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ORIGINAL RESEARCH

Role of Ultrasound in Diagnosis of Patients with Suspect Appendicitis at Al-Wahda Hospital in Derna City, Libya

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ABSTRACT:

The present study is to evaluate the accuracy of uses of Ultrasound in diagnosis patients with suspected appendicitis.This is a prospective cohort study. Ultrasound examinations were done prospectively in patients with suspect acute appendicitis before appendectomy at Alwahda hospital in Derna city, Libya. The results were correlated with each patient's outcome.

Total of 96 patients with Alvarado score from 4 to 7 were underwent USG examination before appendectomy, 40 males and 66 females with mean age of 14.3±8.6years. The ultrasound report had sensitivity 73.7%, specificity 87.5%, PV+96.7% and PV-40%. Overall negative rate of appendectomy was (16/96) 16.6%, however, the negative rate of appendectomy within patients who have positive USG result was (2/61) 3.27%. Use of ultrasonography examination in diagnosis patients with suspected acute appendicitis are very helpful in accuracy diagnosis specially when the result of USG was positive, however, the patients with USG negative result should have more evaluated as we cannot relies on it result only.

Keywords: Ultrasound; Acute Appendicitis; Alvarado Score.

INTRODUCTION

The most frequent medical emergency that needs to be treated right away is acute appendicitis (AA) [1,2]. Appendectomy is the best course of action for acute appendicitis [3].

Early diagnosis lowers the risk of developing complications like gangrene and perforation and improves the success rate of appendectomy [4,5].

Even for experienced surgeons, diagnosing (AA) can be challenging, and a definitive diagnosis can only be made based on the histopathology findings following an appendectomy [6].

However, a number of scoring systems were used to aid in the diagnosis of AA. The most widely used scoring system is the Alvarado score system, which has 8 items as shown in table (1) and is primarily dependent on the patient's medical history, clinical examination, and a few straightforward laboratory investigations [7-9].

The sum of the patient's manifestations yields a total score of 10 for the Alvarado scoring system, as shown in Table (1), and these scores were calculated. Patients with a score of nine to ten require immediate care and cannot wait any longer [3,10].

Furthermore, because patients with a score of 0 to 4 have a very low likelihood of having AA, no additional testing was necessary [3]. Patients with an Alvarado score of four to seven require immediate evaluation [10].

Two of the investigations that will aid in accurate diagnosis are computed tomography (CT scan) and ultrasonography (AA).

Numerous studies have shown that using computed tomography (CT scan), which has high sensitivity and specificity values, can help with the accurate diagnosis of (AA) [10-13].Early detection of (AA) is preferred to avoid the complications that can arise from postponing appendectomy.

Ultrasonography can be done faster, with less exposure to radiation, and at a lower money than a CT scan [2,11-17].

An inflamed appendix has an anteroposterior diameter of (≥ 6mm) and is not compressible, whereas a normal appendix appears on ultrasound as a compressible blind ended structure with a diameter of (≤ 5mm) [4].

The appearance of an appendicolith in ultrasound can aid in the diagnosis of (AA) [19]. The purpose of this study is to assess the accuracy of using ultrasound to diagnose patients with suspected appendicitis.

Table 1. Alvarado Score.

	Manifestations	Score
Symptoms	Migratory pain Anorexia Nausea and or vomiting	1 1 1
Signs	Right lower quadrant tenderness Rebound tenderness Fever	2 1 1
Laboratory data	Leukocytosis Shift to the left in leukocyte count	2 1
Total score		10

MATERIALS AND METHODS

Study Design

This is a prospective cohort study that carries out at Alwahda hospital in Derna city of Libya start from December 2020 to December 2021.All patients who attend to general surgery department at Alwahda hospital with right lower abdominal pain and suspected to have AA (Alvarado score between4-7) will include in this study and will undergo to ultrasonography examination (USG)with graded compression technique before appendectomy.Data for age, gender, clinical examinations, and laboratory data such as leukocytosis will collect from all participants' patients. Diagnosis of AA will be written in the USG Report as favor to have AA or negative to Have AA than we will compare the USG result with surgical finding result that will write in postoperative form as "acute appendicitis" or "gangrenous appendix" and/or normal appendices. Leukocytosis was defined as WBC 10,000 and fever was defined as a central body temperature of 37.5 C or higher. On the basis of the history, physical examination, and laboratory results, we will determine the Alvarado score. All participants' patients, as well as their parents if the patients were minors, will be asked for their informed consent.

Statistical Analysis

The present work used SPSS version 22.0, the Statistical Package for Social Sciences, to conduct our statistical analysis. The collected data were examined using the appropriate statistical tests, with a 0.05 p value.

