

# Notable Intestinal Obstruction Caused by Malignancy Originating from the Proximal Region of the Ascending Colon and the Caecum: A Case Study and Literature Review

Victor Ikechukwu Canice Nwagbara<sup>1</sup>, John Adi Ashindoitiang<sup>1,\*</sup>, Theophilus Ipeh Ugbem<sup>2</sup>, Joseph Stephen Ukam<sup>3</sup>, Joseph Esien Kooffreh<sup>3</sup>, Itunu Oluwadara Adekanye<sup>3</sup> and Maurice Efana Asuquo<sup>1</sup>

<sup>1</sup>Department of Surgery, University of Calabar and University of Calabar Teaching Hospital, Calabar, Nigeria

<sup>2</sup>Department of Pathology, University of Calabar and University of Calabar Teaching Hospital, Calabar, Nigeria

<sup>3</sup>Department of Surgery, University of Calabar Teaching Hospital, Calabar, Nigeria

**Abstract:** Intestinal obstruction is a significant medical condition marked by an impediment in the bowel's capacity to eliminate waste. This condition is characterized by a blockage that hinders digestion and the regular expulsion of waste, which can be attributed to either functional or mechanical factors. A malignant bowel obstruction is frequently observed as a complication in advanced cancer cases, particularly those affecting the digestive tract. A 59 year old male presented with a one-month history characterized by infrequent bowel movements, abdominal distension and pain. Following a comprehensive clinical and imaging studies, a diagnosis of intestinal obstruction was established. The presence of a colonic tumour located in the proximal segment of the ascending colon and caecum, accompanied by a significantly dilated caecum displaying an incompetent ileo-caecal valve and a distended ileum, constituted the indication for a right hemicolectomy. The postoperative course was unremarkable. Ultimately, histopathological analysis confirmed a definitive diagnosis of colon adenocarcinoma. Colonic cancer situated in the proximal ascending colon and the adjacent caecum is uncommon and may manifest as an intestinal obstruction. In appropriate circumstances, right hemicolectomy is considered the preferred therapeutic approach. Early detection and intervention which can be enhanced through targeted screening, are advisable to avert the complications associated with advanced colonic tumours.

**Keywords:** Proximal ascending colon, caecum, cancer, intestinal obstruction, grossly dilated caecum, incompetent ileo-caecal valve, resection.

## INTRODUCTION

Intestinal obstruction is a serious medical condition characterized by blockage in the bowel's ability to pass waste. It is defined as a blockage in the bowel preventing digestion and normal passage of waste and it may be functional or mechanical [1]. Malignant bowel obstruction (MBO) is a common complication of advanced cancer particularly in the digestive system [1,2]. Colorectal cancer (CRC) is the 3rd most common cancer in both men and women and the 4th most common cause of cancer related death. It is classified as sporadic (20%), inherited (5%) and familial (25%) [2]. The proximal colon (right-sided) is made up of the caecum, ascending colon and proximal two-third of the transverse colon. Based on the primary cancer location CRC can be classified as right-colonic cancer (RCC) or left-sided colon cancer (LCC) based on their embryologic origin [3]. The global prevalence of MBO is estimated to range from 3%-15% of cancer patients reaching 10%-29% in patients with colon cancer [1]. In

Calabar, Nigeria, 41.7% of CRC presented as large bowel obstruction [4]. Obstruction of the colon originating from the caecum and proximal ascending colon is considerably less common and clinically distinct from left-sided obstructions, accounting for only about 5-11% of cases of obstructive colon cancer. This is attributed to the larger diameter of the colon, which accommodates liquid stool, allowing tumours to grow to a considerable size before they cause a physical blockage of the lumen [3]. The most common cause of MBO is CRC [5]. RCCs are known to be relatively silent with non-specific symptoms like fatigue, weakness and vague abdominal pain [2]. Acute abdominal pain is typically seen in those with acute complete obstruction, while those with partial or more chronic obstruction present with distension and less abdominal pain [5]. The clinical implications of obstruction in this area typically indicate advanced-stage disease, underscoring the heightened risk of perforation. Furthermore, malignancies located at the ileocaecal valve may present as an obstruction in the distal small bowel [3]. CT is the most widely used stool and is the imaging modality of choice [5]. MBO caused by colonic

