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JURNAL REKONSTRUKSI DAN ESTETIK

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A COMBINATION TECHNIQUE OF AUTOLOGOUS AUGMENTATION AND BREAST LIFTING IN HYPOPLASTIC-THIRD GRADE PTOTIC BREAST: A CASE REPORT

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ABSTRACT

Introduction: Breast ptosis is a common concern among women due to factors such as aging, pregnancy, breastfeeding, and weight loss. To achieve a beautiful breast shape, mastopexy (breast lift) with augmentation is often required. This case report highlights the relevance of the chosen augmentation method in addressing ptosis.
Case Illustration: A 30-year-old woman had breast ptosis after her 2nd child and wanted a breast lift to have lifted and firmer breasts. Due to limited fat tissue available for transfer and her refusal to use silicone implants, the patient chose autoaugmented mastopexy. Before surgery in August 2022, breast ultrasound showed abnormalities. Preoperative design was made to determine skin and pedicle positions, using a wise pattern with a superior pedicle to lift the nipple-areola complex (NAC) and an inferior pedicle for autoaugmentation. Surgery was done carefully to achieve symmetry and desired result.
Discussion: Breast tissue changes a lot during and after pregnancy and hormonal factors increases the risk of ptosis. According to Regnault classification, the patient was classified as 3rd degree ptosis. While prosthetic implants are common in breast surgery, the patient declined that option. Autoaugmented mastopexy offers a more natural result without the risks of implants.
Conclusion: Breast lift with autoaugmentation is suitable for patients with breast ptosis seeking a firmer appearance without added volume. This technique utilizes the patient's own tissue to achieve satisfactory results, although outcomes may vary depending on individual factors.

Highlights:

1. This case shows autoaugmented mastopexy as a natural alternative to silicone implants for patients seeking breast enhancement.
2. The combination of breast lift and autoaugmentation using the patient's own tissue is presented as an effective method for achieving a firmer breast appearance while maintaining a natural look.
3. The use of tailored preoperative design, including breast ultrasound, enhances surgical safety and outcomes.

INTRODUCTION

Breast augmentation has been performed since 1895, with the first case involving the removal of a breast tumor in a woman, which was later replaced with fat extracted from her thigh. It subsequently evolved to include injections to achieve the desired results. In the early 20th century, people used various experimental substances such as paraffin oil, beeswax, rubber, and even snake venom. It was not until the early 1960s that silicone implants were developed. The first trial was conducted on a dog named Esmeralda, resulting in a successful breast augmentation. The dog survived for several weeks until it became uncomfortable with the stitches and chewed them out.[1]

Over the past 25 years, breast reconstruction methods have evolved remarkably, offering options such as autologous tissue and implants to improve aesthetics. Implant-based reconstruction is preferred for active individuals or those with a lean build who may lack suitable donor sites for tissue transfer. However, implant-based methods can lead to issues like capsular contracture, where the tissue around the implant tightens. A technical advancement called acellular dermal matrix (ADM) has been developed to provide support for the soft tissue and prevent this complication.

On the other hand, autologous techniques, which utilize the patient's own tissue, are particularly beneficial for women with sufficient adipose tissue in areas like the abdomen, thigh, or gluteal region. These techniques aim to assist individuals with a high body mass index (BMI) or a history of radiation.[2]

Even though augmentation with silicone implants is a well-established and common aesthetic surgery, some patients remain reluctant to use foreign materials in their procedures, even after thorough consultation and education. In this case, some non-surgical methods such as *Polydioxanone thread lift* (PDO) can be applied. PDO is reported to work by promoting neo-angiogenesis, stimulating collagen production, and activating fibroblasts, which subsequently improve skin quality. [3] However, it only provides temporary results, lasting for a maximum of two year. [4] An alternative procedure involves using autogenous fat as an augmentation material, but it has the disadvantage of less than 100% volume retention months after surgery and requires adequate donor sites (commonly the thigh and abdomen).[5]

Nowadays, people seek augmentation for various reasons. Breast augmentation was the second most performed surgical aesthetic procedure in 2022, with a total of 255,200 cases worldwide. [6] Women who have undergone labor and breastfeeding often experience ptotic breasts, caused by loss of elasticity and volume along with excess skin. In response to these demands, the development of breast aesthetic surgery techniques continues to evolve to cater to individual needs.

This case report is particularly important as it provides a comprehensive overview of the challenges and advancements in breast augmentation techniques, especially in light of evolving patient preferences and safety concerns. By documenting a specific case that highlights the successful use of both autologous tissue and implant-based reconstruction, it offers practical insights into decision-making for patients with different body types and medical histories. Additionally, this report addresses the growing trend of patient reluctance toward silicone implants, offering alternatives like PDO thread lifts and autogenous fat transfer. By analyzing the outcomes and patient satisfaction in this case, we can better understand the implications of each method, guiding clinicians in recommending personalized approaches to breast augmentation. This targeted information not only enriches the clinical literature but also empowers patients with the knowledge they need to

make informed choices about their body and health.

CASE ILLUSTRATION

A 30-year-old woman presents with complaints of sagging breasts after her second pregnancy. Seeking to restore a more youthful appearance, she has chosen to undergo mastopexy to achieve lifted and firmer breasts. However, she has expressed several concerns: she does not have enough fat tissue in her abdomen and thighs for effective fat transfer, and she firmly refuses the use of silicone breast implants due to potential complications and personal preferences. After carefully considering her options, the patient decided to pursue a breast lift combined with auto-augmentation, a technique that utilizes existing breast tissue to enhance fullness without the need for foreign implants. This approach aligns with her desire for a natural look while addressing her specific anatomical limitations.

Figure 1. Overview of patient's preoperative breast condition from (A) the front and (B), (C) the sides support the option of fat transfer, patient express her refusal to use silicone breast implant. Upon hearing options available, the patient opted for breast lift with auto augmentation.

The surgery took place in August 2022. In preparation for the procedure, we performed a breast ultrasound screening one week prior, collaborating with a radiologist to ensure accurate assessment. This screening revealed an abnormality in the breast tissue, necessitating further evaluation. The discovery of this abnormality highlighted the importance of thorough pre-operative assessments, allowing for informed decision-making and tailored surgical planning to ensure the best outcomes for the patient.

Directly before the operation, we marked the preoperative design while the patient was in a straight sitting position. The design was marked using a surgical marker to determine the skin excision and pedicle position. We utilized a wise pattern[7] and superior pedicle to reposition nipple-areolar complex (NAC) upward to the level of the inframammary fold (IMF) (4 cm elevation), and an inferior pedicle for auto-augmentation (with a 10 cm base, 5 cm distal flap thickness, and 6 cm elevation). The new nipple-areola complex (NAC) size was reduced to 3.5 cm from the previous 5.5 cm for both breasts. For the pillars, we simulated breast width reduction by moving the breast laterally and medially,

ultimately choosing a height of 6 cm for the new NAC to IMF distance. Lines were drawn from the distal point of the pillars to the IMF to outline the rewrapping and reduce the total breast height.

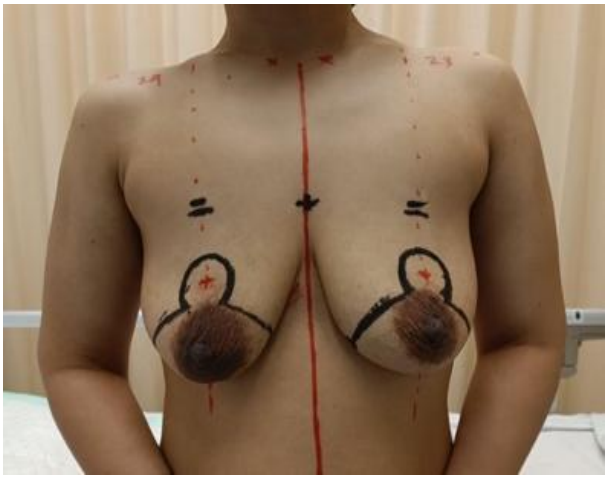
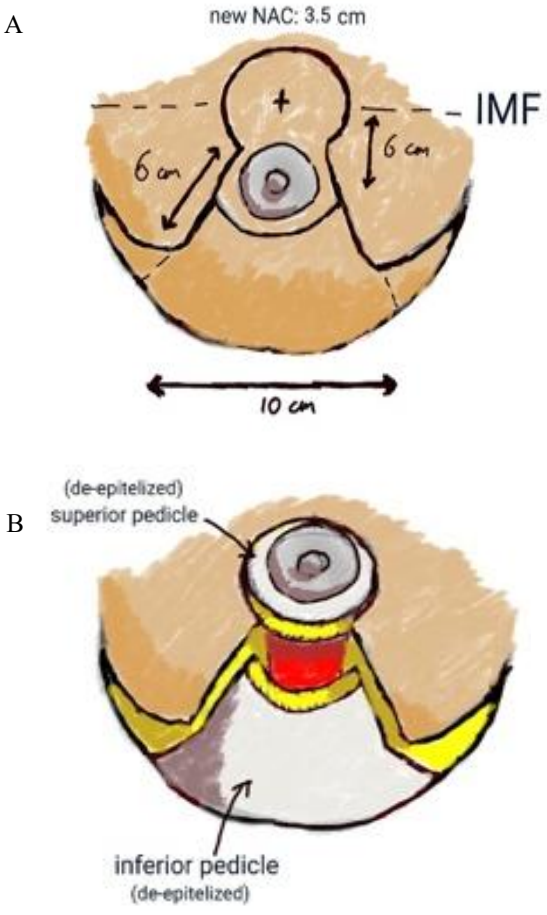
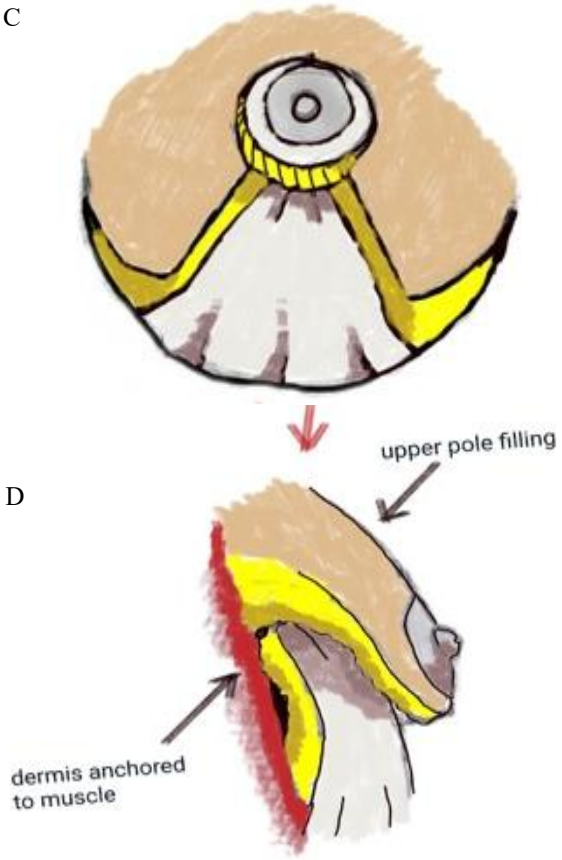


Figure 2. Preoperative design drawn in straight sitting position, with new NAC located at IMF.





Note: Drawing courtesy on own

Figure 3. Durante OP Illustration; (A) Design with measurements; New NAC of 3.5 cm diameter, 6 cm of distant between new NAC and IMF, and 10 cm inferior pedicle base. (B) Inferior pedicle after de-epithelization from anterior and lateral view. (C) Anterior view of inferior pedicle insertion toward muscle fascia.

The pedicles were de-epithelialized and incised through the fat and breast tissue until reaching the fascia plane of the pectoralis major muscle. A pocket was created under the superior pedicle in the suprafascial plane, extending upward to a determined point that would express as upper pole fullness (2 cm above the new NAC position). The lower pedicle was elevated and sutured at its distal flap, anchored to the muscle fascia inside the pocket using 3/0 Vicryl sutures.

We performed a similar procedure for the contralateral breast and temporarily

sutured the skin to achieve the new breast shape. During the operation, evaluations for both breasts were conducted while the patient was in a sitting position under general anesthesia, with precautions and assistance from the anesthesiologist. After achieving symmetry and the desired shape, we continued the procedure by washing the breast pocket with saline, placing a 100 cc Barovac drain, and suturing the superficial fat with 3/0 Vicryl, the dermis with 4/0 Vicryl, and the skin with 6/0 Vicryl. Lastly, before finishing the surgery, we evaluated NAC viability using the capillary refill time test (normal if under 2 seconds). For the final dressing, we applied compression using gauze around the breast and wrapped it with elastomoul.

Figure 4. Durante OP; (A) Pocket dissection until 2 cm above new NAC and (B) Upper and lower pedicle (C) Anchored lower pedicle into muscle fascia plane

Figure 5. Direct Post-Surgery; Result from (A) the front (B) and (C) the sides

Two weeks after the surgery, the swelling began to dissipate, and wound epithelialization was observed at the treated site. All stitches were subsequently removed.

Figure 6. Two Weeks Post-Surgery; Result from (A) the front (B) and (C) the sides.

A yellowish bruise surrounding the scars slowly faded a month later, and the scars were completely healed within two months post-operative care, leaving a red-blue scar following the line of the incisions. There were no complications or complaints from the patient.

Figure 7. One Month Post-Surgery; Result from (A) the front (B) and (C) the sides.

Figure 8. Two Months Post-Surgery; Result from (A) the front (B) and (C) the sides.

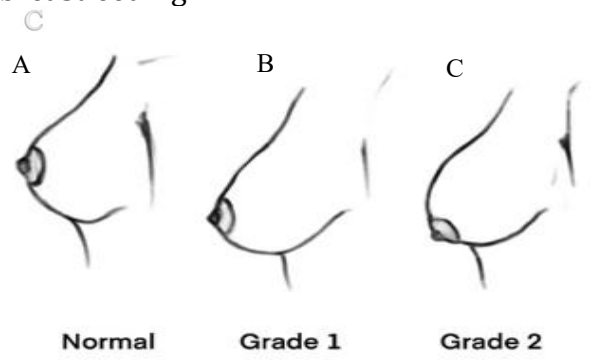
DISCUSSION

Breast tissue undergoes various physiological changes during pregnancy, the postpartum period, and lactation. These changes are influenced by hormonal fluctuations, such as increases in estrogen, progesterone, and prolactin. [8] Particularly, breastfeeding for 7–12 months increases the likelihood of more severe ptosis by four times[9].

Several sources report changes in the breasts postpartum and during breastfeeding, including breast ptosis, tuberous breast deformity, and hyperplasia. [1,10,11] Some nipple and areola physical changes such as enlargement, hyperpigmentation, secondary areolae, erectile nipples, prominence of veins, striae, and enlargement of the Montgomery glands or tubercles (sebaceous glands hypertrophy) are found concurrently[12].

The study findings indicated that breast ptosis significantly affects both woman's attractiveness and perceived age. Increased breast ptosis, characterized by more sagging breasts, is associated with lower attractiveness and is linked to age perceptions in women[13] .

The patient presented as a primary care patient with no history of breast surgery. Given that her nipple was below the inframammary fold (IMF), this is based on the Regnault classification quoted by Mugea.[14] She was classified as having third-degree breast ptosis. The ptosis was formed due to prior postpartum changes and breastfeeding.



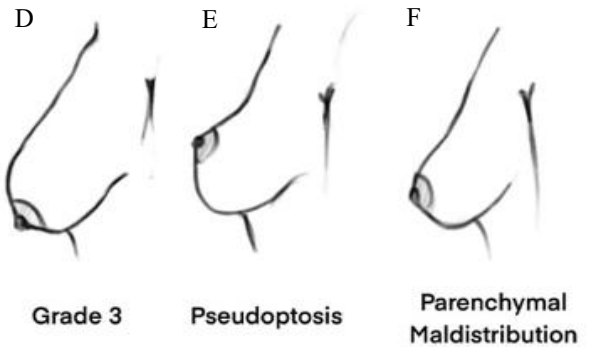


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Figure 9. Regnault Ptosis Classification; (A) Normal, (B) Grade 1: Mild, nipple is at the level of the fold, (C) Grade 2: Moderate, nipple is below the level of the fold, (D) Grade 3: Severe, nipple is below the fold pointing downward, (E) Pseudoptosis: Lower breast sagging, nipple is above or at the similar level to the fold, most of the breast is well below the fold, and the nipple to IMF distance is usually more than 6 cm. (F) Parenchymal Maldistribution: areola at the IMF with hypoplastic loose glandular skin.

Technique

Prosthetic implants usage in breast surgery known to result in improving shape and volume. Implants are made of either silicone or saline and are inserted through an incision beneath the breast or around the areola. They can be placed under the gland, under the muscle, or in a dual position, with approaches including incisions in the axilla or umbilical area.[15]

Autogenous fat transfer is an alternative for non-prosthetic augmentation for those who do not want a foreign body in their augmentation or who prefer small to moderate volume filling and surface refining.[16] Fat transfer has the advantage of providing more natural results compared to prosthetic implants.[17]

Both prosthetic implants and fat grafting can be used concurrently to manage breast volume while still maintaining a natural shape. The combination of both techniques can address limitations in patients with soft tissue defects, allowing for the correction of breast asymmetry and the achievement of the desired breast shape.[16]

There are several options for the placement of the added volume: subfascial, subglandular, submuscular, or dual plane. Any of these can be chosen, as no clinically significant differences have been found.[18]

Autoaugmentation involves filling the breast using a dermoglandular flap to increase fullness in the upper pole and enhance the central projection of the breast by relocating breast tissue.[19] The main goal is to achieve a lifted and firmer breast by repositioning existing breast tissue without adding external volume. This technique is often used not only in primary surgeries but also as a corrective procedure following implant removal.[20]

The patient refused silicone implants, aiming only for firmer-looking breasts. Based on the pre-surgery examination, she was not a candidate for autologous fat grafting due to a lack of sufficient fat. Furthermore, some patients are reluctant to have implants inserted because of their fear of complications associated with breast implants.[21] Women who have previously received silicone breast implants are at risk of autoimmune dysautonomia-related diseases. Those with silicone breast implants have significantly different levels of circulating adrenergic, endothelin, and angiotensin receptor autoantibodies compared to women without silicone breast implants. They are also more susceptible to autonomic-related symptoms due to autoantibodies against autonomic receptors.[22] Patients may experience local complications such as discomfort, inflammation, swelling, infections, capsular contracture, implant rupture, and gel bleed. In addition, they may also experience systemic symptoms such as persistent tiredness, joint pain, muscle aches, fever, dryness, and cognitive impairment.[23]

These indications could be influenced by stress, personality traits, and social

circumstances. Patients experiencing elevated levels of physical or psychological stress appear to be more prone to somatization. Although there is no clear proof of causation, many women have sought implant removal due to significant concerns. A recent literature review revealed that 75% of patients reporting silicone-related issues found relief from their symptoms after removal.[24] In relation to this, patients reportedly seek help from health professionals, including naturopaths (41.4%), psychologists (36.0%), and psychiatrists (25.2%).[25]

Another issue to consider is Breast Implant-Associated Anaplastic Large Cell Lymphoma (BIA-ALCL). Unlike systemic ALCL, which is a highly aggressive metastatic illness, BIA-ALCL shares similarities with cutaneous ALCL, characterized by a less aggressive progression and typically detected early in its development. It is often localized to lymphoma cells found within a peri-implant seroma or capsule tissue.[26]

The psychological dimension is significant, as patients may feel emotionally dissatisfied if the results fall short of their expectations. Therefore, being aware of these risks is essential for those contemplating aesthetic breast surgery. Engaging in open conversations with the surgeon about their concerns and aspirations can help manage expectations and enhance overall results.

A study of 201 women with breast implants found that extroversion and social desirability were the most common personality traits, with neuroticism a close third. Neuroticism was found to correlate positively with body dissatisfaction, while extroversion showed a negative correlation with body dissatisfaction. As a result, individuals with higher levels of neuroticism are more inclined to opt for cosmetic procedures. Previous research, along with the current study, identified higher levels of neuroticism in women undergoing cosmetic surgery, including breast augmentation.[27]

Pre-operative counselling is important to prepare patients for surgery by educating them on the risks and benefits and managing their expectations. A full discussion on the options including the implications of choosing autologous techniques versus implants, is essential to ensure informed decision-making. This process fosters a trusting relationship between the patient and the surgical team, which is vital for overall satisfaction. Post-operative support is equally important, as it assists patients in their recovery and addresses any concerns that may arise. Regular follow-ups can help in monitoring healing, managing complications, and ensuring that the patient's expectations are met. Emotional support during this phase can enhance the overall satisfaction with the surgical outcome.

Long-term clinical follow-up shows that the morphological results regarding volume remain stable three to four months after the procedure, provided the patient’s weight remains constant, with a resorption rate of 30 to 40%. The development of focal fat necrosis is strongly operator-dependent; in our clinical experience, it occurs in 15% of cases during the surgeon’s early experience (after 50 procedures) and decreases by 3% with more experienced surgeons.[28] A mastopexy and autoaugmentation, with or without fat grafting, have limitations and can produce only a somewhat fuller, naturally sloping upper pole at best. This procedure will not create the firm, full roundness that an implant can provide.[29]

Combining autologous fat grafting and auto-augmentation presents several challenges, primarily related to patient acceptance and surgical complexity and determining the appropriate technique according to patient expectations. The term "auto-augmentation" can be misleading as it does not increase breast volume and patients may be disappointed if they were

expecting more. The procedure requires multiple sessions of fat grafting and patients need to be patient. Scars from previous surgery and thin breast tissue can increase the risk of complications like necrosis. Timing is also important; doing fat grafting before implant removal can increase flap security but requires careful consideration of the patient's current satisfaction with their breast shape. Furthermore, the cost of lipofilling is typically not covered by health insurance, adding a financial burden on patients. Overall, achieving stable results and high patient satisfaction remains a significant concern in this combined approach[30,31].

Thus, in this paper, we found that breast lift with autoaugmentation is the most suitable option, resulting in good outcomes and high patient satisfaction. This case presents a feasible guide for similar cases and needs. However, as this case is not representative of circumstances, variables such as above differences, age, previous treatments and medical history are likely to affect the results achieved.

The manuscript includes several strengths, limitations, and new contributions. Bestows the strength of conducting an extensive comparative review of prosthetic as well as the autogenous techniques employed in breast surgery focusing on the patients side as well as the psychological aspects of patient's overall satisfaction. Also addresses the concerns related to implants with regard to the risk assessment and also addresses the clinical aspects of outcome and complications. But the study has its own limitations factors including generalizability due to individual differences, absence of comprehensive long-term results and limited understanding of the number of subjects and the intricacy of the techniques combination. Especially important here is the fact that the manuscript gives emphasis of combining auto fat grafting with auto augmentation and concerning the psychological aspects of patient's experiences and also incorporates the Regnault classification of breast ptosis which is useful in evaluating the subject matter. All in all, the study has worth of adding value when taken in the right perspective however the study also has issues which need to be looked into on its implementation.

