

Ultrasonographic study of Renal Pelvicalyceal System, and its dilatation, which may indicates for acute appendicitis.*

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ABSTRACT:

The present measured the ultrasonographic parameters of the pelvicalyceal system in dyspeptic individuals (263), and another (168) males and (158) females patients who have been diagnosed as cases of acute appendicitis (AA). Samples of their appendices' and peritoneal fluid were taken for histopathological, microbial and immunological studies. The white blood cell count (WBC) and general urine exam (GUE) were estimated for all subjects, which were used in this study prior to appendectomy. This study revealed that (34%) of the patients , were accompanied by right pelvicalyceal system dilatation (RPCSD), (1.5%) effected bilateral pelvicalyceal system dilatation (PCSD,) preoperatively and continued for three to four weeks, post operatively, but all of the cases followed up; restored normal pelvicalyceal system (PCS) later to the appendectomy.

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INTRODUCTION

Acute appendicitis (AA) can be considered as the most common cause of acute abdomen pain, and commonest emergency operation in (USA) and Britain [2]. The proximal parts of the urinary tract consist of the minor and major calyces and the renal pelvis. The minor calyces attached to the renal parenchyma, around the bases of a variable number (7–14) of conical renal papillae, which form the tips of the renal pyramids. Each minor calyx is a trumpet-shaped structure, which surrounds either a single papilla or, more rarely, groups of two or three papillae. The minor calyces unite with their neighbors to form two or possibly three larger chambers, the major calyces [1]. Sanderman J [3] stated that; urinary complications and symptoms might be one of the rare presentations of AA. P.

Ronan [4] and Robert E. [5] they reported that; the diagnosis of acute appendicitis is not easy at all times. AA is common in middle age group; however no age could be excluded, since child hood and elderly patients when suspicious can be affected. Therefore, recent studies prefer clinical evaluation paramount, before considering medical imaging [6]. It is well known that abdominal autonomic nerve supplies play an important role in regulation of body response to appendicitis. Sympathetic supplies of the appendix (as one of the derivatives of the mid gut) have sympathetic supply from the coeliac and superior mesenteric ganglia, and a parasympathetic supply from the Vagus; the nerves are distributed in plexuses around the rami of the superior mesenteric artery. Lumber trunk supplies somatic branches for lower abdomen wall and

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lower limb, but its visceral branches only for pelvic organs. The Vagus give branches to celiac plexus while the pelvic splanchnic support hypogastric plexus [7-8]. In atypical patient, i.e. the patient with prolonged symptoms, inconsistent history, or misleading physical examination, diagnostic analysis and investigations should be helpful in establishing the appropriate diagnosis. Advances occurred with the support of clinical, anatomy and invention of imaging techniques since Last three decades [9]. Abdominal (US) or contrast enhanced CT-scan examination reduces the rate of negative appendectomy [4]. Ultrasonography (US) is quick, simple, easily available and not expensive more applicable than Computed Tomography Scan (CTS), moreover the radiation of the last is harmful in children; even in low dose, for the mentioned causes its preferable the direction of (US) for the examination and diagnosis of diseases, as appendicitis, and renal pelvicalyceal system dilatation, especially in children and pregnancies [10] The normal (US) study of the pelvicalyceal system appears as both anterior and posterior layers fused together in pearly echo free space "white line" [11], but in the case of dilatation for any cause a slit of air (dark slit) appear in side white echo space, separates both layers [12]. The present work aimed to study; normal ultrasonographic finding of the renal pelvicalyceal system, the dilatation of the system which accompany cases of acute appendicitis, and causes of such renal changes.

