Treatment of absent maxillary lateral incisors: orthodontic space closure and associated procedures

Davide Mirabella*[1] and Marco Rosa[2]

Key points

- To provide valuable knowledge to manage patients with absent maxillary lateral incisors.
- To highlight the advantages of the orthodontic space closure treatment option.
- To provide an interdisciplinary protocol to achieve good clinical outcome following orthodontic space closure.

Abstract

Missing maxillary lateral incisors can be treated either with orthodontic space closure or preservation of the edentulous space for tooth replacement. Orthodontic space closure coupled with non-invasive post-orthodontic cosmetic dentistry is a compelling option compatible with optimal function, favourable aesthetics, and periodontal health in the long-term. We present the rationale for space closure and detail contemporary clinical strategies underpinning interdisciplinary treatment planning and excellence in finishing.

Introduction

Missing maxillary lateral incisors is a clinical condition caused by absence of teeth congenitally, periodontal disease or dental trauma. Comprehensive management often requires an interdisciplinary approach both to planning and execution, although the orthodontist tends to be central to decision-making. Two key treatment options exist: orthodontic space closure,[1,2,3,4,5,6,7,8] or preservation of the edentulous space for tooth replacement.[9,10,11,12]

Related planning decisions should integrate local information concerning the occlusion, dental and periodontal health and aesthetics. Moreover, broader considerations including patient expectations, cost/benefit evaluation and the longer-term implications of treatment should be accounted for.

[1]Adjunct Professor, University of Ferrara, Italy; [2]Adjunct Professor, University of Milan, Italy.
*Correspondence to: Davide Mirabella
Email address: davidemirabella@hotmail.com

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Space preservation and prosthetic replacement

Improvements in dental adhesion,[13] and improved predictability of implant therapy,[14] have underpinned the popularity of prosthetic replacement of missing lateral incisors. However, implant placement in the anterior aesthetic zone is complex being influenced by growth, lip-alveolus relationships and smile dynamics.[15]

Relative infra-occlusion of implant-supported restorations is an undesired but common problem occurring as a consequence of vertical eruption of the teeth adjacent to the implant that behaves like an ankylosed tooth.[7,16] This complication may be variable in magnitude and is not predictable, emanating from ongoing vertical cranio-facial growth, culminating in continuous eruption of the anterior teeth.[17,18,19,20,21,22,23] Other biological complications may also occur in the long term such as bone loss around the implant head and the adjacent teeth,[24] loss of papillae in the tooth-implant inter-proximal space,[25] discolouration of the marginal gingiva,[26] peri-implantitis, and abutment or fixture exposure due to retraction of the labial supporting tissues.[23,27]

Given the aforementioned drawbacks, resin-bonded fixed partial dentures (FPDs) may be considered not only as temporary prosthetic solutions during adolescence,[28] but also as a more permanent prosthetic replacement.[29] Resin-bonded adhesive bridgework potentially coupled with soft tissue surgery may offer a viable and aesthetic alternative to implant replacement.[13]

Orthodontic space closure

Orthodontic space closure associated either with unilateral or bilateral maxillary canine substitution was first advocated by Tuverson.[1] Since then, more nuanced clinical approaches have become ingrained leading to increasing acceptance.[2,3,4,5,6,7] It has been proposed that canine substitution has the following advantages both after treatment and in the long term:

- Patient satisfaction from an aesthetic and functional standpoint;[30]
- Sound periodontal health in the medium and long term;[31]
- Better periodontal health when compared to space opening procedures involving prosthetic replacement;[32]
- No increased prevalence of temporomandibular disorders;[30,31,32]

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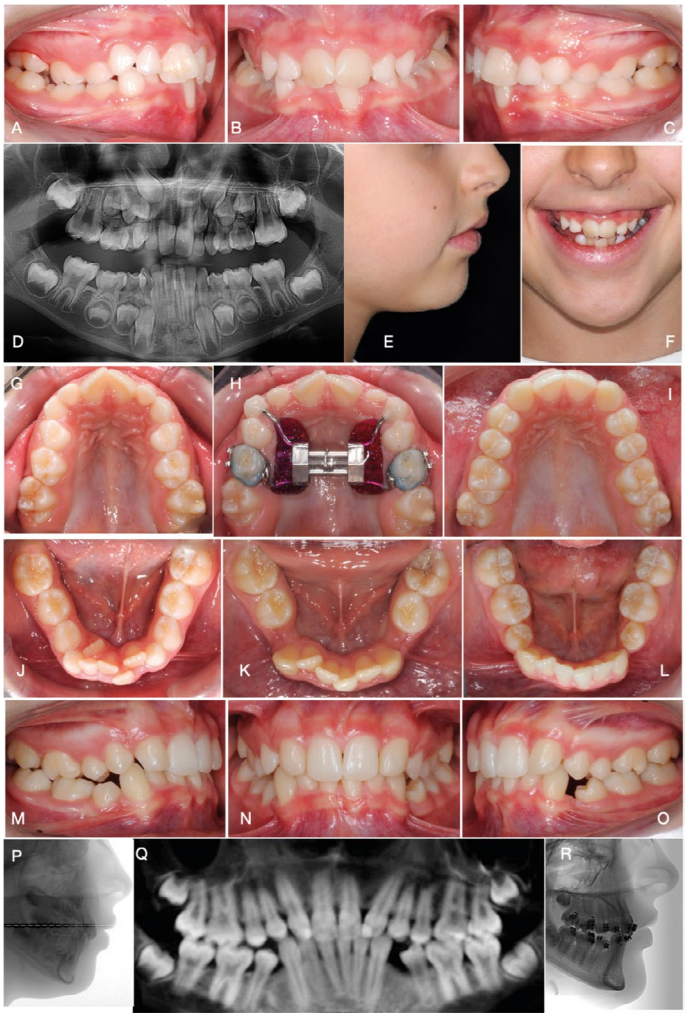

