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ORIGINAL ARTICLE

Emergent groin hernia repair at a County Hospital in Guatemala: patient-related issues vs. health care system limitations

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Abstract

Background The rate of emergent groin hernia repair in developing countries is poorly understood.

Materials and Methods A retrospective analysis of groin hernia repairs performed at a county hospital in Guatemala [Hospital Nacional de San Benito (HSNB)] was undertaken and compared to a literature review in developed countries. Patients with incarcerated hernias were interviewed to determine factors related to late presentation.

Results Twenty-five percent of patients with groin hernias in this analysis presented at HNSB emergently (vs. 2.5–7.7% in developed countries). Most patients were male in their fifth decade of life. Ten percent of hernias were femoral. There was no delay in scheduling patients for surgery presenting for elective repair. Most patients lived within 20 miles of the hospital, but only 50% of patients returned for their follow-up appointment. Most patients with an incarcerated inguinal hernia (56%) did not seek medical attention because of family obligations, but when they did, this decision was influence by their children (66%). None of the patients presenting with an incarcerated hernia had education past secondary school. In fact, most (56%) did not have any form formal education. Nearly 90% of patients who had an incarcerated hernia repaired thought that the hospital provided good-to-excellent care.

Conclusion A high number of patients present emergently for groin hernia repair at a county hospital in Guatemala compared to developed countries. Our data suggest that emergent hernias are likely the result of patient-related issues rather than health care system limitations.

Keywords Femoral hernia · Inguinal hernia · Emergent hernia · Amyand's hernia

Introduction

More than 20 million groin hernia repairs (including inguinal and femoral) are performed every year worldwide [1]. As one of the most common operations performed by general surgeons around the world, small changes might have great impact in outcomes in patients affected by groin hernias. While complications and mortality for groin hernia repair are low, mortality might rise from zero in the elective setting to up to 13% if a patient presents for an operation emergently [2–4]. Thus, investigating factors that lead to an emergent groin hernia repair is pivotal in hernia surgery, especially in developing countries.

The immediate assumption is that developing countries lack access to medical care and elective operations are delayed leading to an emergent clinical presentation [5, 6], but data in developing countries are limited. Data in Central America are even more limited even in large referral county hospitals, especially in regions outside of capital cities.

In 2014, 59% of the population in Guatemala lived below the poverty line (*vs.* 13.2% in the United States). While private insurance is available, it is not common in Guatemala, especially outside of the capital city. Thus, most individuals rely on government subsided public hospitals. According to the Constitution of Guatemala, every citizen has the universal right to health care, but limited resources prevent this right to be implemented effectively [7].

El Petén is the largest department in Guatemala. This department has a growing population, which increased from

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464,763 in 2004 to 687,192 in the most recent census in 2013. The Hospital Nacional de San Benito (HNSB) is one of the four public hospitals in the region and is the largest referral hospital. It is located just outside of the capital city of Flores in San Benito, which is 294 miles by road from Guatemala City.

HNSB has three operating rooms staffed by eight general surgeons. Approximately 250 general surgery operations are performed monthly. Despite being a major hospital in the region, it does not have computed tomography imaging capabilities, and it only obtained limited laparoscopic capabilities in 2013. The most common elective operations are open inguinal hernia repairs and open cholecystectomies, with approximately 90 hernia repairs performed per year [8–11].

Empirical observations at HNSB show a high rate of patients presenting to the emergency department with an incarcerated groin hernia. We undertook this study to determine the rate of emergent groin hernia repairs at the HNSB. We compared this rate to the reported rate of groin hernia repair in the literature in developed countries.

Given our empirical observations during prior visits, we hypothesized that the rate of emergent groin hernia repair was higher than in developed countries and that this would lead to poor outcomes including bowel resection and high rates of recurrence. The overall goal of this analysis is to understand barriers that prevent elective repair of a groin hernia.

