Facial development with the Homeoblock™ Appliance, in conjunction with the placement of porcelain laminate veneers: a case study

Theodore R. Belfor presents a case study using the Homeoblock™ Appliance

Case report

A healthy 41-year-old male presented for treatment and expressed a desire for smile enhancement. His chief complaint was that his teeth were discoloured and that his upper lip was too thin and flat and combined with deep facial lines made him look old. The oral hygiene status was good and there was no active gingival or periodontal disease. Extra-oral and intra-oral photos and stereophotogrammic photos (Figure 1) as well as cephlometric and panorex x-rays were taken followed by alginate impressions.

An upper Homeoblock™ removable functional device was fabricated. The device consists of adams clasps on the second bicuspids, a palatal expansion screw and a Hawley labial bow from cuspid to cuspid, flap springs in contact with the incisors and bicuspids, and a unilateral bite block.

On insertion, the patient was instructed to wear the appliance every evening and throughout the night. Once a week the expansion screw was advanced one full turn

3 (=0.25 mm) the patient reported for clinical adjustments and observation every three weeks; intraoral photos were taken at each visit (Figure 2).

There was palatal expansion after six months treatment with the Homeoblock™ appliance.

Porcelain laminate veneers were placed from second bicuspid to second bicuspid and facial photos were taken. Post treatment photos show a bigger and brighter smile more prominent cheekbones with reductions in the lines of the face (Figure 3). Stereophotogramic images show a fuller upper lip in the post photo (Figure 4) .To evaluate the facial changes the surface colour and texture are removed (Figure 5). To confirm the changes that have taken place a morphometric analysis was carried out by super imposing the post face photo over the pre face photo in 3D space, using the software provided by (3dMD) and a histogram (Figure 6) we can measure the size change in millimeters.

The red end of the scale shows the most positive distances (i.e., those where the post surface is in front of the pre surface); green, the most negative (i.e., those where the post surface is behind the pre surface).

Value: the minimum and maximum distances in the histogram.

Mean: the sined average of the distance measurements.

RMS: the Root Mean Square of the distance measurements.

StdDev: the Standard Deviation (square root of the variance) of the distance measurements.

Data Elems: the number of valid distance measurements.

Cumulative percentage: the accumulated percentage of valid vertices at particular points in the range.

Range percentage: the percentage of the histogram range currently selected.

Abstract

The US market for prosthetics, orthodontics and cosmetic enhancement products is expected to increase from $6.8 billion in 2005 to $10.8 billion in 2010, at an AAGR (average annual growth rate) of 9.9% (Market Research Reports). This growing market presents opportunity that a general dentist cannot ignore. It has been demonstrated that soft tissue facial changes are associated with semi-rapid palatal expansion in adults using the Homeoblock™ functional appliance (OrthoSmile Inc, Catskill,NY). These changes include: an increase in size across the maxillofacial region, a shape change in the zygomatic region bilaterally and an increase in facial symmetry. Singh et al, 2004 also increased symmetry of the eyes and the upper lip and a reduction of the nasolabial fold (Belfor and Singh, 2004). It is the purpose of this article to demonstrate that increased facial volume (size change) in the maxillofacial regions after palatal expansion with the Homeoblock™ intra-oral appliance produces descernable aesthetic enhancement and in combination with porcelain laminate veneers can be a treatment of choice to maximise the dental cosmetic procedure.

A 3dMD/Kodak facial capture system and stereo photogrammetry were used to generate a clinically accurate digital model of the patient's facial surface. It uses a technique of stereo-triangulation to identify external surface features viewed from at least two cameras. This approach incorporates projecting a unique, random light pattern that is used as the foundation for triangulating the geometry in 3D. The capture takes less than two milliseconds per frame. The data are processed creating a highly precise (<0.5-mm RMS, root mean squared of the distance measured), digital model of the patient that is ready for immediate clinical use. Stereophotogrammetry for quantifying facial morphology was introduced in the Journal of Dentistry in 1996 (Ras et al 1996). It was concluded that 'stereo photogrammetry is a suitable 3D registration method for quantifying and detecting development changes in facial morphology'.

