REVIEW ARTICLE

CONTENTS

Orthofacial harmonisation of dental patients' faces: A review of research

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ABSTRACT

Aim: To conduct an analytical review of modern scientific publications and research on the development of new directions of interdisciplinary approaches to the problems of orthofascial harmonization of the face.

Materials and Methods: Analytical-synthetic theoretical methods of analysis of scientific research and registers of professional associations were used. The results of analysis were synthesized and interpreted in the conclusions. Information sources and time frame. Searches were run in PubMed/MEDLINE, Scopus, Web of Science Core Collection, SciELO and LILACS; official registers of professional bodies were consulted for normative documents (Conselho Federal de Odontologia; Ordem dos Médicos Dentistas). Coverage: 1 January 2000 to 1 September 2025 (last search: 1 September 2025).

Conclusions: Orthofacial harmonisation is a promising direction that integrates minimally invasive cosmetic procedures into dentistry. Interest in orthofacial harmonization is driven by increasing patient demand. The advantages lie in the comprehensive restoration of the functionality and aesthetics of organs of the maxillofacial region, in the minimisation of the risks of medical interventions, and in socio-psychological comfort in the interaction between doctor and patient. The prospects for the development of orthofacial harmonisation include: conducting clinical trials, the validation of a scale for assessing the results of the application of orthofacial harmonization, improvement of ethical-legal foundations of physicians' activity, standardization of educational-professional training programs for specialists, and the unification of medical protocols on orthofacial harmonization.

KEY WORDS: interdisciplinary approach, rehabilitation, dentofacial esthetics, facial cosmetic procedures, dentistry

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INTRODUCTION

At the present stage of the development of dentistry, traditional treatment is combined with innovative aesthetic techniques. Under the influence of social networks, dental patients have become more exacting with regard to treatment outcomes; the demand is growing for a holistic approach to the harmonisation of the smile and of the face as a whole. Today, an aesthetic smile is far from being only the beautiful shape of the teeth; it is also the harmonious proportions and functionality of the facial complex. Dentists are compelled to expand their professional functionality: aesthetic procedures are now becoming an integral part of dental treatment planning in the restoration of teeth or in the enhancement of clinical outcomes.

The complex of technologies aimed at restoring the balance between the hard and soft tissues of the organs of the maxillofacial region is outlined by the term orthofacial (orofacial) harmonisation. In contrast to classical orthodontic treatment, whose principal goal is the alignment of the dental arches, the concept of orthofacial harmonisation is oriented towards the aesthetics of the entire face. Orthofacial harmonisation envisages the correction of the nasolabial folds, lips, chin, zygomatic areas and the contours of the middle and lower thirds of the face.

The synergy of dental and cosmetological interventions for achieving a balanced and attractive appearance of patients is developing dynamically in Brazil and the USA, where orthofacial harmonisation has been recognised as a distinct speciality for dentists. The legal precedent for the clinical practice of orthofacial harmonisation in dental treatment facilities is enshrined in the document "Reconhece a Harmonização Orofacial como especialidade odontológica № 198/201" [1]. Thus, the legal status has been consolidated for the use by dentists in Brazil of botulinum toxin injections, fillers and other cosmetic procedures.

The concept of orthofacial harmonisation is gaining in popularity, which in practical terms reflects the growing interest in rapid, non-surgical methods: for example, since 2000 a 144% increase in minimally

invasive aesthetic procedures has been recorded [2]. Among the principal factors of the heightened demand for orthofacial harmonisation we shall cite the peremptory ones: (1) the formation of new aesthetic canons of proportion in social networks and a reduction of the stigma regarding aesthetic interventions; (2) the mass imitation of the appearance of stars of show business, the modelling industry, politics and others; (3) public recognition of the aesthetic appearance as a characteristic of health and an individual's resources. Taken together, these factors indicate that the problem of orthofacial harmonisation goes beyond a fashion trend and is acquiring the features of a stable clinical subsystem with its own standards and boundaries of competence.