Methods

This study is a single-institution retrospective review of inguinal hernia repairs performed at HNSB. Charts were identified by reviewing the operating room logbooks beginning in 2017 and reviewing them in a retrospective fashion. Given the limited chart information and the need to request and retrieve data for each chart, this study was limited to reach a goal of at least 100 charts to facilitate statistical analysis. Review of the logbooks for hernia repair operations was dependent on logbook condition, legibility, and availability for review. From this effort, 109 non-consecutive hernia repairs were found, and their charts were selected for review.

Approval for this study was obtained from the institutional review board (IRB) at the University of Texas Southwestern Medical Center. In addition, written permission from the chief of general surgery and the deputy chief of staff at HNSB was obtained. The entire study regarding collection of data was performed at HNSB.

Data were collected on-site at HNSB by individual review of paper charts. Patients under the age of 16 were excluded, as were patients whose charts were incomplete or damaged beyond legibility. Of the 109 charts reviewed, 90 hernias met criteria for inclusion. This study is registered in accordance with the Declaration of Helsinki, registration number is researchregistry4298. In addition, this work has been reported in line with the STROBE criteria [12].

Patient demographics including: gender, age, location of residence, weight, comorbidities including hypertension and diabetes mellitus type 2, and American Society of Anesthesiologists (ASA) class were collected for each patient. In addition, data surrounding the inguinal hernia repair including date of first visit to HNSB and operation, type of anesthesia, hernia type, and laterality, repair type, whether the surgery was elective or emergent, date of last follow-up visit, and time between presentation and surgery for emergent cases were recorded. The surgeon who performed each case was from a group of eight general surgeons employed by the hospital who had an average of 10 years of general surgical experience and a combined total of 37 years of working at HNSB. For outcomes, post-operative length of stay, re-admission, wound and mesh infections, groin hematoma, hydrocele, recurrence, date of recurrence, and mortality were recorded. For emergent cases, bowel injury and resection were also recorded.

To gain understanding of the reasons why patients presented to the hospital with an incarcerated rather than an elective hernia, patients presenting with an incarcerated hernia were interviewed and asked to answer the questionnaire presented in Fig. 1.

The questionnaire was developed by Drs. Huerta and Ochoa. It was administered and translated by Dr. Ochoa, a surgeon familiar with the operation who is bilingual and the Chief of Surgery at HNSB. Forty-one percent of patients presented with an incarcerated hernia completed the questionnaire.

Review of the literature

PubMed, MEDLINE, Ovid syntax from 1949 to Jan 2018, the Cochrane Library, Google, and Google Scholar were reviewed to identify the rates of emergent groin hernia repair in developed countries. The terms utilized in this search were “inguinal hernia” or “groin hernia” or “femoral hernia”, AND “inguinal hernia repair” or “herniorrhaphy”, AND “outcomes” or “treatment outcomes”, AND “surgery”, AND “ischemia” or “emergent” or “emergency” or “intestinal obstruction” or “strangulation”. In addition, hand searches were performed on Google. All studies were compiled in an EndNote group and all duplicates were removed.

An analysis of the literature identified 92 articles for potential review. Of these, 51 were removed after the abstracts revealed no information related to our analysis.

