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Original Research Article

The role of diagnostic laparoscopy versus ultrasonography and computerized tomography abdomen for chronic/recurrent right iliac fossa pain

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ABSTRACT

Background: Chronic right iliac fossa pain (RIF) is a grey area in surgery. No guidelines are available on the best therapeutic approach. Published data are sparse and limited to small series. Objective of this study was to study the role of diagnostic laparoscopy in chronic / recurrent right iliac fossa pain and to study role of diagnostic laparoscopy versus ultrasonography and computerized tomography abdomen for chronic/recurrent right iliac fossa pain
Methods: This study was conducted in fifty patients with a history of right iliac fossa pain for duration of three or more months. Each patient was subjected to USG and CT scan. Their findings were compared with findings of diagnostic laparoscopy.
Results: Diagnostic accuracy of USG in detecting chronic appendicitis and intra-abdominal pathology as a cause of chronic/recurrent right iliac fossa pain was 66% with sensitivity 75%, specificity 60% and 46% with sensitivity 39.5%, specificity 85.5%. Diagnostic accuracy of CT in detecting chronic appendicitis and intra-abdominal pathology as a cause of chronic/recurrent right iliac fossa pain was 88% with sensitivity 80%, specificity 93.33% and 46% with sensitivity 41.86%, specificity 71.43%. The accuracy of diagnostic laparoscopy in diagnosing chronic/recurrent Appendicitis was 96% with sensitivity 95%; specificity 96.67%; PPV 95%; NPV 96.67%. The overall accuracy of diagnostic laparoscopy in diagnosing chronic/recurrent right iliac fossa pain was 96% with sensitivity 97.67%; specificity 85.71%; PPV 97.67%; NPV 85.71%.
Conclusions: CT is better than USG in diagnosing various intra-abdominal pathologies as causes of chronic/recurrent right iliac fossa pain. More ever, it was evident that diagnostic laparoscopy is even better than the above mentioned modalities.

Keywords: CT scan, Laparoscopy, USG

INTRODUCTION

Chronic right iliac fossa pain (RIF) is a grey area in surgery. No guidelines are available on the best therapeutic approach. Published data are sparse and limited to small series. [1] It is a controversial topic whether a normal looking appendix should be removed at diagnostic laparoscopy or not. Visualization of the appendix is strongly dependent on the type and quality of computerized tomography examination, although appendiceal size, amount of peri-appendiceal fat and degree of ileocaecal bowel opacification are important influencing factors.[2]

With the introduction of multi detector computerized tomography scans and virtual non-enhanced computerized tomography scans the accuracy of this imaging technique has increased. Helical computerized tomography scans have reported sensitivities between 90% and 100%, specificities between 91% and 99%, accuracies between 94% and 98%, positive predictive values between 92% and 98% and negative predictive values between 95% and 100% for the diagnosis of acute appendicitis.[3]

In the surgical setting, the diagnostic laparoscopy can have a significant impact both in acute and chronic abdominal conditions, particularly those, that are diagnostic dilemmas. Chronic abdominal pain of unknown origin is one such condition and represents a significant problem in the surgical patients. Such patients are frequently subjected to extensive and costly investigations which fail to elucidate the cause in most of them. At times, they may be subjected to unnecessary laparotomy, a procedure which is more time consuming and more traumatic, but without any added advantage of the diagnostic accuracy, as compared with the laparoscopy. Diagnostic laparoscopy benefits patients by avoiding unnecessary surgery, avoiding unnecessary delay in diagnosis and treatment and shortening the operative and hospitalized period.[4]

According to latest guidelines by SAGES 2011 (Society of American Gastrointestinal and Endoscopic Surgeons) regarding diagnosis, treatment, and use of laparoscopy for surgical problems during pregnancy, they have recommended that pregnant patients may undergo laparoscopic surgery safely during any trimester without any increased risk to mother and fetus.[5] In case of diagnosis, it is a reasonable alternative to radiological imaging. The benefits of operative exploration are avoidance of ionizing radiation, diagnostic accuracy, and the capability to treat a surgical problem at the time of diagnosis.

