

Improving Safety in Hair Transplantation; Anesthesiologist Perspective

Saç Ekimi Sırasında Güvenliği Artırmak; Anestezist Bakış Açısı

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ABSTRACT

Objective: Over the past decade, there has been a consistent growth in the number of hair transplant procedures owing to advancements in medical equipment, staff proficiency, and an increase in procedure demand. One of the concerns of patients is pain; therefore, different anesthetic techniques have been used to optimize the process. These procedures are often performed under conscious sedation with local anesthesia, outside the operating room, and mostly without the presence of an anesthesiologist. The aim of this case series is to highlight anesthesia-related complications during hair transplantation and to propose preventive strategies based on these real-life events.

Method: This study is a retrospective analysis of closed case files of complicated patients undergoing hair transplantation. Case files of patients who developed complications after hair transplantation and were referred to Koç University Forensic Medicine Department between January 2020 and January 2024 were retrospectively reviewed. The data were analyzed from forensic files, focusing on patient demographics, procedural details, drug usage, complications, and outcomes.

Results: The study included three male cases, aged 28, 34, and 43 years. The hair transplantation procedures were all performed in non-operating room environments and without the presence of an anesthesiologist. It was observed that all cases received fatal yet potentially preventable complications.

Conclusion: Our findings underscore the need for strict adherence to patient monitoring, accurate dose calculation of local anesthetics and vasoconstrictors, and immediate availability of 20% intravenous lipid emulsions.

The presence of an anesthesiologist during long procedures and proper emergency preparedness may significantly reduce morbidity and mortality in hair transplantation units.

Keywords: Hair transplantation, local anesthetic systemic toxicity, anesthesia outside operating room

Öz

Amaç: Son on yılda, tıbbi ekipmanlardaki gelişmeler, personel deneyimi ve artan talep sayesinde saç ekimi prosedürlerinin sayısında istikrarlı bir artış gözlenmiştir. Hastaların en önemli endişelerinden biri ağrı olduğundan, süreci optimize etmek amacıyla çeşitli anestezi teknikleri uygulanmaktadır. Bu işlemler çoğunlukla lokal anestezi ve sedasyon altında, ameliyathane dışında ve anestezi uzmanı bulunmaksızın gerçekleştirilmektedir. Bu olgu serisinin amacı, saç ekimi sırasında ortaya çıkan anesteziye bağlı komplikasyonları vurgulamak ve bu gerçek yaşam vakaları üzerinden önleyici stratejiler sunmaktır.

Yöntem: Bu çalışma, saç ekimi sonrasında komplikasyon gelişen hastalara ait kapalı dosyaların retrospektif analizidir. Ocak 2020 ile Ocak 2024 tarihleri arasında saç ekimi sonrası komplikasyon gelişerek Koç Üniversitesi Adli Tıp Anabilim Dalı'na yönlendirilen hastaların dosyaları retrospektif olarak incelenmiştir. Vakaların verileri adli dosyalardan elde edilmiş olup; hasta demografisi, işlem detayları, kullanılan ilaçlar, komplikasyonlar ve sonuçlar analiz edilmiştir.

Bulgular: Çalışmaya yaşları 28, 34 ve 43 olan üç erkek olgu dahil edilmiştir. Saç ekimi işlemleri, tamamında ameliyathane dışında ve anestezi uzmanı olmaksızın gerçekleştirilmiştir. Tüm olgularda ölümcül ancak potansiyel olarak önlenabilir komplikasyonlar gözlenmiştir.

Sonuç: Bulgularımız, saç ekim ünitelerinde hasta güvenliğini artırmak için işlem boyunca sürekli monitörizasyonun, lokal anestezi ve vazokonstriktör dozlarının dikkatle hesaplanması ve %20 intravenöz lipid emülsiyonlarının hazır bulundurulmasının önemini ortaya koymaktadır.

Uzun süren işlemlerde anestezi uzmanı varlığı ve acil durumlara hazırlıklı olunması, mortalite ve morbiditenin azaltılmasında önemli bir rol oynayabilir.

Anahtar sözcükler: Saç ekimi, lokal anestezi sistemik toksisitesi, ameliyathane dışı anestezi

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INTRODUCTION

The number of hair transplantation procedures has steadily increased over the past decade with technological improvements in medical equipment, proficiency of personnel, and increased request for the procedure. Pain is one of the concerns of the patients, and different anesthetic and analgesic techniques have been used over the past years to optimize the procedure (1). Hair transplantation is often performed under conscious sedation with local anesthesia, outside the operating room, mostly without the presence of an anesthesiologist. There is an increased risk of adverse events when performing anesthesia outside the operating room and it is essential to create a safe environment for the patients to minimize these risks. There are reported cases of local anesthetic systemic toxicity (LAST) complications in patients undergoing hair transplantation (2). In this study, the files of patients who experienced complications during hair transplantation were retrospectively analyzed to determine the risk factors of patient safety. The aim of this case series is to highlight anesthesia-related complications during hair transplantation and to propose preventive strategies based on these real-life events.

