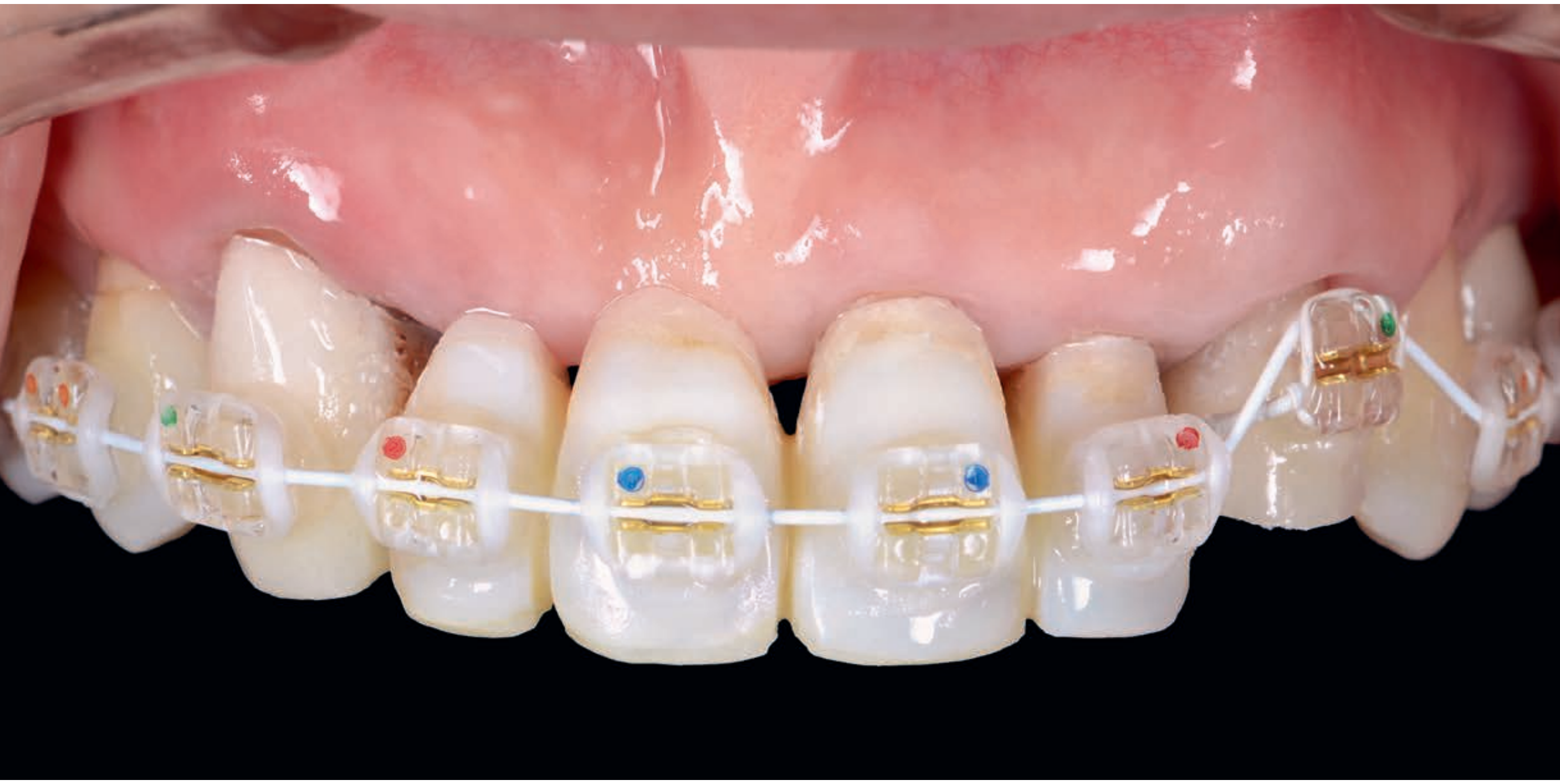
VeryPDF Software Demo Version (http://www.verypdf.com)



© 2025 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY.
NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.

VeryPDF Software Demo Version (http://www.verypdf.com)

VeryPDF Software Demo Version (http://www.verypdf.com)

Submitted December 27, 2023;
accepted February 9, 2024.

©2025 by Quintessence
Publishing Co Inc.

