

Guided digital workflow integrating esthetic crown lengthening and immediate implant placement in a patient with altered passive eruption: a case report¹

Fluxo de trabalho digital guiado integrando aumento de coroa clínica estético e instalação imediata de implante em paciente com erupção passiva alterada: relato de caso

Flujo de trabajo digital guiado integrando alargamiento de corona clínica estético y colocación inmediata de implante en paciente con erupción pasiva alterada: reporte de caso

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ABSTRACT

Background: Prosthetically driven surgical planning via a digital workflow independently increases the predictability of esthetic clinical crown lengthening and immediate implant placement; however, reports integrating both procedures into a single workflow guided by the future position of the gingival margin and the cemento-enamel junction remain scarce. Case Presentation: This report describes the combined and guided use of these two surgical techniques in a 23-year-old female patient presenting with altered passive eruption and a non-restorable external cervical resorption of the right maxillary central incisor. In a single surgical session, esthetic clinical crown lengthening, and immediate implant placement with provisionalisation were performed using a dual periodontal guide and a static surgical guide. Following osseointegration, a subepithelial connective tissue graft was performed to optimise the peri-implant soft tissue contour. Results: At the two-year follow-up, stability of the peri-implant hard and soft tissues and esthetic integration with the

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adjacent teeth were observed, without any biological or prosthetic complications. Conclusion: Planning the definitive gingival architecture prior to implant positioning, with both procedures guided in the anterior maxilla, may contribute to predictable esthetic outcomes in challenging clinical situations.

Keywords: Crown lengthening. Immediate dental implant. Tooth eruption. Workflow.

RESUMO

Introdução: O planejamento cirúrgico protético por meio do fluxo de trabalho digital aumenta, de forma independente, a previsibilidade do aumento de coroa clínica estético e da instalação imediata de implantes; contudo, relatos que integrem ambos os procedimentos em um único fluxo orientado pela futura posição da margem gengival e pela posição da junção cimento-esmalte permanecem escassos. **Relato de caso:** Este relato descreve o uso combinado e guiado destas duas técnicas cirúrgicas em paciente do sexo feminino, 23 anos, com erupção passiva alterada e reabsorção cervical externa do incisivo central superior direito sem condições de restauração. Em sessão única, realizaram-se o aumento de coroa clínica estético e a instalação imediata de implante com coroa provisória, empregando um duplo guia periodontal e uma guia cirúrgica estática. Após a osseointegração, um enxerto de tecido conjuntivo subepitelial otimizou o contorno dos tecidos moles peri-implantares. **Resultados:** Aos dois anos, observaram-se estabilidade dos tecidos duros e moles peri-implantares e integração estética com os dentes adjacentes, sem complicações biológicas ou protéticas. **Conclusão:** Planejar a arquitetura gengival definitiva antes do posicionamento do implante, ambos guiados na pré-maxila, pode contribuir para desfechos estéticos previsíveis em situações clínicas desafiadoras.

Palavras-chave: Aumento de coroa clínica. Carga imediata em implante dentário. Erupção dentária. Fluxo de trabalho.

RESUMEN

Introducción: La planificación quirúrgica protésica a través del flujo de trabajo digital aumenta, de forma independiente, la previsibilidad del alargamiento de corona clínica estético y de la colocación inmediata de implantes; sin embargo, los informes que integren ambos procedimientos en un único flujo orientado por la futura posición del margen gingival y por la posición de la unión amelocementaria siguen siendo escasos. **Presentación del Caso:** Este informe describe el uso combinado y guiado de estas dos técnicas quirúrgicas en una paciente de 23 años con erupción pasiva alterada y reabsorción cervical externa en el incisivo central superior derecho, sin posibilidad de restauración. En una sola sesión quirúrgica, se realizaron el alargamiento de corona clínica estético y la colocación inmediata del implante con corona provisional, empleando una guía periodontal doble y una guía quirúrgica estática. Tras la osteointegración, un injerto de tejido conectivo subepitelial optimizó el contorno de los tejidos blandos periimplantarios. **Resultados:** A los dos años de seguimiento, se observó estabilidad de los tejidos duros y blandos periimplantarios y una integración estética con los dientes adyacentes, sin complicaciones biológicas ni protéticas. **Conclusión:** Planificar la arquitectura gingival definitiva antes del posicionamiento del implante, ambos procedimientos guiados en la premaxila, puede contribuir a resultados estéticos predecibles en situaciones clínicas desafiantes.

Palabras clave: Alargamiento de la corona clínica. Carga inmediata en implante dental. Erupción dentaria. Flujo de trabajo.

INTRODUCTION

Immediate implant placement and provisionalisation has been established as a treatment option for the replacement of single anterior teeth in the aesthetic zone, offering clinical and patient-centred advantages (Meijer *et al.*, 2025; Puisys *et al.*, 2022; Pitman *et al.*, 2022). These include a reduction in total treatment time, lower morbidity due to fewer

surgical interventions, preservation of soft tissue architecture (Ickroth *et al.*, 2024; Seyssens *et al.*, 2021), and high levels of patient satisfaction (Slagter *et al.*, 2021). Furthermore, randomised clinical trials (Cosyn *et al.*, 2024; Puisys *et al.*, 2022) and systematic reviews have demonstrated survival rates comparable to early placement protocols (Ickroth *et al.*, 2024; Puisys *et al.*, 2022).

Altered passive eruption (APE) is characterised by a gingival margin positioned coronally to the cemento-enamel junction (CEJ) (Goldman; Cohen, 1968). Consequently, affected teeth present clinically short crowns despite having normal anatomical dimensions, as part of the anatomical crown remains covered by gingival tissue (Alpiste-Illueca, 2011).

The reported prevalence of APE among patients with excessive gingival display (EGD) ranges from 12% to 35.8% (Volchansky; Cleaton-Jones, 1974; Nart *et al.*, 2014; Andijani; Tatakis, 2019; Amro *et al.*, 2026). Although not considered a pathological condition, APE can have a substantial aesthetic impact. Patients frequently report concerns regarding the appearance of “small teeth” or a “childish smile” (Antoniazzi *et al.*, 2017; Mele *et al.*, 2018). An accurate diagnosis is essential for determining the most appropriate management. Clinical examination, including transgingival probing to identify the CEJ, remains the gold standard for diagnosing APE (Mele *et al.*, 2018), whilst cone-beam computed tomography (CBCT) can serve as an adjunctive diagnostic tool to evaluate the relationship between the gingival margin, the alveolar bone crest, and the CEJ (Januário; Barriviera; Duarte, 2008; Beire *et al.*, 2021; Kahn *et al.*, 2024).

