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RESEARCH ARTICLE

Enhancing pain relief and minimizing infection risk in abdominal surgery: An in-depth comparative investigation

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Abstract: Analgesics and antibiotics are essential for post-operative treatment because an analgesic typically reduces pain after surgery. By using the right antibiotics, surgical site infections (SSI) can be avoided. The purpose of this study is to assess the effectiveness of analgesics and antibiotics in post-operative hernia and cholelithiasis patients in relation to post-operative pain in surgical site infections. This is a prospective observational study and it is conducted for 6month period between November 2022 to April 2023 in surgical ward at Trust Multispecialty Hospitals, Kakinada, Andhra Pradesh. In this study a total of 115 postoperative subjects were selected, hernias are about 75 subjects and cholelithiasis are 40 subjects. Our study results conducted that, preoperative anesthetics and post-operative analgesics helps the subjects to experience moderate pain after surgery. Weak Opioid (Tramadol), narcotic analgesics (Fentanyl), NSAIDs (Aceclofenac), Paracetamol is given for pain relief. Among 115 subjects were treated with prophylactic antibiotics and none of them had developed with surgical site infection. For prophylaxis of SSI Cephalosporins were preferred as antibiotics like Ceftriaxone, Meropenem, Cefotaxim, (Cefoperazone-Sulbactam), (Piperacillin-Tazobactam) respectively. The study reported the concomitant strict usage of Antibiotics have reduced the incidence of Surgical site infections and the pain perception was reported to be low because of combination of Analgesics rather than the Single dosing and the administration of General Anesthesia before the surgery, along with the surgeon skill.

Keywords: Analgesics; Antibiotics; Post-Operative Pain; Surgical Site Infection; Hernia; Cholelithiasis

1. Introduction

Surgery almost often damages the tissue, which results in discomfort poor pain management causes delayed mobility and associated consequences as well as psychological discomfort and worry. Major abdominal operations with upper abdominal incisions induce considerable stomach pain that if not well managed, can result in atelectasis, retention of secretions, shallow breathing, and resistance to physical therapy [1, 2]. 30-80% of patients who have undergone surgery report moderate to severe post-operative pain [3]. Traditionally, systematic analgesics such as opioids, ketamine's NSAIDs, alpha 2 agonists, and Paracetamol or epidural anesthesia are used to manage pain during abdominal surgery [4]. After laparoscopic surgery, it's common for the sufferer to describe the pain as being intense, sharp, electronic, and stabbing [5].

The pain is measured by using the Universal Pain Assessment Tool (UPAT). The UPAT has a 0-10 number score, where the pain can be assessed based on "the Verbal Descriptor Scale", "Wong Baker Facial Grimace Scale" and "Activity Tolerance" [6].

UPAT is used to interpret the pain level in postoperative stages specifically in two population groups, one who underwent surgery with general anesthesia, and another group who undergone surgery with nerve block. The dose of analgesia to be prescribed postoperatively depends upon the level of pain. Anyhow, selecting an opioid is a crucial and frequently employed pharmacological therapy for the treatment of postoperative pain.

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The use of operative antibiotics to stop infections at the surgical site is known as prophylaxis. Prophylaxis has evolved in the standard of care for dirty and contaminated surgery, as well as for procedures involving the implantation of artificial devices. It must be delivered on schedule. Most parenteral antibiotics normally do this during the induction of anesthesia. If the surgery lasts for four or fewer hours, one dose of antibiotics is typically enough [7, 8].

Worldwide health issues known as anti-microbial resistance (AMR) transcends geopolitical boundaries AMR is a normal occurrence but it has gotten worse over the past few decades attributable to several causes including overprescribing inappropriate antibiotic usage bad hygiene habits and widespread anti-microbial use [9].

