Transrectal ultrasound-guided biopsy of pelvic lesions

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Learning objectives

The aim of this study is to describe our experience with transrectal ultrasound (TRUS)-guided biopsy performed in men and women presenting with a pelvic perirectal lesion.

We will discuss the usefulness, indications and potential complications of TRUS-guided biopsy in diagnosis of pelvic lesions.

Background

In daily clinical practice, it is challenging to accurately diagnose suspected neoplasm in the small pelvis. Establishing the diagnosis requires a combination of clinical evaluation, diagnostic imaging and tissue sampling for histological evaluation.

Diagnostic imaging has become increasingly sensitive and specific for identifying small lesions and for distinguishing between benign tumor, malignancy and fibrosis. However, definitive cytological or histological diagnosis is required most of the times before starting treatments that can have significant risk or morbidity.

It is often difficult to obtain biopsy material of sufficient quality for pelvic extrarectal lesions with a minimally invasive technique.

Percutaneous biopsies assisted by either computed tomography (CT) or abdominal ultrasound (US) imaging have several limitations. The distance from the surface to the lesion can be considerable, which renders precise puncture difficult if not impossible. Tumors can be obscured by anatomic structures such as the uterus, adnexa, or bowels. Furthermore, patient discomfort and the risk of intraperitoneal infection are additional problems when this type of approach is used.

TRUS overcomes most of these restrictions and, most important, lesions can be biopsied under visual control rendering the procedure more controlled and safer.

TRUS is a well-established imaging technique for the evaluation of anorectal diseases, mainly in the preoperative staging of rectal cancer, and the use of TRUS-guided biopsy of the prostate gland has gained widespread acceptance in routine practice.

TRUS-guided biopsy is also useful in the assessment of perirectal pathology if the lesions are within the reach of the ultrasound probe. However, this technique remains unfamiliar and underutilized in the field of radiological oncology, with the exception of prostate carcinoma. There are only a few studies in the literature about application of TRUS-guided biopsy in patients with suspected nonprostatic extrarectal malignancy.
In this case series, we describe our experience at the Hospital Santiago Apóstol and the Instituto Valenciano de Oncología with TRUS-guided biopsies of pelvic lesions in 12 patients that were referred for the procedure to the department of Radiology. All of them had undergone prior different imaging techniques (US and/or CT) that demonstrated a solid pelvic lesion localized close to the rectum.

**Imaging findings OR Procedure details**

**Study population**

Between July 2009 and September 2010, we prospectively collected data from a total of 12 patients (9 women / 3 men) who underwent TRUS-guided biopsy at our institution. They had a median age of 63 years (range 38 to 83 years).

The population study was formed by seven patients who had a history of previous malignancy; there was one patient with ulcerative colitis, one patient with a history of cyanogenic cardiopathy and one patient with abnormal level of prostate-specific antigen (PSA). There were three patients who had a history of having received prior pelvic radiotherapy. Finally, two patients did not reveal any relevant medical antecedent.

The indication for the procedure was a suspicion of primary tumor (n=4), metastatic disease (n=4), recurrent tumor (n=2) and radiation fibrosis (n=1).

All of the patients had undergone prior different imaging techniques (US and/or CT) that demonstrated a solid pelvic lesion localized in close proximity to the rectum.

**Normal anatomy of the rectum**

The rectum is the final straight portion of the large intestine, terminating in the anus. The normal rectum is about 12 cm long and has a maximum diameter of 4 cm. It is covered by peritoneum anteriorly and laterally on the superior one third, and anteriorly on the middle one. The rectum is surrounded by fibrofatty tissue which contains nerves, blood vessels, lymphatics and lymph nodes. The lower one third of the rectum is related to the bladder, ureters, seminal vesicles, and prostate in men (Fig. 1) and to the vagina, uterus and cervix in women (Fig. 2).