Present study was conducted to study the role of ultrasonography and computerized tomography in evaluation chronic/recurrent right iliac fossa pain, to study the role of elective diagnostic laparoscopy in evaluation chronic/recurrent right iliac fossa pain, and to study the role of elective diagnostic laparoscopy versus Ultrasonography and computerized tomography in evaluating chronic/recurrent right iliac fossa pain.

METHODS

This study was conducted in fifty patients admitted in the Department of Surgery of ASCOMS and hospital with a history of right iliac fossa pain for duration of three or more months, each patient was subjected to ultrasonography (USG) and computerized tomography (CT SCAN); their findings were compared with findings of diagnostic laparoscopy. Any other adjuvant test if required for confirming diagnosis was done in the individual patient. The patients in the pediatric age group, pregnant women, those with acute abdomen and those with contra-indications for general anesthesia, were excluded from the study.

The study group was examined and investigated as per the proforma attached. The patients were subjected to USG and CT SCAN, the same team of radiologists of our hospital carried the imaging procedure.

USG abdomen was carried by GE LOGIC 500 PRO with

- 3.5 M Hz Curvilinear probe.
- 8-11 M Hz Linear Array probe.

While as CT scan by GE SYTEC 3000i (3rd generation CT) CT scanner with capability of taking up to 1 mm slices.

In patients where a positive finding was obtained with either of the imaging procedure was labeled as pre-operative diagnosis and in rest of the patients where no findings were reported; were labeled undiagnosed.

An attempt was made to establish a definite diagnosis during laparoscopy and such patients were labeled as "diagnostic lap positive". Those in whom no cause could be found were labeled as "diagnostic lap negative."

When a definite pathology was found, an attempt was made to take a biopsy or to use this procedure as a therapeutic tool. For this the options were kept for conversion to open method if needed, and the prior consent was taken from the patients pre-operatively. The radiological imaging tests were carried after keeping the patient nil per oral overnight, so as to have better visualization of the abdomen.

Contrast material (non-ionized) was used in all patients for carrying CT scans. History of allergy to contrast was ruled out in all patients beforehand, none of the patients in the present study were allergic to the contrast material.

RESULTS

The overall accuracy of usg in diagnosing chronic/recurrent appendicitis was = 66% with sensitivity = 75%; specificity = 60%; PPV = 55.5%; NPV = 78%. USG was positive in 27 patients and negative in 23 patients. Out of 20 having the disease, USG said that 15 had the disease and 5 did not have. Out of 30 who did not have the disease, USG said that 12 had the disease and 18 did not have.

The overall accuracy of USG in diagnosing chronic right iliac fossa pain was = 46%; sensitivity = 39.5%; specificity = 85.5%; PPV = 94.4%; NPV = 18.75%. As per the USG, 12 had the disease and 38 did not have. Out of 20 having the disease, USG said that only 8 had the disease and 12 did not have. Out of 30 not having the disease, USG said that 4 had the disease and 26 did not have.

Table 1: Role of USG in chronic appendicitis.

USG result	Disease		Total
	Present	Absent	
Positive	15	12	27
Negative	05	18	23
Total	20	30	50
Sensitivity (%)			75
Specificity (%)			60
Positive predictive value (%)			55.5
Negative predictive value (%)			78
Accuracy (%)			66

Table 2: Role of USG in chronic right iliac fossa pain.

USG result	Disease		Total
	Present	Absent	
Positive	08	04	12
Negative	12	26	38
Total	20	30	50
Sensitivity (%)			39.5
Specificity (%)			85.5
Positive predictive value (%)			94.4
Negative predictive value (%)			18.75
Accuracy (%)			46

The overall accuracy of CECT scan in diagnosing chronic/recurrent appendicitis was 88% with sensitivity = 80%; specificity = 93.33%; PPV = 88.89%; NPV = 87.50%. As per the CECT, 18 had the disease and 32 did not have. Out of 20 having the disease, CECT said that 16 had the disease and 4 did not have. Out of 30 not having the disease, CECT said that 2 had the disease and 28 did not have.

