Modified Cupar’s method for immediate diastema closure

ABSTRACT
Anterior maxillary osteotomy or ostectomy (AMO) is a safe, reliable, and easily adaptable procedure routinely performed in orthognathic surgery for the management of the dentoalveolar segment of the anterior maxilla. The anterior segmental maxillary osteotomy was first performed in 1921 by Cohn–Stock. Several modifications were done regarding approaches for AMO; however, Cupar's method is the most preferred approach by the surgeons and in practice since several decades. A novel midline split osteotomy is performed in combination with Cupar’s method for superior and posterior repositioning of anterior maxillary segment in combination with immediate closure of diastema in this case report.

Keywords: Anterior maxillary osteotomy, midline split, modified Cupar’s method

INTRODUCTION
Anterior maxillary osteotomy or ostectomy (AMO) is an orthognathic procedure, which allows mobilization and repositioning of anterior maxillary segment in an upward, downward, or rotational manner (by osteotomy alone) or in posterior direction (if an ostectomy is performed). Rarely, the segment can be advanced and the gap in between can be grafted with the bone. It was first introduced in 1921 by Cohn–Stock. Several modifications were done regarding approaches for AMO over many years. These modifications were given by Wassmund in 1927, Wundere in 1963, and Cupar in 1954. Cupar’s method is the most preferred approach by the surgeons. In this case report, we have performed a midline split in combination with anterior maxillary osteotomy for posterior and superior repositioning of the anterior maxillary segment along with immediate diastema closure.

CASE REPORT
A 28 years old female patient reported with a chief complaint of forwardly placed upper front teeth since childhood and complained of inability to close her lips. Extraoral examination revealed convex profile, incompetent lips, acute nasolabial angle, gummy smile, and flared and protruding teeth [Figure 1a and c]. Intraoral and radiographic examinations revealed increased overjet and increased overbite. Increased incisal show was also noted. The patient wanted immediate results for personal reasons.

Diagnosis and treatment planning
Radiographs revealed that the overjet was 10 mm and the overbite was 8 mm. The patient had an incisal view of 8 mm at rest. Final diagnosis made was skeletal class two malocclusion. After all the clinical, radiographic investigations, mock surgery and blood investigations superior (by 6 mm) and posterior (by 7 mm) repositioning of anterior maxilla was planned under general anesthesia.

Surgical procedure
Labial incision was placed according to the Cupar’s method, extending from the mesial aspect of right maxillary first molar till the mesial aspect of left maxillary first molar. The area was
infiltrated with local anesthetic solution for hemostasis and clean surgical field. Maxillary first premolars were extracted on both the sides. Labial incision was placed according to the Cupar’s method, extending from the mesial aspect of right maxillary first molar till the mesial aspect of left maxillary first molar. Subperiosteal dissection was done. Piriform apertures were identified and nasal mucosa was protected by placing periosteal elevators. Horizontal osteotomy was performed labially (to allow 6 mm of superior repositioning) 5 mm above the apices of the teeth to avoid damage to the teeth. Vertical osteotomy was performed through the sockets of maxillary premolars to facilitate the posterior reposition of the anterior maxillary segment by 7 mm. The downfracture of the segment was performed with the help of an osteotome. Midline split was done [Figure 2a]. The diastema was closed by simple interdental wiring between the two maxillary central incisors [Figure 2b]. The anterior maxillary segment was fixed in the desired position (according to the prefabricated splint) with the help of two “L” shaped titanium plates. Furthermore, interdental wiring was placed in between the maxillary canine and the second premolar to increase stability of the segment posteriorly. Alar cinch sutures were placed. The incision was closed with 3-0 polyglactin sutures. The patient was discharged within 2 days postoperatively. All interdental wirings were removed after 6 weeks. The patient showed excellent profile changes after the surgical procedure [Figure 1b]. The patient was advised to undergo postoperative orthodontics for the correction of minor occlusal discrepancies.

**DISCUSSION**

Anterior maxillary osteotomy or ostectomy (AMO) with midpalatine split is a safe, reliable, and easily adaptable procedure routinely performed in orthognathic surgery for the management of the dentoalveolar segment of the anterior maxilla. It provides a different approach for segmentalization of the maxilla and exposure of the labial aspect of the maxillary bone by a vestibular circumferential cut and labial flap to facilitate the labial osteotomy under direct vision. A palatal osteotomy is performed through the vertical tunnel. Furthermore, the midpalatine split is made after the downfracture of the segment under direct vision. Vascularity of the segment is maintained by greater palatine pedicle.

Indications for AMO with midpalatine split includes bimaxillary dentoalveolar protrusion, anterior open bite, excessive inclination of anterior teeth, and anteroposterior and vertical maxillary excess where the patient has a stable occlusion posteriorly and patients with the chief complaint of immediate cosmetic corrections along with the presence of wide midline diastema.

The complications encountered during this procedure are similar to that observed in Le Fort I osteotomies. It can be present from minor problems such as hypersensitivity of the
teeth to loss of the osteotomized segment due to avascular necrosis. Some complications are specific to AMOs and are different than those which are encountered during Le Fort I osteotomy. The most commonly encountered complication is palatal tear due to aggressive instrumentation. It can be observed at marginal mucosa extending toward the center or can be observed as a buttonhole defect in the palatal vault. Another possible complication observed in this procedure is delayed union of the maxillary segments and can be associated with the poor bony contact, improper fixation, or stabilization of the bony segments. However, all the complications can be avoided with proper technique and proper instrumentation. None of the mentioned complications were observed in the presented case.

In the presented case, the patient had skeletal Class II malocclusion with acceptable occlusion posteriorly. Furthermore, the patient wanted immediate correction of her appearance. Furthermore, with the proper surgical technique, the expected complications and need for the extensive surgery can be minimized. A combination of AMO (by Cupar’s method) along with the midline split was performed, which provided the desired correction of lip incompetency and protruding teeth. Furthermore, the correction of midline diastema was achieved. The patient showed desirable results after 3 months postoperatively and was satisfied with the surgery.

**CONCLUSION AND CLINICAL APPLICATIONS**

This technique can be employed where correction of bimaxillary dentoalveolar protrusion, anterior open bite, excessive inclination of anterior teeth, anteroposterior and vertical maxillary excess, and the immediate change in the profile is desired. The advantages of this techniques are simple, quick, easily adaptable, immediate, and desired results. Furthermore, with the proper surgical technique, the expected complications and need for the extensive surgery can be minimized.