

Incarcerated and Strangulated Inguinal Hernias in Children: A 10-Year Retrospective Analysis

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Abstract

Background: In pediatric inguinal hernia, the most feared complication is incarceration, which can lead to catastrophic consequences if not resolved expeditiously. **Aims:** This study assessed the usefulness of manual reduction of complicated inguinal hernia in children. **Settings and Design:** This study was designed to study the age at presentation, gestation age at birth, duration of symptoms, success rate of manual reduction of incarcerated inguinal hernia, subsequent treatment, operative findings, and outcome of strangulated cases in pediatric patients. **Materials and Methods:** This is a retrospective study involving 56 children under 15 years of age with a diagnosis of complicated inguinal hernia managed between January 2009 and December 2018 at a tertiary care hospital in Nigeria. Demographic characteristics, clinical presentations, management, and outcome were retrieved. Data were analyzed using SPSS software version 22 (IBM Corp., NY, USA). The results were presented as frequencies and percentages. Categorical variables were analyzed using Chi-square test. $P < 0.05$ was deemed statistically significant. **Results:** The age of patients ranged between 8 days and 14 years, with a median of 2 months; 79% were infants. Males outnumbered females by a ratio of 27:1, and the rate of incarceration was 5.0%. Majority (89.3%) had no previous hospital visits. Those who had successful manual reduction was 80%. Time of presentation was a statistically significant factor for successful reduction, $P < 0.05$. One patient experienced *en masse* reduction, and there was no mortality. **Conclusion:** Majority of those with incarcerated inguinal hernias were infants, and manual reduction was associated with early presentation.

Keywords: Children, incarcerated, inguinal hernia, manual reduction, strangulation

INTRODUCTION

Inguinal hernias are extremely common congenital abnormalities in children, and they constitute a larger part of the general pediatric surgical practice.^[1-3] It occurs as a result of persistence of the processus vaginalis.^[4-6] Once diagnosed, early treatment on an elective basis to prevent the risk of complications such as incarceration, intestinal obstruction, and strangulation has been advocated by most surgeons.^[7,8]

Incarceration occurs in about 3%–18% of children with inguinal hernias.^[3,9] The risk is even higher in infants, particularly those under 6 months, and premature babies. This is because they have a relatively tighter internal ring and inguinal canal which easily traps herniated bowel loops. Thirty percent of boys who experience incarceration are at a risk of testicular atrophy that may affect fertility in future.^[5,6]

There is a universal consensus among pediatric surgeons that attempts at manual reduction by gentle taxis are both safe and

effective especially when there are no signs of strangulation or peritonitis.^[10] Literature reports indicate that 70%–95% of incarcerated inguinal hernias can be successfully reduced manually.^[3,9] Once an incarcerated hernia is reduced, a delay of 24–48 h is necessary to allow resolution of edema of the content of the hernial sac.^[8,9]

This study highlights our experience in the management of incarcerated indirect inguinal hernia in children in a tertiary care hospital in Southwest Nigeria.

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MATERIALS AND METHODS

This retrospective study was conducted at the Children Emergency/Division of Paediatric Surgery, Department of Surgery of Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Southwest Nigeria, during the period from January 2009 to December 2018. Fifty-six patients with incarcerated and strangulated inguinal hernia were included in the study. The data extracted from the case notes were demographic characteristics, gestational age at birth, duration of symptoms, clinical features, and modality of treatment at presentation. Other information retrieved included side involved, location of incision (groin or abdominal), intraoperative findings, and postoperative complications. Following admission, patients were resuscitated with intravenous infusion of 4.3 dextrose in 1/5 saline, intravenous antibiotics, urinary catheterization to monitor renal perfusion, and nasogastric tube aspiration to decompress the bowel. Treatment protocol consisted of manipulative reduction by gentle taxis with or without sedation (intravenous diazepam), analgesics (intravenous pentazocine), and elevation. The practice in the unit was to operate those who had successful reduction within 24–48 h on the next available operating day. Exclusive criteria for manual reduction included gross abdominal distension, severe tenderness, hyperemia over the groin swelling, and high-grade fever. Those who had failed reduction as well as those with strangulation had emergency surgery. Sample size was calculated using Sathian *et al.*'s formula^[11] and a prevalence of 13.9%^[6] of obstructed hernia in children. A pilot study over 5 years showed that an average of five cases of obstructed hernias were seen per annum. The minimum sample size estimated was 50.

