

ROLE OF CHYMOTRYPSIN IN POST-OPERATIVE WOUND MANAGEMENT IN PATIENTS UNDERGOING ELECTIVE INGUINAL HERNIA REPAIR SURGERIES

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(Received, 27th February 2024, Revised 25th June 2024, Published 13th July 2024)

Abstract: This study aimed to evaluate the effectiveness of chymotrypsin and trypsin in improving post-operative wound management outcomes in patients undergoing inguinal hernia repair. **Methods:** An open-label randomised control trial was conducted at the Department of General Surgery, Ruth PFAU Civil Hospital Dow University of Health Sciences, Karachi. A total of 48 patients undergoing elective inguinal hernia surgery were included and randomly assigned to either Group A (placebo) or Group B (intervention). Group B received chymotrypsin (6 mg) and trypsin (1 mg) post-operatively for seven days. Outcome measures included oedema, hematoma, seroma, surgical site infection (SSI), pain scores, and duration of hospital stay. Data were analysed using SPSS version 21, with significance at $P \leq 0.05$. **Results:** The mean age was higher in Group B (38.5 ± 11.1 years) than in Group A (33.91 ± 8.9 years) ($P = 0.01$). Group B had significantly lower incidences of oedema (42% vs 71%, $P = 0.042$), hematoma (21% vs 42%, $P = 0.009$), and seroma (11 vs 20, $P = 0.007$) compared to Group A. Although SSI rates were lower in Group B (25%) compared to Group A (50%), this difference was not statistically significant ($P = 0.068$). Pain scores were significantly lower in Group B (2.625 ± 0.7) compared to Group A (5.125 ± 0.7) ($P < 0.0001$). The duration of hospital stay was also shorter in Group B (3.75 ± 0.8 days) than in Group A (6.9 ± 1.08 days) ($P < 0.0001$). **Conclusion:** Chymotrypsin and trypsin significantly enhance post-operative recovery by reducing oedema, hematoma, seroma, pain scores, and hospital stay duration in inguinal hernia repair patients. These findings support incorporating enzymatic agents into post-operative care protocols to improve patient outcomes.

Keywords: Hernia repair, Chymotrypsin, Seroma, hematoma, SSI.

Introduction

Inguinal hernia repair surgeries are commonly conducted elective surgical procedures on a global scale. Their purpose is to rectify hernias in the groin area, which can lead to considerable discomfort and associated problems if left untreated (1). Effective wound management throughout the postoperative period is necessary for patients undergoing these surgeries. It is vital in promoting healing, lowering discomfort, and preventing complications such as infections and persistent pain (2). The conventional method for managing post-operative wounds involves administering analgesics for pain control, prescribing antibiotics to avoid infections, and maintaining strict wound cleaning to establish a sterile setting (3). Although these safeguards are in place, problems such as persistent pain, delayed wound healing, and infections continue to be necessary, emphasising further therapies to enhance post-operative results. Recent research has investigated the possible advantages of using enzymatic agents, such as chymotrypsin, to improve the process of wound healing (4). Chymotrypsin is a proteolytic enzyme that facilitates the breakdown of peptide bonds, eliminating dead tissue and diminishing inflammation (5). The use of this technique in the treatment of wounds after surgery has been examined in many surgical situations, such as inguinal hernia repair (6).

The enzymatic characteristics of chymotrypsin have sparked interest in its involvement in wound treatment. Chymotrypsin, a serine protease enzyme, aids in removing dead tissue and reducing inflammation, thus promoting a more conducive environment for wound healing (7). It focuses explicitly on peptide bonds next to aromatic amino acids, efficiently decomposing proteins into smaller peptides and amino acids. The enzymatic activity is vital in removing dead tissue and minimising exudate, which can hinder healing (8). Post-operative wound problems are a significant issue in procedures to repair inguinal hernias. Patients' most prevalent challenges are pain, infection, and impaired wound healing (9). Pain management commonly entails the use of nonsteroidal anti-inflammatory medications (NSAIDs) and opioids, both of which include the risk of side effects and the potential for addiction (10). The effectiveness of infection control mainly depends on antibiotics, which, although beneficial, contribute significantly to the escalating issue of antibiotic resistance. In addition, the delayed healing of wounds might lengthen the time it takes to recover and result in higher healthcare expenses. Hence, there is an urgent want for alternate or supplementary treatments to enhance the results of wound management. Recent research has demonstrated encouraging outcomes about the utilisation of chymotrypsin