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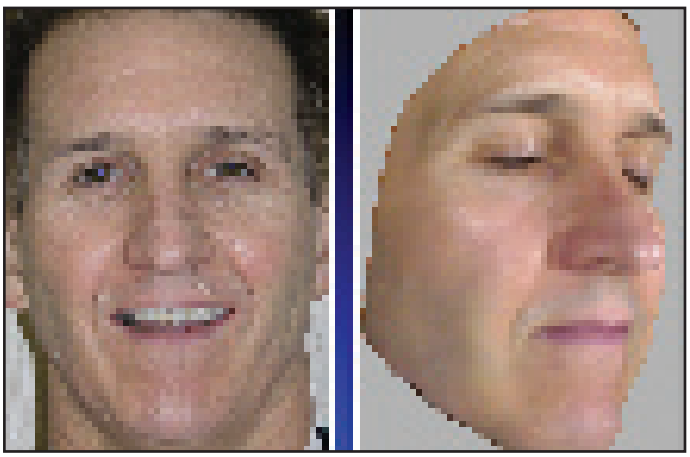

Figure 1: 2D and 3D facial photos

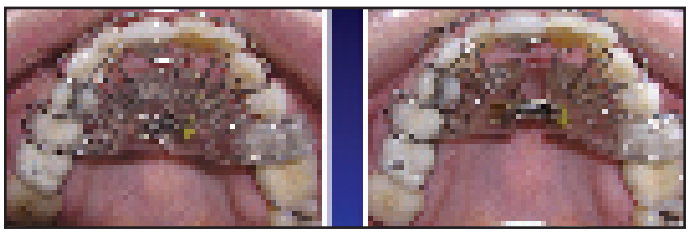

Figure 2: Intraoral photos show palatal expansion after six months with the Homeoblock™ appliance.

Figure 3: Before and after treatment photos

Figure 4: Before and after Homeoblock™ treatment and prior to placement of porcelain laminate veneers

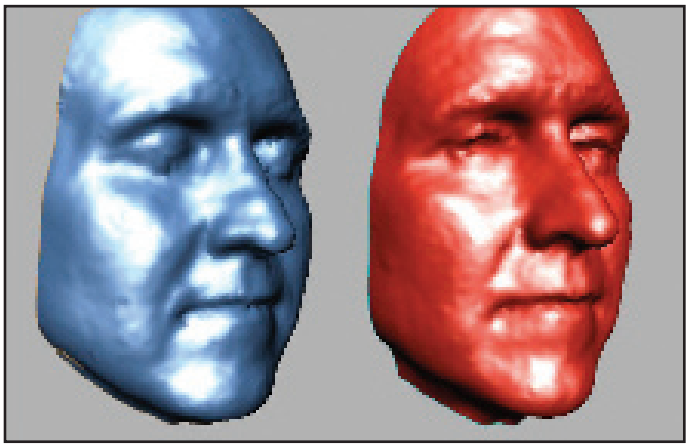

Figure 5: Pre and post 3D facial photos with the surface texture removed.

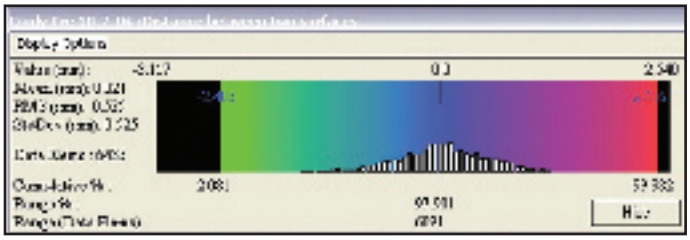

Figure 6: The distance between two surfaces histogram

Range (Data Elems): the number of valid distance measurements in the currently selected histogram range.

Morphometric analysis shows up to 2mm increase in size in those areas that are indicated by a red to purple colour (Figure 7).

Results

Clinically it was evident that changes occurred not only in the dental arch but also on the face (Figures 3, 4, 5, 7). The changes include more prominent cheekbones with a reduction of the naso-labial depression, a wider smile and a fuller upper lip. The placement of the porcelain laminate veneers resulted in better teeth colour. The total effect, which satisfied the patients chief complaints, could not be achieved without the facial development from the Homeoblock™ appliance.

