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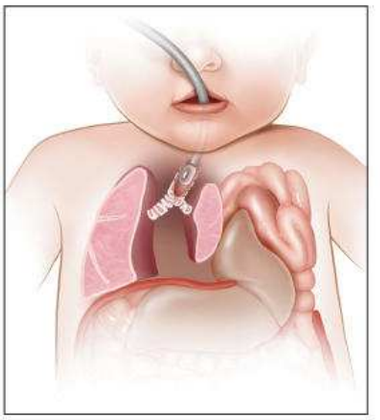

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Effectiveness of Sonography in Detecting Clinically Occult Femoral Hernias

Harun Gupta, MD, DNB, MRCP, FRCR, Nawaraj Subedi, MBBS, MRCP, FRCR, Philip Robinson, MB, ChB, MRCP, FRCR

Objectives—The aim of this study was to evaluate the accuracy of sonography for femoral hernia diagnosis in patients with suspected hernias that were not evident on clinical examination.

Methods—A retrospective analysis was performed for 39 consecutive patients with 40 clinically suspected but occult femoral hernias and subsequent positive sonographic findings for femoral hernias. Clinical records for all patients were reviewed for surgical outcomes and clinical follow-up. Surgical findings of a femoral hernia sac or widened femoral canal requiring repair, with symptomatic relief after the procedure, were considered positive for a femoral hernia.

Results—Among the 40 femoral hernias examined by sonography, 33 of 40 groins underwent surgical exploration, with 32 true-positive findings and 1 false-positive finding on sonography. The false-positive case was an inguinal hernia at surgery. The accuracy of sonography was 96.9% for those with surgical correlations. The remaining 7 patients did not undergo surgery but had clinical follow-up.

Conclusions—This study confirms high diagnostic accuracy of sonography for nonpalpable femoral hernias in symptomatic groins compared to surgical findings.

Key Words—femoral; hernia; musculoskeletal ultrasound; sonography

A femoral hernia is the protrusion of a peritoneal sac through the femoral ring into the femoral canal, posterior (deep) and inferior to the inguinal ligament. The sac may contain preperitoneal fat, omentum, bowel, or fluid. Of the inguinoscrotal hernias, femoral hernias are relatively uncommon, accounting for one-fifth of all groin hernias in female patients and less than 5% in male patients.[1]

A femoral hernia can present with vague nonspecific groin discomfort,[2] which can make initial clinical diagnosis challenging, as the hernia is also often impalpable. However, if palpable, it can be mistaken for an inguinal hernia, and a nonurgent surgical referral can be made.[3] Early diagnosis is important because of the potential for higher complication rates, especially strangulation, compared to other hernias.[4] Up to 40% of femoral hernias can be missed on acute presentation,[5] and emergency surgical management has a higher rate of mortality and morbidity, including a requirement for bowel resection, compared to elective surgery.[6,7] In clinically equivocal cases, imaging may help confirm an early diagnosis.

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Traditionally, herniography was the radiologic investigation for clinically occult groin hernias,[8] but it is an invasive procedure involving ionizing radiation. Studies evaluating computed tomography in emergency presentations have confirmed high accuracy for detecting femoral hernias.[9,10] However, although computed tomography is the first-choice investigation of an acute abdomen due to strangulated inguinoscrotal hernias, its elective nonurgent use may be limited by cost and the degree of radiation exposure.

Sonography has high diagnostic accuracy for diagnosing inguinal hernias,[11–15] with only a minority of studies[13,15] describing its use in a small number of femoral hernias (<5% of total study cohorts, <5 patients). The aim of this study was to evaluate the accuracy of sonography in clinically equivocal femoral hernia diagnosis.

Materials and Methods

A retrospective analysis was performed over 5 years (2007–2013) on the outcomes of 39 consecutive patients with diagnoses of femoral hernias on sonography but with no palpable hernia clinically (examined by surgical staff and senior trainees). Institutional ethics approval stated that individual patient consent was not necessary in this retrospective study.

