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The prostate exam

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Abstract

Objective: To help students, residents, and general practitioners to improve the technique, skills, and reproducibility of their prostate examination.

Methods: We developed a comprehensive guideline outlining prostate anatomy, indications, patient preparation, positioning, technique, findings, and limitations of this ancient art of urological evaluation.

Results: The prostate exam was the first diagnostic test used for prostate cancer screening and other urological conditions. Although several alternative procedures have been developed in the past century, the prostate exam is still an important part of genital–pelvic evaluation because of its simplicity, cost and time effectiveness, and relatively minimal patient discomfort experienced.

Conclusion: With an aging population and increasing incidence of prostate diseases, it is imperative that healthcare professionals possess the knowledge, skills, and attitudes to make the prostate exam a routine part of a complete physical examination.

Keywords

benign prostatic hyperplasia, diagnosis, differential, digital rectal examination, prostatic neoplasms, rectal palpation

Introduction

The prostate exam, called a digital rectal exam (DRE), or rectal examination in recent medical literature, has been used for centuries under the Latin term *palpatio per anum* or examination *per rectum*. Legend has it that Petroncellus of Salerno used the DRE to diagnose cancer in the 11th century, although it is not clear whether the cancer was rectal or prostatic;[1] and it was the only available diagnostic test for prostate cancer before 1920.[2] Since then, diagnostic procedures have

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increased in number, complexity, and expense, including prostatic acid phosphatase, carcinoembryonic antigen, prostate specific antigen (PSA), human kallikrein 2, prostate specific membrane antigen, transrectal ultrasound, isotope studies, and magnetic resonance imaging.[2] Although several of these procedures were expected to replace DRE, to this day DRE stands as an important part of genital–pelvic examination for the diagnosis of benign and malignant prostate diseases because of its simplicity, limited invasiveness that is well tolerated, and time and cost efficiency.

An effective DRE requires a meticulous, thorough, and skillful examination technique that is usually acquired only after a fairly long learning curve.[3] Although DRE is an essential part of any complete physical examination, and a particularly important element of urological study, it has only fair reproducibility in the hands of experienced examiners.[4] More practice and greater experience certainly contribute to exam expertise,[4] but sharing knowledge through lectures,[3] books, and articles is a helpful and effective method for improving skills and accelerating experience.[5] For this reason, we developed a detailed guideline reviewing prostate anatomy, exam indications, patient preparation, patient positioning, technique, range of findings, and limitations of DRE to assist in the teaching of medical students, residents, and general practitioners.

Anatomy

The prostate is a compound tubuloalveolar exocrine gland of the male reproductive system weighing an average of 20 to 30 grams and measuring 4 × 3 × 2cm.[6] The function of the prostate gland is to store and secrete a slightly alkaline fluid, milky or white in appearance, that helps carry and nourish sperm and constitutes about 25 per cent to 30 per cent of the volume of semen.

It is located in the pelvic cavity, below the lower part of the symphysis pubis, above the superior fascia of the urogenital diaphragm, surrounding a segment of the urethra just below the urinary bladder (prostatic urethra), and anterior to the rectum,[6] through which it may be reliably examined; the posterior surface of the prostate is distant about 4cm from the anal verge, and only the Denonvillier's fascia and some loose connective tissue separate it from the examiner's finger.

For purposes of description, the prostate can be divided into surfaces: base, apex, anterior, posterior, and lateral surfaces; lobes: anterior (isthmus), median, posterior, and lateral lobes; or zones: peripheral, central, transition, and anterior fibromuscular (or stroma) zones (Figure 1).[6]

Indications

DRE should be performed on every male after age 40 and in men of any age who present for urologic evaluation.[4] Specific indications are as follows:

Prostate cancer screening

Given the uncertainty about the benefits of population-based screening, several medical agencies and organizations around the world support informed decision making about prostate cancer screening, providing individual patients with current information about the benefits and risks of screening – including overdiagnosis and overtreatment – so that each man can make his own decision.

