

Morbidity and Mortality of Emergency Hernia Surgery in Children in Bujumbura: Analysis of Favourable Factors

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Abstract

Background: Management of emergency hernias surgery should include certain complications most often up after 30 days of the operation. **Aim:** To analyze the factors contributing to morbidity and mortality after 30 days of emergency hernia surgery in children in the surgical departments of 8 Bujumbura hospitals. **Patients and Methods:** This is a prospective study over a period of one year which included all hernias operated on in emergency from January 1, 2022 to February 29, 2023. **Results:** During the period, 282 patients (children) were admitted to the operating theatre for abdominal parietal hernias, of which 46 were admitted for emergency hernia surgery. Males accounted for 86.96% (40), sex ratio 6.6. The average age was 3.4 years. The persistence of the peritoneo-vaginal canal represented 52.17% of cases. Inguino-scrotal hernia was prevalent (43.48%). The main complication was strangulation (80.43%). Morbidity accounted for 1.3% of complications (infection, residual pain, testicular atrophy, hernia recurrence). No deaths were found. Altemeier stage and gender were statistically related to morbi-mortality of emergency hernia surgery in adults at 30 days post-op ($p = 0.0260$ and $p = 0.0212$ respectively). **Conclusion:** Abdominal parietal hernias are common in children, dominated by groin hernias. The high frequency of strangulation calls for awareness of cold hernia repairs.

Keywords

Hernia, Strangulation, Herniorrhaphy, Morbidity, Mortality, Early

1. Introduction

A hernia is the protrusion of an organ, such as the intestine, through the wall of the cavity in which it normally resides [1]. Pediatric hernias are common developmental abnormalities that differ from adult hernias in their management [1]. It ranks 2nd before vesicular lithiasis and after appendectomies in order of frequency. Worldwide, the prevalence of strangulated hernias is estimated at 0.3% - 2.9% [2]. It is ten times more common in Africa than in Europe [3]. In Australia in 2019, 34% of 86 patients operated on for an abdominal hernia developed a post-operative complication. In Pakistan in 2014, more than 50% of patients operated on for an abdominal hernia had a complicated hernia [3]. In Benin, hernia surgery accounted for 12.6% of operating theatre activity in 2018 [4]. Abdominal wall hernias are classified into groin hernias (inguinal, femoral, and obturator hernias) and ventral hernias (epigastric, umbilical, paraumbilical, spigelian, and incisional hernias) [2]. Although these hernias are benign and easy to diagnose clinically, they can become complicated and life-threatening for the patient. Strangulation is the dreaded complication which unfortunately is still a frequent reason for seeking care in Africa [3]. About 10% of patients with abdominal wall hernia require emergency surgery. However, these operations are associated with a high rate of postoperative morbidity and mortality [5]. The aim of this study was to analyze the factors favouring morbidity and mortality after 30 days of emergency hernia surgery in children in the surgical departments of 8 Bujumbura hospitals and to analyze the results in the light of the literature.

2. Patients and Methods

Our prospective study was conducted at 8 Bujumbura hospitals: Kamenge University Hospital Center (CHUK), Kamenge Military Hospital (HMK), Prince Louis Rwagasore Clinic, Prince Régent Hospital, Police Hospital, BAHO Polyclinic, Tanganyika Care polyclinic and Bumerec Hospital, over a period of one year from January 1, 2022 to February 29, 2023. The aim of our study is to analyze the factors contributing to morbidity and mortality after 30 days of emergency hernia surgery in children from zero to 15 years old.

We included in our study all children from zero to 15 years old undergoing emergency hernia surgery for strangulated or engorged abdominal parietal hernia (all types) in the surgical departments of 8 Bujumbura hospitals during the study period. Patients undergoing elective or accelerated abdominal hernia surgery and strangulated incisional hernias were not included.

We have developed a questionnaire of five parameters including demographic data, Anamnesis data, clinical examination, factors associated with morbidity and mortality, complications related to surgical treatment.