1. **When did you first notice you had a groin hernia that needed medical attention? Choose ONE answer.**
   a. Days
   b. Weeks
   c. Months
   d. Years
   e. Unknown
2. **Once you noticed there was a problem, how long did it take you to decide to seek medical attention? Choose ONE answer.**
   a. Days
   b. Weeks
   c. Months
   d. Years
   e. Unknown
3. **How serious do you think this problem was? Choose ONE answer.**
   a. Not serious at all
   b. Somewhat serious
   c. Very serious
   d. Extremely serious
4. **What was the main reason preventing you from seeking medical attention? Select all that apply?**
   a. Financial reasons
   b. Inability to take time off work
   c. Family obligations
   d. It was not giving me any problems
   e. No hospital available within my city
   f. I went to see a personal healer (curandero)
   g. I was afraid of going to the hospital
   h. I thought I needed insurance
5. **If given an option for cure of your hernia what would you prefer? Choose ONE answer.**
   a. Going to the hospital (surgery)
   b. Taking medicine for the hernia
   c. Going to an alternative medicine doctor (curandero)
   d. Hope it will go away on its own
6. **What made you decide to seek medical attention now? Choose ONE answer.**
   a. Pain
   b. Discomfort
   c. Looks
   d. My spouse (or significant other) told me
   e. My children told me
   f. My friend told me
7. **Who has the strongest influence for you to come to the hospital?**
   a. Myself
   b. My spouse
   c. My friends
   d. My children
   e. My employer
   f. My doctor
   g. My priest
8. **What is your highest level of education? Choose ONE answer only.**
   a. None
   b. Elementary school
   c. Secondary school
   d. Highschool
   e. University
   f. Graduate school
9. **If your friend had a hernia like yours, what would you advise?**
   a. Wait for it to get better (do nothing)
   b. Wait until the pain is unbearable
   c. Fix immediately
   d. Fix when it is convenient
10. **What do you think of the care provided at the hospital?**
    a. It provides poor care
    b. It provides good care
    c. It provides excellent care

Fig. 1 Questionnaire given to patient who presented with an incarcerated inguinal hernia. The questionnaire was translated and administered by Dr. Ochoa who is bilingual

After review of the abstracts, 25 manuscripts were reviewed in full. Of these, ten were included in the analysis.

Statistical analysis

All data was extracted into an Excel spread sheet for analysis. Continuous data were expressed as mean ± standard deviation (SD), and categorical values were presented as percentages. Because this is a descriptive manuscript, no formal statistical analysis was required for data presentation.

Results

Patient demographics

In total, this study included 90 hernias. Most of the patients were men (84.3%) in their fifth decade of life. The majority of hernias were indirect and 10% of hernias repaired were femoral. One fifth of hernia types were not identified in the operative report. More than 90% of the patients had an ASA class of I–II, with less than 25% of patients having either diabetes mellitus type 2 or hypertension; however, comorbid conditions were not typically recorded in the chart. There was no height recorded and thus no ability to calculate body mass index. Average weight of patients was 66.7 ± 10.9 kg (147 ± 24 lbs.) Patients had to travel an average of 30.7 ± 73.8 miles to get to the hospital for surgery, with 42% of patients living within 5.0 miles of the hospital and 62% within 20 miles (Table 1).

Table 1 Patient demographics

n = 90			
Demographics		**Hernia type**	
Gender (male)	84.3%	Bilateral	8.4%
Age (years)	53.5 ± 21.8	Indirect	53.3%
Weight (kg)	66.7 ± 10.9	Direct	11.1%
Distance travelled to HNSB (miles)	30.7 ± 73.8	Femoral	10.0%
ASA class		Pantaloon	1.1%
I	61.5%	Unclassified	20.0%
II	32.5%	Repair of recurrent	4.4%
III	4.8%	**Comorbidities**	
IV	1.2%	HTN	22.9%
Elective cases	75%	DM	4.8%
Wait time (weeks)	9.9 ± 31.1	**Type of repair**	
Emergent cases	25%	Open repair	100%
Emergency time (h)	11.1 ± 30.6	Lichtenstein	71%
Anesthesia		Patch and plug	2%
Regional	97.60%	Tissue repair	24%
General + local	1.20%		
Unclassified	1.20%		

Operative data are presented as well. Mean ± standard deviation

HNSB Hospital Nacional de San Benito, *ASA* American Society of Anesthesiologists

Operative intervention

The waiting period for an elective case at HNSB was 9.9 ± 31.1 weeks. One out of four patients undergoing groin hernia repair had an acute incarceration at presentation requiring an emergent operation. Time from presentation in the Emergency Department to operation was 11.1 ± 30.6 h in emergent cases.

