Middle and Lower Face Soft Tissue Reconstruction: A 10-Year Retrospective Study

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Abstract Retrospectively analyze the reconstruction methods and surgical outcomes of patients with middle and lower face soft tissue defects treated at our hospital over the past 10 years. **200** patients with middle and lower face soft tissue defects were surgically reconstructed at our hospital. Medical charts were retrospectively reviewed and analyzed to abstract the pertinent information. The lesion was mainly at the eyelid, lips, chin and nasal-cheek region. There were 41 (63.08 %) men and 24 (36.92 %) women. In our study, male to female ratio = 1.7:1. We used direct closure for night patients, local flap for 141 patients, free flap for 38 patients, combined flap for 12 patients involving extensive mid face and lower face defects. Most patients had their tumor resected and reconstructed in single stage procedure mostly with local advancement flap, and no flap failure was presented post-operatively. Middle and lower face soft tissue defects can be successfully treated with local flap in a single stage approach and step-by-step approach.

Keywords Middle, lower face defects · Soft tissue reconstruction · Retrospective study

Introduction

Face reconstruction pose challenging even for an experienced surgeon in that the face play aesthetic role in one's appearance. Reconstructive surgery of mid face and lower face requires a complete understanding of anatomy of this region. Defects involving mid face and lower face occur due to tumor, trauma, infections disease, congenital nevi, hemangioma or facial cleft. However, the vast majority of causes requiring reconstruction result from tumor ablation. Facial reconstruction methods vary from primary closure to local, distant or free flaps depending on several factors: size of defect, location of face, the conditions of adjacent tissues. Local flap was first option to repair facial defects, the use of local tissue gives the best aesthetic results, because of favorable color and texture matching. However, they are unavailable for large defect. The large face defect could not be reconstruction by local flap or regional flap. Distance or free flap may be employed for reconstruction of these defects. It's difficult to obtain a satisfactory outcomes that are a success from the functional and aesthetic respects, therefore we should combine several reconstruction methods in a patient with a large facial defect. The step-by-step approach was necessary methods addressing reconstruction of middle and lower face defects, restoration of function and aesthetic improvement. In this article we present our retrospective experience that physical appearance of patient and aesthetic improvement were first point for immediate and long-term reconstruction; Long-term restoration of function was main point.

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Patients and Methods

Between January 2004 and April of 2014, 200 patients underwent surgery for middle face and lower face defects. All were treated at department of oral and maxillofacial surgery of first teaching hospital of Xinjiang Medical university of Xinjiang, China. Pathological diagnosis of lesions included basal cell carcinoma, squamous cell carcinoma, and benign skin tumour. The localizations of defects included medial cheek subunit, nasofacial crease, chin region, nasal ala, melolabial fold, and upper and lower lips. Selection of appropriate operation for the patient was the most important part for plastic surgeon, so elective procedure different sizes, shapes and types of flaps were designed and used. Except a few number of operation were performed under local anaesthesia, others operations were performed under general anaesthesia. In all cases, the donor sites were chosen after thorough examination of the area in order to design the safest flap pedicle with the smallest scar. All patients were followed up for at least 2 years on regular basis, and follow-up information gained from the outpatient records, interviews with family members, and relevant medical examination.

Table 1 Histological finding in 200 patients with middle and lower face defects

Histology	Number	%
Basal cell carcinoma	90	45
Squamous cell carcinoma	40	20
Injury	43	21.5
Necrosis	15	7.5
Benign tumor	12	6

Results

There were 126 men (63.08 %) and 74 women (36.92 %) In our study, with a male to female ratio of 1.7:1. Their median age at presentation was 42 years (range 4 years to 75 years). In our 10 years experience revealed that most popular factor causing middle and lower face defects was basal cell carcinoma, accounting for 45 %, maxillofacial trauma is another important factor occurring facial deformities in young adult, many of whom have under 30 years old (Table 1; Fig. 1). for the treatment of defects frequent type of subunit was lips, accounting for 38.5 %, especially lower lip is the most frequent location subunit and combination defects involving several subunits equally accounting for 38.5 %, other types of subunit involving cheek, chin, perinasal accounting minimum percentage (Table 2). Local flap was the first option for middle and lower face reconstruction, accounting for 75 %, free flap and combined flap was the second option, accounting for 19 and 6 % (Table 3). All local flap were viable, and functional results were excellent in most patients, the aesthetic results was satisfactory with good color matching and contour; all the free flap survived without even partial

