

PATTERN OF ABDOMINO-PELVIC COMPUTED TOMOGRAPHY REFERRALS AND FINDINGS IN LAGOS, NIGERIA

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ABSTRACT

Background: Computed tomography (CT) has become an important tool in medical imaging to complement conventional x-rays examination and ultrasonography.

Aim: To determine the pattern of abdomino-pelvic computed tomography referrals and findings in an adult Nigerian population.

Patients and Method: A retrospective study of CT request cards and results of 195 patients who underwent CT scan at EKO hospital, Ikeja was conducted. Statistical Package for Social Science (SPSS) Version 21.0 was used to analyze the data.

Results: The frequency of males referred for CT scan of abdomino-pelvis was significantly more than females (54.87%, n=107 vs 45.13%, n=88; p<0.05). Age group between 30 to 39 years had the highest frequency of referral (21.03%). Abdominal-pelvic pain and discomfort (21.03%) was the major reason while Ca prostate (2.05%) was the least common reason for referral of patients for CT abdomino-pelvis. Renal disorders referral in men was 1.9 times more than in women. Enlarged liver with masses (55%) was a major finding in most patients within 50-59 years old. Some incidental CT findings unrelated to the primary reasons for referral of patients were noted.

Conclusion: Referrals for CT imaging investigations should be justified. This work revealed the referral pattern of patients for CT abdomino-pelvis as well as the pattern of findings observed.

Keywords: Abdomino-pelvis, Computed tomography, referral, findings, pattern, Eko Hospital.

INTRODUCTION

Since the introduction of CT in the 1970's, it has found wide spectrum of clinical applications to complement conventional x-rays investigations and medical ultrasonography [1]. Recent applications of CT in preventive and interventional medicine have been emphasized [2,3,4]. The rapid increase in the utilization of cross-sectional imaging examinations over the past two decades, combined with the ongoing improvement in the spatial and contrast resolution of these studies, has led to a marked increase in the number of findings detected that are unrelated to the referral clinical indications of the examination [5,6,7,8]. An estimated 72 million scans were performed in United States in 2007^[9] and about 31% of abdominal CT scans in USA were radiology self-referrals [10].

Abdomino-pelvic CT scan is the second most frequent CT investigations in a standard radiological department after brain CT [11]. It is estimated that 0.4% of current cancer in the United States are due to CTs performed in the past; and these may increase to as high as 1.5–2% with 2007 rate of CT usage [12]. Following the advances in abdominal ultrasonography and MRI which demonstrate abdominal structures with high spatial resolution and no radiation, documentation of the findings is paramount as to ascertain it is uncertain whether the cost and risk of abdomino-pelvic CT scans are justified.

MATERIALS AND METHODS

This study was retrospectively carried out using secondary data on 195 patients who underwent abdomino-pelvic CT scans at The EKO Hospital, Lagos, Nigeria over a 14 months period. The whole

of the evaluated cases were scanned using the same equipment, performed in both pre-contrast and contrast phase and were reported by one consultant radiologist who specialized in CT reporting. The equipment used for scan was a fifth generation GE helical Hi-Speed CT machine with the following specifications: maximum kilovoltage (150kV), minimum kilovoltage (40kV), maximum milliamperage (500mA), minimum milliamperage (50mA), tilting angle (60°). Information such as the date for the scan, patient's age, sex, and provisional diagnosis (clinical indications) were obtained from the patients' request cards while CT findings and final diagnosis were obtained from patient's folder containing radiologist report. Only cases with incomplete information were excluded from the study.

RESULTS

The result of this study showed that age group of patients referred for CT abdomino-pelvis was dominantly 30-59 years and male (n=107) were greater in number the female (n=88). T-test conducted also showed that males are significantly more than females (P<0.05) [figure 1]

The most common reason for referral of patients for CT abdomino-pelvis was abdominal pain and discomfort (21.03%) while the least common clinical indication was Ca prostate and BPH (2.56%)[Table 1].

Table 2 showed that male were referred more for injury (7/10), GIT bleeding (13/14), renal disorder (11/14) and liver disease (9/13) than

females but females were referred more for abdominal pain and discomfort (21/41) than males. It was deduced from Table 3 that enlarged liver with no focal lesion was the most common abnormal findings in CT abdomino-pelvis and age group 30-39 years had the highest frequency. The pancreas had the least abnormality with frequency of normality of 47.

