Cross-sectional Study

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Retrospective cross-sectional study to evaluate outcome of loco-regional flaps in head and neck reconstruction in Sudanese patients

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Introduction: The soft tissue of the head and neck region poses both esthetic and functional aspects and must be retorted simultaneously, as any defect will be easy recognizable and will affect the quality of patient's life. Reconstruction by local- regional flap still the most popular approach used and outcome also better than other options.

Objectives: To assess the outcome of loco-regional flaps in head and neck reconstruction in Sudanese patients.

Patients and methods: Retrospective cross-sectional, multicenteric study (Soba University Hospital, Khartoum North Teaching Hospital and an associated specialized hospital) – Khartoum, Sudan, 84 patients underwent head/neck reconstruction during the period from 2017 up to 2021 were included.

Results: Out of 84 patients, 47.6% were female and 52.4% were male. The etiology of head and neck defects in the majority (69%) was neoplastic, and in 11.9% it was trauma. According to site of defect, in 23.8% of patients was Cheek unit, 21.4% was nasal site, and 16.7% was neck site. Surgery in 85.7% of patients were primary, while in 14.3 was delayed. Fasciocutaneous flaps were used in 64.3%, followed by myocutaneous flap in 28.6%; functional outcome was excellent in 61.9%, adequate in 35.7%, and was inadequate in only 2.4%. The majority of patients 66.2% did not develop any complications.

Conclusion: Loco-regional flaps are ideally useful in covering head and neck defects. It has an acceptable esthetic and functional outcome in the majority of cases. It can be considered as a reliable option for reconstruction especially in resource constrained centers.

Keywords: head and neck flap, head and neck reconstruction, head defects, loco-regional flaps

Introduction

The soft tissues in the oral and maxillofacial region (OMFR), such as the eyelids, nose, lips, cheek, and tongue contribute to important functions, which include vision, respiration, mastication, swallowing, and speech. In addition, they contribute significantly to the perception of the beauty of an individual. Since individuals place a high value on facial esthetics, soft tissue defects in the OMFR may negatively affect the perception of facial beauty, resulting in significant psychological morbidity in addition to functional problems[1].

Extensive head and neck tissues defects are a challenge for reconstructive surgery. The goals for reconstruction of these tissue defects, created by various etiologies, remains the same. The management of the defect depends upon the size of the defect, location of the defect, co-morbid conditions of the patient and the type of defect, that is, whether traumatic or post malignancy[2]. Today, the goals of the reconstruction are to achieve good functional as well as esthetic outcomes. Functional aims include oral competence, clarity of speech, mastication, mobility of the tongue, bolus transport, avoidance of nasal regurgitation, and aspiration. Whereas, esthetic outcomes are a restoration of the bony framework, soft tissue contour, chin prominence, and mobility of the jaw. It is very challenging to attain all these aims of reconstruction in most of the patients[3].

The differences between the structures involved, in terms of function and tissue features, are the main difficulties[4]. Local flaps are flaps generated adjacent to the primary defect, such as: rotation, advancement, and transposition while regional flaps typically have axial-based vascularity, wherein these flaps are

HIGHLIGHTS

- Head and neck defects can be caused by multiple etiology and several esthetic units may be affected.
- Choose of reconstruction method must respect functional and esthetic aspects.
- Pedicles flaps play a major role in head and neck reconstruction in developing countries like Sudan and able to manage the pathology with minimal complications and a good functional outcome.
- Lack of researches and publishing in developing countries especially in Africa make world unawares with etiologies of head and neck defect and reconstruction. Therefore, this article to reflect part of this problem.

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dependent on a specific vascular pedicle for viability. An example of a regional flap is the pectoralis major myocutaneous flap. Loco-regional flaps had been widely used for oral reconstruction, especially prior to the advent of free tissue transfer. In recent years, there has been a resurgence in interest in loco-regional options[5]. When reconstruction involves the facial or neck skin, the use of loco-regional skin flaps gives optimal esthetic results because they are similar to the respected tissue in terms of color, texture, hair bearing, and thickness[4].

The use of loco-regional flap in reconstruction in head and neck can be considered reliable reconstructive choices that are less expensive than free flap alternatives; therefore, we want to highlight the outcome of loco-regional flaps reconstruction.

