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Bilateral inguinal hernioplasty in emergency surgery: Is it feasible? Comparative retrospective study using “propensity score matching”

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ABSTRACT

INTRODUCTION: Hernias, particularly groin hernias, are prevalent surgical pathologies worldwide, often necessitating surgery in cases of complications. This study investigates the safety and efficacy of performing bilateral inguinal hernioplasty when one side faces complications, addressing the lack of consensus in emergency groin hernia treatment.

MATERIALS AND METHODS: A retrospective, single-center study spanning a duration of 10 years was conducted, including adult patients who underwent emergency surgery for inguinal hernia. Propensity score matching was employed to create similar groups for comparative analysis of unilateral versus bilateral emergency groin hernioplasty. Surgical techniques, complications, mortality, and long-term outcomes were evaluated.

RESULTS: This study included 341 patients. Data obtained from the study revealed high morbidity and 90-day mortality rates, consistent with the data of existing literature. Propensity score matching yielded two comparable groups. Short-term outcomes showed no significant differences in complication rates, mortality, surgical site infection, or hospital stay between unilateral and bilateral hernioplasty groups. Bilateral surgery takes approximately 15 min of the procedure time. Long-term outcomes exhibited similar recurrence rates between groups.

CONCLUSION: This study supports the practice of bilateral inguinal hernioplasty in emergency scenarios when one side faces complications. It is a safe approach without any significant increase in morbidity or hospital stay, while reducing the need for a subsequent intervention and its associated risks and costs. Further prospective research is necessary to confirm these findings.

Keywords:

Bilateral hernia repair, emergency hernia repair, hernia surgery, open posterior hernia repair

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Introduction

Hernia is the most common surgical pathology in adults in the Western world. Groin hernia (GH) is exceptional within this group, with a probability of 27%–43% in men and 3%–6% in women for developing a GH throughout life.^[1] Although conservative management has reasonable outcomes in the follow-up of patients with

inguinal hernia,^[2] the only treatment option is surgery, especially if it becomes complicated. Nevertheless, a recent publication suggests that performing hernia taxis is safe as it delays emergency surgery and makes elective surgery preferable in selected cases.^[3] Multiple studies have demonstrated higher morbidity and mortality rates in emergency surgical inguinal hernia (IH) repair compared to elective cases, with a

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substantial increase in complications and mortality.^[4,5] Hence, surgery is usually indicated for patients with IH, who try to avoid the risks of emergency surgery.^[6] Sometimes, the organization of many health systems, such as ours, faces difficulties in early hernia repair in many cases.^[7] This situation has been exacerbated by the COVID-19 pandemic,^[8] forcing a redistribution of resources to the detriment of benign surgical pathology. Despite numerous international guidelines and recommendations from organizations such as the European Hernia Society (EHS),^[9] HerniaSurge group,^[5] or the International EndoHernia Society (IEHS),^[10] the appropriate approach for the treatment of IH, especially in an emergency situation, remains unclear. We consider emergency surgery for treating IH for cases where the patient experiences acute pain, incarceration, intestinal obstruction, strangulation, ischemia, or peritonitis. If any of these symptoms are detected, we perform emergency hernioplasty, following the EHS recommendations.^[9] Determining the exact risk of suffering incarceration or complicated IH is difficult as it depends on various factors, such as female sex, femoral hernia, age >65 years, inguinoscrotal hernia, and recurrent hernia.^[11,12] Regarding bilateral hernias, some studies suggest that they have a lower risk of incarceration/strangulation,^[12] making them less common in emergency surgery and leading to uncertainty about the ideal therapeutic approach in these cases. Three international guidelines recommend performing bilateral hernioplasty in patients with bilateral IH at the same time.^[5] Therefore, in our Surgery Service, we have considered performing bilateral inguinal hernioplasty when one side faces complications. The primary objective of this study is to determine if this practice is safe and does not worsen the results obtained when compared to treating only the complicated side.