Ethical, legal and educational aspects remain critical for the sustainable development of the sphere of orthofacial harmonisation: sources on legal issues record gaps in training, competence boundaries and the readiness of dentists to manage complications, which requires the standardisation of training, the unification of informed consent and the specification of communication practices with patients and the public reporting of results.

The demand for services that combine aesthetics with functionality highlights scientific research into the interdisciplinary problem of orthofacial harmonisation. At the same time, team interaction among different specialists–dentists, maxillofacial and plastic surgeons, dermatologists–appears as a necessary condition for a safe trajectory in complex clinical cases and for improving the quality of care.

AIM

To conduct an analytical review of modern scientific publications and research on the development of new directions of interdisciplinary approaches to the problems of orthofascial harmonization of the face.

MATERIALS AND METHODS

Design and reporting. Narrative review with systematic-search elements, reported with reference to PRISMA and PRISMA-S positions (protocol not registered, as this is a non-interventional review).

Information sources and time frame. Searches were run in PubMed/MEDLINE, Scopus, Web of Science Core Collection, SciELO and LILACS; official registers of professional bodies were consulted for normative documents (Conselho Federal de Odontologia; Ordem dos Médicos Dentistas). Coverage: 1 January 2000 to 1 September 2025 (last search: 1 September 2025). Reference lists of included papers were hand-searched.

Search strategy and keywords. Controlled vocabulary and free-text terms were combined with Boolean operators and spelling variants. Core string for PubMed/MEDLINE: («orofacial harmonization» or «orofacial harmonization» or «orthofacial harmonization» or «facial harmonization» or «facial harmonisation) and (dentistry or dental or odontolog) and ((«botulinum toxin» or BoNT-A) or «hyaluronic acid» or «filler» or «digital smile design» or «PDO thread» or «biostimulator» or «collagen»). For Scopus/Web of Science the same terms were searched in Title/Abstract/Keywords; for SciELO/LILACS Portuguese/Spanish synonyms were added: «harmonização orofacial», «harmonización orofacial». Database filters (document type, year limits) were applied where supported.

Eligibility criteria. Population/Context: dental patients or dental/odontology settings, including interdisciplinary teams (dentists, orthodontists, prosthodontists, maxillofacial and plastic surgeons, dermatologists). Concept/Interventions: orofacial/orthofacial/facial harmonisation procedures relevant to dental practice (hyaluronic-acid fillers, botulinum toxin type A, collagen biostimulators, PDO threads, digital smile design and other digital planning tools), plus legal/ethical frameworks regulating their use by dentists. Study types: peer-reviewed clinical trials, observational studies, case series/case reports with explicit methods and outcomes; systematic, narrative or integrative reviews; doctoral theses from accredited repositories when providing unique data on ethics/legislation or outcomes; official regulations/standards of professional bodies. Language: English, Portuguese, Spanish, Ukrainian. Exclusion: non-medical blogs, promotional/training materials without methods or data; purely dermatological/cosmetology reports with no dental relevance; letters/comments without primary data. No restriction by direction of results was applied to avoid positivity bias.

SELECTION PROCESS AND DATA ITEMS

Two reviewers independently screened titles/abstracts and full texts; disagreements were resolved by discussion. Extracted items: study design, population, intervention(s), outcomes (aesthetic/satisfaction scales, morphometric changes, safety/complications), digital-planning use, and–where applicable–ethical-legal scope and training requirements. Due to clinical and methodological heterogeneity, findings were synthesised narratively without meta-analysis.

Study yield. The final sample comprised 30 sources (see References).

LIMITATIONS

Heterogeneity of designs and outcomes precluded quantitative pooling; inclusion of grey literature (theses, regulations) was necessary given the emerging status of the field; language limited to four languages; database indexing differences (especially in LILACS/SciELO) mean that some non-indexed works may have been missed.

REVIEW AND DISCUSSION

The analysis of research and publications showed that orthofacial harmonisation is taking shape as a new line of scientific inquiry and as a distinct, interdisciplinary subsystem of modern dentistry, within which aesthetic minimally invasive interventions are integrated with orthodontic, prosthetic and surgical approaches to achieve holistic facial symmetry and proportion. The practice of orthofacial harmonisation has been implemented in the specialisation of dentists.

