ORIGINAL ARTICLE

Outcomes of surgical management of intestinal atresias

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Abstract

Background: Outcome of managing intestinal atresias has improved in many developed countries, but most reports from low and middle income countries (LMICs) still show high morbidity and mortality.

Objective: The objective of the following study is to evaluate the outcome of surgically managed intestinal atresias in our health resource-limited setting.

Patients and Methods: All cases of intestinal atresias managed surgically from July 2007 to July 2012 were retrospectively analyzed.

Results: There were 23 patients comprised of 11 males and 12 females; 10 duodenal atresias (DA), 13 jejunoileal atresias (JIA) and no colonic atresias. The mean age at presentation to the surgeon was 10.3 days (range 2-43 days) for JIA and 10.6 days (range 1-35 days) for DA. Average weight at presentation was 2.2 kg for JIA and 2.4 kg for DA. Mean duration from presentation to surgery was 3.4 days for JIA and 4.8 days DA. All the JIA had primary repair; type 1 DA had duodenotomy and web excision while others had diamond duodenoduodenostomy. However one DA had duodenojejunostomy. 7 out of 10 DA patients (70%) had at least one associated anomaly, the most common being annular pancreas. There were 4 re-operations in JIA and none in DA (17.4% reoperation rate for 3 anastomotic leaks, 1 anastomotic stricture). Average hospital stay was 23 days for JIA and 12.3 days for DA. Overall, 5 (5) patients died (2 JIA and 3 DA) giving a mortality rate of 21.7%. Mortality rate for DA is 30% while for JIA is 15.4%. Causes of death were: Sepsis with disseminated intravascular coagulation (1), sepsis from anastomotic leakage (1), septic shock (1), anesthesia-related (1), undetermined (1). Two of the mortalities (40%) had re-operation for anastomotic leak.

Conclusions: Short-term survival of neonates with intestinal atresias in our unit is still poor when compared with statistics from developed countries. Late presentation is common in this series, but does not appear to have negatively affected outcome. A high proportion of the mortalities had reoperation for anastomotic leak.

Key words: Intestinal atresia, outcomes, surgical management

Date of Acceptance: 22-Nov-2013

Introduction

Intestinal atresia is one of the leading causes of neonatal intestinal obstruction (NIO). It ranks as the second most common cause of NIO in many series especially from developing countries.[1-3] In most patients DA and JIA occur separately though they may rarely occur together in one patient.[4] In most developed countries prenatal diagnosis, early presentation, availability of neonatal parenteral nutrition and neonatal surgical intensive care services are the norm. Thus, outcome of management in intestinal atresias has markedly improved in these developed countries over the past decades.[5,6] In many low and middle income countries (LMICs), outcome has remained poor.[1,7]

In this study, we sought to highlight the short-term outcome of surgical management of intestinal atresias in our unit.

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Access this article online	
Quick Response Code:	**Website**: www.njcponline.com
	DOI: 10.4103/1119-3077.134045
	PMID: 24909473

Patients and Methods

The patients managed by the Pediatric surgery unit of UNTH from July 2007 to July 2012 for intestinal atresias were selected and their medical details especially outcome variables were manually retrieved from the case notes, theatre and ward records and retrospectively reviewed. We excluded suspected cases of intestinal atresias who died before any definitive diagnosis was made or operative intervention offered, as well as those discharged against medical advice. However, we included only cases intestinal atresias who had surgical operation. Statistical Package for Social Sciences (SPSS 15.0 version, SPSS Inc, Chicago Ill) was used for data entry and analysis. Results were expressed as means, ranges and percentages.

