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ORIGINAL ARTICLE

# Lip repositioning: An alternative to invasive surgery a 4 year follow up case report

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**Abstract** Excessive Gingival Display (EGD) is a multifactorial condition that needs to be managed in a sequential manner in order to reach the proper treatment technique that targets and resolves the underlying etiologies. An innovative procedure called lip repositioning has been introduced and used recently either alone or in combination with other techniques. It can be used in certain cases as an easier, less complicated alternative to major surgical methods providing a pleasant satisfactory camouflage effect with lower morbidity. A case report is presented to show the preparatory and surgical steps used to treat a 25-year-old patient with EGD using lip repositioning technique as an alternative to invasive surgery with satisfactory results that has been stable for 4 years.


## 1. Introduction

This case illustrates the preparatory steps to reach the diagnosis with the corresponding surgical technique used for management as a minimally invasive alternative to orthognathic surgery with satisfactory results that has been stable for four years. Peck and Peck (1995) have found that Excessive Gingival Display (EGD) also known as "gummy smile" is a common condition with a 2:1 female predilection. According to Geron and Atalia (2005), the normal gingival show during smiling is from 0 to 2 mm while Saadoun (2005) accept 3 mm as satisfactory.

An excessive gingiva to lip distance of 4 mm or more is classified unattractive by lay people and general dentists as Kokich et al. (1999) have shown. This condition could be due to an individual or combination of causes. Bhola et al. (2015) and Humayun et al. (2010) have advocated that these causes could

*Abbreviations*: EGD, Excessive Gingival Display; VME, Vertical Maxillary Excess; HUL, Hyperactive Upper Lip; KAUFD, King AbdulAziz University Faculty of Dentistry; KAG, Keratinized Attached Gingiva; OPG, Orthopantomograph; PA, Peri-apical x-ray; CEJ, Cemento Enamel Junction; MGJ, Mucogingival Junction; NSAID's, Non Steroidal Anti Inflammatory Drugs; CHX, Chlorhexidine; MCPF, Mucosal Coronally Positioned flap

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be classified to Intra-oral [altered passive eruption –APE–, gingival hyperplasia, compensatory over-eruption with attrition, anterior dentoalveolar extrusion with deep bite] and Extra-oral [vertical maxillary excess, short upper lip, hyperactive upper lip].

Vertical maxillary excess –VME– is a skeletal condition in which there is an increase of vertical length of maxilla with longer lower third of the face. Diagnosis of VME is visually made by measuring the amount of gingival display and confirmed by cephalometric analysis as mentioned by Robbins (1999). On the other hand, as Bhola et al. (2015) and Humayun et al. (2010) stated confirming the presence of a short upper lip and/or hyperactive upper lip –HUL– needs a set of measurements that will be mentioned later in case description (2.1).

Different treatment modalities are present whether surgical or non-surgical and the choice of the techniques used needs proper patient selection, data collection, preparation and identification of the underlying causes as explained by Oliveira et al. (2015) and Bhola et al. (2015). Surgical techniques treating VME is well reported as in the article by Robbins (1999) and also the surgical intervention for short upper lip and HUL cases has been reported by some authors including Humayun et al. (2010), Bhola et al. (2015), Rubinstein and Kostianovsky (1973), Litton and Fournier (1979) and Miskinyar (1983).

To the best of our knowledge, the management of a diagnosed combination of VME and HUL has been investigated by Humayun et al. (2010), Bhola et al. (2015), Rubinstein and Kostianovsky (1973), Litton and Fournier (1979), Miskinyar (1983), Rosenblatt and Simon (2006) and Simon et al. (2007).

## 2. Case description and results

In May 2014, a 25-year-old female patient was referred from the Orthodontic Department at King AbdulAziz Faculty of Dentistry –KAUFD– after completing her treatment, to the Saudi Periodontics Board clinics for a consultation about her gummy smile.

