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# CT-Guided Needle Biopsy of Deep Pelvic Lesions by Extraperitoneal Approach Through Iliopsoas Muscle

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## Abstract

We report our experience with computed tomography (CT)-guided coaxial needle biopsy of deep pelvic lesions by an extraperitoneal approach through the iliopsoas muscle, using a curved needle for difficult-to-reach lesions. We reviewed the records of all patients with pelvic masses who underwent CT-guided percutaneous biopsy via iliopsoas muscle between January 1999 and December 2001. Direct anterior or posterior approach to the lesion was obstructed by bowel, bladder, vessels, or bones in all patients. An 18-gauge guide needle was advanced through the iliopsoas muscle and a 22-gauge Chiba needle was used to perform the biopsy. A custom-tailored curved 22-g needle was used in 17 procedures when the location of the iliac vessels and the slope of the iliac wing obstructed a straight path to the lesion. Fifty-three patients underwent 57 CT-guided needle biopsies during the study period. The lesions comprised obturator (n = 25), internal iliac (n = 11), anterior external iliac (n = 4), and common iliac nodes (n = 4); soft tissue masses along pelvic side-wall (n = 6); adnexal lesions (n = 5); a loculated fluid collection, and a perirectal node. All lesions were safely accessed, and major vessels and viscera were avoided in all cases. Of the 57 biopsies, 53 (93%) yielded diagnostic specimens. No major complications were encountered. CT-guided coaxial needle biopsy by an anterolateral approach through the iliopsoas muscle, with the use of a curved needle in selected cases is safe and effective for obtaining samples from deep pelvic lesions.

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Percutaneous biopsy performed under image guidance is widely considered a safe and effective procedure. However, deep pelvic masses pose problems for interventional radiologists because overlying bowel, bladder, and bones, as well as uterus and adnexa in female patients often preclude a direct approach to these lesions. The anterior approach with computed tomography (CT) or ultrasound (US) guidance allows access to lesions located anterior, superior, or lateral to the urinary bladder. However, this approach has certain limitations: deep masses can be difficult to reach because of intervening structures; the bowel or bladder may be unavoidably traversed; bowel peristalsis may deflect the needle from its projected path; and peritoneal transgression may be painful [1, 2]. The CT-guided transgluteal approach can also be used for biopsy of deep pelvic lesions but there is a theoretical risk of injuring the sciatic nerve, gluteal vessels, or a branch of the sacral plexus [3–5]. Internal iliac vessels or a distended rectum may obstruct the path to deep lesions. Furthermore, patients who have undergone recent abdominal or pelvic surgery, who have anterior abdominal wounds or colostomy bags may not be able to lie in a prone position; oblique or lateral decubitus positioning may occasionally be used to allow transgluteal access in these patients. Transvaginal and transrectal approaches with US guidance have also been described for biopsy of deep pelvic lesions [6, 7]. However, these approaches allow access only to lesions close to the rectal or vaginal walls and can be cumbersome and painful for the patient.

At our institution, we perform percutaneous biopsies of pelvic lesions using a coaxial needle technique, advancing the needle through the iliopsoas muscle on a plane parallel to the iliac bone. Our review of the medical literature revealed only one other report describing this technique [8]. The purpose of the present study is to report our recent experience with CT-guided coaxial needle biopsy of deep pelvic lesions using an approach through the iliopsoas muscle.

## Materials and Methods

We retrospectively reviewed the medical records of all patients diagnosed with pelvic masses who underwent CT-guided percutaneous needle biopsy via the iliopsoas muscle between January 1, 1999, and December 31, 2001. Diagnostic pelvic CT or magnetic resonance imaging scans obtained before the biopsy procedure were available for all patients included in this analysis. In each case, evaluation of the diagnostic imaging study had shown that direct anterior, posterior, and lateral approaches to the lesions were obstructed by small or large bowel loops, the bladder, bony structures, external or internal iliac vessels, or a combination of these.

