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Premolar Maxillary Set Back Osteotomy: Long Term Results

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ABSTRACT

This study was carried out in 16 patients with maxillary dentoalveolar protrusion to assess long term outcomes of the premolar set back osteotomy through tunneled and non tunneled techniques. The extraction of the necessary premolar tooth depends upon the inclination of upper incisors and tooth mass consideration. Twelve patients were subjected for second premolar set back osteotomy and 4 patients for the first premolar set-back osteotomy. The second premolar setback osteotomy through tunneled technique is the our advised technique rather than first premolar set-back osteotomy through non tunneled technique.

INTRODUCTION

Maxillary dentoalveolar protrusion must be distinguished from skeletal maxillary protrusion. In the former there is labial inclination of the maxillary anterior teeth, and the facial convexity on profile examination is limited to the upper lip region. In the latter there is a convexity of the inferior orbital rims, anterior maxilla, and nose, in addition to that observed in the upper lip region **[1]**.

Wilhelm **[2]** who described the surgical technique of premolar recession (set-back) osteotomy favored a two-stage procedure to correct maxillary protrusion. In the first stage of the palate was raised, the second premolar teeth were extracted, and an osteotomy was performed through the palate and alveolar arch. Three to four weeks later, the second stage completed the correction. Wilhelm considered the one stage procedure dangerous. Wunderer **[3]**, however, disagreed and advocated one-stage procedure. He designed an anterior mucoperiosteal flap to maintain the blood supply. The operation is performed without risk provided that either a labial or palatal mucoperiosteal flap remains attached to the repositioned segment. A more conservative technique is to raise a subperioteal tunnel (Wassmund) over the area of proposed osteotomy for resection of palatal bone and the vomer. A short midline palatal mucoal incision aids in exposure without jeopardizing the blood supply. The proper technique for correction of maxillary dentoalveolar protrusion for each patient still unclear and which tooth to be extracted still to be declared **[4]**. In this study we are going to compare the outcome of one stage technique verifying the surgical steps of tunnel and non tunnel operation of premolar recession osteotomy and we extract the second premolar or the first one depending on the inclination of upper incisors and the tooth mass consideration.

MATERIAL AND METHODS

Sixteen patients were subjected for premolar set-back osteotomies, 10 were females and 6 were males, preoperative diagnosis and planning for patients with jaw asymmetries and deformities includes careful clinical assessment was done to distinguish the maxillary dentoalveolar protrusion from skeletal maxillary protrusion. In the former there is labial inclination of the maxillary anterior teeth, and the facial convexity on profile examination is limited to the upper lip region. In the latter there is a convexity of the inferior orbital rims, anterior maxilla, and nose, in addition to that observed in the upper lip region. The upper jaw "shows" an excess gum tissue above the teeth and is unattractive when the patient smiles. In addition, the patient is unable to close his lips together without straining while the lower position of the upper teeth pushed (Figs. 1-a,b; 2-b; 5-a,b,c).

Photographic analysis and a complete orthognathic work-up involving cephalometric and panorex radiographs. Dental impressions and models have been in consideration in cooperation with pedodentist and orthodentist. All findings are ana-

lyzed and pre-surgical model performed to ascertain the feasibility of various treatment options. In maxillary dento-alveolar protrusion, cephalometric analysis of several skeletal points and measurements confirms the clinical impression. Such measurements as PNS-ANS, Ba-ANS, PNS-ULE and SNA are increased (Fig. 2c,d).

Our surgical technique is the premolar set-back osteotomy addressed to correct the anterior maxillary dentoalveolar protrusion and the anterior open bite when posterior occlusion is correct rather than entire maxillary skeletal set back Le fort I osteotomy in patients who have horizontal maxillary excess.

The extractions chosen for the upper arch are largely dependent on the inclination of the upper incisors and the tooth mass considerations. In this study, the selection of the patients with excessive gummy smiling, categorized to patients with upper incisors are too upright, in this group the second premolar set-back osteotomy through extraction of the upper second premolars will correct the tooth mass and allow some labial tipping of the upper incisors during aligning of the teeth (Fig. 1). In patients with gummy smiling and upper incisors are tipped labially excessively before treatment, the first premolar set-back osteotomy through extraction of the first premolars will allow them to be uprighted during space closure (Figs. 2,3).

Two surgical techniques were employed, tunnel (Wassmund) for 8 patients and non tunnel (Wunderer) for 8 patients.

