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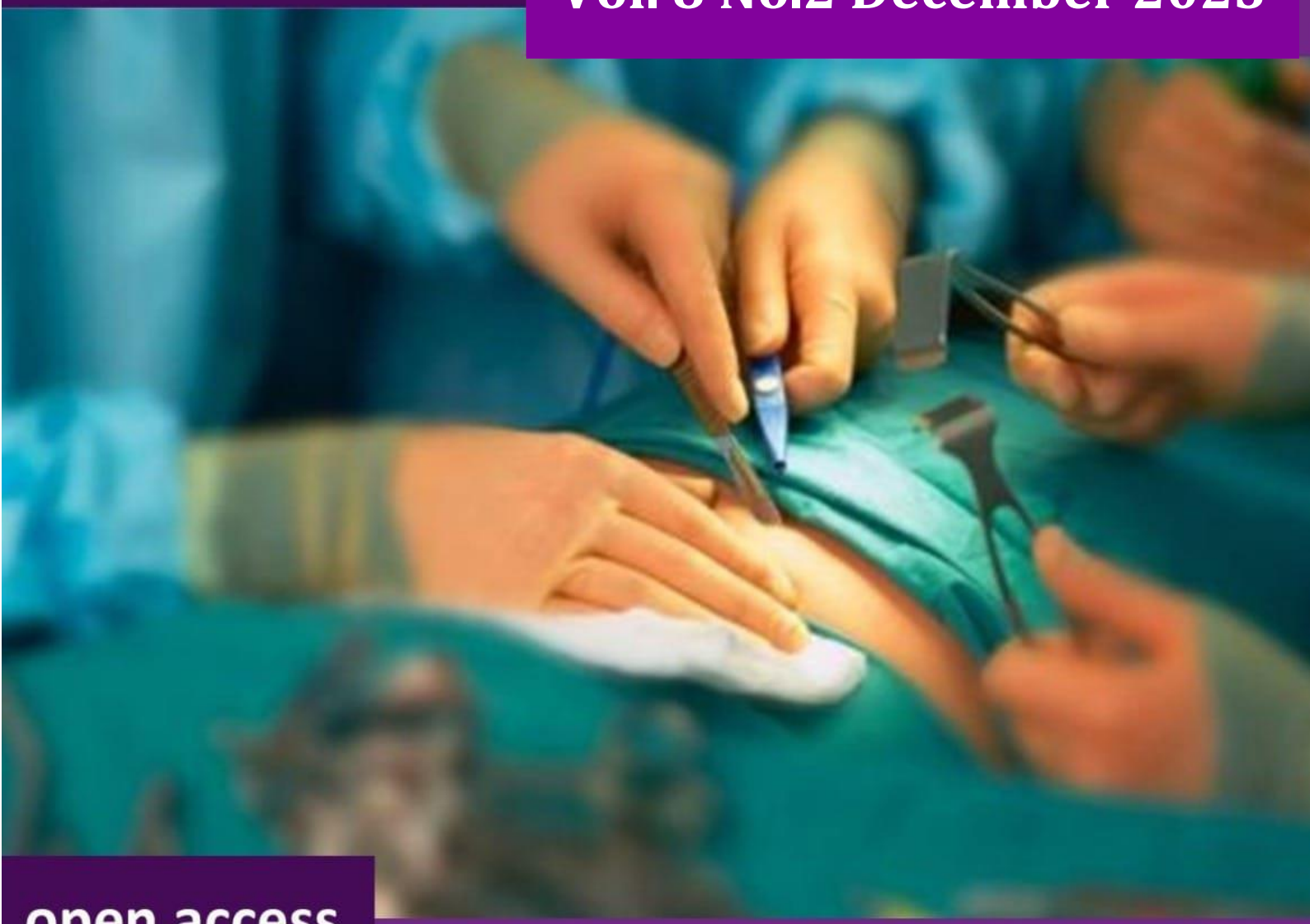

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JURNAL REKONSTRUKSI DAN ESTETIK

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FOCUS AND SCOPE

burn and wound, hand, microsurgery, oncoplastic, craniofacial and external genitalia reconstruction, and aesthetics.

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JURNAL
REKONSTRUKSI DAN ESTETIK

A CASE REPORT: A SCROTAL FLAP FOR PENILE PARAFFINOMA RECONSTRUCTION

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ABSTRACT

Introduction: A large penile size is a source of pride and a symbol of masculinity for many men. One commonly used alternative for penile enlargement is the injection of high-viscosity liquids, such as paraffin, silicone, vaseline, and other substances, into the penis. However, this procedure can lead to negative consequences, including paraffinoma and siliconoma, which can cause pain during erections and even a reduction in penile size.
Case Illustration: A 29-year-old male presented with complaints of penile enlargement, hardness on palpation, and pain during erections for the past three months before admission to the hospital. The patient's social history revealed that one year before admission, he had undergone a paraffin injection on the penile shaft, which was performed by non-medical personnel. Physical examination revealed a circumferentially enlarged penile shaft that was hard on palpation. A wide excision of the fibrotic tissue on the penile shaft was performed, and a scrotal flap was used to cover the exposed area.
Discussion: We performed a wide excision of the fibrotic tissue on the penile shaft and followed it with a V-Y scrotal flap procedure to cover the exposed area. This single-stage surgery was feasible because the scrotal skin was still healthy and suitable for defect coverage.
Conclusion: Penile reconstruction surgery with a scrotal flap is one of the therapeutic options for addressing paraffinoma cases, offering both cosmetic and functional benefits.

Highlights:

1. The single-stage scrotal flap technique can be used for paraffinoma cases where the lesion does not involve the scrotum.
2. The therapy addresses concerns related to restoring the penile function as a sexual organ with the best appearance.
3. The V-Y plasty can be used not only to form the penile shaft but also to minimize penile shortening.

INTRODUCTION

Penile paraffinoma is a case of penile mass due to subcutaneous liquid paraffin injection. This case is also known as a sclerosing lipogranuloma. Sclerosing lipogranuloma (SL) affecting the male external genitalia is an uncommon chronic inflammatory condition characterized by the presence of subcutaneous masses. The fundamental pathological mechanism

involves a persistent granulomatous response to deteriorating internal or external lipids. The Austrian surgeon, Robert Gersuny, introduced paraffin injections for cosmetic purposes in 1899. He injected this substance into a man's scrotum for testicular replacement after castration due to tuberculous epididymitis. Vaseline, paraffin, and mineral oil remained popular in Europe and the United States until the early 1900s. He subsequently published what appeared to be the initial documentation of genital reconstruction using a foreign substance.[1–3] However, this procedure can also have negative complications including skin necrosis, decreased erectile function, and pain during intercourse.[4,5]

The use of paraffin injections for penile girth enhancement is an outdated and obsolete procedure. Paraffin is used in these injections to increase the girth or length of the penis or to create a perceived enhancement in sexual pleasure. The procedure of penile injection is still common in Southeast Asia, Korea, the Middle East, some Eastern European countries, and Indonesia which is done by non-medical personnel or the patient himself.[6] In Asian and Eastern European cultures, a large penile size has been frequently considered as a symbol of masculinity for many men.[2,4,7]

The treatment choices for this case include non-surgical and surgical treatments. The non-surgical treatment which involves antibiotics, non-steroidal anti-inflammatory drugs, steroid injection, and topical cream was reported to be ineffective. The only effective treatment is a surgical approach. Performing penile reconstructive surgery is the mainstay treatment of penile paraffinoma that can achieve cosmetic and functional effectiveness.[8,9]This scientific report aims to learn more about the surgical technique with a scrotal flap in the management of penile paraffinoma.[10–12]

CASE ILLUSTRATION

A 29-year-old unmarried man came to the Plastic Surgery Department with complaints of penile enlargement and hardened skin three months before his admission to the hospital. One year prior to admission, the patient claimed to have increased the size of his genitals by injecting an unknown high-viscosity liquid into the shaft of his penile, with the assistance of non-medical personnel. The patient reported experiencing pain during erections and a reduction in penile length. There were no complaints related to urination, and the patient had not experienced a fever. The patient mentioned being sexually active despite being unmarried.

The patient's vital signs and general physical examination were within normal range. The genital examination revealed a circumferentially enlarged penile shaft that was firm on palpation (Figure 1). The patient underwent a comprehensive examination to prepare for general anesthesia, including routine blood tests, hepatitis B surface antigen screening, and a chest X-ray. The results were all within normal limits.

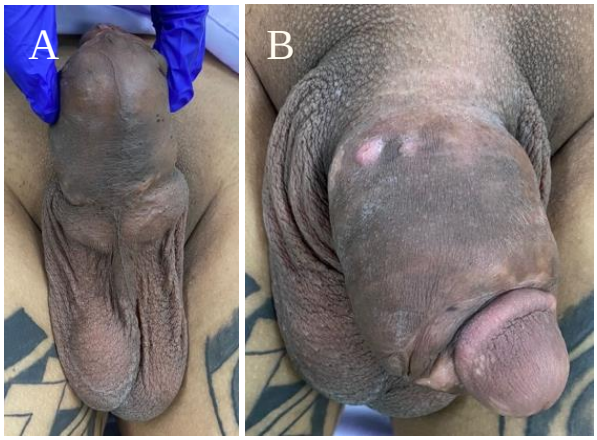

Figure 1. Before Reconstructive Surgery. (A) Ventral View, (B) Dorsal View.

During the preoperative examination, the patient received intravenous prophylactic antibiotics (Ceftriaxone). The surgery was performed under general

anesthesia. Reconstructive surgery can be performed into two stages: wide excision of the fibrotic tissue and the use of a scrotal flap. A circular incision was made on the distal coronal section of the penile shaft to expose the fibrotic tissue. The fibrotic tissues on the penile shaft were excised from the distal penile region to the upper part of the scrotal area. The wide excision continued until no fibrotic tissues remained (Figure 3). Subsequently, the exposed area was closed using a scrotal flap. The scrotal flap procedure was carried out immediately after the wide excision because the scrotal skin was found to be suitable for reconstruction. A transverse incision was first made at the center of the scrotum, with the same horizontal length as the penile diameter and a vertical length equivalent to the length of the penile. The penile was then inserted into the skin, with the glans positioned to protrude through the incision. The wound was closed by suturing the coronal and dorsal parts. The final stage of the reconstruction involved an incision made on the ventral part of the penile shaft and the scrotum, with a V-Y flap design. Suturing was performed to close the wound (Figure 4).

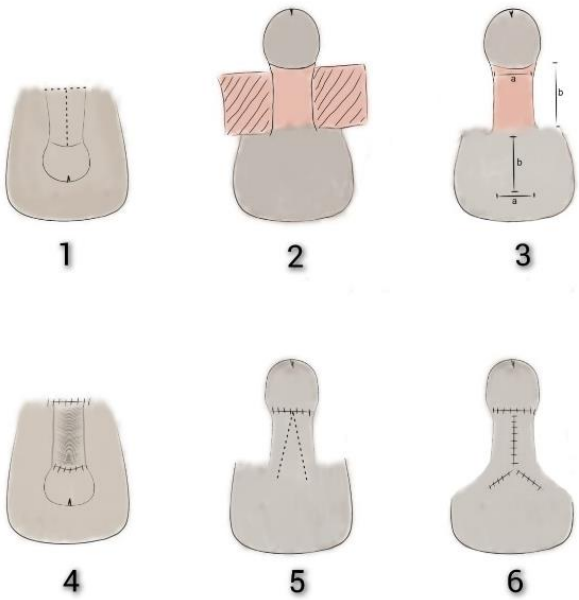

Figure 2. Illustration Step of Wide Excision (1-3) and Scrotal Flap (4-6).

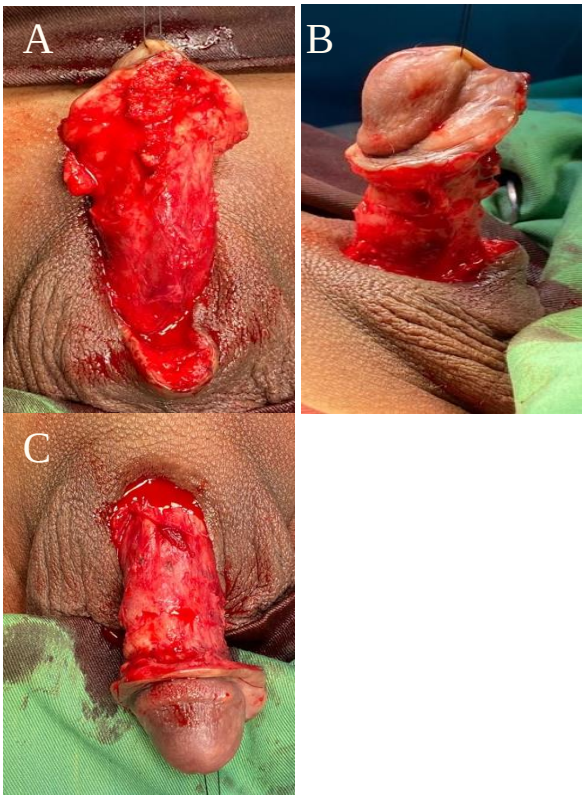

Figure 3. Intraoperative Appearance, Post-Wide Excision of The Fibrotic Tissue. (A) Ventral View, (B) Lateral View, (C) Dorsal View.

Figure 4. Post-Reconstruction Appearance with Scrotal Flap. (A) Dorsal View, (B) Lateral View, (C) Ventral View.

An evaluation two weeks after the surgery showed positive results. The patient reported being able to achieve an erection successfully without pain. However, there was a suture breakage in the dorsal area of the penile shaft, necessitating an operation to repair and close the wound (Figure 5).

Figure 5. Evaluation Two Weeks Post-Reconstruction Surgery.

DISCUSSION

Paraffinoma, also known as sclerosing lipogranuloma, can develop following the injection of liquid paraffin or a similar substance. This procedure remains an option for many men, despite its well-documented side effects. The substance is typically injected into the subcutaneous tissue of the penile shaft, with variations in its distribution, ranging from the distal shaft to the mid-shaft or the entire penile shaft, often with the migration of the substance to the infra-pubic area, scrotum, and/or glans. Paraffinoma can be confined to either a partial or complete layer of Dartos fascia or may infiltrate the skin and extend deep into the deep fascia (Figure 6).[4,9]

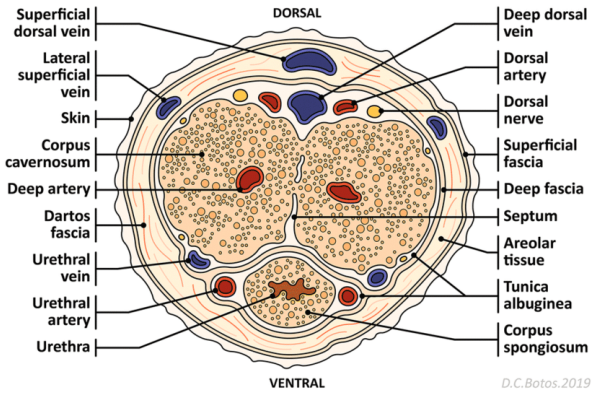

Figure 6. Vascularization of Penile.[10]

Most people believe that paraffin injection can provide the effect of changing the penile contour, increasing the size of the penile, solving the problem of sexual dysfunction, and providing satisfaction in

sexual intercourse. However, in the long term, this foreign substance can develop into sclerosis lipogranulomas which is a subcutaneous inflammatory response to the breakdown of the foreign substance. Since the human body has no enzymes to metabolize the foreign substance, an induced granulomatous reaction and irritation of the subcutaneous tissue can occur. Subsequently, this can stimulate the nerves in the penile and cause pain, especially during erection.[11]

In this case, the treatment option should aim to restore the penile function as a sexual organ with the best appearance. For this to be achieved, surgical removal of the foreign material and granuloma is the best option. This surgery can be followed by skin grafting or a scrotal flap to cover the raw surface.[6,8] This patient underwent surgery to remove the formed fibrotic tissue and foreign material. The damaged tissue is excised deep enough that all the layers of skin along the penis are removed. According to Zhao, et al., in deeper infiltrations with severe paraffinoma, the excision can be followed by a scrotal flap procedure to reconstruct the raw surface because the scrotum is easily available, extensile, and has the same color as the penile skin.[12,14] The researchers performed the reconstruction with a scrotal flap. This procedure can be done in a single stage of surgery due to the good condition in which the existing scrotal skin was in and there was a sufficient amount for a scrotal flap. Tunneling was done from the scrotum to cover the penile shaft area. The V-Y flap design is done on the ventral side of the penile to provide a better shape of the penile shaft and scrotum aesthetically and can also help the penile reach full erection. The blood supply to the organ is critical for safe and reliable flap elevation and transfer. The arterial supply of the scrotum is from the posterior scrotal branches of the perineal artery, the anterior scrotal branches of the deep external pudendal artery, and the cremasteric artery. The penile is supplied by the internal pudendal artery, a branch of the internal iliac artery.[1,15–17]

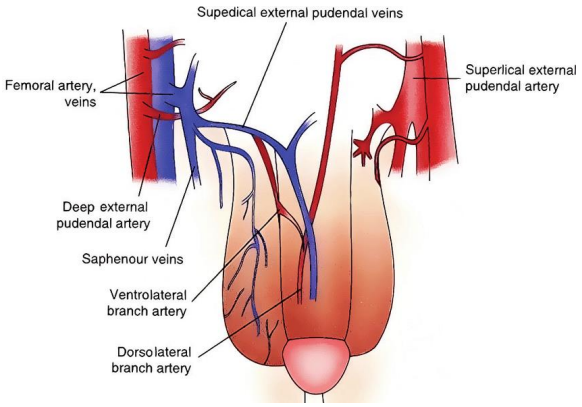

Figure 7. Blood Supply of Penile and Scrotum.[15]

Boyke Subhali classifies penile parafinoma based on the availability of scrotal skin. This case is a category 2 where the lesion is only on the shaft of the penis, without wide migration of the scrotum or suprapubic area. The scrotal skin is still in good condition and can be used to cover the defect with only a single stage.[18]

This technique has numerous advantages including the color of the penile skin being greatly matched, the size and skin sensitization of the penile looking natural, and of course easy to apply. However, the technique caused the scrotal hairs to be moved into the penile shaft resulting in a hairy penis and the scar line along the shaft may develop into a hypertrophic scar or keloid. Thus, good techniques should be considered.[14,17,19]

The article discusses various substances used for penile injections, not limited to paraffin, which broadens the scope of the research and provides a comprehensive overview of potential complications. The use of a scrotal flap in this context focuses on different techniques for penile reconstruction. This research specifically addresses the complications associated with paraffin injection, which may set it apart from studies that examine a broader range of penile enlargement

procedures. The inclusion of a detailed case illustration provides valuable insights into the clinical application of the described surgical technique.

The strength of this case is the case illustration addresses a common issue related to penile enlargement procedures using high-viscosity liquids, providing valuable clinical insights into the complications associated with such practices. The description of the surgical technique involving wide excision of fibrotic tissue and the use of a scrotal flap for closure provides a practical solution to address the problem in a single-stage surgery, which can be beneficial for both patients and healthcare providers. The case of a 29-year-old male who underwent non-medical penile injection procedures adds authenticity to the discussion and highlights the real-world consequences of such practices. However, the research is based on a single case illustration, which may limit the generalizability of the findings. The case does not provide comparative data or a control group for assessing the effectiveness of the described surgical technique in comparison to other methods. The case involves a procedure performed by non-medical personnel, which is a critical issue but may not be representative of all cases.

The use of a scrotal flap for penile reconstruction in cases of paraffinoma is a novel approach that may differ from traditional methods. It is a unique approach not widely explored in existing literature. This technique's novelty could make this study stand out.

CONCLUSION

Penile paraffinoma occurs as a result of the injection of a high-viscosity fluid into the penile area with the aim of enlarging the penis. However, this procedure has been reported to produce side effects that can damage both the function and appearance of the penile. The best treatment option is to surgically remove the fibrotic tissue and close the exposed area with a scrotal flap to restore the function and shape of the penis. Additionally, managing penile paraffinomas can pose significant surgical complexity. An integrated surgical strategy involving both urology and plastic surgery enhances the preservation of both function and appearance.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare in this article.

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This research has no financial interest or affiliation concerning material.

AUTHOR CONTRIBUTION

RTRLI conceptual the manuscript and content revision. JM was content revision. KYH was grammar and content revision. MAUH was written conceptual, data analysis collection, and final approval.

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A CASE REPORT: REVEALING DELAYED CARDIAC PHENOMENON IN ELECTRICAL BURNS, AN INTERESTING PUZZLE

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ABSTRACT

Introduction: Electricity is an integral aspect of modern life but poses potential long-lasting consequences. Electrical burns, although infrequent, hold significant implications and can lead to adverse cardiac outcomes. This study explores the intricate interplay between electrical injuries, neurological responses, and cardiac manifestations, emphasizing the need for comprehensive understanding and management.

Case Illustration: A 28-year-old male tile builder sustained an electrical shock while working on a rooftop. He experienced convulsions and unconsciousness after his hair entangled with a high-voltage cable. Clinical evaluation revealed burns and vital signs within the normal range. Subsequent electrocardiogram (ECG) assessments unveiled ST-segment elevation and hyperacute T waves. Troponin I levels increased on the third day, indicative of a myocardial infarction (MI) induced by the electrical injury.

Discussion: Electrical burns are complex and necessitate a multidisciplinary approach for accurate diagnosis and management. Collaborative efforts involving burn surgeons, cardiologists, and neurologists are essential to comprehend the holistic impact of electric injuries. This case shows that electrical injuries leading to loss of consciousness can later result in heart issues, as evidenced by significant electrocardiogram changes, emphasizing the need for ongoing monitoring. It underscores the importance of an interdisciplinary approach in managing burn injuries, particularly electrical burns, which can have hidden complications.

Conclusion: Understanding the intricate dynamics between electrical injuries, neurological responses, and cardiac outcomes can improve therapeutic strategies and patient outcomes. This case underscores the importance of thorough and all-encompassing management to ensure the best possible care for the patient.

Highlights:

1. Electrical injuries pose risks to the heart, with differing outcomes based on voltage exposure.
2. The importance of ongoing observation is due to the development of delayed cardiac issues.
3. Collaboration among medical specialties is essential to manage electrical burn injuries and associated cardiac complications effectively.

