



# Influence of Contents in Manual Reduction of Incarcerated Inguinal Hernia in Neonates and Infants

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## ABSTRACT

**Background:** Incarceration of the intestine is frequently seen in inguinal hernia in infants below one year of age. Most of the cases are seen in neonates below the age of one month. Manual reduction is the first line of treatment in cases with an incarcerated inguinal hernia in neonates and infants before they are operated upon. If the reduction is successful, then surgical repair is performed after 48 hours. It was observed that in some cases of incarceration manual reduction fails. Our observation is that in the cases where manual reduction fails, the nature of contents of hernia sac play an important role. **Objective:** To identify the nature of the contents of incarcerated inguinal hernia sac in neonate and infants in whom manual reduction was unsuccessful. **Study Design:** Observational study. **Duration:** January 2016 to June 2018. **Setting:** Department of Pediatric Surgery, Allied Hospital, Faisalabad Medical University Faisalabad and Faisal Hospital, Canal Road, People's Colony, Faisalabad. **Methodology:** All male & female neonates and infants presenting with an incarcerated inguinal hernia were included in this study. Cases with other anomalies having incarcerated inguinal hernia were excluded from this study i.e. anorectal malformations, spina bifida, babies with ventriculoperitoneal shunts etc., Informed consent was obtained from their parents. **Results:** There were 72 cases with age ranging between 36/40 weeks to one year. There were 62 males and 10 females. Manual reduction was performed in male babies only. Out of 62 male babies, 6 were premature, 40 were neonates and 16 were infants. Babies with failed manual reduction underwent immediate surgery. In the 6 preterm babies' manual reduction was successful. Manual reduction was successful in 42 cases. In the 13 cases who had to be operated upon caecum alone or accompanied with the appendix was found on the right side. In one case Meckel's diverticulum with rim of ileum was found on right side. On the left side caecum with appendix was seen in two and in the other 4 a loop of sigmoid colon full with semisolid stool was present. The gut was viable in all cases and was reduced manually. **Conclusion:** Amyand hernia found major cause of failed manual reduction along with impacted stool in sigmoid colon.

**Keywords:** Manual reduction, Right inguinal hernia (RIH), Left inguinal hernia (LIH), Incarcerated, Amyand hernia.

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Submitted for Publication: 16-12-2019

Accepted for Publication: 21-01-2020

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**Citation:** Mahmood K, Siddiqui MK, Khalid MB. Influence of Contents in Manual Reduction of Incarcerated Inguinal Hernia in Neonates and Infants. APMC 2020;14(1):62-5.

## INTRODUCTION

Inguinal hernia is the commonest condition requiring surgery in infancy and neonatal age. It occurs in 0.8% to 4.4% of live male births.<sup>1,2</sup> The incidence is lower in females.<sup>3</sup> Contents can become incarcerated in the hernial sac. This usually involves the gut, if appendix is present it is called Amyand hernia. But the ovary can also be involved in the females.<sup>4,6</sup> The occurrence of this complication (incarceration) varies between 7-16 % and is more commonly seen in premature neonates with incidence of 30%.<sup>3,6</sup> If the contents become incarcerated in the sac the patient presents with signs of acute intestinal obstruction. The initial management in these cases is manual reduction of the contents under sedation. This is successful in 95% of cases. These undergo operative correction of the condition after 48 hours when the edema of the hernial sac and surrounding tissues subsides.<sup>2</sup> This management plan is widely accepted all over the world in expert hands with reports of few complications. It is uncommon to find gangrenous bowel even if manual reduction failed.<sup>4</sup>

**Objective:** The objective of the study was to see the different inguinal hernial contents that incarcerate in the sac in neonates, premature babies and in infants in which manual reduction failed.

## METHODOLOGY

**Study Design:** It is an observational study. A retrospective review was done of the cases presenting with incarceration, in whom manual reduction was not successful. This was done to identify the contents of the hernias in those cases and see if this had a relation with the failure of manual reduction.

**Settings:** Pediatric Surgery Department, Allied Hospital, Faisalabad Medical University, Faisalabad and Faisal Hospital, Canal Road, Peoples Colony, Faisalabad Pakistan.

**Duration:** January 15, 2016 to June 14, 2018.

**Sample Size:** 62 patients, age range 36 weeks to 1 year.

### Operational Definitions:

**Incarcerated Inguinal Hernia:** Incarceration is entrapment of bowel without the vascular compromise of strangulation.

**Manual Reduction:** Manual reduction is a non-operative maneuver in which gentle pressure is applied under sedation to reduce the contents of the incarcerated inguinal hernia by expert hands.

**Pre-term:** Baby born alive before 37 weeks of pregnancy is called preterm baby.

**Neonate:** A new born baby in first 4 weeks after birth is called neonate.

**Infant:** The term "infant" is typically applied to young children under one year of age.

**Sampling Technique:** Convenience sampling/Non probability consecutive sampling.

#### Sampling Selection

**Inclusion criteria:** All male & female premature, neonates and infants with incarcerated inguinal hernias included in this study.

