Review Article

Role of ultrasonogram in chronic abdominal pain

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Abstract

Abdominal Pain is very common reason for Out Patients Department and ward visit. In Pediatric population almost more than half cases are not having anyu specific reason for that. These are classified as Functional Abdominal pain. Many times patients insist for radiographic evaluation.

Key words: Abdominal pain, Chronic abdominal pain, Ultrasonogram

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Introduction

Abdominal pain is a common problem & constitutes about 3% of the hospital visit among adults [1].It may be acute or chronic. Chronic abdominal pain is defined as continuous or intermittent abdominal discomfort lasting for more than six months. It may occur due to problems of the gut, biliary tract, pancreas, gynaecological or genitourinary origin. Sometimes Chronic abdominal pain may be part of a functional syndrome [2]. The term "chronic abdominal pain" also includes "recurrent abdominal pain," which is characterised by more than 3 episodes of abdominal pain; severe pain sufficient to affect daily activities; symptoms lasting more than 3 months; and absence of any organic cause [3]. Chronic abdominal pain usually occurs beyond 5 year of age & nearly 10% of children require detailed evaluation.

The usual Presenting features of chronic abdominal pain include undifferentiated abdominal pain (Functional, inflammatory bowel disease, coeliac disease, mechanical obstruction, irritable bowel syndrome) [4], intestinal colic, symptoms suggestive of Crohn's disease, pelvic or iliac fossa pain (gynaecological disease, Crohn's disease, functional syndromes), dyspepsia, biliary symptoms, right upper quadrant pain & renal tract symptoms. Majority will subside with appropriate symptomatic treatment.

However signs like iron deficiency anaemia, blood in stool, awakening at night with gastrointestinal symptoms, unexplained weight loss, family history of colorectal cancer & age at onset over 50 years should provoke detailed workup study [5,6].

The evaluation of Chronic Abdominal Pain will lead to an etiological diagnosis which may involve variedsystems. Genitourinary causes include Congenital abnormalities, Endometriosis, Ovarian cyst, ovarian cancer, Renal calculi, Sequelae of acute Pelvic inflammatory disaeases; Gastrointestinal causes include Celiac disease, Chronic appendicitis, cholecystitis, hepatitis, pancreatitis, pancreatic pseudocyst, Colonic/ gastric/ pancreatic cancer, Crohn disease, Granulomatous enterocolitis, Hiatus hernia with reflux, Intestinal Tuberculosis, Lactose intolerance, Parasitic infestation (giardiasis), Peptic ulcer disease, Postoperative adhesive bands & Ulcerative colitis.

Systemic disorders like Abdominal epilepsy, Familial angioneurotic edema, Familial Mediterranean fever, Food allergy, Immunoglobulin A–associated vasculitis (formerly Henoch-Schönlein purpura), Lead poisoning, Migraine equivalent, Porphyria and Sickle cell disease also present with chronic abdominal pain [7].

Hence the evaluation of chronic abdominal pain requires a thorough understanding of the etio- pathogenesis, epidemiologic spectrum & a knowledge of the varied patterns of presentation.

There are multiple modalities of investigations including conventional abdominal radiographs, ultrasonogram, computed tomography, magnetic- resonance imaging, Lapaoroscopy and endoscopy. Sometimes an invasive procedure like Biopsy may be required for an etiological diagnosis for chronic abdominal pain.

Abdominal ultrasound is a common imaging test used to examine various abdominal organs including the liver, gallbladder, spleen, pancreas, kidneys, inferior vena cava & aorta [8]. It still remains as the initial imaging test for patients presenting with right upper quadrant pain. Along with graded compression it is the imaging modality of choice for children below 14 years presenting with right lower quadrant pain.

The American Council of Radiology has recommended ultrasound as the initial imaging study for right upper quadrant pain, regardless of presence or absence of fever, raised white blood cell count or a positive Murphy's sign. A recent meta-analysis done on 2012 has found that ultrasound has a sensitivity of 81% & specificity of 83% for diagnosing acute cholecystitis [9].