For those well-informed men who wish to be tested for prostate cancer, it is recommended that screening with DRE and serum PSA determination should be offered annually beginning at age 45 to men who have at least a 10-year life expectancy. African American men and/or those with one or more first degree relatives (father or brothers) diagnosed with prostate cancer before age 65 should begin screening at age 40.

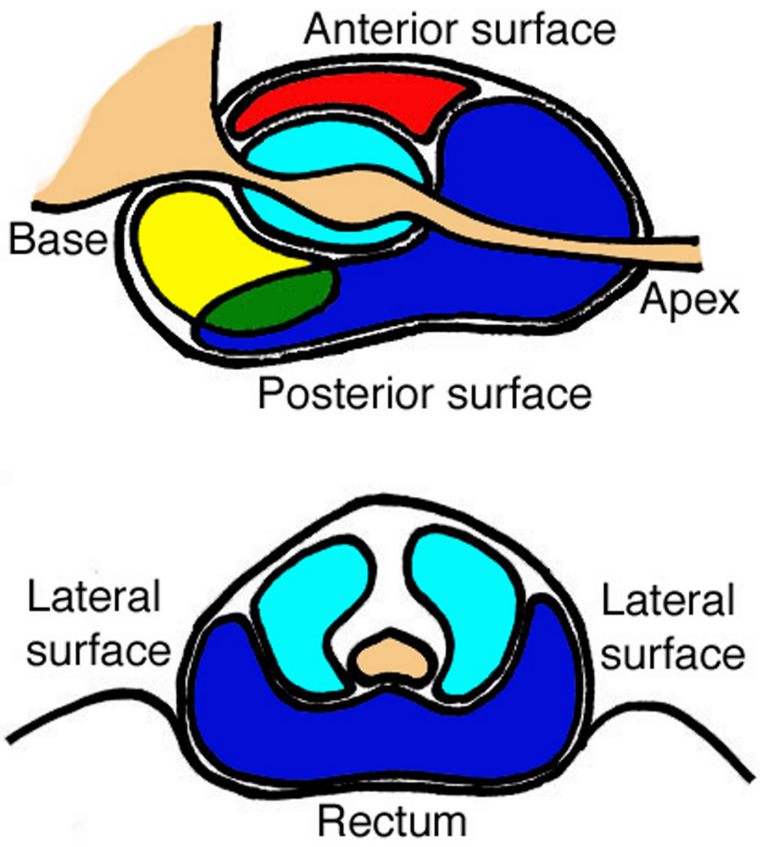

Figure 1. Anatomy of the prostate gland. Anatomical zones of the prostate: anterior fibromuscular zone (red); transition zone (light blue); central zone (yellow); peripheral zone (dark blue) – note that most of the peripheral zone is available for examination through the rectum.

Lower urinary tract symptoms

DRE is important in the differential diagnosis of lower urinary tract symptoms. It may provide clues toward the diagnosis of benign prostatic hyperplasia (BPH), prostate cancer, prostatitis, and neurogenic disease. When programming surgical treatment for BPH, DRE may indicate what type of surgical therapy is warranted (open or endoscopic treatment) based upon prostate size.[4]

Staging of prostate cancer

The tumor, node, metastasis (TNM) staging system for prostate cancer is summarized in Figure 2.[7]

Unknown primary neoplasm with signs of metastatic disease

Although prostate cancer rarely presents as unknown primary carcinoma, patients with blastic skeletal metastases, suspicious DRE, and/or elevated PSA should be investigated for prostate cancer.[8]

