Interdisciplinary planning as a landmark for treatment: Case report with a 2-years follow-up

Roberto Perasso¹, Monica Imelio², Renato Alcidi³

Case report: young adult woman with esthetic complaints regarding her smile and frontal teeth aspect. At first glance, the problem seemed to be only the shape of the lateral upper incisors and a small diastema between the central incisors. The diagnosis shared between the orthodontist and the prosthodontist led us to consider some other important aspects, such as the deep bite, the teeth inclination and the lips support. All these findings led us to consider that the right way to improve the esthetics of the patient’s smile was to plan an orthodontic treatment. This would serve not only for the distribution of the spaces, but mostly it would improve all other problems, before the restoration of the upper lateral teeth with two ceramic veneers. Results: the treatment plan achieved the right distribution of spaces for upper lateral incisors, significant correction of the incisors inclination with important reduction of overbite and better lip support, upper laterals restorations with ceramic feldspathic veneers, obtaining a good integration with natural teeth satisfying patient complaint. Conclusion: in cases which involve interdisciplinary approach, the fundamental step comes from the beginning, when only an initial diagnosis shared among the team of specialists can define the patient problems from different points of view. In this way, we can better understand the competency fields and plan the right treatment and time sequence.

Keywords: Conoid upper lateral. Deep bite. Alexander discipline. Feldspathic ceramic veneer. Interdisciplinary treatment.

Relato de caso: paciente adulta jovem, sexo feminino, buscou tratamento devido à queixa com a estética do sorriso e o aspecto dos dentes anteriores. À primeira vista, o problema parecia ser apenas o formato dos incisivos laterais superiores e um pequeno diastema entre os incisivos centrais. O diagnóstico conjunto do ortodontista e do protesista fez com que considerássemos outros aspectos importantes, tais como mordida profunda, inclinação dentária e suporte labial. A partir de todas essas constatações, consideramos que a maneira mais adequada de melhorar a estética do sorriso seria planejar o tratamento ortodontico. Assim, o tratamento serviria não apenas para melhor distribuição dos espaços, mas também melhoraria todos os outros problemas antes da restauração dos dentes laterais superiores ser realizada com duas facetas de cerâmica. Resultados: o tratamento planejado levou à correta distribuição dos espaços nos incisivos laterais superiores, com correção significativa da inclinação dos incisivos, importante redução da sobremordida e um melhor suporte labial, com restauração dos laterais superiores usando facetas de cerâmica feldspática, obtendo-se uma integração ideal com os dentes naturais, resolvendo as reclamações da paciente. Conclusão: em casos envolvendo abordagem multidisciplinar, as etapas iniciais são fundamentais, e apenas um diagnóstico inicial discutido entre a equipe de especialistas pode determinar os problemas do paciente sob diferentes perspectivas. Dessa forma, podemos compreender melhor os campos de competência e planejar a sequência e o tempo de tratamento mais adequados.

Palavras-chave: Incisivo lateral superior conoide. Mordida profunda. Disciplina de Alexander. Faceta de cerâmica feldspática. Tratamento interdisciplinar.

¹Private practice (Novi Ligure/AL, Italy).
²Private practice (Tortona/AL, Italy).
³Private practice (Alessandria/AL, Italy).

» The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

How to cite: Perasso R, Imelio M, Alcidi R. Interdisciplinary planning as a landmark for treatment: Case report with a 2-years follow-up. Dental Press J Orthod. 2018 Nov-Dec;23(6):41.e1-12.
DOI: https://doi.org/10.1590/2177-6709.23.6.41.e1-12.onl

Submitted: January 07, 2017 – Revised and accepted: May 16, 2018

Contact address: Roberto Perasso
E-mail: dott.perassoroberto@gmail.com
INTRODUCTION
A 27-year-old woman came to our office to evaluate the esthetics of her anterior frontal teeth area.

Her complaint was her smile, the space between the upper central incisors, and the altered shape of the upper lateral teeth (conoid).

We identified the need for an interdisciplinary approach due to alterations of shape and teeth position. Photos, impressions and radiographs were taken at the first appointment (Figs 1 to 6).