Coslet, Vanarsdall, and Weisgold (1977) classified APE into two types (Types 1 and 2) and two subtypes (Subtypes A and B), proposing treatment recommendations according to each clinical presentation. The management of APE is exclusively surgical and aims to expose the entire anatomical crown through clinical crown lengthening procedures. Depending on the anatomical features of each case, treatment may involve gingivectomy or an apically positioned flap, with or without osteotomy and osteoplasty, to re-establish the supracrestal attachment and achieve a stable, aesthetic gingival architecture (Coslet; Vanarsdall; Weisgold, 1977; Mele *et al.*, 2018; Kahn *et al.*, 2024).

The development of digital guides for immediate implant placement reflects the convergence of several technological advancements over the past two decades, which have transformed a technically demanding procedure into a more predictable and prosthetically

driven approach. Digitally guided immediate placement evolved from the broader development of computer-assisted implant surgery. The introduction of CBCT enabled the three-dimensional visualisation of the alveolar bone and adjacent structures, whilst the development of specific software allowed for the integration of CBCT data with surface scans for virtual implant planning (Tatakis; Chien; Parashis, 2019). Initially, the objective was to accurately transfer the virtual implant position to the surgical field via individualised guides. Stereolithography, alongside photopolymerisation techniques, enabled the production of guides from images and 3D designs. However, these early applications were focused on healed ridges rather than immediate placement scenarios (Tatakis; Chien; Parashis, 2019). A decisive breakthrough was the introduction of intraoral scanners (IOS), which allowed for the direct digital capture of intraoral structures and the generation of STL files that could be integrated with CBCT data (Ballesteros *et al.*, 2025). The digital workflow then evolved into two distinct approaches: static computer-assisted surgery, utilising physical surgical guides equipped with metallic sleeves, and dynamic navigation, featuring real-time optical tracking. For immediate placement, the static approach initially gained prominence by providing stable drill guidance within the challenging anatomy of fresh extraction sockets (Tomar *et al.*, 2026; Chen *et al.*, 2023; Chandran *et al.*, 2023).

Immediate implant placement presents particular challenges: limited visual control without flap elevation, risk of buccal implant deflection during site preparation, and the need for precise three-dimensional positioning to prevent future soft tissue recession (Pitman *et al.*, 2024; Nava *et al.*, 2026). Systematic reviews have established that digitally guided immediate placement achieves acceptable accuracy, with mean deviations of 0.74 mm coronally, 1.01 mm apically, 0.50 mm in depth, and 2.34° in angulation (Xing; Lin; Lyu, 2025).

Unlike implant surgery, where digital guidance is already well established, digitally guided clinical crown lengthening is a relatively recent application, emerging alongside the widespread availability of accessible planning software and low-cost 3D printing technologies. The first digitally guided crown lengthening technique was described by Liu *et al.* (2018), who introduced a dual-guide approach providing independent references for gingival resection and bone recontouring. Building upon this concept, Coachman *et al.* (2023) described an advanced digital workflow for aesthetic crown lengthening aimed at

improving diagnosis, surgical execution, and postoperative evaluation in the anterior aesthetic zone. The protocol employed a 3D-printed dual periodontal surgical guide featuring windows for each tooth, whose outer and inner margins served as references for osteotomy and gingivectomy, respectively. These advancements established the contemporary digital workflow for crown lengthening, encompassing intraoral scanning, the integration of CBCT and surface scan datasets, virtual surgical planning via image superimposition, and the fabrication of individualised surgical guides to accurately transfer the virtual plan to the surgical field (Coachman *et al.*, 2023). The first randomised clinical trial to validate digital guides for aesthetic crown lengthening was published by Carrera *et al.* (2023), demonstrating that the guided dual approach achieved clinical outcomes comparable to conventional techniques, maintaining stable periodontal parameters throughout the follow-up period.

When altered passive eruption is present in patients requiring anterior tooth replacement, correcting the gingival architecture becomes an essential component of the treatment plan. Failing to correct the altered gingival levels may compromise the symmetry of peri-implant soft tissues and, ultimately, the aesthetic outcome, even when ideal implant positioning is achieved.

Although guided digital workflows have been independently described for immediate implant placement (Tomar *et al.*, 2026; Chen *et al.*, 2023; Chandran *et al.*, 2023) and aesthetic clinical crown lengthening, reports integrating both procedures into a single prosthetically driven digital plan remain scarce (Rodeja-Vazquez *et al.*, 2025). In patients concurrently presenting with altered passive eruption and the need for immediate implant replacement in the anterior aesthetic zone, digital integration may facilitate comprehensive smile planning, enhance the transfer of the virtual design to the surgical field, and increase the predictability of hard and soft tissue management. Therefore, the aim of this case report is to describe a fully digital workflow that combines guided aesthetic clinical crown lengthening for altered passive eruption with guided immediate implant placement and provisionalisation in the aesthetic zone, highlighting the surgical sequence, digital planning protocol, and short-term clinical outcomes.