**Exclusion criteria:** Males & females' babies with incarcerated inguinal hernia with other anomalies like anorectal malformation, spina bifida, babies with ventriculoperitoneal shunts etc are excluded in this study.

**Non operative management:** We prefer the following technique. Sedation was given with midazolam (Dormicum) 50-100mcg/kg i/v over 2-3 minutes diluted before manual separation. Make the child lie down and calm him without feeding with the feet elevated on the baby couch. You should Stand on the ipsilateral side of the child, or at the feet of an infant, place the left index and middle finger on the ipsilateral anterior superior iliac crest and sweep the fingers down along the inguinal canal toward the ipsilateral scrotum, keeping tension on the testicle in the male child, inguinal mass, or scrotal skin with the left hand. Apply constant gentle traction on the scrotum skin with the left hand. Constant gentle traction on the scrotum helps align the long axis of the hernia sac with the axis of the inguinal canal. Next, at the level of the ipsilateral internal ring, apply pressure with the right index finger and thumb on either side of the hernia neck. This, along with traction on the scrotum, helps to align and to keep open the external and internal rings. It also prevents the hernia sac from overlapping or being caught on these potential barriers during reduction. Finally, with the left hand at the apex of the mass, and with constant pressure at the level of the internal ring from the right index finger and thumb, walk your left fingers slowly up the groin toward the internal ring, keeping constant pressure on the bottom of the hernia contents. This may take several minutes. If successful, the hernia contents will gradually disappear into the internal ring. To be certain it is reduced; compare it with the contralateral side. Use a mirror image technique for the right side.<sup>7</sup> If this technique is unsuccessful or the child has a difficult time tolerating it, sedation may be used. We do not recommend reduction of the bowel under general anesthesia because injury to the bowel may occur or gangrenous bowel may be placed back into the peritoneal cavity and be unrecognized. Often sedation alone may be sufficient to promote spontaneous reduction. Then inguinal hernia repair is performed after 24-48 hours when the edema of the hernia sac and surrounding tissues subsided.<sup>2,4</sup> The cases where manual reduction fails proceed for surgical operation after preparation immediately to reduce the contents of incarcerated hernias.

## RESULTS

Seventy-two babies fulfilling the inclusion criteria, with informed consent from their parents, during January 2016 to June 2018 were included in the study. 62 were males and 10 were females. In 10 female babies, 2 were premature with gestational age 36 weeks and 8 were neonates. Manual reduction was not done in female babies as reducing the ovary is difficult and may damage it. They are operated upon as soon as possible.

Out of 62 male babies, 6 were premature, 40 were neonates and 16 were infants. Routine laboratory tests and clinical examination were performed. Manual reduction was performed in all male babies and results were noted. The ages of the cases and side involved is shown in table 1

**Table 1: Ages of the patient and side involved**

	Right inguinal Hernia (RIH)	Left inguinal Hernia (LIH)	Total
Premature	4(66.6%)	2(33.3%)	6 (9.67%)
Neonate	27(67.5%)	13(32.5%)	40(64.51%)
Infants	12(75%)	4(25%)	16(25.80%)

Manual reduction was successful in all of the 6 premature cases. They were operated upon after 48 hours. The results of manual reduction performed in the 40 neonates is given in table 2.

**Table 2: Side of the hernia and result of Manual Reduction**

Side of hernia	Manual reduction successful	Manual reduction Failed
RIH 27(67.5%)	17(62.96%)	10(37.04%)
LIH 13(32.5%)	9(69.23%)	4(30.77%)

In 16(N) infants with incarcerated inguinal hernias manual reduction was attempted and the results are given in table 3.

**Table 3: Side of infant hernia with result of Manual Reduction**

Side of hernia	Manual reduction successful	Manual reduction Failed
RIH 12(75%)	8(66.66%)	4(33.33%)
LIH 4(25%)	2(50%)	2(50%)

Manual reduction was not successful in 20 cases and was not attempted in 10 female cases and these cases were operated upon. The nature of the contents found in the hernial sac was noted and is described below. The nature of the contents found in the hernial in 10 female babies is shown in table 4.

**Table 4: Nature of contents found in the hernial sac of females**

RIH	n (%)	LIH	n (%)	BIL. H	n (%)
Ovaries on the wall of the sac	4 (80)	Ovaries in the sac	2 (66.66)	Ovaries in the sac	2 (100)
Ovary reduced spontaneously before operation	1 (20)	Fallopian tube & ovary	1 (33.33)		

The nature of the contents found at operation in neonates is given in table 5.