Each patient underwent sonography (LOGIQ 9; GE Healthcare, Waukesha, WI; or Acuson Antares; Siemens AG, Erlangen, Germany) using a linear transducer (16–5 or 10–4 MHz depending on the patient's body habitus) performed by 1 of 2 experienced radiologists (14 and 5 years of experience) or 3 sonographers (each with >15 years of experience) with consultant review. With the patient supine, the femoral vessels were viewed in the transverse axial plane inferior to the inguinal canal, where the femoral canal lies medial to the femoral vein. Assessment of the femoral canal with the patient at rest and during straining (coughing or performing a slow Valsalva maneuver) was performed while maintaining light transducer pressure. A femoral hernia was defined as a protrusion of intra-abdominal bowel or fat into the femoral canal. The canal was then viewed in the long axis to confirm that the hernia passed deep to the inguinal ligament and expanded the canal, with a mass effect (Figures 1–5).

The clinical notes for all patients were reviewed to record the intraoperative findings and subsequent outpatient follow-up. Intraoperative findings of a femoral hernia sac and widened femoral canal requiring repair, leading to symptomatic relief after the procedure, were considered positive for a femoral hernia.

For the statistical analysis, surgical verification of a femoral hernia sac or widened femoral canal was considered the reference standard for a positive result in this study. The results were expressed as percentages of the positive cases for which surgical verification of a femoral hernia was available.

Results

The 39 patients included 15 men and 24 women with an age range of 34 to 74 years (mean age, 59.6 years). Among these patients, 40 femoral hernias and 4 inguinal hernias were found on sonography, with 1 patient having bilateral femoral hernias and 4 patients having concurrent inguinal hernias. Of the 4 patients with concomitant inguinal hernias, 3 were ipsilateral and 1 was contralateral to the side of the femoral hernias.

Figure 1. Left femoral hernia. Transverse sonogram showing herniation of fat (arrows) into the femoral canal medial to the femoral vein (FV). FA indicates femoral artery.

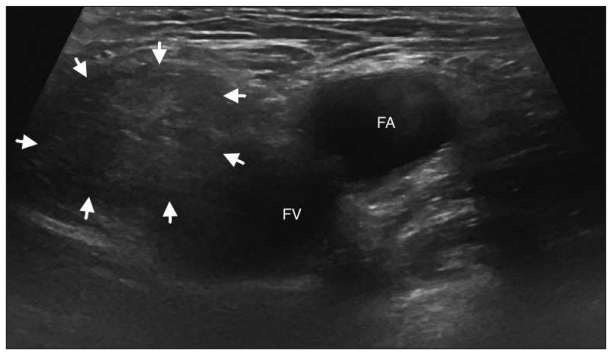
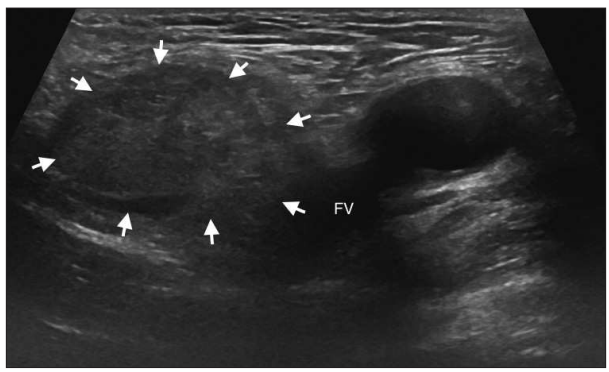


Figure 2. Left femoral hernia. Transverse sonogram showing herniation of peritoneal fat and a sac containing a trace amount of fluid (arrows) into the femoral canal medial to the femoral vein (FV). Partial effacement of the femoral vein by the hernia sac is shown.



Thirty-two patients (82%) with diagnoses of femoral hernias on sonography underwent surgery. The time to surgery from the referral for sonographic assessment was less than 18 weeks (range, 3–18 weeks). This group constituted 33 femoral hernias, as 1 patient had bilateral femoral hernias. Of the 33 femoral hernias detected on sonography, 32 were confirmed at surgery. Of the 4 inguinal hernias, 2 underwent surgery and were confirmed at surgery.

Taking cases with surgical verification into consideration, the diagnostic accuracy of sonography was 96.9 % (32 of 33) for clinically nonpalpable femoral hernias. The false-positive case was found to be an inguinal hernia at surgery.

Seven patients did not undergo surgery. One of these patients had a diagnosis of a possible recurrent femoral hernia on sonography and also underwent magnetic resonance imaging for further characterization, which showed

Figure 3. Longitudinal sonogram medial to the femoral vein. The femoral hernia (arrows) can be seen extending from the abdomen into the femoral canal.

