

JURNAL
RESPIROLOGI
INDONESIA

Majalah Resmi Perhimpunan Dokter Paru Indonesia
Official Journal of The Indonesian Society of Respiriology



The Correlation of Microsomal Epoxide Hydrolase (EPHX1) His139Arg Gene Polymorphism and Lung Cancer Incidence in H. Adam Malik General Hospital Medan

Differences in Levels of Human 1,3-β-D-Glucan from Bronchoalveolar Lavage (BAL) Fluid between The Immunocompromised and Immunocompetent Groups Patients with Suspected Lung Cancer

Association Between CEA Serum Level on NSCLC Patients with EGFR Mutation from Tissue and Plasma Sample

Comparison of Eutectic Mixture of Local Anesthesia Cream and Subcutaneous Lidocaine to Reduce Chest Tube Removal Pain and Willingness to Repeat Procedure

Risk Factors for Mortality of Patients with COVID-19 in RSJPD Harapan Kita, Jakarta

An Evaluation of Short-Acting β₂-Agonist Prescriptions and Associated Clinical Outcomes in Asthma Management in Indonesia – The SABINA Indonesia Study

Increased Serum SP-D Level, Neutrophils and Lymphocytes Sputum in Malang Splendid Bird Market Workers

Expression of Immune Checkpoint Marker PD-L1 in Surgical Lung Cancer Specimens

The Effect of Roflumilast on Absolute Neutrophil Count, MMP-9 Serum, %VEP₁ Value, and CAT Scores in Stable COPD Patients

The Surfactant Protein D (SP-D) Serum Levels in Limestone Mining Worker

Gastro-Esophageal Reflux Is Not a Common Cause of Chronic Cough: A Singapore Case Series

Impact of Underweight on the Unsuccessful Treatment Outcome Among Adults with Drug-Resistant Tuberculosis: A Systematic Review

JURNAL RESPIROLOGI INDONESIA

Majalah Resmi Perhimpunan Dokter Paru Indonesia
Official Journal of The Indonesian Society of Respiriology

Editorial Advisory Board

M. Arifin Nawas
Faisal Yunus
Agus Dwi Susanto

Editorial-in-Chief

Fanny Fachrucha

Editorial Board

Feni Fitriani Taufik
Noni Novisari Soeroso
Tutik Kusmiati
A. Farih Raharjo
Ginangjar Arum Desianti
Irandi Putra Pratomo
Jamal Zaini
Mia Elhidsi

International Editorial Board

Guido Vagheggini
Mayank Vats
Motoyasu Kato
Ira Paula Wardono

Secretariat

Shalzaviera Azniatinesa
Suwondo
SST : Surat Keputusan Menteri Penerangan RI
No.715/SK/DitjenPPG/SST/1980 Tanggal 9 Mei 1980

Editorial Office

PDPI Jl. Cipinang Bunder, No. 19, Cipinang Pulo Gadung
Jakarta Timur 13240 Telp: 02122474845
Email : editor@jurnalrespirologi.org
Website : <http://www.jurnalrespirologi.org>

Publisher

The Indonesia Society of Respiriology (ISR)
Published every 3 months (January, April, July & October)

Jurnal Respiriologi Indonesia

2nd Rank Accreditation
According to the Decree of the Minister of Research and
Technology/Head of the National Research and Innovation
Agency of the Republic of Indonesia Number: 200/M/KPT/2020
December 23, 2020

JURNAL RESPIROLOGI INDONESIA

Majalah Resmi Perhimpunan Dokter Paru Indonesia
Official Journal of The Indonesian Society of Respiriology