Use of Ultrasonogram for chronic abdominal pain has many advantages like high-resolution imaging technique, good versatility & real-time imaging capability, wide availability, inexpensive, painfree, non –invasiveness, easy-to-use, extremely safe and most important the absence of any ionizing radiation. It is useful to find the cause of abdominal pain, kidney infections, diagnose & monitor tumors, ascites, renal & gallstones, to evaluate pelvic or scrotal pain, abscesses, inflamed appendix, identify abnormal abdominal fluid & evaluating those presenting with pain & vomiting. It gives a clear picture of soft tissues pathology missed in x-ray images. Because of its real-time imaging, it is useful for guiding minimally invasive procedures like needle biopsies & fluid aspiration. Its real-time dynamic examination helps analyse bowel motility & blood flow [10].

Depending upon the location of the symptoms ultrasonogram can be done like Upper abdominal ultrasound, Pelvic abdominal ultrasound, transvaginal ultrasound, transrectal ultrasound, endoscopic ultrasound. Upper abdominal ultrasound is indicated for the evaluation of Right Upper Quadrant/ epigastric pain along with raised liver/ pancreatic enzymes. For lower abdominal pain, Pelvic abdominal ultrasound, transvaginal or transrectal ultrasound can be done [11].

An abdominal ultrasound can also be used as a diagnostic tool for conditions such as Abdominal aortic aneurysm, Hydronephrosis, Portal hypertension, Obstruction of bile ducts, Cirrhosis, blood clot/ fluid in abdominal cavity, hernia, kidney blockage or tumour. Ultrasound is useful for suspected Crohn's disease due to its high negative predictive value [12,13]. Pelvic ultrasound is the investigation of choice for women of reproductive age with suspected endometriosis, ovarian or other adnexal disease [14]. Renal ultrasound is useful for ruling out renal obstruction, intra-renal calculi & renal masses [15]. Visualization of morphologic changes in chronic pancreatitis by transabdominal ultrasound has varying diagnostic accuracy with a sensitivity of 70% to 80% [16,17]. One large study reported sensitivities for Ultrasound to be around 85% for features calcifications, pancreatic duct dilations & cysts which is comparable to CT [24].

Ultrasonogram also helps in assessing the severity of disease as in chronic pancreatitis [18,19]. Here as the disease worsens, the pancreas loses its hyperechogenicity & becomes progressively heterogeneous due to focal inflammation [20,21]. This progressive inflammation & fibrosis & irreversible structural changes involving parenchyma & pancreatic duct can be evaluated using Ultrasonogram [22,23]. It also detects late stages where there is irregularly dilated Main pancreatic duct, Pseudocysts with pancreatic & intraductal calculi and pancreatic atrophy [20,24].

Though extremely useful**,** ultrasound is highly operator dependent. As Ultrasound waves are disrupted by air or gas it can not be used for imaging air-filled bowel or organs obscured by the bowel. Similarly for obese patients, imaging can be difficult due to greater amounts of tissue attenuating the sound waves. Though ultrasound cannot differentiate a benign or malignant tumor, it can be used during biopsy guiding the placement of the needle. It is also useful to drain fluid from a cyst or abscess & to examine blood flow inside the abdomen.

Ultrasonogram among children is different as several factors are unique including increased radiosensitivity to ionizing radiation, smaller body size & less body fat [25]. The spectrum of the Chronic Abdominal Pain is also different among Children. The different types of chronic abdominal pain among children are Abdominal migraine, Functional abdominal pain, Functional dyspepsia & Irritable bowel syndrome. Common causes of chronic abdominal pain in children include Inflammation of esophagus/ stomach, parasitic infections, urinary tract infection, Menstrual cycle, Anxiety & stress from problems at school or home, Constipation, lactose intolerance, peptic ulcer, Crohn disease, Kidney stones & gallstones. Functional abdominal pain is a very common disorder affecting 1 out of 5 children & adolescents.

Doppler ultrasound is a technique which assesses blood flow through arteries & veins in abdomen, liver and kidneys. It is useful to evaluate blockages to blood flow, clots, narrowing of vessels, tumors , congenital vascular malformations, reduced or absent blood flow to various organs, greater than normal blood flow to different areas

commonly associated with infections. Chronic pain caused by vascular conditions such as mesenteric artery stenosis ('mesenteric angina') are initially best investigated with Doppler ultrasound. Endoscopic Ultrasonogram with characterization of ductal & parenchymal changes with or without the aid of weighted scores like Rosemont score is currently the gold standard for chronic pacreatitis imaging [26].

