



Acute Appendicitis Diagnosis- Ultrasound vs CT Scan –Retrospective Study of 100 Cases

Authors

Dr Sudarsan Sethy¹, Dr Bhupesh Kumar Nayak, Dr Kishan Bhoi²

¹Asst Professor, ²Senior Resident, Department of General Surgery,
VSS IMSAR, Burla, Sambalpur, Odisha, India

Mob: 8895064191, Email: drsudarsan1976sethy@gmail.com

Abstract

Acute appendicitis is a common cause of abdominal pain for which prompt diagnosis is rewarded by a marked decrease in morbidity and mortality. The diagnosis of acute appendicitis depends mostly on clinical evaluation along with few laboratory tests, but the role of a high resolution real time ultrasonography in diagnosing acute appendicitis is very much commanding as, it has been used to complement the clinical diagnosis. The diagnosis can only be confirmed by histopathological examination of the specimen of resected appendix. Therefore in present study it will be tried to correlate between the ultrasonography findings which will later be confirmed by histopathological findings to establish the diagnosis of acute appendicitis. A retrospective study of 100 cases with high resolution ultrasound & ct scan abdomen & pelvis was carried out in the department of general & laparoscopic surgery, VSS IMSAR, Burla, Odisha 2016 to ascertain the accuracy of diagnosis.

Introduction

Amaynd is credited with the first appendectomy in 1736 when he operated on a boy with enterocutaneous fistula within an inguinal hernia³. An exploration of the hernia sac, he discovered the appendix which had been perforated by a pin resulting in faecal fistula. As a result of his original description an inguinal hernia containing the appendix carries Amyand's eponym to this day⁸³

Ultimately it was Fitz (1886) who was able to wipeout the heap of misconception. In this comprehensive authoritative still lucid description he correctly ascribed the appendix as the chief offender in the inflammation of the right lower quadrant. He used the term 'acute appendicitis'

and pleaded for early appendectomy to offer a cure to the patients.

In the United States Willard Parker, H.B. Sands and especially Charles McBurney practiced and wrote clearly about the surgery of appendicitis. The modern period may be dated from the work of McBurney in the New York in 1889 when he published his classical paper based on this experience in the previous year. It is this papers that he describes the point of maximum tenderness which is always associated with his name.

Aims and Objectives

1. To study the diagnostic accuracy of USG & CT scan of abdomen & pelvis in acute appendicitis

2. Cost effectiveness of USG & CT scan of abdomen & pelvis in acute appendicitis

Inclusion Criteria

Any patient presenting to the emergency/OPD with tenderness over mc burneys point.

Exclusion Criteria

Patients with right iliac fossa tenderness but not presenting with mc burneys point tenderness were excluded

Materials & Methods

Our study covers 100 patients in the department of general surgery, VSSIMSAR, Burla from 2016.

We collected data from ultrasound reports, CT scan of abdomen & pelvis

Clinical Diagnosis

Symptomatology

The classic story of acute appendicitis is the onset of central abdominal pain followed by nausea and one or more episodes of vomiting and mild elevation of temperature. But his classic sequence is present in only in 5-60% of cases (Storer, 1984, Condon 1985). (80,21)

Pain: Pain is the earliest and most common symptoms of appendicitis. Lewis et al (1975) in their review of 1000 cases, found that pain was present in 99% of cases 21 was situated in the right lower quadrant in 75%, periumbilical in 10% and diffuse all over abdomen in 7%⁵⁷. I Migration of pain was present in 49.6% of cases.

Anorexia, Nausea and Vomiting: In Lewis series (1975) 92% patients complained of anorexia. Nausea and vomiting were reported in 78% and 68% of the cases respectively.

Fever: Fever is much less constant a feature. Piper et al (1982) found that only 20.8% of their series complained of fever Lewis et al (1975) reported that only 30% of their patients complained of fever.

