

Original Research Article

## A Histomorphological Study of Intestine Resections at a Rural Tertiary Care Centre

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**Abstract:** Technological advancement like chromoendoscopy, autofluorescence and magnification endoscopy has propelled usage of endoscopy for pre-operative diagnosis. Intestine resection now accounts for less than 1% of all surgeries. Despite these a death rate of 1.1% due to acute abdominal conditions compels to look at indications and pathological features of associated diseases. Clinical details for all the 27 patients who had undergone intestinal resection were collected. The specimens were formalin fixed and examined. Microscopic features were recorded from the evaluation of sections. Out of 27 specimens, 13 were small intestinal resections. Ischemic bowel disease and perforation were common in small intestine and adenocarcinoma was common in large intestine. Uncommon pathologies like synchronous ampullary carcinoma and rectal carcinoma, a case of intestinal lipoma and inflammatory myofibroblastic tumors were included in collective. Peritonism following blunt injury should direct investigation for perforation. Aggressive surgical approach is commonly resorted to in Ischemic bowel disease.

**Keywords:** Intestinal resection, Ischemic bowel disease, Perforation, Ampullary carcinoma, Synchronous tumors

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### INTRODUCTION:

The global estimated number of surgeries done in 2012 was 319.2 million. The expected range of operations calculated based on health expenditure for the year 2012 in India was roughly 9801319 -12556488 [1]. A population based survey in India has revealed 1.1% of deaths from acute abdominal conditions contributing to 72, 000 deaths in 2010. Surgery for abdominal conditions and injuries at emergency ward are the most efficient cost-effective public health intervention [2]. Improving surgical capacity at the district hospital is among the world's top priorities as nearly a billion people lack access to basic surgical care [3]. We designed this descriptive histomorphological study of intestine resection specimens to give an insight into anatomical distribution of intestinal lesions, common age group they present, etiology and the spectrum of histological features.

### MATERIALS AND METHODS:

A total of 27 consecutive specimens of intestinal resection were received in 18 months for pathological evaluation from July 2012 to December 2013. Details from requisition forms and relevant clinical details from records were collected. Resected specimens were fixed

in formalin and detailed gross anatomical features were recorded. Tissue blocks from representative areas were processed. The slides were evaluated for underlying pathology.

### RESULTS:

Anatomically, 13(48%) were small intestine resections; seven were each of large intestine and ileo-colectomy resections. Age of the patients ranged between 9 to 84 years with a mean age of 51 years (Table 1). 45% of cases had ischemic bowel disease followed by 30% cases with adenocarcinoma (Table 2). Seven cases of perforation and two cases of stromal neoplasm were also included. While ischemic bowel disease and perforation were common in small bowel, adenocarcinoma was common in large bowel. Ischemic bowel disease was distributed equally in all age groups. 80% of all adenocarcinoma were seen in elderly. A lone case of adenocarcinoma in mid-adulthood with signet ring morphology suggestive of Micro satellite instability – high (MSI-H) was seen. A case of co-existent rectal adenocarcinoma and per-ampullary carcinoma of pancreato-biliary type was also included. Both the cases of stromal neoplasm, Lipoma and Inflammatory myofibroblastic tumor were seen in small

bowel (Figure 1). Pain abdomen was the common presenting symptom in ischemia (7/9) and perforation (7/7). Constipation and distension abdomen were the other common symptoms in ischemic cases (5/9).

History of black colored stools was exclusively seen in adenocarcinoma cases (4/8). The case of jejunal lipoma was detected incidentally on radiology. Relevant gross and microscopic features are summarized in Tables 3-5.

