Mild Pelvicalyceal System Dilatation Observed by Ultrasound as a Sign of Acute Appendicitis

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ABSTRACT

Background and Objectives: The positive pelvicalyceal changes observed by ultrasound in suspected acute appendicitis cases confuse the mind in taking a decision for surgical interferences or medical management. This study aims to analyze the effect of pelvicalyceal system dilatation on the diagnosis of acute appendicitis and the associated factors of mild pelvicalyceal system dilatation in acute appendicitis.

Methods: The study assessed 326 suspected acute appendicitis in addition to 260 cases of functional dyspepsia as a control group. Ultrasound of the abdomen was a principal imaging study in the research with the emphasis on pelvicalyceal dilatation, combined in some cases with KUB, CT and Doppler-Ultrasonography.

Results: Out of 326 cases of acute appendicitis, ultrasound revealed that 34% had RPCSD and 7% had bilateral BPCSD. The pelvicalyceal dilatations were observed in 54.5% of the acute recurrent cases or chronic appendicitis and suppurative appendicitis were 30%. The recorded length of appendix ranged from 3.8 to 18 cm. The position of appendix were mainly pelvic (59%) followed by retrocecal (36.4%).

Conclusions : The Pelvicalyceal system dilatation observed by ultrasound in the suspicious acute appendicitis patients can be served as a sign for diagnosis of acute appendicitis in states of hesitation.

Key words: Acute appendicitis, Pelvicalyceal system, Retrocecal, Pelvic.

INTRODUCTION:

The large numbers of pathological disorders that share in acute right lower quadrant (RLQ) abdominal pain, frequently will obscure appendicitis diagnosis especially when pelvicalyceal system dilatation (PCSD) observed by ultrasound (US) in these cases. Pelvicalyceal system dilatation appears as dark slit of air (about 5mm) inside white echo space, formed by both anterior and posterior layers of pelvis [1, 2]. It had been observed by various researches that the hidden anatomy and anatomical variability of the appendix position, cause atypical, inconspicuous, delayed, complicated presentation of acute appendicitis (AA) and vague acute abdomen [3,4]. There is an old adage, which state that; most of the cases of right lower considered acute appendicitis until proven otherwise, however most of the physician has been misled by this axiom [1,2,5]. For this reason, the astute clinician wants to have a good list of possibilities in mind for all the abdominal pain. Anatomical consideration is the key, for recalling inclusive lists of the causes of RLQ pain and in visualizing of the structures layer-by-layer [6]. In most of acute abdominal patients the base in the usage of US for diagnosis of acute appendicitis is an exclusive manner; the direct finding is occasional in 70% of cases [7]. Anyhow high-resolution (US) is perhaps more widely used in urology, the size of the kidneys, thickness of the cortex, presence of pelvic dilatations and hydronephrosis can be measured with great accuracy [8]. The complicating effects of AA on the kidneys had been reported previously as

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some case reports moreover to some simple urinary changes [9, 10].

MATERIAL AND METHODS

In this study (326) patients of acute abdomen who suspected to have acute appendicitis investigated in addition to (260) cases of functional dyspepsia as a control group in the period of (2006-2008) in Erbil city hospitals and postgraduate laboratory in anatomy department.

The study designed to perform the sonographic study of the PCS in (326) patients of suspected (AA) and (260) dyspeptic (control group). In dyspeptic person upper gastrointestinal endoscopy (OGD) were previously performed.

For acute appendicitis (AA) Patients: 1. Clinical examinations were performed and (MANTRELS) score were applied. 2. Laboratory investigations included (GUE, HB and WBC). 3. Ultrasonographies in all of the patients moreover post operatively in positive cases

4. Operations of appendicectomies were performed and per-operative study including; appendicular positions, bacteriology and histopathological studies were achieved. In control group cases upper gastrointestinal endoscopy (OGD) with abdominal ultrasonography performed. The study results statistically analyzed as the following:

1. Eta-test introduced for estimation of the relation between nominal and interval variables
2. Contingency Coefficient administered for estimation of the relations between nominal and nominal variables,
3. Chi-square for (Interval with Interval)
   P-value < 0.05 regarded as Significant value.

