

A Retrospective Study to Assess the Outcome of Single-Stage Continent Reconstruction of Composite Pericommissural Defects using a Combination of Pacman-Style Free Radial Forearm Flaps and Modified Elastic Musculomucosal Flaps: An Observational Study

Setubandhu Tiwary¹, C. M. Narayan²

¹Assistant Professor, Department of Surgery, RDJM Medical College and Hospital, Muzaffarpur, Bihar, India

²Professor and HOD, Department of Surgery, RDJM Medical College and Hospital, Muzaffarpur, Bihar, India

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Corresponding Author: Dr. C. M. Narayan

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Abstract:

Aim: The aim of the present study was to evaluate the efficacy and the outcomes of Single-Stage Continent Reconstruction of Composite Pericommissural Defects Using a Combination of Pacman-Style Free Radial Forearm Flaps and Modified Elastic Musculomucosal Flaps.

Methods: This retrospective cohort study was conducted in the Department of Surgery for the period of 1 year. 50 patients underwent this type of reconstruction using a combination of PFRFF and OEMMF for the CPECPC defects.

Results: Of the 52 patients, 40 were male and 10 were female. Ages of the patients were in the range of 35 to 52 years with an average age of 41.7 years. The CPECPC defects included 20% of the lateral upper lip and up to 36% of the lateral lower lip defects. The average score obtained at the end of the follow-up period was 11.7 (p=0.038) using the institutional assessment scoring system which evaluated both the overall aesthetics and function of the neocommissure and modiolus. 96% of cases (48 out of 50 patients) started regaining continence of the oral cavity as early as third post-operative week. All the cases had regained complete oral continence with re-establishment of all functions of the lip at the 6-month post-operative period.

Conclusion: The combination of oblique elastic musculomucosal flap and Pacman-style free radial forearm flap for the reconstruction of composite commissure and pericommissure defects may be a useful addendum from the point of re-establishing the aesthetics and continence in the reconstructed lips.

Keywords: Pacman-style free radial forearm flaps, oblique elastic musculomucosal flaps, oral commissure reconstruction, oral continence

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Introduction

Reconstruction of the head and neck with microvascular free flaps has been performed since 1959. [1] In the past, the use of vascularized flaps was considered the most appropriate. [2] Reconstructive methods and techniques have evolved to permit free tissue transfer for the reconstruction of the head and neck. [3] The use of free vascular-supplied tissue, particularly the radial forearm free flap, is considered the last choice of treatment in case of recurrences. [2] Small defects are usually treated with local xenogenic or allogenic grafts.

However, in case of extensive defects, dural and osseous structures require a different approach like vascularized tissue transplants. [2] The choice of free flap depends on the tissue type, size, and

location of the defect. [4,5] The fasciocutaneous radial forearm free flap became a successful choice for reconstructing defects. This flap gives a wide surface of up to 9 × 12 cm of pliable and thin soft tissue. [4] Previous studies have illustrated the use of radial forearm free flaps in different surgeries. [1-4]

‘The increasing prevalence of oral and oropharyngeal cancer [6-8] has led to an increase in the use of microvascular free flaps for reliable and anatomically accurate orofacial reconstruction. [9,10] Since its introduction in the 1980s, the vascularised radial forearm free flap (RFFF) has become a widely used method for reconstructing orofacial soft tissues following tumour ablation, with flap survival rates between 90% and 98.3%.

[11-13] However, harvesting the radial artery can lead to hand ischemia and reduced functionality [14,15] and damage to the sensory branch of the radial nerve can result in diminished grip strength and loss of sensation. [16,17]

The aim of the present study was to evaluate the efficacy and the outcomes of Single-Stage Continent Reconstruction of Composite Pericommissural Defects Using a Combination of Pacman-Style Free Radial Forearm Flaps and Modified Elastic Musculomucosal Flaps.

