Excessive gingival display: differences in diagnosis and management by periodontists and dermatologists in Saudi Arabia

Mansour Hamad Alaskar1* , Hani Saud Almoharib1, Fahad Saeed Alamri2, Fahad Ahmed Alshehri2, Naif Abdullah Alfuhaid2, Mani Abdullah lharbi3

ABSTRACT

Background: Excessive gingival display (EGD), commonly known as a “gummy smile,” is defined as overexposure of the maxillary gingiva (>3 mm) when smiling. The prevalence of EGD ranges from 10.5% to 29% of the population worldwide. Multiple factors contribute to EGD, including dental, skeletal, and muscular etiologies. Various treatments for EGD include both surgical and nonsurgical approaches.

Objectives: This study aimed to identify the similarities and differences in diagnosis and treatment strategies used by periodontists and dermatologists for EGD.

Methods: A cross-sectional study was carried out based on the results obtained using a digital survey. A questionnaire focusing on the study objectives was formulated using Google Docs and distributed to specialty practitioners via their institutional email accounts. The first section of the questionnaire collected socio-demographic information from the physician participants. The second section explored their familiarity with EGD, including the different clinical variables, diagnostic measures, and potential treatments. Statistical analysis was carried out using Fisher’s exact test.

Results: Fifty respondents (both male and female) representing various academic levels and institutions in Saudi Arabia participated in this study. Most of the participants from both specialties were familiar with EGD (p = 0.05); however, patient selection varied significantly based on the extent (in mm) of preoperative gingival display (p < 0.001). The participants also differed in their preferred approach to the management of EGD due to different causes.

Conclusion: The findings presented in this study revealed the strengths and limitations of the management strategies used by these specialists. Taken together, our findings demonstrated the importance of a shared training program and ongoing collaboration to optimize the treatment of EGD.

Keywords: Gummy smile, periodontist, dermatologist, esthetics, diagnosis, management.

Introduction

Esthetics has been a major concern among populations for many decades [1]. One’s perception of an appealing smile is a significant component of esthetic self-esteem and socialization [2]. Excessive gingival display (EGD), also known as a “gummy smile” is a common problem with a significant impact on one’s oral image and physical appearance. EGD is a developmental or acquired condition affecting the periodontium that results in the

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overexposure of the maxillary gingiva (>3 mm) during smiling [2-5]. The prevalence of EGD in the population ranges from 10.5% to 29% [6] and is both more prevalent and noticeable in women than men [7].

An appropriate diagnosis of EGD and determination of its etiology will be necessary in order to select the ideal treatment. However, it may be difficult to determine the etiology of EGD in a given patient because of the numerous factors that may be contributing simultaneously [3,4,8,9]. Etiological factors contributing to EGD have been divided into dental (e.g., altered passive eruption, short clinical crown, or dentoalveolar extrusion), gingival (e.g., gingival hyperplasia), skeletal (e.g., vertical maxillary excess), or muscular (e.g., short upper lip length, hyperactive lip activity) concerns [1,3,8,10]. Patients requesting treatment from dentists, periodontists, and dermatologists must undergo a thorough examination to determine the cause of this condition and identify procedures that have been effective in resolving them [11]. For example, if both clinical examination and radiographic imaging studies confirm the diagnosis of vertical maxillary excess, a LeFort I osteotomy is recommended. Other treatment modalities for EGD include orthodontia, osseous esthetic crown lengthening, gingivoplasty, and lip repositioning. However, all of these procedures are complicated, invasive, and irreversible [1,3,8,10]. Thus, some patients diagnosed with EGD would prefer nonsurgical approaches, including injections with botulinum toxin (Botox) or hyaluronic acid fillers. Botox injections have been identified as an effective treatment for EGD when performed by experienced practitioners [10].

Given the complex issues involved in the diagnosis and treatment of this esthetic condition, this study aimed to identify the similarities and differences between diagnostic and treatment strategies used by periodontists and dermatologists for EGD. A secondary goal was to establish a referral system that linked these two practice specialties within Saudi Arabia.

Methods

Study design

The project was designed as an observational, descriptive, cross-sectional study based on the results obtained from a digital survey. A questionnaire focusing on the study objectives was formulated using Google Docs and distributed to specialty practitioners via their institutional email accounts.

