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Review Article

Review of Plastic and Reconstructive Surgery in a General Hospital Setting: Experience from a Developing Country

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Abstract

Background: Plastic and reconstructive surgery in developing countries and underserved areas are significantly limited and face changes to start a proper service. This study presents a review of plastic surgery services and experiences in a district hospital located in an underserved area.

Methods: This descriptive, retrospective, hospital-based study was conducted to review patients who presented to the plastic and reconstruction departments from January 2014 to January 2015. All patients seen in the outpatient clinic or emergency departments for plastic surgical consultation or management were included in the study.

Results: The total of 403 cases fulfilled the inclusion criteria. The emergency surgical operation performed in our unit were distributed in the following descending order; fingertip injury (32%), cut wrist (12.7%), cut extensor tendon (9.9%), gunshot injuries (9.4%), fracture of a small bone of the hand (8.3%), and lower limb trauma. Surgery for congenital deformities constituted the most elective operation done in our unit (31.6 %), followed by tumor surgery (18.7%), burn surgery (17.3%), aesthetic surgery procedure (12.2%), and other miscellaneous cases (12.2%).

Conclusion: This report demonstrates the efficacy of secondary hospital setting to accommodate a large volume of patients during the first year of establishment, and further predicting development needs, staff training, and governmental support.

Keywords: plastic surgery, reconstruction, underserve area, sub-Saharan, developing countries

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1. Introduction

Plastic surgery is considered a type of surgical specialty that needs variable principles and skills and operates on resolving the congenital or acquired ailments presented in each patient's organ(s) or system. The reconstructive part of plastic surgery encompasses a variety of procedures that play an important role in managing many patients' problems and reducing hospital costs by decreasing the length of hospital stay [1, 2]. Plastic surgery also involves various specialties including burn, trauma, tumor surgery, aesthetic surgery, cleft surgery, and hand surgery [3]. Generally, the common causes of surgical conditions are injuries, malignancies, and congenital anomalies; however, plastic and reconstructive surgeons perform nearly one-half of these emergencies and important procedures [4, 5].

In the United States, there is an increased tendency to establish plastic surgery departments independently, rather than including them with other surgical specialties [6]. In contrast, some developing countries consider plastic surgery as an unnecessary field, and the establishment of a department in publicly funded hospitals was not considered [7]. For instance, there is a significant lack of data from sub-Saharan Africa regarding plastic surgery practice [8]. However, plastic surgery cases represent about 20% of the surgical workload in rural hospitals [9]. In Zambia, for example, there are no plastic surgery units outside of the capital. Instead, a mobile service delivers the necessary services to rural areas. This model of mobile service delivery operates based on two to three visits annually [5]. Up until the past decade, plastic surgery services in Sudan used to be exclusively conducted in Khartoum at two centers – the Omdurman Hospital [10] and the Soba Hospital [11]. However, after a training specialty was established in Sudan's medical specialization board in 2010, more than five units were established inside Khartoum state and the other five units in other states [12].

This study reviews and demonstrates plastic surgery services and experiences in a district hospital and underserved areas. Additionally, challenges and obstacles of the hospital setup as well as the development plans have been discussed.

2. Materials and Methods

2.1. Study type

This descriptive, retrospective, hospital-based study was conducted to review patients who presented to the plastic and reconstruction departments from January 2014 to January 2015.

2.2. Inclusion and exclusion criteria

All patients seen in the outpatient clinic or emergency departments for the purposes of surgical consultation and management were included in the study.

2.3. Study area

The Elobeid Teaching Hospital is a referral governmental hospital in North Kordofan State. The hospital has 600 beds. There are eight internal medicine units, five surgical units, three orthopedic units, and an ENT unit, forming the medical and surgical departments. Furthermore, the hospital has emergency departments, radiological departments, central laboratories, and operating rooms.

2.4. Plastic and reconstruction units

This is the first functioning plastic surgery unit in the hospital, headed by a plastic surgeon specialist and two residents.

