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What does Pelvic Ultrasound add to the Diagnostic work-up for Appendicitis?

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Abstract

Introduction: The evaluation of female patients with abdominal pain for appendicitis can be lengthy and difficult. Often, a pelvic ultrasound is obtained in addition to other imaging to assess for gynecologic pathology. Our goal was to determine if signs of a structural gynecologic pathology are appreciable on right lower quadrant (RLQ) ultrasound done as part of an appendicitis evaluation in a pediatric population, or if a separate pelvic ultrasound is needed.

Materials and Methods: All patients under age 21 years undergoing a RLQ ultrasound from 2010-2013 for evaluation of possible appendicitis from the emergency department (ED) at a tertiary care center were retrospectively identified. Of these, patients eventually receiving a gynecologic diagnosis were included. RLQ ultrasound results were compared to pelvic ultrasound results, other radiographic studies, and surgical/ surgical pathology reports.

Results: Of the 31 patients who underwent a RLQ ultrasound and ultimately received a gynecologic diagnosis with structural abnormalities (e.g. ovarian cyst), only four patients (12.9%) showed any evidence of this diagnosis on RLQ ultrasound.

Discussion: RLQ ultrasound rarely identified structural pelvic pathology in female patients undergoing evaluation for suspected appendicitis. When clinical suspicion is equivocal enough to require corroborative testing, pelvic ultrasound was additive in this small group of patients.

Keywords

Ultrasound; appendicitis; Magnetic resonance imaging; radiation

Introduction

Because of the potential for gynecologic pathology, female pediatric patients with abdominal pain often present a greater diagnostic conundrum than males. In fact, up to 40% of women of reproductive age with pelvic pain are susceptible to misdiagnosis [1]. Therefore, female patients of reproductive age tend to undergo more extensive emergency department (ED) work-ups for abdominal pain prior to diagnosis and treatment of appendicitis [1-3]. While little data has been published on the prevalence of this practice, many surgeons request a pelvic ultrasound prior to surgery. While not excluding the potential for appendicitis, the presence of gynecologic pathology may alter the physician's pre-test

probability of a patient having appendicitis. Tayal et al. evaluated the impact of endovaginal ultrasound in emergency physicians' suspicion of appendicitis or right adnexal pathology in non-pregnant adult women with right lower quadrant (RLQ) pain, and demonstrated the manner in which imaging of pelvic pathology alters the perceived probability of appendicitis for emergency physicians [4].

In a patient undergoing evaluation of abdominal or pelvic pain in that area, it is unclear what diagnostic value is added by performance of a pelvic ultrasound, over and above a RLQ ultrasound. It is not uncommon for a radiographic study to indicate a diagnosis outside of the system being primarily evaluated. Case reports allude to the possibility of an ultrasonographic diagnosis of appendicitis via transvaginal ultrasound performed for a presumed gynecologic pathology [5-7]. Another paper by Thorpe et al. at the Children's Hospital of Pittsburgh discusses a case of pelvic pathology found incidentally on renal ultrasound for RLQ and back pain in a pediatric patient [8]. It seems possible that the RLQ ultrasound might similarly show some evidence of large cysts or masses.

Certainly, there are cases in which, after a thorough investigation, sufficient clinical equipoise remains, and pelvic ultrasound is an integral component of further decision making [9]. In the patient for whom the primary concern is appendicitis, it seems possible that an unsuspected gynecologic condition mimicking appendicitis would be visualized on a RLQ ultrasound. This specific question of whether a female child with no evidence of gynecologic pathology on an abdominal ultrasound requires further pelvic imaging has not, to our knowledge, been studied. We hypothesized that identification of a structural gynecologic abnormality on pelvic ultrasound after a completely normal right lower quadrant ultrasound would be rare.

Case Study

Setting/Patients: Female patients under 21 years of age presenting to an urban, tertiary Pediatric Emergency Department (PED) and receiving a RLQ ultrasound for the evaluation of appendicitis were retrospectively identified from the years 2010 to 2013. Of them, those receiving a final diagnosis of a gynecologic pathology were included for the purpose of this study. These were further divided into patients in whom a radiographic equivalent might reasonably be anticipated: gynecologic masses (including cysts, solid masses, and ectopics), hydrosalpinx, and ovarian torsion versus those with gynecologic issues without expectation of a radiographic equivalent (e.g. clinical diagnosis of pelvic inflammatory disease without identified hydrosalpinx). Incarcerated patients and those leaving against medical advice or before treatment completed were excluded.