INTRODUCTION

Electricity stands as an indispensable cornerstone of contemporary human existence, yet it retains the capacity to yield enduring repercussions. Although modern life relies heavily on electricity, it remains consequential, bearing the potential to impose lasting adversities. Among these, electrical burns emerge as

prominent consequences, capable of transpiring within both domestic and occupational milieus. While comparatively uncommon, the impact of electrical injuries on cardiac health assumes paramount significance due to their potential for gravely adverse outcomes.[1]

Traditionally, the classification of electrical injuries segregates them into distinct categories high-voltage exposures, exceeding the threshold of 1000 V, and low-voltage exposures, confined below this demarcation. Significantly, the heart is predisposed to heightened vulnerability in such scenarios.[1] Specifically, low-voltage electrical injuries tend to precipitate ventricular fibrillation a state of tumultuous cardiac rhythm while instances of high-voltage exposure more frequently culminate in asystole, marking a comprehensive halt in the heart's electrical activity.[2]

Sometimes, electrical exposure can cause a rare but major complication: myocardial infarction (MI), a condition characterized by impaired blood perfusion to the heart muscle. These symptoms usually appear immediately after electrical injury, but several cases show delayed heart defects.[2] Research into complications of burns to the heart, especially late myocardial infarction, is still ongoing. Several hypotheses have been put forward by experts regarding the pathogenesis and management, but they are still being debated.[3]

This particular case study describes an example in which an electrocardiogram showed marked ST-segment elevation an indicator of myocardial tension while Troponin I levels showed a marked increase on the third day of therapeutic management.

CASE ILLUSTRATION

We present a compelling case involving a 28-year-old male patient who arrived at the emergency room following a fall from a height after an electrical shock incident. The patient, employed as a tile builder, was engaged in the repair of roof tiles while positioned in a seated stance. A lamentable mishap transpired when the patient's hair became ensnared in a high-voltage cable (> 1000 Volts), provoking immediate convulsions and ensuing loss of consciousness. This sequence of events culminated in the patient's descent from the rooftop, which measured approximately 2 meters. Upon his admission to the hospital's emergency department, the patient had successfully regained consciousness. The patient communicated experiencing a headache and weakness; however, notable absences were complaints of nausea, vomiting, or chest pain. Pertinently, the patient's medical history bore no evidence of chronic ailments or antecedent cardiac afflictions.

A comprehensive physical assessment unveiled the patient had full consciousness, as ascertained through a Glasgow Coma Scale score of 15. Recorded vital signs encompassed a blood pressure reading of 133/85 mmHg, a pulse rate of 71 beats per minute, and a respiratory rate of 20 breaths per minute. Anthropometric data of the patient showed a body weight of 65 kg, a height of 165 cm, and a calculated body mass index (BMI) of 23.8 kg/m^2. The Wong-Baker face pain scale quantifying pain intensity resulted in a score of 3.

Figure 1. Clinical Manifestation

Further physical examination illuminated disruptions in the patient's integumentary tissue, exhibiting a spectrum of hues from pale pink to bright pink and white, which signified varying levels of injury to the dermal and subdermal layers. Calculation of the burnt regions found an area of 4.5% on the facial region, 9% on the thoracic region, 9% on the left lower limb, and 4.5% on the right foot (Figure 1). Supporting laboratory evaluations unveiled hemoglobin levels of 18.9 gr/dL, a hematocrit of 53.3%, an erythrocyte count of 6.4 x 106/µL, a leukocyte count of 15,570/µL, and a platelet count of 440,000/µL. Electrocardiogram findings fell within the state of normalcy (Figure 2). Our medical team concluded a diagnosis of superficial-mid-deep dermal electric burn injury, with an aggregate burn area of 36%.

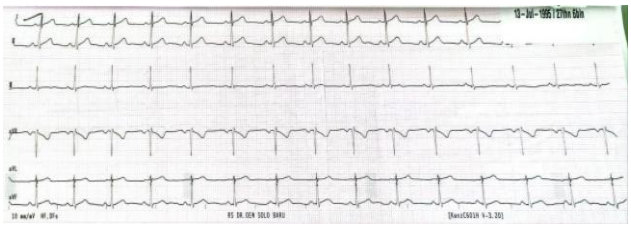

Figure 2. Initial Electrocardiogram Result at The Time of Admission.

Consequently, the patient underwent preliminary fluid management, entailing calculations grounded in the modified Baxter-Parkland formula. This computation yielded a total fluid requirement of 9,360 cc, with the initial half of the required fluid being administered over 8 hour, followed by the remaining volume in the next 16 hours. Additionally, the patient received intravenous medication through 2 doses of 1 gram ceftriaxone injection, 3 doses of 1 gram paracetamol injection, and 2 doses of 50 milligrams ranitidine injection to anticipate his nausea. These therapeutic measures were dispensed within an isolation setting, complemented by a regimen of serial electrocardiogram monitoring.

On the third day of hospitalization, the patient underwent an electrocardiographic examination, unveiling ST-segment elevation in leads II, III, and avF, accompanied by the observation of hyperacute T waves in leads V2 to V4 (Figure 3). Subsequent evaluation included a Troponin I assessment, yielding a result of 4.81 ng/mL. This aggregation of findings prompted the identification of ST-segment elevation myocardial infarction (STEMI) characterized by an inferior pattern elicited by the antecedent electrical injury.

A cardiologist in our medical team meticulously directed the therapeutic trajectory of this patient, instigating a heparin infusion at a rate of 12 units/kg/hour. Supplementary interventions encompassed the administration of 3 doses of 5 milligrams of isosorbide dinitrate (ISDN), alongside a single dose of 75 milligrams of clopidogrel (CPG). Given the intricate diagnostic landscape and the patient's dynamic clinical condition, the medical team decided to transfer the patient to a more specialized medical facility, with consideration to facilitate an elevated continuum of comprehensive management and attentive care, aligning with the evolving exigencies of the patient's situation.

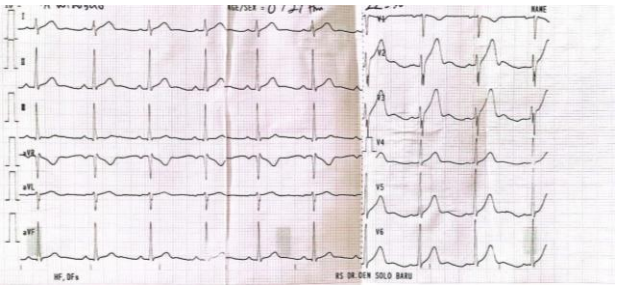

Figure 3. Electrocardiogram Results on The Third Day.

DISCUSSION

Burn injuries are more common in developing countries, with Indonesia estimating approximately 195,000 burn-related deaths each year. While scientific progress in burn treatment has led to a significant increase in survival rates, the mortality rate associated with burns remains elevated.[4]

Electrical injuries, which can occur due to various incidents such as lightning strikes or electric shocks, often lead to significant morbidity and mortality. These injuries are typically accidental and cannot be prevented. Without immediate treatment, they can result in fatal damage, causing dysfunction in multiple organs and tissues, especially in the heart, leading to conditions like arrhythmias and respiratory arrest. The outcome of electrical injuries depends on factors like voltage intensity, the path of electric current, the patient's health, and timely treatment. Early and accurate diagnosis relies on specific laboratory results. Effective management and treatment can reduce or even eliminate losses, especially those caused by complications resulting from electrical injuries.[5]

Electrical injuries encompass a wide range of adverse effects on humans, ranging from superficial burns to potentially fatal arrhythmias.[6] Contemporary research underscores the severity of this impact and reveals that although only 2.2% of electrical injuries treated in emergencies end in death, 42.9% of these have significant consequences. These statistical revelations highlight the increased electrical danger inherent in injuries that traverse the cardiac region, which often leads to a disproportionate increase in mortality rates.[7]

The impact of electrical injury extends beyond the realm of arrhythmias, accelerated hypertension, to even myocardial infarction. Although our understanding of medical intricacies continues to advance, the pathophysiology of electrical current-induced arrhythmias remains a daunting subject.[8] Various simple theories manifest necrotic tissue due to exposure to electric current, as well as modification of the function of the intrinsic sodium/potassium pump in the heart.[9]

A study conducted by Arrowsmith and colleagues screened 145 cases over a 5-year, revealing three occurrences of ectopic need and one occurrence of atrial fibrillation (AF) in the context of cardiac complexity stemming from electrical injury. In addition, this study highlights the relationship between loss of consciousness triggered by electric shock and a greater likelihood of cardiac complications.[10]

In line with these revelations, our case also shows important interactions between electrical injury, loss of consciousness, and subsequent cardiac consequences. The patient in this case experienced rapid loss of consciousness after the electric shock episode, which later manifested as heart disease.

The susceptibility of the heart muscle to ischemia is increased due to impaired blood flow caused by the vascular effects of the electrical burn itself and the effects of the release of vasoactive substances. One hypothesis states that free radicals produced as a result of electrical burns can trigger endothelial dysfunction, leading to arterial vasospasm caused by the release of catecholamines.[11]

Research by Xenopoulos and colleagues suggests that thermally or electrically induced coronary artery vasospasm may contribute to ischemia and acute myocardial infarction.[12] Investigations also suggested the potential for impaired perfusion of the right coronary artery due to ischemia and electrical injury, given its proximity to the anterior chest wall.

A deviant ECG upon admission is said to be the most reliable indicator of potential heart-related complications. Hence, performing an initial ECG for all individuals who have suffered electrical injuries, regardless of the voltage involved is of utmost importance. Patients who have been exposed to electrical injuries and exhibit any of the 4 risk factors defined by ERC: (i) experiencing cardiopulmonary arrest, (ii) losing consciousness, (iii) displaying abnormalities in their electrocardiogram, and (iv) sustaining damage to soft tissues and burns, are categorized as high-risk patients. They necessitate continuous cardiac monitoring in the intensive care unit. Conversely, conscious patients without any of these risk factors do not require inpatient cardiac monitoring following electrical injuries.[13]

Heart problems after electrical injury can occur at unusual times, requiring prolonged monitoring and intervention. Delayed complications such as ST-segment elevation myocardial infarction (STEMI) indicate ongoing inflammation and ischemia even days after the initial injury.[14]

In our case, the clinical assessment indicated burn injuries, and the patient's vital signs were found to be within the expected range. Follow-up ECG evaluations revealed the presence of ST-segment elevation and highly pronounced T waves. On the third day, the Troponin I levels increased, signaling a myocardial infarction (MI) triggered by the electrical injury. Consequently, it became essential to maintain continuous cardiac monitoring for the patient in the intensive care unit.

In the case presented in this article, significant electrocardiogram changes, including ST-segment elevation on the third day, underscore the latent nature of this cardiac problem, thus emphasizing the need for ongoing monitoring and assessment.

The study by Bose and colleagues underscores the importance of detecting acute myocardial damage after electrical burns and advocates assessment of Troponin I levels within 6 hours postinjury to confirm myocardial necrosis. More detail, their research showed a marked decrease in Troponin I levels after 72 hours of electrical injury.[15] In contrast, our case showed a different pattern, where this case showed a substantial increase in Troponin I levels on the third day after electrical trauma injury. The uniqueness of this case highlights the importance of further exploration to determine the optimal time

to evaluate Troponin I levels after electrical injury.

This article shows that electrical burns are a complex case, which requires a collaborative approach. Burn surgeons, cardiologists, and even intensivists must work together to understand the holistic impact on patient physiology. Such interdisciplinary involvement has proven to be indispensable because of the need for careful monitoring and more extensive follow-up to understand and address the complexities associated with delayed cardiac arrest.[15] Our case provides a clear example that an interdisciplinary approach is truly necessary in the management of burn injuries, especially burn injuries. electricity, where this case often causes hidden complications.

The article presents a rare and unusual case who experienced an electrical shock incident while working on a rooftop. This incident led to a complex set of injuries, including electrical burns and cardiac issues, making it an intriguing case for medical professionals. This cardiac complication is not only rare but also potentially life-threatening, making it a critical aspect of the case. The article provides comprehensive clinical and laboratory data, which is essential for both diagnosis and treatment. This includes detailed information on the patient's vital signs, anthropometric data, and laboratory results, enhancing the credibility and thoroughness of the case study. Also, it provides quantitative data, including burn area calculations, laboratory results, and electrocardiogram findings. This data contributes to a thorough understanding of the patient's condition and the medical interventions applied. The article discusses the diagnostic challenges faced by the medical team due to the dynamic clinical condition of the patient. This highlights the complexity of managing such cases and the importance of specialized care.

This article highlights the significance of vigilant patient monitoring, which facilitates the early detection of complications like myocardial infarction. This early discovery enabled medical professionals to initiate timely treatment, potentially mitigating the risk of more severe complications. However, this case report still provides major limitations in that this case report does not discuss the development of the patient's condition and subsequent management. The patient was referred to a more specialized hospital, and as a result, we have no insight into the further development of cardiac tissue damage.

CONCLUSION

Short-term and long-term complications of electrical burns need to be considered. One long-term complication, although rare but posing significant heart-related risks, is myocardial infarction. Careful, continuous monitoring and interdisciplinary collaboration between specialists, such as burn surgeons, cardiologists, and neurologists, are essential for comprehensive patient management, in treating patients in these cases. This case report is only an initial description of the complications of electrical burn injuries, further and larger research is still needed in the treatment of myocardial infarction in patients with electrical burn injuries.

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CONFLICT OF INTEREST

Authors have no conflict of interest to declare.

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None to be declared.

AUTHOR CONTRIBUTION

In crafting this article, ES played a central role by conceiving the concept, conducting the literature review, analyzing clinical data, and drafting the initial manuscript. AF and YP served as crucial editors, offering invaluable input and meticulously reviewing the manuscript to enhance its clarity, coherence, and suitability for publication. Their editorial contributions were pivotal in ensuring the successful publication of this work.

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TREATMENT OF PRESSURE ULCERS OF THE SCALP IN DECOMPENSATED HYDROCEPHALY: A CLINICAL CHALLENGE

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ABSTRACT

Introduction: A pressure injury is a localized injury to the skin and/or underlying tissue usually over a bony prominence, that caused by compression. Multiple studies have demonstrated that age, moisture, immobility, and friction/shear are key risk factors. We report a challenging case of multiple pressure injuries over the scalp in hydrocephalus patients. In order to treat and accelerate the recovery of these severe skin disorders, the study recommends using the TIME principles.
Case Illustration: Three toddlers with Hydrocephalus was consulted due to multiple Pressure Injury over the scalp in the bilateral temporoparietal and occipital region. After ventriculoperitoneal shunting (VP-shunt), the wounds were managed in accordance with TIMERS guidelines.
Discussion: Pediatric tissues are more susceptible to deformation injuries. Severe skull deformity and macrocephaly are serious problems that may lead to difficulties in head control and child positioning increases the risk of pressure injury. After VP-shunt, wound care is even more challenging since the surgical wound is closely related to pressure injuries. Shunt exposure can occur in these patients. According to both examination and intervention of TIMERS, guidelines are essential as well as controlling risk factors of pressure injury development.
Conclusion: Surgeons should be aware that children with hydrocephalus may experience scalp injuries and changes to their body composition, which challenge the diagnosis and care process.

Highlights:

1. Children with hydrocephalus may face challenges related to scalp injuries and changes in body composition, which can complicate diagnosis and care.
2. Inserting a shunt in infants or young children with hydrocephalus as a preventive measure against pressure ulcers.
3. Surgeons should be aware of these factors and consider comprehensive approaches to treatment.

INTRODUCTION

Hydrocephalus is a condition characterized by an excessive accumulation of cerebrospinal fluid in the central nervous system due to disruptions in its secretion, flow, or absorption. Worldwide, the prevalence of hydrocephalus has reached 85 cases per 100,000 individuals, and in Indonesia specifically, it affects around 10 in 1,000 individuals annually. The classification of communicative hydrocephalus that occurs in an acquired and acute manner necessitates surgical intervention, such as the placement of a VP shunt, to facilitate the drainage of cerebrospinal fluid (CSF). Nevertheless, postoperative infection complications remain notably high.[1]

The development of macrocephaly resulting from disruptions in cerebrospinal fluid circulation can lead to progressive hydrocephalus. This condition can result in severe mental retardation or neurological impairments, rendering the affected child incapable of sitting or walking, unable to balance their heavy head, and restricting them to a lying position in bed. Additionally, the inability to eat or drink without assistance can easily lead to malnutrition, increasing the risk of pressure injuries.

It is estimated that pressure injuries affect between 1 to 3 million individuals annually in the United States. Nevertheless, in Indonesian hospitals, pressure injuries represent a concealed healthcare issue. The incidence of pressure injuries remains remarkably elevated within the ICU setting. There are only four published studies on pressure injuries in Indonesia, indicating a pressing need for increased awareness regarding this problem.[2–4]

Numerous studies have demonstrated that age, moisture, immobility, and friction/shear are significant risk factors for pressure injuries. Factors such as pressure, friction, chronic illnesses, and skin conditions can cause pressure injuries. Age, nutrition, and oxygen supply are also intrinsic factors that can contribute.[5] Sick or immobile children are at a higher risk of developing pressure injuries and deep tissue injuries. Furthermore, the type of injury and potential causes differ between adults and children. Pediatric patients' most common locations for pressure injuries are the ears and the back of the head.[6–8] When infants and toddlers are lying supine, there is high pressure on the back of their heads.[9]

Individuals suffering from hydrocephalus experience limited mobility due to the weight of their heads, and their notably fragile skin can result in scalp pressure injuries if proper monitoring is not in place. Skin damage and the ensuing infections pose risks for shunt infections in patients and could potentially lead to fatal outcomes unless caregivers are meticulous in averting these issues by consistently altering the head's positioning and furnishing head and neck support, which could include the use of cushions.[10]

This report is a concise case series involving multiple pressure injuries in individuals with hydrocephalus. It is worth noting that there is a scarcity of publications addressing pressure injuries in hydrocephalus patients. Within this series, we have identified the difficulties encountered in the diagnosis and staging of pressure injuries and the potential for complications in individuals with hydrocephalus.

CASE ILLUSTRATION

Case 1

A one-year-old male with severe hydrocephalus and multiple pressure injuries on the bilateral temporoparietal and occipital regions was referred from a lower-level general hospital located on another island within the same province, approximately 527.3 kilometers away, to our provincial-level general hospital. Upon physical examination, his head circumference measured 101 cm, his height was 79 cm, he weighed 13 kg, and his upper arm circumference was 10.5 cm, which falls

below the normal range for a one-year-old male (normal range: 12.5 - 17.1 cm).

The wound on the left temporoparietal region measured 10 x 7.5 cm and exhibited dry necrotic tissue, some slough, and an obscured wound base (Figure 1A). On the right temporoparietal region, there were two wounds, measuring 7 x 6 cm and 2 x 5 cm, both with necrotic tissue at the wound base. The edges of these wounds were flat and well-defined (Figure 1B). In the occipital region, there was a 14 x 8 cm wound with a well-defined margin, signs of bleeding, and the wound base consisted of a portion of the galea (Figure 1C).

Laboratory results revealed hypoalbuminemia, with an albumin level of 1.17 g/dL, and a multislice computed tomography (MSCT) without contrast indicated diastasis of cranial sutures. Following ventriculoperitoneal shunting (VP-shunt), the wounds were managed according to the TIMERS guideline.

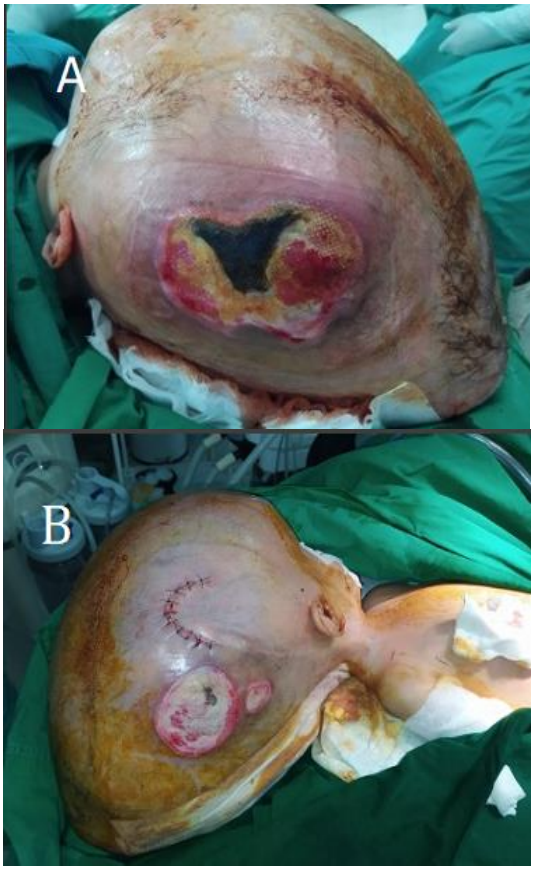

Figure 1. The Wound is on The Left Temporoparietal Region (A), The Right Temporoparietal Region (B), The Occipital Region (C).

Case 2

A six-month-old female with hydrocephalus, who had undergone ventriculoperitoneal shunting (VP shunt) and temporoparietal and occipital regions before the surgery, was referred from a lower-level general hospital located in another regency on a different island within the same province, approximately 604 kilometers away, to our provincial-level general hospital. Upon physical examination, her head circumference measured 67 cm, her height was 64 cm, she weighed 8.1 kg, and her upper arm circumference was 12 cm, which fell below the normal range for a six-month-old female (normal range: 11.7-16.3 cm).

The wound on the left temporoparietal region measured 10 x 5 cm and exhibited dry necrotic tissue with an obscured wound base (Figure 2A). In the occipital region, there were multiple wounds, measuring 3 x 2 cm superiorly, 4 x 2 cm inferiorly, and 5 x 3 cm on the left side, all with well-defined margins and obscured wound beds (Figure 2A). On the right side of the temporoparietal region, there were two wounds situated next to the VP shunt wound sutures, each measuring 6 x 5 cm. These wounds displayed dry necrotic tissue and obscured wound bases. Additionally, there was another wound positioned medially, measuring 3 x 2 cm, which presented with

slough. The boundaries of these wounds appeared flat and distinct (Figure 2B).