Table 2 Reconstruction site in 200 patients with middle and lower face defects

Site	Number	%
Lip	77	38.5
Cheek	31	15.5
Combination	77	38.5
Perinasal region	9	4.5
Chin	6	3

Fig. 1 **a** A 43-year-old man with a basal cell carcinoma. **b** Extant of tumor resection was marked, giant soft tissue defects of the half face. **c** Intraoperative view after complete closure of defect

Table 3 Types of flap used in 200 middle and lower face reconstructions

Types of flap	Number	%
Rotation flap	25	12.5
Direct closure	9	15.5
Advancement flap	31	4.5
Estlander flap	22	11
Karapandzic flap	9	4.5
Crass lip flap	3	1.5
Melolabial flap	3	1.5
Mycutaneous flap	3	1.5
Submental flap	3	1.5
Cervicofacial flap	3	1.5
Cervical platyma myocutaneous flap	3	1.5
Nasolabial transposition flap	9	4.5
Superficial webster flap	3	1.5
Wing flap	9	4.5
Tongue flap	12	6
Free radial forearm flap	28	14
Pectoralis major flap	10	5
Combined flap (free flap + local flap)	12	6

necrosis, donor sites of flap healed well. There were some complication such as microstomia, oral commissure and buccal region as well as labial deformities, but there were no complication such as haematoma, wound dehiscence in the early postoperative period. In addition, no tumor recurrence occurrence occurred during the follow-up period, satisfactory functional and aesthetic results were achieved in the reconstructed regions.

Discussion

It was generally accepted that reconstruction of the face is often a significant task. The middle and lower face is difficult to reconstruct because some areas have 2-dimensional structures, and others have 3-dimensional structures. The 2-dimensional structures include flat areas such as cheek, chin. The 3-dimensional structures include the central areas of the face, such as lips and nose [1]. Facial aesthetic are extremely important when the involving the face [2], therefore success from functional and aesthetic facial reconstruction is a very challenging discipline.

After facial defects, the aim of reconstruction of lower, middle face must be to maintain oral competence, mobility, possible sensation, and maximize aesthetic result. The restoration of the natural appearance should not be the only standard of reconstruction; preservation of adequate function is of great important. When defects involve more than one subunit in the middle and lower face, more complex reconstructive procedure are required.

The lower lip vermilion is most common site in the facial reconstruction preferring to reconstruct a wide variety of reconstructive options. Small lesion involving up to 30 % can be fusiform fashion or “V” shape excision and closure via advancement of adjacent tissue in the literature. When the defect is limited to small partial-thickness of the vermilion, a horizontal advancement flap [3] may be used to resurface the area of defect. If simple advancement is insufficient, a V–Y advancement flap can be used. Nasolabial transposition flap [4] is mostly use for partial defects of the lateral upper or lower lip, especially when an advancement flap can not provide enough mobility. Kawamoto [5] described a cross-lip vermilion flap for repair of large defect of upper lip vermilion allowing a good color and texture match; lingual mucosal flap [3] have been reported for vermilion defect, the dorsum of tongue has a papillated surface that is a poor match to the vermilion, so that they are rarely preferred because they are an unpleasant experience for the patient. The ventral surface of tongue match to the vermilion more closely in color and texture, therefore this flap is ideal flap in upper or lower lip small or large vermilion reconstruction, the only disadvantage is that the flap is divided and inset after 10 to 14 days.

It is undoubtedly fact that reconstruction of lower lip defect is eased by devoid of a dominant central structure such as philtrum, lower lip has a uniform contour, it is more elastic, and there is a greater laxicity of soft tissue than that of upper lip. These characteristics allow for better mobilization of tissue adjacent to the defect avoiding obvious distortion during reconstruction procedure rendering good aesthetic outcome; defects $\leq 1/3$ horizontal length of the lower lip may be rebuild with direct closure, even large defects may be closed primarily in elderly patients with lax skin, so the patient's age, elasticity, and residual adjacent soft tissue decide the reconstruction option that can be closed directly.