According to WHO to prevent SSI antibiotics must be administered between 6 to 120 minutes before the surgery. While post-operative surgical antibiotic prophylaxis failed to demonstrate your statistically meaningful effect operative to SAP may reduce SSI [10]. The Centre for Disease Control and Prevention classifies surgical wounds into four categories, clean, clean contaminated, contaminated, dirty, or infected [11]. Although there is a negligible chance of infection problems following elective laparoscopic cholecystectomy and hernia, the indication of prophylaxis is effective for the prevention of surgical site infection [12, 13]. The subjects who were underground surgery had moderate postoperative pain, moderate mobility, and earlier discharge. 100% prevention of SSI after surgery by prophylactic antibiotics has been found in this study [14, 15].

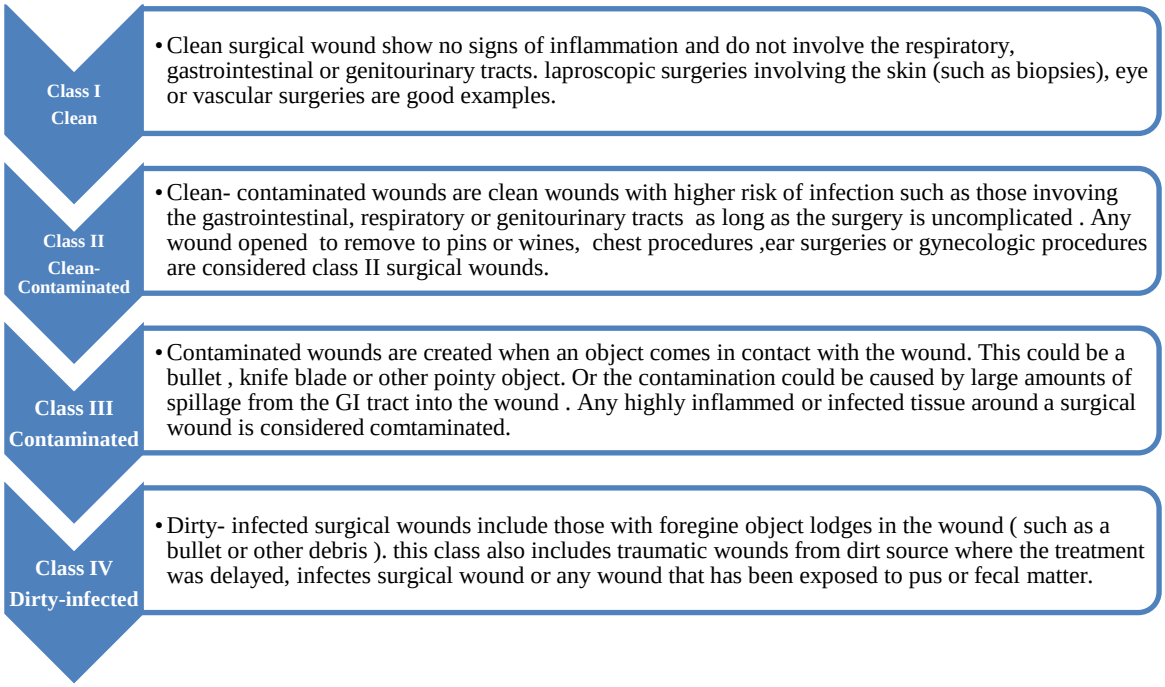

Figure 1. Surgical wound classification based on The American College of Surgeons

The aim of our study is to determine the role of antibiotics and effectiveness of analgesia after abdominal surgery. The main objective of our study is to assess the effectiveness of postoperative analgesics and role of antibiotics, evaluate the type of analgesics to be administered depending on the condition and to characterize the type of antibiotics given after abdominal surgery

2. Methodology

The study was a prospective single-centered observational study that was conducted in the Department of General Medicine at Trust Multispeciality Hospitals in Kakinada. The duration of the study was about 6 months from November 2022 to April 2023. This was a non-comparative observational study conducted on around 300 diabetic-hypertensive individuals. The sample data was collected according to the data collection form, as per the study criteria, the time taken to collect the data was about five and a half months, and the remaining time was allocated for the study Data's statistical analysis.

