Hypodontia

BACKGROUND

Hypodontia refers to the absence of 1 or more deciduous or permanent teeth, with the exclusion of the third molars. Usually the teeth affected are the mandibular second premolars, maxillary lateral incisors, and maxillary second premolars. Factors contributing to hypodontia are genetic and environmental, with inherited tendencies playing a greater role. Hypodontia can be mild, with 3 or fewer missing teeth; moderate, with fewer than 6 missing teeth; or severe with 6 or more teeth missing. Anodontia refers to the congenital absence of all the teeth, whether the primary or the permanent dentition. The management of hypodontia requires a multidisciplinary approach and involves 3 primary modalities: accept the residual spacing, close the space, and open the space and restore it with prostheses. The arguments for and against each of these approaches were presented, noting the most advantageous scenarios for space opening and space closing, with the aim of guiding practitioners in choosing the best treatment approach.

ASSESSMENT METHODS

Eruption patterns should be closely monitored to detect missing teeth early. Lateral incisors should erupt between ages 8 and 9 years; should this fail to occur, radiographs are required to evaluate the situation. Missing primary teeth is associated with missing permanent successors, so early referral and interventions are advisable.

When evaluating the possibility of hypodontia, details of any other malocclusions should also be noted. If it's suspected that an impacted canine is present based on palpation and radiographic examination, the case would be classified using the Index of Orthodontic Treatment Need. A checklist of proper information to obtain is valuable in the assessment process.

TREATMENT OPTIONS

Accepting The Space

When discussing the diagnosis with the patient, it's important to include the option of no treatment and acceptance of the spacing. For patients who are not concerned about the missing tooth and the malpositioning of the adjacent teeth, this may be desirable. Close monitoring should be undertaken until the adjacent canine has erupted to ensure it isn't impacted. The decision not to treat, as well as a complete listing of the options discussed, should be documented in the patient's chart.

Closing The Space

If the patient opts for closing the space, orthodontic treatment can minimize the need for restoration and help to maintain periodontal health. Although some clinicians advocate the use of 'ultra-thin' veneers to disguise canines and achieve a more esthetic look, this option causes more destruction of tooth substance and undermines the primary reason for space closure. This option should not be recommended routinely or considered until the gingiva are mature.

Multidisciplinary plans for treatment are essential for successful and predictable space closure. The goal is to avoid the need for long-term restorative care, with the primary treatment being orthodontic alignment.

Patients with the most favorable outcomes are those who have minor spacing problems, who are motivated for orthodontic care and have no caries or periodontal problems, who require lengthier and more complex treatment because of unfavorable spacing width, who have a favorable skeletal profile, who have crowding of their teeth, who are missing the bilateral lateral incisors, who have canines with esthetics that are good for camouflage, whose space is not affecting dental symmetry, and who have small canines that are unfavorable for the use of adhesive bridges. Having favorably proportioned canines in the absence of both lateral incisors also enhances the outcome. It can be difficult to make up for unilateral missing laterals and have an esthetic result. Dentists should undertake a diagnostic wax-up or Kesling setup to help visualize possible results.

When considering canine camouflage, it's important to address the color of the canine, which differs from that of other teeth. In addition, canines are longer and wider than lateral and central incisors, making it difficult to reduce the canine tip to achieve an ideal endpoint. Canines are also more pointed than incisors, which can require the direct addition of composite to achieve squared-off mesial and distal incisal corners. If the first premolar is becoming the canine, adjustments of the palatal cusp and the addition of composite to the mesio-buccal aspect can be required.

Space closure is usually achieved through the application of upper and lower arch fixed appliances. Intra-maxillary springs or elastic power chains and/or inter-maxillary elastics are used for traction. Canine guidance is not possible if they are being moved to the lateral incisor position, so the occlusal goal is to achieve anterior group function. Tooth movement is slow and may pose problems in fully closing the space, often as a result of alveolar bone narrowing. As with all orthodontic treatment, there is a risk for relapse. Good retention must be continued after the active phase of orthodontic treatment has been completed.

The goal is to torque the canine root palatally, reducing the canine eminence and placing the canine root in a position nearly where the permanent maxillary lateral incisor would be.