Orthofacial harmonisation is a modern interdisciplinary field of medicine that combines aesthetic and functional dental interventions to improve facial symmetry, contour and appearance. Its historical prerequisites were laid by the German artist A. Dürer in 1528 in his treatise «Vier Bücher von Menschlicher Proportion» («Four Books on the Proportions of the Human Body»), where modular ratios and geometric constructions were described for the body and the head with facial coordinate grids [3]. A. Dürer's canons of beauty became the "framework" for subsequent clinical rules: the equality of vertical thirds (forehead–nose–chin), the correspondences between the intercanthal distance and the palpebral fissure, and so on, which became the technical basis for further anatomic–anthropometric analysis of the face in the European tradition; in contemporary digital planning these canons are used as a starting model which is then individualised to the patient's specific morphological data [4]. Sociocultural determinants such as demographic ageing and the "pro-ageing" paradigm, the post-pandemic «Zoom effect», and the cults of social networks and AR filters are forming new standards of proportion and lowering the stigma with regard to aesthetic interventions. However, A. Dürer's canons are used in diagnostics and communication with patients [5].

To date, the integration of dentistry and cosmetology has been legally enshrined in a number of states. For example, in Brazil dentists, as early as 1966, under national legislation, were entitled to perform limited «extra-oral» aesthetic procedures, H.M. Alharkan (2024) [6]. In 2011, however, Resolution CFO-112/2011 restricted dentists' use of hyaluronic acid injections and botulinum toxin [7]. In 2016 Resolution CFO-176/2016 rescinded the earlier acts and permitted the use of botulinum toxin and dermal fillers within dental procedures [8]. In 2019 the dental council recognised "Orofacial Harmonization" as a distinct specialisation in dentistry and outlined the professional requirements for a dentist with the new specialisation [1].

In Portugal it is legally established that rejuvenation of the perioral area belongs to the professional sphere of the dentist, and the concept of «facial harmonization» has been included in the inventory of skills of a dental practitioner [9]. The interdisciplinary approach to facial harmonisation initiated in Brazil and Portugal is rapidly gaining popularity in different countries of the world as the concept of orofacial harmonisation [10].

The publication by R. Tran Cao (2020) reports that in the USA the integration of dentistry with aesthetic medicine is denoted in the scientific literature by the term «facial esthetics/aesthetic dentistry»: injections of botulinum toxin and dermal fillers are regarded as a logical extension of aesthetic dental practice provided that the state's legal regulation is complied with and the procedures are performed by licensed clinicians. It is emphasised that legal access and the qualification requirements for the doctor vary between states and continue to evolve, Tran Cao (Dent Clin North Am, 2020) [11]. Researchers S. Davison et al. (2019) note that the expansion of cosmetic interventions in dentistry necessitates the development of a single federal standard for specialist training and the elaboration of safety protocols [12].

In the context of clinical verification of aesthetic reference points it is appropriate to cite the results of the study by A. Yakushenko et al. (2019), in which, on a sample of 40 female patients aged 20–25 years with Angle Class I occlusion, macro-, mini- and micro-analysis of the face was performed using a photometric method applying the «1/5» rule; it was found that this classical rule held true in only 15% of cases, the parallelism of the key horizontals (inter-pupillary, supra-ciliary, commissural) was recorded in 65%, overall symmetry in 70%, with exposure of the incisal edge of the upper incisors within 2–3 mm observed in 50%, a «harmonious smile» (when the upper arch follows the contour of the lower lip) in 35%, and a wide buccal corridor, indicative of narrowing of the dental arch in the premolar area, in 75%. The presented empirical results underscore the variability of aesthetic parameters and substantiate the need for individualised planning of orofacial harmonisation during the rehabilitation of dental patients [13].

