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Case Report

Mini-implant and Modified Nance Button Assisted Alignment of a Horizontally Impacted Maxillary Canine - A Case Report

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Main points:

- The priorities in the management of a highly placed horizontally impacted canine are to move its crown away from the roots of the incisors and to reorient it vertically before it is erupted intraorally. The mini-implant and modified Nance button provided an appropriate point for force application to redirect the impacted canine from a horizontal to a more vertical position.
- A modified closed-eruption technique used initially to bond an attachment on the canine helped maintain intact gingival attachment at the end of treatment.
- Once the canine was palpable in the vestibule, an open eruption was planned, and a cantilever spring was used for forced eruption. The cantilever spring is a one-couple system that allows for the delivery of relatively constant optimal forces and moments, thus avoiding the need for frequent reactivations.

ABSTRACT

Orthodontic alignment of a horizontally impacted canine placed high and deep in the maxilla represents a challenging clinical scenario. This article describes a case report of a 16-year-old postpubertal male patient who was concerned about an unesthetic smile. The clinical and radiographic investigations revealed that the patient had retained deciduous canines and bilaterally impacted maxillary canines. The right impacted canine had a good prognosis. The left canine was horizontally impacted in the labial side with a Kau-Pan-Gallerano index score of 19, which indicates a "difficult" degree of treatment. The initial treatment plan was application of distal traction to the impacted left canine from reinforced anchorage unit to change its inclination from horizontal to vertical before erupting it toward occlusion. In this case report, we demonstrated the use of a mini-implant and a modified Nance button–assisted forced eruption of an impacted canine. The 12-month follow-up review showed that the results were maintained during the time, and the previously impacted teeth showed intact gingival attachments. A conservative surgical exposure of the impacted canine and well-planned biomechanics helped us achieve a desirable, esthetic outcome.

Keywords: Canine impaction, mini-implant, modified Nance button

INTRODUCTION

The canines play a crucial role in establishing an esthetic smile and functional occlusion. Canines have the longest period and deepest area of development, as well as the most devious eruptive path (1-3), making them more susceptible to impaction. This case report demonstrates the application of a modified Nance button with a mini-implant for the successful management of a horizontally impacted maxillary canine situated in a labial position in an adolescent patient.

CASE PRESENTATION

Diagnosis and Etiology

A 16-year-old male patient presented with a chief concern of an unesthetic smile (Figure 1 a-g). The extraoral examination showed a straight profile. The intraoral examination revealed Angle Class I molar relationship with

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Figure 1 (a-g). Pretreatment facial (a-b) and intraoral (c-g) photographs

6 mm of spacing in the maxillary anterior region, retained maxillary deciduous canines, missing permanent canines, increased overjet, and normal overbite. The patient had an increased facial angle with counterclockwise rotation of the mandible (decreased Frankfort-mandibular plane angle), which manifested as a mild skeletal Class III relationship (Table 1). He had proclined anterior teeth (Table 1, Figure 2a). The panoramic radiograph (Figure 2b) revealed impacted maxillary canines; the left and right canines were located in sector 4 and 1, respectively (4). A cone beam computed tomography (CBCT) image revealed that the crown of the left canine was close to the labial cortex and at the apical one-third of the central incisor root (Figure 2 c, d).

Table 1. Cephalometric data

	Normal values	Pretreatment	Post treatment
SNA (°)	82+2	80	81
SNB (°)	80+2	82	82
ANB (°)	2	-2	-1
Ao-Bo (mm)	-1	-2	0
NPg-FH (°)	89+ 3.9	92	89
Ar-Go-Me (°)	126+6	128	123
FMA (°)	25	22	22
SN-GoGn (°)	32	25	26
U1-NA (°)	22	50	33
U1-NA (mm)	4	14	8
U1-SN (°)	102+2	130	122
L1-NB (°)	25	32	26
L1-NB (mm)	4	8	6
U1-L1 (°)	125+7	100	114
IMPA (°)	90	99	95

