

Frequently Performed Surgical Procedures for The Treatment of Noma Cases in Ethiopia

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Abstract

Background: Noma, a devastating disease that causes severe destruction of facial tissue, necessitates comprehensive surgical intervention to restore functionality and improve the quality of life for affected individuals. This cross-sectional study aimed to determine the most frequently employed surgical procedures for reconstructing Noma defects in Ethiopia.

Methods: A retrospective cross-sectional analysis was conducted on the medical charts of Noma patients from the Facing Africa database. Electronic medical records between 2007 and 2019 at Facing Africa were reviewed to identify the surgical procedures performed for reconstructive purposes. To determine the commonly used procedures, the frequency of each technique was calculated using SPSS Version 2020 in the analysis.

Results: Between 2007 and 2019, Facing Africa conducted a total of 438 surgical procedures to treat 235 cases of Noma. Among these, reconstructive surgery, which includes two or more of the commonly practiced procedures, is the most frequently used technique with 177 procedures. The submental flap ranked second in terms of frequency, with a total of 47 procedures performed. Ankylosis release, aimed at addressing limited jaw movement, was carried out 35 times, while commissuroplasty, focusing on the separation of fused oral commissures, was performed 26 times. The radial forearm free flap was employed 23 times as a viable option for reconstructing facial defects. Coronoidectomy, involving the removal of a portion of the jawbone to improve mouth opening, was performed 11 times. Additionally, debulking, targeting the removal of excessive scar tissue or hypertrophic masses, was carried out 10 times. The Estlander flap, another technique used for lip reconstruction, was utilized 9 times as part of the treatment approach.

Conclusion: This retrospective analysis highlights the most frequently used surgical procedures for reconstructing Noma-related defects in Ethiopia. Reconstructive surgery, submental flap, ankylosis release, and commissuroplasty emerged as the predominant techniques employed. The findings of this study provide valuable insights into the surgical management of Noma cases and can guide healthcare professionals in selecting appropriate reconstructive strategies. Further research is needed to evaluate the outcomes and long-term effects of these surgical interventions to optimize patient care and improve functional outcomes for individuals affected by Noma.

Keywords: Noma, facial reconstruction, surgical procedures, flap, debulking

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Introduction

Noma, also known as cancrum oris, is a devastating disease that primarily affects children living in poverty-stricken regions with limited access to healthcare and nutrition (1). This condition leads to severe facial tissue destruction, resulting in disfigurement and functional impairments (Figure 1).

The treatment of Noma requires a multidisciplinary approach, and surgical intervention plays a crucial role in reconstructing defects and improving the quality of life for affected individuals. Accordingly, different types of surgical procedures are commonly used to treat Noma cases (2). Depending on the complexity of the case, one or more of these surgical procedures are applied to reconstruct orofacial defects associated with Noma. These surgical procedures address various aspects of the disease, ranging from tissue replacement and scar release to restoring facial symmetry and mobility (1). Reconstructive surgery is a fundamental component of Noma treatment, aiming to restore facial form and function by addressing the extensive tissue loss caused by the disease (3). Various techniques are employed in reconstructive procedures, including skin grafts, local flaps, and microvascular-free flaps. These techniques serve the purpose of replacing lost tissue, reconstructing facial features, and promoting healing (1-3). Among the surgical procedures used for Noma reconstruction, the submental flap is frequently utilized. This technique involves harvesting a

flap of skin and underlying tissue from the neck region, which is then transferred to the facial defect. By reconnecting the blood supply, the submental flap provides a reliable source of tissue for reconstructing intraoral defects and restoring facial symmetry (4). Scar tissue and fibrous bands resulting from Noma can lead to limited mouth opening and impaired jaw movement. To address this issue, ankylosis release is performed. This surgical procedure aims to release the adhesions, remove scar tissue, and resect fibrous bands, thereby restoring normal jaw function and improving oral hygiene and nutrition (5). Noma often affects the lips, causing the fusion of the corners of the mouth, known as oral commissures. Commissuroplasty, a surgical technique, is employed to separate the fused commissures and restore the natural shape and mobility of the lips. This procedure not only improves the aesthetic appearance but also facilitates speaking, eating, and oral hygiene maintenance (3-5).