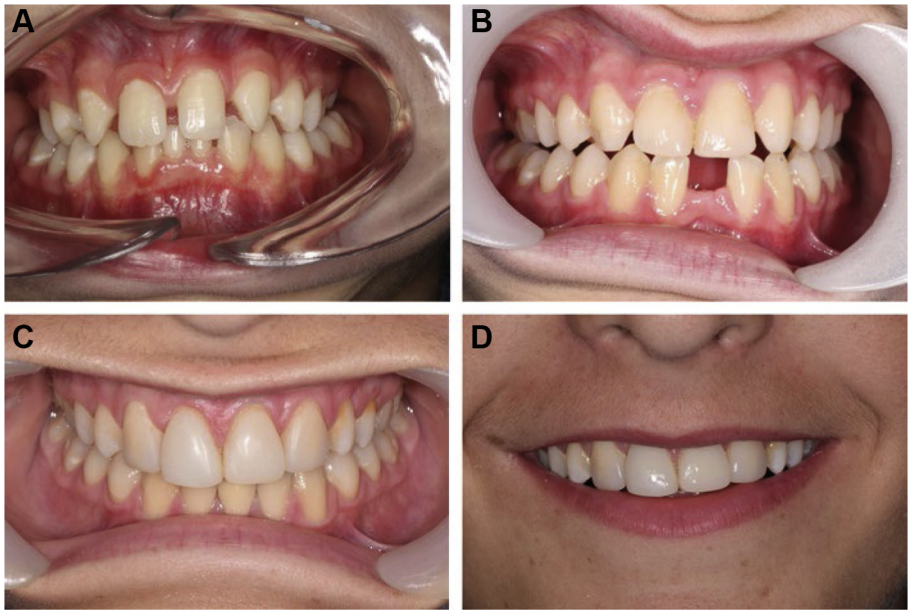

Figure 3. A, Pretreatment intraoral view shows both missing laterals in the maxilla and pointed canines. There is also a missing incisor in the mandible. **B,** Results at debond after planned space closure undertaken. Note the canines are pointed, despite being modified during orthodontic treatment and the centrals asymmetrical. **C,** Intraoral view following replacement of the 31 with an adhesive bridge, shape modification of the centrals and laterals, and direct composite veneers of the canines and centrals. **D,** Extraoral view posttreatment. While this patient has clearly undergone operative dentistry, it would be hard to spot these as canines. (Courtesy of Westgate E, Waring D, Malik O, et al: Management of missing maxillary lateral incisors in general practice: Space opening versus space closure. *Br Dent J* 226:400-406, 2019.)

Orthodontic treatment may also be done to extrude the canine, which would allow the gingival margins to migrate down and mimic those of a lateral incisor coupled with mesial rotation of the first premolars for esthetics (Figure 3).

Few data indicate the longevity of direct bonded restorations that modify canine or premolar shape. However, anterior composites used to manage tooth wear have very good survival, with some evidence indicating failure occurs only after 5 or 6 years. In addition, the failure does not involve tooth fracture, caries, or pulpal death but rather staining and fracture of composites, which can be readily addressed.

Table 4. Argument For and Against Space Opening

Argument for	Argument against
Aesthetic result for larger spans	Requires patient to enter into restorative cycle
Possible to maintain canine guidance	Long-term prosthesis management, including financial implications
If canine unsuitable for camouflage	Loss of bone
	Lengthier orthodontic treatment times

(Courtesy of Westgate E, Waring D, Malik O, et al: Management of missing maxillary lateral incisors in general practice: Space opening versus space closure. *Br Dent J* 226:400-406, 2019.)

If the patient is not motivated to undergo orthodontic treatment, small spaces may be closed or reduced using restorative measures, such as composite additions or indirect prostheses, such as veneers and crowns. Closing larger gaps without orthodontic treatment can result in poor esthetic results. Clinicians should bear in mind the fundamental principles of smile design when planning for restorative management.

Opening The Space

Space opening is done to allow the esthetic restoration of the site with a prosthesis. This option requires a patient who is motivated and suitable for orthodontic treatment. The goal is to create a single unit space that will allow a like-for-like replacement of the missing tooth. Biologically, it's desirable to maintain or create canine guidance to protect future prostheses. Advocates for space opening believe that canine guidance will protect the functional outcome and be more predictable long-term. However, alternative strategies will be needed if space closure cannot be achieved (Table 4).