SNA: Sella, Nasion, A-point; SNB: Sella, Nasion, B-point; ANB: A-point, Nasion, B-point; Ao-Bo: A-point and B-point to occlusal plane, NPg-FH: Nasion - Pogonion to Frankfort plane angle, Ar-Go-Me : Articulare-Gonion-Menton angle, FMA: Frankfort mandibular angle; SN-GoGn: Angle that is measured at the junction of the planes Sella -Nasion to Gonion-Gnathion , U1-NA: Angle between upper incisor inclination and NA plane; U1-SN: Angle between upper incisor inclination and SN plane, L1-NB: Angle between lower incisor inclination and NB plane, U1-L1: Angle between upper and lower incisor inclination, IMPA: Inter-incisor mandibular plane angle

The Kau-Pan-Gallerano index (5) showed a score of 8 for the right canine and 19 for the left canine, which indicates "easy" and "difficult" degrees of treatment, respectively (Figure 3 a, b).

Treatment Objectives

The treatment objectives were to (1) get both the canines in arch with minimal impact on the supporting periodontium and (2) achieve normal overjet and a Class I canine relationship.

Treatment Alternatives

As the degree of difficulty was higher for the impacted left canine, extraction of the same and replacement with the help of a fixed prosthesis or a dental implant was advised. However, the patient denied the prosthesis. Autotransplantation of the left impacted canine was not considered as the procedure's success rate was not good. Finally, we decided to attempt forced eruption and alignment of the impacted teeth with the consent of the patient and his parents.

Treatment Progress

A 0.022×0.028 inch preadjusted edgewise appliance was used. After extracting the deciduous canines, the right impacted canine erupted spontaneously. The maxillary molars were banded, and a modified Nance acrylic button with a hook extension on the palatal side was placed in the maxillary arch (Figure 4a-b). A