CONCLUSION

Breast lift with autoaugmentation is commonly performed for patients with breast ptosis who seek a firmer appearance without increasing volume. Preoperative procedures include breast screening, taking a medical history, assessing the degree of ptosis, and marking the breast with a mastopexy pattern. During surgery, breast tissue is repositioned using inferior and superior flaps from the patient's own tissue, achieving a pleasing breast shape that meets the patient's expectations. Autoaugmented mastopexy is an effective option for those who decline implants and have specific physical characteristics. The short-term results indicate high levels of patient satisfaction without complications, making it a practical choice for similar cases. However, outcomes can vary based on individual factors such as age and medical history.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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The authors declare no additional sources of funding, and no financial interests.

AUTHOR CONTRIBUTION

BSN contributed to the conception and design of the study, critical revision of the article, final approval of the article, provision of study materials or patients, and the collection and assembly of data. NFA was responsible for the analysis and interpretation of the data, drafting of the article, and collection and assembly of data. LML contributed to the analysis and interpretation of the data, critical revision of the article, and final approval of the article.

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IMPLEMENTATION OF AN OCCLUSAL WAFER IN SEVERE MANDIBULAR FRACTURE CASES WITH POST-ORIF MALOCCLUSION: A CASE SERIES

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ABSTRACT

Introduction: Improper treatment of severe mandibular fractures can lead to malocclusion, which poses a significant challenge for reconstructive surgeons. The occlusal wafer provides an effective solution for managing malocclusion following ORIF plating of maxillofacial fractures during the one-month postoperative evaluation period. Made from acrylic resin, the occlusal wafer serves as an intermediate guide in orthognathic surgery. It helps reposition the maxilla, adjust the mandible, and modify the jawbones to achieve ideal occlusion. The device can reshape the dental arch to any pre-planned position within 2 to 4 weeks.

Case Illustration: We present two cases of patients with segmental fractures.Case 1: A 26-year-old male also had segmental fractures of the left angle and right body of the mandible. He achieved occlusion after ORIF plating; however, malocclusion developed during the three-week follow-up.Case 2: A 28-year-old female presented with segmental fractures of the left angle and right body of the mandible. She initially achieved occlusion after ORIF plating, but malocclusion was noted during the one-month follow-up.

Discussion: Both of these patients had segmental fractures and experienced malocclusion following ORIF plating, but occlusion was achieved after occlusal wafer installation.

Conclusion: The use of an occlusal wafer facilitates optimal occlusion, streamlines the surgical procedure by reducing operating time, and enhances the ease of postoperative monitoring. This approach proves particularly valuable in cases where ORIF plating has been performed yet ideal occlusal alignment remains unachieved.

Highlights:

1. This study shows that occlusal wafers can effectively correct malocclusion in patients with segmental mandibular fractures after ORIF plating.
2. Occlusal wafers help reshape the dental arch within 2 to 4 weeks, reduce surgery time, and simplify follow-up care, making them a valuable option for surgeons.

INTRODUCTION

Trauma, sports injuries, and auto accidents are common causes of maxillofacial fractures. The most prevalent maxillofacial fractures occur due to two-wheeled motor vehicle incidents, particularly among young males aged 20 to 40. The zygoma and maxilla are most frequently affected, followed by the jaw. Reduction surgery is often necessary for maxillary and mandibular fractures, while conservative treatment is typically used for zygoma fractures.[1]

After maxillofacial fracture surgery, various complications can arise. These may include dental issues, nonunion, malunion, malocclusions, soft tissue problems, temporomandibular joint disorders, facial asymmetry, nerve damage, osteonecrosis, and infections.[2]

Mandibular fractures are the most common types seen in maxillofacial trauma. Due to the unique structure of the mandible, including its hinge joint and the masticatory muscles attached to it, careful management is essential to prevent displacement during treatment.[3] Displacement during fracture reduction can lead to malocclusion.[4]

The three-dimensional position of the condyle in the condylar fossa will change when fractured mandibular segments reduce in the displaced position. Then, the issue of whether the temporomandibular joint could function completely comfortably in a new circumstance would arise. According to a previous study, temporomandibular joints still appear to be functioning normally despite distortion brought on by disease, trauma, or remodeling due to centric postural adaptation. Additionally, they insisted that the restorative phase should begin if the occlusion remains tolerably stable for up to three months and there are no other issues.[5] However, malocclusion can develop in some patients, whether during the initial trauma or the recovery period after surgery.

Post-traumatic malocclusion occurs in 5-20% of cases.[6] Even with proper treatment, complications like malocclusion can arise due to inadequate occlusion establishment, inaccurate anatomic reduction, and poor plate fixation. Malocclusion is the primary reason for additional surgical intervention after maxillofacial trauma.[2] According to some studies, 0.5% to 3% of cases would require a further revision surgery, and 4% to 8% of patients would require occlusal adjustment correction.[4]

Treatment options for malocclusion include occlusal modification with a wafer, post-traumatic orthodontics, and corrective jaw surgery. Surgeons must carefully assess changes in a patient's occlusion following mandibular fractures. Complications can lead to increased pain, longer hospital stays, higher healthcare costs, and disruptions in daily activities. Therefore, minimizing complications is crucial in managing mandibular fractures.[7]

The purpose of this article is to report the use of occlusal wafers in patients with severe mandibular fractures who experienced post-ORIF malocclusion. This clinical case series will describe patients who underwent ORIF for fractured mandibles that resulted in altered occlusion and the utilization of occlusal wafers to achieve stable occlusion.

CASE ILLUSTRATION

Case 1

A 26-year-old male presented to the Plastic Reconstructive and Aesthetic Surgery Department at Zainoel Abidin General Hospital with a primary complaint of lockjaw. The patient reported a one-month history of trismus following a traumatic incident in which he slipped and fell in his backyard. Notably, he did not pursue medical evaluation or treatment immediately after the injury.

On September 12, 2022, the patient underwent ORIF plating surgery, with

satisfactory occlusion initially achieved postoperatively. However, three weeks following the procedure, he reported discomfort in his bite and difficulty with mouth opening. Clinical examination revealed malocclusion and a pronounced open bite, with the absence of contact across all teeth. The patient was subsequently diagnosed with an old segmental mandibular fracture involving the left angle and right corpus, accompanied by malocclusion (Figure 1).

Figure 1. Clinical photographs A) preoperative, B) post-first ORIF procedure, and C) three weeks postoperative.

On October 4, 2022, a secondary ORIF procedure was performed, with an occlusal wafer applied to address the malocclusion. At the six-week postoperative follow-up, the patient presented with corrected occlusion, a comfortable bite, and full mouth-opening capability (Figure 2).

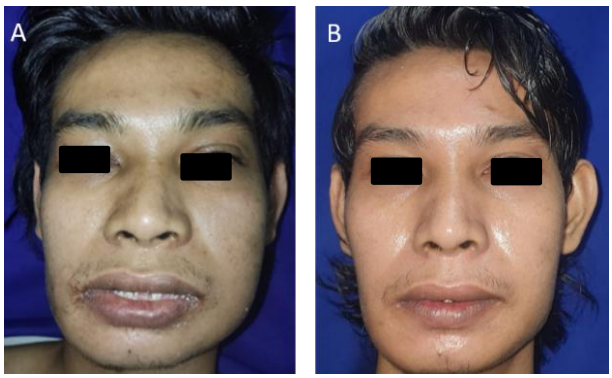

Figure 2. Clinical photograph during A) post second ORIF procedure B) six weeks post operative

Case 2

A 28-year-old female presented to the Plastic, Reconstructive, and Aesthetic Surgery Department at Zainoel Abidin General Hospital with a primary complaint of difficulty in fully closing her mouth. She reported that this issue had persisted for one week following a slip and fall in her garden. In November 2021, the patient underwent ORIF plating surgery, achieving prompt fixation and satisfactory postoperative occlusion. However, three months post-surgery, she began experiencing discomfort during biting and limitations in mouth opening. Examination identified a pronounced malocclusion, characterized by the absence of contact between all teeth (Figure 3).

Based on the assessment, this patient was diagnosed with a segmental fracture of the mandible (left angle and right corpus) and severe malocclusion.

Figure 3. Clinical photograph A) Preoperative, B) Post-first ORIF procedure, C) Three months postoperative

Following assessment, the patient was diagnosed with a segmental mandibular fracture involving the left angle and right corpus, along with severe malocclusion. To address these complications, a secondary reconstructive ORIF plating procedure was scheduled and performed on May 24, 2022, with the placement of an occlusal wafer to maintain proper occlusion. At the six-week postoperative follow-up, the patient demonstrated established occlusion, reported a comfortable bite, and displayed no limitations in mouth opening (Figure 4).

Figure 4. Clinical photograph A) Post-second ORIF procedure, B) Six months postoperative

DISCUSSION

Despite being the largest and strongest facial bone, the mandible is the most frequently fractured bone (36-70% of the time). These injuries are most commonly seen in men in their thirties.[8-10] Mandibular (jaw) fractures are primarily caused by assaults (48–65%), followed by car accidents, slips and falls, and gunshot wounds.[10-11] The high prevalence of mandibular fractures can be attributed to its unique characteristics, including prominence, an unprotected position on the face, mobility, and less bone support compared to other facial bones.[12] Our cases also involved falls, which supports this observation. The mandible is the only mobile facial bone, making it more susceptible to fractures than the mid-face in cases of maxillofacial injury.[13]

Mandibular fractures frequently develop at multiple sites, depending on the direction and intensity of the trauma. These fractures can be classified according to their anatomical sites, including the symphysis/parasymphysis, horizontal branch, angle, ramus, condyle, and coronoid process.[10] The most frequently fractured areas are the body (29%), condyle (26%), angle (25%), and symphysis (17%), while the ramus (4%) and coronoid process (1%) are less commonly fractured.[14] Consistent with these statistics, the present cases also involved fractures of the body and angle of the mandible.

Car accidents, motorcycle accidents, and physical assaults are the primary causes of fractures in the condyle, symphysis, and angle, respectively. Mandibular fractures can result from direct or indirect trauma and can be complete or incomplete, open or closed, single, double, or comminuted.[15]

Depending on the fracture location, patients may present with symptoms such as pain that worsens with jaw movement, trismus, dental malocclusion, swelling, bleeding, external and intraoral tenderness, dysphagia, and a step deformity at the fracture site. Anesthesia of the lower lip may occur due to injury to the inferior alveolar nerve.

Mandibular fractures can also lead to complications, including malocclusion, persistent pain, temporomandibular joint syndrome, and impaired chewing.[16] In the present cases, both patients suffered fractures of the angle and body of the mandible, resulting in severe malocclusion and trismus.

Mandibular fracture treatment aims to precisely reduce the fractured bone to reconstruct pre-traumatic occlusion and

restore normal masticatory function, pronunciation, shape, and sensation. Rigid fixation is essential for the formation of primary callus, leading to the development of various treatment methods. Despite careful planning and execution, complications can arise during the postoperative period. These may include malocclusion, infection, nonunion, malunion, and exposure of foreign objects.[16]

In the present cases, we noted the occurrence of malocclusion in both patients, particularly when early occlusion was achieved. The delayed onset of malocclusion may be attributed to the complexity of the fractures and their natural progression. Based on the classification by Nakamura et al.[17], our cases fall into the category of complications that can arise even after appropriate treatment.

When malocclusion is deemed too significant for correction through occlusal equilibration or orthodontic therapy alone, surgical options must be considered. Generally, combining orthodontic therapy with orthognathic surgery yields the best results. However, if ideal occlusion is achievable on articulated models, one may proceed without orthodontics. Combining orthodontics with surgery allows for the correction of major malocclusions, provided that the post-traumatic bones and joints are functional.[18] In our cases, we employed a combined surgical and orthodontic approach to address the severe malocclusion that developed after the initial ORIF procedure.

The orthognathic surgery wafers serve multiple purposes: a) they provide an intermediate guide for repositioning the mobilized maxilla relative to the intact mandible, b) they help achieve the planned final occlusion, and c) they offer post-operative proprioceptive guidance. The wafer allows dental arches to be placed in any desired preplanned position, reducing the need for intra-operative decisions that can be limited by access issues, especially when viewing posterior segments. These cases also highlight the use of occlusal wafers when post-operative occlusion is not sufficiently stable.[19,20] Additionally, the wafer can act as post-operative proprioceptive guidance. After rigid fixation of the mandible, the wafer can be wired to the maxilla or, less frequently, to the mandible. This provides proprioceptive guidance for up to two weeks, helping the patient achieve the planned occlusion with or without elastics, overriding the patient's pre-operative proprioceptive drive. This also enhances the arch relationship for any final orthodontic refinement.[21]

Wafers can be made from self-cured or heat-cured methyl methacrylate, or in rare cases, cast from silver or cobalt chromium alloy for complex cleft palate cases. It is crucial to use recent models for wafer construction. Impressions must be taken at least two weeks after any final adjustments of the orthodontic stabilizing arch wire. Using models from before the removal of an appliance is ineffective. A poorly designed wafer can compromise even the best surgical technique.[22] Proffit and White recommend that for patients whose arches have been leveled before surgery, wafers should be as thin as possible, with 1 to 2 mm of material between the teeth to prevent breakage. High-impact acrylic can help resolve this issue.[23] It has also been suggested to make the wafer slightly thicker posteriorly (<2mm) to allow for upward recoiling of the condyle post-operatively.[19]

However, various challenges arise in constructing these wafers. Acrylic wafers have poor compressive and tensile strength, take time to make, and can be bulky. They may also distort during curing, increasing the risk of inaccurate jaw localization during surgery. To expedite the preparation of acrylic wafers, self-cured acrylic resin is often used, but this can cause irritation to soft tissues due to

monomer leaching. Strength can be enhanced by incorporating carbon fibers. Alternatively, a clear silicone wafer has been recommended to reduce preparation time and overall cost, although this material may be too flexible for accurate jaw positioning.[24]

Problems may be encountered in stabilizing an acrylic wafer during orthognathic operations while the maxilla and mandible are being repositioned. Previously scalloped labio-buccal extensions to the wafer, which are perforated, have been used to wire the wafer to the orthodontic brackets. However, the wafer is cumbersome and both the construction in the laboratory and the placement in theatre are time-consuming. To overcome these problems of labour intensity, dimensional stability and occlusal accuracy, a new technique for making wafers has been developed using light cured acrylic resin. To stabilize the wafer during operation, orthodontic elastic power chain is incorporated into the wafer.[25] Because of its advantages in stability and accuracy we also utilized acrylic resin wafer to resolve severe malocclusion in our presenting cases.

The acrylic resin wafer is a valuable tool in the management of mandibular fractures, offering a quick and effective solution for achieving dental alignment. With a fabrication time of just 15 minutes, the wafer's thin and rigid structure ensures a precise fit for the patient's dental arches. Its dimensional stability and inert nature prevent the leaching of harmful monomers, making it a safe choice for clinical use. One of the significant advantages of this wafer is the integration of a power chain, which facilitates easy positioning and secure attachment to the maxillary teeth. This feature is particularly beneficial during inter-maxillary fixation, as it completely eliminates the need for wires, thereby reducing the risk of glove perforation during surgical procedures.

Moreover, certain designs of the wafer can be customized to include the patient's name and an orientation arrow, enhancing usability for clinical teams. However, while the advantages are substantial, it is essential to consider the wafer's potential disadvantages. The material's brittleness poses a risk, as it may break if accidentally dropped on a hard surface, which could lead to complications during treatment. Overall, the acrylic resin wafer represents a significant advancement in surgical aids for managing severe malocclusion associated with mandibular fractures, balancing efficiency with patient safety.[10]

The study highlights several strengths in the use of occlusal wafers for correcting severe malocclusion in patients with mandibular fractures. One key advantage is the effective restoration of dental alignment post-surgery, showcasing a reliable method for improving patient outcomes. Additionally, the introduction of light-cured acrylic resin for wafer fabrication simplifies the process, allowing for quick production—taking just 15 minutes—while ensuring a precise fit. This innovative approach not only enhances stability and accuracy during surgical procedures but also reduces the risk of complications, such as glove perforation, by eliminating the need for wires.

However, there are some limitations to consider. The wafers can be brittle, posing a risk of breaking if dropped, and patients may experience initial discomfort as they adjust to wearing them. Moreover, the success of the wafers heavily relies on the accuracy of the initial models; any flaws in construction can lead to improper positioning during surgery. Despite these challenges, the study introduces a novel approach by combining orthodontic therapy with the use of occlusal wafers, offering a more comprehensive treatment strategy for severe malocclusion. The customizable design, which can include patient-specific features like names and orientation markers, represents a significant advancement in surgical aids.

Overall, this research addresses common issues faced with traditional wafers, providing an efficient and effective solution for improving patient care in the management of mandibular fractures.

CONCLUSION

The application of an occlusal wafer facilitates optimal occlusion, reduces surgical duration, and streamlines postoperative monitoring, presenting itself as an effective option in cases where ORIF plating has been completed without achieving ideal occlusion. Furthermore, the wafer serves as an effective tool for postoperative proprioceptive guidance. The use of an acrylic resin wafer provides additional benefits, including enhanced dimensional stability and precise occlusal alignment.

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CONFLICT OF INTEREST

This study does not involve any conflicts of interest.

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AUTHOR CONTRIBUTION

CAP conceptualized the study, gathered patient data, and drafted the manuscript. MA contributed to the clinical management of the cases, reviewed the literature, and provided critical revisions to the manuscript. TNP performed data analysis, assisted in drafting figures, and contributed to the final edits of the manuscript. All authors approved the final version of this paper for publication.

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COMPLETE UNILATERAL CLEFT LIP SURGERY USING MODIFIED ROTATION-ADVANCEMENT FLAP TO ENHANCE AESTHETIC APPEARANCE IN RSPAL DR. RAMELAN HOSPITAL: A CASE SERIES

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ABSTRACT

Introduction: Unilateral cleft lip is a common congenital anomaly affecting the upper lip and nose, impacting both aesthetics and function. Advances in surgical techniques have enhanced cleft lip repair, with the rotation-advancement flap being a notable method. This study examines the outcomes of a modified Millard's rotation-advancement flap technique, developed and refined over 14 years. Case Illustration: Between September 2023 and February 2024, four patients with complete unilateral cleft lip and associated nasal deformity were treated at RSPAL Dr. Ramelan Hospital. Each patient underwent cleft lip repair using the modified rotation-advancement flap technique.

Case Illustration: Four patients presented with complete unilateral cleft lip with nose deformity came to RSPAL Dr. Ramelan Hospital between September 2023 and February 2024, We performed cleft lip surgery using the modified rotation-advancement flap for each patient.

Discussion: Surgical outcomes showed excellent symmetry, proper vermilion border alignment, and minimal scarring. Complications were rare, with no instances of wound dehiscence or infection. The study discusses the aesthetic and functional improvements achieved with this technique, underscoring its effectiveness in treating complete unilateral cleft lip and enhancing patient quality of life.

Conclusion: The Modified Rotation-Advancement Flap technique provides a valuable approach for unilateral cleft lip repair, yielding satisfactory aesthetic and functional results. Further research with long-term follow-up and larger sample sizes is needed to confirm its efficacy and refine the technique.

Highlights:

1. Complete unilateral cleft lip influences not only the aesthetics of the face but also the functionality of the lip, nose, and upper jaw (maxilla).
2. The surgery aims to establish a symmetrical, functional, and visually appealing contour of the lip, vermilion border, and nasal structure.
3. The modified rotation-advancement flap represents a valuable approach for complete unilateral cleft lip repair surgery.

INTRODUCTION

Complete unilateral cleft lip is a complex congenital deformity significantly affecting facial aesthetics and function. [1] It arises when there is an improper fusion of the nasal and upper lip structures during embryonic development. Occasionally, a complete unilateral cleft lip is discovered with the nasal tip depressed, the ala displaced, the nostril floor widened, the columella slanted, and the alar and lower lateral cartilage drooping [2] This defect influences not only the aesthetics of the face but also the functionality of the lip, nose, and upper jaw (maxilla). Surgical repair is essential to address both the aesthetic and functional aspects of the deformity [3]

The surgery aims to establish a symmetrical, functional, and visually appealing contour of the lip, vermilion border, and nasal structure. Repositioning the orbicularis oris muscle along the cleft is crucial for achieving muscle continuity and restoring function. The nasolabial units, consisting of the columella, philtrum, Cupid's bow, and nose (including the nasal alar and tip), should exhibit symmetry. The upper lip should have the correct length, width, and protrusion in comparison to the lower lip, and its detailed structures, such as the contour of the philtral ridge, the placement of the Cupid's bow peak, and the projection of the upper labial tubercle, should look natural. [4]

Over the past few decades, surgical techniques for repairing unilateral cleft lip have significantly improved. The modern approach incorporates tailored planning, careful tissue management, and precise surgical techniques.[3]The modified rotation-advancement flap technique, developed as a modification of the classic Millard technique, is a well-established surgical approach for repairing complete unilateral cleft lips. This technique aims to achieve optimal lip symmetry and minimize scar formation by utilizing precise incisions and tissue rearrangement.[2]

The authors of the current study have employed a modified rotation-advancement flap technique based on 14 years of experience. This article introduces a novel approach to complete unilateral cleft lip repair developed by the senior author to enhance surgical outcomes for patients with this condition. The surgical technique and outcomes of the surgeries, including aesthetic improvements and functional results, are discussed. This case series highlights the effectiveness of the modified rotation-advancement flap in achieving satisfactory results for patients with complete unilateral cleft lips, contributing to their overall well-being and quality of life.

CASE ILLUSTRATION

Four Four patients presented with complete unilateral cleft lip and associated nose deformities at RSPAL Dr. Ramelan Hospital between September 2023 and February 2024. We performed cleft lip surgery using the modified rotation-advancement flap for each patient.

Case 1

A 3-month-old female patient was diagnosed with a complete unilateral cleft lip on her right side, accompanied by a nose deformity involving the drooping of her lower lateral cartilage and alar cartilage.