2.5. Perioperative assessments

Preoperative assessments vary between elective cases and emergency patients. Every patient was evaluated by the plastic surgery team and the final decision was taken following that evaluation. Additionally, the relevant investigations were requested, and definitive surgery was done urgently. Elective cases were also evaluated and enrolled in the treatment program. The type of anesthesia usually depends on the patient's diagnosis and the type of surgery. It can include block, spinal, or general anesthesia according to the site and the age of the patient.

Moreover, the surgical technique depends on the type of operation which for a wide range of pathology needs plastic and reconstructive surgery. A tourniquet was used in cases that needed a bloodless field to allow generous dissection and clean anatomy. The principles of the reconstructive ladder were followed to cover the defects according to our setting. These include primary closure, healing by secondary intension skin, graft, local, regional, and distant flap. In cases of cleft lip repair, Millard repair was utilized for the procedure, whereas bipedicle mucoperiosteal flaps were used for cleft palate repair. In tumor surgery, we employed a wide local excision with a safety margin followed by immediate reconstruction according to the site and the size of the defect. In the rest of the procedures, the same principles were applied. Postoperatively, the

patients were seen in the outpatient clinic every two weeks, one month, two months, and six months. All patients' dressings and plaster of Paris abdications were done in the clinic. In some cases, the patients required further rehabilitation or chemotherapy to achieve satisfactory results.

2.6. Data collection

A flowchart form was used to collect the data. Classification of work, diagnosis, and operations were collected, tabulated, and analyzed. Data were analyzed using the Statistical Package for the Social Services (SPSS) version 21.0.

3. Results

A total of 403 cases were included in the study. Patients were aged from 3 months to 85 years with most of the cases being males (83.4%). Three hundred and twenty patients required surgical intervention (79.4%), whereas seventy-four (18.4%) patients were treated conservatively. Nine patients (2.2%) were referred for further management. Out of the 320 surgical operations done, 181 had emergency surgical intervention, whereas 139 had elective operations. The conservative management provided for patients in our series include different procedures such as wound dressings for a burn patient, local wound debridement, and steroid injections for keloid. Nine (2.2%) patients were referred for further management.

The emergency surgical operation performed in our unit are distributed as follows – fingertip injury (32%), cut wrist (12.7%), cut extensor tendon (9.9%), gunshot injuries (9.4%), fracture in the small bone of the hand (8.3%), lower limb trauma (Figure **1**) (6.6%), a cut wound in the face (6.6%), peripheral nerve injuries (5%) (Figure **2**), eyelid injury, and crush hand injuries (each 2.2%). Ring avulsion injuries, thumb amputation, and human bites constitute the least common conditions (each 1.7%) (Figure **3**). All emergency surgical procedures are shown in Table 1.

Table 2 demonstrates the elective surgical procedures. Surgery for congenital deformities constituted most elective operations done in our unit (31.6 %), followed by tumor surgery (18.7%), burn surgery cases (17.3) (Figure **4**), aesthetic surgery procedure (12.2%), and other miscellaneous cases (12.2%). Elective hand surgery procedures represent the rest of the elective operations (8%).

Forty-four patients were operated on for congenital deformities. These anomalies include a cleft lip (25), cleft (6), polydactyly (5), hypospadias (4) hemangioma (3), and spina bifida (Figure **5**). The oncological surgical procedures were done for 26 patients,

and these were categorized according to the nature of the tumor. The categories were squamous cell carcinoma (8), basal cell carcinoma (6), malignant melanoma (3), and soft tissue sarcoma (4). Resection with a safety margin was performed and the reconstruction was done according to the reconstructive ladder based on available options. The site of the squamous cell carcinoma was the scalp in six cases and the lower limb in the rest. The site of the basal cell carcinoma was mainly in the face and resection with local flap reconstruction was done (e.g., midline forehead flap) (Figure **6**). Moreover, we had three cases of advanced breast carcinoma operated on for defect covering using a TRAM flap in two cases and a split-thickness skin graft for one patient (Figure **7**).

