Accuracy of preoperative computer tomography scan staging of gastric and colorectal cancer at Muhimbili National Hospital

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ACCURACY OF PREOPERATIVE COMPUTER TOMOGRAPHY SCAN STAGING OF GASTRIC AND COLORECTAL CANCER AT MUHIMBILI NATIONAL HOSPITAL

By

Stephen Saul

A Dissertation Submitted in (Partial) Fulfilment of the Requirements for the Degree of Master of Medicine (General Surgery) of

Muhimbili University of Health and Allied Sciences

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CERTIFICATION

The undersigned certifies that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled, ***"Accuracy of preoperative Computer Tomography scan staging of Gastric and Colorectal cancer"*** in partial fulfilment of the requirements for the degree of Master of Medicine (General Surgery) of Muhimbili University of health and Allied Sciences**.**

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Dr. Larry Akoko

Supervisor.

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Date

DECLARATION AND COPYRIGHT

I **Stephen Saul,** declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature …….. Date …….

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DEDICATION

This dissertation is dedicated to;

My dear and lovely wife, Liberatha S. Sunday

and

My son, Joel S. Saul

ABSTRACT

Background: Computed Tomography (CT) has been used in the initial detection, staging and follow-up of malignant tumors regardless of the site of the primary lesion. For patients with gastric and colorectal malignancy, the disese can be detected by CT scan and help in a proper staging and treatment plan . This study aimed at determining the accuracy of preoperative CT scan staging of gastric and colorectal cancer managed at Muhimbili National Hospital (MNH).

Methods: Cross-sectional study carried out between March 2017 and February 2018. All patients with gastric and colorectal cancer with CT scan, where CT TNM findings were compared to intraoperative ones. Intraoperative staging was considered the gold standard and a 2X2 contingency table was constructed. Specificity, sensitivity, accuracy and predictive values were computed.

Results: A total of 58 participants were recruited in this study. The CT was found to have sensitivity, specificity, accuracy, positive and negative predictive value of 0.0% to 94.1%, 14.3 to 100%, 54% to 84%, 0.0% to 100% and 47% to 95% respectively in detecting TNM in gastric cancer. Also CT was found to have sensitivity, specificity, accuracy, positive and negative predictive value of 0.0% to 88%, 55% to 100%, 51% to 94%, 0.0% to 100%, and 42% to 94% respectively in detecting TNM in colorectal cancer.

Conclusion: The CT scan was found to be highly sensitive in detecting the disease confined to the primary organ (gastric or colorectal) and highly specific in detecting disease metastasis to lymphnode, liver and peritoneum. It has good accuracy in staging colorectal cancer and low in staging gastric cancer.

Key words: Accuracy, Computer Tomography, Gastric, Colorectal**.**

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CT	Computerized Tomography
MNH	Muhimbili National Hospital
NPV	Negative Predictive Value
SPSS	Statistical package for Social science
PPV	Positive Predictive Value
T3	Tumor involvement of the peri-gastric/pericolic adipose tissue
T4	Tumor infiltration of the adjacent structures

OPERATIONAL DEFINITION

Sensitivity; is the percentage of all patients with disease who have a true positive test according to the laparotomy finding.

Specificity; is the percentage of all patients without disease who have a negative test according to the laparotomy finding.

Accuracy; refers to a proportion of all cases with correct diagnosis as per gold standard (laparotomy).

Positive Predictive Value; refers to percentage of persons with positive test results who actually have the disease

Negative Predictive Value; measures the probability of a disease being actually absent if the test for that disease is Negative.

Evaluation; Staging the disease

Confine; Disease that is still in organ of origin (has not involved nearby structures or distant organs)

Regional lymph nodes; Group of lymphnode receiving drainage from the organ

Distant lymph nodes; Referring to Mesenteric lymphnode, celiac lymphnode, paraortic lymphnode

Laparotomy was the gold standard

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Computed Tomography has been used in the initial detection, staging and follow-up of cancer regardless of the site of the primary lesion. In patients with gastric cancer, upper gastrointestinal examination and endoscopy play important roles in the initial detection of the tumours, although gastric cancer may be detected with CT. However, both upper gastrointestinal examination and endoscopy have a limited ability to help predict extraluminal extension, lymphnode metastasis, and occurrence of distance metastasis in patient with gastric cancer; CT does it and is used for preoperative staging(1).

To reduce mobidity and mortality of patients with gastric cancer, it is essential to choose an optimal therapeutic approach, and this, in turn, depends on early detection and accurate preoperative staging. Indeed, prognosis is related to depth of invasion of the gastric wall and lymph node involvement. Survival is improved with curative resection and palliative chemotherapy. A small early gastric cancer confined to the submucosa (T1 stage) can be treated with nonsurgical endoscopic mucosal resection. Preoperative chemotherapy or radiation therapy is recommended for advanced gastric cancer. Accurate preoperative staging, therefore, can help increase cure rates and quality of life (2).