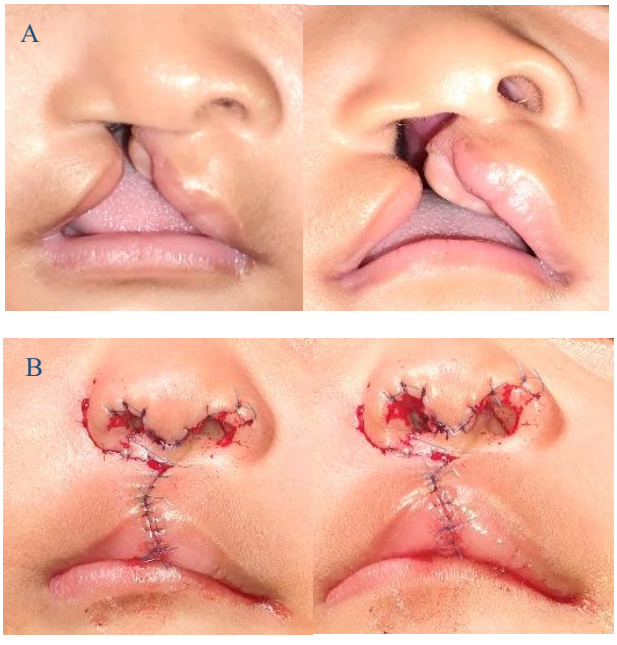


Figure 1. (A) Pre-operative photographs of Case 1. (B) Post-operative photographs. (C) One-week follow-up post-operation shows symmetrical ala nasi, a straight columella, and a natural lip contour.

Case 2

A 3-month-old male patient was diagnosed with a complete unilateral cleft lip on his right side, along with a nose deformity involving the drooping of his lower lateral cartilage and alar cartilage.

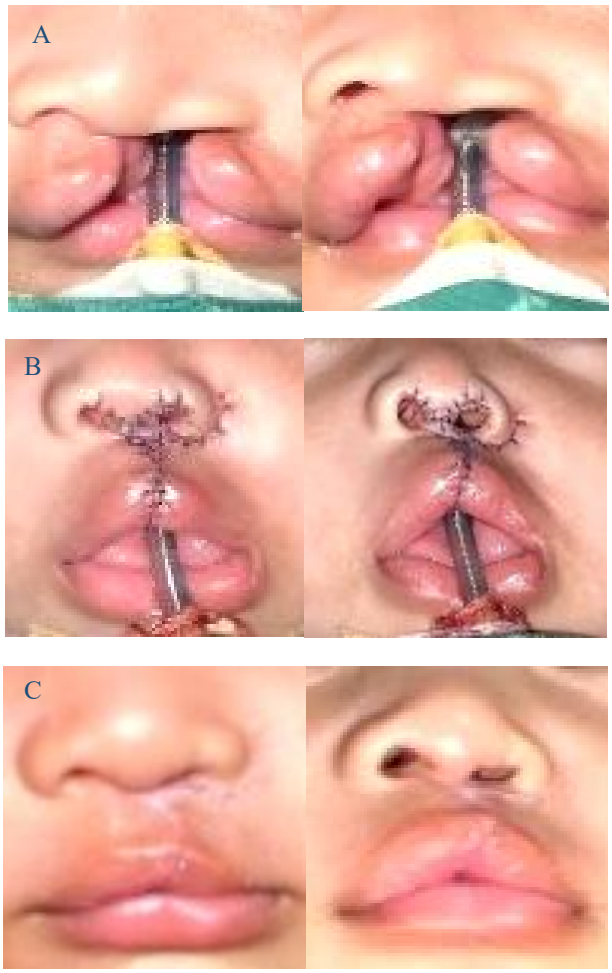


Figure 2. (A) Pre-operative photographs of Case 2. (B) Post-operative photographs. (C) One-week follow-up post-operation shows symmetrical ala nasi, a straight columella, and a natural lip contour.

Case 3

A 3-month-old male patient was diagnosed with a complete unilateral cleft lip on his right side, along with a nose deformity involving the drooping of his lower lateral cartilage and alar cartilage.

Figure 3. (A) Pre-operative photographs of Case 3. (B) Post-operative photographs. (C) Six-month follow-up post-operation shows symmetrical ala nasi, a straight columella, and a natural lip contour.

Case 4

A 3-month-old male patient was diagnosed with a complete unilateral cleft lip on his right side, along with a nose deformity involving the drooping of his lower lateral cartilage and alar cartilage.

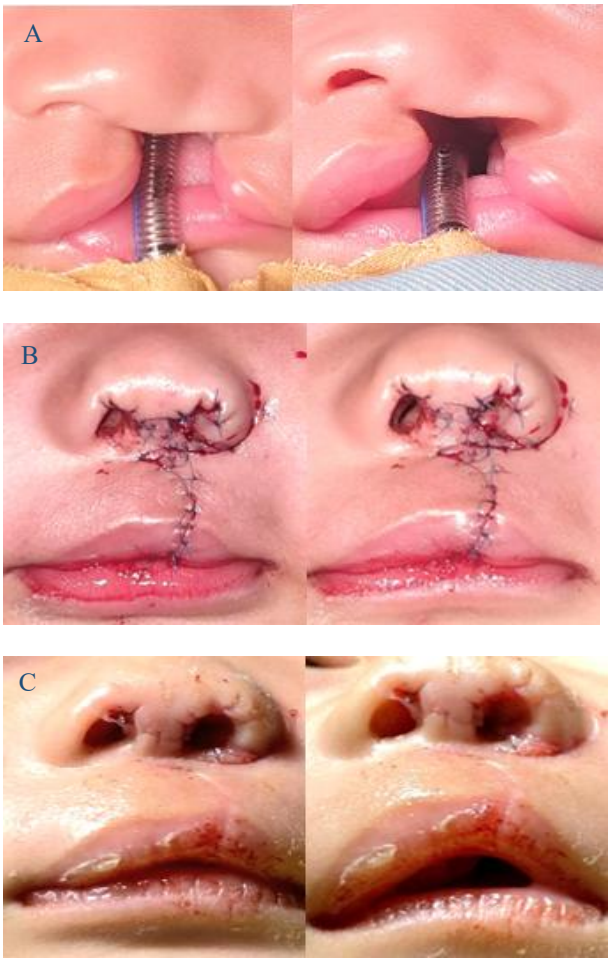
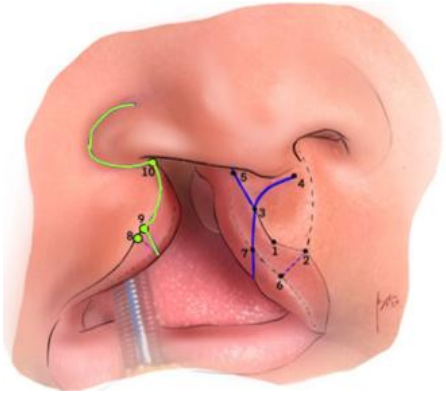


Figure 4. (A) Pre-operative photographs of Case 4. (B) Post-operative photographs. (C) One-week follow-up post-operation shows symmetrical ala nasi, a straight columella, and a natural lip contour.

Case Management

The Design

Cheiloraphy Unilateral describes the strategic placement of incision lines and the mobilization of tissue necessary for the reconstruction of a unilateral cleft lip.



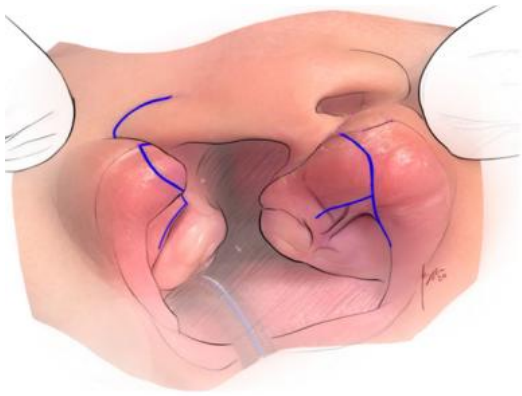


Figure 5. Design Cheiloraphy Unilateral

The design not only seeks to achieve optimal aesthetic symmetry between the affected and unaffected sides of the face but also emphasizes restoring the lip's functional capacity. This includes improving the patient's ability to perform essential functions such as speaking, eating, and smiling. The ultimate goal is to enhance the patient's facial appearance, improve their facial dynamics, and contribute to a more natural and harmonious lip and nasal contour. Through these carefully executed steps, the procedure helps to reduce scarring and ensures the long-term success of the reconstruction.

Medial Segment

To create a detailed outline for the medial segment of the lip and surrounding structures, follow these steps for precise anatomical reference points. First, identify point 1 at the center of Cupid's bow, then mark point 2 at the junction where the cupid bow meets the left philtrum ridge. Next, measure point 3 on the right cupid bow, ensuring it mirrors the left side, maintaining equal distance from point 1 to both points 2 and 3. Determine point 4, which is located 1 mm above the base of the columella, and extend a line to the left philtrum ridge without crossing the imaginary line of the normal left philtrum. Point 5 is located at the junction of the white skin roll and the base of the nose. For point 6 , measure perpendicularly from

point 2 to the dry-wet border of the vermilion to establish the normal width of red lips. Position point 7 at the dry-wet border below point 3, adjusting laterally toward point 6 until its length matches the distance between points 2 and 6. Finally, connect point 3 to point 4 with a curved line that starts straight and then bends towards point 4. Draw a straight line from point 3 to point 5, and another from point 3 to point 7, extending it parallel to the oral mucosa until it reaches the frenulum, while also extending laterally along the gingiva buccal sulcus. This methodical approach ensures accurate anatomical representation for further procedures or assessments.

Lateral Segment

For the lateral segment of the lip reconstruction, precise anatomical reference points must be established. Start by identifying point 8 at the tip of the bulkiest portion of the vermilion. Next, mark point 9 , which is positioned 1 mm medially from point 8; this placement is essential for achieving a smooth, non-angular curvature of the white skin roll when suturing it to the medial segment. Then, determine point 10 at the junction where the white skin roll meets the base of the nose in the lateral segment. From point 10 , draw a line to point 9 that extends to the oral mucosa. Additionally, extend this line from point 10 along the base of the nose until it reaches the alar crease. Finally, ensure the design continues to extend until it meets the oral mucosa. This systematic approach is vital for achieving a harmonious integration of the lateral segment with the overall lip structure.

The Operation

Medial Segment

To begin the surgical procedure, start by making a skin incision according to the design using a blade no. 15 . Next, deepen this incision along the designated lines with a blade no. 11 . Carefully dissect the medial lip mucosa from points 3 to 5 until you reach the sulcus, ensuring to preserve the frenulum. Then, incise the oral mucosa along the gingivobuccal sulcus, extending 10 mm laterally. Following this, dissect the muscle away from the skin and mucosa and release it from the periosteum. The orbicularis muscle should then be split into quarters. Finally, pull the triangular flap laterally until the columella is aligned straight. These steps are essential for the successful reconstruction of the medial segment.

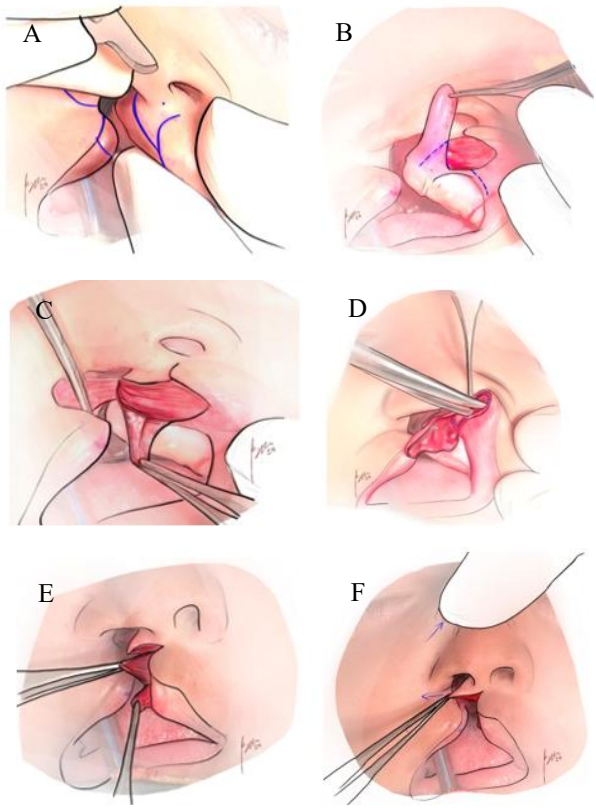


Figure 6. The Incision of The Medial Segment.

Lateral Segment

In the lateral segment of the operation, begin by making subcutaneous deep incisions according to the design using Blade No. 15. Next, deepen these incisions along the designated lines with Blade No. 11. Use Metzenbaum scissors to dissect the

muscle from the skin and mucosa in this segment. Following that, incise the mucosal lining of the nose in an L-shaped design. Incise the mucosa laterally about 10 mm long, starting 5 mm from the gingivobuccal sulcus. Finally, release the soft tissue along the alar crease from the periosteum to complete the lateral segment preparation.

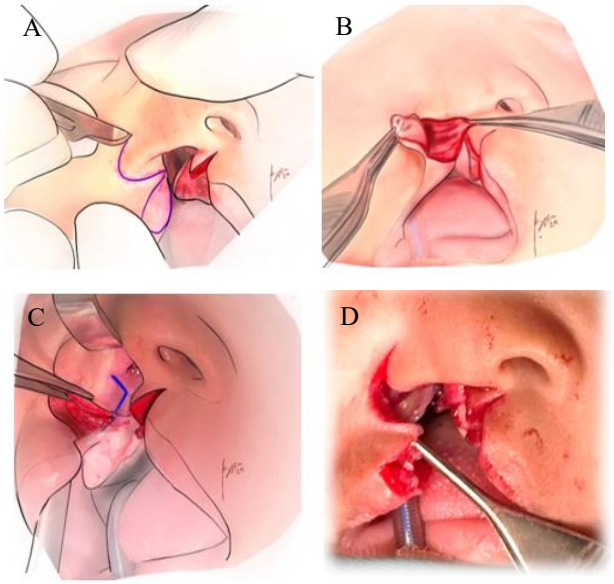


Figure 7. The Incision of The Lateral Segment.

Suturing Lateral Segment and Medial Segment

In the suturing phase for both the lateral and medial segments, begin by using Nylon 7.0 to suture the triangular flap to the alar base, effectively forming the nasal floor. Next, utilize Vicryl 5.0 to suture the muscle at point 10 to the muscle at point 4, filling the gap from the cleft and lifting the nose. Proceed to suture the medial and lateral orbicularis oris muscles together.Lift the alar rim on the cleft side and secure it with sutures. Measure any excess skin in the lateral segment to ensure it fits with the medial segment at points 3-4, then excise the excess. Using Nylon 7.0, suture the medial and lateral lip segments together, starting 0.5 mm above the white skin rolls to accurately align this crucial landmark before continuing with the rest of the skin. Next, employ Vicryl 6.0 to suture the oral mucosa, beginning from the innermost intraoral area and working upward to the border of the wet-dry vermilion, ensuring uniform bulkiness of both medial and lateral lips . Finally, reattach the frenulum and use Nylon 7.0 for suturing the dry vermilion area.

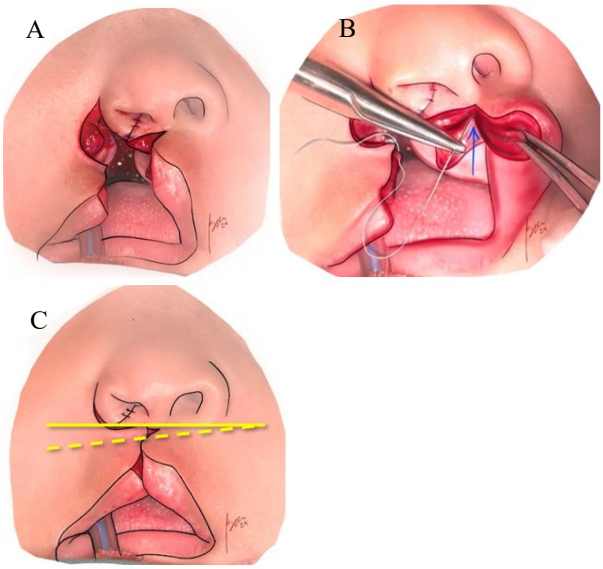


Figure 8. Suturing the triangular flap to the alar and the muscle of flap point 10 with point 4.

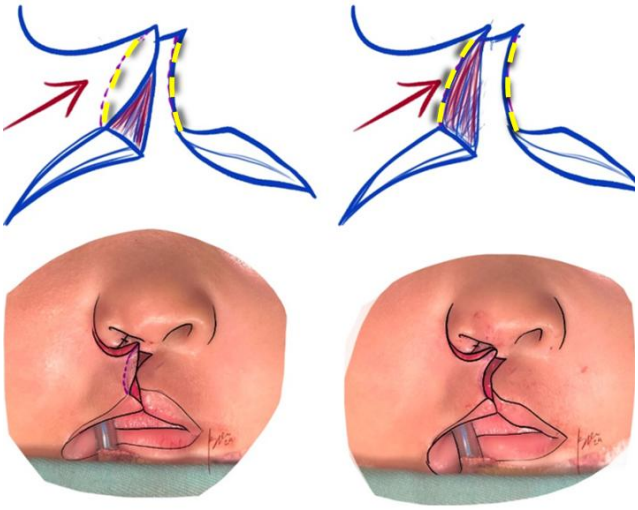


Figure 9. Measure the excess skin at the lateral segment to fit with the medial segment.

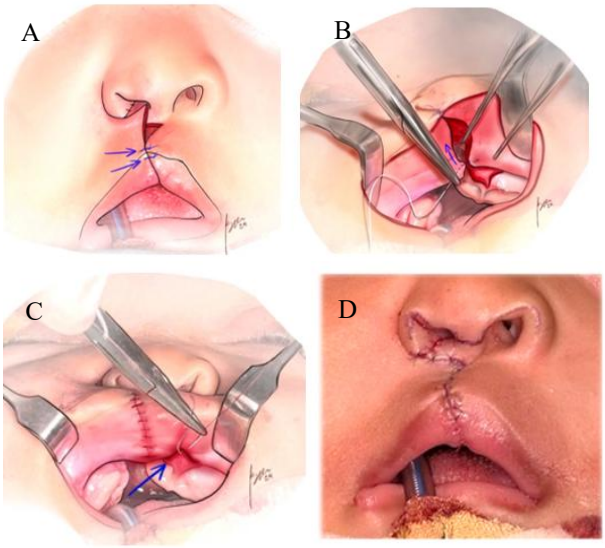


Figure 10. Suturing the Lips of The Medial Segment and Lateral Segment.

Nose Correction

Nose deformities are corrected by making an incision at the columella and along the alar rim using blade No. 11, followed by dissecting the subcutaneous tissue until both nasal cartilages are exposed. The deformed lateral crus cartilage is identified and anchored to the normal lateral crus using nylon 6.0 sutures to ensure symmetry. Stitches are then fixed to the roof of the nose with nylon 6.0 to create a defined rim, and the procedure is completed by suturing the skin with nylon 7.0.

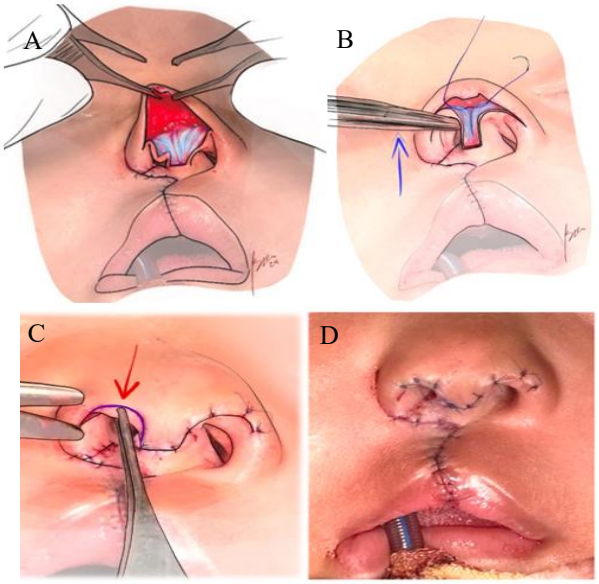


Figure 11. Nose Correction.

DISCUSSION

Cleft lip deformity is one of the most frequent congenital malformations. It results from the failure of the frontonasal and maxillary processes to fuse during development. Disruptions in the embryological formation of the upper lip can lead to a cleft lip, which may be either unilateral or bilateral. Additionally, depending on their severity, cleft lip deformities can be classified as complete or incomplete. A complete cleft involves a full vertical split of the upper lip and is often associated with an alveolar defect, as the alveolus is a component of the main palate. In contrast, an incomplete cleft affects only a portion of the upper lip's height, leaving a connected segment between the separated areas.[5,6]

Unilateral cleft lip deformity is primarily characterized by a reduction in vertical lip height due to the thinning of lip tissues near the cleft margin, resulting in several anatomical abnormalities. On the cleft side, the lower lateral cartilage typically exhibits a long, more caudally positioned lateral crus and a shorter medial crus. The columella is usually situated on the non-cleft side, while the nasal tip and nasal septum deviate towards the non-cleft side. Additionally, the alar base on the cleft side is often shifted laterally, downward, and backward. These nasal deformities are mainly attributed to the abnormal insertion of the orbicularis oris muscle and the absence of the anterior nasal floor[5,7,8].

