

Brief Research Report

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# Introduction of free-hand MRI-guided transperineal prostate biopsies as an outpatient procedure

Torben Brøchner Pedersen<sup>1, 2</sup>, Stefan Tiessen<sup>1</sup>, Jens Karstoft<sup>3</sup> & Mads Hvid Poulsen<sup>1</sup>

1) Department of Urology, Odense University Hospital, 2) Department of Clinical Research, University of Southern Denmark, 3) Department of Radiology, Odense University Hospital, Denmark

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**ABSTRACT**

**INTRODUCTION.** Direct biopsy of the prostate is used for diagnosing prostate cancer and most prostate biopsies are performed transrectally with ultrasonic guidance (TRUS-BX). The transrectal approach carries a risk of sepsis as bacteria may transfer directly into the prostate from the rectum. Approximately 6% of the patients will be hospitalised within seven days after TRUS-BX. Increasing antibiotic resistance has spurred a renewed interest in the transperineal approach (TP-BX). Aseptic TP-BX may be performed, significantly reducing the risk of infection. We described the first Danish experience with multiparametric MRI-guided freehand TP-BX.

**METHODS.** Men scheduled for TP-BX were included. Patient age, prostate-specific antigen level, previous biopsy history, weight and height were recorded. We employed a visual analogue scale (VAS) for the various procedure parts and the patients rated their satisfaction. Complications and International Society of Urological Pathology scores were recorded and cancer detection rates calculated.

**RESULTS.** A total of 143 men had TP-BX performed in a consecutive series. The cancer detection rate was 81.8% (95% confidence interval: 74.5-87.8%). The procedure was well tolerated with a median VAS of 2 (range: 0-7), and patients expressed a high degree of satisfaction with the procedure. One patient was hospitalised due to infection.

**CONCLUSION.** TP-BX is well tolerated and feasible as an outpatient procedure performed in local anaesthesia. Transperineal biopsies have a low risk of infection.

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Prostate cancer (PC) is the second most prevalent solid tumour cancer disease among men globally, surpassed only by lung cancer [1]. With a rapidly ageing population, the incidence is expected to rise significantly. Curative treatment is possible but requires establishing an early diagnosis. The current standard of care for diagnosing PC in Denmark is multiparametric MRI (mpMRI)-guided transrectal ultrasonic biopsies (mpMRI-TRUS-BX). mpMRI offers excellent sensitivity and specificity for the detection of PC, and the introduction of mpMRI in the diagnostic pathway has likely reduced the number of biopsies performed [2].

Nevertheless, histopathological confirmation of suspected PC remains mandatory before curative treatment. The use of prophylactic antibiotics reduces the risk of potentially fatal sepsis, but TRUS-BX still entails a significant

risk of infection [3]. Among procedures conducted on Danish men diagnosed with PC, 6% will require hospitalisation within seven days of biopsy, thus placing a substantial burden on the healthcare systems and contributing to increased morbidity [4]. Contrary to mpMRI-TRUS-BX, mpMRI-guided transperineal biopsies (mpMRI-TP-BX) may be performed without perforating the rectal wall, thereby reducing the risk of infection [5]. As the first clinical department in Denmark, we hereby present our initial experience with mpMRI-TP-BX.

## METHODS

Patients initially scheduled for mpMRI-TRUS-BX were offered mpMRI-TP-BX instead. The biopsy procedure was performed by the first or second author. The ten first patients were administered a single dose of antibiotics (amoxicillin with clavulanic acid and pivmecillinam), but subsequent biopsies were performed without any antibiotic prophylaxis [6]. Patients were placed in the lithotomy position with the scrotum elevated by a pair of single-use mesh underwear that was cut open to expose the perineum. The perineal skin was disinfected and then anaesthetised with a subcutaneous injection of approximately 10 ml of lidocaine 10 mg/ml using a 23-gauge subcutaneous needle. A biplane ultrasound transducer was subsequently inserted into the rectum, visualising the prostate. A 19-gauge spinal needle injected a further 10 ml of lidocaine below and above the levator ani muscle just laterally from the midline [7]. Software registration with an integrated fusion system was used to fuse mpMRI prostate contours with ultrasonic imaging. A 17-gauge coaxial needle was then introduced below the prostatic capsule, and a Medax 18-gauge biopsy needle was placed inside. Three to five biopsy cores were taken per mpMRI lesion. Targeted biopsies were not combined with systematic biopsies. Immediately after the procedure, patient pain was assessed utilising the 11-point visual analogue scale (VAS) (0: no pain to 10: severe pain). Patients were asked to rate their pain during the procedure steps. A week after the procedure, the patients were requested to complete a questionnaire addressing post-procedural discomfort and any complications. Histopathology reports were registered. p values and 95% confidence intervals (CI) were calculated using a two-sided exact binomial test unless otherwise stated.