### *2.1. Preparatory steps*

During the first visit, the chief complaint was taken from the patient focusing on her esthetic concerns. The medical history was taken and it was unremarkable, dental history including her oral hygiene habits, other habits and any previous dental treatment besides Orthodontic work were discussed. Extra-oral and intra-oral examinations were prepared. Then periodontal charting was also made followed by requesting any extra radiographs needed.

Our measurements were done starting with detecting the patient's smile type by both visual inspection during the dialogue and a photo shooting session guiding the patient to show her emotional smile. The patient had a high smile line and a Duchene type of smile which is identified following the article of (Ekman et al., 1990) that extends up to the second premolar on both sides [Fig. 1]. On the dental chair, the patient was asked to pronounce the letter "M" so that the amount of incisal exposure at rest was measured according to Sarver (2004). The lip length at rest was also measured as mentioned in the article of Peck et al. (1992). Also, both gingival and teeth display during full smile were measured using a periodontal probe and a caliber as shown in Fig. 2. The status of the incisal edge is an important point to focus on and check to exclude presence of attrition. Amount of the Keratinized attached gingiva –KAG– was measured in the periodontal chart which ranged from 5 to 7 mm. Panoramic radiograph as an overview plus periapical x-rays to give a hint about the position of the CEJ as shown in Fig. 3 which confirmed here the normal 2 mm distance from the bone crest thus reducing the chances of having APE as an etiology according to Robbins (1999), and Garber and Salama (1996). Cephalometric analysis was requested from the orthodontic department [Fig. 4].

Finally, Lip mobility was calculated as mentioned by Peck et al. (1992) and McLaren and Rifkin (2002) as the following equation: [Gingival Display + Tooth length] − Incisal display at rest [5 + 7] / [7 + 9] − 2 = 10–14 mm.

By the end of her visit, a preliminary diagnosis of VME or HUL or both was explained to the patient. Analysis of the data and the interpretation of the measurements were done which lead to the confirmation of the diagnosis of [VME II] according to Garber and Salama (1996) in their classification which was also found in the cephalometric analysis. Also, the measurements revealed hyperactivity in the movement of the upper lip. At the next visit, the patient was told the final diagnosis and treatment options were given to the patient including: [orthographic surgery, lip repositioning surgery and botox injections] Then, the steps of the surgery were further elaborated and she decided to proceed with the lip repositioning surgery first and then check the need for botox.

### *2.2. Surgical steps*

At the day of the procedure, topical gel was placed followed by 2 carpules of local anesthetic solution [Lidocane Hcl 2% with 1:100,000 epinephrine] to cover the vestibule area from tooth #16 to #26. Then, the area of 10–14 mm of the mucosa to be removed was marked according to the rule of "twice gingival display". Width of the incision is decided according to the horizontal dimension until last tooth shows during full dynamic smile. The incision started at the mucogingival junction –MGJ– peeling out a strip of mucosa as superficial as possible removing only 1 mm of epithelium leaving the connective tissue and the muscle fibers intact. Then suturing was done using the simple interrupted technique by a Prolene suture size 5/0 for both anchoring and stabilizing sutures starting with the midline anchoring suture to maintain proper symmetry then, closing the gaps with stabilizing sutures to help keeping the lip in the new position coronally.

Surgical steps are summarized in Fig. 5.

#### *2.2.1. Follow up and post-operative instructions*

Postoperative instructions according to Humayun et al. (2010), Rosenblatt and Simon (2006) and Simon et al. (2007) was explained to the patient emphasizing on minimum lip movements as much as possible. NSAID's and Ibuprofen 600 m q6h prn were also prescribed to the patient for the first 3–4 days. Patient was instructed on using icepacks for 20 min' interval during the first 24 h. Regular oral hygiene methods were stopped for 2 days. Chlorhexidine –CHX– mouthwash 10 ml bid for 2 weeks was given to the patient.