Tsutomu Tanno, DDS
Akira Hasuike, DDS, PhD
Koji Naito, DDS, PhD
Chihiro Ishikura, DDS
Akiyoshi Funato, DDS

Orthodontic Implant Site Development Using Labial Root Torque: A Case Series with CBCT Analysis

This case series assessed the efficacy of orthodontic implant site development with labial root torque (OISD-LRT) as a nonsurgical technique for addressing labial bone deficiencies in seven patients. The procedure involved strategically placing a multibracket device 2 to 3 mm apically on the hopeless teeth, gradually shifting them with Ni-Ti wires at the rate of 2 mm per month, and maintaining overcorrection for 2 months before extraction. OISD-LRT consistently augmented tissue for flapless guided implant surgery, with an average treatment duration of 404 ± 311.7 days. CBCT scans at various stages revealed increases in both vertical and horizontal bone dimensions, especially in the sockets with complete labial bone loss. Despite inevitable postextraction reductions in bone height and width, sufficient dimensions were maintained to ensure long-term implant stability. This case series highlights the effectiveness of OISD-LRT as a valuable method for horizontal bone augmentation, particularly in patients with labial bone deficiency. This approach provides a robust foundation for subsequent implant placement, showcasing its success in addressing challenging anatomical conditions and contributing to the broader field of implant dentistry. *Int J Periodontics Restorative Dent 2025;45:357–367. doi: 10.11607/prd.7094*

Keywords: *alveolar ridge augmentation, case series, dental implantation, implants, orthodontic extrusion, torque*

The presence of facial lamellar bone is considered a prerequisite for both a high implant survival rate[1] and good esthetic results.[2] A widely accepted understanding is that the extraction of a tooth triggers remodeling processes in surrounding tissues, resulting in a narrower and shorter ridge.[3] The primary cause of these changes is significant structural and dimensional modifications in the labial bone wall, leading the ridges to shift toward a more lingual position.[4]

In cases with compromised labial bone walls, a tissue augmentation procedure becomes necessary and can be accomplished through various nonsurgical or surgical approaches.[5,6] Orthodontic implant site development (OISD) presents a unique nonsurgical opportunity to leverage existing attachment apparatuses to stimulate vertical growth of gingival and osseous tissues.[7] OISD was initially introduced for immediate implant placement and referred to as *orthodontic extraction*.[8]

© 2025 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY. NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.
VeryPDF Software Demo Version (http://www.verypdf.com)

VeryPDF Software Demo Version (http://www.verypdf.com)

The value of this nonsurgical technique lies in eliminating at least one surgical procedure for implant therapy, such as staged or simultaneous guided bone regeneration (GBR) or mucogingival surgery.[9]

Although OISD is a highly effective tool for vertical tissue gain, it has limitations regarding horizontal tissue augmentation. Tissue augmentation was exclusively observed in areas with robust and healthy periodontal ligament (PDL) cells. Thus, the extent of tissue augmentation by these cells is intricately determined by the perimeter of the tooth and is limited to the horizontal direction. In 2003, Nozawa et al introduced a technique involving forced eruption and buccal root torque to address severe buccal bone issues.[10] OISD using labial root torque (OISD-LRT) presents a novel solution for esthetic cases with compromised labial bone walls. While a case report in 2019 demonstrated promising outcomes with OISD-LRT,[11] a comprehensive quantitative analysis and thorough discussion of its indications and contraindications are currently lacking. This case series aimed to present multiple cases and evaluate the efficacy of OISD-LRT for nonsurgical horizontal ridge augmentation in the esthetic zone, utilizing CBCT examination.

Materials and Methods

Case Selection

This case series presents the clinical management of seven patients who underwent dental implant placement in the esthetic zone to address hopeless teeth. Emphasis was placed upon on addressing the challenges associated with esthetic implant procedures arising from labial bone resorption. This is a retrospective, single-center, nonconsecutive case series report. The patients underwent comprehensive treatment at the Tanno Dental Clinic, a private practice located in Tochigi, Japan, between December 2012 and February 2017. All patients were treated by a well experienced practitioner (T.T.) after obtaining written informed consent according to routine clinical procedures. The cases were identified from existing medical records.

Patients were included if they met the following criteria: *(1)* at least 18 years old; *(2)* physically and psychologically capable of undergoing implant surgery and restorative procedures (American Society of Anesthesiologists Class I or II); *(3)* good oral hygiene with full-mouth plaque scores ≤ 15%; *(4)* having OISD-LRT employed in Elian Type II or Type III sockets in the esthetic zone[12]; and *(5)* having CBCT images at baseline, immediately after tooth extraction, and after superstructure placement. Smoking, pregnancy, and medications that could compromise bone augmentation or implant surgery were considered among the exclusion criteria. This case series is purely descriptive and observational, devoid of any experimental aspects, and adheres to the current ethical standards of the Declaration of Helsinki. Submission to an Institutional Review Board was not required and was crafted according to the PROCESS (Preferred Reporting Of CasE Series in Surgery) guidelines for the improvement of the quality of scientific reports.[13]

Orthodontic Treatment

Figure 1 shows the workflow and individual steps in a typical single-implant case, and Fig 2 illustrates the process for multiple-implant cases.