\*Address correspondence to this author at the Department of Surgery, University of Calabar and University of Calabar Teaching Hospital, Calabar, Nigeria; E-mail: ashindoitiang90@yahoo.com

adenocarcinoma is a surgical emergency with increased operative morbidity and mortality and the treatment of choice is emergency right hemicolectomy (RHC) [2,6]. Patients who exhibit acute obstructive symptoms generally have significantly poorer outcomes compared to those who undergo elective surgical interventions [4]. The 5-year survival rate for those with obstruction was 16% compared with 37% in the elective group [5]. Presented is a 59-year-old man a month history of infrequent passage of stool, abdominal distension and pain. Following a preoperative diagnosis of intestinal obstruction, he was offered a RHC on account of colonic tumour in the proximal ascending colon with a grossly dilated caecum with an incompetent ilio-caecal valve and dilatation of the ileum with an uneventful postoperative period. The clinical significance of this report is to highlight the rare location of colonic cancer that involved the proximal descending colon and the caecum and the importance of the recognition of symptoms large bowel cancer, the need for prompt diagnosis and treatment in view of the potential complications with its eventual impact on the patient.

## CASE REPORT

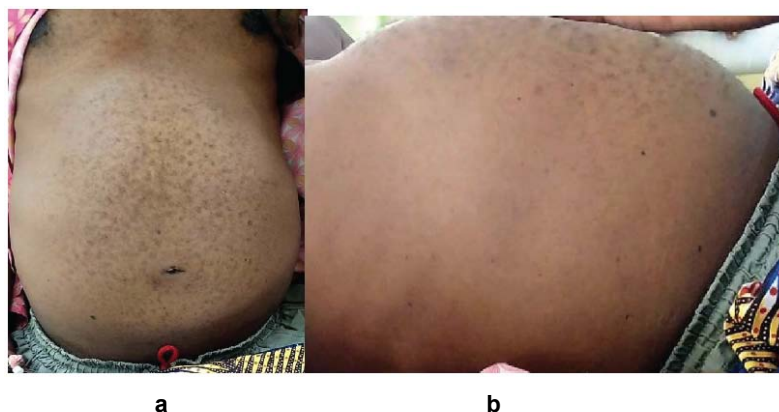
A 59-year-old male presented to the emergency department reporting a one month history of infrequent passage of stool and abdominal bloating and fullness of a similar duration. The patient was apparently well until a month prior to presentation when he noticed the onset of infrequent stooling following a week of the passage of loose stool. However, during this period he passed flatus. The abdominal swelling which was generalized, progressively increased in size without an intervening period of remission. There was no history of fever but admitted to loss of weight and loss of

appetite, this was not associated with nausea and vomiting. Abdominal pain was colicky, non-radiating without relieving or aggravating factors.

Upon examination, a middle aged man was observed in mild respiratory distress, exhibited no pallor or jaundice, dehydrated and showed neither pedal oedema nor peripheral lymphadenopathy. His vital signs were recorded as follows: temperature at  $36.4^{\circ}\text{C}$ , pulse rate of 83 beats per minute, blood pressure 120/70mmHg, respiratory rate at 22 cycles per minute and oxygen saturation ( $\text{S}_{\text{pO}_2}$ ) level of 95% while in room air. The patient had a body mass index (BMI) of  $23\text{kg}/\text{m}^2$ . Abdominal examination revealed a distended abdomen that moved with respiration, additionally, there was generalized tenderness and hypoactive bowel sounds, Figure 1a, 1b.

