Dynamic Trans-rectal Sonography: A Valuable Tool for both Diagnosis and Tailoring Therapy for Urinary Incontinence after Prostate Cancer Treatment

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Introduction

Current guidelines recommend definitive treatments for prostate cancer, including radical prostatectomy, radiation therapy, and focal therapy like High-Intensity Focus Ultrasound (HIFU). However, these treatments often result in distressing urinary incontinence. Factors contributing to post-prostatectomy incontinence include age, urethral length, prior procedures, nerve preservation, and surgical techniques. Yet, these anatomical factors can change after surgery, making a single strategy ineffective.

Pelvic floor muscle training (PFMT) is crucial for managing post-prostatectomy incontinence (PPI). However, conflicting PFMT methods yield differing results due to variations in study approaches and factors such as incontinence severity. Urodynamic studies, while helpful, are too invasive for initial diagnosis, necessitating a less invasive diagnostic tool for tailored PFMT.

This study employs post-operative dynamic trans-rectal sonography to assess stress urinary incontinence (SUI) components and severity, guiding personalized PFMT. This approach, less invasive than alternatives, can customize treatment for urinary incontinence after prostate cancer procedures.

Methods and Materials

Patients with distressing urinary incontinence post-prostate cancer treatment were referred to our **Uro-rehabilitation team** for intensive PFMT. This prospective clinical trial enrolled consecutive patients from **January to March 2023**. **Dynamic trans-rectal sonography** assessed **pelvic floor support** and **urethral competence during rest, cough,** and **strain**. Additional evaluations included **anal manometry** and **other pelvic floor parameters**. The **standard PFMT program** involved **six weekly sessions** of **vision-guided biofeedback** and **trans-anal electrical stimulation**. Incontinence severity was gauged with the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (**ICIQ-UI SF**) and **daily pad count**. Patient profiles were obtained through chart review.

Results

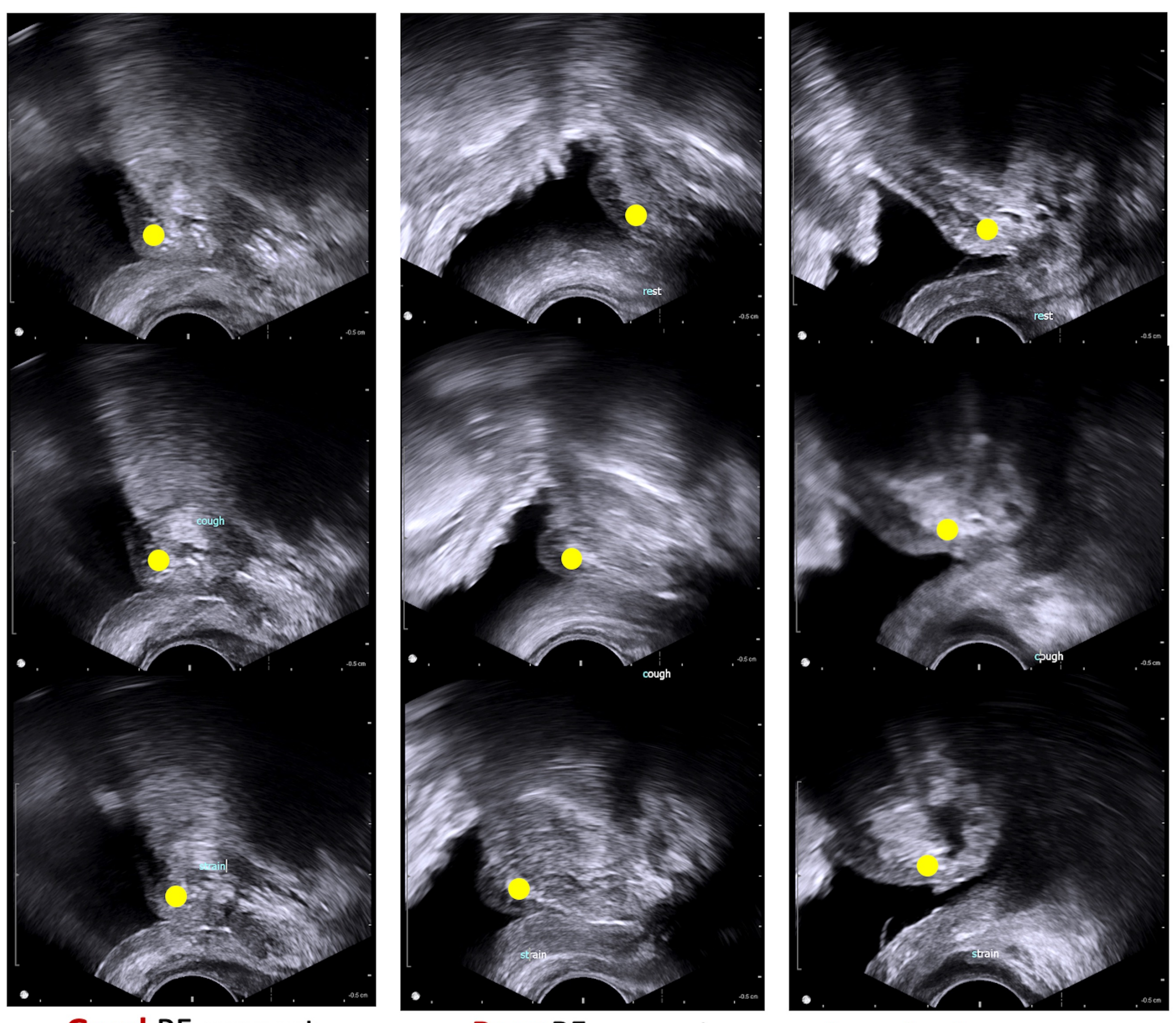
Ten patients completed six intensive PFMT sessions during the study period. Patient characteristics are outlined in Table 1. Ultrasound results were divided into two stress urinary incontinence components: **intrinsic sphincteric deficiency (ISD) presence** and **impaired pelvic floor support degrees** (Fig. 1). Median age at definitive prostate therapy was **66 years** (IQR 62-74), with a median time of **10 months** (IQR 3-24 months) from prostate surgery to PFMT. Among them, eight patients underwent robotic radical prostatectomy (six conventional, two Retzius-sparing), and the remaining two received HIFU therapy.

