

## CLINICAL REPORT

# Interdisciplinary treatment with implant-supported two-unit cantilever prosthesis for a patient with hypodontia: A clinical report

Shao-Chun Wang, DDS,<sup>a</sup> Jessica Chia-Yi Wang, DDS,<sup>b</sup> Chen-Jung Chang, DDS, MS,<sup>c</sup> and Kuo Yuan, DDS, MS, PhD<sup>d</sup>

Hypodontia, the developmental failure of 6 or fewer teeth, excluding third molars,<sup>1,2</sup> is the most prevalent dentofacial malformation.<sup>3</sup> The prevalence of missing permanent teeth ranges from 2.5% to 6.9%, depending on the population studied.<sup>4-6</sup> In patients where the permanent successor is absent, the primary tooth may be retained.<sup>7,8</sup> The etiology of hypodontia has been suggested to be multifactorial but is typically caused by genetic factors.<sup>1,9,10</sup> These patients require careful treatment planning and the interdisciplinary collaboration of orthodontics, prosthodontics, implantology, and psychology teams to achieve satisfactory treatment outcomes.<sup>11</sup>

Implant-supported prostheses can be a suitable treatment option for the replacement of teeth missing because of agenesis after careful treatment planning.<sup>12</sup> The replacement of 2 adjacent missing teeth remains a clinical challenge, especially when the missing teeth are located in the esthetic zone.<sup>13</sup> The presence of a papilla between 2 implant-supported crowns is predominantly dictated by the distance between the proximal contact and the location of the crest of the interproximal bone.<sup>14</sup> Two adjacent non-platform-switched implants have been suggested to be placed 3 to 4 mm apart to establish an optimal interimplant papilla fill, while it is possible to

## ABSTRACT

A 21-year-old woman with multiple congenitally missing maxillary anterior teeth received interdisciplinary treatment to restore function and esthetics. The treatment was initiated with orthodontic treatment, followed by implant placement, bone and soft-tissue augmentation, and prosthetic treatment including a screw-retained implant-supported 2-unit cantilever fixed dental prosthesis. (*J Prosthet Dent* 2021;■■:■-■)

retain bone with platform-switched implants placed 1.5 to 3 mm apart.<sup>15,16</sup> When these anatomic principles cannot be met, alternative treatment options, for example, a single implant supporting a 2-unit cantilever fixed dental prosthesis (FDP), may be considered.<sup>15-20</sup> In a retrospective case series of 2-unit cantilever FDPs, papilla index scores of 1 and 2 were observed in most patients, no technical complications were detected, and an implant survival rate of 100% was found,<sup>20</sup> which is consistent with studies with follow-up from 1 to 5 years.<sup>17,18,21</sup>

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A 21-year-old woman presented to the Division of Orthodontics at National Cheng Kung University Hospital in 2015 with the chief complaint of the poor appearance of her anterior teeth. Her medical history included bipolar disorder controlled with medication and no parafunctional habits. Intraoral and radiographic examinations revealed a congenitally missing maxillary right lateral

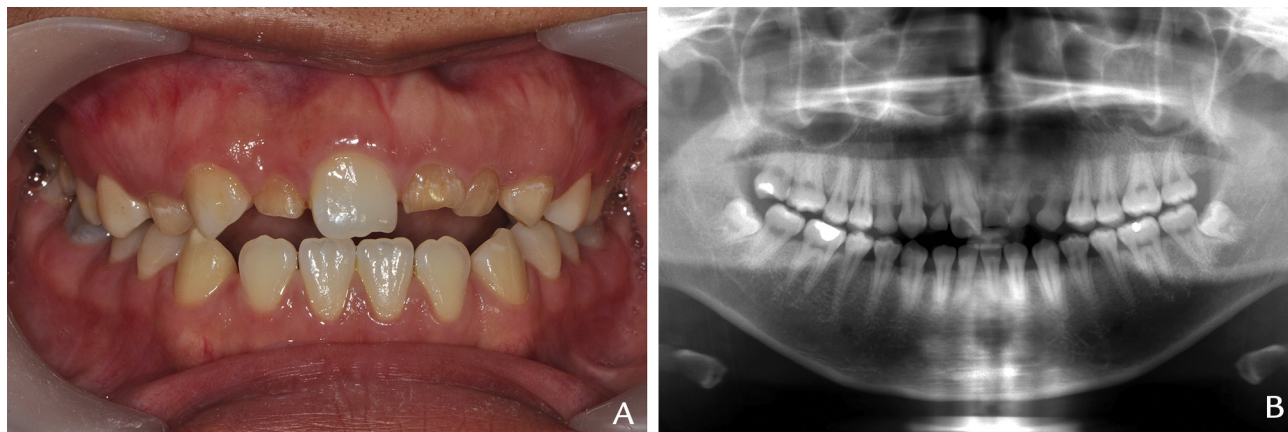
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<sup>a</sup>Attending Physician, Division of Prosthodontics, Department of Stomatology, National Cheng Kung University Hospital, Tainan, Taiwan, ROC.