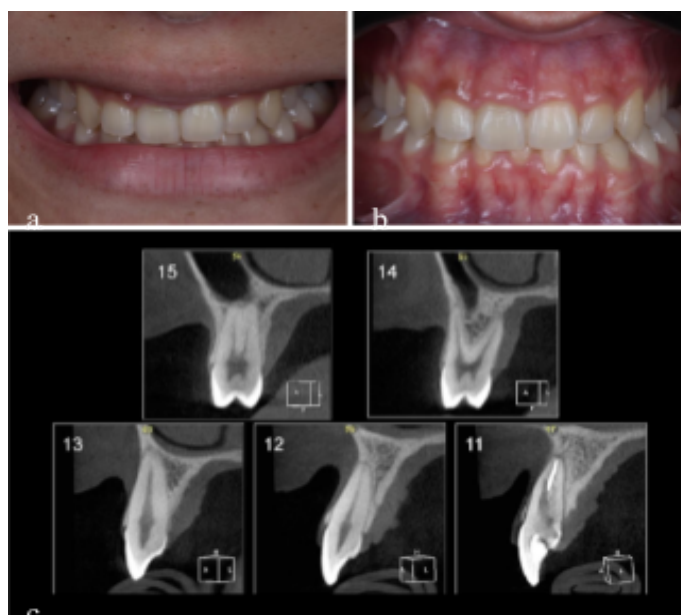
MATERIALS AND METHODS

A 23-year-old female patient, a dental student at Veiga de Almeida University, presented to the integrated clinic complaining of sensitivity in tooth 11. Following clinical examination, periapical radiography, and CBCT, an external cervical resorption (ECR) was diagnosed and classified as 3-C-p according to Patel *et al.* (2018). Endodontic treatment, conducted by an experienced endodontist, was initiated in an attempt to arrest the lesion's progression; however, it was unsuccessful. Consequently, tooth extraction followed by immediate implant placement and provisionalisation was indicated. Clinically, it was observed that the maxillary anterior teeth appeared reduced in size, with a "childish" appearance characteristic of Type 1 altered passive eruption (APE) with a wide band of keratinised mucosa and attached gingiva, Subgroup B (Coslet *et al.*, 1977). This was corroborated by the tomographic slices, which showed the alveolar bone crest positioned at the same level as the cemento-enamel junction, indicating the need for osteotomy in addition to gingivectomy. As the vertical positioning of the implant is directly related to the location of the gingival margin, the possibility of performing immediate implant placement concurrently with clinical crown lengthening was discussed with the patient. The patient signed a free and informed consent form, expressly authorising the publication of images in accordance with National Health Council (CNS) Resolution No. 466/2012, complemented by Ministry of Health Resolution No. 510/2016. Furthermore, the study was approved by the Research Ethics Committee of Veiga de Almeida University, Brazil (CAAE 0069831800005291), and registered on the Brazilian Registry of Clinical Trials (REBEC) platform (RBR-8t6c99).

Therefore, a fully digital workflow was adopted to allow for the simultaneous planning of the aesthetic clinical crown lengthening and the immediate implant placement. Digital impressions were obtained using an intraoral scanner and merged with the CBCT data via image superimposition. Virtual planning was performed to establish the ideal gingival architecture prior to defining the three-dimensional implant position using Nemostudio software (Nemotec – SL, Madrid, Spain), according to the future prosthetic emergence profile. Based on this planning, a dual periodontal guide and a static surgical guide for the implant were designed and fabricated.

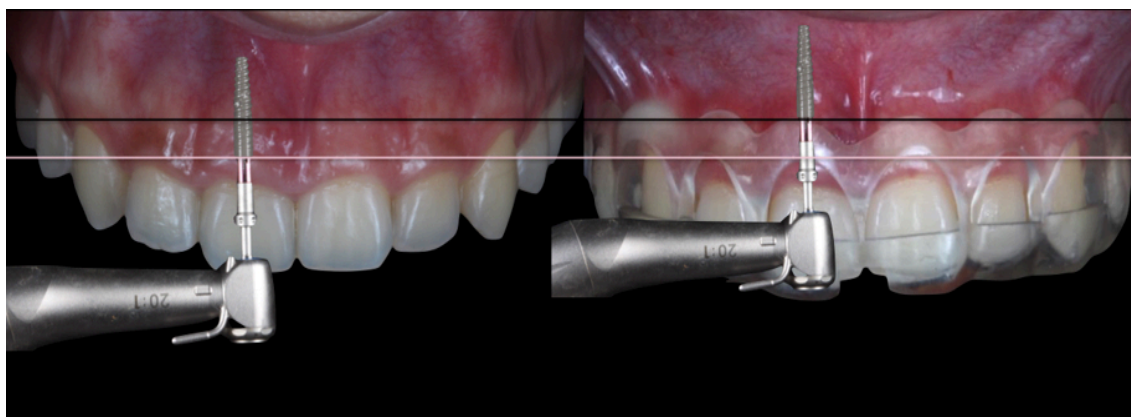
The periodontal guide was designed according to the protocol proposed by Coachman *et al.* (2023). The measurements obtained from the CBCT included the distance from the CEJ to the gingival margin and from the CEJ to the alveolar bone crest. These measurements were used to determine the planned gingival margin and the amount of bone recontouring according to the patient's periodontal phenotype. Following the biological parameters proposed by De Rouck *et al.* (2009), a distance of 3 mm was planned between the future gingival margin and the alveolar bone crest for this thick-scalloped phenotype (Type B) (Zhao *et al.*, 2023). Consequently, the distance between the inner and outer margins of the periodontal guide was designed to reproduce this relationship during surgery.

Figure 1 – a) Initial intraoral and b) extraoral aspects. c) Tomographic image showing an invasive cervical lesion and a failed endodontic treatment.



Source: The authors (2026).

Figure 2 – a) Apico-coronal implant position in relation to the existing gingival margin. b) Placement of the dual periodontal guide, illustrating the new apico-coronal implant position based on the future gingival margin level (pink line).



Source: The authors (2026).

Following local anaesthesia with 4% articaine containing 1:100,000 epinephrine (DFL Indústria e Comércio S.A., Rio de Janeiro, RJ, Brazil), the dual periodontal guide was positioned, and its passive seating was verified. The inner margin of the guide was used to outline the new gingival margin, and an internal bevel gingivectomy was performed using a 15C blade, followed by the refinement of the gingival contour with Castroviejo micro-scissors. Subsequently, a full-thickness flap was elevated, exposing the underlying alveolar bone. The outer margin of the guide served as a reference for the osteotomy and osteoplasty necessary to establish the planned bone level, which were performed using diamond burs. Throughout the procedure, the guide was repeatedly repositioned to verify the accuracy of the soft and hard tissue recontouring. Completing the periodontal phase prior to implant placement allowed the implant to be positioned according to the definitive soft tissue architecture, rather than the preoperative gingival margin.