Materials and Methods

A retrospective, observational, single-center study was conducted by the Surgical Emergency Department based on the Emergency Surgery Unit database of our University Hospital, between January 2008 and December 2018. An independent data manager oversees this database. All patients over 18 years old who underwent emergency surgery for inguinal hernia were included. Exclusion criteria were immediate death, associated procedures, lack of data, loss of postoperative follow-up, and severe hemodynamic instability. The analysis was performed following the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) criteria.^[13] We performed a comparative analysis of sociodemographic variables, comorbidities, presentation of symptoms, type of hernia, and characteristics of the surgery. We classified all hernias using the modified Kingsnorth classification^[14] (our group has demonstrated a correlation with

this classification and hernia surgical time and complications in a previous study).^[15] We compared two groups: patients who underwent emergency inguinal hernioplasty for complicated unilateral groin hernia (UH group) and patients who underwent emergency bilateral inguinal hernioplasty for complicated unilateral hernia, with non-complicated contralateral hernia (BH group). A descriptive analysis of complications, mortality, and recurrences was performed in the sample. After the initial comparative analysis, propensity score matching was carried out, resulting in two similar groups in terms of demographic characteristics, morbidity, hernia characteristics, and perioperative characteristics. Subsequently, a comparative analysis was carried out between these matched pairs from the two groups (UH vs. BH) to compare the postoperative results. The variables studied were surgery time, hospital stay, complications classified according to Clavien-Dindo,^[16] 90-day mortality, medical complications, and surgical site complications (seroma, hematoma, surgical site infection, orchitis, acute urinary retention, postoperative ileus; long-term complications, chronic infection, and recurrence). For the assessment of complications, daily in-hospital follow-up was carried out. After hospital discharge, follow-up and face-to-face assessment were conducted in the nurse's office in the second postoperative week and in the office of the abdominal wall surgeons 1 month and then 1 year after the surgery. The diagnosis of inguinal hernia was made by clinical examination according to the recommendation of the EHS,^[5] and in case of diagnostic doubts, ultrasound or abdominal tomography was performed by an abdomen specialized radiologist. Complications were recorded and classified according to Clavien-Dindo.^[16] Emergency surgery department consultations, reinterventions, and readmissions were also recorded. Mortality was analyzed at 90 days. The chosen technique for emergency inguinal hernia surgery is as follows: for the complicated side, the open posterior approach using the Nyhus technique^[17] is employed. The same technique is used if the non-complicated side is a recurrence or had undergone a previous anterior approach before. If the non-complicated side is a primary hernia, an anterior open approach is performed, according to the Lichtenstein technique.^[18] In cases of extreme hemodynamic instability, damage control surgery is performed. For the statistical analysis, the SPSS® statistical software, version 24.0 (IBM, Armonk, New York, USA) was used. A univariate comparative analysis was performed using Fisher's exact test or the chi-square test (χ^2) to evaluate the association of the categorical variables and the Student *t*-test or the Mann-Whitney *U*-test when necessary, for the quantitative variables. A $P < 0.05$ was considered statistically significant. Numerical variables were presented as mean and standard deviation when they were in a normal distribution. If they were not in a

normal distribution, the median and interquartile range were used. Categorical variables were represented as proportions. This study was carried out in accordance with the ethical principles derived from the Declaration of Helsinki (Fortaleza, Brazil, October 2013) as well as in compliance with the General Data Protection Regulation 2016/679 and the Organic Law 3/2018, of December 5th, on the Protection of Personal Data.

Clinical trial registry

This work is a retrospective analytical study. No clinical trials were involved.

Results

During the study period, a total of 361 emergency hernioplasties were performed at our University Hospital. Twenty patients were excluded due to the following reasons: one patient being lost to follow-up, three patients had lack of relevant data, 15 patients because of other procedures associated, such as oncological surgery in two of them, three patients needed small bowel adhesiolysis, and 11 patients with concomitant incisional or ventral hernia repairs. Finally, 341 patients were included in analysis. Bilateral inguinal hernioplasty was performed in 38 of them (11.1%) (patients who had bilateral hernia with one complicated side). None of them had bilateral complicated hernia. The groups were not statistically similar; hence, propensity score matching was performed, resulting in two groups of 38 patients with similar characteristics. The distribution by groups

can be seen in the flow chart of the study [Figure 1]. Regarding general characteristics between both groups, there was a clear prevalence of the male sex in both groups, with a mean age of around 71 years. Anesthetic risk was measured by the ASA score, with a percentage of patients with ASA III or higher of 45.5% in the UH group and 52.7% in the BH group. About 70.3% and 76.3% of patients had comorbidities, with cardiovascular involvement and COPD being the predominant ones, and there were no differences between groups. The complication rate was high, with 143 patients (41.9%), and a 90-day mortality of 20 patients (5.9%). The causes of morbidity and mortality included refractory septic shock, acute renal failure, and other medical complications such as pneumonia and cardiovascular ischemic complications. Two patients died due to the progression of advanced cancer disease during follow-up. Regarding long-term results after 1 year of follow-up, hernia recurrence was observed in 6.5% (22 patients). Nine of these were treated successfully. One of them was a third recurrence. The other patients either refused surgery or were excluded by anesthesiologists for hernia repair due to a high anesthetic risk. In the bilateral inguinal hernioplasty group, all recurrences occurred on the complicated side, except for one patient who had recurrence on both sides. As mentioned in the *Methods* section, the two groups compared did not have similar characteristics. The differences were as follows: more inguinoscrotal hernias in the BH group (36.8 BH vs. 22.8 UH; $P = 0.05$), the use of prophylactic antibiotics (94.7 BH vs. 81.8 UH; $P = 0.04$), and a higher use of general anesthesia.