[Citation: Farooqi, A., Zaheer, F., Abbas, S., Shaikh, S.N., Sadia., Salman, S., (2024). Role of chymotrypsin in post-operative wound management in patients undergoing elective inguinal hernia repair surgeries. *Biol. Clin. Sci. Res. J.*, 2024: 961. doi: <https://doi.org/10.54112/bcsrj.v2024i1.961>]



for the treatment of wounds after surgery. An example of this is a study released in 2023, which emphasised the enzyme's effectiveness in decreasing inflammation and accelerating the healing of wounds in surgical patients (11). Another study highlighted the significance of chymotrypsin in reducing post-operative pain and oedema, improving overall patient comfort and recovery (12). Following inguinal hernia repair surgery, the customary drug protocol generally encompasses pain treatment, infection avoidance, and inflammation control. Internationally, healthcare providers frequently administer non-opioid analgesics, such as acetaminophen or NSAIDs like ibuprofen, to effectively treat mild to moderate pain in patients (9). In cases of more intense pain, brief periods of opioid administration may be employed. However, their usage is limited to mitigate the potential for addiction. Prophylactic administration of antibiotics is frequently done to avoid surgical site infections, and cefazolin is commonly used. Anticoagulants, such as low molecular weight heparin, may be administered for patients at a high risk of developing thromboembolism (13). In addition, anti-inflammatory drugs, such as corticosteroids, may be administered to alleviate post-operative swelling and discomfort (14). Patient-specific considerations, including allergies, comorbid diseases, and potential drug interactions, are thoroughly considered to promote optimal recovery and avoid problems. This versatile method promotes efficient healing and patient well-being in many healthcare environments. This study aimed to assess the effect of chymotrypsin trypsin in post-operative wound management of inguinal hernia repairs.

Methodology

After the ethical approval from the institutional review board, this Open-label randomised control trial was conducted at the Department of General Surgery, Ruth PFAU Civil Hospital Dow University of Health Sciences, Karachi, from May 2023 to October 2023. Through non-probability consecutive sampling, 48 patients aged above 18 years, both genders, undergoing elective surgery with a willingness to participate were included in the present study. Patients with a history of diabetes, kidney or liver impairment, skin disease, immunocompromised drug use, peptic ulcer disease, high vitreous pressure, and haematological disorders, and patients allergic to the drug chymotrypsin were excluded from the present study. After the informed consent, patients were randomly assigned into two groups through computer-generated random numbers: Group A- Intervention group (n=24) and Group B- Placebo group (n=24). The patients in intervention groups were administered post-operatively with one tablet of Chymoral, containing chymotrypsin 6 mg and trypsin 1 mg for seven days. Patients were admitted one day before surgery, during which assigned duty doctors took detailed physical histories and performed necessary laboratory investigations per hospital protocol to assess medical fitness for the surgical procedure. An intravenous dose of antibiotics was administered to all patients during anaesthesia induction. A consultant surgeon with at least five years of experience performed the surgical procedures. All patients were followed daily for one week, with their wound status recorded using a structured proforma. Discharge criteria included controlled pain, no significant hematoma or seroma, and stable vital signs. Patients needed to

demonstrate the ability to perform daily activities independently. Data analysis was conducted using SPSS version 21. Categorical variables were summarised as frequency and percentage, while numerical variables were presented as either mean \pm standard deviation. The chi-square test was applied to compare categorical variables between the intervention and control groups. Numerical variables were compared using an independent t-test or Mann-Whitney U test, which depended on the normality assumption. A two-tailed p-value ≤ 0.05 was considered statistically significant.