METHODOLOGY

Subjects and patients

263 normal non-diseased volunteers, and 326 patient (168 males and 158 females) complaining abdominal pain and signs of (AA) were considered in this study. The patients divided into (7) age groups by

decades. Patients were subjected to (US) for examining their appendixes (measurement and locations) and renal pelvicalyceal system. Diagnosed cases as acute appendicitis treated surgically by appendectomy. The histopathological sections were taken from appendixes, and their peritoneal fluid were examined well. The present work was done in Erbil city (Emergency, Department of Rizgary Hospital, Zheen Private Hospital and Erbil Teaching Hospitals. The histopathological technique were done in the histopathological higher study lab of the Department of Anatomy / College of Medicine / Howler Medical University. The following steps were followed:-

- 1- Thorough history were recorded including right iliac fossa pain. Cases with previous urological problems, operations, were excluded.
- 2- Investigations including (GUE) for pus cells, red blood cells and crystals, WBC by automatic Coulter method (Swilab Alfa standard produced by Boul company Sweden-2008). Hemoglobin (Hb) concentration also measured by Coulter method.
- 3- The MANTRELS (Alvarado) Score (table 1) are calculated and recorded for each case of acute appendicitis.
- 4- The ultrasound changes in the pelvicalyceal parameters, once preoperatively and repeated weekly after surgical interference (appendectomy), for 2-4 time, consequently to follow up the (PCSD).
- 5- (US) with graded compression (at room temperature) was commonly used, a curvilinear array transducer, usually 3.5 MHz is employed (G50 Siemens US machine, Toshiba

SSA- 100A and Siemens SPU 2200) (figure 1).

- 6- Transverse, Sagittal, and longitudinal images were obtained, including right lower quadrant and right flank extending from right upper quadrant area to right pelvis. For females, their uterus and adnexia examined well, for exclusion of any pathologies, Each examination lasted for 15-20 minutes. Normal pelvicalyceal system mainly pelvis of the kidneys was examined ultrasonographically [11], and so for case of dilatation for any cause [12].
- 7- Classical Operative techniques (Grid-iron muscle splitting incisions) were used, except for doubtful cases pfannenstiel incisions were done to them [13].
- 8- Peritoneal fluid was taken for microbial and pathological study.
- 9- Parts of each appendix were taken for histopathological sections and examination.

Statistical analysis:

Eta-test introduced for estimation of the relation between nominal and interval columns . Contingency Co efficiency administered for estimation of the relations between nominal and nominal values, and asymptotic standard error measured by Null hypothesis. Significant effect of ages, duration and rebound tenderness were seen on the (PCSD) as the incidence of (AA) [14].

RESULTS:

Appendicitis and (PCSD):

The (US) examination (Table:1) revealed that; (110) (or 34%) of the patients had (RPCSD) which appeared as a slit of air (dark slit) inside white echo space, separates both layers of the (PCS) (figure: 2), and five of the cases (or 1.5%) had

bilateral (PCSD). Later on after surgical interference (appendectomy); (96) of them resumed normal (PCS) within (3 weeks), while the reminders (14) of the cases resumed normal pelvicalyceal system within four weeks. Ultrasonographic measurement which were done prior to surgical interference to the patients that diagnosed clinically as cases of (AA) and repeated in first, second, third and fourth week's postoperatively resulted in that; cases with (RPCSD), (155) case were clear-cut had appendicitis, the remainder (171) cases the (US) were inquiry, although they were clinically resembled acute appendicitis.

Histopathological and Microbiological Findings:

The histopathology revealed (70%) acute appendicitis feature; including perforated, impending perforation (figure:3-4-5), and mucocoele, (25%) of acute recurrent and chronic types, and (5%) were negative. Of the acute cases (15.3%) were catarrhal (figure 6), (9.5%) drumstick appendix, (3.9%) cases gangrenous, and (2.2%) had negative feature (figure 7). General urine examination (GUE) revealed significant relation with (RPCSD) with a P value = < 0.05 in that; Pus cells were positive (10-35) in 106 with percentage of (32%) per high power microscopic field. Pus cells and red blood cells RBCs (10-30) were (19) (6%) of the cases before and after (seven days) following the appendicectomy. White blood cells count (WBC) in 118 cases was < 10500 while, 208 cases was > 10500. The presence of urinary symptoms had no significant relation with right renal changes (RRC), Contingency Coefficient test was used for this purposes. A mismanaging were seen in patients with (RPCSD) in that they given analgesics and inappropriate antibiotics (P-value-0.0210). The amount polymorph mononuclear cells (PMN) cells and lymphocytes in the peritoneal contents