The coagulation parameters and platelet counts were obtained in all patients to ensure that they did not have any hemorrhagic diathesis. Written informed consent was obtained from all patients, and all biopsies were performed after induction of conscious sedation and administration of local anesthesia. All biopsy procedures were performed using a helical CT scanner (CTi Smartview; GE Medical Systems, Milwaukee, WI). CT fluoroscopy was not used in any of the patients. Patients were positioned supine, and preliminary 5-, 7-, or 10-mm thick contiguous axial slices were obtained to confirm the location of the target lesion and to determine the optimal entry site of the needle. After the patient's skin had been disinfected and draped in a sterile fashion, 1% lidocaine was used to anesthetize the skin and subcutaneous tissue. All biopsies were performed using a coaxial needle technique. An 18-gauge guide needle (Chiba; Cook, Bloomington, IN or Hawkins; Medical Device Technologies, Gainesville, FL) was inserted medial to the iliac crest and advanced through the iliopsoas muscle towards the target lesion, using CT to check the needle's trajectory, and taking care to ensure that the needle remained lateral to the iliac vessels. When the needle trajectory and position had been appropriately adjusted the distance from the needle tip to the target lesion was measured, and a 22-g Chiba needle of appropriate length was advanced coaxially through the guide needle into the lesion. In cases where the location of the external iliac vessels and the slope of the iliac wing precluded a straight route to the target lesion, a curved 22-g needle advanced coaxially through the straight 18-gauge guide needle was used to obtain a biopsy specimen. The technique for imparting a curve to the needle has been described previously [9]. The needle tip with the stylet in place is grasped with hemostat forceps without totally closing the jaws of the forceps and gently bent to impart a curve to the distal part of the needle shaft. Before starting, it is important to ensure that the biopsy needle is not sharply angled or kinked and that the inside stylet slides freely in and out of the needle. Most commercially available 22-gauge Chiba needles can be easily curved because of their flexibility. The degree and length of curvature are based on the depth and location of the target area in relation to the tip of the guide needle.

After confirming the needle tip position, aspirates were obtained. The specimens were immediately reviewed by the cytopathologists to assess their adequacy for diagnosis; additional samples were obtained when required. When recommended by the cytopathologist, additional core biopsies were also obtained with 20-gauge quick-core biopsy needles (Cook, Bloomington, IN) advanced coaxially through the same guide needle.

The procedures were performed on an outpatient basis unless the patients were already hospitalized. The patients were observed in the radiology nursing unit with frequent monitoring of vital signs, and discharged 1 hour after the biopsy procedure. Follow-up clinical, radiologic and pathologic information was obtained for patients whose biopsy specimens were non-diagnostic or negative for malignancy on cytopathologic examination.

## Results

During the study period, 53 patients (27 men and 26 women) ranging in age from 31 to 79 years (mean, 55 years) underwent 57 CT-guided needle biopsies of pelvic lesions using an approach through the iliopsoas muscle. Four patients underwent repeat biopsy of the same lesion at a later date either because the initial biopsy specimens failed to yield malignant cells on pathologic evaluation but there was high clinical suspicion of malignancy (three patients) or because the lesion failed to respond to appropriate treatment (one patient); these were regarded as distinct biopsy procedures. The lesions sampled comprised obturator or deep external iliac (Fig. 1), internal iliac (Fig. 2), anterior external iliac, and common iliac lymph nodes (Fig. 3); soft tissue masses (Fig. 4) or a loculated fluid collection along the lateral pelvic wall; adnexal masses (Fig. 5); and a perirectal node (Table 1). The lesions ranged in size from 6 to 90 mm with a mean of 27 mm. The depth of the biopsied lesions ranged from 7 to 18 cm with a mean of 11 cm. A curved needle was used in 17 (30%) of the 57 procedures. Core biopsy samples were obtained during 10 biopsy procedures in 9 patients; one patient, in whom 20-gauge core biopsy was nondiagnostic underwent a repeat biopsy with an 18-gauge quick-core needle at a later date.

