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ORIGINAL ARTICLE

Pericostal Suturing of The Ribs in Closure of Thoracotomy versus Intracostal Nerve Sparing Closure

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ABSTRACT

Background: Post-thoracotomy pain is a common and significant complication following open chest surgery. Convential pericostal suturing has been the standard closure technique, but it may exacerbate nerve compression. An alternative method, intracostal suturing, aims to spare the subcostal nerve bundle and potentially reduce postoperative pain. This study aimed to evaluate the effectiveness of intracostal (nerve-sparing) sutures compared to standard pericostal sutures in reducing postoperative pain following thoracotomy.

Methods: A prospective randomized clinical trial was conducted on 74 patients undergoing thoracotomy at Zagazig University Hospitals between August 2023 and August 2024. Patients were randomized into two groups: Group I (pericostal sutures, n=37) and Group II (intracostal sutures, n=37). Postoperative outcomes assessed included pain intensity using the Numerical Rating Scale (NRS), need for opioid analgesia, duration of chest tube drainage, length of hospital stay, pulmonary function tests, and postoperative complications.

Results: Patients in the intracostal group exhibited significantly lower postoperative pain scores at multiple time points (2 hours, 1st day, 2nd day, and 1 month postoperative; $p<0.05$). They also demonstrated a reduced need for opioid analgesia compared to the pericostal group ($p<0.05$). No significant differences were observed between the groups regarding chest tube drainage duration, hospital stay, pulmonary function outcomes, or complication rates.

Conclusion: Intracostal suturing in thoracotomy closure significantly reduces postoperative pain and analgesic requirements without increasing complication rates, offering a superior alternative to traditional pericostal suturing techniques for improving patient outcomes.

Keywords: Ribs, Pericostal Suturing, Thoracotomy, Intracostal Nerve Sparing.

INTRODUCTION

Thoracotomy remains one of the primary approaches in cardiothoracic surgery to gain access to intrathoracic organs and structures [1]. The technique used during closure remarkably how the ribs are approximated can influence the degree of intercostal nerve compression and is a significant factor affecting postoperative pain. Compression of the intercostal neurovascular bundle during rib closure may lead to reduced respiratory effort, secretion retention, increased pulmonary complications, and physical activity limitations in the postoperative period [2].

Managing postoperative recovery after thoracotomy requires a comprehensive approach, which includes effective pain control, pulmonary care, physical rehabilitation, and

surveillance for complications like atelectasis or wound infections. Patients often benefit from early ambulation, respiratory physiotherapy, and education to lower the chances of developing long-term pain issues. In many cases, even basic respiratory maneuvers such as spirometry are limited due to pain during breathing [3].

Post-thoracotomy pain typically begins as acute traumatic pain and can progress to a persistent form known as post-thoracotomy pain syndrome if it lasts more than two months. Chronic pain has been reported to last up to five years in some cases, with a prevalence ranging from 25% to 60% [4,5].

The pain associated with thoracotomy is often due to multiple intraoperative factors. During chest opening, the vertical blades of thoracic retractors apply pressure on the intercostal nerve of the upper rib. Similarly, during closure, pericostal sutures placed below can compress the lower rib's neurovascular bundle. These two pressure points together are believed to be key contributors to postoperative pain [6].

Damage to the intercostal nerves is widely considered the primary source of this pain. Therefore, modifying closure techniques to minimize nerve injury may help reduce both acute and chronic pain after thoracotomy [7].

Thoracotomy is a remarkably painful procedure. Poorly controlled pain can lead to higher analgesic use, impaired mobilization, delayed recovery, and increased risk of postoperative pulmonary issues due to shallow breathing or inability to clear secretions. Since pain is often aggravated with breathing, it can severely impair recovery. Some recent studies have indicated that intracostal (nerve-sparing) rib closure may result in better pain outcomes compared to conventional intercostal suturing techniques [7]. Therefore, this study aimed to evaluate the effectiveness of intracostal (nerve-sparing) sutures compared to standard pericostal sutures in reducing postoperative pain following thoracotomy.

METHODS

We conducted this prospective randomized clinical study at the Cardio-thoracic Surgery Department at Zagazig University Hospitals from August 2023 to August 2024; Seventy-four patients eligible for thoracotomy and meeting the inclusion and exclusion criteria were randomized equally into two groups (1:1 ratio). Group I (pericostal group) included 37 patients undergoing rib approximation with pericostal sutures. Group II (intracostal group) included 37 patients who received rib approximation through intracostal (nerve-sparing) sutures using a drilling technique.