**Table 1: Age distribution among patients with intestinal resection**

Age (years)	Ischemia	Perforation	Adeno Carcinoma	Stromal Neoplasm	Enterocutaneous fistula	Total
1 – 20	1	1	–	–	–	2
21-40	3	–	1	–	–	4
41-60	3	5	3	1	1	13
61-80	2	1	3	1	–	7
≥81	–	–	1	–	–	1
Total	9	7	8	2	1	27

**Table 2: Distribution of pathologies in intestine specimens**

	Small intestine	Large intestine	Ileo – caecal	Total
Ischemic Bowel Disease	4	1	4	9
Perforation	6	–	1	7
Adeno carcinoma	1	7	–	8
Stromal neoplasms	2	–	–	2
Fistula	1	–	–	1
Total	14	8	5	27

**Table 3: Profile of Specimens with Ischemic bowel disease**

Lab no	Age	Site	Length	Cause	OT FINDINGS			Infarct
					Adhesion	Peritoneal effusions	Perforation	
137/12	40	SI	210	Vasculitis	_____	_____	_____	Transmural
281/12	60	SI	140	SMA thrombosis	_____	Purulent	_____	Transmural
1516/12	59	SI	8	Umbilical hernia	+	Serous	_____	Transmural
1736/12	65	SI	65	Incisional hernia	+	Serous	_____	Mural
1801/11	11	IL-C	60	Sepsis	+	Purulent	_____	Mural
3428/12	30	LI	25	Assault	_____	Blood	+	<b>Mural</b>
2635/11	50	IL-C	69	_____	_____	Feculent	+	<b>Transmural</b>
1396/12	25	IL-C	39	_____	_____	Serous	+	<b>Transmural</b>
4550/11	70	IL-C	30	_____	_____	Feculent	+	<b>Transmural</b>

**Table 4: Clinico-pathological profile of intestinal perforation**

Sr no	Lab no	Age	Cause	No of perforations	Site	Length (cm)	Peritoneal effusion
1	357/11	45	Trauma	Single	Ileum	18	_____
2	2038/11	50	Trauma	<b>Multiple</b>	<b>IL-C</b>	<b>275</b>	Fecal
3	5003/11	50	_____	Single	Ileum	14	Fecal
4	5288/11	49	Trauma	Transection	Jejun	8	Blood
5	566/12	9	Trauma	Multiple	Ileum	10	Fecal
6	705/12	55	Trauma	Single	Ileum	13	Fecal
7	2728/12	62	<b>Diverticula</b>	Single	Jejun	10	Fecal

**Table 5: Pathological Profile of adenocarcinoma cases**

SN	Age	Type	Site	Tumor size(cm)	Length of specimen	LVI	PNI	Margin	Nodal status	TNM stage	Outcome
2	60	Adenocarcinoma	Duodenum	3X4	6	-	-	I	0	T2N0	
1	60	Mucinous adenocarcinoma	Rectum	7X6	37	+	-	I	0	T3N0	
3	84	Adenocarcinoma	Biliary + Rectum	3X3	6	+	-	I	0	T1N0	Poor
4	67	Adenocarcinoma	Sigmoid colon	4.5X3.5	12	+	-	I	2	T3N1	
5	49	Adenocarcinoma	Descending colon	4.5X3.5	16	-	+	I	3	T3N1	
6	67	Adenocarcinoma	Ascending colon	6X4	7	+	-	P	0	T3N0	Poor
7	75	Adenocarcinoma	Recto-sigmoid junction	8X2.5	21	-	+	I	0	T3N0	
8	35	Signet ring carcinoma	Rectum	3x4	22	-	+	I	21	T3N2	

**DISCUSSION:**

A higher number of small intestinal resection in our study correlates with the previous studies [4]. High number of the intestinal pathologies such as ischemia and perforation in our study which is commoner in small bowel explains the high number of small intestine resection.

Ischemic bowel disease is classified as occlusive and non-occlusive according to pathogenesis of the disease [5]. Five out of nine patients with intestinal ischemia were aged more than 41. The incidence of acute mesenteric ischemia increases with age [6]. The occlusive vascular diseases like thrombosis and embolism are frequently seen in later decades.

