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# THE USE OF AIR INSUFFLATION IN THE MANAGEMENT OF INTUSSUSCEPTION

***[1]Dr. Majid Khalid Ali, [2]Dr. Mohammed Shamil Younis Khayyat and [3]Dr. Ranaa Nafei Majeed**

[1,2]M.B.Ch.B.-F.I.B.M.S/ Al-Khansa'a Teaching Hospital.
[3]M.B.Ch.B.-F.I.B.M.S/ Ibn-Al-Atheer Teaching Hospital.

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***Corresponding Author: Dr. Majid Khalid Ali**
M.B.Ch.B.-F.I.B.M.S/ Al-Khansa'a Teaching Hospital.

**ABSTRACT**

**Objective:** To study the management of intussusception by air insufflation in comparison with the traditional surgical methods from the point of cost and hospital stay. **Patients and Methods:** A prospective study of 78 cases of intussusception. All of our patients were managed at Al-Khansa'a Teaching Hospital between December 2020 and March 2023. **Result:** The method of air insufflation was used as the initial procedure in 31 cases. Surgery was used in cases with late presentation and in cases where air-reduction failed, or thought to be unsuccessful. There was only one recurrence following air insufflation reduction of intussusception giving an incidence of 4.1%, and no bowel perforation was encountered during the performance of the procedure. The operative findings of those patients with failed air insufflation reduction were recorded. In only 3 of them, there were resection of gangrenous bowel. No specific lead points were found in any of these seven patients. **Conclusion:** From this small prospective study we concluded that air- insufflation is a safe, simple and very effective method of treating intussusception.

**KEYWORDS:** No specific lead points were found in any of these seven patients.

## INTRODUCTION

Intussusception is a condition where one part of the gut is invaginated into another, usually proximal to the distal. It typically occurs in well-nourished male children aged 4 to 12 months, causing abdominal pain, vomiting, and normal stool. The cause is unclear, but it may be due to a larger ileum and ileocecal valve size in infants. Intussusception can occur after abdominal trauma or surgical procedures, but is typically idiopathic. Recurrent intussusception is more common in older children.[1,2]

Intussusception is a common condition in infants, primarily occurring in the first year of life, typically between 5 and 10 months. It is more common in white children and can be triggered by intestinal spasms or diet changes.[3] The human rotovirus is a major etiologic agent for acute gastroenteritis in infants, and increased serologic response to adenoviruses in children with intussusception may increase peristalsis. Symptoms include vomiting, abdominal pain, a palpable mass, and lethargy. Intussusception is often present in one-third of patients.[4]

Laboratory studies, such as white blood cell count and electrolyte loss, are used to identify peritonitis and electrolyte loss. Plain abdominal X-rays may not be necessary for diagnosis in patients with typical symptoms of Intussusception, but may show the absence of gas in the right lower quadrant and large bowel. Barium enemas are often used for diagnostic and therapeutic purposes, showing an abrupt termination of the barium column and a "coiled spring" sign. Ultrasound is recommended for initial screening of patients suspected of having intussusception, but is unnecessary in most infants and children due to the availability of simpler, reliable methods.[5-7]

Intussusception is a critical condition in young children, requiring intravenous fluids, nasogastric suction, and antibiotics. Treatment options include non-operative reduction using barium, water soluble or air enema, and operative technique. The choice depends on the patient's condition, disease duration, availability of skilled radiological services, and surgeon experience.[8,9] Hydrostatic or pneumatic reduction should be attempted under controlled conditions, with longer symptoms increasing the risk. Non-operative barium enema offers advantages like avoiding surgery risks and shorter hospital stays. Ultrasound-guided hydrostatic reduction

is popular for identifying ischaemic intussusception and predicting its reducibility.[9,10]

## PATIENTS AND METHODS

A prospective study of 78 patients with intussusception admitted to the pediatric surgery center in AL-Khansaa teaching hospital from December 2020 to the end of March 2023. Most of these cases came from Nineveh province, the rest were referred to our center from different areas in the north of Iraq.

A special data collecting form has been used including: Name, Age, Sex, Season, Residency, History of admission to other hospital, Clinical presentation, A coexisting illness, Investigations, Type of Management, and postoperative Notes and Complications.

The method of air insufflation was used as the initial procedure in 31 cases. Surgery was used in cases with late presentation and in cases where air-reduction failed, or thought to be unsuccessful.