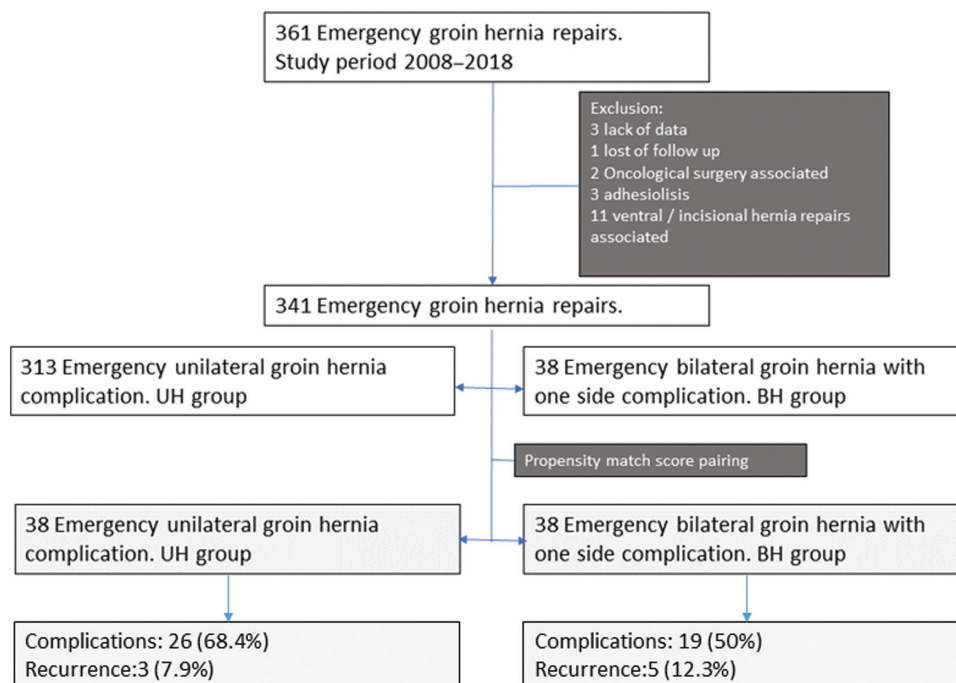


Figure 1: Study's flow-chart

Tables 1 and 2. To carry out the comparative analysis of the groups, statistically similar groups were obtained by propensity score matching, resulting in two groups of 38 patients each. In the short-term results, there were no statistically significant differences between the two groups. A high complication rate was noticed (68% UH vs. 50% BH; $P = 0.51$), as well as mortality (7.9% UH vs. 2.6% BH; $P = 0.3$). 9.3% (six patients) experienced surgical site infection, all of them in the

UH group, with no statistically significant difference. Hospital stay was not prolonged (9.6 days UH vs. 6.4 days BH; $P = 0.14$). The surgery was not significantly prolonged, and it should be noted that the mean surgery duration was longer in the BH group, with an average of 15 min more (118 min. UH vs. 133 min. BH; $P = 0.95$). Regarding long-term results, there were four patients with recurrence in the BH group (all on the complicated side, and one of them with bilateral