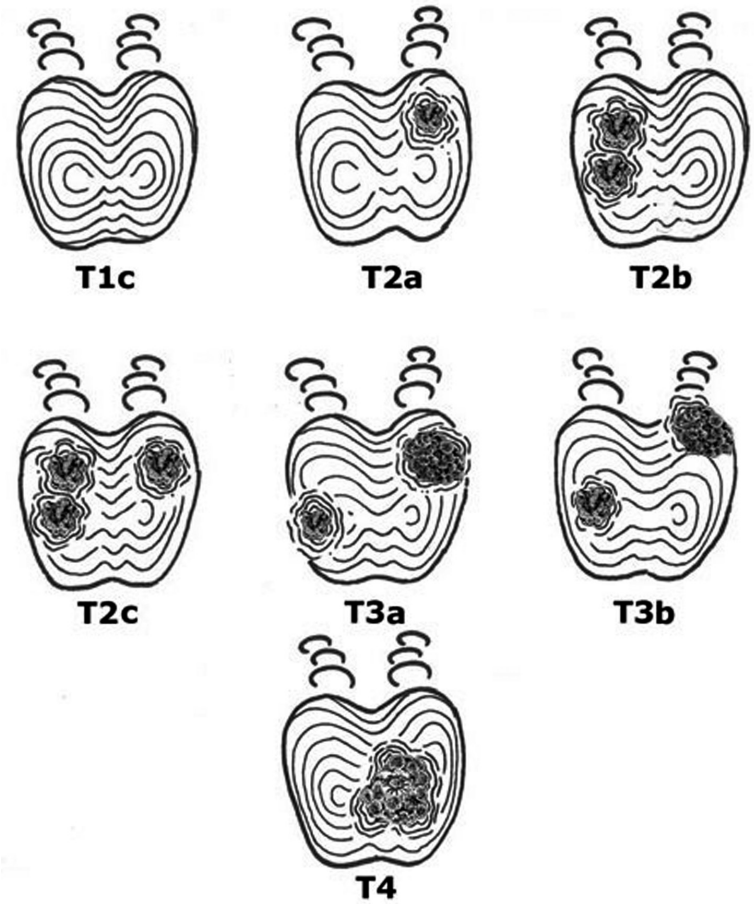

Figure 2. Clinical staging of prostate cancer. T1c: Tumour identified by prostate needle biopsy due to elevation in PSA only. The tumour is clinically inapparent, neither palpable by DER nor visible by imaging; T2: Tumour confined within prostate; T2a: Tumour involves one-half of one lobe of the prostate or less; T2b: Tumour involves more than one-half of one lobe of the prostate, but not both lobes; T2c: Tumour involves both lobes of the prostate; T3: Tumour extends through the prostatic capsule: T3a: Extracapsular extension (unilateral or bilateral) including microscopic bladder neck involvement; T3b: Tumour invades seminal vesicle(s); T4: Tumour is fixed or invades adjacent structures other than seminal vesicles: external sphincter, rectum, levator muscles, and/or pelvic wall.

Urethral injury after pelvic fracture

When urethral disruption is suspected, DRE is mandatory, as it may reveal a 'high-riding' prostate, or blood in the stool in the presence of associated rectal injury.[4]

Active surveillance for prostate cancer

Monitoring prostate cancer post-radical prostatectomy

Contraindications

Unwilling patient

The rejection rate to DRE during prostate cancer screening was 8.2 per cent in one study.[9] Reasons for refusing DRE include absence of urological complaints, misconception that DRE adds nothing further to PSA testing especially if PSA is very low, lack of family history for prostate cancer, no previous history of DRE, anticipated pain and discomfort, fear of finding a cancer, and social and cultural beliefs.[9] Patients unwilling to undergo DRE should be scheduled for return visits and offered DRE in future consultations.

