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Original Article

Intestinal Web in Jejunum and Ileum among Children: A series of 11 cases

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Abstract

Objective: Web in the small intestine of children is not a commonly encountered entity. Due to partial obstruction, patients may present with varied symptoms and at different ages. The study objective was to share our experience over the web in Jejunum and Ileum regarding its presentation, management, and outcome.
Study type, settings & duration: This retrospective descriptive case series was conducted at Medicare Hospital, Saidpur Road, Rawalpindi from January 2021 to December 2022.
Methodology: This descriptive case series was experience at a pediatric surgery center over twelve years. All patients with the diagnosis of web in the small intestine were included. The demographic details, presentation, investigations, management, and postoperative course were noted. Data was analyzed by SPSS version 26.
Results: Eleven patients with web in small intestine were included in this study. The mean age of the patients was 35.42±50.81 months, and six patients (54.5%) were male. All patients presented with features of intestinal obstruction. All patients underwent surgery. Per-operatively, the web was found in 4 patients (36.4%) in the jejunum, while in 7 patients (63.6%), it was in the ileum. The mean hospital stay of the patients was 15.54±8.74 days. Nine of our patients (81.8%) were discharged safely to home; however, two patients (18.2%) died. The web of jejunum was found to be significantly associated with higher ventilator requirements, anastomotic leakage, redo surgery required, time to start an oral feed and total hospital stay compared to Ileal web.
Conclusion: Web in the small intestine are rare and not easy to treat, particularly in the settings of emergency presentation. Moreover, jejunal atresia is associated with a poor postoperative course.
Key words: Intestine, intestinal obstruction, child, newborn, ileum, jejunum, diaphragm.

Introduction

Congenital atresia of the gastrointestinal tract (GIT) is one of the most commonly encountered diseases in neonatal surgical practice. GIT atresia is divided into four categories, including type 1 (web/windsock), type 2 (attached by a fibrous cord), type 3A (having V-shaped mesentery defect between two loops), type 3B (apple peel atresia) and type 4 (multiple atresias).[1-3] This classification changes according to the location in GIT, but type 1 atresia remains the same in all locations. It is the rarest of all these types, and no obstruction is visible on external examination; however, intraluminal obstruction is there due to the presence of the web.[1] This web may be complete causing complete obstruction, or it may have a hole in it of variable size, leading to incomplete obstruction. When there is incomplete obstruction, the patient may present late with varying symptoms, and diagnosis becomes very difficult.[4]

The exact cause of the web in the small intestine is debatable in the literature. Tandler has reported that it occurs due to the failure of recanalization of the gut during embryonic life.[5] According to Louw and Bernard, there may be intrauterine vascular events leading to a compromise in blood supply and causing this to

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Authors Contribution

AIS, MA, OU & JM conceptualized the project. FIA & AIS did the data collection. FIA, MA, OU & YR did the literature search. MA, OU, JM & YR performed the statistical analysis. Drafting, revision & writing of manuscript were done by FIA, MA & UA

happen.[6] Another theory explains it due to intestinal hyperproliferation and muscular hypoplasia.[7] Park et al. reported neuronal and fibromuscular dysplasia of the intestinal epithelium, leading to this happening.[8]

Hyperbilirubinemia is a common concomitant condition in these cases due to increased enterohepatic circulation of bilirubin, often resulting in jaundice.[9] Approximately 10% of infants with jejunal or ileal atresia also have cystic fibrosis and meconium ileus.[10] The first successful surgical repair of small-intestine atresia was reported by Fockens in 1911.[11] However, high mortality rates persisted for many years despite surgical intervention, even in leading pediatric surgical centers. Over recent decades, survival rates for patients with intestinal obstruction have markedly improved due to advancements in our understanding of intestinal physiology, etiologic factors, pediatric anesthesia, and surgical and perioperative care of newborns. Accurate and timely diagnosis and treatment are critical for improving outcomes, relying heavily on appropriate imaging techniques.[12] Despite the challenges posed by radiation hazards in neonates, advancements such as collimation tools and ultrasonography (US) have enhanced imaging quality while reducing risks.[13]

Comprehensive perioperative care remains crucial for the successful treatment of neonates with intestinal atresia[14] Key components include early diagnosis, proper preoperative stabilization, precise imaging, optimal surgical procedure selection, and diligent postoperative neonatal care. Future therapeutic approaches may explore the use of growth factors to improve long-term outcomes, particularly given the role of hormone levels in causing atresia[15]