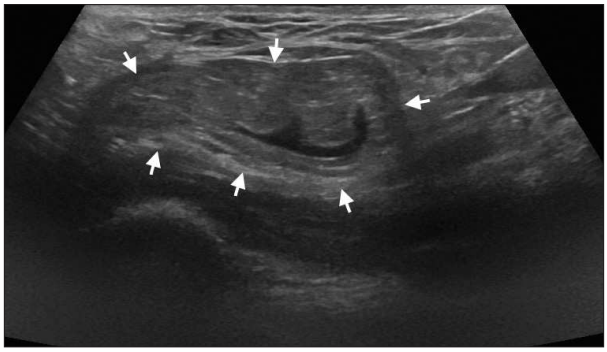


Figure 4. Transverse sonogram showing a herniated fluid-filled sac (arrows) extending from medial to the femoral vein (FV) and lying superficially in the inguinal region.

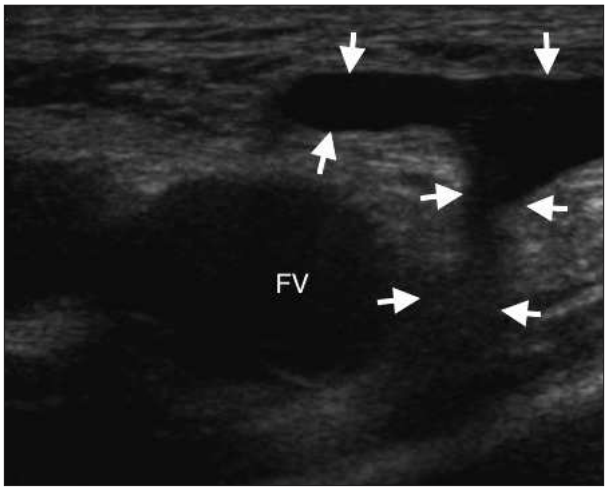
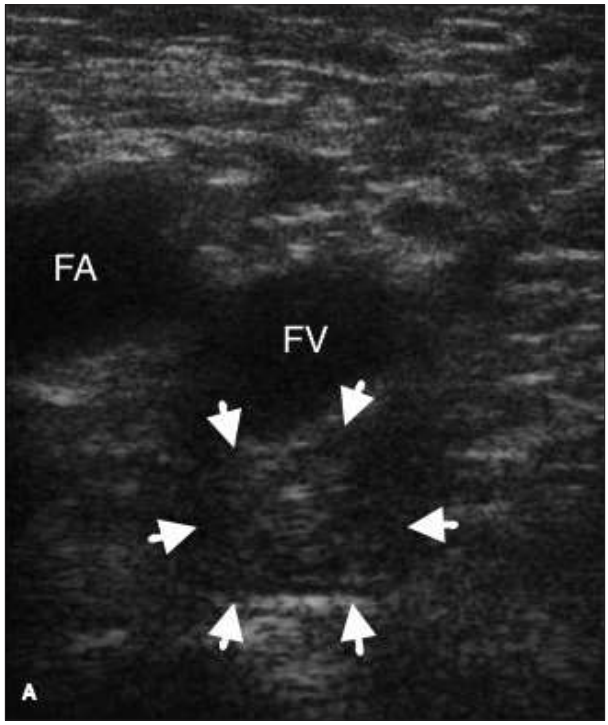
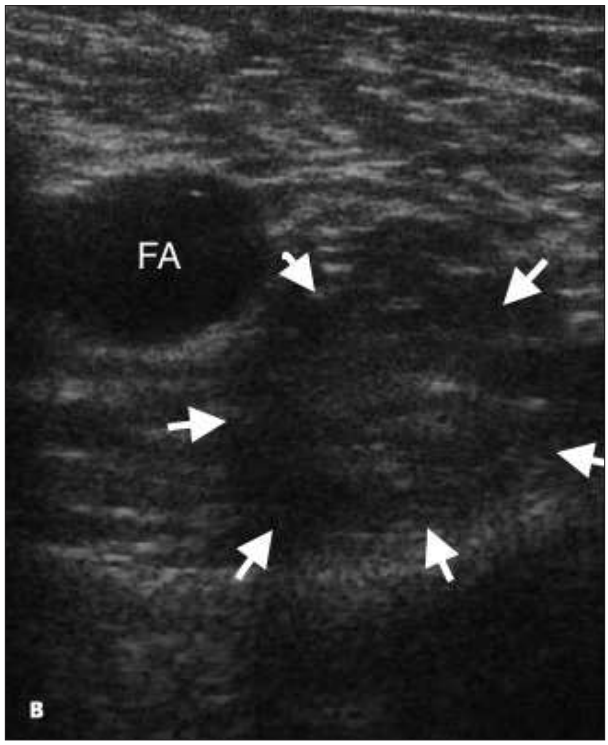