The study criteria include both males and females who have both diabetes and hypertension and all types of subjects who are currently receiving treatment at the hospital. The study criteria exclude those subjects who do not have either diabetes or hypertension, pregnant women, breastfeeding women, Pediatric patients, and subjects who are not receiving treatment in the same hospital. The data was collected from the subjects by taking their prescriptions, and by interviewing them after collecting their written informed consent forms. The data collection form consists of about patient's demographic details, co-morbid conditions,

occupation, diagnosis, clinical outcome, and the anti-diabetic and anti-hypertensive drugs prescribed by the physician. The analysis of the study was done with respect to patient consent and other data collected from the public domain. Thus, the approval of the ethical committee was not required for further publication.

The data was collected from the subjects and arranged according to the study criteria and statistical analysis was conducted using Microsoft Excel. Simple statistics were used to analyze the study. The results of the study were expressed in percentages (%). To determine the relationship between anti-diabetic or anti-hypertensive drug therapy with blood glucose levels or blood pressure levels by using relative risk (measurement of risk). If the relative risk is more than 1 then positive outcome, relative risk is less than 1 it is considered as negative outcome.

3. Results and discussion

Table 1 shows that gender wise distribution of Hernia and Cholelithiasis of 115 subjects, in that Hernia were about 75 subjects and Cholelithiasis were about 40 subjects. In Hernia, males were 65 (86.7%), and females were 10 (13.3%). In Cholelithiasis, males were 11 (27.5%), and females were 29 (72.5%). Out of 115 subjects, in that Hernia were about 75 subjects and Cholelithiasis were about 40 subjects. Number of subjects <40 years were 20, in that Hernia were 15 (75%), and Cholelithiasis were 5 (25%). Number of subjects >40 years were 95, in that Hernia were 60 (63.2%), and Cholelithiasis were 35 (36.8%).

Table 1. Age and Gender wise distribution

Age wise distribution				
S.no	**Age**	**No. Of subjects**	**Hernia**	**Cholelithiasis**
1.	<40 Years	20	15 (75%)	5 (25%)
2.	>40 Years	95	60 (63.2%)	35 (36.8%)
Gender wise distribution				
S.no	**Gender**	**Hernia (n=75)**	**Cholelithiasis (n=40)**	**Total no of subjects**
1.	Male	65 (86.7%)	11 (27.5%)	76 (66.1%)
2.	Female	10 (13.3%)	29 (72.5%)	39 (33.9%)
3.	Total	75 (65.2%)	40 (34.8%)	115 (100%)

Figure 2 shows diagnosis wise distribution of 115 subjects, where the patients with Inguinal hernia were 35 (30.4%), Umbilical hernia were 20 (17.5%), Incisional hernia were 13 (11.4%), Epigastric hernia were 7 (6.1%) and Cholelithiasis 40 (34.7%)