Two cases of ischemic bowel were attributed to hernia. A case of recurrent small bowel ischemia in a 40 year male was diagnosed provisionally as Vasculitis. Thrombus was noted intra-operatively in Superior mesenteric artery (SMA) in a case. As vascular occlusion is better tolerated by mesenteric circulation due to the extensive collateral circulation [6, 7], intestinal ischemia frequently is caused by non-occlusive processes, such as sepsis, cardiac insufficiency and drugs (digitalis) [5, 8]. Less frequently, patients with non-occlusive mesenteric ischemia may not have clear risk factors as in four of our cases [7].

The case with SMA thrombosis had longest segment of intestine resected. Thrombosis is seen at the origin of SMA trunk, while vascular occlusion due to other causes is usually distal to origin of pancreaticoduodenal artery from SMA. Hence stomach, duodenum and jejunum are spared in latter cases [6, 7].

Grossly, the ischemic segment displays the characteristic dull grey surface, thinned out flappy

friable walls and effaced mucosal folds (Figure 2a). Gangrenous segment appeared blue black. Histologically, mucosal infarction was seen in all cases (Figure 2b). Three-fourth of the intestinal blood flow is directed to mucosa to support its high metabolic rate. As mucosal supply is critical, mucosal ischemia is evident first [5-7]. Mucosal ischemia allows bacterial translocation across the barrier [6]. Two of our cases were associated with purulent peritoneal effusion. The extent of infarct varied, transmural infarct was seen in most cases (Figure 2c). Consequent perforation was seen in four cases as secondary pathology. Frank peritonitis with sero-sanguinous, purulent or feculent effusion was evident in most cases. Peritonitis or hemorrhagic effusion denotes advanced ischemia and gangrene [6]. All the cases displayed coagulative necrosis on microscopy, while the case of umbilical hernia showed hemorrhagic necrosis of intestinal wall. Mesenteric vein occlusion, though less frequent results in hemorrhagic necrosis (Figure 2d) [8].

Presence of peritonitis and the intent to respect the ischemic segment substantiated surgery in all cases. As intra-operative assessment of bowel viability is often inaccurate [7], histological evaluation provides the confirmatory diagnosis.

Trauma, hernia and gangrene are the common underlying causes for intestinal perforation in adults. As terminal ileum was the commonest site for perforation celiotomy was performed in all cases. Surgical resection will not only provide sufficient material for pathological examination, but also allows removal of diseased area [9].

Jejunal diverticulosis is rare with an incidence of 0.25%-1% among general population. Small bowel diverticula are frequently seen in the elderly with a slight male predominance [10]. Uncoordinated

peristalsis is thought to cause these diverticula distributed along points of perforation of intestinal wall by blood vessels [9]. The varied clinical presentation and rarity make pre-operative diagnosis unlikely. Therefore, they are likely to be surprise finding on laparotomy as in our case. Perforation is rare due to low intra-luminal pressure [10].