Fig. 1 a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r) SF, Part 1 – Missing 1.2 / two-phase treatment. A young eight-year-old girl presented a Class II subdivision R malocclusion in mixed dentition (A, B, C, D, F, G, J), convex profile (E, P), congenitally missing maxillary right lateral incisor (D), severe crowding (J), gingival recession on lower left central incisor (B), narrow palate (G) and unilateral posterior crossbite (A, B). Interceptive treatment consisted in the rapid maxillary expansion (H) anchored onto the deciduous teeth and the serial extraction of the lower first premolars (K), the upper deciduous canines and the permanent upper left lateral incisor. Seven years later, at the end of the transition, after the full eruption of all permanent teeth except the third molars, the lower crowding and extractions sites self-corrected (L, Q) while the upper permanent canines spontaneously erupted in the place of the lateral incisors (I, Q). Two composite restorations were made on the upper canines to fill the black triangles and let them resemble lateral incisors (N). The periodontal conditions across the agenesis sites are within the normal range and the recession on the lower left central incisor improved spontaneously (M, N, O). The profile improved according to the correction of the lower incisors inclination on the mandibular plan (R)

- Orthodontic treatment is performed in a single phase, can be finished before the end of growth without dictating a need for orthodontic re-treatment. In contrast, up to 11% of subjects of adolescent patients planned for implant-supported restorations may require pre-prosthetic orthodontics;[33]
- Physiologic 'canine' or group function can be achieved;[32]
- Prolonged professional maintenance is typically less involved.[30,31]

However, space closure may impact smile aesthetics due to tooth size and morphology issues allied to potential asymmetry. This may relate to confining auxiliary procedures to the reshaping of the mesialised canine.[2,5,6,7] It is also noteworthy that altered tooth size and shape may coexist with congenitally missing lateral incisor (CMLI). Therefore, the following potential associated factors should be considered during the orthodontic finishing stage:

- Altered gingival margin levels; ie loss of the 'high-low-high' effect;
- Yellowish and bulky appearance of the remodelled maxillary canine;
- Persistence of a crown width imbalance between the reshaped canine and the adjacent teeth;
- Presence of peg-shaped contralateral maxillary lateral incisor;
- Presence of the 'cuspid eminence' in the upper lateral incisor area;
- Undersized upper first premolar in the canine region;
- Reduced crown width and abnormal crown shape of maxillary central incisors;
- Space reopening in the anterior portion of the arch.[34]

Conversely, in order to achieve a satisfactory result, interdisciplinary treatment planning should be based upon a meticulous evaluation of the following:

- Lifelong cranio-facial growth and maturation;
- Presenting malocclusion;
- Long-term periodontal health;
- Overall aesthetics and patient expectations;
- Final tooth position (crowns and roots) in accordance with the planned post-orthodontic restorative procedures.[34,35]

Timing of intervention

Based on the timing of diagnosis, a range of procedures may be appropriate in order to achieve the established treatment goals. In the mixed dentition, interceptive orthodontics sometimes coupled with serial extraction strategy may assist in guiding canine eruption into the anterior edentulous space and facilitating posterior teeth eruption with a mesial direction (Fig. 1). This approach may have twofold advantages: shortening the length of future orthodontic treatment and improving periodontal tissue morphology across the edentulous sites (Fig. 2).[34]

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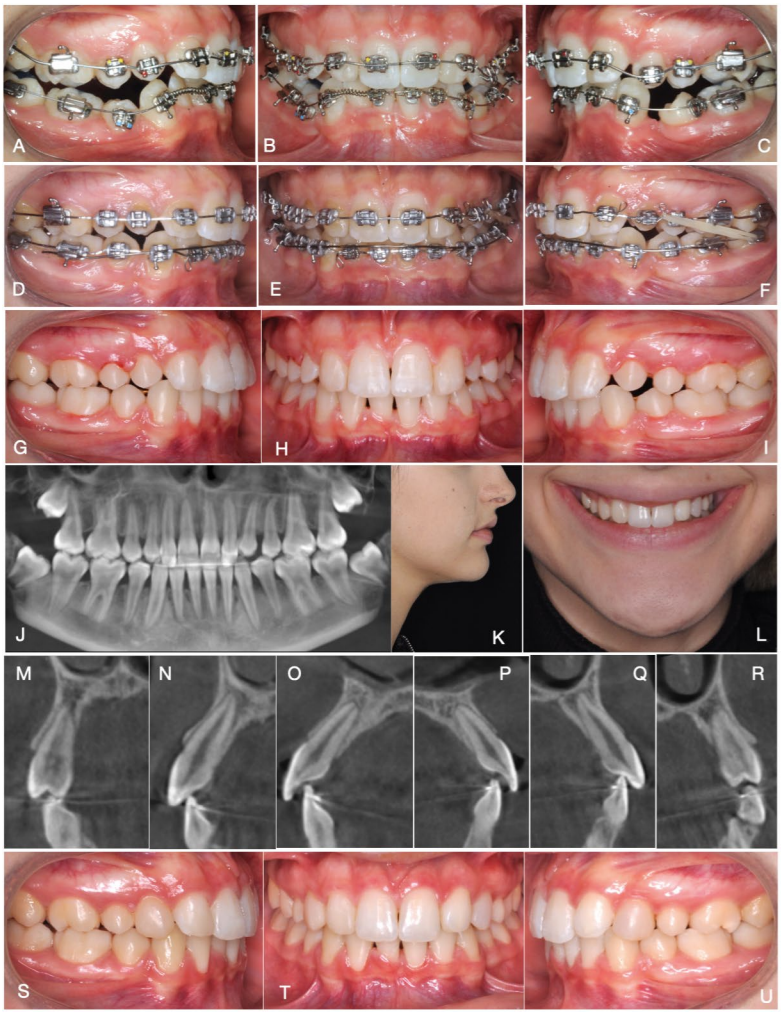

