Sağlık ve Sosyal Refah Araştırmaları Dergisi

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ARAŞTIRMA MAKALESİ / RESEARCH ARTICLE

IS THERE COVID-19 IN SURGICAL SMOKE?

CERRAHİ DUMANDA COVID-19 VAR MI?

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ABSTRACT

Depending on the use of electrocautery device in surgical procedures, the distribution of small particles oath the formation of surgery smoke occurs. Surgical smoke is as mutagenic as cigarette smoke oath contains many harmful oath carcinogenic polycyclic aromatic hydrocarbon compounds. of addition, viruses, bacteria oath live cells can be released during electrocauterization of tissues oath carried by surgical smoke. Inhalation of this smoke by the operating theater staff poses a danger. Despite the use of surgery masks oath operating theater ventilation, this danger is not completely eliminated. therefore, additional measurements oath safety measures are needed _ Of the COVID-19 pandemic, the risk of transmission from surgical smoke increases during the surgical processes of patients carrying this virus. There is the same risk in terms of similar airborne diseases of this study, it was investigated whether the surgical smoke generated due to cauterization used during the procedure in patients diagnosed with COVID-19 and going through surgical procedures contains COVID-19 virus RNA fragments (RT-qPCR) and the chemicals contents of the surgical smoke were investigated by GC-MS.

Keywords: Surgical Smoke, COVID-19, GC/MS, Virus, RNA.

JEL Classification Codes: R11, O53, E13, O47.

ÖZ

Cerrahi prosedürlerde elektrokoter cihazının kullanımına bağlı olarak, küçük partiküllerin dağılımı ve cerrahi duman oluşumu meydana gelir. Cerrahi duman, sigara dumanı kadar mutajeniktir ve birçok zararlı ve kanserojen polisiklik aromatik hidrokarbon bileşiği içerir. Ayrıca, cerrahi dumanla taşınan dokuların elektrokoterizasyonu sırasında virüsler, bakteriler ve canlı hücreler açığa çıkabilir. Bu dumanın ameliyathane personeli tarafından solunması tehlike oluşturmaktadır. Ameliyathane havalandırmasında cerrahi maske kullanılmasına rağmen bu tehlike tamamen ortadan kaldırılamamaktadır. Bu nedenle ek ölçümlere ve güvenlik önlemlerine ihtiyaç duyulmaktadır _ COVID-19 pandemisinde, bu virüsü taşıyan hastaların cerrahi süreçleri sırasında cerrahi dumandan bulaşma riski artmaktadır. Hava yoluyla bulaşan benzer hastalıklar açısından da aynı riskin söz konusu olduğu bu çalışmada, COVID-19 tanısı almış ve cerrahi işlemlerden geçen hastalarda işlem sırasında kullanılan koterizasyon nedeniyle oluşan cerrahi dumanın COVID-19 virüsü RNA fragmanları içerip içermediği araştırılmış (RT- qPCR) ve cerrahi dumanın kimyasal içerikleri GC-MS ile incelenmiştir.

Anahtar Kelimeler: Cerrahi Duman, COVID-19, GC/MS, Virus, RNA.

JEL Sınıflandırma Kodları: R11, O53, E13, O47.

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GENİŞLETİLMİŞ ÖZET

Amaç ve Kapsam:

Bu çalışmanın amacı, elektrokoter cihazının kullanımına bağlı olarak cerrahi işlemler sırasında oluşan cerrahi dumanın, COVID-19 virüsü RNA fragmanları ve potansiyel olarak zararlı kimyasal bileşenler açısından içeriğini incelemektir. Özellikle, COVID-19 pandemisi sürecinde, cerrahi işlemler sırasında koterizasyonun bir yan etkisi olarak cerrahi dumanın bulaşıcı ve kimyasal potansiyelini değerlendirmek önemli bir sağlık riski oluşturmuştur. Bu çalışma, elektrokoter cihazının kullanıldığı cerrahi prosedürlerde oluşan dumanın, hastalar ve ameliyathane personeli için potansiyel bir enfeksiyon kaynağı olup olmadığını araştırmayı amaçlamaktadır. Çalışmanın kapsamı, COVID-19 tanısı almış hastalar üzerinde yapılan cerrahi işlemler sırasında oluşan cerrahi duman örneklerinin toplanmasını ve bu dumanın içeriğinin belirlenmesini içermektedir. Cerrahi dumanın içerdiği COVID-19 virüsü RNA fragmanları, Real-Time PCR (RT-qPCR) yöntemi ile tespit edilecek, aynı zamanda dumanın kimyasal bileşenleri Gaz Kromatografisi-Kütle Spektrometrisi (GC-MS) kullanılarak analiz edilecektir. Bu çalışma, cerrahi dumanın enfeksiyon ve kimyasal zehirlenme risklerini belirleyerek, ameliyathane güvenliğini artırmaya yönelik ek güvenlik önlemlerinin gerekliliğini ortaya koymayı hedeflemektedir.