Latex allergy (use latex-free gloves)

Recent anal surgery or trauma

Recent myocardial infarction or intracranial hemorrhage

Severe rectal pain

Patient positioning

The most commonly advised positions for DRE are illustrated in Figure 3. Preferences vary individually according to each physician and their patients. In Brazil, more than half of urologists prefer examining their patients in the modified lithotomy position.[10] In the United States (US), DRE is more often performed in the standing-up position, while patients in the United Kingdom (UK) are usually examined in the left lateral position.[11] Frank et al compared the preference of patients between the standing position and the left-lateral position and found better patient acceptance with the standing up position.[12] Furlan et al reported that more than half of their patients preferred the modified lithotomy position.[13]

Despite preferences and potential advantages of each position, there is little evidence to suggest that positioning of the patient makes much difference in the diagnostic yield of DRE.[11] In some patients, however, especially in the presence of obesity, an exaggerated flexion of knees/hips may be necessary to allow for complete palpation of the prostate. In bedridden or very sick patients, DRE may be performed satisfactorily in dorsal *decubitus*, with the knee close to the examiner flexed and abducted; or in the lateral (Sims') position, with the upper knee flexed toward the patient's abdomen/chest.[14]

Patient instructions

Administering an effective DRE requires the integration of interpersonal, psychomotor, and cognitive skills involving adequate patient–physician rapport and communication, clear patient orientation and instruction about each part of the examination, and feedback to the patient regarding the findings of the examination.[3,5]

It is important to make the patient feel comfortable by performing DRE in a warm and reserved exam room with a toilet available if necessary, asking patient consent and informing previously how he will be positioned, and how the examination will occur. The patient should be informed what to expect, and the steps of examination should be explained to him while they are being performed.[3,9]

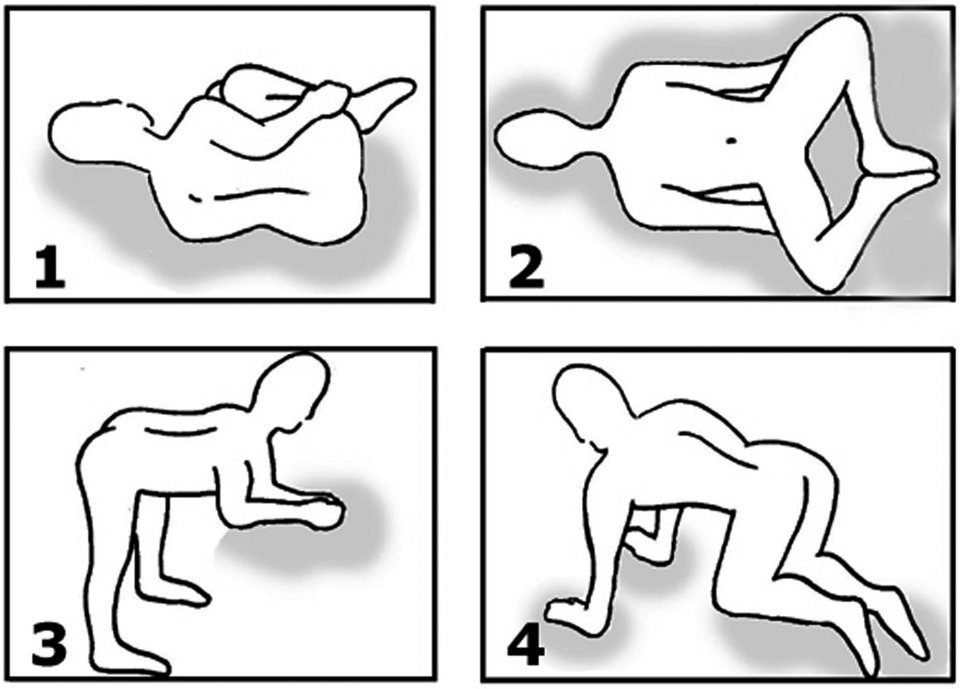

Figure 3. Patient positioning. (1) Left-lateral position: patient on his left-side with legs flexed toward the abdomen/chest; (2) Modified lithotomy position: patient lies on the back with his knees flexed, and hips flexed and abducted (variant of the lithotomy – or Loyd-Davis – position); (3) Standing-up position: patient standing up with heels slightly apart, toes turned in, and body leaning over the examining table on the elbows (variant of the standing elbow-knee position); (4) Kneeling while resting on the table with the hands (or elbows) (variant of the exaggerated knee-chest position).