Her laboratory results indicated anemia (hemoglobin=7.6 g/dL), a neutrophil count of 11,240/µL, and a leukocyte count of 20,320/µL. The wounds were addressed in accordance with the TIMERS guidelines. We provided treatment for the wounds at the outpatient department every two or three days for roughly 2.5 months before her hospitalization. Regrettably, the wounds worsened, and she encountered shunt exposure because her parents did not follow the care schedule. She unfortunately succumbed to a shunt-related complication ten days after her hospitalization.

Figure 2. The Wound on The Left Temporo-Parietal Region (A), The Right Temporo-Parietal Region (B).

Figure 3. Picture of The Shunt is Extruded from The Thin Skin of The Patient.

Case 3

A seven-month-old female with hydrocephalus, who had previously undergone a ventriculoperitoneal (VP) shunt surgery and had multiple pressure injuries on the right temporo-parietal and occipital region even before the surgery, was referred from a lower-level general hospital located in a regency approximately 33.6 kilometers away to our provincial-level general hospital.

During the physical examination, her head circumference was measured at 64 cm, and her height was 64 cm, with a weight of 9 kg. Her upper arm circumference was 13.5 cm, which was slightly below the median range for her age (normal range: 13.9 cm; 11.8 - 16.5 cm).

The wound on the right temporo-parietal region measured 3 x 2 cm, with a granulated wound bed and signs of epithelialization on the wound's edges (Figure 4A). In the occipital region, there was a wound measuring 5.5 x 5 cm with a well-defined margins and necrotic tissue, and the wound bed was part of the galea (Figure 4B).

Her laboratory results showed a hemoglobin level of 11.5 g/dL, an increasing level of C-reactive protein at 1.78 mg/dL, and a random blood sugar level of 71.50 mg/dL. The wounds were managed according to the TIMERS guidelines, and we provided treatment twice a week at the

outpatient clinic for approximately 3 weeks before she was hospitalized.

Figure 4. The Wound on The Right Temporo-Parietal Region (A), Occipital Region (B).

DISCUSSION

The National Pressure Ulcer Advisory Panel (NPUAP) provides a definition for pressure injuries as localized harm to the skin and the tissues underneath, typically occurring on bony areas due to extended and/or intense pressure of shear and friction. The terms pressure ulcer, decubitus ulcer, pressure ulcer, and pressure injury are commonly utilized interchangeably. However, the preferred term is pressure injury, as it encompasses cases where not all damage results in a complete breakdown or ulceration of the skin.[6]

Documentation and reporting regarding pressure injuries in hydrocephalus patients in developed countries are insufficient, primarily because cases of significantly enlarged head circumferences are infrequently documented. There is a scarcity of published studies on pressure injuries in Indonesia, highlighting the urgent need for increased awareness of this issue. According to a previous study, the incidence of pressure injuries in immobilized patients in the surgical treatment room at Public Hospital Kupang in April and May 2009 was alarmingly high, reaching 60.7%.[11] Another study conducted in 2007 reported a pressure injury incidence of 33.4% in an ICU unit in an Indonesian public hospital.[4] During the period from January to June 1999, a 15-bed intensive care unit (ICU) at Pontianak Public Hospital in Kalimantan Barat Province recorded a 29% occurrence rate for pressure injuries. It is worth noting that pressure injuries are more commonly observed among hospital inpatients (ranging from 4% to 30%) when compared to residents of long-term care facilities (2.4% to 23%) and patients receiving home care (4%).[12]

Previous research reported the cases of nine children with severe hydrocephalus, whose head circumferences ranged from 56 to 94 cm, with an average of 67 cm. Within this group, three cases involved skin injuries on the side opposite to the surgery site, which were attributed to the weight of the head. These injuries occurred within a period of 2 weeks to 6 months post-operation. Additionally, four patients experienced shunt infections, with two cases resulting from gram-negative bacteria (*Escherichia coli, Pseudomonas, and Klebsiella*), while the cause of infection in one patient remained undetermined. Tragically, three patients passed away during the follow-up period, primarily due to shunt infections and sepsis.[10]

In developing and underdeveloped countries, the management of hydrocephalus is often accompanied by economic challenges, resulting in treatment delays. Recognizing the financial burdens, parents frequently find themselves

compelled to forgo essential medical care. Conversely, many patients experiencing pressure injuries have specific mental or physical conditions that restrict their mobility.[10]

Research on pediatric pressure injuries is notably insufficient in comparison to studies focusing on adults. Nevertheless, healthcare practitioners must account for the disparities in pressure injuries between adult and pediatric populations when treating children with complex medical conditions. Given the substantial anatomical and physiological distinctions between children and adults, findings derived from adult studies cannot be universally applied to pediatric patients.[6]

During the course of pediatric growth and development, there are rapid changes in body composition, which distinguish it from that of adults. Typically, toddlers have a higher proportion of fat and a lower proportion of muscle compared to adults. This results in their subcutaneous tissue being softer and more susceptible to deformation when subjected to similar forces.[8] Simultaneously, their skin is less flexible in comparison to that of adults.

The composition of adipose tissue changes significantly with age, despite the fact that the majority of it consists of fat stored in adipocytes. In newborns, approximately 35.5% of adipose tissue is composed of lipids, while 56.5% is water. In adults, the corresponding figures are 26.3% lipids and 71.7% water. As a result, fat tissue in babies and infants is inherently softer and more pliable.[13] During early development, there are also substantial changes in muscle composition. In infants and children, the endomysium (connective tissue within muscles) is thinner, making their relaxed skeletal muscles considerably softer than those of adults.[14] Toddlers and the elderly are more susceptible to mechanical stress and deformation due to their less flexible, non-extendable skin tissues. Age also influences the coefficient of friction in human skin. However, in the early years of life, it is so low that it doesn't seem to pose an additional biomechanical risk for the pediatric population.[15]

Moreover, the comorbidities present in medically complex individuals affect their body composition. In contrast to children with minimal functional impairment, those with significant functional limitations exhibit reduced lean body mass and higher percentages of body fat.[16] This, coupled with difficulties in head control and positioning arising from severe skull deformities and macrocephaly, puts hydrocephalus infants and children at constant risk of pressure injuries to the scalp.[10,17]

In our cases, the patients are entirely reliant on their parents for care. The occurrence of pressure injuries in the occipital region led parents to position the head in a sideways manner without alternating, resulting in pressure injuries in both the occipital and bilateral temporoparietal regions. The authors encountered several challenging issues when diagnosing these patients with pressure injuries alongside hydrocephalus.

First and foremost, it is crucial to take into account the anatomical location when assessing the type of tissue involved in the wound.[18,19] A Stage 3 pressure injury is defined in the staging system as full-thickness tissue loss. While subcutaneous fat may still be visible, the fascia should remain intact and cover any exposed bone, tendon, or muscle. Although slough may be present, it cannot obscure the extent of tissue loss. In some anatomical areas, like the occiput, subcutaneous tissue is virtually absent, making it impossible to diagnose Stage III pressure injuries in these areas.[19]

The second challenge involves healthcare providers who care for children with complex medical conditions needing to consider the distinct characteristics of pressure injuries in children when compared to adults. Children with hydrocephalus may encounter scalp injuries and experience alterations in their body composition. This can make the diagnosis of

stage III pressure injuries challenging, especially if subcutaneous tissue is absent. Malnutrition plays a significant role in promoting the development of pressure injuries.[12]

In our cases, the patients exhibited clinical signs of malnutrition based on upper arm circumference and hypoalbuminemia, both of which serve as indicators of surgical or ICU outcomes. Notably, albumin provides insights into the nutritional status over an extended period.[20] Another concern is the impact of sweating and excess moisture, both of which can contribute to skin breakdown. To address chronic wounds in children, surgeons are advised to adhere to the TIMERS guidelines, as they are another essential factor in the development of pressure injuries.[12]

The TIME guidelines outline a comprehensive framework for the management of wound bed preparation, providing healthcare professionals with a structured approach for treating chronic wounds. The TIME framework is further elaborated in Table 1, illustrating how clinical evaluation can be correlated with the underlying pathophysiology.

This framework is centered around four key components. "T" stands for Tissue, focusing on the assessment of non-viable or deficient tissue. "I" represents Infection or inflammation. "M" addresses issues related to Moisture imbalance, and "E" pertains to the evaluation of the wound's Edge, specifically whether it is non-advancing or undermined.

Table 1. TIME Principles [21]

Wound Bed Preparation				
Clinical Observations	**Proposed Pathophysiology**	**Wound Bed Preparation Clinical Actions**	**Effect of Wound Bed Preparation Actions**	**Clinical Outcome**
Tissue	Defective matrix and cell debris impair healing	Debridement (episodic or continuous), autolytic, sharp, surgical, enzymatic, mechanical or biological agents	Restoration of wound base and functional extracellular matrix proteins	Viable wound base
Infection or inflammation	High bacterial counts or prolonged inflammation. Increased inflammatory cytokines. Increased protease activity. Decreased growth factor activity	Remove infected foci. Topical or systemic antimicrobials, anti-inflammatories, protease inhibitors	Low bacterial counts or controlled inflammation. Decreased inflammatory cytokines. Decreased protease activity. Increased growth factor activity	Bacterial balance and reduced inflammation
Moisture imbalance	Desiccation slows epithelial cell migration. Excessive fluid causes maceration of the wound margin	Apply moisture-balancing dressings. Compression, negative pressure or other methods of removing fluid	Restored epithelial cell migration, desiccation avoided. Oedema, excessive fluid controlled, maceration avoided	Moisture balance
Edge of wound	Desiccation slows epithelial cell migration. Excessive fluid causes maceration of wound margin	Reassess cause or consider corrective therapies: debridement, skin grafts, biological agents, adjunctive therapies	Migrating keratinocytes and responsive wound cells. Restoration of appropriate protease profile	Advancing edge of wound

The "T" in TIME pertains to the external appearance of the wound bed and specifies the type of tissue that is present, which can include granulation, slough, epithelialization, or necrotic tissue.[21] All of these tissue types indicate challenges in the healing process, necessitating appropriate interventions. Various debridement techniques are available, with the most commonly used method in clinical practice being the use of different dressing materials to facilitate autolytic debridement.[21] It is crucial to regularly reassess the wound's condition and the chosen treatment as debridement progresses. However, in cases where the root cause of necrosis, such as insufficient blood supply, remains unaddressed, necrosis may reoccur. Many chronic wounds, including pressure ulcers, leg ulcers, or diabetic foot ulcers, may require periodic debridement.[21]

This aspect of the TIME guideline recognizes that wounds may contain non-viable or deficient tissues that impede the healing process due to an imperfect extracellular matrix and the presence of cell debris. Clinical intervention for this issue typically involves debridement, which can be either episodic or continuous. There are several methods for removing debris, including autolytic, sharp, surgical, enzymatic, mechanical, or biological debridement.

Surgical debridement is a procedure performed by surgeons that involves the removal of non-viable tissues, often requiring anesthesia. Sharp debridement, on the other hand, entails the use of scalpels or scissors to remove dead tissues. Autolytic debridement is the most commonly employed approach in clinical practice. It involves the use of a range of products that create local optimal conditions for the body's endogenous enzymes, such as matrix metalloproteinases (MMPs), to break down non-viable tissues. Maintaining a moist environment is crucial for autolytic debridement, and commonly used materials for this purpose include hydrogels and hydrocolloids, which provide fluid to the wound.

Enzymatic debridement involves the application of exogenous enzymes, such as streptokinase and streptodornase (available in the UK), to enhance enzymatic activity in the wound. These enzymes work to break down fibrin and fibrinogen. Bio-surgical debridement, on the other hand, employs sterile maggots or larvae to remove debris from the wound. The larvae of the greenbottle fly, Lucilia sericata, are commonly used for this purpose. They have several effects on the wound: (a) their movement helps loosen surface debris, (b) they secrete enzymes onto the wound's surface, which liquefy dead tissue, and (c) their secretions alter the wound's pH. The larvae remain in place on the wound for about three days and are then removed.

The TIME framework takes into account the influence of infection and inflammation on wounds and recommends the removal of infected areas because elevated bacterial counts or prolonged inflammation can lead to an increase in inflammatory cytokines, heightened protease activity, and a decrease in growth factor activity. Clinical intervention includes the removal of infected areas, as well as the application of topical and systemic antimicrobial agents and anti-inflammatories, in addition to the use of protease inhibitors.

For wounds experiencing moisture imbalances, which can result from either desiccation (slowing epithelial cell migration) or excessive fluid (causing wound maceration), the TIME guidelines recommend the utilization of moisture-retaining dressings, compression, negative pressure, or other methods to address fluid accumulation.

According to the TIME guideline, when the wound's edge does not progress as anticipated due to factors such as non-migrating keratinocytes, unresponsive wound cells, or abnormalities in the extracellular matrix or abnormal proteases,

clinical interventions such as debridement, skin grafting, biological agents, and adjunctive therapies should be considered.[21]

Most open wounds harbor a variety of bacterial species, but whether or not a wound becomes infected depends on the patient's response to these microbes. Patients' overall health, immune system, pharmacological treatments, nutritional status, and the presence of underlying medical conditions all play a role in determining their ability to combat bacterial intrusion. It's not always the case that the presence of bacteria in a wound leads to infection. Early detection of symptoms allows for the use of local topical treatments and can prevent the undesirable side effects often associated with systemic therapy. Following the principle of moist wound healing, maintaining the right balance of moisture is crucial. The formation of a dry scab can hinder the healing process and lead to less favorable outcomes because dehydrated tissues impede the movement of epithelial cells. The majority of wounds contain some level of exudate, which typically supports the healing of acute wounds. Chronic wound exudate tends to have a higher concentration of proteolytic enzymes than normal.[21]

One of the most difficult clinical challenges is managing exudate. Recognizing the causes of elevated fluid levels is crucial for clinicians because managing them is a practical concern. The proliferation of keratinocytes, fibroblasts, and endothelial cells can be slowed or prevented in chronic wounds when there is an excessive amount of fluid present. In order to improve clinical outcomes for patients, wound assessment and review as well as the establishment of reasonable and achievable goals are essential.[21]

It is obvious that the wound is not healing if epidermal cells are unable to migrate across the wound bed. This deficiency could be brought on by clinical infection, critical colonization, or non-responsive keratinocytes and fibroblasts. Excessive inflammatory response, increased proteolytic activity, or dehydration of the wound surface are other factors that could also delay epithelialization.[21]

Any practitioner can use TIME to evaluate wounds in clinical practice. The model's simplicity makes it adaptable for use in a variety of settings, which encourages clinicians to clearly and consistently record their assessments.[21]

The TIMERS framework (Tissue, Inflammation and/or Infection, Moisture, Epithelial, Repair and Regeneration, Social and Individual) is indispensable for surgeons when addressing chronic wounds.[22] A targeted approach to wound care prioritizes debridement, maintaining bacterial balance, and moisture management, with treatment strategies closely aligned with the root cause of the wound.

Hypoalbuminemia, which is a condition characterized by low levels of serum albumin, serves as an indicator for assessing long-term nutritional status, providing insights into an individual's nutritional status over an extended period. A previous study has suggested a link between having a serum albumin level below 3.3 g/dl and the development of pressure injuries. It has been demonstrated that the administration of albumin can significantly reduce the incidence of pressure injuries in ICU patients.[20]

Thirdly, the hot and humid climate in our region contributes to this issue. The combination of elevated temperatures and increased perspiration, along with additional moisture from wound exudate, can result in maceration and exacerbate skin deterioration. This, in turn, can prolong the development of pressure injuries.[17]

Implantation of a shunt in newborns and young children with hydrocephalus is a common and effective medical procedure. Hydrocephalus is a condition characterized by the accumulation of cerebrospinal fluid in the brain, leading to increased intracranial pressure. This can cause various symptoms

and complications, including head enlargement, developmental issues, and the risk of pressure ulcers.

The implantation process typically involves surgically placing a shunt system that includes a tube, valve, and reservoir. The valve regulates the flow of cerebrospinal fluid, and the tube directs it away from the brain. Shunt implantation can help manage intracranial pressure, prevent further brain damage, and improve the child's quality of life.

The study suggests that the most effective way to prevent pressure ulcers in newborns and young children with hydrocephalus is the timely implantation of a shunt. Shunt implantation is a vital and highly effective treatment for hydrocephalus, but it should be acknowledged that it does not directly act as a preventative measure for pressure ulcers. The prevention of pressure ulcers in children with hydrocephalus involves additional measures such as proper positioning, skincare, and addressing risk factors like malnutrition and immobility. Healthcare professionals caring for children with hydrocephalus should implement a comprehensive care plan that includes both shunt management and pressure ulcer prevention strategies.

The study's strength lies in its detailed examination of the difficulties and complications associated with pressure injuries in hydrocephalus patients, encompassing factors like wound location, alterations in body composition, and the impact of socioeconomic conditions in developing nations. The introduction of the TIMERS framework and the emphasis on clinical assessment and intervention guidelines offer practical guidance for healthcare providers in effectively managing pressure injuries. It highlights the intricacies and challenges of dealing with pressure injuries in pediatric hydrocephalus patients, although its limitations include a restricted scope for generalization due to the small sample size. Studies of pressure injury in hydrocephalus patient are very limited.

The novelty of this study is found in its thorough examination and the application of clinical guidelines to tackle this issue, providing valuable guidance for healthcare professionals confronting such cases. Overall, the study imparts valuable insights into the complexities of pressure injuries in hydrocephalus patients, but it could benefit from improved organization, enhanced clarity, and a more concise presentation of information. The study takes into consideration a variety of factors contributing to pressure injuries in pediatric hydrocephalus patients, encompassing differences in anatomy and physiology, changes in body composition, infection, inflammation, and nutritional status. This comprehensive approach offers a more holistic understanding of the problem.

CONCLUSION

Healthcare professionals caring for children with complex medical conditions need to take into account the distinct characteristics of pressure injuries in children, particularly in cases of hydrocephalus, as they can present challenges in the diagnostic process. Children with hydrocephalus might encounter scalp injuries and alterations in their body composition, which can complicate the identification of pressure injuries. Factors such as malnutrition, perspiration, and excessive moisture can individually or in combination contribute to skin breakdown. Furthermore, the prompt implementation of a shunt in newborns and young children with hydrocephalus is considered the most effective approach to prevent the occurrence of pressure ulcers. Additionally, surgeons are advised to adhere to the TIMERS guidelines when managing chronic wounds in pediatric patients.

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CONFLICT OF INTEREST

The authors declare no conflict of interest in this article.

FUNDING DISCLOSURE

This research has no financial interest or affiliation concerning material.

AUTHOR CONTRIBUTION

The cases in this paper are patients treated together between EBM and RAD. RAD and EBM conceptualized, proposed the main idea, supervised, and revised the final paper. LBK contributed with data acquiring, manuscript preparation writing, revising, and data analyzing. WU was responsible for content revision, AMAA played a role in data analysis, as well as content and grammar revision, and DT and KK were involved in content revision.

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A CASE REPORT: ENHANCING TARSAL AND MUSCULAR SUPPORT FOR ECTROPION CORRECTION IN TESSIER 3 AND 5 FACIAL CLEFT

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ABSTRACT

Introduction: Facial cleft is a rare and challenging craniofacial malformation with a low incidence ranging from 0.75 to 5.4 per 1000 common cleft. Due to the high variance in its occurrence, good techniques have not been established yet.

Case Illustration: In this case study, we present the medical history of a 45-year-old woman who previously underwent multiple surgeries for the reconstruction of her lower eyelid. The initial surgeries were performed to address a unilateral facial cleft classified as Tessier 3 and 5, utilizing ear cartilage grafts for the tarsal plate. However, she subsequently experienced complications, including ectropion, epiphora, and soft tissue deformities around her left eye. The goal of the current surgical intervention is to rectify the ectropion and enhance overall facial aesthetics for improved outcomes.

Discussion: The primary objectives of this surgical techniques are to enhance the tarsal support through the tarsal strip technique and to provide muscle support using the mid-face lifting technique. Additionally, we removed the scar and excess tissue from the lower lid to adjust the tarsal's proper length. These methods aim to address the ectropion and prevent its recurrence.

Conclusion: This combination of techniques can be a potential alternative for rectifying ectropion by reinforcing both tarsal and muscular support structures.

Highlights:

1. The oblique facial cleft is an uncommon and intricate craniofacial anomaly characterized by a low occurrence rate and significant variability.
2. The treatment is intricate and relies on the surgeon's expertise and discernment.
3. Utilizing a combination of Tarsal Strip and Midface Lifting techniques could serve as an alternative approach to address ectropion by enhancing both tarsal and muscular support.

INTRODUCTION

Facial cleft is a rare and challenging craniofacial malformation.[1] Its prevalence varies, ranging from 0.75 to 5.4 per 1000 cases of common clefts.[2] In 1976, Paul Tessier established a classification system for craniofacial malformations.[3] This system relies on direct anatomical observations derived from clinical examinations and surgical dissections. Malformations are assessed based on their association with either the lip and upper jaw system or the eyelid and orbital cavity system.[4]

Tessier number 3 cleft, referred to as the medial orbito-maxillary cleft, extends diagonally from the lacrimal groove, encircling the base of the nose and upper lip, resulting in a cleft lip. In severe instances, the frontal process and medial wall of the maxilla may be entirely absent.[3] In the case of Tessier Number 5, known as a lateral orbito-maxillary cleft, a gap initiates near the oral commissure on the upper lip, extending as a groove across the cheek before concluding at the junction of the middle and lateral thirds of the lower eyelid. Bone involvement typically encompasses an alveolar cleft in the premolar region, extending across the maxilla to the lateral side of the infraorbital nerve, reaching up to the infraorbital rim and orbital floor. This lack of formation results in a shortened distance between the oral commissure and the lower eyelid, with the medial cantus usually positioned normally, while the lateral canthus is generally dystrophic.[5]

The etiology of craniofacial clefts remains unclear, with the most plausible explanation emerging from developmental factors. The loss of essential elements in craniofacial bone formation leads to the failure of bone formation and fusion, resulting in a significant defect. Additionally, various genetic and environmental factors contribute to craniofacial development.[6]

Due to the rarity and variability in occurrence, coupled with the low incidence of these cases, the development of effective techniques has been hindered. Consequently, the selection of treatment approaches is highly individualized, presenting a complex and challenging task that heavily relies on the expertise and judgment of the surgeon.[4]

CASE ILLUSTRATION

A 45-year-old female patient visited our clinic reporting issues including ectropion, epiphora, and soft tissue deformities affecting her left eye. Her medical history revealed prior surgeries related to Tessier classifications 3 and 5 for a unilateral facial cleft, involving multiple attempts to reconstruct the lower lid through ear cartilage grafts for the tarsal plate. Upon physical examination, we observed an ectropion-like condition in her left eye, marked by a scar and residual graft tissue within the lower lid's middle third. Additionally, there was evident incompleteness in the tarsal plate, accompanied by flattened mid-cheeks, accentuating the tear-trough area and elongating the lid height, contributing to an older, fatigued appearance. The patient's diagnosis was established according to the Tessier classification of 1976.[3]

Figure 1. Pre-surgery picture of a patient with uncorrected Tessier 3 and 5 facial cleft with a moderate degree of ectropion on the left. [7]

In this particular case, the surgical intervention was focused on addressing the ectropion by reinforcing the tarsal support through the application of a tarsal strip technique. Simultaneously, a midface lifting technique was employed to provide muscle support.