Yöntem:

Çalışma, COVID-19 tanısı almış hastalar üzerinde gerçekleştirilen cerrahi işlemler sırasında oluşan cerrahi dumanın içeriğini analiz etmek için tasarlanmıştır. Araştırma, cerrahi dumanın hem virolojik hem de kimyasal bileşenler açısından detaylı bir şekilde incelenmesini kapsamaktadır. Bu amaçla, belirli kriterlere göre seçilen COVID-19 hastalarından elde edilen cerrahi duman örnekleri üzerinde yapılan analizler iki ana aşamadan oluşmaktadır: virolojik tespit ve kimyasal analiz. Cerrahi duman örnekleri, COVID-19 tanısı almış ve elektrokoter cihazının kullanıldığı cerrahi işlemler sırasında ameliyat masasına yerleştirilen hastalardan alınmıştır. Duman, cerrahi işlemler sırasında kullanılan elektrokoter cihazının etkisiyle ortaya çıkmakta olup, operasyona başlamadan önce sterilize edilmiş özel filtreleme cihazları kullanılarak toplanmıştır. Duman örnekleri, genellikle ameliyat sırasında ve sonrasında, özellikle dumanın yoğun olarak oluştuğu anlarda, anestezi monitörlerinin yakınına yerleştirilen numune alıcı cihazlarla toplanmıştır. Bu numune alım süreci, hem hastanın hem de ameliyat ekibinin maruziyetini minimize edecek şekilde planlanmıştır. Virolojik analiz için toplanan cerrahi duman örneklerinde, COVID-19 virüsünün RNA'sının varlığı, Real-Time Polimeraz Zincir Reaksiyonu (RT-qPCR) yöntemi ile tespit edilmiştir. Bu yöntem, RNA'dan cDNA sentezi gerçekleştirilip, spesifik primerler kullanılarak COVID-19 virüsünün genetik materyalini hedef almıştır. Numune alımında dikkat edilmesi gereken en önemli faktör, dumanın içinde virüs taşıyan RNA fragmanlarının bulunup bulunmadığını doğru şekilde tespit edebilmekti. Bu nedenle, RT-qPCR prosedüründe kullanılan tüm reaktifler ve laboratuvar ortamı, kontaminasyon riskini minimize etmek amacıyla sıkı sterilizasyon kuralları altında tutulmuştur. Numune alma ve işlem süreleri boyunca hava geçişlerinin minimize edilmesi sağlanarak, elde edilen verilerin doğruluğu garanti altına alınmıştır. Kimyasal bileşenlerin analiz edilmesi amacıyla, cerrahi duman örnekleri, Gaz Kromatografisi-Kütle Spektrometrisi (GC-MS) cihazında incelenmiştir. Bu analiz, cerrahi dumanın kimyasal yapısını anlamak için oldukça önemlidir çünkü elektrokoter cihazının kullanımı sırasında bir dizi zararlı kimyasal bileşik ortaya çıkabilir. GC-MS yöntemi, örneklerin bileşenlerine ayrılmasını ve her bir bileşiğin kütlesinin belirlenmesini sağlayarak, dumanın içeriğinde bulunan potansiyel olarak kanserojen veya toksik kimyasalların tespit edilmesine olanak tanır. Bu yöntem, cerrahi dumanın içeriğindeki polisiklik aromatik hidrokarbonlar (PAH'lar), aldehitler, karbon monoksit ve diğer uçucu organik bileşenleri analiz etmek için kullanılmıştır. Ayrıca, kimyasal analizde, dumanın içeriğindeki mikro partiküllerin büyüklük ve yoğunluk analizleri de yapılmıştır. Çalışma, cerrahi dumanın potansiyel risklerini belirlemek ve bu risklerin cerrahi süreçlerde nasıl minimize edilebileceğine dair öneriler sunmayı hedeflemektedir. Tüm numune alım ve analiz süreçlerinde, klinik etik kurallarına uygunluk ve hasta güvenliği ön planda tutulmuş, hasta onamları alınarak işlemler gerçekleştirilmiştir.

