

Adhesive Intestinal Obstruction in Children: A 10-Year Experience in a Teaching Hospital in Enugu, Nigeria

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Abstract: Background: Following an injury, the peritoneum tries to repair itself through biochemical and cellular responses. These responses result in the formation of adhesions that may cause bowel obstruction. Methodology: This was a retrospective review of children who presented, to our pediatric surgery unit, with adhesive intestinal obstruction (AIO) between January 2008 and December 2017. The patients were reviewed for age at diagnosis of AIO, gender, age at initial surgery, time interval from the initial surgery to the development of AIO, type of initial surgery, duration of symptoms before presentation, treatment and outcome. Result: Thirty four children were admitted with AIO. There were 24 males and 10 females with 36 episodes of bowel obstructions. The mean age of the patients at diagnosis of AIO was 81.5 months (range: 12 - 168) whereas the mean age of the patients at initial surgery was 59.7 months (range: 1 - 144). The mean interval between the initial surgery and onset of AIO was 23.2 months (range: 11-48). Majority of the patients (44.1%) developed AIO within 12 months after their initial surgery. Laparotomy for typhoid intestinal perforation was the most common initial procedure that led to AIO. Non-operative treatment was successful in twenty three patients (67.6%) while ten patients (29.5%) had surgery. One patient (2.9%) was discharged against medical advice. There was no mortality. Conclusion: AIO is uncommon in children. In this series, laparotomy for typhoid intestinal obstruction was the most common operation leading to AIO. Non-operative treatment was effective in two-third of our patients.

Keywords: Intestinal Obstruction, Children, Adhesive, Experience

1. Introduction

Adhesive intestinal obstructions (AIO) are post-operative bowel obstructions resulting from cellular interactions involved in the process of healing. AIO is not very common and is reported to occur in 1% to 9% of children who undergo laparotomy [1-4]. The time of occurrence of AIO following surgery cannot be predicted. It can occur in days, months or years following laparotomy [5]. The exact etiology of AIO is unknown. It is believed that injury to the mesothelium resulting from bowel manipulation and exposure to non-organic materials result to inflammation and influx of fibroblasts that causes adhesion [6-7]. The diagnosis of AIO is made based on history of previous abdominal

surgery; abdominal pain, vomiting, constipation and/or abdominal distension. Prevention and treatment of AIO have remained a source of great controversy [4, 5, 8, 9]. Treatment could be operative or non-operative (conservative). The results of non-operative treatment are variable while operative treatment, though definitive, could be complicated by adhesion reformation [4, 9, 10]. Some previous studies have asserted the usefulness of non-operative treatment; while some other studies reported that non-operative treatment has no role in the management of adhesive intestinal obstruction [4, 8-11]. This study describes our experience in the management of AIO in the paediatric surgery unit of a teaching hospital in Enugu, Nigeria.

2. Methodology

The medical records of children admitted into Enugu State University Teaching Hospital between January 2008 and December 2017 with a diagnosis of AIO were retrospectively analyzed. All the children below the age of 15 years, who presented during the study period, with a diagnosis of AIO, were analyzed. Diagnosis of AIO was made based on a history of previous abdominal surgery, abdominal pain, vomiting and inability to pass flatus/faeces. In addition, erect and supine abdominal x ray showed dilated bowel loop and multiple air/fluid levels respectively. Children who had surgery at a peripheral hospital for AIO before being referred to us for reoperation were excluded from the study. Cases with incomplete records were also excluded.

Information was extracted from the case notes, operation notes, operation register, and admission-discharge records. The information extracted include age at diagnosis of adhesive intestinal obstruction, gender, age at initial surgery, time interval from the initial surgery to the development of adhesive intestinal obstruction, type of initial surgery, duration of symptoms before presentation, type of treatment offered and outcome. At presentation, the patients were resuscitated and non-operative treatment started on all the patients except those with obvious signs of peritonitis. The non-operative treatment consisted of nil by mouth, intravenous fluid, correction of fluid/electrolyte derangements, nasogastric decompression, intravenous antibiotics and close monitoring. The monitoring comprises of checking and recording the temperature, abdominal girth, abdominal examination for localized tenderness and bowel sounds every 8 hours. Full blood count and abdominal x rays were repeatedly done depending on the patients' clinical condition. The quantity and quality of the nasogastric

drainage was also recorded. Non-operative treatment was continued for patients who showed response evidenced by absence of fever, leukocytosis, localized abdominal tenderness, passage of flatus/faeces and decreased nasogastric drainage. Patients who don't respond to non-operative treatment are considered candidates for surgery.