The problematics of orofacial harmonisation of the face today are developing at the interface of distinct specialities: dentists, orthodontists, prosthodontists, maxillofacial surgeons, dermatologists and cosme-

tologists pool their knowledge to adjust the shape of the dental arches, the position of the jaws, the volume of the soft tissues and the features of the skin. Orofacial harmonisation includes various minimally invasive procedures: injections of botulinum toxin to reduce muscular activity, fillers based on hyaluronic acid, collagen biostimulators, polydioxanone threads, surgical liposuction of the chin, bichectomy (removal of Bichat's fat pads), non-surgical rhinoplasty, and others. Accordingly, the interdisciplinary approach encompasses prosthetics, orthognathic methods, the use of hyaluronic-acid (HA) fillers, botulinum toxin type A (BoNTA), digital technologies for smile planning, and the assessment of psychosocial outcomes.

Analysis of the source base of the research showed that orofacial harmonisation of the face is a relatively new area of scientific inquiry; therefore, full doctoral studies are still sporadic. Among them, the dissertation by L. Rodrigues (2021) is of scientific value; it focuses on legal and ethical aspects and demonstrates a low level of preparedness of dentists to eliminate complications [14].

In the doctoral study by B. Ferreira Silva (2022) the «medicalization» of beauty is explored through the prism of Michel Foucault; the author points to the risk of losing the individuality of human appearance due to counter-narratives on social media. The researcher demonstrates the influence of the commercialisation of aesthetics on medical ethics and identifies organisational measures needed for the legitimisation of the new specialisation. B. Ferreira Silva indicates that some training courses are more business-oriented than evidence-based, and therefore it is important to introduce regulatory mechanisms and educational standards. B. Ferreira Silva compares harmonisation with mass production, which gives rise to standardised faces, and therefore demands the development of ethical norms and a more considered attitude to procedures [15].

Defining the limits of professional competence is a key aspect of the dissertation by L. Rodrigues (2021), where it is shown that Brazilian dentists recognise their competence in administering botulinum toxin and performing bichectomy, but are sceptical about carrying out nasal remodelling and more complex plastic interventions; in the event of necrosis more than 72% of doctors would transfer the patient to a doctor of another speciality. This indicates the need for a clear delineation of responsibility between dentists, dermatologists and plastic surgeons [14].

The review by J. Pereira et al. (2024) summarises the outcomes of clinical cases using hyaluronic acid and botulinum toxin to correct Class III prognathism, scars after cheiloplasty, chin deformities and infraorbital defects: in all cases improvements in aesthetics and in patient satisfaction were observed without serious complications. In patients with prognathism an increase in premaxillary volume and improved nasal projection were noted, and in patients with post-cheiloplasty scarring, satisfaction on a visual analogue scale amounted to 8 points out of 10 [16].

Patients with congenital or acquired deformities often experience psychological difficulties associated with body image, self-esteem and social interaction. Successful harmonisation can improve social integration, reduce the fear of smiling and contribute to overall well-being. However, doctors must recognise that aesthetic correction does not resolve all psychological problems; psychotherapeutic support is sometimes necessary to adapt to changes. Of interest are the social studies by D. Fangueiro (2023), which evaluated the outcomes of aesthetic rehabilitation of patients after orthodontic treatment. Injections of hyaluronic acid into the middle third of the face were administered to 18 patients with a unilateral complete cleft lip and palate. The results of assessment by non-professionals indicated improved attractiveness, whereas orthodontists did not note significant changes [17].

Objective measurement of the results of harmonisation requires validated instruments. The Brazilian adaptation of the FACE-Q Satisfaction with Facial Appearance Overall Scale (FACE-Q SFAOS) was tested on 25 specialists in harmonisation; its internal consistency was high ($\alpha = 0.927$) and acceptability good. Specialists with more than two years' experience and those who apply lip fillers rated the scale higher than beginners. The use of such questionnaires makes it possible to align objective indices (shape, symmetry, proportions) with subjective satisfaction, which helps to adjust the protocol.

In more complex clinical cases dentists usually prefer manually created digital smile designs, whereas in symmetrical or less complex cases the share of choices in favour of AI-generated options increases, particularly among non-professionals; however, overall the preference still lies with manual designs [18].