Results

There were 23 patients in all, 11 males (48%) and 12 females (52%) with a male:female ratio 1:1.1. There were 10 cases (43%) of duodenal atresia (DA) and 13 cases (57%) of jejunoileal atresia (JIA) but no cases of colonic atresia. Mean age at presentation to pediatricians was 7.14 days (ranges from 3 h to 35 days) and mean age at presentation to the surgeon was 10.7 days (ranges from 1 day to 43 days). The mean age at presentation to the surgeon was 10.3 days (range 2-43 days) for JIA and 10.6 days (range 1-35 days) for DA. Only 47.8% (11/23) presented to the surgeon within 7 days of life [Table 1]. Average weight at presentation was 2.2 kg (median 2.2 kg, range 1.4-3.35 kg) for JIA and 2.4 kg (median 2.5 kg, range 1.85-2.8 kg) for DA. 50% of DA weighed <2.5 kg and 70% of JIA weighed <2.5 kg at presentation. Of those with information on prenatal ultrasonography (18/23), only 50% (9/18) had prenatal ultrasound and of this only 56% (5/9) had prenatal suspicion of intestinal atresia. Those with prenatal diagnosis of polyhydramnios presented at a mean age of 4.2 days while others averaged 12.3 days. Out of those with information on gestational age at birth (17/23) only 23.5% (4/17) were preterm deliveries. Mean duration from presentation to surgery was 3.4 days for JIA (median 2 days, range 1-7 days) and 4.8 days for DA (median 3 days, range 2-13 days). All the JIA had primary repair; type 1 DA had duodenotomy with web excision while others had diamond duodenoduodenostomy. One had duodenojejunostomy as documented in some other series.[1,7] Nearly 70% (7/10) of DA had at least one obvious associated congenital anomaly: Annular pancreas (4), congenital cardiac anomaly (1), Down's syndrome (1), high ano-rectal malformation (1). Oral intake was commenced on a mean of 5 days post-operatively in DA (median 5 days, range 4-8 days) and 9.6 days in JIA (median 8 days, range 7-17 days). There were 4 reoperations in JIA patients (17% re-operation rate). The reoperations were for 3 anastomotic leaks and 1 anastomotic stricture and the patients were aged 2-10 days. Two of the re-operated cases died. There were no reoperations in DA. Average hospital stay was 23 days for JIA (median 22 days, range 16-30 days) and 12.3 days for DA (median 12 days, range 6-25 days). In all five (5) patients died (2 JIA and 3 DA) giving a mortality rate of 21.7%. Mortality rate for DA is 30% while for JIA is 15.4%. Causes of death were: Sepsis with disseminated intravascular coagulation (1), sepsis from anastomotic leakage (1), septic shock (1), anaesthesia-related (1), undetermined (1). Two of the mortalities (40%) had re-operation for anastomotic leak. Mean duration of follow-up was 93 days (range 25-186 days). Average weight for mortalities is 2.19 kg (range 1.85-2.6 kg) and for survivors 2.35 kg (range 1.4-3.35 kg). Average age at presentation for mortalities was 7.4 days and for survivors 11.5 days. Nearly 75% of mortalities weighed <2.5 kg at presentation while 53% of the survivors weighed <2.5 kg.

Table 1: Age at presentation to the surgeon and type of atresia

Type of atresia	0-7 days	8-14 days	15-21 days	22-28 days	>28 days	Total
Duodenal atresia	3	6	-	-	1	10
Jejunoileal atresia	8	3	1	-	1	13
Total	11	9	1	-	2	23

Discussion

Poor outcome of intestinal atresias has been a challenging situation in most LMICs with mortalities as high as 50%, 41.7% and 41% in various series from Nigeria[1,2,7] and 28% in Nepal.[8] These are as opposed to low mortality values of 11% in Netherlands[5] and 7% and 4.6% in North America.[6,9] Dearth of neonatal surgical intensive care unit facilities and late presentation in poorer countries have been the purported factors largely contributing to this disparity in mortality statistics.[1,7,8] The short term mortality of 21.7% in our series seems to be a modest improvement over similar series from the developing countries done mainly in the last decade.[1,2,7] In this study, the patients were managed postoperatively mainly in the Pediatric surgical ward as there is no neonatal surgical intensive care unit. Parenteral fluids and antibiotics are continued until bowel function and oral intake are established.

Late presentation to the surgical team [Table 1] does not seem to have negatively affected the outcome as the average age at presentation for the survivors (11.5 days) was more than that of the mortalities (7.4 days). This is in contrast to other studies, which emphasize late presentation as an important cause of mortality.[1,7,8] We employed meticulous pre-operative resuscitation, with fluids containing appropriate electrolytes and calories ensuring normalization of indices before surgery. This may

have contributed to the modest reduction in mortality despite late presentation.