VOLUME 42, NUMBER 2, April 2022

TABLE OF CONTENT

Original Article

- The Correlation of Microsomal Epoxide Hydrolase (EPHX1) His139Arg Gene Polymorphism and Lung Cancer Incidence in H. Adam Malik General Hospital Medan* 86
Rosidah Hanum Hasibuan, Noni Novisari Soeroso, Setia Putra Tarigan, Yahwardiah Siregar, Erna Mutiara, Lucia Aktalina
- Differences in Levels of Human 1,3-β-D-Glucan from Bronchoalveolar Lavage (BAL) Fluid between The Immunocompromised and Immunocompetent Groups Patients with Suspected Lung Cancer* 90
Asih Trimurtini, Ngakan Putu Parsama Putra, Teguh Rahayu Sartono, Harun Al Rasyid
- Association Between CEA Serum Level on NSCLC Patients with EGFR Mutation from Tissue and Plasma Sample* 97
Frenky Hardiyanto Hendro Sampurno, Suryanti Dwi Pratiwi, Ngakan Putu Parsama Putra
- Comparison of Eutectic Mixture of Local Anesthesia Cream and Subcutaneous Lidocaine to Reduce Chest Tube Removal Pain and Willingness to Repeat Procedure* 107
Roman Diaz, Yusup Subagio Sutanto, Ahmad Farih Raharjo
- Risk Factors for Mortality of Patients with COVID-19 in RSJPD Harapan Kita, Jakarta* 115
Zhara Juliane, Asri C Adisasmita, Yoga Yuniadi
- An Evaluation of Short-Acting β2-Agonist Prescriptions and Associated Clinical Outcomes in Asthma Management in Indonesia – The SABINA Indonesia Study* 121
Wiwien Heru Wiyono, Muhammad Amin, Susanthy Djajalaksana, Amira Permatasari Tarigan, Febrina Susanti, Hisham Farouk, Helyanna
- Increased Serum SP-D Level, Neutrophils and Lymphocytes Sputum in Malang Splendid Bird Market Workers* 129
Ratih Dwi Ary Merdekawati, Tri Wahyu Astuti, Garinda Alma Duta
- Expression of Immune Checkpoint Marker PD-L1 in Surgical Lung Cancer Specimens* 136
Elisna Syahrudin, Jamal Zaini, Lisnawati, Yayi DB Susanto, Sarah Fitriani, Shanty R. Kusumawardani, Romi Baginta
- The Effect of Roflumilast on Absolute Neutrophil Count, MMP-9 Serum, %VEP1 Value, and CAT Scores in Stable COPD Patients* 141
Ratna Andhika, Suradi, Yusup Subagio Sutanto
- The Surfactant Protein D (SP-D) Serum Levels in Limestone Mining Worker* 151
Sita Andarini, Anna Yusrika, Sri Wening Pamungkasningsih, Farhan Hilmi Taufikulhakim, Ahmad Hudoyo, Widhy Yudistira Nalapraya, Agus Dwi Susanto
- ### Case Report
- Gastro-Esophageal Reflux Is Not a Common Cause of Chronic Cough: A Singapore Case Series* 156
Vijo Poullose
- ### Literature Review
- Impact of Underweight on the Unsuccessful Treatment Outcome Among Adults with Drug-Resistant Tuberculosis: A Systematic Review* 161
Kemas Rakhmat Notariza, Jaka Pradipta

Comparison of Eutectic Mixture of Local Anesthesia Cream and Subcutaneous Lidocaine to Reduce Chest Tube Removal Pain and Willingness to Repeat Procedure

Roman Diaz, Yusup Subagio Sutanto, Ahmad Farih Raharjo

Department of Pulmonology and Respiratory Medicine Faculty of Medicine, Universitas Sebelas Maret, RSUD dr. Moewardi, Surakarta

Abstract

Background: Patients with chest tube tend to have allodynia (pain from stimuli that is normally painless) and hyperalgesia (increased sensitivity to pain). Anesthetics has not been used routinely during chest tube removal because of the assumption that the procedure is brief and the pain is short-lived, though it could be the most painful part of chest tube procedures.

Objective: This study compared the effectiveness of local anesthetic eutectic mixture of local anesthesia (EMLA) cream and subcutaneous infiltration of lidocaine to reduce pain of chest tube removal, 10 minutes afterwards and its effect on the patient's willingness to repeat the procedure.

Method: A quasi-experimental clinical trial conducted on 28 patients undergoing chest tube removal at dr. Moewardi Hospital from September 2020. The EMLA group (n=14) received 2 grams of topical EMLA cream applied two hours before chest tube removal. The lidocaine group (n=4) received subcutaneous infiltration of 2% lidocaine five minutes before chest tube removal. Pain was measured by visual analog scale (VAS) before, during and 10 minutes after the chest tube was removed, then the patients were asked to fill out a willingness to repeat procedure questionnaire.