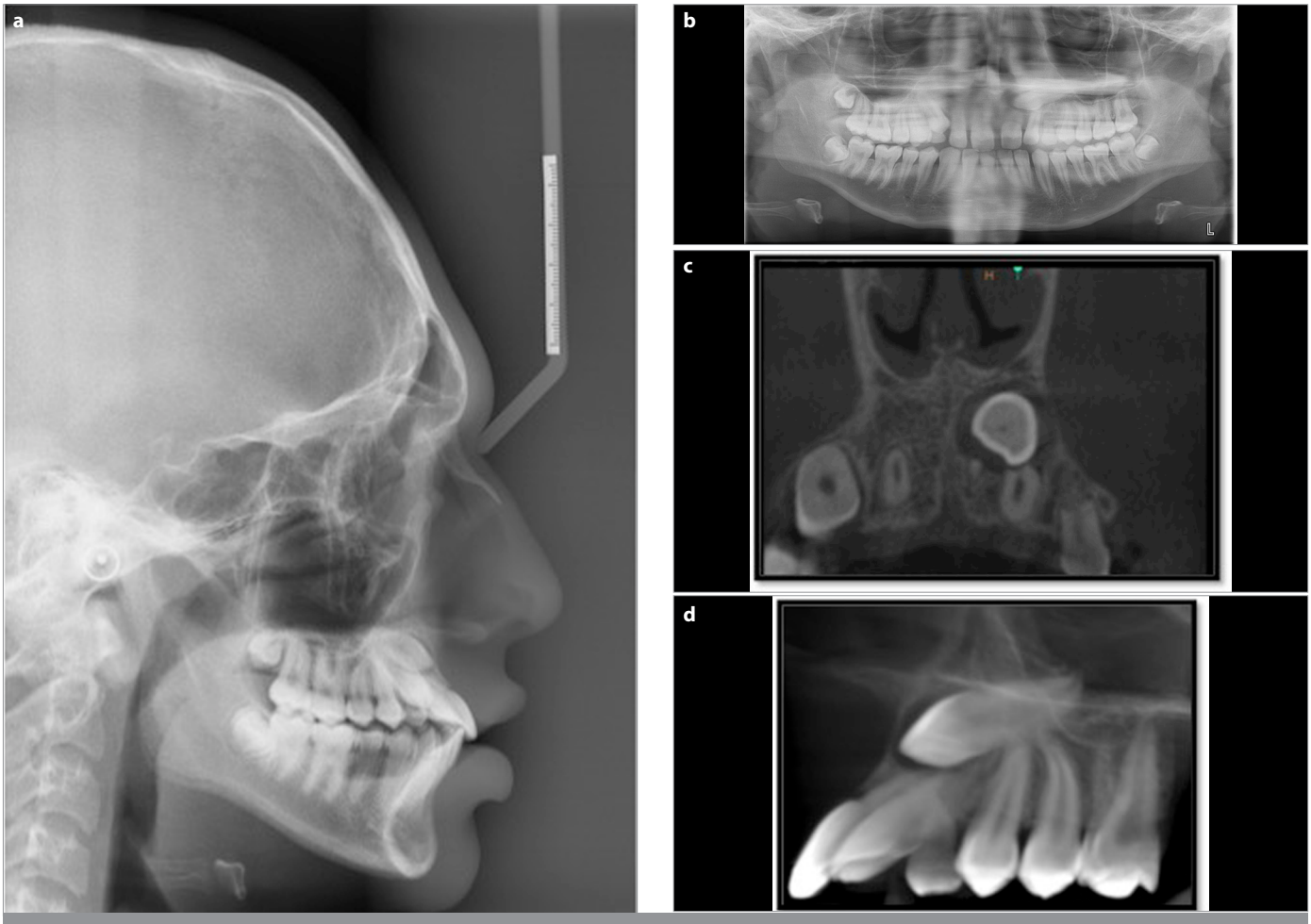

Figure 2 (a-d). Pretreatment lateral cephalogram (a), panoramic radiograph (b), coronal view of the CBCT image (c), sagittal view of the CBCT image, and the impacted left maxillary canine (d)

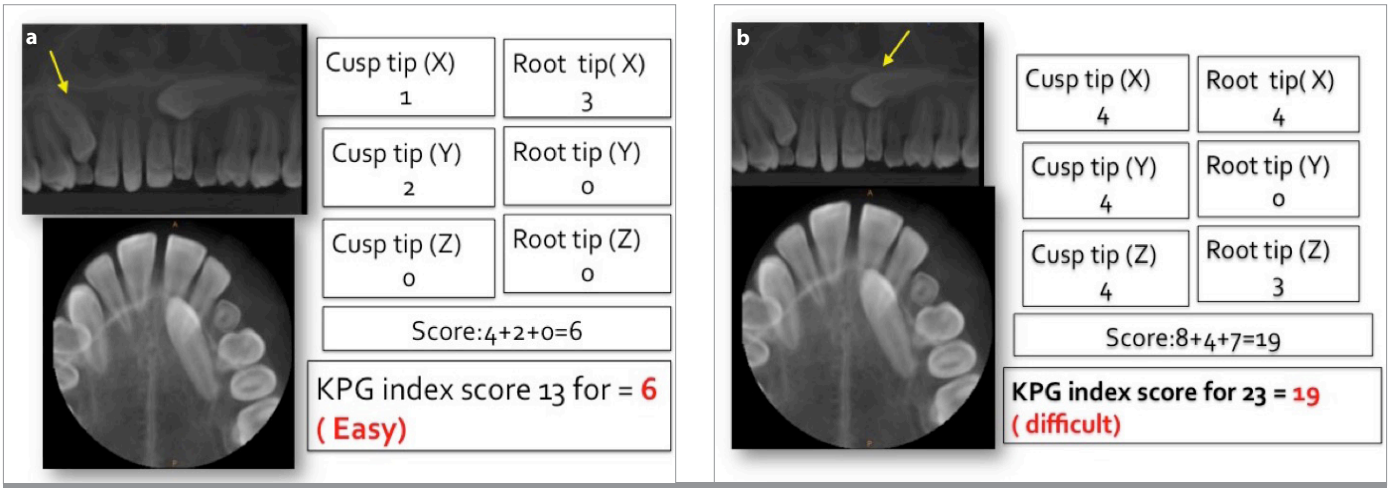

Figure 3 (a, b). Kau-Pan-Gallerano index score for the right (a) and left (b) impacted canines. Yellow arrow indicates the impacted canine

Figure 4 (a, b). Occlusal (a) and lateral (b) views show a modified Nance button used for forced eruption of the left impacted canine

