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CLINICAL EVALUATION OF GENIOPLASTY WITH EITHER SILASTIC (SOLID SILICONE) AND MEDPOR (POROUS POLYETHYLENE) AS CHIN ALLOPLASTIC AUGMENTATION

Abdelbadia Abdullah Abdelmabood*,
Wallid Ahmed Abdullah** *and* Mohamed Esam Amer***

ABSTRACT

Purpose of the study: our study was to assess the clinical outcome of both Silastic and Medpor as chin alloplastic augmentation procedures.

Material and Methods: This randomized clinical study was performed on ten patients with retruded chin with a mean age of 25 years, out of whom 6 received silastic chin implant and 4 received Medpor chin implant. The primary clinical outcome variable was patient satisfaction after application of silastic or medpor chin graft depending on Genioplasty Outcome Evaluation (GOE). Other variables in this study were surgical time, postoperative pain score, and postoperative chin edema.

Results: Ten patients underwent the protocol of the study .They were 5 males and 5 females. 6 patients received a Silastic Chin graft and 4 patients received a Medpor Chin Graft The Overall patient satisfaction outcome and GOE, data were recorded pre-surgical and at 6 months with the postoperative follow-up. The presurgical GOE score for all patients who received Silastic Chin Graft 35.19±8.7 and Medpor Chin Graft were 33.17±9.0. GOE after 6 months were 74.56±7.2 for patients who received Silastic Chin Graft and 76.66±8.2 for patients who received Medpor Chin Graft (P-value = 0.0001).

Conclusions: Both Silastic and Medpor alloplastic chin implants can be used as a simple technique of chin augmentation in moderate chin retrusion. All the patients in the study showed significant improvement in chin profile with a high degree of satisfaction according to Genioplasty Outcome Evaluation (GOE).

KEYWORDS: Genioplasty, Genioplasty Outcome Evaluation. Silastic Chin graft, Medpor Chin graft.

* Assistant Professor of Oral Maxillofacial Surgery, Faculty of Dental Medicine & Oral Surgery.Zagazig University
** Professor of Oral Maxillofacial Surgery, Faculty of Oral Surgery & Dental Medicine Zagazig University
*** Lecturer of Orthodontic, Faculty of Dntal Medicine & Oral surgery, Zagazig University

INTRODUCTION

Genioplasty as surgical correction of chin contour and size consider fundamental orthognathic craniofacial surgery. Chin augmentation with Silastic chin graft or Medpor Chin graft become the popular simple technique of chin augmentation with a simple maneuverer. Facial beauty differs according to the form, proportion, and contour of the facial profile. The chin area considers the most prominent part of the lower third of the facial profile. According to literature, males with small-sized chins are associated with weak, passive characters while females with small-sized chins usually complained of psychological problems. Chins according to aesthetic ideal analysis characterized by a small size chin to fit into the curved facial outline[(1)].

The procedure of sliding Genioplasty was described by ***Hofer***[(2)] and some modifications were developed by ***Trauner and Obwegeser***[(3)]. This surgical procedure attempted to correct the shape, contour, and profile of the chin area with different surgical modalities including sliding genioplasty alone or with interposition grafting. Genioplasty remains the fundamental procedure in reshaping the chin for esthetic outcomes[(4)]. Postoperative complications that are associated after osseous Genioplasty as wound dehiscence, mental nerve affection, and tooth damage represent about 3-5% [(5-7)].

With the development of chin augmentation materials, the goal of bioengineers was still to discover new materials with an acceptable degree of biocompatibility, simplicity of adaptation, not produce serious complications to the patients, ability to withstand stress in the chin area, and able to incorporate with the surrounding tissue in the chin area. With the discovery of Chin Implants of various materials, the surgeons offered different options or modalities to change and modify the form, size, and contour of the chin area [(8)].

Polyester fiber (*Mersilene, Ethicon, Somerville, New Jersey*) is a biocompatible non-resorbable fiber, placed in the subperiosteal pouch to augment the chin area. The associated complications as infection, degree of bone resorption, increase surgical time, and unaccepted patient satisfaction [(9,10)].

Solid silicone or Silastic Chin graft (*Silastic, Michigan Medical Corporation, Santa Barbara, California, USA*) is polydimethylsiloxane characterized by solid form without any porous form. This nonporous form prevents bacterial penetration inside the implant core body. When the Silastic graft is placed in the chin area, the human body will tend to form a fibrous capsule around the inserted implant [(11)].

Silastic Chin graft is offered as one of the best biocompatible materials for chin augmentation including vertical and horizontal width, ease of manipulation, and a significant degree of patient satisfaction [(12)].