## RESULTS

A total of 143 men were offered prostate biopsies using the transperineal approach between January 2022 and August 2022. Patient consent was obtained prior to inclusion. A detailed population description is available in **Table 1**. One procedure was aborted due to pain causing only one biopsy core to be obtained. The remainder of commenced procedures were completed. Representative prostate tissue was obtained from all but one patient. We report one admission due to sepsis within the first seven days after the procedure. This patient had not been administered antibiotics before the biopsy, and we suspect an accidental rectal perforation may have been the cause as ultrasonic visualisation was poor.

**TABLE 1** Patient characteristics grouped by International Society of Urological Pathology grade of transperineal biopsy results.

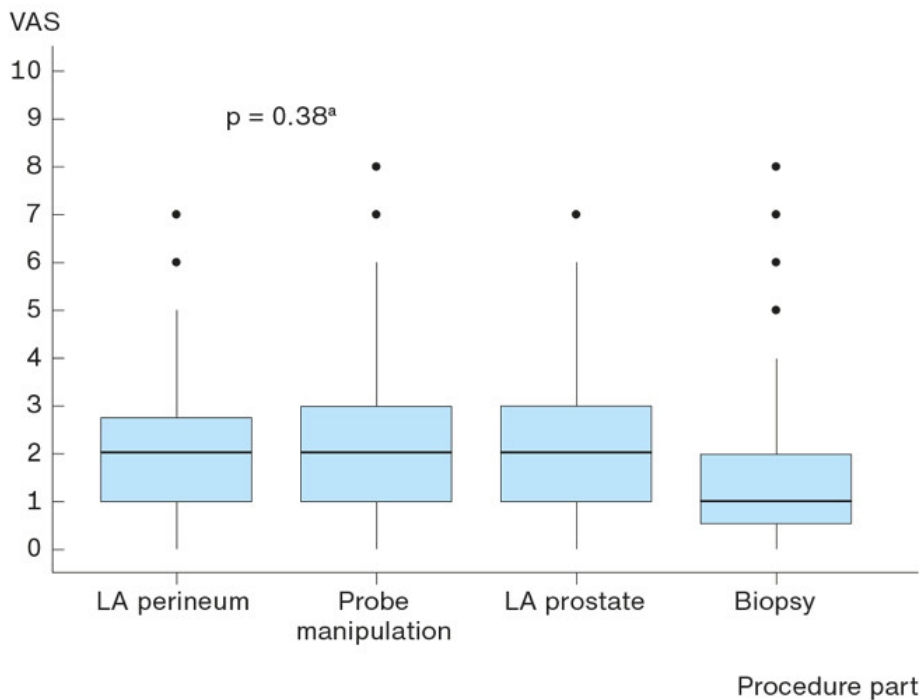
	Total (N = 143)	Negative (n = 26)	ISUP 1 (n = 18)	ISUP ≥ 2 (n = 99)
<i>Age, yrs</i>				
Min.	53.1	55.2	53.4	53.1
Median (IQR)	69.2 (64.2-72.9)	67.3 (58.9-71.6)	68.0 (62.7-72.1)	70.0 (65.9-73.6)
Max	77.9	76.5	77.9	77
<i>Biopsy history, n (%)</i>				
Biopsy naïve	75 (52.4)	15 (57.7)	5 (27.8)	55 (55.6)
Previous negative	11 (7.7)	4 (15.4)	2 (11.1)	5 (5.1)
ISUP 1	43 (30.1)	6 (23.1)	9 (50.0)	28 (28.3)
ISUP 2	9 (6.3)	1 (3.8)	1 (5.6)	7 (7.1)
ISUP 3	5 (3.5)	0	1 (5.6)	4 (4.0)
<i>PSA concentration, ng/ml</i>				
Min.	3.3	3.4	5.1	3.3
Median (IQR)	8.9 (6.7, 14.0)	8.2 (6.1, 9.6)	7.2 (5.5, 9.2)	10.0 (7.1, 19.0)
Max	83	14	18	83
<i>Prostate volume, ml</i>				
Min.	8.8	21.5	11.4	8.8
Median (IQR)	44.0 (31.3-58.6)	51.7 (37.7-65.5)	48.7 (34.2-59.4)	41.2 (30.7-56.2)
Max	169	101.7	123.6	169
<i>PSA density, ng/ml<sup>2</sup></i>				
Min.	0.04	0.05	0.07	0.04
Median (IQR)	0.22 (0.15-0.35)	0.16 (0.13-0.19)	0.17 (0.12-0.24)	0.25 (0.18-0.41)
Max	3.46	0.5	0.47	3.46
<i>PI-RADS, n (%)</i>				
3	13 (9.1)	6 (23.1)	1 (5.6)	6 (6.1)
4	70 (49.0)	15 (57.7)	10 (55.6)	45 (45.5)
5	60 (42.0)	5 (19.2)	7 (38.9)	48 (48.5)
<i>Lesions/patient, n</i>				
Min.	1	1	1	1
Median (IQR)	1 (1-1)	1 (1-1)	1 (1-1)	1 (1-1)
Max	4	2	4	3
<i>Biopsy cores/patient</i>				
Min.	1	1	4	3
Median (IQR)	4 (4-5)	4 (4-5)	4 (4-5)	4 (4-5)
Max	7	7	7	7
<i>Primary MR lesion longest diameter, mm</i>				
Min.	7.2	9.09	7.78	7.2
Median (IQR)	15.6 (11.9-20.2)	14.5 (12.5-17.7)	14.1 (10.7-19.1)	16.0 (11.9-24.2)
Max	61.46	32.42	33.98	61.46
<i>Length of representative prostate tissue, mm</i>				
Min.	1	1	1.5	20
Median (IQR)	47.0 (35.5-57.5)	46.0 (26.5-54.5)	40.5 (30.0-54.5)	49.0 (39.0-58.5)
Max	102	88	102	84
<i>Carcinoma biopsy involvement, mm</i>				
Min.	1	-	1	1
Median (IQR)	20.5 (11.0-37.0)	-	5.0 (1.3-15.0)	28.0 (13.5-39.9)
Max	74	-	46	74

