

Pediatric intussusception in a Saudi Arabian tertiary hospital

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Summary

There are various methods of diagnosing and treating pediatric intussusception. This is an indication that no single method is acceptable to all and no single method is ideal for all cases. Because of this, we reviewed the cases and management of intussusception, seen at Aseer Central Hospital over a 7-year period.

Materials and methods: Thirty four pediatric patients admitted at Aseer Central Hospital over a 7-year period (from 1993 to 2000) at Aseer Central Hospital, Southwestern region of Saudi Arabia were reviewed. These are by no means all the cases of intussusception seen during this period. Adult cases and incomplete records of pediatric cases were not included in this series. The 34 cases that met the objectives of this paper were analyzed with regards to the age group distribution, sex, nationality, type and site of intussusception, the cause of intussusception, the method of diagnosis and the treatment given, were also reviewed. Their case files were reviewed and used for the analysis.

Results: The age range was 2 months to 8 years (Mean = 10.86 months). There were 21 boys and 13 girls, a male : female ratio of 1.6:1.0. All (100%) presented with vomiting, 91% with bloody stools and 82% with colicky abdominal pain. Twenty-eight patients (82.3%) had diagnostic barium enema, and 8 of these were successfully reduced. Exploratory laparotomy was performed for 26 patients and 6 of this required surgical resection. There was no mortality in this series, but one patient had a wound dehiscence which was treated conservatively.

Conclusion: The management of pediatric intussusception depends on the presentation, the available facilities and the expertise of the treating surgeons.

Key-words: Pediatric intussusception, Management, Saudi Arabia.

Résumé

Il y a des méthodes diverses de faire le diagnostic de et de soigner l'intussusception pédiatrique. C'est à dire, qu'il y a une indication qu'une seule méthode n'est pas acceptable pour tous et aucune méthode est idéale pour tous les cas. A cause de ce phénomène, nous faisons le bilan des cas et la prise en charge des intussusception vues au centre hospitalier d'Aseer au cour d'une période de 7 ans.

Matériels et méthodes: Trente quatre patients pédiatriques admis au centre hospitalier d'Aseer au cours d'une durée de sept ans (de 1993 au 2000) au centre hospitalier de la région du Sud ouest d'Arabie Saoudite ont été passé en revue. Certes, il y d'autre cas d'intussusceptions vues pendant cette période. Cas des adultes et dossiers incompet ne sont pas compris dan ces séries. Les cas de 34 qui ont satisfait les

objectifs de cet étude ont été analysés en ce qui concerne la distribution de groupe d'âge, sexe, nationalité, type et le siège d'intussusception la cause d'intussusception, la méthode du diagnostic et le traitement donné ont été également passé en revue. Leurs dossiers médicaux ont été passé en revue et utilisés pour l'analyse.

Résultat: La tranche d'âge était 2 mois au 8 ans (noyen 10,86 mois). Il y avait 21 garçons et 13 filles, proportion sexe masculin : sexe féminin de 1,6 : 1,0. Tous (100%) se sont présentés avec vomissements, 91% avec fèces du sang 91% et 82% avec douleur abdominale coligue. Vingt huit patients soit 82,3% avaient eu le diagnostic anémie barium, dont 8 était connu du succès. On avait opéré la laparotomie exploratoire pour 26 patients dont 6 demandent l'intervention chirurgicale. Il n'y avait aucune mortalité dans cette série, mais un patient avait une blessure dehiscence qu'on avait soigné du façon classique.

Conclusion: La prise en charge d'intussusception pédiatrique dépend sur la présentation aménagement disponible et la compétence des chirurgiens qui soignent les patients.

Introduction

Diagnosis and Management of Intussusception remain controversial¹. Ravitch² advocated usage of barium enema even in all suspected patients. Controversy continues because of the many factors that may affect success of this modality of treatment. Factors may include delay in presentation and neonatal intussusception³ facilities available and the experience of the treating surgeon.

The purpose of this paper is to present our experience at Aseer Central Hospital over a 7-Year period in managing this condition.

Results

The youngest patient was two months and the oldest 8 years. Average age was 10.86 months. Seven patients were over 12 months of age. Twenty one patients were males and thirteen patients were females, a male to female ratio of 1.6 to 1.0. All the patients were Saudi nationals.