Results: Topical EMLA cream was comparable to 2% lidocaine infiltration for reducing pain during chest tube removal (P=0.679) and 10 minutes thereafter (P=0.833). EMLA cream did not increase the patient's willingness to repeat the procedure (P=0.815)

Conclusion: Topical EMLA cream is capable of replacing the subcutaneous infiltration of 2% lidocaine as a local anesthetic for chest tube removal but does not increase the patient's willingness to repeat the procedure. (*J Respirol Indones 2022; 42 (2): 107–14*)

Keywords: Chest tube, pain, EMLA, lidocaine, repeat procedure

Perbandingan Krim *Eutectic Mixture of Local Anesthesia* dan Lidokain Subkutan untuk Mengurangi Nyeri Melepas Selang Dada dan Kesiediaan Mengulang Prosedur

Abstrak

Latar belakang: Pasien terpasang selang dada akan memiliki kondisi alodinia (rasa nyeri dari rangsang yang secara normal tidak menimbulkan nyeri) dan hiperalgesia (peningkatan sensitivitas terhadap nyeri). Penggunaan antinyeri belum dilakukan secara rutin ketika melepas selang dada dengan anggapan bahwa prosedur tersebut hanya berlangsung cepat. Nyeri yang dirasakan juga dianggap terjadi dalam tempo yang singkat padahal bisa jadi merupakan bagian paling menyakitkan dari rangkaian prosedur pemasangan selang dada.

Tujuan: Penelitian ini membandingkan efektivitas anestesi lokal krim eutectic mixture of local anesthesia (EMLA) dan infiltrasi subkutan lidokain 2% untuk mengurangi nyeri melepas selang dada, 10 menit setelah selang dada dilepaskan dan pengaruhnya terhadap kesiediaan pasien untuk mengulang prosedur.

Metode: Uji klinis kuasi-eksperimental dilakukan pada 28 pasien yang akan dilakukan tindakan pelepasan selang dada di RSUD dr. Moewardi mulai bulan September 2020 dengan consecutive sampling. Kelompok EMLA (n=14) mendapatkan krim EMLA topikal 2 gram yang diaplikasikan dua jam sebelum selang dada dilepas. Kelompok lidokain (n=14) mendapat infiltrasi subkutan lidokain 2% lima menit sebelum selang dada dilepaskan. Nyeri diukur dengan visual analog scale (VAS) sebelum, saat dan 10 menit setelah selang dada dilepaskan, kemudian pasien diminta mengisi kuesioner kesiediaan mengulang prosedur.

Hasil: Krim EMLA topikal sebanding efektivitasnya dengan infiltrasi lidokain 2% untuk mengurangi nyeri saat melepas selang dada (P=0,679) dan 10 menit setelahnya (P=0,833). Krim EMLA tidak meningkatkan kesiediaan pasien untuk mengulang prosedur (P=0,815).

Kesimpulan: Krim EMLA secara topikal mampu menggantikan infiltrasi subkutan lidokain 2% sebagai anestesi lokal dalam prosedur pelepasan selang dada tetapi tidak meningkatkan kesiediaan pasien untuk mengulang prosedur. (*J Respirol Indones 2022; 42 (2): 107–14*)

Kata kunci: Selang dada, nyeri, EMLA, lidokain, mengulang prosedur.

Correspondence: Roman Diaz
Email: preventer.cyclone@gmail.com

INTRODUCTION

Chest tube insertion is a procedure that is often performed in pulmonary medicine practice. An estimated 1.330.000 chest tube insertion procedures were performed in 1995 in the United States. A fully conscious patient will experience excruciating pain when the chest tube is inserted. Therefore, pain medication is always given by intravenous injection or subcutaneous infiltration before the insertion procedure.¹

The use of painkillers has not been done routinely when removing the chest tube with the assumption that the procedure is short and the pain only occurs briefly. In truth, the patient normally experiences a moderate to a severe increase in pain during the chest tube removal procedure. Patients with chest tube tend to experience allodynia (pain from normally painless stimuli) and hyperalgesia (increased sensitivity to pain). Chest tube insertion causes sensitization of sleep nociceptors on the skin's surface, muscle tissue and parietal pleura. The release of adenosine triphosphate (ATP) and inflammatory mediators causes a decrease in the nociceptor sensitivity threshold. As a result of these two processes, other procedures performed where the chest tube is attached will induce pain in higher intensity to the patient.¹⁻³

Administration of local anesthetics either topically or subcutaneously before chest tube removal has been shown to reduce pain during the procedure compared to systemic anesthesia and placebo. Topical anesthetics provide more comfort to the patient since the application is painless. Eutectic mixture of local anesthesia (EMLA) is a topical anesthetic in a mixture of 2.5% lidocaine and 2.5% prilocaine in the form of a cream. Valenzuela et al. (1999) proved that EMLA was significantly better to reduce chest tube pain than systemic opioid administration.^{4,5}

This research aims to compare the effectiveness of two local anesthetic modes, namely topical EMLA cream and 2% lidocaine by subcutaneous infiltration to reduce pain during chest tube removal and 10 minutes after the chest tube is removed. The score of

patient satisfaction in both groups was then measured by a questionnaire of willingness to repeat the procedure.