METHODS
Diagnosis and etiology
The presence of peg-shaped maxillary lateral incisors has been studied as a congenital malformation.\(^2\)\(^,\)\(^3\) The prevalence of this malformation has been found in 1.69% of boys and in 1.75% of girls; and it was associated with other dental anomalies, as follows: congenitally missing teeth, 31.8%; dens invaginatus, 19.7%; palatally displaced canines, 12.1%; supernumerary teeth, 7.6%; and transposition, 7.6%.\(^3\)

In this case report we didn’t find any other dental anomaly associated with the two conoid upper lateral incisors.

We made an initial DSD analysis for the interdisciplinary discussion (Fig 7).

Taking into consideration the esthetics in the upper frontal area, we considered that the space distribution and the position of the teeth did not allow us to harmonize the upper lateral incisors with the right shape and improve the lip support. These were the findings regarding the overall diagnosis:

Dental and skeletal Class I (upper limit, ANB = 4°), deep bite with severe short face (SN.GoGn = 22°, FMA = 15°, Y-axis = 65°), vertical position of the upper incisors (1.NA = 2°, 1-NA = 1 mm) with very steep anterior guidance, moderate crowding of the lower incisors (Figs 3, 4 and 5).

Figure 1 - Initial facial views.

Figure 2 - Initial facial views smiling.
Figure 3 - Initial intraoral views.

Figure 4 - Initial intraoral views.

Figure 5 - Initial lateral cephalometric radiograph.

Figure 6 - Initial panoramic radiograph.

Figure 7 - Initial DSD.
Treatment objectives

Orthodontic treatment objectives were to open the bite, increase the vertical dimension\textsuperscript{4}, reduce the overbite of the frontal teeth\textsuperscript{5}, solve the lower anterior crowding and create the right symmetrical space for the reconstruction of the upper laterals.

The issues for these restorations in an adult patient are the minimally invasive dentistry, a high biomechanical resistance and a long term stability. For this reason, we opted for ceramic veneers.\textsuperscript{6,7}

In order to obtain a good light transmission, we decided to use feldspathic ceramic veneers.\textsuperscript{8,9,10}

Treatment alternatives

The approach to restore the frontal teeth without orthodontic treatment would have implied to do a more invasive prosthetic rehabilitation, in order to manage the spaces of the upper incisors, and it wouldn’t have corrected the deep bite.

Composites are the first choice for restoration in young patients due to its adaptability (to be modified with growth). However in this case of an adult patient, the composite wasn’t chosen due to its lower performances on the long term stability, in comparison with ceramic.\textsuperscript{6,7}

Treatment progress

1) Orthodontic treatment.
2) Bleaching treatment.
3) DSD to analyze and decide the desired lateral shape together with the patient.
4) Reconstruction of the upper laterals with two ceramic veneers.

1) Orthodontic treatment

The Alexander discipline, a straight-wire technique, was used.\textsuperscript{11}

The most important goal in the treatment was to correct the open bite by levelling the lower Spee curve. According to the Alexander discipline, this goal can be obtained by using an anterior bite stop.

This could be a removable bite plane or, as in this case, two Bite-Turbo\textsuperscript{®} (Ormco\textsuperscript{TM}) applied on the palatal side of the upper incisors, followed by an application of some composite to increase the volume for a right contact with the lower incisors\textsuperscript{11} (Fig 8).

This anterior bite plane, by which we gain the space for lower bonding, and the rectangular lower arch (flat or with a reverse curve of Spee) together with the AD brackets prescriptions\textsuperscript{5} allowed us to level the originally deep curve of Spee\textsuperscript{12}.

Another goal was to reduce the retroinclination of the upper and lower incisors (Fig 4-5) in order to obtain more space in the arches for the upper lateral incisors and for the lower crowding solution\textsuperscript{13,14,15}. This increase of the anterior torque would give a better support to the lips.\textsuperscript{16,17}

We evaluated that these goals would be well accepted from a functional point of view related to the reduction of the overbite and the steepness of the anterior guide, still respecting the functional area of the patient.\textsuperscript{18}

The orthodontic treatment lasted 11 months and an immediate retention with fixed splint from canine to canine was applied, both on the upper and on the lower arches.