All patients presented with vomiting. Twenty eight (82%) presented with colicky abdominal pain and thirty one (91%) with bloody stools. These presentations were in various combinations among the thirty-four patients. Duration of

Table 1 Findings of Barium enema

Site of Pathology	No of Patients
Ileocolic	19
Ascending colon	4
Transverse colon	7
Descending colon	6
Not recorded	1

symptoms ranged from 6 hours to seven days with an average of 38 hours. Because of the delay in presentation, physical findings varied. Twenty one patients (61.7%) presented with abdominal distension, twenty three (67.7%) with dehydration and twenty patients (58.8%) had a palpable abdominal mass.

Plain abdominal X-rays were performed for 31 patients and 28 of them showed air fluid levels and distended bowel. Diagnostic barium enema was done for twenty-eight (82.3%) patients. The other 6 patients were not fit for the study because of their general condition and were operated upon as soon as resuscitation was effected.

Barium enema showed the exact "hold up" at the site of obstruction as in table no. 1.

Some patients showed more than one site of pathology. Only one patient underwent abdominal ultrasound to diagnose his pathology and hence was not subjected to the barium enema study. Barium enema was successful in reducing the intussusception in eight patients. A total of twenty six patients underwent operative exploration. Twenty patients were successfully reduced manually intraoperatively. This includes 20 patients who could not be reduced by barium enema treatment. Out of the 26 patients operated upon only six needed surgical resection. Four patients were re-admitted 4 to 12 days post operatively because of recurrence and were reduced with hydrostatic barium enema. Four patients had enlarged mesenteric lymph nodes, two had Henoch-Schonlein purpura, and one patient had Meckel's diverticulum initiating the intussusception. No mortality in this group and apart from the recurrence in 4 patients, one patient had superficial wound dehiscence which was treated conservatively.

Discussion

Classical signs and symptoms of pediatric intussusception include abdominal pain, vomiting, rectal bleeding and abdominal mass. Delay in presentation in our group of patients could explain the high incidence (91%) of rectal bleeding as compared to others^{4,5,6}. Presence of air fluid levels and bowel distensions on plain abdominal X-rays, although not specific may prove to be of good value as noticed by Luke and his colleagues⁷ that its presence may decrease success rate of barium enema reduction rate from 81% to 49%.

Barium enema was diagnostic in almost all cases subjected to the study. It has been reported that ultrasound could be a superior tool and much less invasive for diagnostic purpose⁸. When barium enema is used for reduction, a wide variation of success rate has been reported ranging between 18% and 100%^{8,9}. Our success is comparable to others. We cannot state which is the preferred reducing agent barium, gas or saline. Early decision to reduce the intussusception surgically was the standard treatment of choice before the 70's¹⁰; this practice did not disappear totally but decreased from 82% to 22%.^{8,12} as hydrostatic reduction took over. However in cases of adult intussusception, surgery is indicated because there is usually a cause e.g. neoplasm¹¹. In our group of patients 76% underwent laparotomy, and our decisions were based on duration of symptoms, signs and symptoms of peritonitis, age of the patient and hydrostatic pressure reduction failure. Only 6 patients needed surgical resection of the affected intussuscepted bowel. Because of

our policy to intervene surgically early, there was no mortality. Stringer et al¹³ reviewed deaths from intussusception in England and Wales between 1984-1989 and found a total of 33 cases. Factors related to mortality were a delay in diagnosis, inadequate intravenous fluid therapy and delay in recognizing recurrent or residual intussusception.

In conclusion, we feel that the patient's own clinical status, response to diagnostic and therapeutic measures dictate the line of management.

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Table 2 Distribution of the studied cases according to survival and pneumonia at presentation

Pneumonia at presentation	Deaths		Survivals		Total	
	n	%	n	%	n	%
None/mild	15	48.4	68	97.1	83	72.2
Moderate/severe	16	51.6	2	2.9	18	17.8
Total	31	100	70	100	101	100

$$\chi^2_{(1)} = 34.87 \quad p < 0.001$$

Table 3 Direct causes of mortality

Causes of death	n	%
I. Avoidable causes		
• Primary sepsis	10	32.3
• Technical problems	8	25.8
• Severe pneumonia	5	16.0
II. Unavoidable causes		
• Major congenital anomaly	6	19.3
• Bilateral renal agenesis	2	6.5

Table 4 Organisms recovered from blood at death (n = 23)