Patients should empty their bladder before DRE because, if it does not relieve the discomfort,[15] a distended bladder may falsely indicate prostate enlargement,[14] especially when performing bimanual examination.[16]

After positioning, the patient is asked to breathe out slowly to relax the rectal sphincter muscle and is informed that a lubricated gloved finger will be introduced through his rectum to determine any irregularities on the prostate gland. He should be advised that mild to moderate discomfort may occur and that the urge to urinate is not unusual.[15]

The findings of examination are described to the patient, avoiding medical terms or language that he may not understand. This helps minimize physical and emotional discomfort, and allays patient anxiety. The patient should be advised before withdrawing the examining finger, and the colour of any fecal matter on the glove is documented.[3]

After the exam, tissue for removing jelly is offered, and the patient is asked if he wants to use the toilet before discussing the findings of the examination.[3]

Examination technique

Before performing DRE, the buttocks are gently spread apart and the sacrococcygeal and perianal areas are inspected for pathology such as melanoma, condilomas, anal fissures or fistulae, external hemorrhoids, anal prolapse, anal eczema, and bacterial or mycotic infection.[3,11,14]

The fingertip of the examiner is positioned at the entrance of the anus for a few seconds, applying gentle pressure against the anal sphincter reflex contraction. After the sphincter relaxes, when the patient is breathing out slowly, the examiner finger is slowly inserted all the way into the rectum with a slight rotation movement, and the entire circumference of the rectum is examined for any areas of irregularity in the rectal mucosa (internal hemorrhoids, rectal fistulae, polyps or carcinoma), and then pulled back to feel the prostate in the anterior rectal wall. Estimation of anal sphincter tone is of great importance. A flaccid or spastic anal sphincter suggests similar changes in the urinary sphincter and may be a clue to the diagnosis of neurogenic disease.[4,11] The patient can be steadied by the examiner's free hand,[17] which can also provide gentle counter pressure when necessary. The fingertip is positioned in the longitudinal groove (median sulcus) between the two lobes of the prostate and moved gently over one lobe before the other, mediolaterally and anteroposteriorly, to determine the shape and size of the prostate, consistency, symmetry, nodularity, sensitivity, and mobility.[17]

Findings

Shape and size

The normal configuration of the prostate is somewhat conical, and is usually described as having a chestnut, pear or heart shape, with an approximate weight of 20 to 30 grams. As the prostate grows larger, it tends to assume an elliptical configuration,[18] but it can show very different enlargement shapes caused by different patterns of lengthening along the three-dimensional prostate.[2] Even prostates with the same size can show different enlargement shapes because of their different proliferation characteristics,[2] resulting sometimes in asymmetric growth and intravesical projections.

The surface of the prostate is easily evaluated through DRE to determine the shape, whether rounded or flat, the depth of the lateral sulci, changes in the median sulcus and median notch, the accessibility of its upper limits to the tip of the examining finger, and the degree of its encroachment into the rectum, all of which also indicate relative changes in prostate size (Figure 4).[4]

Determination of prostate gland size and shape is important for BPH management since it influences the likelihood of having moderate to severe urinary symptoms, the risk of complications such as urinary retention, and the response to 5-alpha-reductase inhibitors. It is also helpful in surgical planning prior to transurethral or retropubic prostatectomy, brachytherapy, and radical prostatectomy.[18,19]

DRE is well known to underestimate large prostates and overestimate small glands.[19] Prostate size may be inaccurately assessed through DRE when prostate lobe protrusion occurs preferentially into the bladder or anteriorly toward the prevesical space. The size of prostate lobes on DRE is not a criterion as to the size of their protrusion into the bladder. When only the median lobe is enlarged, prostate assessment through DRE may be normal.[16] These shortcomings may occasionally be overcome by alterations in the position of the patient and by making the examination bimanual.[16] Transrectal ultrasound has been used as the criterion standard adopted for comparisons of prostate size estimation.[18,19] Although DRE can only approximately determine prostate shape and size, the degree of prostatic enlargement is of more practical interest than the precise estimate of prostate volume.[19]

Consistency

The consistency of the prostate may be elastic, hard, boggy, soft or fluctuant. The consistency of a normal prostate or an enlarged benign prostate is elastic or rubbery, similar to the consistency of the thenar eminence of a hand closed in a tight fist with the thumb folded into the palm (Figure 5).