Medpor Chin graft is porous polyethylene (*Medpor, Porex Surgical, Newman, Georgia*) that has pores measuring 100- 300μm in diameter. These pores enable entry of macrophages with subsequent fibrous anchorage. This anchorage results in a decrease of micro-displacement which is common with silastic chin implant but lack flexibility compared to Silastic chin graft [(13)].

Aim of the study

To evaluate the clinical outcome of Genioplasty with both Silastic and Medpor as chin alloplastic augmentation procedure

PATIENT AND METHODS

After patient acceptance and signing on the informed consent agreement according to the guidelines of the Declaration of Helsinki, ten patients with retruded chin were selected from the outpatient clinic of the oral maxillofacial department and orthodontic department, Faculty of Oral Surgery & Dental Medicine, Zagazig University. All the patients were randomly allocated to either Silastic Chin graft (6 patients) or Medpor

chin graft (4 patients). The time of the study was from January 2019 to March 2021 with a mean age of 25 years. All the patients were instructed to fill and complete the Genioplasty Outcome Evaluation (GOE) questionnaire which is accepted by Rhinoplasty Outcome Evaluation [14] This GOE evaluation should be answered before surgery and after the surgery within the follow-up stage.

Inclusive criteria

- Patient with mild retrogenia who had to request cosmetic correction of the retruded chin.
- Above the age of 20 year

Exclusive criteria

- Previous chin surgery
- Patient with severe retrogenia that indicated genioplasty by osteotomy.
- Medically compromised patients that will affect healing ability.
- Patient with a history of infection to Medpor or Silastic body prosthesis.

Preoperative:

1- The intra-oral and extra-oral clinical examination was done. Aesthetic analysis was performed including face proportions, size, contour, muscle activity, and tooth-to-lip relationship. Lateral and frontal photographs were obtained **(Fig 1, 2).**

2- Orthodontic phase for leveling and alignment using brackets with Roth prescription (0.022-inch slot – American Orthodontics). The preoperative orthodontic phase ranged from 6 months to 15 months relying on the amount of malalignments and whether the patient needed extraction or not. **(Fig 3).**

3- Preoperative cephalometric radiographs were obtained just before surgical intervention to obtain the following guidelines:

- Each image was traced on acetate paper to locate skeletal, dental and soft tissue landmarks on the cephalometric film. **(Fig. 4)**
- A vertical plane through soft-tissue nasion and perpendicular to the Frankfort horizontal was

Fig. (1) Preoperative photograph with lateral extra-oral profile

Fig. (2) Preoperative photograph with frontal extra-oral profile

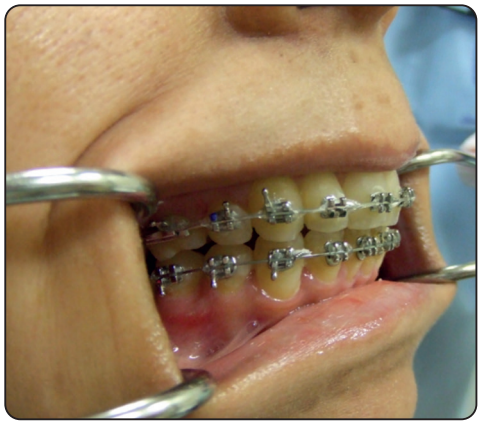

Fig. (3) Preoperative photograph with an orthodontic appliance

constructed. Then the distance between this vertical plane and soft tissue pogonion was measured. The soft-tissue pogonion normally fell on this vertical plane according to If the soft tissue pogonion was more than 5 mm behind this vertical line, the patient was considered to have chin retrusion and was included in our study[15]. **(Fig 5)**

Surgical technique

- Under general anesthesia to facilitate the surgical procedure, through an intraoral vestibular approach that starts from canine to canine, followed by careful dissection to avoid trauma to the mental bundles.
- Mentalis muscle was excised by diathermy to complete the dissection. The inferior border of the mandible was reached with further dissection extended posteriorly to aid in the insertion and adaptation of the selected chin implant.
- The placement of the chin graft and the selection depended on the aesthetic analysis as the chin area was divided into 3 compartments including the center of the chin, submentanion, and body of the chin.
- With a Silastic chin implant, it should cover the chin central area and due to its flexibility