Single organism	n	%	Combined infection	n	%
Klebsiella spp	5	21.7	Klebsiella spp & MRSA	1	4.3
P. aeruginosa	5	21.7	Klebsiella spp & P. aeruginosa	1	4.3
Serratia spp	4	17.4	Candida & P. aeruginosa	1	4.3
Enterobacter spp	1	4.3	Klebsiella spp & Serratia spp	1	4.3
Staph epidermidis	1	4.3			
Salmonella spp	1	4.3			
Citrobacter spp	1	4.3			
Staph aureus	1	4.3			
Total	19	82.6		4	17.4

Table 5 Full model logistic regression analysis for factors predicting mortality of the studied neonates

The linear combination (Z) = -0.1049 constant

- +1.1117 if the associated anomaly is either major or incompatible
- 3.9397 if no pneumonia
- 4.8554 if mild pneumonia
- +1.7205 if there is major leakage
- +1.8545 if there is sepsis at presentation
- +3.5070 if there is acquired sepsis
- +1.7333 if the gap is long

Associated anomaly is coded (0) for none or minor and (1) for major or incompatible. Leakage by barium is coded (0) for no major leakage and (1) for major leakage. Sepsis at presentation and acquired sepsis are coded (0) for no and (1) for yes. The gap is coded (0) for short and (1) for long gap.

44 neonates (13.6%) in risk group B. All cases died due to verified sepsis, proven by blood cultures. Four cases died due to secondary sepsis, three of them were due to major leaks. The remaining one was due to inadvertent division of a bronchus. Twenty-two patients (71%) died among 31 neonates in group C. Two patients (6.5%) died due to bilateral

renal agenesis. Six patients (19.3%) died due to major associated anomalies. Eight patients (25.8%) died due to primary sepsis. One patient (3.2%) died because of secondary sepsis due to peritonitis after jejunal perforation. Five patients (16.1%) died as a result of severe pneumonia. Twenty-three patients (74.2%) of those who died had positive blood

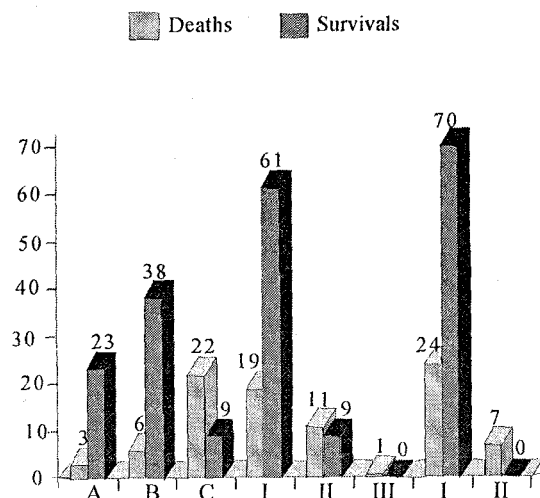


Fig. 1 Distributions of the studied cases and the different groups of classification.

cultures. The different types of organisms recovered are shown in table 4. Waterston C patients had 71% mortality rate which is significantly higher ($p < 0.05$) than each of Waterston A (11.5%) and Waterston B (13.6%). The mortality rates for Montreal-II patients were statistically greater than Montreal-I (100% vs. 25.5%). Similarly, the mortality rates for class 3 (100%) in Spitz et al' classification were significantly higher ($p < 0.05$) than each of class 1 (23.8%) and class 2 (55%).

Table 5 shows the logistic regression equation for factors significantly predicting mortality of the studied neonates. From the equation, it is noted that the predictors increasing the probability of mortality were the presence of major or incompatible associated anomalies, sepsis at presentation or that acquired during hospitalization, if the gap was long, and if there was major leakage as shown by the different values of the estimated coefficient. On the other hand, compared to severe pneumonia, none and mild pneumonia are associated with decreased log odds of mortality. This equation of full model logistic regression is statistically significant, where the model $\chi^2_{7} = 69.795$ ($p < 0.0001$). This model explained about 70.8% of the variation in the occurrence of mortality.

The equation succeeded in 91% to correctly classify the studied cases, being better in classifying survivors (94.2%) than deaths (83.9%).

Regarding correlation between mortality in the present study and other prognostic classifications, it was found that Kendall's tau-b value is the highest for the Waterston (0.479), followed by Montreal (0.410), then that of Spitz (0.297). This means that Waterston classification is the most applicable in our group of patients.