2) Bleaching protocol

The patient asked for a brighter teeth color, therefore we performed a bleaching treatment in two steps before the dental restoration. The first step was a chairside starter application with 40% hydrogen peroxide gel (Opalescence Boost). The second step was a take-home whitening protocol with 10% carbamide peroxide (Opalescence PF) for two weeks.\textsuperscript{19}

Figure 8 - Orthodontic progress, occlusal view with bite blocks.
3) Digital Smile Design

The DSD (Fig 14) can be helpful to find an ideal esthetic and drive the diagnostic wax-up\(^2\) (Fig 15). For a better communication with the patient, through the mock-up, we have created the shape of the wax-up directly in the mouth of the patient. We used a light-cured resin (Visco LC Anaxadent) and a transparent silicone (Anaxadent) positioned on a standard transparent impression tray. This way the light could pass through to cure the resin\(^2\) (Fig 17).

A new picture set (Figs 16 and 17) with the mock-up was useful for the team to discuss and choose the final shape together with the patient.

In this specific case the lateral shape is driven (Fig 16) by the natural central incisors and the patients' desire.
Interdisciplinary planning as a landmark for treatment: Case report with a 2-years follow-up

Figure 14 - Final DSD.

Figure 15 - Wax-up.

Figure 16 - Intraoral mock-up views.

Figure 17 - Smile mock-up view.
4) Ceramic veneers

Clinical preparation

Every phase was executed with the intra-operative microscope.

The silicon index was useful to perform a minimally invasive preparation (Fig 18), by which we removed an enamel thickness of 0.2-0.4 mm only in some cervical and buccal areas.

Every preparation edge was rounded, for the best fitting of the composite cement.19

Particular attention was observed for the undercuts in the interproximal areas.22

After a careful cleaning of the preparation areas, we took a one-step impression with polyether material (Permadyne Espe) on a customized impression tray.

The original transparent impression used for the mock-up was used also for the temporary restoration that was molded with acrylic resin (Coldpack A1). It was refined and fixed with this sequence: phosphoric (37.5%) etching for 30” in two or three small areas, cleaning with water for 60”, enamel adhesive application and light-curing for 60” (Optibond FL).9

Laboratory technique

In order to perform an indirect prosthesis, we needed a working model with abutments, which accurately reproduced the position, surface and preparation margin, the adjacent teeth and the soft tissue around. The rising up profile of the restoration is important to condition and maintain the periodontal health.23

We used feldspathic ceramic (Creation CC Klema Meiningen) baked on refractory abutment (GC Orbit Vest Leuven, Belgium).

When an opaque layer to reconstruct tooth structure9 or to cover a dark abutment is not needed, the stratification begins directly with dentin color base mass.

We built up the teeth to the natural dimension obtaining the shape from a palatal silicon index of the wax-up.

The realization of the contour profile is simplified by the use of reference points marked with pencil (Fig 19), the enamel ridge and the transition angle lines are reduced or sharpened by using a diamond burr.

The vertical and horizontal surface texture is created with the help of surface colored powders (gold/silver) (Fig 19).

Once we had created a surface texture, we started the polishing phase by combining the use of both mechanical technique with diamond silicon polishers and glazing by oven. Then we mechanically finished polishing by using pumice powder or diamond paste, in order to obtain highly brilliant surfaces (Fig 20).
Interdisciplinary planning as a landmark for treatment: Case report with a 2-years follow-up

Figure 19 - Surface texture of veneers.

Figure 20 - Surface finishing of veneers.

Figure 21 - Close-up of final frontal teeth.
**Veneers cementation**

The veneers cementation is a very important and difficult phase.

The preparations of the teeth proceeded one by one, with the following steps: cleaning with pumice and water, etching with 37% phosphoric acid for 20” (the adjacent teeth were protected with teflon tape), cleaning with water for 60”.