Procedures: Data was retrospectively collected. Pediatric emergency medicine attending physicians, pediatric or emergency medicine resident physicians, or medical students performed all data collection. All received training instructions from one of the study coordinators. For all patients, the final read for radiographic studies was ascertained, as was the operative diagnosis, if available and the final discharge diagnosis if an operation was not performed. Patients who were not hospitalized and not seen in follow-up were called for follow-up more than one month after discharge to ensure appendicitis was not diagnosed at a later visit if follow-up records were unavailable. The right lower quadrant ultrasound reading was examined for any evidence that a gynecologic diagnosis was suspected. Point of care ultrasounds were not reviewed; only those performed and read in the radiology suite were utilized for this study.

Radiographic studies: Right lower quadrant ultrasounds are performed with a 14 or 18 MHz linear transducer with the use of Doppler. Pelvic ultrasounds are performed with an endocavitary probe in sexually active girls and trans-abdominally with a full bladder for pre-pubescent and virginal girls. MRIs are performed without contrast with a 1.5 Tesla magnet using 5mm slices through the entire right lower quadrant. CTs are performed with a 64-slice scanner using intravenous contrast only.

Statistical analysis: Descriptive statistics only are reported. Due to the small numbers, further statistical analysis was not attempted.

Results: During the study period, 331 female patients underwent RLQ ultrasound for evaluation of appendicitis. A gynecologic diagnosis was given in 47 (14.2%) cases. Of these, 16 had a non-structural diagnosis (pelvic pain, cervicitis, clinical pelvic inflammatory disease, known normal pregnancy, vaginitis/vaginosis, presumed ruptured cyst) and were excluded, leaving 31 patients for analysis. These patients had a mean age of17.2 years (range 11.4-21.9 years), mean white blood cell count of 10.7/mcL (range 4-19.6/mcL), and mean maximum temperature of 99ºF (range 97-101.6 ºF). The chief complaint was abdominal pain or right lower quadrant in 21, rule out appendicitis in 2, vomiting in 3, pelvic pain in 2, back pain in 1, and suprapubic pain or urinary complaints in 2. Appendicitis was the leading diagnostic concern in 15 of the patients, while gynecologic pathology was felt to be as or more likely in the remainder.

Of these patients, 29 underwent pelvic ultrasound. Six patients had the RLQ ultrasound done first, 15 done concurrently, and 8 had the pelvic ultrasound performed first. Ultrasound was performed transvaginally only in 3 patients, transabdominally only in 9 patients, and by both techniques in the remainder. Additionally, a CT scan was performed in 3 and an MRI in 5. The majority of the patients (25) had some type of intact ovarian cyst or mass discovered beyond a simple corpus luteal cyst. No patient was found to have appendicitis in addition to their gynecologic pathology in the ED. No missed cases of appendicitis were identified in the 90.3% of patients for whom follow-up was available.

A total of 4 patients (12.9%) had the pelvic pathology identified or suggested on RLQ ultrasound. When performed, the pelvic ultrasound demonstrated the gynecologic abnormality in all but one case (a patient with a CT that suggested hydrosalpinx and an MRI which showed a paraovarian cyst). Regarding emergent treatment, eight patients received an operation, typically due to suspicion of ovarian torsion, and two additional patients were emergently medically managed (one with hydrosalpinx and one with an ectopic pregnancy). Further outpatient management was impacted in the remainder of the patients, most of whom required ultrasonographic monitoring or non-emergent surgical removal of the ovarian lesion.

Discussion

As focused tests with minimal radiation gain popularity for the diagnosis of appendicitis, physicians must attain a comfort level with the interpretation of these studies. At our institution, RLQ ultrasound is a standard first-line test for appendicitis. In our data set, just under 15% of female patients with abdominal pain concerning enough to merit a radiologic investigation for appendicitis eventually received gynecologic diagnoses, and RLQ ultrasound detected only a small percentage.

