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Original Research Article

Hydrostatic reducibility of intussusception among different age groups in paediatric population-a descriptive study

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ABSTRACT

Background: Intussusception is one of the most frequent causes of bowel obstruction in infants and toddlers. In children, it is often an idiopathic condition and treated non-surgically by radiologic reduction. Primary aim of study was to analyse the outcome of hydrostatic reduction of intussusception across different paediatric age group patients admitted in a medical college hospital.
Methods: This is a hospital based descriptive study conducted in tertiary care centre for one year duration in 2014-2015. 90 patients admitted with diagnosis of intussusceptions for hydrostatic reduction were interviewed with the proforma and details were collected. The procedural detail of hydrostatic reduction was also collected. Patients were followed up for a period of 48 hours post successful hydrostatic reduction.
Results: Hydrostatic reducibility of intussusception was 63.3% in less than 3 months age group compared to 93.3% each in other two groups. Overall hydrostatic reducibility was of 83.3%, while 16.7% went for laparotomy. First group had 36.7% cases gone for laparotomy. Analysis of each of the study variables was done to find out their association with hydrostatic reducibility. Only duration, bleeding per rectum, lethargy, dehydration, side of lesion and total count were found to have a statistically significant p value. Logistic regression analysis of the above five variables revealed that only the 'duration of symptoms' had a statistically significant independent association with hydrostatic reducibility of intussusception ,with a p value of 0.033 and odds ratio 12.477. 5.3% of cases of first group had recurrence within 48 hours of hydrostatic reduction, while 10.7% and 21.4% of cases from second and third group respectively had recurrence within 48 hours of reduction. Overall recurrence of intussusception within 48hours is 13.3%.
Conclusions: Hydrostatic reduction of intussusception is more successful in paediatric age group > 3 months compared to < 3 months. Shorter duration of symptoms, especially < 48 hours may have a favourable effect on hydrostatic reducibility of pediatric intussusception. Rate of recurrence of intussusception within 48 hours of successful hydrostatic reduction is 13.3 per 100 paediatric cases.

Keywords: Hydrostatic reduction, Intussusception, Ultrasound, Ileocolic

INTRODUCTION

Intussusception refers to a condition where one segment of the intestine becomes drawn in to the lumen of the proximal segment of the bowel. Intussusception is one of the most frequent causes of bowel obstruction in infants and toddlers. It is the most common abdominal emergency in early childhood, particularly in children younger than two years of age. Occasionally an intussusception may have an identifiable lesion that

serves as a lead point, drawing the intussusceptum into the distal bowel by peristaltic activity.[1-4] As the mesentery of the proximal bowel is drawn into the distal bowel, it is compressed, resulting in venous obstruction and oedema of the bowel wall. If reduction of the intussusception does not occur, arterial insufficiency will ultimately lead to ischemia and bowel wall necrosis. Although spontaneous reduction may occurs, the natural history of an intussusception is to progress to a fatal outcome as a result of sepsis unless the condition is recognized and treated appropriately.

Approximately 75 percent of cases of intussusception in children are considered to be idiopathic because there is no definite disease trigger pathological lead point. Idiopathic intussusception is most common in children between three months and five years of age and is often treated non-surgically by radiologic reduction. Intussusception is unusual in adults, and the diagnosis is commonly overlooked. In the majority of cases in older children a pathologic cause is identified.[3]

In the last few decades several studies were done worldwide demonstrating the effectiveness of hydrostatic reduction of intussusception. Its effectiveness is well established among the most common age groups (5-15 months). But, there is a difference of opinion regarding the effectiveness of hydroreduction in the unusual age groups (<3 months; >18 months). Our study aims in evaluating the effectiveness of hydro reduction of intussusception in different paediatrics age groups.[5,6]

METHODS

It is a descriptive study conducted in paediatric surgery division, Govt. Medical College. Study period was one year (2014-2015). Study population was the patients admitted in paediatric surgical wards that were diagnosed to have intussusception and attempted for ultrasound guided hydroreduction.

Patients presented with signs of peritonitis were excluded from the study. 90 consecutive cases admitted who were diagnosed to have intussusception without evidence of peritonitis and attempted for ultrasound guided hydroreduction was taken as sample.