METHODS

This study is a quasi-experimental with the population of patients to whom chest tube removal is to be performed. The study was conducted in dr. Moewardi Hospital, Surakarta during September and October 2020 until the number of samples needed was met. The research subjects consisted of 28 patients who underwent removal of chest tube, divided into the EMLA group (n=14) and the lidocaine group (n=14).

Pain at the chest tube insertion site was measured thrice using a visual analog scale (VAS) for pain. The first VAS measurement was performed before the local anesthetic was applied. Patients in the EMLA group will receive EMLA cream spread by the radius of 2 cm from the site of chest tube insertion. The cream is then covered with a transparent occlusive dressing and left for 120 minutes before the chest tube is removed. Patients in the lidocaine group will receive 2% lidocaine infiltration at 3, 6, 9, and 12 o'clock from the chest tube insertion site five minutes before the chest tube removal procedure.

The second VAS measurement was performed when the chest tube was removed and the sutures tied, while the third one was done 10 minutes after the procedure. Patients were then asked to complete a questionnaire of willingness to repeat chest tube procedure on a scale of 0 (highly likely, not willing) to 10 (very likely willing).

The inclusion criteria in this study included patients who were to undergo a chest tube removal procedure, willing to participate in the study by signing informed consent, aged ≥ 18 years, could read and write and were free from short and medium-acting systemic pain medications within 24 hours or systemic long-acting painkillers within 72 hours. Exclusion criteria included patients with decreased consciousness, symptomatic central nervous system disorders, requiring re-stitching of a chest tube

closure or retainer and allergy to lidocaine or prilocaine. The criteria for discontinuation were if the patient experiences a loss of consciousness within 10 minutes after the chest tube is removed. The research was done after the researcher obtained approval and ethical clearance from the Health Research Ethics Committee of Dr. Moewardi Hospital (No.1.070/IX/HREC/2020).

Data analysis was carried out using SPSS version 19 for Windows and presented using Microsoft Office 2016. The normality test of research data was carried out using the Shapiro-Wilk test because the number of samples was less than 50 subjects. Statistical testing on paired samples was done using paired t-test if the data distribution was normal and Wilcoxon test if not. Statistical testing on unpaired samples was tested using the independent

t-test if the data distribution was normal and Mann-Whitney test if not.

RESULT

This study was conducted on 28 patients undergoing chest tube removal at Dr. Moewardi Hospital, Surakarta. The number of subjects was 14 people in the EMLA group and 14 in the lidocaine group, making total number of subjects 28. There were no resignation nor discontinuation of subjects from either the first or second group. The subjects were characterized by age, gender, occupation, level of education, presence of malignancy in the lung, presence of malignancy outside the lung, presence of infection in the lung and infection at the chest tube insertion site and duration of chest tube insertion.

Table 1. Basic characteristics of research subjects

Characteristics	Group		Total	P
	Lidocaine	EMLA		
Age	53.43±11.78	50.07±16.81	51.75±14.35	0.546
Gender				
Female	5 (35.7%)	6 (42.9%)	11 (39.3%)	0.669
Male	9 (64.3%)	8 (57.1%)	17 (60.7%)	
Education				
Elementary	7 (50.0%)	4 (28.6%)	11 (39.3%)	0.243
Junior High School	3 (21.4%)	4 (28.6%)	7 (25.0%)	
Senior High School	4 (28.6%)	5 (35.7%)	9 (32.1%)	
University	0 (0.0%)	1 (7.1%)	1 (3.6%)	
Job				
Laborer	3 (21.4%)	2 (14.3%)	5 (17.9%)	0.808
Employee	0 (0.0%)	1 (7.1%)	1 (3.6%)	
Trader	2 (14.3%)	2 (14.3%)	4 (14.3%)	
Farmer	6 (42.9%)	5 (35.7%)	11 (39.3%)	
Civil servant	0 (0.0%)	1 (7.1%)	1 (3.6%)	
Not working	3 (21.4%)	3 (21.4%)	6 (21.4%)	
Lung Malignancy				
Yes	9 (64.3%)	11 (78.6%)	20 (71.4%)	0.678
No	5 (35.7%)	3 (21.4%)	8 (28.6%)	
Malignancy outside Lung				
Yes	0 (0.0%)	1 (7.1%)	1 (3.6%)	1.000
No	14 (100.0%)	13 (92.9%)	27 (96.4%)	
Lung Infection				
Yes	7 (50.0%)	6 (42.9%)	13 (46.4%)	0.705
No	7 (50.0%)	8 (57.1%)	15 (53.6%)	
WSD site infection				
Yes	3 (21.4%)	2 (14.3%)	5 (17.9%)	1.000
No	11 (78.6%)	12 (85.7%)	23 (82.1%)	
Duration of WSD insertion				
<7 days	0 (0%)	0 (0%)	0 (0%)	1.000
7–14 days	6 (42.9%)	6 (42.9%)	12 (42.9%)	
>14 days	8 (57.1%)	8 (57.1%)	16 (57.1%)	