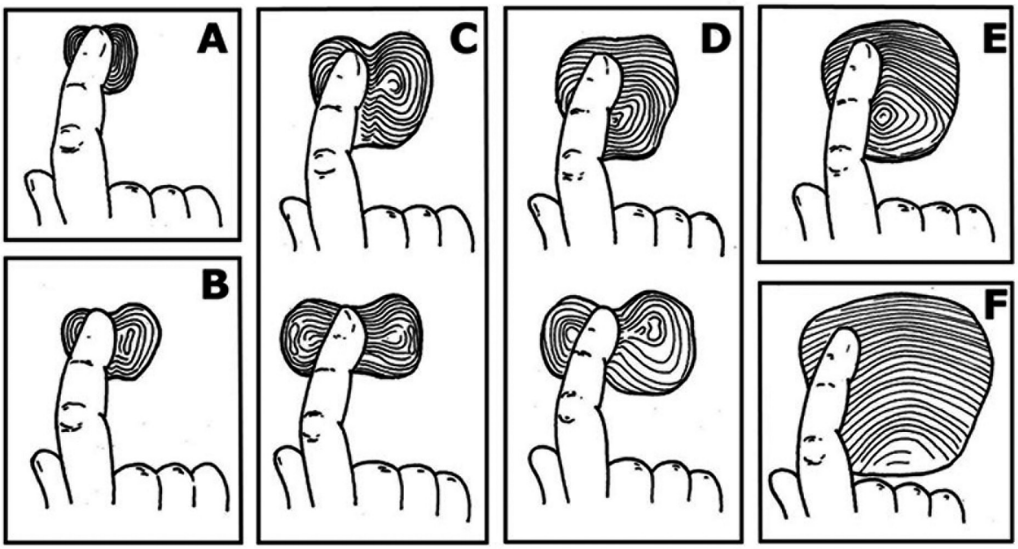

Figure 4. Determination of prostate size. (A) Normal prostate, Grade I (approximately 20g): Flat or slightly rounded surface, median sulcus usually unnoticed or shallow, superficial depth of lateral sulci, with approximately one fingertip length anteroposteriorly, and one fingertip mediolaterally; (B) Grade I/II prostate (approximately 30g): Surface of the prostate between Grade I, and Grade II; (C) Grade II (approximately 40g): Bilobar rounded surface, well-delimitated median sulcus, superficial/intermediary depth of lateral sulci, with approximately two fingertips of length anteroposteriorly, and one/one and a half fingertip mediolaterally (above), or one fingertip length anteroposteriorly, and two fingertips mediolaterally (below); (D) Grade II/III (approximately 50g): Rounded surface, partial obliteration of the median sulcus, intermediary depth of lateral sulci, with approximately the same length of a Grade II prostate (above), or an asymmetric surface with one lobe Grade II, and the other lobe Grade III (below); (E) Grade III (approximately 60g): Rounded surface, complete obliteration of the median sulcus, intermediary/deep depth of lateral sulci, with two fingertips anteroposteriorly, and two fingertips mediolaterally; (F) Grade IV (approximately 80g or greater): Rounded surface, complete obliteration of the median sulcus, deep depth of lateral sulci, with no accessibility of the upper limits of the prostate to the tip of the examining finger.