Study instrument

A self-designed survey with close-ended questions was designed for this study. The questionnaire was written in English and converted to an electronic format using Google Docs. The integrity of the questionnaire was preserved by maintaining the options and answering fields exactly as they would appear in paper format. The questionnaire was validated in a pilot study of several dermatologists and periodontists at King Saud University, which ensured the feasibility of the study before distributing the questionnaire to the participants.

The questionnaire was divided into two parts. The first section collected socio-demographic information from each participant, including gender, university of graduation, qualifications, and years of experience, as well as the nature of the worksite and region. The second part of the questionnaire focused on awareness of EGD by periodontists and dermatologists together with diagnostic measures and treatment approaches used by practitioners of these two specialties.

The inclusion criteria for this study were practicing periodontists and dermatologists in Saudi Arabia. All other medical and dental specialists and undergraduate students were excluded from consideration.

Sampling and sample size

The sample size was determined at an alpha level of significance 0.05 with an effect size of 0.6 and a power of 0.95. Estimates revealed that 50 respondents, including 25 from each group of specialty practitioners, would be sufficient for this study.

Statistical analysis

Statistical analysis was carried out using IBM Statistics 25. Descriptive statistics were used to evaluate the socio-demographic characteristics of the study participants. Fisher’s exact test was used to evaluate the survey responses. A p-value of <0.05 was considered statistically significant.

Results

Fifty physicians responded to our survey and participated in this study. Table 1 documents the demographic variables of the study respondents. Most of the respondents were male (56%). Interestingly, most of the study participants (72%) graduated from universities based in the Kingdom of Saudi Arabia, and 58% report Board certification as among their qualifications. More than half of the study participants (54%) were residents of the Central region of the country.

As shown in Table 2, most of the study participants (90%), including all periodontists (100%) and most dermatologists (80%), were aware of EGD as a concept (p = 0.05). The participants were then asked to provide information on their criteria for this diagnosis based on the patient’s preoperative gingival display as measured in mm. Overall, 40% of the participants (56% of periodontists and 24% of dermatologists) reported 3-6 mm of gingival display as the minimal diagnostic criterion for this condition. On the contrary, 34% of the participants (40% of the periodontists and 28% of the dermatologists) reported that they diagnosed this condition based on a gingival display of >6 mm, while 24% of the participants noted
that they did not know what criteria to use. Interestingly, only 2% of the participants reported 0-3 mm as the diagnostic criteria for patient selection \((p < 0.001)\).

The participants were then asked how they would treat patients diagnosed with EGD due to one of a variety of potential causes (Table 3). Fifty percent of the participants (88% of periodontists and 12% of dermatologists) reported a preference for esthetic osseous crown lengthening for EGD caused by altered passive eruption. However, 34% (0% of the periodontists and 68% of dermatologists) reported that they did not know how they would manage EGD under these circumstances \((p < 0.001)\). The participants were then asked how they would manage EGD resulting from hypermobility of the upper lip. In this case, 48% of the participants (40% of the periodontists and 56% of the dermatologists) reported a preference for Botox injections, while 26% (48% of periodontists and 4% of dermatologists) indicated a preference for a lip repositioning procedure. Twenty percent of the study participants (0% of the periodontists and 40% of dermatologists) stated that they did not know how they would manage EGD resulting from hypermobility of the upper lip \((p < 0.001)\). The participants were then asked how they would manage EGD resulting from vertical maxillary excess. In this case, 44% of the participants (80% of the periodontists and 8% of the dermatologists) noted a preference for a LeFort I osteotomy procedure, while 36% (0% of periodontists and 72% of dermatologists) reported that they did not know how they would manage EGD resulting from this cause \((p < 0.001)\). Finally, the participants were asked how they would manage EGD resulting from shortness of the upper lip. Thirty-six percent of the participants (4% of the periodontists and 36% of the dermatologists) reported that they did not know which type of Botox should be used to treat EGD. Forty-four percent of the participants (16% of the periodontists and 72% of

As shown in Table 4, 52% of the participants (80% of the periodontists and 24% of the dermatologists) reported that they did not know which type of Botox should be used to treat EGD. Forty-four percent of

<table>
<thead>
<tr>
<th>Variables</th>
<th>Responders n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
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<td>56</td>
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<tr>
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<td>44</td>
</tr>
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<td>50</td>
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<tr>
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<td>4</td>
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<td>Years of experience</td>
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<tr>
<td>0-5</td>
<td>17</td>
<td>34</td>
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<tr>
<td>6-10</td>
<td>23</td>
<td>46</td>
</tr>
<tr>
<td>11-15</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>16-20</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>More than 20</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Site of work</td>
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<td></td>
</tr>
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<td>28</td>
</tr>
<tr>
<td>Military hospital</td>
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<td>12</td>
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<tr>
<td>University hospital</td>
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<td>20</td>
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<td>Central</td>
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<tr>
<td>Southern</td>
<td>5</td>
<td>10</td>
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</table>

Table 2. Awareness of and criteria used to diagnose EGD.
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Table 3. Management of EGD based on etiology.