Characterization of research subjects in both groups was carried out to determine the homogeneity of the two groups as a feasible clinical trial procedure. The normality of the distribution of the characteristics of the subjects in both groups was tested using the Shapiro-Wilk test.

The categorical variables included gender, occupation, level of education, presence of malignancy in the lung, presence of malignancy outside the lung, presence of infection in the lung, presence of infection at the site of chest tube insertion, and duration of chest tube insertion. Characteristics of research subjects in the form of categorical data are presented in frequency (percentage). The homogeneity test used for categorical data is the chi-square/Fisher exact test.

The numerical variables in this study, namely age and VAS score, are presented by mean±standard deviation (SD). Homogeneity test for numerical data uses an independent t-test if the data distribution is normal and Mann-Whitney test if not. The basic characteristics of the two groups of subjects are said to be homogeneous if the homogeneity test gives $P>0.5$. All data on the characteristics of subjects and research variables between the two groups had $P>0.05$, indicating that the characteristic data between control and treatment were homogeneous.

The EMLA cream group had a mean initial VAS score of 2.02 ± 1.48 which then increased to 4.66 ± 1.82 during the removal procedure. The average increase in pain VAS scores in the EMLA cream group was 2.63 ± 1.67 , so it was concluded that in the group of subjects receiving local anesthesia with EMLA cream there was an increase in mild pain when the chest tube was removed.

The mean initial VAS in the lidocaine group was 1.61 ± 1.46 , while the score during chest tube removal was 4.66 ± 1.45 . The mean increase in pain VAS scores in the lidocaine group was 3.05 ± 1.70 , so in this group, there was also an increase in mild pain when the chest tube was removed.

The mean initial VAS in the EMLA cream group and the lidocaine group, respectively 2.02 ± 1.48 and 1.61 ± 1.46 , did not have a statistically significant

difference with $P=0.456$. The lidocaine group had a higher increase in VAS when the chest tube was removed, namely 3.05 ± 1.70 (mild increase) compared to 2.63 ± 1.67 (mild increase) in the EMLA cream group, but statistically this difference was not significant either with $P=0.679$. It can be concluded that the effectiveness of topical EMLA cream is comparable to subcutaneous infiltration of 2% lidocaine in reducing pain during chest tube removal.

The mean score of VAS 10 minutes after chest tube removal in the EMLA cream and lidocaine injection groups was 1.73 ± 1.30 and 1.79 ± 0.97 respectively. The statistical test between the scores of the two groups got $P=0.833$. This means that there was no statistically significant difference in the VAS scores between the two groups 10 minutes after the chest tube was removed.

Table 2. Comparison of the effectiveness of EMLA cream and lidocaine infiltration for relieving chest pain

Group	Initial VAS	VAS during chest tube removal	VAS increase
Lidocaine	1.61 ± 1.46	4.66 ± 1.45	3.05 ± 1.70
EMLA	2.03 ± 1.48	4.66 ± 1.82	2.63 ± 1.67
<i>P</i>	0.456	1.000	0.679

The mean initial VAS in the EMLA cream group was $2.02 + 1.48$. The mean VAS score 10 minutes after the chest tube was removed was 1.73 ± 1.30 . There was a decrease in the score of VAS at 10 minutes after the chest tube was removed compared to the initial VAS with a mean decrease of -0.30 ± 1.62 , which was not statistically significant with $P=0.501$.