Data was collected using a semi structured questionnaire based interview. Successful reduction or failure of reduction of intussusceptions was the outcome variable. Successful reduction of intussusception is demonstrated by the free flow of saline in to the distal ileum within two attempts of ultrasound guided hydroreduction.

Failure of reduction of intussusception is defined as absence of free flow of saline in to distal ileum within two attempts of ultrasound guided hydroreduction or perforation of bowel during the procedure. Data was analyzed using Chi square test and logistic regression.

RESULTS

Out of the 90 patients studied, 63.3% was male and 36.7% was females with a male to female ratio of 1.8:1(Table 1). 64.4% of the patients presented within 48 hours of symptoms and 35.6% patients presented after 48 hours (Figure 1).

Table 1: Gender.

Gender	Age groups						Total	
	0-3 months		3-18 months		>18 months			
	N	%	N	%	N	%	N	%
Male	17	56.7	21	70	19	63.3	57	63.3
Female	13	43.3	9	30	11	36.7	33	36.7
Total	**30**	**100**	**30**	**100**	**30**	**100**	**90**	**100**

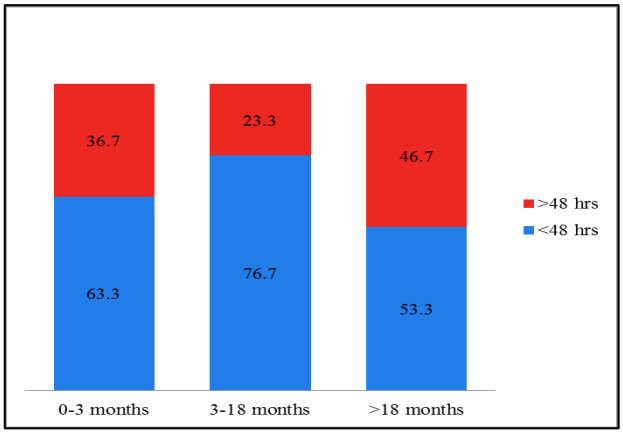

Figure 1: Bar chart showing age and duration of symptoms.

Bleeding per rectum was present in 37.8% patients and was absent in 62.2%. 67.7% of patients in the age group less than 3 months presented with bleeding per rectum, compared to 33.3% and 13.3% in 3 to 18 months age groups and >18 months age groups respectively.

Table 2: Side of the lesion.

Side of lesion	Age groups						Total	
	0-3 months		3-18 months		>18 months			
	N	%	N	%	N	%	N	%
Right	24	80	29	96.7	29	96.7	82	91.1
Left	6	20	1	3.3	1	3.3	8	8.9
Total	**30**	**100**	**30**	**100**	**30**	**100**	**90**	**100**

$\chi 2 = 6.860$; df = 2; p = 0.032.

36.7% of the patients had mass palpable per abdomen whereas 73.3% patients had no palpable mass. Lethargy was present in 21.1% of the patients overall with a maximum of 33.3% which was seen in the less 3 months age group. Overall, dehydration was present in 22.2%

cases with a maximum of 36.7% which was also seen in the less than 3 month age group.

History of antiepileptic drug intake was present in only 2.2% of cases. Respiratory tract infection was present in 23.3 % of the cases. The side of lesion was right side in 91.9% of patients (Table 2).

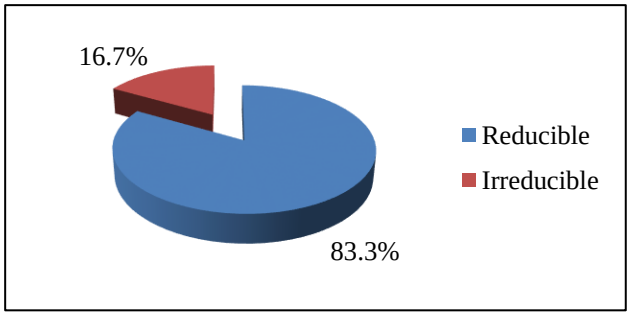

Figure 2: Pie chart showing overall hydrostatic reducibility.

Hydrostatic reducibility of intussusception was only 63.3% in, less than 3 months age group compared to 93.3% each in other two groups. Overall hydrostatic reducibility was of 83.3%, while 16.7 % went for laparotomy. First group had 36.7% cases gone for laparotomy (Table 3) (Figure 2).