Statistical Package for Social Science (SPSS) version 23 was used for data entry and analysis. Data were expressed as percentages, means and ranges.

3. Results

3.1. Demography

Of the 1102 laparotomies done over the study period, 36 episodes of AIO were recorded in 34 patients. Two patients had 2 episodes of AIO. This gives an incidence of 3.1 percent. The follow up period was for 18 months. There were 24 males (70.6%) and 10 females (29.4%) with a male to female ratio of 2.4:1. The mean age of the patients at diagnosis of AIO was 81.5 months (range: 12 - 168) whereas the mean age of the patients at initial surgery was 59.7 months (range: 1 - 144). The mean interval between the initial surgery and onset of AIO was 23.2 months (range: 11-48). Majority of the patients (44.1%) developed AIO within 12 months after their initial surgery. With respect to the duration of symptoms before presentation to the hospital, the mean period was 3.3 days (range: 2 – 6). Regarding the duration of hospital stay for all the patients, the overall mean period was 11.0 days (range: 8 – 20). The mean duration of stay for patients that had surgery was 15.8 days (range: 8 – 20) while the mean duration for patients treated non-operatively was 11.2 days (range: 8 – 18) (Table 1).

Table 1. Patients' Demography.

Variables	Mean	Range
Age at diagnosis of AIO	81.5 months	12 – 168
Age at Initial surgery	59.7 months	1 – 144
Initial surgery to onset of AIO	23.2 months	11 - 48
Duration of Symptoms	3.3 days	2 – 6
Duration of hospital stay	11.0 days	7 – 20

AIO, Adhesive intestinal Obstruction.

3.2. Initial Operative Procedure

The initial operative procedures leading to adhesive intestinal obstruction are as shown in Table 2. Laparotomy for typhoid intestinal perforation, in 14 patients (41.1%), was the most common procedure leading to AIO. This was followed by laparotomy for intussusception in 8 patients (23.5%), appendectomy in 4 patients (11.8%) and laparotomy for strangulated hernia in 4 patients (11.8%). Other procedures were laparotomy for blunt abdominal trauma in 2 patients (5.9%) and laparotomy for intestinal malrotation in 2 patients (5.9%).

Table 2. Operative Procedures leading to AIO.

Operative procedures	Number	Percentage
Laparotomy for Typhoid intestinal perforation	14	41.1
Laparotomy for Intussusception	8	23.5
Appendectomy	4	11.8
Laparotomy for strangulated hernia	4	11.8
Laparotomy for blunt abdominal trauma	2	5.9
Laparotomy for intestinal malrotation	2	5.9

3.3. Presenting Symptoms

Our patients presented with abdominal pain, bilious vomiting, constipation and abdominal distension in various combinations. The most common symptom was abdominal pain which occurred in 17 patients (50%). Frequencies of occurrence of the predominant symptoms are shown in Table 3.

Table 3. Presenting Symptoms.

Presenting Symptoms	Number	Percentage
Abdominal pain	17	50.0
Bilious Vomiting	9	26.5
Constipation	7	20.6
Abdominal distension	1	2.9

3.4. Investigations

All the patients had plain abdominal radiograph and abdominal ultrasound. Only one patient (2.9%) had a gastrograffin meal and follow through.

3.5. Treatment of AIO

All the patients on presentation to the pediatric surgery unit were resuscitated and subjected to non-operative treatment except for those who had obvious features of peritonitis. Non-operative treatment was successful in twenty three patients (67.6%) while ten patients (29.5%) had surgery. One patient (2.9%) was discharged against medical advice. Of the ten patients that had surgery, six patients (17.6%) had adhesiolysis while 4 patients (11.7%) had bowel resection and anastomosis (Table 4).

Table 4. Modalities of treatment.

Method of Treatment	Number	Percentage
Non-operative	23	67.6
Operative	10	29.5
Adhesiolysis	6	17.7
Bowel resection and anastomosis	4	11.8

3.6. Outcome

Thirty three patients (97.1%) did well and were discharged home. One patient (2.9%) was discharged against medical advice. There was no mortality. Of the ten patients that had surgery for the treatment of their AIO, two had surgical site infection and one had intra-abdominal abscess post-operatively.

4. Discussion

In ninety five percent of individuals, opening the peritoneal cavity, in whatever type of surgery, leads to formation of adhesions or bands. These post-operative adhesions may obstruct the bowel causing AIO. AIO is a life-long issue to the patient and a challenge to the surgeon [12, 13]. AIO is a cause of morbidity, mortality as well as an economic burden [14]. Some methods of preventing post-

operative adhesion include good surgical technique and use of anti-adhesive agents such as hyaluronic acid [15].