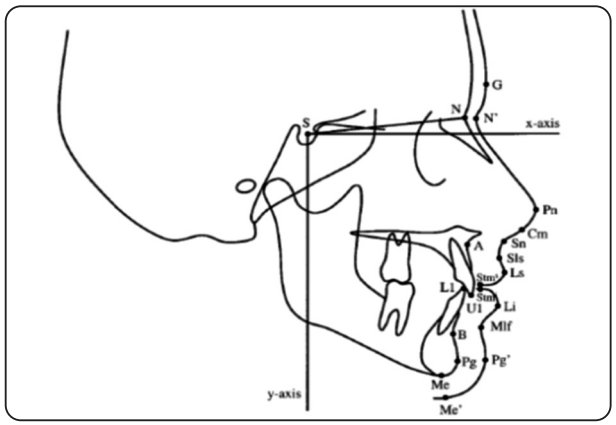

Fig. (4) cephalometric hard and soft tissue outline map associated with reference points

Fig. (5) Preoperative lateral cephalometry

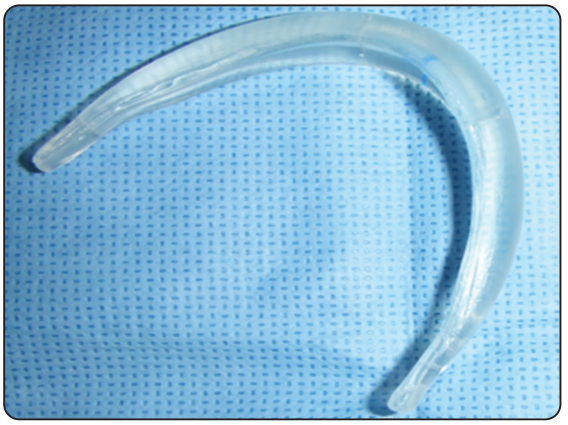

Fig (6): Photograph showing Silastic Chin graft

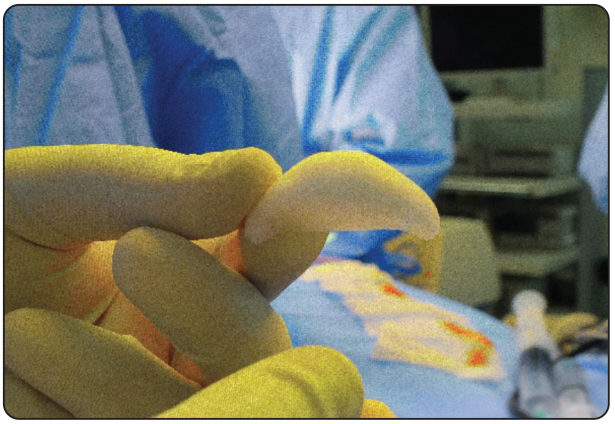

Fig (7) Photograph showing Medpor Chin Implant

the extended arms were being inserted supraperiosteal. The main central part should be subperiosteal, to decrease the micro-displacement associated with Silastic prostheses **(Fig 6, 8)**.

- With Medpor chin implant, this type of implant has a degree of porosity and lacks the flexibility property with the need for an extended surgical incision. To facilitate its adaptation, it was recommended to be inserted into warm saline with 250 Amoxicillin solution. Medpor implant was split down in midline followed by rigid fixation with a titanium screw to avoid the associated micro displacement and achievement of perfect adaptation Medpor chin graft **(Fig 7,9)**.

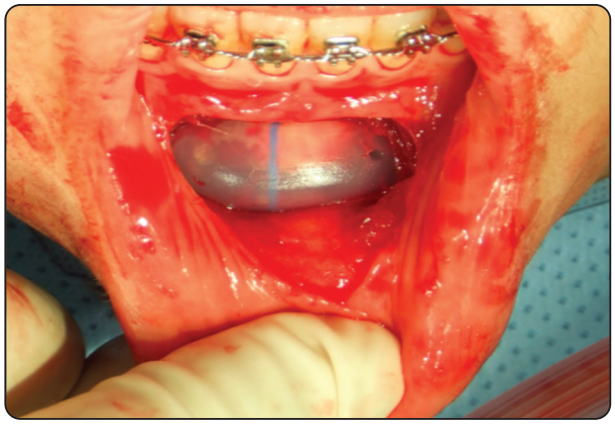

Fig (8) Photograph shows vestibular incision and application of Silastic Chin graft

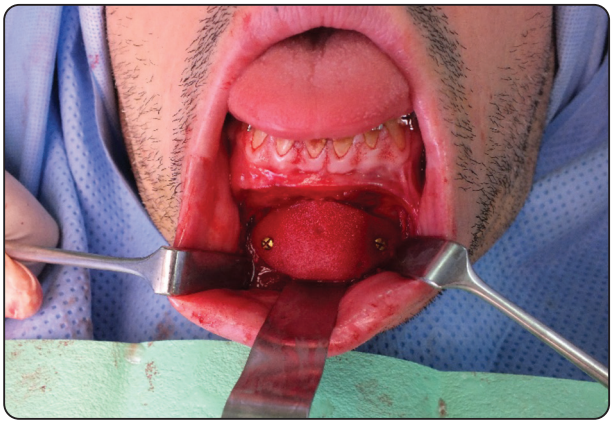

Fig (9): Photograph shows vestibular incision and application of Medpor Chin graft with screw fixation