89.5% cases of first group was reduced with less than 500 ml of fluid, whereas 67.9% and 60.7% of cases respectively of second and third group were reduced with >500 but less than 1000ml of fluid. 21.4% of the cases in third group required >1000 ml fluid for reduction. 97.3% of the cases were reduced in the first attempt itself (Table 4). 5.3% of cases of first group had recurrence within 48 hours of hydrostatic reduction, while 10.7% and 21.4% of cases from second and third group respectively had recurrence within 48 hours of reduction. Overall recurrence of intussusception within 48hours is 13.3 % (Figure 3).

Table 3: Hydrostatic reducibility.

Hydrostatic reducibility	Age groups						Total	
	0-3 months		3-18 months		>18 months			
	N	%	N	%	N	%	N	%
Reducible	19	63.3	28	93.3	28	93.3	75	83.3
Irreducible	11	36.7	2	6.7	2	6.7	15	16.7
Total	**30**	**100**	**30**	**100**	**30**	**100**	**90**	**100**

$\chi 2 = 12.960$; df = 2; p = 0.002.

Table 4: Volume of fluid.

Volume of fluid	Age groups						Total	
	0-3 months		3-18 months		>18 months			
	N	%	N	%	N	%	N	%
Up to 500 ml	17	89.5	9	32.1	5	17.9	31	41.3
500-1000 ml	2	10.5	19	67.9	17	60.7	38	50.7
>1000 ml	0	0	0	0	6	21.4	6	8
Total	**19**	**100**	**28**	**100**	**28**	**100**	**75**	**100**

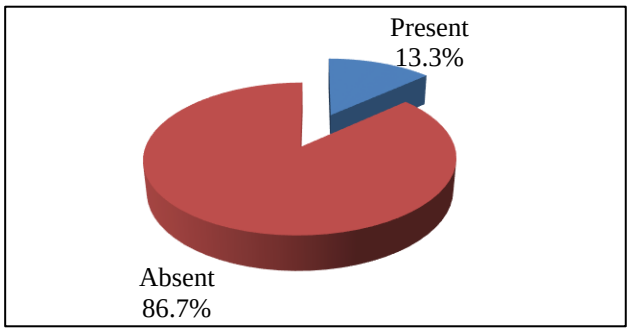

Figure 3: Pie chart showing overall recurrence.

Univariate analysis of each of the variables was done to find out their association with hydrostatic reducibility. Only duration, bleeding per rectum, lethargy, dehydration, side of lesion and total count were found to have a statistically significant p value (Table 6). 74.7% of the cases who were hydrostatically reducible had duration of symptoms <48 hours. 86.7% of cases who were irreducible had duration of symptoms > 48 hours (Figure 4). 69.3% of the reduced cases had no bleeding per rectum, whereas 73.3% of the irreducible cases had bleeding per rectum.

Table 5: Univariate analysis of each variable versus hydrostatic reducibility.

		Reducible		Irreducible		Total		χ^2	p
		N	%	N	%	N	%		
Gender	Male	49	65.3	8	53.3	57	63.3	0.775	0.379
	Female	26	34.7	7	46.7	33	36.7		
Duration	<48 hours	56	74.7	2	13.3	58	64.4	20.522	<0.001
	>48 hours	19	25.3	13	86.7	32	35.6		
Vomiting	Present	53	70.7	13	86.7	66	73.3	1.636	0.201
	Absent	22	29.3	2	13.3	24	26.7		
Bleeding PR	Present	23	30.7	11	73.3	34	37.8	9.681	0.002
	Absent	52	69.3	4	26.7	56	62.2		
Mass abdomen	Present	25	33.3	8	53.3	33	36.7	2.153	0.142
	Absent	50	66.7	7	46.7	57	63.3		
Lethargy	Present	7	9.3	12	80	19	21.1	37.481	<0.001
	Absent	68	90.7	3	20	71	78.9		
Dehydration	Present	7	9.3	13	86.7	20	22.2	43.251	<0.001
	Absent	68	90.7	2	13.3	70	77.8		
Weaning age	<4 months	20	26.7	2	13.3	22	24.4	1.203	0.273
	>4 months	55	73.3	13	86.7	68	75.6		
Antiepileptic drug	Present	1	1.3	1	6.7	2	2.2	1.636	0.201
	Absent	74	98.7	14	93.3	88	97.8		
RTI	Present	17	22.7	4	26.7	21	23.3	0.112	0.738
	Absent	58	77.3	11	73.3	69	76.7		
Side of lesion	Right	72	96	10	66.7	82	91.1	13.28	<0.001
	Left	3	4	5	33.3	8	8.9		
Total count	**<11000**	**55**	**73.3**	**5**	**33.3**	**60**	**66.7**	**9**	**0.003**
	>11000	**20**	**26.7**	**10**	**66.7**	**30**	**33.3**		

Table 6: Logistic regression analysis.