RESULTS AND DISCUSSION

The study population consist of 106 patients 66 (62.3%) females, and 44(37.7%) males with mean age of 14.3±8.6, who attend to the surgical department at Alwahda hospital complained from lower right abdominal pain. Out of 106, (10 patients) were discharge home with no further investigations needed while, (96 patients) diagnostic with suspected acute appendicitis underwent ultrasound examination before appendectomy. The result of Ultrasound examination was 35 (36.5%) patients unlikely to have AA (negative result) while 61(63.5%)

patients were more likely to have AA (positive result). The result of the histopathology as seen in (figure 1)has shown that, 16(16.7%) had normal appendix, 59(61.5%) had acute appendicitis, 12(12.5%) had gangrene, and 9(9.4%) had perforated appendicitis. The validity of the ultrasound examination as seen in table (2), shown that, the sensitivity and the specificity were high (73.7% and 87.5%), respectively. Also, it showed high positive predictive value (96.7%) compared with negative predicative value (40%). It shows that 35 patient who had normal ultrasound result underwent surgery for appendectomy.21 out of 35 patients (60%) confirmed to have acute appendicitis, while 14 out 30 patients (40%) confirmed to have normal appendix on histopathology result. .Overall negative rate of appendectomy was (16/96) 16.6%, however, the negative rate of appendectomy within patients who have positive USG result was (2/61) 3.27%.

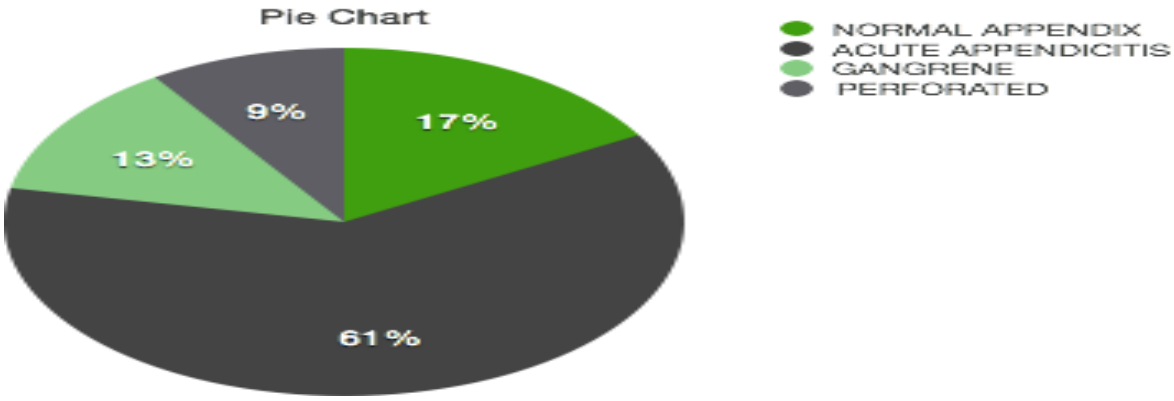

Figure (1): Histopathological Finding.

Table (2) sensitivity, specificity, positive and negative predictive values for ultrasound results [n = 96].

Ultrasound result	Appendicitis		Total
	Yes	No	
Positive**	59	2	61
Negative*	21	14	35
Total	**80**	**16**	**96**

*A negative result, **A positive result for values.

For acute appendicitis (%), Sensitivity= (73.7%), Specificity= (87.5%), PV (+) = (96.7%), PV (-) = (40%).

Predict of complication (gangrene and perforation)

As show in table (3). It had shown that 12(20%) patients had gangrene &9(15%) patients had perforated as a surgical complication on the Histopathological finding when the ultrasound report had a positive result. No complications were seen in patients underwent appendectomy when the ultrasound result had negative result.

Table 3. Surgical Complications of Ultrasound Results (Positive and Negative).

Ultrasound result	Surgical complications			Total
	Acute	Gangrene	Perforated	
Positive**	38	12	9	59
Negative*	21	0	0	21
Total	59	12	9	80

Diagnosis patients with suspected acute appendicitis are more challenging especially when the clinical examination finding is not clear to rich the definite diagnosis. Our result has to support that use of ultrasound examination for patient with suspected appendicitis (Alvarado score between 4-7) are very helpful and this result have an agreement with others studies that show a high accuracy rate for uses of ultrasonography as a diagnostic modality of patients with suspected AA [6,24-27]. Furthermore, this study had shown that positive USG result might predict the development of a complication such as gangrene or perforation. Our finding shows high sensitivity rate for uses of ultrasound examination and this is finding consistency with other studies that support of uses of ultrasonography as modality of choice for patients with suspected AA before operation [2,20-23].Other important finding in our study that is the nearly 97% positive predictive value for acute appendicitis when ultrasound examination has appositive result. It means that any patient who had positive USG result is more likely to have acute appendicitis. However, irrespective of this possibility, out of 35 patients, 21 patients with negative USG result need appendectomy, and therefore, presence of some clinically findings should be outweighed to the USG when it has a negative result. Also, our finding shows high specificity rate when the USG result was negative (87.5%). However, the negative predictive value was very low 40% and this may have a negative effect to have a trust only on USG result in diagnosis of patient with suspected appendicitis. It is very important for patients with acute abdominal pain and suspicious AA to undergo for carful clinical examinations and further investigations likes serum inflammatory markers and CT scan, whereas short time of observations may need for others.