Post-burn contracture releases were done in five patients, and they were reconstructed using a skin graft or flap depending on the site. One patient developed a severe form of contracture following a third-degree burn and his family refused to be grafted, they were therefore discharged against medical advice. Eleven patients required operative intervention for elective hand surgery conditions, three underwent tendon transfer for low radial nerve injury, two underwent tendon graft for neglected tendon injury, and two underwent mallet finger treatment. Four patients underwent surgery for hand mycetoma.

Aesthetic surgery was performed in 17 cases. The most common operations performed on patients were an abdominoplasty (seven cases), followed by scar revision (five cases) and reduction mammoplasty (four cases). Surgery for gynecomastia was done for one patient in Table 3. Most of the plastic surgical procedures were successful with a reasonable hospital stay time of three to five days after surgery. The overall success rate for the operation was 96%. Two flaps failed – one TRAM flap for breast reconstruction for carcinoma of the breast and another local fasciocutaneous flap for distal leg defect following trauma. Five cases of skin grafts had taken graft less than 30% due to infection. Moreover, we encountered two cases of wound dehiscence in cleft lip and cleft palate congenital deformity. One patient died following a full-thickness flame burn on the third day.

4. Discussion

Plastic surgery as a specialty started following the First World War when patients with complex wounds presented a problem for management [7]. Plastic surgery treated injuries, malignancy, and congenital anomalies, which constitute 66% of measured surgical diseases worldwide in disability-adjusted life years (DALYs) [2]. In Sudan, plastic surgery services were historically provided only in the capital, and this was due to the lack of plastic surgeons to run them [12]. However, this fact began to

Figure 1: Hand trauma: A, B, and C show the finger tip degolving injury. D, E, and F prsent the neglected hand burn.

Figure 2: Nerve injury and repair.

change after a local program for training plastic surgeons started in 2010. In this study, we reviewed the data of 403 patients who presented to the plastic surgery unit in the Elobeid Teaching Hospital from January 2014 to January 2015 who needed surgical intervention. The goal of documenting this work is to raise awareness on the future

Figure 3: Skin graft.

Figure 4: Burn management.

direction of this surgery, as the concept of plastic surgery in this region is still largely considered a cosmetic luxury. The total number of patients reviewed in this study is the same as that available in international data [1, 7, 8]. A study done by Kieran *et al.* showed the ratio of elective to emergency procedures to be 2:1 [13], whereas in our series the emergency operations were almost equal to elective ones. Our data showed a great volume of hand injuries in plastic surgery emergency operations, which is inconsistent with other data from sub-Saharan Africa [8, 14] .The most common elective operation performed in our unit was surgery for congenital anomalies, with cleft lip and palate representing the majority, followed by burn surgery. However, a study conducted by Guzman *et al.* showed that burn surgery was the most common operation, followed by congenital anomalies [8]. This could be explained by raising awareness in the community about these anomalies and encouraging their early presentation for treatment. Nevertheless, we operated on two adult patients for cleft lip. Regarding the

Figure 5: Clif lip repair.