Patients older than 2 years undergoing thoracotomy for various indications were included in the study. All Patients with previous thoracic surgery within the past 6 months or pre-existing neuropathic or chronic thoracic pain were excluded from the study.

After institutional review board approval of IRB (#11063-10-9-2023), written informed consents were obtained from all participants. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Preoperative Phase

All patients enrolled in the study underwent a thorough preoperative clinical evaluation to ensure optimal surgical planning and perioperative care. The assessment began with detailed history taking, which included the collection of personal data and information regarding the current illness. Particular attention was given to identifying comorbid conditions such as diabetes mellitus, hypertension, hepatic or pulmonary disorders, and any state of immunosuppression. Medication history was reviewed to identify potential interactions or contraindications, and a family history was elicited to rule out any genetic predispositions to complications.

This was followed by a comprehensive clinical examination. A general assessment was conducted first, including the recording of vital signs, after which a focused chest and cardiac examination was performed to detect any abnormalities that might influence anesthetic or

surgical risk. Radiologic and laboratory investigations were then conducted. Imaging studies included a chest X-ray and high-resolution chest computed tomography (CT) scan to evaluate pulmonary anatomy and pathology. Baseline blood investigations comprised a complete blood count (CBC), liver and kidney function tests, and a coagulation profile to assess fitness for surgery and detect any underlying derangements.

Intraoperative (Interventional) Phase

During surgery, all patients were positioned in the lateral decubitus position under general anesthesia. The ipsilateral arm was carefully elevated and supported above the head to allow optimal exposure. All incisions were performed as classic posterolateral thoracotomies; minimally invasive, muscle-sparing, or mini-thoracotomy techniques were not utilized in this series. After skin incision, dissection continued through the subcutaneous tissue and division of the latissimus dorsi and serratus anterior muscles to access the thoracic cavity.

To enter the pleural space, the intercostal muscles were incised along the upper margin of the lower rib, taking care to minimize trauma to the surrounding structures. Meticulous hemostasis was achieved before closure.

Rib Closure Technique:

In Group I (Pericostal sutures), rib approximation was performed using the standard technique: No. 2 Vicryl (polyglactin 910) round sutures were passed around the superior border of the upper rib and the inferior border of the lower rib. As is conventional, this approach did not avoid the neurovascular bundle, and the tension required for rib approximation may result in bundle compression. No rib approximator was used in any case; approximation was accomplished manually with sutures alone. On average, three sutures were used for rib closure in each patient.

In Group II (Intracostal sutures), a drilling device (either a Medtronic IPC system or manual driller) was used to create holes in the rib cortex, allowing passage of No. 2 Vicryl round sutures directly through the rib. This technique intentionally avoids compression of the intercostal neurovascular bundle. Rib approximation was performed with a figure-of-eight suture pattern through the drilled holes. As in the pericostal group, an average of three sutures was used per patient. For both groups, closure was then completed in layers for muscle, subcutaneous tissue, and skin (Figure 1).

Postoperative Phase

Postoperative care was centered on close monitoring and evaluation until the patient achieved full clinical recovery. Pain intensity was rigorously assessed using the Numerical Rating Scale (NRS), ranging from 0 (no pain) to 10 (worst possible pain). Pain scores were recorded twice daily during the first three postoperative days and then as needed. These scores were categorized as follows: no pain (0), mild (1–3), moderate (4–6), or severe (7–10) [8].

Patients also underwent daily clinical evaluations, including chest auscultation and inspection of the surgical site. Radiologic assessment via chest X-ray was performed to evaluate lung re-expansion. Routine blood tests were repeated to monitor for any postoperative changes or complications.

Postoperative complications were carefully documented and included re-operation, pleural effusion, surgical site infection, sepsis, subcutaneous emphysema, pneumothorax, persistent air leak, and pneumonia. Each event was recorded with attention to its impact on hospital stay and overall recovery.

Additional postoperative outcomes included the duration of hospital stay, analgesic requirements, and spirometry performance in correlation with reported pain levels. Duration of chest tube drainage and the incidence of wound-related complications were also noted, contributing to the overall evaluation of surgical outcomes.