Wassmund or tunneled technique (Fig. 4):

- Two vertical buccal labial incisions.
- Extraction of necessary teeth.
- A palatal subperiosteal tunnel is developed and the palatal bone is sectioned transversely from the vertical osteotomy site of one side to the contralateral side.
- A midpalatal sagittal mucosal incision, immediately distal to incisive foramen, may be used to facilitate transverse palatal bone osteotomy.

Wunderer or non tunneled technique:

- Two vertical buccal libial incisions.
- Extraction of necessary teeth.
- Arching incision is carried through palatal mucosa anterior to the site of osteotomy on one side to the contralateral interdental space.

Postoperative follow up in the form of plain X-ray to assess the degree of bony healing should be accounted at 6 weeks.

RESULTS

In our study the female to male ratio was 10 to 6, their age above 12 years old. Females asking more for cosmotic surgery especially who have extensive gummy smile that considered shameful for them. The immediate post-surgical healing phase is one of the most important parts of treatment. During this time there is temporary swelling especially of the lips, cheeks, and perhaps bruising, but this is a normal healing response that will disappear within the first 7 to 14 days.

During this time the patient might experience a drop in weight, however, this can be regained after the initial bone healing has been completed in six weeks however, the complete healing process required approximately 3 to 6 months. During the first week after surgery the dietary intake is very important and the patients were advised to eat different available supplements, and it is very important for the patient to practice the best possible oral hygiene.

The second premolars (second premolar set-back osteotomy) were extracted in 12 patients and the first premolars (the first premolar set-back osteotomy) were extracted in the rest remaining 4 patients. The second premolar set-back osteotomy with extraction of the second premolar were done for the patients whom have their upper incisors upright, after correction the incisors became tipped libially with correction of gummy smiling (Figs. 1,5,6). While the first premolar set-back osteotomy were done for the patients whom have upper incisors are excessively tipped liabillay so after correction the incisors are upright during space closure with correction of gummy smiling (Figs. 2,3).

The post-surgical orthodontic treatment phase was commenced approximately four to eight months post surgery. The orthodontist would be able to make minor adjustments to ensure new bite and the teeth are in the best possible relationship. Usually this phase required 3 to 12 months after which orthodontic appliances would be removed.

In our study there was no relapse in either technique, all patients stayed in new position with no changes in the bite or dentoalveolar relation.

Fig. (1-A,B): Preoperative: Maxillary dentoalveolar protrusion with upper incisors are too upright.

Fig. (1-C,D): Postoperative: Labial tipping after second premolar set-back osteotomy.

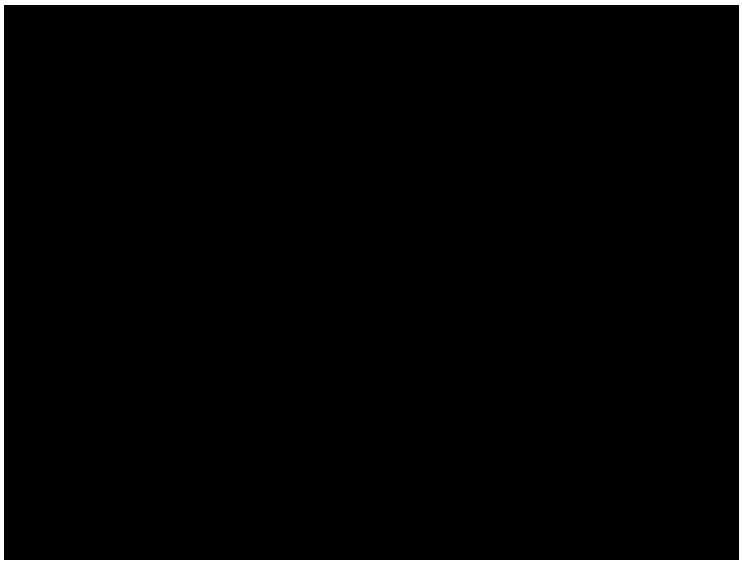

Fig. (2): Preoperative: Maxillary dentoalveolar protrusion with upper incisors are excessively tipped labially.

Fig. (3): Postoperative: Upright of upper incisors after the first premolar set-back osteotomy.

Fig. (4): Steps of surgical tunneled technique.

