



RADIOLOGICAL EVALUATION OF COLONIC MASSES BY ULTRASONOGRAPHY AND BARIUM ENEMA

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ABSTRACT **Aim and Objective:** In present study large bowel masses including intussusception were evaluated by radiological procedures with main emphasis on ultrasound as the screening modality and double contrast barium enema as confirmatory investigation.

Method: Total 73 cases (all ages and both sexes) referred from all outpatient departments with colonic symptoms and in whom barium enema was advised and bowel mass were accidentally detected during USG abdomen for some other indication was included in the study. Patients satisfying the inclusion criteria underwent USG followed by Barium enema.

Result: Total number of cases evaluated by barium enema was 73 and positive cases were 32. Abdominal pain (46.87%) was the most common presenting complaint. 50% of lesions were neoplastic, 40.60% inflammatory, 6.25% intussusception and 3.12% intussusception with colonic carcinoma. 15 out of 16 neoplastic cases and all the inflammatory (13 cases) cases showed pseudokidney sign. All 3 cases of intussusception had USG findings. Narrowing, deformity and shortening of the involved segment was the predominant finding on barium enema in inflammatory masses while in neoplastic lesions, lumen reduction, mucosal irregularity and shouldering in barium enema were highly suggestive of malignancy. At barium enema meniscus sign and spring coil appearance was pathognomonic of intussusceptions. The sensitivity and specificity of ultrasound to detect colonic masses was 96.87% and 97.56% respectively.

Conclusion: Ultrasound is reasonably sensitive and highly specific for detection and location of bowel masses and also it is superior screening procedure to characterize colonic masses into inflammatory, neoplastic and intussusceptions groups. Barium enema is a better confirmatory method for evaluating colonic masses.

KEYWORDS : Intussusception, Ultrasonography, Barium enema, Bowel mass, Carcinoma, Pseudokidney

INTRODUCTION

The ability of ultrasound examination to detect and evaluate lesion of the parenchymal organs and retroperitoneal structure is well known. However there is a lack of enthusiasm in studying the gastro-intestinal tract by ultrasound on the part of ultrasonologists. This has been mainly because of the scattering effect of gas contained within the bowel. Now certain sonographic pattern arising from normal and abnormal bowel have become recognized such as the reproducible "gut signature" by normal bowel and the "pseudokidney sign" by abnormal bowel [1].

Ultrasound studies are done as a preliminary screening test prior to radiographic evaluation of gastrointestinal tract using double contrast barium enema therefore recognition of the sonographic patterns arising from the bowel is of practical significance in patient care since echo complexes arising from masses of bowel may be encountered intricacy on sonography. High frequency ultrasound examination of bowel wall may be useful in demonstrating the depth of invasion of mucosal tumors with respect to the submucosa and in differentiating mucosal from extra mural masses [2]. By employing real time scanning we can describe sonographic pattern arising from abnormal bowel like bowel tumors, inflammatory lesions, intussusception and ischemic bowel disease [3].

Though ultrasound cannot replace barium studies and endoscopies in the final diagnosis of gastrointestinal masses it is extremely useful to direct the further diagnostic evaluation. Because of availability cast effectiveness, non-invasive nature, zero radiation and portability, 'ultrasonography' is widely used to detect the mass lesion. The present study was carried out with objectives to study sonographic features of abnormal bowel, also to detect the intussusceptions as a cause of large bowel mass and acute abdominal pain by ultrasound and to confirm and reduce it by barium enema examination.