STATISTICAL ANALYSIS:

Data findings were analyzed using SPSS v22.0 (SPSS Inc., Chicago, IL, USA). Quantitative data were expressed as mean ± SD or median (IQR), and qualitative data as frequency and

percentage. Normality was tested using the Kolmogorov-Smirnov test. Categorical variables were compared using Chi-square or Fisher's Exact Test, and McNemar's test for paired data. Student's t-test was used for normally distributed quantitative variables, while Mann-Whitney U and Kruskal-Wallis tests were used for non-parametric data. Correlations were assessed using Pearson's or Spearman's tests as appropriate. A p-value ≤ 0.05 was considered significant.

RESULTS

The mean age was slightly lower in Group A (30.73 ± 19.71 years) than in Group B (36.23 ± 20.28 years), but this difference was not significant (p = 0.069). Males comprised 59.46% of Group A and 54.05% of Group B, while females accounted for 40.54% and 45.95%, respectively, with no significant sex difference (p = 0.593). The demographic data the distribution of various thoracic conditions before intervention was similar between both groups, with no statistically significant differences observed (p > 0.05) (Table 1).

The distribution of surgical procedures was similar between the pericostal and intracostal groups, with lobectomy being the most common in both. No statistically significant difference was found between the groups regarding the types of operations performed (p = 0.759) (Table 2).

Postoperative pain scores were significantly lower in the intracostal group compared to the pericostal group at all measured time points. Patients who underwent intracostal closure reported less pain 2 hours postoperatively (5.3 ± 0.74 vs. 8.22 ± 0.85), on the first day (4.35 ± 0.59 vs. 7.03 ± 0.80), second day (3.10 ± 0.52 vs. 5.35 ± 0.82), and even after one month (0.89 ± 0.57 vs. 2.27 ± 0.90), with all differences being statistically significant (p < 0.05) (Table 3).

The need for postoperative opioid analgesia was significantly lower in the intracostal group (48.64%) compared to the pericostal group (75.67%) (p < 0.05), however, there was no significant difference in the duration of chest tube drainage between the groups (p = 0.182).The postoperative hospital stay was slightly shorter in the intracostal group (5.65 ± 2.38 days) compared to the pericostal group (6.97 ± 4.27 days), but the difference was not statistically significant (p = 0.190). (Table 4).

No statistically significant differences were revealed between the pericostal and intracostal groups regarding preoperative or postoperative pulmonary function tests (FVC, FEV1, and FEV1/FVC), with all p-values > 0.05 (Table 5).

Postoperative complications occurred at a comparable rate in both groups (13.5%), with no statistically significant differences (p > 0.05). Common complications included prolonged air leak and wound infection (2.7% each in both groups), with isolated cases of hemothorax and rib fracture. One patient from each group (2.7%) died postoperatively due to unrelated comorbid conditions—aspiration pneumonia in a patient with metastatic adenocarcinoma in Group A, and septic shock following wound infection in a patient with undiagnosed metastatic cancer in Group B (Table 6).

Table 1: Patients demographic data and final diagnosis of studied patients among both groups in the pre-interventional stage

	Group A [Pericostal closure] (N = 37)	Group B [Intracostal closure] (N = 37)	P. Value
Age (Years)	30.73 ± 19.71	36.23 ± 20.28	0.069
Sex			
Male	22 (59.46%)	20 (54.05%)	0.593
Female	15 (40.54%)	17 (45.54%)	0.593

Diagnosis of the patients	Thoracotomy				Total		Chi-Square Tests
	Peri costal		intra costal				
	No.	Percentage %	No.	Percentage %	No.	Percentage %	
Tumors	11	29.7%	14	37.8%	25	33.8%	0.593
Empyema	11	29.7%	9	24.3%	20	27%	
Bronchiectasis	8	21.6%	3	8.1%	11	14.9%	
Hydatid cyst	4	10.8%	3	8.1%	7	9.5%	
Chylothorax	1	2.7%	1	2.7%	2	2.7%	
Destroyed lung	0	0.0%	1	2.7%	1	1.4%	
Diaphragmatic hernia	1	2.7%	0	0.0%	1	1.4%	
FB aspiration	1	2.7%	2	5.4%	3	4.1%	
fungal ball	0	0.0%	1	2.7%	1	1.4%	
Pericardial effusion	0	0.0%	1	2.7%	1	1.4%	
Emphysematous bullae	0	0.0%	1	2.7%	1	1.4%	
Sequestrated lobe	0	0.0%	1	2.7%	1	1.4%	
Total	37	100%	37	100%	74	100%	

