Stripping Massage and Literature Review in Post-Thoracoscopic Chest Pain Management

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Abstract

The aim of this randomized study was to investigate whether stripping massage (SM) of myofascial trigger points in the lower rhomboid muscle could alleviate chest pain in patients following thoracoscopic surgery. In addition, a literature review was conducted to assess the effectiveness of various pain management techniques. Sixty adult patients who reported a visual analog scale (VAS) score of 4 or higher were randomly assigned to receive conventional analgesics alone (conventional group) or combined with SM twice daily for 2 weeks (SM group). VAS scores and the use of additional analgesics were evaluated on postoperative days 1, 3, 7, 14, and 30. Using the PubMed and Cochrane Library databases, a review of current pain management techniques was carried out up to January 31, 2022. A subgroup analysis was also performed to examine the treatment effect during different surgical periods and techniques. Results showed that the SM group had significantly lower VAS scores on postoperative days 3, 7, 14, and 30 ($p < 0.001$), as well as a shorter hospitalization duration and reduced need for additional analgesics ($p < 0.001$). The literature review included a total of 20 studies (2,342 cases of chest pain relief after thoracoscopic surgery), which indicated that serratus anterior plane (SAP) blocks were commonly used as a perioperative approach to reduce pain and opioid consumption. SM and SAP can both serve as adjuvant treatments for chest pain in patients following thoracoscopic surgery, with SM being a safe and noninvasive pain control option after hospital discharge.

Keywords
- postoperative pain
- surgery
- complications
- thoracoscopy/VATS

Introduction

Patients who undergo thoracic surgery often experience pain and related comorbidities that can impede their recovery and increase the risk of postoperative complications such as pneumonia and stress ulcers. While video-assisted thoracoscopic surgery (VATS) has become a popular approach to reduce postoperative pain, a significant proportion of patients (38%) still report moderate to severe pain.[1] To prevent the development of chronic pain, it is crucial to manage acute chest pain effectively following thoracoscopy. However, opioid and nonopioid analgesics that are typically used for pain control can have various adverse effects.[2] Therefore, there is a need for alternative modalities such as massage and nerve blocks that can reduce the use of opioids and nonsteroidal anti-inflammatory drugs.

Approximately 66% of patients develop trigger points around the scapula as a cause of postthoracoscopic chest pain.[3,4] Prolonged VATS in a lateral decubitus position may restrict the displacement of shoulder fascia, which could contribute to myofascial pain syndrome of the rhomboid

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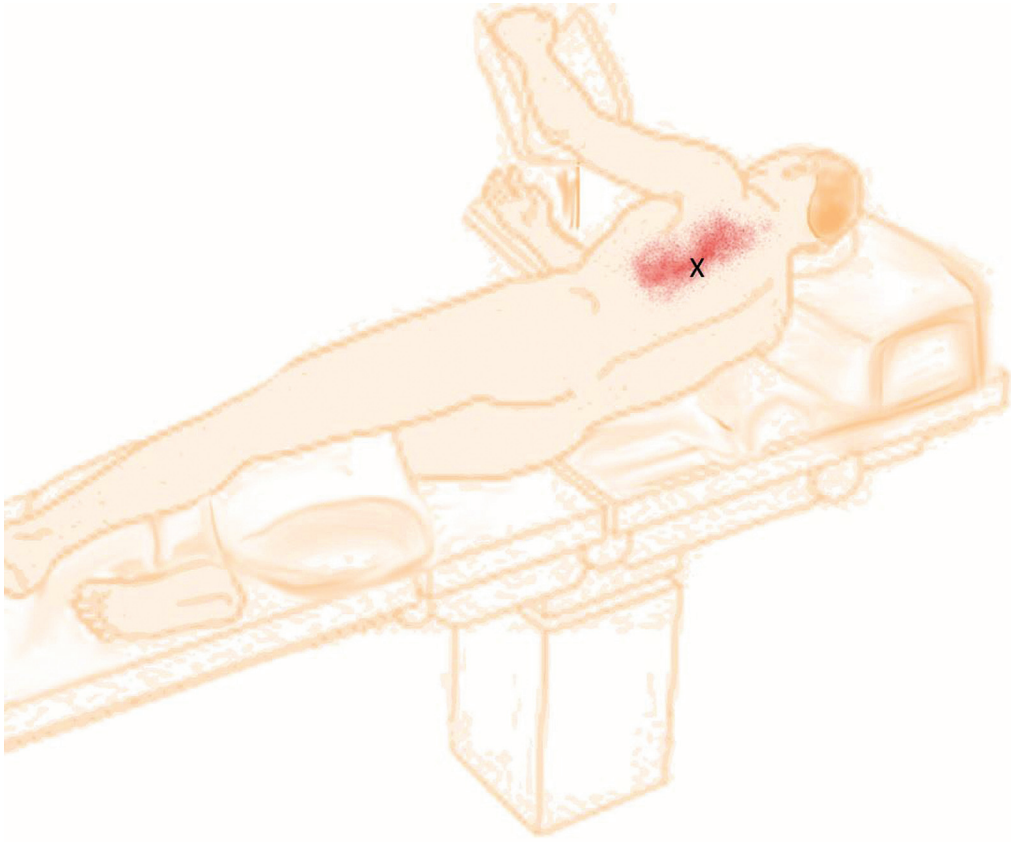