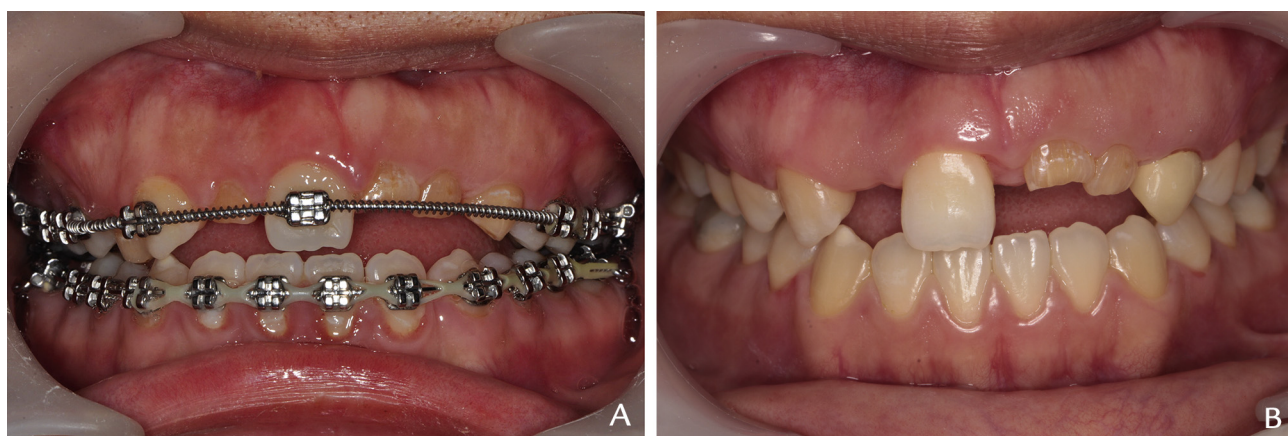
<sup>b</sup>Resident, Department of Stomatology, National Cheng Kung University Hospital, Tainan, Taiwan, ROC.

<sup>c</sup>Lecturer and Attending Physician, Division of Orthodontics, Department of Stomatology, National Cheng Kung University Hospital, Tainan, Taiwan, ROC.

<sup>d</sup>Attending Physician, Division of Periodontics, Department of Stomatology, National Cheng Kung University Hospital, Tainan, Taiwan, ROC.



**Figure 1.** Patient with congenitally missing maxillary right lateral incisor, left central incisor, lateral incisor, and canine with retained primary teeth, including primary maxillary right lateral incisor and canine, and left central incisor, lateral incisor, and canine. A, Pretreatment intraoral view. B, Pretreatment panoramic radiograph.

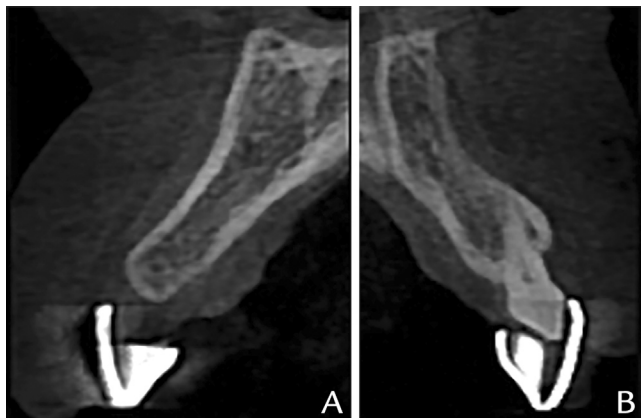


**Figure 2.** Orthodontic treatment. A, Bands, elastics, and brackets placed. B, Intraoral view after completion of orthodontic treatment.

incisor, left central incisor, left lateral incisor, and left canine. Primary teeth included a maxillary right lateral incisor and canine and a left central incisor, lateral incisor, and canine. External root resorption of the primary maxillary right lateral incisor was found (Fig. 1). The orthodontic treatment plan was to extract the primary maxillary right lateral incisor and canine to correct the maxillary dental midline, which had shifted 3 mm to the left side with respect to the facial midline, as well as to provide appropriate space in the maxillary arch for subsequent prosthetic treatment. The primary maxillary left central incisor, lateral incisor, and canine were preserved for bone maintenance during this phase.