Bulgular:

Virolojik analizler, cerrahi duman örneklerinde COVID-19 virüsü RNA fragmanlarının tespit edilebildiğini göstermiştir. RT-qPCR yöntemiyle yapılan testlerde, cerrahi dumanın bazı örneklerinde SARS-CoV-2 genetik materyali saptanmıştır. Bu bulgu, cerrahi dumanın potansiyel bir enfeksiyon kaynağı olabileceğini ve COVID-19 virüsünün elektrokoterizasyon sırasında havaya karışabileceğini işaret etmektedir. Kimyasal analizler ise cerrahi dumanın birçok zararlı bileşen içerdiğini ortaya koymuştur. GC-MS ile yapılan incelemelerde, cerrahi duman örneklerinde kanserojen özellik gösteren polisiklik aromatik hidrokarbonlar (PAH'lar), aldehitler, uçucu organik bileşikler (VOC'ler) ve toksik gazlar gibi çeşitli kimyasal maddeler bulunmuştur. Ayrıca, dumanın içeriğinde mikro partiküllerin yoğunluğu da yüksek bulunmuş, bu durumun özellikle cerrahi personel için ciddi bir sağlık riski oluşturabileceği vurgulanmıştır.

Sonuç ve Tartışma:

Bu çalışma, elektrokoter kullanımına bağlı olarak oluşan cerrahi dumanın hem COVID-19 virüsünü taşıma potansiyeline hem de çeşitli zararlı kimyasal bileşenler içerebileceğine dair önemli bulgular sunmuştur. Cerrahi duman örneklerinde SARS-CoV-2 RNA fragmanları ve kanserojen özellik taşıyan kimyasal maddeler tespit edilmiştir. Bu sonuçlar, cerrahi dumanın sadece enfeksiyon riski değil, aynı zamanda toksik ve kanserojen etkiler taşıyan bir sağlık tehdidi oluşturduğunu ortaya koymaktadır. Ameliyathane ortamlarında, özellikle COVID-19 gibi hava yoluyla bulaşan hastalıklar söz konusu olduğunda, cerrahi dumanın solunmasından kaynaklanabilecek risklerin önlenmesi için gelişmiş hava filtrasyon sistemleri ve ek güvenlik önlemlerinin alınması gerektiği vurgulanmaktadır.

