Medical Research Archives

ESMED
European Society of Medicine

OPEN ACCESS

Published: April 30, 2023

Citation: Raja AS, Gajanthody S, et al., 2023. Role of Dexamethasone as an adjuvant in the treatment of intussusception: A prospective study, Medical Research Archives, [online] 11(4). https://doi.org/10.18103/mra.v11i4.3723

DOI
https://doi.org/10.18103/mra.v11i4.3723

ISSN: 2375-1924

RESEARCH ARTICLE

Role of Dexamethasone as an adjuvant in the treatment of intussusception: A prospective study

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ABSTRACT

Background: Intussusception is one of the most commonly encountered abdominal emergencies in children for which the preferred treatment modality has always been non operative hydrostatic reduction. Recurrence is a common concern after a successful hydrostatic reduction. Adjuvant treatment with pharmacological agents have been considered to reduce chances of recurrence.

Aim: The study was conducted to examine the role of dexamethasone in decreasing early recurrent intussusception.

Materials and methods: A prospective cohort study was conducted in a tertiary care center from June 2018- June 2022 on 51 pediatric patients, admitted with intussusception and divided into a dexamethasone and non-dexamethasone group. Data was collected regarding demography, rate of recurrences, duration of hospital stay, surgery performed if any including the intraoperative findings and associated complications. The level of significance was set at 5%. SPSS version 27 was used to perform the statistical analysis.

Result: After ultrasound-guided hydrostatic reduction, the dexamethasone group showed significant reduction in recurrence, compared to the non-dexamethasone group. In this study, 7 cases showed recurrence despite three attempts of hydrostatic reduction and intraoperatively noted to have a pathological lead point.

Conclusion: Dexamethasone is one of the greatest discoveries of the 20th century with its vast use in multiple diseases. The use of dexamethasone during hydrostatic reduction of intussusception in a pediatric population makes it a wonderful drug with remarkable results and patient outcome.

Keywords: Intussusception, dexamethasone, hydrostatic reduction, intestinal obstruction, lead point, recurrent intussusception.

Introduction

Intussusception is defined as the telescoping of one segment of the bowel into an immediately adjacent segment [1]. With an incidence of 1 to 4 in 2000 live births, intussusception is a common cause of bowel obstruction in infancy and early childhood. [1,2]

Currently, treatment modalities for intussusception include both nonoperative and operative procedures with the nonoperative reduction procedure being performed using a hydrostatic enema under ultrasound or fluoroscopic guidance. The operative reduction is reserved for those cases where the nonoperative management has failed or in cases with bowel necrosis or peritonitis. [1,3]

Approximately, the recurrence rate for non-surgical reduction is reported as 5 to 10%.[1] Intussusception is referred to as recurrent when after being spontaneously reduced, it is re-diagnosed clinically and by ultrasound, and later confirmed intra-operatively; or it is a post-operative intussusception in a patient where it was reduced during open surgery or non-operatively either with the hydrostatic or pneumatic method.[3]

Most recurrences occur within the first few days after the initial reduction, some within hours. About 70% of children have only one recurrence, but up to eight recurrences have been reported in children without definite diagnosed lead points. Recurrent intussusceptions have a high reducibility rate. The time between the onset of symptoms and arrival in the hospital is shorter in case of recurrence because of the awareness of the parents. [1,3,4] The earlier the diagnosis, the greater the chance for a successful reduction, but always with a risk of repeat recurrence remains. Hydrostatic reduction has been regarded as the primary means of treatment of childhood intussusceptions since the 1940s. Glucagon has been used in recent years to induce hypotonia of various parts of the gastrointestinal tract and is now gaining acceptance in several gastrointestinal cases in paediatric age group. [4,5] This study was conducted to analyse the effectiveness of Dexamethasone in decreasing the rate of recurrence of intussusception post ultrasound guided hydrostatic reduction.

Materials and methods

A prospective cohort study was conducted at a tertiary health centre, from June 2018 to June 2022. A total of 51 patients with the diagnosis of intussusception were included in the study. Patients were randomly allotted into two groups that is Dexamethasone and non-Dexamethasone. All the patients underwent ultrasound guided hydrostatic reduction by a qualified paediatric surgeon. 26 out of 51 patients each received 0.1 mg/kg/dose Dexamethasone injection prior to the procedure and continued post – procedure for 2 days/ 6 doses. Intussusception was diagnosed radiologically and ultrasound guided hydrostatic reduction was attempted (maximum 3 attempts six to eight hours apart). A 20F Foley's catheter pre lubricated with 2% lignocaine jelly is inserted into the rectum and the balloon is inflated. One litre of normal saline (pre-warmed to normal body temperature) is suspended 100 centimetres above the bed level and connected to the catheter through a fluid line. The normal saline is allowed to run freely into the rectum. Gradual distension of the colon and reduction is monitored by real time ultrasound. Criteria for successful reduction include disappearance of the radiological signs of intussusception and passage of fluid and air bubbles from the caecum into the terminal ileum. After successful hydrostatic reduction, patients were monitored with ultrasound abdomen at 8 hour and 24 hours post reduction to rule out risks of recurrence and post reduction complications. Oral feeds were started once reduction is confirmed after 8 hours with a repeat ultrasound.