The questionnaire has 20 items divided into five parameters. The first is Socio-demographic and clinical characteristics data with 4 items exploring patient identity (age, gender, etc.), date of admission, length of hospitalization and

health care. The second parameter with 2 items exploring hernias risk factors and no risk factors; the third with 4 items exploring general status, conjunctiva, methods of clinical examination and type of hernia complications; the fourth with 6 items exploring incorrect hemostasis, bleeding disorder, failure to close the hernia sac, defect in wall reinforcement, insufficient asepsis and types of surgery according to Altemeir's classification; the fifth parameter with 4 items exploring intraoperative complications, early postoperative complications, late postoperative complications, medium and short-term complications.

3. Data Collection

Data collection was based on history and clinical examination elements from admission until the 30th day of the postoperative period. Data collection was done as soon as the patient entered the surgery department, while the search for factors associated with postoperative morbidity and mortality was found during the operation and on the operative report. Then we set up an appointment on the 30th postoperative day and we also gave the phone number to the child's parents to contact the hospital in case of any complications that occurred before the given appointment.

Data Analysis

The data were co-signed on a pre-established data collection form and processed using the following software packages: EPI INFO version 7.2.2.6, R version 3.5.0, Microsoft Excel and Microsoft Word. The Chi-square test and the Wald test were used. A difference was considered significant when $p < 0.05$.

4. Results

During the period of our study, 282 patients (children) with abdominal hernia were admitted to the operating room, of which 46 cases ($n = 46$) were managed as emergencies. There were 40 boys (86.96%) and 6 girls (13.04%), sex ratio 6.6. The majority of the cases in our study were operated on at the Kamenge University Hospital Center (69.57% of cases). The average age was 3.4 years with extremes of 1 year and 14 years.

The age group under 5 years was the most represented with 76.09% of the cases. The patients resided in the city of Bujumbura in 54.35% of cases followed by Bubanzaprovince with 7 cases (15.22%) (**Table 1**).

Abdominal pain and nausea were the main functional signs in our study with 100% and 97.83% of cases respectively. Inguino-scrotal hernia was present in 43.48% of cases. Umbilical hernia also represented 43.48% of cases. Of the 46 hernias admitted in emergency, 37 were strangulated (80.43%) and 9 (19.57%) were engorged.

Autologous parietal repair was performed using the Bassini technique:

- ✓ Kelotomy.
- ✓ Isolation of the hernia sac.

Table 1. Breakdown of patients by socio-demographic and clinical characteristics.

	Characteristics	Number	Percentage
Age	<5 years	35	76.09
	>5 years	11	23.91
Sex	Male	40	86.96%
	Female	6	13.04
Place of origin	Bujumbura Town Hall	25	54.35%
	Other Province	21	45.65
Occupation	Student	13	28.26
	Other and Pre-school age	33	71.74
Health care	CHUK	32	69.57
	Other facilities	14	30.43
Clinic signs	Pain	46	100.00
	Nausea	45	97.83
	Vomiting	39	84.78
	Gas and stoppage of bowel movements	23	50.00
Type of hernia complication	Strangulation	37	80.43
	Involvement	9	19.57

- ✓ Checking the vitality of the hernia sac contents.
- ✓ Reduction of the hernia.

Prosthetic repairs were not carried out, as the vast majority of hernias in children are linked to developmental abnormalities.

According to Altemeier's classification, clean contaminated surgery was the most frequent with 52.17% of cases, contaminated surgery 10.87%. Anastomotic resection was performed in 3 patients (6.52%) and omentum resection in one patient (2.17%). Four patients (8.70% of cases) had a surgical site infection. One patient (2.17% of cases) developed ischaemic orchitis. Four patients (8.70% of cases) had residual pain at 30 days post-operatively. Forty-five patients (97.83%) had returned to work. There were no deaths at 30 days during the study period (**Table 2**).