## RESULTS

The majority of patients in this study were under the age of 1 year (89.7)%. 4-9 months being the commonest age group (73)%, with a peak incidence in the 6$^{th}$ and 7$^{th}$ months of age. Only 8 patients were between 1 and 5 years (10.2%). The youngest patient in this study were 2 males aged 1 month and the oldest was a male aged 5 years (Table.1)

**Table 1: Age Distribution.**

| Age (Months) | Number | Percent |
|---|---|---|
| 0-3 | 3 | 3.8% |
| 4-9 | 61 | 78.3% |
| 9-12 | 6 | 7.7% |
| 12-24 | 4 | 5.1% |
| 24+ | 4 | 5.1% |
| Total | 78 | 100% |

There were 57 males (73 %) and 21 females (27 %). The male to female ratio in this study was 2.7:1 (Table.2, FIG.5)

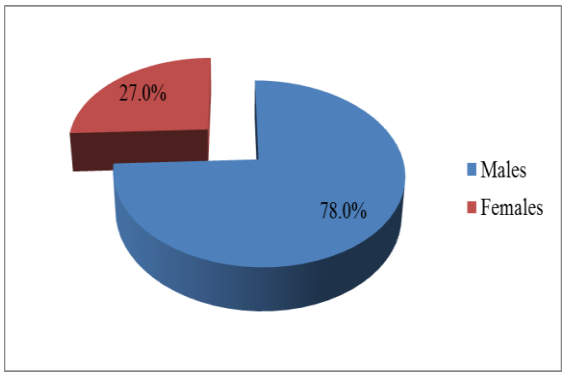


**Figure (1): Pie Chart Representing Sex Distribution.**

About (18%) of these cases in this study were presented within the first 24 hrs of the onset of symptoms, 34.5% of the cases were presented within 24-48 hr of the onset of symptoms, and 20.5% patients within 48-72 hrs. 27% of cases diagnosed after 72hrs. (Table 2).

**Table (2): Duration of symptoms.**

| Duration of symptoms | Number | Percent |
|---|---|---|
| 24-48 hours | 41 | 52.5 |
| 48-72 hours | 16 | 20.5 |
| More than 72 hours | 21 | 27 |
| Total | 78 | 100 % |

The majority of cases in this study were presented with vomiting, abdominal pain (screaming attack), bleeding per rectum (red currant jelly), and sometimes prolapsing bowel per rectum. In late cases constipation and abdominal distention were present (table 3). on physical examination abdominal mass were present in majority of cases. Red currant jelly (91%) and palpable mass sometimes detected on rectal examination. Abdominal distention and abdominal tenderness were found in late cases.

**Table (3): Clinical presentation.**

| | | Number | Percent |
|---|---|---|---|
| Symptoms | 1. Abdominal pain (screaming attacks) | 74 | 94.8 |
| | 2. Bleeding per rectum | 67 | 85.9 |
| | 3. Vomiting | 73 | 93.5 |
| | 4. Diarrhoea | 30 | 38.5 |
| Signs | 1. Abdominal mass | 66 | 84.6 |
| | 2. Red currant jelly | 71 | 91 |
| | 3. Abdominal distention | 28 | 35.9 |
| | 4. Palpable mass per rectum | 8 | 10.2 |
| | 5. Prolapsing bowel from anus | 4 | 5.1 |

On physical examination, abdominal mass was palpable in 66 (84.6%) patients, in 8 patients the mass was palpable on rectal examination, and in 4 patients the mass was prolapsed from the anus. No mass could be felt in 12 (15.4%) patients. (Table 4).

**Table (4): Location of the mass.**

| Location of the mass | Number |
|---|---|
| Right iliac fossa | 14 |

| | |
|---|---|
| Right hypochondrium | 25 |
| Epigastrium | 4 |
| Left hypochondrium | 6 |
| Left iliac fossa | 17 |
| Palpable on rectal examination | 8 |
| Prolapsing bowel from anus | 4 |

Among 78 cases, 31 cases were treated with Air insufflation from the start. 24 cases show successful reduction and 7 considered failure. Among these 7 there were 2 cases showing complete reduction by air insufflation during laparotomy with clear evidence of intussusception from the congested oedematous bowel and enlarged lymph nodes. There were 54 cases laparotomies: some of them done as preference of surgeons. The operative finding is shown in table 5.

**Table (5): Operative finding in 54 cases.**

| | | |
|---|---|---|
| Non-complicated Cases | Viable bowel<br>Serosal tear<br>Already reduced | 30<br>4<br>2 |
| Complicated cases | Gangrenous<br>Tumors(NHL)<br>Meckel's diverticulum<br>Cystic duplication of the caecum | 14<br>1<br>2<br>1 |
| Total | | 54 |

Most of the complications of treatment were observed in those underwent surgery and 3 patients died in the post-operative period, owing to severe sepsis and poor general condition preoperatively, in addition to electrolyte disturbances as shown in table (6).