In cases where a tooth with a hopeless root lacks a crown, the initial step entails placing a temporary crown. Prior to proceeding with orthodontic treatment, it is imperative to complete the initial periodontal treatment and address any caries to ensure optimal oral health and minimize the risk of infection. After successfully completing the initial treatment, a multibracket device is affixed to initiate the leveling phase (see Figs 1d and 2c). Following satisfactory leveling, it is crucial to temporarily fix other adjacent teeth to prevent unexpected movement. Particular attention should be paid to the potential impact of lingual root torque, which can have adverse effects on neighboring teeth, potentially leading to flare-outs or open bites. Practical options for addressing this issue include lingual fixation or the double-wire technique. On the lateral surface of teeth undergoing OISD-LRT, the multibracket device was positioned approximately 2 to 3 mm apically compared to the adjacent teeth (see Figs 1e, 2d, and 2g).

© 2025 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY.
NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.

VeryPDF Software Demo Version (http://www.verypdf.com)

VeryPDF Software Demo Version (http://www.verypdf.com)

▲ **Figs 1a to 1i** Case 1, a 39-year-old man. *(a and b)* Initial clinical and radiographic views, respectively, of the fractured maxillary left canine (tooth 23). *(c)* The labial bone plate was partially resorbed (Elian Type II socket). *(d)* After placing a temporary crown on the fractured root, orthodontic leveling was initiated. *(e)* The multibracket device was carefully positioned approximately 2 to 3 mm apical compared to adjacent teeth. Tooth movement was controlled at a rate of approximately 2 mm per month using orthodontic Ni-Ti wires. *(f)* After 1 month, the bracket was repositioned 2 to 3 mm away from the gingival margin. *(g and h)* This process was repeated over several months, gradually moving the bracket position apically to allow the root to tilt and become exposed. *(i)* The bracket was ultimately placed at the apex of the tooth and retained. ⟶

© 2025 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY. NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.

VeryPDF Software Demo Version (http://www.verypdf.com)

VeryPDF Software Demo Version (http://www.verypdf.com)

▲ **Figs 1j to 1o** *(j)* After 2 months of retention, the root was extracted. *(k)* After completing the comprehensive orthodontic treatment, implant placement was performed using a flapless, guided surgery. *(l)* Histologic assessment of drilling bone shows vital bone components in augmented tissue. *(m)* Clinical view after delivering the superstructure. *(n and o)* CBCT images during OISD-LRT treatment and at the follow-up (17 months after superstructure placement), respectively.

© 2025 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY.
NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.

VeryPDF Software Demo Version (http://www.verypdf.com)

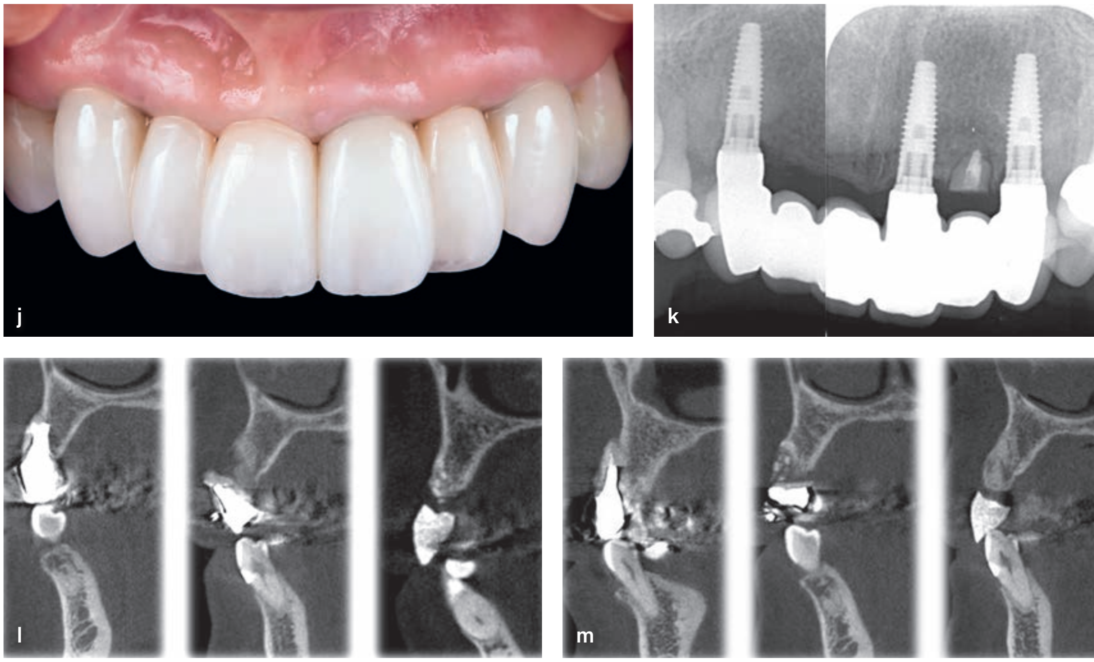
VeryPDF Software Demo Version (http://www.verypdf.com)