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1. INTRODUCTION

Operating rooms: They are environments that contain many advanced equipment and therefore many risks can negatively affect the health of patients and employees. One of these risks is the smelly and visible surgical smoke, which contains many harmful substances (York, Autry, 2018). High heat released during the use of electrocautery, the use of high-speed drills, the use of saws, laser processing and the use of ultrasonic instruments for hemostasis, excision and dissection; It causes the burning of proteins and other organic substances and the formation of thermal necrosis in the cells of surrounding tissues. Like this, Surgical smoke is released as a result of the breakdown and evaporation of fat and protein in the tissues (York, Autry, 2018; Yavuz Van Gıersbergen, Şahin Köze, 2017). 95% of surgical smoke consists of water, and the remaining 5% consists of dead and living cellular material, blood particles, bacteria, viruses, toxic gas and vapor (Olgun, 2020). Surgical smoke can spread mutagenic gases, carcinogens, particles containing DNA components or Human Papilloma Virus (HPV) into the air. Therefore, surgical smoke endangers the health of patients and operating room staff. Concern about the presence of live elements in surgical smoke and the subsequent risk of contamination to surgical personnel was expressed in several articles published in the 1980s. The COVID-19 pandemic has revived these concerns about the presence and possibility of transmission of the COVID-19 virus to surgical personnel during the use of coagulation devices. To date, there have been no reports of the COVID-19 virus being found in surgical smoke, and if found, its infectious potential is unknown. Most previous studies have focused on HPV or bovine papillomavirus, and very few have focused on viruses such as HIV, HBV, and polio (Bogani et al., 2021). The general conclusion of these studies is the possibility of a potential but not clearly measured virus transmission hazard from smoke inhalation during surgeries of patients with related diseases, a hypothesis that could be considered for COVID-19. Additionally, virus DNA has been found in surgical smokes in previous studies, but this finding does not confirm the infectious potential of the virus (Matta et al., 2022). It should be noted that it does not determine According to some experts, the entire intact virion, not just the DNA, has the potential to spread infection, and in some cases, the entire virion can be weakened or destroyed by sealing devices, making them unable to spread infection (Vaghef Davari & Sharifi, 2021). There is currently no evidence that COVID-19 can be transmitted through surgical smoke. However, previous studies have shown the presence of different viruses in surgery smoke, such as choriobacteria, human papillomavirus (HPV), poliovirus, human immunodeficiency virus (HIV) and hepatitis B5-8. The aerosol produced by laparoscopic or robotic surgery, especially when using low temperature ultrasonic devices may not be effective deactivate the cellular components of a virus5. COVID-19 has extremely high levels of infectiousness the infection is mainly transmitted via droplets (≥5 μm in diameter) produced by the respiratory tract of an infected person oath excreted over short distances (<1 m) by both symptomatic oath ill patients, especially during coughing or sneezing. due to the risk associated with the aerosol mode of transmission of COVID-19, concerns have been raised regarding the use of minimally invasive techniques oath the occurrence of pneumoperitoneum. Protecting operating room staff against COVID-19 is extremely important to securing medical services during the COVID-19 pandemic. In the light of this information, this research and evaluations were conducted to answer the following questions (Vaghef Davari & Sharifi, 2021):

i. Is there any risk of infection for operating room staff exposed to surgical smoke?
ii. Is there any evidence for the presence of virus in surgical smoke in patients with ongoing viral infection?
iii. Are there viruses in surgical smoke that are not transmitted through blood?
iv. Is there COVID-19 in surgical smoke?

There are few studies in the literature on whether surgical smoke carries viruses. Publications on whether COVID-19 is carried by surgical smoke are based on assumptions, and there is no concrete evidence of the transmission of COVID-19. This study aimed to investigate whether the surgical smoke generated during the operations of patients with COVID-19 infection carries the COVID-19 virus and, if so, the possibility of infection. Our project is one of the first studies on this subject.

2. METHODOLOGY

Place and Time of Research

This prospective observational study was conducted between April 2023 and January 2024 in the operating room of a state hospital where one of the researchers on the project was on duty.

Population and Sample

This study was designed as a case-control study and conducted between April 2023 and January 2024 in the general surgery operating room of a state hospital located in Istanbul. Air samples were collected during surgeries using the active sampling method. The population of the study consisted of surgeries performed between April 2023 and January 2024 on patients diagnosed with COVID-19, as well as air samples taken from the operating rooms where these surgeries were conducted. No sampling selection was applied; all operating room air samples from surgeries involving patients diagnosed with COVID-19 during this period were included. The control group consisted of air samples obtained from operating rooms where surgeries were performed on patients without a COVID-19 diagnosis. The population of the research consisted of 30 cases and 30 control group surgeries that were diagnosed with COVID-19 between April 2023 and January 2024. Due to the coronavirus disease 2019 (COVID-19) pandemic in 2020, the number of surgeries during this period is relatively low. Additionally, surgeons and operating room personnel have used smoke evacuation devices for surgical smoke control during surgery due to infection control and ethical concerns. The power analysis of the study was calculated in the GPower 3.1 program for the number of samples. Okoshi, et al.'s (2022) "Measurement of particles matter 2.5 in surgical smoke oath its health Calculation was made based on the "hazards" study (Okoshi et al., 2022). According to the results of this study, it was determined that for 80% power, the number of samples should be at least 32 in total, with 16 in at least two groups. Considering that the sample's ability to represent the universe is strong, the sample size in this study was 60 surgeries, 30 for each group. Our sample was divided into two: experimental and control groups. The experimental group consisted of 30 emergency Caesarean and Orthopedic surgery cases diagnosed with COVID-19, and the control group consisted of 30 emergency Caesarean and Orthopedic surgery cases without a diagnosis of COVID-19.