Fig. 2 a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u) SF, Part 2 – Missing 1.2 / two-phase treatment. The orthodontic treatment started at 16 years of age (A, B, C) and lasted 16 months. It was aimed at obtaining ideal occlusal planes, stable occlusal relationships (D, E, F, G, H, I, J), and ideal display of the upper front teeth (L) and gingival margins (H). The roots are parallel (J) and well positioned into the periodontal envelope (M, N, O, P, Q, R). The profile improved as well as the lip posture (K). Six composite restorations were made on the upper six front teeth and the occlusal relationships are stable two years after the end of treatment (S, T, U)

When orthodontic treatment is started in the permanent dentition, two main different clinical paths are possible: 1) orthodontic therapy followed by single-step minor post-orthodontic restorations including reshaping and/or subtle composite build-up of the maxillary canines performed at the end of orthodontic therapy; or 2) orthodontic therapy followed by more extensive restorative procedures including veneers or porcelain crowns provided in early adulthood, but preceded by composite restorations permitting maturation of periodontal tissues during adolescence.[34]

Skeletal and dental characteristics

While patient-specific planning with bespoke objective setting is recommended, a key goal of space closure is to achieve a Class I canine relationship with the upper first premolar acting as maxillary canine with optimal aesthetic and periodontal positioning of the maxillary and mandibular incisors. Traditionally, space closure has been suggested where an orthodontic space requirement exists in the maxillary arch, chiefly due to crowding or excessive overjet. However, the advent of skeletal anchorage procedures has afforded greater flexibility in this respect.[35,36,37,38,39]

Class I malocclusion

Where lower arch extractions are planned, space closure in the upper arch is generally recommended (Figures 1, 2 and 3). More challenging biomechanics may be required when the lower arch is treated non-extraction (Figures 4, 5, 6, 7, 8 and 9) as space closure in the upper arch may dictate mesial movement of the posterior segments, which can be complicated by advancement of the lower dentition. This may necessitate the use of Class III mechanics (Figures 5c and 5d) or even the use of skeletal anchorage (Figures 8j, 8k, 8l, 9m, 9n, 9o and 9p) at the highest.[35]

Class II malocclusion

Class II malocclusion can be treated by orthodontic space closure in the upper arch often with non-extraction treatment in the lower arch. While the effect of retraction of the maxillary incisors on the upper lip support should be monitored, this approach may offer a simple means of addressing both the malocclusion and the effective hypodontia.

Class III malocclusion

Congenitally missing lateral incisors in the presence of a Class III malocclusion may be particularly challenging. Although space reopening may be the treatment of choice, clinical experience suggests that the 'opened' edentulous site often lacks adequate bone. Further, the amount of maxillary central incisor proclination to compensate for the Class III malocclusion may detract from the aesthetic result, flattening the smile arc and leading to an unfavourable central incisor position relative to the planned implant restorations.

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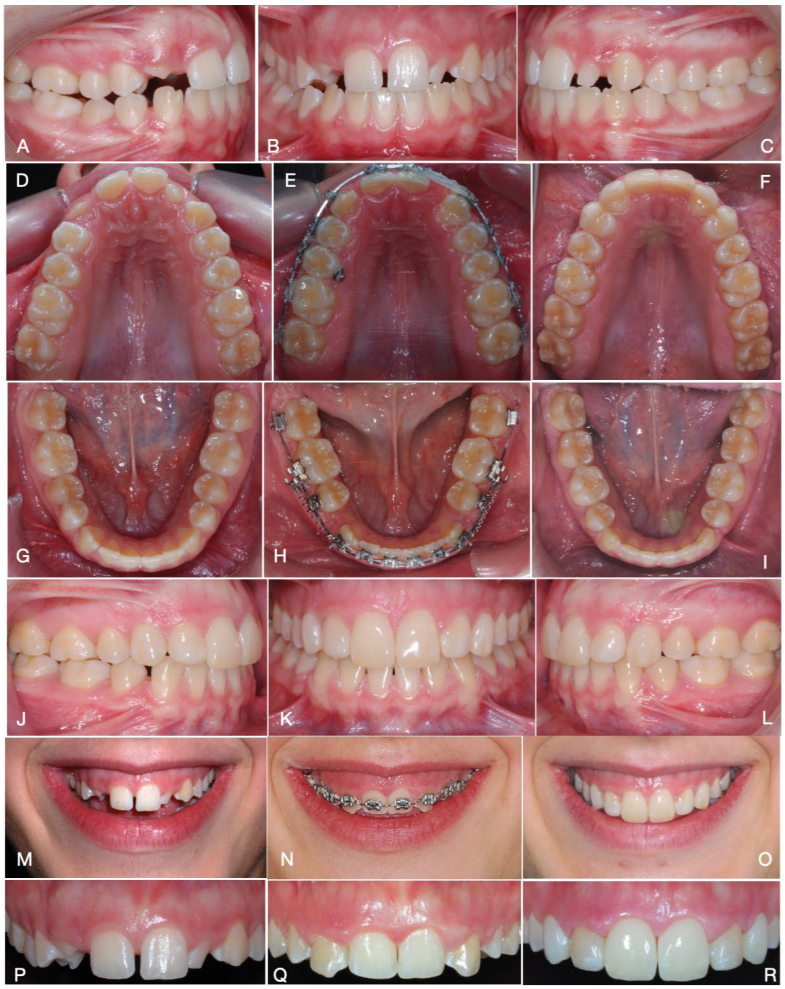