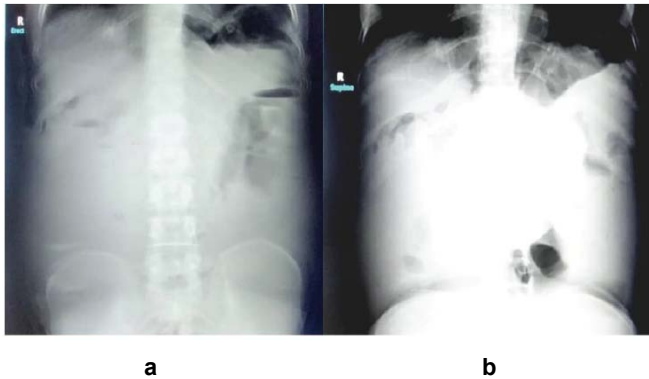
Digital rectal examination revealed haemorrhoids at the right posterior and left lateral positions. The sphincteric tone was normal with no rectal mass felt. The examining finger was stained with brown faecal matter. Assessment of a bowel obstruction was made.

The workup performed included a packed cell volume of 36%, alongside a total white blood count  $11 \times 10^3/\text{ul}$  with a differential count: neutrophil count of 70%, lymphocyte count of 29%, eosinophil count of 1%, basophil count of 0% and monocyte count of 0%. Electrolyte level, urea and creatine measurements showed: sodium ( $\text{Na}^+$ ) at  $148\text{mmol}/\text{l}$ , potassium ( $\text{K}^+$ ) at  $3.4\text{mmol}/\text{l}$ , bicarbonate ( $\text{HCO}_3^-$ ) at  $19\text{mmol}/\text{l}$ , chloride ( $\text{Cl}^-$ ) at  $112\text{mmol}/\text{l}$ , urea at  $3.4\text{mmol}/\text{l}$  and creatine at  $100.9\mu\text{mol}/\text{l}$ . The retroviral serology returned non-reactive results. The total serum protein was  $76\text{g}/\text{l}$ ; albumin was  $18\text{g}/\text{l}$  and globulin was  $58\text{g}/\text{l}$ . The urinalysis was reported as normal. The protein specific antigen was reported as  $2.5\text{ng}/\text{ml}$  (0.0-4.0). Abdominal X-ray was reported as: a veil of opacity



**Figure 1:** a and b: depict clinical images of the abdomen, illustrating the distended abdomen with fullness mainly at the right flank from bowel obstruction.

seen over the abdomen. There is bilateral flank fullness. There was no demonstrable air fluid levels. There was the presence of rectal gas shadow consistent with paralytic ileus, Figure 2a, 2b.



**Figure 2:** a and b: Abdominal X-ray. a – erect, b – supine, showed a veil of opacity seen over the abdomen. There is bilateral flank fullness without demonstrable air fluid levels.

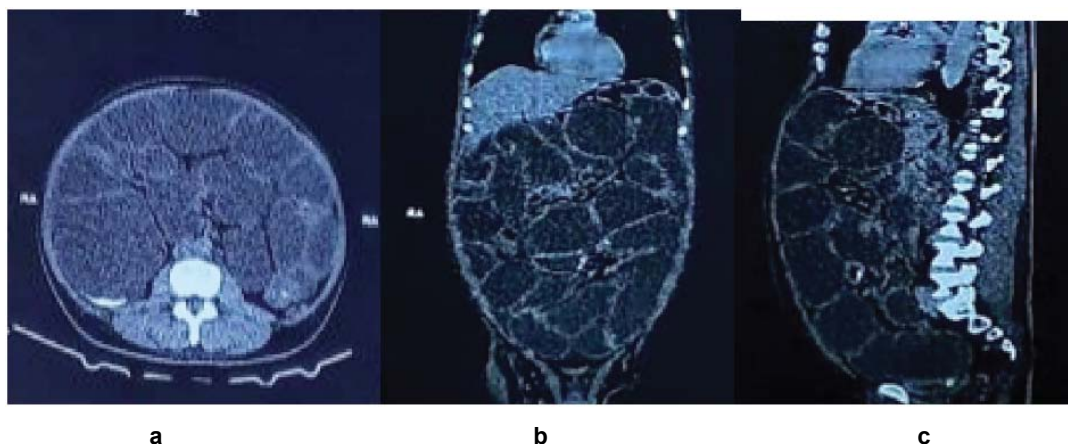
The abdominopelvic ultrasound scan (USS) revealed markedly dilatation of the bowel containing fluid and food debris.