Inclusion criteria: All patients between the age group of 0-4 years with a clinical and radiological diagnosis of intussusception who has undergone hydrostatic reduction at least once were included in this study.

Exclusion criteria:

1. Patients who presented with complicated intussusception or showed features of perforation or peritonitis at presentation.
2. Cases with definitive lead point confirmed with radiological evaluation

The data collected included demographic data, presenting complaints, recurrences post reduction and number of reduction attempts, duration of hospital stay post procedure, surgery performed or not.

Statistical analysis

Data was entered in the excel spread sheet. Descriptive statistics of the explanatory and outcome variables were calculated by frequency and proportions for qualitative variables. Inferential statistics like Chi-square test and Fischer exact test was applied for qualitative variables to find the association. The level of significance is set at 5%. SPSS [Statistical Package for Social

Sciences] version 27 was used to perform the statistical analysis.

Results

The study included 51 patients over a period of 4 years, of which 39 were boys and 12 girls, whose age ranged from 4 - 47 months. The duration of hospital stay was less than 24 hours for 40 patients who had no recurrence after first attempt of hydrostatic reduction, while the 5 patients who required a second attempt were monitored for 24 to 48 hours. The 6 cases with operative intervention had a longer duration of stay (more than 48 hours) for post-operative monitoring. In this study, abdominal pain was the most common presenting symptom (74.5%), followed by vomiting (68.6%). [Table 1]

Table 1: The clinical presentations and their frequency of occurrence in the cases

Clinical presentation	Total	Percentage
Abdominal pain	38	74.5%
Vomiting	35	68.6%
Red currant jelly stools	15	29.41%
Abdominal distension	10	19.6%

The study population have been randomly divided into two groups based on Dexamethasone administration. Prior to ultrasound guided hydrostatic reduction Dexamethasone was administered to 26 subjects. A significant reduction in the rate of recurrence after 8 hours was noted in patients in whom Dexamethasone was administered (84.6%) in comparison to the non-Dexamethasone group (72%) (p value – 0.273). [Table 2]

Table 2: Comparison between patients who received Dexamethasone after presenting with intussusception and the frequency of recurrence after 8 hours of treatment [N=51]

Dexamethasone treatment	Total n	Recurrence of intussusception after 8 hours				P value*
		No recurrence		Recurrence		
		n	%	n	%	
Did not receive	25	18	72	7	28	0.273
Received	26	22	84.6	4	15.4	
Total	51	40	78.4	11	21.5	

*Chi square test

A repeat attempt of ultrasound guided hydrostatic reduction was done in patients with recurrence after 8 hours followed by an ultrasound abdomen scan after 24 hours since first attempt at reduction. It was noted that the recurrence was more after 24 hours in the non-Dexamethasone group, 71.4%, than in the Dexamethasone group, 25% (p value- 0.262). [Table 3]

Table 3: Comparison between patients who received Dexamethasone after presenting with intussusception and the frequency of recurrence after 24 hours of treatment [N=11]

Dexamethasone treatment	Total n	Recurrence of intussusception after 24 hours				P value*
		No recurrence		Recurrence		
		n	%	n	%	
Did not receive	7	2	28.5	5	71.4	0.137
Received	4	3	75	1	25	
Total	11	5	45.4	6	54.5	

*Fischer exact test as 50% cells have n value less than 5

During the study, there were 6 patients who had recurrence after 24 hours of non–operative management. A third attempt for hydrostatic reduction was given in those 6 patients and in 2 patients intussusception had reduced spontaneously, and the remaining 4 patients were taken up for open reduction and noted to have a pathological lead point in them.

Discussion

Majority of cases (more than 80%) are represented by ileocolic intussusceptions, with the ascending colon as the intussuscipiens and the

terminal ileum acting as the intussusceptum. A "lead point" is believed to cause the bowel to invaginate and commence the telescopic overlap eventually giving rise to intussusception; Majority of intussusceptions have no definite lead point, and considered idiopathic. Some of the idiopathic cases are noted to precipitate by hyperplastic lymphoid tissue in the distal bowel which acts as the lead point. Approximately 6% of cases, have a pathological lesion which acts as the lead point, such as a Meckel diverticulum, Henoch-Schönlein purpura, enteric duplication cyst, polyp or lymphoma. [1,8 – 12] The first successful surgical reduction in a paediatric patient was performed in 1871 by Jonathan Hutchinson. [12,13] By 1905, Harald Hirschsprung had accumulated 107 cases of hydrostatic enema reduction, nevertheless the treatment of intussusception in children was predominantly surgical until the mid-twentieth century. [2,8,9]