All lesions were safely accessed through the iliopsoas muscle. Major vessels and viscera were avoided in all cases. Forty-six biopsy specimens yielded definite benign or malignant diagnoses (Table 2). Pathologic evaluation of the other 11 biopsy specimens failed to reveal any evidence of malignancy or a definite benign diagnosis. Biopsy of pelvic lymph nodes in four patients yielded only benign lymphoid cells; the benign nature of these lymph nodes were confirmed at subsequent surgery (one patient) or by documentation of lesion stability on follow-up imaging (three patients followed up to 12, 20, and 24 months after biopsy). Aspiration of a cystic mass in a patient with a history of ovarian cancer failed to reveal any malignant cells; the size of the lesion had been stable for 2 years at the time of our retrospective analysis. Biopsy of an adnexal lesion in another patient yielded only fibromuscular tissue; follow-up transvaginal ultrasound showed normal ovaries and multiple fibroids with no evidence of mass lesion. In another patient in whom fine needle aspiration cytology of an adnexal lesion had shown only benign ovarian epithelial cells, subsequent


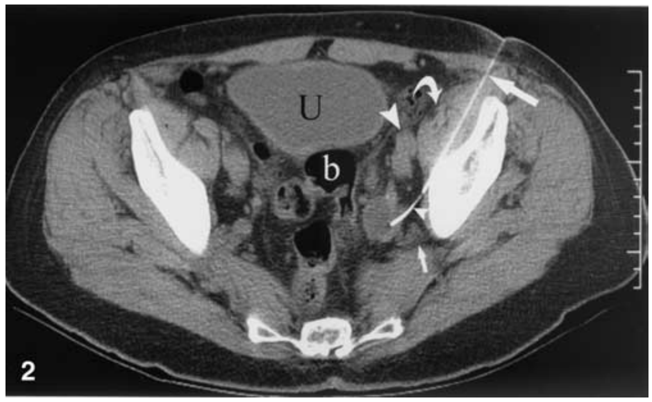


**Figure 1.** Axial CT scan shows placement of needle through the iliopsoas muscle (m) to perform biopsy of a deep external iliac lymph node (arrowhead). A direct approach was obstructed by bowel loops (thin arrows), the external iliac vessels (thick arrows), the iliac wing and the sacrum.

**Figure 2.** Axial CT scan shows a curved 22-gauge needle (small arrowhead) advanced coaxially through an 18-gauge guide needle (large arrow) to sample an internal iliac lymph node. Anterior approach was obstructed by bowel loops (b), bladder (U), and external iliac vessels (large arrowhead), and a transgluteal approach was obstructed by the internal iliac vessels (small arrow). Note expected location of femoral nerve (curved arrow) in the fat plane between the iliacus and psoas muscles.

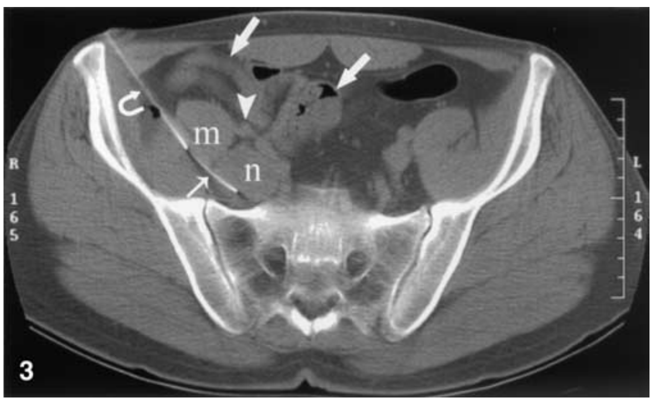



**Figure 3.** Axial CT scan shows the use of a coaxial curved needle (thin arrow) advanced inside a guide needle (curved arrow) placed through the iliopsoas muscle (m) to obtain a biopsy specimen from a common iliac lymph node (n) as alternative approaches were obstructed by bowel loops (thick arrows), the common iliac vessels (arrowhead), and bony structures.

**Figure 4.** Axial CT scan shows a large soft tissue mass (m) occupying the left half of the upper pelvis. A direct approach was not possible because of intervening bowel loops (thick arrows), bones, and external iliac vessels (thin arrow). Because the location of the bowel and external iliac vessels (thin arrow) and the slope of the iliac wing precluded a straight path to the lesion, a curved needle (arrowheads) inserted through a straight guide needle was used.

surgery revealed a corpus luteal cyst. On the basis of follow-up information, biopsy results for these seven patients were considered true negative findings. Thus, 53 (93%) of the 57 biopsies yielded correct diagnoses.