Morbidity and mortality in these patients are often associated with other medical conditions, such as short-bowel syndrome, cardiac anomalies (especially in infants with Down syndrome), prematurity, respiratory distress syndrome, cystic fibrosis, and other congenital anomalies. The complexity of the lesion and potential surgical complications further contribute to patient outcomes.[16]

The exact incidence of web in jejunum and ileum is unknown; however, it is very low.[17] Also, in a study, which included 37 patients with type 1 atresia of the GIT, jejunoileal atresia (JIA) was found in only three patients (11%).[18] In another report, including 24 JIA over a period of 11 years, type 1 JIA were 4 cases (16.66%).[19] In a large series of 25 years including 128 JIA, type 1 atresia was reported in 29 cases (22.6%).[20] Still, literature is scarce over the type 1 JIA, and single case reports still appear in the literature.[21] The study's objective was to share our experience over the web in the small intestine regarding its presentation, management, and outcome in our setup.

Methodology

This retrospective descriptive case series was based on the experience of a pediatric surgery center. All patients with a diagnosis of intraluminal jejunoileal atresia web within the last 12 years were included. A predesigned English proforma was used for data collection. The authors collected the demographic details (age, gender, and weight) of each patient, preoperative presentation, investigations, intraoperative findings, procedure, and postoperative management course. The data was collected from January 2021 to December 2022 at the Medicare Hospital, Saidpur Road, Rawalpindi. SPSS version 26 was used and simple descriptive statistics analyzed data. We also stratified the location of the web of the intestine for postoperative events and complications.

The ethical approval was obtained from the Ethical Review Committee of Medicare Hospital, Rawalpindi vide letter no. IRB/27/2020.

Results

We included 11 patients with the small intestinal web in this study. The mean age of the patients was 35.42±50.81 months (range: 3 days to 12 years). We found that four patients were neonates, and six patients had presented within the 1st year of life. The gender distribution was almost equal in both genders (male: 6/11; 54.5%). The mean weight of patients was calculated as 9.60±7.72 kg (range: 1.9kg-22kg). Most of the patients had pain abdomen (63.6%) and bilious vomiting (72.7%). On examination, all of these patients had features of intestinal obstruction, and six patients (54.5%) had absent bowel sounds. X-ray findings showed intestinal obstruction with multiple air-fluid levels in all patients and intestinal perforation in 1 patient. The age groups, gender, presenting features, clinical examination, and x-ray findings are summarized in Table-1.

As all the patients who presented to us were experiencing intestinal obstruction, so all of them were explored. Per-operatively, the web was found in 4 patients (36.4%) in the jejunum, while in 7 patients (63.6%), it was in the ileum. No extraluminal cause of obstruction was found in all patients, and a remarkable luminal caliber difference at a certain point was found, so an enterotomy was done, and the intraluminal web was confirmed. After enterotomy, either resection of the intestine with

anastomosis (n=5; 45.5%) or excision of the web with Heineke-Mikulicz enteroplasty (n=6, 54.5%) was done. The mean distance from the Duodeno-jejunal junction in jejunal atresia was 20.00±9.12 cm, and in the case of ileal atresia, it was 23.00±7.09 cm proximal to the ileocecal junction. Two patients had peritonitis and preoperative perforation of the gut, one had jejunal, and another had ileal atresia. Some per-operative pictures are shown in Figures-1 & 2.

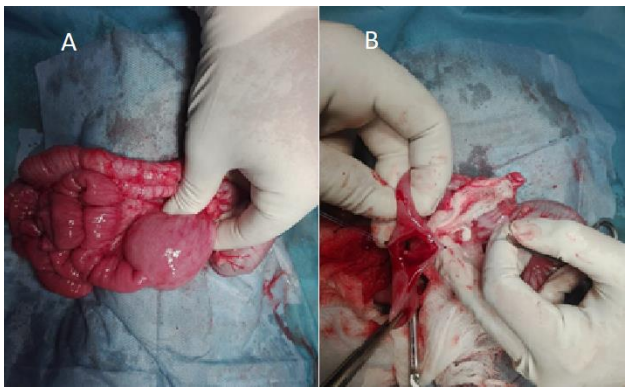

Figure 1: A) Disparity of the lumen at level of web, B) Intraluminal web visible after enterotomy.