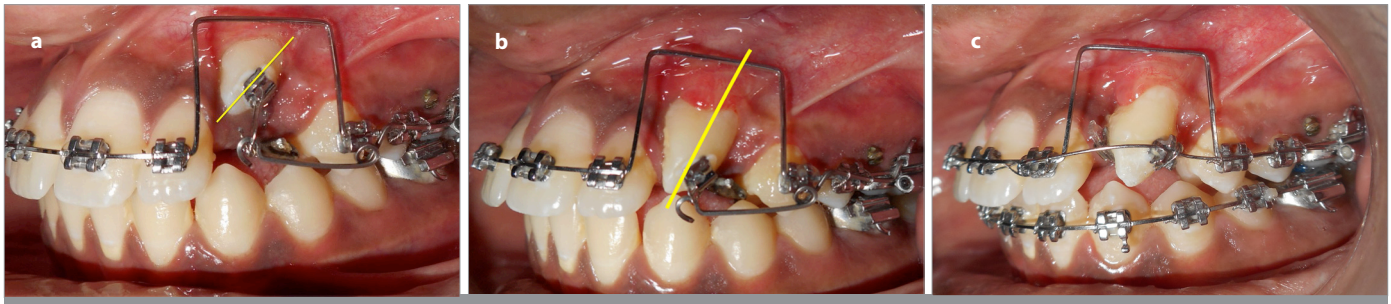

Figure 5 (a-c). Progress intraoral photographs show a cantilever spring in position at the start (a), and at the end (b) of cantilever mechanics, and a 0.014-inch nitinol archwire piggybacked on a 0.019×0.025-inch stainless steel base archwire for alignment of the impacted canine (c). Yellow line indicates the long axis of canine

Begg's bracket with a ligature extension was bonded on the left impacted canine. This attachment was used to apply a traction force from the impacted canine to the mini-implant (diameter, 1.3 mm; length, 8 mm) placed in the interradicular space between the left second premolar and first molar. Once the angulation of the canine improved, the vertically directed force was applied on the canine from the hook of the Nance button. Subsequently, the maxillary teeth were bonded, leveling and alignment was done, and an open coil spring was used for space consolidation. As the canine approached the attached gingiva, the 0.019×0.025-inch stainless steel base archwire with a horizontal offset was placed, and a cantilever spring fabricated with a 0.017×0.025- inch beta titanium wire was used for canine extrusion (Figure 5a-b). Once the canine approached the occlusal plane, the preadjusted brack-

Figure 6 (a-g). Posttreatment facial (a-b) and intraoral photographs (c-g)

et was used to replace the Begg's bracket, and a 0.014-inch nitinol archwire was piggybacked onto the existing stainless steel base archwire (Figure 5c). As the alignment proceeded, a continuous rectangular archwire provided an additional moment to upright and torque the canine. The fixed appliance was removed after finishing and detailing of the arches, followed by placement of canine-to-canine fixed lingual retainers in both the arches.

Treatment Results

The total treatment time was 22 months. The smile esthetics improved (Figure 6 a, b). Intraorally, a well-interdigitated buccal occlusion with a Class I molar and canine relationship was established (Figures 6 c-g and 7a). The posttreatment intraoral photograph showed a slightly longer clinical crown of the maxillary left canine (Figure 6d); however, it was asymptomatic, and the gingival