Table (2): Types of operations among studied patients of both groups

Operation performed	Thoracotomy				Total		Chi-Square Tests
	Peri costal		intra costal				
	No.	Percentage %	No.	Percentage %	No.	Percentage %	
Lobectomy	16	43.2%	14	37.8%	30	40.5%	0.759
Decortication	11	29.7%	9	24.3%	20	27.0%	
Cyst excision	4	10.8%	3	8.1%	7	9.5%	
Open biopsy	2	5.4%	4	10.8%	6	8.1%	
Bi lobectomy	0	0.0%	1	2.7%	1	1.35%	
Bullectomy	0	0.0%	1	2.7%	1	1.35%	
Open removal of FB	1	2.7%	2	5.4%	3	4.05%	
Hernia repair	1	2.7%	0	0.0%	1	1.35%	
pleuro-pericardial window	0	0.0%	1	2.7%	1	1.35%	
Pneumonectomy	0	0.0%	1	2.7%	1	1.35%	
Thoracic duct ligation	1	2.7%	1	2.7%	2	2.7%	
Wedge resection	1	2.7%	0	0.0%	1	1.35%	
Total	37	100.0%	37	100.0%	74	100.0%	

FB; Foreign Body

Table (3): Grades of postoperative pain score among studied groups using numerical pain score

Postoperative pain score	Thoracotomy		P value
	Peri costal	intra costal	
	Mean ±SD	Mean ±SD	
Postoperative pain score 2 H post operative.	8.22±0.854	5.3±0.740	<0.05
Postoperative pain score for the 1st day	7.027± 0.798	4.35± 0.587	<0.05
Postoperative pain score for the 2nd day	5.35± 0.823	3.10± 0.515	<0.05
Postoperative pain score after one month	2.27± 0.902	0.89± 0.566	<0.05
Pain score during rest	6.10± 0.698	3.64± 1.030	<0.05
Pain score during cough	7.94± 1.129	5.59± 0.698	<0.05

Table (4): Comparison between both groups regarding the need for analgesia, duration of ICT drainage, hospital stay in days postoperative

Opioid	Thoracotomy				Total		Chi-Square Tests
	Peri costal		intra costal				
	No.	Percentage %	No.	Percentage %	No.	Percentage %	
Need for PCA analgesia	28	75.67%	18	48.64%	46	62.16%	<0.05
No need for PCA analgesia	9	24.32%	19	51.35%	28	37.83%	
Groups	Thoracotomy						P value
	Peri costal		intra costal				
	Mean ±SD		Mean ±SD				
Duration of ICT drainage	6.43±3.5		5.37±2.1				0.182
Groups	Thoracotomy						P value
	Peri costal		intra costal				
	Mean ±SD		Mean ±SD				
Postoperative hospital stay in days	6.97±4.27		5.65±2.38				0.190

PCA: Patient-Controlled Analgesia; ICT: Intercostal Tube; SD: Standard Deviation; No.: Number.

Table (5): Comparison between pre and post op. PFT among studied groups

Variable	Timing	Thoracotomy		P value
		Peri costal	intra costal	
		Mean ±SD	Mean ±SD	
FVC	Pre. Op.	2.19±0.26	2.21±0.15	0.33
	Post. Op.	1.89±0.24	1.93±0.95	0.251
FEV1	Pre. Op.	1.74±0.24	1.7±0.43	0.916
	Post. Op.	1.58±0.34	1.48±0.3	0.759
FEV1/FVC	Pre. Op.	79.7±3.8	76.76±16.5	0.434
	Post. Op.	73.37±14.5	76.5±13.4	0.232

FVC: Forced Vital Capacity; FEV1: Forced Expiratory Volume in the First Second; SD: Standard Deviation; Pre. Op.: Preoperative; Post. Op.: Postoperative.