Postoperative care

- The wound was irrigated and sutured with watertight closure with sequences layerwise.
- Extra oral chin dressing with mild compression was placed after the operation to reduce postoperative swelling, assist in mentalis closure, and prevent the formation of a hematoma. It was removed after 48–72 hours post-operation.
- Selected proper antibiotics and analgesics were prescribed. The patients were instructed on a liquid diet for one week postoperatively and gradually progressed to a soft and then regular normal diet after that.

-Postoperative assessment and follow-up

- **Over-all patient satisfaction outcome and GOE**: data were recorded at the follow-up period of one month, 3 months, and 6 months with the postoperative follow-up.
- **Postoperative chin edema:** On one month, 3 months, and 6 months with the postoperative follow-up, patients were instructed to be in an upright position with centric teeth occlusion, the 4 points were determined as Tragus, corner of the mouth, Gonion, and External canthus of the eye 3 lines are outlined starting from the corner of the mouth to each peripheral points and the mean value was calculated .
- **Pain**: By using the Visual Analog Scale (VAS) as the patients were instructed to mark the degree of perceived pain on A 10- cm Horizontal line demarcated from 0 (no pain) to 10 (worth pain).
- Postoperative complications including, degree of implant mobility, degree of lower lip paraesthesia
- Postoperative soft tissue relationships of the chin to lip and nose are very simple methods for determining chin projection. As an esthetic plane is outlined passing from the nose tip to

the pogonion, the upper and lower lip both the lie same with or slight lie 1-2 mm posterior to the esthetic line. The chin should rest slightly posterior to the lower lip. **(Fig 10)**

Fig. (10): photographs show the difference in chin profile preoperative and 6 months postoperative after Chin Implant augmentation

RESULTS

- This study was conducted on ten patients with deficient mild retruded chin require Chin Genioplasty with a mean age of 25 years. They were 5 males and 5 females. 6 patients received a Silastic Chin graft and 4 patients received a Medpor Chin graft.
- The average surgical time was 65±10 minutes for patients who received Medpor Chin Implant and 40±5 minutes for patients who received Silastic Chin Implant.
- Postoperative soft tissue relationships of the chin to lip and nose were accepted for all patients either with Silastic chin graft or medpor chin graft. As an esthetic plane is outlined passing from the nose tip to the pogonion, the upper and lower lip both lie the same with or slight lie 1-2 mm posterior to the esthetic line.

Overall patient satisfaction assessment: The Overall patient satisfaction outcome and GOE, data were recorded pre-surgical and at 6 months with the postoperative follow-up. The presurgical GOE score for all patients who received silastic chin graft 35.19±8.7and medpor chin graft were 33.17±9.0 . GOE after 6 months were 74.56±7.2 for patients who received silastic chin graft . and 76.66±8.2 for patients who received medpor chin graft(P-value = 0.0001).

Postsurgical chin edema

First-Day Postsurgical: There was a significant difference between postoperative edema overall 6 patients received Silastic chin graft and overall patients received medpor chin graft, in the 1st day it was 11.2± 0.4 Cm^2 for patients received Silastic chin graft., while for patients who received medpor chin graft it was11.9± 0.8 Cm^2. In comparing with the baseline chin edema that was 10.7±0.9 Cm^2 (P-value = 0.0001).

Third-Day Postsurgical: There was a significant increase in the mean of chin edema postoperative as the mean of Silastic chin graft was 12.8± 1.8 and for patients who received medpor chin graft 14.7± 0.7 Cm^2. In comparing with the baseline chin edema that was 10.7±0.9 Cm^2 (P-value = 0.0001).

Seven Day postsurgical: there was no significant difference between patients who received medpor chin graft or Silastic chin graft, as it was 10.7± 0.5 Cm^2 for all patients. In comparison with the baseline, chin edema was 10.7±0.9 Cm^2 (P-value ≤ 0.05) with no significant difference.

- Pain: By using the Visual Analog Scale (VAS), it was found that the Mean ± SD of pain score on Day 1 postoperative for patients who received silastic chin graft was 7.98±0.87 while for patients received medpor chin graft 6.87±0.83(P-value ≤ 0.05) as no significant difference. On the 3rd Day, the mean ± SD of pain score for patients who received a Silastic chin graft was 6.98±0.67 while for patients who received a medpor chin graft 6.90±0.86 (P-value ≤0.05) was no significant difference. On 7 Day mean ± SD of pain score for patients who received silastic chin graft was 5.98±0.97 while for patients who received medpor chin graft 4.90±0.76 (P-value ≤ 0.05) as no significant difference.

