THE ATLANTIC Journal of Medical Science and Research

Atlantic J Med Sci Res 2026;6(3):301-7
DOI: 10.5455/atjmed.2026.03.022

Original Article

Comparison of the wide-awake local anesthesia with no tourniquet (WALANT) technique with local anesthesia in chest tube placement procedures

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Received: 07 March, 2026
Accepted: 11 June, 2026
Published: 07 September, 2026

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CITATION
Calbay A, Ulas AB, Akgol Gur ST, et al. Comparison of the wide-awake local anesthesia with no tourniquet (WALANT) technique with local anesthesia in chest tube placement procedures. Atlantic J Med Sci Res. 2026;6(3):301-7. DOI: 10.5455/atjmed.2026.03.022

Abstract

Aim: Wide-awake local anesthesia with no tourniquet (WALANT) is increasingly used in surgical practice due to its safety profile, reduced resource requirements, and elimination of sedation. Although widely studied in hand surgery, its role in emergency thoracic procedures remains unclear. This study aimed to compare the efficacy of WALANT and lidocaine-based local anesthesia in patients undergoing emergency tube thoracostomy, focusing on pain perception, bleeding-related complications, and clinical outcomes.

Materials and Methods: This prospective, single-blind, controlled study was conducted between November 1, 2023, and August 1, 2024, in the emergency medicine and thoracic surgery clinics of a tertiary care hospital. Sixty-six adult patients requiring chest tube placement were included and randomized based on medical record number parity into two groups: WALANT (n = 33) and lidocaine local anesthesia (n = 33). The WALANT solution consisted of lidocaine, isotonic saline, sodium bicarbonate, and epinephrine. Pain was assessed using the Visual Analog Scale (VAS) before and five minutes after the procedure. Bleeding-related complications and demographic variables were recorded. Statistical significance was set at $p < 0.05$.

Results: The mean age of participants was 46 ± 20 years; 78.8% were male. Indications included spontaneous pneumothorax (37.9%), traumatic pneumothorax (22.7%), malignant effusion (21.2%), hemothorax (10.6%), and empyema (7.6%). A statistically significant reduction in VAS scores was observed when comparing pre- and post-procedural pain between groups ($p = 0.004$). WALANT demonstrated significant pain reduction particularly in patients with traumatic pneumothorax ($p = 0.01$). No severe bleeding complications were observed in either group, including patients receiving anticoagulant or antiplatelet therapy.

Conclusion: WALANT appears to be a safe and effective alternative to lidocaine-based local anesthesia for emergency tube thoracostomy. It provides significant analgesic benefit without increasing bleeding-related complications and may be particularly advantageous in trauma-related thoracic injuries. Further studies incorporating patient-reported outcomes and long-term follow-up are warranted.

Keywords: Anesthesia, local, tube thoracostomy, local anesthesia, pneumothorax, emergency medicine, thoracic procedures

INTRODUCTION

Wide-awake local anesthesia with no tourniquet (WALANT), introduced by Lalonde, is a local infiltration anesthesia technique that integrates lidocaine and epinephrine without the need for sedation or tourniquet use (1,2). Initially developed for hand surgery and selected trauma cases, WALANT has obtained increasing popularity because of its safety profile, reduced resource requirements, lower costs, and high patient satisfaction (3–5).

By removing sedation, WALANT allows procedures to be performed while patients remain fully awake and avoids the need for fasting, anesthetic monitoring, and prolonged recovery periods. These advantages have enabled its use in resource-limited settings and have been associated with shorter hospital stays and

lower healthcare costs (6–9). In addition, the vasoconstrictive effect of epinephrine provides improved hemostasis without increasing the risk of tissue ischemia when used appropriately. Previous studies have demonstrated favorable outcomes in various surgical procedures, including selected flap surgeries and digital replantation or revascularization procedures (10-12).

Although WALANT has been extensively investigated in hand surgery, evidence concerning its use in thoracic procedures remains limited. Tube thoracostomy is one of the most frequently performed emergency interventions and is commonly associated with procedure-related pain. Conventional local anesthesia provides adequate analgesia in most cases; however, pain during tube insertion and relates to regarding bleeding remain important clinical issues. Moreover, analgesic strategies that can improve patient comfort without increasing procedural complexity are still needed.

