

# Comparison of Different Genioplasty Techniques in Terms of Neurosensory Deficit and Haematoma Formation

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## ABSTRACT

**Objective:** To compare different types of genioplasty techniques (chin advancement, rotation and advancement, setback, and reduction) in terms of neurosensory deficit and haematoma formation.

**Study Design:** Comparative analytical study.

**Place and Duration of the Study:** Department of Oral and Maxillofacial Surgery, Armed Forces Institute of Dentistry, Rawalpindi, Pakistan, from January 2022 to April 2023.

**Methodology:** Patients requiring genioplasty and fulfilling the inclusion criteria i.e. both genders aged 16-60 years were included and divided into 4 groups according to the type of genioplasty performed. Genioplasty was planned as per the ortho treatment plan and performed under general anaesthesia. Setback genioplasty was performed on 8 patients, advancement genioplasty on 11 patients, reduction genioplasty on 3, and advancement with rotation genioplasty on 16 patients. Postoperatively neurosensory deficit was recorded on follow-up after 1 month by subjective and objective assessments, and haematoma formation was assessed clinically on the 7<sup>th</sup> day after the procedure.

**Results:** Advancement with rotation genioplasty showed the highest frequency of neurosensory deficit (almost 50%) and reduction type genioplasty showed the least frequency of neurosensory deficit (<1%,  $p = 0.49$ ). The frequency of haematoma formation was maximum in the advancement with rotation genioplasty (62.5%) and minimum in equal setback genioplasty (25%,  $p = 0.61$ ).

**Conclusion:** Advancement with rotation genioplasty had the highest rate of postoperative neurosensory deficit and haematoma formation when compared with other techniques of genioplasty.

**Key Words:** *Genioplasty, Neurosensory deficit, Haematoma, Advancement with rotation genioplasty, Setback genioplasty.*

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## INTRODUCTION

Chin is an important part of human facial features.<sup>1</sup> Being specific to aesthetics, the human chin is considered as one of the most prominent features of the facial region.<sup>2</sup> Chin projection and shape are one of the most dominant features. Leonardo *da Vinci* a famous engineer, mathematician, and photographer gave the rule of thirds by dividing the face in three horizontal planes.<sup>3</sup> Lower one-third constitutes from subnasale to the chin with chin being the most important part. Any deformity of the chin can impact the aesthetics badly and cause an unaesthetic look of an otherwise normal-appearing face.<sup>4</sup> With the advancement of aesthetic surgical procedures, chin deformities can also be managed surgically to make it look appropriate in relation to the other two-thirds of the face.

Among patients with abnormal facial profiles in the Asian population, 41-56% have retro-gnathic mandible and up to 15% have a prognathic mandible.<sup>5,6</sup> Retrognathic mandible is accompanied by retrogenia and prognathic mandible causes pronounced chin. Genioplasty is a surgical procedure which involves repositioning and reshaping the human chin to improve esthetics.<sup>7</sup> Retrogenia can be managed by advancement genioplasty or implants and pronounced chin can be receded with reduction genioplasty.<sup>8</sup> Transverse discrepancy can be corrected with rotational genioplasty.<sup>9</sup> The procedure is performed as a multi-disciplinary team procedure with the orthodontist being a main member in making a treatment plan (type of genioplasty and extent of movement) by careful cephalometric analysis.

Genioplasty was a widely accepted treatment option for chin discrepancies by the 1960's. Traditionally, many surgeons used different approaches and materials for genioplasty. This procedure was performed intraorally or extraorally using bovine cartilage, dermal graft, and submental rotational flap for the correction of deformity.<sup>10,11</sup> However, Trauner *et al.*'s sliding genioplasty performed intraorally is the most accepted method used for both advancing and receding the chin.<sup>12</sup>

With the advancement of surgical planning aids, accurate treatment planning (linear and rotational measurements) can be made and guiding splints can be used which help in reducing the

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challenges encountered pre, per, and postoperatively.<sup>13</sup> However, similar to other surgical procedures, this surgery has also some inevitable complications associated with it. Neurosensory deficit is one of the most common and important of these complications.<sup>14</sup> This study will help the surgeons in preoperative counselling about the possible complications which can occur after genioplasty.