After that, we applied primer and adhesive (IV generation, Optibond) on the teeth and only adhesive on the veneers (already prepared with silane). The, we applied the light-curing composite (Enamel UD2), previously warmed at 55°C on the restorations.

Subsequently, we put the veneer on the tooth, with a slight and ongoing pressure, in order to remove all the excesses with brush, scaler, floss and plastic strip.

After the excesses were removed, we proceeded with the light-curing for 5 minutes from every direction.

Finally, we refined with straight blade chisel, finishing stripes, floss and rubber polishers, to obtain brilliant surfaces. 8,10,22

The final retention, according to the Alexander discipline, was made by a wraparound retainer (its goal is to maintain the teeth position without occlusal interference) on the upper arch and by a fixed splint from 3 to 3 in the lower arch. 11

Final photographs are presented in Figures 22 to 26, and follow-up photographs after 2 years can be seen in Figure 27.

![Figure 22 - Final facial views with veneers.](image-url)

![Figure 23 - Final facial views with veneers.](image-url)
Interdisciplinary planning as a landmark for treatment: Case report with a 2-years follow-up

Figure 24 - Final intraoral views with veneers.

Figure 25 - Final overbite and overjet.

Figure 26 - Smile with veneers.

Figure 27 - Two-years follow-up intraoral views.
Table 1 - Baseline (A) and final (B) cephalometric values.

| Measurements     | normal | A     | B     | A/B diff. |
|------------------|--------|-------|-------|-----------|
| SNA Steiner      | 82°    | 83°   | 83°   | 0         |
| SNB Steiner      | 80°    | 79°   | 80°   | 1         |
| ANB Steiner      | 2°     | 4°    | 3°    | 1         |
| Wits Jacobson m = 0±2mm; f=1±2mm | +1mm    | +1mm  | 0     |
| Angle of convexity Downs | 0°     | +2°   | +3°   | 1         |
| Y-axis Downs     | 59°    | 65°   | 65°   | 0         |
| Facial angle Downs | 87°   | 88°   | 89°   | 1         |
| SN-GoGn Steiner  | 32°    | 22°   | 22°   | 0         |
| FMA Tweed        | 25°    | 15°   | 15°   | 0         |
| IMPA Tweed       | 90°    | 95°   | 103°  | 8         |
| 1.NA (degrees)   | 22°    | 2°    | 11°   | 9         |
| 1.NA (mm) Steiner | 4mm    | 1mm   | 3mm   | 2         |
| 1.NB (degrees)   | 25°    | 17°   | 21°   | 4         |
| 1.NB (mm) Steiner | 4mm    | 2mm   | 4mm   | 2         |
| 1/1 interincisal angle Downs | 130°   | 157°  | 137°  | 20        |
| 1-APo Ricketts   | 1mm    | -1mm  | 0.5mm | 1.5       |
| Upperlip-S line  | 0mm    | 0mm   | 0mm   | 2         |

RESULTS

» Right and symmetrical distribution of the space for the upper lateral incisor (Fig 10).
» Alignment of the lower incisors
» No changes of the VD (Figs 11 to 13).
» Significant correction of the incisors inclination (1.NA from 2° to 11°, 1/1 from 157° to 137°) (Table 1), with important reduction of the overbite (Figs 11-26) and better lips support (Figs 11-13).
» Upper lateral restorations with good integration with natural teeth satisfying patient requests.

CONCLUSION

A treatment plan which rises from an initial shared diagnosis is important in interdisciplinary cases. This allows the specialists to define the different points of view and better understand the competency fields, so as to plan the right sequence time for the treatment.