▲ **Figs 2a to 2i** Case 2, a 57-year-old woman. *(a and b)* Initial clinical and radiographic views, respectively. The maxillary incisors and canines were diagnosed as hopeless (teeth 13, 21, 22, and 23). Both canines (teeth 13 and 23) were diagnosed as Elian Type III sockets. *(c)* After placing temporary crowns and a bridge, multibracket devices were carefully positioned. For tooth 23, the bracket was placed approximately 2 to 3 mm apical compared to adjacent teeth. *(d to f)* OISD-LRT for the teeth was performed using all remaining teeth as fixation sources, and *(g and h)* OISD-LRT for tooth 13 was subsequently performed in the same manner. *(i)* After completing the comprehensive orthodontic treatment, implants were placed using flapless guided surgery.

⟶

© 2025 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY. NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.
VeryPDF Software Demo Version (http://www.verypdf.com)

VeryPDF Software Demo Version (http://www.verypdf.com)



▲ **Figs 2j to 2m** *(j and k)* Clinical and radiographic views, respectively, after delivering superstructures. *(l and m)* CBCT images of teeth 13 and 23, respectively.

The tooth movement was controlled at approximately 2 mm/month using orthodontic Ni-Ti wires. To provide the necessary counter torque movement to the root, a coronal force should be applied to the facial surface of the tooth during orthodontic extrusion (Fig 3). It is important to recognize that in conventional orthodontic extrusion techniques, this type of tooth movement is often considered a contraindication because of the potential for complications, such as fenestration or dehiscence of the facial plate.

After 1 month, if the desired movement is confirmed, the bracket should be repositioned 2 to 3 mm away from the gingival margin (see Figs 1f, 2e, and 2h). Adjustments can be made to the incisal edge or palatal side if the tooth comes into contact with the opposite tooth. This process was repeated over several months, gradually moving the bracket apically to allow the roots to tilt and become exposed (see Figs 1g and 1h). Ultimately, the brackets should be positioned at the apex of the tooth, and overcorrection should be performed to extend 2 to 3 mm beyond the attachment level of both adjacent teeth. Once the tooth can be retracted almost perpendicularly to the alveolar bone, it is important to implement retention for 2 months before conducting the extraction procedure (see Figs 1i and 2f).

Implant Treatment

In most cases, OISD-LRT enables sufficient horizontal and vertical tissue augmentation. Thus, flapless surgery is indicated in many cases (see Figs 1j and 2i). As per the standard practice, a superstructure is delivered after creating and adjusting provisional restorations.

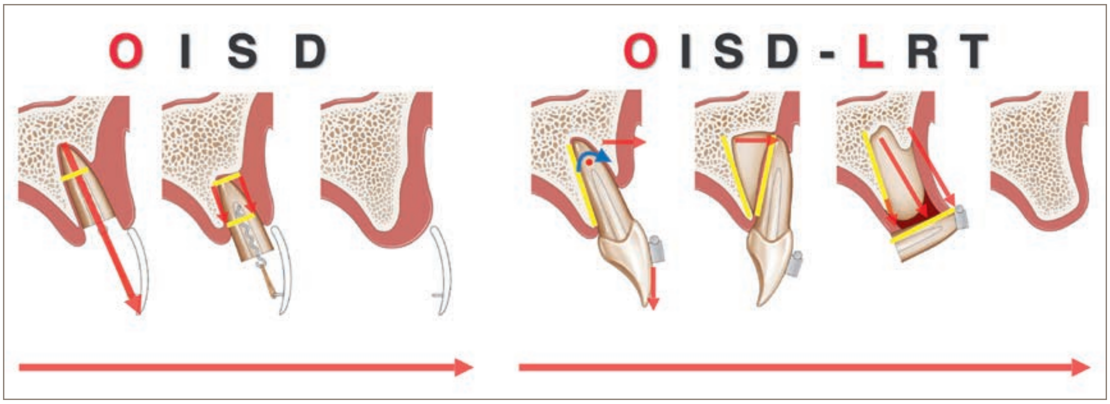
CBCT Analysis

A detailed CBCT analysis was performed at three critical junctures: baseline (T0), immediately after tooth extraction (T1), and after superstructure placement (T2). Employing a CBCT machine featuring the standard mode with voxel size at 0.146 mm^3 and FOV of φ82.00 × 75.1 mm (Fine Cube, Yoshida), cross-sectional views perpendicular to the alveolar ridge were acquired. The radiologic procedure was performed using the following steps (Fig 4):