Patients who have more favorable outcomes with space opening procedures are those with a single missing lateral tooth with or without peg-shaped contralateral incisor, those with sufficient enamel on the abutment tooth for bonding, those whose bone quantity is sufficient for use of an implant or retained maxillary deciduous lateral incisor, those who have a gap that is large or uneven, and patients strongly motivated for

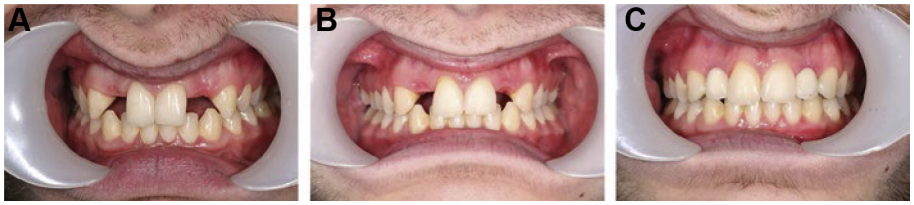

Figure 7. A, Preoperative view of patient with both missing laterals and diminutive canines. **B,** Space optimization and modification of the canines and centrals with composite. **C,** Postoperative views with adhesive bridges fitted. (Courtesy of Westgate E, Waring D, Malik O, et al: Management of missing maxillary lateral incisors in general practice: Space opening versus space closure. *Br Dent J* 226:400-406, 2019.)

orthodontics who are caries free and in good periodontal health. In addition, patients whose dentition is spaced, those who have a Class III skeletal profile, and those whose canine shape and size are unfavorable for camouflage techniques will likely benefit from opening the space.

The space created should be sufficient to accommodate a lateral incisor proportionate to the central incisor, with 7 mm being about the optimal sized space. Reduction may be required if the central incisors are small but well-proportioned. Dental implants require a minimum of 7 mm in both the intracoronal and intraradicular spaces. Central incisors should have a crown width about 80% of their length. Restorative modifications may be needed if these conditions cannot be achieved otherwise, or the shape may be altered during orthodontic treatment.

The average central incisor is 10 to 11 mm by 8 to 9 mm, but in hypodontia, incisors are often poorly proportioned and narrow. Before the debonding appointment, the dentist should review the spaces that have been created. This time presents an opportunity to adjust the initial treatment plan in light of the orthodontic result that has been achieved.

Once the space is suitable, options for restoring the area include a removable prosthesis, conventional or adhesive bridgework, autotransplantation, or an implant-retained prosthesis. The fastest and most straightforward approach is the use of partial dentures. This is a flexible option that can alter facial height and maintain the space for interim treatment planning. Bridgework should be attempted only after thorough assessment of the abutment teeth. Unless the canines are heavily restored and protection of the remaining tooth structure is sought, conventional bridgework should be avoided. Pulpal death with this option is quite common in young patients. The bridge of choice is a resin-retained structure, but these require sufficient enamel on which to bond. It's recommended that the canine be the tooth of choice.

Short clinical crowns and microdontal teeth can limit how much palatal enamel is present for bonding. The amount of enamel present can be augmented through electrosurgery or formal crown lengthening. Although the central incisors may serve as abutments, they can be prone to greying of the abutment, compromising the esthetics of the restoration. The alveolar ridge should also be evaluated when planning the shape of the pontic. Site preparation using electrosurgery or a high-speed handpiece with a round coarse diamond bur can help develop the future pontic site and encourage a more natural emergence. These techniques can help to provide good esthetics and high success rates after 5 and 10 years.

Even though the success rates of adhesive bridges appear lower than those of dental implants, the clinician and patient must remember that resin-bonded bridges are a simple, inexpensive, and elegant solution to the hypodontia problem (Figure 7). In addition, failure of a bridge through debonding that requires recementing is both less costly and less labor intensive to address than managing the complications associated with implants.

Implants offer an alternative when dentures and adhesive bridgework are undesirable or cannot be provided. Usually implants are done only in patients over age 18 years, once craniofacial growth is complete. Patients considering implants should undergo a careful assessment of the amount and quality of bone present and the angulation of the adjacent teeth and their roots. Often bone augmentation is needed in hypodontia, but implants provide an independent, fixed restoration with residual spacing as needed.