In our study, the evaluation of the Clavien-Dindon classification found that the majority of postoperative complications did not require medical or surgical treatment (Clavien-Dindon Grade I classification). The Altemeier stage and gender were statistically related to morbidity and mortality of emergency hernia surgery in adults at 30 days post-op ($p = 0.0260$ and $p = 0.0212$ respectively). The mean length of stay in hospital was 4 days with extremes of 1 day and 13 days (**Table 3**).

Table 2. Distribution of patients by risk factors for abdominal hernia.

Risk factors	Number	Percentage
Abdominal constipation	3	6.52
Pressure chronic cough	1	2.17
Persistence of the peritoneo-vaginal canal	24	52.17
Persistence of the umbilical ring	19	41.30
Persistence of the Nuck canal	2	4.35
Prematurity	1	2.17
Profession of strength	1	2.17
No risk factors	1	2.17

Table 3. Distribution of patients according to the factors influencing morbidity and mortality according to the Clavien-Dindo classification established at 30 days post-operatively.

Variables	Modalities	Total	Grade 0	Grade 1	Grade 3	p-value
Age	<5 years	35	28	6	1	0.2619
	>5 years	11	7	4	0	
Gender	Male	40	32	8	0	0.0212
	Female	6	3	2	1	
Type of hernia complications	Enthusiasm	9	7	2	0	0.8831
	Etrangement	37	28	8	1	
Altemeir stadiums	Own	17	15	2	0	0.026
	Clean contaminated (suffering from hernia sac content)	24	18	6	0	
	Contaminated (digestive wound)	5	2	2	1	

5. Discussion

The management of parietal hernias represents more than a quarter of the surgeon's operating room activity [4]. Approximately 10% of patients with symptomatic ventral hernias require emergency repair to avoid impending bowel ischemia or perforation secondary to incarceration or strangulation [6]. Our study was limited by the lack of authorisation to collect data from certain hospitals in Bujumbura. All our patients responded to the 30-day post-operative appointment. In our study, 16.31% of cases underwent emergency hernia surgery. This result can be explained by the fact that the majority of our patients consult us at the stage of complications. Male predominance is a constant in all studies. Our patients had a mean age of 6.6 years, higher than the 2.1 years found by Chang SJ *et al.* [7]. The inguino-scrotal variety of hernias was the most

frequent as found in all studies. The frequency of other types of hernias varied from one author to another. In 2022, inguinal hernia alone accounted for 63.3% of patients taken to the OR in an Indian study [8]. Irfan F *et al.* [9] found that inguinal hernia represented more than 58.3% of parietal hernias. The other types of hernia are extremely rare in emergencies. For inguinal hernias, the right side was the most affected as observed by all. The proportion of strangulated hernias is high (80.43%); this is a particularity of the African authors who still operate as many strangulated hernias, Sakiye KA *et al.* operated more than half of the patients with groin hernia (50.9%) in emergency for strangulation. Dissanayake *et al.* in Australia operated on 86 patients for abdominal hernia in emergency over a period of 3 years [10]. The precarious social conditions of patients, who have to pay for treatment, are one of the reasons why they only seek emergency treatment when complications arise. With 1.3% of complications and no deaths, we could say that the results are good, because for a purely functional surgery, mortality should be zero. Altemeir stage, gender and time elapsed between consultation and appearance of symptoms ($p = 0.0260$, $p = 0.0212$ and $p = 0.018$ respectively) were the statistically proven factors favoring morbidity in our study contrary to Arianna B. *et al.* [11] and Bessa SS *et al.* [12] who found that only Altemeir stage was associated with morbidity. This result could be explained by the fact that the majority of our patients consulted late in relation to the onset of symptoms and arrived at the hospital at an advanced stage of complications (necrosis of the hernial contents). This result could also be explained by the fact that a large proportion of the patients in our study were referred by hospitals in the interior of the country due to a lack of competent staff and arrived late. The mean length of hospitalization was 4 days with extremes of 1 day and 33 days. This is explained by the fact that the majority of the patients had a poor general condition due to the hernia complication.