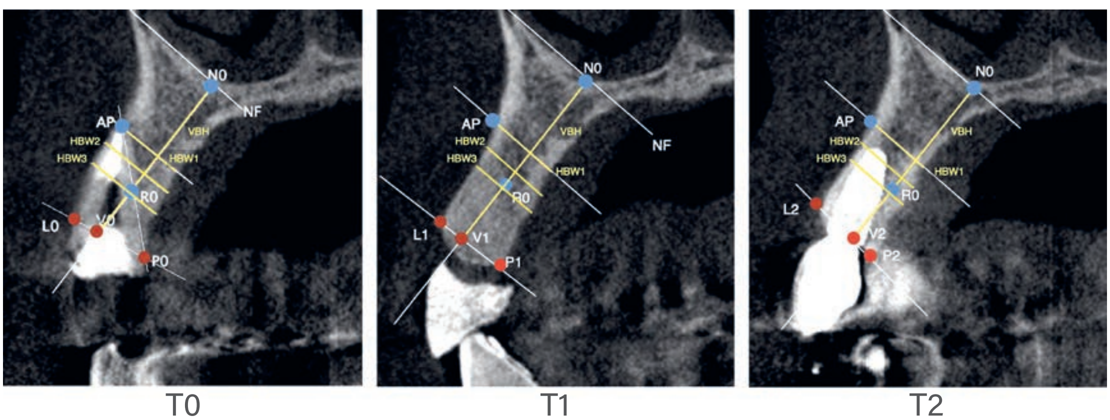
1. Baseline (T0) CBCT scans were used to precisely identify the crucial anatomical landmarks, including the nasal floor (NF),

© 2025 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY.
NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.
VeryPDF Software Demo Version (http://www.verypdf.com)

VeryPDF Software Demo Version (http://www.verypdf.com)



▲ **Fig 3** Conceptual illustrations of OISD and OISD-LRT. In OISD-LRT, the bracket's light force is harnessed to rotate the tooth root around its center of resistance, causing the root to move toward the labial side. This movement takes advantage of the wider palatal PDL tissue, leading to a significant enhancement in horizontal bone augmentation when compared to the conventional vertical traction in OISD.



▲ **Fig 4** Example radiologic measurements via CBCT (Case 1). The vertical bone height (VBH) was determined as the distance from the floor of the nasal cavity (N0) to the center of the alveolar crest (V0). Horizontal ridge width (HBW) was determined as the length of the line perpendicular to the vertical ridge line at three specific levels: at the apex level (HBW1), 2.5 mm coronal (HBW2), and 5.0 mm coronal (HBW3).

apex (AP), labial bone crest (L0), and palatal bone crest (P0).
2. The reference point (R0) was established at the midpoint of the line connecting AP and P0.
3. Draw a perpendicular line to NF, passing through R0.
4. Identify the intersection (this becomes point V0) of the L0–P0 line and the line drawn in Step 3.
5. The alveolar vertical bone height (VBH) was measured as the distance from N0 to V0.
6. A line was drawn perpendicular to the N0–V0 line, passing through the AP.
7. Measure the distance from the labial bone surface to the palatal surface of the line drawn in Step 6 as the horizontal ridge width at position 1 (HBW1).
8. Measure the width at the 2.5 mm coronal to the apex as HBW2 and at 5 mm coronal as HBW3.
9. In the T1 and T2 images, the NF, AP, and R0 were superimposed on the T0 image. The labial and palatal bone crests were annotated at each follow-up visit. VBH, HBW1, HBW2, and HBW3 were measured at T1 and T2.

All measurements were conducted using the ruler function in the CBCT viewing software (Fine Cube) and Fiji (National Institutes of Health). To ensure precision, two measurements were

© 2025 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY.
NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.
VeryPDF Software Demo Version (http://www.verypdf.com)

VeryPDF Software Demo Version (http://www.verypdf.com)

Table 1 Descriptive Data of Patients and Implants

Parameter	
Patients, n	7
Age, mean ± SD	42.7 ± 11.6 y
Sex, n (%)	
Female	5 (71.4%)
Male	2 (28.6%)
Smokers, n (%)	0 (0%)
Placed implants, n (%)	
Total	7 (100%)
Central incisor	3 (42.9%)
Lateral incisor	1 (14.3%)
Canine	3 (42.9%)
Elian classification, n (%)	
Type II	5 (62.5%)
Type III	3 (37.5%)
Ortho treatment duration, mean ± SD	404 ± 311.7 d
Superstructure type, n (%)	
Total	7 (100%)
Single standing implant	5 (71.4%)
Multiple implants supported	1 (14.3%)
Removable denture	1 (14.3%)

performed for each parameter. The measurements were rounded to the nearest 0.1 mm, and the average of the two measurements was used for subsequent statistical analyses.