Table (6): Types of postoperative complications among studied groups

complication	Thoracotomy				Total		Chi-Square Tests
	Peri costal		intra costal				
	No.	Percentage %	No.	Percentage %	No.	Percentage %	
Prolonged air leak	1	2.7%	1	2.7%	2	2.7%	0.85
Infected wound	1	2.7%	1	2.7%	2	2.7%	
Hemothorax	0	0.0%	1	2.7%	1	1.35%	
Died	1	2.7%	1	2.7%	2	2.7%	
Rib fracture	2	5.4%	1	2.7%	3	40.5%	
Total	5	13.5%	5	13.5%	10	13.51%	

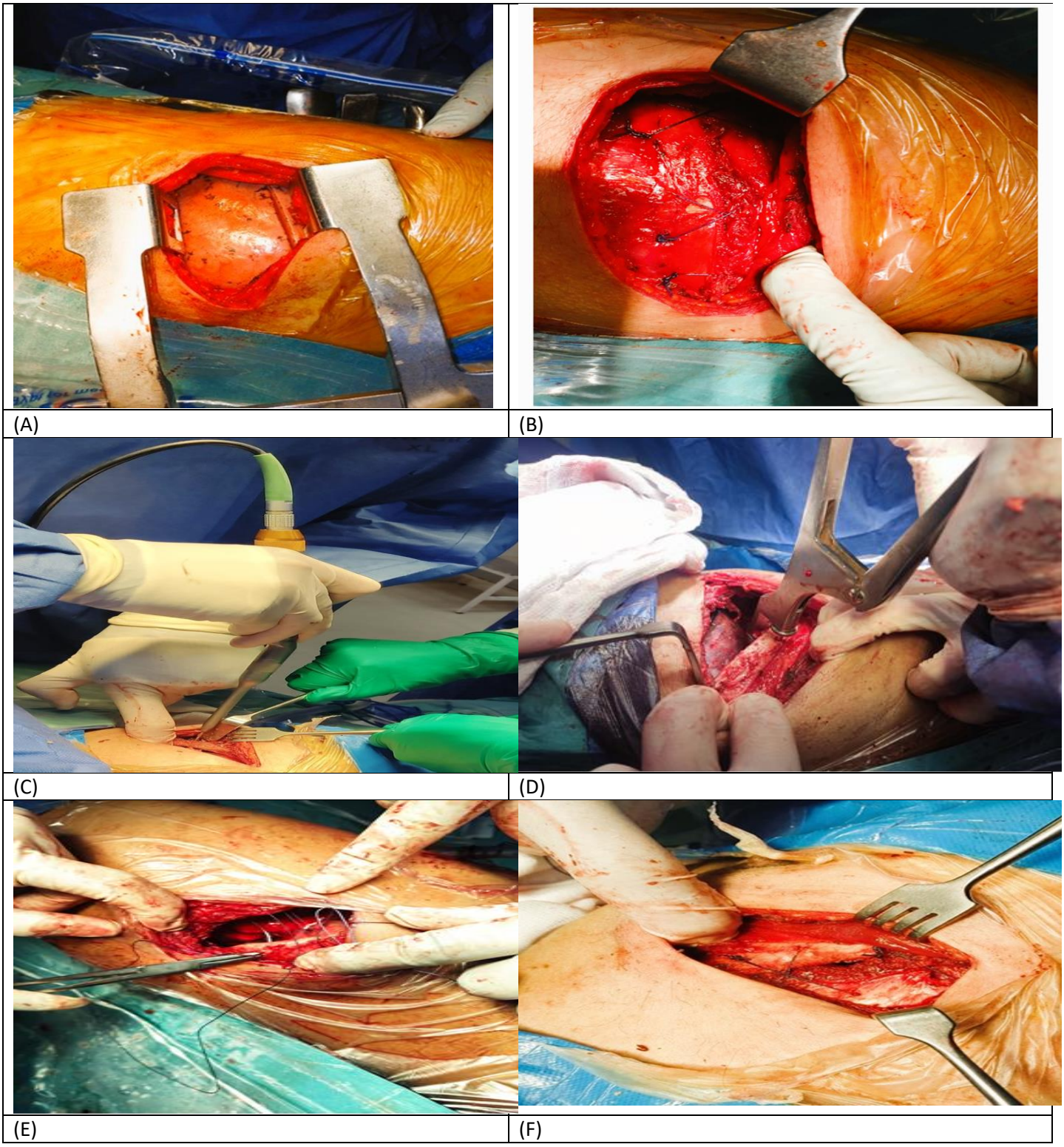

Figure 1 Steps of intervention: (A): thoracotomy incision through the skin , subcutaneous , muscle layers and the ribs with access to the thoracic cavity, (B): Standard pericostal closure of thoracotomy using figure of 8 suturesz, (C): the usage of Medtronic driller hand piece in making holes in the ribs , (D): the usage of manual rib driller in making holes through the ribs, (E): Passing the needle suture through the hole in the rib, (F): figure of 8 intracostal sutures avoiding nerve bundle compression,

DISCUSSION

Pericostal suturing during thoracotomy closure may inadvertently injure the intercostal neurovascular bundle, which lies along the inferior margin of the rib. This anatomical vulnerability puts the cutaneous branch of the intercostal nerve at risk, often leading to localized trauma. As a result, patients may experience postoperative pain and paresthesia that can persist from days to several months [9]. To reduce nerve injury and subsequent pain, some surgeons have adopted intracostal closure techniques, where sutures are passed through drilled holes in the rib rather than looping around it. This approach helps in avoiding direct compression of the intercostal bundle and has shown promising results in terms of reduced postoperative pain [10].