Orthodontic treatment was initiated in 2015. Complete-mouth fixed appliances were bonded and banded except for the retained primary teeth (Fig. 2A). After initial alignment and leveling, the primary maxillary right lateral incisor and canine were extracted. Subsequently, an interim crown shaped to replicate a permanent canine was delivered to the primary maxillary left canine.

The orthodontic treatment was completed in 36 months, with coincident dental midlines and adequate space for prosthetic treatment being achieved (Fig. 2B). A cone beam computed tomography scan showed insufficient bone volume in the maxillary right lateral incisor (Fig. 3A) and left central incisor positions (Fig. 3B). The primary maxillary left central and lateral incisors were atraumatically extracted and, after 2 months of healing, 1 implant (Astra Tech Implant System, 3.5×11 mm; Dentsply Sirona) was placed in the maxillary right lateral incisor position, and another implant (Astra Tech Implant System, 4.5×11 mm) was placed in the maxillary left central incisor position with the 2-stage protocol and a surgical guide based on the diagnostic waxing (Fig. 4). Simultaneous bone grafting with xenografts (InterOss; SigmaGraft) and resorbable collagen membrane (EZ-Cure; Biomatlante) were provided in both positions. Six months later, the implants were uncovered, gingivectomy around the primary maxillary left canine was performed for gingival harmony, and the modified roll technique described by Scharf in 1992<sup>22</sup> was performed



**Figure 3.** Cone beam computed tomography images with surgical guide. A, Maxillary right lateral incisor area. B, Maxillary left central incisor area with primary tooth in place.



**Figure 4.** Diagnostic waxing after completing orthodontic treatment.



**Figure 5.** Interim prostheses. A, Intraoral view on day of delivery. B, Intraoral view of 3-month follow-up after definitive adjustment of emergence profile.

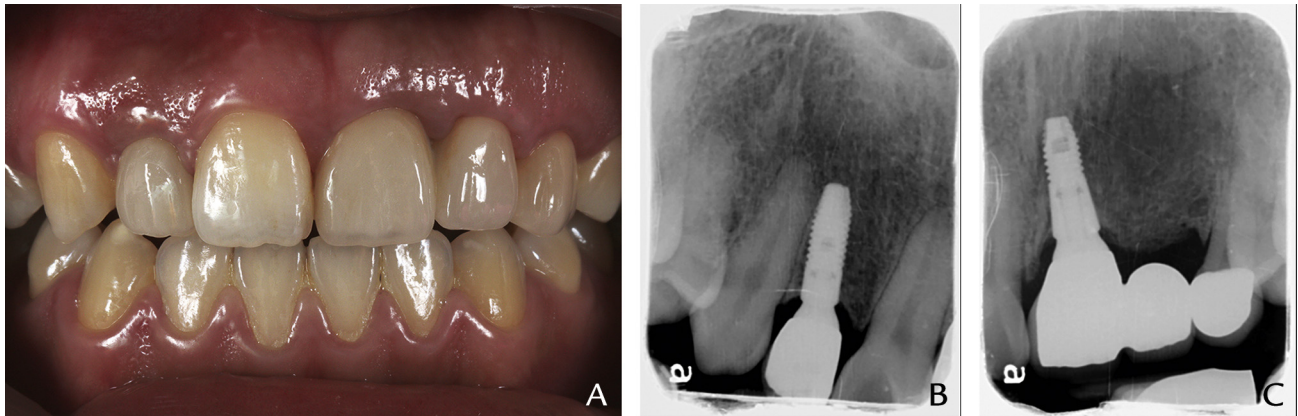
over the maxillary left incisor region for soft-tissue augmentation.

In 2019, an interim implant-supported screw-retained crown and 2-unit cantilever FDP was delivered. She returned to the clinic every month for emergence profile adjustment to shape the papilla and facial gingival levels (Fig. 5). After 3 adjustments and another 3 months of follow-up, a ceramic veneered zirconia crown (Ceramill Zirconia; Amann Girrbach AG) and 2-unit cantilever FDP was cemented (RelyX U200; 3M ESPE) on titanium abutments extraorally with screw-access holes on the palatal surfaces and delivered using torque values recommended by the manufacturer, 20 Ncm and 25 Ncm, respectively. Both access holes were sealed with polytetrafluorethylene tape and light-polymerizing composite resin (Filtek Z250; 3M ESPE). A ceramic veneered zirconia crown was cemented (RelyX U200; 3M ESPE) on the primary maxillary left canine (Fig. 6). The occlusal scheme was group function on both sides, with no occlusal contact on the cantilevered pontic during protrusive movement.