The sample exclusion criteria are as follows.

i. Surgeries other than Caesarean section and Orthopedic surgeries
ii. Those not diagnosed with COVID-19
iii. Non-emergency surgery

Apart from the exclusion criteria mentioned above, the fact that the samples were collected only from emergency surgeries conducted in a state hospital in Istanbul constitutes are the limitations of the study.

Data Collection Method and Tools

Randomization of the sample was not performed, and cases diagnosed with COVID-19 and undergoing emergency surgery were designated as the experimental group, and cases with the same type of surgery and without a diagnosis of COVID-19 were designated as the control group. After the samples of the experimental group was collected and GC/MS and RT-PCR analyses completed, samples of the control group were collected and same analyses performed. Surgical smoke containing air samples were collected by the researchers with the following materials.

Material List

i. Gillian Gilairplus dust-air-gas sampling pump (portable)
ii. Aluminum cyclone head
iii. 0.22 µm PTFE filter
iv. Filter holder cassette
v. Virus Transfer Medium
vi. Automatic pipette and sterile pipette tips
vii. Sterile petri dishes
viii. Tedlar Bag 3L

Process steps

In order to perform analyzes on surgical smoke, samples were taken from the surgical smoke released during the operations of 30 patients with negative Covid-19 PCR results as the control group and 30 patients with positive Covid-19 PCR results as the test group, during the project period.

a) Sterilization of filters, filter cassettes, hoses and cyclone heads

Since the materials in question will enter the operating room environment, they must be sterilized beforehand. All of the materials were subjected to autoclave sterilization in the sterilization unit of the operating room and were sterilized at 132°C for 30 minutes.

b) Surgical smoke sampling

The sampling pump was attached to the waist of the operating personnel, and the cyclone head was positioned on the collar. The sampling pump was set to draw 1L/min of air and was made operational before the operation began. Sampling was performed throughout the entire operation and the resulting surgical smoke was filtered through a 0.22 µm filter via cyclone head as much as possible.

c) Collection of samples from the filter

The filter holder cassette and filter were delivered to the laboratory without delay after sampling. The cassette was opened under aseptic conditions in a laminair class2 biosafety cabinet and the PTFE filter inside was placed in a sterile petri dish.

The inner surface of the cassette and filter were washed with VTM and VTM was poured onto the filter. By pressing and pulling with the VTM automatic pipette for a few minutes, the filter was ensured to be thoroughly contacted with the VTM and washed. The VTM solution in which the filter was washed was placed back into a sterile tube, labeled and stored at +4°C for subsequent analysis. VTM solution has a feature that does not allow degradation of nucleic acids and allows them to be stored at room temperature for 1 week.

d) Analysis of the presence of nucleic acid in surgical smoke samples by RT-PCR

RNA was first extracted from the samples taken from the liquids of the filters washed with VTM solution using a commercial kit, and then complementary DNA synthesis was performed with the cDNA synthesis kit.

RT- qPCR analysis, primers specific to the CoVid-19 virus were used to analyse whether there was CoVid-19 in surgical smoke.

e) Gas Chromatography analysis of surgical smoke collected in the Tedlarbag

3L volume leak-proof Tedlar to protect against surgical smoke released during the operation Bond The tanks were filled and the collected gas sample was analyzed in the Gas Chromatography Mass Spectrometry device (Agilent, USA). HP Molesieve 5A capillary column was used in the GC/MS device. The inlet temperature was set to 50 °C, the valve temperature was set to 80 °C, the Hydrogen gas flow rate was 4.8 ml/min and the sample volume was 250 µl. Detector temperature was set to 180 °C, oven temperature was set to 50 °C, reference gas flow was 40 ml/min. up gas flow was set at 10 ml/min.