Fig. 1 Long-term restricted fascia displacement in lateral decubitus position may cause myofascial pain syndrome of the rhomboid muscle.

muscle (►**Fig. 1**). Myofascial trigger points (MTrPs) are characterized by marked muscle hypersensitivity in certain areas.[5] MTrP forms can be categorized based on the presence of active and latent trigger points. Active trigger points cause pain even at rest, whereas latent trigger points cause limited movement. Stripping massage (SM) is a tissue massage technique that can be used to manually deactivate MTrPs, leading to reflexive hyperemia, which helps to improve muscle fascia flexibility and alleviate pain sensations.[6] As it is relatively simple to administer to patients after they leave the hospital, it has gained popularity as an analgesic therapy. Hence, the goal of this study was to evaluate the impact of SM on pain in patients with active rhomboid trigger points following thoracoscopic surgery. Despite its significance, there are no existing guidelines for optimal perithoracoscopic chest pain management. In addition, we conducted a systematic literature review to explore more effective and safer analgesic techniques, such as paravertebral block or serratus anterior plane (SAP) blocks, for pain control after VATS.

Material and Methods

Study Design

This randomized clinical trial was approved by the Hospital Human Research Ethics Committee with a reference number of 202011061RINA. The trial was also registered at https://clinicaltrials.gov with the registration number NCT04716816. The visual analog scale (VAS) is a widely recognized and practical assessment tool for evaluating chest pain, commonly used in both clinical practice and research studies.[7–9] The study's main objective was to measure the reduction in VAS scores as the primary outcome, while reduced opioid consumption was the secondary outcome. Additionally, a literature review was conducted on the PubMed and Cochrane Library databases, focusing on various postthoracoscopic surgery chest pain treatments. The keywords "chest pain" and "thoracoscopic surgery" were used in the search. The study excluded manuscripts related to thoracotomy, chest wall surgery, robotic surgery, combination surgeries, trauma, as well as book reviews, case reports, and review articles. The search terms were connected using Boolean operators such as "AND," "OR," and "NOT" to identify all relevant articles. To avoid duplication, patients were excluded if they appeared in multiple comparison group studies. The included studies were checked for more than two cohorts. Subgroup analyses were performed separately for preoperative, postoperative in-hospital, and after-hospital discharge time points. SM will be the focus of discussion and systematically compared to other management types.

Participants

The study's treatment allocation and procedures were explained to all participants who met the inclusion criteria of having a postoperative day 1 VAS score of $\geq$4. The nurse practitioners at our institute recorded the daily postoperative VAS scores for chest pain for each patient during routine

clinical practice. Patients who had more than moderate postoperative chest pain, a VAS score of ≥4, and referred pain over the lateral aspect of the lower chest wall and met the inclusion criteria signed consent forms before the study began (►**Fig. 1**). The sample size needed for the study was calculated using G * Power software (version 3.1.9.2; Franz Faul, University of Kiel, Germany), based on a pilot study of intergroup differences in VAS scores of 10 patients. A *t*-test with a type I error rate of 5% (alpha = 0.05) was used, and the effect size in the main outcome variable (VAS) was 1.37, with a type II error rate (beta) set at 0.10 (power of 0.9). With a 10% dropout rate taken into account, a sample size of 30 participants per group was required. Patients who met the inclusion criteria of having more than moderate postoperative chest pain, a VAS score of ≥4, and referred pain over the lateral aspect of the lower chest wall, were given a detailed explanation of the treatment allocation and procedures. They were then randomly allocated into two groups, assigned to receive either conventional analgesics (conventional group) or conventional analgesics combined with SM over lower rhomboid trigger point twice daily (SM group), in a 1:1 allocation ratio using sealed envelopes and computer-generated block randomization with block sizes of two, four, and six. Patients who had mild chest pain with a VAS <4 on postoperative day 1, a history of coagulopathy, thoracoscopy combined with other types of surgery, use of pain medications or latent trigger points before surgery, signs of bone metastasis, or rib fractures were excluded. Data were collected by an attending surgeon who was blinded to the group assignments.