For Colorectal cancer, careful patient selection is required to properly apply the new options in surgical management brought about by the advent of preoperative radiation therapy (3). Since the basis for Selection is the stage of the disease, accurate staging of rectal cancer is important. Digital Rectal examination for cancer within the reach of the finger has been a mainstay of assessment, with additional helpful information provided by endoscopy, contrast material-enhanced radiographic studies and CT scan (4).

Technological advancement in CT have changed the practice of diagnosing, preoperative staging and plan of treatment of patients with gastric or colorectal cancers. Development of high resolution scanners, technical refinement in obtaining better quality studies, experience and

accuracy of CT has led to better interpretation of the findings. CT is accurate in diagnosing intramural and extra intestinal components: mesentery, peritoneal cavity, retroperitoneum and solid organs.

Technical Considerations of CT

Routine CT examinations of the abdomen usually result in the inadequate evaluation of most primary gastrointestinal lesions, unless a special effort is made to enhance their visualization. The goal of obtaining high-resolution study can be accomplished only by determined attempt to follow several general principles of CT examination: Visualization of the intestinal lumen and its mucosal surface and evaluation of the thickness of the intestinal wall require the gastrointestinal tract to be empty and clean and its lumen to be opacified and distended. Patient should fast, and `adequate preparation of the colon is essential, particularly in patients in whom colonic disease is suspected or known to be present. Visualization of intestinal lumen is achieved by oral administration of contrast (Air, barium or gastrografin) at least 1 hour before scanning(5).

The successful acquisition of high-resolution images requires the liberal use of thin (5mm) sections over the area suspected or known to be pathologically involved. This can be done during initial scanning, when the location of the lesion is known or during repeated scanning at the end of the examination, when an abnormality is suspected but is inadequately imaged. At this time, 1mg intravenous glucagon to inhibit peristalsis, additional barium in the stomach or colon, and proper positioning of the patient should be considered before repeating thin sections over the area of interest are obtained (6).

1.2 LITERATURE REVIEW

Gastric Cancer

Gastric cancinoma is the fourth most common cancer worldwide and the second most common cause of cancer-related death. The only cure available is surgical excision of the gastric cancer which depends on the stage of the disease at presentation. The extent of stomach wall invasion by the tumor, metastasis to the lymph nodes and the presence of distant organ metastasis determines the stage of the tumour. However, due to non-specific symptoms of gastric cancer, patients often present at inoperable stages with locally advanced or metastatic disease.(7)

Gastric tumours are often localized in the antral and pyloric sites (50%), lesser curvature (13%) and cardia (10%), while in 10% of cases there is already widespread involvement of the gastric walls at the time of diagnosis. The greater resolution of the CT for assessing the tumour status has made possible to recognize gastric wall layers in some cases, and is essential in estimating the depth of the tumour. However it was found that, for the neoplasm confined to the mucosa and submucosa the CT had diagnostic accuracy ranging from 23% to 56% and accuracy value increase for tumour in advanced stage 88% to 95% for T4, while recognition of infiltration to the serosa was found to have accuracy value of 70% to 80% (8). A study by Robert Michael Kwee and Thomas Christian Kwee, found that the CT had an accuracy ranging from 77.1% to 88.9%, sensitivity ranging from 82.8% to 100%, and specificity ranging from 80% to 96.8% on local staging of gastric cancer.(9)

A prospective study done by Tatsuro Fukuya et al involved 58 patients with gastic cancer, looking at Lymphnode metastasis in patient with gastric cancer found that, the fraction of metastasis-positive nodes increased as the size of the lymp nodes increased, the sensitivity for detecting metastasis-positive nodes was always higher than that for detecting mestasis-negative nodes except in 11mm, 13mm, and 14mm lymph nodes, of which they were few. 75% of of metastatic-positive nodes and 41.8% of mestatasis-negative nodes of at least 5mm were detected. Difference in sensitivities for detecting positive and negative nodes was significant.(10)

On evaluating the accuracy of dynamic CT in the preoperative staging of the gastric cancer, patients were diagnosed using endoscopic biopsy and were prospectively staged by the dynamic CT. It was found that, the accuracy of dynamic CT for tumor detection was 80% in early gastric cancer and 90% in advanced gastric cancer, with overall detection rate of 96%. The accuracy of CT in detecting increasing degrees of depth of tumour invasion when comparing with pathological TNM staging was 20% and 87% in early and advanced cancer respectively. The sensitivity, specificity and accuracy of CT in the preoperative staging was 93, 90 and 91.6% respectively. The sensitivity, specificity and accuracy of CT in assessing metastasis to regional lymph nodes was 97.2%, 65.7% and 87% respectively. Also it was found to have an overall sensitivity of 87.5% and specificity of 99% and the sensitivity of detecting peritoneal involvement was 30% when ascites or peritoneal nodules were absent (11).