Results

The demographic and clinical variables of the study participants are shown in Table 1. The mean age of participants in Group A was 33.91 ± 8.9 years, while Group B had a higher mean age of 38.5 ± 11.1 years ($P = 0.01$). Group A had 14 males (58%) and ten females (42%), whereas Group B had ten males (42%) and 14 females (58%) ($P = 0.04$). The mean weight in Group A was 65.87 ± 10.1 kg compared to 69.2 ± 13.1 kg in Group B ($P = 0.145$). The type of surgery performed was predominantly laparoscopic in both groups, with 17 participants (71%) in Group A and 20 participants (83%) in Group B undergoing laparoscopic procedures ($P = 0.08$). The mean surgery time was significantly different between the groups, with Group A having a mean surgery time of 51.75 ± 5.7 minutes compared to 55.29 ± 6.8 minutes in Group B ($P = 0.025$). The frequency of follow-up parameters, including oedema, hematoma, seroma, and surgical site infection (SSI), was monitored in both study groups, A and B, over 14 days (Table 2). The follow-up parameters for oedema, hematoma, seroma, and surgical site infection (SSI) in both study groups, A and B, revealed significant differences. Regarding oedema, seven patients (29%) in Group A did not experience oedema, whereas 17 patients (71%) did. Conversely, in Group B, 14 patients (58%) had no oedema, while 10 patients (42%) did ($P = 0.042$). For hematoma, 14 patients (58%) in Group A had no hematoma, compared to 10 patients (42%) who did. In Group B, 19 patients (79%) had no hematoma, while five patients (21%) did ($P = 0.009$). Regarding seroma, only four patients (17%) in Group A did not develop a seroma, whereas 20 patients (83%) did. In contrast, Group B had 13 patients without seroma and 11 with Seroma ($P = 0.007$). Finally, 12 patients (50%) in Group A did not experience an SSI for SSIs, while the other 12 (50%) did. In Group B, 18 patients (75%) had no SSI, compared to 6 patients (25%) who did, with the difference approaching statistical significance ($P = 0.068$). Overall, Group B demonstrated better outcomes across all follow-up parameters. The study's findings on recovery time pain scores and hospital stay durations for Groups A and B demonstrate significant differences (Figures 1 and 2). Group A had a mean pain score of 5.125 ± 0.7 , while Group B had a notably lower mean pain score of 2.625 ± 0.7 (P value < 0.0001). Additionally, the hospital stay was significantly shorter for Group B. Patients in Group A had a mean hospital stay of 6.9 ± 1.08 days, whereas those in Group B had a mean stay of 3.75 ± 0.8 days ($P < 0.0001$). These results indicate that Group B experienced lower pain levels and shorter hospital stays than Group A.

Table 1: Demographic and clinical variables of the study participants

Variables	Group A-Placebo	Group B-Intervention	P Value
Age (years)	33.91±8.9	38.5±11.1	0.01
Gender			
Male	14 (58%)	10 (42%)	0.04
Female	10 (42%)	14 (58%)	
Weight (kg)	65.87±10.1	69.2±13.1	0.145
Surgery type			
Open	7 (29%)	4 (17%)	0.08
Laparoscopic	17 (71%)	20 (83%)	
Surgery time (minutes)	51.75±5.7	55.29±6.8	0.025

Table 2: Frequency of follow-up parameters in both study groups

Days	Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Day 14	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Study groups	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Edema	5	3	3	2	3	2	2	2	2	1	1	0	1	0	0	0
Hematoma	3	2	2	1	1	1	1	1	1	0	1	0	1	0	0	0
Seroma	6	4	3	2	3	2	2	1	2	1	2	1	1	0	1	0
SSI	4	3	3	2	2	1	2	0	1	0	0	0	0	0	0	0