In cases where extensive tissue reconstruction is required, the radial forearm free flap is commonly employed. This technique involves harvesting a portion of skin, underlying tissue, and blood vessels from the forearm, which is then transferred to the facial defect. The radial forearm free flap provides a versatile source of tissue that can be sculpted to reconstruct complex defects and restore facial contours (6). Restricted mouth opening due to abnormal bony growth of the coronoid process, a part of the jawbone, is a common issue in Noma cases. Coronoidectomy is a surgical procedure performed to remove a portion of the coronoid process, increasing the range of mouth opening and improving oral function. This procedure is particularly beneficial when conservative treatments fail to alleviate limited mouth opening (7). In some instances, Noma may result in the formation of excessive scar tissue or hypertrophic masses in the facial region. Debulking, a surgical procedure, involves the removal of these abnormal tissue growths to improve facial aesthetics and functional outcomes. By reducing the bulkiness of affected areas, debulking enhances the patient's ability to eat, speak, and perform daily activities (1, 8). Reconstructive surgery, including techniques such as the submental flap, ankylosis release, commissuroplasty, radial forearm free flap, coronoidectomy, and debulking, plays a vital role in addressing the challenges posed by Noma and helping patients regain their confidence and functionality (9). Yet, the combined efforts of skilled surgeons, along with a multidisciplinary team, are essential in successfully treating Noma cases and providing affected individuals with a chance to regain their self-esteem and lead fulfilling lives (10). In general, the treatment of Noma involves a range of surgical procedures aimed at reconstructing facial defects, restoring functionality, and improving the quality of life for affected individuals (11-13). This retrospective cross-sectional study was initiated primarily to identify the most frequently employed surgical procedures for reconstructing Noma



Figure 1: An 18-year-old Ethiopian girl with a defect in her L face which started at age 7 and has caused blindness in her left eye and difficulty eating solid foods. The defect affected much of the L maxilla – the oral and nasal cavities both visible through the defect. The L eye has been lost to the disease. She had complete ankylosis of her jaw and was unable to open her mouth at all and is therefore feeding through the defect.

defects in Ethiopia. The findings of the study are anticipated to provide valuable insights into the surgical management of Noma and can assist healthcare professionals in selecting appropriate reconstructive strategies.

Methods

The objective of this study was to identify the prevailing surgical procedures commonly used for treating Noma cases in Ethiopia. To achieve this, a retrospective review of electronic medical charts from the Facing Africa database was conducted. By analyzing the available patient records, the study aimed to identify the frequently employed surgical interventions for Noma treatment in Ethiopia.

Study Design

This retrospective cross-sectional analysis was conducted in February 2023 and utilized data obtained from the medical charts of Noma patients in the Facing Africa database.

The setting of the Study and Data Source

Electronic medical records from the Facing Africa database covering the period between 2007 and 2019 were reviewed. The database provided a comprehensive collection of Noma cases, enabling a representative analysis of surgical procedures.

Data Collection

A standardized data collection form was developed, encompassing pertinent demographic and clinical information. The form ensured consistency and systematic extraction of relevant data from the medical charts. Data collected included patient age, gender, surgical procedures performed, and associated clinical details.

Inclusion and Exclusion Criteria

Medical charts of Noma patients who underwent surgical treatment for reconstructive purposes within the specified time frame were included. Cases with incomplete or missing data were excluded to maintain data integrity.

Data Analysis

The frequency of each surgical procedure was calculated to determine the commonly utilized procedures for reconstructing Noma defects. The collected data were imported into the Statistical Package for the Social Sciences (SPSS) version 2020 software for analysis. Descriptive statistics, including frequencies and percentages, were employed to summarize and describe the data.

Results

The researcher conducted a comprehensive analysis of the surgical procedures performed to treat Noma cases between 2007 and 2019. The surgeries were carried out at multiple hospitals, including Yekatit 12 Hospital, Cure Hospital,

Myusngsung Christian Medical Centre, and Hallelujah General Hospital. During this time frame (as indicated in Table 1), a total of 438 surgical procedures were conducted at different health facilities in Addis Ababa, Ethiopia. A total of 235 noma cases ranging from 1-year-old children to 66-year-old women, including 139 women and 96 men were treated surgically. Out of these cases, 102 medical records provided details about which sides of the face were affected by the

Table 1: Surgical Procedures Performed for Treating Noma Cases in Ethiopia

Surgical procedures performed	Frequency	Proportion by percent
Reconstructive	177	40.41
Exploratory	4	0.91
Emergency	1	0.23
Cosmetics	3	0.68
No surgery	9	2.05
Excision	4	0.91
Debulking	10	2.28
Debridement	5	1.14
Radial forearm free flap	23	5.25
ALT (anterior lateral thigh) flap	3	0.68
Submental flap	47	10.73
Turnover flap	3	0.68
Abbe estlander flap	5	1.14
Modified MC Gregor flap	1	0.23
commissuroplasty	26	5.94
Nasal reconstruction	6	1.37
Coronoidectomy	11	2.51
Ankylosis release	35	7.99
Parascapular flap	2	0.46
Scapular flap	4	0.91
Free flap	8	1.83
Bone graft	8	1.83
Z-plasty	6	1.37
Karapandzic flap	5	1.14
Abbe flap	4	0.91
Estlander flap	9	2.05
Pedicle flap	1	0.23
Auricular cartilage	2	0.46
Forehead flap	6	1.37
SSG	1	0.23
Nasolabial flap	3	0.68
V-Y flap	2	0.46
Fujimori gate flap	3	0.68
PTF flap	1	0.23
Total	438	100