Author’s contribution (ORCID®)

Roberto Perasso (RP) 0000-0003-3276-4892
Monica Lucia Imelio (MLI): 0000-0002-4037-618X
Renato Alcidi (RA): 0000-0003-0894-9205

Conception or design of the study: RP, MLI, RA. Data acquisition, analysis or interpretation: RP, MLI, RA. Writing the article: RP, MLI, RA. Critical revision of the article: RP, MLI, RA. Final approval of the article: RP, MLI, RA.
REFERENCES

1. Magnússon TE. Prevalence of hypodontia and malformations of permanent teeth in Iceland. Community Dent Oral Epidemiol. 1977 July;5(4):173-8.
2. al-Emran S. Prevalence of hypodontia and developmental malformation of permanent teeth in Saudi Arabian schoolchildren. Br J Orthod. 1990 May;17(2):115-8.
3. Kim JH, Choi NK, Kim SM. A Retrospective Study of Association between Peg-shaped Maxillary Lateral Incisors and Dental Anomalies. J Clin Pediatr Dent. 2017;41(2):150-3.
4. Abduo J. Safety of increasing the vertical dimension of occlusion: a systematic review. Quintessence Int. 2012 May;43(5):569-80.
5. Alexander RG. The Alexander Discipline: Long-Term Stability. Hanover Park, IL: Quintessence; 2011. v. 2, p. 111-3.
6. Lacy AM, Wada C, Du W, Watanabe L. In vitro microleakage at the gingival margin of porcelain and resin veneers. J Prosthet Dent. 1992 Jan;67(1):7-10.
7. Meijering AC, Creugers NH, Roeters FJ, Mulder J. Survival of three types of veneer restorations in a clinical trial: a 2.5-year interim evaluation. J Dent. 1998 Sep;26(7):563-8.
8. Gurel G. Porcelain laminate veneers: minimal tooth preparation by design. Dent Clin North Am. 2007 Apr;51(2):419-31, ix.
9. Magne P, Belser U, Restauri adesivi in ceramica dei denti anteriori. Un approccio biomimetico. Passirana di Rho, MI: Quintessenza Edizioni; 2003. p. 294-96.
10. Touati B, Mora P, Nathanson D. Estetica dentale e restauri in ceramica. Milano: Masson; 2000.
11. Alexander RG. The 20 Principles of the Alexander Discipline. Hanover Park, IL: Quintessence; 2008.
12. Bernstein RL, Preston CB, Lampassio J. Leveling the curve of Spee with a continuous archwire technique: a long-term cephalometric analysis. Am J Orthod Dentofacial Orthop. 2007 Mar;131(3):363-71.
13. Mutinelli S, Manfredi M, Cozzani M. A mathematic-geometric model to calculate variation in mandibular arch form. Eur J Orthod. 2000 Apr;22(2):115-25.
14. Steiner CC. The use of cephalometric as an aid to planning and assessing orthodontic treatment: report of a case. Am J Orthod. 1960 Oct;46(10):721-35.
15. Tweed CH. The Frankfort-Mandibular Incisor Angle (FMIA) in orthodontic diagnosis, treatment planning and prognosis. Angle Orthod. 1954 July;24(3):121-69.
16. Arnett GW, McLaughlin RP. Facial and Dental Planning for Orthodontists and Oral Surgeons. 1st ed. Oxford: Elsevier; 2004.
17. Rosati R, Menezes M, Silva AM, Rossetti A, Lanza Atisano GC, Sforza C. Stereo photogrammetric evaluation of tooth-induced labial protrusion. J Prosthodont. 2014 July;23(5):347-52.
18. Dawson PE. Funzionale Occlusione: Certificato TMJ To Sorriso Modello. Milano: Elsevier; 2009.
19. Terry DA, Geller W. Odontoiatria Estetica e Ricostruttiva. Selezione dei materiali e delle tecniche. Passirana di Rho, Milano: Quintessenza Edizioni; 2012.
20. Coachman C, Calamita M. Digital smile design: a Tool for treatment planning and communication in Esthetic Dentistry. QDT. 2012; 35:103-11.
21. Gurel G, Morimoto S, Calamita MA, Coachman C, Sesma N. Clinical performance of porcelain laminate veneers: outcomes of the aesthetic pre-evaluative temporary (AFT) technique. Int J Periodontics Restorative Dent. 2012 Dec;32(6):625-35.
22. Terry DA. The evolution of the of the porcelain veneer. Pract Proced Aesthet Dent. 2006 June;18(5):318-20.
23. Magne M, Bazos P, Magne P. The alveolar model. QDT. 2009;32:39-46.