The surgical correction of complete unilateral cleft lip poses unique challenges due to the complex anatomical and functional considerations involved. Efforts to maintain anatomical boundaries and relocate incision lines to less noticeable areas led to the development of the rotation advancement flap repair technique, notably advanced by Millard. The essential actions of Millard's surgical technique involve rotation and advancement. This technique elevates the Z-plasty just below the nasal

sill while also rotating the central lip element to its natural anatomical position.[8–10]

The effectiveness of the rotation flap in restoring vertical lip height relies on the back-incision technique. This involves making an incision across the midline of the columellar labial junction, extending back towards the noncleft side philtral column without violating it. The length of thisback-incision is determined incrementally during surgery, guided by the surgeon's experience to achieve the necessary downward rotation. The defect created by the back-incision is filled by advancing the leading edge of the flap from the lateral lip, thereby correcting the deficiency in vertical lip height. Simultaneously, mobilizing the advancement flap into the rotation flap's defect corrects alar flare and reconstructs the nasal sill on the cleft side. Subsequently, a superiorly based triangular C-flap can be rotated either medially to lengthen the columella or laterally into the nose to assist in nasal floor closure, provided there is sufficient columellar length. [8]

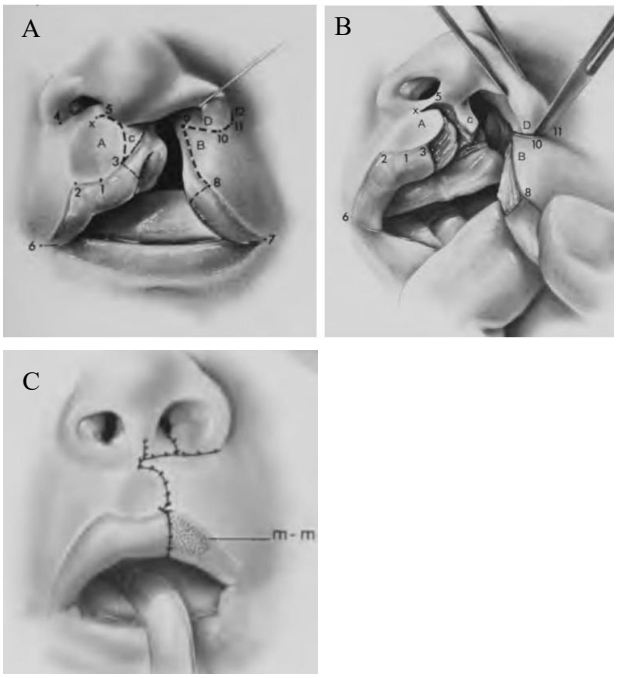


Figure 12. The original MillardRotation-Advancement Flap Technique.[11]

The rotation advancement technique offers several advantages, including maximal preservation of tissue, versatility in addressing various cleft lip configurations, and a scar that is discreetly placed along the new philtral column. However, there are also notable disadvantages. These include the risk of nostril stenosis, challenges in closing wide clefts effectively, and increased complexity for less experienced surgeons. The technique demands skilled intraoperative judgment for adjusting flap modifications as the procedure unfolds.[12,13]

The Millard rotation-advancement flap has been successful in addressing these deformities, but modifications to these techniques may be necessary to enhance aesthetic outcomes further and minimize postoperative complications. [5,14]

The Modified Rotation-Advancement Flap technique has been refined by our senior author, highlighting several key updates for improved outcomes. First, a semicircular incision is made along the nasal-cheek crease to address the nasal deformity. To enhance the natural curvature of the cupid’s bow, an additional 1 mm is added medially from point 8 to point 9 when suturing to the medial segment. Flap point 3 (C-Flap) is established to serve as the nasal base rather than being positioned at the nasolabial area. The orbicularis oris muscle is split to create a denser vermillion, filling the void left by the cleft on the nasal base. For lip suturing, the process begins with the innermost intraoral mucosa and progresses outward to maintain symmetrical vermillion width. The triangular flap incision must align with the normal philtrum ridge, and the width of the dry-wet vermillion must match between the lateral and medial segments to avoid notching; the incision on the dry vermillion of the medial segment should be slightly slanted while maintaining this width. Lastly, it is essential to ensure that the muscle in the lateral segment is entirely separated

from the overlying skin and mucosa for optimal healing.

A semicircular incision is typically made along the nasal cheek crease to release the deformed nose, allowing it to be repositioned to achieve the desired nasal contour. This incision is particularly useful for correcting wide gaps. Subsequently, the flap at point 3 (C- flap) is utilized to pull the columella into a contralateral position, creating a perpendicular columella. This flap is then sutured to the nasal ala, forming the nasal base. In contrast, Millard's technique uses the C flap advancement to fill the gap created by the rotation of the medial lip element at the base of the columella. This method also helps to lengthen the shortened columella on the cleft side.[12]

The orbicularis muscle on the lateral segment is separated into two parts; the upper one is used to fill and lift the nasal base. The lower part is then sutured to the orbicularis muscle in the medial segment. The addition of 1 mm medial to point 8 is important for forming a natural, non-angled Cupid's bow when sutured to the medial segment. Sometimes, sewing the lips from the outside causes them to be pulled inward, making them appear thin and lacking in volume. Therefore, stitching should be done from the inside to the outside, and attention should be paid to the symmetry of lip thickness between the medial and lateral segments during stitching. At this stage, the cleft lip should be properly corrected, marked by the formation of parallel ala nasi, a perpendicular columella, a parallel white skin roll, and symmetrical shape and thickness of the lips. However, generally, the nostrils are still not corrected, especially in wide gaps. Nose correction with rhinoplasty can be performed at this stage to ensure that a round and symmetrical nostril is ultimately achieved.

The modified rotation-advancement flap described in this case series represents a refinement of the traditional approach, incorporating flap design, tissue handling, and wound closure adjustments to achieve more natural and symmetrical lip contours. This technique can also be applied to wide cleft lips.[14]

A significant advantage of the modified technique is its ability to enhance the vermilion contour and achieve better lip symmetry, which are crucial aspects of aesthetic lip reconstruction. Through precise alignment and tension adjustments of the rotation-advancement flap, surgeons can create a smooth and natural transition between the cleft and non-cleft sides of the lip, resulting in a harmonious and aesthetically pleasing lip appearance. This aspect is particularly important in pediatric patients, where achieving satisfactory aesthetic outcomes can have a significant impact on psychosocial development and quality of life.[15]

This case series describes four cases of complete unilateral cleft lip surgeries performed using the Modified Rotation-Advancement Flap technique. The surgical outcomes showcased excellent symmetry, precise alignment of the vermilion border, and minimal scarring. Complication rates were low, with no instances of wound dehiscence or infection reported. These findings underscore the effectiveness of the Modified Rotation-Advancement Flap in reducing postoperative complications and promoting optimal healing outcomes.

The uniqueness of this technique lies in its tailored approach to enhancing aesthetic results while addressing functional challenges, marking a significant advancement in cleft lip repair. However, limitations may include the potential for complications in less experienced hands and the need for precise execution to avoid asymmetry. Overall, the impact of the modifications to the Rotation-Advancement Flap is profound, enhancing not only patient outcomes in terms of appearance and function but also contributing to the body of knowledge in cleft lip surgical techniques, paving the way for further innovations in the field.

CONCLUSION

The Modified Rotation-Advancement Flap represents a valuable approach for the repair of complete unilateral cleft lip, providing satisfactory outcomes in both aesthetics and function. Its meticulous surgical principles and emphasis on lip symmetry make it a preferred choice for many surgeons worldwide. Further research, long-term follow-up studies, and larger sample sizes are required to validate its effectiveness and refine surgical techniques.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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AUTHOR CONTRIBUTION

The authors' contributions are as follows: Conceptualization: JN. Data Collection: JN, RD, BW. Drafting the article: JN, RD, BW. Critical revision of the article and proofreading: All authors have reviewed and approved the final version of the manuscript for publication.

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REKONSTRUKSI DAN ESTETIK

A COMBINATION OF CHEEK FLAP, CARTILAGE INSERTION, AND FAT TRANSFER ON POST-TRAUMA LOWER EYELID ECTROPION RECONSTRUCTION

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ABSTRACT

Introduction: Ectropion correction surgery is a procedure designed to restore the anterior lamella to its anatomical position. This study aims to propose a combination of cheek flap and fat transfer as a method for post-traumatic ectropion reconstruction surgery.

Case Illustration:A 10-year-old girl presented with ectropion caused by scar formation and volume loss in the infraorbital region following a traumatic incident seven years prior. The procedures performed in this case included a Mustarde rotational cheek flap to reconstruct the scar tissue in the infraorbital region that led to the ectropion, pure ear cartilage insertion to repair the damaged tarsal plate or tarsus, and fat transfer to address the volume loss in the infraorbital area. The donor fat was harvested from the inguinal region

Discussion: The rationale for using the Mustarde rotational cheek flap, cartilage insertion, and fat transfer was based on the wide donor area, particularly in cases where the vertical dimension exceeds the horizontal dimension. This approach is believed to yield better outcomes compared to other methods, such as skin grafts. In this case, fat transfer was employed to restore the volume lost beneath the scar tissue following trauma. This combination technique is thought to be more durable and to provide superior results compared to alternative methods, while also being economically advantageous.

Conclusion: The combination of the Mustarde rotational cheek flap, cartilage insertion, and fat transfer is believed to improve the outcomes of the reconstruction procedure following scar tissue release and correction of volume loss beneath the scar.

Highlights:

1. This study introduces an innovative approach for post-traumatic ectropion reconstruction in children by combining Mustarde rotational cheek flap, cartilage insertion, and fat transfer.
2. This method effectively addresses the challenges of cicatricial ectropion caused by injuries or burns, leading to improved, durable, and cost-effective outcomes in restoring eyelid function and volume.

INTRODUCTION

Ectropion is a condition characterized by the outward rotation of the eyelid, often affecting the lower eyelid unilaterally or bilaterally.[1,2] This outward rotation can expose the inferior cornea, leading to a foreign body sensation, superficial punctate keratopathy, corneal erosion, and even corneal ulceration.[3,4] When ectropion is caused by scarring from chemical burns, trauma, or surgery, it is referred to as cicatricial ectropion, which results in mechanical shortening of the anterior lamella and downward pulling of the eyelid.[5]

Among the various forms of ectropion,involutional ectropion is the most common acquired form, with an incidence that increases with age due to involutional factors such as horizontal weakness and vertical instability of the eyelids. Paralytic ectropion occurs due to weakness of the seventh cranial nerve (facial nerve), which may result from a stroke, tumor, or surgical complications. Cicatricial ectropion can occur across various age groups and results from chemical burns or scarring due to trauma or surgery. In cicatricial ectropion, there is mechanical shortening of the anterior lamella of the eyelid, causing the eyelid to be pulled downwards. Mechanical ectropion is a type that is rarely encountered and is due to specific anatomical causes, such as dermatochalasis, edema, chalazion, orbital fat, or eyelid tumors.[3]

The implications of ectropion are significant, particularly because the lower eyelids are highly susceptible to malposition. Even small scars or minor irregularities can lead to patient dissatisfaction. Consequently, ectropion, lagophthalmos, and retraction often arise as unintended outcomes of attempts to repair or rejuvenate the periocular area, which can also pose serious risks to the eyes. Therefore, the ability to prevent these issues and address them when they occur is crucial for any facial surgeon.[6]

Eyelid reconstruction poses significant challenges in plastic surgery due to the need to address aesthetic, functional, and anatomical considerations.[7] The primary goal of ectropion surgery is to restore the normal length of the anterior lamella. Various methods exist, including composite flaps, skin grafts, mucosal membrane grafts, and fat transfer.[8] However, there is currently no standard, widely accepted algorithm for ectropion reconstruction surgery.[7]

This case report presents a 10-year-old girl who sought treatment for a concave and downward-pulled infraorbital region following a traumatic incident seven years earlier. Physical examination revealed cicatricial ectropion and volume loss in the right lower eyelid and infraorbital region. The purpose of this study is to propose an innovative combination of cheek flap, cartilage insertion, and fat transfer for the reconstruction of post-traumatic ectropion, presenting a novel approach compared to traditional methods.

CASE ILLUSTRATION

The patient was a 10-year-old girl who visited the plastic surgery clinic with her family because her infraorbital region appeared depressed and pulled downward following a traumatic incident. When she was 3 years old, she was struck in the right eye by a swinging swing. In 2023, reconstruction surgery was planned for her but was rescheduled due to her general condition, which included existing comorbidities and inadequate blood supply prior to the surgery.

During the physical examination in the clinic, she was found to be in good general condition, fully conscious, and with stable vital signs. A neurological examination revealed no abnormalities in the facial nerve. Eye movement was unrestricted, indicating no issues with the Oculomotor (III), Trochlear (IV), or Abducens (VI) nerves. The light and corneal reflexes in both eyes were also normal, suggesting no abnormalities in the Optical (II), Oculomotor (III), Trigeminal (V), or Facial (VII) nerves.

Upon examination, ectropion was observed on the right lower eyelid, with depression noted in the right infraorbital

region extending from the lateral canthus to the pre-auricular area (Figure 1). Palpation revealed that the skin around the eyelid was adhered to the bone, extending two fingers below the eye. *Punctum lacrimalis* was intact.

Figure 1. Ectropion on Right Lower Eyelid Before the Procedure

A Contrast Head Computed Tomography (CHCT) scan was performed on September 26th, 2023, which revealed thinning of the buccal soft tissue in the infraorbital region due to soft tissue fibrosis. Based on the physical examination and supporting tests, the patient was diagnosed with cicatricial ectropion of the right lower eyelid, accompanied by volume loss in the infraorbital region.

Surgery Procedures

Before the surgery, the participant and her family provided informed consent for the procedures and this case report, following a thorough explanation by the author, who also served as the surgeon. The consent was given both verbally and in written form by her guardian.

The surgery was performed under general anesthesia, with the patient positioned supine. The surgical area was disinfected using povidone iodine. An incision was made along the scar in the infraorbital region (middle malar), extending through the anterior lamella of the right lower eyelid and terminating in the pre-auricular region (Figure 2).

Figure 2. Surgical Incision in the Infraorbital Region During and After the Surgery

The incision was made according to the cheek flap design around the lesion. During the surgery, it was found that there was depression of the inferior rim of the orbit, partial damage to the inferior tarsal plate/tarsus, and partial loss of the orbicularis oculi muscle and infraorbital fat pads. After making the incision, the surgeon released the scar tissue and inserted a pure cartilage to replace the damaged tarsal plate/tarsus. The donor cartilage was taken from the helix of the right ear. The Mustarde method was then used to perform the cheek flap procedure, covering the defect in the subciliary area. Dermofat graft transfer was utilized to fill and increase the volume of the defect around the medial canthus and nasal flank to reduce tension on the flap. The donor fat was harvested from the right inguinal region. In order to account for anticipated tissue resorption, about 120% of the intended amount of the dermofat graft was harvested. Our surgical expertise indicated that harvesting up to 6×4 cm was feasible. The incision site was closed after the carefully planned dermofat graft was placed as needed to accommodate the dead space at the deformity site. Lastly, a fixation suture was used to complete the treatment, taking into account the patient's asymmetry and form.[8]

Postoperative Assessment

During the surgery, a stent was placed to bridge and close the gap between the superior and inferior eyelids. The stent was also used to secure the position of the defect in its anatomical location. After the surgery, closed wound care was applied for three consecutive days (Figure 3). The wound was cleaned with normal saline, and gentamicin ointment was applied to keep the surgical wound moist and covered with dressing. After seven days, the dressing was removed for evaluation, and the stitches were taken out periodically (Figure 4).

Figure 3. Closed Wound Care on the Last Day of Admission and Third Day After the Procedure

Figure 4. Dressing Removal and Stitch Evaluation on the Seventh Day After the Procedure

A follow-up examination was scheduled to evaluate the ectropion. The patient and her family were instructed to massage the infraorbital area to loosen the scar formation and prevent the pulling of the scar tissue. The patient was also encouraged to exercise her eyes by opening and closing them with maximum effort. If the patient was found asleep with her eyes open, it was advised to close them using adhesive tape. Follow-up examinations were to be conducted every three months (Figure 5).

Figure 5. Follow-Up Examination and Postoperative Care Several Months After the Procedure

DISCUSSION

Ectropion is a condition characterized by the outward rotation of the eyelid, often affecting the lower eyelid, which can lead to irritation, tearing, and cosmetic concerns.[9,10] This condition can be categorized into congenital types, such as congenital ectropion and congenital upper eyelid eversion, and acquired types, including involutional, cicatricial, paralytic, or mechanical.[10] Cicatricial ectropion, specifically, arises from the formation of scar tissue following eyelid injuries or burns, causing mechanical shortening of the anterior lamella and resulting in the eyelid being pulled downwards.[11] Treatment for cicatricial ectropion typically involves surgical intervention aimed at releasing scar tissue

and lengthening the anterior lamella, with or without horizontal shortening, to restore proper eyelid function and appearance.[3,4]

Cicatricial ectropion of the lower eyelid can be challenging to treat, with surgical interventions depending on the underlying causes, eyelid mechanics (horizontal or vertical laxity), external position, and severity of the condition. Techniques such as lateral tarsal strip, canthopexy, or medial spindle incision are employed based on the eyelid's location and laxity. If intractable laxity occurs with loss of supportive tissue, more extensive surgical procedures, including transplantation of auricular cartilage and fascia lata, may be necessary.[12] However, postoperative complications, including tenting, cosmetic dissatisfaction, and medial inferior ectropion, can arise. A common issue with intractable lower eyelid ectropion is lagophthalmos, resulting from impaired tear conduction due to the separation of the lower lacrimal punctum from the lacrimal lake.[13,14] This is because other reconstructive procedures typically only address horizontal traction, without accounting for the spherical structure of the eye.[15]

Treatment for cicatricial ectropion typically involves a combination of techniques aimed at lengthening the skin surface and resecting the subcutaneous cicatricial tissue to restore normal anatomical function and appearance.[5] One of the most effective approaches in reconstructing cicatricial ectropion is the use of local random flaps, which have been shown to yield better outcomes compared to the skin graft method.[9] Unlike skin grafts, flap methods offer superior advantages in terms of color match, texture, and blood flow, contributing to more natural and aesthetically pleasing results.

In this case, the Mustarde cheek rotational flap technique was used after releasing the cicatricial tissue. This method helped restore the lost tissue and correct the ectropion. By using tissue from the adjacent cheek, the procedure aimed to improve both the appearance and function of the affected area, ensuring better healing and a more natural result.[9]

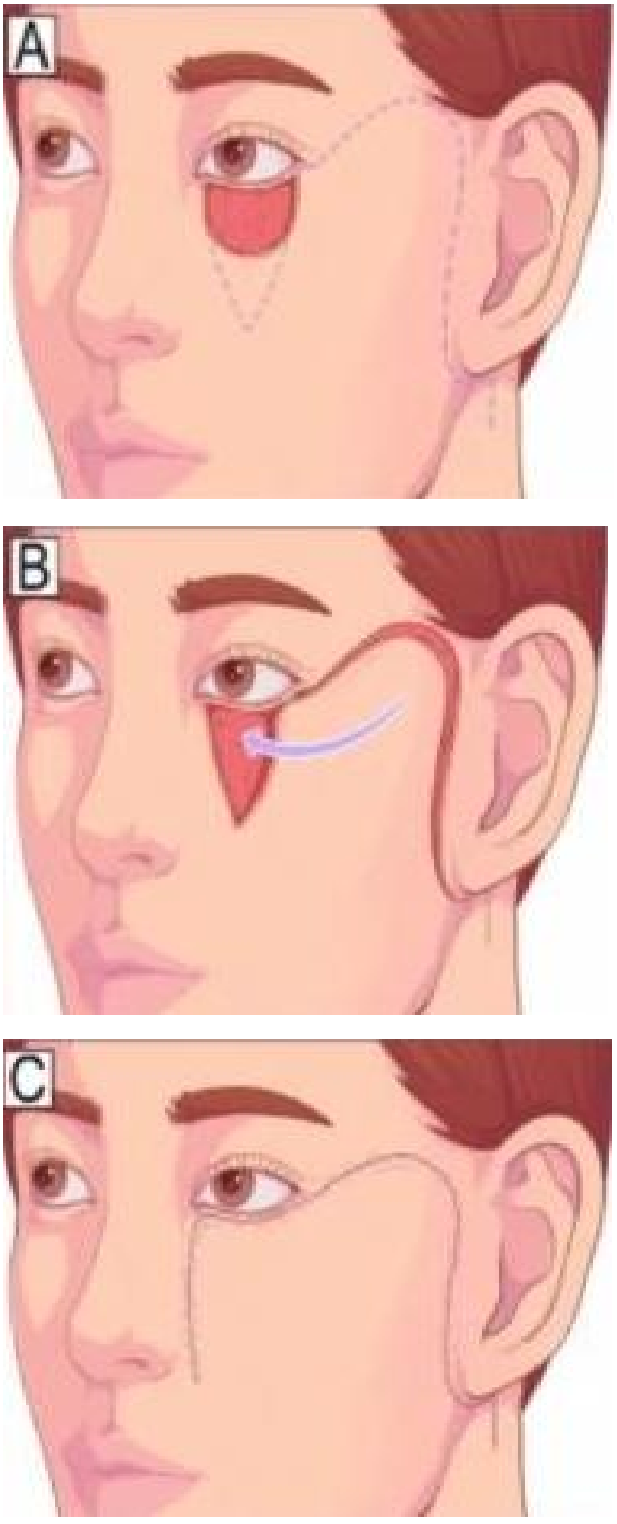

Figure 6. Mustarde Rotational Cheek Flap Procedure

The surgery was performed under general anesthesia with the patient in a supine position, and the surgical area was

disinfected. An incision was made along the scar in the infraorbital region, extending through the lower eyelid to the pre-auricular area. During the procedure, issues such as depression of the inferior orbital rim and partial damage to the tarsal plate were noted. A cartilage flap from the right ear was inserted to replace the damaged tarsal plate, and a Mustarde cheek flap was used to cover the defect. Fat transfer from the right inguinal region was also performed to enhance volume and reduce tension on the flap.[16] Postoperatively, a stent was placed to secure the eyelids, and wound care was conducted for three days. Follow-up instructions included massaging the area to prevent scar formation and regular eye exercises, with examinations scheduled every three months to monitor the ectropion.

The Mustarde cheek rotational flap is one of the flap methods used in ectropion reconstruction, utilizing flaps from the lateral cheek tissue and preauricular area. This method is the treatment of choice for deep vertical defects involving the anterior lamella of the lower eyelid, especially when the vertical aspect of the defect is larger than the horizontal aspect. The advantage of this technique is that it can be applied to large donor areas with good vascularization.[9] Research conducted by Kiran et al. (2022) showed that the flap method yields more optimal results than grafting in ectropion correction.[7] Observations in the group that underwent reconstruction using the graft method indicated a recurrence of ectropion, while no recurrence was found in the group using the flap method.[8]

Despite these advantages, this technique has several drawbacks, including the use of a relatively thick flap from the cheek area, which may not be ideal for the eyelid. Additionally, this procedure has the potential to cause damage to the facial nerve (N. VII).[9]

The auricular cartilage insertion procedure performed during surgery aims to replace part of the damaged inferior tarsus. Auricular cartilage is known for its ability to mimic the function of the tarsus due to its thin, soft, and malleable nature, allowing it to adapt to the curvature of the eyeball. Cartilage insertion is also an easy procedure to perform with a high success rate, as cartilage can survive on the regional blood supply.[17] Research conducted by Watanabe et al. (2015) demonstrated that using auricular cartilage in ectropion reconstruction successfully maintained normal eyelid mobility without causing fixation of the lower eyelid.[18] All study patients showed good anatomical and functional results after surgery, with no complications or need for reoperation.

The use of fat transfer is recommended as a technique for increasing soft tissue volume and improving contours in the facial area.[19] In this case, the fat transfer method aims to restore volume in the flap area that was lost after the patient experienced trauma and underwent reconstruction procedures. Fat transfer has several advantages, including longer-lasting results compared to other methods, such as hyaluronic acid gel.[8] However, it also carries risks of long-term instability due to fat tissue resorption and has a higher susceptibility to infection. While there are many donor area options, the quantity of available fat donors can be quite limited.[5]

In this case, the fat donor was taken from the right inguinal region. This choice was based on the recommendation that, in young patients with low abdominal circumference, fat should be harvested from lower body areas, such as the buttocks and upper thighs.[19] Research by Choi et al. (2020) shows that using fat from the inguinal region is an effective, simple, and affordable surgical option for facial deformities with cicatricial tissue.[5]

The combination of the cheek flap and fat transfer methods is expected to yield optimal repair results after scar removal, restoring eyelid function to near normal and improving volume in areas experiencing loss.