Therefore, this study aimed to compare the efficacy of the WALANT technique with conventional lidocaine-based local anesthesia in patients undergoing tube thoracostomy. Specifically, we evaluated pain perception, bleeding-related complications, and clinical outcomes to determine whether WALANT could represent a safe and effective alternative for selected patients requiring thoracic tube placement.

A review of the current literature reveals no research articles or case reports on the use of the WALANT method in intrathoracic procedures. Our study will be a first in this respect.

MATERIALS AND METHODS

Study Design

This prospective, single-center, single-blind, quasi-randomized controlled study was conducted between November 1, 2023, and August 1, 2024, at the emergency medicine and thoracic surgery clinics of Atatürk University Research Hospital.

Participitants

This experimental study included 66 patients who required chest tube placement. The inclusion criteria were the absence of pregnancy, an age of 18 years or older, a Glasgow Coma Scale score of 15 (oriented and cooperative), and the hemorrhagic shock stage being not greater than 1. Exclusion criteria included being < 18 years old, diagnosed with pregnancy, scoring < 15 on the Glasgow Coma Scale, being unoriented and uncooperative, and being in hemorrhagic shock stage > 1.

Limited data exist on the use of the WALANT technique in pediatric populations (13-16). Accordingly, this study was restricted to adult patients to ensure a more homogenous patient group and improve the validity of the results.

Ethical Approval

The study commenced after receiving approval from the Atatürk University Faculty of Medicine Clinical Research Ethics Committee (date: 26/10/2023, protocol code: B.30.2.ATA.0.01.00/834). Written informed consent was obtained from all volunteers participating in the study. The study was conducted in accordance with the Declaration of Helsinki and good clinical practices.

Sample Size and Post-hoc Power Analysis

Since no previous controlled studies evaluating the WALANT technique in tube thoracostomy were available during the study design phase, an a priori sample size calculation could not be performed. Therefore, a post-hoc power analysis was conducted based on the observed differences in pain scores between the two groups. Assuming a two-sided significance level of 0.05 and using the observed effect size (Cohen's $d \approx 0.73$) derived from post-procedural VAS score differences, the achieved statistical power for the total sample of 66 patients (33 patients per group) was approximately 85%. These findings suggest that the study had adequate power to detect clinically meaningful differences in pain outcomes between the WALANT and conventional local anesthesia groups.

Data sources and measurements

Imaging was performed for the complaints presented by the patients at the time of presentation, and after obtaining their consent to undergo the chest tube placement procedure, the method of local anesthesia was determined using a single-blind random selection process. In single-blind randomized studies, either the clinician or the participant is unaware of the treatment being administered. In our study, the patient was designated as the blinded party. Randomization was performed based on the parity of the medical record number as Quasi-randomization. Patients with an odd record number received local anesthesia using the WALANT technique. The local anesthesias with lidocaine and WALANT anesthesia were administered by emergency medicine and thoracic surgery clinic assistants (with over 12 months of residency experience). For patients in the WALANT group, a standardized WALANT solution was prepared (Figure 1). The epinephrine dose was adjusted to 1/1,000,000 for each patient. The epinephrine component was diluted within the final WALANT solution before administration. No undiluted epinephrine was injected directly into the tissues. The solution was composed of 5 mL of 2% lidocaine, 4 mL of 0.9% isotonic sodium chloride, 1 mL of 8.5% sodium bicarbonate, and 1 mL of 1:100000 epinephrine.

Local anesthetic medication was administered in the area where the chest tube would be placed, along the pathway between the ribs where the tube would follow, by inserting a 10-mL syringe just above the lower rib into the skin and tissue. After confirming the presence of hemo/pneumothorax, the needle was advanced to touch the pleural membrane and then withdrawn, allowing the anesthetic to be injected. To ensure dose standardization, 11 mL of the prepared WALANT solution was injected into each patient (Figure 2A and 2B).

After waiting approximately 20 minutes to allow hemostasis to reach its maximum level, the chest tube placement procedure was performed. Pain was assessed using the Visual Analog Scale (VAS) before the procedure and five minutes after its completion. A VAS is one of the pain rating scales used for the amount of

pain that a patient feels ranges across a continuum from none to an extreme amount of pain. From the patient's perspective, this spectrum appears continuous; their pain does not take discrete jumps, as a categorization of none, mild, moderate and severe would suggest. Patients were asked to give a score of 10 for the highest pain experienced and 0 for no pain at all.