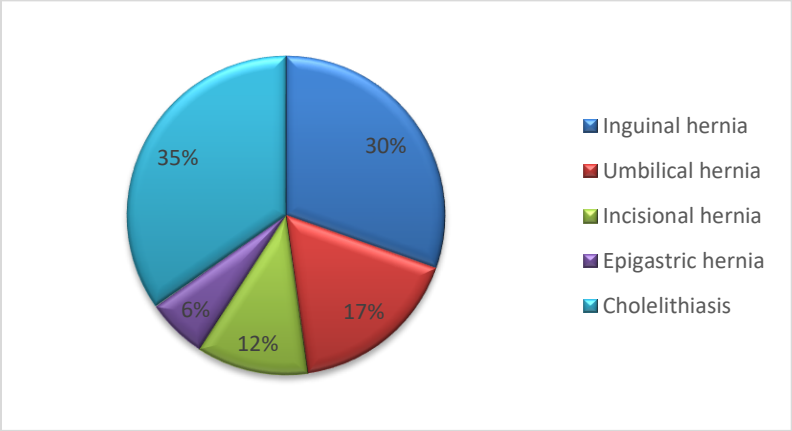

Figure 2. Diagnosis wise distribution

Table 2 shows the median length of hospital stay of subjects underwent open surgery and laparoscopic surgery. In out of 75 subjects 27 (36%) who underwent open hernia surgery and 48 (64%) underwent laparoscopic hernioplasty surgery. In out of 40 subjects 3 (7.5%) undergone open surgery and 37 (92.5%) undergone laparoscopic surgery. Median length of hospital stay of subject's undergone open surgery was 5 days and laparoscopic surgery was 3 days. The anesthesia record of 115 subjects diagnosed with Hernia and Cholelithiasis. In Hernia out of 75 subjects, 45 (60%) were given general anesthesia and 30 (40%) were given spinal anesthesia. In Cholelithiasis out of 40 subjects, 27 (67.5%) were given general anesthesia and 13 (32.5%) were given spinal anesthesia. The duration of general anesthesia was 24 hours and spinal anesthesia was 4 hours.

Table 2. Median length of hospital stay and anesthesia record

Median length of hospital stay				
S.No	**Type of Surgery**	**Hernia Subjects**	**Cholelithiasis Subjects**	**Median Length of Hospital Stay**
1.	Open surgery	27 (36%)	3 (7.5%)	5 days
2.	Laparoscopic surgery	48 (64%)	37 (92.5%)	3 days
Anesthesia record				
S.no	**Anesthesia type**	**Hernia**	**Cholelithiasis**	**Duration of anesthesia**
1.	General anesthesia	45 (60%)	27 (67.5%)	24 hours
2.	Spinal anesthesia	30 (40%)	13 (32.5%)	4 hours

Table 3 shows the surgical wound classification of 115 subjects diagnosed with Hernia and Cholelithiasis. In Hernia out of 75 subjects, 72 (96%) were observed with clean wound and 3 (4%) were observed with clean contaminated wound. In Cholelithiasis out of 40 subjects, 38 (95%) were observed with clean wound and 2 (5%) were observed with clean contaminated wound. In Hernia out of 75 subjects 56 (74.7%) were given monotherapy and 19 (25.3%) were given combinational therapy. In Cholelithiasis out of 40 subjects 29 (72.5%) were given monotherapy and 11 (27.5%) were given combinational therapy.

Out of 75 subjects with Hernia, 50 (66.7%) were administered with Inj. Ceftriaxone, 4 (5.2%) were administered with Inj. Cefotaxim, 2 (2.7%) were administered with Inj. Meropenem, 17 (22.7%) were administered with Inj. Cefoperazone + Sulbactam, and 2 (2.7%) were administered with Inj. Piperacillin + Tazobactam. In Cholelithiasis out of 40 subjects, 22 (55%) were administered Inj. Ceftriaxone, 3 (7.5%) were administered with Inj. Cefotaxim, 3 (7.5%) were administered with Inj. Meropenem, 9 (22.5%) were administered with Inj. Cefoperazone + Sulbactam, and 3 (7.5%) were administered with Inj. Piperacillin + Tazobactam.

In Hernia out of 75 subjects, 35 (46.7%) were administered with Tab. Tramadol, 30 (40%) were administered with Inj. Tramadol, Inj. Fentanyl, 8 (10.7%) were administered with Inj. Tramadol, Inj. Aceclofenac, and 2 (2.6%) were administered with Inj. Tramadol, Inj. Paracetamol. In Cholelithiasis out of 40 subjects, 17 (42.5%) were administered with Tab. Tramadol, 14 (35%) were administered with Inj. Tramadol, Inj. Fentanyl, 2 (5%were administered with Inj. Tramadol, Inj. Aceclofenac, and 7 (17.5%) were administered with Inj. Tramadol and Inj. Paracetamol. The pain score assessment of 115 subjects diagnosed with Hernia and Cholelithiasis is obtained by using the Wong Baker Facial Grimace Scale. In Hernia out of 75 subjects, 15 (20%) experienced mild pain, and 60 (80%) experienced moderate pain. In Cholelithiasis out of 40 subjects, 5 (12.5%) experienced mild pain, and 35 (87.5%) experienced moderate pain