<table>
<thead>
<tr>
<th>Questions and choices</th>
<th>Respondents</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Periodontists</td>
<td>Dermatologists</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>No.</td>
</tr>
<tr>
<td>How would you manage EGD knowing that the cause is altered passive eruption</td>
<td>Esthetic osseous crown lengthening</td>
<td>22 (88%)</td>
</tr>
<tr>
<td></td>
<td>Botox</td>
<td>0 (0%)</td>
</tr>
<tr>
<td></td>
<td>Lip repositioning</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td>Injectable filler (hyaluronic acid)</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td>Gingivectomy</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td>I don’t know</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>No.</td>
<td>25 (100%)</td>
</tr>
<tr>
<td>How would you manage EGD knowing that the cause is hypermobility of the upper lip</td>
<td>Esthetic osseous crown lengthening</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td>Botox</td>
<td>10 (40%)</td>
</tr>
<tr>
<td></td>
<td>Lip repositioning</td>
<td>12 (48%)</td>
</tr>
<tr>
<td></td>
<td>Injectable filler (hyaluronic acid)</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td>Gingivectomy</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td>I don’t know</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>No.</td>
<td>25 (100%)</td>
</tr>
<tr>
<td>How would you manage EGD knowing that the cause is vertical maxillary excess</td>
<td>Esthetic osseous crown lengthening</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td>Botox</td>
<td>0 (0%)</td>
</tr>
<tr>
<td></td>
<td>Lip repositioning</td>
<td>3 (12%)</td>
</tr>
<tr>
<td></td>
<td>Le Fort I</td>
<td>20 (80%)</td>
</tr>
<tr>
<td></td>
<td>Gingivectomy</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td>I don’t know</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>No.</td>
<td>25 (100%)</td>
</tr>
<tr>
<td>How would you manage EGD knowing that the cause is shortness of the upper lip</td>
<td>Esthetic osseous crown lengthening</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td>Botox</td>
<td>4 (16%)</td>
</tr>
<tr>
<td></td>
<td>Lip repositioning</td>
<td>9 (36%)</td>
</tr>
<tr>
<td></td>
<td>Injectable filler (hyaluronic acid)</td>
<td>8 (32%)</td>
</tr>
<tr>
<td></td>
<td>Gingivectomy</td>
<td>2 (8%)</td>
</tr>
<tr>
<td></td>
<td>I don’t know</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>Total</td>
<td>No.</td>
<td>25 (100.0%)</td>
</tr>
</tbody>
</table>

Fisher’s exact test Sig. (2-sided).

the dermatologists) correctly identified Type A as the agent typically used for nonsurgical management of EGD (p < 0.001). Participants were also queried as to how long Botox might be effective after injection. Sixty-six percent of the study participants (80% of the periodontists and 52% of the dermatologists) indicated an effective period of 6-8 months, while 26% (8% of periodontists and 44% of dermatologists) reported 2-3 months (p < 0.05). Most of the participants (64% overall, 84% of periodontists and 44% of dermatologists) reported that permanent muscle weakness should be considered one of the complications of multiple Botox injections, while 36% reported that they did not believe this to be the case (p < 0.01).

