Abstract:
Karapandzic flap is a modification of Gilles fan flap is used for the reconstruction of total and subtotal defect of lower lip. 12 cases of post oncological excision defect of lower lip are reconstructed with karapandzic flap. The operative technique for identification of neurovascular bundle is defined in this paper (namely motor buccal branch and sensory buccal branch, superior labial artery and its perforator, sometimes mental nerve branch.). Author has given dissection technique of identification of above mentioned structure also we addressed microstomia (usually results in this reconstruction) by fabricated cheek angled auricle retractors.

Keyword : Karapandzic flap, Modified Gilles fan flap, Neurovascular bundle, Microstomia, Fabricated cheek retractor.

Aim of study:
To define operative technique for the safe harvest of Karapandzic flap in the reconstruction of post oncological excision of total and subtotal lower lip defect.

Introduction:
Reconstruction strategies for the Total and Subtotal loss of lower lip is real challenging job. Though numerous techniques are available loco-regional flaps are the best choice for the reconstruction of Total and Subtotal full thickness loss of lower lip. This is because it results in the immediate postoperative period, a sensate and continent oral cavity also there is good color, and texture & thickness match, apart from intact sensation & function.

Review of Literature:
The first evidence of lip reconstruction is witnessed as far back as 3000 BC in Hindu writings, as well as in the Sanskrit writings of Susruta in 1000 BC. Several Contemporary procedures are newer renditions of techniques first explained by Dieffenbach, Sabatini, Abbe, and Estlander in the 19th
Karapandzic flap was first introduced for lower lip reconstruction in 1974, by Dr. Miodrag Karapandzic, M.D. of Yugoslavia in Journal of plastic surgery in 1974. Benefit of this method was one stage surgery to restore the integration of Orbicularis oris muscle. Lips have important functional and aesthetic roles in daily living. They are the focal point of the lower face, with several aesthetic units intricately controlled by a complex series of muscles. Lip provides oral competence, deglutition, articulation, expression of emotion, and symbolized beauty. Several key factors including exceptional anatomy makes reconstruction of the lower lip especially challenging. The aim of reconstruction is always reinstatement or preservation of function and aesthetics. Aesthetic considerations include suitable symmetry and normal anatomic proportions, presence of a philtrum, normal oral commissures, and establishment of a vermilion-cutaneous white border. The karapandzic method of lip reconstruction is advantageous because it reestablishes the integrity of the oral sphincter and thereby achieves oral competence. This technique is a single stage procedure and scars are located mostly in the natural labio-mental groove or nasal sill. The best results are achieved in central defect of lip that is 3.5-7.0 cm in length. The indication of its adequacy is a well-marked nasolabial fold.

**Background Anatomy**

Blood supply to both lips from external carotid system, facial artery ascends from neck over the mid-body of mandible just anterior to the insertion of masseter muscle. Facial artery ascends in a plane deep to the platysma, risorius and zygomaticus major and minor muscle and superficial to the buccinator and levator anguli oris. This artery branches into inferior and superior labial artery, courses beneath the orbicularis oris and anastomosis with the contralateral vessels. The Superior labial artery 1.1 cm lateral and 0.9 cm superior to the oral commissure. The Inferior labial artery 2.6 cm lateral and 1.5 cm inferior to the oral commissure. Facial and labial arteries communicate with the sub-dermal plexus through a dense population of musculocutaneous perforators.

**Nerve supply: Motor innervation:**

From the seventh cranial nerve, mainly buccal and marginal branches to the perioral musculature. The fibers supply majority of muscles of face from its undersurface, except the 3 deepest muscles.
Sensory innervation:
From the maxillary and mandibular branches of fifth cranial nerve. Infraorbital nerve, terminal branch of maxillary nerve innervates upper lip. The nerve runs beneath levator labii superioris and superficial to levator anguli oris. The lower lip receives sensory innervation from branches of mandibular nerve. Mental nerve, branch of inferior alveolar nerve which itself is a branch of mandibular nerve innervates lower lip. Nerve located in the sub mucosa.

Materials and Method:
12 Patients, Female 7 & Male 5, are treated by surgical oncologist for the Squamous cell Carcinoma involving lower lip, belonging to Stage 3 & 4 disease.

Figure: 3 60/f with Lesion in central lower lip
Age group ranges from 40-60 years with mean average of 50 years. Among 12 patients, 2 patients have undergone pre-op. Radiotherapy and the rest, surgery done has a primary modality of treatment for loco-regional control of diseases. All of these had Total and Subtotal full thickness loss of lower lip with commissure maintained in one on either side. All of these patients reconstructed with Karapandzic flap.