Patients presenting with life-threatening thoracic emergencies requiring immediate decompression or resuscitative interventions were not eligible for inclusion. Therefore, all enrolled patients were hemodynamically stable and suitable for a short pre-procedural waiting period required for WALANT administration.

In the control group, determined using the single-blind method with Quasi-randomization, lidocaine (1.5–2 mg/kg) was administered for local anesthesia after ensuring there were no contraindications. The chest tube was inserted following routine procedural protocols. Pain assessment was performed similarly to the WALANT group, using the VAS before the procedure and five minutes after the procedure.

Demographic data, including age, gender, and the indication for chest tube placement, were collected. Statistical analyses were conducted using IBM SPSS 20. Data were presented as means, standard deviations, medians, minimums, maximums, percentages, and counts. The normality of continuous variables was evaluated using the Shapiro-Wilk test, Kolmogorov-Smirnov test, Q-Q plots, skewness, and kurtosis. For comparisons between two independent groups, the independent-sample t-test was used if the normality assumption was met, while the Mann-Whitney U test was employed otherwise. For comparisons between two dependent groups, the paired-sample t-test was used if normality was satisfied, and the Wilcoxon test was applied otherwise. The statistical significance level was set at $p < 0.05$.

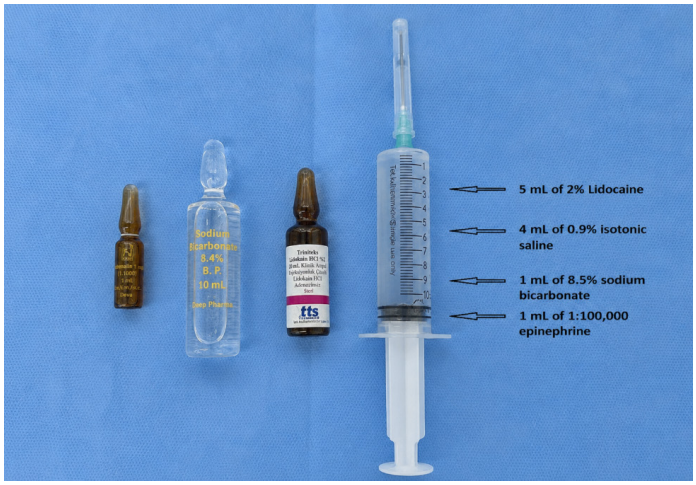

Figure 1. Photograph of the drugs and mixing ratios in the wide-awake local anesthesia with no tourniquet (WALANT) solution

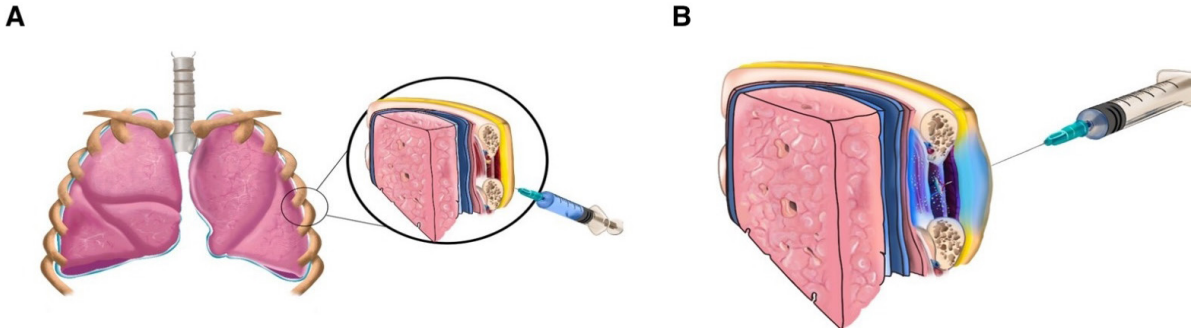

Figure 2. Application of local anesthesia technique prior to tube thoracostomy; **A.** General view of the injection site at the intercostal space, with the needle inserted into the skin/subcutaneous tissue above the inferior border of the rib; **B.** Application of local anesthetic solution/drug in a safe area away from neurovascular structures by retracting the needle after contacting the pleural membrane under negative pressure

RESULTS

The study included a total of 66 patients, of whom 14 were female (21.2%) and 52 were male (78.8%). The mean age of the participants was 46 (± 20) years, ranging from 18 to 91 years. Chest tubes were placed for five distinct indications: spontaneous pneumothorax (37.9%), traumatic pneumothorax (22.7%), malignant effusion (21.2%), hemothorax (10.6%), and empyema (7.6%) (Table 1).