Fig. 3 a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r) PD – Missing 1.2 / small crowns / 2.2, 3.4 and 4.4 extractions / orthodontic space closure with fixed appliances / six composite restorations. A 12-year-old girl was missing the upper right lateral incisor and the maxillary left lateral incisor was peg-shaped in the context of a Class II subdivision R (A, B, C, D, G). Considering the hyper-divergent skeletal pattern, the slight protrusion of the incisors, the wide exposure of the gingival margins (M) and the upper midline slightly shifted to the right, the orthodontic treatment plan was orthodontic space closure, with the extraction of the lower first premolars and upper left peg-shaped lateral incisor (E, H, N). Fixed appliances were used in both arches and treatment time was 24 months (F, I). All teeth were undersized, thus the width of the canines was ideal to substitute the lateral incisors (N, O). In order to establish proper crown shape and size, six composite restorations were made on the upper front teeth the day of the appliance removal (J, K, L O)

Conversely, retraction of the anterior dentition during space closure may risk loss of upper lip support and aesthetic impairment. Therefore, orthodontic treatment requires careful management of central incisor position to prevent excessive flattening of the facial profile with maximum anterior anchorage supported by temporary anchorage devices being of potential value in this scenario (Figures 4, 7 and 8). Orthognathic surgery may also be considered when the severity of the facial and/or skeletal imbalance cannot be addressed by orthodontic treatment only (Fig. 6).[40]

Biomechanics of space closure

Clear aligner therapy may be an effective tool in the orthodontic finishing phase (Fig. 9) but remains challenged in achieving true bodily movement during space closure.[41] Therefore, space closure mechanics should generally be carried out with fixed appliances (Figures 9m, 9n, 9o, 9p). Before space closure, alignment and levelling of the arches should be fully achieved, occlusal planes should be flat and stainless steel rectangular archwires should be in place.[42] Arch wire stiffness is crucial in maintaining dental arch shape and flat occlusal planes, in controlling the position of the anterior dentition, and in achieving true bodily movement. When significant mesial movement of the posterior segments is the orthodontic goal, skeletal anchorage may be helpful (Figures 7, 8 and 9). While a range of approaches exist, commercial systems relying on the insertion of mini-implants in mid-palatal sites connected to a sliding structure may permit efficient posterior space closure.[35,36,37,38,39,43,44] Clinical experience also suggests that other advantages include short treatment time, efficient unilateral space closure, and minimal need for cooperation.[35,44,45] Notwithstanding this, further scientific evidence to support their predictability would be welcome.[46,47]

Orthodontic finishing in the anterior region

Different finishing strategies may be implemented according to the planned restorations, with close communication between the orthodontist and the restorative dentist important before, during and after orthodontic treatment.[5,6,7,8]

The size and shape of the canine with respect to the adjacent teeth should be considered. Patients with congenitally missing maxillary lateral incisors may have coexisting microdontia and abnormal morphology of the maxillary central incisors compared to normal controls.[48,49,50] The following questions should therefore be addressed before planning the interdisciplinary treatment:

1. Is an imbalance in size and shape present in the anterior dentition?
2. Are gingival margins visible upon smiling?
3. What are the patient-specific aesthetic demands based on patient expectation and preference?

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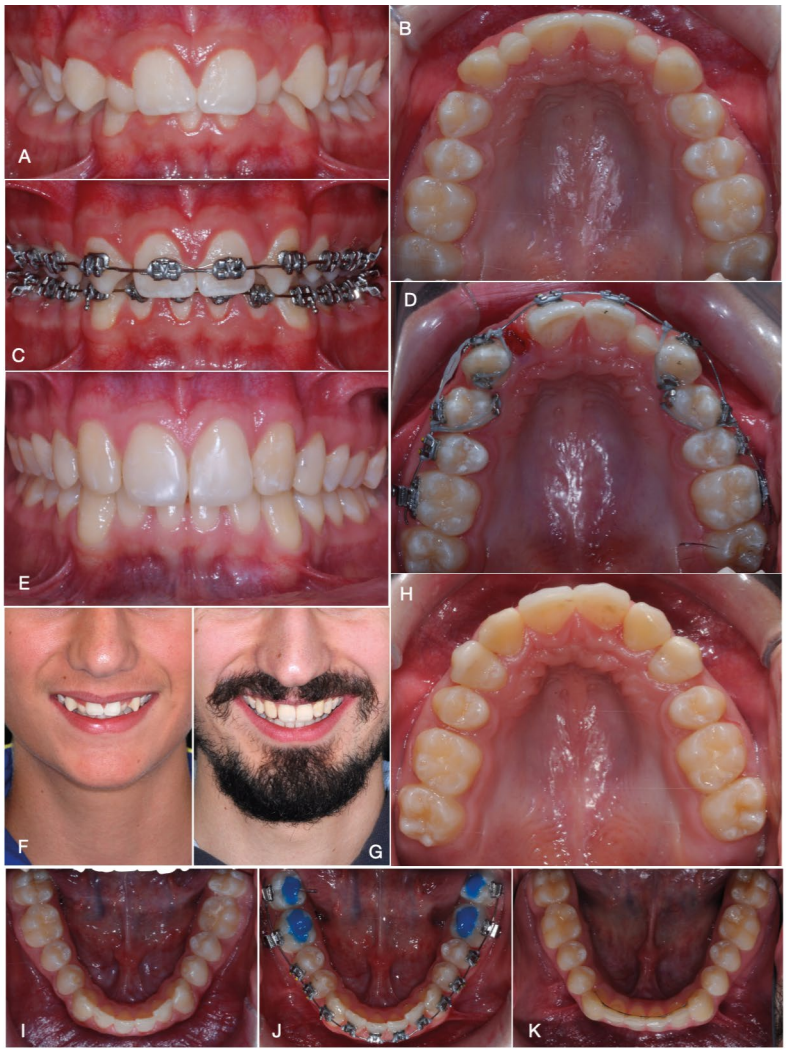