Tooth 11 was then extracted with minimal trauma, and the implant surgical guide was seated. Site preparation and placement followed the digitally planned three-dimensional position. A 3.5 × 13 mm Helix Acqua GM implant (Neodent, Curitiba, PR, Brazil) was placed, maintaining a minimum buccal gap of 2 mm, which was filled with xenograft particles (Cerabone®, Straumann AG, Basel, Switzerland). A prefabricated universal abutment was connected, and an immediate provisional restoration was fabricated utilising the patient's natural clinical crown. Occlusal adjustment eliminated

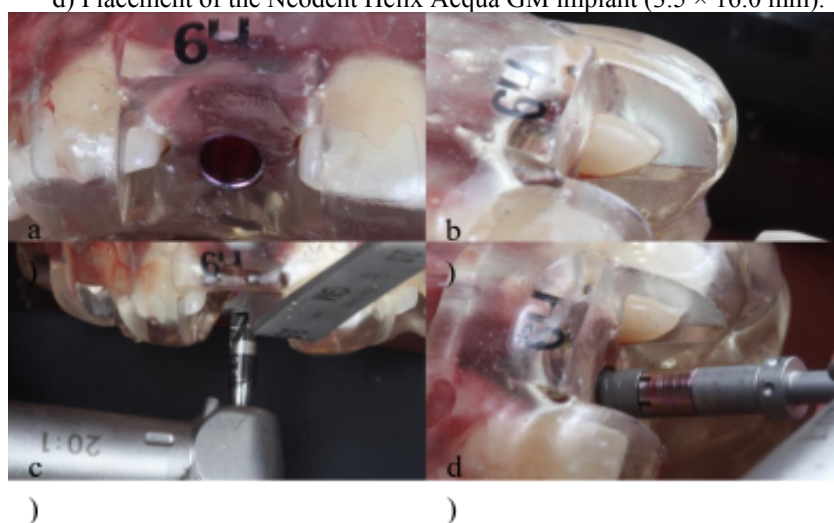
both centric and eccentric contacts, ensuring a non-functional immediate provisionalisation protocol. Finally, the flap was repositioned without tension and sutured using 6-0 nylon (Techsuture, Bauru, SP, Brazil) with simple interrupted and suspensory sutures to achieve hermetic wound closure.

Figure 3 – a) Placement of the dual periodontal guide following local anaesthesia. b) Intraoral view after gingivectomy guided by the dual periodontal guide. c) Round diamond bur (size 2) defining the maximum extent of the vertical osteotomy.



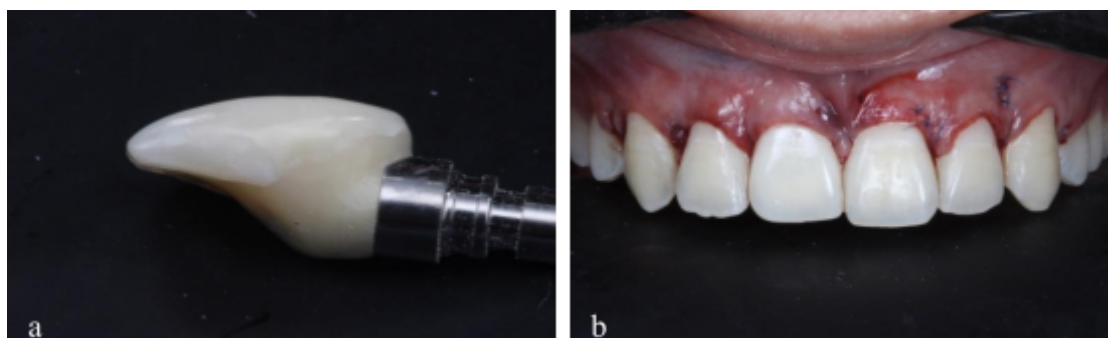
Source: The authors (2026).

Figure 4 – a) Placement of the static implant surgical guide following extraction. b) Verification of the guide's seating through the inspection window, illustrating intimate contact with the left central incisor. c) Osteotomy preparation using the final drill in the sequence (3.5 mm diameter) with the aid of the reducer key. d) Placement of the Neodent Helix Acqua GM implant (3.5 × 16.0 mm).



Source: The authors (2026).

Figure 5 – a) Provisional restoration fabricated using the patient's natural tooth and relined with composite resin. b) Intraoral view of the immediate provisional restoration in situ; the incisal edge was positioned slightly apically to prevent any contact during centric and excursive movements, especially given the patient's Class II malocclusion.



Source: The authors (2026).

RESULTS

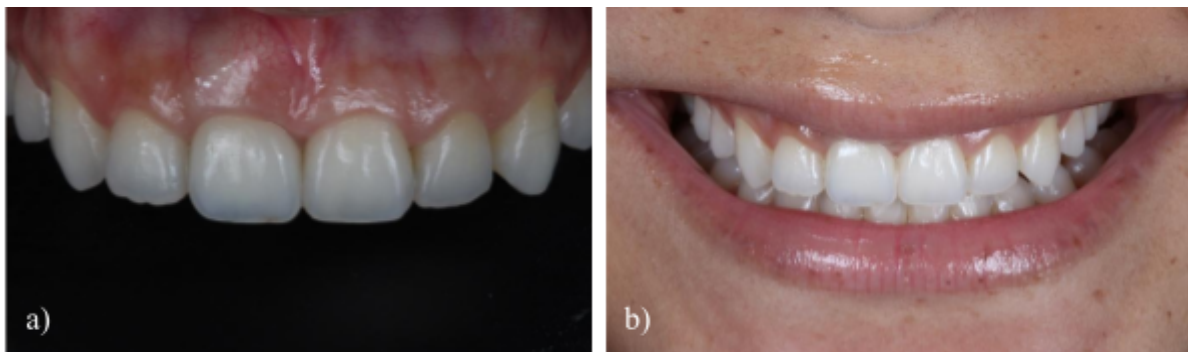
Sutures were removed after seven days. Following a three-month healing period, osseointegration progressed uneventfully, and the peri-implant tissues exhibited satisfactory healing; however, a soft tissue volume deficiency was noted, yielding a Pink Esthetic Score (PES) of 12 (Fürhauser *et al.*, 2005). To improve aesthetics and the long-term stability of the soft tissues, a subepithelial connective tissue graft (SCTG) was proposed to enhance the buccal soft tissue contour and optimise the emergence profile (Seyssens *et al.*, 2021). Although the SCTG could have been performed simultaneously with the implant placement, the reassessment was intentionally postponed to the 3-month mark (Struys *et al.*, 2025). This decision, consciously made and agreed upon with the patient, aimed to prevent prolonging the initial surgical procedure, which had already encompassed aesthetic clinical crown lengthening (including gingivectomy and osteotomy), immediate implant placement, and provisionalisation in a single session. After an additional three months of soft tissue maturation, a digital impression was taken at the implant level. A customised zirconia abutment on a titanium base (Ti-base) was fabricated to support an adhesively cemented lithium disilicate crown. At the two-year follow-up, stable peri-implant hard and soft tissues were observed, alongside harmonious gingival margins, preservation of the buccal contour, and satisfactory aesthetic integration with the adjacent dentition. No biological or prosthetic complications were detected during this period.