Colorectal neoplasms

Accurate preoperative staging colorectal cancer is essential in determining the optimal therapeutic planning for individual patients. The CT in preoperative staging of colorectal cancer may be useful for planning surgery and/or neoadjuvant therapy, particularly when local tumor extend into adjacent organs or distant metastases are detected. The contrast enhanced soft-tissue mass may have an homogeneous density or appear heterogeneous in certain lesions because of patchy irregular areas of lower density related to zones of decreased blood supply and tumor necrosis.(12)

A study done looking at the role of CT in the preoperative evaluation of 90 cases of proven colon carcinoma, the overall detection rate was 84%; however, the rate varied from 68% in unprepared colons to 95% in clean colons that were adequately distended with air. Sensitivity of detection depends mainly on the size of the lesion and the quality of the examination. CT was less sensitive than barium enema in detection, but it had a similar specificity in differentiating neoplastic lesions from inflammatory lesions. On the basis of our criteria of staging, CT evaluation resulted in a sensitivity of 55% for local invasion, 73% for regional nodes, and 79% for liver metastases. (13)

In colorectal cancer, CT detection of peritoneal carcinomatosis is moderate and poor in individual peritoneal tumor deposits. Therefore, preoperative CT seems not to be a very reliable tool for detection of presence, size, and location of peritoneal tumor implants (14). In a study done by Abdel-Nabi et al it was found CT had a sensitivity of 29% and specificity of 89% of detecting metastasis to lymphnode and liver from primary colorectal cancer and in another study by assessing liver metastasis using helical CT, it was found that CT had an overall detection rate of 85.1% and positive predictive value of 96.1% (15)(16).

A study that involved 42 patients with rectal carcinoma that used CT for preoperative staging of the disease found that, it had an accuracy of 97.6% on detecting local invasion of the disease, however it had accuracy, sensitivity, specificity of 78.6%,88%, 64.7% respectively in detecting lymph nodes involvement. In hand with other studies defining the extra parietal extension of the neoplasm and infiltration of the pericolonic or perirectal fat (T3), CT had sensitivity ranging between 60% and 97%. In recognition of metastasis to adjacent organs (bladder, vagina, and abdominal and pelvic muscles) indicating advanced stages of the disease (T4) reported a sensitivity of 80% and accuracy of 89 %. It has low specificity of 58% to 65% and high sensitivity of 73% to 88% when assessing involvement of the abdominal and pelvic lymph node stations (17)(18)(19)(20).

1.3 PROBLEM STATEMENT

Accurate treatment of any malignancy requires that an accurate stage is made available so that decisions as to whether to offer neoadjuvat therapy or not are easily made. This staging can be achieved by several modalities of which CT scan is one of them and is now readily available at MNH. However, how useful the CT scan reports are to the surgeon at MNH is unknown and sometimes surgeries are abandoned due to inoperability of some cases with CT scans.

1.4 RATIONALE OF THE STUDY

Addressing diagnostic accuracy is important and this study will provide useful information as to how to increase usability of CT scans in the staging of patients with both gastric and colorectal cancer at MNH.

1.5 ESEARCH QUESTIONS

Do CT scan results differ significantly from intraoperative findings on patients with gastric or colorectal cancer and how does this difference if any compare with that reported in other studies?

2.0 OBJECTIVES

2.1 BROAD OBJECTIVE

To determine the accuracy of preoperative CT scan staging of gastric and colorectal cancer managed at MNH.

2.2 SPECIFIC OBJECTIVES

2.2.1 To determine time interval from CT scanning to surgical intervention

2.2.2 To determine the sensitivity of Computed tomography in evaluating gastric and colorectal cancer at MNH.

2.2.3 To determine the specificity of Computed tomography in evaluating gastric and colorectal cancer at MNH.

2.2.4 To determine the positive predictive value of Computed tomography in evaluating gastric and colorectal cancer at MNH.

2.2.5 To determine the negative predictive value of Computed tomography in evaluating gastric and colorectal cancer at MNH.

3.0 METHODOLOGY

3.1 Study design

This was a cross sectional observational hospital based study that involved all patients with gastric and/or colorectal neoplasms admitted at Muhimbili National Hospital during the period of study from March 2017 to February 2018.

3.2 Study Area.

The study was conducted at MNH in General surgery wards. MNH is a Public National referral hospital and University teaching hospital located at Upanga ward, in Ilala municipal Dar es Salaam. It receives patients from the city of Dar es salaam, the Coast Region and those referred by some of the upcountry secondary care hospitals. The hospital has a bed capacity of 1600, whereby 120 beds are dedicated to general surgery service. The hospital has different diagnostic equipments like MRI, CT scan (Siemen 128 slide, duo system, made in German) , Ultrasound and X-rays. Also has gastroenterology unity were endoscopic procedure for diagnosis and/or treatment are done.

3.3 Study Population

All surgical patients admitted in the male and female adult general surgical firms of Muhimbili National hospital.