RESULT:

In 110 (34%) cases, mild right pelvicalyceal dilatation were observed *(RPCSD).*

In 23 (7%) of cases (BPCSD) were observed preoperatively and weekly examinations by ultrasound continued for resumed to normal two to three weeks after appendectomy. In cases of positive PCSD; Intra-operative appendix position were studied which showed that 59% pelvic, 36.4% retrocecal, 1.98% paracolic, 0.9% was sub-ileal and in 1.8% cases were not clearly visible because of mass formation (phlegmon). The length of appendix range from 3.8 -18 cm, statistically showed no significant effects on the results of PCSD, and this proves that this complication is beyond the mechanical cause. Pathologically acute recurrent appendicitis or chronic (ARA) shown in 54.5% and suppurative appendicitis in 30%, may be due to more antibody production and prolonged biochemical poisoning. Longer duration of complainings were observed in BPCSD. In 53% of patients bacteriological examination revealed combined growth of bacteria (E coli, Kliebsella, streptococcus and Bacteroid), 33% single bacteria E Coli, 2% Clostridia and in 12% no growth isolated. No significant relations were found with PCSD. Urinary examinations (GUE) revealed; 15-35 (+++) pus cells/ hpmf in 33% of patients and 10-30 pus cells plus RBCs / hpmf in 24%. Patients. Clinically 83% were asymptomatic of urinary problems, and 78% related with PCSD. Urinary examination of all PCSD patients revealed RBCs and WBCs. WBC count revealed: 55.5% < 10500 cells/ml and 44.5% > 10500 cells/ml. In 22 patients MANTRELS score revealed: <5, in 100 patients score were 5-6 and in 204 patients score were ≥7. Anyhow statistically the scores showed no significant relation with PCSD (P-value > 0.05). In comparison of the results, Positive appendicitis approval in patients, who had PCSD, was (97.3%) and macroscopically negative or normal appendix per-operatively was (2.7%).

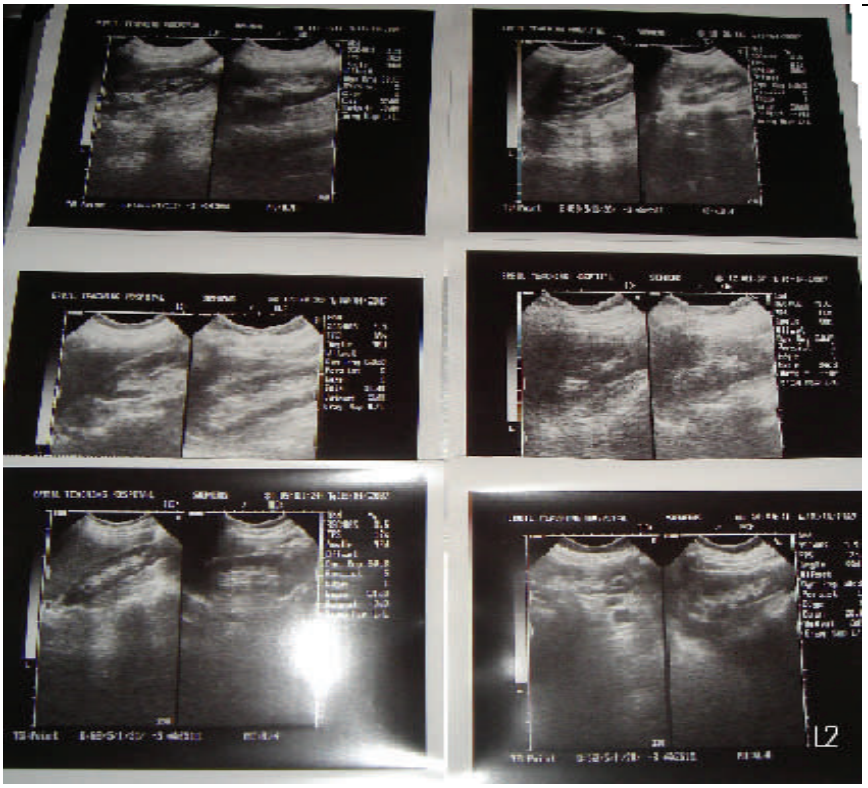

Figure 1: Sonographic figures of renal pelvises in positive PCSD

DISCUSSION :