The lidocaine group had an initial mean VAS score of 1.61 ± 1.46 . The mean VAS 10 minutes after chest tube removal in the lidocaine injection group was 1.79 ± 0.97 , so in the lidocaine injection group the VAS score 10 minutes after chest tube removal increased instead compared to the initial VAS with a mean of 0.19 ± 1.17 . The increase was not statistically significant either with $P=0.562$.

As mentioned previously, the mean changes in initial VAS and VAS 10 minutes after chest tube removal in the EMLA cream and lidocaine injection groups were -0.30 ± 1.62 and 0.19 ± 1.17 respectively. The statistical test showed $P=0.713$, which means that there is no significant difference in the change in

VAS score 10 minutes after the chest tube is removed in both groups. It can be concluded that topical EMLA cream is comparable to subcutaneous injection of 2% lidocaine to control pain 10 minutes after the chest tube is removed.

Table 3. Comparison of topical EMLA cream and 2% lidocaine subcutaneous injection for pain relief 10 minutes after chest tube removal

Group	Initial VAS	VAS after 10 mins	VAS change	P
Lidocaine	1.61±1.46	1.79±0.97	0.19±1.17	0.562
EMLA	2.03±1.48	1.73±1.30	-0.30±1.62	0.501
P	0.456	0.833	0.713	

A comparative test of the effect of EMLA cream and lidocaine injection for chest tube removal on the patient's level of willingness to repeat the chest tube procedure was carried out using the Mann-Whitney unpaired test because based on the normality test, the data were not normally distributed. The willingness to repeat the procedure in the lidocaine group had an average score of 5.57±3.08, while the EMLA cream group had an average score of 5.79±3.77. Based on statistical tests, there was no significant difference between those two ($P=0.815$), so it can be said that the use of EMLA cream to reduce pain in chest tube removal did not increase the patient's willingness to repeat the procedure when compared to the subcutaneous injection of 2% lidocaine.

Table 4. Effect of EMLA cream and lidocaine infiltration when removing the chest tube on the patient's level of willingness to repeat the chest tube procedure

Group	The level of willingness to repeat the procedure
Lidocaine	5.57 ± 3.08
EMLA	5.79 ± 3.77
P	0.815

DISCUSSION

This study is a quasi-experimental to compare two modes of local anesthetic to reduce pain in chest tube removal. The subjects in this study were patients undergoing chest tube removal. The research subjects were divided into two groups. The first group received local anesthetic cream EMLA topically and the second group received local anesthetic subcutaneous infiltration of 2% lidocaine. The dependent variable was the increase in the VAS score during and 10 minutes after the chest tube was

removed, analyzing the comparison of the effectiveness of the two modes of local anesthesia to control pain during the removal procedure. Another dependent variable is the patient's willingness to repeat the entire series of chest tube insertion procedures to analyze patient's satisfaction with the overall procedure.

This research was conducted on 28 subjects at dr. Moewardi Hospital. The average age of the study subjects was 51.75±14.35 years, where patients in the lidocaine group were 53.43±11.78 years old, and the EMLA group had an average age of 50.07±16.81 years. The statistical test results got $P=0.546$ which means there is no significant difference in the age between the lidocaine and EMLA groups.

Among all the research subjects, 17 patients are male (60.7%), with 9 (64.3%) in lidocaine group and 8 (57.1%) in EMLA group. There was no significant difference between the genders in the two study groups. Most of the subjects have education level of elementary school or equivalent, amounting to 11 patients (39.3%), with 7 of them in EMLA group, which makes 50% of the group. In the lidocaine group, most have high school education or the equivalent, namely 5 patients (35.7%). Statistical test results showed $P=0.243$ which means there is no significant difference in the two groups based on education level. Farming makes up the majority of the subjects' occupations, with 11 patients (39.3%) who were divided into 6 (42.5%) in the lidocaine group and 5 (35.7%) in the EMLA group. The statistical test obtained the score of $P=0.808$, which means that there is no significant difference in the profession of the research subjects.

20 of the 28 research subjects had lung malignancy (71.4%), with 9 patients (64.3%) in lidocaine group and 11 patients in (78.6%) EMLA group. Extrapulmonary malignancy was found in one patient from the EMLA group (7.1%). The results of statistical tests concluded that there was no significant difference between the two groups based on malignancy in the lung ($p=0.678$) or outside the lung ($P=1.000$).