A hard consistency is the same of the consistency of the knuckle of the thumb (Figure 5), and it may be present as a discrete nodule, focal induration, or a diffusely hard prostate. A boggy consistency is similar to that of the thenar eminence when the fist is closed but relaxed. It may be palpable on BPH depending on the proportion of hypertrophied – glandular *versus* stromal – elements; when it is congested due to sexual abstinence or chronic inflammation with drainage deficiency; in acute prostatitis, when it is also exquisitely tender to touch and warm; and in prostatic sarcoma.[14] A localized soft or fluctuant region may represent a prostatic or perirectal abscess, for which surgical drainage is required.[4,14]

Symmetry

The halves of the prostate should be symmetric in both size and consistency.[20] While carcinomas arising in the transitional zone of the prostate often manifest as 'incidental' prostate cancers at transurethral or retropubic prostatectomy,[11,21] subtle findings such as asymmetry between prostate

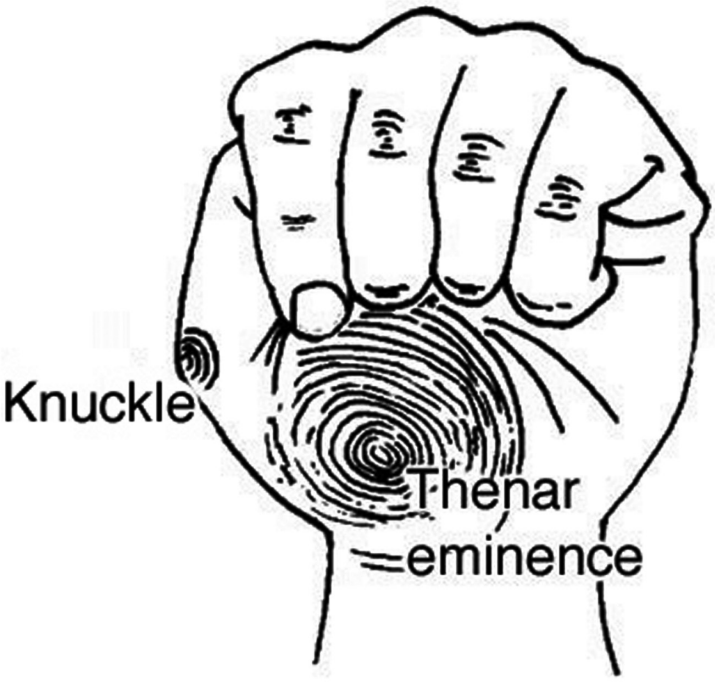

Figure 5. Prostate consistency.

lobes may also be suggestive of the presence of prostate cancer. For this reason, some consider prostate asymmetry as though it were a nodule, and an independent indication for prostate biopsy.[22] On the other hand, Hansen Jr. et al reported that an asymmetric prostate showed no increased risk of prostate cancer when compared with a normal DRE, concluding that observation without biopsy is safe in these patients. In the presence of elevated PSA, an asymmetric prostate would have intermediate cancer detection rates between those for a normal and a suspicious DRE.[23]

Nodularity

Prostate surface should be evaluated for smoothness, irregularity or nodulation. A normal prostate or an enlarged benign prostate surface should be smooth and regular. Prostate cancer usually presents as a stony hard nodule that is palpable on the periphery of the gland. The majority of prostate cancers arise from within the peripheral zone of the prostate, which comprises the posterior surface of the gland including the apical, lateral, posterolateral and anterolateral portions of the prostate. It is fortuitous that this part of the gland is accessible and hence is more likely to be palpable by DRE (Figure 1).[11,24]

Although an abnormal DRE may suggest the presence of prostate cancer, cancer can only be confirmed by the pathologic examination of prostate tissue (transrectal ultrasound-guided prostate biopsy).[11,21] Mean positive predictive value for DRE (i.e. the proportion of men with a positive DRE who actually have prostate cancer) is approximately 34 per cent. This means that when a

patient has abnormal DRE findings, the chance of having cancer is roughly one out of three.[25] Differential diagnosis include peripheral-zone calcifications, which are a common feature of BPH associated with chronic inflammation, especially granulomatous prostatitis;[11] midline prostatic cysts, usually due to seminal vesicle/ejaculatory duct anomalies (remnants of the Müllerian duct system); prostatic *calculi*; prostatic infarction; or a rectal wall phlebolith, polyp or tumour.[11] Nodules in the base of the prostate should be distinguished from a unilaterally distended seminal vesicle.