Fig. 4 a, b, c, d, e, f, g, h, i, j, k) FS, Part 1 – Missing 1.2 and 2.2 / upper space closure with Class 3 elastics and fixed appliances / six direct composite restorations. A 14-year-old boy showed mobile deciduous lateral incisors at the end of the transition stage (A, B, F), while the maxillary lateral incisors were congenitally missing. Considering the young age of the patient and the expectations of the parents, the orthodontic treatment plan consisted of the extractions of the deciduous incisors and upper space closure (C, D, E, G, H). No extractions were made in the lower arch (I, J, K). Images G,H and K were taken 7 years post-op

No imbalance in size and shape in the anterior dentition

Central incisor positioning

1. Crown long axis parallel to the long axis of the face;
2. The upper lip/incisal margin vertical display tailored to age, gender, and skeletal pattern;
3. The vertical position of the anterior dentition contributing to a smile arc paralleling the lower lip line; and
4. Gingival margin exposure between 0–3 mm upon full smiling.[51,52,53,54]

Canine

Before restorative procedures, the substituted maxillary canine should resemble as much as possible the missing lateral incisor. In the presence of a normal-sized dentition, the mesio-distal width of the canine should be reduced to a lateral incisor dimension proportional to the adjacent central incisor crown width.[2]

Given that vertical movements are effective in remodelling the periodontal profile and the gingival levels without compromising periodontal health in the long term,[31] the canine vertical position is also important to achieve the natural 'high-low-high' appearance of the anterior gingival scallop. In a natural intact dentition, the gingival margin of a lateral incisor should be 1 mm (0–2 mm) coronal to the line connecting the gingival margins of the central incisor and the canine.[55] Therefore, the substituted canines should be extruded to move the gingival margin inferiorly; ie 1 mm lower than the central incisor gingival margins.[5] Finally, depending upon the amount and direction of extrusion performed, grinding of the canine tip and palatal enamel equilibration to establish the functional goal of a light anterior contact may be necessary.[34,36,56]

The bucco-palatal position of the canine should also be evaluated. The canine root eminence should also be reduced by applying palatal root torque to move the root away from the buccal cortical plate (Figures 2n, 2q, 8w and 8y).[35,40,44] This orthodontic procedure is also recommended in patient with a thin phenotype and during the extrusive movement due to the tendency for orthodontic extrusion to generate a moment moving the canine root buccally.

Upper first premolar

When space closure treatment is chosen, the upper first premolar will act as the canine, both from a functional and aesthetic standpoint. If aesthetic demands are low, the upper first premolar could be left in occlusion with palatal cusp interferences addressed as required. Where optimal aesthetics are sought, the upper first premolar may be intruded to a point where the gingival margin approximates the vertical level of the central incisor or slightly above this. Intrusion may generate an undesirable buccal flaring of the first premolar crown and with compensatory torque or inset bends applied to stainless steel or beta-titanium rectangular archwires to counteract this

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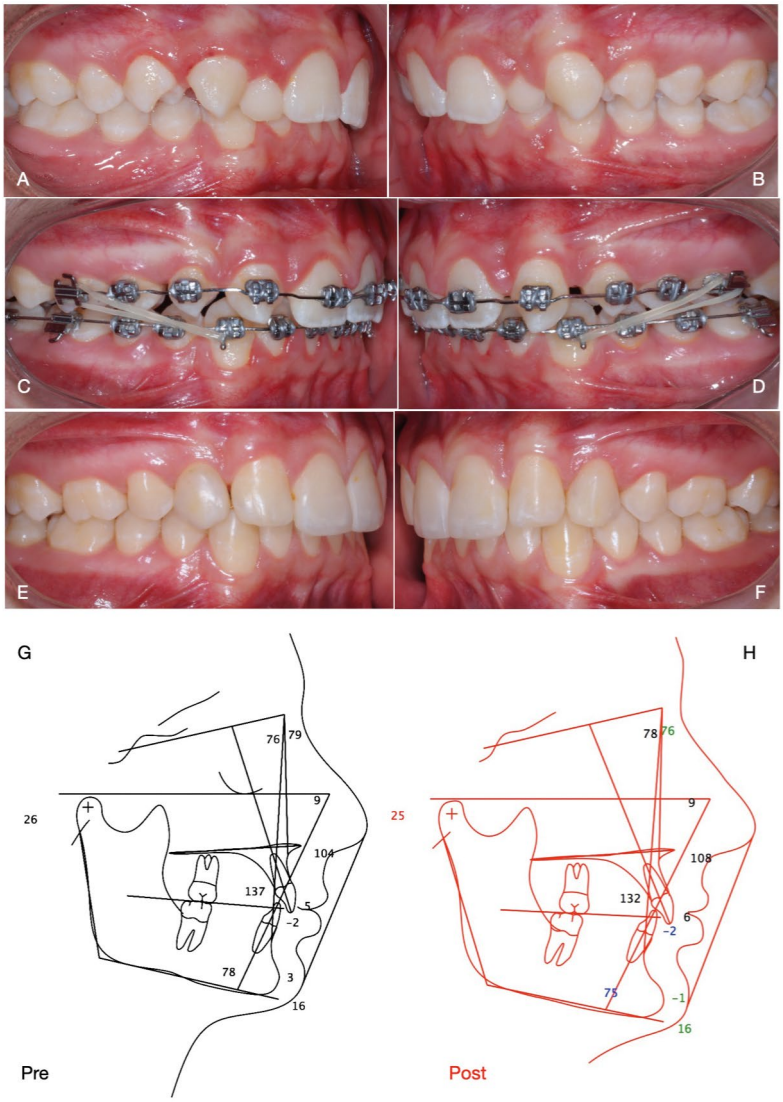