3.4 Study sample

All patients with CT scans reports and confirmed histologic diagnosis of colorectal or gastric cancer.

3.4.1 Inclusion criteria

i. Above 18 years of age
ii. Underwent laparotomy for surgery.
iii. Has CT scan report

4.4.2 Exclusion criteria

Inability to perform adequate examination to reach to a stage at surgery.

4.5 Sample size

Only 58 patients were available for the study

4.6 Sampling method

Convenient consecutive sampling of all cases presenting with CT scan report and Histology of gastric or colorectal cancer.

4.7 Methods

Patients work up was done by the managing physician: including diagnostic workups for histology and CT scan. Listing for surgery and subsequent surgery was also done by the managing physiscian. The researcher was not involved in any decision making in the management. The managing surgeons were informed of the the study to provide TNM information as detailed as they could and document in the surgical notes. To aude memory, a medical student was instructed to take notes during surgery. This was later compared after surgery by the CT scan report that had been collected earlier.

4.8 Data collection

Using a pre structured checklist, information on socio-demographic characteristics, diagnosis and findings from radiological report of abdominopelvic CT scan TNM status, center where the CT scan was done, time interval since the CT was done to operation and the intraoperative TNM status (confinement of the tumor to primary organ, metastasis to locoregional lymphnodes, metastasis to distant lymphnodes, metastasis to liver and peritoneum), were all filled in the designed checklist.

4.9 Data Analysis

It was done using SPSS computer software version 23.0 and the data was managed electronically in the computerized software program after cross checking the filled checklist for quality control of the data which was obtained from the selected files of patients who met the inclusion criteria. Descriptive analysis was done, results was summarized in frequency distribution tables and figers. Computation of sensitivity, specificity, positive predictive value and negative predictive value using the intraoperative findings as gold standard was done as per the formulas below;

Sensitivity, The numerator was all patients who had a disease and found to have a disease on the CT scan in the specified organ/tissue (example; Lymph node, liver), and the denominator was total number patients who had a disease (include; those who were found to have a disease on the CT scan and those found to have no disease on CT scan while had disease) under the study.

$$\textit{Sensitivity} = \frac{\text{True Positive x 100\%}}{\text{(True Positive + False Positive)}}$$

Specificity, the numerator was all patient who had no disease and found to have no disease on the CT scan, and the denominator was total number of patient who had no disease (include; those found to have no disease on CT and intraoperatively and those who had no disease but found to have disease on the CT scan) under the study.

$$\textit{Specificity} = \frac{\text{True negative x 100\%}}{\text{(True Negative + False positive)}}$$

Positive predictive value; the numerator was all patients who had a disease on CT scan and intraoperative, and the denominator was all patients who had a disease on the CT scan (include; those who had a disease on intraoperative and those who had no disease on intraoperative found).

$$\textit{Positive predictive Value (VPV)} = \frac{\text{True Positive x 100\%}}{\text{(True positives + False Positive)}}$$

Negative predictive value; the numerator was all patients found to have no disease on CT and intraoperatively, and the denominator was total number of patients with no disease on CT scan (include; those with no disease on CT and found to have a disease on intraoperative and those without disease on CT scan and intraoperative findings).

Negative predictive value (NPV) = $\frac{\text{True Negative x 100}}{\text{(True Negative + False Negatives)}}$

4.10 Study Limitations.

- Human error on reporting of laparotomy finding
- CT scan finding were interpreted by different radiologist with varying level of experience.

4.11 Ethical consideration and Ethical clearance

Ethical clearance was sought from the Research and Publication Committee of the School of Medicine and from the Senate Research and Publications Committee of the Muhimbili University of Health and Allied Sciences. Administrative permission to conduct the study was obtained from Muhimbili National Hospital as per the hospital management protocols. Involvement of the patient was according to standard of care, there was no any extra intervention that was detected by research purpose. No direct patient identifiers were collected and information collected was kept confidential before and after the study.

4.0 RESULTS

This study enrolled a total of fifty eight [58] participants, among them 41.4% were suffering from Gastric malignancy and 58.6% colorectal malignancy. Most of the participants in this study were of the age group of 51-60 years 23 (39.7%). The mean age of the study population was 53.29 ± 11.702 and age range 22-77 years. Of all the participants 33 (56.9%) were male. As can be seen in figure 1, in both diseases, male were the majority