Figure 5. **A**, Transverse sonogram without the Valsalva maneuver. Fat herniation (arrows) is shown on the medial and inferior aspect of the femoral vein (FV). FA indicates femoral artery. **B**, Transverse sonogram with the Valsalva maneuver. Fat herniation (arrows) into the femoral canal accentuates and completely effaces the femoral vein.





scar tissue only in the femoral canal; therefore, surgery was not performed. On clinical follow-up of the remaining patients who did not undergo surgery (n = 6), 2 died of malignancies; 1 declined surgery; and 3 had no progression of symptoms.

Discussion

Several previous studies have shown high sensitivity (86%–100%) and specificity (82%–97%) of groin sonography in diagnosing inguinal hernias.[12–18] Two of these studies prospectively evaluated clinically occult groin hernias, in which high diagnostic accuracy was confirmed for detection of occult hernias in 120 and 59 symptomatic groins, respectively.[13,14] All of these studies were primarily designed to assess the accuracy of inguinal hernia detection and showed high sensitivity for diagnosing femoral hernias, but the numbers of patients were very small, and not all hernias were clinically occult.[12,14] This study, however, was primarily designed to assess the accuracy of sonography for clinically occult femoral hernias in symptomatic groins and confirmed high (92%) sensitivity in cases in which surgical verification was available, suggesting that this technique can also be applied to this disease process.

Several studies have reported high diagnostic sensitivity and specificity for other imaging techniques in assessments of inguinal and abdominal wall hernias but, again, with limited evaluations of femoral hernias. In a retrospective review of 63 patients, Loftus et al[19] demonstrated high sensitivity and specificity (81% and 92%, respectively) for herniography in clinically occult groin hernia evaluations. The study comprised only 3 positive cases of femoral hernias, 1 of which was false positive. Suzuki et al[9] reported that computed tomography correctly identified the femoral hernia sac in 45 of 46 symptomatic cases, and 33 of 45 were incarcerated lesions that were determined on physical examination. However, the number of clinically occult cases was not presented in that study. Computed tomography is the first choice of investigation for patients presenting with acute abdomen due to strangulated inguinoscrotal hernias, but elective nonurgent use may be limited by cost and access, with sonography providing a better alternative, as there is no involvement of radiation.

In previous sonographic studies of inguinal hernia detection,[13,16,18,20,21] false-positive findings have been attributed to cases of canal bulging or the presence of an inguinal lipoma. The 1 false-positive scan in this study was an inguinal hernia. The accuracy of sonography in previous series may also have been limited by low resolution in terms of hardware, software, and the use of relatively low-frequency transducers. During the period of this study, examinations were performed on equipment that was less than 5 years old and used high frequency transducers.

A limitation of this study was that it was a retrospective analysis of patients with positive sonographic findings for femoral hernias. Therefore, it was not possible to determine or comment on patients with negative sonographic findings who may still have gone on to have surgery based on clinical symptoms and findings. It was therefore also not possible to reach conclusions about the negative predictive value, sensitivity, and specificity of sonography when diagnosing femoral hernias. However, the main purpose of this study was evaluation of the accuracy of sonography rather than clinical evaluation. Another limitation of the study was that the surgical findings of a hernia sac and widened canal were subjective by the surgeon, and there is a possibility of a bias on the part of the surgeon in terms of the sonographic findings. However all patients were followed in a surgical outpatient clinic after surgery, and a symptomatic improvement was taken as a final measure of the accuracy of the sonographic findings.

In conclusion, this retrospective study of symptomatic patients with impalpable femoral hernias showed high diagnostic accuracy of sonography, as verified by surgical findings. Although sonography can be operator dependent, this examination should be the first-line investigation for patients with suspected femoral hernias when expertise is available.

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