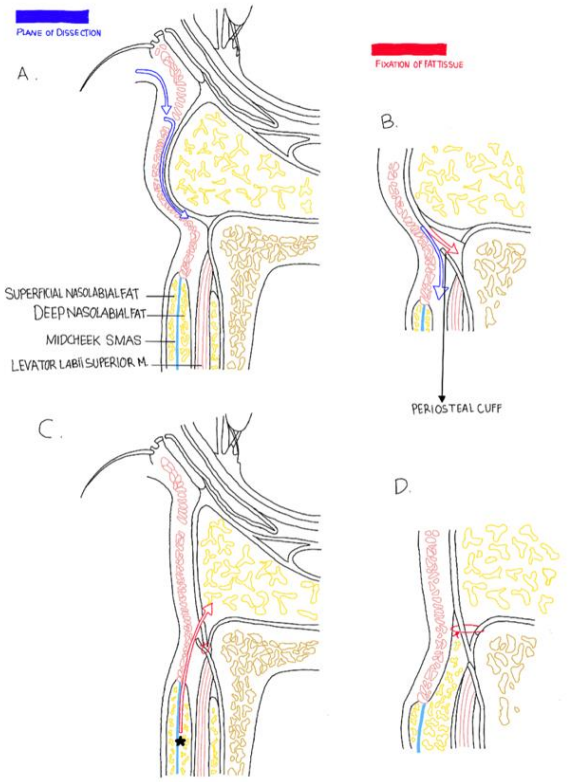

Figure 2. A, B, C, and D show a muscle flap dissection which was made onto the orbital rim then the orbital fat was transposed and placed under the periosteal cuff.[9]

For the midface lifting aspect, the author adopted a modified version of the fat preservation technique introduced by Mendelson in 2001[8], as outlined by Lee et al.[9] The surgical procedure was conducted under light sedation, complemented by a local anesthetic solution containing lidocaine and epinephrine in a 10:1 ratio. An infraciliary incision, executed with a number 15 blade in a bevelled fashion, was made to initiate the procedure. Initially, the skin and the orbicularis muscle flap were meticulously separated from the orbitalis septum along the preseptal space until the orbital rim was exposed. Subsequently, the premaxillary space was dissected, and a periosteal cuff was fashioned.

Upon completion of the dissection, the medial and central orbital fat were transposed and positioned beneath the periosteal cuff. This was followed by suturing them together using Polydioxanone (PDS II) 5-0. The next step involved separating the orbicularis muscle flap from the skin. The muscle flap was then pulled and advanced in a superolateral vector to elevate the midface area, providing the necessary muscle support. Finally, the flap was secured to the inner aspect of the lateral orbital rim with PDS II 5-0 sutures.

To ensure the proper length of the tarsal, we conducted a wedge resection to excise excess scar tissue and utilized a remaining cartilage graft to reconstruct the tarsus. The application of the tarsal strip technique, as derived from Anderson et al.[10] was employed to fortify the tarsal support. The technique involved a lateral canthotomy and cantolysis, achieved by making an incision on the outer corner of the eye and separating it from the surrounding tissue. Subsequently, the appropriate crus of the lateral canthal tendon was transected. Tarsal strips were then crafted from both the lower and upper lids. The eyelid was split into anterior and posterior lamellae, and the tarsal strip was fashioned from the posterior lamella. To prevent epithelial trapping, it was crucial to thoroughly clean the epithelium from the tarsal strip. Using scissors, an excess margin from the anterior lid and eyelash follicle was removed. The tarsal strip was then sutured to the periosteum at the lateral orbital wall, allowing for the adjustment of height and tension of the lateral cantus. Finally, the lower lid skin

was draped over the lower eyelid, excess skin was conservatively marked and excised, and the incision was closed with nylon 7-0 sutures.

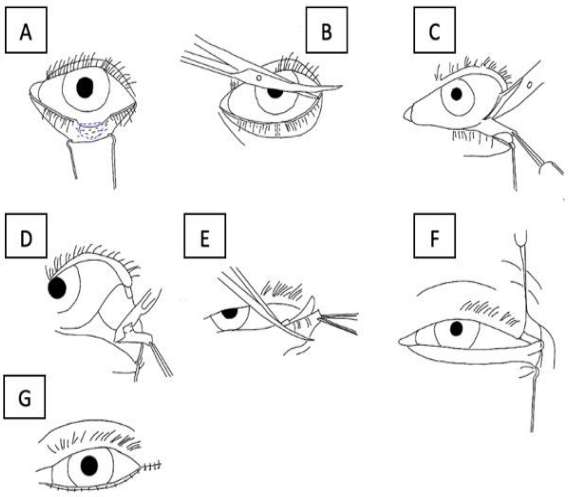

Figure 3. (A) Excised excess scar tissue with a wedge resection. (B) and (C) A lateral canthotomy and a lateral cantolysis were performed, then a lower lid was split into anterior and posterior lamellae, and the tarsal strip was fashioned from the posterior lamella. (D) and (E) Palpebra conjunctiva was shaved from the tarsal strip, then the Anterior lamella was excised. (F) and (G) Tarsal strips are sutured together to the periosteum at the lateral orbital wall.[7]

These approaches are intended to overcome the ectropion and prevent recurrency and give better facial aesthetic result. After seven days post-surgery (Figure 4A), the ectropion was successfully corrected with minimal swelling and bruising. All sutures were removed, and although there was a slight slant in the appearance of the eyes at this point, it was expected to return to normal over time, with no restrictions on normal activities. At the three-month mark following the surgery (Figure 4B), there were no indications of recurrent ectropion. The initial complaint about constant tearing had gradually improved to a normal condition, and overall aesthetic appearance was notably enhanced.

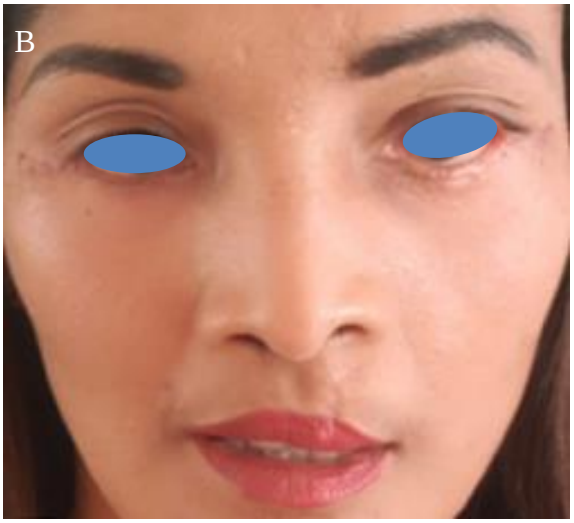

Figure 4. (A) 7 Days after surgery, (B) 3 months following surgery.

DISCUSSION

Craniofacial congenital clefts represent abnormalities affecting the cranium and face, characterized by defects along the anatomic lines of fusion. These malformations exert adverse effects on patients' lives, encompassing functional, psychosocial, and aesthetic aspects. Among orofacial anomalies, midline mandibular cleft stands out as one of the rarest conditions.[11-13]

The etiology of craniofacial clefts refers to the underlying causes or origins of these congenital anomalies, and as mentioned, it remains unclear. Craniofacial clefts are rare birth defects characterized by abnormal openings or gaps in the tissues of the head and face. The most common types involve the lip and/or the palate, and they can vary in severity. Several factors may contribute to the development of craniofacial clefts, but a precise understanding of the etiology is still elusive.

Genetic mutations passed down from parents to their children can play a role in craniofacial clefts. Some cases may be linked to specific genetic syndromes that affect facial development. Exposure to certain environmental factors during pregnancy, such as maternal smoking, alcohol consumption, nutritional deficiencies, or exposure to toxins, may increase the risk of craniofacial clefts. Teratogens are substances that can interfere with normal fetal development. Exposure to certain teratogens during pregnancy, such as drugs, alcohol, or infections, may increase the risk of craniofacial clefts. Interaction of Genetics and Environment are often considered that craniofacial clefts result from a complex interplay between genetic predisposition and environmental factors. Certain individuals may have a genetic susceptibility, and environmental influences during critical periods of development could contribute to the manifestation of clefts.Irregularities during the embryonic development of the face and skull can lead to cleft formation. Failures in the fusion of facial structures during early pregnancy can result in clefts.Problems with the blood supply to developing facial tissues may contribute to anomalies in craniofacial development.In some instances, the cause of craniofacial clefts remains unknown and is classified as idiopathic. These cases may involve a combination of genetic and environmental factors that are not yet fully understood.

Research in genetics, embryology, and molecular biology continues to shed light on the underlying causes of craniofacial clefts. Improved understanding of these factors may contribute to better preventive measures, early detection, and management strategies. Additionally, a multidisciplinary approach involving genetics counselors, surgeons, and other healthcare professionals is often necessary for comprehensive care in cases of craniofacial clefts.

In 1976, Tessier introduced an anatomical classification system for craniofacial clefts, categorizing them into 15 groups numbered from 0 to 14.[3,14,15] This classification encompasses clefts that either involve or do not involve the orbit, differentiating those in the middle parts of the face (clefts 0, 1, 2, and 14) and lateral parts of the face (cleft 7). The remaining nine clefts impact the orbit and periocular area, with clefts 3–6 described as southbound and clefts 8–13 as northbound. While an equivalent counterpart exists for almost every cleft at the top part of the orbit, each cleft is independently created.[15-19]

Tessier cleft number 5 remains difficult to classify. According to earlier publications, there's been documentation of a dual phenotypic manifestation related to cleft number 5.[20,21] The first form, considered the more severe presentation, involves maxillary medial dysplasia alongside a considerable soft tissue defect.[22] On the other hand, the second, milder form exhibits a vertical sclerodermic furrow along with a bony cleft located on the lateral aspect of the maxilla.[23,24] Tessier's initial publication noted this dual presentation in just one patient who had a bilateral facial cleft number 5.[3]

Racz, C. (2018)[25] identified the existence of two distinct variations within Tessier cleft number 5. Tessier's classification from 1976 delineated several

distinctive features that differentiate cleft number 5 from neighboring clefts (such as numbers 4 and 6). These distinctions encompass its position in relation to the infraorbital nerve (medial for cleft number 4 and lateral for cleft number 5), its location on the eyelid (medial third for cleft number 4 and lateral third for cleft number 5), its positioning on the alveolus (behind the lateral incisor for cleft number 4, behind the canine for cleft number 5, with no alveolar involvement for cleft number 6), its placement on the lip (lateral to the philtrum for cleft number 4, lateral third and on the oral commissure for cleft number 5), and its orbital rim involvement (present in cleft 5 but positioned more laterally on the zygomatic corpus for cleft number 6). Furthermore, an added complexity arises with the inclusion of cleft number 6 in Treacher Collins syndrome. Isolated cleft number 6 occurrences are infrequent and are typically classified as cleft number 5 according to Tessier's 1976 classification.[3,25]

Facial Tessier Cleft type 3, a form of craniofacial malformation, affects various structures including the vermilion border of the upper lip and the nasal wing, leading to the absence of an oral vestibule in this region. The cleft extends through the sidewall of the nose to the medial angle of the eye, medially in relation to the lower lacrimal point. This condition is accompanied by a fissure in the lower eyelid, downward dislocation of the medial angle of the eye, microphthalmia, hypertelorism, improperly formed nasopharyngeal tract, a cleft in the medial orbital wall, and a cleft in the hard palate and the maxillary alveolar process.[26]

The soft tissue characteristics of Tessier 3 cleft begin superiorly at the lacrimal portion of the lower eyelid, extend around the alar base within the naso-labial groove, and terminate inferiorly as a cleft lip. In Tessier 3 cleft, the tissue deficiency is situated along the medial cleft margin, leading to constriction of the nasal soft tissues. Conversely, there is tissue excess along the cheek on the lateral cleft margin. Tissue excess is present along the medial cleft margin, but the nose is correctly positioned. Excess tissue can be released from the skin next to the nose on the medial cleft margin. In the case of Tessier 3 cleft, the incision for the opening is placed within the supra-alar crease, and the triangle is designed using the skin excess along the lateral cleft margin. For Tessier 3 cleft, the initial incision is made within the supra-alar crease, and the triangular shape is crafted utilizing the surplus skin along the lateral margin of the cleft. [3,27]

The surgical treatment of these cases poses a significant challenge due to the rarity of these anomalies and the absence of established standard care guidelines.[28] Additionally, the traditional management approach entails intricate markings that can be challenging for surgeons to memorize, discouraging many from attempting the surgery. Surgeons also grapple with complexities such as determining the optimal age for surgical intervention and devising methods to minimize scarring in these cases.

Each uncommon craniofacial cleft is distinct and presents a unique set of challenges. The infrequency of the condition and the varied manifestations make the development of a universal diagnostic and treatment algorithm particularly difficult.[3,6] Several techniques have been suggested for managing craniofacial deformities.[29,30] The prevalent approach employed by surgeons to address Tessier craniofacial clefts is the use of local flaps.[4,31] However, the complexity of the malformations poses challenges in accurately marking flaps, and in some instances, this technique results in scarring that does not align with the natural folds of the anatomical unit.[32] The utilization of the tissue expansion technique emerges as a potentially more effective solution, offering tension-free reconstruction with tissue quality comparable to that of the

surrounding area.[33] Unfortunately, the availability of tissue expanders in Indonesia is constrained. As a result, we are proposing an alternative method that not only has the potential to yield superior results but also conceals scars within the natural contours of the face. This research focuses on employing a dual approach involving midface lifting and a tarsal strip technique as an innovative alternative for lower eyelid reconstruction. This unique combination of techniques represents a groundbreaking modality, never before utilized to address soft tissue issues in patients with facial clefts. Additionally, it offers the advantage of simplifying the intricate marking process for surgeons and enhancing overall surgical outcomes.

The main objective of the surgical procedure is to establish robust support for the lower eyelid by enhancing both muscle and tarsal support. This goal is achieved through the implementation of the midface lifting technique, which involves dissecting from the perceptual space to the premaxillary space, allowing the midface area to move when the muscle flap is pulled towards the superolateral vector, creating an anti-gravity effect. Consequently, this effect provides additional support to the orbicularis muscle.

In this particular case, the patient had undergone multiple surgeries, including the reconstruction of the tarsal plate using an ear cartilage graft, leading to the presence of scar tissue and remnants of the cartilage graft. To address this issue, a wedge excision technique was employed to remove the scar tissue, and the remaining graft was secured to the tarsal, effectively forming a unified plate. In the final step of the procedure, tension and strength were restored to the tarsal plate using a tarsal strip. This involved performing a lateral canthotomy and transecting the appropriate crus of the lateral canthal tendon. The height and tension of the lateral cantus were adjusted by suturing it to the periosteum at the lateral orbital wall.

The combination of these techniques complements each other, working synergistically to rectify ectropion by strengthening both the muscles and tarsal support. Although the long-term evaluation of ectropion recurrence remains unconfirmed, the results at the three-month follow-up were highly satisfactory. Where, the initial issue with constant tearing gradually improved to normal conditions, there are no signs of recurrent ectropion. Overall, there has been a significant improvement in aesthetic appearance.

The strength of this study lies in the innovative combination of the midface lifting and tarsal strip techniques as an alternative approach to reconstructing a lower eyelid in patients with a facial cleft. This study comprehensive overview of Tessier craniofacial clefts, encompassing various classifications and distinct features of different cleft types. It presents a detailed description of Tessier cleft number 5, highlighting the complexities and dual phenotypic presentations associated with this condition. Additionally, it delves into the specifics of Tessier cleft type 3, elucidating the tissue deficiencies and excesses along different cleft margins, offering insights into the surgical approach.

This novel combination has not been previously utilized for addressing soft tissue problems associated with facial clefts. The proposed technique offers potential advantages, particularly in simplifying the complex marking process and improving surgical outcomes. The midface lifting technique, involving dissection from the preseptal space to the premaxillary space, provides sturdy support to the lower eyelid by allowing the midface area to move anti-gravity when the muscle flap is pulled and advanced towards a superolateral vector. This not only addresses the primary goal of strengthening muscle and tarsal support but also offers an innovative anti-gravity effect, enhancing the overall effectiveness

of the procedure. The use of a tarsal strip further contributes to the restoration of tension and strength in the tarsal plate. The combination of techniques, including wedge excision to remove scar tissue and tie over the remnant cartilage graft to the tarsal, provides a comprehensive solution. The lateral canthotomy and adjustment of the lateral cantus height and tension contribute to the overall success of the procedure. the comprehensive exploration of rare craniofacial cleft types, providing a nuanced understanding of the unique characteristics and challenges associated with each. The discussion of Tessier cleft number 5 and the nuances of its distinct features, as well as the detailed soft tissue descriptions and surgical implications for Tessier cleft type 3, add depth to the understanding of these conditions. Furthermore, it acknowledges the absence of established standard care guidelines, emphasizing the complexity of managing these anomalies.

However, it is essential to acknowledge the limitations of the study. The long-term evaluation of ectropion recurrence remains uncertain, and the proposed technique's effectiveness may vary among different patients. Additionally, the study mentions the limited availability of tissue expanders in Indonesia, which prompted the exploration of alternative approaches. Continued research and long-term evaluations could further validate its effectiveness and broaden its applicability.

CONCLUSION

This combined technique shows promise in effectively reconstructing an ectropion eye, particularly within the context of this uncommon facial cleft condition, by enhancing both tarsal and muscular support. However, further evaluation is necessary to ascertain its effectiveness in preventing ectropion recurrence. The three-month follow-up detailed in this article demonstrates outstanding outcomes, leading to patient satisfaction.

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CONFLICT OF INTEREST

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AUTHOR CONTRIBUTION

The authors confirm contribution to the paper as follows: Study conception and Design: TA; Drafting of the article : HTH, AIG; Analysis and interpretation of results: HTH; Critical revision of the article for important intellectual content TA, HTH Final Approval: TA; Administrative, technical, or logistic support: AIG; Collection and Assembly of data: AIG. All authors reviewed the results and approved the final version of the manuscript.

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THE INFLUENCE OF CLEFT LIP AND PALATE SEVERITY ON SURGICAL OUTCOMES

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ABSTRACT

Introduction: An orofacial cleft is a congenital abnormality in which an abnormal opening or cleft of the lips and/or palate. There are three main types of orofacial clefts, specifically cleft lip (CL), cleft palate (CP), and cleft lip and palate (CLP). Data in 2017 showed that the most encountered characters are patients with cleft lip and palate. The distribution of the incidence of cleft lip and palate at Cleft Lip and Palate (CLP) Center Faculty of Medicine University of Muhammadiyah Malang was dominated by the complete unilateral type, which was 45.22%. Generally, the severity of cleft lip and/or palate is influenced by the severity of the preoperative cleft.
Methods: This study used a retrospective cohort design taken from 40 medical records at Cleft Lip and Palate (CLP) Center Faculty of Medicine University of Muhammadiyah Malang. The preoperative photo data were categorized according to the severity of the cleft, then postoperative photos were assessed according to the Visual Rating Chart (VRC) indicator.
Results: The intraclass correlation coefficient (ICC) reliability test between evaluators has a strength of > 0.8 on the outcome of lip and nose surgery and also > 0.9 on the outcome of the palate, indicating that there was no perception gap between evaluators. The Mann-Whitney non-parametric test had a significance of $p < 0.05$, indicating that there was a positive correlation between the severity of unilateral cleft lip and palate and the outcome of surgery.
Conclusion: There is a correlation between the severity of the unilateral cleft lip and palate and the surgical outcome.

Highlights:

1. The severity of unilateral CLP was assessed by categorizing preoperative photo data based on the severity of the cleft, and this severity was then correlated with the surgical outcomes.
2. The research identified a positive correlation between the severity of unilateral cleft lip and palate and the outcomes of surgery.
3. This connection is associated with the way wounds heal, where the width of the gap and the precise tension of sutures are pivotal factors influencing surgical outcomes.

INTRODUCTION

An orofacial cleft is a congenital abnormality resulting in an abnormal opening or cleft of the lips and/or palate. Asia has been reported to have the highest number of cleft lip incidences along with the most severe deformities.[1] Cleft lip and palate malformations remain the most prevalent congenital abnormalities, presenting significant challenges for Indonesia's healthcare system.[2] The annual incidence comprises 7,500 individuals born with cleft lip malformation and/or accompanied by a new palate.[3] Analysis of data from the Cleft Lip and Palate (CLP) Center at the Faculty of Medicine, University of Muhammadiyah Malang, reveals that the distribution of cleft lip and palate cases is predominantly the complete unilateral type, accounting for 45.22%, followed by the incomplete unilateral cleft at 18.41%.[4]

Assessment of surgical outcomes, based on severity, is imperative to provide feedback to the medical team, minimizing the occurrence of complications that may impact oral function, aesthetic appearance, nutritional intake, and speech development. Cleft lip and palate severity is categorized into two classifications: mild and severe. The evaluation employs a measurement of the ratio between cleft width and normal nostril width, objectively determined through the nostril width ratio (NWR) method, introduced by Campbell et al.[5,6] Mild severity is indicated by a cleft width ratio of less than 2, while the severe category encompasses a cleft width ratio exceeding 2.[5] Post-surgery, the severity assessment outcome for unilateral cleft lip and palate is divided into three assessments: lip, nose, and palate outcomes.[7] These are respectively categorized as good, moderate, and poor outcomes based on the visual rating chart. The good category shows almost no visible cleft and fistula so they do not require re-surgery. The moderate category shows cleft asymmetry and fistula formation requiring minor reconstructive procedures. The poor category is described in the form of visible asymmetry and significant gap formation so neds a requires corrective surgery.