Its diagnostic quality is comparable to computed tomography (CT) & magnetic resonance imaging (MRI) [27,28]. Endoscopic ultrasonogram changes correlates with histopathologic findings & extent of exocrine dysfunction [27,29].

Of late modern Ultrasound probes are developed with dynamic frequencies, better depth-focusing technology, high-frequency, significantly better noise reduction & improved resolution are accessible. This helps in better characterization of lesions especially calcifications, where overall reduction of random noise features is important.

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References

1.Viniol,A; Keunecke,C; Biroga, T; Stadje, R; Dornieden, K; Bösner, S; Donner-Banzhoff, N; Haasenritter, J; Becker, A (October 2014). "Studies of the symptom abdominal pain--a systematic review and meta-analysis.". Family practice. 31 (5): 517–29. doi:10.1093/fampra/ cmu 036.

2. Richard Mendelson, Imaging for chronic abdominal pain in adults. Aust Prescr. 2015 Apr; 38(2): 49–54. doi: 10.18773/austprescr.2015.019

3. Gijsbers CF, Kneepkens CM, Schweizer JJ, et al. Recurrent abdominal pain in 200 children: somatic causes and diagnostic criteria. Acta Paediatr 2011; 100:e208.

4. Rome Foundation. Guidelines--Rome III diagnostic criteria for functional gastrointestinal disorders. J Gastrointestin Liver Dis 2006;15:307-12.

5. O'Connor OJ, McSweeney SE, McWilliams S, O'Neill S, Shanahan F, Quigley EM, et al. Role of radiologic imaging in irritable bowel syndrome: evidence-based review. Radiology 2012;262:485-94

6. Whitehead WE, Palsson OS, Feld AD, Levy RL, VON Korff M, Turner MJ, et al. Utility of red flag symptom exclusions in the diagnosis of irritable bowel syndrome. Aliment Pharmacol Ther 2006;24:137-46.

7. Greenberger NJ: Sorting through nonsurgical causes of acute abdominal pain. Journal of Critical Illness7:1602–1609, 1992.

8. Stoker J, van Randen A, Laméris W, Boermeester MA. Imaging patients with acute abdominal pain. Radiology. 2009 Oct; 253(1): 31-46. doi: 10.1148/radiol.2531090 302.

9. Catalano, M.F., Lahoti, S., Geenen, J.E., and Hogan, W.J. Prospective evaluation of endoscopic ultra-sonography, endoscopic retrograde pancreatography, and secretin test in the diagnosis of chronic pancreatitis. Gastrointest Endosc. 1998; 48: 11–17

10. Maria Antonietta Mazzei, Susanna Guerrini, Nevada Cioffi Squitieri, Lucio Cagini, Luca Macarini, Francesco Coppolino, Melchiore Giganti,Luca Volterrani. The role of US examination in the management of acute abdomen; Critical Ultrasound Journal20135(Suppl 1):S6.DOI: 10. 1186/ 2036-7902-5-S1-S6

11. Burges A, Schmalfeldt B. Ovarian cancer: diagnosis and treatment. Dtsch Arztebl Int. 2011;108:635-641

12. Dong J, Wang H, Zhao J, Zhu W, Zhang L, Gong J, et al. Ultrasound as a diagnostic tool in detecting active Crohn's disease: a meta-analysis of prospective studies. Eur Radiol 2014;24:26-33.

13. Horsthuis K, Bipat S, Bennink RJ, Stoker J. Inflammatory bowel disease diagnosed with US, MR, scintigraphy, and CT: meta-analysis of prospective studies. Radiology 2008;247:64-79.