Despite a marked decline in appendicitis associated mortality over the past 50 years, rates of perforation and negative appendectomy, remain unchanged because they are influenced strongly by factors untouched by the intervening technological advances [11]. Gulzar S. *et al*; stated that the responsibility for diagnostic delay depends on both physicians and patients, moreover to various anatomical position change of appendix ([12]). Accordingly the present research on the PCSD in the suspected states of AA was done, aimed in touching one of the non-touched factors. In order to decline the incidence of perforations or negative appendicectomies. This study interrogate PCSD in the benefit of diagnosis of AA. In certain urological cases PCSD were observed and excluded like vesico-uretric reflux with neurogenic bladder, pregnancies and obstructive urological obstructive urinary tract stone, which caused various degrees of PCSD. These changes acceptable on urological bases and compatible with what had been recorded in this regard [13, 14, 15] As the (PCASD) most observed in acute recurrent cases this had been also documented by (Omundsen M, Dennett E 2006) that the recurrences and durations of the pathology are two important factors needed for secondary renal changes to occur [16]. Right PCSD was observed in two cases of twisted complicated right ovarian cyst by (US), congested or inflamed appendix also observed per-operatively. Anyhow (fig. 5), it is settled that the ovarian cyst and adnexial torsion in young girls, rarely affect on the kidney functions [14]. Caecal and ileal US showed in one of the patient ileal oedema in a patient with typical signs of AA, although the width of appendix was below suspected level in appendicitis as seen generally it was (0.43cm); during laporatomy typical appendicitis was found .

and excised, but no PCSD were observed. Ileal edema observed also previously, and attributed to the low position of appendix [17]. Anatomical positional effect of appendix will decide the series of complications, which may occur in delayed cases [18.] Other research's results, documented that more than half of patients with ascending retrocecal appendicitis present with atypical clinical presentation [19]. Anyhow blood supply variability of appendix showed no certain variations in the complications. The position of appendix showed significant effect on the results of the (PCSD) in the (AA) patients, as the (PCSD) were more prominent in the retrocecal and pelvic appendices rather than other sites. These changes explained by the direct anatomical relation effects of appendix on the renal collecting system or directly on the right ureter and consequently on the (PCS) (20). This result coincides with the statements which had been documented by A-Tundidor Bermudez AM *et al* (2004); B-Herscu G *et al* (2006) that Pelvic and retrocecal appendix positions were associated with a higher incidence of complications and urology symptoms [9,10]. In comparison of the results Positive appendicitis in patients, who had (PCSD), was (97.3%) and macroscopically negative or normal appendix per-operatively was (2.7%). The positive appendicitis results in patients who had no (PCSD) were (93%), while the negative laporatomies were (7%) (Fig. 6) (21). By this result we considerd the importance of renal changes signs for the diagnosis of (AA) especially in interlaced cases (Fig 2).

Although the symptoms of flank pain, nausea, haematuria and pyurea with or without fever, UTI, and frank vomiting are highly suggestive of renal stones, and should be considered in the differential diagnosis of acute appendicitis [22]. In this study observed nearly in all the cases of acute appendicitis with the positive (PCSD) patients complained of no urological symptoms. It should not be missed that the acute urological conditions are the most disorders of the genitourinary tract cause diagnostic confusions [23]. It had been observed that PCSD is one of the intermediate steps of urinary tract complications due to appendicitis, it is reversible if appendicectomy performed otherwise it progresses to more aggressive complications like hydronephrosis, renal parenchyma damage, which are less likely to be reversed in addition to involvement of contra lateral renal pelvis and end in renal failure [24].The possibility of an appendicolith with or without acute appendicitis must always be considered in the differential diagnosis of acute lower abdominal and pelvic disorders, and in the consideration of common acute urological disorders [23].Regarding to the observed (PCSD) changes especially on right side may be interpreted as the following:

1. Multiple and recurrent infection of appendix and its surrounding leads to increase in nerve endings ganglions, sproutings and neurogenic toxic materials which interfere with ureter functions [24,25].
2. A toxic enzymes called Endthelin-1 (ET-1) secreted in the area of infection which result in ischemia and recurrent toxic effect on the ureter [24].
3. According to previous points mentioned and due to local and distant infection spread ureteral dysarrythimia and ureteral palsy observed by studies which lead as an end result to right renal PCSD and in delayed cases even left renal changes [15]. It is observed that most of the cases of PCSD associated with urinary changes but not vice versa. This study results that urologically non-reasonable PCSD observed by (US) in acute abdomen cases, in favor of AA diagnosis.