**Table (6): Complications.**

| Complication | Air insufflation | | Laparotomy | |
|---|---|---|---|---|
| | No. | % | No. | % |
| Failure | 7 | 22.5 | - | - |
| Recurrence | 1 | 4.1 | - | - |
| Death | - | - | 3 | 5.5 |
| Faecal Fistula | - | - | 1 | 1.85 |
| Burst Abdomen | - | - | 1 | 1.85 |
| Superficial wound infection | - | - | 7 | 12.9 |

In the 7 cases with failed reduction, 2 cases showing complete reduction by air insufflation during laparotomy with clear evidence of intussusception from the congested oedematous bowel and enlarged lymph nodes, 3 cases were gangrenous intussusception, underwent resection, and 2 cases showing partial reduction, with easy manual reduction during laparotomy (Table 7)

**Table 7: Results of air-insufflation reduction.**

| Results of air-insufflation reduction | No. |
|---|---|
| Total | 31 |
| Successful reduction | 24 |
| Failed reduction | 7 |
| * Complete reduction during laparotomy | 2 |
| * Gangrenous bowel | 3 |
| * Partial reduction | 2 |

Reducibility versus duration of symptoms demonstrated in table (8) and showed that the most frequent air-insufflation achieved reduction of intussusception was in 24-48 hrs.

**Table (8): Reducibility versus duration of symptoms.**

| Duration | No. Of patients | Successful | Failed | % of Failure |
|---|---|---|---|---|
| 12-24 hours | 13 | 10 | 3 | 23 |
| 24-48 hours | 16 | 13 | 3 | 18.75 |
| 48-72 hours | 2 | 1 | 1 | 50 |
| Total | 31 | 24 | 7 | 22.5 |

Table (9) showed that with relation to the mass location as identified by physical examination at time of presentation, air-insufflation achieved reduction of intussusception as follows; 5 patients "out of 6" in

whom the mass was palpable in the right iliac fossa, while 13 patients "out of 15" in whom the mass was palpable in the right hypochondrium. In 2 patients "out of 4" in whom the mass was palpable in the epigastrium. In 3 patients "out of 4" in whom the mass was palpable in the left hypochondrium. In 1 patient "out of 2" in whom the mass was palpable in the left iliac fossa.

**Table (9): Reducibility versus mass location.**

| Mass location | No. of patients | Successful reduction |
|---|---|---|
| Right iliac fossa | 6 | 5(83.3) |
| Right hypochondrium | 15 | 13(86.6) |
| Epigastrium. | 4 | 2(50) |
| left hypochondrium | 4 | 3(75) |
| left iliac fossa | 2 | 1(50) |
| Total | 31 | 24(77.4) |

The period of hospitalization ranged from 24-48 hours, for a mean hospital stay, it is 36 hours (Table 10). The parents were informed about the possibility of recurrence.

**Table (10): Hospital stay after successful air-insufflation reduction of intussusception in 24 patients.**

| Hospital Stay | Number of Patients | Cause |
|---|---|---|
| 24 hours | 17 | Observation |
| 36 hours | 5 | Observation |
| 48 hours | 2 | vomiting twice |

The findings at laparotomy in these cases are summarized in (table 11). In 7 patients with failed reduction, symptoms lasted 24 hours. In 2 cases, a technical error occurred when the sigmoidoscope was used for insufflation. In 2 cases, complete reduction was achieved through air-insufflation, while in 3 cases, gangrenous bowel was present.

**Table (11): Operative findings in 7 patients.**

| Duration of symptoms | Number of patients | Operative findings |
|---|---|---|
| 24 hours | 2 | ileo colic intussusception. Complete reduction by air-insufflation during laparotomy. |
| 24 hours | 2 | ileo colic intussusception. Manual reduction |
| 24 hours | 3 | gangrenous bowel with resection and end-end anastomosis |

## DISCUSSION

Air-insufflation reduction was attempted as the primary line of treatment in 31 patients with intussusception selected to be candidates for this method of treatment over the period from December 2020 to March 2023 in pediatric surgery center at AL-Khansa'a hospital for sick children.

In our study, the majority of patients were under the age of 1 year (89.7%), 4-9 months being the biggest age group (73%), with a peak incidence in the 6$^{th}$ and 7$^{th}$ months of age. This is similar to studies done by Das et al.,[11] and Fahiem et al.,[12] Moreover, among the cases in Jena et al.,[13] 78.7% were infants with median age 8 months while Tesfaye et al.,[14] showed that the median age of the study participant was 13 months.