Statistical analysis

Data collected were analyzed using the SPSS software version 22 (IBM Chicago, IL, USA). The results were presented as tables and frequencies. Continuous variables were compared with *t*-test and categorical variables with Chi-square or Fisher's exact test. $P < 0.05$ was deemed statistically significant.

RESULTS

During the period under review, a total of 1115 patients with inguinal hernias were managed, of which 56 (5.0%) cases presented with features of incarceration and strangulation. There were 54 (96.4%) males and 2 (3.6%) females, with a male-to-female ratio of 27 to 1. Their ages ranged from 8 days to 14 years, with a median of 2 months.

More than three-quarter of the children were infants. Table 1 shows the age distributions of the patients. Only five (8.9%) patients were born prematurely (before 37 weeks of gestation), while fifty (89.3%) cases had no previous hospital visits, among whom three were premature babies. There were 39 (69.6%) hernias on the right and 17 (30.4%) hernias on the left.

The duration of symptoms varies from 1 to 120 h, with a median of 24 h. Twenty-four (42.9%) patients presented after

24 h of the onset of symptoms. The most common symptoms were painful (or inconsolable cry), irreducible, inguinoscrotal swelling, vomiting, and constipation. Other clinical features are shown in Table 2.

Nonoperative manual reduction was attempted in fifty (89.2%) patients and was successful in forty (80.0%) cases. In this cohort of patients, there was a statistically significant difference between the duration of pain which heralded the onset of incarceration and successful manual reduction, $P < 0.05$ [Table 3]. Following reduction, the patients were on admission for 24 to 48 h, and there were no postreduction features of peritonitis.

Sixteen patients including six who were not eligible for manual reduction because of strangulation and ten who had failed reduction, had emergency surgery; these included 1 exploratory laparotomy for generalized peritonitis and 15 groin surgeries. Findings at surgery were nine viable edematous bowel and spermatic cord; one patient with reduction *en masse*, though the bowel loop was viable; and six gangrenous small bowel loops. The median duration of painful groin swelling in those with strangulation was 3 days.

The 56 children had herniotomy including six bowel resection and anastomosis. All surgeries were done under general anesthesia. Of the 40 patients who had successful manual reduction, 32 cases were operated within 24 to 48 h on a routine list. Others were operated within 2 weeks. Postoperative complications were observed in five (31.25%) patients; these

Table 1: Age distribution of patients

Age group (months)	Frequency (%)
0-1	17 (30.4)
2-12	27 (48.2)
13-48	8 (14.3)
49-180	4 (7.1)

Table 2: Clinical presentations of patients

Clinical features*	Frequency (%)
Painful irreducible groin swelling	56 (100)
Vomiting	40 (71.4)
Constipation	15 (26.8)
Abdominal distension	14 (25.0)
Fever	7 (12.5)
Dehydration	12 (21.4)

*Multiple response

Table 3: Relationship between the duration of symptoms and manual reduction of incarcerated hernia

Duration of symptoms (h)	Successful reduction, <i>n</i> (%)	Nonsuccessful reduction, <i>n</i> (%)	<i>P</i>
1-24	29 (72.5)	3 (30.0)	0.024
>24	11 (27.5)	7 (70.0)	

included scrotal hematoma in two patients which subsided over time, surgical-site infection in two patients, and adhesive bowel obstruction in one patient. There were no deaths recorded.