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was significantly related with (PCSD). The microbial examination showed different mono and combined growth of bacteria (*E.coli*, Anaerobic, Protease and *Klliebsella*), and the high protein content of the fluid significantly affected the right renal changes (RRC) at (P-value=0.02). Growth of more than one bacteria in the culture significantly was related to the (PCSD) at (p-value= 0.01).

DISCUSSION

(US) are more useful in detecting than in ruling out appendicitis The (US) criteria for diagnosis of AA are; the inflamed appendix should be a peristaltic and non-compressible, and a threshold diameter of 6 mm is invaluable for diagnosing (AA) [15]. Vasileios N. et al [16] described that perforation of appendix into the urinary bladder likely to be happening and Emilio Etala [17] mentioned that; the selective urinary system changes as a confluences of (AA), may caused or may be presented as cystitis, appendicular mass (Appendicular phlegmon) and renal failure due to appendicitis, such results are compatible with that obtained by the present study in that (PCSD) resulted as a consequences of appendicitis. In the same way It was reported by Ian McColl [18] that negative appendectomy arranged in (15-40%) of those undergoing emergency operations for suspected appendicitis, and it was stated by Pisarra VH. [19]; that no certain definite, indirect sign detected by (US) in this regard, so for definitive presentation of acute appendicitis, further diagnostic testing and close follow-up is needed. In same manner; the (US) examination (Table:1) revealed that; (110) (or 34%) of the cases had right pelvicalyceal system dilatation (RPCSD), and 17 of the cases (or 1.5%) had bilateral (PCSD). later on after (3 weeks) of the surgical interference (appendectomy); 96 of the cases resumed normal pelvicalyceal system, the other 14

cases returned normal after 4 weeks. Accordingly the mechanism of the changes occurring in the surrounding of appendix specially (PCSD) during its inflammation, might be postulated mainly due to the followings:-

- 1- Infections of the (RPCSD) are significantly related with peritoneal fluid infection surrounding appendicitis area, and increased polymorph nuclear (PMN) cells with high rate of protein in the fluid , an idea in agreement with what mentioned by Nigar Coskun, and et al [20], they showed that mast cell density, number of Schwann cells and ganglia were significantly greater in acute appendicitis.
- 2- Body defense for local infection in order to limit more spread, like that what occurs in paralytic illus may affect the ureter also. Normal uretric peristalsis occurs in order to prevent vesico-uretric reflux [21], but ending of these peristalsis lead to restriction of urinary drainage so may leads to (RPCSD).
- 3- Pressure effect of distended inflamed appendix on the adjacent organs, indirectly effect on the bladder, intern the latter by itself affected by cystitis and increase back pressure effect on the ureter; then dilatation of the RPCS. In this respect the present result in agreement with that described by Omundsen M and Dennett E. [22], who mentioned that appendicitis for more than 24 hours leads to complications including in the other abdominal organs.

CONCLUSION

In atypical presented cases of suspected acute appendicitis, (RPCSD) certainly can be regarded as indirect (US) sign of (AA), such results observed in 34% of the (AA) diagnosed cases, which are subjected to

surgical interference, such cases were subsided after the operation.