Other Symptoms: Alteration of bowel habit was present in 25.8% patients of the series present by Pieper et al (1982). Among them 16.4% presented with diarrhea and 9.4% complained of constipation. Janik et al (1979) found that 15% of their series of 1642 patients of pediatric age group

presented with predominant symptoms of diarrhoea and concluded that unexplained diarrhoea might be an important mode of presentation in children⁵¹.

Physical Signs

Tenderness elicited on palpation over Mc burneys point is the hall mark of diagnosis of acute appendicitis. Pieper et al (1982) demonstrated that tenderness could be elicited in 99.6% cases. Only 3 patients among their series of 1018 failed to reveal this sign, which include 2 paraplegic patients tenderness was found to be generalised in 10.4% diffuse over lower abdomen in 14.4% and was confined to the right iliac fossa in the remaining 70.8% cases. The sign of rebound tenderness was present in 19.1% and was more frequent in perforated cases (4.9%). Rigidity was found to be another important sign and found to be more frequent in the perforated (49.9%), than in the non-perforated cases (26.5%). Generalised rigidity was found to be an infrequent finding (3.5%).

Other specific signs of acute appendicitis such as Psoas test, Obturator test, Rovings sign etc. are more often absent and are found in various intra abdominal disorder apart from acute appendicitis (Shepherd 1960). These help a little in the diagnosis.

Laboratory Studies

Leucocyte Count and Morphology

Leucocyte Count has long been regarded as an useful parameter in the diagnosis of acute appendicitis Balton et al (1975) showed that 63% of their series of 100 patients had a count greater than 11,000/cc⁹. They demonstrated that total PMF was more significant as 69% of patients with acute appendicitis had PMF count greater than 7000/cc.

Ultrasonography

High resolution real time US is a widely available inexpensive non invasive diagnostic modality that enables direct visualization of the inflamed appendix and/or peri-appendicular abscess. It may

suggest an alternative diagnosis such as inflammation of terminal ileum, mesenteric adenitis, other gynecological disorder or urologic diseases. In healthy individuals, the appendix usually can't be visualised. In patients with acute appendicitis however, an inflamed appendix or periappendicular fluid collection / abscess is usually seen.

Table Accuracy of Ultrasound for the diagnosis of acute appendicitis

	Sensitivity (%)	Specificity (%)	Accuracy (%)
Balthazar et al ⁸	76	91	83
Horton	76	90	80
Wisc et al ⁸⁸	62	71	69
Teraswa et al	86	81	N/A

The ultrasound derived diagnosis of appendicitis had a sensitivity of 69% a specificity of 100% a positive predictive value of 98% a negative predictive value of 88% and an overall accuracy of 95%. The surgeon's clinical impression had an overall accuracy of 71.2%. They concluded that the overall accuracy of ultrasonography in the diagnosis of acute appendicitis was statistically superior to that of the surgeon's clinical impression. However, 24% of the patients with normal ultrasonography findings were ultimately found to have appendicitis at operation emphasizing the point that ultrasonography relied on the exclusion of the surgeon's careful and repeated evaluation.

Ripolles T. et al (BJR Jan 1998) in their article have expressed that the diagnosis of acute appendicitis is made on US, when a non compressible, abnormally thickened (6 mm) appendix is seen⁷⁴. Their article also reviews US findings in conditions which can clinically mimic acute appendicitis. Examples of (Chron's disease, Tubo-ovarian abscess, typhilitis, sigmoid diverticulitis, perforated sigmoid neoplasm, perforated peptic ulcer, perforated acute cholecystitis, caecal carcinoma & appendiceal tumours are included in the differential diagnosis

According to Berry & Choudhury in ultrasound an inflamed appendix is seen as a "Blind-ended Aperistic⁷⁰", non-compressible concentrically layered Tubular structure at the point of maximum probe tenderness with the average diameter more than 6mm. ultrasonographic diagnosis of acute appendicitis was based on the criteria of Jeffery et al which includes the following⁵²;