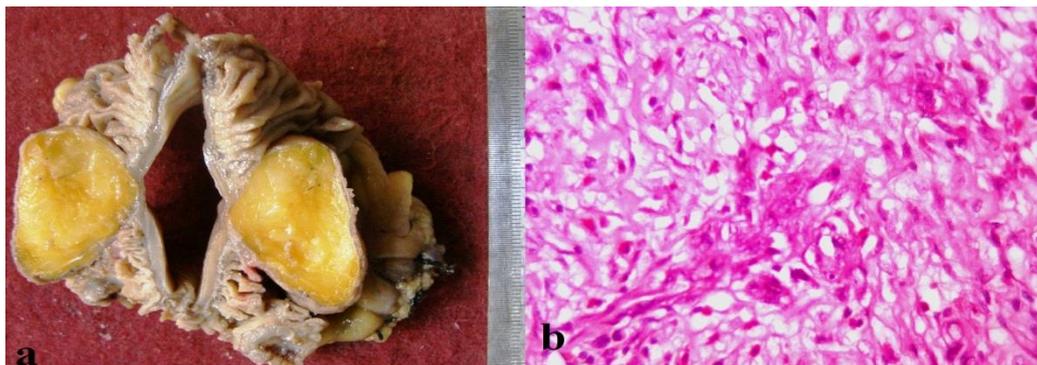
The most common cause of small intestinal perforation is typhoid [4]. In a study by Chaudhary *et al.*; out of 646 typhoid patients with enteric perforation, primary ileostomy was done in 410 (64.06%), primary closure in 212 (33.12%) and resection in 24 cases [11]. Typhoid enteric perforation was not seen in our case series as surgical resection for enteric perforation is rarely resorted to. The rate of perforation in typhoid varies from 5.3% to 17.9% according to large series [9]. The median age of 27 patients enrolled in a study of typhoid with intestinal perforation was 23 years [12]. This contrasts with median age of 50 years in our study group of patients with perforation. No etiology could be ascertained in a case of ileal perforation. Histological evaluation from edge of perforation showed no significant pathology (Figure 3a). Similar cases have been registered by Yusuf *et al.*; The authors postulate that such perforation could be result of chronic ischemia or drugs [4].

Six out of seven colorectal carcinoma cases were aged more than 50 years. The incidence of colorectal carcinoma increases with age with more than 90% of cases diagnosed in patients older than 50 years [13]. Left sided adenocarcinomas were commoner with five cases of recto-sigmoid and one case of descending colon. These findings conformed to results of a study by Rasool *et al.*; who found left sided adenocarcinoma in 63.23% of their cases [13, 14]. All cases showed ulceroproliferative type of growth. Sulegaon *et al.*; stated that 57.37% cases of large intestinal adenocarcinomas were typed as moderately differentiated [15]. Similarly, three of our colorectal adenocarcinomas were moderately differentiated and two were typed as well differentiated (Figure 3b). One case each of mucinous adenocarcinoma and signet ring adenocarcinoma suggestive of MSI-H histology were encountered (Figure 3c and 3d). Other histological features suggestive of MSI-H include medullary phenotype, Crohns like lymphocytic infiltrate, tumor infiltrating lymphocytes etc [16].