Figure 6 – a) Aesthetic and functional reassessment at 3 months, revealing a buccal soft tissue volume deficiency (PES = 12). b) Surgical placement of a subepithelial connective tissue graft to address the contour defect. c) Following a further 3-month healing period, try-in of the zirconia framework to promote peri-implant tissue biocompatibility. d) Cementation of the definitive, characterised lithium disilicate crown.



.Source: The authors (2026).

Figure 7 – a) Intraoral and b) extraoral views at the 2-year follow-up following the initial surgery



Source: The authors (2026).

Table 1 - Chronology and timeline of clinical, surgical, and prosthetic stages.

Moment / Time	Clinical Stage	Procedures and Therapeutic Decisions	Outcome / Parameter Evaluated
Baseline (T initial)	Diagnosis and Conservative Attempt	Complaint of sensitivity in tooth 11. Tomographic diagnosis of External Cervical Resorption (ECR Class 3-C-p) and Altered Passive Eruption (APE). Coslet Classification Type 1B. Attempted endodontic treatment (unsuccessful).	Confirmation of non-restorable tooth 11; indication for extraction and peri-implant rehabilitation integrated with clinical crown lengthening.
Preoperative Phase	Digital Planning and Prototyping	Intraoral scanning (STL files) and CBCT with lip retraction (DICOM). Merging and planning in NemoStudio software. Definition of the new gingival margin and bone crest (3 mm rule). 3D printing of the dual periodontal guide and the static implant surgical guide.	Procurement of individualised surgical guides for precise sequential execution in a single session.
Day of Surgery (T0)	Integrated Surgical Intervention in a Single Session	Local anaesthesia and positioning of the dual periodontal guide. Internal bevel gingivectomy and full-thickness flap with guided osteotomy/osteoplasty. Atraumatic extraction of tooth 11. Guided placement of Helix GM implant (3.5 × 13 mm) with palatal and apical anchorage. Filling of the buccal gap with Cerabone®. Fabrication of a non-functional immediate provisional restoration (natural crown). 6-0 nylon sutures.	Aesthetic crown lengthening of the anterior teeth and three-dimensional implant positioning guided by the definitive gingival architecture.
7 to 14 days	Immediate Postoperative Period	Monitoring of initial tissue healing. Suture removal at 7 days.	Initial healing without infectious complications or suture dehiscence.
3 months	Secondary Peri-implant Plastic Phase	Clinical evaluation of osseointegration and soft tissue maturation. Execution of a subepithelial connective tissue graft (SCTG) from the palate using a tunnelling/envelope technique on the buccal aspect of tooth 11.	Gain in peri-implant soft tissue volume and thickness to optimise the emergence profile.
6 months	Definitive Prosthetic Rehabilitation	Digital impression/scanning at the implant level following 3 months of SCTG maturation. Fabrication and placement of a customised zirconia abutment on a Ti-base and a cemented lithium disilicate crown.	Establishment of the definitive prosthetic contour in harmony with the re-established gingival margin.
2 years (Tfinal)	Longitudinal Follow-up	Clinical periodontal and peri-implant evaluation (probing, keratinised mucosa, pink/white aesthetics). Periapical/tomographic radiographic control evaluation.	Dimensional stability of hard and soft tissues, absence of biological or prosthetic complications, and harmonious aesthetic integration.

Source: The authors (2026).

DISCUSSION

This case report describes a digitally integrated workflow that combines guided aesthetic clinical crown lengthening and guided immediate implant placement into a single prosthetically driven treatment concept. Rather than treating both procedures as independent interventions, digital planning allowed the definitive gingival architecture to be established prior to implant positioning, ensuring that the implant was placed according to the planned prosthetic and periodontal outcome. The central aspect of this workflow was that the virtual correction of the gingival architecture preceded the implant planning. As the depth and bucco-lingual position of the implant directly influence the peri-implant soft tissue profile, planning the implant according to the definitive gingival margin, rather than the preoperative anatomy, can contribute to greater aesthetic predictability.

An additional justification for this sequence relates to the diagnosis of altered passive eruption. In the present case, APE was identified during the comprehensive clinical and tomographic examination, although it was not the patient's primary complaint. Had the implant been planned solely based on the preoperative gingival margin, without recognising the APE, it would likely have been positioned more coronally, since immediate implants are typically placed approximately 3 to 4 mm apically to the existing gingival margin to allow for a proper emergence profile. Subsequent correction of the gingival levels via clinical crown lengthening would have exposed the implant-supported restoration and compromised the peri-implant aesthetic relationship, potentially hindering the harmonious correction of the adjacent teeth. Therefore, establishing the definitive gingival architecture prior to implant planning was essential to ensure that the implant position corresponded to the intended final aesthetic outcome, rather than the preoperative soft tissue anatomy (Rodeja-Vazquez *et al.*, 2025). In this workflow, the definitive gingival margin became the reference for implant positioning, rather than the implant positioning dictating the final gingival architecture.

Although digital guidance for aesthetic clinical crown lengthening was introduced only recently, the protocol proposed by Coachman *et al.* (2023), and subsequently validated in the randomised clinical trial by Carrera *et al.* (2023), has demonstrated that guided surgery accurately reproduces the planned gingival and bone contours. The present case broadens the application of this concept by integrating the periodontal guide into the

immediate implant placement planning, yielding a high PES/WES (Pink Esthetic Score/White Esthetic Score) (Belser *et al.*, 2009) at the 2-year evaluation.