Materials and methods

This is a retrospective cross-sectional, hospital-based, multicenter study, performed in all plastic surgery units – Khartoum, Sudan, during the period from September 2020 to February 2021.

All patients attending the selected hospitals and operated with loco-regional flap in head and/or neck, during the period from January 2017 up to February 2021 were included. All procedures were performed by expertise plastic surgeons. Patients with inefficient data were excluded. Data was collected by using direct interviewing questionnaire, filled by researcher and some information was taken from patients records.

Collected data was analyzed by using Statistical Package of Social and Science (SPSS) 23 software program, then data presented in table of frequencies and percentages.

Functional disability assessment

Eye functional disabilities were recognized if there is any:

1. Eye ball loss.
2. Ectropion.
3. Ptosis.
4. Exposure keratitis.
5. Excessive tearing.

Oral functional disabilities were recognized if there is any:

1. Speech difficulties.
2. Feeding difficulties.
3. Mouth hygiene difficulties.

Neck functional disability is recognized by the developmental of neck contracture

If patient had at least one of these problems we considered him has inadequate function.

Esthetic functional outcome assessment

To assess esthetic outcome patient's satisfaction visual scoring were applied. A score of 10 was used (0 indicating the worst and 10 indicating the best). Cumulative scores were calculated for each patient as follow:

1. Poor: <5
2. Acceptable: 5–7
3. Excellent: 8–10

Postoperatively all patients had been followed up for 12 months then final outcome assessed.

The work has been reported in line with the strengthening the reporting of cohort, cross-sectional, and case–control studies in surgery (STROCSS) criteria[6].

Results

Eighty-four patients were included in this study; among them, 12 (14.3%) were within age group 1–20 years old, 28 (33%) within age group 21–40 years old, 26 (31.0%) within age group 41–60 years, and 18 (21.4%) were >60 years old (Fig. 1).

Out of patients, 40 (47.6%) were female, and 44 (52.4%) were male.

The etiology of head and neck defects in the majority 58 (69%) was neoplastic, in 10 (11.9%) was trauma, in 8 (9.5%) was inflammatory, and only 4 (4.8%) was due to congenital defects.

The commonest type of tumor was SCC in 28 (33.3%), followed by BCC in 14 (16.7%) (Table 1). According to the site of defect, in 20 (23.8%) of patients was Cheek unit, in 18 (21.4%) was nasal site, 14 (16.7%) was neck site, and 10 (11.9%) was involving the scalp.

Regarding reconstructive surgery, 72 (85.7%) of patients had primary reconstruction, while 12 (14.3) was delayed primary or secondary reconstruction.

According to the complexity of flaps, 44 (52.4%) were island flaps while 40 (47.6%) were pedicle flaps.

The most common type of flap used was fasciocutaneous flap 54 (64.3%), followed by myocutaneous flap in 24 (28.6%) (Table 2, Figs. 2–4).

The commonest flap used was forehead flap 10 (25%), followed by pectoralis major muscle flap 7 (17.5%).

Functional disability outcome: inadequate eye function was reported in nine (10.7%) among them four (4.7%) were having excessive tearing, three (3.5%) were suffered eye ball loss, and two (2.3%) were complicated by ptosis. In adequate mouth function is reported in five (5.9%) of patients, all of them cannot brush their tooth (Table 3).

Overall, in adequate function was reported in 14 (16.6%) of patients. Visual satisfaction was excellent in 22 (26.2%), acceptable in 44 (52.4%), and poor in 14 (16.7%).

The majority of patients 64 (66.2%) did not develop any complications; on the other hand, common complications was infection (7.10%), tumor recurrence (7.10%), hematoma (4.80%), and total flap necrosis (4.80%).

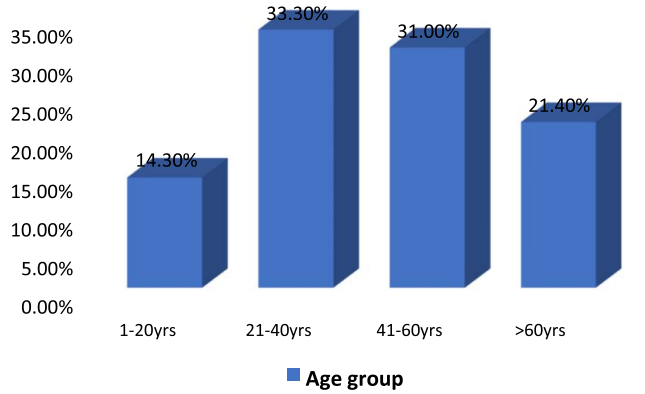

Figure 1. Patient distribution according to age groups.