The lidocaine local anesthesia/WALANT procedure was applied to 66 patients based on their file numbers, with an equal distribution (33 patients received lidocaine local anesthesia, and 33 patients received WALANT). In the lidocaine local anesthesia group, a reduction in the VAS scores was observed in male patients ($p = 0.05$), while no statistically significant change was found in female patients ($p = 0.22$) (Figure 3).

A statistically significant reduction in VAS scores was identified in patients receiving chest tubes due to traumatic pneumothorax ($p = 0.01$) and malignant effusion ($p = 0.04$) (Figure 4). Comparing the VAS scores taken before and after the chest tube placement in patients who received lidocaine local anesthesia with those who received WALANT, a statistically significant difference was noted ($p = 0.004$). Patients with empyema who underwent tube thoracostomy with lidocaine-based local anesthesia constituted the group that benefited most from the anesthesia, experiencing the greatest reduction in VAS scores. Similarly, patients with traumatic pneumothorax who were treated with the WALANT technique prior to chest tube placement exhibited a statistically significant reduction in VAS scores (Table 2 and Table 3).

Table 1. Distribution of anesthesia methods by patient demographics and indications

Patient characteristic		WALANT group (n = 33)	Lidocaine group (n = 33)	Total (n = 66)
Age	18–60 years	20 (60.6%)	26 (78.8%)	46 (69.7%)
	≥61 years	13 (39.4%)	7 (21.2%)	20 (30.3%)
Gender	Male	27 (51.92%)	25 (48.07%)	52 (78.8%)
	Female	6 (42.85%)	8 (57.14%)	14 (21.2%)
Indication	Spontaneous pneumothorax	11 (37.90%)	14 (62.10%)	25 (37.90%)
	Traumatic pneumothorax	7 (46.6%)	8 (53.3%)	15 (22.7%)
	Hemothorax	4 (57.15%)	3 (42.85%)	7 (10.60%)
	Empyema	4 (80%)	1 (20%)	5 (7.6%)
	Malignant effusion	7 (50%)	7 (50%)	14 (21.20%)

WALANT: wide-awake local anesthesia with no tourniquet

Table 2. Evaluation of tube placement indications and VAS scores (1: spontaneous pneumothorax, 2: traumatic pneumothorax, 3: hemothorax, 4: empyema, 5: malignant effusion)

VAS scores		Pre-treatment VAS score					Post-treatment VAS score					p*
		Mean	SD	Median	Min	Max	Mean	SD	Median	Min	Max	
Indication	1	4 ± 2	2	4	0	8	4 ± 2	2	4	0	8	0.432
	2	5 ± 3	3	6	0	10	4 ± 2	2	4	2	6	0.015
	3	5 ± 2	2	4	2	8	4 ± 2	2	4	0	8	0.340
	4	5 ± 3	3	4	2	10	3 ± 1	1	2	2	4	0.180
	5	5 ± 2	2	4	2	8	3 ± 2	2	4	0	6	0.046

*Statistically significant at < 0.05; VAS: Visual Analog Scale, SD: standard deviation, min: minimum, max: maximum

