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Transrectal ultrasonography in male subfertility patients: an intra- and interobserver study

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Abstract The purpose of this paper was to examine whether ultrasound abnormalities of the prostate and seminal vesicles, which may be related to male accessory gland infection, are reproducible. Forty-seven men attending an infertility clinic were studied. Imaging findings of transrectal ultrasonography were recorded. Kappa (κ)-values to determine the intra-and inter-observer variation were assessed. Calcifications have good intra-observer ($\kappa = 0.77$; 95% CI: 0.59–0.96) and good inter-observer reproducibility ($\kappa = 0.73$; 95% CI: 0.54–0.93). Dilatation of the peri-prostatic plexus had moderate intra-observer ($\kappa = 0.57$; 95% CI: 0.33–0.80) and good inter-observer reproducibility ($\kappa = 0.74$; 95% CI: 0.55–0.94). Other ultrasound abnormalities of the prostate were not reproducible. None of the ultrasound abnormalities of the seminal vesicles were reproducible. In our study the prevalence of ultrasound abnormalities which may be related to male accessory gland infection was as high as 96%. However, only calcifications and dilatation of the venous plexus had good reproducibility. Other observed ultrasound abnormalities of the prostate and seminal vesicles were poorly reproducible and are therefore of no use in the diagnosis of male accessory gland infection.

Key words Transrectal ultrasonography · Intra- and interobserver variation · Male infertility · Male accessory gland infection

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Introduction

Transrectal ultrasonography (TRUS) has proven its usefulness in the diagnosis of benign prostatic hyperplasia and prostatic carcinoma [13]. In male infertility, TRUS can be used to detect and evaluate the treatment of ejaculatory duct obstruction and to demonstrate congenital hypoplasia of the seminal vesicles [12, 7].

The role of TRUS in the diagnosis of inflammation of the prostate and seminal vesicles is still controversial. Many ultrasonographic abnormalities such as capsular thickening, calcifications, dilatation of the peri-prostatic venous plexus, edema of the bladder neck, and enlargement and cystic formation in the seminal vesicles are said to be characteristic findings in male accessory gland infection [4–6, 9, 10, 14–16]. However, most of these ultrasound abnormalities are not well defined. Furthermore, certain ultrasonographic features that were said to be typical in patients with prostatitis were also found in prostates of healthy men [14].

Male accessory gland infection may be associated with poor semen quality and male infertility [1–3, 17]. TRUS may be of value in the diagnosis of accessory gland infection in male subfertility patients. However, before the accuracy of TRUS can be studied in the diagnosis of male accessory gland infection in a subfertility population, the intra- and interobserver variation of the above-mentioned ultrasonographic abnormalities has to be determined [11].

The objective of this study was, therefore, to determine the reproducibility of these ultrasonographic features.

Material and methods

Between November 1995 and April 1996 we asked a cohort of 47 men of subfertile couples, who consecutively presented at the Center for Reproductive Medicine of the Academic Medical Center in Amsterdam, to participate in the study. These men were included in the study whether they had accessory gland infection or oligo-

astheno-teratospermia. This study was carried out as part of a study in the detection of sexually transmitted disease as a cause of male infertility. Approval by the Institutional Review Board of our hospital was obtained. All patients gave written informed consent.

Prostate specific antigen values in serum were measured (hybritech test) to exclude prostatic carcinoma. All patients had a TRUS. All examinations were performed with a 7.5-Mhz probe (Brüel & Kjær, Nærum, Denmark). The prostate was scanned in the transverse and sagittal planes. Calcifications were defined as hyperechogenic areas with an ultrasonic shadow. There are no strict definitions of dilatation of the peri-prostatic plexus, thickening of the prostatic capsule and edema of the bladder neck. If the periprostatic plexus, the prostatic capsule, or the region of the bladder neck were more prominent compared to normal ultrasonographic findings, they were recorded as abnormal. The seminal vesicles were also scanned in the transverse and sagittal planes. Cysts, the presence of honeycomb structures due to septa inside the seminal vesicles that are not visible in normal seminal vesicles, calcifications, and dilatation of the venous plexus were recorded. Calcifications were defined as hyperechogenic areas with ultrasonic shadow and dilatation of the venous plexus was defined as a visible plexus. All examinations were done by one observer and recorded on videotape. Intraobserver variation was assessed in all patients using the videotape. For interobserver variation, two observers assessed all patients independently. Both observers were blinded to the results of the first scan and to the presence or absence of genital tract infections of the patient. Both observers were senior urological residents with similar experience and skills in TRUS. The data were analyzed by calculation of the Kappa-coefficient (κ) [8].

Results

The mean age of the patients was 34.2 years with a range from 24.8 to 51.7 years. The median PSA value was 1.4 ng/ml with a range from 0.5 to 11 ng/ml.

TRUS was well tolerated by all patients. No hypoechogenic lesions were observed.