One of the loops shows luminal diameter of 5.8cm in the central abdomen - Intestinal obstruction. The CT showed significantly dilated small and large bowel loops with extensive area of thickening, Figure 3a, 3b, 3c – intestinal obstruction.

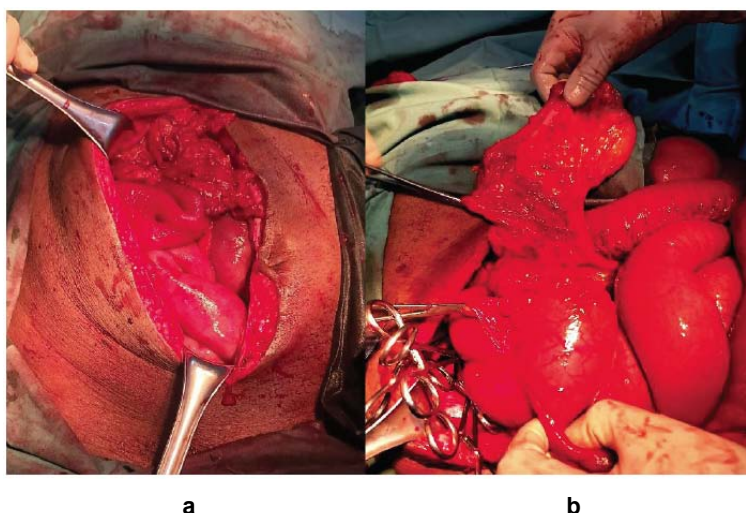
He was resuscitated with intravenous fluids and electrolytes replenishment. Decompression was the placement of a nasogastric (NG) tube for proximal pressure relief and antibiotics administration with ceftriazone and metronidazole. The patient had a right hemicolectomy with a postoperative diagnosis of large bowel obstruction secondary to ascending colonic tumour with several pertinent findings:

1. Markedly distended bowel loops extending from the ileum to the proximal ascending colon maximal at the caecum with incompetent ileo-caecal valve Figure 4.
2. Collapsed segment of the ascending colon with an obliterating mass at the junction between the ascending colon and the caecum protruding partly into the caecum, Figure 4.
3. Minimal serous fluid in the peritoneal cavity, distended gallbladder, normal liver and spleen

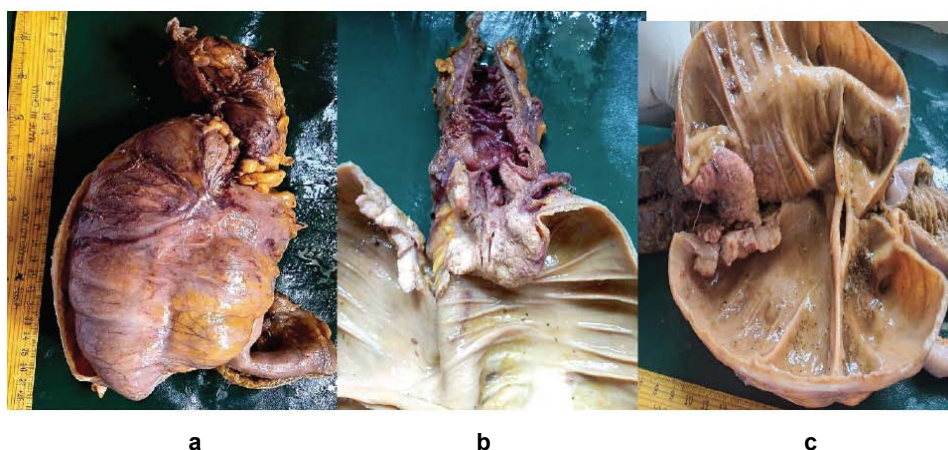
Under general anaesthesia with endotracheal intubation with the patient in supine position, through a midline incision deepened to the peritoneum that was divided between haemostats with the above stated findings, a right hemicolectomy was done. Closure of the wound was achieved through a mass closure technique using nylon 2. The subcutaneous layer was approximated using interrupted sutures vicryl 2/0, while the skin was secured with interrupted vertical mattress sutures of nylon 2/0. The excised specimen was sent for histological examination. The postoperative course was stable with sutures removed on the seventh postoperative day and the patient discharged to the outpatient department. He later returned to the outpatient with the histological report indicating the following: Gross examination revealed: intestinal tissue consisting of the ileum, distended caecum and ascending colon, Figure 5a, that measured 42cm in length and 24cm in its widest circumference. Cut surface shows serosa covering with mesenteric fat and a palpable lymph node that measured 0.5cm at the junction of the caecum and the ascending colon. The lumen is obliterated at the junction between the caecum and the ascending colon by a circumferential greyish white tumour with areas of haemorrhage and