Inclusion criteria:
Patients with Total and Subtotal full thickness loss of lower lip, following post oncological excision with part of commissure or full commissure maintained in one on either side.

Exclusion criteria:
1 Patients with lesion extension into adjacent zones like cheek, chin are excluded.
2 Patients with severe debilitating illness like post radiation changes, and post chemotherapy changes are excluded.
3 Patients with recurrent malignancy of lower lip.

Surgical technique:
Routinely the modality of treatment is planned in tumour board for all patients with multi-specialty integrated approach. Here tumour board constitute Surgical oncologist, Reconstructive surgeon, Medical oncologist, Psychiatrist, Psychologist, Radiotherapist. The treatment plan is tailored to the patients, and those patients with Total and Subtotal post excision defect of lower lip is only included in this study.

After anesthetic assessment and cardiac evaluation, high risk informed consent by explaining the procedure, side effects, complication of surgery and anesthesia are obtained in all cases.

Anesthesia:
General anesthesia through nasotracheal intubation with anti-trendelenberg position of 10 degree.

Surgical procedure:
After neck dissection which is usually bilateral supra-omohyoid dissection and after wide local excision of lesion in the lower lip by the surgical oncologist the defect was assessed. Of the 12 cases, in 3 patients as a part of neck dissection, facial artery ligated.
In both sides and rest of cases one facial artery ligated as part of neck dissection.

**Marking:**

From the lower end of defect marking extended in curvilinear manner along Nasolabial furrow up-to the level of alar base and taken across the upper lip region for half a centimeter.

**Procedure:**

No infiltration has done (as it causes distortion of anatomical structure). Throat pack placed. Incision deepened to subcutaneous plane. At the level of alar base, sensory buccal branch is identified which cross Orbicularis oris and runs in superficial fascial fascia, superficial to Orbicularis oris and deep to the subcutaneous fat. These nerve is carefully protected as it enters into the flap. Deep to Orbicularis oris and superficial to buccinators muscle, at the same level and caudal to the curvilinear course of supra labial vessels, motor buccal branch of facial nerve are identified. Perforators to the flap from Angular artery and Naso-palatine artery are carefully delineated by peri-perforator dissection and protected. Stretching the lower end of Karapandzic flap, mental nerve in the sub-mucosal plane is carefully dissected as it enters into distal end of flap. (especially in sub-total lower lip defect cases) Perforators from infra-labial branch of facial artery identified just below the modiolus in the plane between Risorius, Orbicularis oris superficially and Depressor angular oris, buccinators on the deeper aspect and this structure is carefully delineated by peri-perforator dissection and protected. Thus sensory buccal branch, motor buccal branch, mental nerve, angular, supra labial & infra labial artery and its perforator are carefully skeletonized. Levators of the lip on the incision
line, buccinators fibers on peri-commissure area are divided. Corresponding mucosal incision is placed on the inner aspect there by Ad-hoc perforator plus flap which is pedicled superiorly and medially at peri-philtral region maintaining all skeletonized neuro-vascular bundle laterally is obtained.

At the level of naso-labial furrow the excess outer long edge of the infero-lateral wound is closed by cinching, this equalizes the length of wound on either side. Site of the Neo angle is marked for post op. fabrication and positioning post operatively the cheek angled retractor which are customized for each patients.

Throat pack carefully removed, suction placed to clear laryngo/oropharynx collections. Most of time delayed extubation is planned by anesthetist. Ryle's tube inserted after intubation for post op. tube enteral feeding for 2-3 days.

**Post op. course:**
After 24 hours Ryle's tube feeding started with patient in reclining posture and continued for 3 days post op.

**figure:7** Creation of window adjacent neurovascular bundle

**figure:8** Isolation of neurovascular bundle

Same procedures done on other side, both the Karapandzic flap are mobilized and the advancing edges closed in midline by incorporating rotation advancement primary movement. The spiraling perforators mobilized and mobilized nerves facilitate the rotation advancement which is the primary movement of the flap. Wound closed in layers, begin with mucosa using 3.0 monocryl, muscle closed with 3.0 vicryl, skin edge closed with 3.0 prolene with good match of white roll that has been advanced.

**figure:10** Day 2 post op. with Ryle's tube in-situ
1 * After 3 days patients are asked to swallow liquids after retaining in mouth for some time.

2 * After oral competence checked and ability to swallow checked in Ryle's tube in situ and after patient gains confidence, Ryle's tube removed and oral fluids started. Solid food started after fixation of denture in total edentulous cases. Dentures also improve the co-aptation and position of the upper and lower lips.