**Fig. 1** Patient's smile type.

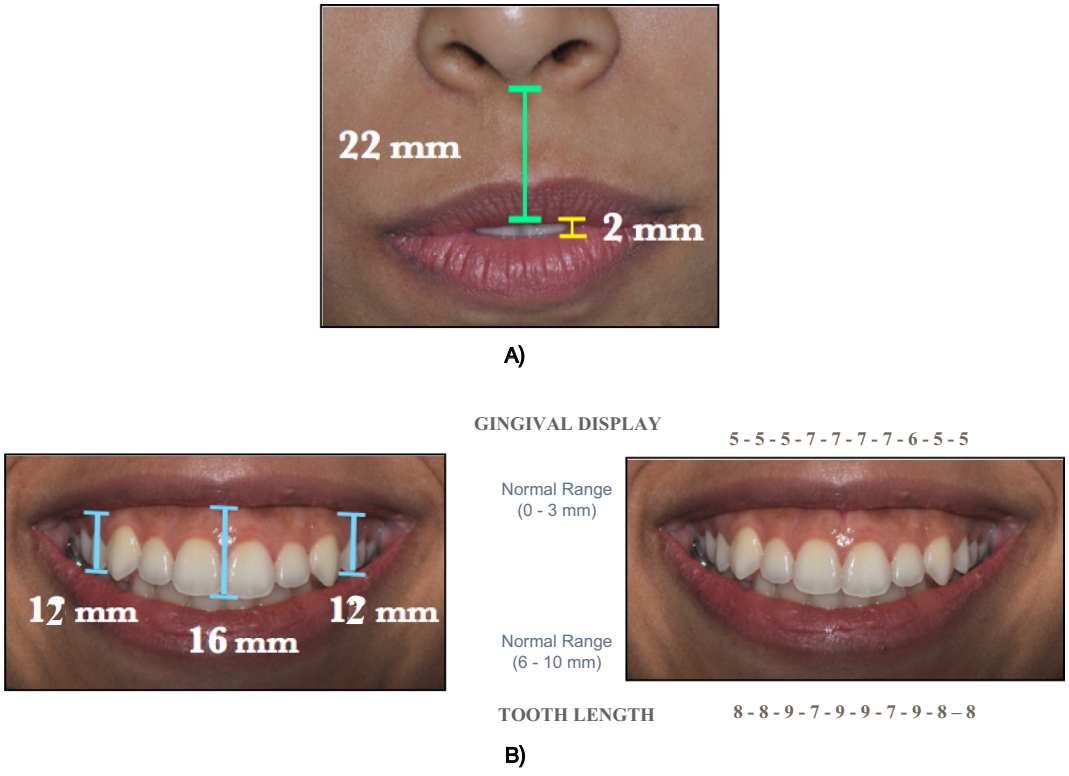


**Fig. 2** A – Lip length in millimeter and amount of incisal display at rest in millimeter. B – Amount of dento-gingival display at maximum smile in millimeter.

*2.2.2. Follow up and results*

At the 1st week follow up visit, the patient was comparing the difference in her gum show during smiling and laughing which she was content about but complained of a little swelling and restriction in the lip movement, other than that no remarkable events were found. The 2nd follow up week, she came for suture removal. At this visit, the swelling was almost gone, the surgical site showed good healing and the lip restriction was better. Sutures were removed followed by gentle swabbing with a wet gauze and irrigation. Fig. 6 shows both intra oral and extra oral pre-operative condition while, Fig. 7 elaborates the post-operative results of the surgical site and the patient's smile up to a period of 4 years. Through which healing with scar tissue occurred giving almost stable results with slight relapse at the right side.