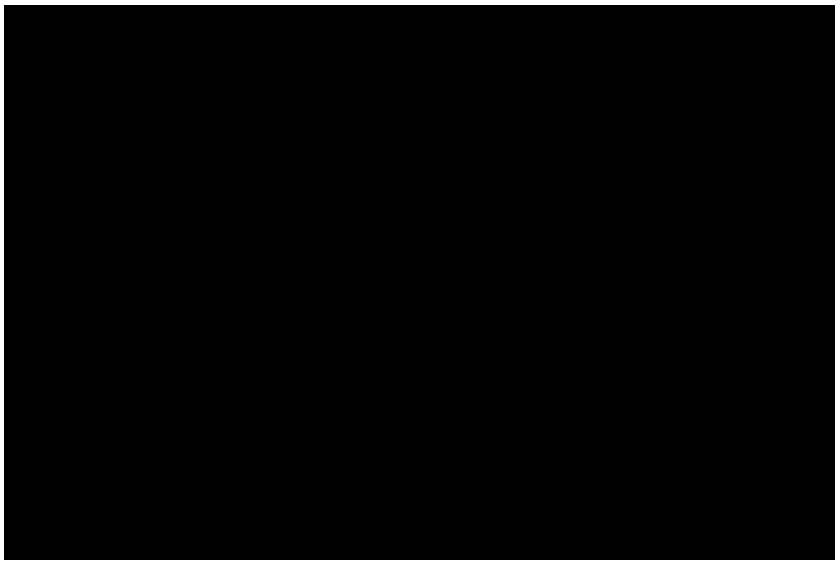

Fig. (5-A,B): Preoperative: Maxillary dentoalveolar protrusion with the upper incisors are too upright.

Fig. (5-C,D): Postoperative: Labial tipping after the second premolar set-back osteotomy.

Fig. (6-A,B,C): Preoperative: Maxillary dentoalveolar protrusion.

Fig. (6-D,E,F): Postoperative: After the second premolar set-back ostetomy.

DISCUSSION

In our study we select the patients with gummy smiling according to maxillary dentofacial protrusion with aid of clinical and cephalometeric prediction. The patients should be after growing age; people who care for seek the correction were female more than male [1]. The anesthesia by the endotracheal tube through the nose rather than oral cavity to get more convenient space for the surgery [5]. In this study we compare the outcome of two different techniques for maxillary setback osteotomy, tunneled and non tunneled techniques also the extraction of proper tooth according to position of incisors.

The extractions of the second premolar were done in 12 patients rather than the commonly used techniques where the first premolars were extracted. Preoperative assessment to the degree of incisors inclination and to tooth mass considerations [6]. The upper incisors are too upright in 12 patients for that reasons the second premolar is our target to be extracted to correct the tooth mass and allow some labial tipping of the upper incisors during aliment of teeth. In patients whom subjected for extraction of the first premolar their upper incisors are tipped labially excessively before treatment, the extractions of the first premolar allow them to be uprighted during space closure. One factor that must be understood regarding the presurgical treatment of the maxillary arch is that there is no anchorage requirement in the maxilla since the maxilla will be surgically repositioned relative to the mandibular dentition [7]. Thus the lower arch is critical to success and the maxillary teeth need only be aligned and leveled within the confines of alveolar bone.

Wasumnd or tunnel technique gave us the least side effect like periodontal inflammation and rapid return back to normal activity owing to faster healing and bone union due to good blood supply to premaxilla through buccal labial and palatal bipedicled flap [4]. In our study although we keep the using of oscillating saw in all steps of osteotomy apart from in three cases we used curved osteome and hammer especially in palatal osteotomy with no big difference except more bleeding during surgery and no difference in outcome of bone union and healing except we keep monomaxillary fixation for more couple weeks. The incisions at the site of osteotomy should be closed in anatomical layers apart from the midsagittal incision sometimes we leave it without stitches for spontaneous healing and we did not face any problem. Post operative oedema in the upper and lower lip gradually faded away in short time except the oedema over maxillary sinus in both side, due to opening of maxillary sinus during osteotomy slowly gone away in 6 weeks with no vacuum headache in these cases. The patients with protruding premaxilla can close their back teeth together and yet a space remains open between their front teeth. These people lost the ability to incise their food. They are unable to bite effectively into a sandwich and pizza that become a food that must be consumed with a fork and knife [5]. Regarding the functional outcome most of the patients felt some thing new about the biting function rather than were used to do adaptation to eat before surgery. In this study the patients by time, have been grateful for the new biting function after surgery. All patients have been delighted by the ultimate outcome concerning the cosmoses since there is no protruding premaxilla and the lip repose more accepted after the surgery. There is no too gummy smiling apart from a little pit gummy. This little pit gummy during smiling is more attractive rather than no gummy at all [8]. However, when excessive amount of gingival tissue is exposed during smiling or when the lips are at rest, the esthetic problem is apparent.