Fig. 5 a, b, c, d, e, f, g, h) FS, Part 2 – Missing 1.2 and 2.2 / upper space closure with Class 3 elastics and fixed appliances / six direct restorations. The original malocclusion was a Class II subdivision L (A, B). The mesial movement of the upper molars, premolars and canines was performed with a sliding technique supported only by intermaxillary Class 3 elastics (C, D). Immediately after the orthodontic treatment, six direct composite restorations were performed on the six upper front teeth. Five years after the end of the orthodontic treatment, the occlusal relationships are correct (E, F) and stable, while the composite restorations are aesthetically not well balanced mainly due to the large size of the permanent canines. The restorations can and should be replaced and improved at the end of growth. After the upper space closure (red tracing), the position of the upper incisors and the interincisal angle have not worsened compared to the beginning of treatment (black tracing) and remain within normal limits (G, H)

effect. Remodelling of periodontal tissue as a consequence of orthodontic intrusion may also temporarily predispose to 'pseudo-pocketing'. Periodontal probing may assist in accurately locating the periodontal structures to assess the true gingival level.[34,55,57] Depending upon the amount of upper first premolar root divergence and the alveolar bone width, slight mesio-palatal rotation of the first premolars may be introduced to prevent proximity between the buccal root and the cortical plate.[5,6,7,34,44]

Imbalance in size and shape in the anterior dentition

Interdisciplinary management of patients with congenitally missing maxillary lateral incisors is more complex in the presence of an imbalance in crown size. CMLI patients are likely to have reduced crown width, abnormal central incisor crown shape and peg-shaped contralateral incisor in 45% of cases of unilateral agenesis.[48,49,50] In the presence of microdontia, while the canine may appear too large compared to the adjacent central incisor, it is important to recognise that the issue may relate to the central incisor itself.[5,6,7,8,44,49] Accurate measurement of central incisor crown width is an important diagnostic element. If imbalance in crown size and proportion is not addressed, the following are risked:

- Reopening of the spaces and/or large embrasures in case of space closure;[58]
- Inadequate space for the implant in case of space preservation treatment;[59]
- Inadequate vertical display of the central incisors;[34,44,48]
- Disproportion in anterior crown width and compromised aesthetics.[5,6,7]

As such, a paradigm shift dictating increased size of the central incisors and if necessary of the first premolars rather than focusing solely on reducing canine width should be considered (Fig. 3).

Central incisor

Central incisors may be restored not only to increase their crown width and length, but also to modify crown morphology. Their final position should be established as follows:

- Leave sufficient clearance palatally and/or buccally to allow for composite restorations, veneers or full crowns;[44]
- Create appropriate mesio-distal interproximal space according to the information retrieved from diagnostic wax-up;[34]
- Position the crown vertically in accordance with the planned post-restoration increase in crown length and with the post-treatment position of the gingival margin.[44]

Canine

- Variation in canine colour and crown shape may call for vital bleaching and restorations that may differ in design, material and thickness. Pre-restorative