From Table 4, it can be deduced that liver disorders, ascites and renal abnormalities occurred more in male than female while pancreatic tumour with biliary obstruction and splenic enlargement /mass were more frequently seen in female than male. It was also observed that CT was able to diagnose prostatic enlargement/Ca in 19 cases against 9 patients that had clinical history of prostatic Ca and BPH. With the confidence interval set at 95% (i.e. P<0.05)*, it was found that only hydronephrosis/hydroureter, uterine fibroid/adnexal masses and Ca prostate/prostatic enlargement showed significant association with gender. The last two may be due to sex specificity.

Table 5 showed that the most frequent diagnosis in patients that present with abdominal pain and discomfort was enlarged liver (n = 8) followed by liver mass/PLCC (n = 6). From table 6, renal cyst/mass was the most common diagnosis in abdominal pain and discomfort. CT was also able to diagnose 3 out of 4 patients with Ca prostate and BPH (75%). Table 7 showed that 52% (10/19) of patients that presented with abdominal pain and discomfort was normal. Also 4 out of 7 patients with clinical history of Ca Cervix (57%) had positive findings.

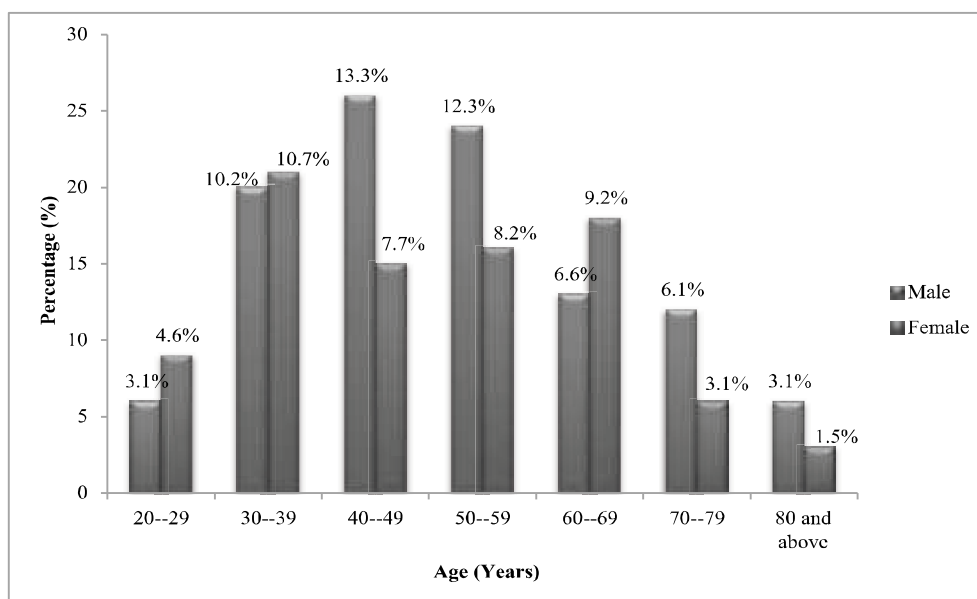


Fig. 1: Age and gender distribution of reviewed cases

Table 1: Distribution of clinical indications according to the patient's age

Age Distribution/Indications	Abdominal pain and discomfort	Abdomino-pelvic mass/Malignancy Injury/ Trauma	GIT Bleeding	Jaundice	Abdominal distension Liver Diseases	Ca Breast	Ca Prostate	Ca Cervix	BPH	GIT disorder	Renal disorders	Others	Total		
20-29	4	2	1	1	2	0	0	0	1	0	0	1	3	15	
30-39	14	4	3	0	2	0	1	4	0	1	0	3	4	41	
40-49	8	3	5	3	2	1	6	2	0	1	0	5	1	41	
50-59	10	3	0	5	2	1	1	4	1	1	2	5	4	40	
60-69	2	3	1	3	3	4	4	1	3	3	1	1	0	31	
70-70	2	2	0	1	3	0	0	0	0	0	1	1	3	18	
≥80	1	2	0	1	0	1	1	0	0	0	1	1	0	9	
Total	41	19	10	14	14	7	13	11	4	7	5	13	14	23	195