Pain Control

This study involved the use of intraoperative multilevel intercostal nerve blocks in conjunction with postoperative oral analgesics in 60 thoracoscopic cases. After the induction of anesthesia, an additional dose of 2% lidocaine was injected at the surgical site and the portal wound was covered with a wound protector (Applied Medical, Rancho Santa Margarita, CA, United States). In addition, an intercostal block via thoracoscopy was administered by infiltrating 0.5% bupivacaine (1.5 mL in each intercostal space) into the intercostal nerves located under the parietal pleura, 2 cm lateral to the sympathetic chain, using a 25-G top-winged infusion needle. Patients in the study received oral analgesics starting 6 hours after surgery, consisting of acetaminophen (325 mg) and tramadol (37.5 mg) four times a day. During hospitalization, nalbuphine (10 mg) was prescribed as needed, up to twice a day. After discharge, the pain management protocol included acetaminophen (500 mg) as needed every 6 hours. Patients in the SM group received the first SM treatment when their postoperative VAS score was ≥4 on day 1. The caregivers were trained by a single practitioner to apply firm and slow pressure with their thumb on the lower rhomboid trigger point twice daily for 5 minutes, for a total of 4 weeks (►**Fig. 2**). The pressure during successive strokes was increased gradually based on the patient's pain tolerance in the SM group. The patient's family was taught the rhomboid trigger point position and performed all manual physical therapy practices as a home program. Patients were discharged if there were no perioperative complications. The analysis included the number of thoracoscopic ports used, as well as chest tube numbers and sizes, which can significantly affect postoperative pain. Postoperative VAS scores and the number of additional analgesic prescriptions were collected and evaluated on days 1, 3, 7, 14, and 30 (**Supplement Data 1**, available in the online version).

Statistical Analysis

The primary outcome of the present study was the intergroup difference of pain level reduction in VAS scores (type

Fig. 2 Perform stripping massage by applying firm and slow pressure on lower rhomboid trigger point along scapula's medial margin twice daily for 5 minutes over 4 weeks using thumb.

I error rate, 5%; type II error rate, 0.10; and effect size, 1.37). The secondary outcome was the dose of rescue oral analgesic drugs that each patient took to control their chest pain. All continuous variables were analyzed using parametric tests (unpaired *t*-tests). VAS scores were analyzed using nonparametric tests (*z*-tests: Wilcoxon signed-rank test and Mann–Whitney U test). Categorical variables were compared using Fisher's exact test. The generalized estimating equation method was used for repeated measures (**Supplement Data 2**, available in the online version). Simple slope analyses were conducted to examine whether the rate of VAS change within each treatment condition differed from zero. IBM SPSS software (version 22; IBM Corp., Armonk, NY, United States) was used for the statistical analyses. Statistical significance was set at p-values < 0.05.

Results

Descriptive Statistics and Baseline Treatment Condition Comparability

From January 1, 2021 to May 31, 2021, a total of 727 patients underwent thoracoscopy with general anesthesia at two institutions. Participant flow through the trial is displayed in ►**Fig. 3**. Out of these patients, 60 adults (27 women and 33 men) with a mean age of 58.8 ± 15.15 years and a postoperative VAS score of ≥ 4 were randomly assigned to receive either conventional analgesics (conventional group, $n = 30$) or conventional analgesics combined with SM twice daily (SM group, $n = 30$) (►**Fig. 3**). Both the conventional group and SM group were administered a standardized postoperative analgesic regimen. No significant differences were observed between the two groups in terms of demographics, procedure,