Of the other four patients with negative biopsies, repeat fine-needle aspiration/core biopsies performed at a later date yielded definite diagnoses in three patients. Hence, the initial biopsy procedures in these three patients can be regarded as biopsy failures. In one patient, fine needle aspirates as well as 20-gauge core biopsies from an obturator lymph node were negative for malignancy. A repeat core biopsy performed with an 18-gauge core biopsy needle revealed Hodgkin's lymphoma. In another patient in whom initial fine needle aspiration was non-diagnostic, a repeat core biopsy revealed Hodgkin's lymphoma. In another patient with a history of carcinoma of the cervix, initial biopsy of an ovarian mass showed only bland squamous cells. The patient underwent a repeat fine- needle aspiration biopsy, which yielded a diagnosis of cystic teratoma of the ovary. Fine-needle aspiration from a cystic pelvic lesion in a patient with a history of prostate cancer yielded thick yellowish fluid, which was negative for malignant cells. The patient was lost to further follow-up and a definite opinion regarding the benign or malignant nature of the lesion could not be made.

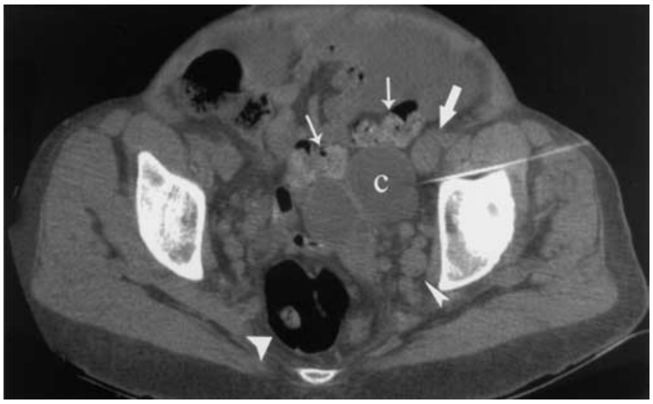


**Figure 5.** Axial CT scan shows a needle advanced through the iliopsoas muscle to obtain a biopsy specimen of a cystic adnexal mass (c). Presence of external (thick arrow) and internal (small arrowhead) iliac vessels, bowel loops (small arrows), and rectum (large arrowhead) precluded a direct approach.

**Table 1.** Location of target lesions in 57 biopsy procedures

| Target lesion | Number |
|---|---|
| Deep external iliac/obturator lymph node | 25 |
| Anterior external iliac lymph node | 4 |
| Internal iliac lymph node | 11 |
| Common iliac lymph node | 4 |
| Soft tissue masses along lateral pelvic side-wall | 6 |
| Loculated fluid collection along lateral pelvic side-wall | 1 |
| Adnexal mass | 5 |
| Perirectal node | 1 |

**Table 2** Pathologic findings in 57 biopsy procedures

| Biopsy (FNA/Core) result | Number |
|---|---|
| Metastases from known/unknown primary | 30 |
| Non-Hodgkin's lymphoma | 9 |
| Hodgkin's lymphoma | 4 |
| Schwannoma | 1 |
| Plasmacytoma | 1 |
| Cystic teratoma of ovary | 1 |
| No evidence of malignancy/no definite benign diagnosis | 11* |

*In seven patients, follow-up confirmed benign nature of the lesion. In three patients, repeat biopsies revealed definite tumor diagnoses. One patient was lost to follow-up.

No major complications associated with the biopsy procedures were encountered. One patient experienced severe pain every time the needle had punctured the lesion; hence, the procedure was aborted after two fine-needle aspirations. Cytpopathologic evaluation of the aspirated specimens failed to show any malignant cells; follow-up clinical and imaging course confirmed the benign nature of the lesion.