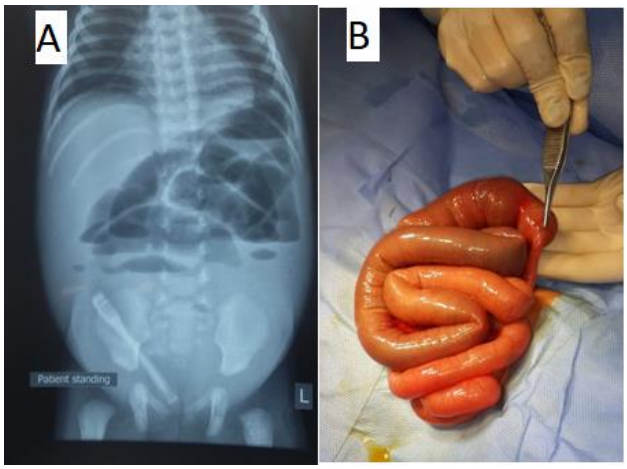

Figure 2: A) X-ray showing intestinal obstruction, B) Intraluminal web causing obstruction.

As per departmental protocol, we provided total parenteral nutrition (TPN) to 8 patients (72.7%). Also, four patients (36.4%) needed ventilator support postoperatively. The postoperative course remained uneventful in 6 patients, while three patients developed a leak of anastomosis and two patients had postoperative ileus, which was settled by conservative measures. Three patients, who developed a leak of anastomosis, needed a redo surgery, and end-to-end anastomosis was done in all of them. The mean time for starting the feed was 10.18±5.86 days (range: 3-19 days). The mean hospital stay of the patients was 15.54±8.74 days (range: 6-30 days). Nine of our patients (81.8%) were discharged safely to home; however, two patients (18.2%) died, and both of these had an anastomotic leakage and needed redo surgery.

We stratified the location of the web of the intestine for postoperative events and complications. It was observed that jejunal web was

Table 1: Demographic and presentation details.

	n (%)
Age groups	
Neonates	4 (36.4)
Infants	2 (18.2)
Above 1 year	5 (45.5)
Gender	
Male	6 (54.5)
Female	5 (45.5)
Presenting features	
Pain abdomen	7 (63.6)
Bilious vomiting	8 (72.7)
Constipation	3 (27.3)
Abdominal distention	11 (100)
General physical examination	
Healthy looking and hydrated	4 (36.4)
Sick looking and dehydrated	7 (63.6)
Abdominal examination	
Abdominal distention	11 (100)
Absent Bowel sounds	6 (54.5)
X-ray findings	
Air under Diaphragm	1 (9.1)
Multiple air fluid levels with cut-off sign	10 (90.9)

Table 2: Comparison of post-operative course according to site of web in small intestine.

Post-operative events	*Site*		*p-Value*
	Jejunum	*Ileum*	
TPN Requirement			0.125
Yes	4	4	
No	0	3	
Ventilator Requirement			0.044
Yes	3	1	
No	1	6	
Anastomotic Leakage			0.007
Yes	3	0	
No	1	7	
Redo Surgery			0.007
Required	3	0	
Yes	1	7	
No			
Outcome			0.039
Discharged	2	7	
Expired	2	0	
Time to start oral feed (mean ± SD) (Days)	16.00±2.58	6.85±4.29	0.038
Total hospital stay (mean ± SD) (Days)	22.50±8.81	11.57±6.16	0.004

Table 3: Details of patients included in this study.

Age	*Gender*	*Weight (Kg)*	*Site*	*Procedure performed*	*TPN Required*	*Ventilator Required*	*Time to establish feed (Days)*	*Hospital Stay (Days)*	*Post-operative complication*	*Outcome*
12 years	Female	22	Ileum	Resection and anastomosis	No	No	5	7	No	Discharged
13 months	Male	9.0	Jejunum	Heineke-Mikulicz Enteroplasty	Yes	No	15	30	Sepsis	Discharged
4 months	Male	6.0	Ileum	Heineke-Mikulicz Enteroplasty	Yes	No	3	8	post-operative Ileus	Discharged
10.4 years	Female	22	Jejunum	Resection and anastomosis	Yes	Yes	19	30	Anastomosis leak	Discharged
6 months	Male	7.0	Ileum	Heineke-Mikulicz Enteroplasty	No	No	4	6	No	Discharged
6 Days	Female	2.50	Ileum	Heineke-Mikulicz Enteroplasty	Yes	No	5	16	Sepsis	Discharged
3 Days	Male	2.0	Jejunum	Heineke-Mikulicz Enteroplasty	Yes	Yes	13	13	Anastomosis leak and sepsis	Expired
3 Days	Female	3.2	Ileum	Resection and anastomosis	Yes	No	14	20	Post-operative Ileus	Discharged
5 years	Male	16	Ileum	Resection and anastomosis	No	No	5	6	No	Discharged
4 years	Male	14	Ileum	Heineke-Mikulicz Enteroplasty	Yes	Yes	12	18	Sepsis	Discharged
5 Days	Female	1.9	Jejunum	Resection and anastomosis	Yes	Yes	17	17	Anastomosis leak and sepsis	Expired