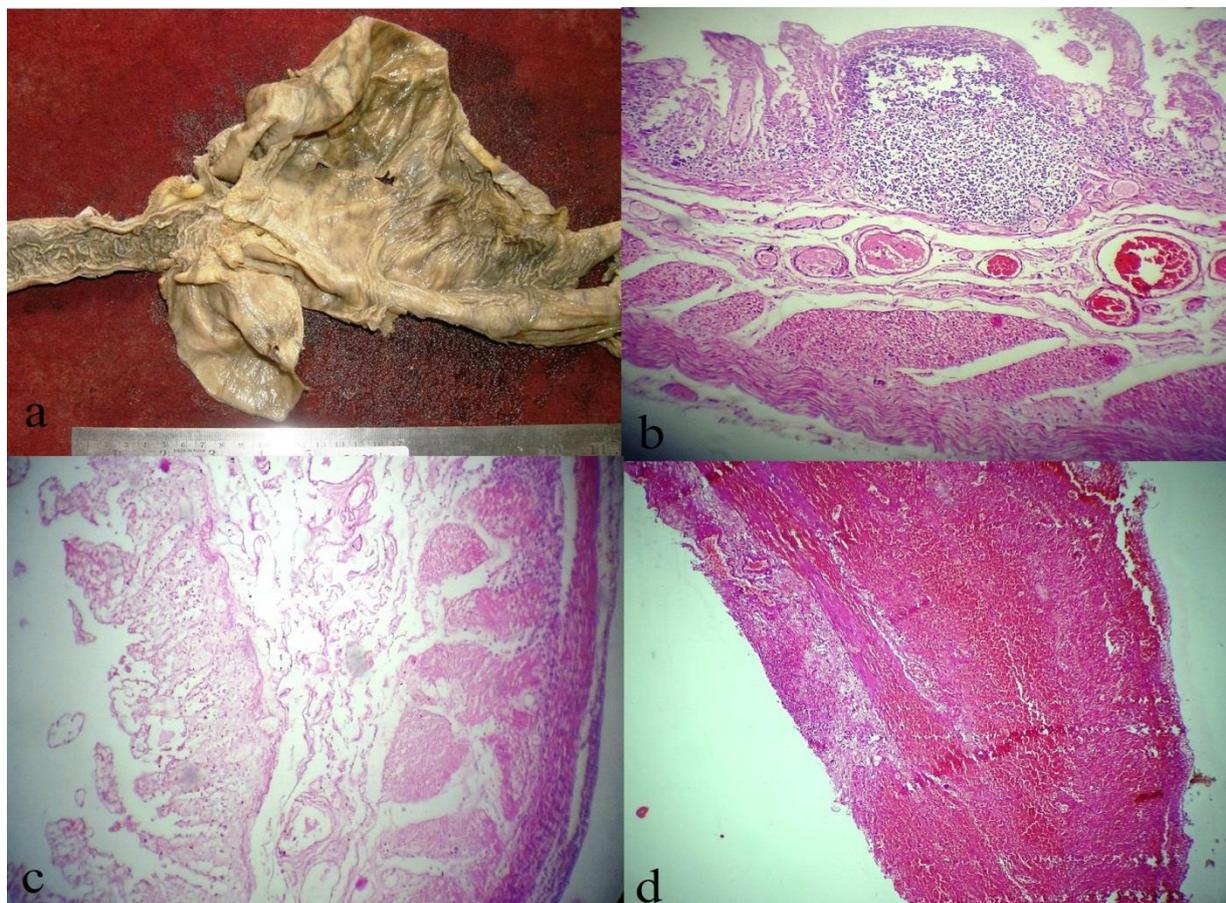
The present study includes a rare case of synchronous ampullary carcinoma and rectal adenocarcinoma in an 81 year old male. A case series of five ampullary carcinomas associated with other malignancies by Eriguchei *et al.*; also highlighted the

incidence of this tumor in late elderly [17]. Twenty similar cases have been reported in literature in the past [17, 18]. A pancreato-duodenectomy for ampullary carcinoma and curative abdomino-perineal resection for rectal adenocarcinoma was offered for our patient. The other commonly associated malignancies along ampullary carcinoma include prostatic carcinoma, gastric carcinoma, colon carcinoma, bile duct and pancreatic carcinoma, urothelial carcinoma, lung carcinoma etc [17]. Analysis of SEER program data from 1973-1999 shows a total of 30 among 2043 cases of ampullary carcinoma to develop synchronous or metachronous colon carcinoma [18]. Such association may be manifestation of hereditary cancer syndrome or non-familial [13, 19]. We report both the tumors as synchronous because both ampullary and rectal carcinoma were histologically distinct. No evidence to support familial polyposis colon syndrome was noticed on sigmoidoscopy or intra-operatively. Immunohistochemistry for Mismatched repair gene was ordered. The tumor tissue was found negative for MLH1 but nuclear positivity was seen for PMS2, MSH2 and MSH6. Negative for MLH1 signifies high frequency of micro-satellite instability (MSI-H). MSI-H could be the result of sporadic or heritable mutations. Further molecular testing for methylation of MLH1 promoter region is suggested to rule out sporadic mutations [20]. The patient succumbed during post-operative care. Our case conforms to the poor outcome of such associations highlighted in earlier reports [17].