Discussion

There are very few studies in the literature that consider the similarities and differences between periodontists and dermatologists with respect to the diagnosis and management of EGD. To the best of our knowledge, none of the studies that have been carried out included a cross-sectional design. Our study included 50 survey respondents, including 25 dermatologists and 25
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As noted in the results, our findings revealed that most of the study participants were aware of the term EGD and its multifactorial causes, as well as the accepted limit of a normal gingival display during smiling. This permits us to conclude that both the periodontists and dermatologists were capable of identifying patients with EGD. However, our findings revealed significant differences when participants were asked to describe their approaches to and management of EGD due to a variety of underlying causes. Most of the dermatologists who participated in this study were not aware of the appropriate management of EGD caused by altered passive eruption or vertical maxillary excess. This might be attributed to the fact that this condition requires surgical intervention. This finding suggests that dermatologists may need more training focused on the identification and management of EGD, particularly for those cases that need to be referred to a periodontist. Dermatologists and periodontists also reported significantly different approaches to the management of EGD caused by hypermobility or shortness of the upper lip. Collectively, these results suggest the need for an improved referral system that will facilitate communication between periodontists and dermatologists on these types of cases. On the contrary, 80% of the periodontists who participated in our study were not aware of the type of Botox that is typically used to treat EGD. Periodontists need to be trained on the use of Botox for the treatment of EGD, especially for patients who prefer nonsurgical treatment. Interestingly, more than half of the participants reported that the effectiveness of Botox injections lasted for 6-8 months; others noted that the effective period was limited to 2-3 months. A previous systematic review on this subject concluded that Botox typically remains effective for 30-32 weeks (i.e., 6-8 months) posttreatment [2]. Similarly, we obtained varied responses to the question regarding permanent muscle weakness as a complication of Botox injections. Of note, a recent systemic review reported that repeated injections of Botox could result in partial muscle atrophy and permanent muscle weakness even after the therapeutic effect had faded [10].

Among the limitations of our study, we focused on only two of the specialty practices that patients frequently encountered with EGD. We recognized that EGD was also treated by oral and maxillofacial surgeons and plastic surgeons. We also recognized the small sample size (N = 50 participants). These points might be addressed in a future study.

Taken together, our findings suggest that periodontists and dermatologists require additional training focused on the different approaches that might be used to manage EGD. This will ultimately result in maximum patient satisfaction with respect to both the treatment modality and its results.

**Conclusion**

Periodontists and dermatologists are frequently asked to evaluate and manage patients with potential

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**Table 4. Use of botulinum toxin to treat EGD.**

<table>
<thead>
<tr>
<th>Botox has eight types, what type is usually used for EGD</th>
<th>Responders</th>
<th>Dermatologists</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4 (16%)</td>
<td>18 (72%)</td>
<td>22 (44%)</td>
</tr>
<tr>
<td>B</td>
<td>0 (0%)</td>
<td>1 (4%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>E</td>
<td>1 (4%)</td>
<td>0 (0%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>I don’t know</td>
<td>20 (80%)</td>
<td>6 (24%)</td>
<td>26 (52%)</td>
</tr>
<tr>
<td>Total</td>
<td>25 (100%)</td>
<td>25 (100%)</td>
<td>50 (100%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How long is the effectiveness period for Botox injection</th>
<th>Responders</th>
<th>Dermatologists</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 month</td>
<td>1 (4%)</td>
<td>0 (0%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>2-3 months</td>
<td>2 (8%)</td>
<td>11 (44%)</td>
<td>13 (26%)</td>
</tr>
<tr>
<td>6-8 months</td>
<td>20 (80%)</td>
<td>13 (52%)</td>
<td>33 (66%)</td>
</tr>
<tr>
<td>I don’t know</td>
<td>2 (8%)</td>
<td>1 (4%)</td>
<td>3 (6%)</td>
</tr>
<tr>
<td>Total</td>
<td>25 (100%)</td>
<td>25 (100%)</td>
<td>50 (100%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Permanent muscle weakness is considered one of the complications of repeated doses of Botox injections</th>
<th>Responders</th>
<th>Dermatologists</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>21 (84%)</td>
<td>11 (44%)</td>
<td>32 (64%)</td>
</tr>
<tr>
<td>No</td>
<td>4 (16%)</td>
<td>14 (56%)</td>
<td>18 (36%)</td>
</tr>
<tr>
<td>Total</td>
<td>25 (100%)</td>
<td>25 (100%)</td>
<td>50 (100%)</td>
</tr>
</tbody>
</table>

*a Fisher’s exact test Sig. (2-sided).
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EGD. The results of this study revealed similarities and differences in the diagnosis and management of EGD and revealed the strengths and limitations of both specialties based on the nature and etiology of the problem. Due to the multifactorial nature of this aesthetic issue and the demand for more conservative approaches, we need to develop improved communication and referral systems between periodontists and dermatologists.

List of Abbreviations
Botox Botulinum toxin
EGD Excessive gingival display

Conflict of interests
The authors declare that there is no conflict of interest regarding the publication of this article.

Funding
None.

Consent to participate
Written consent was obtained from all the participants.

Ethical approval
Ethical approval of this study was provided by the Ethics Committee of King Saud University (No. E-21-6272), dated 29 September, 2021.

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References