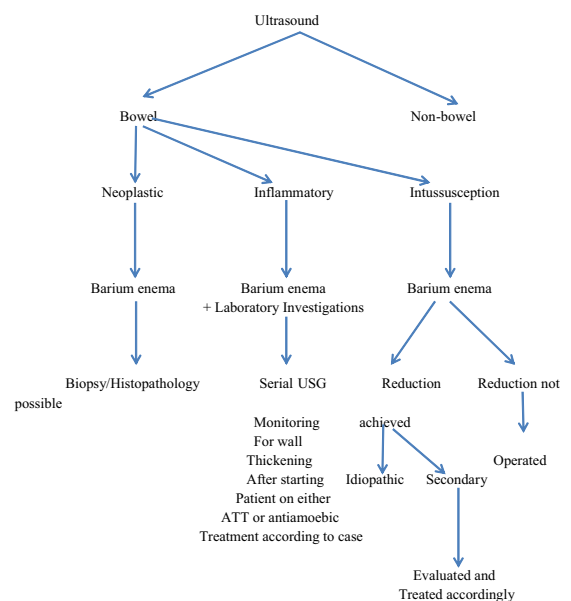
MATERIALS AND METHODS

In this hospital-based prospective study, total 73 cases (all ages and both sexes) referred from all the outpatient department with colonic symptoms and in whom barium enema was advised and bowel mass were accidentally detected during USG abdomen for some other indication was studied. The study was carried out in the Department of Radiology at Indira Gandhi Government Medical College and Hospital, Nagpur. Masses on USG examination found to be of non-

bowel origin, masses of appendicular and anal origin, patients with debilitated status, who could not tolerate barium enema were excluded from the study.

A detailed history was taken; general, local and pre-rectal examination as well as clinical and radiological investigations was done. Patients satisfying the inclusion criteria underwent USG and patient with clinical suspicion of large bowel disease referred for Barium enema (single or double contrast). All the patients were warned of complications of barium enema like perforation and they were told to contact immediately if they develop any unusual symptoms. All the patients were treated accordingly and follow up of patient was done. Patients were not allowed to leave the department until blurring of vision due to buscopan was reasonably attenuated.

Research design



OBSERVATIONS AND RESULTS

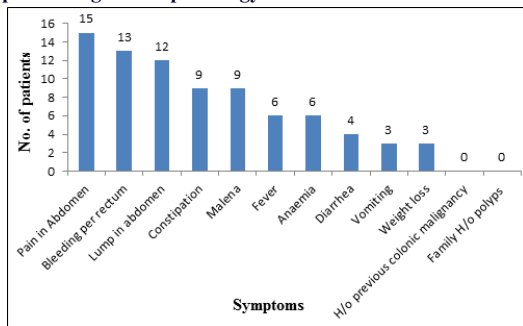
Total number of cases evaluated by barium enema was 73 and positive cases were 32. Among 32 cases, 18 (56.14%) were male and 14 (43.75%) were female with male to female ratio of 1.2:1. The age of patients ranged from 1.5 to 80 years as shown in table 1.

Table 1: Age and sex distribution of patients

Age group	No. of positive cases (%)	Male	Female
0-10	1 (3.2%)	1	0
11-20	4 (12.5%)	1	3
21-30	2 (6.25%)	0	2
31-40	7 (21.87%)	4	3
41-50	4 (12.5%)	3	1
51-60	7 (21.87%)	6	1
61-70	4 (12.5%)	1	3
71-80	3 (9.37%)	2	1
Total	32 (100%)	18 (56.24%)	14 (43.75%)

Majority of patients presented with pain in abdomen (15; 46.87%) followed by bleeding per rectum (13; 40.62%) and lump in abdomen (12; 37.50%), (Figure 1). Each patient had 3-4 symptoms.

Figure 1: Clinical presentation in various patients of clinically suspected large bowel pathology



Final diagnosis showed that the 16; 50% of lesions were neoplastic, 13; 40.60% inflammatory, 2; 6.25% intussusception and 1; 3.12% intussusception with colonic carcinoma. 15 out of 16 neoplastic cases and all the inflammatory (13 cases) cases showed pseudokidney sign. All 3 cases of intussusception had USG findings as shown in table 2.

Table 2: Echo-pattern of the bowel masses as seen in ultrasound

Group	Echo pattern	No. of Cases
Neoplastic	Pseudokidney with sonolucent halo greater than 2 cm diameter	15
Intussusception	Multiple concentric ring sign and crescent-in-doughnut on axial scan and sandwich sign, hay-fork sign and pseudokidney sign in longitudinal scan	2
Intussusception with colonic carcinoma	Same sign as intussusception	1
Inflammatory	-	13
Tuberculosis	Pseudokidney with sonolucent	11
Ameboma	Halogreater than 2cm diameter	2
Total number of true positive cases detected on ultrasound		31

61.53% of inflammatory masses had wall thickness of 11-15 mm with mean wall thickness of 13.72 mm while 60.00% of neoplastic masses had wall thickness of 21-25 mm with mean of 20.66 mm. The mean length of pseudokidney in neoplastic and inflammatory masses was 74.80 mm and 61.00mm respectively. Out of 15 neoplastic colonic masses detected on ultrasound, 14 (93.34%) cases exhibited neoplastic characteristics and 1 (6.67%) case exhibited inflammatory characteristics.