**Transrectal ultrasound-guided biopsy protocol**
After informed consent was obtained, patients were prepared for the procedure with a cleaning enema and local application of an anesthetic gel (tetracaine) before the examination. The procedure included a digital rectal examination.

Patients routinely received a single-dose of oral antibiotic prophylaxis with fluoroquinolone (Ciprofloxacin) in order to avoid infectious complications.

Sedation with oral midazolam was necessary in only two patients who expressed their anxiety before the biopsy.

The procedure was carried out with patients in the lithotomy position (Fig. 3) using an 18-gauge biopsy gun (Magnum, Bard) guided by a ultrasound with a 2-dimensional 6 MHz intracavitary transducer with a special biopsy aid that allows precise positioning of the biopsy needle under constant ultrasound control (Fig. 4). A special biopsy software program activated a dotted line on the monitor, allowing exact visualization of the needle tract. On average, the procedure took from 15 to 20 minutes.

Patients were asked to remain in the unit for 30 minutes after the procedure to watch for immediate complications and delayed vasovagal reactions.

**Results**

In all patients, the suspected lesion was easily detectable by TRUS. The examinations were well tolerated and let us obtain at least three biopsy cores in each case. The number of cores amounted to an average of 4 (range 3 to 10).

Several minor complications occurred after the procedure consisting on mild haematuria (n=5) and autolimited rectal bleeding (n=4) which were managed conservatively.

All patients had a successful TRUS-guided biopsy on first attempt that provided adequate tissue for definitive pathological diagnosis and influenced patient management.

A large variety of diagnoses including primary and secondary malignancies, as well as tumor recurrence and benign pathologies, could be established (Table 1).

One case of cervical carcinoma (patient 1 [Fig. 6, 7]) and one perirectal manifestation of recurrent cervical carcinoma (patient 2 [Fig. 8, 9]) were diagnosed.

Patient 3 presented with unilateral obstructive uropathy at abdominal US. She had a history of prior pelvic radiotherapy due to cervical carcinoma. CT examination revealed a soft tissue presacral mass involving the right distal ureter. TRUS-guided biopsy confirmed the diagnosis of radiation fibrosis.
There was one patient (number 4) with a complex cystic and solid adnexal mass (Fig. 10, 11). Several core biopsies were taken of the solid component, yielding a diagnosis of recurrent ovarian cystadenocarcinoma.

Patient 5 had undergone previous surgery due to rectal carcinoma. The CT showed a focal wall thickening of the rectum that was biopsied using a TRUS access. The diagnosis of recurrent rectal carcinoma could be established.

The youngest patient (number 6) of our study population had ulcerative colitis. Diffuse wall thickening of the descending and sigmoid colon was seen at CT (Fig. 12). TRUS-guided biopsy of the rectum (Fig. 13) confirmed the suspected diagnosis of primary lymphoma of the colon.

Patients 7 and 8 presented with a rectouterine soft tissue mass that could be diagnosed of metastases of breast carcinoma and adenocarcinoma of unknown origin (Fig. 14, 15), respectively.

In two patients (numbers 9 [Fig. 16, 17] and 10 [Fig. 18, 19]) the diagnoses of lymph node metastases of bladder carcinoma and malignant pheochromocytoma were established.

A woman (patient 11) with a long history of cyanogenic cardiopathy benefited of conservative treatment as pathological result of TRUS-guided biopsy was extramedullary hematopoiesis (Fig. 20, 21).

Patient 12 was referred to our department because of a rapidly rising PSA level and coexisting benign prostate hypertrophy. Digital rectal examination was abnormal and TRUS showed bilateral hypoechoic lesions in the lateral zones of the prostate (Fig. 22). A modified sextant biopsy protocol was performed obtaining 10 cores of the peripheral prostate, complemented by directed puncture of both ultrasonically visible lesions. The diagnosis of multicentric carcinoma could be stated.