disease. Consequently, 51% of these cases (n=52) reported deformities on the left side of the face, while 47% (n=48) and 2% (n=2) documented deformities on the right side and in the central facial area, respectively. These medical records also revealed varying levels of tissue damage at specific facial landmarks, including the cheek, upper lip, lower lip, nose, hard palate, maxilla, commissure, zygomatic bone, infraorbital area, eyes, mandible, and chin.

Reconstructive surgery, consisting of two or more of the other procedures described, emerged as the most frequently utilized surgical procedure, being performed a remarkable 177 times. This highlights the importance of this technique in addressing the complex facial defects caused by Noma. The submental flap was the second most frequently employed procedure, with a total of 47 cases. This technique proves particularly useful for intraoral defects, allowing for the restoration of oral competence and facial symmetry. Ankylosis release, aimed at releasing adhesions and restoring normal jaw function, was performed 35 times, demonstrating its significance in addressing limited mouth opening and impaired jaw movement. Commissuroplasty, which focuses on separating fused oral commissures, was conducted 26 times, contributing to improved aesthetics, speech ability, and oral hygiene maintenance. Other commonly performed procedures included the radial forearm free flap (23 times), which serves as an effective option for reconstructing facial defects, and coronoidectomy (11 times), which helps improve oral function by increasing mouth opening. Debulking, involving the removal of excessive scar tissue or hypertrophic masses, was carried out 10 times, while the Estlander flap was employed 9 times for lip reconstruction.

Discussion

There are several surgical techniques commonly employed in the reconstruction of facial defects caused by Noma, a severe infectious disease (14). The use of various surgical procedures for reconstructing facial defects associated with Noma disease is crucial in restoring both form and function for affected individuals (4, 8, 15). A range of surgical procedures is employed in the reconstruction of facial defects associated with Noma disease. These procedures aim to restore facial form and function, improve aesthetics, and enhance the quality of life for affected individuals (16). The choice of technique depends on the specific characteristics of the defect and the individual patient's needs and circumstances (17). One commonly used technique is the Anterior Lateral Thigh (ALT) flap. This microvascular free flap involves harvesting tissue, including skin, fat, and sometimes muscle, from the anterior lateral thigh and transferring it to the facial defect. The ALT flap provides a reliable source of tissue for large and complex facial defects, allowing for the reconstruction of functional and aesthetic components (18, 19). Another frequently employed procedure is the Submental flap. This

technique involves transferring a flap of tissue, including skin and underlying structures, from the submental region (below the chin) to the facial defect. The submental flap is particularly useful for intraoral defects, as it allows for the restoration of oral competence and facial symmetry. For smaller facial defects, a local flap technique known as the turnover flap is often used. This technique involves mobilizing adjacent healthy tissue and rotating it over the defect to provide coverage. A turnover flap is a useful option when the defect is relatively small and does not require extensive tissue transfer (20-22). The Abbe Estlander flap is a procedure commonly employed for the reconstruction of lip defects caused by Noma. It involves creating a V-shaped incision in the unaffected portion of the lip and advancing the tissue to close the defect. This technique restores the continuity of the lip, improves oral competence, and enhances aesthetic outcomes (23). A similar technique is the Modified McGregor flap, which also focuses on lip reconstruction. It involves creating an elliptical incision in the unaffected portion of the lip and advancing the tissue to cover the defect. The modified McGregor flap helps restore lip function and aesthetics, allowing for improved oral competence and speech (24). In cases where there is a significant loss of bone due to Noma, costochondral grafting may be employed. This technique involves harvesting a section of cartilage from the patient's rib and using it to reconstruct defects involving the jaw or other bony structures. The costochondral graft provides stability and support, restoring jaw function and facial symmetry (7, 9). Scar revision and improving scar orientation and flexibility can be achieved through the use of Z-plasty. This technique involves creating a Z-shaped incision and rearranging the tissue to redistribute tension along the scar line. Z-plasty can be employed to improve the appearance of scars resulting from Noma treatment or previous surgical interventions (25). The Karapandzic flap is primarily used for reconstructing defects involving the lower lip. It involves transferring tissue from adjacent regions to reconstruct the lip, preserving its mobility and function. This procedure allows for the restoration of oral competence and aesthetic appearance (8, 20-22).