METHODS

Study Design

This study employs an observational analytic approach using a retrospective cohort method, utilizing medical record photos from the Cleft Lip and Palate (CLP) Center of the Medical Faculty at the University of Muhammadiyah Malang, Malang Indonesia. The study's sample comprises patients with unilateral cleft lip and palate who underwent surgery at the CLP Center of the Faculty of Medicine, University of Muhammadiyah Malang, during the period of 2019-2020. The study encompasses a cohort of 40 patients, all of whom underwent surgical interventions using a single fixed technique and under the care of a designated operator. The study protocol was approved by the Health Research Ethics Committee University of Muhammadiyah Malang to conduct this study (No.E.5a/264/KEPK-UMM/XII/2021.

Preoperative Assessment

Preoperative cleft severity was graded utilizing the Unilateral Cleft Lip and Palate Severity Index. This assessment tool is based on defined guidelines that evaluate the overall appearance of the primary deformity and separates patients into 2 categories according to the progressive degree of lip and nose involvement (Figure 1).

The "complete cleft lip" category represents a condition where there is a total cleft in the lip, characterized by a nostril width ratio (NWR) of less than 2. This deformity is further characterized by a short hemicolumella, deviation of the columella and tip, posterior displacement of the alar base, and a slumping of the lower lateral cartilage. On the other hand, the "severe complete cleft lip" category describes a more severe form of a

complete cleft lip, with an NWR greater than 2, indicating that the width of the cleft side nostril is more than twice that of the noncleft side. In this case, there is a substantial gap between the medial and lateral elements, allowing for easy passage of the tongue or an endotracheal tube. This condition is accompanied by a significant nasal deformity where the alar is completely spread across the cleft, often resulting in a complete distortion of the normal alar curvature. The determination of the NWR can be observed in Figure 2.[5]

Figure 1. Unilateral Cleft Lip and Palate Severity Index[5]

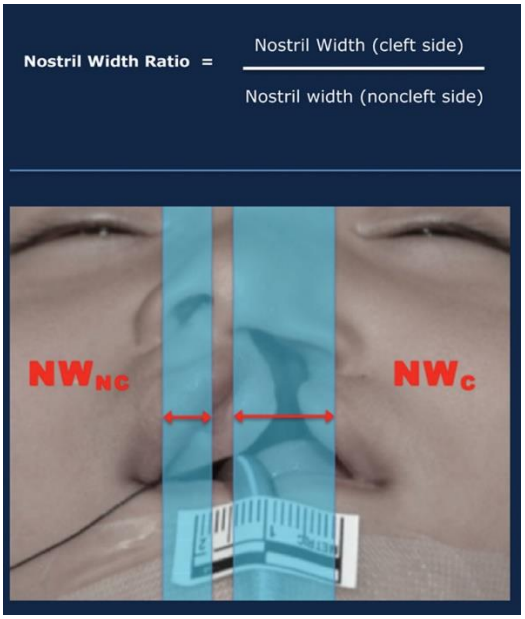


Figure 2. Calculation of Nostril Width Ratio (NWR)[5]

Praoperative Assessment

An illustrative depiction of each distinct outcome was created, accompanied by a succinct textual description, resulting in the formulation of the Visual Rating Chart (VRC) (Figure 3). To simplify, the researchers categorized values 1 and 2 as "good" outcomes, value 3 as "moderate," and values 4 and 5 as "poor," indicating the need for additional surgical procedures. The assessment of surgical outcomes for unilateral cleft lip and palate cases took place at least 6 months after the surgery, involving a clinical examination. Acknowledging the subjectivity in outcome assessment, the researchers involved a panel of five evaluators to minimize potential bias, ensuring a thorough evaluation of the 40 photographic samples. (Figure 4).

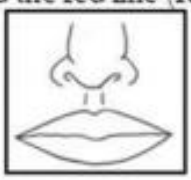
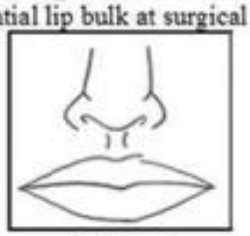
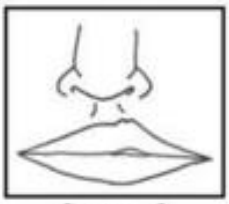
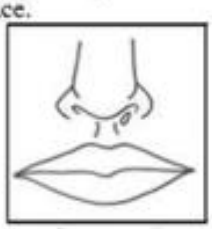
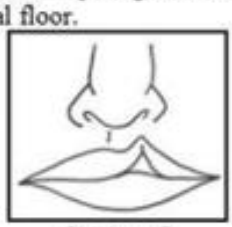
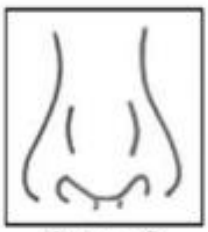
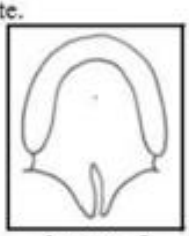
LIP REPAIRS	NASAL REPAIRS	PALATAL REPAIRS
L I - Lip is continuous in bulk, no notching at both vermilion borders i.e the white roll (WR) and the red line (RL).  Score = 1	**N I** - Nostril is not flared, alar base symmetrically positioned and restoration of alar dome.  Score = 1	**P I** - Complete palatal closure with a well formed 'U' shaped uvula.  Score = 1
L II - Malalignment of WR, and/or differential lip bulk at surgical site.  Score = 2	**N II** - Nostril not flared, dome restored, alar base asymmetry.  Score = 2	**P II** - Complete palatal closure with clefting, disfigurement or shrinkage of the uvula.  Score = 2
L III - Lip notched at either or both borders (i.e. WR and RL) without exposure of underlying teeth or gingiva.  Score = 3	**N III** - Nostril not flared, dome not restored, ± alar base asymmetry.  Score = 3	**P III** – An isolated hard palatal dehiscence between the incisive foramen and vibrating line.  Score = 3
L IV – Isolated lip/nasal floor dehiscence.  Score = 4	**N IV** – Nostril is flared.  Score = 4	**P IV** - An isolated hard palatal dehiscence anterior to the incisive foramen.  Score = 4
L V – Notching of lip involving at least 1/3 of lip length but not up to the nasal floor.  Score = 5	**N V** - Shortened columella  Score = 5	**P V** – Dehiscence involving the soft palate.  Score = 5

Figure 3. The Visual Rating Chart - A Diagrammatic Description of the Outcome of Cleft Lip and Palate Repairs[7]

No	Pre Operative	Post Operative of lip and Nose	Post Operative of Palate
1	 Mild	 - Lip: Good - Nose: Good	 Good
2	 Severe	 - Lip: Moderate - Nose: Poor	 Poor
3	 Severe	 - Lip: Poor - Nose: Moderate	 Moderate

Figure 4. Postoperative Photographs Assessed by All Evaluator

Statistical Analysis

The data analysis for this study involved two phases of reliability testing between assessors and a chi-square correlation test. In cases where the chi-square correlation test did not meet the criteria, it was followed by the Mann-Whitney non-parametric test. The ICC Test was used to assess reliability, aiming to reduce the inherent subjectivity in the evaluation of cleft lip and palate repair outcomes conducted by researchers and evaluators.

RESULTS

In this study, the labioplasty procedure utilized the Noordhoff surgical technique, while the palatoplasty procedure employed the Von Langenbeck technique. When analyzing data collected between 2019 and 2020 from a sample size of 40 cases, it became apparent that the assessment of the severity of unilateral cleft lip and palate was primarily concentrated in the severe category. This severe category accounted for 22 cases, representing 55% of the total, in contrast to the mild category,

which consisted of 18 cases, amounting to 45% of the cases under investigation (Table 1).

Table 1. Distribution of Unilateral Cleft Lip and Palate Preoperative

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Mild	18	45.0	45.0	45.0
	Severe	22	55.0	55.0	100.0
	Total	**40**	**100.0**	**100.0**	

In the assessment of individuals with unilateral cleft lip and palate, the data reflects varying outcomes across three key categories: lip, nose, and palate. Regarding lip outcomes, the majority of subjects, comprising 65.5% of cases, were categorized in the "good" category, indicating favorable results. A significant proportion, at 22.5%, fell into the "moderate" category, suggesting acceptable outcomes. The "poor" category had the lowest representation at 15%, indicating that a smaller number of individuals had less favorable lip outcomes. Moving on to the assessment of the nose, the data demonstrates that the "good" category was still the most frequent, with 42.5% of cases falling within this favorable outcome range. The "moderate" category accounted for 37.5% of cases, reflecting moderately positive results. The "poor" category, though less common, was represented by 20% of cases, signifying individuals with less favorable nose outcomes.

Finally, the palate assessment exhibited the highest frequency in the "moderate" category, encompassing 50% of cases. This suggests that a significant portion of individuals had satisfactory palate outcomes. The "good" category accounted for 32.5% of cases, indicating positive results, while the "poor" category was the least common, with 17.5% of cases showing less favorable palate outcomes.

The data reveals that "good" outcomes were predominant in both lip and nose assessments, while the "moderate" category was most prevalent in palate assessment. "Poor" outcomes were the least common across all three categories, underscoring a generally favorable trend in the assessment of individuals with unilateral cleft lip and palate (Table 2).

Table 2. Characteristic Outcome of Unilateral Cleft Lip and Palate

Indicator / Outcome	Mild	Valid Percent	Mode-rate	Valid Percent	Poor	Valid Percent
Lip	25	62.5	9	22.5	6	15.0
Nose	17	42.5	15	37.5	8	20.0
Palate	13	32.5	20	50	7	17.5

The inter-rater reliability among assessors was assessed using the ICC reliability tests (Table 3). The significance of lip and nose assessments yielded values >0.8, signifying a robust and highly significant agreement among evaluators. The significance of palate assessment displayed values >0.9, indicating an almost perfect agreement among evaluators.

The initial step involved conducting a Chi-square correlation test to investigate the connection between the severity level of unilateral cleft lip and palate and the outcomes of surgical procedures. Since the expected count values were greater than 20%, the analysis was continued with the use of the non-parametric Mann-Whitney test. The Mann-Whitney test revealed that the $p<0.05$ for each surgical outcome, indicated a notable association between the severity of unilateral cleft lip and palate and the results of the surgical procedures, as shown in Table 4. The Mann-Whitney non-parametric test shows the value of each of the results of the operation is $p < 0.05$ which means there is a significant relationship between the severity of unilateral cleft lip and palate and the outcome of surgery (Table 5).

Table 3. The Result of Intraclass Correlation Coefficient

		Intraclass Correlation	95% Confidence Interval Lower Bound	Upper Bound	F Test with True Value 0 Value	df1	df2	Sig
Lip	Single Measures	.502	.359	.651	6.032	39	160	.000
	Average Measures	.834	.737	.903	6.032	39	160	.000
Nose	Single Measures	.545	.404	.687	6.980	39	156	.000
	Average Measures	.857	.772	.917	6.980	39	156	.000
Palate	Single Measures	.666	.541	.781	10.974	39	156	.000
	Average Measures	.909	.855	.947	10.974	39	156	.000

Table 4. The Crosstabs of Chi Square Test

			Lip			Nose			Palate		
			Good	Moderate	Poor	Good	Moderate	Poor	Good	Moderate	Poor
Severity	Mild	Frequency	16	0	2	11	6	1	11	6	1
		Expected Count	11.3	4.1	2.7	7.7	6.8	3.6	5.9	9.0	3.2
	Severe	Frequency	9	9	4	6	9	7	2	14	6
		Expected Count	13.8	5.0	3.3	9.4	8.3	4.4	7.2	11	3.9

Table 5. The Result of the Mann-Whitney Test

Test Statistics			
	Lip	Nose	Palate
Mann-Whitney U	112.000	114.500	84.000
Wilcoxon W	283.000	285.500	255.000
Z	-2.715	-2.444	-3.390
Asymp. Sig. (2-tailed)	.007	.015	.001
Exact Sig. [2*(1-tailed Sig.)]	.019	.022	.001

DISCUSSION

A range of studies from various Asian countries, including the Palestinian Territories (35 births with CLP (1.01/1,000 live births))[8], Thailand (784 patients with CL/CP (59.8%)), Singapore (16.72% per 10,000 live births)[9], China (1.4 OFCs per 1000 live births)[10], Pakistan (1574 instances of CLP)[11], India (0.73 per 1,000 and 0.10 per 1,000 respectively)[12,13], and Nepal (220 orofacial clefts)[14], provide insights into the prevalence of cleft lip and palate (CLP) in different populations. In these studies, the incidence of CLP varies, with some showing a higher prevalence in males and different types of CLP, such as CL/CP, CPO, and CL.[15] For instance, Indonesia also faces a significant incidence of CLP, with 1,596 recorded cases.[16] These findings highlight the importance of understanding and addressing CLP in diverse populations.

The results of this study showed that the incidence of cleft lip and palate unilateral weight category is more dominant than the mild category. This study is relevant to several studies in Asia that the incidence of cleft lip and palate complete more often found.[6] Many factors can contribute, one of which is the genetic factor of the TGF Gene and the Msx1 Gene.[17] Moreover, familial genetic evidence suggests an augmented likelihood of severity in siblings of individuals with cleft lip.[18]

In developed nations, most scientists hold the belief that cleft lip and palate (CLP) cases result from a combination of genetic and environmental factors, which include maternal illnesses, medication use, and malnutrition. In these countries, CLP is

typically detected prior to birth through ultrasonography. This early identification provides an opportunity for educating parents about potential causes and necessary post-birth procedures. Timely and age-appropriate treatment is essential for individuals with orofacial cleft deformities to ensure both functional and aesthetic well-being. The treatment process is intricate and demands a multidisciplinary and interdisciplinary approach. The occurrence of clefts in the lip and/or palate takes place in a critical orofacial region, typically before birth, rendering it a complex congenital deformity.[19,20]

The utilization of the ICC reliability test, involving a panel of five evaluators who meticulously examined 40 photographs, effectively curtailed subjectivity in evaluating surgical outcomes. This underscores the efficacy of the visual rating chart (VRC) introduced by Adeola and Oladimeji (2015) as a robust standard for assessing surgical results. This standardized VRC approach holds promise in furnishing patients with comprehensive information regarding treatment strategies and the management of primary and secondary enhancements.[7]

Labioplasty surgical outcomes at mild severity resulted in the output of good category surgery results that are very dominant, but there is an even distribution related to severe severity. Research by Abidin et al. (2015) revealed that it can occur as a result of the surgeon in charge being very experienced and skilled in handling cases of unilateral cleft lip. The study also revealed that mild cases will give better results.[21] Skillful operator selection and technique implementation contributed to favorable outcomes, with the Noordhoff technique proving effective in restoring function, symmetry, and aesthetic.[22]

Remarkably, the outcomes of lip surgery surpassed those of nose surgery in terms of percentages. This phenomenon is common in both unilateral and bilateral cleft lip and palate cases, attributed to the transverse nasal muscle's incomplete insertion into the anterior nasal spine, which leads to medial alar cartilage dislocation and skin insertion posterior to the nasal ala due to columella length discrepancies.[23] Another study also explained that the results of the asymmetrical rhinoplasty are often associated with the width of the gap in both unilateral and bilateral cases although lip and nose surgery is performed at one time, so secondary rhinoplasty-related repairs are more recommended after facial growth has been completed to avoid scarring that affects the aesthetic and long-term adverse prognostic.[24]

Palatoplasty surgery outcomes demonstrated significant strength. This means that at mild severity it will produce better surgical output than at severe severity. Notably, the outcomes of palatoplasty exhibited a pronounced significance, suggesting that mild severity cases yielded superior surgical outcomes in contrast to severe severity cases. This aligns with research by Rossell-Perry et al. (2014), highlighting the link between cleft palate severity and palate fistula incidence.[25] The significance between severity and surgical outcomes on the palate frequently hinges on gap width, surgeon proficiency, appropriate procedure selection, and surgical technique. The von Langenbeck technique, employed in this study, is recognized for its simplicity and avoidance of palate lengthening attempts. Notably, modifications have been made to preserve the major Palatine vascular pedicle, thereby curbing scar formation that could impede facial growth and contribute to velopharyngeal incompetence.[24]

The study's limitations include a retrospective design with potential biases, focusing on a single center, a two-year analysis timeframe, subjectivity in outcome assessment, reliance on a single operator and technique, absence of adjustments for confounding variables, limited follow-up

duration, and scope limitations due to excluding speech development and patient satisfaction. These aspects call for careful interpretation, emphasizing potential gaps and the need for broader research.

The study boasts several notable strengths. This study lies in its approach to evaluating the relationship between cleft severity and surgical outcomes in a comprehensive manner, covering lip, nose, and palate categories using standardized techniques. This approach contributes to a deeper understanding of the factors that influence surgical success in cleft lip and palate patients. This study employed standardized surgical techniques, encompassing Noordhoff and Von Langenbeck procedures, ensuring uniform treatment approaches. The inclusion of a substantial sample of 40 patients undergoing unilateral cleft lip and palate surgery enhances the study's robustness. Comprehensive outcome evaluation across lip, nose, and palate categories provides a holistic perspective on surgical results. Furthermore, the clinical relevance of addressing the pertinent issue of cleft lip and palate repairs, coupled with the exploration of the relationship between severity and surgical outcomes, amplifies the study's practical implications. These combined strengths collectively bolster the study's credibility, potential for yielding valuable insights, and relevance within the realm of cleft lip and palate surgeries. The unique aspect of this study lies in its comprehensive evaluation of surgical outcomes for cleft lip and palate (CLP) patients, particularly those with unilateral cleft lip and palate. It differentiates itself from other studies by exploring the relationship between the severity of the cleft and the surgical results, covering lip, nose, and palate categories. This comprehensive approach allows for a more holistic understanding of the outcomes.

CONCLUSION

The conclusion of this study has a significance value of $p < 0.05$ with the non-parametric Mann-Whitney test. This study shows that there is a positive correlation between the severity of the unilateral cleft lip and palate to the output of surgery results. This correlation is rooted in the intricate dynamics of wound healing, influenced by intrinsic factors. Notably, a broader gap width is associated with a deteriorating prognostic trajectory of surgical outcomes. The meticulous tension applied to sutures is a key determinant, intricately intertwined with the wound healing process and tissue oxygenation. Oxygenation is the most important factor that can affect the wound healing process, where oxygenation is related to vascularization. Disruption to the wound healing process carries implications that reverberate through the outcome of surgical Interventions.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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This study received no external funding.

AUTHOR CONTRIBUTION

RRA contributed to the study conception and design, analysis, and interpretation of the data, drafting of the article, critical revision of the article for important intellectual content, and final approval of the article. NKZ contributed to research concepts, statistical analysis, data

collection, and administrative, technical, or logistic support. BS contributed to the research concept, statistical analysis, and data collection. JS and BSN designed the research and contributed to critical revision of the article for important intellectual content. All authors approved the manuscript submission.

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A META-ANALYSIS: THE UTILIZATION OF NEGATIVE PRESSURE WOUND THERAPY IN DIABETIC FOOT ULCERS

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ABSTRACT

Introduction: Diabetes mellitus has a global prevalence and significant consequence known as diabetic foot ulcers. Negative pressure wound therapy (NPWT) is a modern therapeutic strategy for managing diabetic foot ulcers. The primary objective of this study is to assess the efficacy and safety by doing a thorough literature review and performing a meta-analysis.
Methods: The search platforms chosen for this study were PubMed, Embase, and Cochrane Library databases with years of publication between 2013 and 2022. The analysis was conducted using the software RevMan 5.4 and R statistical software.
Results: In the present investigation, a total of 291 articles were first subjected to screening. The analysis ultimately included nine relevant literatures after the screening process. The selected literature encompassed a collective sample size of 890 patients. The random effect model used in the analysis revealed a statistically significant discrepancy in the healing rate that had negative pressure wound therapy (NPWT) intervention with the healing rate analysis shows OR 0.77 [0.65, 0.90] p=0.0, and other outcome analysis shows no statistically significant result, adverse event incident OR 0.01 CI [0.00 to 0.04), *p* =0.23, and amputation rate was OR 0.01 CI [0.00 to 0.02] p = 0.81.
Conclusions: This research has provided evidence of the effectiveness of negative pressure wound therapy (NPWT) as a potential approach for accelerating the wound healing process. However, when utilizing this innovative approach, it is imperative to guarantee meticulous regulation and modification of the negative pressure value to mitigate any potential risk of bleeding in the wound.

Highlights :

1. Diabetes mellitus has a global prevalence of more than 500 million individuals, and it is associated with a significant consequence known as diabetic foot ulcers (DFUs).
2. Diabetic foot is a commonly observed complication of diabetes mellitus, characterized by the development of non-healing ulcers, which can have a substantial negative impact on the overall well-being of those affected.
3. Negative pressure wound therapy (NPWT) effectively eliminates necrotic tissue and wound secretions, stimulates the production of granulation tissue, mitigates bacterial infection, and expedites the process of wound healing.

INTRODUCTION

Diabetes mellitus has a global prevalence of more than 500 million individuals. In the year 2019, diabetes was the primary reason for 1.5 million fatalities, and 48% of all diabetes-related deaths took place prior to individuals reaching the age of 70 years. It is associated with a significant consequence known as diabetic foot ulcers or DFUs. DFUs exhibit a significant degree of chronicity and morbidity, frequently presenting with complications such as infections that can progress to osteomyelitis and necessitate amputations. Comorbidities are associated with a decline in immune function and the ability to repair wounds.[1,2]

The five-year survival rate for amputations connected to diabetes is 40%, which exceeds the mortality rate observed in numerous cancer cases. Diabetic foot is a prevalent complication of diabetes mellitus that arises from elevated blood glucose levels. This condition manifests as peripheral nerve and vascular impairments, leading to dry and irritated skin on the foot. Ultimately, this can progress to the formation of non-healing ulcers, significantly diminishing the quality of life for affected individuals. The application of novel medical treatments has resulted in the progressive incorporation of diverse approaches in wound therapy, driven by the fundamental principles of biochemistry and cytohistology.[3–9]

Negative pressure wound therapy (NPWT) is a therapeutic technique that can be utilized to manage superficial wounds and promote the removal of exudate from deep wounds. The intervention can efficiently remove necrotic tissue and wound fluids, promote granulation tissue formation, reduce bacterial infection, and accelerate the wound healing process.[10] Negative Pressure Wound Therapy (NPWT) is a mechanical device consisting of a tube connected to a suction apparatus. The present technique induces a sub-atmospheric pressure gradient between the site of injury and the surrounding environment, thereby promoting the elimination of exudate and accelerating the wound-healing process.[11]

The previous case report has investigated NPWT successfully as a wound healing treatment for diabetic foot. Negative Pressure Wound Therapy (NPWT) has proven to be a highly effective treatment for improving skin survival and accelerating wound healing across various wound types. NPWT's mechanisms are diverse, with a biological role that includes macro-deformation, micro-deformation, fluid removal, wound contraction promotion, and the creation of a warm, moist, and enclosed wound environment. It also supports angiogenesis, granulation tissue growth, and inhibits bacterial growth These advantages result in reduced dressing change frequency, minimized wound exposure, lower infection risk, optimal conditions for subsequent skin transplantation, and an increased success rate for skin graft procedures.[12]

The author intends to conduct a systematic review and meta-analysis to further explore aspects related to wound healing rate, the rate of amputations, and the occurrence of adverse events following the application of NPWT for diabetic foot ulcers.