Ethical Statement

From Nişantaşı University Scientific Research Ethics Committee (Decision no : 2022/34) and the Chief Physician of Health Sciences University Beylikdüzü State Hospital for the feasibility of the research.

Evaluation of Data

qPCR analysis from all samples collected from 30 controls and 30 cases were obtained as whether the samples contain the CoVid19 virus or not (Negative-Positive). Therefore, the data were not subjected to a statistical analysis program

3. RESULS

The presence of CoVid-19 was detected as negative (N/A) in RT- qPCR analyzes performed on surgical smoke samples filtered as a control group. qPCR analyzes of the samples collected and filtered from the test group; the presence of CoVid-19 was also found to be negative (N/A). Therefore, no further statistical analyses was required.

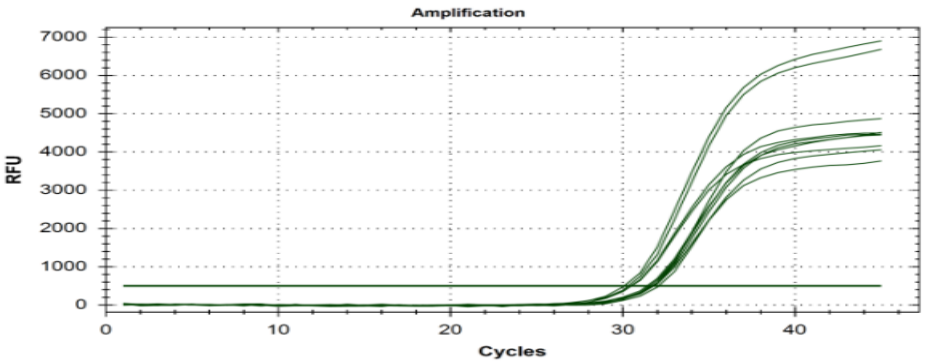

Fig.1 RT- qPCR control peaks (HEX)

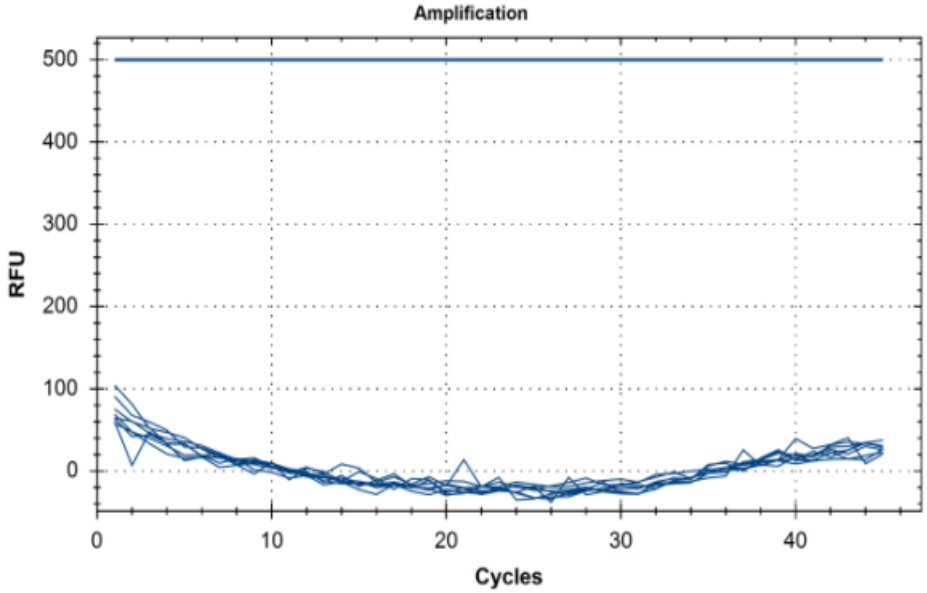

Figure 2. Negative Covid-19 samples Test and control group (FAM)

In a 3-liter sealed bag (Tedlar Bag) according to the GC/MS analysis results of the collected surgical smoke; While the majority of the components found in surgical smoke are water and carbon dioxide, some various volatile organic compounds, aldehyde and ketone derivatives and trace amounts of carbon monoxide have also been detected.