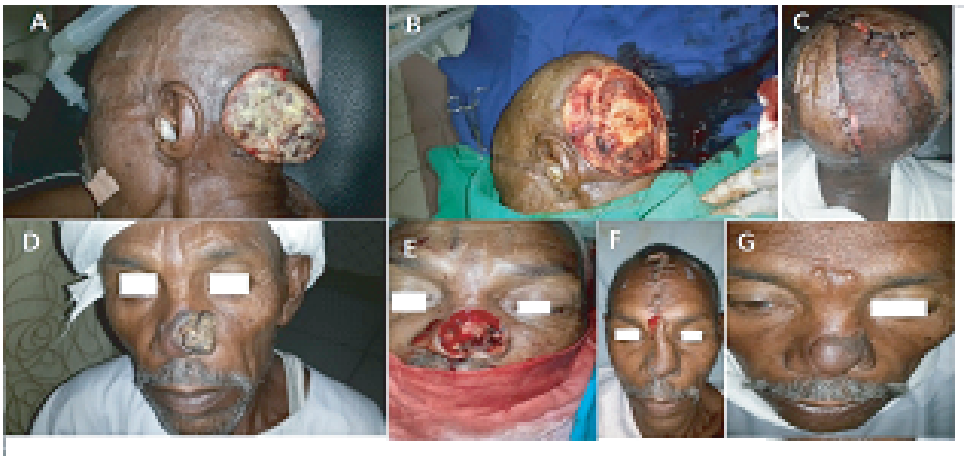

Figure 6: A, B, and C show squamous cell carcinoma. E, F, G, and H show basal cell carcinoma.

reconstructive ladder, we followed in our series, a skin graft was found to be the most common procedure, whereas the V-Y advancement flap was the most common flap done for fingertip injuries. We did not use free tissue transfer in our setting due to a lack of facilities. These include a lack of microsurgery-trained personnel and equipment, which makes the management of some cases challenging, so we referred some cases to more well-equipped centers.

Recently, plastic and reconstructive surgeries have become cost-effective and have had a positive impact on the economy [2]. The total number of plastic surgery cases treated in the first year of establishing the units indicates the need for developing this service in parts of the country where the catchment area is large, the access to the

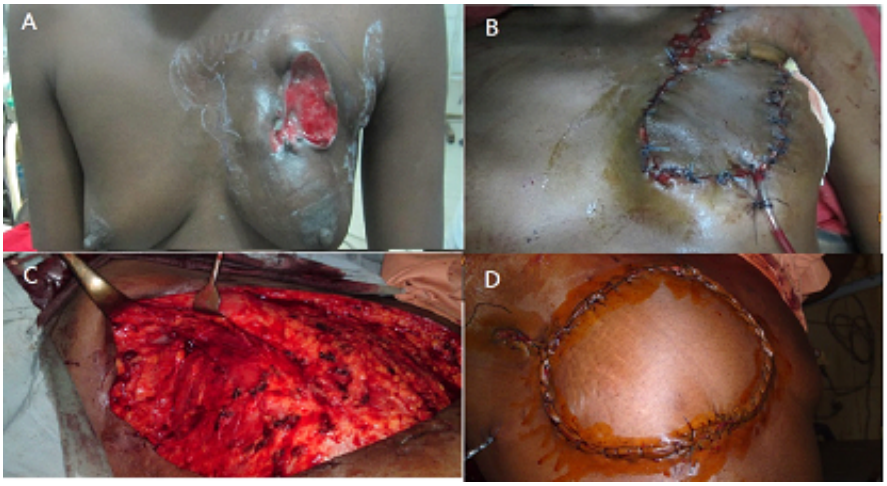

Figure 7: Breast canser reconstruction.

TABLE 1: Types of emergency reconstructive work.

Classification	Diagnosis	Operation/Procedure	N = 181	Percentage (%)
Hand injuries	Fingertip injury	Skin graft + local flap	58	32
	Cut wrist	Exploration and repair	23	12.7
	Cut extensor	Exploration and repair	18	9.9
	Nerve injury	Primary repair	9	5
	Crush hand	Skin graft + local flap	4	2.2
	Ring avulsion injury	Distant flap	3	1.7
	Thumb amputation	Skin graft + local flap	3	1.7
	Fracture hand bones	ORIF + closed reduction	15	8.3
Gunshot	Gunshot injury	Skin graft + local flap	17	9.4
Lower limb	Lower limb trauma	Skin graft + local flap	12	6.6
Face	Cuts over the face	Direct skin closure	12	6.6
	Eye lid injury	Direct skin closure	4	2.2
Human bite	Lip + nose	Direct closure repair + composite flap	3	1.7

service in the capital is demanding financially, and difficult in terms of traveling. We tried to provide the best service according to the locally available resources. We are reporting this work now to provide information about the services available to patients. However, plastic surgery has been on a downward trend recently in our country and we need to raise the attention of the stallholders in providing health services to this problem. This is particularly true because, in the last five years, five units of plastic surgery service were established and started to provide great work for patients in five cities – Medani, Nyala,

Table 2: Types of elective reconstructive work.