This research has been ethically approved by the ethics committee of the Department of Education and Research at Dr.

Soebandi General Hospital . Patients in this study have consented to all forms of publication, including clinical photos, procedural history, and evaluations of the results. A limitation of this study is the short postoperative observation period, which restricts the ability to compare the progress of the repair process and the success of cicatricial tissue reconstruction and volume improvement. Therefore, longer-term observation is necessary to evaluate the results of this intervention. This study provides novelty by involving a combination of several methods for ectropion reconstruction.

CONCLUSION

Cicatricial ectropion is the outward rotation of the eyelid caused by injury or burns to the eye. The combination of the Mustarde cheek rotational flap, cartilage insertion, and fat transfer is believed to yield better outcomes in the reconstruction procedure following scar tissue release and correction of volume loss beneath the scar.

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CONFLICT OF INTEREST

This study does not involve any conflicts of interest.

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This research was not funded by any party.

AUTHOR CONTRIBUTION

AE contributed to the planning, data collection, analysis, writing, and approval of the paper for publication. DPA oversaw the research design, coordinated data collection and analysis, and led the writing and editing process for publication.

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EARLY CLEFT LIP REPAIR: A LONG TERM FOLLOW-UP

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ABSTRACT

Introduction: Published reports on the long-term outcomes of cleft lip surgery within the Indonesian population are limited, especially for those treated early in the neonatal period. This study presents follow-up data on early-managed cases, aiming to objectively evaluate the long-term results of such management.
Case Illustration: A newborn with a complete unilateral cleft lip and palate had surgery on day two, achieving a symmetrical lip and nasal base. At 12 months, cleft palate surgery was performed. Fifteen years later, the patient sought a lip revision, expressing satisfaction with the results and opting against further procedures. Case 2: Another newborn with an incomplete cleft underwent surgery on day five, followed by palate repair at 12 months. Ten years later, the parents reported satisfaction with the outcomes and no desire for further revisions.
Discussion: The discussion focused on the merit of early management and no negative impact on muscular and maxillary growth.
Conclusion: The positive effects of early management through muscle management were observed in the long-term follow-up, as shown in these two reported cases.

Highlights:

1. Early cleft repair benefits patients by reconstructing near-normal lip anatomy that persists after ten to fifteen years.
2. The early procedure did not result in muscular or maxillary hypoplasia in long-term follow-ups; rather, development occurred in tandem with normal growth.

INTRODUCTION

Case reports on the long-term outcomes of cleft lip management in the Indonesian population are rarely published. This scarcity reflects both the unique characteristics of cleft lip cases and congenital disorders in Indonesia. When patients experience no issues and accept the results, they often feel follow-up is unnecessary, which may contribute to the lack of reports on short- and long-term outcomes in this population.

Evaluations of cleft lip management in Indonesia were limited to prevalence,[1] charity (social works),[2] management during a pandemic,[3] and short outcomes of a single center.[4–6] There were long-term management evaluations, but they did not orient to early management.[7,8] The outcome of cleft lip surgery, particularly those managed early (in the neonatal period), is extremely rare. The fact is, early management is considered to not adhere to the general protocol, i.e., the rule of over ten (Wilhelmsen and Musgrave's, 1966)[9] as the prime time, but indeed, it adhered to clinical practice guidelines[10] and *Pedoman Nasional Praktik Klinik* (PNPK)[National Guidelines on Clinical Practice]released by Ministry of Health of Indonesia, such as 0-6 months of first life.[11] The other reason is the Indonesian characteristics described in the second sentence of this paragraph. The author reports cases managed early aimed to provide objective long-term outcomes of early management as the answer to the question asked in the past twenty years: What is the evidence of long-term effects of early management?

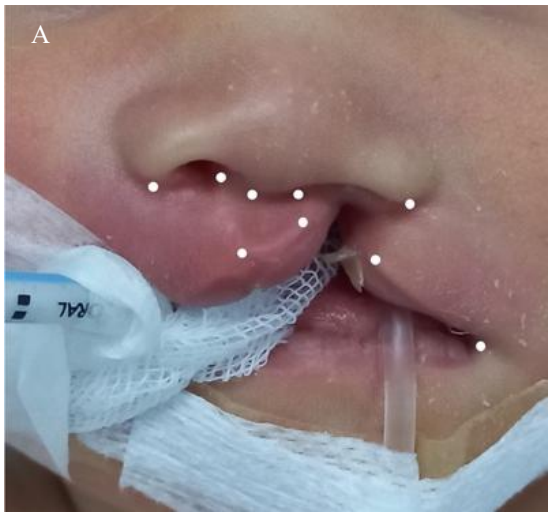
Additionally, Additionally, Awareness of the importance of early cleft lip management in Indonesia remains limited among healthcare professionals and the public, mainly due to a lack of information and training. Additionally, there is a belief that early intervention may not always yield significant outcomes. Therefore, exploring the long-term effects of early management is crucial to understanding its effectiveness. Increased research in this area can enrich the medical literature and help shift cleft lip management practices in Indonesia toward evidence-based policies.

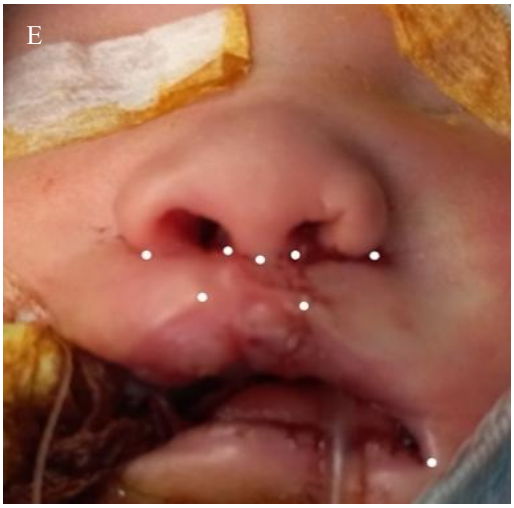
CASE ILLUSTRATION

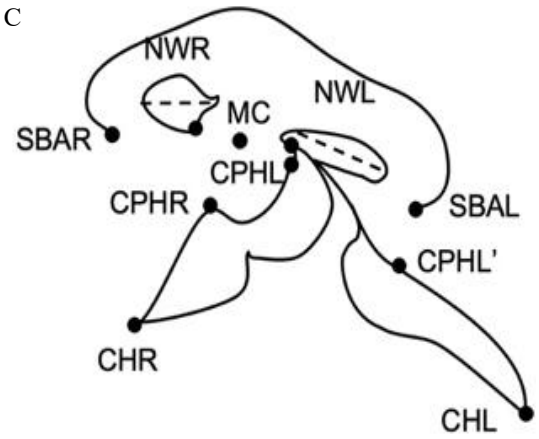
Case 1

A full-term newborn delivered through Caesarean section weighed 3300g and had an Apgar score of 10. The pediatrician consulted regarding complete clefts of the lips, gums, and palate. The patient presented with a left-sided complete unilateral cleft (Figure 1) and an asymmetrical alar base. The alar base of the cleft side moved laterally, posteriorly, and caudally (detailed in Figure 1 A,B,C).

After a comprehensive explanation, including informed consent, it was decided to proceed with cleft lip correction on the second day of life. The Millard method was applied, incorporating muscle management, which involved dissection and mobilization of the nasal base (including the cartilage lobe) and the orbicular muscles on the cleft side to achieve cranio-medio-anterior projection, fixed to the nasal spine. Flap C was used to cover the nasal base posteriorly to the nostril, but it did not reconstruct the columellar base. The immediate postoperative results showed a symmetrical lip and alar base, although the nostril appeared relatively small on the cleft side, with kinking of the alar cartilage (Figure 1 D, E, F).







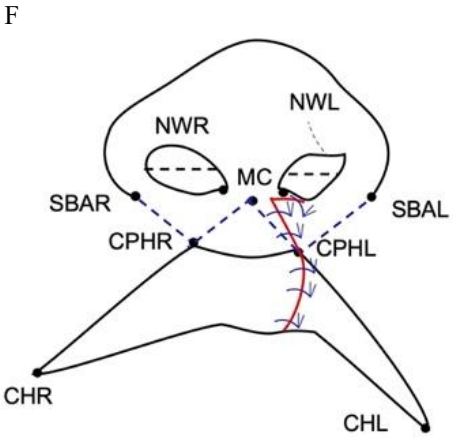


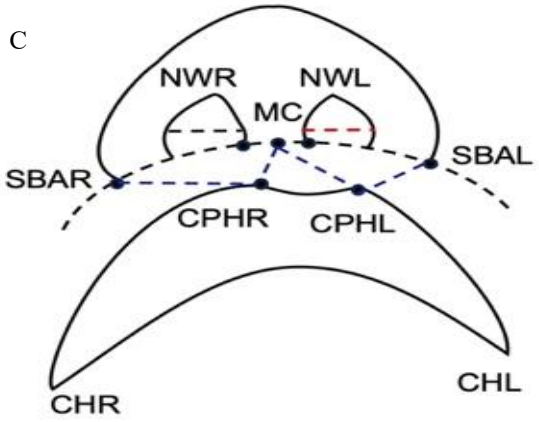
Figure 1. A Newborn with a Complete Cleft Lip And Palate Underwent Early Cleft Lip Repair on The Second Day of Early Life. Preoperative (A) Anterior Aspect, (B) Mento-Occipital Aspect and Immediate Postoperatively (C) Anterior Aspect, (D) Mento-Occipital Aspect.

The symmetrical nasal base and upper lip. Preoperatively, the vertical height of the lip (from the alar base to the Cupid's bow) on the non-cleft side (SBAR-CPHR) was 1.2 cm, while on the cleft side (SBAL-CPHL) it was 1.4 cm. The midline columella crease to Cupid's bow (MC-CPHR) measured 1.0 cm on the non-cleft side, compared to 0.8 cm on the cleft side. The nostril width on the non-cleft side (NWR) was 0.5 cm, whereas on the cleft side (NWL) it was 0.8 cm. Postoperatively, the vertical height of the lip from the alar base to the Cupid's bow was 1.2 cm on both

the right and left sides. The midline columella crease to Cupid's bow (MC-CPH) measured 1.0 cm on both sides, and the nostril width was 0.5 cm on the non-cleft side (NWR) and 0.4 cm on the cleft side (NWL). The horizontal lip length to the commissure was 1.6 cm for both the non-cleft side (CHR-CPHR) and the cleft side (CHL-CPHR).

Postoperatively, the neonate was immediately given a bottle for feeding, discharged, and followed up on the seventh day after surgery. No problems with the surgical wounds were observed until the 14-day and 30-day follow-up visits. The next step in the treatment plan was cleft palate surgery, which was performed at 12 months of age. The von Langenbeck method was used for the palate repair, and the alveolar gap was closed with a lip mucosal interposition flap. Additionally, the alveolar bony defect was filled with an absorbable surgical sponge. Postoperatively, an immediate change in the infant's voice was objectively noted, and both parents were aware of this change. There were no oral-nasal fistulas or other complications during the one-month follow-up, and the surgical site healed well. However, despite the plan for an alveolar bone graft procedure at the age of 6 years, the family unfortunately did not follow up for further care, potentially impacting long-term outcomes and the child's development.

After fifteen years, the patient came for the possibility of lip revision (Figure 2) after orthodontic treatment for the last two years (Figures 3A and 3B).



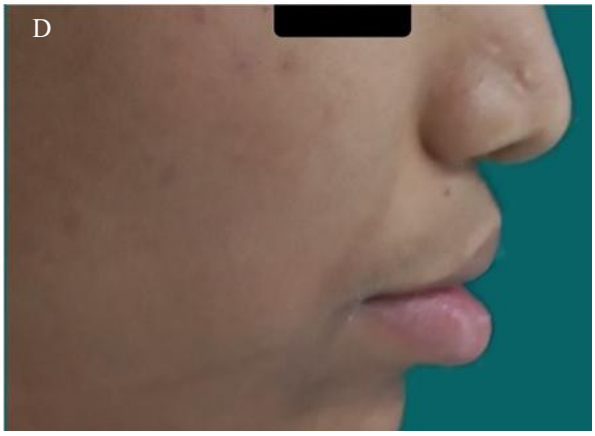


Figure 2. Fifteen Years After Early Cleft Lip Repair

The following observations were made fifteen years after the early cleft lip repair: (Figure 2A) Anterior aspect, (Figure 2B) Mento-occipital aspect. A long-term symmetrical nasal base is maintained. The muscular bundle on the cleft side (Figure 2D) resembles that of non-cleft individuals (Figure 2C), with a relatively larger lower lip volume, often referred to as a stigma of clefts. The vertical height of the lip, measured from the alar base to Cupid's bow, was 2.5 cm on both the right and left sides. The midline columella crease to Cupid's bow (MC-CPH) was 1.8 cm on both the right and left sides, while the nostril width measured 1 cm on the non-cleft side (NWR) and 0.9 cm on the cleft side (NWL). The horizontal lip length to the commissure was 3 cm (CHR-CPHR) on both sides.

Figure 3. A well-aligned alveolar arch is maintained clinically with orthodontic treatment (A), although the cleft remains (B) untreated with bone grafting yet.

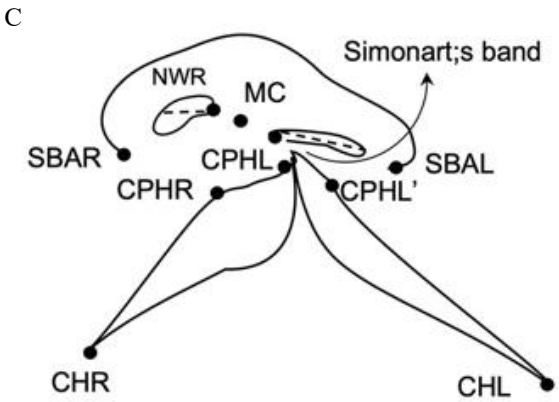
Both the patient and his parents were not concerned about the alveolar cleft and disagreed with proceeding with a bone grafting procedure or maxillary osteotomy. The lip corrections performed included scar revision, white-line approximation for natural alignment, and fat grafting for volume correction on the cleft side (Figure 4). The patient and parents were delighted with the surgical results, including the nasal shape. However, they realized that there is nothing perfect in the world.

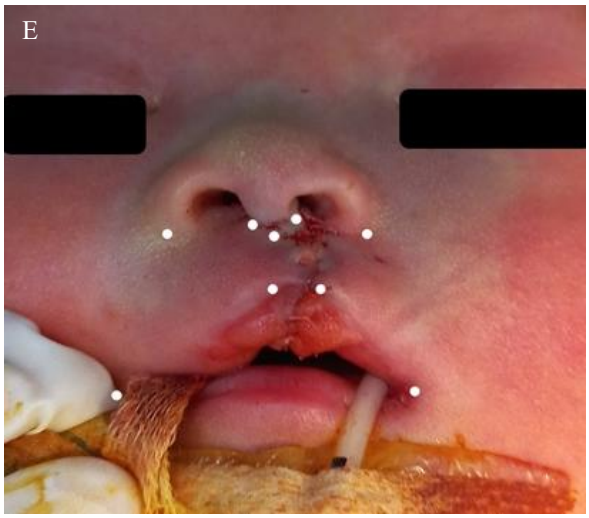
Figure 4. Immediate Picture after Scar Revision and Buccal-Fat Grafting to Fill Up The Lip Volume on The Cleft Side.

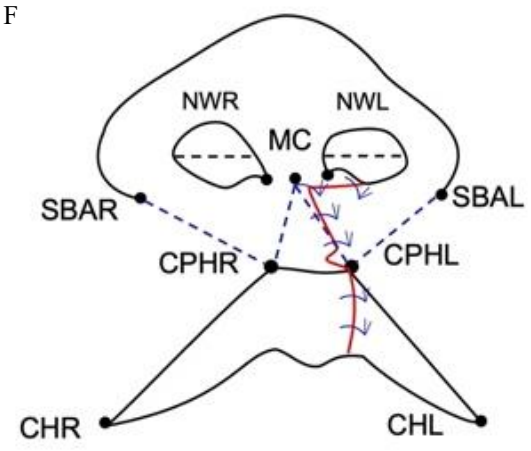
Case 2

A full-term newborn delivered through Caesarean section weighed 3200g and had an Apgar score of 10. The pediatrician was consulted for an incomplete cleft in the lips,

alveolus, and palate. Upon examination, complete clefts were identified, along with a Simonart's band and a narrow-type alveolus and palate. The alar base on the cleft side was positioned laterally and caudally (detailed in Figure 5 A, B, C).







Note: Clinically symmetrical nasal base and upper lip.

Figure 5. Early Cleft Lip Repair in a Newborn with Complete Cleft Lip and Palate

A newborn with a complete cleft lip and palate underwent early cleft lip repair on the second day of life. Preoperative images show (Figure 5A) the anterior aspect and (Figure 5B) the mento-occipital aspect, with notable Simonart's band. Immediate postoperative images depict (Figure 5C) the anterior aspect and (Figure 5D) the mento-occipital aspect.

Preoperatively, the vertical height of the lip (from the alar base to Cupid's bow) on the non-cleft side (SBAR-CPHR) was 1.1 cm, and on the cleft side (SBAL-CPHL) was also 1.1 cm. The midline columella crease to Cupid's bow (MC-CPHR) measured 1.0 cm on the non-cleft side, while on the cleft side (MC-CPHL), it was 0.8 cm. The nostril width on the non-cleft side (NWR) was 0.5 cm, compared to 0.9 cm on the cleft side (NWL).

Postoperatively, the vertical height of the lip from the alar base to Cupid's bow was 1.1 cm on both sides. The midline columella crease to Cupid's bow (MC-CPH) measured 1.0 cm on both sides, and the nostril width was 0.5 cm on both the non-cleft side (NWR) and the cleft side (NWL). The horizontal lip length to the commissure was 1.5 cm on both sides (CHR-CPHR and CHL-CPHR).

The surgical lip correction was performed on the fifth day after delivery, following the same steps applied in the previous case, as the bilirubin level was below 10 mg/dL. The nostril retainer was used solely for 2-3 weeks after surgery. Cleft palates were managed using the Langenbeck procedure. After the cleft palate surgery, the alveolar cleft was addressed. The mucoperiosteal flaps were released from the bony alveolus, and the alveolar margins on both sides were decorticated from the dental margin to the pterygoid to facilitate alveolar bone formation. A surgical sponge was inserted into the defect, which was then closed with a mucosal interposition flap. These procedures were completed over 12 months. After the last follow-up visit, the patient did not return for a month. Ten years later, he came for a follow-up, and the parents felt it was unnecessary to proceed with any revision and expressed their gratitude for the satisfactory outcomes (Figure 6 A, B, C, D).

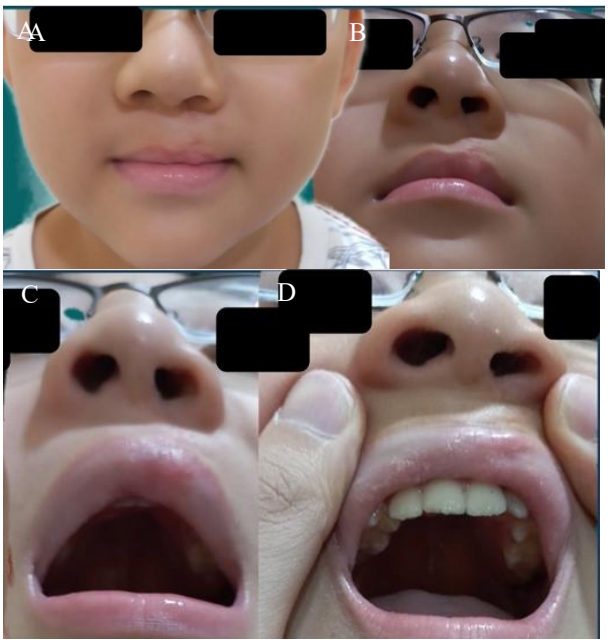


Figure 6. Figure 6. Ten Years after Early Cleft Lip Repair

Ten years after the early cleft lip repair, the following observations were made: (Figure 6A) Anterior aspect and (Figure 6B) mento-occipital aspect. A long-term symmetrical nasal base is maintained, although the left alar on the cleft side is relatively smaller. Due to certain limitations, the author was unable to proceed with measurements. However, the alveolar arch appears well-aligned.

DISCUSSION

More than twenty years ago, the author presented a case series on early cleft lip surgery performed during the neonatal period at a scientific meeting. Nineteen cases were managed within 2 to 24 days, with the perspective of safety and immediate postoperative outcome. However, the peer

group rejected this approach, arguing that early management did not conform to the standard protocol (specifically, the "rule of ten").[9] In addition, the concept was considered an intention to change the protocol and was not supported by the evidence, particularly the long-term outcomes, as shown by Hammoudeh et al.[12]

However, the author proceeded with early management in a non-teaching hospital. The rationale for this procedure was based on critical thinking: Why not perform it earlier? Of course, patient safety is fundamental.[13,14] Early correction can provide benefits for patients and families. Early reconstruction of a 'normal' lip configuration allowing the normal sucking achieved earlier.[12,15,16] Such normal sucking is not achieved solely by bringing the cleft side and the non-cleft one together. The author proceeded with muscle management, which allowed a normal anatomical configuration of the upper lip (arch) and nasal base at once,[17] as proposed by Fara (1972) and applied by Millard (discussed in the cleft craft).[18] Alar base and alar nasalis muscle dissection of the cleft side freed up from its attachment in the incisura nasalis (piriform aperture), allowing alar cartilage mobilization and moving medially and fixed to the nasal spine. Aligning the lateral muscular fibers involved an approximation to the non-cleft side with adjustments to achieve a symmetrical nostril.[19–24] Nasal symmetry is established early, potentially reducing the need for secondary cleft lip nose correction later, which often yields unsatisfactory results.[23,25] In both cases, the noses are nearly symmetrical, as seen from the anterior aspect. Even though, in the occipital-mental aspect, the nostril on the cleft side appears smaller in Case 1 (Figure 1d and 1e). Further, no defect (basin) is denoted in the alar base of the cleft side (Figure 1e), although the alveolar cleft remains unmanaged with the alveolar bone graft.

This observation may challenge the previous notion that both the alveolar cleft and hypoplastic maxilla are responsible for the asymmetrical nasal base and alveolar arch. The flat columellar base on the cleft side (Case 2) is likely due to the use of Flap C to close the defect at the nasal base during cleft lip surgery, rather than advancing it to the alar base of the cleft side, as in the traditional Millard method.[26] However, neither the patients nor the parents in both cases accepted this outcome as it was.