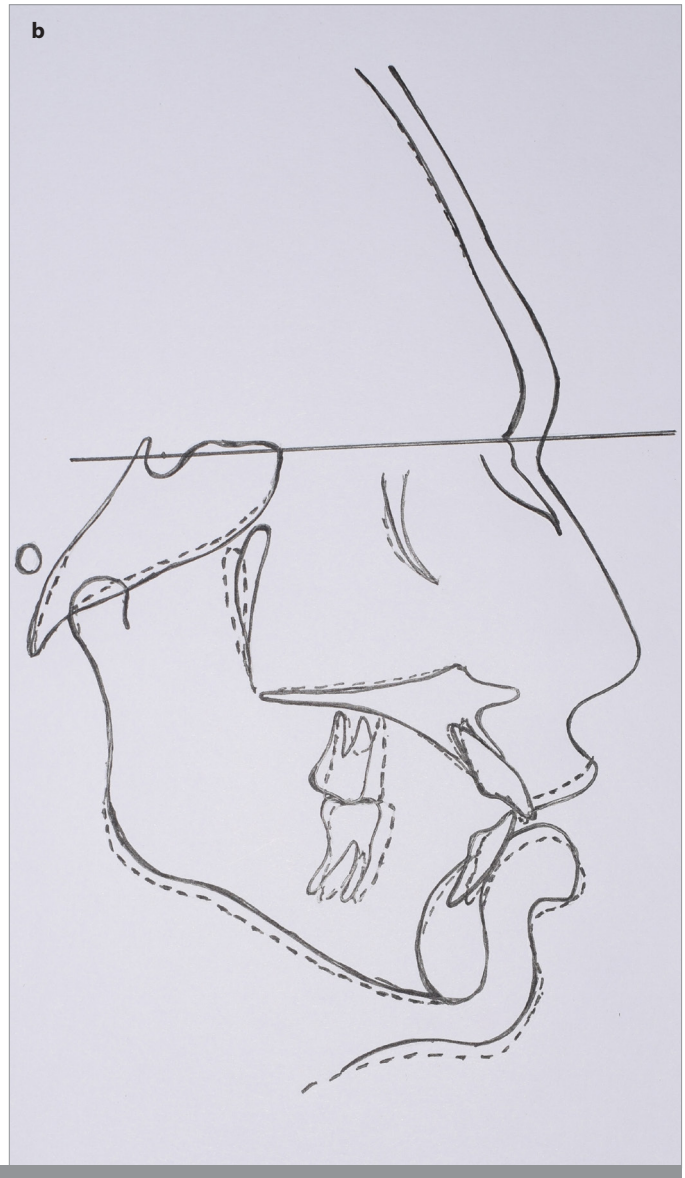

Figure 7 (a-c). Posttreatment lateral cephalogram (a), panoramic radiograph (b), and superimposition of pretreatment (solid line) and posttreatment (dotted line) cephalometric tracings on sella-nasion plane at sella (c)

Figure 8 (a, b). The 12-month postretention intraoral frontal photograph (yellow arrow shows the gingival level of previously horizontally impacted canine) (a) and a panoramic radiograph (b)

contour was healthy. The posttreatment panoramic radiograph showed good root paralleling (Figure 7b). The superimposition showed that the patient's skeletal pattern remained unaltered by the mechanics (Figure 7c). The 12-month follow-up review showed that the results were maintained during the time, and the canines showed intact gingival attachments (Figure 8 a, b).