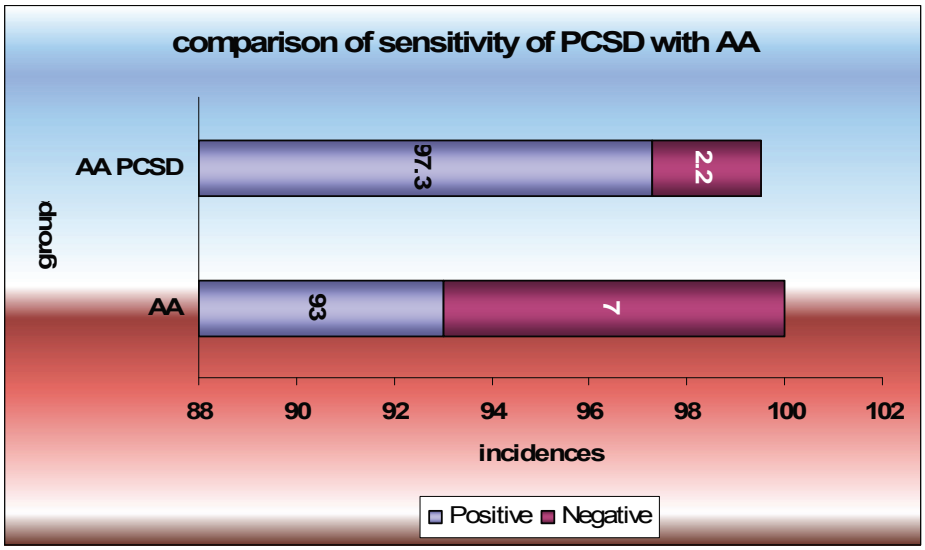

Figure 2 : Sensitivity of PCSD sign in acute appendicitis diagnosis

Table 1: Summary of statistical results

Related sign or changes	Significances					
	RPCSD		LPCSD		Both	
Age	0.031	S	0.030	S	0.736	NS
Sex	0.974	NS	0.736	NS	0.736	NS
C/O	0.467	NS	0.008	NS	0.008	HS
Duration	0.001	HS	0.000	HS	0.000	HS
Stature	0.030	S	0.086	NS	0.410	NS
RBT	0.626	S	0.738	NS	0.736	NS
Cough tenderness	0.028	S	0.815	NS	0.815	NS
Rovsing	0.760	NS	0.642	NS	0.642	NS
Obturator	0.001	HS	0.969	NS	0.969	NS
Psoas	0.002	S	0.840	NS	0.840	NS
Treatment received	0.002	S	0.247	NS	0.247	NS
Haematuria and Pyuria	0.001	HS	0.001	HS	0.001	HS
Mantrels score	0.180	NS	0.084	NS	0.084	NS
WBC	0.089	NS	0.020	S	0.021	S
HB	0.075	NS	0.014	S	0.014	S
Appendicular dimensions	0.406	NS	0.740	NS	0. 740	NS
Caecal position	0.001	HS	0.000	HS	0.003	HS
Appendicular position	0.001	HS	0.005	HS	0.005	HS
Type of blood supply	0.001	HS	0.191	NS	0.191	NS
Periappendicitis fluid	0.001	HS	0.0٧٣	NS	0.073	NS
Peritoneal exudates	0.189	NS	0.003	HS	0.003	HS
Type of bacterial attack	0.338	NS	0.003	HS	0.003	HS

CONCLUSION:

It had been observed that PCSD is one of the intermediate steps of urinary tract complications due to appendicitis, it is reversible if appendicectomy performed otherwise it progresses to more aggressive complications like hydronephrosis, renal parenchyma damage, which are less likely to be reversed in addition to involvement of contra lateral renal pelvis and may end in renal failure**.** Practically this study result can help in enforcement of diagnostic efficiency of MANTRELES score by adding (2) degrees to (AA) cases with (RPCSD) this can be explained by emphasis of appendicitis one degree, another for RPCSD as its complication. While adding (3) degrees for (BPCSD) the third degree of more advanced complication of left kidney involvement.

REFERENCES:

1. Alan S, James L. Alimentary tract, appendix. In paul R.Wheater, H george Burkitt Histology, 2nd edition. Hong Kong, lyntone house. 1993; pp 172-176.
2. Gerst SR, Hedvig H. Radiology of the urinary tract in: Tanagho EA, McAninch JW. Smthi's general urology. 7th edition. McGraw-Hill Companies, Inc. New York. 2008: Ch (6) 71-78.
3. Michael H. An approach to the 'acute abdomen' in pathways in surgical management, Edward Arnold (publisher) ltd. London. 1989 .ch24:p 280- 294
4. Harold E. Abdomen and the pelvis; Vermiform appendix. A revision and applied anatomy for clinical students;10th edition; Blackwell Scientific Publication. London 2001: chapter 2 p80-85.
5. Guidry SP, Poole GV. The anatomy of appendicitis. Am Surg. Jan 1994; 60 (1):68- 71.
6. Luigi S, Ochoa JB, Tommaso L, Hines J, Talavera F, Grosso MA.. e- Medicine.General surgey. Abdomen.appendicitis; 2006.
7. Asif S. Gastrointestinal tract and abdominal cavity. In :MCQS in clinical imaging.Champan and Hall medical, 2-6 boundary row, London. 1994: ch4:pp 116-140.
8. Christopher F. The kidneys and ureters In: Williams NS, Bulstrode CJK, O'Connel PR. Bailey & Loves short practice of surgery.25th edition, Hoder Arnold. London. 2008;Ch 71: 1285-1313
9. Tundidor Bermudez AM, Amado Dieguez JA, Montes de Oca Mastrapa JL.Urological manifestations of acute appendicitis. Arch; Esp Urol 2006;58(3):207-12.
10. Herscu G, Kong A, Russell D, Tran CL, Varela JE, Cohen A, Stamos MJ. Retrocecal appendix location and perforation at presentation. Am Surg 2006; 72(10):890.
11. Hale DA, Molloy M, Pearl RH, Schutt DC, Appendicectomy: a contemporary appraisal. Ann Surg 1997; 225(3):252-261.
12. Gulzar S, Umar S, Dar GM & Rasheed R. Acute appendicitis – importance of clinical examination in making a confident diagnosis. Pak J Med Sci 2005: 21(2):125-132.
13. Bergin C. Genitourinary infection In: Mike B. Siroky, Robert A. Edelstein, Robert J. Krane. Manual of urology diagnsis and therapy.second edition. Lippincott Williams and Wilkins. A wolters kluer company Phyladilphia, New York12. 1999: 247-269
14. Gerber GS, Brendler CB. Evaluation of the urologic patient. In: Patrick C.

Walsh, Alan B. retic, Alan J. wein, Louis R. Kavoussi,.Andrew C. Novick, Alan W. Parten and Crag A. Peter- Campbells Urology.Eighth edition. Saunders-Elsevier science.the curtis center.Independent square west Philadelphia; Pennsylvania. 2002: Ch 3-pp 81-83

15. Kabalin JN. Surgical anatomy of retroperitoneal organs, kidneys, ureter,bladder. In: Alan B. etik, E. Darcott Vaugan, Alan J, Wein, Louis R. Kavossi, Andrew C. Novick, Alan W. Partin, and Craig A. Peters. Campbells Urology 8th Edition,V 1, 2002: pp 10
16. Omundsen M, Dennett E. Delay in appendicectomy and associated morbidity: a retrospective review. Anz J Surg 2006; 76(3)153-155.
17. Steve H,.Robinson PJ. Appendicitis.Large bowel. In:David Sutton.Text book of radiology and Imaging. Volume 1: Section 4. Churchill Livingst one. Elsiver limited.Pheladilphia.2003: ch21:652-3:
18. Guidry SP, Poole GV. The anatomy of appendicitis. Am Surg 1994; 60 (1):68- 71.
19. Kim S, Lim HK, Lee JY, Lee J, Kim MJ, Lee AS. Ascending retrocecal appendicitis: clinical and computed tomographic findings. J Comput Assist Tomogr 2006;30 (5): 772-6.
20. Sinnatamby CS. Abdomen. In: Lasts anatomy regional and applied.10th edition.churchill Livingston. London: 2006: pp249-290.
21. Jeffrey RB, Manaster BJ, Gurney JW, Zimmerman RD, Cure JK, Donney LF. Diagnostic Imaging Emergency. PartII-section 3: Abdomen/ Pelvis , AIRSAY-Canada. 2007:pp 76-79
22. Green R. Urology consultation, urology examination- Urology instistute. stuart george instituite 2002:13244-6748
23. Teke Z, Kabay B, Erbiş H, Tuncay OL. Appendicolithiasis causing diagnostic dilemma: a rare cause of acute appendicitis. Ulus Travma Acil Cerrahi Derg 2008; 14(4):323-325.

24. Morishita K., guishimiyagi M.,Hashiguchi M., Stein GH, and Tokuda Y.Clinical prediction rule to distiguish pelvic inflammatory diseases form acute appendicitis in women of child bearing age. American J Emerg Med 2007;25(2):152-7.
25. Nigar C, Muzaffer IS, Gulsum O. ELPEK: Mast cell density and neuronal hypertrophy in patients with acute appendicitis The Turkish Journal of Gastroenterology, 2003.
26. Cathy M. Functional obstruction: the renal pelvis rules. J Clin Invest 2004; 113(7): 957–959.