The distribution of ultrasonographic findings of the prostate and seminal vesicles for both observers are shown in Tables 1 and 2.

In only two patients none of the above-mentioned ultrasound abnormalities could be found.

The reproducibility data are shown in Tables 3 and 4. In the present study calcifications had good reproducibility. Dilatation of the venous plexus had a moderate intraobserver and good interobserver reproducibility. Edema of the bladder neck and thickening of the prostatic capsule were not reproducible. None of the ultrasound abnormalities of the seminal vesicles were reproducible or the prevalence was too low to calculate a reliable kappa value.

Discussion

Our results show that calcifications and dilatation of the venous plexus are reproducible in male subfertility patients. This applies both for intra- and interobserver reproducibility. Ultrasound abnormalities such as edema of the bladder neck, thickening of the prostatic capsule, and the echogenic pattern of the prostate are not reproducible. Abnormalities of the seminal vesicles are not reproducible.

To our knowledge, no study has been done to assess the reproducibility of ultrasonographic features that may be associated with male accessory gland infection. Although we studied a small number of patients, the 95% confidence intervals of the κ-values are small enough to support our conclusions.

Poor agreement for the other ultrasonographic variables may be explained by the following. The borders of the prostatic capsule are not clearly defined. There are no data on the normal size of the prostatic capsule in healthy men or patients. The same applies for the size of the bladder neck. Strict criteria are also lacking for the ultrasonographic image of a honeycomb structure of the seminal vesicles.

Furthermore, measurements of these ultrasound abnormalities are dependent on the position of the probe and therefore may be different at each investigation.

Table 1 Frequencies of ultrasonographic abnormalities of the prostate (*TRUS* transrectal ultrasonography)

Ultrasound abnormality	TRUS observer I		Video observer I		Video observer II	
	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)
Calcifications	19	40	16	34	19	40
Dilatation venous plexus	26	55	28	60	24	51
Edema bladder neck	14	30	14	30	3	6
Thickening capsule	24	51	21	45	6	13

Table 2 Frequencies of ultrasonographic abnormalities of the seminal vesicles (*TRUS* transrectal ultrasonography)

Ultrasound abnormality	TRUS observer I		Video observer I		Video observer II	
	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)
Honeycomb left	8	17	3	6	6	13
Honeycomb right	8	17	1	2	6	13
Cystic lesion left	15	32	11	23	1	2
Cystic lesion right	14	30	12	26	1	2

Table 3 Kappa values of intra- and interobserver variation of ultrasonographic abnormalities of the prostate

Ultrasound abnormality	Intraobserver		Interobserver	
	kappa	(95% CI)	kappa	(95% CI)
Calcifications	0.77	(0.59–0.96)	0.73	(0.54–0.93)
Dilatation venous plexus	0.57	(0.33–0.80)	0.74	(0.55–0.94)
Edema bladder neck	0.59	(0.34–0.85)	0.01	(−0.24–0.26)
Thickening capsule	0.28	(0.00–0.55)	0.08	(−0.20–0.36)

Table 4 Kappa values of intra- and interobserver variation of ultrasonographic variables of the seminal vesicles

Ultrasound abnormality	Intraobserver		Interobserver	
	kappa	(95% CI)	kappa	(95% CI)
Honeycomb left	0.50	(0.08–0.91)	0.33	(−0.09–0.75)
Honeycomb right	0.19	(−0.36–0.74)	0.33	(−0.09–0.75)
Cystic lesion left	0.47	(0.18–0.76)	0.09	(−0.31–0.49)
Cystic lesion right	0.36	(0.05–0.67)	0.04	(−0.48–0.39)

Dilatation of the venous plexus and calcifications in the seminal vesicles were seen in low frequencies. Therefore no kappa values for these ultrasonographic variables could be computed. However, it is likely that these abnormalities, like calcifications and dilatation of the venous plexus in the prostate, have good reproducibility.

Other abnormalities associated with male infertility such as a müllerian duct cyst (prostatic utricular cyst) or hypoplasia of the seminal vesicles, were not seen in our study group.

We acknowledge that reviewing recorded ultrasonograms is not an ideal study design but in terms of patient acceptability it was the best alternative. Video recordings were standardized to prevent bias by focusing on abnormalities.

Three-dimensional ultrasound examinations and the use of automated analysis of ultrasonographic images may lead to a more reproducible assessment of prostate and seminal vesicles in the future. In conclusion, in our study the prevalence of ultrasonographic abnormalities that may be related to male accessory gland infection was as high as 96%. However, only calcifications of the prostate gland and dilatation of the venous plexus in male subfertility patients had good intra- and interobserver reproducibility. Other ultrasonographic abnormalities were poorly reproducible and are therefore of no value in the diagnosis of male accessory gland infection with TRUS.

The accuracy of TRUS using reproducible criteria as a diagnostic tool to select men with male accessory gland infection should be a subject for further study.

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