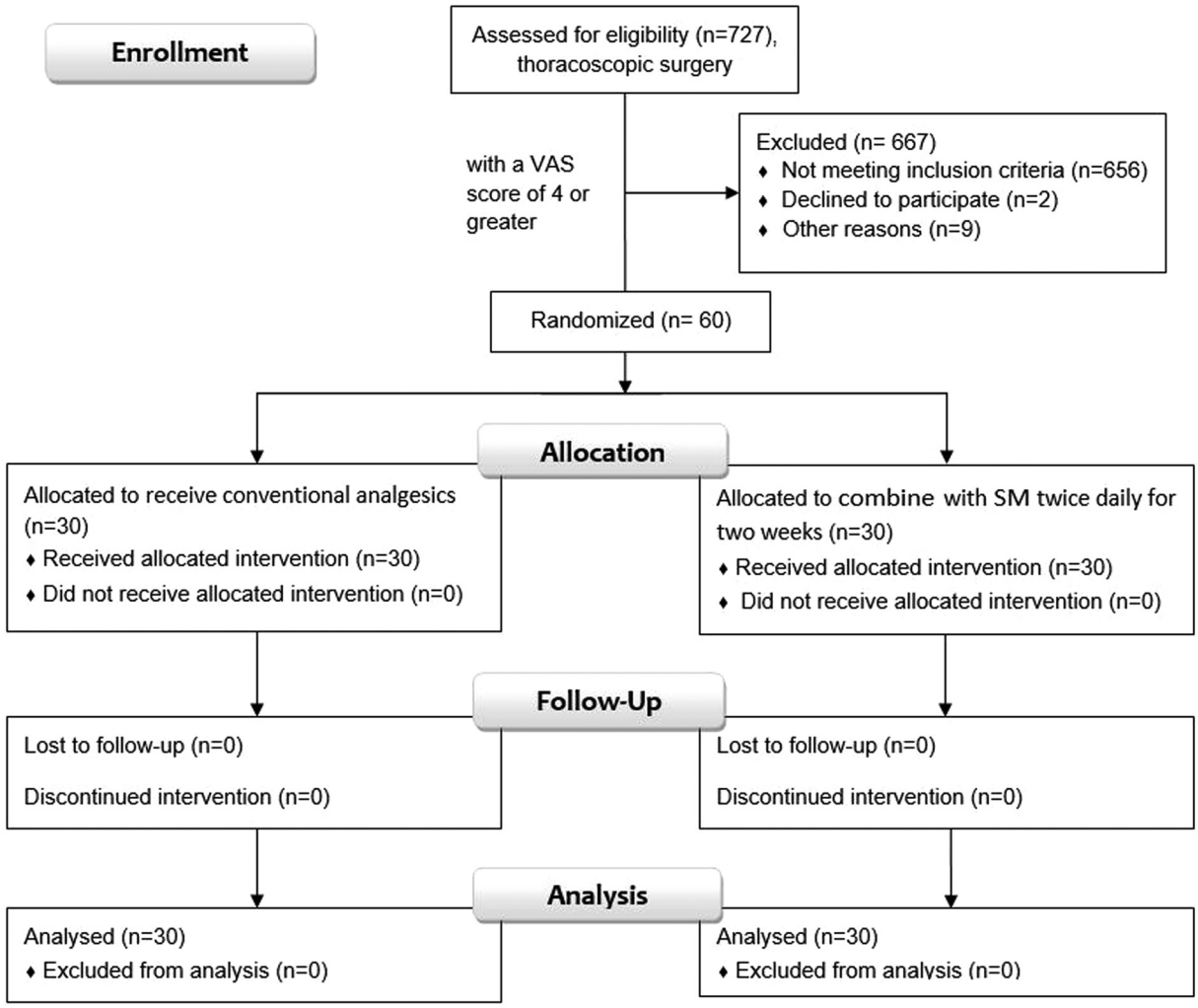

Fig. 3 Consort flow chart. SM, stripping massage; VAS, visual analog scale.

Table 1 Patient characteristics of two groups after thoracoscopy with different pain control intervention

Variables	Conventional analgesics ($n = 30$)	Stripping massage & analgesics ($n = 30$)	*p*-Values
Male, *n* (%)	19 (63.3%)	14 (46.7%)	0.299
Age, years (SD)	61.6 (12.61)	56.0 (17.1)	0.152
Underlying disease			0.492
Lung diseases	25	24	
Mediastinal tumor	4	6	
Esophageal diseases	1	0	
Operation type, *n* (%)			0.521
Lobectomy	2	1	
Sublobar resection	24	25	
Mediastinal tumor resection	2	4	
Esophageal tumor resection	1	0	
Surgery time, min (SD)	83 (58.9)	60 (34.3)	0.074
Port number			0.286
Single port	24	27	
Two ports	6	3	
Postoperative drain			0.471
Drainless, *n* (%)	20 (66.7%)	25 (83.3%)	
12 Fr catheter	3	1	
24 Fr chest tube	2	2	
28 Fr chest tube	5	2	
Postoperative hospital stay, days (SD)	4.9 (3.25)	3.8 (1.25)	0.072

Abbreviations: Fr, French; SD, standard deviation.

surgical duration, postoperative chest tube or drainless management, or postoperative hospital stay (►**Table 1**). Moreover, no significant differences were observed in the initial postoperative day 1 VAS score (►**Table 2**). However, ►**Table 2** highlights significant intergroup differences in the posttreatment values of the outcome measures. We analyzed both treatment groups' baseline and ending measures, and there were no dropouts or discontinued interventions in these 60 patients (►**Fig. 3**). However, the administration of SM in patients with active rhomboid trigger points following thoracoscopic surgery was effective in reducing the need for rescue analgesics (►**Table 2**). Additionally, there were no complications related to SM, such as local swelling, bleeding, or infection.