Figure 2. Cheek advancement flap.

Figure 3. Forehead flap for nasal reconstruction.

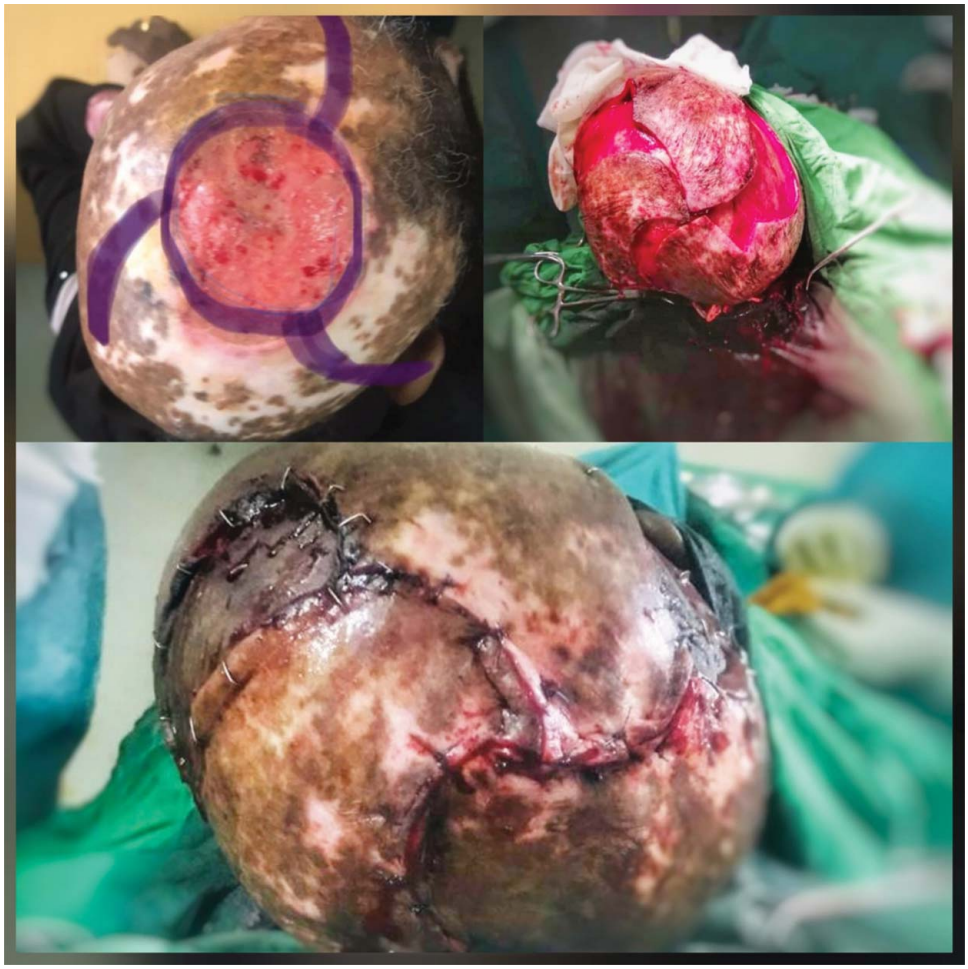

Figure 4. Pinwheel flap (triple rotational flap) post scalp SSC excision.

Discussion

In this study, 84 patients were involved, more males than females (52.4%) and (47.6%), respectively, had oral and maxillofacial soft tissue reconstruction. Similar results were obtained by Agbara *et al.*[7] which found that (71.4%) were males and (28.6%) were females. Another study by Findlay *et al.*[8], showed similar results. This may be related to etiological factors. Tumor and trauma excision accounted for most of the defects, many studies on trauma and tumors involving the OMFR have shown a male preponderance[9].