**Figure 3:** a, b, c: (axial, coronal and sagittal views respectively) – CT scan of the abdomen - showing significantly dilated small and large bowel loops with extensive area of thickening.



**Figure 4: a, 4:** Intraoperative pictures showing distended small bowel, distended caecum and appendix *in situ*.



**Figure 5:** Gross pictures. **a** - Intestinal tissue consisting of the ileum, distended caecum and ascending colon. **b, c** - Cut surface shows the lumen of the proximal ascending colon is obliterated at the junction between the caecum and the ascending colon by a circumferential greyish white tumour extending into the grossly dilated caecum with areas of haemorrhage and necrosis. The dilated caecum demonstrated the incompetent ileo-caecal valve and the opening into the appendix.

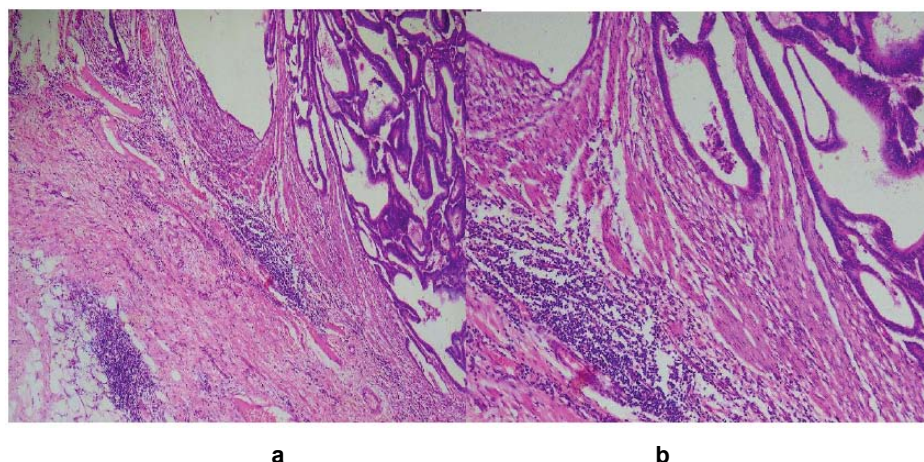
necrosis with the tumour extending into the caecum, Figure 5**b**, 5**c**. The appendix measured 6 x 1.5cm, with a smooth external surface with prominent blood vessels. The lumen contained faecal matter.

Microscopy showed: sections of intestinal tissue with cystically dilated to irregular shaped gland lined by malignant columnar epithelial cells infiltrating the muscularis propria and serosa. The tumour cells has scanty cytoplasm, hyperchromatic nuclei with prominent nucleoli and loss of nuclear polarity, Figure 6**a**, 6**b**.

The resection margin was viable. The sections of the lymph node showed tumour metastasis. A definitive diagnosis of adenocarcinoma of the colon (Astler-Coller stage 1). The resources necessary for conducting molecular profiling were absent in our environment.