The patient, environment, and methods used during the procedure are studied to determine whether there are any deviations from current evidence-based medical practices. To the best of our knowledge, this article is the first to present mortality after hair transplantation surgery in medical literature.

METHODS

After obtaining approval from the Institutional Review Board for Clinical Investigations at Koç University Hospital (2024.249.IRB2.111), case files of the patients having complications after hair transplantation and applied to Koç University Forensic Medicine Department between January 2020 - January 2024 were retrospectively reviewed. In addition to ethics committee approval, permission from the legal guardians of the deceased patients was also obtained.

The data of the cases were sourced from forensic investigation files. Details of the patients including age, gender, comorbidities, location of the incident, drugs and doses used in the procedure, mortality, and autopsy findings were analyzed.

RESULTS

In 2023, three cases were identified to have anesthesia related complications during hair transplantation outside operation room and all of them were included in the study. These files are examined as follows:

CASE 1

A 43-year-old man (67 kg) with no history of known diseases or allergies was scheduled for hair transplantation. After pre-medication with an unknown dose of intravenous (IV) midazolam, local anesthetic (LA) was administered to the planned areas of the head with the following doses: lidocaine 100 mg, bupivacaine 50 mg, and adrenaline 0.025 mg. Because the patient reacted to the painful stimuli, an additional dose of LA was performed. The procedure was started with hair root removal from the beard and bleeding was observed during root removal. An additional dose of vasoconstrictor was applied to minimize bleeding. At the 48th minute of the procedure, a sudden cyanosis was seen. Due to the lack of breathing efforts and no pulse, the patient was immediately intubated, and resuscitation was started. A response to cardiopulmonary resuscitation (CPR) was obtained at the 17th minute. He was taken to the intensive care unit (ICU) and remained there for 3 days where he was deceased in the follow-up. In his autopsy findings, there were rare intimal thickening and atheroma plaques in the aorta. The left main coronary artery, circumflex branch, and right coronary artery were not occluded, the left anterior descending coronary artery was divided into 2 branches and 1-3 cm of one branch extended within the muscle. In his histopathology findings, the heart consisted of multifocal small foci of granulation tissue areas and several foci of small scarring; coronary arteries were unremarkable. Due to the brain death, the medulla spinalis had acute and subacute degeneration areas and signs of axonal damage, and there was severe autolysis in the brain, cerebellum, and brain stalk.

CASE 2

A 28-year-old man (94 kg) with no history of diseases or allergies underwent hair transplantation. His pre-operative assessment did not show any remarkable findings. The medical records of the hair transplantation procedure could not be obtained. However, according to findings gathered in court-records: Lidocaine 60 mg, bupivacaine 25 mL, and prilocaine 60 mg were administered to the patient for local anesthesia. A verbal comment by one of the medical staff was "After the grafts were collected under local anesthesia, he felt a chest pain and then the cardiac arrest occurred." Ventricular fibrillation was seen and despite 25 minutes of CPR and coronary angioplasty, he could not be saved. Postoperative electrocardiogram (ECG) (Figure 1) and coronary angiography (Figure 2) are seen. In his autopsy, coronary artery disease -seen as healed coronary artery plaques (Figure 2)- was the only remarkable finding. The medications were not in the lethal doses in the post-mortem toxicology workup. Autopsy was performed 2 days after death. The absence of any medical records of the peri-operative process was noted to be a major medico-legal flaw.