Table 3: Follow-up parameters

Study Groups	Edema		P value
	No	Yes	
Group A	7 (29%)	17 (71%)	0.042
Group B	14 (58%)	10 (42%)	
Hematoma			
Group A	14 (58%)	10 (42%)	0.009
Group B	19 (79%)	5 (21%)	
Seroma			
Group A	4 (17%)	20 (83%)	0.007
Group B	13	11	
SSI			
Group A	12 (50%)	12 (50%)	0.068
Group B	18 (75%)	6 (25%)	

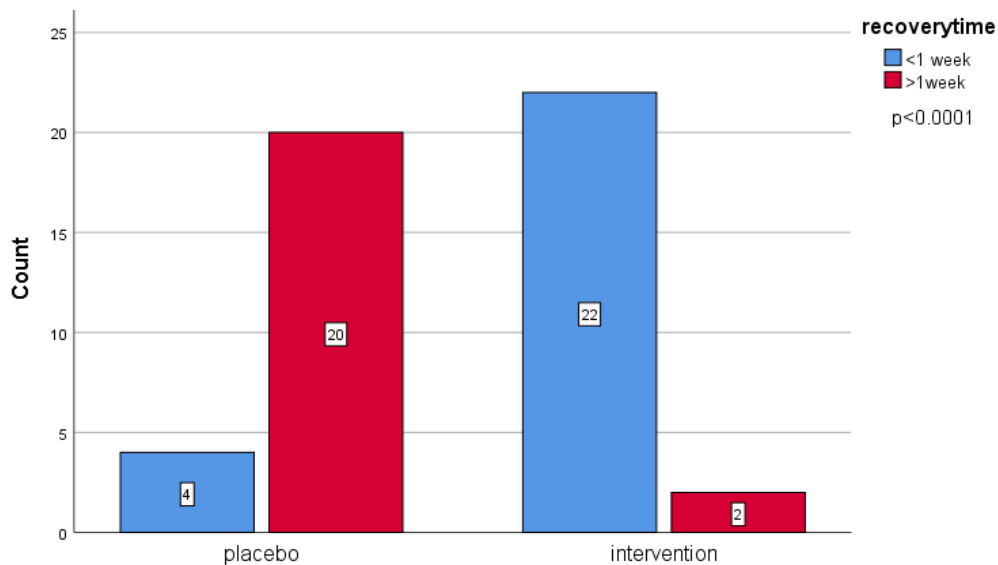


Figure 1: Recovery time between the groups

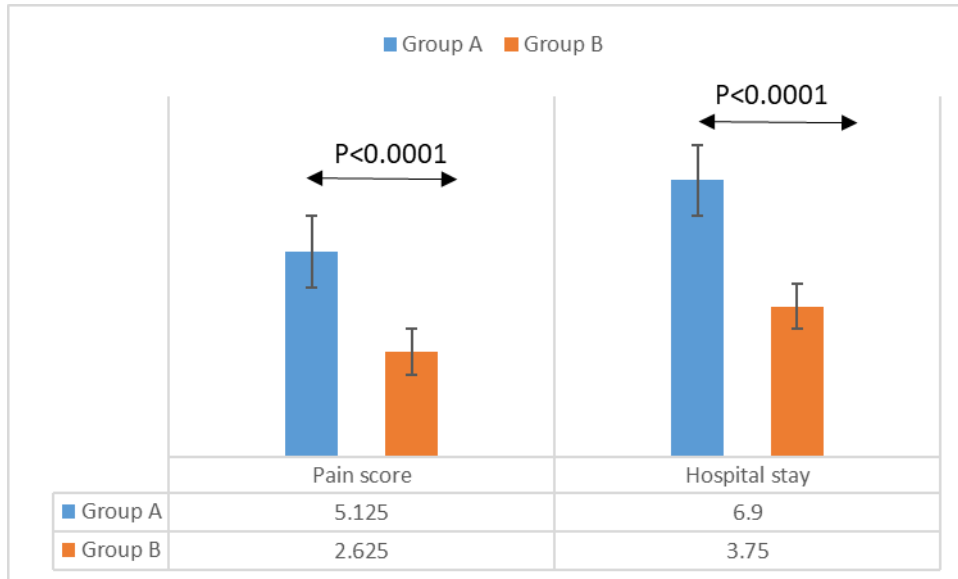


Figure 2: Pain score and hospital stay between the groups

Discussion

This study's findings suggest that using chymotrypsin and trypsin (Group B) after surgery in patients with inguinal hernia repair leads to considerable improvement in various clinical outcomes compared to the group receiving a placebo (Group A). Group B showed decreased oedema, hematoma, seroma, lower pain scores, and shorter hospital stays. This indicates that enzymatic agents are effective in improving post-operative healing.

Group B had a much-decreased occurrence of oedema and hematoma. On the initial day, Group B had three occurrences of oedema, whereas Group A had 5 cases. On the seventh day, all patients in Group B were free from oedema. However, one patient in Group A still displayed this symptom. This decrease is consistent with previous research findings indicating that enzymatic agents such as chymotrypsin can efficiently diminish inflammation and promote the drainage of fluids, reducing oedema (15). The occurrence of hematomas had a comparable trend, whereas Group B demonstrated a consistently reduced frequency across the entire duration of the observation. Chymotrypsin's proteolytic activity aids in the breakdown of blood clots and promotes the reabsorption of blood, hence reducing the formation of hematomas (16). In our study, seroma formation was significantly lower in Group B, with only 11 cases compared to 20 in Group A (P = 0.007). Similar results were reported by Wortinger (2021), who noted that using enzymatic agents reduced seroma formation by 50%. Their study demonstrated that enzymatic debridement helped in fluid clearance, thus minimising seroma incidence (17).