METHODS

The search platforms chosen for this investigation were Embase, Pubmed, and the Cochrane Library databases. The search keywords utilized were "negative pressure wound therapy" OR "vacuum-assisted closure therapy," OR "diabetes" OR "diabetic foot," OR "chronic wound" OR "morbidity" OR "Quality-adjusted life year."

The inclusion criteria in the study were as follows: (a) The study employed a randomized controlled trial (RCT) design, with a publication period spanning from 2013 to 2022. (b) The participants were diagnosed with DF. (c) The study was conducted and reported in the English language. (d) The patient had a medical procedure known as negative pressure

debridement, which is also commonly referred to as vacuum negative pressure therapy. (e) The study assessed many indicators, including wound healing rate, incidence of adverse responses, and amputation rate. The criteria for exclusion were as follows: (a) Studies conducted in languages other than English. (b) Studies with a sample size of less than 10 participants. (c) Foot trauma not caused by diabetes. (d) Studies that do not include outcome measures or have incomplete data.

The researchers conducted a systematic search of databases, resulting in the identification of relevant publications that were subsequently compiled by two scholars. Duplicate articles were eliminated, and an initial screening phase involved the assessment of titles and abstracts of the publications. Subsequently, a more thorough review of the complete texts was performed, and the papers were categorized based on predetermined criteria for inclusion or exclusion. In cases where the researchers did not reach a consensus during the screening phase, an impartial third party was consulted to assist in resolving any disagreements. The dataset comprised a wide range of parameters obtained through extensive text analysis, including factors such as authorship, publication date, the number of patients who received the intervention, gender distribution, levels of glycosylated hemoglobin, duration of the intervention, age, body mass index (BMI), location and size of the ulcers, and the duration of follow-up. The data underwent a transformation process to make it more suitable for subsequent synthesis. For instance, metrics that were initially expressed as a proportion of the entire body of literature were converted into specific patient counts.

The synthesis was conducted using RevMan version 5.4 and R statistical software. The statistical measures employed for reporting continuous variables were the weighted mean difference (WMD) and the 95% confidence interval (CI). Binary variables, on the other hand, were reported using the odds ratio (OR) and the 95% CI. The statistical data was displayed using a forest plot, with a significance level of α=0.05. The examination of literature heterogeneity was conducted using I2 analysis and Q calibration. The heterogeneity in the data was indicated by an I^2 value greater than 25% or a significant P value. The random effects model analysis was employed when heterogeneity was seen among studies.

On the other hand, in situations where there was an absence of heterogeneity. In order to address the potential presence of variability in the literature, a sensitivity analysis was performed utilizing the exclusion strategy. This involved carefully excluding each study one by one.

RESULTS

The current study encompassed an initial assessment of 291 publications and subsequently underwent a sequence of procedures, which included confirming duplication, conducting primary screening, and re-screening. Ultimately, seven papers were deemed suitable for inclusion in the research, with a combined sample size of 890 participants. The screening process is visually represented in Figure 1.

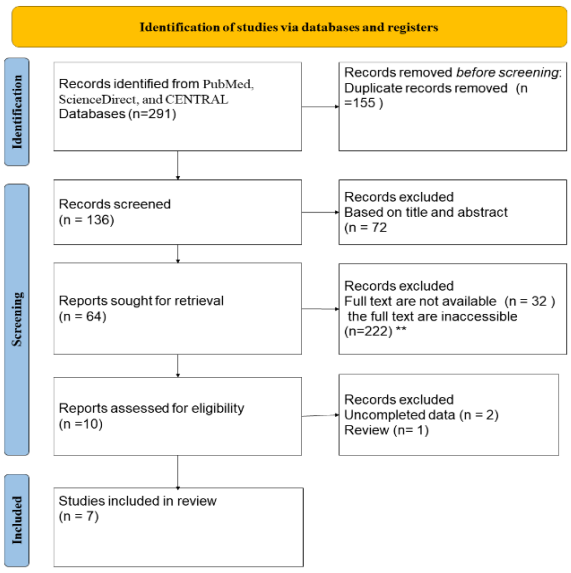

Figure 1. PRISMA Flow Chart

The critical characteristics of the seven randomized controlled trials (RCTs) in this study are succinctly summarized in Table 1. The participants' age span ranged from 50 to 69 years. The duration of the interventions varied from one week to 56 days. Furthermore, the observation period's duration exhibited variability, with a minimum of two weeks and a maximum of six months. The tabulated data can be found in Table 1.

Table 1. Characteristics of Study

Author and Year of Publication	Country	Population	Type and Duration of Intervention	Follow Up Time
Borys et al. (2018)[13]	Poland	75	NPWT and 9 days	Six months
Chiang et al.[14] (2017)	New Zealand	22	NPWT and 14 days	Six months
James et al. (2019)[15]	India	54	NPWT and N/A	N/A
Lone et al. (2014)[16]	India	56	NPWT and 8 weeks	Two months
Seidel et al. (2020)[17]	Germany	345	NPWT and 16 weeks	Six months
Vaidhya et al. (2015)[18]	India	60	Eight days	N/A
Sajid et al (2015)[19]	Pakistan	278	NPWT and 1 week	2 weeks

*N/A : Not Available

Table 1 conducted in various countries, offer valuable insights into the application of Negative Pressure Wound Therapy (NPWT) for the treatment of diabetic foot ulcers. Notably, these studies exhibit diversity in the duration of NPWT intervention and the follow-up periods, contributing to a comprehensive understanding of its effectiveness across different populations and settings.

This study focused on the investigation of a meta-analysis conducted in multiple nations. Two of the studies took place in Europe, with one conducted in Poland and the other in Germany. Three research investigations were carried out in India, while one study was performed in Pakistan, and an additional study was undertaken in New Zealand. The main treatment intervention applied to the participants in this study was Negative Pressure Wound Treatment (NPWT). In each of the research studies, the control group received standard wound care, which included regular topical dressing, traditional wound dressing, and SWMC.

Wound Healing Rate

After completing a comprehensive review of the available literature, it was discovered that four studies have provided data on the markers of wound healing rate displayed by the participants. The existing body of research provides evidence of statistical heterogeneity, as evidenced by an odds ratio (OR) of 0.77 95% (CI) [0.65, 0.90], p=0.01, and an I^2 value of 73%, which means the result shows the statistically significant of NPWT treatment for DFUs. The results suggest that the patient had a positive impact on wound healing after the utilization of NPWT.

Incidence of Adverse Events

Two investigations have successfully identified the variables that exhibit associations with the incidence rate of adverse patient events. The conducted studies did not exhibit substantial statistical heterogeneity, as indicated by an I^2 value of 0% and a P-value of 0.23. The results obtained from the comprehensive analysis using a random effect model (odds ratio [OR] = 0.01, 95% [CI]: 0.00 to 0.04), p=0.23. The result shows no statistical significance of NPWT in reducing incident adverse events.

Amputation Rate

To gather data on patient amputation rates, a set of four studies was conducted. The analysis revealed no statistically significant heterogeneity among the studies included in the research. The findings indicate that there is no statistically significant reduction in the amputation rate with the use of NPWT (Odds Ratio [OR] = 0.01, 95% Confidence Interval [CI]: 0.00 to 0.02, p = 0.81).

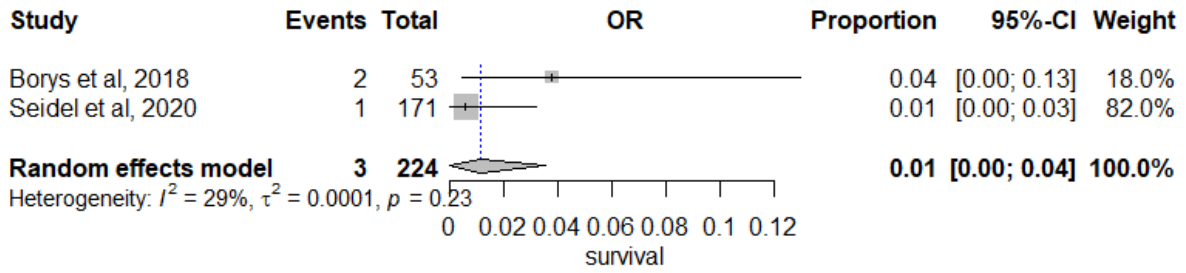

Figure 2. Adverse Event After Intervention

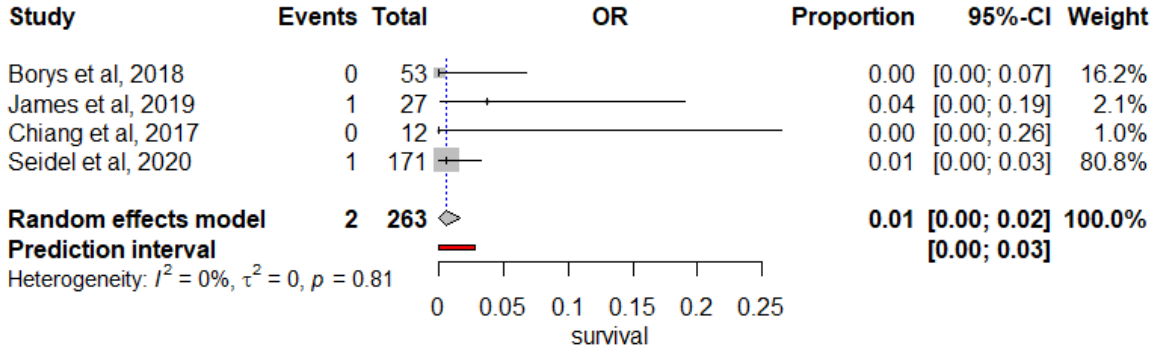

Figure 3. Amputation of Extremities

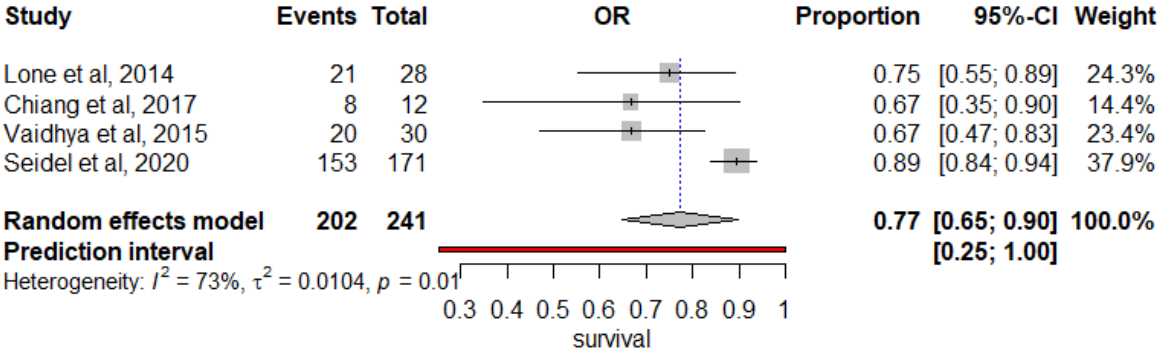

Figure 4. Wound Healing Rate

DISCUSSION

A diabetic foot ulcer (DFU) stands as a prevalent complication stemming from inadequately managed diabetes mellitus. Diabetic foot ulcers impact millions of people globally annually, leading to heightened risks of amputation and mortality. The societal consequences of diabetic foot problems are substantial, affecting individuals with disabilities, leading to hospital admissions, and incurring substantial healthcare expenses.

While, The psychological impact of diabetic foot issues can be profound. It often results in emotional distress, anxiety, and depression for individuals dealing with these complications. The fear of amputation, pain, and the challenges of managing the condition can take a toll on a person's mental well-being. Additionally, the lifestyle changes required to manage diabetic foot problems, such as restricted mobility and potential dependency on others for care, can lead to feelings of frustration and a reduced

quality of life. The psychological impact of diabetic foot issues should not be underestimated, and addressing the emotional well-being of individuals is an important aspect of their overall care. Although substantial endeavors have been made, the quest for an efficient remedy to facilitate DFU healing continues to be a prominent clinical challenge, representing a significant issue within the realm of chronic wound management.[20–23]

In patients diagnosed with diabetes, elevated blood glucose levels give rise to atypical cell proliferation, impairment of vascular endothelial cells, alterations in the micro-environment, and an inflammatory reaction within the peripheral nerves and blood vessels. Several factors are crucial in the complex healing process of diabetic foot ulcers (DFU). [24, 20]

The primary approaches for treating diabetic foot ulcers involve surgical removal of damaged tissue, alleviating pressure on weight-bearing areas, addressing lower extremity ischemia and foot infections, and promptly referring patients to multidisciplinary care, constituting the initial treatment protocols.[20]

Diabetic Foot Ulcer (DFU) is considered one of the most concerning complications of type 2 diabetes mellitus. DFU is a condition affecting the feet of diabetic individuals and is characterized by sensory, motor, autonomic neuropathy, as well as macrovascular and microvascular issues. Several factors contribute to the development of DFU, including elevated blood sugar levels, neuropathy, joint limitations, and deformities. The diagnostic process for DFU typically starts with a medical history, which includes details about previous ulcers, amputations, injuries, and the patient's diabetes history. Physical examination involves assessing vascular health, neurological and musculoskeletal function, as well as evaluating the presence of any infections. Effective management of DFU often requires a multidisciplinary approach.[25]

Diabetic foot ulcers are a prevalent and perilous manifestation of diabetes, arising from a combination of causes, including repetitive stress, inadequate glucose management, and neuropathy. Associated immunological deficits are known to result in the swift development of deep-tissue infections via the formation of skin ulcers. The diagnostic process encompasses clinical assessment, culture and sensitivity testing, radiography, and imaging techniques. The comprehensive management of diabetic foot ulcers (DFU) encompasses many interventions, such as antibiotic therapy, surgical debridement, meticulous wound care, and metabolic optimization.[26,27]

Muscle flaps are commonly used to reconstruct infected wounds due to their ability to enhance vascular perfusion and fill empty spaces. However, The utilization of muscle flaps to address large diabetic foot ulcers (DFUs) presents challenges in individuals with limited blood circulation in their lower limbs.[28] Complications of diabetic foot ulcer commonly connected with muscle flaps include hematoma formation, wound dehiscence, flap loss seroma development, fat necrosis, scarring, and delayed healing, rendering them less preferable in specific scenarios.[29] The conventional method for managing foot wounds often entails the utilization of moist-to-dry dressings and the implementation of skin grafts. Nevertheless, This method has certain disadvantages, including a prolonged healing period, an elevated risk of infections, heightened levels of discomfort, and difficulties in promoting the optimal formation of granulation tissue when tendons, bones, or implants are exposed.[30] Certain surgeons may opt for extracting extensor tendons and employ methods such as negative pressure wound therapy (NPWT) or moist dressings to facilitate the formation of granulation tissue, which might result in enduring impairment and deformation of the foot.[30,31]

Negative pressure wound therapy (NPWT) is a therapeutic approach that utilizes differential internal and exterior pressures to promote the removal of deeply buried necrotic tissue and wound fluids. This strategy has been shown to successfully reduce the occurrence of wound infection and promote a favorable moist wound environment, hence facilitating wound healing.[32] However, the signs presented regarding the repercussions of this phenomenon in clinical practice demonstrate a significant degree of variability.[33]

In the previous study, it was stated that Negative Pressure Wound Therapy (NPWT) outperforms traditional methods in the treatment of diabetic foot ulcers. NPWT not only reduces the time to rehospitalization but also lowers the risk of amputation or surgical removal of the diabetic foot. Despite the higher costs associated with NPWT, the approach proves to be cost-effective. It is essential to emphasize the importance of employing proper therapy techniques and selecting patients judiciously.[34]

Another study provided an explanation that NPWT has brought about a significant transformation in the management of challenging and persistent wounds. It also serves as an adjunct therapy for preparing wounds before surgical procedures like skin grafts and flap surgery, contributing to improved wound healing rates. This chapter provides a comprehensive overview of the NPWT device's composition, mechanism of action, application techniques, advantages, suitable use cases, restrictions, potential side effects, and innovative developments.[35]

However, it's important to note that while NPWT is a valuable tool for wound healing, it may pose challenges in treating wounds with inadequate tissue oxygenation, such as diabetic foot ulcers. NPWT can reduce tissue oxygenation in wound areas due to the external compression applied by the foam and tubing. The foot, being particularly sensitive to ischemia, and considering that diabetes often coincides with atherosclerosis, caution is necessary when applying NPWT to diabetic foot ulcers to minimize compression pressure.[35]

The result of this study shows the positive impact of NPWT as a promising intervention to promote the healing rate for chronic wounds such as diabetic foot ulcers with (OR) of 0.77 95% (CI) [0.65, 0.90], p=0.01. This result was supported by research from Liu et al.[36] who conducted a meta-analysis that identified 11 randomized controlled trials (RCTs) and included 1044 patients. Moreover, a significant proportion of these articles exhibited a deficiency in giving full explanations of the randomized techniques and processes. Specifically, only three studies included specific information addressing allocation concealment. The present study included nine randomized controlled trial (RCT) articles published within the past decade, which specifically examined the application of negative pressure wound therapy (NPWT).[37] In the realm of wound care, conventional methodologies have involved the implementation of various dressings to facilitate and accelerate the wound healing process. However, it is imperative to recognize that these dressings tend to adhere to the wound's scab, perhaps causing harm to the formation of granulation tissue during dressing replacement. Consequently, there exists a potential for impeding the overall progress of wound healing. Numerous studies have provided evidence supporting the efficacy of Negative Pressure Wound Therapy (NPWT) in enhancing the wound microenvironment, modulating microvascular hemodynamics, mitigating wound infections, and facilitating the regeneration of endothelial cells.[38] The findings of this meta-analysis revealed that the most commonly seen adverse effects during treatment were wound edema, bleeding, pain, and infection.

The results of this study suggest that the utilization of NPWT did not lead to a

greater prevalence of unfavorable consequences. However, it is imperative to highlight that no statistically significant difference was seen between the two treatment regimens. The current study did not incorporate a statistical analysis of the negative pressure value employed in the Negative Pressure Wound Therapy (NPWT) approach. Numerous studies have provided evidence regarding the importance of maintaining a negative pressure range of 50-200 mmHg to manage excessive bleeding and effectively promote optimal wound healing. Moreover, accurate identification and management of infections in cases of diabetic foot infection, along with the administration of suitable antibiotic therapy, are of utmost importance.[39] It is critical to prioritize the optimization of blood glucose levels as a key factor in improving wound healing and reducing the harmful effects on cellular immunity, thereby lowering susceptibility to infections.[40]

The study provides detailed information on the challenges and complications associated with DFUs, the diagnostic process, and various treatment methods, with a specific focus on NPWT. The study the need for further research, particularly in exploring the impact of NPWT on gene expression in diabetic patients, which can be considered a novel area of investigation. The article hints at a novel aspect by suggesting that NPWT may impact gene expression in individuals with diabetes. This potential influence on gene expression could open up new avenues for research into the underlying mechanisms of NPWT in wound healing. Future research could delve into optimizing the application of NPWT in terms of negative pressure levels. Future research could explore whether tailoring NPWT parameters to individual patient characteristics could enhance its effectiveness and to explore emerging or innovative therapeutic approaches for diabetic foot ulcers.

The limited number of studies to analyze has a possible impact on this meta-analysis's result, resulting in a potential bias. In order to conduct a thorough analysis of the effectiveness of Negative Pressure Wound Therapy (NPWT), additional samples are necessary. Additionally, a recent study has shown evidence that negative pressure wound therapy (NPWT) can impact gene expression alterations in persons diagnosed with diabetes. This discovery implies that exploring the influence of NPWT on gene expression holds potential as a fruitful area of investigation for future research within the discipline. Further research is needed to confirm this finding.

CONCLUSION

This meta-analysis aims to assess the effectiveness and safety of negative pressure wound therapy (NPWT) in managing diabetic foot ulcers (DFUs). The result of our analysis shows that NPWT has a significant effect on the healing rate. These findings of our study indicate that the application of NPWT is a viable strategy for expediting the process of wound healing in diabetic foot ulcers. NPWT can be a promising intervention for patients with diabetic foot ulcers to reduce morbidity. Nevertheless, it is imperative to meticulously manage and adjust the negative pressure value to mitigate any potential risk of bleeding in the wound. To confirm these findings, further research is needed.

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CONFLICT OF INTEREST

The authors assert that there are no conflicts of interest about the publishing of this study.

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None.

AUTHOR CONTRIBUTION

NPGRS and IPKM designed the study. The manuscript was originally composed by the authors NPGRS and IPKM. Moreover, the author conducted a thorough examination and provided their endorsement for the definitive iteration of the document.

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CURRENT ROLE OF SOCIAL MEDIA IN AESTHETIC PLASTIC SURGERY: WHY PLASTIC SURGEONS MUST TAKE CONCERN?