Table 1: Demographic and comorbidity patient characteristics

	Unilateral hernia repair $N = 313$	Bilateral hernia repair $N = 38$	<i>P</i> -value
Age; mean (SD)	70.1 (16.7)	72.5 (14.1)	0.41
Sex: ♂/♀; <i>N</i> (%)	234 (78.9)/69 (23)	30 (78.9)/8 (21.1)	0.49
BMI; mean (SD)	25.8 (3.8)	25.2 (3.8)	0.49
Comorbidities; <i>N</i> (%)	213 (70.3)	29 (76.3)	0.28
Heart disease; <i>N</i> (%)	114 (37.6)	15 (39.5)	0.82
COPD; <i>N</i> (%)	49 (16.2)	9 (23.7)	0.24
Renal failure; <i>N</i> (%)	27 (8.9)	5 (13.2)	0.39
Liver cirrhosis; <i>N</i> (%)	13 (4.3)	2 (5.3)	0.51
Neurological disease; <i>N</i> (%)	46 (15.2)	3 (7.9)	0.22
Diabetes mellitus; <i>N</i> (%)	51 (16.8)	4 (10.5)	0.56
Immunosuppression; <i>N</i> (%)	43 (14.2)	4 (10.5)	0.77
Smoking; <i>N</i> (%)	64 (21.1)	7 (18.4)	0.16
Frailty*; <i>N</i> (%)	36 (11.9)	3 (7.9)	0.46
Charlson Index: mean (DS)	4.31 (2.81)	4.39 (2.86)	0.82
ASA; <i>N</i> (%)			
I	44 (14.5)	3 (7.9)	0.77
II	121 (39.9)	15 (39.5)	0.77
III	108 (35.6)	15 (39.5)	0.77
IV	29 (9.6%)	5 (13.2)	0.77
V	1 (0.3)	0	0.77

Table 2: Surgery and hernia characteristics

	Unilateral hernia repair $N = 313$	Bilateral hernia repair $N = 38$	<i>p</i> -value
Intestinal obstruction; <i>N</i> (%)	80 (26.4)	14 (36.8)	0.17
Inguinoscrotal hernia (H3-H4 Kingsnorth); <i>N</i> (%)	69 (22.8)	14 (36.8)	0.05
Duration of symptoms; mean (DS) hours; <i>N</i> (%)	44 (41)	43 (39)	0.71
Recurrent hernia; <i>N</i> (%)	69 (22.8)	11 (28.9)	0.39
Ischemic sac content; <i>N</i> (%)	52 (17.2)	4 (10.5)	0.29
Surgery contamination*; <i>N</i> (%)			
Grade I	167 (55.1)	28 (73.3)	0.16
Grade II	84 (27.7)	7 (18.4)	0.16
Grade III	25 (8.3)	1 (2.1)	0.16
Grade IV	27 (8.9)	2 (5.3)	0.16
<i>Surgical characteristics</i>			
Duration of surgery waiting time; mean (DS) Hours	7.8 (14)	5.8 (6.7)	0.134
Bowel resection; <i>N</i> (%)	33 (10.9)	3 (7.9)	0.59
Open approach (anterior/posterior); <i>N</i> (%)	108/194 (47/63)	16/22 (42/58)	0.67
Need of assisted laparotomy; <i>N</i> (%)	25 (8.3)	3(7.9)	0.94
Hernioscopy; <i>N</i> (%)	1 (0.3)	0	–
Prophylactic antibiotics; <i>N</i> (%)	248 (81.8)	36 (94.7)	0.04
<i>Type of anesthesia; N (%)</i>			
Locoregional	151 (49.8)	17 (44.7)	0.04
Sedation and local	0	1(2.6)	–
General	152 (50.2)	20 (52.6)	0.04

*Frailty determined by albumin (g/L) < 3.4, creatinine (mg/dL) > 2, and hematocrit (%) < 35.

Table 3: Postoperative outcomes

	HU N = 38	HB N = 38	P-value
Surgery duration, min. Mean (SD)	118 (45)	133 (46)	0.95
Complications <i>N</i> (%)	26 (68.4)	19 (50)	0.51
<i>Clavien-Dindo classification N</i> (%)			
I	4 (10.5)	6 (15.8)	0.51
II	12 (3.6)	9 (23.7)	0.51
IIIa	2 (5.3)	0	0.51
IIIb	2 (5.3)	2 (5.3)	0.51
IV	2 (5.3)	1 (2.6)	0.51
V	3 (7.9)	1 (2.6)	0.51
90-day postoperative mortality <i>N</i> (%)	3 (7.9)	1 (2.6)	0.30
Medical complications <i>N</i> (%)	22 (57.8)	17 (844.8)	0.25
Acute urinary retention <i>N</i> (%)	4 (5.9)	5 (12.3)	0.72
Surgical site infection <i>N</i> (%)	6 (9.3)	0	–
Wound hematoma; <i>N</i> (%)	7 (18.4)	7 (18.4)	0.61
Seroma <i>N</i> (%)	2 (5.2)	1 (2.6)	0.50
Scrotal hematoma <i>N</i> (%)	1 (2.6)	4 (10.6)	0.16
Ileus <i>N</i> (%)	3 (7.9)	2 (5.3)	0.64
Hospital stay. Days; mean (SD)	9.6 (10.5)	6.4 (7.1)	0.14
Chronic wound infections <i>N</i> (%)	1 (2.6)	0	–
Recurrence <i>N</i> (%)	3 (7.9)	5 (12.3)	0.45
Complicated hernia side recurrence <i>N</i> (%)	–	4 (10.6)	–
Chronic pain <i>N</i> (%)	0	0	–
Follow-up in months; mean (SD)	6.61 (13.4)	6.8 (9.5)	0.56

recurrence). It is worth mentioning that one case of chronic mesh infection in the UH group died due to respiratory complications in the postoperative period. No cases of chronic groin pain were observed Table 3.