14.Richard Mendelson, Imaging for chronic abdominal pain in adults. Aust Prescr. 2015 Apr; 38(2): 49–54. doi: 10.18773/austprescr.2015.019

15. Richard E. Gray, DO Heidi L. Gaddey. An imaging guide to abdominal pain; J Fam Pract. 2015 May;64 (5): 286-291

16. Ikeda, M., Sato, T., Morozumi, A., Fujino, M.A., Yoda, Y., Ochiai, M., and Kobayashi, K. Morphologic changes in the pancreas detected by screening ultrasonography in a mass survey, with special reference to main duct dilatation, cyst formation, and calcification. Pancreas. 1994; 9: 508–512

17.Martinez-Noguera, A. and D' Onofrio, M. Ultra-sonography of the pancreas: 1. Conventional imaging. Abdom Imaging. 2007; 32: 136–149

18. Conwell, D.L., Lee, L.S., Yadav, D., Longnecker, D.S., Miller, F.H., Mortele, K.J., Levy, M.J., Kwon, R., Lieb, J.G., Stevens, T., Toskes, P.P., Gardner, T.B., Gelrud, A., Wu, B.U., Forsmark, C.E., and Vege, S.S. American Pancreatic Association practice guidelines in chronic pancreatitis: Evidence-based report on diagnostic guidelines. Pancreas. 2014; 43: 1143–1162

19. Drewes, A.M., Frokjaer, J.B., Jørgensen, M.T., Knoop, F., Mortensen, M.B., Schaffalitzky de Muckadell, O., Nøjgaard, C., Olesen, S., Phillipsen, E., and Rasmussen, H. Diagnostik og behandling af kronisk pankreatit. Dansk Selskab forGastroenterologiog Hepatologi, Aalborg; 2015

20. Bolondi L, Priori P, Gullo L, Santi V, Bassi SL, Barbara L, et al. Relationship between morphological changes detected by ultrasonography and pancreatic exocrine function in chronic pancreatitis. Pancreas 2(2): 222–229, 1987.

21. Jones SN, Lees WR, Frost RA. Diagnosis and grading of chronic pancreatitis by morphological criteria derived by ultrasound and pancreatography. Clin Radiol 39(1): 43–8, 1988.

22. De Backer AI, Mortelé KJ, Ros RR, Vanbeckevoort D,Vanschoubroeck I, De Keulenaer B. Chronic pancreatitis: diagnostic role of computed tomography and magnetic resonance imaging. JBR-BTR 85(6):304–310, 2002.

23. Dimcevski G, Erchinger FG, Havre R, Gilja OH. Ultrasonography in diagnosing chronic pancreatitis: new aspects. World J Gastroenterol 19(42):7247–7257, 2013

24. Homma T, Harada H, Koizumi M. Diagnostic criteria for chronic pancreatitis by the Japan Pancreas Society. Pancreas 15(1):14–15, 1997.

25. Balachandran B, Singhi S, Lal S: Emergency management of acute abdomen in children. Indian J Pediatr 2013, 80: 226–34. 10. 1007/ s12098-013- 0991-1.

26. Catalano, M.F., Sahai, A., Levy, M., Romagnuolo, J., Wiersema, M., Brugge, W., Freeman, M., Yamao, K., Canto, M., and Hernandez, L.V. EUS-based criteria for the diagnosis of chronic pancreatitis: The Rosemont classification. Gastrointest Endosc. 2009; 69: 1251– 1261

27. Kalmin, B., Hoffman, B., Hawes, R., and Romagnuolo, J. Conventional versus Rosemont endoscopic ultrasound criteria for chronic pancreatitis: Comparing interobserver reliability and intertest agreement. Can J Gastroenterol. 2011; 25: 261–264

28. Pungpapong, S., Wallace, M.B., Woodward, T.A., Noh, K.W., and Raimondo, M. Accuracy of endoscopic ultrasonography and magnetic resonance cholangiopan-creatography for the diagnosis of chronic pancreatitis: A prospective comparison study. J Clin Gastroenterol. 2007; 41: 88–93

29. Albashir, S., Bronner, M.P., Parsi, M.A., Walsh, R.M., and Stevens, T. Endoscopic ultrasound, secretin endoscopic pancreatic function test, and histology: Correlation in chronic pancreatitis. Am J Gastroenterol. 2010; 105: 2498–2503

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