The majority of patients underwent regional anesthetic (97.6% spinal alone). The type of repair was with mesh in 71% of cases, with the Lichtenstein repair most commonly performed. Bassini was the most common type of tissue repair. There were no laparoscopic cases for the repair of inguinal hernias at HNSB (Table 1).

Outcomes

Half of the patients returned for the recommended follow-up within 25.5 ± 33.6 days. The length of hospital stay was 1.5 ± 1.6 days. One patient required re-admission due to urinary retention. One wound infection was captured as well as one case of inguinodynia. Two patients had a recurrence, which occurred in 2.2 ± 0.8 years from the time of the index operation. One quarter of the patients who presented with acute incarceration were found to have reversible ischemic changes ($n = 6$). One patient required 5 cm of a bowel resection (Table 2).

Table 2 Patient Outcomes

Post-Op LOS (days)	1.5 ± 1.6		*n* (%)
Returned for follow-up	54.2%	Readmissions	1 (1.20)
Follow-up period (days)	25.5 ± 33.6	Wound infection	1 (1.20)
Emergent cases *n* = 21	*n* (%)	Inguinodynia	1 (1.20)
Ischemic changes	6 (28.6)	Recurrence	2 (2.41)
Bowel resection	1 (4.8)	Time to recurrence (years)	2.2 ± 0.8

Post-Op LOS post-operative length of stay

Interviews with patients presenting with incarcerated inguinal hernias

When asked when patients first noticed a problem (Q1), 33% responded months and 56% indicated years; of these, 44% of patients took months to seek attention and 44% years (Q2). Of patients presenting with an incarcerated hernia, 22% did not think that this was a serious problem and 67% somewhat serious. Only 11% of patients indicted that this was a very serious problem (Q3). Most patients (56%) were unable to seek attention because of family obligation, 22% had work obligations, and only 10% were as a result of financial reasons (Q4). Most patients (56%) would have preferred to take medication for their hernia if that had been an option (Q5).

Notably, the decisions to seek medical attention (Q6 & Q7) was driven by the patient's children in most cases (56%). Pain and discomfort only played a small part on the decision to seek medical attention (33%). The patient's children played the strongest factor for patients with an incarcerated hernia to go to the hospital (66%).

None of the patients presenting with an incarcerated hernia had education past secondary school. In fact, most (56%) did not have any form formal education (Q8).

After going through the experience of having a hernia repaired, 78% of patient would recommend a friend to have it immediately repaired (Q9) and 89% of the patients thought that the hospital provided good-to-excellent care (Q10).

Review of the literature

A literature search to identify the rates of emergent groin hernia repair in developed countries yielded ten studies from seven different countries (Table 3). The rate of emergent hernia repair ranged from 2.5 to 7.7% and included between 494 and 212,591 hernia repair total.

Discussion

Barriers to provide adequate health care in developing countries exist in many forms and each site might encounter a different set of issues within the same country. It is important to identify specific problems, such that preventative strategies can be undertaken. We have previously reported barriers to the adoption of laparoscopic surgery in the same hospital as we did with groin hernias in this report. In that study, we found that it was lack of funding to provide laparoscopic equipment and ancillary staff that presented the major barriers [9]. In the present manuscript, we investigated barriers that lead to emergent rather than elective hernia repair.

Guatemala is an underdeveloped country where access to care is limited by hospital resources and inadequate patient education as well as patient's financial resources [7]. In fact, in this study, we found that none of the patients with an incarcerated inguinal hernia had an education beyond secondary school and 56% of them did not have any form of formal education.

We undertook this study to determine the rate of emergent inguinal hernia repairs at a county hospital in Guatemala and compared this to reported rates in the literature in developed countries. Our analysis also included data regarding system-related issues leading to the observed high rate of emergent inguinal hernias.