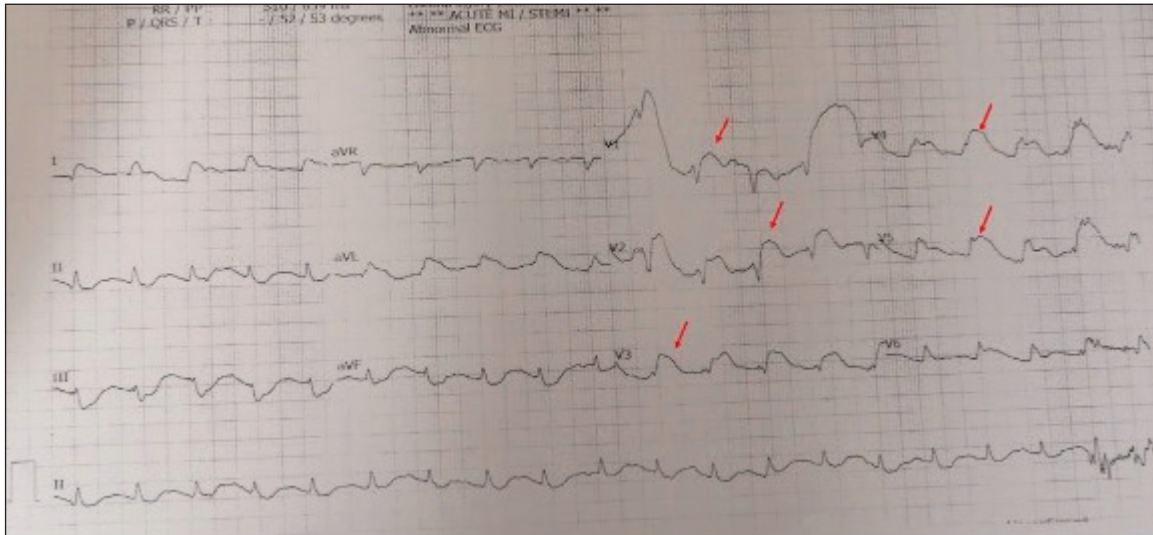


Figure 1. Postoperative electrocardiogram of the case 2. Red arrows indicating ST segment elevations.

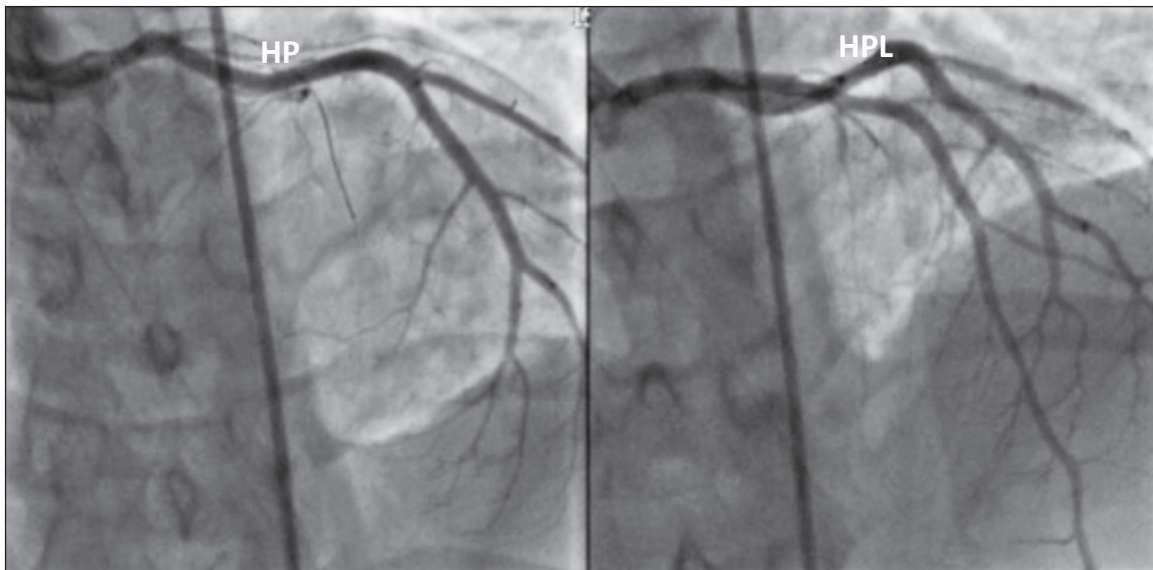


Figure 2. Postoperative coronary angiography image of the case 2. (HP: Healed plaque, HPL: Healed plaque lateral view).

CASE 3

A 34-year-old man (85 kg) with no history of known diseases or allergies underwent a total 7 hours of hair transplantation. There were no medical records of the pre-operative anesthesia assessment, peri-operative anesthesia form, or any notes regarding the operation. According to post-mortal testimonies, a mild hypotension which was responsive to fluid replacement occurred during the procedure. After approximately two hours following his discharge from the hospital, cardiac arrest occurred. The resuscitation was unsuccessful. His autopsy findings showed total, near-total, and moderate coronary artery occlusions in the left anterior descending, circumflex, and right coronary arteries, respectively. A dark col-

or change was seen in the left ventricle. In his histopathology, early ischemic changes in the myocardium, focal scarring, and fibrin thrombus were noted. Autopsy was performed 3 days after death. The patient was not admitted to an ICU. Once again, the absence of medical records was noted to be a major medical flaw.