This study aimed to compare the haematoma formation and neurosensory deficit resulting from reduction and advancement genioplasty.

### METHODOLOGY

This comparative analytical study was conducted in the Oral and Maxillofacial Surgery Department of the Armed Forces Institute of Dentistry, Rawalpindi, Pakistan, from January 2022 to April 2023. An approval was obtained from the Ethical Committee of the Armed Forces Institute of Dentistry. The study enrolled 38 subjects. All the patients who reported to the department (during the mentioned period) with chin problems, either prominent or receded chin, who wanted to get their problems fixed were considered for this study. Patients from both genders, aged 16-60 years, who were undergoing genioplasty were included in the study. Patients with congenital deformities, having neurological ailments, and those on medications which could alter the neurosensory sensations were excluded from the study.

Patients fulfilling inclusion criteria who got genioplasty done and gave their consent to be a part of this study were categorised according to the type of genioplasty they were having, as per the treatment plan of the orthodontist. Purposive non-probability sampling technique was used in categorisation. The procedure was explained in detail and possible outcomes were discussed. Queries of the patients were answered and coun-

selling was performed. Postoperatively they were assessed for neurosensory deficit and haematoma formation. The patients were categorised according to the type of genioplasty i.e. advancement genioplasty, setback genioplasty, rotation-and-advancement genioplasty, and reduction genioplasty.

Neurosensory deficit was assessed after one month. For the subjective assessment, visual analogue scale was used. For objective assessment, parameters such as two-point discrimination, contact detection, and nociception were used. Haematoma formation was assessed clinically on the 7<sup>th</sup> day.

Statistical analysis was performed by using Statistical Package for Social Sciences (version 23.0) (SPSS Inc., Chicago, IL, USA). Quantitative and qualitative variables were analysed. Quantitative variables were expressed as mean and SD, and qualitative variables were expressed as frequency and percentages. For qualitative variables like gender of the patients, postoperative haematoma formation, and postoperative neurosensory deficit, Chi-square test was used and for the comparison of quantitative variables, such as age of the patients, t-test was used. For the level of significance, p-value was used. A p-value of less than 0.05 was considered statistically significant.

### RESULTS

Total 38 patients (8 in setback category, 11 in advancement, 3 in reduction, and 16 in advancement with rotation category) having a mean age of 21 years were included in the study. Of these 38 patients, 13 were males and 25 were females (Table I).

On objective assessment, all patients were able to discriminate two points (minimum damage) in setback type and reduction type genioplasty procedures. While in advancement and advancement plus rotation type procedures, two patients showed medium levels of damage i.e. contact detection.

**Table I: Descriptive data.**

Parameters	Study parameter			
	Setback (n = 8)	Advancement (n = 11)	Reduction (n = 3)	Advancement with rotation (n = 16)
Quantitative variables				
Age	20.0 ± 3.11	20.82 ± 3.125	22.3 ± 2.51	21.69 ± 2.46
Qualitative variables				
Gender	Frequency			
Males	3 (7.9%)	4 (10.5%)	1 (2.6%)	5 (13.2%)
Females	5 (13.2%)	7 (18.4%)	2 (5.3%)	11 (28.9%)

**Table II: Comparison of neurosensory deficit and haematoma formation between different types of genioplasty.**

Parameters	Study parameter			
	Setback (n = 8)	Advancement (n = 11)	Reduction (n = 3)	Advancement with rotation (n = 16)
Neurosensory deficit (p-value: 0.494)				
Reduced sensation	2 (25 %)	2 (18 %)	0 (0%)	8 (50%)
Almost normal sensation	5 (62.5%)	7 (63 %)	2 (66%)	6 (37.5%)
Fully normal sensation	1 (8%)	2 (18%)	1 (33 %)	2 (12.5%)
Haematoma formation (p-value: 0.610)				
No haematoma	6 (75%)	5 (45%)	2 (66%)	6 (37.5%)
Haematoma	2 (25%)	6 (55%)	1 (33%)	10 (62.5%)

*p-value was calculated using the Chi-square test.*

In patients with setback genioplasty, 25% showed reduced sensation, 62.5% showed almost normal sensation, and 8% showed fully normal sensation one month after the surgery. While in advancement genioplasty category, 18% had reduced sensation, 63% had almost normal, and 18% had fully normal sensation. In reduction type genioplasty, 66% had almost normal sensation and 33% had fully normal sensation. In advancement with rotation genioplasty category, 50% had reduced sensation, 37.5% had almost normal sensation, and 12.5% had fully normal sensation (Table II).