Two flap are mainly used for repair of defects with length between $1/3$ and $2/3$ of horizontal of the lower lip. There are the Estlander flap and Karapandzic flap. Karapandzic flap [6] is mainly used for medium lower lip defect that do not require new lip tissue for reconstruction and that are either located centrally or more laterally where they involve portion of commissure. It is adapted for both upper lip and lower lip defects, this flap not only respects the orbicularis oris muscle, but also the motor nerve of the lips. Thus, the oral sphincter remain intact and function satisfactory after this surgical procedure. The main disadvantages of this procedure are unsight scar and potential microstomia; Karapandzic flaps are reserve for defects up to two-third of full-thickness volume. Estlander flap [7] that is a full-thickness lip switch flap is used for reconstruction of defect that involve the commissure, this flap

Fig. 2 **a** Deformity of lower face before surgery. **b** Harvested with pectoralis major flap. **c** After 3 months postoperative view of patient

provides an elegant and reliable solution, this is one stage procedure and it has the potential disadvantages, the commissure junction loses its acute angle, leaving an unsightly rounded aspect.

Reconstruction of defect $>2/3$ of horizontal length of the lower lip (large defects) continues to be a difficult problem for reconstructive surgeons. The main aim of the reconstructive effort are the functional considerations of the oral competence such as articulation, speech, and role of lip in mastication; Wing flap [8] is useful method for large defect of lip, mental region is ideal donor site for large defect of lower lip. When using the lateral or nasolabial portion as a donor site, the structure and function of modiolus lost, and sensory innervation is not preserved. For functional reconstruction of lower lip, the modiolus should not be destroyed. In this method, we designed the medial edge of the flap along the mental wrinkle line, and it is rotation flap. Thereby avoiding the trap door deformity. In extensive lip defects obtaining adequate colour and texture was formidable problem for plastic surgeons, thence free tissue transfer or combination of flap to achieve an acceptable result.

Reconstruction of upper lip defects is more complicated because of intricate anatomy, such as nose, philtral columns; repair upper lip require special consideration in males and females by virtue of the location of hair-bearing skin in men. Compare to the lower lip, laterally located defects and central located defects may be different.

Reconstruction of small upper lip defects ($\leq 1/3$ of the horizontal length of lip) was employed method that there are primary closure, local flap from nasolabial fold, perialar crescentic closure. When the defect involves the central upper lip tissue, with intact vermillion, a nasolabial flap can be used for the defect. Laterally located defects can be used with primary closure. Centrally located defects can be closed after perialar crescentic skin excision [9]. Repair the defects with length between $1/3$ and $2/3$ horizontal of the upper lip, Abbe flap [10] and karapandzic flap and

Estlander flap was useful flap. Centrally located defects can be use an Abbe flap or karapandzic flap, we preferred to employ the Abbe flap, it has the better function and aesthetic results. Laterally located must be consideration two subunits, such as commissure and philtrum. An Estlander flap can be utilized for the defect when defect involvement of commissure. If the defects involved philtrum, the combination of perioral crescentic excision with use of an Estlander flap which is versatile choice for facial reconstruction, in case of lateral excision involving the large cheek tissue, a pediculated Submental flap [11] combined Estlander flap enable full-thickness reconstruction. Repair of large lower lip defects with local flaps will lead to severe microstomia, distant flap may provided more acceptable functional and aesthetic results (Fig. 2).

Compare to the lips, however, the cheek's relative uniform of color and contour render reconstruction options prone to extensive contracture less desirable due to high visibility and potential for distortion of neighboring system. The goal of cheek reconstruction is the intent to reestablish both internal and external coverage, expressivity, masticatory function, and aesthetic contour and quality. When small-size defects can be close in a layered, liner fashion with minimal associate tissue distortion [12]. Moderate-sized cheek defects are generally not amenable primary closure due to potential distortion of neighboring structures. In such circumstances rotation flap, advancement flap is ideal flap for this defects, because this options were maximization of aesthetic appearance, preventing the more distortion. Large partial-thickness defects require more tissue coverage, the reconstructive surgeon is generally consider extended local or regional options. Cervicofacial flap and free radial forearm flap was ideal method for these defects. Cervicofacial flap [13] has emerged as workhorse for extended local tissue reconstruction for large-sized defects. This flap was used the random blood supply of subdermal plexus to permit simultaneous rotation and advancement of large segment of cheek. Radical