Table 2: Distribution of the clinical indications for CT referral according to gender of the patients

Clinical Indications	Male	Female	Total	%
Abdominal pain and discomfort	20	21	41	21.03
Abdominal mass/malignancy	8	11	19	9.74
Injury	7	3	10	5.13
GIT bleeding	13	1	14	7.18
Jaundice	8	6	14	7.18
Abdominal distension	4	3	7	3.59
Renal disorders	11	3	14	7.18
Liver disease	9	4	13	6.67
Ca breast	0	11	11	5.64
Ca Prostate	4	0	4	2.05
Ca Cervix	0	7	7	3.59
BPH	5	0	5	2.56
Other GIT disorders	8	5	13	6.67
Others	10	13	23	11.79
Total	107	88	195	100

Table 3: Distribution of CT Findings according to patient's age

Age Distribution/ CT Finding for abdomino pelvis	Normal liver	Enlarged liver with no focal lesion	Enlarge liver with masses	Enlarged liver with irregular margin	Normal size liver with masses	Ascites	Pancreatic tumour and biliary obstruction	Gallstone GB disorders	Normal pancreas	Renal cyst/mass	Hydronephrosis/ hydroureter	Renal enlargement /calculi	Normal kidneys	Splenic enlargement /mass	Normal spleen	uterine fibroid /adnexal mass	Ca prostate/prostate enlargement	GIT mass/abnormalities
20-29	5	1	1	1	1	1	0	0	5	1	0	2	4	1	4	2	0	2
30-39	8	13	7	0	4	3	1	2	8	5	4	2	8	6	10	4	0	11
40-49	9	10	2	2	7	3	1	2	12	6	0	5	11	3	12	5	4	5
50-59	5	9	5	4	4	6	4	2	11	5	4	2	9	3	10	2	5	2
60-69	4	8	1	4	4	3	2	3	6	7	5	1	4	4	6	7	4	5
70-70	3	2	4	0	3	2	3	3	2	5	2	1	2	0	2	2	4	4
≥80	1	3	2	1	0	1	1	0	1	1	1	3	1	0	0	1	2	1
Total	35	46	22	12	23	19	12	12	45	30	16	16	39	17	44	23	19	30

Table 4: Crosstab Pearson Chi-Square of CT abnormal findings and gender

CT Findings	Male	Female	Asymp.Sign Values (Pearson Chi-Square)
Enlarged liver with no focal lesion	26	20	.797
Enlarged liver with masses	11	11	.626
Enlarged liver with irregular margin	9	3	.148
Normal size liver with masses	13	10	.866
Pancreatic tumour/biliary obstruction	5	7	.343
Hydronephrosis/hydroureter	13	3	.027*
Renal enlargement/calculi	9	7	.445
Splenic enlargement/masses	11	7	.394
Uterine fibroid/adnexal masses	0	23	.000*
Ca prostate/prostatic enlargement	19	0	.000*
GIT mass/abnormalities	17	13	.830
Gallstone and GB disorders	7	5	.974
Renal cyst/masses	18	12	.539
Ascites	14	5	.083

Table 5: Distribution of CT Findings in Digestive system in relation to the clinical indication

CT Findings / Indications	Abdominal pain and discomfort	Abdomino-pelvic mass/Malignancy	Injury/ Trauma	GIT Bleeding	Jaundice	Abdominal Distension	Liver Diseases	Ca Breast	Ca Prostate	Ca Cervix	BPH	GIT disorder	Renal disorders	Others	Total
Liver mass/PLCC	6	3	1	2	3	2	1	6	3	0	0	0	4	2	33
Liver disease /metastases	1	0	0	2	0	2	2	2	7	0	1	1	1	0	19
Head of pancreas enlargement	0	1	0	1	5	0	0	1	1	0	0	0	1	3	13
Obstructive biliary tree /Jaundice	2	0	0	0	5	1	0	0	0	0	0	0	0	0	8
Enlarged liver	8	2	2	0	3	2	0	4	0	1	1	1	4	0	28
Bowel tumour/mass	0	2	0	0	0	0	0	0	0	0	0	0	0	5	7
Ascites	1	0	1	1	0	2	1	0	0	0	0	1	1	2	10
GIT disorders	3	1	0	5	1	2	0	2	0	1	1	0	7	1	24
Splenic cyst / splenomegaly	0	0	0	1	4	0	0	1	1	0	0	0	1	2	10
Total	21	9	4	12	21	11	4	16	12	2	3	3	19	15	152