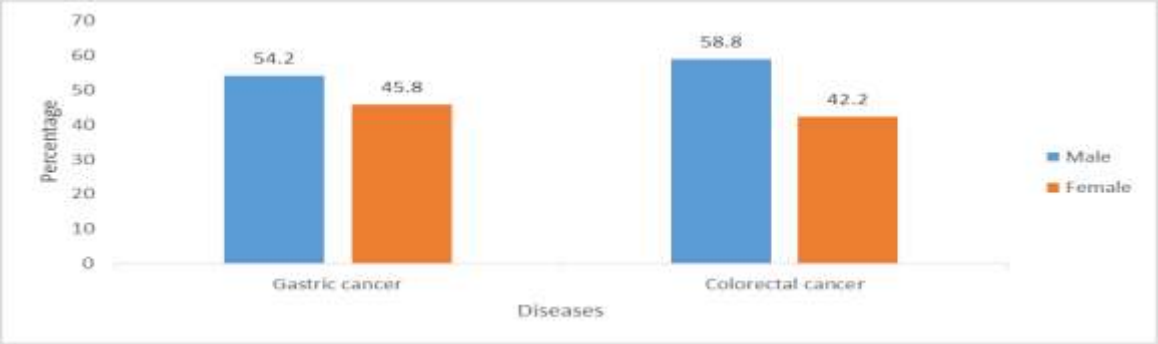

Figure 1: Distribution of diseases among sex (n=58).

Most of the participants with gastric and colorectal malignancy were found within the age group of 51-60 years, 11(45.5%) among all patient with gastric malignant and 12(35.5%) among all patient with colorectal malignancy. [Fig. 2]

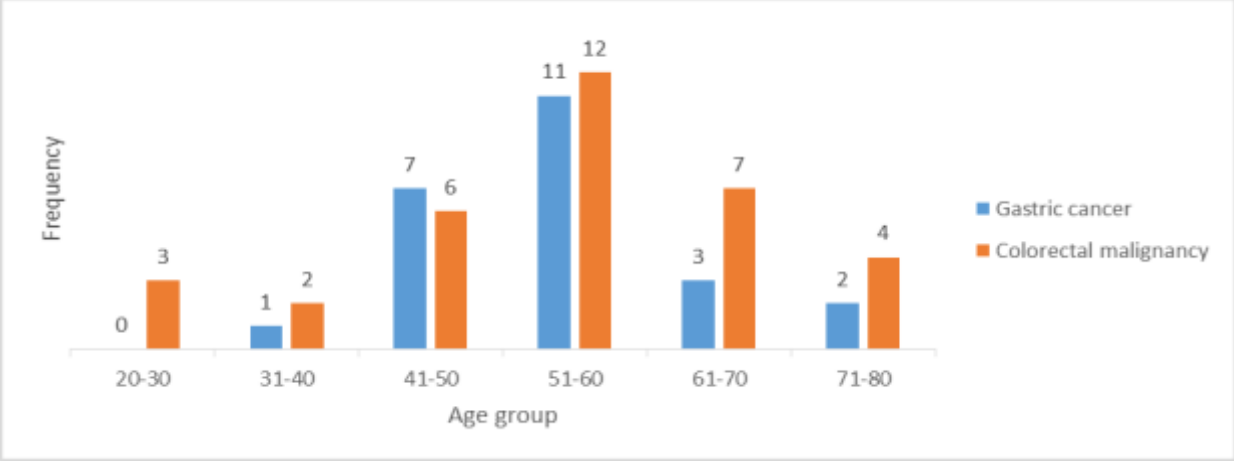

Figure 2: Distribution of diseases within age groups (n=58)

Of all participants who had gastric malignancy, 70.8% were operated within a month after the CT scan evaluation and 8.4% were operated more than two months after the CT scan evaluation. Also, of those participants with colorectal malignancy, 70.6% were operated within a month after the CT scan done and 5.6% were operated more than two months since the CT scan done. As shown from Table 1 below:

Table 1: Time difference of the investigation and Operation (n=58)

	Gastric malignancy		Colorectal malignancy	
Time (Month)	Frequency	Percentage	Frequency	Percentage
1 month	17	70.8	24	70.6
2 months	5	20.8	8	23.5
Above 2 months	2	8.4	2	5.9
Total	24	100	34	100

The CT has sensitivity of 94.1% and accuracy of 70.1% in detecting if the disease is confined to the organ of origin. It has a sensitivity 0.0% in detecting the disease metastasis to distant lymph node and peritoneum. Also has specificity of 100% in detecting disease metastasis to locoregional, distant lymph node and peritoneum. As shown from table 2 below:

Table 2: Performance of CT on evaluating Gastric malignancy (n=58)

Factors	**Sensitivity (%)**	**Specificity(%)**	**VPV (%)**	**NPV (%)**	**Accuracy(%)**
Disease confined to gastric	94.1	14.3	72.7	50.0	70.1
Metastasis to locoregional lymph nodes	23.1	100	100	47.4	54.5
Metastasis to distant lymph nodes	0.0	100	0.0	82.6	82.6
Metastasis to liver	50	81.8	20.0	94.7	79.2
Metastasis to peritoneum	0.0	100	0.0	83.3	83.3

The CT has sensitivity 88% and accuracy of 79.4% in detecting if the disease is confined to the colorectal. It has a specificity of 100% in detecting the disease metastasis to Peritoneum, locoregional and distant lymph nodes. Also has accuracy of 91% and 94% in detecting metastasis to liver and peritoneum. As shown from Table 3 below:

Table 3: Performance of CT on evaluating Colorectal malignancy. (n=58)

Factors	Sensitivity (%)	Specificity (%)	VPV (%)	NPV (%)	Accuracy (%)
Disease confined to colorectal	88.0	55.6	84.6	62.5	79.4
Metastasis to locoregional lymph nodes	25.0	100	100	42.3	51.6
Metastasis to distant lymph nodes	0.0	96.8	0.0	90.9	88.2
Metastasis to liver	50	100	100	90.3	91.2
Metastasis to peritoneum	0.0	100	0.0	94.1	94.1

5.0 DISCUSSION

The study involved 58 participants of which 41.4% gastric malignancy and 58.6% had colorectal malignancy, with male preponderance in study participants in both disease. There was no reason for that preponderance. Majority of this participants were operated with a month after the CT scan findings.

The management of a patient with gastric malignancy depends on the accurate evaluation of the local extent of the disease and distant metastasis, this is fundamental in planning therapeutic strategy and prognosis of the patient. This helps the surgeon to decide whether the surgery is likely to be curative or palliative in nature and avoid unnecessary laparotomy. Prognosis is related to the depth of invasion of the gastric wall layers and lymphnode involvement (2). By using the CT scan, we are able to diagnose if the tumor is confined in the gastric wall, has penetrated the serosa and involved the adjacent structures or distant organs.

On assessing specific parameters of the study, CT was found to have sensitivity and accuracy of 94.1% and 70.8% respectively in detecting confinement of the tumor to the gastric. These results correlate with the finding in other studies where the sensitivity and accuracy was increasing with the increase in size of a tumour and involvement of gastric wall layers (8)(9). However it has low specificity in detecting if the disease was confined to the gastric wall layers comparing to other studies were it was found to range from 80% to 96.8% (9). The difference may be attributed to poor preparation of patient, skills of the technician, competence of the radiologist interpreting the CT images and time from when the CT scan was done. Positive and negative predictive value of 72.7% and 50% respectively; on detecting if the tumour is still confined to the gastric.

Assessing metastasis of the disease to locoregional or distant lymphnode preoperatively is crucial in staging the disease and prognosis of the patient. This study found the CT to have an accuracy of 54.5% and low sensitivity (23.1%) and higher specificity (100%) compared to other studies where the overall sensitivity of assessing locoregional lymphnode involvement was 87.5% (10). The sensitivity from other studies were increasing as the size of the lymphnode increased which were contributed by a well distended stomach and/or intestine by contrast, proper positioning the patient and the size of the slice of the CT images over the area suspected or known to be pathologically involved (6)(12). In this study increase in the size of locoregional lymphnode was

not associated with increase in sensitivity but had a similar finding on specificity with the study done in Europe (11). The difference in the sensitivity may be explained by the technicalities of preparation of patient,doing and interpreting the CT scan images as was observed in other study (12). The sensitivity of the CT in detecting liver metastasis in patients with gastric malignancy was 50%, accuracy 79.2%, specificity 81.8% and positive and negative predictive value of 20% and 94.7% respectively. Also has poor sensitivity and higher specificity in determining peritoneal metastasis from this study, which differs from a study by F.D'Elia et al where the sensitivity was 30% (11). This may be contributed by the size, site, morphology of tumour deposits, presence of ascites and adequate bowel opacification.

Management of the patient with colorectal malignancy depends on the preoperative assessment of the disease locally and if has distant metastasis. The sensitivity 88% from this study on assessing the tumour if confined to the colorectal concurred with those found in a study by Balthazar EJ et al, where it was found to increase depending on the degree of bowel preparedness and distention of the colon with contrast (13), the accord of the findings may be due to thinner section thickness of the slice of our CT scan images. Also the result on sensitivity and specificity (88% and 55.6%) are similar with the finding from other studies assessing extent of the tumor (17)(18)(20)(21). However this study found CT to have low accuracy 79.4% of assessing the confinement of the disease in organ of orign compared to a study done by Giuseppe Angelelli et al where it was found to be 97.6%. This difference may be contributed by the time lag between the investigation and the operation where the disease is continuing worsening.

Assessment of disease metastasis to locoregional lymphnode as one of the important parameter in staging and planning for treatment, CT scan was done and found to have sensitivity, specificity, accuracy, positive and negative predictive value that was increasing as the lymphnode size increased and found to be 25%, 100%, 87.5%, 100% and 42.3 respectively in this study, The sensitivity was found increasing with increase in the size of lymphnode (<=9mm and >9mm had sensitivity of 0.0% and 42.5% respectively). These results are similar to the finding noted by Abdel-Nabi et al (15). However, these findings are low compared to a studies done in western countries looking at regional lymphnode involvement where by the overall

detection rate was 85.1% (13)(16). On assessment of distant lymphnode metastasis (aortic, celiac and superior mesenteric lymph node), the CT has poor sensitivity, meaning that it is not a very reliable investigation to assess distant lymphnode metastasis, although has specificity, accuracy and negative predictive values of 96.8%, 88.2% and.90.91%.