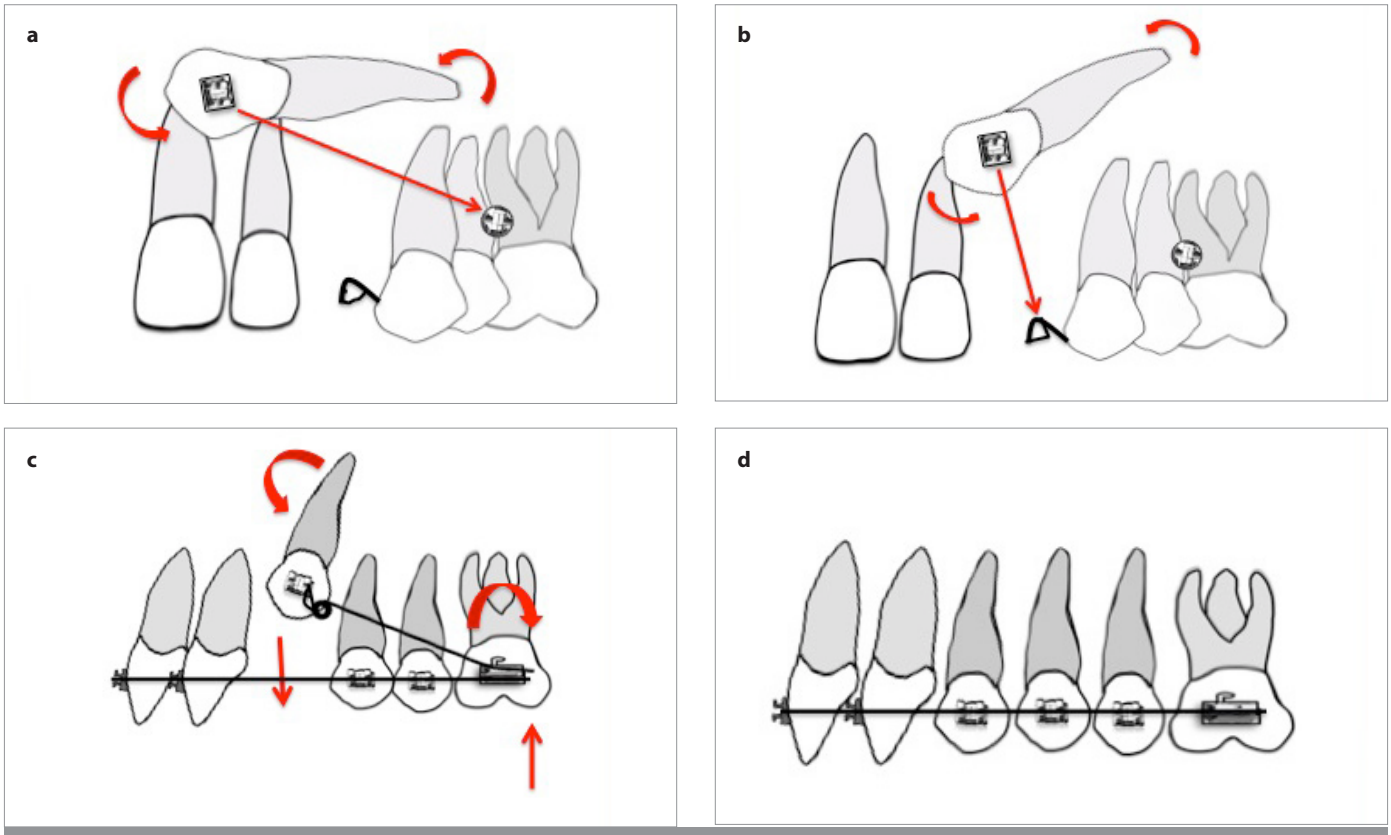

Figure 9 (a-d). Illustrations show the treatment strategy used for eruption of the impacted left canine. Distally directed elastic chain force from the impacted canine to the mini-implant (a), a vertical vector of force from the hook of a modified Nance button (b), the canine with a cantilever spring (c), and the canine in the final position (d)

DISCUSSION

In this case, a CBCT image helped us in precise localization of the impacted maxillary canine, and it was brought into alignment with meticulous planning (6-9). Several locations for the insertion of temporary anchorage devices have been suggested. The interradicular area between the second premolar and first molar in the maxilla is the safest zone in all dentoskeletal patterns (10). The pretreatment radiograph showed sufficient interradicular space in this region, which enabled the placement of a mini-implant. In this case, the canine was erupted using a modified closed-eruption technique. A small window created by the removal of an overlying soft tissue and bone was large enough to accommodate a small attachment, yet small enough for hemostasis to be secured to facilitate the immediate bonding of an attachment (11-14).

Surgical access and orthodontic traction need to be negotiated very delicately between the roots of the incisors, and no attempt at root uprighting or torque should be undertaken until the canine is well clear of both the incisors (15). Therefore, the initial alignment and early use of rectangular archwires was ruled out and was deferred to later stages of treatment (15). The mini-implant was used for initial application of distally directed horizontal force. This initial force element not only tipped the canine and changed its inclination from horizontal to slightly vertical but also pulled the crown tip away from the roots of the incisors (Figure 9a). Subsequently, a vertical vector of force was applied from the hook of the modified Nance button (Figure 9b). Once the canine bulge was palpable in the attached gingiva, an open eruption was performed with the help of a segmental approach (9). A one-couple cantilever spring was used (Figure 9c) to generate a counterclockwise moment and to upright the canine before pulling it into the oral cavity (Figure 9d). As the extrusion force is also labial to the center of resistance of the canine, a moment tends to tip the tooth, thus improving its labiolingual position (9, 16).

CONCLUSION

This case demonstrates that a proper diagnosis helps to develop an optimum treatment plan. A conservative surgical exposure with well-planned biomechanics using a simple modified Nance button–assisted with a mini-implant helped us to achieve desirable esthetic outcomes.

Informed Consent: Written informed consent was obtained from the patient/parent who agreed to take part in this case study.

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