Table 3: Role of CECT in chronic appendicitis.

CECT scan result	Disease		Total
	Present	Absent	
Positive	16	02	18
Negative	04	28	32
Total	20	30	50
Sensitivity (%)			80
Specificity (%)			93.3
Positive predictive value (%)			88.9
Negative predictive value (%)			87.5
Accuracy (%)			88

The overall accuracy of CECT scan in diagnosing chronic/recurrent right iliac fossa pain was = 46% with sensitivity= 41.86%; specificity = 71.43%; PPV = 90%; NPV=16.67%. As per the CECT, 43 had the disease and 7 did not have. Out of 20 having the disease, CECT said that 18 had the disease and 2 did not have. Out of 30 not having the disease, CECT said that 25 have the disease and 5 did not have it. The accuracy of diagnostic laparoscopy in diagnosing chronic/recurrent appendicitis was = 96% with sensitivity = 95%; specificity = 96.67%; PPV = 95%; NPV = 96.67%. As per diagnostic laparoscopy, 20 had the disease and 30 did not have. Out of 20 having the disease, diagnostic laparoscopy said that 19 had it and only one did not have it. Out of 30 not having the disease, diagnostic laparoscopy said that 29 did not have it and only one had it.

Table 4: Role of CECT scans in chronic right iliac fossa pain.

CECT scan result	Disease		Total
	Present	Absent	
Positive	18	25	43
Negative	02	05	07
Total	20	30	50
Sensitivity (%)			41.9
Specificity (%)			71.4
Positive predictive value (%)			90
Negative predictive value (%)			16.7
Accuracy (%)			46

Table 5: Role of diagnostic laparoscopy in chronic appendicitis.

Diagnostic laparoscopy	Disease		Total
	Present	Absent	
Positive	19	01	20
Negative	01	29	30
Total	20	30	50
Sensitivity (%)			95
Specificity (%)			96.7
Positive predictive value (%)			95
Negative predictive value (%)			96.7
Accuracy (%)			96

Table 6: Role of diagnostic laparoscopy in chronic right iliac fossa pain.

Diagnostic laparoscopy	Disease		Total
	Present	Absent	
Positive	42	01	43
Negative	01	06	07
Total	43	07	50
Sensitivity (%)			97.7
Specificity (%)			85.7
Positive predictive value (%)			97.7
Negative predictive value (%)			85.7
Accuracy (%)			96

The overall accuracy of diagnostic laparoscopy in diagnosing chronic/recurrent right iliac fossa pain was 96% with sensitivity 97.67%; specificity 85.71%; PPV 97.67%; NPV 85.71%. As per the diagnostic laparoscopy 43 had the disease and 7 did not have it. Out of 43 having the disease, diagnostic laparoscopy said that 42 had the disease and only one did not have it. Out of 7 not having the disease, diagnostic laparoscopy said that 6 did not have the disease and only one had it.

DISCUSSION

Fifty patients, who presented with complaints of abdominal pain of three or more months duration, were included in the study. Different authors have used different time criteria for defining chronic abdominal pain. Miller K et al defined chronic pain, in their study as pain of three or more month's duration. Salky BA on the other hand, in a similar study, included patients with pain of more than one-week duration.[6,7]

Our patients were observed to have pain ranging from three to twenty-two months, with an average of 10.9 months. Easter DW et al and Vander Velpen GC et al noticed a mean age of presentation of 40.3 years and 39 years respectively.[8,9]

In the present series; females were more than males in ratio of 2.3:1. A similar female preponderance was noted by Easter DW et al, Vander Velpen GC et al and Salky BA also reports female preponderance, in his series, to the tune of 70%.[8,9,7]