Images for this section:
Fig. 1: Sagittal anatomy of the rectum in men
Fig. 2: Sagittal anatomy of the rectum in women
Fig. 3: Lithotomy position
Fig. 4: Endocavitary transducer and biopsy set
Table 1. Group of patients with perirectal pelvic lesions undergoing TRUS-guided core biopsy.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Sex</th>
<th>Age</th>
<th>Previous diagnosis</th>
<th>Imaging findings</th>
<th>Post Biopsy Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>78</td>
<td>None</td>
<td>Rectouterine soft tissue mass</td>
<td>Cervical carcinoma</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>59</td>
<td>Cervical carcinoma</td>
<td>Perirectal necrotic mass</td>
<td>Recurrent cervical carcinoma</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>55</td>
<td>Cervical and pancreatic carcinoma</td>
<td>Soft tissue presacral mass and unilateral obstructive uropathy</td>
<td>Radiation fibrosis</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>60</td>
<td>Ovarian cystadenocarcinoma</td>
<td>Complex adnexal mass</td>
<td>Recurrent ovarian carcinoma</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>70</td>
<td>Rectal carcinoma</td>
<td>Focal wall thickening of the rectum</td>
<td>Recurrent rectal carcinoma</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>38</td>
<td>Ulcerative colitis</td>
<td>Wall thickening of the descending and sigmoid colon</td>
<td>Primary lymphoma of the colon</td>
</tr>
<tr>
<td>7</td>
<td>F</td>
<td>81</td>
<td>Sigmoid carcinoma</td>
<td>Perirectal soft tissue mass</td>
<td>Metastasis of breast carcinoma</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>83</td>
<td>None</td>
<td>Rectouterine peritoneal necrotic mass</td>
<td>Metastasis of adenocarcinoma (unknown origin)</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>64</td>
<td>Advanced bladder carcinoma</td>
<td>Bladder wall thickening and inguinal adenopathies</td>
<td>Lymph node metastasis of bladder carcinoma</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>52</td>
<td>Malignant pheochromocytoma</td>
<td>Presacral necrotic mass and enlarged pelvic lymph nodes</td>
<td>Lymph node metastasis of pheochromocytoma</td>
</tr>
<tr>
<td>11</td>
<td>F</td>
<td>46</td>
<td>Cyanogenic cardiopathy</td>
<td>Bilobulated soft tissue presacral mass</td>
<td>Extramedullary hematopoiesis</td>
</tr>
<tr>
<td>12</td>
<td>M</td>
<td>73</td>
<td>BPH, PSA rising, DRE abnormal</td>
<td>Bilateral hypoechoic lesions in the peripheral zone of the prostate</td>
<td>Bilateral prostate adenocarcinoma</td>
</tr>
</tbody>
</table>

Abbreviations: F, female; M, male; BPH, benign prostatic hyperplasia; PSA, prostate-specific antigen; DRE, digital rectal examination.

**Fig. 5:** Table 1. Group of patients with perirectal pelvic lesions undergoing TRUS-guided core biopsy
Fig. 6: CT axial with administration of intravenous contrast
Fig. 7: TRUS-guided biopsy. Histological diagnosis: cervical carcinoma
**Fig. 8:** CT axial with administration of intravenous contrast
Fig. 9: TRUS-guided biopsy. Histological diagnosis: recurrent cervical carcinoma
Fig. 10: CT axial with administration of intravenous contrast
Fig. 11: TRUS-guided biopsy. Histological diagnosis: recurrent ovarian carcinoma
Fig. 12: CT axial with administration of intravenous contrast
Fig. 13: TRUS-guided biopsy. Histological diagnosis: primary lymphoma of the colon
Fig. 14: CT axial with administration of intravenous contrast
Fig. 15: TRUS-guided biopsy. Histological diagnosis: Peritoneal metastasis of unknown origin
Fig. 16: CT axial with administration of intravenous contrast
Fig. 17: TRUS-guided biopsy. Histological diagnosis: lymph node metastasis of bladder carcinoma
Fig. 18: CT axial with administration of intravenous contrast
Fig. 19: TRUS-guided biopsy. Histological diagnosis: lymph node metastasis of pheochromocytoma
Fig. 20: CT axial with administration of intravenous contrast
Fig. 21: TRUS-guided biopsy. Histological diagnosis: extramedullary hematopoiesis
Fig. 22: TRUS-guided biopsy. Histological diagnosis: multicentric prostate carcinoma
Conclusion