Tenderness

Several medical conditions may produce tenderness during DRE including anal stenosis, fissure, abscess and fistula, proctitis, prostatitis and prostatic abscess.[11,15] In the absence of organic disease, tenderness and discomfort may result from poor lubrication, which causes unnecessary friction between the gloved finger and the dry, sensitive rectal mucosa, and painful pulling of hair in the perianal region[14]; anal sphincter reflex contraction; and pressure to the prostate, seminal vesicles and bladder trigone, which are innervated by afferent branches of the visceral nervous system that transmit sensations of pain to branches of both the parasympathetic and sympathetic divisions of the autonomic nervous system.[15]

Romero et al reported that 61 per cent of patients undergoing DRE for prostate cancer with no clinical evidence of urinary tract infection or prostatitis complained of moderate to unbearable pain.[15]

Mobility

The prostate may be fixed in position by lateral adhesions following inflammatory/infectious disease, trauma, surgery, radiotherapy and/or hormone therapy, extraglandular infiltration in the presence of advanced prostate cancer, or it may be freely movable.[17]

Limitations

The limitations of DRE have been described at length and are generally well recognized.[16] Until 1980, DRE was the most efficient test for the diagnosis of prostate cancer.[2] Since the introduction of PSA for clinical use in 1985–6, there has been an observed increase in detection rates of prostate cancer and a higher proportion of early-stage disease at diagnosis compared with DRE-based screening. In both screened and non-screened populations, DRE misses 23 per cent to 45 per cent of prostate cancers that are subsequently found with biopsies done for serum PSA elevations.[4] These results reflect to some extent the high subjectivity, interindividual variability, and poor reproducibility of DRE;[4,11] the population studied (screening versus routine practice), since one might expect better performance criteria for DRE in patients seeking consultation because of lower urinary tract symptoms; and the stage of disease, because the certainty of diagnosis by DRE increases directly in proportion with the staging of prostate cancer.[21] Further, Nagler et al argued that DRE is a significant barrier to participation in prostate cancer screening and it may decrease prostate cancer detection rates by excluding nearly one quarter of potential participants.[26] In prostate cancer staging, DRE can both overestimate and underestimate the extent of disease.[4] The majority of palpable cancers are not early cancers and many clinically-important cancers are not palpable, especially those located in the transitional zone and anterior zone of the

prostate. DRE, however, is most important to determine which tumours may be amenable to excision.

Despite these limitations, it is still recommended that both DRE and PSA should be used during prostate cancer screening because up to 25 per cent of men with prostate cancer have PSA levels less than 4ng/ml.[4] DRE also detects more selectively high-grade (clinically significant) prostate cancers, and an abnormal DRE improves positive predictive value of an elevated PSA.[27]

Perspectives

Since the beginning of prostate cancer screening, healthcare providers have been searching for a procedure to replace DRE as a diagnostic tool to avoid discomfort, embarrassment and masculinity-related barriers.[28] While several procedures have failed to do so thus far, some have yet to prove whether they have better sensitivity, specificity, accuracy and precision at acceptable costs, while avoiding overdiagnosis and overtreatment of potentially indolent prostate cancers. Recent advances in genomics, proteomics, and cellular and molecular biology may improve how urologists diagnose and treat prostate cancer in the near future.

Conclusions

With an aging population and increasing incidences of prostate ailments, it is imperative that healthcare professionals possess the knowledge, skills, and attitudes to make DRE a routine part of a complete physical examination. DRE is important in differential diagnosis of lower urinary tract symptoms; it has important clinical and medico-legal implications in the suspicion of numerous conditions; it may easily assess the degree of prostate enlargement; and, although not suitable as a solitary screening tool, it increases both the chance of finding prostate cancer and detecting clinically-significant disease.

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