## Discussion

We found that CT-guided needle biopsy of pelvic lesions by an anterolateral approach through the iliopsoas muscle allows safe access to lesions in various locations in the pelvis. This approach is particularly useful for external iliac, internal iliac, and obturator nodes. An anterior transperitoneal approach is not suitable for these lesions, especially those located posterior to the vessels, because of intervening bowel loops and bladder and the risk of injury to vessels [1]. A transgluteal approach to internal iliac, or obturator nodes can occasionally be used but often requires needle advancement close to the ischial tuberosity, which increases the risk of injury to the sciatic nerve and gluteal vessels [5]. Biopsy of lymph nodes located above the level of the greater sciatic foramen, which are not accessible using the transgluteal approach, can also be safely performed using the anterolateral approach through the iliopsoas muscle. Our approach also allows safe access to common iliac nodes when the anterior transperitoneal approach is obstructed by bowel loops or when these nodes are located posterior to the iliac vessels. Soft tissue mass lesions or loculated fluid collections located along the lateral pelvic wall can also be safely accessed using the anterolateral approach when alternative approaches are not possible because of intervening bowel loops, bladder, or bony structures. In addition, the anterolateral approach offers a viable alternative to the transvaginal approach for biopsy of adnexal lesions; five adnexal mass lesions were safely accessed in our series.

In our experience, the anterolateral approach is less painful for the patient than is the anterior transperitoneal approach as peritoneal transgression is avoided. The needle is inserted through the anterolateral abdominal wall muscles and advanced through the iliopsoas muscle medial and parallel to the iliac wing. Needle insertion through the iliopsoas muscle was also well tolerated in all the patients in our series. The iliac bone prevents lateral deviation of the needle, allowing accurate needle placement [8]. Advancement of the guide needle through the iliopsoas muscle also stabilizes the biopsy needle, permitting long needle paths without the risk of needle deflection due to anterior abdominal wall movement or bowel peristalsis, which is a potential problem with the anterior transabdominal approach.

With the anterior transabdominal approach, the potential risk of inadvertent transgression of bowel or bladder limits the size of biopsy needle that can be used. Although bowel transgression with a 22-gauge needle is generally considered safe, puncturing the bowel with 18-gauge needles should be avoided [1]. Since the anterolateral approach does not pose a risk of bowel or bladder injury, use of large caliber needles and core biopsies is possible; we routinely used 18-gauge guide needles in all of our patients and also obtained core biopsies in 10 patients.

Another advantage of our technique is that it is performed with the patient lying comfortably in a supine position. This is especially useful for patients who are unable to lie in a prone position owing to obesity, abdominal wounds, or colostomy bags. In this study, biopsy of a perirectal nodule was safely performed by the anterolateral approach through the iliopsoas muscle in a patient who could not lie prone owing to a recent abdominal surgery precluding the transgluteal approach.

Few reports have described the use of curved needles for image-guided percutaneous biopsies [9–11]. Use of a custom-tailored, curved, 22-gauge needle advanced coaxially through a straight 18-gauge guide needle allows safe access to lesions that cannot be reached with a straight needle because of the location of iliac vessels and the slope of the iliac wing. This technique was safely used in 17 of our patients. We have previously described the use of this technique for circumventing intervening structures, for sampling different parts of the same lesions, and for compensating for the suboptimal trajectory of the guide needle [9]. The major limitation of the curved-needle coaxial technique is the inability to perform a core biopsy. It is not possible to impart a curve to a cutting type core biopsy needle without compromising the needle's cutting action; it may also result in shearing the slotted stylet.

For most patients who have had previous diagnostic contrast-enhanced CT, the preliminary non-contrast-enhanced CT scans are sufficient for biopsy planning. However, contrast administration is occasionally necessary to differentiate vessels from lymph nodes; one of our 53 patients received intravenous injection of contrast agent during the procedure.

No complications directly attributable to the trans-iliopsoas approach were encountered in our patients. The approach poses a theoretical risk of injury to the femoral nerve, which runs in the fat plane separating the iliacus and psoas muscles. Injury, however, is unlikely because the femoral nerve is located at the medial end of the fissure between the muscles, whereas the needle usually passes through the lateral portion of the fissure. The deep circumflex iliac vessels are located just medial to the anterior portion of the iliacus muscle and care should be taken to avoid them when using this approach. Care should also be taken to avoid puncturing the ureter, which is located posterior to the external iliac vessels and anterior to the internal iliac vessels.

In conclusion, CT-guided coaxial needle biopsy by an anterolateral approach through the iliopsoas muscle, with the use of a custom-tailored curved needle in selected cases is safe and effective for obtaining samples from deep pelvic lesions in various locations of the pelvis.

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