Perceived Control Over Pain

There were no significant differences between the conventional and SM groups in terms of surgical duration or type. The initial postoperative day 1 VAS score for chest pain did not show any correlation with surgical duration (*p* values $= 0.195$). Although postoperative hospital stay did not differ significantly between the two groups (4.9 days vs. 3.8 days, *p*-values $= 0.072$), most cases of postoperative chest pain after thoracoscopy could be controlled in outpatient clinics. However, the SM group had significantly lower VAS scores on postoperative day 3 (*p*-values < 0.001). In contrast, in the conventional group, 20% of patients had postdischarge VAS scores of ≥ 4, with a mean postoperative hospital stay of 4.9 ± 3.25 days. Moreover, the SM group perceived lower pain scores from postoperative day 7 to day 30 (*p*-values < 0.001). Simple slope analyses showed that pain intensity scores significantly decreased over time in the SM group (*p*-values < 0.001; ►**Fig 4**). Generalized estimating equation analyses showed that VAS significantly decreased over time in the conventional analgesics + SM condition ($B = 1.106$, $SE = 0.179$, *p*-values $= 0.000$, 95% confidence interval $= 0.754, 1.457$; ►**Table 3**). Additionally, the SM group had a shorter duration of rescue medication use than the conventional group (5.3 ± 1.53 days vs. 22.1 ± 11.97 days, *p*-values < 0.001). The SM group also had a significantly lower number of acetaminophen tablets (500 mg) taken after discharge compared to the conventional group (30.5 ± 34.12 vs. 52.9 ± 36.14, *p*-values < 0.001). In one patient from the conventional group with an intrathoracic goiter, a higher VAS score was observed on postoperative day 14 and rescue nonopioid analgesics were continuously prescribed to manage this patient's symptoms after an imaging study.

A Retrospective Analysis of Randomized Controlled Trials

We evaluate the quality of randomized controlled trials study planning and realization. A literature review was conducted, and 20 comparison group studies (2,342 cases

Table 2 Outcomes of pain control between two groups after thoracoscopy

Variables	Conventional analgesics ($n = 30$)	Stripping massage & analgesics ($n = 30$)	*p*-Values
Day-1 postoperative VAS			0.594
4	17	16	
5	11	9	
6	2	4	
7	0	1	
Day-3 postoperative VAS,			<0.001
0	3	16	
2	10	14	
3	4	0	
4	11	0	
5	2	0	
Day-7 postoperative VAS			<0.001
0	6	28	
2	14	2	
3	4	0	
4	5	0	
5	1	0	
Day-14 postoperative VAS			<0.001
0	13	30	
2	13		
3	3		
8	1		
Day-30 postoperative VAS			<0.001
0	15	30	
2	14		
4	1		
Days of analgesic usage, days (SD)	22.1 (11.97)	5.3 (1.53)	<0.001
The number of pills after discharge (acetaminophen 500mg), mean ± SD	52.9 ± 36.14	30.5 ± 34.12	<0.001

Abbreviations: SD: standard deviation; VAS: visual analogue scale

of chest pain relief after thoracoscopic surgery) published between April 2009 and January 31, 2022 were analyzed (►**Fig. 5**). Various techniques for managing perithoracoscopic chest pain and defining optimal management were evaluated (►**Tables 4** and **5**). In three studies, SAP blocks were considered as the preoperative approach, which significantly reduced pain and opioid consumption ($p < 0.005$) and stabilized intraoperative circulation. Additionally, intraoperative SAP blocks were associated with reduced postoperative rescue analgesia and VAS scores. SAP block with liposomal bupivacaine or epidural analgesia was linked to lower narcotic consumption. Other effective alternatives, including patient-controlled intravenous analgesia (PCIA) with dexmedetomidine, phrenic nerve block, and intramuscular stimulation, have shown significant efficacy in treating chest pain after thoracoscopic surgery (►**Tables 4** and **5**). Each of these emerging alternatives to intravenous or oral analgesic access was performed during hospitalization. Considering the noninvasive approach, utility, and risk-benefit aspects, the combination of SM and oral analgesics was the only feasible method that could be self-administered at home in this prospective randomized study.

Discussion

VATS offers several advantages over thoracotomy, such as shorter hospitalization and postoperative drainage duration, and lower morbidity rates.[10] However, during VATS, it's challenging to prevent injury to the nerve branches that extend to the muscle or fascia, and patients in prolonged lateral decubitus positions may experience muscle strain (►**Fig. 1**). Thoracoscopic procedures can cause bad posture and fascial damage, which are often seen in patients with postoperative chest pain.[11] Trigger points may be activated by bad posture and respond well to management that focuses on deactivating MTrPs. To prevent the development of trigger points, these muscles may require treatment before the onset of symptoms.[12] Ohmori et al investigated the contribution of myofascial involvement and ipsilateral upper extremity elevation to thoracotomy-related pain.[13] Physical therapy for myofascial pain typically involves stretching exercises, ultrasound, massage, or needling techniques.[14–16] Elsharkawy et al[17] and Longo et al[18] reported effective postoperative pain control using ultrasound-guided block interventions targeting the medial border of the scapula between the rhomboid major and intercostal muscles for various surgeries including breast and lung surgery. However, these previous interventions designed for controlling postoperative chest pain were relatively invasive. In contrast, SM targets the tender spot and increases parasympathetic activity, activating nonnociceptive fibers and releasing endorphins, thereby producing an analgesic effect and alleviating pain sensation.[19–21] Noninvasive SM increases tissue temperature and blood flow through tissue friction, which in turn improves tissue oxygenation and the removal of waste metabolites. It relaxes the restricted fascia of the spastic muscle and thus relieves pain in patients with active rhomboid trigger points after thoracoscopic surgery.[22] Compared to the control group, the SM group showed significantly lower postoperative VAS scores and required fewer rescue analgesics ($p < 0.001$). Notably, SM in combination with oral analgesics was the only practical method that could be performed at home by the patient's family, which highlights the potential of physical therapy to reduce pain and restore normal function in patients with postthoracoscopic myofascial pain syndrome. The SM group had their family members perform all physical practices after being taught the rhomboid trigger point position, resulting in lower postoperative