In the present study USG showed an overall accuracy of 66% with sensitivity of 75%; specificity = 60%; PPV = 55.5%; NPV = 78% (TP = 15, FN = 5; FP = 12; TN = 18) for appendicular pathology. However, Rioux M demonstrated sensitivity of 93% for USG in diagnosing acute appendicitis and of 45 patients with proven appendicitis, 5 had histological evidence of chronic inflammatory changes with superimposed acute changes.[10] However in the present study the overall Accuracy of USG in diagnosing different pathologies causing right iliac fossa pain was 46% with sensitivity 39.5% specificity = 85.5%; PPV = 94.4%; NPV = 18.75% (TP = 17; FN = 26 FP = 1; TN = 6).

In comparison, CECT was more accurate in finding appendicular pathology, in our study out of 50 patients it showed 16 (TP); 2 (FP); 28 (TN); 4 (FN) making sensitivity 80%, Specificity 93.3%, PPV 88.89%, NPV 87.5%, and overall Accuracy 88%. Similar results were obtained by Lee SC et al who carried an audit on 343 patients with right iliac fossa (RIF) pain.[11] They concluded, although CT is useful in diagnosing appendicitis, we do not recommend routine CT abdomen for patients with right iliac fossa pain as no significant additional benefit is seen in the group of patients with clinical appendicitis. However, there may be a role for it in patients with equivocal clinical features, but a randomized clinical trial is needed for further evaluation.

Similar results were published by Ege G et al in their study on 123 patients with appendicitis; they found sensitivity of 96% and specificity of 98% for unenhanced helical CT scan.[12]

Grayson DE et al found in their study that visualization of the appendix is strongly dependent on the type and quality of CT examination, although appendiceal size, amount of peri-appendiceal fat and degree of ileocaecal bowel opacification are important influencing factors.[2] Lane MJ in their study reported multi detector and virtual non enhanced CT scans showed sensitivities between 90% and 100%, specificities between 91% and 99%, accuracies between 94% and 98%, positive predictive values between 92% and 98% and negative predictive values between 95% and 100% for the diagnosis of acute appendicitis.[3]

However, in the present study the overall accuracy in diagnosing other causes of chronic/recurrent right iliac fossa pain for CECT was 46%. The overall sensitivity was 41.86%, specificity 71.43%, PPV 90%, NPV 16.69% among 50 patients CECT scan showed 18 (TP); 2 (FP); 5 (TN); 25 (FN). Salky BA in his studies also reported a comparable incidence of 33%, and 25% respectively.[7] Velpen VGC et al however in their study had a yield of only 4.4% cases of appendicitis among the patients of chronic abdominal pain.[9]

Appendicitis was suspected on diagnostic laparoscopy on the basis of gross serosal inflammation (fifteen patients), visible faecolith (four patients), and omental wrapping around the appendix (one patient). In our study in a female patient, the appendix appeared to have serosal inflammation, appendicectomy was done but histopathology showed negative result for any inflammation. Histopathology of all the nineteen appendices, revealed chronic inflammation, and confirmed the results of visual inspection. Appendicolith as cause of appendicitis was observed in 4 patients (two female and two male patients). Additionally, seven more patients were subjected to laparoscopic appendicectomy, even though they had no features of appendicitis on diagnostic laparoscopy.

Seven of these patients, (two male and five female) were diagnostic laparoscopy negative. All had history of right iliac fossa pain. The histopathology of all appendices was normal, except in one female patient histopathological examination revealed features of chronic appendicitis. Thus, all these patients underwent appendicectomy for normal appearing appendix and features of appendicitis were revealed in only one patient. As in our study in seven patients (two males; five female) the appendicectomy was done even in a normal looking appendix, as no other pathology was evident. Among them pain was relieved in only two patients (both female). Chao K et al in their pilot study on role of diagnostic laparoscopy in chronic right iliac fossa pain, performed appendicectomies in seventeen patients with normal looking appendix.[13] Twelve of their patients were cured of pain. They, recommended thus, that concurrent appendicectomy should be considered in patients with episodic well localised right iliac fossa pain, even if appendix is normal looking.