Table 6: Distribution of CT Findings in urinary system in relation to the clinical indications

CT Findings / Indications	Abdominal pain and discomfort	Abdomino-pelvic mass/Malignancy	Injury/ Trauma	GIT Bleeding	Jaundice	Abdominal distension Liver Diseases	Ca Breast	Ca Prostate	Ca Cervix	BPH	GIT disorder	Renal disorders	Others	Total
Renal cyst/mass	7	1	2	3	1	1 2	1	2	0	2	2	3	1	23
Hydronephrosis	5	3	0	1	1	1 0	0	0	2	0	2	8	3	26
Enlarge prostate /prostate Ca	0	1	0	1	2	2 0	0	3	0	3	2	3	2	19
Total	12	5	2	5	4	4 2	1	5	2	5	6	14	6	68

CT Findings / Indications	Abdominal pain and discomfort	Abdomino-pelvic	Injury/ Trauma	GIT Bleeding	Jaundice	Abdominal distension Liver Diseases	Ca Breast	Ca Prostate	Ca Cervix	BPH	GIT disorder	Renal disorders	Others	Total
Leiomyoma uterine	2	2	0	0	0	0	1	0	1	0	2	1	1	10
Adnexal mass	4	1	0	0	0	0	1	0	0	0	0	0	0	6
Normal organs #	10	1	2	1	1	0	1	2	0	0	0	1	6	25
Ca Cervix	0	0	4	0	0	0	0	0	0	0	1	0	0	5
Ca Breast	0	0	0	1	0	0	0	0	4	0	0	0	0	6
Abdomino-pelvic mass	0	0	0	0	0	0	0	4	0	0	0	0	0	1
Lymphadenopathy	1	1	1	2	1	1	0	0	0	0	0	1	1	12
Total	2	1	0	1	0	0	0	0	0	0	0	0	0	5
Total	19	6	7	5	2	1	2	7	0	5	0	5	8	74

DISCUSSION

This study was carried out to evaluate the pattern of referrals and findings on abdominopelvic CT scans. Males (54.87%) referred for abdominopelvic CT scan within the scope of this study were significantly more than females (45.13%) ($P < 0.05$). The sex distribution of the patients was similar to that reported by Poortman *et al* [13].

The result revealed that abdominal pain and discomfort (21.03%) was the major reason for referral of patients and benign prostate hypertrophy (BPH) and Ca prostate were least common reasons for referral of patients for CT abdomino-pelvis. This study showed that males were referred more for injury to the abdomen (7/10) than females. Our finding agreed with the work of Onwuchekwa & Alazigha [14] and Erundu *et al*. [11]

Ca prostate/prostate enlargement was not seen in patients younger than 40 years. This agreed with the work of Borley & Feneley [15] who concluded that Ca prostate was a rare diagnosis in male younger than 40 years. Ha *et al*. [16] reported that frequency of suspected nephrolithiasis (renal disorder) are more in men than women. Also Vikram *et al* [17] recorded that the incidence in men of renal cell carcinoma is 1.6 times greater than in women. Both studies were in agreement with the findings of this work that renal disorders in males was 1.9 times (ratio 43:22) more than in women. The difference may be attributed to the larger number of patients included in this work.

The result also showed that enlarged liver with masses was a major finding in most patients within 50-59 years old. This is similar to the study done by Pan *et al*. [18] who stated that hepatocellular carcinoma occurs mostly in people between 50-60 years old. Also, enlarged liver with no focal lesion (46 out of 195=23.59%) was the most common abnormal finding in abdominopelvic CT scans.

Dimango *et al* [19]. stated that in the cases of pancreatic ductal tumour; the ratio of male to female was 20:1 and most patients were older than 60 years. It disagreed with the findings of this work which recorded a ratio of 5:7 in case of pancreatic tumor and biliary obstruction. This may be attributed to the difference in geographical location and the number of patients included. No spleen enlargement/mass was noted in the age group older than 70 years. This may be

due to the decrease in hematopoietic functioning of the spleen with age.