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ABSTRACT

Introduction: In the medical field, particularly in areas like plastic aesthetic surgery and cosmetology, social media has emerged as a convenient and interactive means of educating and promoting the services of doctors, hospitals, and institutions. However, there remains a pressing need for further research to thoroughly understand the influence of social media on plastic surgery procedures. This study aims to review the literature on the current facets of social media that impact patients' decision-making in aesthetic plastic surgery.
Methods: Database PubMed was used for the search terms: "plastic surgery," aesthetic, and "social media". Publication time ranges were set from 2019 until 2023. Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) were used to help arrange this literature review.
Result: Thirteen records were included in this study. The studies uniformly emphasize the effectiveness of social media as a communication tool between doctors and patients or social media users. Popular platforms like Facebook, Instagram, Snapchat, and Twitter are widely used, varying based on factors like country, age, and gender. These platforms enable the global spread of education and information about plastic aesthetic surgery, effectively reaching a diverse audience.
Conclusion : Social media serves as a platform for disseminating educational content, promoting professional work, engaging with the wider public community, and facilitating patient-doctor interactions in the decision-making process for plastic aesthetic surgery. Additionally, it plays a role in influencing patients' preferences regarding specific aesthetic plastic surgery procedures.

Highlights:

1. This study shows that in the era of society 5.0, digital technology has played a major role in doctor-patient communication in the medical field, especially in plastic aesthetic surgery.
2. Only a few plastic surgeons comprehend this digital transformation. It is hoped that this study will help plastic surgeons better understand and adapt to social media.

INTRODUCTION

The past two decades have witnessed a profound shift towards a technologically advanced society, driven by the technological revolution. Concurrently, social media platforms have experienced a rapid surge in popularity.[1] Social media is defined as a digital medium facilitating the creation and dissemination of information within virtual networks and communities.[2] Merriam-Webster characterizes social media as electronic communication forms

wherein individuals establish online communities to share information, ideas, personal messages, and other content.[3] The widespread presence of social media networks positions them as effective tools for connecting with patients. Initially conceived for communication across distances, social media has evolved into a crucial instrument for enterprises and businesses, offering an accessible avenue for outreach, promotion, and development.[4] As in the medical area, social media now provides a simple, communicative ways of educating and even promoting the work of a doctor, hospital, or institution, especially in plastic aesthetic surgery and other cosmetology topics.

At first glance, social media is beneficial for plastic aesthetic surgeons. However, it must be remembered that the social media content that users read is not necessarily scientific truth. Furthermore, the topic of aesthetic plastic aesthetic surgery can be done by non-plastic surgeons. Nevertheless, the user cannot distinguish the truth. Further studies regarding the impact or influence of social media on plastic surgery procedures are critically needed for plastic surgeons to adapt and determine future attitudes toward social media.

METHODS

A digital search were conducted on September 16, 2023 using Database PubMed. The following search terms: "plastic surgery", aesthetic, "social media" were applied. Since this research focuses on collecting the latest literature, a time range was set from 2019 until 2023. Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) were used to assist the arrangement of this literature review. Literature includes review and systematic review articles explaining the impact or influence of social media in plastic aesthetic surgery decision-making by patients who are, in this case, social media users. Figure 1 below shows the PRISMA flowchart.

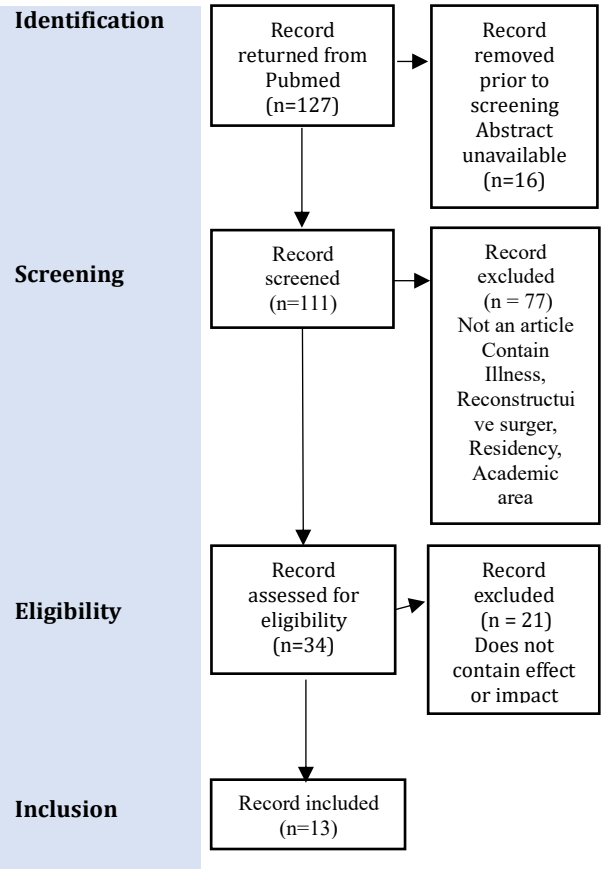

Figure 1. PRISMA flowchart in this study

RESULT

The Pubmed search yielded 127 records. After using PISMA flowchart, 13 records were chosen in this study. These articles were taken from 13 jounals, which are Aesthetic Surgery Journal Open Forum (n=3), Public Library of Science ONE (n=1), Plastic Reconstructive Surgery Global Open (n=3), Cureus (n=1), European Journal of Plastic Surgery (n=2), Indian Journal Plastic Surgery (n=2), Clinical Cosmetic and Investigational Dermatology (n=1). Table 1 below shows the summary of the included records.

Table 1. Records Included in This Study

Author	Title	Journal	Study type	Summary
Shauly, 2023[4]	The New Era of Marketing in Plastic Surgery: A Systematic	Aesthetic Surgery Journal	Review article	Delivering the correct content and using the right platform are both important in a cosmetic surgeon's social media marketing strategy. In

	Review and Algorithm of Social Media and Digital Marketing	Open Forum		addition, the age of the target demographic has a major impact on selecting appropriate material and a medium. Taken as a whole, social media marketing has the potential to attract new patients, inform existing ones, and expand a business's reach.
Nischwitz, 2021[5]	Analysis of social media use by European plastic surgery societies: A missing link for #PlasticSurgery.	PLoS One.	Retrospective analysis	The ever-increasing popularity of social media platforms demonstrates their essential role as modern information highways. Through their online communities, plastic surgeons and their professional associations may raise awareness about the benefits of relying on scientific data when making clinical decisions. The findings demonstrate that (a) polypresent PSS have more social media coverage than present PSS, as assessed by the number of Facebook followers as the most pervasive social media platform, and (b) there is no significant difference between the two groups' engagement across platforms. Therefore, we think having a social media presence is a great first step in expanding your audience. ASPS exhibited greater numbers compared to EURAPS, supporting the necessity for a social media task group to address education and patient safety in Europe. The quantitative facts supplied provide as reasonable basis for subsequent study. For European PSS, social media remain a mysterious technology whose full potential has yet to be realized.
Janik PE, 2019[6]	Internet and Social Media as a Source of Information About Plastic Surgery: Comparison Between Public and Private Sector, A 2-center Study.	Plast Reconstr Surg Glob Open.	Cohort study	Our research shows that people still trust recommendations from friends and family above other sources when looking for information on cosmetic surgery. Aesthetic plastic surgeons may be able to attract more patients by effectively using social media to reach and engage with their target demographic. Today's internet users expect businesses to have a strong online presence, and private practice cosmetic surgeons are no exception.
Alghonaim, 2019[7]	Social Media Impact on Aesthetic Procedures Among Females in Riyadh, Saudi Arabia.	Cureus	Cross sectional study	Women in Riyadh, Saudi Arabia, utilize Instagram more than any other social media site to get insight about cosmetic surgery options. Furthermore, the usage of face filters on social media has led to an increase in the number of cosmetic treatments being done. Finally, we propose that doctors set up professional and scientific social media profiles in order to give full and reliable information regarding cosmetic treatments.
AlBahlal, 2023[8]	The Effect and Implication of Social Media Platforms on Plastic Cosmetic Surgery: A Cross-sectional Study in Saudi Arabia From 2021 to 2022.	Aesthet Surg J Open Forum.	Cross sectional study	Based on the results of the research, it seems that Snapchat is the most influential social media site in terms of encouraging people to seek cosmetic treatment. This calls for further research on the effects of social media among cosmetic surgeons.
Mortada, 2023[9]	Use and Influence of Social Media on the Private Practice of Plastic Surgeons in Saudi Arabia.	Plast Reconstr Surg Glob Open.	Cross sectional study	While opinions on the use of social media within the profession of plastic surgery vary, there is no denying its increasing importance. There is a disparity in the usage of social media amongst disciplines. Private hospital and cosmetic surgeons are more likely than others to embrace social media and use it professionally.
Salinas CA, 2022[10]	Who is talking about #Facelift on Instagram?	Eur J Plast Surg.	Retrospective analysis	Over the last several years, we've seen a rise in plastic surgeons using Instagram to promote their most popular facelift procedures. In 2021, however, non-doctors and non-plastic surgeons created the vast majority of Instagram posts on the surgical technique #facelift.

Panse NS, 2017[11]	Advocacy and mass education in plastic surgery: Efforts and outcomes.	Indian J Plast Surg.	Expert opinion	To effectively advocate for cosmetic surgery and educate our patients, our team has to work together in a focused, long-term way.
Gupta, 2020[12]	An Updated Review of Plastic Surgery-Related Hashtag Utilization on Instagram: Implications for Education and Marketing.	Aesthet Surg J Open Forum.	Retrospective analysis	ABPS and RCPSC board-certified plastic surgeons continue to be underrepresented amongst individuals sharing top plastic surgery-related material on Instagram. The upper posts were mostly utilized for advertising rather than teaching. Patients who utilize social media to discover a possible provider assume risks related to their safety and the outcomes of their surgery due to the high proportion of non-board certified physicians posting. Board-certified surgeons should make an effort to increase their online visibility since social media is and will remain an integral part of the cosmetic surgery industry.
Thakurani S, 2021[13]	Evolution of aesthetic surgery in India, current practice scenario, and anticipated post-COVID-19 changes: a survey-based analysis.	Eur J Plast Surg.	Case control studies	In addition to its obvious potential in the business and academic worlds, social media also has enormous potential as a means of entertainment and relaxation. The role of teleconsultations needs to be reprised and legalised. Webinars and virtual conferences will find more takers future.
Pearlman, 2022[14]	Factors Associated with Likelihood to Undergo Cosmetic Surgical Procedures Among Young Adults in the United States: A Narrative Review.	Clin Cosmet Investig Dermatol.	Retrospective analysis	Teens and twenty-somethings in the United States are increasingly considering cosmetic surgery. This group is poised to become an essential one to reach out to in the field of cosmetic surgery, both now and in the future.
Al Qurashi, 2022[15]	Influential Factors for Selecting a Plastic Surgeon: A National Survey in Saudi Arabia.	Plast Reconstr Surg Glob Open.	Cross-sectional study	According to the results of this survey, patients primarily consider the surgeon's credentials when deciding on a cosmetic surgeon. Attracting patients requires present and prospective Saudi Arabian aesthetic surgeons to have high levels of training and education. In addition, the evidence was unmistakable that patients are more comfortable with a surgeon who has received worldwide board certification. Thus, visiting overseas to world-renowned institutes to develop surgical abilities is encouraged.
Rudy, 2021[16]	Mining the Twittersphere: Insights about Public Interest in Facial Reanimation Surgery from a Decade of Twitter Data.	Indian J Plast Surg.	Retrospective analysis	Public interest in face reanimation surgery is being driven, in part, by the rising number of tweets discussing facial paralysis.

All of the studies mentioned above agreed that social media is an effective communication tool between doctors and patients/social media users. The most popular platform used varies by country, age, and gender, but Facebook, Instagram, Snapchat, and Twitter are at the top. Using these platforms, education or doctor's work on plastic aesthetic surgery can be spread globally, so that more people will be aware of it and, eventually, consider having it done by the plastic surgeon they have seen on social media. A study by Gupta, 2020 indicated that Board-certified plastic surgeons are still underrepresented among those who post top plastic surgery-related content on Instagram. Moreover, remember that a non-plastic surgeon can create content about plastic aesthetic procedures, as demonstrated in a 2022 study by Salinas CA.

Social media, particularly Instagram, has emerged as a significant source of information for aesthetic procedures, wielding substantial influence among females in Riyadh, Saudi Arabia. The utilization of facial filters on social media platforms has notably contributed to a discernible upsurge in the prevalence of aesthetic procedures, underscoring the platform's impact on beauty standards and cosmetic trends.

To ensure the dissemination of comprehensive and reliable information about cosmetic procedures, it is recommended that physicians establish professional and scientific social media accounts. This proactive approach aims to

enhance the quality of information available on these platforms, fostering a more informed and discerning audience.

Individuals swayed by social media platforms, with Snapchat standing out prominently, demonstrate a heightened interest in seeking cosmetic treatment. This observation emphasizes the need for further studies to delve into the nuanced impact of different social media platforms among plastic surgeons and their potential patients.

While plastic surgeons hold divergent views on social media, there is a unanimous acknowledgment of its escalating role within the field. The adoption and perception of social media, however, differ across various practice types, with surgeons in private hospitals and those specializing in aesthetic surgery expressing a more positive inclination toward integrating social media into their professional practices.

An observable trend among plastic surgeons is the active creation of content related to facelift procedures on Instagram. Intriguingly, a substantial portion of content under the hashtag #facelift in 2021 originated from non-physicians and non-plastic surgeons, highlighting the diverse content contributors on this visual platform.

Efforts toward promoting advocacy for plastic surgery and educating patients require dedicated and sustained collaboration. Notably, board-certified plastic surgeons find themselves underrepresented in top plastic surgery-related content on Instagram, with a majority of posts leaning towards self-promotion rather than educational endeavors.

Looking ahead, the narrative anticipates an increasing interest in cosmetic surgical procedures among young adults in the United States. It also advocates for the reassessment and legalization of teleconsultations, foreseeing a rise in the popularity of webinars and virtual conferences within the field of plastic surgery.

Surgeon qualifications emerge as a pivotal factor influencing the choice of a cosmetic surgeon, with an international board certification being notably preferred. The suggestion to travel abroad to esteemed institutions for skill enhancement reflects a commitment to maintaining high standards in the field.

In the realm of social media discussions, the escalating discourse on facial paralysis on Twitter is noted to correlate with heightened publications and surgeon engagement on facial reanimation surgery. This intersection of online conversations and medical discourse underscores the evolving dynamics between digital platforms and public interest in specific surgical domains.

DISCUSSION

Social media networks encompass various platforms like Facebook, Twitter, YouTube, Instagram, Pinterest, and Snapchat. These platforms boast staggering user bases, with Facebook is the most frequently utilized network, created in 2004 with 1.86 billion monthly users or approximately one-fourth of the world population. There are almost 1.3 billion people who use YouTube, a video-sharing platform launched in 2005. The photo-sharing app Instagram, which launched in 2010, has 600 million active users every single month. Twitter, a microblogging network that has been around since 2006, has 313 million active users per month throughout the world. Pinterest, a photo-sharing website that emphasizes collection postings, was launched in 2010 and has now amassed 150 million members. There are about 150 million daily users of Snapchat, a picture and video sharing platform launched in 2011.[17]

Statista reports that, the average daily social media usage for global internet users has seen a consistent rise, escalating from 90 minutes per day in 2012 to 147 minutes per day in 2022.[18] The usage patterns of social media platforms differ among various age groups and genders. Initially catering to college students, Facebook's user base has expanded to include an older demographic. Millennials, born between 1981 and 1996,

tend to favor Snapchat and Instagram, while the baby-boomer generation, born between 1946 and 1964, shows a preference for Facebook.[19] Among Twitter users aged 15 to 17, there's an equal split between genders, whereas among adult users, males outnumber females.[17] In contrast to platforms like Instagram, Pinterest, Facebook, and Snapchat, which have a predominantly female user base, YouTube's user demographic skews towards males, constituting 62% of its users.[20]

Shauly et al.'s systematic review revealed that the utilization of social media enables plastic surgeons to enhance not only their advertising efficiency but also their ability to educate, disseminate research, and effectively engage with patients.[4] Conversely, patients find it more convenient to connect with a plastic surgeon that aligns with their requirements, allowing for easier inquiries and questions prior to any engagement. This aspect was explored in greater detail through the examination of the impact of social media marketing on plastic surgery using an electronic database. The criteria for inclusion and exclusion were satisfied by a collection of 16 articles identified from PubMed.[4] These articles revealed that the utilization of social media empowers plastic surgeons not just for streamlined advertising but also for enhanced educational efforts, effective dissemination of research, and improved engagement with patients.[21] On the other hand, patients have increased ease in finding a plastic surgeon that suits their requirements, facilitating more straightforward inquiries and the ability to ask questions in advance.

Social media plays a multifaceted role in influencing decisions related to plastic aesthetic surgery for patients. Firstly, it serves as a tool for disseminating educational content, providing valuable information and insights. Secondly, social media acts as a platform for plastic surgeons to showcase their work and connect with a wider audience, effectively promoting their practice. Lastly, it facilitates direct engagement with patients, serving as a conduit for interaction, communication, and relationship-building within the realm of aesthetic surgery.[22]

Social Media for Tool to Share Education

Plastic aesthetic surgeons exhibit a higher comfort level with using social media compared to other surgeons, reflecting the evolving landscape of marketing strategies within the field. This transformation, inherent in technological revolutions, brings forth both promising opportunities and potential pitfalls. Plastic surgeons can effectively capture interest by showcasing procedure results, sharing scientific advancements, providing insights into their personal lives, and even offering educational content for patients.[1] The internet, easily accessible with a simple click, provides patients with an abundance of information. Roughly half of individuals undergoing cosmetic procedures note that social media played a significant role in influencing their decision-making process, with a similar percentage reporting their active following of plastic surgeons on social media platforms.[23]

Patients are not only utilizing the internet for educational purposes but are increasingly relying on social media as their primary source of referrals. A significant 63% acknowledge that these platforms serve as their initial search method.[24] Walden et al. discovered that whereas more than half of patients use Google or other internet resources to acquire further information, just ten percent of patients seeking cosmetic operations talk with a plastic surgeon directly. This is despite the fact that more than half of patients use Google or other online resources to gain additional information.[25] Additionally, Twitter has proven to be a helpful resource for academic plastic surgeons in recent years.[26]

Social media serves as a valuable tool for plastic aesthetic surgeons to share educational content. This platform allows surgeons to disseminate information, insights, and advancements in the field,

reaching a wide audience. Plastic surgeons can leverage various formats such as posts, videos, infographics, and live sessions to educate both colleagues and the general public. By utilizing social media, surgeons can contribute to the continuous learning of their peers, showcase their expertise, and enhance public understanding of plastic surgical procedures, recovery processes, and address frequently asked questions. Live sessions and webinars offer real-time engagement, allowing surgeons to interact directly with an audience, share expertise, and clarify queries instantaneously, safety measures, and innovations. By leveraging platforms like Instagram, Twitter, or YouTube, surgeons can present results, share real-life experiences, and educate patients about various cosmetic procedures. This educational outreach through social media helps patients gain a deeper understanding of aesthetic surgery, enabling them to make informed decisions and engage more actively in their healthcare journey. This educational role of social media not only fosters professional development within the medical community but also empowers individuals to make informed decisions about cosmetic procedures.

While social media can be a powerful tool for Plastic Aesthetic Surgeons to share education, it's important to acknowledge potential drawbacks. One of the challenges is the risk of misinformation and the spread of unverified content. The open nature of social media platforms allows for a wide range of information to circulate, including content that may not be evidence-based or aligned with medical standards.

The brevity of social media posts can also limit the depth of educational content. In-depth and nuanced information may be challenging to convey effectively in a short post or video, potentially leading to oversimplification of complex topics.

Moreover, the competitive nature of social media can encourage some practitioners to prioritize marketing over educational content. This shift may lead to a focus on sensationalized before-and-after images or promotional content rather than substantive educational materials. The visual nature of plastic aesthetic surgery content on social media may inadvertently contribute to unrealistic expectations among the audience. Filters, image editing, and before-and-after comparisons can sometimes create an idealized perception of outcomes, which may not accurately represent the realities and potential risks associated with plastic surgery procedures. The pressure to generate attention and engagement on social media may compromise the depth and accuracy of educational content shared by plastic aesthetic surgeons.

Lastly, the interactive nature of social media allows for user comments and discussions, which may lead to the sharing of personal opinions and experiences that may not be universally applicable. This dynamic environment can sometimes blur the line between professional advice and anecdotal information.

Social Media to Promote Work and Outreach to The Broader Public Community

An in-depth examination of three prominent social media platforms uncovered that 63% of posts on Instagram were generated by plastic surgeons, and a significant 83% of these posts were aimed at self-promotion.[27,28] Additionally, plastic surgeons rank prominently among top social media influencers and generate a higher volume of promotional content.[29] Those specializing in aesthetic-focused practices exhibit a greater likelihood of utilizing social media, with the majority acknowledging its effectiveness as a marketing tool. This acknowledgment is attributed to the prevalent visual components inherent in the majority of social media platforms.