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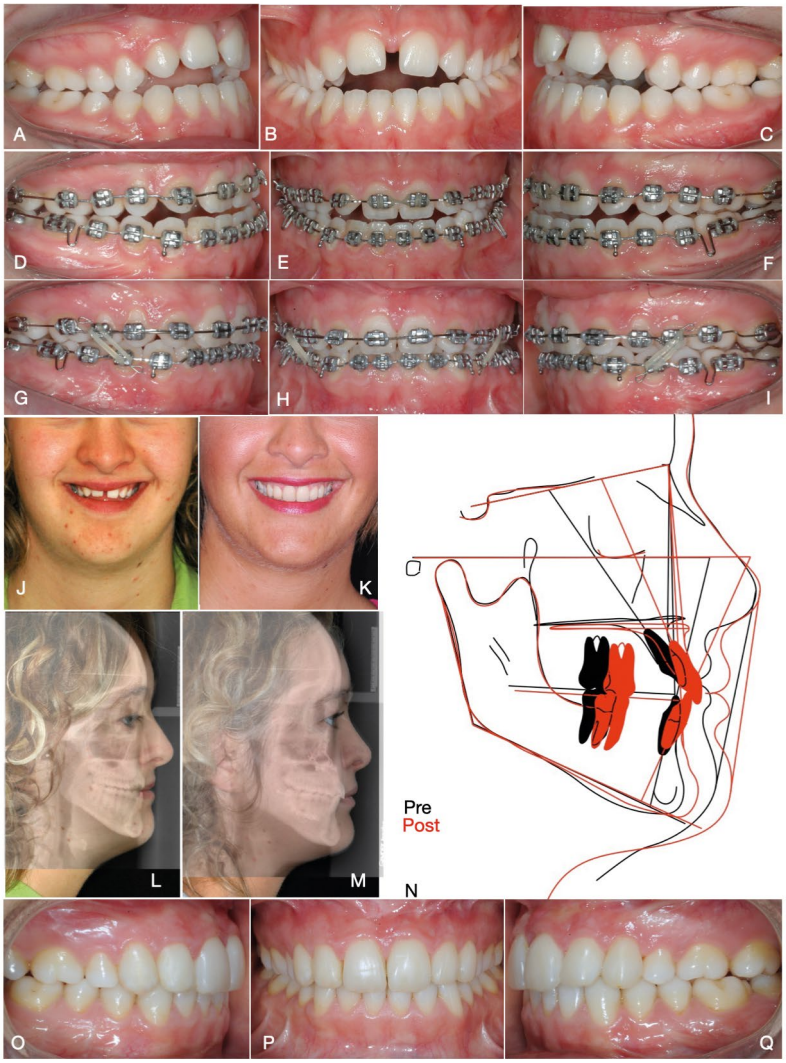

Fig. 6 a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q) FO – Missing 1.2 and 2.2 and skeletal hyperdivergent Class III / upper space closure and surgical correction of the skeletal discrepancy and of the occlusal relationship. A 22-year-old woman showed a hyperdivergent skeletal Class III mainly due to the maxillary vertical and A/P hypoplasia (L). The malocclusion was a Class II subdivision R molar relation (A, C), small teeth, missing upper laterals, anterior open bite (B), flat smile arc, and reversed hidden smile line (J). Considering the high expectations of the patient, orthodontic space closure and surgical correction of the occlusal relations and skeletal discrepancy were chosen (D, E, F, G, H, I, M). The orthodontic treatment aimed to close the upper spaces, upright the protruded upper incisors and level the dental arches (D, E, F) before the surgical stage (M, N). The superimposition of the tracings before (black) and after (red) treatment show the skeletal and occlusal changes (N). Six composite restorations were performed on the upper canines, small first premolars and central incisors immediately after the end of the active orthodontic treatment. Five years post-op, the occlusion is stable (O, P, Q) while the aesthetics of the smile is well balanced (K)

canine bucco-lingual position should be adjusted accordingly;[34,44]

- The final mesio-distal position of the canine will be dictated by the restorative plan. Since mesio-distal crown inclination (crown tip) may affect the location and appearance of the gingival zenith, liaison with the restorative dentist before debonding is recommended;[34,44]
- Canine anatomy and periodontal phenotype will determine the amount of extrusion needed to achieve the 'high-low-high' appearance of the gingival scallop.[34,44]

Lower dentition

CMLI patients have reduced crown widths in both upper and lower dental arches. Therefore, widening of the maxillary anterior teeth may result in a tooth-size discrepancy with maxillary excess and an increased overjet. Consequently, enlargement of mandibular anterior teeth or thickening of maxillary restorations may be needed to achieve ideal outcomes.[5,6,7,44]

Minor periodontal surgery

Evaluation of the exact vertical position of the gingival margins may be difficult during orthodontic treatment. This may relate to the following: a) swollen or hypertrophic gingiva mainly due to poor oral hygiene; b) periodontal tissue remodelling subsequent to orthodontic movements;[60,61] or c) presence of passive/active altered eruption.[62] While periodontal procedures are typically not required, these may vary from simple gingivectomy when the periodontal structures are in their physiologic position to muco-gingival or resective surgery when periodontal tissues require relocation.[63]

Single-stage or two-stage restorative procedures and/or local bleaching

Post-treatment tooth size and morphology should be planned before the end of orthodontic therapy.[34] Following orthodontic treatment in adolescent patients, no-prep composite restorations are recommended as the periodontal tissues are not yet fully mature.[34,44]

Adult patients are sometimes better treated definitively with ceramic restorations. Indirect restorations may help not only in achieving the best aesthetics, but also in compensating for any post-orthodontic occlusal imperfection.[34,44] Finally, at-home vital bleaching of canine may be recommended in adults. When vital bleaching is planned, a brighter composite shade should be considered.[34]

Conclusions

Space closure is an effective treatment modality being compatible with aesthetics, stability, and periodontal health. In order to minimise the effects of persistent cranio-facial growth, space closure may be preferable in growing patients, young adults, and in the presence of high

