

Facial Profile Changes With Extraction of Four First Premolars

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ABSTRACT

The objective is to know about the facial profile changes after the extraction of first four premolars through various studies. A well-balanced and harmonious soft-tissue profile is an important consideration in orthodontic diagnosis and treatment planning. Extraction of premolar teeth is often necessary to achieve treatment goals. This often changes the soft-tissue profile which can be enhancing, or in some instances, detrimental.

Key words: Premolars, Extraction, Teeth, Facial profile.

INTRODUCTION

For years, orthodontists have studied the soft tissue profile in patients treated orthodontically, seeking facial harmony, and the correct dental positioning. Premolar extractions generally result in some flattening of the face. This can be either advantageous or detrimental depending on the particular patient's profile. Other studies have attempted to quantify the relationship between the amount of incisor retraction and the subsequent amount of lip retraction¹⁻⁸.

Extraction of four first premolars among various racial groups

A study was done to compare and evaluate soft-tissue profile changes in Caucasian patients and African American patients treated with extraction of four first premolars. The selection criteria for that study was : Patients with Four first premolars extracted for orthodontic treatment. No congenitally missing teeth (excluding third molars).No functional appliance or surgical procedure used between the pre- and post-treatment lateral cephalometric radiographs.

Orthodontically treated utilizing pre-adjusted edgewise appliances. Clinical records were randomly examined and cases meeting the above stated criteria were utilized for the study.

RESULTS

It was found in both the Caucasian and the African American groups, the upper and lower lips became less protrusive as a result of treatment. The Caucasian sample displayed the greater decrease in protrusion of both upper and lower lips. The lips of the African American population have been found to be normally more protrusive than those of Caucasians⁹⁻¹³. Thicker lips and stronger tongues may be contributing factors in the differing lip changes found in the Caucasian and African American groups. Comparing treatment results in the Caucasian sample and the African American sample with defined normal values for soft tissue profile esthetics for each population demonstrated distinct differences between the two groups. The African American group was less likely to exhibit excessive lip flattening with treatment.

Upper and lower lips of both Caucasians and African Americans became less protrusive with four premolar extraction treatment. Caucasians displayed a greater amount of reduction of lip protrusion than the African Americans, shown to be significant in the mean changes of A-E line, Ls-E line, Li-E line, B-E line, Li-S line, Li- H line, and LL-Sn-Pog plane. The nasolabial angle increased in both Caucasians and African Americans with treatment. No significance in the mean change was exhibited in either group. The labiomental angle exhibited great variability in response to treatment in both the Caucasian and African American patient. Change in upper lip length was shown to be significant between the two groups with Caucasians exhibiting a mean decrease and African Americans demonstrating a mean increase. Twenty-seven and one-half percent of Caucasian patients could be defined as excessively flat after treatment. Twelve and one-half percent of African American patients could be defined as excessively flat after treatment.

Extraction of four first premolars in class I minimally crowded patients

When arch length discrepancy ranges from 5 to 9 mm, such cases are considered borderline for extraction treatment. Then when crowding becomes 10 mm or more, extractions are almost always required. Tweed became one of the strongest advocates for extractions. The most frequently used extraction pattern to treat crowding is four first premolars. The non-extraction treatment was seen to have little effect on profile, whereas extractions were seen as beneficial to the profile in cases that exhibited greater initial protrusion. Ricketts believed that the ideal adult lower lip should be located 4 mm behind the E-plane \pm 3 mm¹⁴

Many of the extraction studies have used Rickett's E-plane to evaluate the amount of profile change that occurs during treatment. In a study conducted by Kocadereli after the extraction of four first premolars, the average retraction of the upper lip and lower lip for the extraction group with respect to the E-plane was 1.0 mm and 1.1 mm respectively²¹. The maxillary and mandibular incisors showed significant retroclination in the extracted patients.

Another study conducted by Drobocky and Smith showed the following results. Mean changes following the extraction treatment were retraction of the upper and lower lips behind the E line of -3.4 mm and -3.6 mm respectively, and an increase in the nasolabial angle of 5.2 degrees. Also, 80 to 90% of the patients had soft tissue measurements that indicated the profile either improved or remained satisfactory throughout treatment²².

Relation of Incisor Position to Lip Position

The lips and soft tissues surrounding the oral cavity play a significant role in facial esthetics. The soft tissues surrounding the mouth are in close proximity to the dentition. Riedel found that the changes in the soft tissue profile correlated well with changes in the skeletal profile¹⁵. Bloom conducted a study to evaluate the relationship between the changes to incisor position and resulting soft tissue changes¹⁶. The incisor and lip positions showed a strong linear relationship. While the upper lip was shown to follow the movement of the upper incisors ($r=.87$), there was an even stronger correlation between the lower lip and the lower incisors ($r=.93$).

Hanson completed a thesis at Saint Louis University, where she looked at different extraction patterns and the resulting dental and soft tissue changes. She reported relatively good correlations between incisor movement and lip position. The ratio for the upper incisor to upper lip was 2:1 ($r=.71$) and the lower incisor to lower lip was 1.3:1 ($r=.73$). Burstone stated that if a redundancy of lip tissue exists, most likely the tissue will not fall back following retrusion of the teeth¹⁷.

Oliver also demonstrated in his study of 40 Caucasian patients with a Class II, Division 1 malocclusion that lip thickness affects the correlation between incisor retraction and subsequent soft tissue response. He found that there was a high correlation for patients with thin lips or with high lip strain, but that there was a weak correlation for patients with thick lips or low lip strain¹⁸.

Neger showed cases where the dentoskeletal changes were significant, but net change in soft tissue profile was rather slight. He

also showed cases where the profile improved significantly following retraction of teeth, so he saw variable results in different cases¹⁹. Wylie evaluated cases that Tweed had treated and made the argument that it wasn't the angulation or position of the lower incisor that improved the facial profile in his cases. Rather, he claimed that it was primarily mandibular growth that should be credited for the improvement in facial profile²⁰.

Overall, there appears to be some degree of relationship between changes in incisor position and resulting changes in the soft tissues. However, the strength of this correlation appears to differ among individuals.

CONCLUSION

Extractions are often times performed to alleviate crowding and to correct anterior-posterior discrepancies of the occlusion. They are also performed to decrease or limit protrusion of the lips and dentition. There is generally some flattening of the facial profile following extraction treatment. This can either be beneficial or detrimental to the patient's profile depending on the case.

While there have been other studies that have evaluated the soft tissue profile changes following extraction treatment, few studies have attempted to control for the amount of crowding or the initial anterior- posterior relationship of the occlusion. This investigation seeks to evaluate the soft tissue profile changes that occur for Class I patients with minimal crowding that undergo orthodontic treatment that includes extraction of four first premolars.

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