The CT has the sensitivity, specificity, accuracy, positive and negative predictive value of 50%, 100%, 91.2%, 100%, and 90.3% respectively on assessing metastasis of colorectal malignancy to liver. The sensitivity result is low compared to the observed in other studies (13). Also it has poor sensitivity on detecting peritoneal metastasis, therefore, preoperative CT seems not to be a useful tool for detecting the presence, size, and location of peritoneal tumor implants (14). Despite of its being high specificity and having a good accuracy on detecting peritoneal metastasis.

6.0 CONCLUSION AND RECOMMENDATION

6.1 CONCLUSION

The CT scan was found to be highly sensitive in detecting the disease when confined to the primary organ (gastric or colorectal) and highly specific in detecting disease metastasis to lymphnode, liver and peritoneum. It has good accuracy in staging colorectal cancer and low in staging gastric cancer.

6.2 RECOMMENDATIONS

From the findings of this study, I recommend the following:

- A CT scan examination should be done close to the time of surgery. This may assist appropriate treatment decision.
- There should be a standard guideline in reporting CT scan findings by the Radiologist at MNH, to avoid discrepancies in the reporting of the CT scan findings and to ensure that all relevant information are available for guidance in decision making.

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APPENDIX

Appendix 1. CHEKLIST

1. Patient demographic data (Fill in the space provided)

Age of the patient	
Sex	
Ward	

2. Pre-operative diagnosis (Put tick where appropriate in the space provided)

	Yes	No
Malignant gastric neoplasm		
Malignant colorectal neoplasm		

3. Hishological diagnosis (Put tick where appropriate in the space provided)

	Yes	No
Gastric adenocarcinoma		
Colorectal adenocalcinoma		

4. CT scan findings: (Put tick where appropriate in the space provided)

	Yes	No
Tumour confined in the gastric		
Tumour confined in the colorectal		
Metastasis to loco-reginal lymph node		
Metastasis to distant lymph nodes		
Metastasis to the liver		
Metastasis to peritoneum		

5. Size of the lymphnode- gastric cancer (Put tick where appropriate in the space provided) on CT report

	≤ 5mm	>5mm-9mm	>9mm
Metastasis to loco-reginal lymph node			
Metastasis to distant lymph nodes			

6. Size of the lymphnode- colorectal cancer (Put tick where appropriate in the space provided) on CT report

	≤5mm	>5mm-9mm	>9mm
Metastasis to loco-reginal lymph node			
Metastasis to distant lymph nodes			

7. Date the CT scan was done ……..……..
8. The institution where CT scan was done……...…….……

9. Operative findings: (Tick if was found documented on operation notes)

	Yes	No
Tumour confined in the gastric		
Tumour confined in the colorectal		
Metastasis to loco-reginal lymph node		
Metastasis to distant lymph nodes		
Metastasis to the liver		
Metastasis to peritoneum		

10. Size of the lymphnode in approximation - gastric cancer (Put tick where appropriate in the space provided) on intraoperative finding.

	≤ 5mm	>5mm-9mm	>9mm
Metastasis to loco-reginal lymph node			
Metastasis to distant lymph nodes			

11. Size of the lymphnode in approximation - colorectal cancer (Put tick where appropriate in the space provided) on intraoperative finding.

	≤ 5mm	>5mm-9mm	>9mm
Metastasis to loco-reginal lymph node			
Metastasis to distant lymph nodes			

12. Date of operation: ……..……..

APPENDIX 2: OTHER TABLES OF RESULTS

Table 1: Tumour confined to gastric or colorectal (n=58)

CT scan finding	Gastric Malignancy			Colorectal Malignancy		
	Intraoperative finding					
	Yes	No	Total	Yes	No	Total
Yes	16	6	22	22	4	26
No	1	1	2	3	5	8
Total	17	7	24	25	9	34

On gastric malignancy: sensitivity is 94.1%, Specificity is 14.3%, positive predictive value is 72.7%, negative predictive value is 50%, and accuracy is 70.1%.

On colorectal malignancy: sensitivity is 88%, Specificity is 55.6%, positive predictive value is 84.6%, negative predictive value is 62.5%, and accuracy is 79.4%.

Table 2: Metastasis to locoregional lymphnode (n=53)

CT scan finding	Gastric Malignancy			Colorectal Malignancy		
	Intraoperative finding					
	Yes	No	Total	Yes	No	Total
Yes	3	0	3	5	0	5
No	10	9	19	15	11	26
Total	13	9	22	20	11	31

On gastric malignancy: sensitivity is 23.1%, Specificity is 100%, positive predictive value is 100%, negative predictive value is 47.4%, and accuracy is 54.5%.