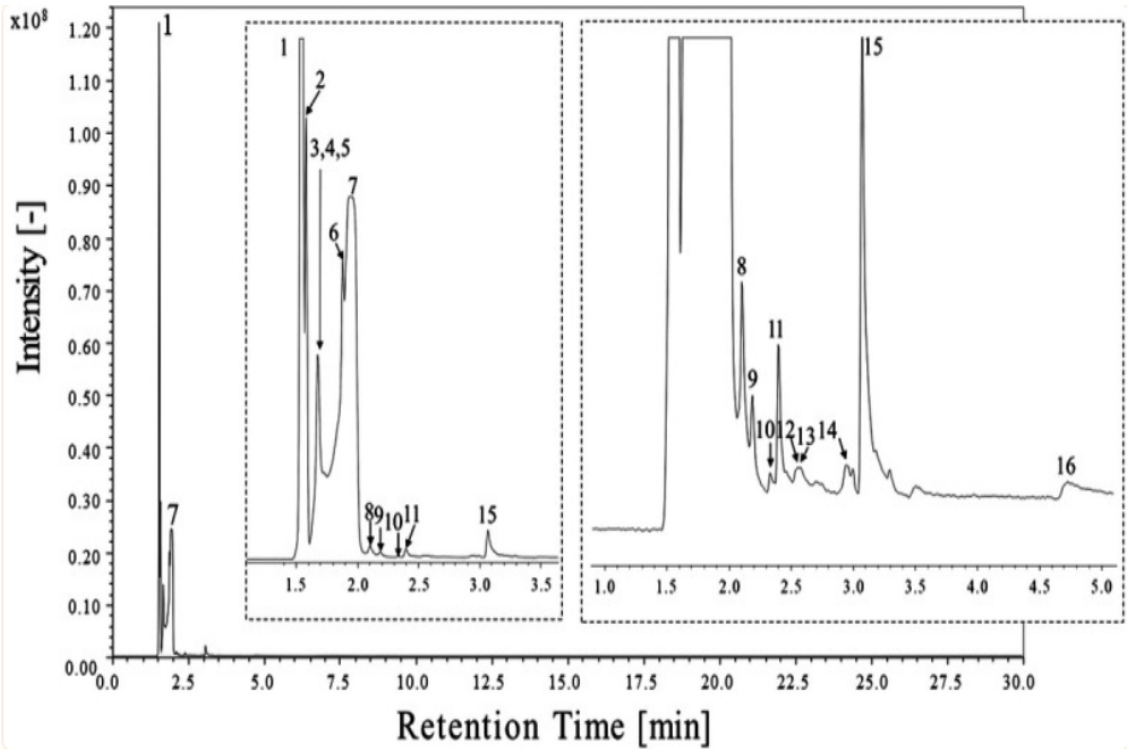

Figure 3. Chromatogram obtained from GC analysis of surgical smoke

Table 1. Definitions of peaks observed in the GC chromatogram

Pig	retention time	Compound	Normalized Area
1	1.54	Carbon dioxide	44.4
2	1.58	propene	8.3
3	1.67	Acetaldehyde	1.2
4	1.68	1-Butene	1.8
5	1.68	1,3-Butadiene	1.6
6	1.88	2-Propenal	10.7
7	1.94	Water	31.8
8	2.10	1,3-Cyclopentadiene	0.2
9	2.19	cyclopentene	0.1
10	2.33	2-Butenal	0.0
11	2.40	1-Hexene	0.2
12	2.56	2-Methylfuran	0.0
13	2.58	Cyclopentene, 3-methyl	0.0
14	2.94	1,4-Cyclohexadiene	0.0
15	3.07	benzene	1.1
16	4.73	Toluene	0.2

When the concentration calculation was made by area normalization of the peaks observed in the chromatogram, it was seen that short-term exposure limits were not exceeded according to occupational health and safety instructions.