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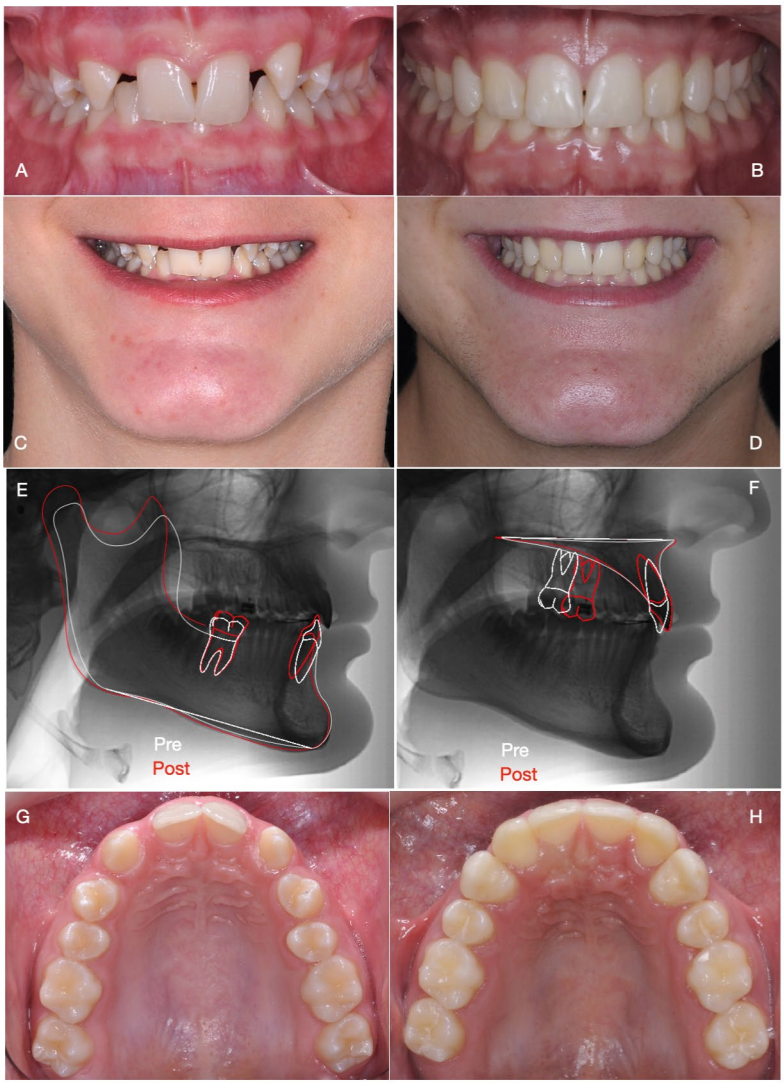

Fig. 7 a, b, c, d, e, f, g, h) PM, Part 1 – Missing 1.2 and 2.2 / hypodivergent Class III / upper space closure supported by skeletal anchorage. A 14-year-old boy showed a skeletal severe hypodivergent, Class III malocclusion with both maxillary CMLI at the end of the transition (A). The smile line was not ideal with uneven, not-visible gingival margins (A) and papillae (C), wide inter-incisors angle and deep bite. Considering the expectations of the parents, who didn't accept a prosthetic replacement of the missing incisors, orthodontic treatment was aimed at the upper space closure (A, B, G, H) and improvement of the smile aesthetics (C, D) by upper incisors extrusion, lower incisors intrusion and correction of the inter-incisors angle by slight root lingual torque (E, F). The orthodontic extrusion of the lower molars (E) would also have produced a mandibular post-rotation and slight improvement of the vertical dimension. The superimposition on the final lateral cephalogram (E, F) shows the dental changes between after (red) and before (white) the orthodontic treatment

smile line. This may be performed in a single stage, reducing the complexity and burden of care. Multiple restorations may, however, be indicated after orthodontic space closure given the predilection to coexisting microdontia and misshapen central incisors. As such, detailed joint planning and ongoing liaison between orthodontist and restorative clinicians underpins optimal outcomes with orthodontic space closure in the aesthetic region.

Ethics declaration

The authors declare no conflict of interest. Written consent to publish was obtained for the figures included in this article.

Author contributions

Davide Mirabella: conceptualisation, literature review, original draft writing and editing; Marco Rosa: conceptualisation, literature review, clinical cases, and reviewing.

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Fig. 8 a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z) PM, Part 2 – Missing 1.2 and 2.2 / hypodivergent Class III / upper space closure supported by skeletal anchorage. With the aim of quickly moving the upper molars and premolars forward, with no cooperation and without lower appliances, a limited to the upper arch biomechanics supported by skeletal anchorage was planned (G–U). No extractions were made in the lower arch. After the upper space closure, the orthodontic finishing stage was performed with fixed appliances also in the lower arch (P, Q, R) with the aim to flatten the curve of Spee by molars/premolars extrusion and canines/incisors intrusion. The orthodontic finishing phase was also aimed at extruding and levelling the gingival margins of the upper front teeth (S, T, U) and positioning their roots correctly in the periodontal envelope (A–F and V–Z). The day of the appliance removal, six composite restorations were performed on the upper first premolars, canines and central incisors (S, T, U) to idealise the aesthetic proportions of the crowns

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Fig. 9 a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u) AG – Missing 1.2 and 2.2 / clear aligners space closure supported by skeletal anchorage. A 13-year-old girl with both upper CMLI in the last stages of the mixed dentition, Class I malocclusion (A, B, C, T) and hypodivergent skeletal pattern was asking for an orthodontic treatment with clear aligners. Immediately after the extractions of the upper deciduous canines and lateral incisors, the upper space closure was performed with palatal fixed appliances supported by two temporary anchorage devices (D, E, F, M). The biomechanics were effective in mesialising premolars and molars from a perfect Class I occlusal relationship to a full Class II relationship, without any cooperation and without appliances in the lower arch (D–P). The space closure lasted 14 months. The orthodontic finishing was performed with clear aligners in both arches (K). Four composite restorations were performed after the orthodontic treatment on the upper canines and first premolars (Q, R, S, U)

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