On colorectal malignancy: sensitivity is 25%, Specificity is 100%, positive predictive value is 100%, negative predictive value is 42.3%, and accuracy is 51.6%.

Table 3: Tumor metastasis to distant Lymphnode (n=57)

CT scan finding	Gastric Malignancy			Colorectal Malignancy		
	Intraoperative finding					
	Yes	No	Total	Yes	No	Total
Yes	0	0	0	0	1	1
No	4	19	23	3	30	33
Total	4	19	23	3	31	34

On gastric malignancy: sensitivity is 0.0%, Specificity is 100%, positive predictive value is 0.0%, negative predictive value is 82.6%, and accuracy is 82.6%.

On colorectal malignancy: sensitivity is 0.0%, Specificity is 96.8%, positive predictive value is 0.0%, negative predictive value is 90.9%, and accuracy is 88.2%.

Table 4: Metastasis to the liver (n=58)

CT scan finding	Gastric Malignancy			Colorectal Malignancy		
	Intraoperative finding					
	Yes	No	Total	Yes	No	Total
Yes	1	4	5	3	0	3
No	1	18	19	3	28	31
Total	2	22	24	6	28	34

On gastric malignancy: sensitivity is 50%, Specificity is 81.8%, positive predictive value is 20%, negative predictive value is 94.7%, and accuracy is 79.2%.

On colorectal malignancy: sensitivity is 50%, Specificity is 100%, positive predictive value is 100%, negative predictive value is 90.3%, and accuracy is 91.2%.

Table 5: Metastasis to the peritoneum (n=58)

CT scan finding	Gastric Malignancy			Colorectal Malignancy		
	Intraoperative finding					
	Yes	No	Total	Yes	No	Total
Yes	0	0	0	0	0	0
No	4	20	24	2	32	34
Total	4	20	24	2	32	34

On gastric malignancy: sensitivity is 0.0%, Specificity is 100%, positive predictive value is 0.0%, negative predictive value is 83.3%, and accuracy is 83.3%.

On colorectal malignancy: sensitivity is 0.0%, Specificity is 100%, positive predictive value is 0.0%, negative predictive value is 94.1%, and accuracy is 94.1%.

Table 6: Metastasis to locoregional lymphnode of <=9mm (n=56)

CT scan finding	Gastric Malignancy			Colorectal Malignancy		
	Intraoperative finding					
	Yes	No	Total	Yes	No	Total
Yes	1	0	1	0	0	0
No	5	18	23	12	20	32
Total	6	18	24	12	20	32

On gastric malignancy: sensitivity is 16.7%, Specificity is 100%, positive predictive value is 100%, negative predictive value is 78.3%, and accuracy is 79.2%.

On colorectal malignancy: sensitivity is 0.0%, Specificity is 100%, positive predictive value is 0.0%, negative predictive value is 62.5%, and accuracy is 62.5%.

Table 7: Metastasis to locoregional lymphnode of >9mm (n=56)

CT scan finding	Gastric Malignancy			Colorectal Malignancy		
	Intraoperative finding					
	Yes	No	Total	Yes	No	Total
Yes	1	0	1	3	0	3
No	6	17	23	4	25	29
Total	7	17	24	7	25	32

On gastric malignancy: sensitivity is 14.3%, Specificity is 100%, positive predictive value is 100%, negative predictive value is 73.9%, and accuracy is 75%.

On colorectal malignancy: sensitivity is 42.5%, Specificity is 100%, positive predictive value is 100%, negative predictive value is 86.2%, and accuracy is 87.5%.

Table 8: Metastasis to distant lymphnode of <=9mm (n=57)

CT scan finding	Gastric Malignancy			Colorectal Malignancy		
	Intraoperative finding					
	Yes	No	Total	Yes	No	Total
Yes	0	0	0	0	0	0
No	1	23	24	1	32	33
Total	1	23	24	1	32	33

On gastric malignancy: sensitivity is 0.0%, Specificity is 100%, positive predictive value is 0.0%, negative predictive value is 95.8%, and accuracy is 95.8%.

On colorectal malignancy: sensitivity is 0.0%, Specificity is 100%, positive predictive value is 0.0%, negative predictive value is 97%, and accuracy is 97%.

Table 9: Metastasis to distant lymphnode of >9mm (n=57)

CT scan finding	Gastric Malignancy			Colorectal Malignancy		
	Intraoperative finding					
	Yes	No	Total	Yes	No	Total
Yes	0	0	0	0	0	0
No	2	22	24	2	31	33
Total	2	22	24	2	31	33

On gastric malignancy: sensitivity is 0.0%, Specificity is 100%, positive predictive value is 0.0%, negative predictive value is 91.7%, and accuracy is 91.7%.

On colorectal malignancy: sensitivity is 0.0%, Specificity is 100%, positive predictive value is 0.0%, negative predictive value is 93.9%, and accuracy is 93.9%.