Results

Seven patients (five women, two mean) with a mean age of 42.7 ± 11.6 years were included in this case series. Eight sockets were treated with OISD-LRT. The seven implants successfully replaced three central incisors, one lateral incisor, and three canines (Table 1). One patient had two implants treated with OISD-LRT, followed by the placement of multiple implant-supported superstructure (Case 2). Following OISD-LRT, one patient who was initially scheduled for implant treatment opted for an alternative approach and chose a removable denture instead of an implant. In five of the eight sockets, facial soft tissue was present, but the buccal plate was partially missing, and these sockets were diagnosed as Elian Type II sockets. In the other three sockets, both the facial soft tissue and buccal plate of the bone were markedly reduced, and the sockets were diagnosed as Elian type III sockets. The healing process was uneventful in all patients, and no postoperative complications were observed. The mean duration of orthodontic treatment was 404 ± 311.7 days. The aforementioned multiple implant case (Case 2) had the longest treatment duration (1,028 days), while the case without implant treatment demonstrated the shortest treatment duration (144 days).

Quantitative analysis of the CBCT results is presented in Table 2. In the initial CBCT analysis (T0), the mean VBH was 17.67 ± 3.42 mm. HBW1 measured 9.09 ± 2.06 mm, HBW2 was 7.40 ± 2.34 mm, and HBW3 was 6.32 ± 3.65 mm. Following OISD-LRT (T1), a noticeable increase was observed in both VBH and HBW, which is crucial for secure implant placement, although a slight reduction in HBW1 bone width was seen. Despite the inevitable reduction in bone height and width after root extraction, the findings at T2 confirmed sufficient bone height and width to ensure long-term implant stability. Particularly, Elian Type III sockets exhibited a substantial increase in bone width, with an increase of 2.26 ± 4.41 mm at HBW2 and 4.59 ± 2.38 mm at HBW3 between T0 and T1.

Case 1 describes the treatment of a 39-year-old man following the radiographic diagnosis of a hopeless maxillary left canine (tooth 23) with a fracture (see Figs 1a and 1b). On CBCT analysis, partial resorption of the labial bone plate was confirmed, and the patient was diagnosed with an Elian Type II socket (see Fig 1c). Following OISD-LRT treatment and 2 months of retention (see Figs 1d to 1i), the root was extracted (see Fig 1j). During the orthodontic treatment, the patient experienced persistent discomfort. With the patient's consent, multiple additional CBCT imaging sessions were conducted during orthodontic treatment, and the results confirmed the absence of any abnormalities in the surrounding tissues, ensuring the overall safety and effectiveness of the treatment. Following completion of the comprehensive orthodontic treatment, implant placement was performed using flapless guided surgery (see Fig 1k). Histologic assessment of the drilled bone

© 2025 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY.
NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.
VeryPDF Software Demo Version (http://www.verypdf.com)

VeryPDF Software Demo Version (http://www.verypdf.com)

Table 2 CBCT Measurements of Bone Vertical Height and Horizontal Width

Bone height/width	T0	T1–T0	T2–T1
VBH, mm	17.67 ± 3.42 mm	3.23 ± 2.76 mm	–1.82 ± 2.10 mm
HBW1 (apical)	9.09 ± 2.06 mm	–0.27 ± 0.74 mm	–0.78 ± 1.13 mm
HBW2 (middle)	7.40 ± 2.34 mm	0.80 ± 3.78 mm	–0.67 ± 1.17 mm
HBW3 (coronal)	6.32 ± 3.65 mm	1.10 ± 4.81 mm	–0.41 ± 1.17 mm

revealed vital bone components in the augmented tissue (see Fig 1l). A definitive restoration for the implant was placed, with marginal tissues framing the implant in a harmonious manner (see Fig lm). CBCT images confirmed the complete vertical and horizontal bone preservation (see Figs ln and 1o).

Case 2 illustrates the treatment results in a 57-year-old woman with hopeless maxillary incisors and canines (teeth 13, 21, 22, and 23; see Figs 2a and 2b). Both canines (teeth 13 and 23) were diagnosed with Elian Type III sockets, and after following OISD-LRT for both teeth (see Figs 2c to 2h), implant placement was performed using a flapless guided surgery (see Fig 2i). Definitive superstructures were placed, with marginal tissues framing the implants in a harmonious manner (see Fig 2j). CBCT and radiographic imaging revealed a substantial increase in the VBH and horizontal width (see Figs 2k to 2m).