Fig 1. Different phenotypes in the dynamic trans-rectal sonography amoung patients with post-prostatectomy incontinence

Rest

Cough

Strain



Pelvic Floor Support | **Good** PF support | **Poor** PF support | **Impaired** PF support
ISD | ISD(-) | ISD(-) | ISD(+)

Table 1. The characteristics of the patients

	Patients with UI received PFMT (n=10)
Age when received prostate treatment (year-old)	66 (62-74)
Age when received PFMT (year-old)	66.5 (66-75.8)
Period from prostate treatment to intensive PFMT(mont	10 (3-24)
Prostate size (gm)	33.5 (23.8-40.9)
PSA when diagnosed with prostate cancer (ng/ml)	9.1 (5.4-11.0)
Gleason score	
GS=7	6 (60%)
GS=8	2 (20%)
GS=9	2 (20%)
T stage	
cT2c (in HIFU patients)	2 (20%)
pT2	6 (60%)
pT3a	2 (20%)
Type of definite treatment for prostate cancer	
Robotic radical prostatectomy-Conventional	6 (60%)
Robotic radical prostatectomy-Retzius sparing	2 (20%)
HIFU	2 (20%)
Significant improved UI after PFMT	7 (70%)
Baseline functional transrectal sono	
Pelvic floor movement in stress test (cm)	0.8 (0.6-1.2)
Severity of urethral imcompetence	
Mild	5 (50%)
Moderate	2 (20%)
Severe	3 (30%)
ICIQ-SF	
Baseline ICIQ-SF	
Q3 (frequency of UI)	5 (4-5)
Q4 (severity of UI)	6 (4-6)
Q5 (QoL of UI)	8 (7-10)
Total score	19 (15-21)
Post-PFMT ICIQ-SF	
Q3 (frequency of UI)	4 (4-4)
Q4 (severity of UI)	4 (2-4)
Q5 (QoL of UI)	6 (5-8)
Total score	16 (11-17)
Change of ICIQ-SF	
Q3 (frequency of UI)	-1 (-1 to 0)
Q4 (severity of UI)	-2 (-2 to 0)
Q5 (QoL of UI)	-2 (-3 to -1)
Total score	-4 (-8 to -1)
OAB/UUI	
Basline OAB/UUI	6 (60%)
Post-PFMT OAB/UUI	3 (30%)
Pelvic floor evaluation	
Baseline pelvic floor parameter	
IAS length (cm)	3 (2.8-3.1)
Oxford muscle power	2 (2-2.5)
Manometry-maximum (mmHg)	20.2 (16.3-21.4)
Manometry-mean (mmHg)	2.5 (1.8-3.6)
After intensive PFMT	
IAS length (cm)	3.5 (3.3-3.6)
Oxford muscle power	3 (2.5-3)
Manometry-maximum (mmHg)	33.2 (28.9-56.7)
Manometry-mean (mmHg)	7.4 (5.1-10.2)
Change of Pelvic floor parameter	
IAS length (cm)	0.7 (0.5-0.8)
Oxford muscle power	1 (0.5-1)
Manometry-maximum	17.1 (8.7-33.4)
Manometry-mean	3.2 (2.9-6.7)

Values are expressed as median (IQR) or number (percentage)

Abbreviation: **GS**, Gleason Score; **HIFU**, High Intensity Focus Ultrasound therapy; **IAS**, internal anal sphicter length; **ICIQ-SF**, International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form; **ISD**, intrinsinc sphincter deficiency

Discussion

Of the **seven** patients who experienced a remarkable reduction in daily pad usage (≥ 3pads/day), three achieved **complete** continence without protective pads. Their baseline sonographic findings showed less intrinsic sphincteric deficiency (ISD) severity and impaired pelvic floor support.

However, the remaining **four** patients still needed 1-3 pads daily after completing six sessions of intensive PFMT. Their baseline dynamic trans-rectal ultrasound showed more severe ISD and pelvic floor hypermobility in these four patients, which helped predict the need for prolonged pelvic floor rehabilitation and further treatment when patient counseling before initiation of intensive PFMT.

Among the **three** patients who continued using > 4pads daily, **one** still had **severe ISD due to HIFU** and **salvage radiation therapy**. The other **two** patients who still had **severe PPI** showed **much-improved** ISD and pelvic floor support in dynamic sonography but had **urge urinary incontinence (UUI)**. Video-urodynamic tests confirmed **no more SUI** but **marked detrusor overactivity** with UUI in these two patients, and further strategies for UUI were offered to them.

Conclusions

Post-prostatectomy incontinence is a complex condition that can be caused by intrinsic sphincteric deficiency, impaired pelvic floor support, and urge urinary incontinence. **Dynamic trans-rectal sonography** is a **feasible** and **less invasive tool** for **identifying the specific components of PPI** and providing valuable information for **developing individualized continence programs.**

References

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