The incidence of lung infection in the subjects was 13 (46.4%), which occurred in 7 patients (50.0%)

in lidocaine group and 6 (42.9%) in EMLA group. Chest tube infection was found in 5 patients (17.9%), of which 3 (21.4%) came from the lidocaine group and 2 (14.3%) from the EMLA group. The statistical test results obtained $p=0.705$ for lung infection and $P=1.000$ for chest tube infection, so it can be concluded that there was no significant difference between the two groups. The longest duration of chest tube insertion was >14 days which happened in 16 patients (57.1%), with each group having 8 patients (57.1%). In another 12 (42.9%) patients, the chest tube was inserted for 7–14 days. No patient had a chest tube for less than 7 days. The statistical test got $P=1.000$, meaning there was no significant difference between the two groups.

Chest tube removal, even if it only lasts for a short time, can be the most painful part in the entire series of chest tube insertion procedures. Bruce et al in their literature review stated that there was an increase in moderate to severe pain or a VAS score of 4 to 10 experienced by the patients when the chest tube was removed, so it is highly recommended not to perform chest tube removal without prior local anesthetic administration.⁵

This study compared the effectiveness of local anesthetic with topical EMLA cream and 2% lidocaine by subcutaneous infiltration to reduce pain when the chest tube is removed. The EMLA cream group experienced an increase in mild pain with a mean increase in pain VAS score of 2.63 ± 1.67 . The lidocaine group also experienced an increase in mild pain with a mean increase in pain VAS score of 3.05 ± 1.70 . The lidocaine group experienced a higher increase in pain VAS score than the EMLA group, but the difference was not statistically significant with $P=0.679$. This study showed that EMLA cream applied topically 2 hours before chest tube removal was comparable to subcutaneous infiltration of 2% lidocaine to reduce pain from chest tube removal.

The researchers have not obtained a previous study comparing two different modes of local anesthetic in chest tube removal procedures. Research comparing infiltrative local anesthesia with systemic anesthesia was conducted by Jawad et al in Cairo, Egypt and Akrofi et al in Liverpool, England.

Both studies concluded that infiltrative local anesthesia is better than systemic anesthesia with non-steroidal anti-inflammatory drugs (NSAIDs), opioids or a combination of both.^{6,7}

Previous studies comparing topical local anesthetics with systemic anesthesia or placebo conducted by Watanabe et al in Akita, Japan, Singh et al in Andhra, India and Valenzuela et al in Morgantown, USA, also concluded that topical anesthesia is better compared to systemic anesthesia with opioids or placebo for pain relief when removing the chest tube.^{4,8,9}

The local anesthetic mode used in the two groups in this study used an anesthetic agent from the amino amide group with differences in the application method (topically and subcutaneously). The point of action of the two anesthetic agents is also the same, namely at voltage-gated sodium channels (VGSC) to inhibit the propagation of pain impulses from nociceptors. Topical use of EMLA cream has advantages over subcutaneous infiltration of 2% lidocaine because it does not cause additional pain in its application. The biggest drawback of using EMLA cream in this study was the two-hour waiting time before chest tube removal could be performed, but given that patients with a chest tube inserted usually have been in treatment for a relatively long time, an additional two hours of waiting time shouldn't be a problem to worry about.^{2,10}

Patients with chest tube insertion are in a state of allodynia or hyperalgesia around the chest tube insertion site due to sensitization of nociceptors by inflammatory agents. Chronic C nerve fiber activity will cause a long duration of pain, often for hours after the chest tube was removed. Pain is usually felt as a pull rather than a sharp prick. This study found that the mean VAS score 10 minutes after the chest tube was removed in the EMLA group was 1.73 ± 1.30 . In the lidocaine group, the mean VAS score 10 minutes after the chest tube was removed was 1.79 ± 0.97 . There was no significant difference in the VAS score 10 minutes after the chest tube was removed in the two groups with $P=0.833$.

Compared to the initial VAS, the EMLA group had a decrease in pain VAS score with a mean of -

0.30±1.62, while in the lidocaine group, there was an increase in VAS score with a mean of 0.19±1.17. These differences did not reach significance with $P=0.713$. The results of this study demonstrated that topical EMLA cream was comparable to subcutaneous infiltration of 2% lidocaine to revert pain to the initial score within 10 minutes after chest tube removal.