Table 3. Effect of applied method on tube placement indications and VAS scores

Indications					Valid N	Mean ± SD	p*
Applied method	Lidocaine local anesthesia	Tube placement indication	Spontaneous pneumothorax	Pre-treatment VAS score	14	4 ± 2	0.159
				Post-treatment VAS score	14	3 ± 2	
			Traumatic pneumothorax	Pre-treatment VAS score	8	5 ± 3	0.129
				Post-treatment VAS score	8	3 ± 2	
			Hemothorax	Pre-treatment VAS score	3	4 ± 2	0.564
				Post-treatment VAS score	3	3 ± 1	
			Empyema	Pre-treatment VAS score	1	4 ± .	NA
				Post-treatment VAS score	1	2 ± .	
			Malignant effusion	Pre-treatment VAS score	7	4 ± 2	0.025
				Post-treatment VAS score	7	3 ± 2	
	WALANT	Tube placement indication	Spontaneous pneumothorax	Pre-treatment VAS score	11	4 ± 2	0.748
				Post-treatment VAS score	11	4 ± 3	
			Traumatic pneumothorax	Pre-treatment VAS score	7	6 ± 2	0.053
				Post-treatment VAS score	7	4 ± 2	
			Hemothorax	Pre-treatment VAS score	4	6 ± 2	0.450
				Post-treatment VAS score	4	4 ± 3	
			Empyema	Pre-treatment VAS score	4	5 ± 3	0.317
				Post-treatment VAS score	4	3 ± 1	
			Malignant effusion	Pre-treatment VAS score	7	5 ± 2	0.336
				Post-treatment VAS score	7	4 ± 2	

*Statistically significant at < 0.05; VAS: Visual Analog Scale, SD: standard deviation, WALANT: wide-awake local anesthesia with no tourniquet, NA: not applicable

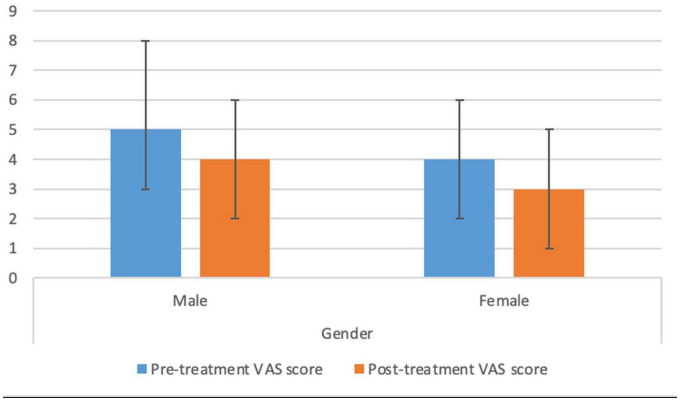

Figure 3. Pre- and post-treatment VAS score analysis by gender

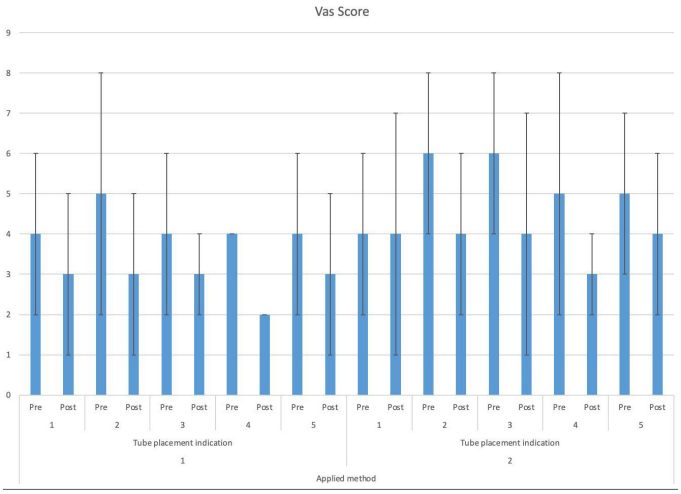

Figure 4. Effect of applied method on tube placement indications and VAS scores (1: spontaneous pneumothorax, 2: traumatic pneumothorax, 3: hemothorax, 4: empyema, 5: malignant effusion; method 1: lidocaine local anesthesia, method 2: WALANT local anesthesia)

DISCUSSION

The main finding of this study was that the WALANT technique provided superior pain control compared with conventional lidocaine-based local anesthesia during tube thoracostomy without increasing clinically related bleeding complications. The analgesic benefit was particularly noticeable among patients with traumatic pneumothorax, suggesting that WALANT may represent a valuable alternative for selected thoracic procedures performed in hemodynamically stable patients.