Materials and Methods

This retrospective cohort study was conducted in the Department of Surgery, RDJM Medical College and Hospital, Muzaffarpur, Bihar, India for the period of 1 year. 50 patients underwent this type of reconstruction using a combination of Pacman-Style Free Radial Forearm Flaps (PFRFF) and oblique Modified Elastic Musculomucosal Flaps (OEMMF) for the composite post-excisional commissural and pericommissural (CPECPC) defects.

Our institutional ethical committee approved the conduction of this clinical study. Written informed consent was obtained from all patients regarding the use and display of clinical material, photographs, and videos for research and publication purposes.

Patients with stage III and IVA oral commissure carcinoma who had undergone wide local excision with neck dissection resulting in the moderate to large CPECPC defects and subsequently undergone reconstruction with OEMMF and PFRFF were included in the study. The essential criteria for performing the OEMMFs are that at least 1cm of the residual ipsilateral lip should be available. Those with mandibular involvement with carcinoma of the oral commissures were excluded. Those with oral submucosal fibrosis were excluded.

Pre-operative inter-commissural distance was measured. In those cases with blunting or distortion and destruction of the commissure due to carcinoma, the ideal symmetrical commissural point was marked and the inter-commissural distance was measured at repose.

Surgical Technique

After the wide local excision and neck node management were done by the oncologist, reconstruction was performed after the assessment of the defect. The OEMMFs were harvested by placing two incisions—one on the white roll falling short of the ipsilateral philtral column (but in the

lower lip it could cross the center) and another on the labial aspect of gingivobuccal sulcus falling short of the apex by 2 mm. By an oblique incision through marginalis (marginal artery included in the flap) and proprius orbicularis oris muscle, the OEMMFs were constructed. The OEMMFs were nothing but white roll orbicularis oris mucomuscular flaps. Utilizing the innate stretchability of the OEMMF, they were pulled toward the marked area of neo-commissure. The anatomically looking neo-commissure was reconstructed using white roll vermilion orbicularis oris components of the OEMMFs. The neo-modiolus was constructed by suturing the static iliotibial tract fascial sling with both upper and lower lip marginalis components of the OEMMFs. The other end of fascial sling was sutured to the zygomatic arch with exaggerated tension placing the neo-commissure with an average of 5 mm overcorrection. The proprius and peripheralis residuum of both OEMMFs were sutured laterally to the neo-modiolus. Latter reduced the size of the lining defect. With patterns obtained from the defect, the two PFRFF cutaneous islands were marked on the non-dominant forearm. The distal Pacman island, which was meant for the lining, was smaller when compared with the proximal Pacman cutaneous island designed for the cover. The jaws of the Pacman were facing each other, and the fascial sling was enclosed between the two paddles of PFRFF. The Pacman cutaneous paddles were in continuity with the narrowed adipofascial element and in few cases also islanded based on the independent perforator. This design allowed the freedom to orient the two paddles independently without being compressed by the iliotibial tract fascial sling. The proximally based PFRFF was harvested and was used for the inset for the composite peri-commissural defect. Then, microvascular anastomosis was performed with the prepared neck vessels. The neck wound was closed with the Segmuller drain.

Post-Operative Follow-up

The function and the aesthetics of the neo-commissure were assessed at the end of 6, 9, and 12 months by two independent observers using the institutional scoring system. The functional outcome was assessed by the lip competence by looking for the ability to retain food and saliva, ability to chew, and smile. The aesthetic outcome was assessed for the re-establishment of anatomically looking neo-commissure. Finally, the computed score for each patient was obtained.