## 3. Discussion

This is a case presented to report the use of lip repositioning technique as a less invasive method to manage EGD with a

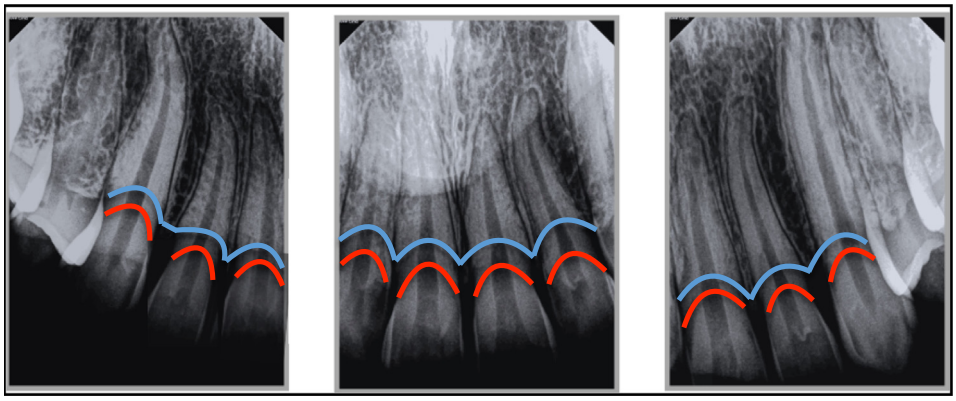

**Fig. 3** Periapical X-rays showing normal cemento enamel junction –CEJ– to bone crest relationship.

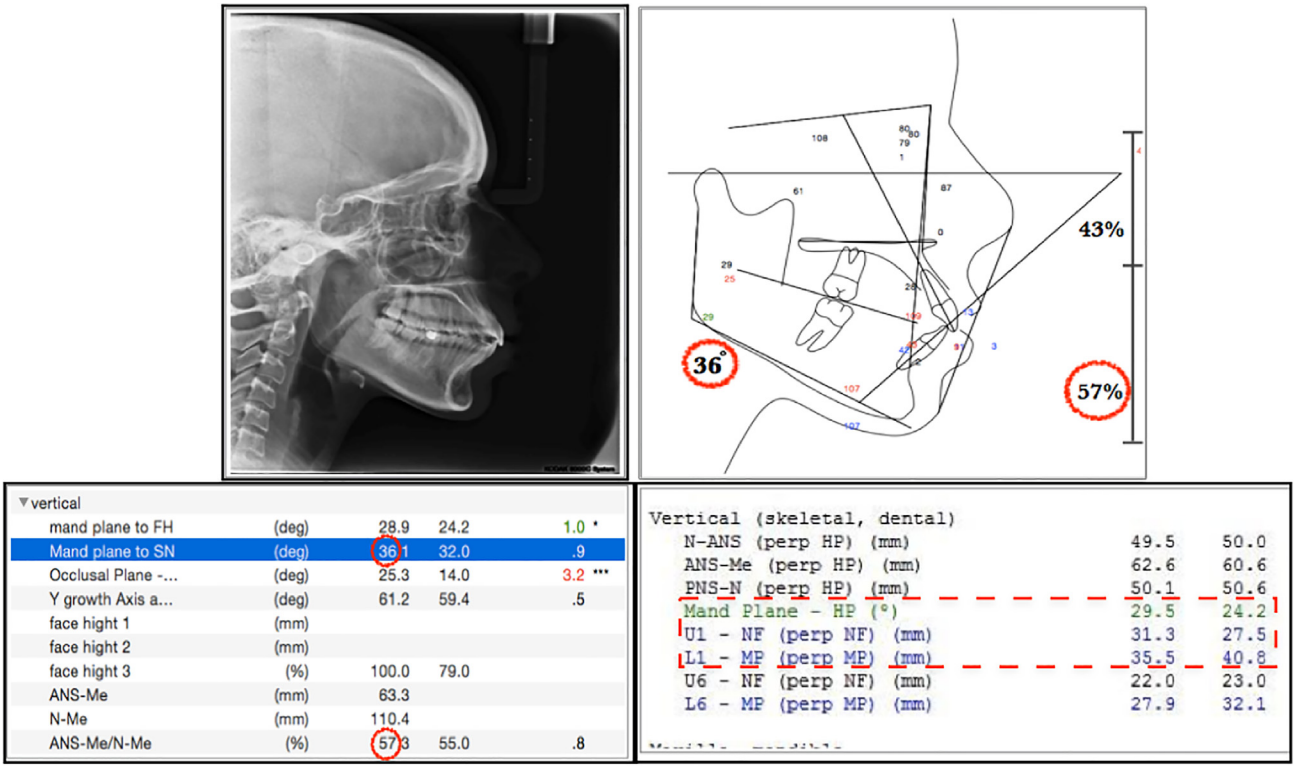


**Fig. 4** Cephalometric X-ray and analysis.

combined underlying cause of moderate VME and HUL. The technique was originally described as a cosmetic surgery by Rubinstein and Kostianovsky (1973) for correction of gummy smile caused by HUL. It was advocated again by Litton and Fournier (1979) for managing a case with short upper lip. This older technique was done by detaching the muscles from the bone in order to coronally position the upper lip with no reported complications.

Due to the occurrence of relapse, (Miskinyar, 1983) modified the original technique into myectomy and partial resection of the Levator labii superioris instead of complete separation from the bone. This resection was believed to reduce chances of relapse. The author also reported that one patient out of seven had post-operative paraesthesia. After a period of 25 years, these authors – (Rosenblatt and Simon, 2006) and Simon et al. (2007) have re-introduced this procedure back into the dental field. They used a partial thickness elliptical – shaped incision at the alveolar mucosa keeping the muscle fibers intact. They arbitrarily removed an area of 10–12 mm of mucosa with good results for a maximum follow up period of 8 months.

Later, Humayun et al. (2010) and Bhola et al. (2015) started to put the guidelines and used the technique to reduce the amount of gingival display for a patient with simple VME plus HUL. In their case report, Humayun et al. (2010) referred to the surgery as mucosal coronally positioned flap –MCPF– and they were the first authors to advocate the use of the rule of "Twice the gingival display". They were able to achieve