The Reasons for a Gummy Smile Might be: Excessive maxillary vertical growth, short upper lip, incomplete anatomic crown exposure, and combinations of these factors. Usually, mouth breathing can exacerbate this condition so you have to rule out the accurate etiological factor [8-9].

After the completion of orthodontic and orthognathic treatment, we need to see the patient periodically to monitor and make sure the teeth and jaws are staying in their new proper position. In our study there is no need to do post operative orthodontic treatment, only in one patient who in need to just touch up to get more aliment between the canine and second premolar.

Segmental osteotomy provides a means of selective surgical-orthodentic correction of a dentoalveolar malocclusion. Correction is achieved if only that part of the dental arch is actually deformed. When the deformity is in the anterior portion, an additional advantage is that monomaxillary fixation need to be only temporary [10]. The rigid fixation by plate and screw was done in 8 patients, so the monomaxillary fixation is released after the desired occlusion is ensured. When there is no available plate and screw, the monomaxillary arch bar is used alone with circumdental wiring between the mobile segment and the rest of the maxillary arch in 4 patients. Monomaxillary arch bar with interosseous wiring is used in 4 patients. All the mobilized segment fragments were clinically stable despite roengenographic evidence of incomplete healing in several patients. The

survival of mobilized segment depends on the preservation of either unipedicled or bipedicled mucoperiosteal flap. The flap should be protected throughout the operation and supported by the left hand during the osteotomy. It should also be designed to provide coverage of the lines of osteotomy and bone graft sites [11]. The precaution, and careful apposition of the alveolar bone adjacent to the interdental osteotomy, decreases the risks of excessive alveolar bone loss and subsequent peridental problems [12-13]. Thin tapered osteotome has been used to complete the interdental osteotomy, in order to prevent damage to the roots of the neighbouring teeth. Injury to the apices of the teeth is always a possibility. Therefore, it is advisable to preserve at least 5mm of bone beyond the apices. The canine teeth have the longest roots and are the most apt to be injured. An estimate of their length can be obtained from intraoral roentgenograms. The teeth in the mobilized segment usually retain their vascularity and regain their sensibility in all our cases coincided with what reported by Barton [14] and Pepersack [15] the Hutchinson and MacGregor [16], who postulated that the return of sensibility is due to the perivascular nerve supply. Since the maxillary sinus is entered during the operation, alterations in sinus function theoretically may occur. Such problems have not been reported in our study that have been coincided with what reported by Young and Epker [17]. It is important to evaluate preoperatively any history of sinus disease and to eliminate any pathologic condition before the operation [18]. Relapse is an unpredictable risk of orthognathic surgery. Relapse may be dental or skeletal or both [19]. The stability of maxillary osteotomies affected by the magnitude of the anterior movement and the magnitude of the inferior repositioning of the maxilla, the adequacy of mobilization of the down fractured maxilla at surgery, the extent of bone contact in the newly established position of the maxilla and the type of fixation [20]. Cunningham et al. [18], on the other hand, did not find any correlation between relapse and the magnitude of maxillary advancement. The most stable maxillary procedure is superior repositioning, and forward movement is also reasonably stable. Inferior repositioning is less stable, especially if it causes downward rotation of the jaw and stretching of the elevator muscles. The least stable orthognathic procedure is transverse expansion of the maxilla [21]. In our study there was no relapse in either technique.

Conclusion:

The one stage technique for set-back osteotomy has been established safe with no major complications.

The author found out the second premolar set-back osteotomy is more anatomical and during surgery the buccal pedicle of the flap is more wide especially during dissection rather than narrow base of the flap in cases subjected for the first premolar set-back osteotomy. Moreover, interoperative alignment at the site of osteotomy is much more in cases subjected for second premolar set-back osteotomy.

The Wassmund technique maintains excellent dual vascular supply of the anterior maxillary segment by preserving both palatal and labialbuccal soft tissue pedicles with the least side effects as no periodontal inflammation and rapid return back to normal activity as well as fasting healing.

Follow up orthodontic therapy are mostly not needed for that patients. Although no relapse in both techniques, but it is presumlly more logically in bipedicled tunnel technique.

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