Early re-operation seems to be an important risk factor for mortality in JIA in this study and mainly followed anastomotic leakage. Improved surgical techniques with the use of well laid fine sutures and operating loupes may help prevent this. There was no reoperation in DA. This is as opposed to another study in the United States of America,[9] where reoperation was mainly for adhesive intestinal obstruction and was done for both DA and JIA and did not affect mortality statistics. Two of the five mortalities were re-operated for anastomotic leak.

There were more mortalities in DA than JIA in this study. This is opposed to other studies with no mortality in DA.[9,10] These mortalities in DA were related to anesthetic complications and sepsis.

The mean weights at presentation between DA and JIA were similar and most of the patients weighed <2.5 kg at presentation despite the fact that most were term deliveries. This may be explained by late presentation, the intrinsic small bowel anomaly leading to malabsorption and by lack of proper parenteral nutrition before presentation. Furthermore average weight for the mortalities (2.19 kg) and survivors (2.35 kg) were similar.

There are more females than males in this study as opposed to many others with more males than females.[8,9,11] Furthermore in this present study the DA occurred in 43.5% of cases. This high proportion of DA to JIA was also corroborated by Ozturk *et al*.,[12] Dalla *et al*.,[13] Burjonrappa *et al*.[9] in developed countries, but other series in developing countries[1,2,7] recorded much less DA.

Nearly 50% of the mothers had prenatal ultrasonography and only in about half of these were there prenatal suspicion of bowel obstruction. In some other studies in more developed countries rate of prenatal diagnoses were as high as 43.4%[9] and 86.6% respectively.[14] Those patients with polyhydramnios presented to the surgeon at an earlier average age of 4.2 days compared with a mean of 12.3 days. Hence prenatal ultrasound suspicion tends to encourage earlier presentation as also corroborated by other authors.[10]

The age at presentation to the surgeon in this study is higher than age at presentation in most studies in both developing and developed countries.[1,7,15,16] We tried to state the age at presentation to the surgeon as opposed to presentation to the hospital, which is usually initially to the neonatologists who later invite the surgeons commonly on a later date after their initial evaluation and commencement of resuscitation. The average interval between presentation to neonatologists and presentation to the surgeons were 4.5 days for JIA and 2.1 days for DA. This interval reflects the time it takes to assess, investigate and diagnose NIO by neonatologists before inviting the surgeons to manage these patients.

70% associated anomalies for DA in this series is comparable to 76% by Burjonrappa *et al*.[9] The common associated anomalies especially annular pancreas were also corroborated by other authors. Majority were delivered vaginally as opposed to Wax *et al*.[14] where 60% of the deliveries were by cesarean section.

There were no temporary venting enterostomies in JIA as recorded by some authors.[2,5,13] All had laparotomy [Figures 1 and 2] with primary surgery involving excision of atretic segment, variable excision of proximal dilated bowel, tapering enteroplasty, bowel anastomosis with no use of transanastomotic tube. This is as opposed to some studies where minimally invasive laparoscopic techniques are already being practiced.[17] In this study, most DA (90%) had open duodenoduodenostomy as opposed to some earlier studies from the same country where gastrojejunostomy[2] or duodenojejunostomy[1] were mainly done for the patients. Total parenteral nutrition was not used for any of our patients.