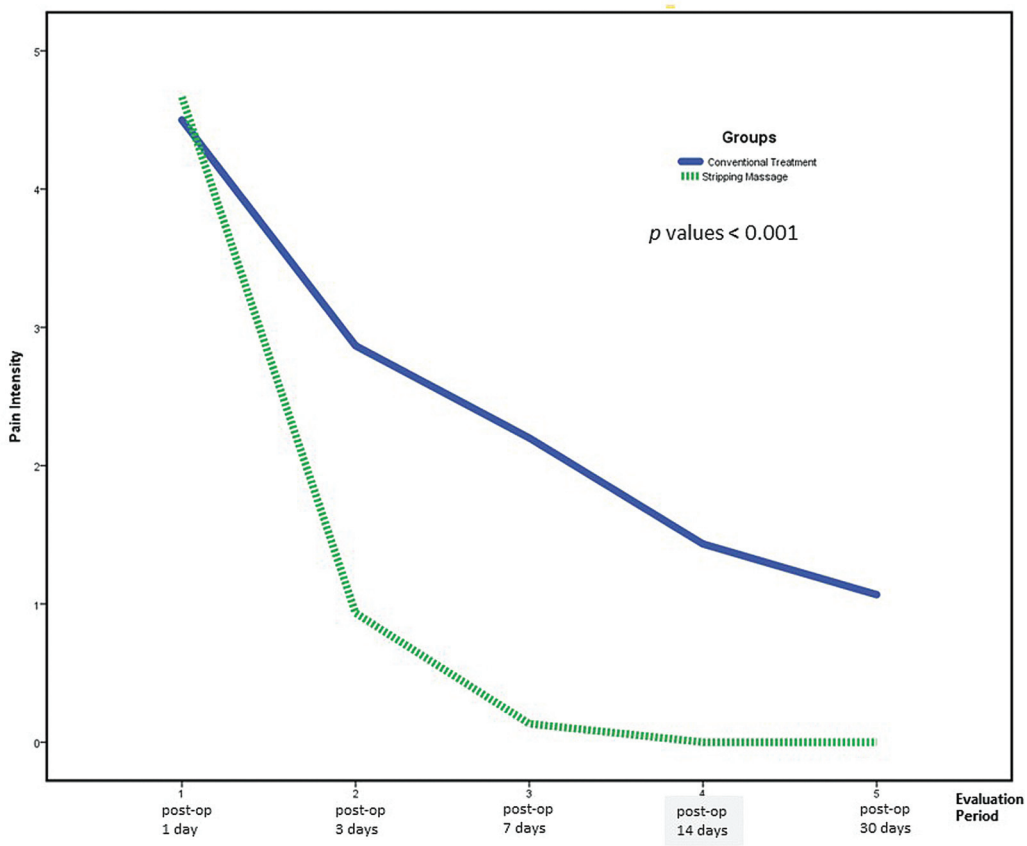

Fig. 4 Pain intensity ratings using visual analog scales over time by treatment condition. post-op, postoperative.

Table 3 Fixed effects for multilevel models examining the effects of conventional treatment, compared to conventional treatment + stripping massage on treatment outcome measures

Outcome	Fixed effect	B	SE	95%	*p*-Values
Pain intensity	Intercept	1.381	0.620	1.259, 1.502	0.000
	CT	1.106	1.795	0.754, 1.457	0.000
	CT + SM	0			

Abbreviations: CT, conventional treatment with analgesics; SE, standard error; SM, conventional analgesics combined with stripping massage on the lower rhomboid trigger point twice daily.
Note: Pain intensity = ratings using visual analog scales [17]