6. Conclusion

Abdominal parietal hernias are frequent and serious because of their unpredictable complications. Strangulation is a frequent complication. In children, abdominal hernias are related to developmental abnormalities. Altemeir stage and gender are statistically related to morbidity and mortality of emergency hernia surgery in adults ($p = 0.0260$ and $p = 0.0212$ respectively). Awareness of the need for cold surgery should be raised to avoid the serious consequences of strangulation.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Questionnaire

1.1. Socio-Demographic and Clinical Characteristics Data

- 1) Patient identity:
- ✓ Name and surname:
 - ✓ Age:
 - ✓ Gender: Male Female
 - ✓ Province:
 - ✓ Patient Phone number: Phone number of contact person:
- 2) Date of admission:
- 3) Length of hospitalization:
- 4) Health care: CHUK HMK CPLR HPRC HPNB HPK
BUMEREC POLYCLINIQUE BAHO

1.2. Anamnesis

➤ Hernia Risk Factors

- ✓ Smoking
 - ✓ Ascite
 - ✓ Asthma
 - ✓ Obesity
 - ✓ Multiparity
 - ✓ Emphysema
 - ✓ Abdominal hyperpressure:
 - Prostatitis dysuria
 - Constipation
 - COPD: Constructive Obstructive Pulmonary Disease
 - Chronic cough
 - ✓ High age
 - ✓ Prematurity
 - ✓ Peritoneal vaginal canal persistence
 - ✓ Malnutrition
 - ✓ Collagen disease
 - ✓ History of abdominal surgery
 - ✓ History of hernia cure
 - ✓ History of dismemberment
 - ✓ Uroandrologic history
 - ✓ Persistence of the canal of Nuck
 - ✓ No risk factors
- #### ➤ Functional signs:
- Pain
 - Abdominal bloating
 - Nausea
 - Vomiting
 - Shutdown of materials and gases

- Incessant crying

1.3. Clinical Examination

- ✓ General status: 1) Good 2) Enough 3) Altered
- ✓ Conjunctiva: 1) Well coloured 2) Pallor of the conjunctiva 3) Icteric

❖ Inspection:

- Abdomen: 1) Distended 2) Normal 3) Flat
- Abdominal or inguinal swelling: Yes No

● Seat:

- 1) Umbilical
- 2) Spiegel
- 3) The white line
- 4) Right inguinal
- 5) Left inguinal
- 6) Femoral
- 7) Interparietal
- 8) Right Inguino-Scrotal
- 9) Left Inguino-Scrotal
- 10) Other

- Presence of scar: 1) Yes 2) No

If yes, what is the type?

- 1) Median laparotomy 2) Lateral 3) Inguinotomy

❖ Palpation:

- Normal
- Pain
- Mass

❖ Percussion:

- Tympanism
- Normal
- Dullness

❖ Type of Hernia Complications:

- Strangulation
- Infatuation

1.4. Factors Associated with Morbidity and Mortality

- ✓ Incorrect hemostasis
- ✓ Bleeding disorder
- ✓ Failure to close the hernia sac
- ✓ Defect in wall reinforcement
- ✓ Insufficient asepsis
- ✓ Type of surgery according to Altemeier's classification:
 - Clean
 - Contaminated

- Clean, contaminated
- Dirty

1.5. Complications Related to Surgical Treatment

1) Intraoperative complications

- Hemorrhages
- Section of the vas deferens or testicular vessels
- Nerve damage
- Bladder, colon or small bowel wound

2) Early postoperative complications

- Hematoma
- Infection
- Seroma or hydrocele
- Urine retention
- Ischemic orchitis

3) Late postoperative complications

- Residual pain
- Hydrocele
- Testicular atrophy

4) Medium and short-term complications:

Recurrence of the hernia

Death

Return to work (quality of life)

Clavien-Dindo classification:

- Grade
- Grade I
- Grade II
- Grade III
- Grade IV
- Grade V (Death)