ORIGINAL ARTICLE

To Identify the Use of Computed Tomography Scan, as a Valid Tool for Diagnosis of Mechanical Gut Obstruction at a Tertiary Care Hospital in Karachi, Pakistan

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ABSTRACT

Aim: To study the role of computed tomography (CT Scan) in pre diagnosed cases of gut obstruction, and its implications for future diagnosis of gut obstruction via this modality.

Method: The type of study is a retrospective analysis of cases of laparotomy patients who had a pre operative CT scan done, over a period of 3 years from 2010 to 2013. We reviewed the patient's files and records, which contained all information regarding the patient, including but not bound to their demographics, complete history and physical examination, and surgical notes. Laparotomy is currently the gold standard for diagnosis of gut obstruction, we compared the results and pattern of CT scans to determine the predictability of this modality as a tool for diagnosis for mechanical gut obstruction. The data was analyzed using SPSS version 19.0.

Results: We conducted our study on 110 patients, as they had the most reliable and complete data, out of the 303 patients reviewed. The mean age of the patients was 50+/-21 years and out of them 77(66.36%) were males and 33(33.64%) were females. All 110 patients had mechanical bowel obstruction as diagnosed on the operating table during the laparotomy procedure, and out of those 102 were diagnosed with mechanical bowel obstruction, using the CT scan modality. The sensitivity and specificity of CT scan as a diagnosing tool for obstruction being 93%. The reasons for obstruction included adhesions (40%), tumors (17%) and hernias (10%). Correct identification of the cause of obstruction via the use of CT scan was seen in 81(74%) of cases.

Conclusion: The use of the CT scan modality is a reliable tool, for diagnosis of gut obstruction, with regards to its sensitivity and specificity. But its role is limited as it fails to show the cause or etiology of the obstruction.

Keywords: Mechanical bowel obstruction, Computed tomography scan, laparotomy,

INTRODUCTION

Mechanical obstruction of the intestine is an acute emergency[1] and accounts for about 20% of admissions in the surgical unit[2]. It is among one of the major causes of morbidity and mortality around the world[3]. Proper and effective management of this acute condition is highly dependent upon its prompt and accurate diagnosis[4]. The full workup and how to approach the correct diagnosis includes but is not limited to, complete history and physical examination, and radiological investigations[5]. Use of computed tomography scans for evaluation and aiding in management have gained recent recognition[6]. Studies have shown that the use of CT scans for diagnosing and detecting small intestinal obstruction has a sensitivity of 93% and specificity of 100%, with an accuracy rate of about 94%[7] some physicians

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believe that the CT scan might show a more prominent role when it comes to the discovery of etiology/severity of the bowel obstruction as compared to its diagnosing abilities[8]. CT scan has proven itself to display the level, severity and site of obstruction[9] and also shows a level of sensitivity when it comes to showing signs of volvulus and strangulation of hernia[10,11]. Over the last century, etiological pattern for intestinal obstruction went through a dramatic change, in the 1920s hernia made up the 50% cases for obstruction and adhesions only the 7%[12]. Today, adhesions make up 65% of cases[3] but it is considered a diagnosis of exclusion[2,7,8] the modality of CT scan is unable to detect intestinal adhesions[2,7]. In a third world country like Pakistan CT scan represents a significant undertaking, considering the financial restraints on the country's patient population. Hence we wanted to conduct a study, trying to find out the accuracy of CT scan at diagnosing intestinal obstruction, also to find out its sensitivity and specificity, and the potential for detecting any underlying etiology.

METHODS

We studied records of all the patients who underwent laparotomy and had a pre-operation CT scan done. From November 2010 to November 2013, the inclusion criteria was those patients who underwent a pre operative CT scan and had an exploratory laparotomy performed. Patients with incomplete data and those who did not have a pre operative CT scan done were excluded from the study. A helical CT scanner present at the emergency department was used to perform the scans in all patients. It was predetermined that intestinal obstruction will be defined as the presence of distended bowel loops (>2.5cm for small intestine and >6.0cm for large intestine), that is proximal to the site of obstruction with a collapsed segment distal to it. The level, site and etiology of obstruction were noted in those patients who had suggestive CT scans for obstruction. Surgical notes were thoroughly studied, reviewed, and correlated with the CT scan reports. The surgical diagnosis was taken as gold standard. Continuous variable analysis was done for patient demographics, presentation and etiology. Data was analyzed using SPSS version 19.0