Discussion

It has been observed that the bony elements of the midface change dramatically with age and, coupled with soft-tissue changes such as the loss of fatty tissue, lead to the appearance of the aged face. These changes are associated with a loss of facial volume (Shaw and Kahn, 2007). Since we have demonstrated that we can enhance facial volume using the Homeoblock™ appliance for palatal expansion (Belfor 2006), we postulate that the Homeoblock™ appliance can reduce some of the lines, depressions and wrinkles of the face. Although the Homeoblock appliance is a palatal expansion device for adults it is unlikely that the semi-rapid expansion with the Homeoblock™ deploys the same physiologic mechanism as more traditional expanders such as the Hyrax or Haas appliances. Since the Homeoblock™ is worn only at night it is likely that the appliance induces a phenomenon more in line with the functional matrix hypothesis (Moss 1997). The development of the hypothesis took a decade of study of the roles of intrinsic (genomic) and extrinsic (epigenetic) factors in cephalic growth. The functional matrix hypothesis stresses epigenetic primacy. Simply put, external forces (epigenetic) are more significant in the size, shape, (e.g.,form) and location of the maxilla than genetic influence. The unilateral bite block of the Homeoblock™ appliance provides strain on the periostium at the mid-palatal suture combined with the widening of the suture results in a cascade of events.

'A mechanical signal is picked up by receptors around the teeth and around the bone. The mechanical signal is transformed into an electrical and chemical response that travels in the bone to the nucleus of a bone cell. The signal passes through the membrane of the nucleus to the genome via 'signal transduction' stimulating the expression of redundant genes or DNA alleles through gene expression via mRNA transcription. Despite the fact that most osteogenic activity is observed during early to late childhood, it is now understood that palatal, maxillary, and circum-maxillary sutures retain biosynthetic potential into late adulthood (Kokich 1988), and it is possible that mechanical stimuli activate genes that are not typically expressed during normal development (Mao and Nah 2004). This process initiates osteoblast and osteoclast activity.

The Homeoblock device is thought to evoke enhanced symmetrical dentofacial development that is genetically encoded for each individual (Belfor and Singh, 2004, 2005). For more information see www.facialdevelopment.com

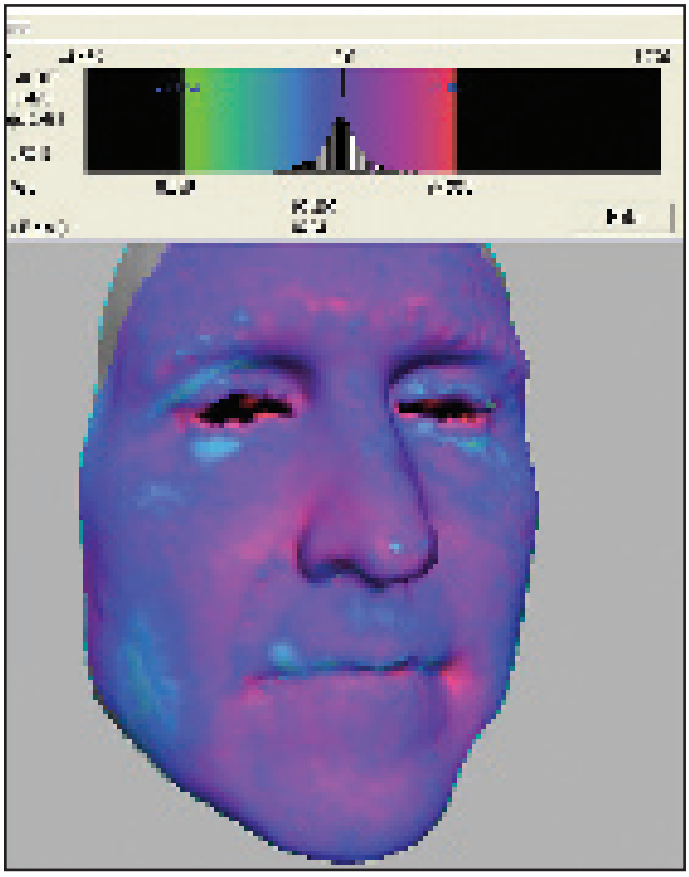

Figure 7: Morphometric analysis using a histogram

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