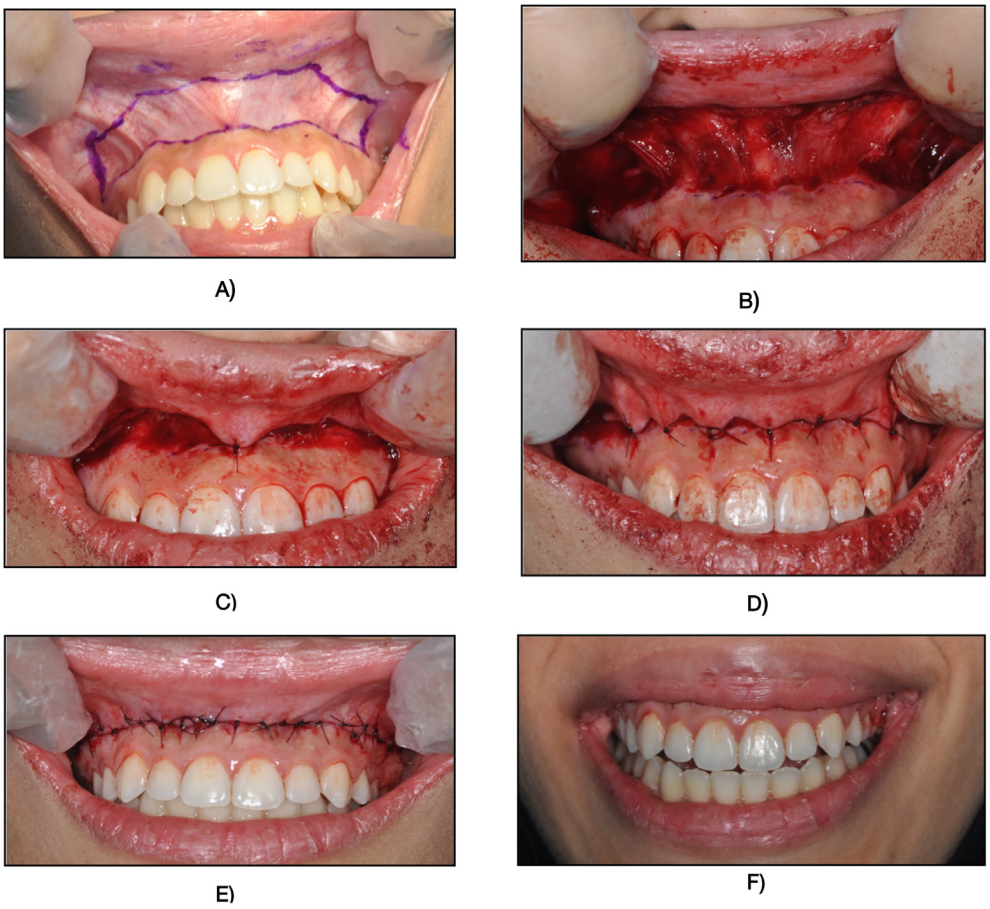


**Fig. 5** Surgical steps. A – Incision area outlined according to the rule "Twice Gingival Display" B – Incision area after superficial incision is finished C – Midline anchoring suture D – Remaining anchoring sutures opposite to papillae E – Both anchoring and stabilizing sutures F – Immediate post – operative picture.


**Fig. 6** Pre-operative pictures.

excellent and stable results for up to 1 year. Then, Bhola et al. (2015) and his group advocated a classification for gummy smile causes and a treatment decision tree as a guide for clinicians.

Proper case selection and diagnosis is critical for success. Diagnosis is done following a series of examinations, measurements and consultations in order to reach the suitable treatment plan.

Measurements needed for the diagnosis process are mentioned in Table 1.

Lip repositioning procedure is indicated in cases of simple VME degree I of [2–4 mm] gingival display, moderated VME degree II of [4–8 mm] gingival show and in cases of HUL as advocated by the following authors, Humayun et al. (2010) and Bhola et al. (2015). For this patient, the measurements revealed VME degree II since the amount of gingival display ranged between [5–7 mm] according to (Garber and Salama, 1996) classification and after calculations, the degree of lip mobility was [10–14 mm] which exceeds the normal range of [6–8 mm] according to Peck et al. (1992) and McLaren and Rifkin (2002). Hence, the selection of this type of surgery was suitable here.

On the other hand, lip repositioning is contraindicated with severe VME degree III of [ > 8 mm] gingival show according to (Bhola et al., 2015) and with a limited amount of KAG or a short vestibule according to (Rosenblatt and Simon, 2006) As far as we know from the literature, this surgical technique gives satisfactory results with a 75–80% improvement in the more severe and complicated cases and up to 100% with stable