In this study, we show a large rate of emergency hernia repairs at HNSB, and based on our literature search, this rate is greater than in developed countries. We found reports of emergent hernia presentation between 2.5 and 7.7% in seven developed countries (Table 3).

At HNSB, 25% of hernia repairs were in patients who presented with incarceration requiring emergent surgery. Other studies in developing countries found similarly high rates of emergent presentation. In a study of 452 patients at a single

Table 3 Review of the literature

Study/country	*N*	Emergent hernia (%)	Citation
Olmstead County, MN/United States	3599	3.8	Hernandez-Irizarry et al. [24]
Herniamed Database/Germany	212,591	2.5	Lorenz et al. [25]
VA Boston Health Care System/United States	1034	6.8	Abi-Haidar et al. [26]
Swedish Hernia Database/Sweden	142,289	5.7	Dahlstrand et al. [17]
Emilia-Romagna Hospitals/Italy	126,913	6.5	Ansaloni et al. [27]
SAGES Outcomes Initiatives Database/United States	1607	2.8	Velanovich et al. [28]
Countess of Chester Hospital/United Kingdom	494	7.7	Malek et al. [29]
Northern General Hospital/United Kingdom	3599	3.8	Tiernan et al. [30]
National Health Service/Scotland	5506	5.3	Hair et al. [31]
Danish Hernia Database/Denmark	51,233	3.6	Kjaergaard et al. [32]
HNSB/Guatemala	90	25	Present study

N total hernias included in the study

institution in Tanzania, Mabula and Chalya found that 84 (18.6%) patients presented with obstruction and 50 (11.1%) with hernia strangulation. In 15.9% of these patients, a bowel resection was required [13]. In a separate study, Samuel et al. performed a literature review to determine emergent hernia rates, which included 13 countries ranging from low income to high income. They found that rates of emergent hernia presentation were lower in high-income countries like the United States (3.7%) and the UK (8.0%), and much higher in low-income countries, at 41.5% and 41.0% in Malawi and Nigeria, respectively [14].

A pivotal question to address is: why is there a disparity in elective presentation rates between industrialized countries and developing countries? The possible answers include: (1) system-related issues such as poor access to medical care, including lack of nearby hospitals and insufficient resources to see patients in a timely manner; (2) patient-related factors including inability to take time off from work and poor education and specific hernia types (i.e., femoral hernias incarcerate more commonly than inguinal hernias [3]). Unlike African Countries, our analysis suggests that at HNSB, the latter rather than the former is likely to play the most important role. For instance, while distance could be one barrier to access to health care in some underdeveloped countries, at the HNSB, 42% of patients lived within only 5 miles of the hospital and 62% within 20 miles. Of patients presenting with an incarcerated inguinal hernia, our analysis showed that they all lived within 10 km from the hospital (6.2 miles).

Once the patients were assessed in clinic, the average time to repair the groin hernia was less than 10 weeks. Yet, only half of the patients in this cohort returned for a follow-up visit. An interview of patients presenting with an incarcerated inguinal hernia revealed that most patients waited months to years once then found that there was groin bulge. Family obligations (56%) and inability to take off from work (22%) were the most common reasons for patients who did not seek prompt medical care. Nearly 90% of patients indicated that the hospital provided good-to-excellent care. These factors argue against system-related issues and in favor of patient factors such as lack of education and family obligations.