Regarding the sex distribution, the current study showed a male preponderance, 57 patients (73%) being males and 21 patients (27%) being females. The male to female ratio in this study was (2.7:1) & this is similar to the studies done by Tesfaye et al.,[14] Ghritlaharey et al.[15]

About (18 %) of these cases in our study were presented within the 1st 24 hours of the onset of symptoms. (34.5 %) of the cases were presented after 24-48 hours of the onset of symptoms, and (20.5 %) patients after 48-72 hours. (27%) were diagnosed after 72 hours. The average duration of symptoms in our study is corresponding to that reported by Baaker et al.[16] Delayed diagnosis is expected in our locality because of late referral by the parents and local general practitioner.

In our study, the majority of Intussusception cases were presented with vomiting (93.5 %), abdominal pain (screaming attack) 94.8 % bleeding per rectum (red currant jelly) 85.9 % and these are identical to those reported in the literature.[16, 17], 71 (91%) patients in our study passed redcurrant jelly stools either spontaneously or after rectal examination.

On physical examination, abdominal mass was palpable in 66 (84.6 %) patients. The sites of the palpable masses were as follows: 14 in the right iliac fossa, 25 in the right hypochondrium, 4 in the epigastrium, 6 in the left hypochondrium, 17 in the left iliac fossa, 8 palpable on

rectal examination, and 4 prolapsing bowel from anus. These findings were also consistent with those reported elsewhere.[15]

Once the diagnosis of intussusception has been made, there is a choice of treatment between operative and non-operative reduction using air- insufflation. The choice between the two methods depends on the general condition of the patient and the duration of the disease.[8] Air insufflation can be attempted in patients with symptoms of more than 48 to 72 hours provided that the general condition is good.

The procedure is fluoroscopically monitored, but it was not available in our study, The maximum safe air pressure is 80 mmHg for younger infants and 110 to 120 mmHg for older infants. Accurate pressure measurements are possible and reduction rates are higher than with hydrostatic techniques. A second trial of air reduction may be undertaken within a few hours if the child does not have an acute abdomen and the symptoms seem relieved but the original reduction failed to show reflux into the terminal ileum.[18] After successful reduction, the patients were observed for approximately 24 hours on intravenous fluids with nothing being given by month. Prior to the procedure, a period of preparation was undertaken involving the insertion of a nasogastric tube, adequate fluid resuscitation, and antibiotic therapy, followed by performing the procedure under general anesthesia.

In our study, air insufflation into the rectum achieved reduction in 24 patients for a successful reduction rate of (77.4 %). The success rate has varied among several series of patients from 80-95%.[9, 19] If we include those 2 cases which were explored and found complete reduction the rate of successful reduction will be 83.8%, but it was opened because of residual mass. This depends on several factors; early diagnosis, and management in a well-established pediatric surgical center and the experience of the surgeon. In our study, air insufflation achieved reduction in (76.9%) patients with the duration of symptoms from 12-24 hours, and in about (81.2%) of patients with the duration of symptoms from 24-48 hours, while it achieved reduction in only 50% of patients with the duration of symptoms from 48-72 hours. We found that as the duration of symptoms increase, the likelihood of air insufflation reduction of intussusception decreases, and this is similar to what was reported in other study.[20] The delay in presentation will give time to oedema and vascular changes that make the intussusception tighter and affect the ease of reduction to supervene.

Following successful air insufflation reduction, the period of hospitalization ranged from 24-48 hours for a mean hospital stay of 36 hours. This is similar to what was found in Ali et al.,[21] One of the advantages achieved by the non-operative treatment of intussusception is the shorter hospital stay as compared with that of the operative treatment (24 – 48 hrs. after successful air reduction compared with 5-7 days after operative technique).

There was only one recurrence following successful air insufflation reduction in our study giving an incidence of (4.1 %). An 11 months old female presented with recurrent intussusception 6 months after her first episode. The recurrence was managed operatively because the mass of intussusception was reached the anus. The intussusception was ileo colic and no specific pathological lead point was found. The low incidence of recurrence in our study may be due to the small sample of patients. In our study, no bowel perforation was encountered during the performance of the procedure. This reflect the strict evaluation of patients, and proper use of this technique. Also, it may be due to small sample in our study.

## CONCLUSIONS

Intussusception is a common surgical emergency in infancy and early childhood, affecting children under 2 years old. Symptoms are longer than reported due to delays, mismanagement, and lack of awareness. The procedure, performed under general anesthesia, has a success rate near the literature average, making it ideal for small hospitals.

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