In our study, complication rates were nearly identical between the two groups—13.5% for both pericostal and intracostal closures. Specific complications like prolonged air leak and wound infection were equally observed at 2.7% in each group, showing no statistically significant difference. Hemothorax occurred only in the intracostal group (2.7%), and mortality was equally distributed between both groups (2.7%). Rib fractures were slightly more common in the pericostal group (5.4%) versus 2.7% in the intracostal group.

Similar findings were reported by Sakakura et al., who described an edge closure method that involves gentle dissection of the intercostal muscle and neurovascular bundle using blunt instruments or low electrocautery. They emphasized careful needle placement under the rib to avoid vascular injury. While one case of intercostal vessel injury was noted due to rough handling, such complications were largely avoidable with proper technique. Excessive use of electrocautery, however, could still pose a risk to nerves and vessels, which is why they advocated for the use of spatulas for safer dissection [11].

Pulmonary complications, including atelectasis, pneumonia, and respiratory failure, remain a significant cause of postoperative morbidity and mortality following thoracic procedures. These complications occur in approximately 6–10% of patients and contribute to an expected mortality rate between 0.5–1.5% [9].

In our comparison of postoperative pain scores at various time points—2 hours, 1st day, 2nd day, and one month—patients in the intracostal group consistently reported significantly lower pain levels than those in the pericostal group. However, there was no significant difference in the length of hospital stay between the two groups.

Our findings align with the results of Allama, who conducted a randomized study on 120 thoracotomy patients comparing intracostal and pericostal closure techniques. Patients in the intracostal group reported lower pain scores and reduced analgesic requirements during the first week and at one month postoperatively. This group also showed faster mobilization and earlier return to daily activities. By three months, analgesic usage remained lower in the intracostal group, though pain scores were similar between groups. No differences were found in either parameter at six months follow-up [10].

Our findings are consistent with those reported by Bayram et al., who conducted a randomized trial on 60 patients undergoing thoracotomy. They compared intercostal sutures, which can compress the neurovascular bundle, with intracostal sutures designed to preserve the nerve. The group with intracostal sutures experienced significantly lower pain scores at rest and during coughing, as measured by visual analog scales. Verbal observer ranking scores were also lower in this group during the first 48 hours postoperatively. There was no significant difference in Ramsay sedation scores, suggesting that neither closure method altered postoperative consciousness levels. Although the consumption of patient-controlled epidural analgesia and results from the von Frey hair test were higher in the pericostal group, these differences were not statistically significant at 30-day follow-up [12].

Similarly, Wu et al. studied 72 patients undergoing non-muscle-sparing thoracotomy, divided into groups based on whether closure

was done with intracostal or pericostal sutures, the latter incorporating an intercostal muscle flap. While there were no statistically significant differences in pain scores during rest or coughing, opioid consumption was significantly lower in the intracostal group from postoperative days 4 to 7. Their interpretation was that both techniques aim to protect the intercostal nerves—intracostal suturing by avoiding compression of the nerve below the incision, and intercostal muscle flaps by shielding the nerve above. As such, combining both may not provide additive benefits in terms of pain reduction [13].

Sakakura et al. conducted a retrospective review of 184 patients undergoing either posterolateral or anterolateral thoracotomy, with variations in closure techniques. Three methods were analyzed: conventional pericostal closure, intercostal muscle flap before retraction, and edge closure using a suture along the caudal rib to avoid nerve strangulation. Results showed that patients who had anterior axillary thoracotomy reported lower pain levels compared to those with posterolateral incisions. Moreover, those who underwent nerve-sparing edge closure experienced significant pain reduction up to one year postoperatively. The intercostal muscle flap alone reduced pain for the first month, but its effect didn't persist long-term [14].