DISCUSSION

In this study, gentle taxis under mild sedation successfully reduced 80% of incarcerated or obstructed inguinal hernia. Literature reports have shown that 70%–95% of incarcerated inguinal hernia can be reduced nonoperatively.^[10,12,13] However, the rate of successful reduction appeared to be much lower in studies in Nigeria. It varies between 46.3% and 57%, which the authors attributed to the late presentation of patients to their centers.^[6,14]

The rate of incarceration has been reported in the general pediatric population to be between 3% and 18%, with higher incidence in infants.^[3,9] In this series, 5.0% of patients managed for indirect inguinal hernias presented with complicated hernias. Incidences in North-central and Southwest Nigeria vary from 4.8% to 13.9%.^[6,14,15] Zamakhshary *et al.*^[5] in Ontario, Canada, found an incidence of 11.9%.

Majority of children in our study were infants. This is comparable to previous reports.^[3,8,14] In a comparative study, Lawal *et al.*^[16] observed that infants are three times more likely than older children to develop complicated hernia. This has underlined the high risk of complicated hernias in infants and as such has brought to fore the need for early elective surgery, particularly in this category of children. Unfortunately, most (89.3%) of the patients in this study presented for the first time with complicated hernias. This is consistent with other reports.^[6,14] It is possible that these children could have developed hernias for some period of time before complications occurred, but ignorance and poverty contributed to delay in presentation. Notwithstanding the fact that most patients in our series had no previous visits, Zamakhshary *et al.*,^[5] in a study of 1065 infants and children under 2 years of age who underwent surgical repair of an inguinal hernia, posited that the risk of developing an incarcerated hernia could be reduced by almost 50% if the hernia were repaired within 14 days after diagnosis. This study had three preterm children who had visited the hospital prior to incarceration. In our practice, we operate on this group of infants after 45–50 weeks of postconception age because of fear of postanesthetic apnea of prematurity. Although there is no consensus on the appropriate age of operation, some authorities believe that all preterm babies should be operated before discharge from baby care unit or soon after diagnosis is made.^[3,9,10]

The duration of symptoms is an important predictor of outcome of manual reduction of incarcerated hernia. The median duration of painful groin swelling in this study was 24 h, and it has significant influence on those who had successful manual reduction. Majority of those who had failed reduction and strangulated obstruction presented late (after 24 h). Previous reports^[6,14] noted that early presentation is a panacea to nonoperative reduction, while late presentation often results

into emergency surgery. Bamgbola *et al.* and Lawal *et al.*^[6,14] in their series found a median duration of symptoms of 18 h and 48 h, respectively. Late presentation is a common phenomenon in our environment and is a reflection of the low socioeconomic status of our populace.^[6,14]

Those children who underwent successful nonoperative reduction in this study were admitted to the ward for close observation and to allow edema to subside. The protocol in this unit is to operate these patients within 24–48 h on a routine list because parents may not return for surgery on time if allowed to take their wards home after successful manual reduction. This is particularly important because there may be recurring episodes of incarceration. However, if the parents are reliable and we cannot easily reschedule the repair without prolonging the hospital stay, we may make an exception and operate as soon as possible. Fortunately, 25% of those who had successful reduction were operated within 2 weeks without recurrence. This is the practice in most hospitals in our environment although there may be variation in the modality of management of this group of patients. In a comparative study of 75 patients who had herniotomy within 72 h of successful manual reduction and 108 patients who had delayed herniotomy 1 to 4 months after successful nonoperative reduction, Gahukamble and Khamage^[17] observed that 15.7% of patients in the latter group had 34 episodes of repeated incarcerations between 5 days and 4 months after reduction. It was thus recommended that herniotomy should be done at most 5 days after a successful manual reduction.

