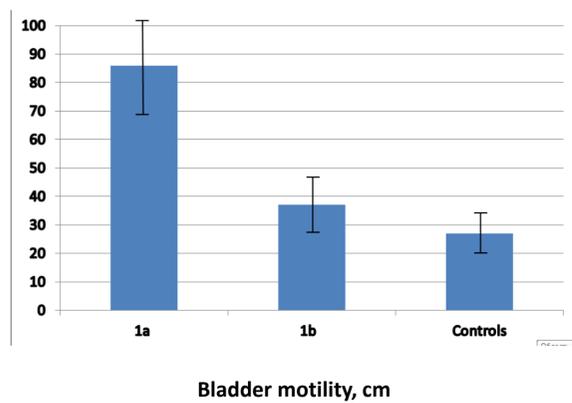
**In 40% of patients of group 1a (12/30) no signs of BPH were diagnosed.**

The median prostate volume in group 1a was  $49.6 \pm 25$  cm<sup>3</sup> (12-130 mm), significantly lower vs group 1b ( $67.6 \pm 21$  cm<sup>3</sup>; 47-190 mm,  $p < 0.05$ ) in and had no significant difference vs controls ( $p > 0.05$ ).

**Transabdominal ultrasound data had poor negative correlation with prostate volume ( $r = -0.1$ ).**

US signs of chronic **prostatitis** were detected in 8 patients of group 1a, in 27 patients of group 1b, and in 7 patients in group 2.

In 16 patients of group 1a (53%) the **myofascial trigger points** in pelvic muscles were diagnosed. Additionally 9 patients of group 1a were assessed for myofascial trigger points in pelvic and low back muscles by physical exam and on US.



**Transabdominal ultrasound data had poor negative correlation with prostate volume ( $r = -0.1$ ).**

## Discussion

Relevant US imaging techniques for assessment interaction of internal genitalia with pelvic floor muscles, resulting bladder neck hypermotility and evoking urogenital symptoms by validated questionnaires conjoined with specific background analysis are essential for **personalized management of pelvic floor dysfunction**.

This marker can be effective for **monitoring conditions** including: **Pelvic pain treatment** can be effectively monitored using current marker [3].

**Physical activity** – personalized exercise programs monitoring.

### Future prospects

Further studies to establish causality in regards to BPH, chronic prostatitis and **myofascial trigger points** and other conditions are required.

Integrative evaluating of **postural im/balance** is essential to local detection of muscle dystonia, weakness and spasticity associated with pelvic disorders [3,4].

**Microbiome & Probiotics.** Microbiome via **gut-brain axis (GBA)**, and local **urinary microbiome** in associations with pelvic mechanics is promising background for probiotic treatment of LUTS [5,6].

**Men health & LUTS** in the point of view of personal health and life quality is still not sufficiently studied and implemented to predictive assessment and **widespread screening programs**. Developing the **panel of biomarkers** for age-related assessment for extensive vision of Men Health from the comprehensive view of **posture-hormonal-microbiome-psyche axis**, stress, emotions, pain, physical activity, and molecular and cellular mechanisms is an important point. Development and validation of comprehensive and **concise questionnaires & simple phenotype tests (like presented one)** for diagnosis male aging organism as a part of men health panel of biomarkers is strongly needed.

## Conclusions

Transabdominal US is feasible and reliable method for assessment bladder neck motility in men with LUTS. The bladder neck hypermotility was diagnosed in 27 % patients with LUTS, had negative correlation with prostate volume, and can be considered significant cause of LUTS in men often irrelevant to BPH.

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