The present study revealed that the etiology of head and neck defects in the majority 58 (69%) was tumor, followed by trauma, then inflammatory, and only 4 (4.8%) was due to congenital defects. Different results were obtained by Multani *et al.*[2] study, which reported that the commonest cause was post-traumatic followed by malignancy, infections, and others, also Agbara

Table 1

Patients distribution according to type of tumor

Type of tumor	Frequency
BCC	14 (16%)
Melanoma	2 (2.4%)
Parotid gland tumor	12 (14.2%)
SCC	28 (33.3%)
Thyroid tumor	2 (2.4%)

Table 2

Patient's distribution according to name of flap used

Name of flap	Frequency
Abbe-estlander flap	2 (2.4%)
Check advancement flap	4 (4.7%)
Double V-Y advancement flap	6 (7.1%)
Forehead flap	20 (23.8%)
Frontalis muscle flap	2 (2.4%)
Hatchet flap (o-z flap)	4 (4.7%)
Karapandzic falp	4 (4.7%)
Latissimus Dorsi flap	4 (4.7%)
Nasolabial flap	2 (2.4%)
Pectoralis major muscle flap	14 (16.6%)
Pinwheel flap (triple rotational flap)	2 (2.4%)
Platysma myocutaneous flap	4 (4.7%)
Rhomboid flap	4 (4.7%)
Submental flap	2 (2.4%)
Superficial temporal artery flap	6 (7.1%)
Temporalis muscle flap	4 (4.7%)
Total	84

Table 3

Patient's distribution according to functional disability

Functional disability	Frequency
Eye assessment	
Adequate	24 (28.5%)
Eye ball loss	3 (3.5%)
Ectropion	0
Ptosis	2 (2.4%)
Expose keratitis	0
Excessive tearing	4 (2.7%)
Nose assessment	
Adequate (breathing)	21 (25%)
No	0
Mouth assessment	
Adequate	8 (9.5%)
Cannot speak	0
Cannot drinking and eating	0
Cannot brush teeth	5 (5.9%)
Neck assessment	
No neck contracture	17 (20.2%)
Neck contracture	0
Total	84

et al.[7] study recorded trauma, as the most common etiological factor, followed by tumor excision and infection. This is most likely due to the fact that most of trauma patients are managed by maxillofacial surgeons as the primary unit of care in a specialized hospital due to the lack of availability in the study centers. Also most poly trauma patients are referred late.

Immediate reconstruction of tissue defects has the advantages of ensuring a reduced number of surgical procedures; the protection and preservation of vital structures; shorter hospital stay; reduced economic cost of treatment; rapid oral rehabilitation; return to normal social life; early administration of postoperative radiotherapy; and minimal fibrosis and soft tissue contraction[10,11]. In this study regarding surgery time lag, 72 (85.7%) of patients were primarily reconstructed, and only 12 (14.3) had delayed primary or secondary reconstructive procedure. Similar study by Rao *et al*., had 50 patients of Basal cell carcinoma had excision and primary reconstruction. Another study by Nigeria[7] stated that only 10 patients (15.2%) had immediate reconstruction. This may be related to etiological factors and financial constraints[12].

The location, size, shape, and orientation of the defects are important factors in determining the method used in reconstruction[13]. Various loco-regional flaps were used for the reconstruction of the diverse OMFR defects. According to the complexity of flaps, 44 (52.4%) were island flaps while 40 (47.6%) were pedicle flaps. Various types of flaps ranging from fasciocutaneous flap 54 (64.3%), followed by myocutaneous flap in 24 (28.6%) were used. Among them, in the current study, forehead flaps were most commonly used, followed by pectoralis major muscle flap. This is consistent with Multani *et al*.[2] who stated that the most common loco-regional flap done was forehead flap (27%) followed by pectoral flap. This may be due to the fact that forehead flap is an axial pattern flap and is very useful for repair with near normal functional and cosmetic results can be achieved. The forehead flap provides adequate tissue (for both external cover and internal oral lining) that can be used to cover defects as far as the lower border of the mandible hence its choice for defects in the cheek (the commonest site of defect in this study)[14,15]. In addition, the forehead flap is easy to mobilize when compared to other loco-regional flaps such as the latissimus dorsi and pectoralis major[16,17].