RESULTS

Out of all the laparotomy procedures done at the department of Surgery, from 2010 to 2013, 303 patients were selected and reviewed based on the fact that they had undergone a pre operative CT scan, and out of that data of 193 were excluded on account of discrepancies and incompletion of the available data. The study population selected then became 110 patients all of whom had a diagnosis of inte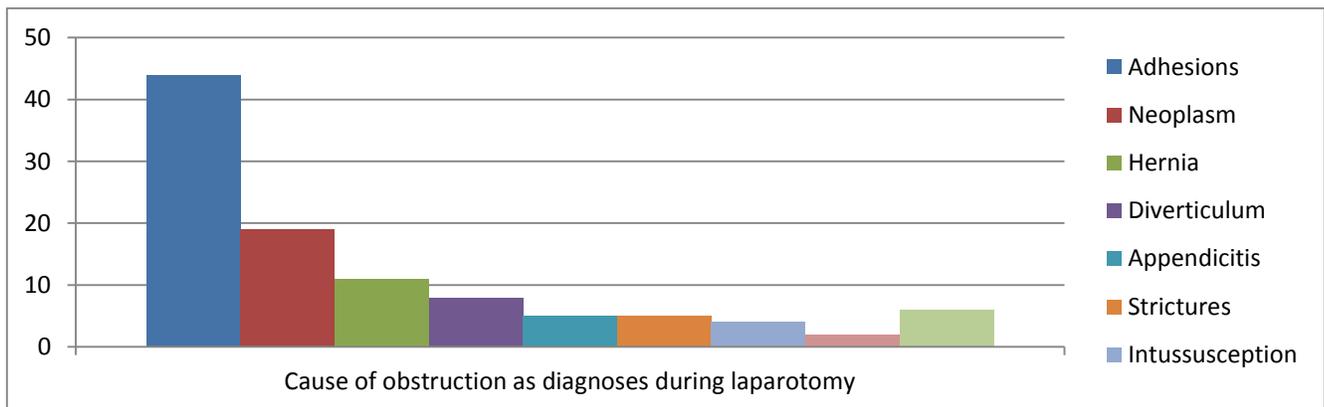stinal obstruction as seen and confirmed via laparotomy procedure. The patients had a mean age of 50 +/- 21 years and out of them 77(66.36%) were males and 33(33.64%) were females. The bulk of these patients presented through the accident and emergency department (75%) and the rest were either referred from other hospitals or from the outpatient clinics at the Hospital. Out of the patients studied 96(87.27%) had small intestinal obstruction, 10(9.09%) had large intestinal obstruction and 4(3.63%) had both large intestinal and small intestinal obstruction. The most common presenting complaints for patients were as follows, distention of the abdomen (25%), nausea and or vomiting (67%), constipation (34%), abdominal pain (91%)

The CT scan was correct in predicting the obstruction in 102 of the 110 patients, making a sensitivity of 93%. Negative CT findings were found in 173 out of 193 patients without any obstruction upon laparotomy making a specificity of (93%), the accuracy was determined to be 93%. The 8 cases which the CT scan missed were of adhesions (6), ischemic bowel (1) and hernia (1). CT scan had a PPV (positive predictive value) of 89% and a NPV (negative predictive value) of 96% for diagnosing mechanical bowel obstruction. Out of the 102 positive CT scan findings the correct etiology was discovered in 81(74%) of the cases.

Table: The diagnosis of intestinal obstruction using the CT scan as compared to the gold standard method of laparotomy. Intestinal obstruction as seen during laparotomy procedure

Intestinal Obs on CT	Present	Absent	Total
Present	102	20	122
Absent	8	173	181
Total	110	193	303

*Obs=Obstruction

Cause of obstruction as diagnoses during laparotomy

- Adhesions
- Neoplasm
- Hernia
- Diverticulum
- Appendicitis
- Strictures
- Intussusception

DISCUSSION

The idea for the use of CT scan as an evaluation tool for intestinal obstruction, as used pre operatively, emerged two decades ago[5]. After that time various studies have shown high sensitivity (90-96%) and high specificity (96-100%) for the CT scan modality as a diagnosing tool for obstruction[5,7]. Our study

reflects high ccuracy also. Plain film radiography as a tool for diagnosis of obstruction has failed and can miss about 20% of cases[13]. Ultrasound is a relatively better option but is highly dependent on the skills and competency of the sonologist, as well as the condition of the bowel, whether it is being obscured by gas or not[13,14,16]. On the other hand contrast studies have shown to have a sensitivity of a 100%[15]. Magnetic resonance imaging (MRI) surpasses CT scan when it comes to sensitivity, specificity and accuracy[17]. But generally plain film abdominal radiography is used as the primary tool and preferred initial investigation, along with patient history and clinical examination, and is helpful in up to 60% of cases, and is indeterminate in 20-30% or cases while it shows false positive results in 10-20% of cases[14,18].