Elective surgery	Diagnosis	Procedure operation	Total N = 139		%
Burn surgery	Burn contracture	Skin graft	19	24	17.3
		Release	5		
Congenital anomalies	Cleft lip and/or palate	Repair	31	44	31.6
	Polydactyl	Excision & primary closure	5		
	Spina bifida	Excision & Direct skin closure	1		
	Hypospadias	Preputial skin flap	4		
	Hemangioma	Excision & primary closure	3		
Tumor surgery	SCC*	Skin graft + local flap	8	27	18.7
	BCC**	Skin graft + local flap	6		
	Malignant melanoma	Excision + graft	5		
	Ca breast	Mastectomy + myocutaneous flap	4		
	Soft tissue sarcoma	Excision + graft	4		
Aesthetic surgery procedure	Sagging abdomen	Abdominoplasty	7	17	12.2
	Scar revision	Revision	5		
	Macromastia	Reduction mammoplasty	4		
	Gynecomastia	Subcutaneous mastectomy	1		
	Neglected hand injury	Two stage Tendon graft	2	11	8
Elective hand surgery	Mallet finger	K-wire fixation	2		
	Drop wrist	Tendon transfer	3		
	Mycetoma hand	Excision with secondary intension and/or graft	4		
Miscellaneous	Mycetoma foot	Excision and skin graft	2	17	12.2
	Keloid surgery	Excision and steroid injection	12		
	Cut Achilles tend	Primary repair	3		

*SCC, squamous cell carcinoma; **BCC, basal cell carcinoma.

Eldamazin, Elobeid, and Elgadarif. Within two years of this, only two centers were still providing the service. The main reasons for this decline, in our opinion, are inadequate funding, lack of awareness of plastic surgery as an important subspecialty, and lack of strategic planning for medical personnel training in the field. All these factors affect the long-term sustainability of these units to provide the service. Future research is needed to address the issue confronting the plastic surgery specialty, particularly the increase in the number of trained plastic surgeons over the last five years.

Table 3: Types of flap and graft procedure.

Myocuteneous flap	Gastrocnemius	2
	LD	1
	TRAM	2
Fasciocutaneous flap	V-Y advancement	26
	Thenar	5
	Cross finger	6
	Radial forearm	1
	Groin	4
	First dorsal metacarpal artery	2
	Medial and lateral malleolar	4
	Random pattern Fasciocutaneous	6
	Composite	1
	Scalp	5
	Median forehead	4
	Preputial skin flap	4
Skin graft	STSG	50
	FTSG	15

5. Conclusion

This study reports the experience of a plastic surgeon working in a hospital with no specialized setting for plastic surgery with reasonable success in terms of the immediate outcome. A large volume of patients' need help in those areas, so upgrading the hospital and establishment with well-equipped units to support plastic surgeons in the peripheries and enhancing their training is crucial to develop the service outside the capital.

What is already known in this topic?

1. The way of treating and managing patients

2. Difficulties in establishing the new services in developing countries and sub-Saharan countries

What this study adds?

1. This is the first report documenting the work done by a plastic surgeon working in a district hospital in Sudan.

2. It reflects the obstacle facing plastic surgery service in our setting and suggestions for solutions.

Acknowledgements

None.

Ethical Considerations

Ethical approval was obtained from the Elobeid Teaching Hospital to review patient records and use the data mentioned in the study. Additionally, patient consent was obtained for the use of their photographs for publication and educational purposes.

Competing interests

The authors of this study have no financial relationships or conflicts of interest relevant to this article to disclose.

Availability of Data and Material

Data is available with corresponding author upon request.

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