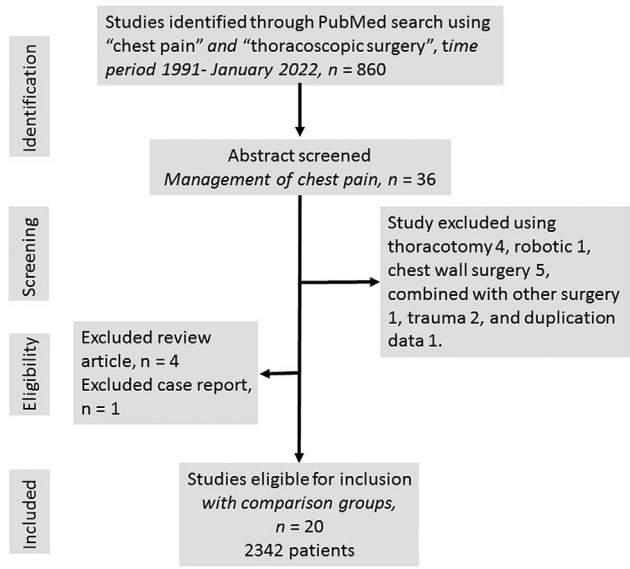

Fig. 5 PRISMA diagram detailing the systematical literature review selection process.

VAS scores. However, one drawback of SM is that it may cause different effects if performed incorrectly by different people or at the wrong site. While other paraspinal muscles or the trapezius can also cause chest pain in the same area after thoracoscopy, the pain is typically less intense than that originating from the lower rhomboid trigger point.

Additional promising techniques for managing postthoracoscopic chest pain include SAP block with bupivacaine or combined epidural analgesia,[23,24] PCIA with dexmedetomidine,[25] phrenic nerve block,[26] and intramuscular stimulation[27] (►**Table 4**, **5**). While epidural, paravertebral, and intercostal blocks are commonly used for regional pain control in thoracic surgery, they each have drawbacks and limitations, such as short duration of in-hospital pain control. The epidural block involves unnecessary sympathetic nerve block and various complications such as hypotension, epidural hematoma, and risks of dural puncture.[28] Paravertebral block and intercostal nerve block have similar efficacies regarding pain control but also have some adverse effects, such as pneumothorax. Ultrasound guidance has improved their safety and accuracy, but they remain challenging to perform.[29] Typically, these

Table 4 The outcomes of various options for varying durations of chest pain following thoracoscopic surgery

Intervention group/control group	Patient No. (study/ control)	Early effect (<6-h)/Late effect (>3 d)	Post-operative pain control	Results
The pre-operative prevention of chest pain following thoracoscopic surgery				
SAP block[31]/ Sham block	20/ 20	$p < 0.005$/ -	PCIA	Preconditioning can stabilize the intraoperative circulation and significantly reduce pain.
SAP block[32]/ Intercostal block	27/ 27	$p = 0.038$/ -	NSAIDs and opioid	Reducing NSAIDs consumption
SAP block[33]/ Sham block	42/ 42	$p = 0.027$/ -	PCIA + intravenous ketorolac	Reducing pain and opioid consumption.
Bupivacaine wound infiltration[34]/ PCIA	42/ 44	$p > 0.05$/ -	Oral tramadol + acetaminophen	Noninferiority was claimed for VAS.
The postoperative in-hospital management of chest pain following thoracoscopic surgery				
Intrapleural bupivacaine[35]/ Intravenous fentanyl	20/ 10	$p = 0.04$/ -	PCIA + intravenous ketorolac	Decreasing postoperative pain and 24-h opioid usage
SAP block[24]/Infiltration block	30/ 30	$p < 0.005$/ -	PCIA + morphine	The SAP group had a shorter time to first mobilization.
SAP block[23,36]/Paravertebral block	29/ 30	$p = 0.04$/ -	PCIA + intravenous lornoxicam	Performing SAP is quicker compared to performing a paravertebral block.
SAP block + epidural analgesia[37]/ SAP block	40/ 40	$p < 0.005$/ -	PCIA	Improved the quality of early postoperative recovery.
SAP block with liposomal bupivacaine[38]/ SAP block with bupivacaine	50/ 32	$p = 0.001$/ $p = 0.58$	PCIA + oral paracetamol 1 g every 8 hours	Reducing in-hospital narcotic consumption.
Intercostal catheter ropivacaine[39]/ Single shot intercostal nerve block	51/44	$p = 0.005$/ -	Oral paracetamol and metamizole	The study cohort had fewer patients requiring opioids for over a day.
Intercostal catheter ropivacaine[40]/ Preoperative ropivacaine at incision wound	419/ 418	$p = 0.032$/ $p = 0.198$	Oral paracetamol, dihydrocodeine, and parecoxib	Effective for acute pain control but not for chronic pain.
Intercostal catheter levobupivacaine[41]/ conventional analgesia	39/ 39	$p < 0.001$/ $p = 0.594$	Oral tramadol + acetaminophen	Lower VAS scores and reducing opioid consumption.
sufentanil and dezocine-based PCIA with/ without dexmedetomidine[25]	72/ 71	$p = 0.005$/ -	Intravenous flurbiprofen 50 mg	The postoperative VAS scores were lower after 2 d.
Phrenic nerve block[26]/ Sham block	42/ 43	$p < 0.001$/ -	PCIA + intravenous paracetamol 1 g	The shoulder pain severity reduced, but there was no improvement in incision pain.
Paravertebral T4 block[42]/ Sham block	30/ 30	$p < 0.001$/ -	PCIA	The consumption of PCIA sufentanil and VAS scores were significantly reduced.
Paravertebral T4-8 block with/ without intravenous parecoxib[43]	37/ 37	$p < 0.005$/ $p > 0.005$	PCIA + intravenous ketorolac	The consumption of ketorolac and VAS scores were significantly reduced.
Epidural analgesia[44]/ Intercostal block	21/ 22	Not significantly different.	High-dose oral celecoxib	There was a significantly higher incidence of procedure-related problems with epidural analgesia.
Intramuscular stimulation[27]/ PCIA	12/14	$p < 0.0007$/ -	Intravenous pethidine or ketorolac	Lower VAS scores.
SAP block + PCIA[45]/PCIA	30/ 30	$p < 0.001$/ $p < 0.05$		Lower VAS scores.