Cho's study indicated that most plastic surgeons employ social media to establish their practice's brand, draw in patients, and educate the general public. Failing to utilize this valuable tool could result in plastic surgeons being overshadowed in the ongoing

discourse. To fully harness the power of social media, it is essential for this field to initiate formal training on the appropriate and ethical utilization of social media.[54]

Another research indicates a notable gap between plastic surgeons and the most influential platforms mentioned in the literature, including Instagram, YouTube, Snapchat, and Facebook. Currently, plastic surgeons show a preference for directing electronic marketing endeavors toward their practice websites rather than social media platforms. The study recommends that surgeons use social media more actively by sharing promotions, before-and-after photos, and videos to expand their client base instead of solely relying on their practice websites for information dissemination.[55]

Social media's integration into practice promotion comes with advantages and drawbacks, notably impacting the doctor-patient relationship.[30] A decade ago, only 30% of plastic surgeons used social media for advertising, while 92% relied on their practice website for advertising purposes. However, a significant 62% of plastic surgeons believed that social media could be advantageous for their practice.[31] These trends are observed on a global scale in the field of plastic surgery, evident in a study highlighting the United States as the highest contributor to Instagram posts related to #PlasticSurgery, amassing over 2 million posts, 369 million likes, and 6 billion views within 21 months. Istanbul, Turkey, emerged as the city with the highest number of related posts, totaling 102,108.[29,32]

According to Arab et al's study, advertisements significantly impacted almost half of the respondents' choices regarding undergoing cosmetic treatments. Moreover, around two-thirds of the respondents displayed potential interest in or openness to undergoing cosmetic procedures in the future. Over half of these individuals follow plastic surgeons and fashion influencers who engage in discussions about cosmetic procedures. The study highlighted that individuals influenced by cosmetic advertisements often had family members or friends who had also undergone cosmetic treatments.[23]

The American Society of Plastic Surgeons conducted a survey in 2021, revealing that nearly half of all patients considering plastic surgery attributed their decision to the influence of social media. The dynamics of how plastic surgery is promoted on these platforms have undergone transformations due to four key factors. Firstly, the prevalence of user-friendly and sophisticated filters has become commonplace, enabling individuals to easily manipulate their appearance, such as altering the nose profile or simulating lip fillers through adept adjustments in "shadow and light." Secondly, the lockdown scenarios during the pandemic isolated people from familiar faces, intensifying the comparison of self-images and idealized versions, impacting self-esteem and body satisfaction. Thirdly, Work-from-home put us in an unfavorable light. Brushing tools didn't include Zoom or Google Meet cameras since they're intended for business use rather than entertainment. All of a sudden, we are staring at our unkempt, dimly lit reflections every day for hours on end. Lastly, big industry names brought a new wave of acceptance. Numerous famous people have spoken publicly about their own cosmetic surgery. Since cosmetic surgery has gained popularity, more research has been done and a dose of realism has been included. The influencers on each social network then started noticing the trend. On Instagram, a hashtag search for "plastic surgery" yields over 6 million results. For many of these standard procedures, many of these display before-and-after comparisons[33]

The American Society of Plastic Surgeons (ASPS) places a strong emphasis on upholding the highest standards of personal and professional conduct among its member surgeons, especially in the realm of Ethical Issues in Online Marketing of Plastic Surgery. The ASPS Code of Ethics explicitly forbids any communication with the public that includes

false, fraudulent, misleading, or deceptive content. Members are obligated to use accurate and respectful language and images in all public communications. Ensuring respectful standards in advertising, professionalism, and ethics is a significant aspect of the fundamental training provided in plastic surgery residency programs. ASPS members are mandated to deliver services with full respect for human dignity, ensuring each patient receives the complete measure of service and devotion. It's crucial to acknowledge that the influence of a professional society's code of ethics is limited by governmental regulations pertaining to the restraint of trade.[34-36]

The ASPS Code of Ethics regulates the use of patient images in various contexts, such as journal articles, textbooks, educational presentations, or online platforms, with the requirement of full consent from patients without any pressure from plastic surgeons. Patients have the right to refuse the use of their personal images. However, if the images have been published or commercialized without consent, removing them from the internet can be challenging as the ownership may have shifted to the business that published them. This means both patients and doctors could lose control over the images. [34, 36, 37]

The primary concern for surgeons when creating surgical videos or images is the safety and well-being of the patient. While procedural videos serve an educational purpose, they should not divert attention from the primary focus on the patient. Patient video images should respect privacy and be appropriate. Identifying features such as recognizable tattoos should be concealed, body parts unrelated to the procedure should be excluded from view, and all information related to the images should be removed to protect the patient's identity. Plastic surgeon websites should ideally reflect diversity and the reality of achievable results by showcasing real people and real outcomes. When using models, it is crucial to identify them as such and clarify that they are models, not patients receiving the advertised services.[34,37,38]

Furthermore, consistently emphasized the importance of safeguarding patient confidentiality, setting and maintaining boundaries, and being aware of the potential for widespread dissemination and lasting presence of content.[39,40] The establishment of doctor-patient relationships on social media was discouraged, along with interactions that could be considered as providing patient care.[39,41] The separation of professional and personal accounts, steering clear of sensationalism, and actively monitoring one's online presence.[42-44]

In 2020, the American Academy of Facial Plastic and Reconstructive Surgery reported that 72% of cosmetic surgeons encountered patients expressing a desire to enhance their appearance specifically for selfies. A study delving into the intricate connection between young adults' perceptions of cosmetic procedures and their social media behaviors underscored the significance of appearance-focused social media usage. The study found that a greater intention to undergo cosmetic procedures was associated with more frequent engagement with highly visual social media platforms.[33]

This suggests a reciprocal relationship: the more young adults use platforms like Instagram and TikTok, the more likely they are to consider cosmetic procedures, and vice versa. This aligns with the idea that visually-oriented social media platforms facilitate and stimulate appearance-focused content, leading to more positive attitudes towards cosmetic procedures due to increased emphasis on appearance. Following influencers who have undergone cosmetic procedures was linked to a heightened perception of the normality of such procedures and a greater intention to undergo them. Conversely, following influencers who have not undergone cosmetic procedures was associated with a lower intention to do so, emphasizing the

significance of distinguishing influencer content. This aligns with the theory of imitation behavior.[45]

Concerning the psychosocial implications of viewing cosmetic-related content on social media, a majority of respondents expressed potential interest in future cosmetic procedures. However, a significant portion indicated that the influence comes from acquaintances or social media influencers undergoing such procedures, rather than an inherent desire to alter their appearance or stand out. This aligns with the outcomes of a study by Furnham and Levitas, revealing that individuals with low perceived self-attractiveness were more inclined to consider cosmetic surgery, highlighting the impact of low self-esteem on decisions related to cosmetic treatments.[46]

A study at Taif University, which examined the knowledge, attitudes, and practices of cosmetic surgery among 220 female students, found that while none of them had undergone cosmetic procedures, 79.1% had learned about cosmetic surgery through mass media.[47] This corresponds with the current study's findings, indicating a significant percentage of Saudi female university students following cosmetic surgery-related accounts on social media. Another study at King Abdulaziz University, involving 600 Saudi female university students, reported that 2.2% had undergone cosmetic surgery, and 23.3% acknowledged the influence of mass media on their decision to pursue cosmetic procedures.[48]

Interestingly, when considering personal factors or demographics, it was found that following cosmetic clinics was significantly correlated with the acceptance and intention of cosmetic procedures. This aligns with a study conducted by Walker et al.,[49] which suggested that viewing images of individuals with enhanced facial features increases interest in cosmetic surgery. Importantly, the research findings suggest that body dissatisfaction does not act as a mediator in the relationship between social media use and the desire for cosmetic surgery. There is a possibility that the desire for cosmetic surgery is not contingent on body dissatisfaction, as some researchers argue that individuals may express the same level of interest in cosmetic surgery regardless of their satisfaction with their bodies.

Another study suggests that following specific cosmetic clinics related to cosmetic procedures is significantly associated with the intention and acceptance of undergoing those procedures when personal or demographic factors aren't considered. On the contrary, following cosmetic brands doesn't correlate with acceptance or intent for cosmetic procedures but is linked to a heightened perception of the prevalence of these procedures. However, concerning the hypothetical intention to undergo cosmetic procedures, the use of social media, especially frequent engagement with visual content like following influencers who have undergone cosmetic procedures and editing one's images, positively relates to the intent to undergo such procedures.[50]

Plastic aesthetic surgeons, particularly those in private practices or focused on aesthetic surgery, can leverage social media platforms can showcase their expertise, share informative content, and engage with a diverse audience. The visually-oriented nature of many social media platforms, such as Instagram, allows surgeons to visually present their work, providing potential patients with a tangible understanding of their skills and the results they can achieve.

Moreover, social media facilitates outreach to a wider demographic, breaking down geographical barriers. Surgeons can reach individuals who may not have easy access to traditional means of information. Through educational posts, live sessions, or Q&A sessions, plastic surgeons can disseminate valuable information, demystify misconceptions, and address concerns, contributing to public awareness and understanding of plastic surgery.

Additionally, social media serves as a platform for community building. Plastic surgeons can create a supportive community where individuals interested in aesthetic procedures can connect, share experiences, gain insights, and best practices, fostering a collective commitment to excellence in the field. Additionally, platforms like Instagram, Twitter, and Facebook enable surgeons to participate in global conversations, stay updated on industry trends, and contribute to the continuous improvement of plastic surgery practices. This sense of community fosters trust and transparency, crucial elements in the decision-making process for potential patients.

Engaging with the public through social media enables surgeons to build a strong online presence, establish credibility, and foster a sense of trust with the community. By responding to inquiries, participating in discussions, and sharing valuable information, surgeons can position themselves as authoritative figures in the field, contributing to the overall positive perception of plastic surgery.

Social Media as a Tool for Facilitating Patient Engagement

Over the last decade, there has been a noticeable shift in how plastic surgeons engage with social media. Thirty years ago, the primary method for choosing a doctor relied heavily on word of mouth. Presently, a comprehensive understanding of practitioners can be constructed through a mosaic of data. Despite the varying quality of information available online and on social media platforms, up to 40% of patients now heavily depend on social media when selecting a plastic surgeon.[51]

Among patients who eventually undergo aesthetic plastic surgery procedures, almost all conduct internet research before their initial consultation. Google serves as the initial go-to platform for individuals seeking information about plastic surgeons, followed closely by the surgeon's practice website and social media platforms, which are identified as the subsequent most influential factors in the selection process.[52] According to a study by Montemurro et al. in 2015, around 95% of patients surveyed utilized the internet to gather information about their desired surgery, with 46% specifically utilizing social media for this purpose.[53]

The utilization of social media has the potential to mislead patients seeking recommendations for medical practices that best suit their needs. Many patients mistakenly believe that practitioners with a higher number of followers on Instagram or those featured on prominent plastic surgery social media platforms are necessarily the most qualified, which is not always accurate. Aldosari et al. mentioned that most patients who visit plastic surgery clinics were influenced in a positive manner, although not solely, by media reports showcasing cosmetic surgery outcomes.[56]

Approximately one-third of the survey participants expressed a preference for cosmetic surgery clinics that actively engage on social media, possibly because of the clear and potentially embellished presentation of the services offered. Similarly, nearly one-third of the study population indicated a preference for consulting plastic surgeons who have a significant presence on social media, likely influenced by the doctor's positive reputation as promoted by influencers or through patient recommendations.[23]

RealSelf.com, established in 2006, is among several social media platforms facilitating engagement between patients and between patients and surgeons. This rapidly expanding platform boasts 9.9 million users who can provide reviews, share before-and-after photos, and rate their surgical experiences. Additionally, RealSelf has 14,000 affiliated providers who can utilize the platform to interact with patients directly regarding pricing details and consultation scheduling or direct them to their personal websites for more information. Additionally, social media serves as a platform for open

communication and dialogue. Patients can engage directly with plastic surgeons, asking questions, seeking clarification, and sharing their concerns. This direct interaction fosters a sense of transparency and trust between patients and healthcare providers, ultimately enhancing the patient experience.

Social media facilitates a sense of community among patients who are considering or have undergone plastic surgery. Support groups, forums, and discussions provide individuals with the opportunity to connect, share experiences, and offer encouragement. This supportive environment can be particularly valuable during the decision-making process and the recovery journey.

Moreover, the real-time nature of social media enables surgeons to disseminate timely information about new technologies, advancements in procedures, and updates about their practice. This continuous flow of information keeps patients well-informed about the latest developments in the field, contributing to an educated and engaged patient community.

While social media has become a prevalent tool for facilitating patient engagement in the realm of plastic aesthetic surgery, it is essential to acknowledge the potential drawbacks associated with this approach. One significant concern revolves around the reliability and accuracy of the information exchanged on these platforms.

The interactive nature of social media platforms enables patients to ask questions, seek advice, and share experiences. However, this open exchange may also lead to the proliferation of misinformation. Patients might encounter conflicting opinions, unverified medical advice, or anecdotal accounts that could impact their understanding of procedures and recovery expectations.

Another challenge is the risk of unrealistic expectations. The visual-centric nature of social media allows for the sharing of before-and-after photos and success stories. While these can be valuable for showcasing a surgeon's capabilities, they may inadvertently contribute to a perception that outcomes are universally flawless. Patients might develop unrealistic expectations about the results of their own procedures, potentially leading to dissatisfaction post-surgery.

Furthermore, social media engagement may blur professional boundaries. The informality of these platforms can create a more casual doctor-patient relationship, potentially compromising the seriousness of the medical context. This informality might lead to misunderstandings or misinterpretations of medical information, impacting the patient's decision-making process.

Privacy concerns also loom large. Patient engagement on social media may involve the sharing of personal information, images, or experiences. Ensuring the confidentiality and security of this information becomes a critical challenge, especially given the public and often permanent nature of content on these platforms.

Plastic Aesthetic Surgery Type Performed

In a study conducted by Sanati-Mehrizy et al., the influence of social media on the number of aesthetic procedures performed was investigated. They note a surge in rhytidectomy cases, possibly correlated with a positive online review from a patient who underwent this procedure. This surge is backed by rating systems that evaluate specific procedures as "worth it," often influenced by anticipated outcomes, achieved results, and procedural costs. Interestingly, the impact of online reviews extends beyond rhytidectomy to other aesthetic procedures. The study identifies a positive growth trend within one year (2015-2016 vs 2016-2017) in abdominoplasty, augmentation mammaplasty, augmentation mastopexy, and rhinoplasty case volumes, despite a general decrease in these procedures. This suggests that social media might have briefly but significantly

stimulated an increase in case volumes for these procedures during that year.[3]

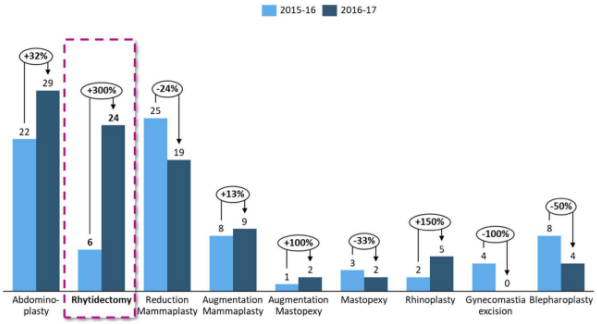

Figure 2. Comparison of 1-year growth rates among individual cosmetic procedures.[3]

The realm of plastic aesthetic surgery is witnessing a positive shift influenced by various factors contributing to the increase in procedures performed and the evolving landscape of patient preferences and outcomes.

One crucial catalyst for the rise in aesthetic procedures is the influence of social media and its visual impact. Platforms like Instagram and TikTok have become powerful channels for sharing before-and-after transformations, allowing patients have easy access to a vast array of information about different plastic surgery options, the direct communication facilitates a personalized approach to treatment, where surgeons can address individual concerns and provide tailored recommendations, ultimately enhancing the patient experience, enabling them to research and educate themselves. This increased awareness often translates into a higher demand for a variety of procedures, as patients become more informed and discerning about their aesthetic goals.

The positive portrayal of plastic surgery on social media, including success stories and transformations, helps destigmatize these procedures. As influencers, celebrities, and everyday individuals share their positive experiences, it contributes to normalizing cosmetic surgery, reducing societal taboos, and fostering a more accepting attitude toward aesthetic enhancements.

The study provides an in-depth understanding of the influence of social media on plastic surgery, addressing its multifaceted impact on both patients and practitioners. It covers trends, patient behavior, surgeon practices, and the psychological aspects influenced by social media exposure, which adds strength and depth to the discussion. The introduction identifies major social media platforms and their user bases. The major social media platforms like Facebook, YouTube, Instagram, Twitter, Pinterest, and Snapchat. Highlighting their popularity and demographics. Statista's data showcases the steady rise in daily social media usage globally, emphasizing the growing influence of these platforms. Specific platforms attract different demographics based on age and gender, influencing their preferences in plastic surgery and related content. This study shown how plastic surgeons leverage social media for education, patient engagement, and promoting their work. Patients increasingly rely on social media for information and referrals. The text mentions how filters, lockdowns, remote work, and celebrity endorsements have influenced cosmetic surgery trends through social media.

Social media's influence on plastic surgery trends could contribute to negative aspects. The pressure to conform to beauty standards promoted on platforms may lead individuals to pursue surgeries without adequate consideration of their actual needs or well-being. Patients may desire outcomes that are heavily influenced by digitally altered images, which could lead to dissatisfaction post-surgery if these expectations are not met. Some patients might have unrealistic expectations about the outcomes of cosmetic procedures, leading to dissatisfaction even with successful surgeries.

Social media platforms might be a source of misinformation regarding plastic aesthetic procedures. This misinformation

can potentially lead to uninformed decisions and dissatisfaction with the results. Individuals may develop a distorted perception of beauty and feel pressured to conform to unrealistic standards, prompting them to undergo unnecessary or excessive cosmetic procedures. Excessive exposure to images and discussions about cosmetic procedures on social media can contribute to the development or exacerbation of body dysmorphic disorders. Individuals with BDD may perceive flaws in their appearance that are not evident to others, leading to unnecessary surgeries.

Negative comments, judgments, or comparisons on social media platforms can have a detrimental impact on individuals who have undergone plastic surgery. This may contribute to feelings of inadequacy or regret. The emphasis on physical appearance on social media can have a negative psychological impact on individuals, fostering feelings of inadequacy or low self-esteem. This can contribute to a cycle of seeking cosmetic procedures in an attempt to attain an idealized appearance perpetuated by social media, without addressing underlying psychological concerns. If these concerns aren't adequately addressed pre-surgery, patients might not achieve the expected psychological benefits. An excessive focus on physical appearance through cosmetic surgeries might overlook or neglect more critical aspects of health and well-being, mental health, and self-acceptance.

The desire for quick transformations, often popularized on social media, may lead to impulsive decisions that compromise safety. Cosmetic surgeries often involve significant costs. Some patients might experience financial strain due to the expenses involved, especially if the results don't meet their expectations. These procedures can incur costs that include the surgical fee itself, anesthesia costs, recovery costs, and post-treatment costs. These expenses can vary depending on the type of procedure, its complexity, and the location of the doctor's practice or medical facility. Some more complex cosmetic procedures or those involving advanced technology may have higher costs.

It is important to consider the costs comprehensively and plan finances carefully before deciding to undergo cosmetic surgery. Patients need to understand that the involved costs may not only cover the procedure itself but also post-treatment costs, medications, and potentially additional costs that may arise during the recovery process.

Some types of cosmetic surgery can be considered an investment in well-being and self-confidence; however, it is crucial to have a clear understanding of the financial aspects. Patients should openly discuss costs with the doctor or clinic performing the procedure and ensure they have a comprehensive understanding of the details involved before deciding to proceed.

It's crucial for individuals considering plastic aesthetic surgery to approach the decision with a realistic mindset, well-informed expectations, and thorough consultation with qualified and experienced surgeons. Additionally, relying solely on social media for information about plastic surgery procedures may lead to misconceptions and contribute to negative experiences.

This study explores how social media exposure affects individuals' perceptions of cosmetic surgery, body image, and their intention to undergo such procedures. Patients heavily use social media for researching plastic surgeons and procedures, indicating a shift from traditional methods of finding doctors. Platforms like RealSelf enable direct engagement between patients and surgeons, allowing for reviews, sharing experiences, and interaction with providers. Studies suggest that online reviews and positive feedback on certain procedures influence the demand for those procedures. This comprehensive coverage makes the information novel and valuable for understanding the current landscape of plastic surgery practices in the age of social media.

This study focuses solely on the role of social media in patients' consideration of plastic aesthetic surgery, and it is limited to the most recent 5 years of review and systematic review articles from a single database. However, the authors became aware during the course of this study that social media's ethical issues, legal aspects, and the impact of social media on academic/plastic aesthetic residency need to be investigated further.

CONCLUSION

The involvement of social media in influencing patient choices regarding plastic aesthetic surgery can be categorized into three main roles: firstly, as a tool for disseminating educational content, promoting professional work, and reaching a wider public audience; secondly, as a means to facilitate engagement between patients and doctors; and thirdly, as a factor that shapes the preferences for specific aesthetic plastic surgery procedures. There is an anticipation for a comprehensive understanding of how social media profoundly impacts patients' surgical decisions. This understanding is seen as essential for plastic surgeons to effectively navigate the digital age, all the while safeguarding the integrity of the field of plastic surgery and upholding the ethical standards and skills imparted through education and training.

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CONFLICT OF INTEREST

The authors declared no potential conflict of interest with respect to the study, authorship, and publication of this article.

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AUTHORS CONTRIBUTION

All of the authors have contributed to the data collection and analysis. TAA contributed to script writing and publication process. HS contributed to concept planning and revision.

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All of the authors have contributed to the planning, data collection and analysis, writing, and approval of this paper for the publishing stages of the research.

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2. Parkin DM, Clayton D, Black RJ, Masuyer E, Friedl HP, Ivanov E, et al. Childhood leukemia in Europe after Chornobyl: 5 years follow up. Br J Cancer 1996;73; 1006-12.

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1. Herndon DN, Enkhbaatar P & Sousse LE. The pathophysiology of inhalation injury. In Herndon DN, editors. Total Burn Care, 4th ed. Edinburgh: Saunders Elsevier; 2017. p. 465-78.
2. Noer MS, Saputro ID & Perdanakusuma DS. Penanganan Luka Bakar. Surabaya : Airlangga University Press; 2006.

Reference to a website:

1. ISSVA Classification for Vascular Anomalies. 2018. (Accessed 5 October 2019). Available from: https://www.issva.org/UserFiles/file/ISSVA-Classification-2018.pdf
2. Rathbun AH, West J & Hausken EG. Young children's access to computers in the home and at school in 1999 and 2000, NCES-2003-036. National Center for Education Statistics, Washington, DC. 2003. (Accessed 4 November 2003). Available from: http://nces.ed.gov/pubs2003/2003036.pdf

Reference in a proceeding:

1. Idrus Jus'at. Penyimpangan positif masalah KEP di Jakarta Utara dan di Pedesaan Kabupaten Bogor Jawa Barat. in Prosiding WNPG VII; 2000. p.153–6.
2. Rachmah Q, Wantanee K. Energy Distribution Of Macronutrients Among Adolescents In Indonesia: Secondary Analysis Of Total Diet Study Data. in 4th Asian Academic Society International Conference (AASIC); 2016. p.170–6.

Bachelor thesis, master thesis, or dissertation:

1. Sumanto, HRA. Komponen - komponen emas (tesis Doktor). Surabaya: Universitas Airlangga; 1997.
2. Wulandari EC. Pengaruh pemberian glutamin per enteral terhadap peningkatan makrofag pada model tikus (Rattus norvegicus) dengan luka bakar kontak termal (tesis). Surabaya: Universitas Airlangga; 2020.

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1. Cookson AH. Particle trap for compressed gas insulated transmission systems. US Patent 4554399; 1985.

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