Results

Table 1: Patient characteristics

| | |
|--------------------------|-------------------------------|
| Gender | |
| Male | 40 |
| Female | 10 |
| Age range | 35-52 years |
| Average age | 41.7 years |
| CPECPC defects included | |
| Upper lip | 10 (20%) |
| Lower lip | 18 (36%) |
| Forearm | 22 (44%) |
| Average score | 11.7 |
| Regaining continence | |
| Oral cavity | 3 rd post week |
| Complete oral continence | 6-month post-operative period |

Of the 52 patients, 40 were male and 10 were female. Ages of the patients were in the range of 35 to 52 years with an average age of 41.7 years. The CPECPC defects included 20% of the lateral upper lip and up to 36% of the lateral lower lip defects. The average score obtained at the end of the follow-up period was 11.7 ($p=0.038$) using the institutional assessment scoring system which evaluated both the overall aesthetics and function of the neocommissure and modiolus. 96% of cases (48 out of 50 patients) started regaining continence of the oral cavity as early as third post-operative week. All the cases had regained complete oral continence with re-establishment of all functions of the lip at the 6-month post-operative period.

Discussion

Reconstruction of the composite post-excisional commissural and pericommissural (CPECPC) defects is the most difficult task from a functional and aesthetic point of view. [18-20] Concertedly 12 pairs of retractors with various vectors antagonize one dominant oral sphincter, integrating the forces at a pair of fibrous modiolus, to form the mobile skeleton of lips and commissure. [21-23]

Loss of commissure—an important aesthetic and function integrated region of the lower third face when not adequately reconstructed results in significant aesthetic deformity with dysfunctions of speech, swallowing, chewing, and smile. To this date, anatomical commissure with continence and good animation is still elusive in the reconstruction of moderate to large CPECPC defects. [22,24] The locoregional flaps can easily obtain animated commissure, but they lack aesthetics envisaging secondary corrections. Furthermore, in the moderate to large pericommissure defects reconstruction, they recruit non-like tissues from the cheek region resulting in more scars and distortion of facial features. The isolated distant flap reconstructions in multiple stages fail to bring good function and aesthetics integration to these sites. Of the 52 patients, 40 were male and 10 were female. Ages of the patients were in the range of 35 to 52 years with

an average age of 41.7 years. The CPECPC defects included 20% of the lateral upper lip and up to 36% of the lateral lower lip defects. The average score obtained at the end of the follow-up period was 11.7 ($p=0.038$) using the institutional assessment scoring system which evaluated both the overall aesthetics and function of the neocommissure and modiolus. 96% of cases (48 out of 50 patients) started regaining continence of the oral cavity as early as third post-operative week. All the cases had regained complete oral continence with re-establishment of all functions of the lip at the 6-month post-operative period.

The local OEMMF containing part of three sphincters of the orbicularis oris muscle (themarginalis, intermedius, and a good portion of peripheralis) were sutured in two layers reconstituting effectively the animated neocommissure, fibrous modiolus, and anterior lining pericommissure region. This reconstituted region is held statically in position by the iliotibial tract fascial sling suspended from the zygomatic arch in the vector of the zygomaticus muscle providing the stability during animation. This technique hinges on the anatomy of the orbicularis oris muscle receiving cross innervations from the contralateral buccal and marginal mandibular branches of the facial nerve. [22] The OEMMFs with their retained innervations and vascularity contributes to the continence of the oral cavity as early as 3 weeks in our study. In contrast to Robotti et al [25] all our series was only primary reconstruction which explains the better results. The hyper-correction of 0.5 cm had invariably resulted in the near-normal position of the commissure after the healing period. This explains our average difference in the pre and post-operative inter-commissural distance which was 4.9mm. Yokoo et al [26] in their series of four cases used radial forearm flap or rectus abdominis myocutaneous flaps in conjunction with the vermilion white roll mucomuscular flap for the reconstruction of composite peri-commissural defects. But in all these cases, the vermilion flap was raised up to the contralateral side commissure with

no mention of maintenance of sensory and motor branches. In addition, there were no attempts to use the vermilion flap for the lining of the composite peri-commissural defect. Our technique resulted in better aesthesis and functional results.

Conclusion

The combination of oblique elastic musculomucosal flap and Pacman-style free radial forearm flap for the reconstruction of composite commissure and pericommissure defects may be a useful addendum from the point of re-establishing the aesthesis and continence in the reconstructed lips.

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