Variables	B	S. E.	p	OR	95% C.I. for OR	
					Lower	Upper
Duration	2.524	1.184	0.033	12.477	1.225	127.045
Bleeding PR	1.013	1.138	0.373	2.754	0.296	25.643
Lethargy	0.303	1.693	0.858	1.354	0.049	37.404
Dehydration	20.821	4519.565	0.996	1.1E+09	0	.
Side of lesion	19.659	4519.565	0.997	3.45E+08	0	.
Total count	0.352	1.146	0.759	1.422	0.15	13.435
Constant	-45.361	9039.13	0.996	0		

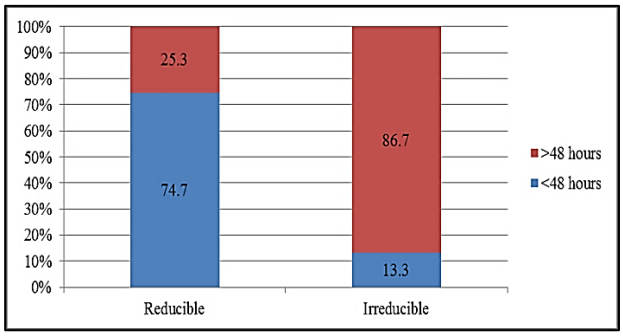

Figure 3: Bar chart showing duration versus hydrostatic reducibility.

Lethargy and dehydration was absent in 90.7% of the reducible cases. 80% and 86.7% cases respectively had lethargy and dehydration among those who were hydrostatically irreducible. 96% of the reducible cases were right sided lesions and 33.3% of irreducible cases were left sided lesions. 73.3% of reducible cases had total count <11000, and 66.7% of irreducible cases had total count >11000.

Logistic regression analysis of the above five variables revealed that only the 'duration of symptoms' had a statistically significant independent association with hydrostatic reducibility of intussusception ,with a p value of 0.033 and odds ratio 12.477 (Table 6).

DISCUSSION

In our study hydrostatic reducibility of intussusception was 63.3% in less than 3 months age group compared to 93.3% each in other two groups. Overall hydrostatic reducibility was of 83.3%, while 16.7% went for laparotomy. First group had 36.7% cases gone for laparotomy. In the study by Fike FB et al, the overall success rate was found to be 76.81%.[20] In the study performed by Suzanne Schuh et al, 84% success rate was noted among age group more than 18 months.[19]

Of the various factors favoring hydrostatic reduction studied only duration of symptoms, bleeding per rectum, lethargy, dehydration, side of lesion and total blood count were found to have a statistically significant p value in our study.

74.7% of the cases who were hydrostatically reducible had duration of symptoms <48 hours. 86.7% of cases who were irreducible had duration of symptoms > 48 hours. In the study by Frankie B. Fike et al, 57.5% with successful reduction had duration of symptoms less than 24 hours, and 59.3% of the cases with failed reduction had duration of symptoms more than 24 hours.[19]

69.3% of the reduced cases had no bleeding per rectum, whereas 73.3% of the irreducible cases had bleeding per rectum. In the study by Fike FB et al, 77.9% of cases had successful reduction when bleeding per rectum was absent and 43% failure when bleeding was present.[19]

96% of the reducible cases were right sided lesions and 33.3% of irreducible cases were left sided lesions in our study. Fike FB et al noted failure of hydrostatic reduction in 12% right colonic lesions, 27% of transverse colonic lesions, 57% of descending colonic lesions and 71% of recto-sigmoid lesions.[19] From these findings, we can infer that left sided lesions may have a less chance for hydrostatic reduction compared to right sided lesions.