According to the site of defects, in this study, the most common site of defect were the Cheek unit and nasal site, followed by neck site and scalp. Agbara *et al*.[7]; in Nigeria, found different results where the lip was the commonest site in 27 (32.1%) followed by the nose in 17 (20.2%). In addition, a study in the US by Guo *et al*., reported that nose (38%) was the commonest site of defects followed by cheek (34%) and ears (28%). Type of flap selection also depends on the size of defect. In this study, 24 (28.6%) was 4–5 cm, 22 (26.2%) was 3–4 cm, and 5–6, and >6 in 18 (21.4%), and 18 (21.4%), respectively. Nevertheless, for defects larger than 1.5–2 cm in diameter, Rohrich *et al*. generally suggest the use of axial pattern flaps such as the forehead flap, the nasolabial flap, and the dorsal nasal flap[13,18]. These methods of reconstruction can often be used interchangeably, but all of them show specific pearls and pitfalls. Certain flaps work better in different areas such as glabella, Miter for horizontal defects, and V-Y and nasolabial flaps for vertical loss of substance[13].

The primary functions of head and neck structures are to keep the airway open and avoid aspiration, keep the mouth clean to make swallowing easier and visual aptitude. Since all of these roles are essential for survival and some of them are important factors in determining a high quality of life[19]. Ideally, these processes should be maintained or restored as long as the care of the disease condition is not jeopardized, so we assessed functional disability outcome among patients according to this issues and found that in adequate eye function was reported in nine (10.7%) among them four (4.7%) were have excessive tearing, three (3.5%) were have eye ball loss, and two (2.3%) were have ptosis. In adequate mouth function found in 5 (5.9%) of patients, all of them cannot brush their tooth. And overall in adequate function was 14 (16.6%) of patients.

In the current series, visual satisfaction was excellent in 22 (26.2%), acceptable in 44 (52.4%), and poor in 14 (16.7%). The higher frequency of satisfaction reported by Schnabl *et al*.[20] study, which assessed patient satisfaction following various methods of facial reconstruction it revealed that (82%) of patients were very satisfied, (16%) were satisfied, and (2%) were unsatisfied, variation in satisfaction frequencies might be attributed to the small sample size included in our study. Likewise, Rao *et al*.[17], report that all patients had satisfactory functional and cosmetic outcome.

Complications following head and neck reconstruction were noted in (33.8%) of patient's donor or recipient site. Infection being the most common, followed by tumor recurrence, hematoma, and total flap necrosis, While Gómez *et al*.[21] study reported complication rate of only (10.9%), and defined complications as major (partial or total flap loss) and minor (dehiscence, infection, and need for reoperation). And there were no major complications. Meanwhile, Agra *et al*.[22], study reported partial flap necrosis in (1.6%) of patients while hematoma reported in (0.8%). In contrast to our findings, other studies reported no major complications[16,17]. This could be related to the preoperative assessment like the choice of flap, intraoperative technique, or postoperative follow up. (14.3%) incidence of infection noted in this study may be related to poor preoperative hygiene and disinfection, wound dressing techniques, and nutritional deficiencies (most of the patients were of low socio-economic status). Tumor recurrence at the recipient bed in the

orofacial region postreconstruction is well documented in the literature[17].

The major limitations of this work are difficulty in data collection and follow up, but the results explain the importance of local flap for head and neck reconstruction and no need for jumping for complex free flaps.

Conclusion

The etiology of head and neck defects in the majority was tumor, followed by trauma, inflammatory, and congenital defects. According to the site of defect, Cheek unit was the commonest site then nasal, neck, and scalp. The most common type of flap used was the fasciocutaneous flap, followed by the myocutaneous flap. Functional and esthetic outcome was satisfactory in the majority of patients. The complications rate was reportedly high particularly infection, tumor recurrence, hematoma, and total flap loss. The loco-regional flaps are a reliable option for reconstruction especially in resource-constrained centers.

Ethical approval

Ethical clearance was obtained from the ethical committee of the SMSB and corresponding authorities. Approval was obtained from hospital administration. A written and verbal permission was obtained from the Administrative authority of selected centers.

Consent

Written informed consent was obtained from the patient for publication and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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Author contribution

I confirm that all the authors have made a significant contribution to this manuscript, have seen and approved the final manuscript and have agreed to its summation. Also, I accept full responsibility for the work and the conduct of study, have access to data, and controlling the decision of publishing.