Performance of pelvic ultrasound is not without difficulty. There is an addition of nearly USD 400

in patient charges and one to two hours length-of-stay when a formal pelvic ultrasound is performed in isolation in the ED [10]. The difference in length of stay is likely mitigated somewhat when the study is paired with a RLQ ultrasound, but not entirely. Care also may be delayed; the use of pelvic ultrasound in the work-up of pediatric patients with appendicitis has been shown to add a median of 4.2 hours to the time from initial evaluation to appendectomy [11]. For children who, due to refusal of an endocavitary study or pre-pubescence, require a trans-abdominal ultrasound, a full bladder is recommended to serve as an acoustic window for imaging [12]. Data is not published on the impact of administering saline to fill the bladder and frequently checking the distension of the bladder, but logically, that might increase both patient length of stay and staff time. Additionally, the finding of pelvic pathology does not necessarily discredit the potential for appendicitis. Pelvic ultrasound has been reported to lead to misdiagnosis in adults, with four of 10 patients found to have pelvic pathology on ultrasound, actually having appendicitis on laproscopy in one report by Stunell [13].

Given these drawbacks, it would be advantageous to claim no additional relevant information was gathered via the pelvic ultrasound. However, our findings suggested a lower yield of diagnosis of pelvic pathology from the right lower quadrant, and a higher rate of unsuspected pelvic pathology than anticipated.

Limitations

Because of the retrospective nature of this study, we have used heterogenous group of young women, some with a slightly higher likelihood of appendicitis and others with greater physician concern for pelvic pathology. Test characteristics were not calculated due both to the small numbers and the fact that most patients did not receive an additional pelvic ultrasound, and pelvic pathology may have been uncovered in untested patients as well had it been performed. Finally, while in many cases it seems entirely reasonable to suspect that the pelvic pathology served as the etiology of the patients'symptoms that is often difficult to substantiate, although our follow-up data does provide reassurance that these patients did not ultimately have appendicitis.

Concusion

The addition of a dedicated pelvic ultrasound to the work-up of right lower quadrant abdominal pain in a female adolescent or pre-adolescent for whom a gynecologic pathology is considered is a reasonable study, even in light of a completely negative RLQ ultrasound.

References

1. Borgstein PJ, Gordijn RV, Eijsbouts QA, Cuesta MA. Acute appendicitis – a clear-cut case in men, a guessing game in young women: a prospective study of the role of laparoscopy. *SurgEndosc.* 1997;11:923-927.

2. Roosevelt GE, Reynolds SL. Does the use of ultrasonography improve the outcome of children with appendicitis? *AcadEmerg Med.* 1998.;5:1071-5.

3. Applegate KE, Sivit CJ, Salvator AE, et al. Effect of cross-sectional imaging on negative appendectomy and perforation rates in children. *Rad.* 2001;220:103-7.

4. Tayal VS, Bullard M, Swanson DR, et al. ED endovaginal pelvic ultrasound in non-pregnant women with right lower quadrant pain.*Am J Emerg Med*. 2008;26(1):81-5.

5. Haider Z, Condous G, Ahmed S, Kirk E, Bourne T. Transvaginalsonographic diagnosis of appendicitis in acute pelvic pain. *J Ultrasound Med.* 2006:25(9):1243-44.

6. Bramante R, Radomski M, Nelson M, Raio C. Appendicitis diagnosed by emergency physician performed point-of-care transvaginal ultrasound: case series. *West J Emerg Med.* 2013;14(5):415-8.

7. Baltarowich OH, Scoutt LM, Hamper UM. Nongynecologic findings on pelvic ultrasound: focus on gastrointestinal diseases. *Ultrasound .Q* 2012;28(2):65-85.

8. Thorpe EL, Marin JR. Identification of Unanticipated Pelvic Pathology on Renal Bedside Ultrasound. *PediatrEmerg Care*. 2013;29(4):536-40.

9. Melnick ER, Melnick JR, Nelson BP. Pelvic ultrasound in acute appendicitis. *The J EM.* 2010;38(2):240-242.

10. McRae A, Edmonds M, Murray H. Diagnostic accuracy and clinical utility of emergency department targeted ultrasonography in the evaluation of first-trimester pelvic pain and bleeding: a systematic review. *Can J Emerg Med.* 2009;11(4):355-364.

11. Poonia N, Gregory J, Thompson G, Lim R, Van Osch S, Andrisiak T, et al. Is pelvic ultrasound associated with an increased time to appendectomy in pediatric appendicitis? *Emerg Med.* 2014;47(1):51-8.

12. Stranzginger E, Strouse P. Ultrasound of the Pediatric Female Pelvis. *Semin Ultrasound CT MR.* 2008;29(2):98-113.

13. Stunell H, Aremu M, Collins D, Torreggiani WC, Conlon KC. Assessment of the value of pelvic ultrasonography in pre-menopausal women with right iliac fossa pain. *Ir Med J.* 2008;101(7):201-7.

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