CONCLUSION

The use of ultrasonography examination in the diagnosis of patients with suspected acute appendicitis are very helpful in accuracy diagnosis specially when the result of USG was positive, however, the patients with USG negative result should have more evaluated as we cannot relies on it result only.

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REFERENCES

1. W. H. Peranteau and D. S. Smink. 2013. “Meckel’s and other small bowel diverticula,” in Maingot’s Abdominal Operation, M. J. Zin- ner and A. W. Stanley, Eds., pp. 623–640, The McGraw-Hill Companies, New York, NY, USA, 12th edition.
2. Douglas CD, N. E. Macpherson, P. M. Davidson , J. S. J. S. Gani. 2000. Randomised controlled trial of ultrasonography in diagnosis of acute appendicitis, incorporating the Alvarado score. *BMJ*; **321**(7266):919-22.

3. Schwartz S.I., F. C. Brunicardi . 2010. Schwartz's Principles of Surgery. 9thed. New York: McGraw-Hill, Medical Pub. Division, p. 1073- 1082.

4. Paydar S, A. Akbarzadeh, A. R. Manafi, F. Ghaffarpasand. 2013. Short-term Outcome of Open Appendectomy in Southern Iran: ASingle Center Experience. *Bull Emerg Trauma;* **1**(3):123-6.

5. Khan S. A., M. A. Gafur, A. Islam, M. S. Rahman. 2011. Correlation between clinical presentation, preoperative finding and histopathological report in acute appendicitis. *Mymensingh Med J*;**20**(4):570-7.

6. Alvarado A. 1986. A practical score for the early diagnosis of acute appendicitis. *Ann Emerg Med*; **15**(5):557-64.

7. Soomro A. G., F. G. Siddiqui, A. H. Abro, Abro S., Shaikh N.A., Memon A.S. 2008. Diagnostic accuracy of Alvarado scoring system in acute appendicitis. *J Liaquat Univ Med Health Sci*; **7**:93-6.

8. Memon Z.A., S. Irfan, K. Fatima, M. S. Iqbal, W. Sami. 2013. Acute appendicitis: Diagnostic accuracy of Alvarado scoring system. *Asian J Surg*; **36**(4):144-9.

9. Pinto F, A. Pinto, A. Russo, F. Coppolino, R. Bracale, P. Fonio, et al. 2013. Accuracy of ultrasonography in the diagnosis of acute appendicitis in adult patients: *review of the literature. Crit Ultrasound J*; **5** Suppl 1:S2.

10. Tan WJ, W. Pek, T. Kabir,Y. C. Goh YC, W. H. Chan, Wong WK, et al. 2013. Alvarado score: a guide to computed tomography utilization in appendicitis. ANZ J Surg; **83**(10):748-52.

11. Quigley A.J, S. Stafrace. 2013. Ultrasound assessment of acute appendicitis in paediatric patients: methodology and pictorial overview of findings seen. Insights Imaging 2013 Aug 31.

12. Sivit C.J., M. J. Siegel, Applegate KE, Newman KD. 2001. When appendicitis is suspected in children. *Radiographics;* **21**(1):247-62.

13. Rao PM, J. T. Rhea, R. A. Novelline, C. J. McCabe, J. N. Lawrason, D. L. Berger, et al. 1997. Helical CT technique for the diagnosis of appendicitis: prospective evaluation of a focused appendix CT examination. Radiology ; **202(**1):139-44.

14. Franke C, Böhn erH, Q. Yang, C. Ohmann, H. D. Röher. 1999. Ultrasonography for diagnosis of acute appendicitis: Results of a prospective multicenter trial. *World J Surg*; **23**(2):141-6.

15. Kaiser S, B. Frenckner, H. K. Jorulf. 2002. Suspected appendicitis in children: US and CT--A prospective randomized study. *Radiology*;**223**(3):633-8.

16. Brenner D, C. Elliston, E. Hall, W. Berdon. 2001. Estimated risks of radiation-induced fatal cancer from pediatric CT. *AJR Am J Roentgenol*; **176**(2):289-96.