Further professional recall visits are conducted at 6-month intervals. The most recent follow-up was 18 months after delivery (Fig. 7). She is satisfied with her esthetics (Fig. 8).

## DISCUSSION

The prognosis is among the most important considerations when managing patients with retained primary teeth.<sup>4</sup> Primary canines and second molars have been reported to have a significantly better prognosis than primary incisors and first molars.<sup>7,8</sup> In this clinical report, the primary maxillary left canine demonstrated adequate root and crown structure and position, but esthetic improvement was required. However, the primary maxillary left central and lateral incisors had unsatisfactory positions and severe infraocclusion, and the primary right canine had a permanent successor. Therefore, after diagnostic waxing and discussion with the orthodontist, the primary maxillary left canine was retained and reshaped, while the remaining primary teeth were extracted at varying stages during treatment.



**Figure 6.** Definitive prostheses. A, Intraoral view at 6-month follow-up. B, C, Periapical radiographs.

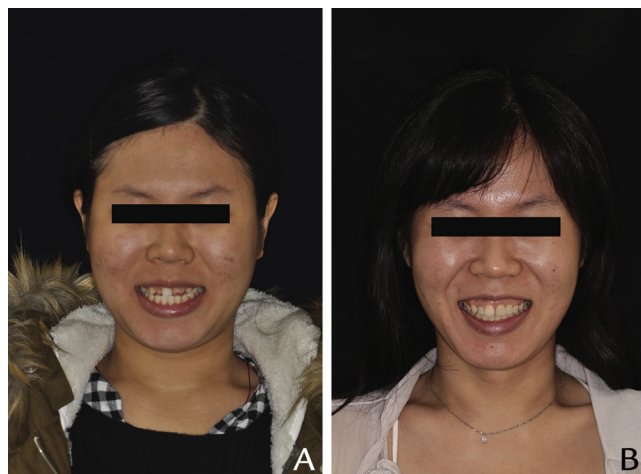


**Figure 7.** Eighteen-month follow-up. A, Intraoral view. B-D, Periapical radiographs.

High-level evidence-based data for the optimal timing of primary teeth extraction in relation to placement of implants in individuals with tooth agenesis are lacking. According to several authors, implants should not be placed immediately but close in time to the

extraction of the retained primary teeth to preserve alveolar bone.<sup>12</sup>

In patients with a missing adjacent maxillary central incisor and lateral incisor, horizontal space available for the placement of 2 implants with sufficient interimplant



**Figure 8.** Photographs of patient smiling. A, Preoperative. B, At 18-month follow-up.

space is often lacking.<sup>13-15</sup> The use of an implant-supported 2-unit cantilever FDP in anterior sites accompanied by high midterm implant survival rates and excellent patient satisfaction is a valid treatment option compared with 2 adjacent implants.<sup>17-20</sup> For this patient, after 3-month adjustments of the emergence profile, a satisfactory papilla contour was achieved and maintained for another 3 months before the definitive prosthesis was fabricated and delivered.

## SUMMARY

When multiple permanent teeth are congenitally missing, an interdisciplinary approach including orthodontic treatment, implant placement, bone grafting, soft-tissue augmentation, and prosthetic treatment is needed to regain function and esthetics. With thorough treatment planning, an implant-supported 2-unit cantilever FDP can be a reliable treatment in the esthetic zone for a patient with hypodontia.

## REFERENCES

1. Al-Ani AH, Antoun JS, Thomson WM, Merriman TR, Farella M. Hypodontia: an update on its etiology, classification, and clinical management. *Biomed Res Int* 2017;2017:9378325.
2. Matalova E, Fleischmannova J, Sharpe PT, Tucker AS. Tooth agenesis: from molecular genetics to molecular dentistry. *J Dent Res* 2008;87:617-23.
3. Nunn JH, Carter NE, Gillgrass TJ, Hobson RS, Jepson NJ, Meechan JG, et al. The interdisciplinary management of hypodontia: background and role of paediatric dentistry. *Br Dent J* 2003;194:245-51.
4. Robinson S, Chan MF. New teeth from old: treatment options for retained primary teeth. *Br Dent J* 2009;207:315-20.
5. Polder BJ, Van't Hof MA, Van der Linden FP, Kuijpers-Jagtman AM. A meta-analysis of the prevalence of dental agenesis of permanent teeth. *Community Dent Oral Epidemiol* 2004;32:217-26.