Discussion

The factors predicting early postoperative mortality could be divided into preoperative, operative and postoperative. The preoperative factors are sepsis at presentation, severe pneumonia and major or life threatening anomalies. Sepsis at presentation may be due to perinatal factors, maternal (e.g. premature rupture of membranes) or neonatal fac-

tors (e.g. impaired host defense) or due to delayed diagnosis. Although, the incidence of clinically proven sepsis in the neonate is only one to five per 1000 live birth, the mortality rate remains high at 30% to 59%⁸. The low rate of appreciation of polyhydramnios in this study (31.6%) might be due to lack of health awareness among pregnant mothers. The delay in diagnosis leads to preoperative feeding, aspiration and increased incidence of pneumonia. Those who died were significantly older at presentation than those who survived. The study showed that those who presented late had higher incidence of pneumonia. Both low gestational age and low birth weight were significantly higher among deceased neonates ($p < 0.03$ & 0.007 respectively). However, gestational age and birth weight were not critical variables when factors were analyzed using the logistic regression.

Eight patients died due to major and life threatening associated anomalies. We think that preoperative abdominopelvic ultra sonography (U. S) and echocardiogram should be the minimum investigation prior to EA repair⁹. This study showed an agreement with Saing et al¹⁰ that the multiplicity of the systems involved significantly increased mortality ($p = 0.0009$). Historically, the overall survival rate in EA with CHD has improved from 3% between 1948 and 1962 to 43% between 1963 and 1977 then to 69% between 1978 and 1988¹¹. In this study, the overall survival rate in patients with CHD and EA was 52%.

Long gaps were important intraoperative factor that increased mortality in this study. Although, all patients were ventilated post-operatively, long gaps showed high incidence of mortality. Brown and Tam in 1996 used the measurement of gap length as a simple predictor of outcome. Long gaps (greater than 3cm) had higher mortality rate than both intermediate (>1 to ≤ 3 cm) and short gaps (≤ 1 cm)¹².

The postoperative factors predicting mortality were major leakage and sepsis. Postoperative esophageal dysmotility was a prominent feature in this study (36%). This may play a role as a factor for morbidity and mortality. However, this was difficult to evaluate retrospectively and warrants further investigation. The factors causing anastomotic leakage are the use of silk suture material, tension at the anastomotic site, end-to-end anastomosis and interference with the blood supply due excessive mobilization¹³⁻¹⁵. Braided silk was associated with an increased incidence of leakage when compared with polyglycolic acid or polypropylene sutures. The overall reported leakage rate with 5/0 silk ranged from 33% to 36%^{13,15}. In this study, silk was associated with 25% leakage rate while prolene was associated with only 9%. The role of the surgeon cannot be ignored as a risk factor for leakage as highlighted by Willis Potts in 1950 and cited by Spitz in 1987¹⁶. In fact, most of the technical errors in this study were made by less experienced surgeons before the year 1991. The incidence of leakage varies widely from 4% to 36%^{17,18}. In this study, there were overall 11 cases (12.6%) out of 87 patients with leaks. It is interesting to know that all but one occurred in groups A and B according to Waterston classification. Probably, early in the course, only full term healthy neonates were offered treatment in this institution.

Primary sepsis was the main cause of mortality in this study (32.3%) followed by secondary sepsis due to major

technical problems (25.8%). Twenty-three patients of the overall mortality (74.2%) proved to have positive blood culture and death. It is worthy to know that eight cases of primary sepsis (25.8%) occurred in Waterston group C patients, two (6.5%) in group B patients and none in group A. Secondary sepsis due to technical problems occurred in three patients (9.7%) in group A and four patients (12.9%) in group B and only one (3.2%) in group C.

In a study done by Spitz et al in 1994⁴, there were 357 patients with EA and 15 with H-type in a period between 1980 - 1992. Forty-six patients died. The most common causes were major and life threatening associated anomalies. Some authors reported that none of their patients died due to primary sepsis^{19,20}. In a study done by Yagu et al, 20 patients out of 113 died. Five due to pneumonia (25%) and four due to sepsis (20%). The authors of this study considered pneumonia as an essential preoperative risk factor when therapeutic strategies for EA were selected. So, we proposed a modified Spitz classification by replacing major cardiac anomalies and low birth weight⁵, with pneumonia.

Conclusion

The study showed that primary sepsis was the main cause of death followed by sepsis due to technical problems. The risk factors predicting mortality were sepsis at presentation, severe pneumonia, major and life threatening congenital anomalies, long gaps, major leaks and sepsis acquired during hospitalization.

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