Table 3 seems to suggest that in the inflammatory lesions, narrowing, deformity and shortening of the involved segment was the predominant finding on barium enema whereas filling defect, mucosal irregularity and pouch formation were supportive findings. 56.25% cases of neoplastic lesions were stenosing (Annular 50% and

semiannular 6.25%) followed by polypoid/fungating in 31.25%. Ulcerative (1; 6.25%), carpet (1; 6.25%) and plaque lesions (0.0%) were uncommon. In neoplastic lesions, lumen reduction, mucosal irregularity and shouldering in barium enema were highly suggestive of malignancy. Eccentricity and concentric were supportive findings, (Table 3).

Table 3: Barium characteristics of inflammatory and neoplastic bowel masses

Barium characteristics of inflammatory masses	No. of cases (%)	Barium characteristics of neoplastic masses	No. of cases (%)
Filling defect	0 (0%)	Lumen reduced	14 (87.50%)
Mucosal irregularity	2 (15.38%)	Mucosal regularity	1 (6.25%)
Ileal narrowing	5 (38.46%)	Mucosal irregularity	15 (93.75%)
Cecal narrowing	8 (61.53%)	Filling defect	4 (25.00%)
Cecal shortening	5 (38.46%)	Shouldering	9 (56.25%)
Ascending colon narrowing	4 (30.76%)	Eccentric	4 (25.00%)
Sigmoid narrowing	1 (7.69%)	Concentric	5 (31.25%)
Rectal narrowing	1 (7.69%)	-	-
All percentage expressed as a total of 13 inflammatory cases		All percentage expressed as a total of 16 neoplastic cases	

All three cases of intussusception showed claw sign and out of 3, two cases showed spring coil appearance on barium enema. Etiology of intussusception showed that out of 3 cases, 2 cases were idiopathic and 1 was associated with carcinoma. Reduction was possible in 2 cases, 1 was operated upon and found growth in ascending colon, 2 ileocolic and 1 colo-colic intussusception were seen in at barium enema.

DISCUSSION

In this series, out of 73 cases referred to radiology department, ultrasound was able to detect bowel mass in 31 cases. All patients were then subjected to barium enema examination. Barium enema was additionally able to detect one case, which was missed on USG. Barium enema was normal in one case which was positive on USG. Thus, total 32 cases were evaluated in this study, among them 13 had inflammatory bowel masses, 16 neoplastic, 2 had intussusception and 1 had intussusception with colonic carcinoma which is correlated with the study done by Bagga et al [4] and Srivastava et al [5].

USG showed pseudokidney sign which consisted of strong echogenic center corresponding to luminal contents surrounded by sonolucent rim or halo of greater than 2 cm diameter corresponding to thickened wall of gastrointestinal trap in 13 inflammatory and 15 neoplastic colonic masses. All 3 cases of intussusception had various signs like multiple concentric ring, crescent-in-doughnut, sandwich and pseudokidney sign.

Tuberculosis causes thickening of wall of the involved segment of colon and ileum. In current study, all 11 cases of tuberculosis bowel masses had pseudokidney sign among them 2 (18.18%) cases had wall thickness in the range of 6-10 mm, 6 (54.54%) had in the range of 11-15 mm and 3 (27.27%) in the range of 21-25 mm. The average wall thickness was 13.72 mm and the mean length of pseudokidney in tuberculosis bowel mass was 61 mm. Two investigations apart from radiological findings, which were relied upon, were Montoux test and ESR. All 11 tubercular cases were montoux test positive with mean induration value of 16.36 mm. ESR was raised in 11 tubercular masses with mean ESR value of 39.20 mm. All the tubercular cases were started on anti-tuberculosis treatment and were serially monitored on USG for wall thickness and length of pseudokidney. In majority of patients, the pseudokidney sign disappeared at the end of 3 months and in some patients it took up to 5 months. During this period the patient also improved symptomatically. All these findings of present study is more comparable to that of Kedar et al study [6] and Nakana et al study [7].