Conflicts of interest disclosure

No conflicts of interest.

Research registration unique identifying number (UIN)

No involving human subjects.

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Data availability statement

Data available.

Provenance and peer review

Not been published before.

References

[1] De Sousa A. Psychological issues in acquired facial trauma. Indian J Plast Surg 2010;43:200.
[2] Multani JS, Nagi GS, Bajwa BS. Local and locoregional flaps in head and neck defects. J Evol Med Dental Sci 2015;4:12–7.
[3] Shah JP, Gil Z. Current concepts in management of oral cancer–surgery. Oral Oncol 2009;45:394–401.
[4] Bianchi B, Ferri A, Ferrari S, *et al*. Free and locoregional flap associations in the reconstruction of extensive head and neck defects. Int J Oral Maxillofac Surg 2008;37:723–9.
[5] Patel UA, Hartig GK, Hanasono MM, *et al*. Locoregional flaps for oral cavity reconstruction: a review of modern options. Otolaryngology 2017;157:201.
[6] Agha R, Mathew G. STROCSS Group. STROCSS 2021: strengthening the reporting of cohort, cross-sectional and case-control studies in surgery. In: STROCSS Group, editors. Int J Surg 2021;96:106165.
[7] Agbara R, Obiadazie AC, Fomete B, *et al*. Orofacial soft tissue reconstruction with locoregional flaps in a health resource-depleted environment: experiences from Nigeria. Arch Plast Surg 2016;43:265.
[8] Findlay MW, Sinha S, Rotman A, *et al*. The keystone perforator island flap in head and neck reconstruction: indications and outcomes from 200 flaps. Plast Reconstr Surg 2013;132(4S1):8–9.
[9] Adebayo ET, Ajike SO, Adebola A, *et al*. Oral and maxillo-facial soft tissue sarcomas in an Africa population. Nigerian J Surg Res 2006;8:3–4.
[10] Martin PJ, O'Leary MJ, Hayden RE. Free tissue transfer in oromandibular reconstruction: necessity or extravagance? Otolaryngol Clin North Am 1994;27:1141–50.
[11] Kroll SS, Schusterman MA, Reece GP. Costs and complications in mandibular reconstruction. Ann Plast Surg 1992;29:341–7.
[12] Metiboba S. Nigeria's National Health Insurance Scheme: the need for beneficiary participation. Res J Int Stud 2011;22:51–6.
[13] Guo L, Pribaz JR, Pribaz JJ. Nasal reconstruction with local flaps: a simple algorithm for management of small defects. Plast Reconstr Surg 2008;122:130e–9e.
[14] Baliarsing AS, Thorat TS, Gupta A. Flap selection in head and neck cancer reconstruction. Int J Otorhinolaryngol Clin 2013;5:63–76.
[15] Siqueira EJ, Alvarez GS, Laitano FF, *et al*. Lower lip reconstruction strategies. Rev Bras Cir Plast 2012;27:536–41.
[16] Chan RC, Chan JY. Deltopectoral flap in the era of microsurgery. Surg Res Pract 2014;2014:420892.
[17] Rao J, Deora H. Surgical excision with forehead flap as single modality treatment for Basal cell cancer of central face: single institutional experience of 50 cases. J Skin Cancer 2014;2014:320792.
[18] Rohrich RJ, Griffin JR, Ansari M, *et al*. Nasal reconstruction, beyond aesthetic subunits: a 15-year review of 1334 cases. Plast Reconstr Surg 2004;114:1405–16.
[19] Ng WM. Reconstructive options in head and neck surgery. Med Bull 2007;12.
[20] Schnabl SM, Breuninger H, Iordanou E, *et al*. Patient satisfaction in 1,827 patients following various methods of facial reconstruction based on age, defect size and site. JDDG 2018;16:426–33.
[21] Gómez OJ, Barón OI, Peñarredonda ML. Keystone flap: overcoming paradigms. Plast Reconstr Surg Glob Open 2019;7:e2126.
[22] Agra IM, Carvalho AL, Pontes E, *et al*. Postoperative complications after en bloc salvage surgery forhead and neck cancer. Arch Otolaryngol Head Neck Surg 2003;129:1317–21.