Muscle management at an early date may control the growth of the protrusive arch on the cleft side and maintain the alveolar arch in complete cleft lip and palate cases.[19,27] This procedure adheres to the principles established by Gillies in 1949, specifically principles 3, 4, 6, and 9. Principle 3 emphasizes the importance of respecting normal anatomy by restoring it to its proper position and preserving it. Principle 4 advises against discarding living tissue until it has been definitively deemed unnecessary. Principle 6 warns against compromising one aspect of care to benefit another, emphasizing the need to avoid tension in the process. Finally, Principle 9 asserts that there should be no standardized approach; each case should be treated uniquely, without adhering to a fixed routine or model, regardless of practices from East Grinstead or St. Louis.

This extensive dissection was formerly believed to negatively impact muscular and maxillary growth. However, the author found a normal alveolar arch one year after cleft lip surgery—when proceeding with cleft palate surgery—despite the alveolar cleft remaining. The alveolar cleft was closed using an interposition flap (lip mucosa) along with palatoplasty, effectively closing the oro-nasal relation on the cleft side.[31] However, in Case 1, a wide gap is noted in the panoramic dental x-ray, but an acceptable alveolar arch was achieved through orthodontic treatment. To our knowledge, the treatment aims to establish a good arch rather than merely close the gap. In contrast, the small gap in

Case 2 was remarkably undetected clinically, even though no alveolar bone graft was performed—only decortication and a surgical sponge were used. The author did not present a panoramic dental x-ray to avoid unnecessary exposure to radiation.

Early management, particularly muscle manipulation (dissection of the orbicularis muscle—the muscle abuts the alar base, freeing the muscles of the alar base from their attachment at the piriform aperture of the maxilla)[19,24,33] had no negative effects in the short- or long-term, particularly on maxillary growth. In short, the author did not find fibrosis in the nasal base of the cleft side during assessment prior to palatoplasty (12 months post-surgery). In the long term, the orbicularis muscle developed normally and maintained the shape of the nasal ridge during the 10- to 15-year follow-up. The author did not observe any negative impact from earlier muscle management on the maxilla (which appeared hypoplastic), but rather noted a normal alveolar arch. The muscles developed well, with no hypotrophy, and the position of the alar base was maintained long-term.

Patients were discharged 2-3 days post-surgery with safety precautions for breastfeeding, ensuring that mothers fed their babies properly. This contrasts with extended hospitalizations reported by Lee and his colleagues.[34]

There is merit in early management. Firstly, a symmetrical lip and nose immediately after surgery without pretreatment. No plaster fixation or lip adhesion is required, nor is nasoalveolar molding (NAM) necessary to treat an asymmetrical nose before surgery. Indeed, The surgical correction aimed at treating the cleft lip results in a symmetrical nasal base, eliminating the need for later rhinoplasty, even without a nasal retainer. This outcome is due to the focus on building a fundamental unit configuration—the upper lip—which establishes the foundation of the nasal unit, rather than simply closing the cleft defect. The most significant achievement comes from the outcome achieved through a single procedure. With earlier management, the healing is remarkable, benefiting both the patient and their parents, particularly during school age, and helping to avoid cleft-related bullying.

This concept differs from most approaches that aim for purely aesthetic results. The author is more concerned with achieving a near-normal anatomical configuration. However, a challenging issue in early management is the need for precision. An imperfect scar was anticipated from the outset and discussed during the consent process, as the tissue had not yet fully developed. Achieving a symmetric lip shape was nearly impossible due to the underdeveloped hard and soft tissue on the cleft side. Nevertheless, approximating the landmarks (the white line and red line of the cleft and non-cleft sides) should be addressed using a surgical loop, which the author did not do.

CONCLUSION

The positive effects of early management by applying muscle management observed in long-term follow-up, as shown in these two reported cases. This fact answers the questions in the past regarding early management, counters the presumed negative effects of early management at once, and may contribute to better knowledge of cleft lip surgery.

CONFLICT OF INTEREST

The author discloses no conflict of interest.

FUNDING DISCLOSURE

No funding.

AUTHOR CONTRIBUTION

YM was responsible for all aspects of the case report. This included conceptualizing the study, managing the patient care throughout the surgical process, and performing follow-up assessments. YM conducted a comprehensive literature review to contextualize the findings and authored the manuscript, ensuring that all relevant details were included. Additionally, YM analyzed the long-term outcomes of the surgical intervention and contributed to the discussion on implications for practice. The author is solely accountable for the content and integrity of this case report.

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JURNAL
REKONSTRUKSI DAN ESTETIK

HELMET USE COMPLIANCE SURVEY FOR CRANIOFACIAL TRAUMA PREVENTION AMONG MOTORCYCLISTS IN JAYAPURA CITY RING ROAD

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ABSTRACT

Introduction: Compliance with helmet use by motorcycle riders and passengers passing through the highway is one of the important factors in preventing craniofacial injuries and head injury. This study designed to survey and evaluate the compliance with helmet use among motorcyclists and passengers on the ring road in Jayapura City.
Methods: This time-based survey study observed compliance with helmet use by motorcycle riders and passengers passing through the Jayapura city ring road for 14 days of observation at three-time orders (morning, afternoon, and evening). Analysis of the collected data was carried out descriptively.
Results: The results showed that during the study period, there were 6,411 motorcycles passing through, 18,602 motorcycle passers-by were at moderate risk of injury due to not wearing helmets (MR-IV) and 11,849 were at high risk (HR-II). The peak of non-compliance with helmet use occurred in the afternoon period (T3). The results showed that 71.92% of the HR-V group did not obey helmet use; 184.82% of the HR-II group did not obey helmet use. While non-compliance with helmet use in the MR-IV group even reached 290.15%.
Conclusion: Helmet use compliance among motorcycle riders and passengers on the Jayapura Ring Road is low, increasing their risk of head injuries in accidents. This highlights the need for strategies to reduce helmet non-compliance in Jayapura City. The study focuses on one of the busiest routes, and further research is needed to assess helmet compliance on other busy routes in the city for a more comprehensive understanding.

Highlights:

1. This study provides insights on helmet compliance among motorcyclists in Jayapura City to help prevent head injuries.
2. The analysis shows non-compliance with helmets, especially on the Jayapura Ring Road, where up to four people ride a single motorbike.
3. Consequently, accidents causing head injuries result in greater health and humanitarian impacts.

INTRODUCTION

Currently, motorcycles have become the most common form of transportation in many developing countries, including Indonesia. Theoretically, road traffic accidents, especially those involving motorcycles, can usually be traced back to four main factors: driver negligence, vehicle issues, poor road conditions, and environmental factors.[1] The biggest contributor to head and facial injuries, including craniofacial injuries, is often driver negligence, particularly the failure to wear helmets.[2]

In relation to this, Many motorcyclists and passengers have various reasons for not wearing helmets, such as discomfort, poor visibility, heat, sweating, or simply feeling tired. [3]Other reasons include short trips (34.8%), not having a helmet (30.5%), and finding the helmet uncomfortable or disruptive (21.7%). Social and cultural attitudes also play a role, influencing how people perceive helmet use, and these factors need more attention in future research.[3]

According to the World Health Organization (WHO), road traffic accidents were responsible for 1.35 million deaths in 2018, and nearly 4,000 people die every day due to road accidents. Motorcycle-related injuries add to this global health burden, making traumatic brain injury (TBI) a leading cause of death and disability, especially in those under 45 years old.[5,6] Two-wheeled motor vehicle accidents cause humanitarian and economic problems. First, the humanitarian side shows that around two million people in the world die each year due to road traffic accidents; In contrast, the financial side shows that billions of rupiah have been spent due to traffic accidents for health financing.[7-11]

A study by Astride et al. (2018) found that 1,324 out of 2,108 traffic accidents treated at Dr. Hasan Sadikin General Hospital in Bandung were caused by riders not wearing helmets.[12] Law number 22 of 2009 (UU Nomor 22 tahun 2009) concerning traffic and road transportation in article 106 paragraph 8 requires every motorcycle driver and passenger to wear a helmet that meets Indonesian national standards.[1]

This study was conducted to obtain a picture of the behavior and compliance with the use of helmets among motorcycle drivers and passengers on the ring road, Jayapura City, Papua. The Jayapura city ring road is a straight track with a distance of about 3,200 meters, which was completed in 2018. Currently, this route is the most widely used route by motorcyclists in Jayapura City because it saves travel time for the same destination. This route has a straight track with very good asphalt performance, so it is preferred by motorcyclists. If motorcyclists are obedient in wearing helmets, the prediction of traumatic brain injury incidents including craniofacial injuries in motorcycle accidents will be at a low number.

Currently, there is no specific scientific research or survey that examines the compliance of motorcycle riders' helmet use in Jayapura. While so far in clinical practice as a neurosurgeon, many patients with head injuries treated were contributed by motorcycle riders who did not comply with wearing helmets while riding (Data not yet published). The contribution of cultural aspects and social behavior that play a role in non-compliance with helmet use does need to be studied further, however, this survey study at least provides an initial objective descriptive picture related to the behavior of helmet use by riders and passengers on the busiest routes in Jayapura City. This study will be an important basis for tightening the rules on mandatory helmet use for the Jayapura community, policy advocacy as well as the basis for information for various other studies that correlate helmet use with the risk of head injury, trauma to the body or the risk of other disabilities due to accidents in motorcycle riders. This study

focuses on data collection on compliance with helmet use among motorcyclists and passengers on the ring road in Jayapura City.

The results of this study can be used to develop educational programs on the use of standardized helmets, the identification of craniofacial injuries resulting from motorcycle accidents, and safe helmet removal techniques for motorcycle accident victims. Based on the data gathered from this study, a targeted program can then be designed, focusing on promotive, curative, and rehabilitative strategies related to craniofacial injury cases.

METHODS

This study is a time-based survey. Observations and recordings of motorcycles passing through the Jayapura Ring Road were conducted over 14 days, at three different times each day. These observations served as the research sample. There are no ethical concerns regarding the need for informed consent from the drivers or passengers observed in this study. Field enumerators, who were responsible for observing and counting the passing motorcycles, were trained to differentiate and classify them according to the criteria of LR-I, HR-II, MR-III, MR-IV, and HR-V. Based on the diagram Figure 1, the injury risk clusters were classified as follows: low-risk injury groups (LR) as Group I, medium-risk injury groups (MR) as Groups III and IV, and high-risk injury groups (HR) as Groups II and V.

The subjects of this study were motorcycle riders and/or passengers passing through the Jayapura City ring road (Figure 2) during the designated observation hours (Table 1). Observations and sampling were conducted at the research location over 14 consecutive days, from April to July 2024.

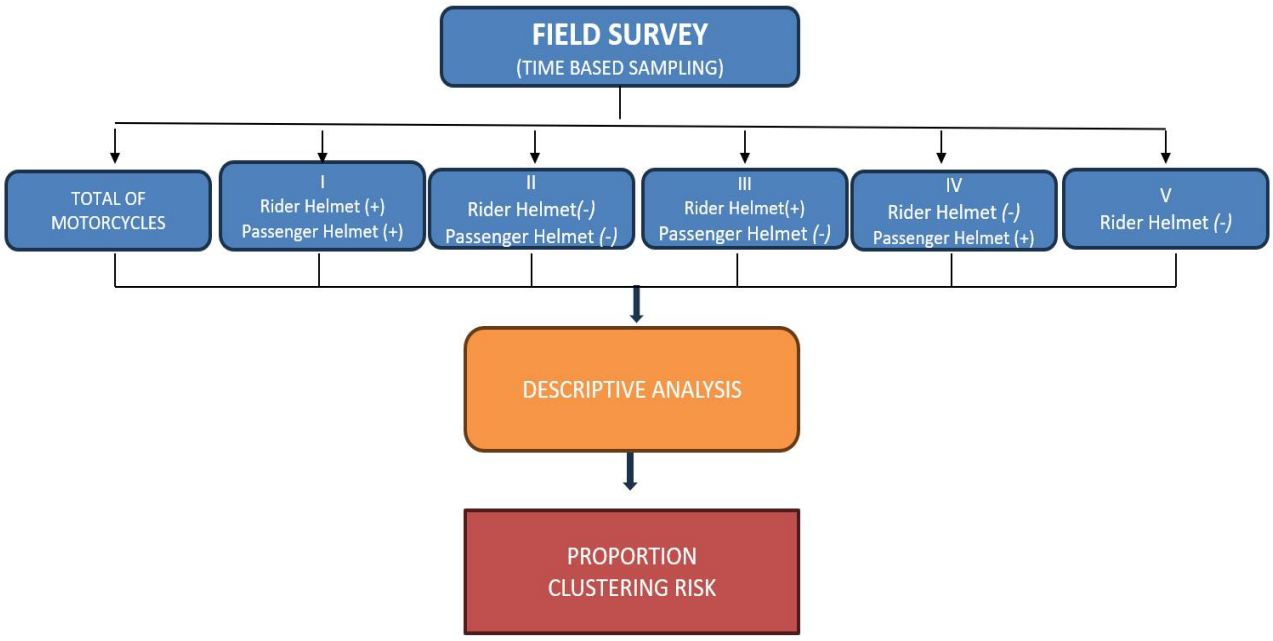


Figure 1. Observation Subject Classification Diagram

Figure 2. Aerial Photo of the 3.2 km Jayapura Ring Road

Table 1. Field Survey Observation Time Frame

Sampling Timing (WIT)	Explanation
07.30 – 09.00 (T1)	Peak time for people going to work (office, school, factory, etc.)
12.00 - 13.30 (T2)	Peak activity time during lunch hour or midday break
15.30 -17.00 (T3)	Peak time for people returning home

The inclusion criteria for this study were as follows: motorcycles passing through the ring road, with observations conducted by two enumerators according to a predetermined time frame based on estimated peak traffic density. These time frames included morning hours (when people are heading to work or school), daytime (during breaks), and evening hours (when returning from activities). Motorcycles passing through the observation point during the sampling hours were counted using a counter tool.

All data were tabulated, and the percentages of helmet use compliance by drivers, passengers, and both were calculated in relation to the total number of motorcycles passing by. The collected data were then analyzed into five risk clusters (low, medium, and high) for craniofacial injuries. The results will be presented in the form of tables, graphs, or diagrams.

RESULTS

The survey and observation for data collection were conducted over 14 consecutive days according to the time frame specified in Table 1. Based on Table 2, the total number of motorcycles passing during the observation period was 6,411. The data shows the number of motorcycles observed at different times of the day (T1, T2, T3) and breaks down the compliance across five risk groups (LR - Low Risk, MR - Medium Risk, HR - High Risk). The results of the observations revealed that one motorcycle could carry a rider accompanied by three or even four passengers, all of whom were not wearing helmets (Figures 3 & 4). Non-compliance with helmet use in the MR-IV group reached 290.16%, in HR-II it reached 184.82%, and in HR-V it reached 71.92%. The MR-IV group represents the scenario where the rider does not wear a helmet but the passenger does, while HR-II refers to the case where both the rider and the passenger are not wearing helmets. In contrast, the LR-I group showed relatively low non-compliance at 4.57%. These findings point to a concerning level of helmet use violations, particularly in high-risk groups. The observation did not include measurements of the motorcycle's speed while crossing the ring road, but the collected data provides important insights into the level of road users' compliance with traffic safety regulations. With a total of 7,229 motorcycles observed, the highest number of motorcycles were recorded during the afternoon/evening hours (T3), when people are returning home. The results underscore a serious issue with helmet use, especially in higher-risk groups, suggesting a need for increased road safety campaigns, stricter enforcement of helmet laws, and greater public awareness to reduce the risk of injuries, particularly craniofacial injuries. Therefore, more intensive efforts are needed to raise awareness and improve compliance with road safety rules.

Figure 3. Observations and Survey Recordings Show Drivers and Passengers Not Wearing Helmets

Figure 4. Observation and Recording of Motorcycle Surveys: Passengers Not Wearing Helmets

Table 2. Observation Results of the Helmet Compliance Survey on the Ring Road

Day		Jam	LR	MR		HR		Total Crossing	Amount According Time
			I	III	IV	II	V		
Wednesday	I	T_1	143	18	794	527	103	213	1,585
		T_2	360	21	740	645	150	150	1,916
		T_3	610	11	855	1,160	170	250	2,806
Thursday	II	T_1	165	1	1,010	405	71	1075	1,652
		T_2	60	6	355	150	109	75	680
		T_3	300	7	510	450	135	150	1,402
Friday	III	T_1	172	3	416	321	87	153	999
		T_2	150	4	235	250	163	120	802
		T_3	240	14	550	360	120	185	1,284
Saturday	IV	T_1	135	2	468	240	59	150	904
		T_2	350	4	384	270	94	175	1,102
		T_3	475	3	422	345	137	220	1,382
Sunday	V	T_1	95	6	265	152	90	54	608
		T_2	354	26	395	450	143	196	1,368
		T_3	368	6	265	427	90	184	1,156
Monday	VI	T_1	93	2	200	191	75	67	561
		T_2	161	15	290	300	110	125	876
		T_3	373	10	450	476	295	201	1,604
Tuesday	VII	T_1	59	0	384	141	36	62	620
		T_2	139	1	340	249	96	120	825
		T_3	218	2	458	325	100	184	1,103
Wednesday	VIII	T_1	39	5	345	113	43	59	545
		T_2	78	10	410	197	97	118	792

Day		Jam	LR	MR		HR		Total Crossing	Amount According Time
			I	III	IV	II	V		
		T_3	189	19	663	317	233	191	1,421
Thursday	IX	T_1	83	2	389	459	121	114	1,054
		T_2	75	5	300	164	69	63	613
		T_3	178	10	484	171	101	159	944
Friday	X	T_1	70	8	230	102	73	109	483
		T_2	193	2	534	309	114	185	1,152
		T_3	208	0	609	342	334	140	1,493
Saturday	XI	T_1	28	1	730	124	85	88	968
		T_2	56	1	384	117	67	70	625
		T_3	196	13	659	274	137	122	1279
Sunday	XII	T_1	15	5	515	100	37	73	672
		T_2	52	6	280	105	71	58	514
		T_3	121	11	445	179	105	103	861
Monday	XIII	T_1	25	2	132	125	81	126	365
		T_2	86	6	409	191	59	93	751
		T_3	154	6	197	271	129	145	757
Tuesday	XIV	T_1	36	3	555	127	38	77	759
		T_2	89	4	420	104	76	91	693
		T_3	238	12	126	124	108	118	608
Grand Total			7,229	293	18,602	11,849	4,611	6,411	
Percentage of Non-compliance with helmet use				4.57%	290.16%	184.82%	71.92%		

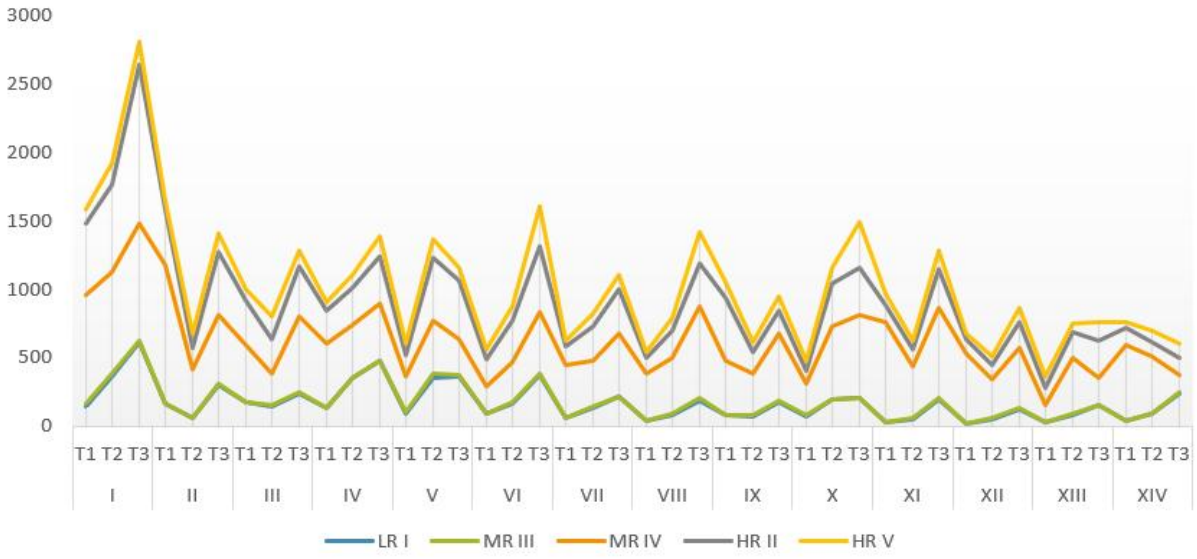
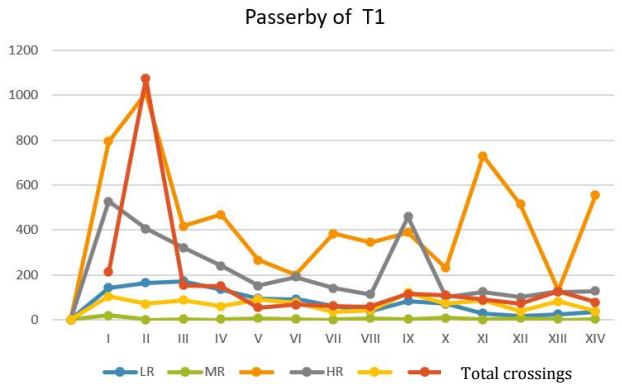


Figure 5. Helmet Compliance Graph on the Ring Road Route

The number of motorcyclists in Group IV (18,602) and Group II (11,849) represents the highest figures during the field observation period. When these two groups are combined, it is clear that most of the motorcyclists passing through the ring road are riders without helmets (Figure 5). This indicates that helmet use compliance among motorcycle riders is very low. Additionally, the HR passers-by in Group II (riders and passengers without helmets) reached the highest number (1,160), which is even four times the total number of motorcycles passing (250 motorcycles). This suggests that one motorcycle is ridden by at least four people, all of whom are not wearing helmets (see Table 2, Day I, T3).

When analyzing helmet use compliance according to the time of passage, it can be seen that the MR-IV group dominates throughout the observation period (Figure 6). This means that motorcyclists on this route are mainly from groups where the rider is not wearing a helmet but the passenger is. The proportion of motorcyclists passing through the ring road is highest during the T3 time period, which corresponds to the hours after work (15:30-17:00 WIT), as shown in the following graph (Figure 7).