DISCUSSION

Main challenges during anesthesia outside the operating room are related to patient, environment, and drugs used during the procedure. Patients with a known history of cardiopulmonary diseases such as coronary artery disease and obstructive sleep apnea, and an increased risk of airway pro-

tection such as morbid obesity are more prone to complications. In these cases, even though none of the patients had comorbidities, they all experienced mortal complications. It is important to create a safe environment for the patients throughout the procedure, therefore regardless of the pre-existing diseases, all patients should be evaluated before the procedure for possible complications. The hair transplantation unit should be designed according to American Society of Anesthesiologists (ASA) 2023 guidelines for nonoperating room anesthesia (3).

We recommend an anesthesiologist to be present during the procedure. Patients are usually facing downwards with minimal access to the airway, therefore continuous monitoring of vital signs including pulse oximetry, ECG and blood pressure should be a standard care to detect early signs of life-threatening events (4). To visualize the face looking downwards at a mirrored operating table may enable early detection of cyanosis (5). The hair transplantation personnel should be trained to recognize the early signs and symptoms of toxicities of the drugs used throughout the procedure. Basic and advanced life support education of the staff is essential in the case of an immediate cardiopulmonary arrest.

Exceeding maximum doses, inadvertent IV administration of LA and systemic absorption of the drugs from highly vascular areas may lead to LAST. Typically, as the LA dose or concentration increases, first neurological then cardiovascular symptoms are seen. In the case of bupivacaine toxicity, life threatening cardiac arrhythmias can be seen directly before neurological signs and symptoms. Intravenous lipid solution infusions have been successfully used to treat serious cardiac arrhythmias in LAST; therefore, it should be available near hair transplantation units (6). The 2020 The American Society of Regional Anesthesia and Pain Medicine guidelines recommend a 20% lipid emulsion bolus dose of 1.5 mL kg⁻¹ followed by an infusion at 0.25 mL kg⁻¹ min⁻¹ (7). Awareness should be raised about keeping better medical records.

Clinicians tend to mix different LA agents to obtain early onset and prolonged duration of action. However, the toxicities of the agents may be additive in the mixtures and not easily measured. It should be emphasized that mixing LAs is not FDA approved, and any adverse reactions would be considered malpractice. Maximum attention should be paid to avoid the toxic and lethal doses of LA. The best treatment of the LAST is to prevent it. Using minimal dosages and negative aspiration before injections should always be used. Toxic dose thresholds should be strictly followed: for example, lidocaine without epinephrine should not exceed 4.5 mg kg⁻¹, and bupivacaine without epinephrine should not exceed 2.5 mg kg⁻¹ (7).

The duration of action of LAs is lengthened by adding vasoconstrictors. Unintentional intravenous and large volumes of subcutaneous injections of vasoconstrictors may result in an increase in heart rate and blood pressure and ventricular arrhythmias causing death may be seen within seconds (8). Patients with preexisting cardiac diseases are especially more vulnerable to cardiac complications. Although vasoconstrictors reduce bleeding and prolong LA action, their systemic effects may pose significant risks, particularly in high doses or unmonitored use. Thus, the risk-benefit ratio should be carefully evaluated.

Furthermore, current guidelines from the Turkish Society of Anesthesiology and Reanimation 2022 guideline and ASA 2023 emphasize that nonoperating room anesthesia settings must be equipped with essential monitoring and emergency equipment including oxygen supply, suction, defibrillators, capnography, and intravenous lipid emulsions, with trained anesthesia personnel present to ensure patient safety (9,10). These guidelines also underscore the importance of leadership structures and team communication in nonoperating room anesthesia environments to improve safety outcomes.

Legislation that determines the minimum standards for patient safety during hair transplantation outside operating room should be set. These standards should be evaluated by experts and penalties for violations should be applied. It was decided in the files presented above that: not noticing the foreseeable consequences on time; not managing the situation according to evidence-based medicine rules; not having the minimum standard team and equipment to detect and manage these complications in a timely manner were the most important factors in the decision of malpractice (11,12).

CONCLUSION

Our findings emphasize the importance of continuous monitoring, cautious drug administration, and emergency preparedness in non-operating room anesthesia. Intravenous lipid emulsions should be available nearby. Legislative regulation and the presence of trained anesthesiology staff may significantly reduce anesthesia-related mortality in hair transplant units.

AUTHOR CONTRIBUTIONS

Conception or design of the work: IO, YG, YS, ACY, EMA, GA

Data collection: IO, YG, YS, ACY, EMA, GA

Data analysis and interpretation: IO, YG, YS, ACY, EMA, GA

Drafting the article: IO, YG, YS, ACY, EMA, GA

Critical revision of the article: IO, YG, YS, ACY, EMA, GA

Other (study supervision, fundings, materials, etc): IO, YG, YS, ACY, EMA, GA

The author (IO, YS, YG, GA, EMA, ACY) reviewed the results and approved the final version of the manuscript.

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