Table 4 (*Continued*)

Intervention group/control group	Patient No. (study/ control)	Early effect (<6-h)/Late effect (>3 d)	Post-operative pain control	Results
The outpatient management of chest pain following thoracoscopic surgery				
Mirogabalin[46]	63/ 63	–/–	NSAIDs and/or acetaminophen	An ongoing program of research.
This study (SM)	30/ 30	$p < 0.001$/ $p < 0.001$	acetaminophen	Lower VAS scores.

Abbreviations: NSAID, nonsteroidal anti-inflammatory drug; PCIA, patient-controlled intravenous analgesia; SAP, serratus anterior plane; SM, stripping massage; VAS, visual analog scale.

Table 5 Comparing different approaches for managing postthoracoscopic chest pain

The choice of invasive treatment for chest pain after thoracoscopic surgery.	Benefits
For chest pain after thoracoscopic surgery, preoperative SAP block and postoperative PCIA with analgesics were recommended as preventive measures.[31–33]	Preconditioning can help stabilize intraoperative circulation and reduce pain and opioid consumption.
Various options exist for the management of chest pain following thoracoscopic surgery during in-hospital care:	
• SAP block with liposomal bupivacaine[38] > SAP block with bupivacaine[23] > paravertebral block, PCIA, or infiltration block[24]	Performing SAP is quicker compared to performing a paravertebral block.
• SAP block + epidural analgesia[37] > SAP block with bupivacaine	Improved the quality of early postoperative recovery.
• Intercostal catheter ropivacaine[39] > single shot intercostal nerve block or preoperative ropivacaine at incision wound	Reducing in-hospital narcotic consumption.
• Other choices: PCIA with dexmedetomidine,[25] phrenic nerve block,[26] or intramuscular stimulation[27]	
The outpatient and noninvasive approach to managing chest pain after thoracoscopic surgery.	
The combination of SM on the lower rhomboid trigger point with oral analgesics showed a safer and more effective approach than traditional analgesic prescriptions.	The duration of rescue medication use was shorter in the SM group compared to the conventional group.

Abbreviations: PCIA, patient-controlled intravenous analgesia; SAP, serratus anterior plane; SM, stripping massage.
Note: >: better than

approaches are reserved for patients with more severe symptoms. However, in another systematic review,[30] conservative approaches were preferred as the treatment of choice. Therefore, this aspect should be taken into account when comparing invasive and non-invasive treatment options.

Our findings demonstrate that applying SM to MTrPs in the rhomboid area in combination with oral analgesics can significantly reduce postoperative analgesic use compared to analgesics alone in patients undergoing VATS procedures. Uncontrolled pain can lead to muscle spasms and limit range of motion, but patients in the SM group experienced reduced pain and analgesic consumption. This may be due to the anti-inflammatory properties of SM, which could act as a viable substitute for analgesics. Therefore, this noninvasive approach could be an effective alternative to invasive interventions for achieving pain control. Despite our efforts to achieve adequate power by conducting a pilot study and considering previous randomized studies with similar patient populations (►**Table 4**), our study has some limitations. First, the sample size was relatively small. Second, the patients were recruited from only two centers. Third, the surgeries types and pathologies were not consistent across all patients, which may have introduced some bias. However, we believe that our review of previous studies and the application of the SM method represents the best available approach for managing perioperative pain after thoracoscopic surgery. To confirm our findings, further multicenter studies with larger sample sizes are warranted.

Conclusion

Considered among the most promising treatment strategies for chest pain after thoracoscopic surgery, SAP blocks are both effective and safe. On the contrary, SM on active rhomboid trigger points is a simple, safe, and less invasive treatment option for postoperative chest pain in patients undergoing VATS and has shown favorable outcomes.

Conflict of Interest
None declared.

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