The results of this study are in line with the results of previous studies by Jawad et al and Singh, which stated that local anesthesia was better than systemic anesthesia or placebo in achieving quicker pain control and returning to the initial pain level. This study showed that EMLA cream reduced pain level 10 minutes after the chest tube was removed to below the initial pain level, although it did not reach significance.^{6,9}

The patient's willingness to repeat the procedure is one measure of patient satisfaction. Research conducted by Loftus et al stated that the patient's willingness to repeat the process was closely related to the absence of pain during the procedure.¹¹ This study showed no significant difference in the level of willingness to repeat the chest tube insertion procedure in the EMLA group and lidocaine (mean 5.79±3.77 and 5.57±3.08 respectively, $P=0.815$). This result was obtained because although the EMLA cream group did not experience pain during the application, both groups still had moderate pain when the chest tube was removed (mean 4.66±1.82 and 4.66±1.45, $P=1.000$). Pain is often associated with patients with a low level of operator proficiency, causing a reluctance to return to the same health facility, especially if the procedure has to be repeated. The series of chest tube insertion procedures is also a complex one and has many stages and complications leading to many factors that reduce patient satisfaction, such as pain during insertion, long duration of treatment and limited movement when the chest tube is inserted.¹²

CONCLUSION

Topical application of EMLA cream was as useful as subcutaneous infiltration of 2% lidocaine to

reduce pain on chest tube removal and control pain within 10 minutes afterwards. On the other hand, it did not increase the patient's willingness to repeat the chest tube procedure. It can be concluded that EMLA cream can replace subcutaneous infiltration of 2% lidocaine as a local anesthetic when removing a chest tube.

REFERENCES

1. Light RW. Chest Tubes. In: Light RW, editor. *Pleural Diseases*. 6th ed. Philadelphia: Lippincott Williams & Wilkins; 2013. p. 466–80.
2. Gold MS. Peripheral Pain Mechanisms and Nociceptor Sensitization. In: Ballantyne J, Fishman S, Rathmell JP, editors. *Bonica's management of pain*. 5th ed. Philadelphia: Wolters Kluwer; 2019. p. 263–304.
3. Santosa TB, Sutanto YS, Septiawan D. Efektivitas Hipnoterapi Saat Bronkoskopi terhadap Kontrol Kecemasan, Sesak Napas dan Batuk. *J Respirologi Indones*. 2019;39(1):21–9.
4. Valenzuela RC, Rosen DA. Topical lidocaine-prilocaine cream (EMLA) for thoracostomy tube removal. *Anesth Analg*. 1999;88(5):1107–8.
5. Bruce EA, Howard RF, Franck LS. Chest drain removal pain and its management: A literature review. *J Clin Nurs*. 2006;15(2):145–54.
6. Al Jawad MA, Ali I, Shokri H, Shorbagy MS. Systemic versus local analgesia for chest drain removal in post cardiac surgery patients: The taming of a beast. *J Egypt Soc Cardio-Thoracic Surg*. 2017;25(4):289–93.
7. Akrofi M, Miller S, Colfar S, Corry PR, Fabri BM, Pullan MD, et al. A randomized comparison of three methods of analgesia for chest drain removal in postcardiac surgical patients. *Anesth Analg*. 2005;100(1):205–9.
8. Watanabe S, Imai K, Kimura T, Saito Y, Takashima S, Matsuzaki I, et al. Effect of lidocaine cream analgesia for chest drain tube removal after video-assisted thoracoscopic surgery for lung cancer: a randomized clinical trial. *Reg Anesth Pain Med*. 2020;45(1):16–21.

9. Singh M, Gopinath R. Topical analgesia for chest tube removal in cardiac patients. *J Cardiothorac Vasc Anesth.* 2005;19(6):719–22.
10. Malamed SF. Clinical action of specific agents. In: Malamed SF, editor. *Handbook of Local Anesthesia.* 7th ed. St. Louis: Elsevier; 2020. p. 57–84.
11. Loftus R, Nugent Z, Graff LA, Schumacher F, Bernstein CN, Singh H. Patient Satisfaction with the Endoscopy Experience and Willingness to Return in a Central Canadian Health Region. *Can J Gastroenterol.* 2013;27(5):259–66.
12. Sun BC, Adams J, Orav EJ, Rucker DW, Brennan TA, Burstin HR. Determinants of Patient Satisfaction and Willingness to Return With Emergency Care. *Ann Emerg Med.* 2000;35(5):426–34.