Chung K et al in their study concluded that clinical judgment should be the prime criteria for performing

appendicectomy in patients of undiagnosed abdominal pain.[14] However in the present study appendicitis was diagnosed laparoscopically in 20 patients and histopathology was positive in 19 patients (95%) with Sensitivity of laparoscopy 95% and CECT scan diagnosed appendicitis in 16 patients with Sensitivity of 80%. Kraemer M et al reported that it is not always necessary to perform incidental appendicectomy.[15] Van den Broek WT et al reported a study of one hundred and nine diagnostic laparoscopies for suspected appendicitis.[16] In this study, normal looking appendix was not removed, and the conclusion was that it is safe to leave a normal looking appendix in place. Out of the forty patients with negative laparoscopy, only one was readmitted during follow up of appendicitis. Jane E et al highlighted a lack of consensus in the management of a normal appendix found at laparoscopy for right iliac fossa pain and demonstrate most surgeons feel guidelines would be useful. In the absence of guidelines, the options may be discussed with the patient before operation.[17]

As in the present study appendicectomy was carried in normal looking appendix and it did not show much benefit to the patients. Post-operative recovery in all but one of our patients was uneventful. Port site infection was noted in this patient who had undergone laparoscopy assisted appendicectomy. We managed this patient with local dressings and antibiotics. Adhesions were the second commonest detected laparoscopic findings in our series. This pathology accounted for 26% of all cases. Velpen VGC found a prevalence of 49%.[9] Miller K et al reported a prevalence of 44.06% cases of peritoneal adhesions, as a causative factor of chronic abdominal pain. Salky BA in a study, found intra-abdominal adhesions in 25% patients of chronic abdominal pain. 44% of these patients had undergone prior surgery.[7] Some studies have reported a very high prevalence of adhesions. 88.5 %. In the report published by Di Lorenzo et al.[18] A history of previous abdominal surgery in such cases was as high as 92.3%.

In our study four of male patients had adhesions; three patients had adhesions in right iliac fossa and one patient in pelvis. Among nine female patients five had adhesions in right iliac fossa and rest in pelvis. Adhesiolysis was offered to all these patients. Laparoscopic adhesiolysis is subject of controversy with diametrically opposite views being presented by various authors. Schrenk P et al showed that in appropriate patient selection, laparoscopy is a useful method in treating abdominal adhesions, in the presence of chronic abdominal pain.[19] As laparoscopy is less traumatic than the open surgery, less adhesion formation following adhesiolysis is very likely.

We could achieve complete laparoscopic adhesiolysis in twelve patients. In one patient, complete adhesiolysis could not be performed laparoscopically, as, no cleavage planes between bowel loops could be identified in him. Laparotomy was done to deal with the complication of adhesiolysis. One developed uncontrollable bleeding, which was taken care of, after conversion to open surgery. This patient had an uneventful post- operative recovery. A conversion rate of 7% was seen in our series of laparoscopic adhesiolysis. On follow up, seven of our patients were relieved of the pain; five of them had undergone complete and two had undergone incomplete adhesiolysis. Six of our patients had no improvement in pain after adhesiolysis. An overall success rate of 53.8% was noticed in ameliorating abdominal pain by adhesiolysis. Barclay L reported similar equivocal results.[20] 23% of the female patients of chronic abdominal pain, in the present study, were found to have gynecological pathology. Pre-operative investigations were conclusive in only two patients, whose Ultrasound and CECT scan revealed right sided ovarian cyst in both patients. Four of our patients revealed evidence of pelvic inflammation, and two had endometriosis.