Discussing about haematoma, after one week in the setback group, 75% patients had no haematoma and 25% had haematoma. In the advancement category, 45% had no haematoma and 55% had haematoma. In reduction genioplasty, 66% had no haematoma 34% had haematoma. In advancement with reduction category, 62.5% had haematoma and 37.5% had no haematoma (Table II).

## DISCUSSION

With an immense increase in awareness among the general population, aesthetic procedures are getting a prime importance as routine procedures performed by a maxillofacial surgeon.<sup>15</sup> Among these procedures, genioplasty is one of the easiest looking yet a challenging procedure.<sup>16</sup> Since it is an aesthetic procedure, it is hard to get the patients satisfied with the results, and if any complications occur they can cause a bad impact postoperatively.<sup>17</sup> To counter any such experience, it is always advisable to have a thorough knowledge of anatomy of the region and chances of complications. Patients should be counselled in detail preoperatively about the outcomes and complications to avoid any medicolegal implications.

Chin discrepancies can be well managed in a couple of ways, either by osteotomy of the bone and its movement in the desired plane by alloplastic grafts, especially in the case of retrogenia. Liao *et al.* in their systemic review assessed the efficacy of different types of implants and found relatable complications among all.<sup>18</sup> They found complication rates as high as 11.1% in HTR Polymer implants and as low as 3.4% in medpore implants. Parameters like allergic potential and cost-effectiveness were not considered in this study.

Danieletto-Zanna *et al.* reported a case of infected silicone implant and did a literature review.<sup>19</sup> Technique sensitivity and allergic potential were considered primarily along with complications, such as implant migration, extrusion, bone resorption, deposition, and infection. Cost-effectiveness is another major aspect, which is not studied well and is very important in the countries like Pakistan.

Schmidt *et al.* concluded autologous implants as the gold standard.<sup>20</sup> Even after extensive research and biotechnological development, no alloplastic material provides better outcomes than autografts.

If genioplasty is performed safely, there is a very low incidence of postoperative complications. The common complications involve sensory loss, haematoma formation, infection, chin ptosis, and necrosis of the bone. In a study by Baus *et al.*, infection and bone resorption were found as the most common complications.<sup>21</sup>

In another study by Khan *et al.*, the association between age, gender, and type of genioplasty was studied for complications such as neurosensory loss, infections, and haematoma as a group. However, these parameters were not considered individually.<sup>22</sup>

In the present study, the authors studied the relationship amongst the type of genioplasty with neurosensory loss and haematoma formation individually. Small sample size and absence of a placebo are two major shortcomings of this study. This study will hopefully provide a more clear association of both the factors individually, and will help the treating physician in more immaculate treatment planning and preoperative counselling.

## CONCLUSION

Among all the genioplasty techniques, advancement with rotation genioplasty carries more chances of neurosensory deficit and haematoma formation. This deficit is temporary in nature in most of the incidents and patients should be counselled beforehand about it. Similarly, haematoma formation can happen and can be managed by submental dressing but still, patients should be informed about it prior to the surgery.

### ETHICAL APPROVAL:

Ethical approval for this study was obtained from the Ethical Committee of the Armed Forces Institute of Dentistry, Rawalpindi, Pakistan (Ref no: 918/Trg, Dated: 13-May-2020).

### PATIENTS' CONSENT:

Informed consent was taken from the patients.

### COMPETING INTEREST:

The authors declared no conflict of interest.

### AUTHORS' CONTRIBUTION:

SAY: Conceptualised the study, interpreted the data, drafted and revised the manuscript.

SM: Conceptualised the study design, supervised the study, and critically analysed the study.

TM: Collected data and assisted in the procedures and conduction of the study.

AM: Critically reviewed the manuscript and analysed the work.

SU, RT: Collected data and conducted the study.

All authors approved the final version of the manuscript to be published.

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