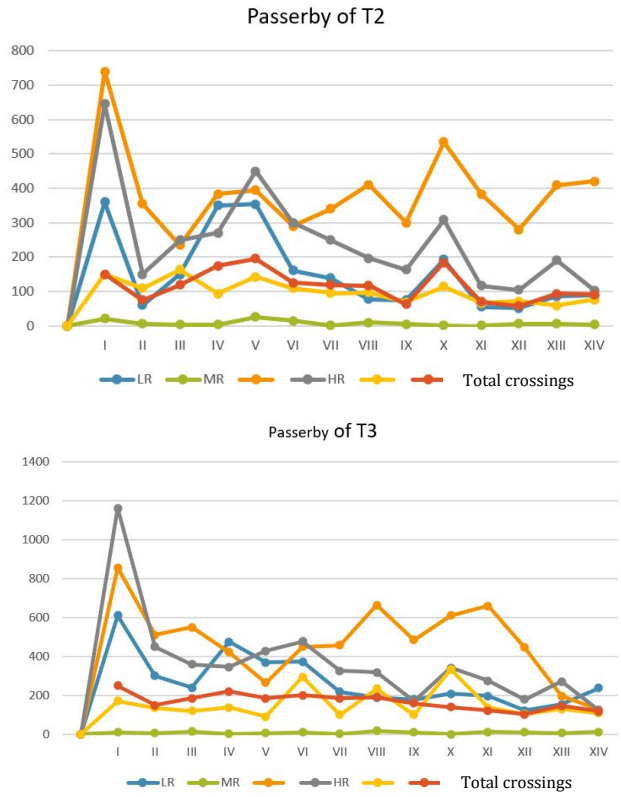


Figure 6. Graphof Compliance with Wearing a Helmet According to The Crossing Time Order

Figure 7. Dominance of Time Order of Motorcycles Crossing the Jayapura Ring Road

Further analysis reveals that the behavior of motorcyclists during the observation period is dominated by the MR-IV and HR-II groups. At T1, the MR-IV group has a median value of 459.5, with a whisker of 1,010; at T2, the HR-II group has a median value of 250.07, with a whisker of 450; and at T3, the MR-IV group has a median value of 478.07, with a whisker of 855 (Figure 8). This pattern highlights that the highest incidence of non-compliance occurs during peak travel times, particularly in the afternoon when traffic is heavier. The data suggests a consistent trend of risky behavior, where a significant number of riders neglect helmet use despite the presence of passengers who may be wearing helmets. This raises concerns about the effectiveness of safety campaigns targeting helmet use, as well as the need for stricter enforcement of traffic safety regulations, especially during peak hours when the risk of accidents is higher.

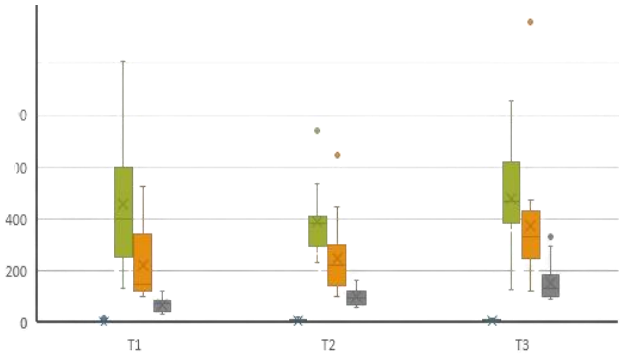


Figure 8. Box Plot of Risk According to Time Order in The MR And HR Groups.

The risk of injury is higher in the MR-IV group, particularly for riders without helmets and passengers wearing helmets, during the T1 observation time (07:30–09:00 WIT), which coincides with the peak of morning activity (when people are heading to work or school). A similarly high risk was observed in the MR-IV group during the T3 observation time (15:30–17:00 WIT), when people are returning home from work, school, or other activities. The results of this survey provide only descriptive data on non-compliance with helmet use in at-risk groups. In the event of an accident, these groups would be more likely to experience head injuries. One limitation of this study is that it did not analyze the relationship between vehicle speed, non-compliance with helmet use, and the risk of head injuries, including their severity, type, and other factors. Further research could explore these connections in greater detail.

DISCUSSION

Non-compliance with wearing helmets puts motorcyclists and passengers who cross the Jayapura City ring road at risk of head injury and craniofacial injuries. In Undang-Undang RI No 22/2009 concerning road traffic and transportation, drivers and passengers are required to wear helmets as standardized personal protective equipment.[1] There are several reasons for non-compliance with wearing helmets, such as short distances, no one supervising (police), troublesome, uncomfortable or imitating other people's habits, or not having a helmet.[6,10,13] In fact, according to the results of this study, the highest mobility on the observation route was crossed by the MR-IV group (18,602) and HR-II (11,849). In these groups, non-compliance with helmet use reached 290.16% and 184.82% respectively. Uniquely, in both groups, all motorcyclists did not comply with wearing helmets. The highest mobilization on the route was during the T3 time period (15.30-17.00) in the afternoon. In this survey, there was no in-depth observation of the reasons for non-compliance with helmet use, although the study revealed that the reason for non-compliance with helmet use was due to not having a helmet.[6,14,15] In general, according to the results of this study, motorcycle passers-by showed that in the T1 time order, non-compliance with helmet use was very low; this can happen because usually in the

morning there are still many traffic police officers who supervise crucial road points on the ring road route. This study has not yet linked non-compliance with helmet use on the observation route and the risk (number and type) of craniofacial injuries that occurred during the observation period and the speed of the passing motorcycle. In fact, data shows that head injuries with the highest death and disability rates occur in motorcycle accidents where the riders do not wear helmets.[16-20] This study also has several limitations, including when the survey was conducted, it was not observed regarding gender (male or female), age limits (children, young adults, or the elderly), and the profession of two-wheeled vehicle users who passed on the observed route. Likewise, the various reasons for motorcycle users related to why they did not wear helmets were not analyzed. This study also did not detail the types of head injuries recorded and were part of the number of motorcycle accidents that occurred during the survey period and also did not specifically classify the types of motorcycles whose riders were obedient or disobedient.[6,16,17]

Head injury is an injury that includes trauma to the scalp, skull, and brain. Head injury can result in very serious neurological disorders. Head injury is a major cause of disability and death, especially in young adults. In the United States, almost 10% of deaths are caused by trauma, and half of all deaths from trauma are related to the brain. A head injury case occurs every 7 seconds and a death from head injury occurs every 5 minutes. Head injury can occur in all age groups, but the highest incidence is in young adults aged 15-24 years. The incidence in men is 3 to 4 times more often than in women.[19,21] The cause of head injury in Indonesia is mostly due to traffic accidents that can be reported only for land transportation, there appears to be a fairly high increase of 47.7% to 64.2%.[24] The main types of injuries in motorcycle accidents are traumatic brain injuries (cranium) and facial injuries (facial area). Both conditions are very serious because they will cause various symptoms such as decreased consciousness, seizures, lacerations of the head structure, to other more severe intracranial damage.[6,12,13,21] More than 50% of head and facial damage is caused by trauma mechanisms and failure of the helmet's protective function. A motorcyclist must wear a standard helmet to avoid craniofacial damage. Craniofacial injuries caused by motorcycle accidents in riders without helmets will have an impact on the severity of craniofacial injury complications. The severity in question can consist of death (30-36%), persistent vegetative conditions (5%), severe disability (15%), moderate disability (15-20%), and unsatisfactory recovery reaching 60%.[2,6,12] Other sequelae due to craniofacial injuries include persistent psychological and behavioral disorders.[18-19]

The program to promote the use of helmets for motorcyclists needs to be improved, especially for people using the ring road in Jayapura City. The program can be carried out in an integrated and comprehensive manner.[20-23] Involving positive influences and the role of several figures (athletes, artists, religious figures, etc.) so as to increase behavioral changes, especially in the younger generation who often use motorbikes as a means of transportation. Likewise, special programs need to be carried out by professional health workers for preventive measures against head injuries due to compliance with helmet use, starting from primary to tertiary health facilities.[6,10,13]

To increase helmet use awareness, it is crucial to implement a multifaceted approach that targets different community sectors and emphasizes the severity of craniofacial injuries. Specific campaigns could include educational initiatives in schools, workplaces, and local communities, focusing on the importance of helmet use for preventing head and facial trauma. Public service announcements, social media campaigns, and television ads could feature medical professionals, community leaders, and

popular figures such as athletes and celebrities to amplify the message. These campaigns should address not only the health risks associated with not wearing a helmet but also the cultural and behavioral barriers that contribute to non-compliance.

In addition, healthcare professionals, including doctors, nurses, and emergency responders, should be involved in promoting helmet use. Medical staff can provide educational materials to patients and their families, emphasizing the importance of helmets in preventing severe injuries. Specialized training programs for healthcare workers should also be established to improve their skills in identifying and managing craniofacial injuries resulting from motorcycle accidents. These programs could be incorporated into medical education curricula and ongoing professional development.

Local government agencies, traffic police, and non-governmental organizations (NGOs) focused on road safety should collaborate with healthcare providers to create comprehensive campaigns that reinforce the legal and health consequences of not wearing a helmet. Community events, such as road safety workshops or helmet distribution programs, could further engage the public and encourage behavioral change. By combining these efforts, a holistic strategy for promoting helmet use can be developed, leading to a significant reduction in craniofacial injuries and improving overall road safety.

Promotion of the use of standardized helmets to training on how to remove helmets from accident victims needs to be carried out. According to the recommendations of the Global Road Safety Partnership and the World Bank Group, there is a type of helmet that is highly recommended for motorcyclists, namely a full-face helmet. This type of helmet is the safest helmet for motorcyclists to use. The advantage is that it can protect the face, head, neck, ears, and chin perfectly; it is also safe to wear in the rain and protects the user from dust, gravel, or insects on the road. This type of helmet can protect the user from unwanted injuries during an accident. The disadvantage is that because it is tightly closed, the user has difficulty hearing the sounds around him, and it is impractical if the user wants to eat or drink in the middle of the road. For glasses users, this type of helmet is very uncomfortable to wear and the price is relatively more expensive than other types.[4]

This study is both strong and novel in its approach to understanding helmet use compliance among motorcyclists in Jayapura, an area where no prior research has been conducted on this topic. The strength of the study lies in its real-world data collection, spanning 14 days with multiple observations at different times of the day, providing a comprehensive view of motorcyclist behavior in natural settings. Additionally, by categorizing helmet use compliance into five risk clusters, the study offers a detailed analysis of when and where non-compliance is most prevalent, which can inform targeted interventions. The novelty of this research is evident in its focus on a previously unexamined population in Jayapura, filling a significant gap in local public health data. Moreover, the study highlights the cultural and social factors influencing helmet use, opening the door for future research into how these aspects impact safety behavior. This research is not only pivotal in guiding local policy changes but also offers valuable insights for broader public health initiatives aimed at reducing head and craniofacial injuries caused by motorcycle accidents.

This study is limited to surveying motorcycles passing through the ring road. Similar survey observations can be conducted at several crucial points of the route passed by motorcycle riders in Jayapura City.

Further research can be conducted to link several interesting things such as the relationship between non-compliance with helmet use, the degree of head injury, the type of helmet used, aspects of health costs

due to head injuries to various interesting demographic aspects (for example age group, gender, basic reasons for not using a helmet, etc.)

CONCLUSION

The highest helmet non-compliance was in the MR-IV group (riders without helmets, passengers wearing helmets) and occurred in all-time orders every day; although the highest peak occurred in the T3 time order. Helmet compliance occurred in the LR-I group and the lowest in MR-III in general in the T1 time order. This helmet non-compliance puts motorcycle riders and passengers who cross the Jayapura ring road at risk of head and craniofacial injuries when an accident occurs. Based on the results of this study, more massive and targeted helmet promotion efforts are needed to further reduce the number of helmet non-compliance among motorcycle users in Jayapura City. The findings of this study can be a driving force for tightening the rules on helmet use for motorcyclists in Jayapura City. Likewise, it is a fact to increase education on helmet use, especially among students and workers who use motorbikes in Jayapura City. In addition, potential research is needed related to efforts to prevent traumatic brain injury in motorcycle riders by increasing helmet compliance.

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CONFLICT OF INTEREST

All authors declare that no conflicts of interest regarding the publication of this article.

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AUTHOR CONTRIBUTION

Data collection, analysis, inpretation of the results and preparing the manuscript unrtaken of all authors.

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JURNAL
REKONSTRUKSI DAN ESTETIK

CLINICAL PROFILE AND MANAGEMENT OF HYPERTROPHICSCARS AT DR. SOETOMO GENERAL ACADEMIC HOSPITAL SURABAYA, INDONESIA

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ABSTRACT

Introduction: Hypertrophic scars are a common clinical issue that occurs following skin injury or trauma, characterized by excessive deposition of connective tissue. These scars can cause cosmetic and functional problems. Proper management is essential to prevent complications. However, data on the clinical profile and management of hypertrophic scars in Indonesia is still limited. This study aims to fill this gap by exploring both the clinical profile and management strategies for hypertrophic scars at Dr. Soetomo General Academic Hospital, Surabaya.
Methods: This study is a retrospective descriptive analysis utilizing secondary data from medical records of patients with hypertrophic scars treated at Dr. Soetomo General Academic Hospital during the 2019-2020 period. Variables analyzed include age, gender, occupation, scar causes, anatomical locations, scar sizes, and treatment methods.
Results: A total of 68 patients with hypertrophic scars were recorded during the study period. Of these, 11 patients were from the inpatient clinic, and 57 from the outpatient clinic. In the outpatient clinic, the majority were female, aged 17-25 years, with trauma, burns, and postoperative wounds as the leading causes. The most common scar locations were the face and hands, with the majority measuring between 1-5 cm^2. Surgical techniques were the most common treatment approach.
Conclusion: Hypertrophic scars are most prevalent in patients aged 17-25 years, predominantly female, with burns being the primary cause. Surgical techniques were the most widely used treatment. Early intervention is crucial for improving clinical outcomes, underscoring the importance of personalized management strategies in treating hypertrophic scars.

Highlights:

1. Most hypertrophic scar patients were aged 17 to 25, mainly female, and the scars were mostly caused by burns on the face and upper extremities.
2. Surgical techniques were the most common treatment, with most scars measuring 1 to 5 cm^2.

INTRODUCTION

Scars are a prevalent clinical concern that is often more complex than commonly perceived. When an injury occurs, the skin repairs itself to maintain the body's defense system and forms scars in the form of scar tissue.[1]

Scar formation is a part of the wound healing process that occurs when body tissue is damaged by physical injury. Hypertrophic and keloid scars result from atypical wound healing responses following trauma, characterized by excessive deposition of connective tissue.[2]

The pathophysiology of keloid and hypertrophic scars is still unknown.[3] However, based on incidence rates, the formation of hypertrophic scar tissue occurs in 40-70% of cases after surgery and in 91% of cases due to burn injuries. It is also noted that 50% of hypertrophic scar patients have a family history of hypertrophic scarring.[4] The parts of the body that most frequently experience hypertrophic scarring are the shoulders, neck, knees, presternum, and ankles.[5] Various treatment options are available for hypertrophic scars, including surgical and non-surgical therapies. According to Ogawa et al., the most effective approach is a combination of radiation therapy and steroid tape.[6]

This study aims to address the gap in data regarding hypertrophic scars at Dr. Soetomo General Academic Hospital in Surabaya, Indonesia. By systematically examining various clinical variables, including age, gender, cause, anatomical location, and treatment options, this research intends to provide valuable insights into the management of hypertrophic scars, ultimately improving clinical outcomes for patients.

METHODS

This research used a descriptive study design. Data were collected retrospectively from the medical records of hypertrophic scar patients at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia. The research instrument was the patients' medical records, which contained observation form data for hypertrophic scar patients obtained from the hospital. The population consisted of all hypertrophic scar patients treated at the hospital from 2019 to 2020. A total sampling technique (saturated sampling) was applied, including all patients with hypertrophic scars during that period. The research variables included: 1) age, 2) gender, 3) occupation, 4) causes of hypertrophic scars, 5) location, 6) size, and 7) therapy used.

RESULTS

During the study period, there were 68 patients, consisting of 11 from the Inpatient Clinic and 57 from the Outpatient Clinic at Dr. Soetomo General Academic Hospital, Surabaya. This research was conducted at the medical record section of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, from September 2021 to March 2022. Data collection was carried out using medical records and data collection sheets, conducted on working days during regular hours. Of the 68 patients with hypertrophic scars, only 63 met the inclusion criteria, so the final sample for this study consisted of 63 patients.

The age distribution of inpatients with hypertrophic scars at Dr. Soetomo General Academic Hospital, Surabaya, during the 2019-2020 period reveals that the majority of patients are in the younger age groups. The highest number of cases was found in children aged 6-11 years (37.5%), with 3 patients, as shown in Table 1.

This age group had the highest prevalence of hypertrophic scarring. Additionally, 37.5% of patients were aged 17-25 years, representing another significant portion of the sample. Interestingly, there were no patients in the 12-16 years, 26-35 years, or 36-45 years age ranges, indicating that hypertrophic scars are less common in these age groups. There were also no cases in individuals aged over 64 years. This suggests that hypertrophic scars are more prevalent

in children and young adults, possibly due to higher rates of trauma or burns in these age groups.

Table 1. Age distribution of inpatients with hypertrophic scars at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, during the period from 2019 to 2020.

Age (years)	Number of Samples	Percentage (%)
0-5	1	12.5
6-11	**3**	**37.5**
12-16	0	0
17-25	3	3.5
26-35	0	0
36-45	0	0
46-55	1	12.5
>64	0	0

Table 2. Age Distribution of Outpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, 2019-2020.

Age (years)	Number of Samples	Percentage (%)
0-5	7	12.7
6-11	8	14
12-16	8	14
17-25	**14**	**25**
26-35	3	5
36-45	5	9
46-55	3	5
>64	1	1

From the results presented in Table 2, the highest number of hypertrophic scar cases in the outpatient clinic at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia occurred in the 17-25 years age group, accounting for 25% of the total cases. This is followed by the 6-11 years and 12-16 years age groups, which each represented 14% of the cases. The 36-45 years age group had 9% of the cases, while 26-35 years and 46-55 years age groups each represented 5%. The smallest percentage of cases was found in the >64 years age group, with just 1% of the total.

This suggests that hypertrophic scarring is most common among younger individuals, particularly in the 17-25 years age range, which may be associated with higher exposure to risk factors like trauma or burns.

Table 3. Gender Distribution of Inpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital Surabaya, Indonesia, 2019-2020.

Gender	Number of Samples	Percentage (%)
Women	4	50.0
Men	4	50.0

Table 4. Gender Distribution of Outpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital Surabaya, Indonesia, 2019-2020.

Gender	Number of Samples	Percentage (%)
Women	**28**	**50.9**
Men	27	49.1

Based on the data from Table 3 and Table 4, the gender distribution of hypertrophic scar patients at Dr. Soetomo General Academic Hospital was fairly balanced. In the inpatient clinic (Table 3), the number of female patients was equal to the number of male patients, with each gender representing 50% of the cases. In contrast, in the outpatient clinic (Table 4), the gender distribution slightly favored females, with 28 female patients (50.9%) compared to 27 male patients (49.1%). This indicates a near-equal gender distribution across both inpatient and outpatient settings, with a very slight female predominance in the outpatient clinic.

Table 5. Occupational Distribution of Inpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital Surabaya, Indonesia, 2019-2020.

Occupation	Number of Samples	Percentage (%)
Unemployed	**3**	**37.5**
Self-employed	2	25.0
Etc	2	25.0
Student	1	12.5
Housewife	0	0.0
No data	0	0.0

Based on the data from Table 5, the largest group of inpatient patients with hypertrophic scarring at Dr. Soetomo General Academic Hospital were those who were unemployed, comprising 37.5% of the cases (3 patients). These patients were typically underage or children who are not working. The second largest groups were self-employed and "other" occupations, each contributing 25% of the cases. A small percentage of patients (12.5%) were students, and no patients identified as housewives or with missing data in this category.

Table 6. Occupational Distribution of Outpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, 2019-2020.

Occupation	Number of Samples	Percentage (%)
Student	**24**	**43.0**
Unemployed	17	30.0
No data	12	21.0
Housewife	2	3.0
Self-employed	0	0.0
Etc	0	0.0

In Table 6, the majority of outpatients with hypertrophic scarring at Dr. Soetomo General Academic Hospital were students, accounting for 43% of the cases (24 patients). This is consistent with the theory that individuals aged 10 to 30 years, especially students, are more prone to trauma due to higher skin tension and greater collagen synthesis[34]. The second largest group were unemployed individuals, representing 30% of the cases (17 patients). Other smaller groups included housewives (3%) and a considerable portion of patients (21%) had missing data regarding their occupations. There were no cases of self-employed or other occupational categories in the outpatient clinic.

Table 7. Causes Distribution of Inpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital Surabaya, Indonesia, 2019-2020.

Cause	Number of Samples	Percentage (%)
Burns	**3**	**37.5**
Post Surgery	2	25.0
Trauma	1	12.5
Enlarged Lump	1	12.5
No data	1	12.5
Post Excision	0	0.0
Congenital Abnormalities	0	0.0
Insect Bite Marks	0	0.0
Combustio	0	0.0
Multifactor	0	0.0
Wound Healing Disorders	0	0.0
Accident	0	0.0
Scratches	0	0.0

In Table 7, the most common cause of hypertrophic scarring in the inpatient clinic at Dr. Soetomo General Academic Hospital was burns, which affected 3 patients (37.5%). This was followed by post-surgery scarring, with 2 patients (25%). Other causes such as trauma, enlarged lumps, and "no data" each accounted for 12.5%. There were no reported cases of conditions such as congenital abnormalities, insect bite marks, or other specific causes like post-excision and wound healing issues.

Table 8. Causes Distribution of Outpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital Surabaya, Indonesia, 2019-2020.

Cause	Number of Samples	Percentage (%)
Burns	12	25.0
Trauma	12	25.0
Post Surgery	5	10.0
Combustio	5	10.0
Wound Healing Disorders	4	8.0
Multifactor	3	6.0
Scratches	2	4.0
No data	2	4.0
Insect Bite Marks	1	2.0
Congenital Abnormalities	1	2.0
Accident	1	2.0
Post Excision	0	0.0
Enlarged Lump	0	0.0

Table 8 shows that the most common causes of hypertrophic scarring in the outpatient clinic were burns and trauma, each accounting for 25% of the cases (12 patients each). Post-surgery and combustio (burns) were also significant causes, each representing 10% (5 patients). Wound healing disorders affected 8% (4 patients), and other causes, such as multifactor, scratches, and insect bite marks, contributed to a smaller portion of the cases. Notably, 4% of patients had missing data regarding their causes of hypertrophic scarring.

In both the inpatient and outpatient clinics at Dr. Soetomo General Academic Hospital, the most common cause of hypertrophic scarring was burns. Inpatients had a higher percentage of burn-related scarring (37.5%) compared to outpatients (25%). Other causes varied between the inpatient and outpatient groups, with trauma, surgery, and other factors contributing in differing proportions. These findings emphasize the significant impact of burns as a leading cause of hypertrophic scars in this setting.