Table 3. Detailed results

Wound classification			
S.no	**Wound classification**	**Hernia**	**Cholelithiasis**
1.	Clean	72 (96%)	38 (95%)
2.	Clean-Contaminated	3 (4%)	2 (5%)
3.	Contaminated	0	0
4.	Dirty Infected	0	0
Therapy used			
S.no	**Type of antibiotic therapy**	**Hernia**	**Cholelithiasis**
1.	Monotherapy	56 (74.7%)	29 (72.5%)
2.	Combinational therapy	19 (25.3%)	11 (27.5%)

Antibiotics administered			
S.no	**Antibiotics administered**	**Hernia**	**Cholelithiasis**
1.	Inj. Ceftriaxone	50 (66.7%)	22 (55%)
2.	Inj. Cefotaxim	4 (5.2%)	3 (7.5%)
3.	Inj. Meropenem	2 (2.7%)	3 (7.5%)
4.	Inj. Cefoperazone + Sulbactam	17 (22.7%)	9 (22.5%)
5.	Inj. Piperacillin + Tazobactam	2 (2.7%)	3 (7.5%)
Analgesics administered			
S.no	**Analgesics administered**	**Hernia**	**Cholelithiasis**
1.	Tab. Tramadol	35 (46.7%)	17 (42.5%)
2.	Inj. Tramadol+Inj. Fentanyl	30 (40%)	14 (35%)
3.	Inj. Tramadol +Inj. Aceclofenac	8 (10.7%)	2 (5%)
4.	Inj. Tramadol + Inj. Dolo	2 (2.6%)	7 (17.5%)
Pain assessment using Wong Baker Facial Grimace Scale			
Score assessment	**Pain score**	**Hernia**	**Cholelithiasis**
Mild pain	1-2	15 (20%)	5 (12.5%)
Moderate pain	3-6	60 (80%)	35 (87.5%)
Severe pain	7-10	0	0

4. Conclusion

This study was carried out to better understand the patients who underwent abdominal laparoscopic surgery for cholelithiasis and an open inguinal hernia. Males were primarily impacted by hernia, whereas females were primarily affected by cholelithiasis. Most of the time, this issue affects people between the ages of 50 and 70. According to ASA Grade, the majority of patients are in normal circumstances (ASA1), while those with comorbid conditions such Type-II diabetes mellitus and hypertension are noted (ASA2). Most of the time, spinal anesthesia, administered as a Subarachnoid Block (0.5% Bupivacaine Hcl 4ml heavy), is chosen. General anesthesia is administered after pre-medicating with antibiotics (Inj. Cefoperazone and Salbactam), and anesthesia is administered as an injection of fentanyl. According to the Pain Score (UPAT), the majority of the study subjects' post-abdominal surgery pain was moderate. As it is a minor abdominal operation, a single antibiotic is used as prophylaxis for hernias, which are typically inguinal and umbilical. Treatment for cholelithiasis included combination therapy. After analgesics have been administered and surgical follow-up has taken place, the perception of pain has been investigated using the Wong Bakers scale as a pain rating scale. As a result of the combination of analgesics rather than single dosing, the administration of general anesthesia prior to the procedure, the skilled of the surgeon, and the concurrent strict usage of antibiotics, the study reported that the incidence of surgical site infections has decreased.

Compliance with ethical standards

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Conflict of interest statement

The authors declare no conflicts of interest.

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Statement of informed consent:

Informed consent was obtained from all individual participants included in the study.

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Author's short biography

Haritha Kandavalli - Being an intern at Trust Multi-speciality hospitals, I am very much interested in surgery related, and gastrointestinal research topics and I am a proactive listener, who is having long term goals of pursuing masters in health informatics at Binghamton University, New York.