## DISCUSSION

The RCC presenting with intestinal obstruction is a rare event. This is expected to decline due to wide implementation of screening protocols [2]. In patients with CRC, 12-16% present with intestinal obstruction with only a few patients have intestinal obstruction from RCC more commonly in the elderly [2]. The mean age of patients with MBO is 61years (58-65years) with the women accounting for 64%(59-69%)<sup>1</sup>. The higher overall frequency of MBO reported in women can be explained by the higher incidence of this complication in patients with ovarian cancer [1].The manifestation of intestinal obstruction arising from malignancies in the cecum and proximal ascending colon exhibits marked differences between isolated and synchronous presentations. While the majority of colorectal obstructions occur on the left side, right-sided



**Figure 6:** a H&E 100x, b: H&E 400x. Section of the colon shows malignant glands of various sizes and shapes infiltrating smooth muscle fibers. The glands are lined by pleomorphic, hyperchromatic cells with coarse nuclei chromatin patterns. There is intense inflammatory infiltrates.

obstructions generally necessitate a larger tumour mass to cause an obstruction, attributable to the broader luminal diameter and the consistency of liquid stool [2,7].

Synchronous malignancies refer to two or more primary tumours identified concurrently or within six months of the initial diagnosis. In contrast, solitary presentations consist of a single primary lesion. Solitary tumours are more prevalent overall and present a lower incidence of obstruction (approximately 7-8% for right-sided cases) in comparison to those associated with left-sided cancers. The occurrence of synchronous tumours ranges from 2-3% to 12.4% among colorectal cancer patients. There is a notable inclination for synchronous tumours to arise in the proximal/right colon compared to solitary tumours. Furthermore, synchronous cases are often associated with a higher incidence of mismatch repair deficiency (dMMR/MSI) and mucinous histology, particularly when located in the right colon [8,9].

The *BRAF* gene, a *RAF* gene that participates in the *RAS-RAF* signaling pathway which mediate cellular responses to the growth signals frequently mutate in CRC particularly in cancer of the right colon. In CRCs, three classical molecular carcinogenetic pathways have been identified: the chromosomal instability (CIN), microsatellite instability (MSI) and  $C_pG$  island methylation phenotype (CIMP) pathways drive the development of CRC and are crucial in the development of targeted therapies aimed at improving patient outcomes [3]. The absence of molecular profiling in our patient represents a limitation in our analysis as molecular profiling plays a crucial role in the management of colorectal cancer, particularly in

tailoring treatment strategies and forecasting clinical outcomes for tumors located in the right-sided colon. Right-sided tumours are significantly more likely, by almost fourfold to present with deficient mismatch repair (dMMR) or high microsatellite instability (MSI-H)[10]. This condition serves as a robust indicator for responsiveness to immune checkpoint inhibitors such as pembrolizumab (Keytruda) and nivolumab (Opdivo). The presence of mutations within the *RAS* (*KRAS/NRAS*) and *BRAF* pathways is notably more prevalent in proximal colon malignancies, suggesting inherent resistance to anti-EGFR agents like cetuximab (Erbix) and panitumumab (Vectibix). Although infrequent, actionable *NTRK* fusions and *BRAF* V600E mutations are predominantly found in the proximal colon, indicating eligible patients for tailored inhibition therapies [11]. Alterations in genes such as *BRAF*, *ARAF*, and *MAPK10* act as independent predictors of decreased disease-free survival (DFS) and overall survival. In contrast, mutations in *MSH6* have been recognized as a favourable prognostic factor associated with prolonged survival [10,12].