Digital technologies have radically changed the approach to the analysis and modelling of the smile. The Digital Smile Design (DSD) system, developed by F. Reviansyah et al. (2025), has become a key tool in dentistry. Specialists in orofacial harmonisation actively use programmes (Adobe Photoshop, Smile Designer Pro, Planmeca Romexis Smile Design, VisagiSMile, etc.) that make it possible to combine 2D photographs with 3D digital impressions to plan the individual proportions of the face. The patient can see the result before the start of treatment, which allows the creation of smile

templates and the consideration of the anatomical parameters and aesthetic preferences of the specific person [19].

The study by G. Ceylan et al. (2023) compared designs created by professional dentists with designs generated by AI in the Smile Designer programme. Four clinical cases with symmetrical and asymmetrical features were analysed; 628 participants (dentists, students and others) evaluated the options using online questionnaires. The results showed that dentists preferred manually created designs in three of the four cases, whereas students and laypersons demonstrated a higher preference for AI-generated variants; women and orthodontists more often tended towards AI designs when assessing the third case, in which there were symmetrical features. The researchers concluded that AI may be useful for rapid generation of smile options, especially in symmetrical cases, but manual planning is more appropriate when proportions are complex [18].

A systematic review by F. Reviansyah et al. (2025) analysed 12 randomised and experimental studies to compare Digital Smile Design with traditional planning methods. The authors concluded that DSD improves aesthetics, saves time, ensures environmental friendliness by dispensing with plaster models, silicone impressions and hydrocolloid materials, and increases convenience for patients [19].

Methodological studies also reveal the standards of aesthetic proportions that are embedded in digital programmes. The ideal width of the central incisor is approximately 75–80% of its length; the occlusal plane should be parallel to the smile line of the lower lip; the dental midline should coincide with the facial midline and be perpendicular to the inter-pupillary line. The recommended ratio of contact points between the incisors–50:40:30–moves apically from the centre towards the canine, forming a natural gradation of the interdental space. These parameters, embedded in DSD software, help dentists to create a smile that harmoniously fits the face and minimises the need for invasive preparation [19].

The COVID-19 pandemic accelerated the development of telemedicine in dentistry. Platforms that allow patients to upload photographs and videos have become widely used for preliminary analysis. For example, the service odontoangela.com makes it possible to assess the upper, middle and lower thirds of the face using photographs sent by the patient, and to gather information about their expectations and psychological state [20]. Specialists receive materials prior to an in-person consultation, which helps quickly to determine the need for orthodontic treatment, fillers or surgery. The study by A. Herrera (2023) emphasises that digital consultations significantly reduce time in the clinic, allow the maintenance of contact with the patient and improve adherence to recommendations [20]. Telemedicine is particularly useful for patients with somatic deformities who live in remote areas or have limited mobility.

An integrative review by J. Borges (2022) showed that the most common preparations for facial correction remain hyaluronic-acid-based fillers (HA) and botulinum toxin type A (BoNT-A). Hyaluronic acid, a natural component of the extracellular matrix, attracts water, stimulates collagen synthesis and provides volume, which makes it suitable for the correction of the lips, nasolabial folds, nose, chin and the upper part of the face [21].

Botulinum toxin type A acts by blocking the release of acetylcholine at the neuromuscular synapse, which leads to relaxation of hyperactive muscles. In orofacial practice it is used to correct wrinkles and asymmetries, to treat bruxism and myofascial pain. A narrative review by T. Gutierre et al. (2023) emphasises that BoNT-A effectively reduces the tone of the masticatory muscles and decreases the load on the teeth in patients with bruxism; the agent also helps in temporomandibular dysfunction and migraine. However, the success of the procedure depends on precise dosing and on the professionalism of the doctor [22].