Soft tissue augmentation was intentionally delayed until the provisionalisation phase. Although a connective tissue graft (SCTG) can be performed simultaneously with immediate implant placement, its staggering reduced the duration of the initial surgery whilst still allowing for soft tissue enhancement prior to the delivery of the definitive restoration. This sequence, planned in agreement with the patient, permitted the refinement of the emergence profile following the initial tissue maturation. An alternative would be the use of a collagen matrix during the initial surgical procedure, avoiding a second intervention and donor site morbidity. Although collagen matrices have emerged as a less invasive alternative (Jepsen *et al.*, 2026; Eeckhout *et al.*, 2023) and demonstrate favourable clinical outcomes, current evidence generally supports the autogenous SCTG as the most predictable approach for achieving greater soft tissue thickness and long-term volumetric stability around implants, particularly in the aesthetic zone. Thus, considering the aesthetic demands of the anterior maxilla and the patient's young age, the SCTG was deemed the most predictable option to optimise the final contour of the peri-implant soft tissues.

As a single case report, the present study does not allow for conclusions regarding the superiority of this workflow over conventional approaches. Nonetheless, it illustrates the clinical applicability of integrating two digitally guided procedures into a prosthetically driven treatment sequence. Prospective clinical studies are necessary to evaluate the accuracy, efficiency, aesthetic outcomes, and long-term stability of this integrated digital workflow.

CONCLUSION

This case report demonstrates that the digital integration of guided aesthetic clinical crown lengthening with guided immediate implant placement is clinically feasible and can facilitate the prosthetically driven treatment of patients presenting with altered passive eruption and the need for immediate implant replacement in the aesthetic zone. Although further studies are required, this workflow may represent a useful strategy for enhancing interdisciplinary planning and achieving predictable aesthetic outcomes.

REFERENCES

ALPISTE-ILLUECA, F. Altered passive eruption (APE): a little-known clinical situation. **Medicina Oral, Patología Oral y Cirugía Bucal**, v. 16, n. 1, p. e100-e104, 2011. Available at: <https://pubmed.ncbi.nlm.nih.gov/20711147/>. Accessed on: 26 Oct. 2026.

AMRO, L. A.; ABDALWAHAB, M. M.; ZAZOU, N.; AMR, A. E. H. Prevalence of different etiologies of excessive gingival display: identifying diagnostic patterns. **The Scientific World Journal**, v. 2026, art. 8869911, 2026. Available at: <https://pubmed.ncbi.nlm.nih.gov/41767215/>. Accessed on: 26 Oct. 2026.

ANDIJANI, R. I.; TATAKIS, D. N. Hypermobility upper lip is highly prevalent among patients seeking treatment for gummy smile. **Journal of Periodontology**, v. 90, n. 3, p. 256-262, 2019. Available at: <https://pubmed.ncbi.nlm.nih.gov/30367736/>. Accessed on: 26 Oct. 2026.

ANTONIAZZI, R. P.; FISCHER, L. S.; BALBINOT, C. E. A.; ANTONIAZZI, S. P.; SKUPIEN, J. A. Impact of excessive gingival display on oral health-related quality of life in a Southern Brazilian young population. **Journal of Clinical Periodontology**, v. 44, n. 10, p. 996-1002, 2017. Available at: <https://pubmed.ncbi.nlm.nih.gov/28555928/>. Accessed on: 26 Oct. 2026.

BALLESTEROS, J.; VÁSQUEZ, S.; REVILLA-LEÓN, M.; GÓMEZ-POLO, M. A comparative study on the accuracy of implant placement using 3D-printed and milled guides without metal sleeves. **Clinical Implant Dentistry and Related Research**, v. 27, n. 4, art. e70072, 2025. Available at: <https://pubmed.ncbi.nlm.nih.gov/40577487/>. Accessed on: 26 Oct. 2026.

BEIRE, J. M.; DE PAULO, D. C. H.; DEVITO, K. L.; FALABELLA, M. E. V. Clinical and tomography evaluation of periodontal phenotypes of Brazilian dental students. **Journal of Indian Society of Periodontology**, v. 25, n. 3, p. 207-212, 2021. Available at: <https://pubmed.ncbi.nlm.nih.gov/34158687/>. Accessed on: 26 Oct. 2026.

BELSER, U. C.; GRÜTTER, L.; VAILATI, F.; BORNSTEIN, M. M.; WEBER, H.-P.; BUSER, D. Outcome evaluation of early placed maxillary anterior single-tooth implants using objective esthetic criteria: a cross-sectional, retrospective study in 45 patients with a 2- to 4-year follow-up using pink and white esthetic scores. **Journal of Periodontology**, v. 80, n. 1, p. 140-151, 2009. Available at: <https://pubmed.ncbi.nlm.nih.gov/19228100/>. Accessed on: 26 Oct. 2026.

CARRERA, T. M. I.; FREIRE, A. E. N.; DE OLIVEIRA, G. J. P. L.; DOS REIS NICOLAU, S.; PICHOTANO, E. C.; RIBEIRO JUNIOR, N. V.; PIRES, L. C.; PIGOSSI, S. C. Digital planning and guided dual technique in esthetic crown lengthening: a randomized controlled clinical trial. **Clinical Oral Investigations**, v. 27, n. 4, p. 1589-1603, 2023. Available at: <https://pubmed.ncbi.nlm.nih.gov/36409356/>. Accessed on: 26 Oct. 2026.

CHANDRAN, K. R. S.; GOYAL, M.; MITTAL, N.; GEORGE, J. S. Accuracy of freehand versus guided immediate implant placement: a randomized controlled trial. **Journal of Dentistry**, v. 136, art. 104620, 2023. Available at: <https://pubmed.ncbi.nlm.nih.gov/37454788/>. Accessed on: 26 Oct. 2026.

CHEN, S. T.; BUSER, D.; SCULEAN, A.; BELSER, U. C. Complications and treatment errors in implant positioning in the aesthetic zone: diagnosis and possible solutions. **Periodontology** 2000, v. 92, n. 1, p. 220-234, 2023. Available at: <https://pubmed.ncbi.nlm.nih.gov/36683018/>. Accessed on: 26 Oct. 2026.