RECOMMENDATION:

1- According of the results of the present study in which further indirect signs of (US) and obtained the searcher recommends that; right renal

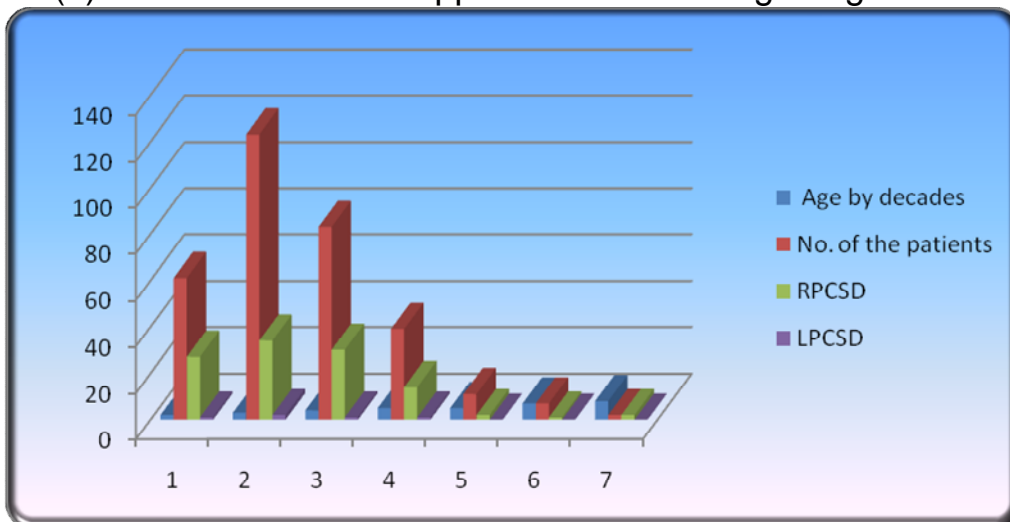
pelvicalyceal system dilatation can be considered as indirect sign of appendicitis.

2- Further studies are required in follow up of operated cases by (US) to see operation effect on renal changes and body response to acute appendicitis.

Table : (1) Alvarado (MANTRELS) score

Characteristic	Score	Characteristic	Score	Characteristic	Score
M = Migration of pain to the RLQ	1	N = Nausea and vomiting	1	R = Rebound pain	1
A = Anorexia	1	T = Tenderness in RLQ	2	E = Elevated temperature	1
L= Leukocytosis	2	S = Shift of WBC to the left	1		
Total	4		4		2

Chart (1) - RPCSD in acute appendicitis according to age distribution



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Figure (2)PCSD observed by us

