



Comparison of Abdominal X-ray Findings and Results of Surgery in Neonates with Gastrointestinal Obstruction

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Abstract

Background

Gastrointestinal (GI) obstruction is one of the most important surgical emergencies in neonates. Surgeons should select between conservative and invasive strategies. Imaging modalities are important in proper diagnosis. This study evaluates the sensitivity of abdominal radiographies (with or without contrast) in detection of neonatal GI obstruction.

Materials and Methods

A cross-sectional study was performed on 62 neonates admitted in NICU of 22 Bahman and Dr. Sheikh Hospitals (Mashhad, Iran) from June 2013 for two years. Radiographic findings were recorded in questionnaires and compared with surgical results in patients who underwent surgery. Statistical analysis was used for determining the sensitivity of radiologic investigations in diagnosis of neonatal gastrointestinal obstruction.

Results

From 62 neonates with GI obstruction, 46.8% of cases were female and the others were male. According to surgery results, the frequency of colon obstruction was 51.6% and small bowel obstruction, gastric outlet obstruction and esophageal obstruction were seen in 27.4%, 9.7% and 17.7% of cases, respectively. The sensitivity of radiographies (with or without contrast) in detection of upper GI obstruction was 100% and in lower GI obstruction was 95.2%.

Conclusion

Generally, sensitivity of radiologic studies (radiographies with and without contrast) in neonatal GI obstruction was 96.5%, so it is a valuable noninvasive diagnostic method in these diseases.

Key Words: Intestinal obstruction, Neonate, Plain radiography, Radiography.

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1- INTRODUCTION

The incidence of surgical emergency in neonates is 1-4 per 100 births (1), and gastrointestinal obstruction is one of the most common surgical emergencies (2). Neonatal intestinal obstruction has the rate of 1 in 1,500 live births (3). Clinical manifestations depend on the site and severity of obstruction. There are many different conditions, such as atresia and stenosis, annular pancreas, malrotation, duplication cyst, meconium ileus, meconium plug syndrome and neonatal small left colon syndrome, Hirschsprung's disease, neoplasia and trauma, which can cause intestinal obstruction in neonates (4). Meconium peritonitis is a rare prenatal disease with an increased rate of morbidity and mortality in the neonatal period (5).

Intestinal atresia accounts for approximately one third of all cases of neonatal intestinal obstruction (6) which occurs in the duodenum in most cases and rarely in the jejunoileal region (7). The mortality rate of neonatal intestinal obstruction is about 21 - 45% in developing countries and 15% in Europe (8, 9); so early diagnosis is very important. Imaging modalities have an important role in proper diagnosis. If only a few loops of dilated bowel are seen, a high obstruction is present. The plain radiograph is often diagnostic, as with the double-bubble sign of duodenal atresia (10). All neonatal high intestinal obstructions are surgical; in the cases of delayed surgery or normal plain abdominal X-ray, an upper gastrointestinal (UGI) series must be done to exclude malrotation and/or midgut volvulus which needs immediate surgery. We aimed to evaluate the sensitivity of abdominal radiographies (with or without contrast) in detection of GI obstruction.

2- MATERIALS AND METHODS

A cross-sectional study was performed on 62 neonates who were admitted in NICU of 22 Bahman and Dr. Sheikh

Hospital (Mashhad city, North East of Iran) from June 2013 for two years for gastrointestinal obstruction. Radiographies with and without contrast and surgical operation were done for all the cases. Neonates that were treated conservatively or those without radiography before surgery, were excluded from the study. Sample volume was calculated based on previous study (11) and following formula:

$$n = \frac{p(1-p) Z^2 (1-a/2)}{d^2}$$

$$0.5(1-0.5) * 1.96^2 / (0.5/4)^2$$

Radiographic findings were recorded in checklists and after surgery, surgical diagnosis was compared with them. Finally, statistical analysis was done using SPSS software version 21.0 to determine the sensitivity of radiologic investigations in diagnosis of neonatal gastrointestinal obstruction.