COACHMAN, C.; VALAVANIS, K.; SILVEIRA, F. C.; KAHN, S.; TAVARES, A. D.; MAHN, E.; PARIZE, H.; SALIBA, F. M. P. The crown lengthening double guide and the digital Perio analysis. **Journal of Esthetic and Restorative Dentistry**, v. 35, n. 1, p. 215-221, 2023. Available at: <https://pubmed.ncbi.nlm.nih.gov/35506552/>. Accessed on: 26 Oct. 2026.

COSLET, J. G.; VANARSDALL, R.; WEISGOLD, A. Diagnosis and classification of delayed passive eruption of the dentogingival junction in the adult. **The Alpha Omegan**, v. 70, n. 3, p. 24-28, 1977. Available at: <https://pubmed.ncbi.nlm.nih.gov/276255/>. Accessed on: 26 Oct. 2026.

COSYN, J.; SEYSSENS, L.; DE BRUYCKERE, T.; DE BUYSER, S.; DJURKIN, A.; EGHBALI, A.; LASSERRE, J. F.; TUDTS, M.; YOUNES, F.; TOMA, S. A multi-centre randomized controlled trial on alveolar ridge preservation with immediate or delayed implant placement: need for soft-tissue augmentation. **Journal of Clinical Periodontology**, v. 51, n. 12, p. 1644-1655, 2024. Available at: <https://pubmed.ncbi.nlm.nih.gov/38084405/>. Accessed on: 26 Oct. 2026.

DE ROUCK, T.; EGHBALI, R.; COLLYS, K.; DE BRUYN, H.; COSYN, J. The gingival biotype revisited: transparency of the periodontal probe through the gingival margin as a method to discriminate thin from thick gingiva. **Journal of Clinical Periodontology**, v. 36, n. 5, p. 428-433, 2009. Available at: <https://pubmed.ncbi.nlm.nih.gov/19419444/>. Accessed on: 26 Oct. 2026.

ECKHOUT, C.; VUYLSTEKE, F.; SEYSSENS, L.; CHRISTIAENS, V.; DE BRUYCKERE, T.; EGHBALI, A.; VERVAEKE, S.; YOUNES, F.; COSYN, J. A multi-centre randomized controlled trial comparing connective tissue graft with collagen matrix to increase buccal soft tissue thickness: a cone-beam CT analysis. **Journal of Clinical Medicine**, v. 12, n. 8, art. 2977, 2023. Available at: <https://pubmed.ncbi.nlm.nih.gov/37109311/>. Accessed on: 26 Oct. 2026.

FÜRHAUSER, R.; FLORESCU, D.; BENESCH, T.; HAAS, R.; MAILATH, G.; WATZEK, G. Evaluation of soft tissue around single-tooth implant crowns: the pink esthetic score. **Clinical Oral Implants Research**, v. 16, n. 6, p. 639-644, 2005. Available at: <https://pubmed.ncbi.nlm.nih.gov/16307569/>. Accessed on: 26 Oct. 2026.

GOLDMAN, H. M.; COHEN, D. W. **Periodontal therapy**. 4. ed. St. Louis: C. V. Mosby, 1968. p. 773-1005.

ICKROTH, A.; SEYSSSENS, L.; CHRISTIAENS, V.; PITMAN, J.; COSYN, J. Immediate versus early implant placement for single tooth replacement in the aesthetic area: a systematic review and meta-analysis. **Clinical Oral Implants Research**, v. 35, n. 6, p. 585-597, 2024. Available at: <https://pubmed.ncbi.nlm.nih.gov/38558205/>. Accessed on: 26 Oct. 2026.

JANUÁRIO, A. L.; BARRIVIERA, M.; DUARTE, W. R. Soft tissue cone-beam computed tomography: a novel method for the measurement of gingival tissue and the dimensions of the dentogingival unit. **Journal of Esthetic and Restorative Dentistry**, v. 20, n. 6, p. 366-373, 2008. Available at: <https://pubmed.ncbi.nlm.nih.gov/19120781/>. Accessed on: 26 Oct. 2026.

JEPSEN, K.; JEPSEN, S.; HÄMMERLE, C. H. F.; MANCINI, L.; STRAUSS, F. J.; STRASDING, M.; HICKLIN, S.; SANZ, M.; SANZ-MARTIN, I.; THOMA, D. S.; SAILER, I. Changes in peri-implant soft tissue dimensions following soft tissue contour augmentation: a 3-year follow-up of a multi-center RCT. **Clinical Oral Implants Research**, v. 37, n. 3, p. 345-356, 2026. Available at: <https://pubmed.ncbi.nlm.nih.gov/41389213/>. Accessed on: 26 Oct. 2026.

KAHN, S.; RODRIGUES, W. J. P. R.; DIAS, A. T.; RESENDE, R.; FERNANDES, J. C. H.; FERNANDES, G. V. O. Crown lengthening surgery in the esthetic area for optimized results: a review with surgical recommendations. **Surgeries**, v. 5, n. 4, p. 1043-1055, 2024. Available at: <https://www.mdpi.com/2673-4095/5/4/84>. Accessed on: 26 Oct. 2026.

LIU, X.; YU, J.; ZHOU, J.; TAN, J. A digitally guided dual technique for both gingival and bone resection during crown lengthening surgery. **The Journal of Prosthetic Dentistry**, v. 119, n. 3, p. 345-349, 2018. Available at: <https://pubmed.ncbi.nlm.nih.gov/28689907/>. Accessed on: 26 Oct. 2026.

MEIJER, H. J. A.; SLAGTER, K. W.; GAREB, B.; HENTENAAR, D. F. M.; VISSINK, A.; RAGHOEBAR, G. M. Immediate single-tooth implant placement in bony defect sites: a 10-year randomized controlled trial. **Journal of Periodontology**, v. 96, n. 2, p. 151-163, 2025. Available at: <https://pubmed.ncbi.nlm.nih.gov/39129325/>. Accessed on: 26 Oct. 2026.

MELE, M.; FELICE, P.; SHARMA, P.; MAZZOTTI, C.; BELLONE, P.; ZUCHELLI, G. Esthetic treatment of altered passive eruption. **Periodontology 2000**, v. 77, n. 1, p. 65-83, 2018. Available at: <https://pubmed.ncbi.nlm.nih.gov/29504162/>. Accessed on: 26 Oct. 2026.