Clinical Significance

The dentist should not only have a handle on the eruption patterns of the teeth of young persons but also be equipped with good relationships with specialists in orthodontics and other areas so that the management of a patient with hypodontia can be accomplished without much stress. Dentists should plan ahead and forge professional friendships so that they are able to participate in the multidisciplinary team needed to help these patients. Knowing the options available and who will do best with each option is valuable when making decisions about referring patients and achieving a desirable outcome.

When considering implants, patients should be informed that the lifetime burden of maintenance associated with implantation may make adhesive bridges a more attractive option. Survival rates of implant-retained crowns are high, but the biological and technical complications over the course of an implant's life must also be considered.

DISCUSSION

General dentists who are called upon to assess a patient for possible hypodontia should be vigilant about the patient's eruption patterns, refer the patient for early treatment, and reinforce the importance of maintaining excellent oral hygiene. Patients and clinicians can benefit from the use of diagnostic wax-ups to depict possible outcomes. In addition, when a patient is undergoing a space opening procedure, it's important to review the patient's response before debonding and adapt the treatment program if needed.

Westgate E, Waring D, Malik O, et al: Management of missing maxillary lateral incisors in general practice: Space opening versus space closure. *Br Dent J* 226:400-406, 2019

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VAPING

Dangers of e-cigarettes

BACKGROUND

Vaping, or using e-cigarettes, has been marketed as a way for smokers to quit smoking. This marketing leads one to believe that e-cigarettes are less harmful than cigarettes and allow the user to enjoy a nicotine fix without the adverse health effects of smoke. In reality, e-cigarettes pose a serious risk to oral as well as overall health. A look at the prevalence of e-cigarettes and the dangers they present was offered.

PREVALENCE

Marketing efforts have made e-cigarettes appeal to a segment of the young population that has no history of tobacco usage and never intended to smoke. Middle and high school students have had declining smoking use since 2014, but since e-cigarettes were introduced, an estimated 20% of high school students may be using tobacco products.

DANGERS

Chemical Exposure

One danger of e-cigarettes is related to propylene glycol (PG), which is primarily used in producing polymers and in food processing. It can also be used as a carrier for inhalant pharmaceutical products, which includes nicotine. PG is a major ingredient of the e-liquid used in e-cigarettes. The breakdown products related to its oral use include acetic acid, lactic acid, and propionaldehyde, all of which have toxic effects on enamel and soft tissue. The hygroscopic qualities of PG produce tissue desiccation, resulting in xerostomia, which is related to an increase in caries, gum disease, and other oral health problems.

Vegetable glycerin (VG) and flavorings combine to produce a 4-fold increase in microbial adhesion to enamel and a 2-fold increase in biofilm formation. Enamel hardness is diminished by 27% when flavorings are added to e-liquid compared to unflavored e-liquid. In addition, e-liquid viscosity allows *Streptococcus mutans* to adhere to pits and fissures. The overall effect is for more cavity-causing bacteria to adhere to softer teeth and lead to rampant decay.

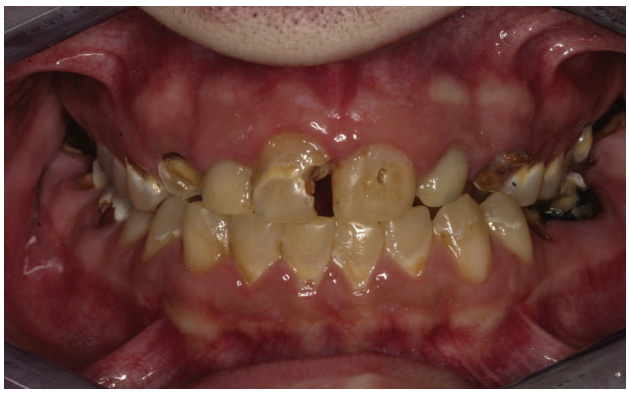

Figure 2. Effects of e-cigarette usage. (Courtesy of Froum S, Neymark A: Vaping and oral health: It's worse than you think. *Dent Econ* 109:78-80, 2019.)

Although the percentage of nicotine is considerably lower than in traditional tobacco products, a single electronic cartridge, which delivers 200 to 400 puffs, can equal smoking 2 to 3 packs of regular cigarettes. Nicotine not only has adverse effects on oral gingival tissues but also affects gingival blood flow, cytokine production, neutrophil function, and the function of other immune cells. Connective tissue turnover is diminished. The ultimate result is a higher risk for developing disease of the gums and loss of teeth.