Another procedure, the Abbe flap, is commonly used for the reconstruction of defects involving the upper lip. It involves transferring a tissue flap from the lower lip to the upper lip to restore continuity and function. The Abbe flap can significantly improve speech, oral competence, and facial aesthetics. The Estlander flap is another technique used in the reconstruction of lip defects. It involves transferring tissue from the unaffected portion of the lip to the defect, allowing for the restoration of lip function and aesthetics (23-25). In cases where there are chin deformities resulting from tissue loss or asymmetry, genioplasty may be employed. Genioplasty is a surgical procedure involving the reshaping or repositioning of the chin. Its aim is to restore facial harmony and balance (4-6).

Debulking is a surgical procedure that involves the removal of excessive scar tissue or hypertrophic masses in the facial region. This technique is employed to improve facial aesthetics and functional outcomes by reducing the bulkiness of affected areas (26). Marsupialization is a procedure used in the management of cystic lesions or abscesses. It involves creating a surgical opening to allow for drainage and ongoing treatment. Marsupialization can be employed in Noma cases where cystic formations or abscesses are present (13-16). Limited mouth opening and impaired jaw movement due to scar tissue and fibrous bands can be addressed through ankylosis release. Ankylosis release is a surgical procedure aimed at releasing these adhesions and restoring normal jaw function. It involves removing scar tissue and improving joint mobility, facilitating proper oral hygiene and nutrition (27). Commissuroplasty is a surgical technique employed to separate fused oral commissures (corners of the mouth) caused by Noma. Its goal is to restore the natural shape and mobility of the lips, improving aesthetics, speaking ability, eating, and oral hygiene maintenance (19). Coronoideotomy is a surgical procedure performed to remove a portion of the coronoid process, a part of the jawbone that can restrict mouth opening. By increasing the range of mouth opening, coronoideotomy improves oral function and facilitates daily activities such as eating and speaking (28). The current study highlights reconstructive surgery as the primary approach, with specific procedures such as the submental flap, ankylosis release, commissuroplasty, radial forearm free flap, coronoideotomy, and debulking being the most commonly employed. The consistency of these findings with similar studies conducted in other regions emphasizes the global consensus on the importance of these surgical interventions in addressing Noma-related defects. The widespread utilization of procedures such as the submental flap and ankylosis release underscores their effectiveness and suitability in managing the complex challenges presented by Noma. Yet, it is worth noting that while procedures such as marsupialization, genioplasty, costochondral graft, extirpation, contracture release, mandibulectomy, scar release, and lower lip reconstruction are common surgical approaches in reconstructing Noma cases, none of the patients at Facing Africa received these procedures during the study period. Of note, this study is not free from certain limitations. For instance, the study did not compare the outcomes or effectiveness of different surgical procedures. It solely aimed to identify the most frequently used techniques, without evaluating their relative benefits or drawbacks. On the other hand, the analysis was based on data from the Facing Africa database, which represents a single center in Ethiopia. This may limit the generalizability of the findings to other settings or populations.

Conclusion

Overall, the identification of reconstructive surgery, including the submental flap, ankylosis release,

commissuroplasty, radial forearm free flap, coronoideotomy, and debulking, as the most frequently used procedures for Noma reconstruction in Ethiopia contributes to our understanding of the current surgical practices in managing Noma-related defects. This knowledge can guide healthcare professionals in developing tailored treatment strategies and improving the quality of life for individuals affected by Noma. Further collaboration and research are necessary to refine surgical approaches, enhance patient outcomes, and ultimately reduce the burden of Noma on affected individuals and communities. Of note, the psychosocial consequences of noma have been shown to have a significant impact on patients, both before and after reconstructive surgery. It is therefore crucial to consider psychosocial support as an integral part of a comprehensive treatment concept.

Ethics Approval and Consent to Participate

The ethical considerations surrounding retrospective non-interventional medical record reviews (NIMRR) hold significant importance and exhibit variation across different countries. Ethical clearance was obtained from the Institutional Review Boards or ethics committees of the Addis Ababa Health Bureau. The approval number of the clearance statement is "A/A/H/B/2116/227." To ensure compliance with ethical standards, all study subjects and/or their legal guardian(s) provided informed consent, granting permission to utilize their medical records for research endeavors. Confidentiality and privacy of patient information were strictly maintained throughout the study. Personal identifiers were anonymized to ensure data protection. To minimize errors in data collection, standardized abstraction forms were also employed. All methods were conducted in adherence to the guidelines and regulations governing the execution and documentation of medical record review studies.

Competing interests

The authors have declared that no competing interests exist.

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