The CT scan shows and characterizes the severity of obstruction, along with its transition point and also help in identifying its complications[5]. According to our study the CT scan was able to identify the etiology of obstruction in 74% of the cases, and it is worst when a case of adhesions is to be diagnosed. In a study conducted at another tertiary care hospital in Karachi, adhesions were shown to be the cause of obstruction in 34% of patients[12]. But our study shows adhesions to be the cause 40% of cases. Another study from Pakistan shows adhesions to be the cause in 41% of cases[19]. The implication being that the etiological factors for obstruction are evolving in our population, hence the need for renewed management and guidelines.

CONCLUSION

According to our study the use of Computed tomography scan proves itself as a highly sensitive and specific diagnostic tool when it comes to the diagnosis of intestinal obstruction. But it lacks in comparison to laparotomy when it comes to finding out the exact etiology of obstruction. Further prospective studies are required to pin down the use of CT scan as a pre operative requirement in patients having mechanical intestinal obstruction.

REFERENCES

1. Miller G, Boman J, Shrier I, and Gordon P H. Natural history of patients with adhesive small bowel obstruction. Br J Surg 2000: 87: 1240-7.
2. Petrovic B, Nikolaidi P, Hammond N, Grant TH, Miller FH. Identification of adhesions on CT in small-bowel obstruction. Emerg Radio: 2006: 12: 88-93; discussion 94-85, 2006.
3. Markogiannakis H, Messaris E, Dardamanis D, Pararas N, Tzertzemelis D, Giannopoulos P et al. Acute mechanical bowel obstruction: clinical presentation, etiology, management and outcome. World J Gastroenterol 2007; 13: 432-7.
4. Cheadle WG, Garr EE, Richardson JD. The importance of early diagnosis of small bowel obstruction. The American surgeon 1988; 54: 565-9.
5. Silva AC, Pimenta M, Guimaraes L S. Small bowel obstruction: what to look for. Radiographics 2009; 29: 423-9.
6. Frager D. Intestinal obstruction role of CT. Gastroenterol Clin North Am.2002; 31: 777-9.
7. Torreggiani WC, Harris AC, Lyburn ID, al-Nakshabandi NA, Zwirewich CV,Brenner C, et. al. Computed tomography of acute small bowel obstruction:pictorial essay. 2003; Can Assoc Radiol J 54: 93-9.
8. Burkill G, Bell J, Healy J. Small bowel obstruction: the role of computed tomography in its diagnosis and management with reference to other imaging modalities. Eur Radiol. 2001; 11: 1405-22.
9. Mak S Y, Roach SC, Sukumar SA. Small bowel obstruction: computed tomography features and pitfalls. Curr Probl Diagn Radiol 2006; 35: 65-74.
10. Donckier V, Closset J, Van Gansbeke D, Zalcman M, Sy M, Houben JJ, et al. Contribution of computed tomography to decision making in the management of adhesive small bowel obstruction. Br J Surg 1998; 85: 1071-4.
11. Barbiera F, Ciraulo R, Cusma S, Pardo S, and Lo Casto, A. [Closed loop intestinal obstruction: Role of computerized tomography]. RadiolMed 1999; 97: 54-9.
12. Hasnain SQ, Ahmed M. Intestinal obstruction in adults at the Aga Khan University Hospital. J Pak Med Assoc.1994; 44: 143-5.
13. Suri S, Gupta S, Sudhakar PJ, Venkataramu NK, Sood B, Wig, JD. Comparative evaluation of plain films, ultrasound and CT in the diagnosis of intestinal obstruction. Acta Radiol 1999; 40: 422-8.
14. Maglinte DD, Howard TJ, Lillemoe K D, Sandrasegaran K, Rex D K. Small-bowel obstruction: state-of-the-art imaging and its role in clinical management. Clin Gastroenterol Hepatol 2008; 6: 130-9.
15. Anderson C A, Humphrey W T. Contrast radiography in small bowel obstruction: a prospective, randomized trial. Mil Med 1997; 162: 749-52.
16. Bogusevicius A, Maleckas A, Pundzius J, Skaudickas, D. Prospective randomised trial of computer-aided diagnosis and contrast radiography in acute small bowel obstruction. Eur J Surg 2002; 168: 78-83.
17. Beall D P, Fortman BJ, Lawler BC, Regan F. Imaging bowel obstruction: a comparison between fast magnetic resonance imaging and helical computed tomography. Clin Radiol 2002; 57: 719-24.
18. Lappas J C, Reyes B L, Maglinte DD. Abdominal radiography findings in small-bowel obstruction: relevance to triage for additional diagnostic imaging. Am J Roentegenol 2001; 176: 167-74.
19. Malik A M, Shah M, Pathan R, Sufi, K. Pattern of acute intestinal obstruction:is there a change in the underlying etiology? Saudi J Gastroenterol 2010;16: 272-4.