It is worth noting that in this series, one patient though regarded as part of failed reduction had reduction *en masse*. We attribute this to the overzealous reduction on the part of an inexperienced surgical resident. Although the risk of *en masse* reduction has been calculated to be 1 in 13,000,^[18] this kind of problem should be envisioned and guarded against as meticulous manual reduction by taxis under sedation, analgesics, or both and simple elevation may be necessary. Therefore, a high level of suspicion is essential, especially when patients continue to have persistent vomiting, progressive abdominal distention, and inconsolable cry or pain following manual reduction. This again has underscored the need for postreduction admission of patients to the ward as serious complications may still occur even after straightforward reduction.

The incidence of postoperative complications (infarction of testis, ovary, or intestine; surgical-site infection; and injury to adjacent structures) following incarcerated inguinal hernia varies between 4.5% and 33%.^[3] Five (31.25%) patients had postoperative complications in this study, and they vary from scrotal hematoma, surgical-site infection, to adhesive bowel obstruction, which were managed conservatively. We had no incidence of recurrent hernia, testicular infarction, or iatrogenic ascent of testicles in our patients. We recorded no mortality in this study. The outcome of the management in this series is consistent with what had been reported from

similar setting where patients presented late after the onset of incarceration.^[6,13] The limitation of this study is that we could not determine how long the patients had developed inguinal hernia before complication sets in.

CONCLUSION

This study has shown that incarceration is more frequent in infants. Patients who present early are more likely to have successful manual reduction.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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ملخص المقال باللغة العربية

الفتق الأربيّ المخنوق والمحصور عند الأطفال: تحليل استعادي لمدة 10 سنوات

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الخلفية: تكون المضاعفات الأكثر خوفاً في الفتق الأربيّ لدى الأطفال هي الحصر، والتي يمكن أن تؤدي إلى عواقب وخيمة إذا لم يتم حلها على وجه السرعة.

الأهداف: قيمت هذه الدراسة فائدة التخفيض اليدوي للفتق الأربيّ المعقد عند الأطفال.

الإعدادات والتصميم: تم تصميم هذه الدراسة لدراسة العمر عند العرض، وعمر الحمل عند الولادة، ومدة الأعراض، ومعدل نجاح التخفيض اليدوي للفتق الأربيّ المحبوس، والعلاج اللاحق، والنتائج الجراحية، ونتائج الحالات الخائفة في مرضى الأطفال.

المواد والأساليب: هذه دراسة بأثر رجعي تشمل 56 طفلاً تحت سن 15 عاماً مع تشخيص الفتق الأربيّ المعقد الذي تمت إدارته بين يناير 2009م وديسمبر 2018م في مستشفى رعاية ثلثيه في نيجيريا. تم استرداد الخصائص الديموغرافية والعروض السريرية والإدارة والنتائج. تم تحليل البيانات باستخدام برنامج SPSS الإصدار 22 (USA ،NY ،IBM Corp.). تم عرض النتائج على شكل ترددات ونسب مئوية. تم تحليل المتغيرات الفئوية باستخدام اختبار مربع كاي. اعتبر $P < 0.05$ ذات دلالة إحصائية.

النتائج: تراوحت أعمار المرضى بين 8 أيام و14 سنة، بمتوسط عمر شهرين. 79٪ كانوا من الرضع. تفوق عدد الذكور على الإناث بنسبة 27:1، وكان معدل الحبس 5.0٪. لم يكن لدى الأغلبية (89.3٪) أي زيارات سابقة للمستشفى. كان أولئك الذين لديهم تخفيض يدوي ناجح 80٪. كان وقت التقديم عاملاً مهماً إحصائياً للتخفيض الناجح، $P < 0.05$. عانى مريض واحد من ردّ كُثليّ، ولم يكن هناك وفيات.

الخلاصة: أغلبية أولئك الذين يعانون من الفتق الأربيّ المحبوس كانوا من الرضع، وارتبط التخفيض اليدوي الناجح بالعرض المبكر.

الكلمات المفتاحية: أطفال، حبس، فتق أربي، تخفيض يدوي، اختناق.