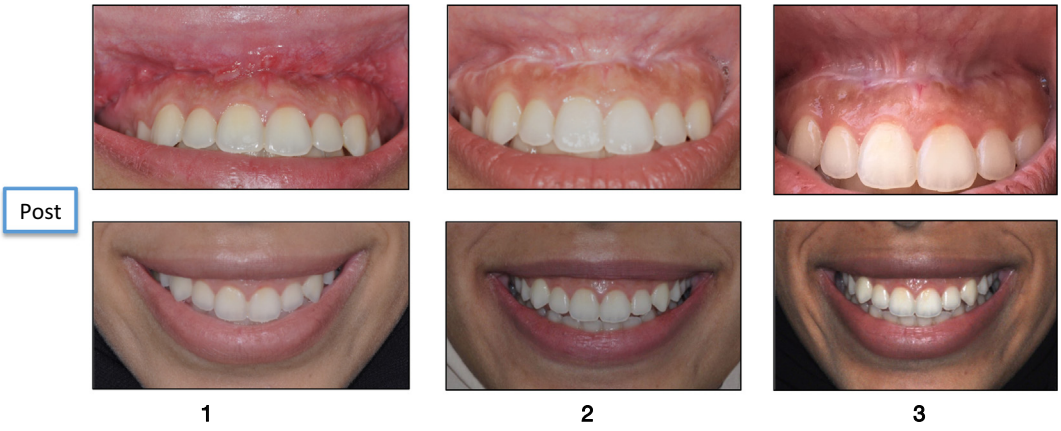


**Fig. 7** Post-operative pictures. 1 – Two week follow up. 2 – One year follow up. 3 – Four year follow up.

**Table 1** Measurements needed for diagnosis.

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|---|
| 1. Incisor display at REST |
| 2. Lip Length "from subnaslae to end of vermilion of the upper lip at midline" |
| 3. Position of CEJ "Bone sounding and Periapical x-rays" |
| 4. Amount of teeth display at MAXIMUM smile + Clinical crown dimensions |
| 5. Amount of gingival display at MAXIMUM smile |
| 6. Extension of the smile "until which tooth Mesially and Distally" |
| 7. Amount of KAG |
| 8. Depth of the vestibule |
| 9. Overjet and Overbite |
| 10. Facial thirds focusing on the lower third "Visual Examination/Cephalometric analysis" |

**Table 2** Causes of relapse.

| |
|---|
| 1. Not following the rule of "Twice the gingival display" during the incision |
| 2. Cutting in the KAG |
| 3. Using the technique in a case with limited amount of KAG |
| 4. Cutting deep into the connective tissue and muscle fibers |
| 5. Cases with high muscle pull |

results in relatively simple cases as was presented in the article of Humayun et al. (2010). Other advantages of this procedure that are mentioned in the following literature Humayun et al. (2010), Bhola et al. (2015), Rosenblatt and Simon (2006) and Simon et al. (2007) include the versatility in use and the modifications present like unilateral cutting in cases of asymmetrical smiles and the ability to keep the frenum intact. It also can be easily reversed by vestibular deepening if the patient is not satisfied with the outcome or repeated again in case of relapse. The use of a trial step after the measurements using only sutures without actually cutting in order to give the patient a prediction of the final results is possible.

The main disadvantage is relapse. Relapse is seen during the first 6–8 weeks and it can be due to one of the common mistakes or conditions shown in Table 2.

When relapse occurs, it can be resolved by either revisiting the surgical site to incise more mucosa as needed or by the use of Botox injections as it was suggested in the following articles Humayun et al. (2010), Bhola et al. (2015), Rosenblatt and Simon (2006), Polo (2008) and Patel (2013).

There are common post-operative complications mentioned in the literature Humayun et al. (2010), Bhola et al. (2015), Rubinstein and Kostianovsky (1973), Litton and Fournier (1979), Miskinyar (1983), Rosenblatt and Simon (2006) and Simon et al. (2007) they range from minor discomfort and some lip movement restriction to swelling, bruising and paraesthesia. Some rare complications are also reported such as mucocele which occurs due to damage to minor salivary glands and it resolves on its own.

The procedure is considered to be simple and safe with good prognosis as the following authors advocate Humayun et al. (2010), Bhola et al. (2015), Rubinstein and Kostianovsky (1973), Litton and Fournier (1979), Miskinyar (1983), Rosenblatt and Simon (2006) and Simon et al. (2007). It is an innovative predictable technique that is used with selective cases either as an adjunctive technique to the commonly used well known modalities of treating gummy smile or as an alternative to the highly invasive surgeries since it provides minimal morbidity, lower incidence of complications and faster recovery time. Additional investigation and more research with larger sample size and longer follow up periods are needed to properly evaluate this technique and its outcome.

## 4. Conclusion

Gummy smile is a multifactorial condition that needs careful examination to detect the causative etiology/etiologies. The more severe the case is, the more is the need for collaborative multiple treatment modality approach.

## Conflict of interest

The Author declares that there is no conflict of interest regarding the publication of this case report.

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