- i. In early acute appendicitis five layers can be identified.
- ii. In suppurative stage, the lumen is distended with pus / fluid and there is increased thickening of the wall with.
- iii. In perforation an asymmetric thickening of the wall with a focal / circumferential lack of visualization.
- iv. In inflamed appendix is seen as a probe tenderness, Blind-ended tubular structure with a laminated wall arise from the base of the caecum, aperistaltic, non compressible, diameter >6mm.
- v. Pericaecal fluid collection
- vi. Single/Multiple inter-loop abscess
- vii. Appendicolith.
- viii. Hyperaemia of mesoappendix.

Hoffmann J. Rasmussen, in their study, "Aids in the diagnosis of acute appendicitis", in 1989, found that Laparoscopy, Barium enema, Ultrasonography and computer assistance of all have all been shown to improve the accuracy but no one method is superior to the other⁴⁵. Such diagnostic aids must be used to reduce the 15-30% negative laparotomy rate when acute appendicitis is suspected, without increasing the incidence of appendiceal perforation.

The diagnosis of acute appendicitis by ultrasound requires expertise and experience. With those 90% of inflamed appendix, 5% of perforation and 85% of mass can be diagnosed. Causes of false negative results are (a) overlooking of appendix, (b) retroverted appendix, (d) obesity, (e) rigidity (Preventing compression), dilated dynamic loops of bowel (Berry & Choudhury).

Computed Tomography (CT) Scan

CT scan is a highly accurate and effective cross-sectional imaging technique for diagnosing and staging acute appendicitis. CT benefits from a high diagnostic accuracy for appendicitis and visualization and diagnosis of the other. Causes of abdominal pain that can be confused with appendicitis. The radiographic ending of appendicitis on CT included of a dilated (>6mm), thick wall appendix that does not fill with enteric contrast or air, as well as surrounding fat standing to suggest inflammation.

Table Accuracy of computed tomography for the diagnosis of acute appendicitis

	Sensitivity (%)	Specificity (%)	Accuracy (%)
Balthazar et al ⁸	96	89	94
Horton et al ⁴⁷	97	100	98
Wisc et al ⁸⁸	96	92	93
Teresa et al	94	95	N/A

Table Comparison of USG and CECT for the diagnosis of acute appendicitis

	Sensitivity (%)	Specificity (%)	Accuracy (%)
USG	75	80	80
CECT	90.90	94	94.33

Clinicopathological Correlation

“To err is human” – as in all other works of life this aphorism fits equally well in the diagnosis of acute appendicitis. It is noted earlier and once more repeated that the diagnosis is still a clinical one and not surprisingly associated with high percentage of inaccurate diagnosis.

- 1) To increase the accuracy more by adding ultrasonography as a complementary diagnostic tool.
- 2) To avoid unnecessary laparotomy and its hazards in patient with doubtful clinical diagnosis and a Negative Ultrasonographic findings.
- 3) To avoid complications of appendicitis by timely intervention in patient with high suspiciousness and positive Ultrasonographic findings.

- 4) To minimize the cost of thereby by avoiding C.T. Scan or Laparoscopy.
- 5) To assess the efficacy of clinical & ultrasonographic diagnosis by correlating with histopathological examination of resected appendix.

Conclusion

Ultrasound of abdomen and pelvis Is a cost effective method of diagnosing acute appendicitis than CT Scan of Abdomen & pelvis diagnostic accuracy is increased by adding ultrasonography as a tool widely available in remote areas than ct scan