Discussion

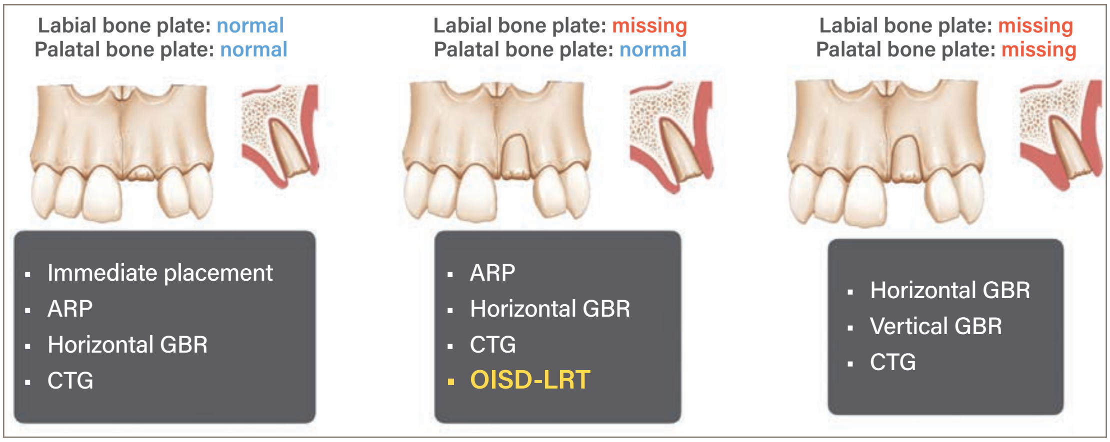
The present case series was designed to gain further insights into bone preservation and augmentation in the anterior maxilla through the application of OISD-LRT. Tooth removal generally results in the loss of alveolar bone. A recent systematic review analyzed 20 articles and used meta-analysis to evaluate postextraction dimensional changes in the alveolar ridge following unassisted socket healing.[14] The results revealed that, especially in nonmolar sites, the mean reductions in horizontal width, buccal vertical height, and lingual vertical height were measured at 2.54 mm (95% CI: 1.97 to 3.11 mm), 1.65 mm (95% CI: 0.42 to 2.88 mm), and 0.87 99 (95% CI: 0.36 to 1.38 mm), respectively.[14] Alveolar ridge preservation (ARP) is the most widely used preventative measure designed to compensate for spontaneous ridge resorption. It aims to impede the onset of physiologic bone resorption and preserve esthetic integrity after tooth extraction. The results of a systematic review revealed that ARP, when compared to tooth extraction alone, prevents horizontal resorption (1.99 mm [95% CI: 1.54 to 2.44 mm]) and buccal vertical resorption (1.72 mm [95% CI: 0.96 to 2.48 mm]).[15] While ARP demonstrated high effectiveness for circumferential sockets, it was insufficient in preventing vertical bone resorption. In contrast to ARP, the present case report highlights the efficacy of OISD-LRP in achieving vertical bone gain. Additionally, even in cases of insufficient bone volume in the buccal bone wall, an effect on horizontal bone gain equivalent to that of ARP was confirmed. Thus, the therapeutic effect of OISD-LRT on postextraction bone resorption was significant, underscoring its high utility.

Although GBR is a viable option for patients with insufficient bone mass, the techniques involved are intricate. The conventional OISD technique serves as a nonsurgical alternative for socket preservation and preimplant hard-tissue augmentation. Despite conventional OISD producing vital bone,[16] it has limitations in achieving horizontal bone volume. The present case series illustrates that OISD-LRT can increase horizontal bone width, demonstrating significant efficacy, especially in Elian Type III cases with extensive labial bone resorption. The success of OISD depends on the amount of PDL present in the tooth roots. OISD-LRT utilizes PDL cells on the palatal side, making it suitable for labial-side bone defects with healthy proximal and palatal PDLs (Fig 5). If performed with careful case selection, OISD-LRT stands out as an excellent treatment approach characterized by its high predictability.

© 2025 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY.
NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.

VeryPDF Software Demo Version (http://www.verypdf.com)

VeryPDF Software Demo Version (http://www.verypdf.com)



▲ **Fig 5** Indication of OISD-LRT and other bone augmentation techniques.

One drawback of OISD-LRT is its potential for unexpected anchor movements. To mitigate this, fixing the adjacent teeth from the palatal side in advance is crucial. Even with sufficient fixation, adjacent teeth may flare, necessitating skilled corrective measures. An interdisciplinary approach involving orthodontists is recommended for comprehensive management. Other than unexpected anchor movements, no other complications have been experienced.

It is important that only essential CBCT is performed. When performing routine radiography, the examination must be justified, and optimal protection should be provided according to the ALARA (as low as reasonably achievable) principles laid down by the International Commission on Radiological Protection.[17] In the present report, cases with CBCT images at baseline, immediately after tooth extraction, and after superstructure placement were included, retrospectively. Additionally, in adherence to the standardized OISD-LRT treatment protocol, an additional CBCT is obtained during the retention period of orthodontic therapy. These four CBCT images play a pivotal role in understanding bone volumes and optimizing treatment plans. The CBCT imaging was performed in such a way that the radiation exposure was minimized and the benefits to the patient are maximized.

Considering the limited scope of this case series, further research with a larger sample size and a large control group is essential. Nevertheless, with careful case selection and proficient orthodontic skills, OISD-LRT has emerged as an extremely useful treatment option.

Conclusions

In cases involving localized bone loss on the labial side, OISD-LRT has emerged as an effective solution, facilitating substantial augmentation of both vertical and horizontal bone dimensions. This innovative approach guarantees consistently reliable and predictable outcomes, ensuring the achievement of esthetically pleasing implant restorations, especially in Elian type III cases with intact PDL tissue on the palatal side. Future studies with longer follow-up periods are required to validate this approach.