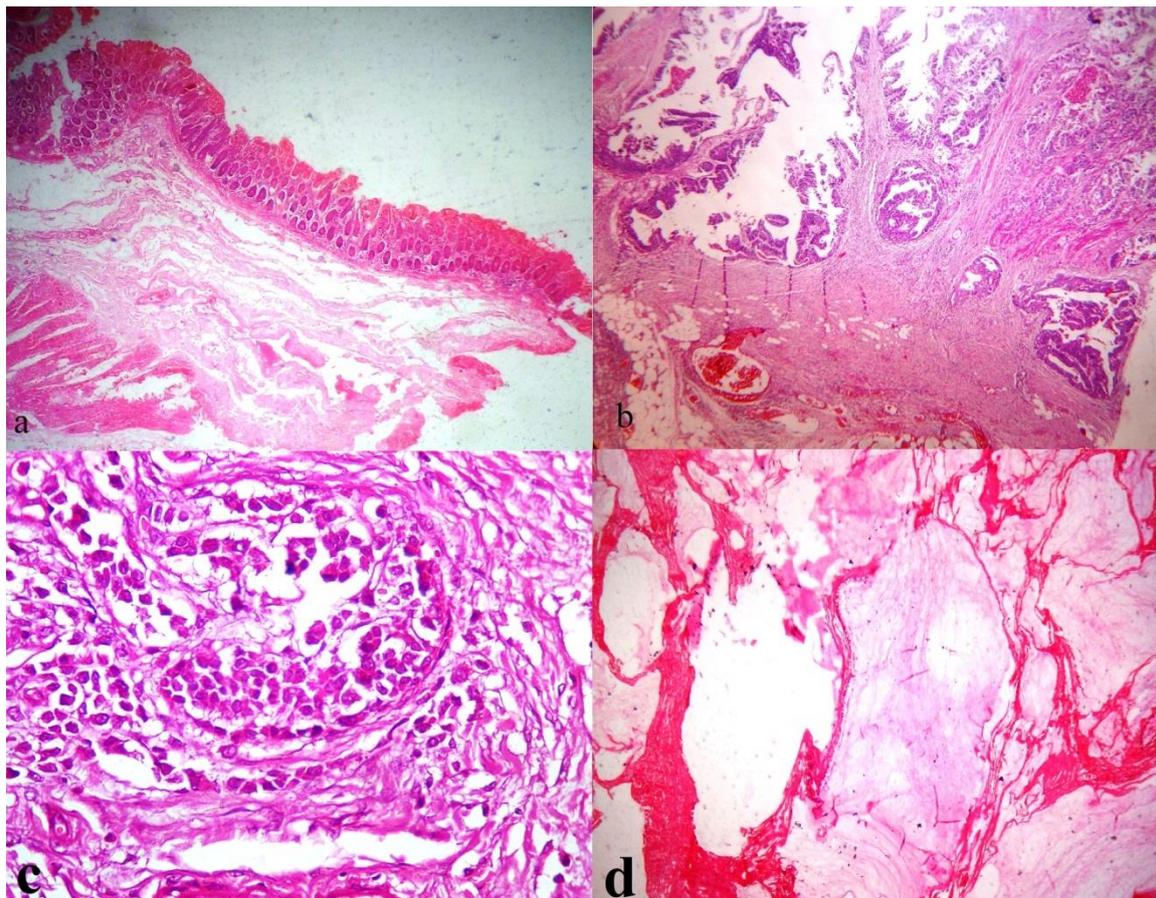
Periampullary carcinoma may have their origin from pancreas, common bile duct, ampulla of vater or duodenum. Often it is difficult to determine the precise origin of the tumor and hence the pathogenesis [21, 22]. Serial section and histological evaluation revealed the origin of tumor to be bile duct (Figure 4a). Histologically, the ampullary tumors are classified as either "intestinal" or "pancreato biliary" applying revised Albores-Saavedra criteria. Other less common types are mixed, mucinous, papillary, clear cell, signet ring carcinoma and poorly differentiated type [22, 23]. The pancreato biliary tumors have tumor cells arranged in simple or branching glands and small nests surrounded by desmoplastic stroma (Figure 4b). The intestinal type typically shows tall pseudo stratified columnar epithelium, nests and cribriform area, mucin resembling colon carcinoma [21]. This classification bears prognostic significance too [22]. Westgaard *et al.*; in a study of 114 periampullary carcinoma showed that pancreato biliary differentiation had a hazard ratio of 3.1 indicating increased probability of death [21]. The poor outcome in our case is in line with these observations.