IQR = interquartile range; ISUP = International Society of Urological Pathology; PI-RADS = Prostate Imaging - Reporting and Data System; PSA = prostate-specific antigen.

Nevertheless, this is equivalent to a 0.7% (95% CI: 0.02-3.83%) one-week admission rate, which is significantly better than the 5.7% average rate in men diagnosed with PC in Denmark (p = 0.0035) [4]. Haemospermia (n = 36), haematuria (n = 24) and voiding difficulties were other reported complications (n = 2). For cancer with an International Society of Urological Pathology score above 1, the detection rate was 69.2% (95% CI: 61-76.7%). Target lesions were located exclusively in the anterior part of the prostate in 54 patients, in the posterior part in 59 patients and in both in 29 patients. Most patients were biopsy naïve (n = 75), followed by active surveillance patients (n = 43) and previously biopsy-negative patients (n = 11). The detection rate for active surveillance patients was 87.7% (95% CI: 76.3-94.9%). The procedure was well tolerated with a median visual analogue scale

(VAS) score of 2 (range: 0-7). No statically significant differences were observed in pain between the different procedure parts (Figure 1).

**FIGURE 1** Visual analogue scale (VAS) at the various procedure steps. Tukey box plot.



LA = local anaesthesia.

a) p value computed by the Kruskal-Wallis rank-sum test.

## DISCUSSION

Increased antibiotic resistance has resulted in the transperineal biopsy again receiving attention, which has contributed to its rapid reintroduction. The European Association of Urology recommends transperineal over transrectal biopsies because the risk of infection is reduced [8]. We reported a low rate of post-biopsy sepsis, which is in line with findings published in a recent literature review by Szabo [5]. Szabo reported zero sepsis cases in 7,396 transperineal biopsy procedures performed without sedation or general anaesthesia. The same review reported a risk of acute urinary retention (AUR) of 1.4% when limited to a subgroup of patients who had fewer than 16 biopsy cores (36/2,575). Zero patients experienced AUR in the first seven days after a biopsy. However, some patients complained of transient voiding difficulties. We did not register procedure duration, but initially we allocated more than an hour for the entire session in our outpatient clinic. This was later reduced to 45 minutes per session, as nursing staff and urologists became more familiar with the procedure.

We routinely allocate 30 minutes for conventional mpMRI-TRUS-BX, and we are confident that time expenditure may be reduced further for the TP-BX procedure. The procedure was well tolerated by the patients as seen by the low reported VAS score. VAS scores were comparable to scores reported from studies on TRUS-BX and TP-BX [9, 10]. Transperineal biopsies performed using a coaxial needle may markedly reduce pain scores [11]. Opponents to transperineal biopsies argue that they are more demanding and that the procedure is associated with a steeper

learning curve than conventional biopsies. Transperineal biopsies are arguably more technically challenging; but the authors feel that after ten procedures, one achieves a good basic proficiency. Both urologists performing the procedures had more than ten years of experience in transrectal prostatic ultrasound. For trainees without prior biopsy experience, Ito et al. found that 30-50 cases are probably needed to achieve the same procedure times as more senior urologists [12].

## CONCLUSION

The present study confirmed mpMRI-TP-BX as a safe and feasible procedure with a low risk of infection. Transperineal biopsies were well tolerated and may readily be performed under local anaesthesia in an outpatient setting. The transperineal approach is slightly more technically challenging but offers improved patient safety.

**Correspondence** *Torben Brøchner Pedersen*. E-mail: [Torben.b.pedersen@rsyd.dk](mailto:Torben.b.pedersen@rsyd.dk)

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