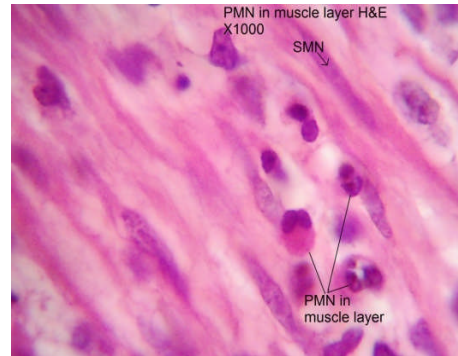


Figure (4) perforated appendix , PMN cells in the serosa. X100

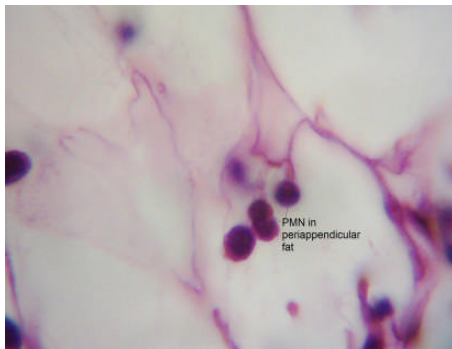


Figure (3) PMN cells in the periappendicular fat. X100

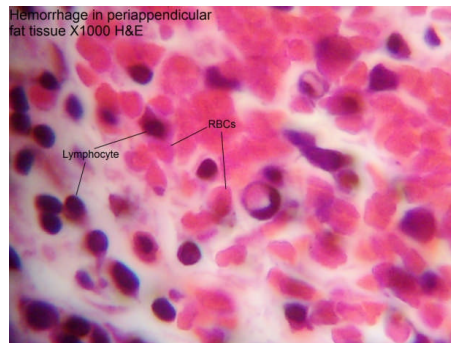


Figure (5) Impeding perforated appendix .X100

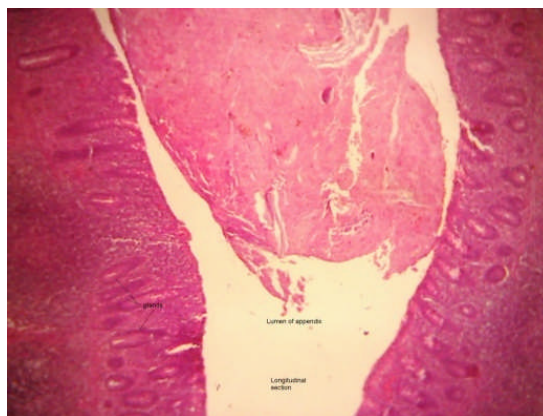


Figure (6) Catarrhal inflammation of appendix. X100

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(دراسة منظومة حوض والكاس الزهري الكلوي بالامواج فوق الصوتية ، وتوسّعه الذي قد يعتبر احدى اعراض التهاب الزائدة الدودية الحاد)**.

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الخلاصة

من الملاحظ خلال السنوات الاخيرة إستعمل الفحص بالامواج فوق الصوتية بشكل واسع لإثبات التشخيص في الحالات المشكوك فيها لإلتهاب الزائدة الدودية الحاد (AA)،. استخدمت الدراسة الحالية الامواج فوق الصوتية لانها تعتبر إحدى الوسائل التشخيصية وخصوصا لايجاد مقاييس منظومة حوض والكاس الزهري الكلوي والختلافات المرضية والتشريحية في الزائدة الدودية الاعضاء الداخلية الاخرى التي ممكن ان تسبب توسع حوض الكلية والكاس الزهري الكلوي .استخدمت الدراسة: (٢٦٣) متطوع ممن يشكون من سوء الهضم وبدون عراض مرضية اخرى ، (١٦٨) شخص يعاني من التهاب الزائدة الدودية الحاد و(١٥٨) مريضة بالتهاب الزائدة الدودية الحاد، تم اخذ عينات من السائل ابريتوني من الجوف البطني للمرضى اثناء اجراء عملية استئصال الزائدة الدودية، وعينات من الزائدة الملتهبة وغير الملتهبة وتم اجراء الفحص النسيجي والمناعي والمجهري لها . اخذت كذلك عينات من دم وبول الاشخاص المستخدمين في الاختبار لاحصاء خليا الدم البيض (WBC) وتحليل البول العام (GUE) لكل المواضيع التي قدّمت في هذه الدراسة قبل عملية إستئصال الزائدة الدودية. هذه الدراسة كشفت بأن (٣٤ %) من المرضى، كان لديهم توسع في منظومة حوض والكاس الزهري الكلوي مصاحب لالتهاب الزائدة الدودية الحاد ، نسبة (1.5%) من الحالات كان قد حدث توسع في الكليتين اليمنى واليسرى وكان موجود قبل الجراحة ومستمر لثلاثة إلى أربعة أسابيع بعد اجراء عملية استئصال الزائدة، لكن كل حالات توسع منظومة حوض والكاس الزهري الكلوي فيها عادت الوضع الطبيعي بعد عملية الاستئصال بثلاثة الى اربعة اسابيع

* (البحث جزءا من اطروحة دكتوراه مقدمة الى عمادة كلية الطب | جامعة هولير الطبية | كاحدى متطلبات نيل شهادة الدكتوراه فلسفة في علم التشريح والانسجة)
** ماجستير في التشريح | دبلوم عالي في الطب والجراحة العامة | كلية الطب جامعة هولير الطبية
*** دكتوراه في التشريح والانسجة | استاذ مساعد | كلية الطب جامعة ديالى
****دكتوراه في علم الأشعة | استاذ | مستشفى رزكري التعليمي