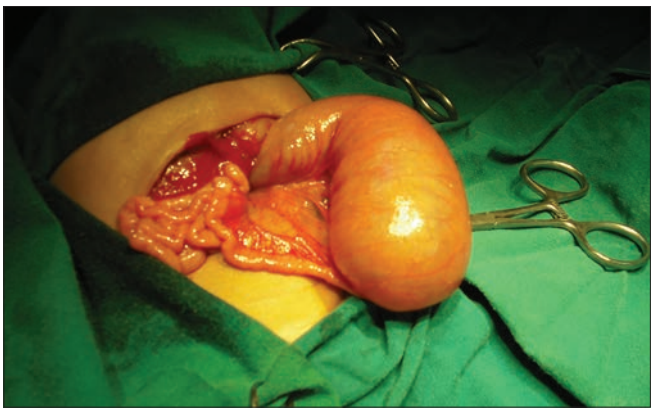

Figure 1: Type 1 jejunal atresia in a neonate

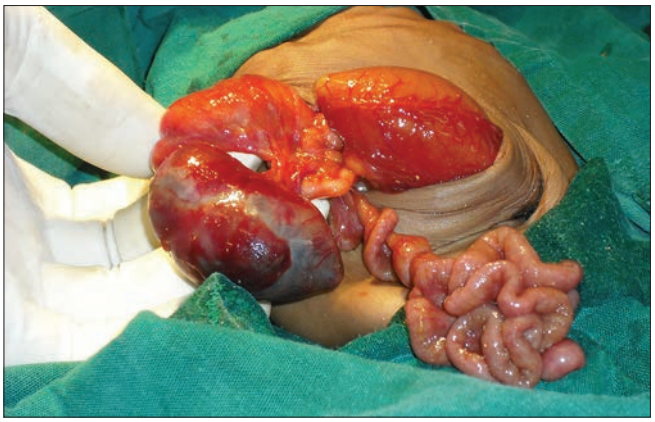

Figure 2: Type 4 jejunoileal atresia in a neonate

Return of bowel function after surgery for intestinal atresia is generally delayed especially due to dysmotility in the proximal dilated bowel [Figures 1 and 2]. Decompression of the stomach and proximal small intestine by continuous nasogastric drainage is continued until bowel function is established and graded enteral feeding commenced. In this study, oral feeding commenced on an average of 5.4 days in DA and 10.8 days in JIA when adequate bowel function was deemed to have occurred based on clinical evaluation. This implies that bowel function returns earlier in DA than in JIA as was also noted in other studies.[5,6] Excision or tapering of proximal dilated bowel may help in earlier return of bowel function.

The re-operation rate of 17.4% is quite high and was for anastomotic leakage and anastomotic stricture. All re-operations were for JIA. This is as opposed to some other series where there were re-operations after surgeries for DA.[18,19] Average duration of hospital stay is significantly higher in JIA (23 days) than in DA (12.3 days). This difference in duration of hospital stay could be explained by earlier return of bowel function and earlier establishment of full oral intake in DA as well as the absence of re-operation in all cases of DA.

There seems to be an increase in hospital-based incidence of small intestinal atresia. We managed 23 cases in 5 years; as opposed to some earlier series where 24 were managed in 13 years[1] and 22 in 19 years.[7] This may be more of increased awareness in society than a real increase in incidence in the general population as the number/unit time is higher in most developed countries.[13] However, a low incidence of 51 in 20 years in Turkey[12] and 114 in 34 years in Netherlands[5] may suggest regional variation in incidence.

Average follow-up duration of 93 days is low when compared with developed countries. As opposed to our setting, long-term follow-up has encouraged detection of delayed morbidities and mortalities, especially relating to prolonged parenteral nutrition and short bowel syndrome, with efforts geared toward tackling them.[5,18]

Limitations of the study

The small number of cases in this single unit retrospective study limits the number in each type and sub-type of intestinal atresia making test of significance misleading and poor follow-up after discharge precludes study of long-term outcome as observed in some other publications.[5,18]

Recommendations/further studies

Multi-institutional analysis for a longer duration will encourage the study of outcome variables in the different types and subtypes of intestinal atresia. Establishment of neonatal surgical intensive care unit, encouraging sub-specialization in neonatal anesthesia, improved competence at primary and secondary levels of health care to ensure early referral to tertiary centers. Improved prenatal services to ensure prenatal diagnosis, planned delivery in a center with efficient neonatal surgical services together with early involvement of pediatric surgeons in postnatal assessment of neonates with prenatal suspicion of intestinal atresia or early postnatal bilious vomiting will also be of immense benefit.

Conclusion

Short-term survival of neonates with intestinal atresias in our unit is still poor when compared with statistics from developed countries. There is however a modest improvement when compared with earlier studies from the same country. Late presentation is common in this series but does not appear to negatively affect the outcome as meticulous pre-operative resuscitation is emphasized. A high proportion of the mortalities had re-operation for anastomotic leak.

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How to cite this article: Ekenze SO, Amah CC. Outcomes of surgical management of intestinal atresias. Niger J Clin Pract 2014;17:479-83.
Source of Support: Nil, **Conflict of Interest:** None declared.