**Table 5: Nature of contents found in the hernial sac of neonates**

Side of hernia with failed manual reduction	Contents noted during surgery	n (%)
RIH 10	Cecum	4 (40)
	Cecum with appendix	6 (60)
LIH 4	Cecum with inflamed appendix 1 (25)	1 (25)
	Hard stool impaction in sigmoid colon 3 (75)	3 (75)

The nature of the contents of the hernial sac in infants with failed manual reduction were shown in table 6.

**Table 6: Nature of the contents of the hernial sac in infants**

Side of hernia with failed manual reduction	Contents noted during surgery	n (%)
RIH 4	Meckel's diverticulum with rim of ileum	1 (25)
	Cecum with appendix	3 (75)
LIH 2	Cecum with appendix	1 (50)
	Hard stool impaction in sigmoid colon	1 (50)

## DISCUSSION

In pediatric surgery practice the inguinal hernial repair is performed electively except those who have experienced incarceration.<sup>2,8</sup> According to some studies early intervention to prevent incarceration is advocated because prematurity and prolong waiting time after diagnosis were reported to be significant risk factors. However, early intervention may lead to a high risk of anesthesia related complications in infants and premature babies.<sup>9,10</sup> FDA drug safety communication warning, general anesthesia and sedation drug may affect the developing brain in children.<sup>11</sup> In our study we noted that inguinal hernial contents play very important role in manual reduction of incarcerated inguinal hernia in neonates and infants. In our study the manual reduction was successful 100% in premature babies, neonates 62.96%-69.23% in RIH & LIH respectively. In infants the successful manual reduction was 66.66%-50% in RIH & LIH respectively. Stylianos S *et al* reported successful manual reduction in 84% of the cases comparable with our study.<sup>2</sup> Rescorla FJ & Grosfeld *et al* reported successful manual reduction rate in incarcerated inguinal hernia was 70%- 90% respectively also comparable with our study.<sup>12</sup> Ghoroubi *et al* found inguinal hernia most commonly in male children (83.7%) and on right side comparable with our study. They performed manual reduction primarily and found in 42.8% of cases manual reduction failed is comparable with our study in which unsuccessful manual reduction rate was 37.78%.<sup>8</sup> Mishra PK *et al* came to conclusion in their study that both open surgery and laparoscopic repair of incarcerated inguinal hernia in children offer safe surgery and comparable outcomes.<sup>12</sup> We did not attempt manual reduction in female babies because the contents of sacs were ovaries and tubes. It is difficult to reduce

ovaries and you may damage it during reduction. We found ovaries in the wall of sac, ovaries and fallopian tubes during exploration.<sup>5</sup> In our study bilateral inguinal hernias were noted in female gender is comparable with the study of Dimisa N *et al* where they noted prematurity and female gender are risk factor for bilateral hernias.<sup>3</sup> In all cases where manual reduction was successful surgeries were performed after 48 hours. In those cases where manual reduction was not successful, after operation no evidence of reduction of gangrenous intestine was noted. Its comparable with the study of Sparnon AL *et al* and in two series each reviewing 1000 consecutive inguinal hernias in infants, no need for exploring laparotomy after reduction of doubtful bowel was noted.<sup>4</sup> Mishra PK *et al* in their study concluded that in incarcerated inguinal hernia laparoscopic repair and open surgery have comparable outcome.<sup>13</sup> Narci A *et al* reported that in girl's sonography for inguinal masses preoperatively may be misleading.<sup>14</sup> Sokratous A *et al* in their study noted less than 1% recurrence rate after incarcerated inguinal hernial repair in pediatric patients. They also stated that groin surgery in childhood is a risk factor for the development of groin hernia in adult age.<sup>15</sup> Ein SH *et al* noted very large incarcerated inguinal hernias up to scrotum containing bowel loops in it.<sup>16</sup>

In our study we observed that contents of hernial sac play very important role in the manual reduction of hernia. In right sided hernias where manual reduction failed, the contents noted during operation were cecum, cecum with appendix and in one case Meckel's diverticulum with rim of ileum. In left sided hernias contents were Cecum with inflamed appendix and cecum with appendix where manual reduction failed. In rest of the cases of left sided inguinal hernias stool impaction in the cecum was noted where manual reduction failed.

## CONCLUSION

Amyand hernia is the leading cause of failed manual reduction in neonates and infants, followed by stool impaction in the sigmoid colon. In female babies where manual reduction was not performed, the contents were ovaries & fallopian tubes.

## LIMITATIONS

Retrospective study design with a small sample size, conducted in two Pediatric Surgical Units with the same surgical team are the limitation of this study.

## SUGGESTIONS / RECOMMENDATIONS

It is recommended that further prospective studies with case control design to include this technique in the management of incarcerated inguinal hernia in neonates and infants.

## CONFLICT OF INTEREST / DISCLOSURE

None.



## ACKNOWLEDGEMENTS

I am thankful to Prof. Dr. Sajid Hameed and our team for helping us to conduct this study.

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