Lethargy and dehydration was absent in 90.7% of the reducible cases. 80% and 86.7% cases respectively had lethargy and dehydration among those who were hydrostatically irreducible. 73.3% of reducible cases had total count <11000, and 66.7% of irreducible cases had total count >11000. Study by Fike FB et al showed that 94.7% of the successfully reduced cases did not have lethargy, whereas 22.1% of failure cases had lethargy.[19]

Even though the above six factors showed statistically significant p values, logistic regression analysis revealed that ‘durations of symptoms’ is the only independent factor favouring reducibility.

Recurrence of intussusception within 48 hours of successful hydrostatic reduction was found to be 13.3% in our study. In the study by Schuh S et al, early recurrence rate was found to be 14% which is comparable with the results in our study.[20]

CONCLUSION

Hydrostatic reduction of intussusception is more successful in paediatrics age group > 3 months compared to < 3 months. Shorter duration of symptoms, especially < 48 hours may have a favorable effect on hydrostatic reducibility of pediatric intussusception. Rate of recurrence of intussusception within 48 hours of successful hydrostatic reduction is 13.3 per 100 paediatrics cases.

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REFERENCES

1. Lloyd DA, Kenny SE. The surgical abdomen. In pediatric gastrointestinal disease: pathopsychology, diagnosis, management, 4th, Walker WA Goulet o, Kleinman RE, et al (Eds), BC decker, Ontario; 2004:604.
2. Mandeville K, Chien M, Willyerd FA. Intussusception: clinical presentations and imaging characteristics. Pediatr Emerg Care. 2012;28:842.
3. Blakelock RT, Beasley SW. The clinical implications of non-idiopathic intussusception. Pediatr Surg Int. 1998;14:163.
4. Navarro O, Daneman A. Intussusception. Part 3: Diagnosis and management of those with an identifiable or predisposing cause and that reduce spontaneously. Pediatr Radiol. 2004;34:305.
5. Del-Pozo G, Albillos JC, Tejedor D. Intussusception in children: current concepts in diagnosis and enema reduction. Radiographics. 1999;19:299.
6. Daneman A, Navarro O. Intussusception. Part 2: an update on the evolution of management. Pediatr Radiol. 2004;34:97.
7. Shekherdimian S, Lee SL, Sydorak RM, Applebaum H. contrast enema for pediatric intussusception: is reflux in to the terminal ileum necessary for complete reduction? J Pediatr Surg. 2009;44:247.
8. Ein SH, Shandling B, Reilly BJ, Stringer DA. Hydrostatic reduction of intussusceptions caused by lead points. J Pediatr Surg. 1986;21:883.
9. Dobranowski J. Manual of Procedures in Gastrointestinal Radiology, Springer Verlag, New York; 1990.
10. Kim YG, Choi BI, Yeon KM. Diagnosis and treatment ofchildhood intussusception using real time ultrasonography and saline enema. Preliminary report. J Korean Soc Med Ultrasound. 1982;1:66-70.
11. Guo JZ, Ma XY, Zhou QH. Results of air pressure enema reduction of intussusception: 6,396 cases in13 years. J Pediatr Surg. 1986;21:1201.
12. Stringer DA, Ein SH. Pneumatic reduction: advantages, risks and indications. Pediatr Radiol. 1990;20:475.

13. Fallon SC, Lopez ME, Zhang W. Risk factors for surgery in pediatric intussusception in the era of pneumatic reduction. J Pediatr Surg. 2013;45:1032.
14. Van den Ende ED, Allema JH, Hazebroek FW, Breslau PJ. Success with hydrostatic reduction of intussusception in relation to duration of symptoms. Arch Dis Child. 2005;90:1071.
15. Yang CM, Hsu HY, Tsao PN. recurrence of intussusception in childhood. Acta Pediatr Taiwan. 2001;42:158.
16. Stein M, Alton DJ, Daneman A. Pneumatic reduction of intussusception: 5- year experience. Radiol. 1992;183:681.
17. Daneman A, Alton DJ, Lobo E. Patterns of recurrence of intussusception in children: a 17- year review. Pediatr Radiol. 1998;28:913.
18. Gray MP, Li SH, Hofmann RG, Goerlick MH. Recurrence rates after intussusception enema reduction: a meta-analysis. Pediatr. 2014;134:110.
19. Frankie B. Fike, Vincent E. Mortellaro. Predictors of failed enema reduction in childhood intussusception. J Pediatr Surg. 2012.
20. Suzanne Schuh, David E. Wesson. Intussusception in children 2 years of age or older. CMAJ. 1987:136.

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