Postoperative complications

- All patients reported a degree of lower lip numbness during the first week postoperatively and full recovery in all cases within subsequent follow-up.
- There was one patient who received silastic chin alloplastic and suffered from infection around the implant after two months. The final decision by removing the inserted alloplastic chin implant after two months postoperatively.
- All patients on examination of the vitality of mandibular anterior teeth, all teeth were sound and not affected.
- No formation of sublingual hematoma in all cases or affection of airway.
- All cases not affected by any source of mandibular fractures postoperatively.

DISCUSSION

This study was conducted on ten patients with deficient mild retruded chin require advancement chin with a mean age of 25 years. They were males and 5 females. 6 patients received Silastic Chin Implant and 4 patients received Medpor Chin Implant instead of sliding Genioplasty. The average surgical time was 65±10 minutes for patients who received Medpor Chin graft and 40±5 minutes for patients who received Silastic Chin graft. This is in the agree with **Yaremchuk,** [16] who demonstrated that Medpor biocompatibility lacks the nature of flexibility. During the application of Medpor chin graft , it takes more time as needed for titanium screw fixation and needs to be submerged in warm saline solution with antibiotic solution

Our results demonstrated during the study time it was found that in all patients who received either Silastic or Medpor alloplastic chin augmentation, there was no resorption of hard tissue. This is in agreement with **Mittelman,** [17] who explained that, with the application of an alloplastic chin implant, the prosthesis was placed above the periosteum and did not affect on vascularization of the bone.

Our results explained that all patients reported a degree of lower lip numbness during the first week postoperatively and full recovery in all cases within subsequent follow-up. This is in contrast with **Lindquist & Obeid,** [18] who explained that 10% of patients after sliding Genioplasty complained of hypoaesthesia in the chin area. This is due to osteotomy of sliding Genioplasty close to the mental nerve bundles.

Our results, there was one patient who received silastic chin alloplastic suffered from infection around the implant with the formation of periimplantitis with extrusion of the inserted silastic chin implant. This is in agreement with ***Walen,*** [19] who demonstrated that silastic chin alloplastic is characterized by microdisplacement as a lack of fibrous tissue anchorage. In this type of alloplastic, there tends to be the formation of a capsule around silastic prosthesis, with the result of micro-displacement leading to chronic periimplantitis with final extrusion.

Our study demonstrated that all cases went uneventful with a normal accepted postoperative degree of pain and swelling with no formation of sublingual hematoma in all cases or affection of the airway. This is in contrast with ***Sullivan,*** [20] who explained that, with step Genioplasty, some complications affect the airway due to the formation of sublingual hematoma as injury to tongue muscles and a high degree of bleeding in Genioplasty with osteotomies.

In overall the study of both medpor and silastic chin implant there was changes in soft tissue profile for all study patients of study over 6 months. This is in agreement with ***Mohammad, et al*** [21] who concluded that Medpor produces better or the same satisfactory benefits as osseous genioplasty in mild to moderate horizontal chin defect.

The Overall patient satisfaction outcome and GOE, data were recorded pre-surgical and at 6 months with the postoperative follow-up. The presurgical GOE score for all patients who received silastic chin graft 35.19±8.7and medpor chin graft were 33.17±9.0, and GOE after 6 months were 74.56±7.2 for patients who received silastic chin graft. and 76.66±8.2 for patients who received medpor chin graft (P-value = 0.0001). This is in agreement with ***Angelo,*** [14] who compare piezotome genioplasty to traditional genioplasty in his study presurgical GOE score was 33±9.5 for traditional genioplasty and 33.33 ± 8.82 for piezotome genioplasty. And at 6 months GOE score was 76±7.5 for traditional genioplasty and 86.93± 8.82 for piezotome genioplasty.

Our results consider that genioplasty with alloplastic grafting is less immediate postsurgical and long term morbidity in same line with agreement of other results of ***Rullo, et al*** [22] and ***Peter,*** [23] who concluded that genioplasty with piezotome decrease the post operative morbidity and enhances the long termpatient satisfaction.

CONCLUSION

Both Silastic and Medpor alloplastic chin implants can be used as a simple technique of chin augmentation in moderate chin retrusion .All the patients in the study showed significant improvement in chin profile with a high degree of satisfaction according to Genioplasty Outcome Evaluation.

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