In the present study, the incidence of AIO was 3.1%. This is similar to the finding of Duron et al [13]. However, Nasir et al recorded an incidence of 4.7% [16]. The exact incidence of AIO in children is unknown but has been reported to range from 2.2% to 8.3% [8, 17]. The finding of male predominance in the present study is consistent with the report of other series [1, 16, 18, 19]. With respect to the time of diagnosis of AIO in our patients, their mean age of 81.5 months is similar to the report of Chirdan et al [19], but not in agreement with the reports of Nasir et al and Al-Salem et al [16, 18]. These differences are difficult to explain but may be related to the age of the patients at the time of initial surgery. The mean age of our patients at the time of initial surgery is similar to that of Al-Salem et al [18]. Majority of our patients developed AIO within 12 months after the initial surgery. This finding is consistently observed in many other reports too [15, 16, 18, 19]. Janik et al reported that 80% of their patients developed AIO within 2 years from the time of initial surgery [9]. It is noteworthy to know that AIO can occur as early as 1 week or as late as 12 years after surgery [18]. Ameh et al in their series in northern Nigeria reported 4 days as the average duration of symptoms in their patients before presentation to the hospital. This is similar to our finding in the current study. This late presentation is associated with high morbidity/mortality and could be explained by poverty and ignorance. The overall mean duration of hospital stay of 11.0 days in our series is similar to that of Nasir et al [16]. Our patients who were treated operatively had a longer hospital stay than those who were treated non-operatively. This is in line with the findings of Lin et al [21]. The reason for this longer hospital stay may be due to the conventional method of treatment of AIO, where the patients are subjected to non-operative treatment. Operative treatment comes in when non-operative treatment fails.

The surgeries predisposing to AIO are variable. Laparotomy for typhoid intestinal perforation was the most common initial surgical procedure predisposing to AIO in our patient. This finding is supported by the reports of previous workers [16, 19]. However, Al-Salem et al and Alberg et al [17, 18] reported appendectomy while Vijay reported pull through surgery for Hirschsprung's disease as the most common cause of AIO in their patients [5]. These variations may be explained by the prevalent pathology in different settings. The clinical symptomatology of our patients are similar to that of Chirdan et al [19]. However, abdominal pain was the most common symptom in our patients while abdominal distension was the most common symptom recorded by Chirdan et al. The explanation for this difference may be the part of the bowel that is obstructed. Proximal bowel obstruction gives early vomiting and minimal abdominal distension while distal bowel obstruction gives more abdominal distension. Abdominal radiograph is a basic imaging modality in patients that have AIO. Hundred percent of our patients had abdominal radiograph similar to

the findings of Chirdan et al [19].

Treatment of AIO still remains controversial. The debate on the optimal management of AIO in children is ongoing [16, 18]. Two thirds of our patients had successful non-operative treatment. This result is consistent with previous published reports [5, 10, 22]. In other reports, majority of the patients were treated surgically due to failure of non-operative treatment or when there is evidence of bowel gangrene [18, 23, 24]. In a study done by Osifo et al in Benin, Nigeria, all their patients had surgical adhesiolysis [25]. They advocated surgical treatment of children who present with AIO to avoid morbidity and mortality seen in resource poor settings. Surgical site infection and intra-abdominal abscess were recorded in our patients post-operatively; Nasir et al and Chirdan et al also recorded surgical site infection and abdominal abscess in their respective series [16, 19]. Emphasis on prevention of AIO has become necessary because published works have shown the great impact of AIO on morbidity and mortality in pediatric population [16]. Prevention of AIO should be multimodal and includes meticulous surgical technique, gentle tissue handling, use of unpowdered gloves and proper intra-abdominal cleansing [6]. Other preventive measures include use of fibrin sealant, intestinal stenting and hyaluronate based barrier membrane [6].

5. Conclusion

This study evaluated 34 cases of adhesive intestinal obstruction (AIO) that were managed at a pediatric surgical unit of a teaching hospital in Enugu over a 10 year period (January 2008 and December 2017). AIO accounted for 3.1% of all laparotomies done during the study period. The most common initial surgery leading to AIO was laparotomy for typhoid intestinal perforation (41.1%), followed by laparotomy for intussusception (23.5%), appendectomy (11.8%) and laparotomy for strangulated hernia (11.8%). Others are laparotomy for blunt abdominal trauma (5.9%) and laparotomy for intestinal malrotation (5.9%). Abdominal pain (50%) was the most common symptom in this series. Sixty eight percent of the patients did well on non-operative treatment. The future lies in measures aimed at preventing AIO.

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