The necessity of careful dosing, appropriate intervals and radiological monitoring when incorporating BoNT-A into OFH protocols is emphasised in the Journal of Oral Rehabilitation [23]. In addition, the results of studies of partial loss of vision after injections of hyaluronic-acid products demonstrate the need to develop clear requirements for safety protocols, training and informed consent in OFH [24]. A publication in the journal Drugs recommends considering BoNT-A as a "last-line" treatment, which is important for prudent use of aesthetic injections in dental practice [25].

Alongside traditional injections, contemporary orofacial harmonisation uses biostimulators, threads and other materials aimed at stimulating intrinsic regenerative processes. One such method is the use of polydioxanone (PDO) threads. A narrative review by V. Marinho et al. (2023) sets out the specifics of the procedure for creating a facial scaffold [26]. Another promising direction is collagen biostimulators. An integrative review by M. Nascimento et al. (2025) summarised the results of 11 studies and demonstrated that biomaterials–polylactic acid (PLLA), calcium hydroxyapatite (CaHA) and polycaprolactone (PCL)–promote polarisation of macrophages towards the M2 type and stimulate neocollagenesis [27].

Thus, current trends in orofacial harmonisation are oriented towards combining various minimally invasive methods.

For example, the combination of hyaluronic acid with biostimulators provides simultaneous restoration of volume and stimulation of endogenous collagen; the addition of PDO threads enhances the lifting effect. Such strategies make it possible to individualise treatment depending on anatomical features, age and patient expectations. At the same time, doctors must understand the potential complications of minimally invasive interventions. A systematic review by N. Manganaro and colleagues (2022) presents the results of an analysis of 33 studies in which complications after procedures of orofacial harmonisation were reported. Most frequently, complications arose as a result of injections of botulinum toxin (19 studies), hyaluronic acid (21 studies) and other fillers; procedures of microneedling, intense pulsed light (IPL) and ultrasound were also mentioned [28]. Complications most often occurred in the eye and peri-orbital region (dry eyes, diplopia, eyelid ptosis), as well as in the forehead and nose (oedema, pain, erythema, necrosis) [28]. The study by M. Maci et al. (2024), devoted to the clinical applications of HA and BoNT-A in dentistry, also draws attention to safety. The authors note that in most included studies adverse effects were mild or moderate, but to improve the evidentiary base the authors call for randomised studies with prolonged follow-up in which both clinical outcomes and patients' quality of life are evaluated [29].

Despite the fact that most complications indicated in the studies by N. Manganaro et al. (2022) and M. Maci et al. (2024) proved to be temporary and without severe consequences, according to J. Souza da Silva (2024) patients with neurofibromatosis may experience specific complications: impaired bone growth, impaired healing, an increased risk of bleeding and fibromas. Therefore, the interaction involved in multidisciplinary work by doctors for the orofacial harmonisation of patients becomes particularly relevant [30].

The foregoing provides grounds for distinguishing directions for further scientific explorations in the field of orofacial harmonisation in which further research is required, in particular:

1) the development of digital protocols for orofacial harmonisation that integrate orthodontic, prosthodontic and surgical treatment;

2) validation of a scale for assessing quality of life, psychological impact and social integration of the dental patient after orofacial harmonisation;

3) development of mechanisms for minimising risks in the performance of orofacial harmonisation procedures;

4) research into the specifics of managing medical institutions that provide services in orofacial harmonisation, etc.;

5) clinical trials that would compare the results of using different types of cosmetic agents (fillers, biostimulators, botulinum toxins, etc.) and methods of their application.

CONCLUSIONS

Orthofacial harmonisation is a promising direction that integrates minimally invasive cosmetic procedures into dentistry. Interest in orthofacial harmonization is driven by increasing patient demand. The advantages lie in the comprehensive restoration of the functionality and aesthetics of the organs of the maxillofacial region, in the minimisation of the risks of medical interventions, and in socio-psychological comfort in the interaction between doctor and patient. The prospects for the development of orthofacial harmonisation include: conducting clinical trials, the validation of a scale for assessing the results of the application of orthofacial harmonization, improvement of the ethical-legal foundations of physicians' activity, standardisation of educational-professional training programmes for specialists, and the unification of medical protocols on orthofacial harmonisation.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest

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