Accuracy diagnosis of pelvic lesions is often a challenge as clinical evaluation, laboratory parameters and imaging findings may be no conclusive. Therefore, histological analysis is required prior institution of treatment, which might range from palliative conservative measures to major surgery.

Percutaneous needle biopsy-guided by either CT or US is limited by the distance from the skin to deep lesions and interposed anatomic structures.

TRUS-guided biopsy overcomes most of these limitations and is not influenced by some common situations in which transvaginal access is not possible or relatively contraindicated: agenesis of the vagina, a virginal introitus and the fear of introducing infection.

It is a minimally invasive technique without radiation exposure of great value as suspected perirectal lesions are easily detectable and evaluated, including the region near to the iliac vessels which is the most common chain for lymph node metastasis from pelvic malignancies, and tissue samples can be collected.

Approaches to obtaining tissue for pathological diagnosis include fine needle aspiration and core biopsy. Both are sensitive at detecting the presence of malignancy. However, core biopsies are usually more definitively diagnostic as they provide a specimen for histological diagnosis and specialized staining, and this allows determining other tumor characteristics such as site of origin, subtype, and grade. Taking into consideration the possibility of false negative results, we would recommend obtaining at least three tissue samples per patient.

TRUS-guided biopsy is generally considered to cause minimal discomfort and, therefore, we performed this procedure using only topical anesthesia. The majority of our patients had only insignificant pain or none at all. We used a sedative drug in only two patients who expressed their anxiety before the biopsy. It appears from the literature that younger patients experience a higher level of discomfort, so this subgroup may benefit from analgesia and/or sedation.

TRUS-guided biopsy should not be performed in patients taking anticoagulant or platelet antiaggregant medication due to the high risk of bleeding (haematuria, per-rectal bleeding or haematospermia). Nevertheless, if a biopsy is necessary, they should be discontinued or the patient should be admitted for overnight observation. When severe haemorrhage occurs, direct compression of the rectal mucosa with the TRUS probe may help as a temporary measure.
Infection is the most common serious complication. The administration of an oral prophylactic antibiotic as a single-dose or short term course is recommended to reduce its incidence rate.

In each of our patients, pathological diagnosis was achieved and the result of the procedure influenced the subsequent management.

TRUS-guided biopsy is an effective diagnostic method in patients with a history of a pelvic malignancy such as cervical and rectal carcinoma, and bladder tumors, playing an important role in the follow-up as conventional imaging techniques can not often distinguish between post-treatment fibrosis and recurrent tumor, particularly if the lesion is small and tumor markers are only slightly raised. Furthermore, regional adenopathies are easily detected and biopsied to verify metastatic involvement at postoperative follow-up.

Patients being diagnosed of benign pelvic tumors may benefit even more as they could receive proper conservative treatments.

When the target lesion appears as a complex cystic and solid mass, the core biopsy must be taken of the solid component to minimize the hypothetical risk of disseminating tumor.

Most prostate cancers are not visualized on TRUS imaging or indistinguishable from coexisting benign prostate hypertrophy. Diagnosis therefore rests on systematic prostate biopsy of the whole gland including lateral zones, complemented by directed sampling of the ultrasonically visible lesions.

Conclusion

In summary, we found TRUS-guided core biopsies of perirectal lesions were accurate, safe and well tolerated, and less adequate percutaneous approach or surgical exploration could be avoided.

Radiologists should become familiar with the potential use of this useful diagnostic tool as there are situations in which this approach may be the most feasible to evaluate men and women with a possible pelvic malignancy.

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