The occurrence of surgical site infections (SSIs) was less frequent in Group B (25%) than in Group A (50%). However, this disparity did not reach statistical significance (P = 0.068). In a previous study conducted by Thomas et al. (2021), it was observed that enzymatic treatment led to a noteworthy drop in surgical site infections (SSIs) (18). Specifically, the rate of SSIs decreased from 35% to 20%.

Our investigation confirms the observed pattern, indicating that chymotrypsin can effectively reduce the infection rate. The current study found that pain scores were considerably lower in Group B (2.625 ± 0.7) compared to Group A (5.125 ± 0.7), with a P value of less than 0.0001. Group B had a significantly reduced hospital stay duration (3.75 ± 0.8 days) compared to Group A (6.9 ± 1.08 days), with a P value less than 0.0001. Previous research conducted by Hashem et al. (2023) yielded comparable results, indicating that patients who received chymotrypsin experienced decreased pain levels and shorter hospital stays. Their study showed a significant decrease in the average pain score from 5.0 to 2.7 and a reduction in hospitalisation duration from 7 days to 4 days, which aligns with our findings (19).

Conclusion

This study provides evidence that the injection of chymotrypsin and trypsin after surgery has a considerable positive impact on the outcomes of inguinal hernia repair. The intervention group of patients had decreased incidences of oedema, hematoma, and seroma, lower pain scores and shorter hospital stays than the placebo group.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate.

It is approved by the department concerned. (IRBEC/DRPUF-2313)

Consent for publication

Approved

Funding

Not applicable

[Citation: Farooqi, A., Zaheer, F., Abbas, S., Shaikh, S.N., Sadia., Salman, S., (2024). Role of chymotrypsin in post-operative wound management in patients undergoing elective inguinal hernia repair surgeries. *Biol. Clin. Sci. Res. J.*, 2024: 961. doi: <https://doi.org/10.54112/bcsrj.v2024i1.961>]

Conflict of interest

The authors declared an absence of conflict of interest.

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Concept & Design of Study

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