The result of Pearson Chi-Square showed that there is no significant association between CT abnormal findings and gender of the patients except for those abnormalities (Ca prostate/prostatic enlargement and uterine fibroid /adnexal mass) that are sex specific and hydronephrosis/ hydroureter which is significantly associated to male ($P = .027$).

Out of 41 patients that complained of abdominal pain and discomfort, the diagnosis include; liver mass/PLCC, Liver disease/metastasis, obstructive biliary tree/jaundice, enlarged liver, ascites, GIT disorders, renal cyst/mass, hydonephrosis, leiomyoma uterine, adrenal mass, abdominopelvic mass and lymphadenopathy. Out of 19 patients that were referred with clinical signs of abdomino-pelvic mass, the diagnoses made were liver mass/PLCC, pancreatic head enlargement, enlarged liver, bowel tumour/mass, hydonephrosis, enlarged prostate/Ca prostate, leiomyoma uterine, adrenal mass, abdominopelvic mass and lymphadenopathy. Out of 10 patients that underwent CT scan with clinical sign; injury/trauma, the diagnosis include: Liver mass/PLCC, enlarged liver, renal cyst/mass, ascites, fracture and abdomino-pelvic mass. Out 14 patients that underwent CT examination with clinical sign of bleeding per GIT; the diagnosis include: liver mass/PLCC, Liver disease/metastasis, head of pancreas enlargement, splenic cyst/splenomegaly, renal cyst/mass, hydonephrosis, enlarged prostate and prostate Ca, abdomino-pelvic mass and lymphadenopathy. Out of 14 patients that underwent CT scan with clinical sign of jaundice; jaundice was confirmed in 35.71% of the patients. Other diagnosis include; liver mass/PLCC, head of pancreas enlargement, enlarged liver, splenic cyst/splenomegaly, renal cyst/mass, hydonephrosis, enlarged prostate/Ca prostate and abdomino-pelvic mass. Out of 7 patients that complained of abdominal distension, the diagnosis include; liver mass/PLCC, Liver disease/metastasis, obstructive biliary tree/jaundice, enlarged liver, ascites, GIT disorders, renal cyst/mass, hydonephrosis, abdomino-pelvic mass. Out of 14 patients that underwent CT scan with clinical sign of renal disorders, the diagnosis include; liver mass/PLCC, Liver disease/metastasis, ascites, renal cyst/mass, hydonephrosis, enlarged prostate/prostate Ca, leiomyoma uterine, abdomino-pelvic mass. Out of

13 patients that underwent CT scan with clinical sign of liver disease, the diagnosis include; liver mass/PLCC, Liver metastasis, head of pancreas enlargement, enlarged liver, splenic cyst/splenomegaly, renal cyst/mass, GIT disorders, adrenal mass. Out of 11 patients that complained of Ca breast, the diagnosis include; liver mass/PLCC, Liver disease/metastasis, enlarged head of pancreas, splenic cyst/splenomegaly, renal cyst/mass, leiomyoma uterine. CT confirmed Ca breast in 36.36% of the patients.

In summary, the study revealed that abdomino-pelvic mass, liver mass/PLCC and enlarged liver were the major diagnosis in patients with abdominal distention. Hydronephrosis (57.14%) was the major diagnosis in patients that underwent CT scan with clinical sign of renal disorders, and 30.77% of the patients referred with clinical sign of liver disease had enlarged liver. Liver mass/PLCC and enlarged liver were the most common diagnosis among the referred patients. Many of the CT findings were unrelated to the reasons for referral giving rise to incidental findings.

CONCLUSION

This study demonstrated that male referred for abdomino-pelvic CT were significantly more than females and abdominal pain and discomfort was the commonest reason for referral. Enlarged liver was a predominant finding in most of the patients. However, some incidental CT findings unrelated to the primary reasons for referral of patients were noted. Hydronephrosis/hydronephrosis, Ca prostate/prostatic enlargement and uterine fibroid /adnexal mass were found to be significantly associated with gender of the patient.