3- RESULTS

In this study 62 neonates with GI obstruction were investigated, of which 46.8% of cases were female and the others were male. There was no significant difference between genders (**Table.1**). Among patients, three cases had esophageal and colon obstruction. One case had two types of colon obstruction and one neonate had colon and bowel obstruction simultaneously. For 38.7% of cases plain radiography and for 61.3% of cases both radiography with and without contrast were done. According to surgery results, the frequency of colon obstruction was 51.6%, and frequency of small bowel obstruction, gastric outlet obstruction and esophageal obstruction were 27.4%, 9.7% and 17.7%, respectively. Comparison of radiographic findings with surgical result revealed that the sensitivity of radiographies was 100% for detection of upper GI obstruction (gastric outlet obstruction and esophageal obstruction) and 95.2% for lower GI obstruction (colon obstruction and small bowel obstruction)

(Table.2). There was no significant difference between radiography with or without contrast in lower GI obstruction ($p>0.5$).

Table1- Diagnostic findings in neonate radiographies

Findings in plain radiography	Number (%)	Findings in contrast radiography	Number (%)
Diffuse dilatation of bowel loops	33 (55)	Non passage of contrast from proximal bowel loops	25 (65.8)
Gastric Dilatation	22 (36.7)	Gastric Dilatation	20 (52.6)
Absent rectal gas	27 (45)	Non passage of contrast from distal bowel loops	12 (31.6)
Dilatation of proximal bowel loops	7 (11.7)		
Double bubble sign	3 (5)	Rectal or anal obstruction	1 (2.6)
Multiple air-fluid levels	2 (3.3)	Abnormal position of Treits ligament	7 (11)
Free gas in abdomen	0		

Table2. Comparing the sensitivity of radiography with surgery results in diagnosis of upper and lower GI tract obstructions

Type of radiography		Upper obstruction			Lower obstruction		
		Esophageal	Gastric outlet	Total	Small bowel	Colon	Total
Only plain X-ray	Before surgery	-	-	-	5	15	20
	After Surgery	-	-	-	5	15	20
	sensitivity	-	-	-	100%	100%	100%
With and without contrast	Before surgery	14	5	19	11	12	22
	After surgery	14	5	19	10	10	20
	Sensitivity (%)	100	100	100	90.9	91.6	90.9

4- DISCUSSION

In this study 62 neonates with gastrointestinal obstruction were selected. The diagnostic findings of radiographies with and without contrast in cases were compared with the results of surgical operation. From 62 cases in our study, three infants had esophageal atresia and colon obstruction and one case had two types of colonic obstruction (imperforate anus and sigmoid atresia) simultaneously. In the present study, 46.8% of cases were female and the others were male; and no significant difference was observed between genders ($p= 0.611$). Plain radiography was done in 20 neonates and for 38 patient's radiography with and without contrast was performed. The most common obstruction among the patients was colon obstruction (51.6%), because of Hirschsprung's and high type anus imperforate. Small bowel obstruction frequency was 27.4%. It was mainly due to

meconial ileus and duodenal atresia. The frequency of gastric outlet obstruction and esophageal obstruction was 9.7% and 17.7%, respectively. In a study in 2010 on 61 neonates with bile vomiting, which led to surgery in 16 cases based on surgery results, malrotation was found in 9.8% of patients and small bowel obstruction, Hirschsprung's and meconium ileus were seen in other operated cases (11). They reported a sensitivity of 85.2% for plain abdominal radiography and 34.4% for contrast radiographies in diagnosis of neonatal GI obstruction. The positive predictive value of contrast radiographies in operated cases was reported as 85.7% (11). In Malhotra's study in 1997, plain radiography was diagnostic in 50-60% of neonatal small bowel obstruction, equivocal in 20-30% and non-diagnostic in 10-20% (12). Lin's team mentioned that in small bowel malrotation, contrast radiography of upper GI system had more

diagnostic accuracy than barium enema (13). In the present study, the sensitivity of radiographies (with or without contrast) in detection of upper GI obstruction was 100% and in lower GI obstruction (Hirschsprung's and low and high type of imperforate anus) it was 95.2%.

5- CONCLUSION

Attention to the present study results shows, in the cases suspicious for upper GI obstruction, contrast studies are almost always necessary and confirms the diagnosis with 100% diagnostic accuracy, but in lower GI obstruction, plain x-ray should be performed first because of its favorable accuracy for detection of the level of obstruction and if it is equivocal or non-diagnostic, then contrast studies can be used.

6- CONFLICT OF INTEREST: None.

7- ACKNOWLEDGMENT

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