Acknowledgments

The authors thank all the clinicians in 5D Japan. This report was not funded by any entity and was performed in a private practice setting. The authors thank Mr Shunsuke Matsuda (Quintessence Publishing Japan) for editorial support during manuscript preparation. The authors declare no conflicts of interest.

References

1. Zhou X, Yang J, Wu L, et al. Evaluation of the effect of implants placed in preserved sockets versus fresh sockets on tissue preservation and esthetics: A meta-analysis and systematic review. J Evid Based Dent Pract 2019;19:101336.

© 2025 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY.
NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.

VeryPDF Software Demo Version (http://www.verypdf.com)

VeryPDF Software Demo Version (http://www.verypdf.com)

2. Kolerman R, Mijiritsky E, Barnea E, Dabaja A, Nissan J, Tal H. Esthetic assessment of implants placed into fresh extraction sockets for single-tooth replacements using a flapless approach. Clin Implant Dent Relat Res 2017;19:351–364.
3. Schropp L, Wenzel A, Kostopoulos L, Karring T. Bone healing and soft tissue contour changes following single-tooth extraction: A clinical and radiographic 12-month prospective study. Int J Periodontics Restorative Dent 2003;23:313–323.
4. Araújo MG, Lindhe J. Dimensional ridge alterations following tooth extraction. An experimental study in the dog. J Clin Periodontol 2005;32:212–218.
5. Masaki C, Nakamoto T, Mukaibo T, Kondo Y, Hosokawa R. Strategies for alveolar ridge reconstruction and preservation for implant therapy. J Prosthodont Res 2015;59:220–228.
6. Funato A, Ishikura C, Naito K, Hasuike A. Resorbable membrane pouch technique for single-implant placement in the esthetic zone: A preliminary technical case report. Bioengineering 2022;9:649.
7. Amato F, Mirabella AD, Macca U, Tarnow DP. Implant site development by orthodontic forced extraction: A preliminary study. Int J Oral Maxillofac Implants 2012;27:411–420.
8. Salama H, Salama M. The role of orthodontic extrusive remodeling in the enhancement of soft and hard tissue profiles prior to implant placement. Int J Periodontics Restorative Dent 1993;13:312–334.
9. Magkavali-Trikka P, Kirmanidou Y, Michalakis K, et al. Efficacy of two site-development procedures for implants in the maxillary esthetic region: A systematic review. Int J Oral Maxillofac Implants 2015;30:73–94.
10. Nozawa T, Sugiyama T, Yamaguchi S, et al. Buccal and coronal bone augmentation using forced eruption and buccal root torque: A case report. Int J Periodontics Restorative Dent 2003;23:585–591.
11. Hayashi J, Shin K. Implant site development by orthodontic extrusion and buccal root torque at a site showing severe gingival recession with periodontitis: A case report. Int J Periodontics Restorative Dent 2019;39:589–594.
12. Elian N, Cho SC, Froum S, Smith RB, Tarnow DP. A simplified socket classification and repair technique. Pract Proced Aesthet Dent 2007;19:99–104.
13. Agha RA, Sohrabi C, Mathew G, et al. The PROCESS 2020 Guideline: Updating consensus Preferred Reporting Of CasESeries in Surgery (PROCESS) guidelines. Int J Surg 2020;84:231–235.
14. Couso-Queiruga E, Stuhr S, Tattan M, Chambrone L, Avila-Ortiz G. Post-extraction dimensional changes: A systematic review and meta-analysis. J Clin Periodontol 2021;48:127–145.
15. Avila-Ortiz G, Chambrone, L, Vignoletti, F. Effect of alveolar ridge preservation interventions following tooth extraction: A systematic review and meta-analysis. J Clin Periodontol 2019;46,195–223.
16. Montevecchi M, Marucci G, Pignataro B, Piana G, Alessandri-Bonetti G, Checchi V. Bone Modeling after orthodontic extrusion: A histomorphometric pilot study. J Clin Med 2022;11:7329.
17. Hayashi T, Arai Y, Chikui T, et al. Clinical guidelines for dental cone-beam computed tomography. Oral Radiol 2018;34:89–104.

Tsutomu Tanno, DDS
Private practice, Tochigi, Japan.

Akira Hasuike, DDS, PhD
Department of Periodontology, School of Dentistry, Nihon University, Tokyo, Japan.

Koji Naito, DDS, PhD
Private practice, Tokyo, Japan.

Chihiro Ishikura, DDS
Akiyoshi Funato, DDS
Private practice, Ishikawa, Japan.

Correspondence to:
Dr Akira Hasuike, hasuike.akira@nihon-u.ac.jp

© 2025 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY. NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.

VeryPDF Software Demo Version (http://www.verypdf.com)