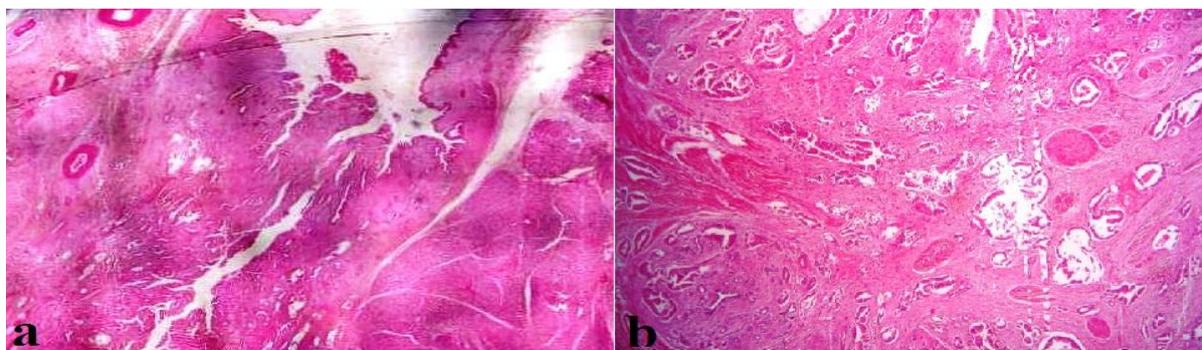
**Fig 1: a, Gross feature of submucosal lipoma in jejunum with circumscribed, yellow, homogenous cut surface. b, Microscopic appearance of Inflammatory myofibroblastic tumor displays plump spindled cells having vesicular nuclei arranged indiscreptly and inflammatory infiltrate (H&E, X400).**



**Fig 2: a, Gross features of ischemic bowel shows thinned out flappy wall. b, Photomicrograph of mucosal infarct with denudation of mucosal epithelia. Note the underlying viable muscularis coat(H&E, X400). c, Transmural infarct shoes necrosis of all the layers (H&E, X400). d, Hemorrhagic necrosis displays extravasation of blood and necrosis within wall(H&E, X400).**



**Fig 3: a, Microscopy in a case of spontaneous perforation shows no significant abnormalities (H&E, X100) . b, Well differentiated adenocarcinoma displays infiltrating glands lined by malignant cells (H&E, X400). c, Infiltrating tumor composed of sheets of cells having eccentric nucleus suggestive of Signet ring cell carcinoma (H&E, X400). d, Mucinous carcinoma typically shows large dissecting pools of mucin (H&E, X100).**



**Fig 4: a, Whole slide microscopic photograph shows the infiltrating tumor arising from distal bile duct (H&E, X100). B, Pancreato-biliary phenotype of ampullary carcinoma displays glands lined by monolayered malignant cells surrounded by desmoplastic stroma (H&E, X400).**

**CONCLUSION:**

Our study highlights the higher prevalence of ischemia and perforation amongst other intestinal pathologies presenting as acute abdomen. Mesenteric ischemia should be suspected in an elderly patient with peritoneal effusion and abdominal pain. Perforation of small bowel is commoner following blunt trauma. Periapillary structures may be distorted due to the presence of tumor. Though determination of tumor origin is difficult, a section through the tumor and

parallel to duct can help. Synchronous or metachronous malignancy should be considered in patients with ampullary carcinoma.

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