associated with significantly higher ventilator requirements, anastomotic leakage, redo surgery, time to start an oral feed and total hospital stay (Table-2). All the details of the patients are given in Table-3.

Discussion

The mean age of patients at the time of surgery was found as 35.42 ± 50.81 months (range: 3 days to 12 years). Previously, it has been reported in neonatal life,[13,22] toddler's age group [23-25] and even adults.[23,26,27]. Because of the partial obstruction, these patients usually do not present at early neonatal life, and suddenly some event or obstructing agent may lead to complete obstruction, which leads to the diagnosis.[23] In this series, four patients belonged to the neonatal age group, and the maximum age was 12 years. The gender distribution was almost equal, and no particular preponderance was found.

All of our patients presented with symptoms and signs of intestinal obstruction. Generally, these patients present with chronic abdomen pain, failure to thrive, vomiting, weight loss or decreased weight gain, and volume depletion. All these features are vague symptoms that make its diagnosis very difficult preoperatively. Reported investigations in the literature regarding its diagnosis may include contrast studies, upper GI endoscopy, ultrasound, and video capsule endoscopy.[28] Generally, patients in our society present late, so in none of the cases, we had an opportunity to go for these investigations, and all of our patients had X-ray and ultrasound only. Even on the X-ray, one patient had perforation and air under the diaphragm, which elaborates the time duration, which may have passed before the presentation. Most of the previous case reports from our region of the world have shown that surgeons usually get time to go for X-rays, ultrasound, and contrast studies.[29] One previous report has shown the role of ultrasound in the diagnosis of the jejunal web, and the authors were able to have a

preoperative diagnosis;[1] however, in none of our cases, we could find a role of ultrasound for this particular diagnosis, but we do suggest getting it done to rule out other associated abdominal pathologies.

All of our patients underwent exploratory laparotomy, and the diagnosis was confirmed per-operatively. Two of our patients had perforations leading to intra-abdominal contamination. Few cases in the literature have shown the role of laparoscopy and per-operative endoscopy if the surgeon has a preoperative suspicion and the procedure is being done electively.[30] We performed enterotomy and Heineke-Mikulicz enteroplasty in 6 patients, and in others, resection with end-to-end anastomosis was performed. Most previous reports have narrated the role of resection with end-to-end anastomosis.[7,31,32] However, few surgeons have also performed Heineke-Mikulicz enteroplasty.[33] We have found no difference in these two techniques, so we leave this decision as per surgeon's discretion and comfort level.

The postoperative course of our patients was not uneventful, and eight patients (72.7%) needed TPN. In another large series, the authors reported that fewer of the patients with JIA needed TPN post-operatively.[34] Another study reports that 17% of the patients had long postoperative ileus, which is also reported in 9% of patients in another large series having 128 JIAs.[35] The mortality rate associated with JIA is generally higher than other parts of the intestine. It is reported as 54% and 15% [36] in the previous larger JIA series. Two patients (18.2%) died in our series, and both of them had anastomotic leakage, needed redo surgeries, developed sepsis and had multi-organ failure.[36] This type is most likely caused by significant proximal midgut infarction from proximal superior mesenteric artery occlusion; it is also believed to result from in utero midgut volvulus.[36]

In this study, an important finding was that jejunal atresia was associated with a worse postoperative course, higher mortality, longer hospital stays, and a longer time for feeding. These findings were not narrated as such in the previous series. We attribute it to the higher needs of TPN, sepsis, and probably higher needs of tapering in jejunal atresia; however, other confounding variables could not be ruled out.

We conclude that web in the small intestine is rare and not easy to treat, particularly in the emergency settings. Moreover, web in jejunum is associated with poor postoperative course, so we recommend TPN in all these patients, which must be started as soon as possible. Also, the role of handling with aseptic techniques to prevent infection, a good anastomotic technique to prevent leakage, and the use of broad-spectrum antibiotics in these children, cannot be overemphasized.

Conflict of interest: None declared.

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