6. Symons AL, Stritzel F, Stamation J. Anomalies associated with hypodontia of the permanent lateral incisor and second premolar. *J Clin Pediatr Dent* 1993;17:109-11.
7. Haselden K, Hobkirk JA, Goodman JR, Jones SP, Hemmings KW. Root resorption in retained deciduous canine and molar teeth without permanent successors in patients with severe hypodontia. *Int J Paediatr Dent* 2001;11:171-8.
8. Stanley HR, Collett WK, Hazard JA. Retention of a maxillary primary canine: fifty years above and beyond the call of duty. *ASDC J Dent Child* 1996;63:123-30.
9. Cobourne MT. Familial human hypodontia—is it all in the genes? *Br Dent J* 2007;203:203-8.
10. Lin IP, Kumchai H, AlRejaye N, Sun AF, Drizen K, Liu JL. Interdisciplinary approach to treat patients with tooth agenesis: a case report. *Clin Adv Periodontics* 2019;9:34-46.
11. Filius MA, Cune MS, Raghoebar GM, Vissink A, Visser A. Prosthetic treatment outcome in patients with severe hypodontia: a systematic review. *J Oral Rehabil* 2016;43:373-87.
12. Bergendal B. When should we extract deciduous teeth and place implants in young individuals with tooth agenesis? *J Oral Rehabil* 2008;35 Suppl 1:55-63.
13. Testori T, Weinstein T, Scutellà F, Wang HL, Zuchelli G. Implant placement in the esthetic area: criteria for positioning single and multiple implants. *Periodontol* 2000 2018;77:176-96.
14. Ramanaukaite A, Rocuzzo A, Schwarz F. A systematic review on the influence of the horizontal distance between two adjacent implants inserted in the anterior maxilla on the inter-implant mucosa fill. *Clin Oral Implants Res* 2018;29 Suppl 15:62-70.
15. Jung RE, Heitz-Mayfield L, Schwarz F. Groups of the 2nd Osteology Foundation Consensus Meeting. Evidence-based knowledge on the aesthetics and maintenance of peri-implant soft tissues: Osteology Foundation Consensus Report Part 3-Aesthetics of peri-implant soft tissues. *Clin Oral Implants Res* 2018;29 Suppl 15:14-7.
16. Rodríguez-Ciurana X, Vela-Nebot X, Segalà-Torres M, Calvo-Guirado JL, Cambra J, Méndez-Blanco V, et al. The effect of interim-implant distance on the height of the interimplant bone crest when using platform-switched implants. *Int J Periodontics Restorative Dent* 2009;29:141-51.
17. Tymstra N, Raghoebar GM, Vissink A, Meijer HJ. Dental implant treatment for two adjacent missing teeth in the maxillary aesthetic zone: a comparative pilot study and test of principle. *Clin Oral Implants Res* 2011;22:207-13.
18. Van Nimwegen WG, Raghoebar GM, Tymstra N, Vissink A, Meijer HJA. How to treat two adjacent missing teeth with dental implants. A systematic review on single implant-supported two-unit cantilever FDP's and results of a 5-year prospective comparative study in the aesthetic zone. *J Oral Rehabil* 2017;44:461-71.
19. Storelli S, Del Fabbro M, Scanferla M, Palandrani G, Romeo E. Implant supported cantilevered fixed dental rehabilitations in partially edentulous patients: systematic review of the literature. Part I. *Clin Oral Implants Res* 2018;29 Suppl 18:253-74.
20. Rocuzzo A, Jensen SS, Worsaae N, Gotfredsen K. Implant-supported 2-unit cantilevers compared with single crowns on adjacent implants: a comparative retrospective case series. *J Prosthet Dent* 2020;123:717-23.
21. Wu MJ, Wang XJ, Zou LD, Xu WH, Zhang XH. Evaluation of the therapeutic efficiency of mandibular anterior implant-supported fixed bridges with cantilevers. *Chin Med J* 2013;126:4665-9.
22. Scharf DR, Tarnow DP. Modified roll technique for localized alveolar ridge augmentation. *Int J Periodontics Restorative Dent* 1992;12:415-25.

## Corresponding author:

Dr Shao-Chun Wang  
Division of Prosthodontics, Department of Stomatology  
National Cheng Kung University Hospital  
No. 138, Sheng Li Rd  
Tainan 704  
TAIWAN, ROC  
Email: shaochun0805@me.com

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