4. DISCUSSION

The COVID-19 pandemic has had a significant impact on the delivery of surgery services to patients worldwide. Guidelines of surgery societies recommend postponement of elective surgical procedures However, the need to perform emergency oath oncological surgery on both COVID-19 and non-COVID-19 patients still remains as laparoscopic surgery is an established treatment modality in surgery oath with the gradually resumption of elective surgeries, the risk of virus transmission via surgery smoke / laparoscopic pneumoperitoneum remains a major concern8. Only what's that study is available investigating the presence of SARS-COV-2 RNA in surgery smoke generated during abdominal surgery procedure. Romero-Velez oath colleagues collected surgical smoke during laparoscopic appendectomy in a COVID-19 patient. However, the virus could not be identified in the smoke using real -time RT- PCR (Romero-Velez et al., 2020).
Yokoe and his colleagues infected HELA cells with COVID-19 virus RNA in in vitro conditions and then collected the surgical smoke by applying an electrocautery device to the cells in a laboratory environment. They reported that they found Covid-19 RNA in surgical smoke, but this does not represent in vivo conditions (Yokoe et al., 2021). In the study published in 2024 by Hurst and Steward, in which the risk of viral infection from surgical smoke was evaluated, the general consensus is that viral diseases transmitted through air will not be infected by surgical smoke (Hurst, R.D., & Stewart, 2024). When these studies were examined, high similarities were seen with the compounds obtained in our research. To date, there is no consistent evidence that healthcare personnel, particularly operating room personnel, are exposed to high risk of SARS-CoV-2 contamination in surgeries. However, in line with the risk of transmission of other viral particles during these procedures, all necessary precautions and protocols should be implemented to minimize the risk of SARS-CoV-2 transmission during such procedures (Mallick et al., 2021; YoavMintz et al., 2020; DragosSerban et al., 2020; Sadr et al., 2021). Due to the possibility of SARS-CoV-2 transmission through aerosols and smoke generation during laparoscopic surgeries in the literature, personnel protection against virus exposure, combined with the use of tools for removal and evacuation from the operating room, low-energy device and air negative pressure condition, provides protection against SARS-CoV-2 infection among personnel. It has been stated that it can minimize the risk of exposure to the virus (Sadr et al., 2021). In general, postponing such operations if possible is essential for the protection of personnel. As recommended by the Royal College of Surgeons, laparoscopic surgery should generally be disregarded, and furthermore, based on guidance published by the Society of American Gastrointestinal and Endoscopic Surgeons, the conduct of such procedures is only permitted using filters for CO2 or other fumes and aerosols released during laparoscopic or robotic surgeries (Hamilton et al., 2020). Finally, American As noted by the College of Surgeons, there is no information supporting the transmission of the SARS-CoV-2 virus to personnel on the others hand, there is no evidence of influenza or influenza virus or others coronaviruses (SARS-

CoV-1 and MERS) which are commonly associated with aerosol spread - can be transmitted by surgical smoke for operating theater personnel. There are studies in the literature showing that viruses such as Hepatitis-B, Hepatitis-C and HIV are present in surgical smoke (Morris et al., 2020). However, as it is known, these viruses are contagious through blood. In the light of the analysis results obtained, the presence of the Covid-19 virus could not be detected in the surgical smoke samples generated from the cautery device used during the surgeries of patients diagnosed with Covid-19. It can be thought that the reason for this is that the Covid-19 virus is a virus that spreads through droplets, not through the air, and targets the respiratory system. It is thought that the presence of the virus may be related to the operation area and duration. Conducting studies based on the operation area can provide a clearer idea about the subject.

5. CONCLUSION

The absence of viruses in surgical smoke in this study does not necessarily indicate the absence of risk. Therefore, the effective evacuation of surgical smoke from the operating room is crucial for ensuring the health and safety of the surgical team. Considering the negative effects of organic compounds such as toluene, benzene, xylene, acrolein and acetaldehyde in the chemical composition of surgical smoke on human health when inhaled, evacuating surgical smoke from the operating room is important to prevent health care providers' health. Thus, the surgical team must be prevented from being exposed to this smoke. More effective smoke evacuation techniques must be developed to protect surgical teams from surgical smoke.

DECLARATION OF THE AUTHORS

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