Although WALANT has been extensively investigated in hand surgery and various surgical procedures, evidence concerning its application in thoracic interventions remains exiguous. Previous studies have demonstrated favorable outcomes in carpal tunnel release, trigger finger surgery, distal radius fracture fixation, and several procedures performed under local anesthesia, including mastectomy, thyroidectomy, prepectoral pacemaker implantation, and subcutaneous implantable cardioverter-defibrillator placement (5,17-20). Consistent with these reports, our findings suggest that WALANT can provide effective analgesia without compromising procedural safety in patients undergoing tube thoracostomy.

An important concern regarding WALANT in emergency procedures is the waiting period required to achieve optimal vasoconstriction and anesthetic efficacy. In the present study, a 20-minute interval was adopted according to previous WALANT literature, aiming to maximize the analgesic and hemostatic effects of epinephrine while avoiding unnecessary delays (21,22). Because patients with life-threatening conditions requiring immediate decompression or resuscitation were excluded, all included patients were hemodynamically stable and suitable for this short waiting period. Therefore, our findings should be interpreted within the context of selected emergency patients rather than unstable thoracic emergencies. Future studies should investigate whether shorter waiting periods could maintain adequate analgesia while improving procedural efficiency.

Interestingly, the greatest analgesic benefit was noticed in patients with traumatic pneumothorax. Since these patients frequently present with associated rib fractures and pulmonary contusions, pain may originate not only from the thoracostomy procedure itself but also from concomitant chest wall injuries. The significant reduction in VAS scores observed in this subgroup suggests that WALANT may provide additional analgesic advantages in trauma-related thoracic conditions. However, larger studies are required to confirm this consideration.

Despite concerns regarding the use of epinephrine and the absence of a tourniquet, no clinically significant bleeding complications or hematoma formation were observed in either group, including patients receiving anticoagulant or antiplatelet therapy. These findings are in agreement with previous reports demonstrating the safety profile of WALANT in patients with increased bleeding risk. Although the amount of blood loss was not quantitatively measured, no intervention-related bleeding events requiring additional treatment were encountered.

Tube thoracostomy is primarily performed to relieve respiratory distress; however, the procedure itself frequently introduces a new source of pain related to the chest tube and respiratory movements. While dyspnea generally improves following drainage, pain associated with the tube remains an important cause of patient discomfort. Therefore, strategies aimed at improving procedural analgesia without increasing procedural complexity may contribute to better patient experience and overall quality of care.

The present study has several strengths. To our knowledge, this is among the first prospective controlled studies evaluating the use of the WALANT technique during tube thoracostomy. Furthermore, all procedures were performed using a standardized anesthetic protocol, and clinically relevant bleeding complications were carefully documented.

Limitations

Several limitations should be acknowledged. Because no previous controlled studies evaluating WALANT in tube thoracostomy were available during study design, an a priori sample size calculation was not feasible. However, post-hoc power analysis demonstrated an achieved statistical power of approximately

85%, suggesting adequate power to detect clinically meaningful differences. Nevertheless, the relatively small sample size and single-center design limit the generalizability of the findings. The heterogeneous indications for tube thoracostomy, the inability to quantify procedural blood loss, and the lack of postoperative wound-healing and infection follow-up represent additional limitations. Moreover, pain perception is inherently subjective and operator-dependent factors may have influenced VAS scores. Finally, hemodynamically unstable patients and those requiring immediate life-saving interventions were excluded; therefore, the present findings cannot be extrapolated to all emergency thoracic conditions.

Future multicenter studies with larger patient populations, objective bleeding assessments, patient satisfaction measurements, and longer follow-up periods are warranted to better define the role of WALANT in thoracic emergency procedures.

CONCLUSION

In hemodynamically stable patients requiring tube thoracostomy, the WALANT technique appears to be a safe and effective alternative to conventional lidocaine-based local anesthesia. WALANT was associated with greater pain reduction without an increase in clinically significant bleeding complications. Future multicenter studies with larger sample sizes are needed to confirm these findings and define the role of WALANT in emergency thoracic procedures.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that there is no financial support.

Ethical Approval
The study commenced after receiving approval from the Atatürk University Faculty of Medicine Clinical Research Ethics Committee (date: 26/10/2023, protocol code: B.30.2.ATA.0.01.00/834).

Informed Consent
Written informed consent was obtained from all volunteers participating in the study. The study was conducted in accordance with the Declaration of Helsinki and good clinical practices.

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