We present this peculiar case of a tumour located in the proximal ascending colon extending to the caecum to highlight some questions. Is this presentation of a synchronous carcinoma of the ascending colon and caecum? Could it be a tumour of the colon extending to the caecum or vice versa? Notably, the lesion in the proximal colon was haemorrhagic while that of the caecum wasn't. Two or more simultaneous cancers in the same organ or different organs represent a distinct clinical and pathological entity [13]. The histology of our patient was similar at both locations, however, the lesion at the proximal ascending colon in the retroperitoneal location was haemorrhagic while that of

the caecum in the intraperitoneal location was not haemorrhagic. Could the difference noted represent different primary locations in support of a synchronous tumour or a primary tumour in the proximal ascending colon with extension to the caecum? A neoplasm situated at the convergence of the proximal ascending colon and the caecum typically signifies a singular, substantial primary tumour; however, there exists a notable clinical probability (ranging from approximately 2.6% to 12.4%) that it may encompass synchronous lesions. The proximal colon, notably the ascending segment and caecum, is identified as the predominant location for the development of synchronous tumours. For lesions to be classified as synchronous, each must be histologically verified as malignant, be physically separate from one another, and not represent metastases of one another [14]. The histology of both sections in our patient was similar and was not physically separate. Synchronous tumours frequently exhibit diverse histological types, such as a flat adenocarcinoma in the caecum alongside a mucinous adenocarcinoma in the ascending colon. The identification of independent adenomatous lesions at the periphery of each distinct tumour mass provides strong evidence for the synchronous emergence of tumours through the adenoma-carcinoma sequence [15]. Synchronous tumours affecting the proximal colon are notably associated with Microsatellite Instability (MSI-H) and Lynch syndrome, with an occurrence rate of approximately 12.8% to 27.3% among cases of multiple colorectal cancers. On average, synchronous lesions are found in 3.5% of all colorectal cancer cases [16].

Abdominal pain is a prominent feature in acute complete obstruction, this is in addition to the history of the absence of bowel movement in several days and non-passage of flatus. In patients with chronic or partial obstruction, the patient present with abdominal distension (as depicted in the clinical photographs of the abdomen), less abdominal pain. They may have a history of constipation up to the time of presentation [5]. In more chronic scenario, the bowel may distend slowly overtime with progression of obstruction giving time for the bowel to accommodate. This was in keeping with the presentation of our patient [5]. Further progression of the obstruction may reveal the signs of dehydration in the patient. Later in the course of the disease, nausea and vomiting will manifest. Colonic distension may result in impaired respiration arising from diminished diaphragmatic movement. Fever may indicate possible perforation and risk of septic shock. Furthermore, the renal function may be affected [5]. In

22% (13-32%) of cases, the diagnosis of cancer coincides with the episode of MBO and 2% of the patients have advanced or terminal diseases [1]. The mean time for initial diagnosis of cancer to MBO is 14 months (13-15months) [17]. Ogilvie syndrome (pseudo-obstruction is an important differential which is seen arising from various medical conditions [2].

In plain abdominal radiographs, the right-sided bowel obstruction with an incompetent ileo-caecal valve may mimic a small bowel obstruction with gasless colon and dilated small bowel (as shown in the patients plain abdominal photographs). The "dilated caecal sign" is suggestive of right-sided right bowel obstruction; it is identified as gasless caecum or ascending colon with faecal material [5]. Imaging studies characteristically demonstrate the features of large and small bowel obstruction and attention should be paid to the size of the caecum in view of the risk for perforation [2]. CT is the modality of choice. It can evaluate both the aetiology and complications. CT was reported by Frager *et al.* with sensitivity and specificity of 96% and 93% respectively in the evaluation of colonic obstruction [17]. The CT of our patient did not identify the colonic tumour probably due to the grossly dilated caecum with the incompetent ileo-caecal valve resulting in gross dilatation of the small bowel. The gross picture on pathologic evaluation may reveal the following macroscopic varieties of annular, tubular, ulcerative and cauliflower or proliferative [2]. Microcopy examination is crucial for the confirmation of the diagnosis of adenocarcinoma in addition to the molecular pathology [18].