References

1. MICHELET I., AGRESTA F. Perforated peptic ulcer : laproscopic approach. *Eur J Surg, 166 : 405-8.*
2. NAESGAARD J. M., EDWIN B., REFIERTSEN O., TRONDSSEN E., PAERDEN A. E., ROSSELAND A. R. Laparoscopic and open operation in patients with perforated peptic ulcer. *Eur J Surg, 1999, 165 : 209-14.*
3. LORAND I., MOLINER N., SALES J. P., DOUCHEZ F., GAYRAL F. Resultats du traitement coelioscopique des ulceres perfores. *Chirurgie, 1999, 124 : 149-53.*
4. MOURET P., FRANCOIS Y., VIGNAL J., BARTH X., LOMBARD-PLATET R. Laparoscopic treatment of perforated peptic ulcer. *Br J Surg, 1990, 77 : 1006.*
5. LEE F. Y.J., LEUNG K. L., LAI B. S.P., MAN NG S.S., DEXSTER S., LAU W.Y. Predicting mortality and morbidity of patients operated on for perforated peptic ulcers. *Arch Surg, Arch Surg, 2001, 136 : 90-3.*
6. LAU W.Y., LEUNG K. L., ZHU X. L., LAM Y.H., CHUNG S.C.S., LI A.K.C. Laparoscopic repair of perforated peptic ulcer. *Br J Surg, 1995, 82: 814-16.*
7. BERGAMASHI R., MARVIK R., JOHNSEN G., THORESEN J. E.K.,

- YSTGAARD B., MYRVOLD H.E. Open vs laparoscopic repair of perforated peptic ulcer. *Surg Endosc*, 1999, 13: 679-82.
8. SVANES C., SALVESEN H., STANGELAND L., SVANES K., SOREIDE O. Perforated peptic ulcer over 56 years. Time trends in patients and disease characteristics. *Gut*, 1993, 34: 1666-71.
9. CHEN C.H., HUANG H.S., YANG C.C., YEH Y.H. The features of perforated peptic ulcers in conventional computed tomography. *Hepatogastro-enterology*, 2001, 48: 1393-96.
10. BLEOCHLE C., EMMERMANN A., TREU H., ACHILLES E., MACK D., ZORING C., BROELSCH C.E. The effect of a pneumoperitoneum on the extent and severity of peritonitis induced by gastric ulcer perforation in the rat. *Surg Endosc*, 1995, 9 : 898-901.
11. Lal S, Morgenstern R, Vinjirayer E, A. Sigmoid volvulus an update. *Gastrointestinal endoscopy clinics of North America*. 2006; 16: 175-187. (PubMed:16546032)
12. Ballantyne G, Brandner M, Beart R, Istrup D. Volvulus of the colon. Incidence and mortality. *Annals of surgery*. 1985; 202:83-91. (PubMed: 4015215)
13. Valentine Pastore, Angela Basile, Raffaella Cocomazzi, Marlena Pastore, Fabio Bartoli. Sigmoid volvulus in a neonate: Case report and review of literature, *African Journal of paediatric surgery* Oct/Decm 2013 (10) issue 4:390392.
14. Raveenthiran V. Restorative resection of unprepared left colon in gangrenous versus viable sigmoid volvulus. *International Journal of Colorectal Disease* 2004; 19:258-263.
15. Grossmann EM, Longo WE, Stratton MD, et al. Sigmoid volvulus in Department of Veterans Affairs Medical Centers. *Dis Colon Rectum* 2000; 43:414-8.
16. Connolly S, Brannigan AE, Heffeman E, Hyland JM. Sigmoid volvulus: a 10 year audit. *Ir J Med Sci* 2002; 171-216-7.
17. Atamanalp SS, Yildirgan MI, Basoglu M, et al. Sigmoid colon volvulus in children: review of 19 cases. *Pediatr Surg Int*. 2004; 20:492-5.
18. Muyco A, Kushner A, Mvula C. Management of sigmoid volvulus at a tertiary care hospital in Africa. *East and central African Journal of Surgery*. 2005; 10: 105.
19. Northeast AD, Dennison AR, Lee EG. Sigmoid volvulus: new thoughts on the epidemiology. *Dis Colon Rectum* 1984;27:260-1.