Two cases of ameboma were found in the study. Ultrasound showed pseudokidney sign in right iliac fossa in both the cases with one had neoplastic characteristics. Wall thickness was measured 13 mm in both the cases. Both the patients had history of dysentery, 3 weeks back. Stool examination for entamoeba histolytica was negative. Barium enema revealed classic deformed conical cecum with mucosal irregularity in both the cases. Terminal ileum was normal. All these

findings are correlated well with the previous studies [8-10]. The diagnosis was presumptive but presumption was well based as patients responded to antiamebic treatment with pseudokidney sign disappearing after 3 weeks and both patients becoming symptom free.

Out of 16 neoplastic large bowel masses all were adenocarcinoma on cytology or histopathology. 4 were in cecum, 2 in hepatic flexure, 1 in transverse colon, 4 in sigmoid colon and 5 were in rectum. Thus, 9 cases involved left side of colon, 6 in right side of colon and 1 involved transverse colon which is comparable with earlier studies [11-13]. USG was able to demonstrate pseudokidney sign in 15 cases, among them 14 cases showed neoplastic and 1 showed inflammatory characteristic. The mean wall thickness for colon carcinoma was 20.66 mm which is similar to the study done by Fleischer et al [14] and Truong et al [15]. On barium enema growth was classified as stenosing in 9 cases (annular in 8 and semiannular in 1 case). Pseudopolypoid/fungating type of growth was seen in 5 cases and carpet like growth in 1 case. This finding correlated well with the Peter and Stephen study [13].

Ultrasound was able to diagnose intussusception in 3 cases and which was a large structure usually >5 cm. At enema examination all the three cases showed meniscus sign and 2 cases showed spring coil appearance. In all patients, intussusception reduction by barium enema was attempted. It was successfully done in 2 patients while in 1 patient reduction was not possible, was operated, which confirmed mass lesion in ascending colon. The height of barium column which was used for reduction was of 1-meter. Wide bore Foley's catheter was used with balloon inflated in rectum. Trans-abdominal manipulation was done in only one patient. No complications related to reduction.

The sensitivity of ultrasound to detect colonic masses was 96.87% while specificity was 97.56%. Both sensitivity and specificity are robust and stable test performance characteristics of a diagnostic test. They are unaffected by prevalence of the disease. Therefore, in current study, we estimated positive predictive value (PPV), it was 0.96 and negative predictive value (NPV). PPV obtained was extremely high and it is explained by the high prevalence of colonic masses in the present study. these types of positive values are frequently obtained in tertiary hospitals and referral centers where the prevalence of disease far exceeds the prevalence seen in general population.

In many cases abdominal ultrasound is the first examination done prior to barium studies. Its importance lies in the fact that ultrasound can detect, determine the characteristic of the bowel mass with minimal stress to the patient and little waste of time. It has obvious benefit of not involving ionizing radiation and costs less than barium study. Low cost is a particular advantage in developing country like India. However, ultrasound is certainly not the technique of first choice in diagnosis of bowel masses, but it leads to further investigations to streamline the patient's work up. Ultrasound suggests itself as a diagnostic alternative in selected patients who cannot be stressed by other investigative methods such as barium enema and colonoscopy.

The main advantage of ultrasound over barium studies and colonoscopy is its ability to demonstrate extra-luminal extension and metastasis in a single examination. Thus, we recommend the use of ultrasound as a screening modality for the detection of colonic masses which can then be subsequently confirmed by barium enema.

CONCLUSION

Ultrasound is reasonably sensitive and highly specific for detection and location of bowel masses especially detection of intussusceptions. Also it is superior screening procedure to characterize colonic masses into inflammatory, neoplastic and intussusceptions groups. Barium enema is a better confirmatory method for evaluating colonic masses.

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