The classical triad of intussusception are abdominal pain, palpable abdominal mass, and red currant jelly stools is quite rare and present in less than 15% of cases. It has been noted that the commonest presentation in our study is pain abdomen, vomiting and red currant jelly stools respectively. The classical triad of presentation was less observed in this study. In a study by Gluckmann et al, 2017, it was seen that there is a male predominance in the occurrence of intussusception, which correlates with our study. [7]

Non operative methods are convenient and safe and hence adopted for all cases of idiopathic intussusception, along with the administration of adjunctive medicines like glucagon, Dexamethasone in some settings. In the early 1970s glucagon became a popular means of inducing smooth muscle relaxation considered an advantage in many radiologic procedures including hydrostatic reduction of intussusception. [9,10] Hyoscine butyl bromide have been administrated to patients, but no comparative studies exist to prove its efficacy except in lines of patient comfort. There have been limited studies using sedation and general anaesthesia to improve reduction rates. It has been observed that sedation interferes with the Valsalva manoeuvre which protects against perforation.[5]

Dexamethasone, a long acting corticosteroid is different in comparison to other anti-inflammatory drugs in their capability to inhibit all components of inflammation and has a potency 25 times greater than short acting products, with a prolonged half-life of 36 – 72 hours, and low therapeutic dose, it can be used safely with less risks of common steroid induced adverse effects.[16] The glucocorticoid available in various forms devises its anti-inflammatory action on inflammatory cells, blood vessels and against the release or formation of mediators. Glucocorticoid receptor (GR), is a protein belonging to the superfamily of nuclear hormone receptors mediates the physiological and pharmacological effects of corticosteroids. The anti-inflammatory and immunosuppressive actions of corticosteroids are mainly attributable to the transcription, or repression, of genes expressed in immune cells. [17,18]

Most cases of intussusception have been caused by focal lymphoid hyperplasia in the terminal ileum which serves as a primary lead point causing invagination of the bowel loops. This highlights the use of steroids, that is Dexamethasone for the intestinal lymphoid hyperplasia which has been consequently advised as a treatment for idiopathic intussusception in children in to decrease the rate of recurrent intussusceptions. [5,15,17] Steroids in intussusception have been in use for more than 5 decades. Yet, it is surprising that has been no mention of this therapeutic modality in the current literature. [10, 12-14]

In our present study, early recurrence of intussusception was noted to be much less in the Dexamethasone group, in comparison to the non-Dexamethasone group, which is in concordance to the study by Essa et al. who evaluated the role of Dexamethasone in decreasing early recurrent intussusception and reported a higher incidence of early recurrent intussusception in the control group (14%) compared to the treated group (2.5%). [8]

In a study by Long et al who compared contrast media, imaging modalities, pharmacologic adjuvants, protocols for delayed repeated enema, surgical approaches and other curative techniques for intussusception management, it has been reported that dexamethasone intramuscularly as an adjuvant therapy may reduce intussusception recurrence after air or liquid enema and is preferred as a medical measure.[19] Similar interpretations are also made in a study by Lin et al in a prospective study with 6 months follow up, where there was statistically significant reduction in rate of recurrence in the group premedicated with intramuscular Dexamethasone before enema reduction than the control group and thereby concluded that premedication with intramuscular dexamethasone could decrease the rate of early recurrent intussusception by averting lymphoid hyperplasia.[9] Dexamethasone has the advantage

of being cheap and easily available. The patients treated with the steroid were found to have started orally post 8 hours of first attempt at reduction, thus requiring less hospital stay.

In our study, 7 out of 51 patients, all of them administered with Dexamethasone presented with recurrence after two attempts of ultrasound guided hydrostatic reduction post 24 hours of admission following which they were taken up for exploratory laparotomy. Intraoperative it was noted that all of them had lead points such as meckel's diverticulum, submucosal distal ileal mass, bowel adhesions secondary to previous surgery, ileal polyp and one was a case of ileo-colo-colic intussusception with meckel's diverticulum, a definitive indication for surgical management. Bowel resection and anastomosis was done in all cases. Post operative recovery was unremarkable in all 7 cases.

Limitations

1. Small sample size
2. The short duration of the study
3. Long term recurrence could not be evaluated

Conclusion

The discovery of corticosteroids more than six decades ago can be considered one of the most ground breaking in the last century. With this study, it can be concluded that Dexamethasone is a revolutionary drug that can be safely used in paediatric age group post ultrasound guided hydrostatic reduction to reduce the chances of early recurrent intussusception, adding another star to the uses of Dexamethasone in this age group.

Conflict of interest: The authors have no conflicts of interest to declare.

Funding statement: No funding sources or grants

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