A second aspect attributable to patient-related factors was the high rate of femoral hernias at HNSB. Femoral hernias are much less common than inguinal hernias (2–4% of all groin hernias), but more likely to result in emergent repair [15, 16]. An analysis of 3980 femoral hernias showed that these were more common in women compared to men (63% vs. 37%) and were more likely to present with a hernia accident compared to inguinal hernias (36% vs. 4.9%) [17]. Another analysis of femoral hernias using ACS-NSQIP data found that older women and those with significant comorbid conditions were more likely to present with an incarcerated femoral hernia which carried a significantly increased rate of complications and mortality [18]. At HNSB, the rate of femoral hernia repair was 10%, which is much higher than is reported in the literature. Of the nine femoral hernias repaired at HNSB, eight had presented with emergent incarceration. It is unclear why femoral hernias are more common in Guatemalan individuals compared to the rest of the world as reported in the literature. However, it is possible that like in children, it might be related to the posterior insertion of the inguinal wall onto Cooper's ligament, which is congenitally narrowed in children who have femoral hernias [19]. However, this issue requires further analysis.

A watchful waiting (WW) strategy has been proposed in the United States and other developed countries as an option to defer surgery for small asymptomatic inguinal hernias [20–22]. These studies also suggest that the rate of hernia incarceration and obstruction in developed countries is low, giving the option for a WW approach. However, given the large percentage of patients with incarcerated inguinal hernias in underdeveloped countries, WW should not be recommended to patients in Guatemala at this time.

Rates of complications were low in our study, but recurrence rate was high [2.4% ($n=2$)]. However, due to inconsistent follow-up of post-operative patients at HNSB, outcomes were difficult to capture, such that this is not a true reflection of all outcomes. Only 50% of patients returned for their follow-up visit and were not generally followed greater than 1-month post-operation. An additional problem in adequately capturing complications was poor documentation. With these limitations in mind, the following complications were identified at HNSB: one patient required re-admission due to urinary retention, and there was one case each of inguinodynia and wound infection. In developed countries, complications from inguinal hernias ranging from mild urinary retention to severe chronic pain and recurrence might occur in up to 35% (range 12–57%) [2, 23]. Follow-up at HNSB was not sufficient to fully capture these outcomes.

This study was conducted to better understand the patients that undergo hernia repair in rural Guatemala and associated outcomes to determine barriers that prevent elective repair. Our study, however, has several limitations. First, as this study is retrospective in nature, only information written in the paper charts was available. This was further complicated at HNSB by the condition of the paper charts, which were sometimes incomplete or damaged and illegible. Storing patient data electronically would not only protect them from loss and physical damage, but would make the data searchable and script legible. Unfortunately, an electronic medical record system has not yet been implemented at HNSB. Second, we recognize that the number of hernias ($n=90$) is small to adequately provide substantial recommendations. However, our analysis was limited by the poor availability

of records requiring examining several years on non-consecutive patients to reach a target of around 100 patients. Even with this target, several patients had to be excluded later as they were children or insufficient information was typically the rule. However, data on Central American countries are currently limited and the information that we report is consistent with previous empirical observations at HNSB. Furthermore, this information could serve as a platform to proceed with further studies on this important subject. Finally, since the hospital services cover a very large land area in northern Guatemala and targets the poorest class of citizens, patients did not consistently come back for follow-up. Furthermore, patients would not necessarily come back to the same hospital later if complications were to occur, which should be considered in future studies involving rural low-resource settings.

Conclusions

This study shows that a substantial number of groin hernias repaired at HNSB present with an incarceration. Because of this, hernias found by general practitioners should be referred, and surgeons should offer elective repair to every patient. Strategies to identify patients with a groin hernia and recommended repair should be implemented as part of patient education practices in el Petén Guatemala. Lack of formal education is a problem at large. There is a substantial influence of children playing a role in patient care and patient's children could be the target of educational strategies to prevent this problem in Guatemala.

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Compliance with ethical standards

Conflict of interests None of the authors have any conflicts of interests to report.

Ethical approval All procedures performed in the studies involving human participates were in accordance with the ethical standards of the institution and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Appropriate Institutional Board Review approval was obtained for the study.

Human and animal rights This article does not contain any study with animals performed by the authors.

Informed consent The informed consent for the retrospective review segment of this study was waived by the Institutional Review Board. Appropriate informed consent was obtained for the participants interviewed for the study.

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