Fig. 3 **a** Deformity of mid face before surgery. **b** Early postoperative view of patient by using radial forearm free flap. **c** Lateral view of patient after reconstruction

forearm free flap [14] was well-established for reconstruction of defects requiring free tissue transfer. Its advantages is well-documental and include a reliable anatomy, long pedicle length, good size vessels, and a soft pliable, potential sensate flap, relative good color match; the major disadvantage is its donor site morbidity, mainly unattractive scarring from the skin graft (Fig. 3). In our experience revealed that cervicofacial flap and radial forearm flap are best suited for large cheek defects. The perioral and perinasal region are commonly involved areas in benign and malignant tumor excision [15]. Various reconstruction method have been described in the literature, we reckoned that rotation flap [16] is excellent option because they generally have random blood supply from the dermal and subdermal plexus vessels, ideally, the donor site is in the lateral aspect of the face where scars are less visible, due to a certain amount of advancement, reconstructive surgeon prefer to choice and patients easily accept that this option could improve their aesthetic outcome.

Few reconstructive methods are available specially for tissue loss over the chin, most consist of combined reconstruction with lower lip [17]. When defect occurs within the chin unit, reconstruction option are determined by size and depth of the defect. A superficial defect may be repaired by primary closure. Reconstruction should be provided to achieve the best cosmetic results, and preserved reasonable function. Platysma myocutaneous flap [18] can be used for limited surface coverage of chin defect, it is more suitable for chin reconstruction due to color and contour, single-stage elevation, minimal donor-site make it more desirable. Although pectoralis major flap and free tissue transfer are either multistage or complex procedure, but in large defect they are provided enough tissue to reestablish the chin area. Pectoralis major flap [19]

has been the popular for head and neck reconstruction that easy reach of the flap, reliable vascularity, technical simplicity, coverage of the exposed vessels by muscle after neck dissection and ability to provide bulk, most patients develop an unesthetic neck contracture band (Fig. 2).

Reconstruction of large facial defects remaining a challenge for plastic surgeons, because it was difficult to obtain reconstructive materials including adequate colour and texture match. In the elderly patients can be utilized combined local flaps to repair extensive middle face defects. The extensive middle and lower face soft tissue defects divided into four types: lip and chin area defects, total or subtotal upper and lower lip defects, lip and cheek involving or not involving perinasal region defects, cheek and chin region defects. Free flap or combined free flap and local flap was described in the literature, but there are no consensus for reconstruction extensive lower and middle face soft tissue defects. In lip and chin region defects the tongue flap and free flap can contributed to good outcome. Tongue flap was very ideal flap for lip reconstruction that yields satisfactory results not only aesthetic appearance but also in functional preservation. Pectoralis major flap was useful flap for chin defect. It does not require any special expertise and infrastructure. It is good option employing combined tongue flap and pectoralis major flap for lip and chin defects reconstruction (Fig. 2). In the total or subtotal defects of upper and lower lip tongue flap and free flap was employed, tongue flap was utilized vermilion defect, free flap was employed lip defects (Fig. 4); we provide support for utility tongue flap and free flap in advanced for Lip and other combination defects in the lower and middle face. In extensive cheek and lip defects in the elderly patients can be utilized combined local flaps to repair extensive middle face defects (Fig. 1). In young patients can be employed

Fig. 4 **a** Facial deformity before surgery. **b** 6 months later patient postoperative view by using abdominal skin flap. **c** Excised bilateral tongue flap to repair lip. **d** Early postoperative result

the free flap because of the adjacent tissue limitation, free flap was the only good option for such defects (Fig. 3). In cheek and chin region defects free flap was the useful flap such combination reconstructions. Our retrospective experience indicated that we provide further support for utility of free flap for reconstruction in lip and cheek combined defects, cheek and chin combined defects.

Middle and lower face soft tissue reconstruction is significant assignment, a successful reconstruction are determined by knowledgeable surgeon's performance and patient's long-term situations. The surgeon should be to prepare careful surgical design, conversant with anatomy knowledge, to employ suitable surgical technique; post-operatively, the patients should cooperate with doctors, have systemic follow-up and individual assessment.

Conclusion

Our study presented 200 cases of soft tissue defects of middle and lower face that had grown over a mean of 10 years period, these defects posed cosmetic, functional, and social problems. Despite the surgical challenge in the treatment of these defects, we have managed to resect and reconstruct our patients in single stage procedure or step-by-step approach without causing any severe postoperative complications. Based on our experience on the treatment of soft tissue defects of face, we can imply that soft tissue defects of the face can be successfully treated with local flap or skin graft in single stage approach and step-by-step approach.

Compliance with Ethical Standards

Conflict of interest None declare.

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