RECOMMENDATIONS

We recommend that abdomino-pelvic ultrasound examination be carried out as first choice imaging modality and prerequisite for abdomino-pelvic CT referral.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Lower A.S and Kay CL (2006). Recent development in CT Review of the clinical applications and advantages of multi-detector CT. *Imaging*; 18: 62-67
2. Cheezum, M.K., Hulten, E.A., Fischer, C., Smith, R.M., Slim, A.M., Villines, T.C. (2012). Prognostic value of coronary CT angiography. *Cardiology Clinics*; 30: 77-91
3. Chandrashekhar, Y (2013). Imaging for Improving Therapy. *Journal of American College of Cardiologists: Cardiovascular Imaging*; 6(5): 582-586.
4. Rubin, G.D (2014). Computed tomography: revolutionizing the practice of medicine for 40 years. *Radiology*; 273 (2): S45-74
5. Smith-Bindman R, Lipson J, Marcus R (2009). Radiation dose associated with common computed tomography examinations and the associated lifetime attributed role of cancer. *Arch. Intern. Med.*; 169 (22); 2078-86. PMID 2008690.
6. Pickhardt PJ, Hanson ME, Vanness DJ, *et al* (2008). Unsuspected findings at screening CT colonography: clinical and economic impact. *Radiology*; 249:151-9.
7. Bovio S, Cataldi A, Reimondo G (2006). Prevalence of adrenal incidentaloma in a contemporary computerized tomography series. *Journal of Endocrinology Invest*; 29:298-302.
8. Wagner SC, Morrison WB, Carrino JA, Schweitzer ME, Nothnagel H (2002). Picture archiving and communication system: effect on reporting of incidental findings. *Radiology*; 225:500-5.
9. Berrington de González A, Mahesh M, Kim KP (2009). "Projected cancer risks from computed tomographic scans performed in the United States in 2007". *Arch. Intern. Med.* 169 (22): 2007-11. doi:10.1001/archinternmed.2009.440. PMID 2008689
10. Blaivas, M., Lyon, M (2007). Frequency of radiology self-referral in abdominal computed tomographic scans and the implied cost. *American Journal of Emergency Medicine*; 25(4):396-9

- 11 Erondu O.F, Okoro CR, Aniemeka JI, Ugiou AC (2011). Patterns of CT referrals among physicians in the south-south region of Nigeria: *American Journal of Scientific and Industrial Research*; 2 (4): 482-487).
- 12 Brenner DJ, Hall EJ. (2007). "Computed tomography--an increasing source of radiation exposure". *North England Journal of Medicine*; 357(22): 2277-84.
- 13 Poortman, Pieter; Lohle, Paul N.M. ; Schoemaker, Cees M.; Cuesta, Miguel A.; Oostvogel, Henk J.M.; Lange-de Klerk, Elly S.M. de; Hamming, Jaap F (2010). Evaluation of the factors that can predict the presence of a malignancy for localized intrahepatic bile duct dilatation without a visible mass or stone as depicted on CT images. *European Journal of Radiology*; 74(1): 67-70.
- 14 Onwuchekwa, C. R., & Alazigha, N. S. (2017). Computed tomography pattern of traumatic head injury in Niger Delta, Nigeria: A multicenter evaluation. *International journal of critical illness and injury science*, 7(3), 150-155. doi:10.4103/IJCHIS. IJCHIS_6_17
- 15 Borley, N., & Feneley, M. R. (2009). Prostate cancer: diagnosis and staging. *Asian Journal of Andrology*, 11(1), 74-80. doi:10.1038/aja.2008.19
- 16 Ha M, Mac Donald RD (2004). Impact of CT scan in patients with first episode of suspected nephrolithiasis. *Journal of Emergency Medicine*; 27(3):225-231.
- 17 Vikram R., Beland M.D., Blaufox M.D., Moreno C.C., Gore J.L., Harvin H.J., Heilbrun M.E., (...), Lockhart M.E. (2016). ACR Appropriateness Criteria Renal Cell Carcinoma Staging. *Journal of the American College of Radiology*, 13 (5), pp. 518-525.
- 18 Lawrence Pan, Gillion Lieberman. Common CT finding secondary to liver Tumours. New Jersey medical school of Radiology-Beth Isreal Deaconess Medical centre. Sept. 2006.
- 19 Dimango EP, Reber HA, Tempero MA (1999). AGA technical review on the epidemiology, diagnosis and treatment of pancreatic ductal adenocarcinoma. *American Gastroenterological Association. Gastroenterology*; 117(6):1464-1484.