In another large retrospective study, Cerfolio et al. reviewed 280 thoracotomy patients—half underwent closure with pericostal sutures and the other half with intracostal sutures. Pain scores were significantly lower in the intracostal group throughout the three-month follow-up period. Furthermore, fewer patients in the intracostal group described their pain as burning, stabbing, or hot, which are classic indicators of intercostal nerve irritation [15].

These collective findings support the concept that nerve-sparing techniques, particularly those avoiding direct pressure on the intercostal neurovascular bundle, can substantially improve the postoperative pain profile for thoracotomy patients.

Limitations:

Several limitations should be considered when interpreting the findings of our study. Firstly, the relatively small sample size of both Proline Mesh only patients and Proline Mesh with Metallic Bar patients may limit the generalizability of our results to a broader population. Additionally, the retrospective nature of the study design could introduce selection bias and potential inaccuracies in data collection. Furthermore, the short follow-up duration may not capture long-term outcomes and complications associated with chest wall reconstruction. Finally, the study did not investigate potential variations in surgical techniques or the experience of the surgical teams, which could influence outcomes. These limitations highlight the need for larger, prospective studies with longer follow-up periods and more comprehensive data collection to further elucidate the optimal approach to chest wall reconstruction.

In conclusion, our study has provided valuable insights into these surgical approaches. As we found no significant differences in patient characteristics, causes of admission, lesion characteristics, laboratory data, or most post-operative outcomes between the two groups. However, it is worth noting that Proline Mesh with Metallic Bar patients exhibited a trend towards a slightly longer postoperative hospital stay and a slightly higher prevalence of Intra operative blood loss with no significant difference. On the other hand, Proline Mesh with Metallic Bar provide less prothesis complication and more rigidity, stability and more cosmetic of chest wall so it preferable specially in large defect and female patient. Overall, these findings strongly advocate for adoption of Proline Mesh with Metallic Bar technique as highly effective and favorable choice in chest wall reconstruction.

Recent modifications in thoracotomy closure, particularly the shift toward intracostal suture techniques, have made a notable impact on reducing postoperative pain. By passing sutures between the lower edge of the caudal rib and the neurovascular bundle, the risk of nerve entrapment is significantly reduced. Compared

to classic pericostal sutures, this approach results in better pain control in both the immediate and short-term postoperative periods, including at 1, 2, and 3 months [16]. In contrast, pericostal sutures increase the likelihood of nerve compression, often resulting in higher pain levels early after surgery.

In our study, we found that patients in the intracostal group required less postoperative analgesia compared to those in the pericostal group. This observation is consistent with the findings of Visagan et al., who noted that nerve-sparing intracostal techniques were associated with decreased pain scores, reduced analgesic requirements, and faster return to daily activities [17].

Pulmonary function testing (PFT) was performed before and after surgery in both groups. We found no significant differences between groups in terms of postoperative pulmonary function outcomes. This aligns with prior literature suggesting that pain control, rather than closure technique alone, has a greater impact on early pulmonary function recovery [18].

Multiple studies have demonstrated expected postoperative decreases in spirometry parameters such as FVC, FEV1, and PEF after thoracotomy. These reductions are typically attributed to pain, surgical trauma, and changes in ventilatory mechanics [19,20]. For example, Ibrahim et al. compared intercostal muscle flap versus standard closure in thoracotomy patients and found significantly better FEV1 values at both 1 and 6 months in the nerve-sparing group [21].

In our study, as in that by Shemais et al., spirometry values dropped slightly by day 30 but not significantly. The mild reduction was anticipated due to the nature of the lung resection involved [22]. Similarly, Miyoshi et al. found significant decreases in FVC, FEV1, and PEF by postoperative day 21, particularly in patients undergoing standard pericostal closure [23].

This single-center study limits the generalizability of findings; larger multicenter trials are needed. Pain assessment was based on the subjective NRS scale, which can vary with individual tolerance and communication. Variability in postoperative analgesia protocols may have also influenced pain outcomes. No significant difference in PFTs between groups was found, possibly due to short-term follow-up, effective pain control in both groups preserving respiratory effort, and a sample size that may have been too small to detect subtle differences.

CONCLUSION

Intracostal suturing in thoracotomy closure significantly reduces postoperative pain and analgesic requirements without increasing complication rates, offering a superior alternative to traditional pericostal suturing techniques for improving patient outcomes.

Conflict of Interest or financial disclosure: No potential conflict of interest to be reported by the authors.

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