Gynecological disease has commonly been incriminated as a cause of chronic abdominal pain. 15.5% cases in the study by Velpen VGC et al had gynecological pathology.[9] Four had salpingitis and one each had endometriosis, ovarian cancer, and Fitz Hugh Curtis syndrome. Chronic pelvic pain was the common denominator in all our eight patients who were detected with gynecological pathology, all the eight patients had pain of more than one-year duration, (mean 17.7 months; ranging from 14-22 months). Associated complaints were elicited in five patients, two of whom had menorrhagia and two other had dyspareunia. Therapeutic laparoscopy was offered to four patients (50%). We performed cyst aspiration on a patient with a small right ovarian cyst. In other patient the cyst was enucleated, and histopathology revealed benign pathology. Both patients had history of menorrhaggia of one-year duration. Pain relief was obtained in both these patients.

Two of our patients on laparoscopy were found to have evidence of endometriosis. An endometriotic nodule on the right anterior pelvic wall was noted in one with a characteristic peritoneal pocket filled with blood. In the other patient right tubo-ovarian endometric nodule was noted. End coagulation was done in both patients. In the immediate post-operative period a decrease in pain intensity was reported by the patients. One of the patients failed to turn up in the follow up clinic and long-term results in her could not be ascertained, however in the other patient there was no further complaint of pain. Diagnostic laparoscopy alone, without any therapeutic procedure, was done in four patients, all of whom had evidence of pelvic inflammatory disease. Biopsy samples from adnexa were obtained in them. In one patient the sample was positive for tuberculosis. She was put on anti-tubercular treatment and was symptomatically relieved.

The remaining three had non-specific inflammation. They were put-on long-term antibiotics, but to no benefit. Overall pain relief in patients of gynecological pathology was 50% in our series. This is comparable to the findings of Howard FM who concluded from his study that,

laparoscopic surgical treatment of pathology noted at time of diagnostic laparoscopy in females with chronic pelvic pain is appropriate but less than 50% may be expected to obtain complete pain relief.[21]

Diagnostic laparoscopy allows direct visualization of the intra-abdominal organs and may find unexpected concomitant pathologies, especially in pre-menopausal women, which may alter subsequent management up to 31% in their study. This is comparable to our study in which eight patients with gynecological pathology were evaluated and as routine underwent USG and CECT scan. Out of eight only two patients with ovarian cysts were picked up by USG and CECT scan and confirmed by laparoscopy, in rest of six patients with pelvic inflammatory disease and endometriosis the radiological investigations were not confirmative. Thus, the diagnostic laparoscopy in the present study for chronic pelvic pain gave yield of 75%.

The diagnostic yield of present study series was 86% with no identifiable pathology being found in 14% cases (two male and five female patients). Velpen VGC et al[9] obtained laparoscopic diagnosis in only 41% of their patients with chronic abdominal pain. Five of our female patients who were diagnostic laparoscopy negative, were found to be suffering from non-specific chronic pelvic pain (CPP). Gynecological text books mention an average prevalence of 3.8% CPP in the female population. In present study, no such surgical procedure was performed on the patients of CPP. However we subjected all these patients to laparoscopic appendicectomy as no other pathology was evident. On follow up two of them were pain free, with the remaining three reported no improvement in their pain status.

Similarly, two male patients, whose diagnostic laparoscopy was negative, were subjected to laparoscopy appendicectomy for a normal looking appendix as no other pathology was evident. However, on follow up no relief in pain was reported. In totality 40% of our patients who were diagnostic laparoscopy negative attained pain relief, even though no therapeutic procedure was performed on them.

CONCLUSION

Computerized tomography is better than Ultrasonography in diagnosing various intra-abdominal pathologies as causes of chronic / recurrent right iliac fossa pain. Moreover, it was evident that diagnostic laparoscopy is even better than the above-mentioned modalities. It is cost effective, prevented delay in diagnosis and treatment and saved patients from recurrent hospital visits for getting their pain diagnosed and relieved.

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