Discussion

The study shows that emergency inguinal hernioplasty in our patient cohort has high morbidity and mortality, as demonstrated in other studies in the literature. A Danish study showed even higher mortality rates, with 8% mortality at 30 days.^[19] One Chinese study reported 40.6% complications and a mortality rate of 7.8%;^[20] also, previous study data indicate a high morbidity up to 49%, recurrence rates (10%), and 30-day mortality.^[21,22] Few studies show better results, with complication rates of 24% and 2.5% mortality.^[23] Specifically, higher rates of infection in the UH group will probably be related to a higher rate of bowel resection and dirty surgery (WHO classification III–IV) High rate of bilateral hernioplasty recurrence is considered a one side recurrence; however, they had bilateral repair, so real recurrence ratio per hernia repair would be 6.5%, which is in line with previous reported data.^[20-23]

Since we studied a 90-day mortality, the post-operative period of observation is longer, and thus the morbidity and mortality may be even higher. Emergency groin hernia repair poses a challenge for general surgeons on call. There are several complex scenarios in emergency groin hernia repair, with elderly, fragile patients and a

higher rate of contaminated surgery due to the need for bowel resection and morbidity directly related to the evolution time of symptoms or bowel obstruction signs.^[24] One factor for reducing morbidity is for planning elective surgery earlier in high-risk patients^[12] to avoid the emergency setting as it is related to higher complication rates.^[25]

As mentioned in the *Introduction*, there is no clear consensus or published data regarding the topic discussed in this article, which is one of the first studies to address the performance of bilateral hernioplasty in an emergency scenario. Based on our results, it seems that performing bilateral inguinal hernioplasty in the context of a complication on one side does not add more morbidity, hospital stay, or the incidence of recurrence. It adds a mean of 15 min more of surgery time (without being statistically significant). By acting like this, we avoid exposing the patient to another anesthesia, admission, and surgical risk in case of not repairing the uncomplicated side. On the other hand, the health costs and use of added resources for a new intervention and new admission are reduced, although we emphasize that we did not carry out a cost study to substantiate this observation. The present analysis has inherent limitations due to the observational and retrospective nature of this study. We attempted to mitigate the biases inherent in this study by using propensity score matching. Even so, we believe that prospective studies with longer postoperative follow-up are necessary to validate these results.

Another line of investigation could be to analyze the laparoendoscopic approach of inguinal emergency hernia repair in order to reduce global complications, specially surgical site occurrences complications; however, these considerations are not based in high evidence studies,^[26,27] and further studies are required for definitive conclusions.

Conclusion

In conclusion, presenting a complicated side when suffering from a bilateral inguinal hernia is not uncommon. Performing bilateral inguinal hernioplasty in this emergency situation does not seem to add morbidity or lengthen hospital stay, thus avoiding the need for a new intervention with inherent risks and costs.

Presentation

Data from the actual manuscript were presented at the Annual meeting of the European Hernia Society in Prague, 31st of May 2024, in the Groin Hernia Surgery Session.

Author contributions

ABS and FOS are the main authors of the manuscript and have contributed equally to this work. All authors are involved in the design of the study. AGC, FOS, MJG, CTM, and ABS collected the data and together with MPG, LRC, and JPR analyzed them and critically reviewed the manuscript until reaching the final version. All authors have read and approved the final manuscript.

Ethical policy and institutional review board statement

The prospective collection of the surgical emergency database of our center is carried out according to the criteria and approval of the Ethics Committee of CEIM Hospital del Mar (No. 2020-95-78, dated on December 1, 2020).

Declaration of patient consent

All patients signed their informed consent for inclusion in our registry for investigation and teaching reasons.

Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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The authors declare that no financing or economic compensation of any kind was received from institutions or organizations during the study.

Conflicts of interest

There are no conflicts of interest.

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Abbreviations

IH Inguinal hernia
 BH Bilateral hernia
 UH Unilateral hernia
 ATB antibiotic
 ASA American Society of Anesthesiologists

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