The dual challenges to resolve in MBO are; first is to relieve the obstruction and the second is to treat the aetiology of the obstruction [2,5]. The right-sided obstructions are managed by oncological sequential resection with primary ileo-colic anastomosis by open or laparoscopic technique [2]. The initial management includes the correction of fluid and electrolyte abnormalities and the insertion of a nasogastric tube. Cancers located in the caecum and the ascending colon are managed oncological resection by RHC: division of ileo-caecal pedicle at its origin from the superior mesenteric vessels and division of the right colic and lymphatic vessels surrounding the superior mesenteric vein and resection of 5-6cm of the terminal ileum up to the proximal third of the transverse colon with a primary ileo-colic anastomosis [2]. In cases of significant intestinal obstruction resulting from malignancies located in the proximal ascending colon and cecum, both laparoscopic and open right

hemicolectomy present feasible surgical options. The laparoscopic method is generally deemed safe and practical even in emergency contexts when managing obstructive right colon cancers. However, the presence of substantial obstruction, characterized by dilated bowel loops, can considerably limit the operative space, thereby elevating technical challenges. Longitudinal studies suggest that, for right-sided colon cancer, both surgical techniques yield oncological equivalence as long as the principles of radical resection are adhered to [19]. Preference for laparoscopic surgery is typically given to hemodynamically stable patients, while those who are unstable or in septic shock may be directed toward an open approach [20]. CRC patients without obstruction showed a tendency to live longer than those with intestinal obstruction. The mean survival time for stage IV disease was reported by Chen *et al* as 49.4 months and 37.2 months for non obstruction and obstruction groups respectively [21]. Improvement in public awareness on prevention and early treatment of CRC through early screening will improve outcomes [22]. The future treatment of CRC will depend on the further research and the development of targeted therapy based on the molecular pathways involved in the development of CRC [3].

Diagnostic algorithm recommended involves an initial assessment for clinical indicators of obstruction, including cramping pain, vomiting, abdominal distension, and obstipation. Imaging hierarchy with Abdominal X-ray: Typically, the initial diagnostic study to validate obstruction, though it may not always provide conclusive results. CT Scan (Gold Standard): Contrast-enhanced CT imaging is critical for identifying the precise location and cause of the obstruction (e.g., caecal neoplasm) and assessing complications such as perforation or ischemia. It may be inconclusive or ambiguous in some cases. Therapeutic algorithm with treatment is categorized based on the patient's stability. Initial stabilization include: Resuscitation - provision of intravenous fluids and electrolyte replenishment. Decompression: Placement of a nasogastric (NG) tube for proximal pressure relief and antibiotics - administration as prophylaxis against gram-negative and anaerobic bacteria if perforation or infection is suspected. Definitive Management (Surgical): Right Colectomy with Primary Anastomosis: This is the preferable surgical option for the majority of patients, involving resection of the tumour and distended proximal colon, followed by an ileocolic anastomosis.

## CONCLUSION

Malignancy located in the cecum or proximal ascending colon characteristically leads to a large bowel obstruction (LBO), which may often mimic the symptoms of a small bowel obstruction (SBO) if the ileocecal valve is not functioning effectively. When the ileocecal valve maintains its function, it poses the risk of developing a hazardous closed-loop obstruction that significantly heightens the likelihood of caecal perforation. Emergency surgical resection remains the predominant treatment option; however, it is associated with increased perioperative risks compared to elective surgery.

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## AUTHOR CONTRIBUTIONS

VICN = Manuscript writing and editing;

JAA = Manuscript writing and editing

TIU = Photomicrographs, manuscript writing and editing

JSU = Case report, manuscript writing and editing

JEK = Case report, manuscript writing

IOA = Case report, manuscript writing

MEA = Conceptualization and supervision of the manuscript

## DATA AVAILABILITY STATEMENT

Data are with the corresponding author and available under request.

## DECLARATION OF CONFLICT OF INTEREST

The authors declare no conflict of interest with respect to the research, authorship and/or publication of this case report.

## ETHICAL STATEMENT

The requirement for ethics approval was waived because this study was a case report of a patient managed by our team, not an interventional study (i.e., no intervention or experimentation was carried out on the patient for the purpose of this study).

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**INFORMED CONSENT**

The patient provided both verbal and written informed consent for the reporting of this case and all accompanying images.

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