17. Mathews JD, A. V. Forsythe, Z. Brady, M. W. Butler, S. K. Goergen, G. B. Byrnes, et al. 2013. Cancer risk in 680

000 people exposed to computed tomography scans in childhood or adolescence: data linkage study of 11 million. *BMJ*; 346:f2360.

18. Di Cesare A, F. Parolini, A. Morandi, E. Leva, M. Torricelli. 2013. Do we need imaging to diagnose appendicitis in children? . *Afr J Paediatr Surg*;**10**(2):68-73.

19. Jeffrey R.B., K. A. Jain, H. V. Nghiem. Sonographic diagnosis of acute appendicitis: Interpretive pitfalls. AJR *Am J Roentgenol* 1994; **162**(1):55-9.

20. Cağlayan K, Y. Günerhan, A. Koç, M. A. Uzun, E. Altınlı, N. Köksal. 2010. The role of computerized tomography in the diagnosis of acute appendicitis in patients with negative ultrasonography findings and a low alvarado score. *Ulus Travma Acil Cerrahi Derg;***16**(5):445-8.

21. Lin WC, C. H. Lin. 2013. Re-appraising the role of sonography in pediatric acute abdominal pain. *Iran J Pediatr*; **23**(2):177-82.

22. Nasiri S, F. Mohebbi, N. Sodagari, A. Hedayat. 2012. Diagnostic values of ultrasound and the modified alvarado scoring system in acute appendicitis. *Int J Emerg Med* ; **5**(1):26.

23. Mittal M.K., P. S. Dayan, C. G. Macias, R. G. Bachur, J. Bennett, N. C. Dudley, et al. 2013. Performance of ultrasound in the diagnosis of appendicitis in children in a multicenter cohort. Acad Emerg Med; **20**(7):697-702.

24. Birnbaum B.A., R. B. Jeffrey. 1998. CT and sonographic evaluation of acute right lower quadrant abdominal pain. *AJR Am J Roentgenol*;**170**(2):361-71.

25. Jahn H, F. K. Mathiesen, K. Neckelmann, C. P. Hovendal, T. Bellstrøm, F. Gottrup. 1997. Comparison of clinical judgment and diagnostic ultrasonography in the diagnosis of acute appendicitis: experience with a score-aided diagnosis. *Eur J Surg*; **163**(6):433-43.

26. Birnbaum B.A., S. R. Wilson. 2000. Appendicitis at the millennium. *Radiology*; **215**(2):337-48.

27. Paulson E.K., M. F. Kalady, T. N. Pappas. 2003. Clinical practice. Suspected appendicitis. *N Engl J Med*; **348** (3):236-42.

28. Paulson E.K., M. F. Kalady, T. N. 2003. Pappas. Clinical practice. Suspected appendicitis. *N Engl J Med*; **348**(3):236-42.

الملخص

تهدف هذه الدراسة إلى تقييم دقة استخدام الموجات فوق الصوتية في تشخيص المرضى المشتبه بإصابتهم بالتهاب الزائدة الدودية. وهي دراسة أترابية مستقبلية. أُجريت فحوصات الموجات فوق الصوتية بشكل استباقي لمرضى يُشتبه بإصابتهم بالتهاب الزائدة الدودية الحاد قبل استئصال الزائدة الدودية في مستشفى الوحدة بمدينة درنة، ليبيا. رُبطت النتائج بحالة كل مريض. خضع 96 مريضًا، تتراوح درجاتهم في مقياس ألفارادو بين 4 و7، لفحص الموجات فوق الصوتية قبل استئصال الزائدة الدودية، منهم 40 ذكرًا و66 أنثى، بمتوسط عمر 14.3 ± 8.6 سنة. بلغت حساسية فحص الموجات فوق الصوتية 73.7%، ونوعيته 87.5%، وقيمته التنبؤية الإيجابية 96.7%، وقيمته التنبؤية السلبية 40%. بلغ معدل النتائج السلبية لاستئصال الزائدة الدودية 16.6% (96/16)، بينما بلغ معدل النتائج السلبية لاستئصال الزائدة الدودية لدى المرضى الذين كانت نتائج فحص الموجات فوق الصوتية لديهم إيجابية 3.27% (61/2). يُعدّ استخدام فحص الموجات فوق الصوتية مفيدًا جدًا في تشخيص المرضى المشتبه بإصابتهم بالتهاب الزائدة الدودية الحاد، خاصةً عندما تكون نتيجة الفحص إيجابية. مع ذلك، ينبغي إجراء المزيد من

الفحوصات للمرضى الذين تكون نتيجة فحصهم سلبية، إذ لا يمكن الاعتماد على هذه النتيجة وحدها.

الكلمات المفتاحية: الموجات فوق الصوتية؛ التهاب الزائدة الدودية الحاد؛ مقياس ألفارادو.