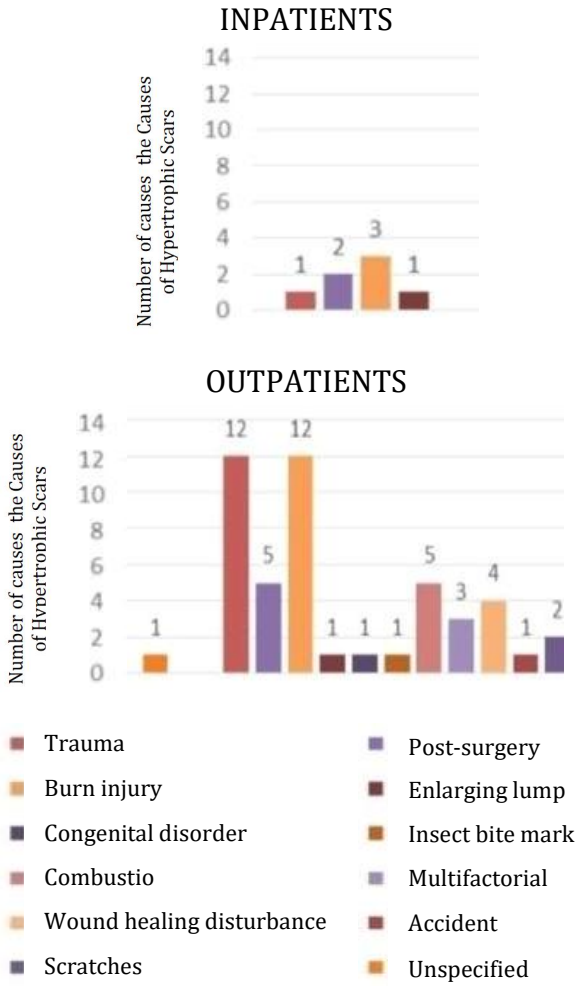

Figure 1. Diagram of the Causes of Hypertrophic Scars of inpatients and outpatients in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

Table 9. Distribution of Hypertrophic Scar Locations in Inpatients at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, during the Period 2019 – 2020

Location	Number of Samples	Percentage (%)
Face	3	25
Palm of Hand	3	25
Mouth	2	16
Ear	1	8
Nose	1	8
Hand	1	8
Gluteus	1	8
Neck	0	0
Chest	0	0
Stomach	0	0
Dorsal	0	0

Thigh	0	0
Knee	0	0
Foot	0	0
Sole	0	0

Table 10. Distribution of Hypertrophic Scar Locations in Outpatients at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia during the Period 2019 – 2020

Location	Number of Samples	Percentage (%)
Hand	14	18
Face	10	13
Chest	8	10
Foot	8	10
Palm of Hand	7	8
Ear	5	6
Thigh	5	5
Neck	4	5
Sole	4	5
Dorsal	4	5
Gluteus	4	5
Stomach	2	2
Knee	1	1
Mouth	1	1
Nose	0	0

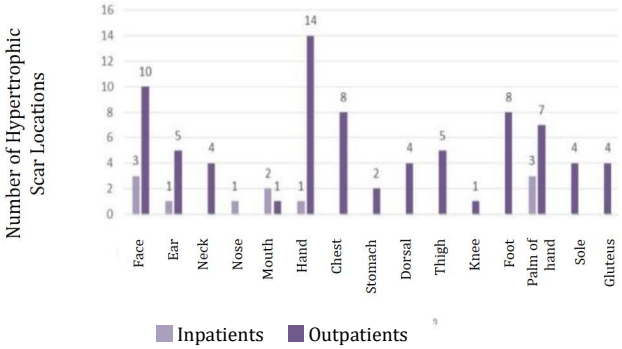

Figure 2. Diagram of the Hypertrophic Scar Locationsof inpatients and outpatients in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

Based on Table 9 (inpatients) and Table 10 (outpatients), the location of hypertrophic scars in both inpatient and outpatient settings at Dr. Soetomo General Academic Hospital in Surabaya predominantly affects the upper extremities and face.

In inpatients, the most common locations for hypertrophic scars were the face and palm of the hand, each accounting for 25% of the cases. Other locations with scars included the mouth (16%) and various other areas such as the ear, nose, hand, and gluteus (each with 8%). No cases were reported for the neck, chest, stomach, dorsal area, thigh, knee, foot, or sole.

In outpatients, the most common locations for hypertrophic scars were the hands (18%), followed by the face (13%), chest, and foot (both 10%). Other locations included the palm of the hand (8%), ear (6%), and thigh (5%). Smaller percentages were found in areas such as the neck, sole, dorsal, gluteus, stomach, and knee, with no cases in the nose.

Figure 2 visually represents these differences in the distribution of hypertrophic scar locations between inpatients and outpatients during the 2019 – 2020 period. It clearly shows that scars are more commonly found on the hands and face, with a higher percentage of upper extremity involvement in outpatients compared to inpatients.

Table 11. Distribution of Scar Size in Inpatients with Hypertrophic Scars at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, 2019–2020

Measure	Number of Samples	Percentage (%)
< 0.5 cm^2	0	0
0.6 – 1 cm^2	0	0
1 – 5 cm^2	0	0
6 – 9 cm^2	0	0
10 – 20 cm^2	0	0
> 20 cm^2	0	0
No data	8	100

According to Table 11, there was no data recorded for the size of hypertrophic scars in any of the inpatients at Dr. Soetomo General Academic Hospital during the 2019–2020 period. All 8 patients (100%) in this group did not have information regarding their scar sizes.

Table 12. Distribution of Scar Size in Outpatients with Hypertrophic Scars at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia,2019–2020

Measure	Number of Samples	Percentage (%)
< 0.5 cm^2	4	4
0.6 – 1 cm^2	0	0
1 – 5 cm^2	21	25
6 – 9 cm^2	4	4
10 – 20 cm^2	12	14
> 20 cm^2	14	16
No data	29	34

Table 12 shows the distribution of hypertrophic scar sizes among outpatients at Dr. Soetomo General Academic Hospital. The majority of patients had no recorded data on their scar size, with 29 patients (34%) missing this information. However, for those who had recorded scar sizes, the most common category was scars ranging from 1 to 5 cm^2, which accounted for 25% of the patients. This was followed by scars greater than 20 cm^2 (16%). The other scar size categories were less represented, with smaller proportions of patients in each group.

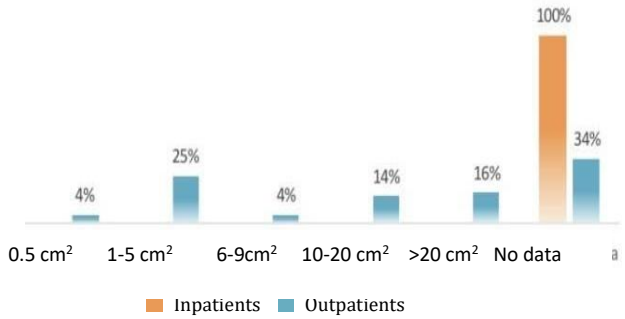

Figure 3. Diagram of the Scar Size Distribution in Inpatients and Outpatients with Hypertrophic Scars at Dr. Soetomo General Academic Hospital,Surabaya, Indonesia.

Figure 3 visualizes the data from Table 11 and Table 12, showing the difference in the distribution of hypertrophic scar sizes between inpatients and outpatients. The outpatient group has more varied scar sizes, with the most common size being between 1 and 5 cm^2, whereas the inpatient group lacks data on scar size entirely.

The data from the 2019–2020 period at Dr. Soetomo General Academic Hospital reveals that, for inpatients, no scar size data was available. In contrast, outpatients showed a more diverse distribution, with most patients having scars ranging from 1 to 5 cm^2. However, a significant portion of outpatient data (34%) was also missing. This suggests that better documentation of scar measurements is needed to improve the accuracy of assessments and treatments in both inpatient and outpatient settings.

Table 13. Distribution of Hypertrophic Scar Therapy in Inpatients at Dr. Soetomo General Academic Hospital, Surabaya,Indonesia, 2019–2020

Therapy	Number of Samples	Percentage (%)
Surgery	8	80
Non-surgical: Injection (Triamcinolone Acetonide)	2 10	20

According to Table 13, surgical therapy was the most frequently used treatment for hypertrophic scars in inpatients, with 8 patients (80%) undergoing surgery. In contrast, 2 patients (20%) received non-surgical treatment in the form of an injection of triamcinolone acetonide.

Table 14. Distribution of Hypertrophic Scar Therapy in Outpatients at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, 2019–2020

Measure	Number of Samples	Percentage (%)
Surgery	27	48
Non-surgical: Injection (Triamcinolone Acetonide)	15	26
Laser	2	3
Radiotherapy	1	1
Silicon Gel Sheet	5	8
No description	6	10

Table 14 shows the distribution of therapies used for hypertrophic scars in outpatients. The most common treatment was surgery, performed on 27 patients (48%). The second most common therapy was the injection of triamcinolone acetonide, used for 15 patients (26%). Other therapies, such as laser treatment (3%), radiotherapy (1%), and silicon gel sheets (8%), were used less frequently. Additionally, there were 6 cases (10%) where no description of the treatment was available.

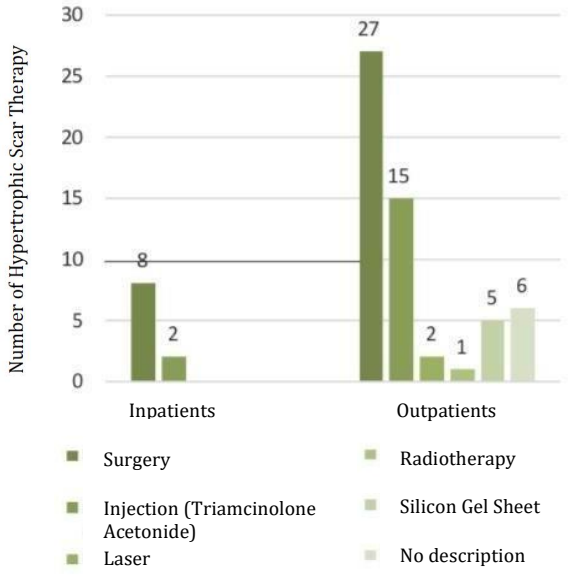

Figure 4. Diagram of Hypertrophic Scar Therapy in Inpatients and Outpatients at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.

Figure 4 provides a visual representation of the therapies used in both inpatient and outpatient settings at Dr. Soetomo Hospital. As indicated by the diagram, the most commonly administered therapies for hypertrophic scars in both groups were surgical operations and triamcinolone acetonide injections. The least commonly used treatment was radiotherapy, which had the lowest frequency of administration.

From the data in Tables 13 and 14, it is clear that surgery is the most frequently used therapy for hypertrophic scars, especially in inpatients (80%), while in outpatients, 48% also received surgical treatment. Non-surgical treatments, such as the injection of triamcinolone acetonide, were commonly used in both inpatient (20%) and outpatient (26%) groups. Other treatments like laser, radiotherapy, and silicon gel sheets were much less frequently used. Radiotherapy was the least utilized therapy across both inpatient and outpatient settings.

DISCUSSION

Scarring can have significant long-term physical and psychosocial effects, particularly for those with deep second- and third-degree burns, which are prone to developing hypertrophic scars.[7] Hypertrophic scars are marked by chronic inflammation and excess capillaries, making them red. A burn that heals in less than 10 days has a 4% chance of developing hypertrophic scars, while one that takes over 21 days has a 70% chance. This indicates that local wound conditions play a key role in hypertrophic scar formation. In contrast, keloids are more genetically influenced. Although similar, hypertrophic scars respond better to 1064 nm Nd:YAG laser treatment, but keloids can recur if any redness or hardening persists.[8, 9]

These scars, including keloids, can cause cosmetic disfigurement and lead to issues such as sleep disturbances, anxiety, depression, and social avoidance. Recent research has begun to explore the biochemical pathways involved in scar formation.[7] Hypertrophic and keloid scars are fibroproliferative disorders with distinct histological features, making them different from other types of scars.

There are different treatment options for keloids and hypertrophic scars, such as standard treatments, medications, excision, radiation, cryotherapy, and phototherapy. Lasers play an important role in managing a variety of scars in our practice. While no single method is considered the best, using a combination of treatments usually works better. The combination of bleomycin, triamcinolone acetonide, and pulsed dye laser seems to be the most effective for

treating both keloids and hypertrophic scars.[8-12]

Accurate identification is crucial for proper management and treatment.[13,14] Understanding clinical signs, patient characteristics, and treatment approaches, such as age, gender, cause, location, and therapy, is crucial for improving the management and outcomes of hypertrophic scars.

This research was conducted retrospectively using secondary data in the form of medical records of hypertrophic scar patients from both the inpatient and outpatient clinics at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, covering the period from 2019 to 2020.

Based on the data obtained from Dr. Soetomo General Academic Hospital, Surabaya, Indonesia for the period of 2019-2020, a total of 11 medical records were collected for patients undergoing treatment in the inpatient unit and 57 records for patients in the outpatient unit. The variables discussed in this study include age distribution, gender, occupation, causes of scars, location of scar tissue, size, and therapy.

The age distribution of hypertrophic scar patients in both inpatient and outpatient settings showed a similar trend, with the highest number of cases found in patients aged 6–11 years and 17–25 years. In the inpatient unit, both age groups had 3 patients each, representing 37.5% of the inpatient sample. Similarly, in the outpatient unit, the highest number of cases was observed in patients aged 17–25 years, with 14 patients (25%), followed by patients aged 6–11 years, with 8 patients (14%).

This finding supports the theory that the incidence of hypertrophic scars is lower in older patients. Patients under the age of 30 are more likely to develop hypertrophic scars due to higher skin tension and greater collagen content.[15] Additionally, younger individuals have more elastic and fibrous skin, which makes them more susceptible to trauma and subsequent scarring.[2]

In the inpatient unit of Dr. Soetomo General Academic Hospital Surabaya for the period 2019–2020, there was a balanced gender distribution, with 50% male and 50% female patients. In the outpatient unit, however, female patients were more predominant, making up 50.9% of the sample with a total of 28 patients. This finding is consistent with previous research by Goldsmith et al. (2012), which noted that female patients tend to visit clinics more frequently due to their greater attention to the aesthetic aspects of their bodies compared to men.[16] Women and girls with a predisposition to keloid scarring should be made aware of this potential risk. In the event of its occurrence, it is crucial to seek the consultation of a specialist for appropriate assessment and management.[17]

Regarding occupation, the highest number of patients in the inpatient unit were those not working, with 3 patients (37.5%) in this category. All of these patients were minors/children. This observation aligns with research by Cai JH et al. (2017), which found that many cases of hypertrophic scars in minors were observed following burn treatment in hospitals. This trend can likely be attributed to the higher levels of activity and curiosity in children, which increases the risk of burns and other injuries. Additionally, the lack of parental supervision may contribute to a higher likelihood of these injuries occurring.[18]

In the outpatient unit, 24 patients (43%) were students, a group with frequent daily activities. This is in line with the theory that individuals between the ages of 10 and 30 are more susceptible to trauma due to higher skin tension and an increased level of collagen synthesis, which contributes to their vulnerability to hypertrophic scarring.[2]

Burns were identified as the most common cause of hypertrophic scarring in both the inpatient and outpatient clinics at Dr. Soetomo General Academic Hospital Surabaya for the period 2019–2020. In the inpatient clinic, 3 patients (37.5%) had hypertrophic scars due to burns, 2 patients

(25%) had scars postoperatively, and 1 patient (12.5%) developed scars due to trauma. In the outpatient clinic, burns were also the leading cause, with 12 patients (25%) affected. A study conducted by Gauglitz et al. found that 90% of hypertrophic scars resulting from burns were caused by hot water. In addition to burns, postoperative scarring is another leading cause of hypertrophic scars, accounting for 40% to 70% of cases. [19]

The most common locations for hypertrophic scars were found on the face and upper extremities. In the inpatient clinic, 3 cases (25% of the total scar locations) were observed on these areas, while in the outpatient clinic, 14 cases (18%) were found on the hands, and 10 cases (13%) on the face. Hypertrophic scarring on the face often results from trauma, acne scars, and ear piercings, all of which increase the potential for scar formation. Inflammation may be a key initiating factor in hypertrophic scar formation, distinguishing it from keloid scars, which are often linked with sustained inflammatory processes.[14] The face is also the area where patients are most concerned about cosmetic appearance, which may explain why many patients seek treatment for hypertrophic scarring in this region.

The least common location for hypertrophic scars was the nose, with only 1 case (1%) reported. This finding contrasts with observations made by Gauglitz et al. (2011), who identified the most common anatomical locations for hypertrophic scars as the shoulder, neck, knee, and ankle. [19]

Regarding scar size, the areas of hypertrophic scarring observed in this study varied widely, ranging from less than 0.5 cm^2 to greater than 20 cm^2. In the inpatient clinic, a large number of patients had no recorded data on scar size, with 8 patients (100%) lacking this information. Similarly, in the outpatient clinic, 29 patients (34%) had no documented scar size. However, among those with recorded data, the most common scar sizes were in the 1–5 cm^2 range, followed by scars greater than 20 cm^2.

Research by Rabello et al. has shown a correlation between scar size and the causative factors that initiate hypertrophic scarring. These scars can develop on any part of the body, but certain factors, such as burn injuries, are associated with a higher likelihood of hypertrophic scarring. Several studies also suggest that burn wounds have twice the risk of developing hypertrophic scars compared to other types of injuries.[2]

The most common therapy for hypertrophic scars in both the inpatient and outpatient clinics at Dr. Soetomo General Academic Hospital Surabaya was surgical rehabilitation. This was observed in 8 patients (80%) in the inpatient clinic and 27 patients (48%) in the outpatient clinic. The second most common therapy was the injection of triamcinolone acetonide, which was administered to 20% of inpatients and 26% of outpatients. Radiotherapy had the lowest usage, with only 1% of patients receiving this treatment.

Over the last decade, hypertrophic scars have increasingly been recognized as treatable conditions, and numerous treatment options are now available. According to Ogawa et al., the most reliable approach for treating hypertrophic scars is a combination of three therapies: radiation therapy, steroid plasters or tape, and surgical excision. Surgical treatment alone can result in scars that are often larger than the original lesion, and to minimize the risk of recurrence, certain surgical techniques such as Z-plasty, W-plasty, and subcutaneous or facial tension-reduction sutures are recommended. Steroid injection therapy is commonly effective for hypertrophic scars that range in size from 1 to 5 cm^2.[6]

In the inpatient clinic at Dr. Soetomo General Academic Hospital Surabaya, surgical excision of hypertrophic scars was the most common treatment. Similarly, in the outpatient clinic, surgical excision was also the dominant therapy. However, this finding is not entirely consistent with the recorded scar sizes. The data indicated that most outpatient cases had scars smaller than 10

cm^2, but this was influenced by the 29 patients (34%) for whom no scar size data was available.

Steroid injections, particularly with triamcinolone acetonide, were commonly used in both inpatient and outpatient clinics. This therapy was typically administered for scars in the 1–5 cm^2 range, which accounted for 25% of cases. According to Gauglitz et al., triamcinolone acetonide is the most frequently used corticosteroid for treating hypertrophic scars. It is typically administered in doses ranging from 10–40 mg/ml, with injections given every 3-4 weeks for several months until satisfactory results are achieved. In some cases, additional sessions may be required.[19]

The use of silicone gel sheets ranks third in terms of frequency of administration in the outpatient clinic at Dr. Soetomo General Academic Hospital Surabaya, with a percentage of 8%. The mechanism of action for silicone gel sheeting in hypertrophic scar therapy is that the silicone sheet allows oxygen to reach the skin surface, which helps in scar healing without blocking this essential function.[20] Some studies suggest that silicone gel and silicone gel sheets are more effective than a placebo for treating hypertrophic scars. When combined with PG, silicone gel and sheets show better results than PG alone, according to the POSAS assessment. A new silicone gel with hypochlorous acid has also been developed for scar treatment. Hypochlorous acid works as a biocide and anti-inflammatory, making it useful for post-procedure care, recent traumatic scars, or non-epithelialized skin.[21,22]

Radiotherapy is the least commonly used therapy for hypertrophic scars due to its controversial nature. Radiotherapy involves the application of superficial X-rays, which have a radiation effect on keloids and result in decreased collagen production. The total therapeutic dose of radiotherapy is typically limited to 40 Gy to minimize the risk of post-treatment side effects, such as hypo- and hyperpigmentationis revision provides better readability and a more formal tone, while ensuring the content is clear and accurately conveys the mechanism of silicone gel sheeting and the potential concerns regarding radiotherapy.[5] While some studies suggest that early postoperative radiotherapy may increase the risk of infection and wound dehiscence, others propose starting radiotherapy between 24–48 hours and 5–10 days after surgery. The present study did not show an increase in postoperative infection, possibly due to radiotherapy's effect on small blood vessel occlusion and reduced inflammatory mediators. Additionally, combining surgical resection with radiotherapy produced optimal results when administered within 24 hours after surgery. [23-25]

The novelty and strength of this study lie in its comprehensive analysis of hypertrophic scar patients at Dr. Soetomo General Academic Hospital Surabaya during the 2019-2020 period, encompassing both inpatient and outpatient populations. This study provides valuable insights into various factors such as age distribution, gender, occupation, causes, scar locations, size, and therapeutic approaches, particularly within an Indonesian context, where data on hypertrophic scars are limited. A key strength of the study is its use of real-world, retrospective data from medical records, ensuring high relevance and applicability. Additionally, the study's comprehensive dataset, which includes a robust sample size of 68 patients, allows for a thorough examination of clinical characteristics and treatment modalities. By focusing on specific causes like burns, trauma, and post-surgical wounds, as well as detailing scar size and location, the study contributes significantly to understanding hypertrophic scarring and provides practical insights for clinical decision-making and future research. The exploration of varied therapeutic options, from surgical excision to corticosteroid injections, adds further depth to the findings, making this study a valuable resource for advancing knowledge and treatment

strategies for hypertrophic scars in similar settings.

This research has several limitations that can affect this research a little hampered, such as the presence of the covid pandemic which resulted in a long data collection process and incomplete secondary data (medical records) so that some data tends to be difficult to conclude, also does not rule out the existence of some misspelled words or data.

CONCLUSION

The study findings show that hypertrophic scars are most commonly found in patients aged 17-25 years, with the majority being female. Burns are the leading cause, and the scars are most frequently located on the face and hands. Surgical techniques are the most commonly used therapy for managing hypertrophic scars. Early intervention is crucial to improving treatment outcomes, and a personalized management approach should be applied to enhance clinical results for patients at Dr. Soetomo General Academic Hospital, Surabaya. These findings also highlight the importance of developing more effective management strategies based on the clinical profile and characteristics of each patient.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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AUTHOR CONTRIBUTION

ARP was responsible for the conceptualization of the research, drafting of the manuscript. Data collection and analyzing data was carried out by ARP and EE. ARP, IDS, and EE, who also participated in its critical revision. All authors reviewed and approved the final version of the manuscript, ensuring its accuracy and completeness before submission for publication.

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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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