3 * Fabricated simple angled cheek auricle retractor instituted after 10 days for correction of microstomia. Duration of follow up : 6 months. Surgical correction of microstomia not done in any of our cases.

Complications:

<table>
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<th>Number</th>
<th>Corrected by:</th>
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<tr>
<td>Infection &amp; mild wound dehiscence</td>
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Assessment parameter:
Assessed at end of 1 month, 3 month and 6 month by independent observer in all 12 patients using below mentioned criteria like Scar, Microstomia, and Continence. Two point discrimination is tested with Semmes-Weinstein monofilaments. Observer score is incorporated with subjective satisfactions of patients by Smiley chart.
### SMILEY CHART

<table>
<thead>
<tr>
<th>S.No</th>
<th>Age/Sex</th>
<th>Histopathological diagnosis &amp; stage of tumour</th>
<th>Quality &amp; Quantity of Resultant defect</th>
<th>Procedure done</th>
<th>Complications</th>
<th>Satisfaction Index</th>
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<tbody>
<tr>
<td>1.</td>
<td>60/F</td>
<td>SCC, Stage 3</td>
<td>Subtotal lower lip defect</td>
<td>Karapandzic flap B/L</td>
<td>Microstomia</td>
<td>Happy</td>
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<tr>
<td>2.</td>
<td>44/F</td>
<td>SCC, Stage 3</td>
<td>Subtotal lower lip defect</td>
<td>Karapandzic flap B/L</td>
<td>Microstomia with mild wound infection.</td>
<td>In between</td>
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<tr>
<td>3.</td>
<td>53/M</td>
<td>SCC, Stage 4</td>
<td>Total lower lip defect</td>
<td>Karapandzic flap B/L</td>
<td>Microstomia</td>
<td>Happy</td>
</tr>
<tr>
<td>4.</td>
<td>51/F</td>
<td>SCC, Stage 3</td>
<td>Subtotal lower lip defect</td>
<td>Karapandzic flap B/L</td>
<td>Microstomia</td>
<td>Happy</td>
</tr>
<tr>
<td>No.</td>
<td>Age</td>
<td>Stage</td>
<td>Defect Type</td>
<td>Flap Type</td>
<td>Outcome</td>
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<tr>
<td>5</td>
<td>43/M</td>
<td>SCC, Stage 3</td>
<td>Subtotal lower lip defect</td>
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<td>Microstomia</td>
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<tr>
<td>6</td>
<td>51/F</td>
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<td>Microstomia with mild wound infection.</td>
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<tr>
<td>7</td>
<td>48/F</td>
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<td>Subtotal lower lip defect</td>
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<td>Microstomia</td>
<td></td>
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<tr>
<td>8</td>
<td>45/F</td>
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<td>Microstomia</td>
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</tr>
<tr>
<td>9</td>
<td>53/M</td>
<td>SCC, Stage 4</td>
<td>Total lower lip defect</td>
<td>Karapandzic flap B/L</td>
<td>Microstomia</td>
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Discussion:
Karapandzic ad-hoc' perforator plus loco-regional flap scores well over the rest of loco-regional flap for it provides early postoperative continence of oral cavity with intact sensation. This method also provides reconstruction with good color, texture match with this flap. Since the flap retains robust blood supply, harvested on the perforator pedicle superiorly and medially, we never noticed vascular compromise in any of our flap. Though Gilles and McGregor flap can be used, but doesn't have advantage of early post op. oral continence with intact sensation when compared to above mentioned flap. All the patient retained sensation of reconstructed lip from day one. Only problem is the microstomia which addressed in all patients, since they are in geriatrics age group, by simple customized angled cheek retractor which is instituted after 10 days.

Most of our patients are satisfied except for the rounded angles but are satisfied with good continence and intact sensation.

Conclusion:
Karapandzic ad-hoc perforator plus flap provides superior results than any other loco-regional flap in Total and Subtotal post oncological excision of lower lip with short learning curve. With understanding of anatomical structures that is Neuro-vascular bundle, paves the way for safe and early harvesting of flap.

References:

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<tr>
<td>12</td>
<td>48/M</td>
<td>SCC, Stage 3</td>
<td>Subtotal lower lip defect</td>
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<td>Microstomia</td>
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4 Sawhney CP. Restoration of function to a lower lip reconstruction by flaps. Plast Reconstr Surg 1977; 60: 77-82.


8 Lips and perioral Region Anatomy, Babak Jahan-parwar, Arlen D Meyers WebMD LLC 2013.

Reply to the reviewer
1. Duration of follow up: 6 months.
2. Surgical correction of microstomia not done in any of our cases. (added)
3. Figure of fabricated angled cheek auricular retractor insitu with patient. (added-Figure no. 14)