NART, J.; CARRIÓ, N.; VALLES, C.; SOLÍS-MORENO, C.; NART, M.; REÑÉ, R.; ESQUINAS, C.; PUIGDOLLERS, A. Prevalence of altered passive eruption in orthodontically treated and untreated patients. **Journal of Periodontology**, v. 85, n. 11, p.

e348-e353, 2014. Available at: <https://pubmed.ncbi.nlm.nih.gov/25126692/>. Accessed on: 26 Oct. 2026.

NAVA, P.; SABRI, H.; HAZRATI, P.; NAVA, C.; SALEH, M. H. A.; WANG, H.-L. Accuracy of static, dynamic, and robotic guided surgery in immediate implant placement: a systematic review and network meta-analysis. **Clinical Oral Implants Research**, v. 37, n. 5, p. 525-542, 2026. Available at: <https://pubmed.ncbi.nlm.nih.gov/41714848/>. Accessed on: 26 Oct. 2026.

PATEL, S.; FOSCHI, F.; CONDON, R.; PIMENTEL, T.; BHUVA, B. External cervical resorption: part 2: management. **International Endodontic Journal**, v. 51, n. 11, p. 1224-1238, 2018. Available at: <https://pubmed.ncbi.nlm.nih.gov/29737544/>. Accessed on: 26 Oct. 2026.

PITMAN, J.; COSYN, J.; CHRISTIAENS, V.; YOUNES, F.; DE BRUYCKERE, T.; VERVAEKE, S.; GLIBERT, M. Accuracy of immediately placed implants using surgical guides from different 3-dimensional printers: an in vitro study. **Clinical Implant Dentistry and Related Research**, v. 26, n. 5, p. 922-929, 2024. Available at: <https://pubmed.ncbi.nlm.nih.gov/38932561/>. Accessed on: 26 Oct. 2026.

PITMAN, J.; SEYSSENS, L.; CHRISTIAENS, V.; COSYN, J. Immediate implant placement with or without immediate provisionalization: a systematic review and meta-analysis. **Journal of Clinical Periodontology**, v. 49, n. 10, p. 1012-1023, 2022. Available at: <https://pubmed.ncbi.nlm.nih.gov/35734911/>. Accessed on: 26 Oct. 2026.

PUISYS, A.; AUZBIKAVICIUTE, V.; VINDASIUTE-NARBUTE, E.; PRANSKUNAS, M.; RAZUKEVICUS, D.; LINKEVICIUS, T. Immediate implant placement vs. early implant treatment in the esthetic area: a 1-year randomized clinical trial. **Clinical Oral Implants Research**, v. 33, n. 6, p. 634-655, 2022. Available at: <https://pubmed.ncbi.nlm.nih.gov/35318752/>. Accessed on: 26 Oct. 2026.

RODEJA-VAZQUEZ, M.; TORRES-RODRÍGUEZ, J. C.; COSTA-PALAU, S.; NART, J.; REAL-VOLTAS, F. A combination crown lengthening and implant placement guide. **The Journal of Prosthetic Dentistry**, v. 134, n. 4, p. 952-956, 2025. Available at: <https://pubmed.ncbi.nlm.nih.gov/38555269/>. Accessed on: 26 Oct. 2026.

SEYSSENS, L.; DE LAT, L.; COSYN, J. Immediate implant placement with or without connective tissue graft: a systematic review and meta-analysis. **Journal of Clinical Periodontology**, v. 48, n. 2, p. 284-301, 2021. Available at: <https://pubmed.ncbi.nlm.nih.gov/33125754/>. Accessed on: 26 Oct. 2026.

SEYSSENS, L.; EECKHOUT, C.; COSYN, J. Immediate implant placement with or without socket grafting: a systematic review and meta-analysis. **Clinical Implant Dentistry and Related Research**, v. 24, n. 3, p. 339-351, 2022. Available at: <https://pubmed.ncbi.nlm.nih.gov/35313067/>. Accessed on: 26 Oct. 2026.

SLAGTER, K. W.; RAGHOEBAR, G. M.; HENTENAAR, D. F. M.; VISSINK, A.; MEIJER, H. J. A. Immediate placement of single implants with or without immediate provisionalization in the maxillary aesthetic region: a 5-year comparative study. **Journal of Clinical Periodontology**, v. 48, n. 2, p. 272-283, 2021. Available at: <https://pubmed.ncbi.nlm.nih.gov/33141935/>. Accessed on: 26 Oct. 2026.

STRUYS, T.; CHRISTIAENS, V.; DE BRUYCKERE, T.; PITMAN, J.; VAN HOVE, P.-J.; COSYN, J. A randomized controlled trial on the timing of soft tissue augmentation in immediate implant placement: soft tissue changes and esthetic outcome. **Clinical Implant Dentistry and Related Research**, v. 27, n. 1, art. e70013, 2025. Available at: <https://pubmed.ncbi.nlm.nih.gov/39980395/>. Accessed on: 26 Oct. 2026.

TATAKIS, D. N.; CHIEN, H.-H.; PARASHIS, A. O. Guided implant surgery risks and their prevention. **Periodontology 2000**, v. 81, n. 1, p. 194-208, 2019. Available at: <https://pubmed.ncbi.nlm.nih.gov/31407433/>. Accessed on: 26 Oct. 2026.

TOMAR, S.; CHAUDHARY, P.; GANGULY, A. Comparing the clinical outcomes of guided and freehand dental implant surgery: an umbrella review of systematic reviews and meta-analyses. **The Journal of Prosthetic Dentistry**, v. 135, n. 5, p. e53-e59, 2026. Available at: <https://pubmed.ncbi.nlm.nih.gov/41206337/>. Accessed on: 26 Oct. 2026.

VOLCHANSKY, A.; CLEATON-JONES, P. E. Delayed passive eruption: a predisposing factor to Vincent's infection? **Journal of the Dental Association of South Africa**, v. 29, n. 5, p. 291-294, 1974. Available at: <https://pubmed.ncbi.nlm.nih.gov/276255/>. Accessed on: 26 Oct. 2026.

XING, Q.; LIN, J.; LYU, M. The accuracy of immediate implantation guided by digital templates and potential influencing factors: a systematic review. **International Dental Journal**, v. 75, n. 2, p. 439-452, 2025. Available at: <https://pubmed.ncbi.nlm.nih.gov/39521681/>. Accessed on: 26 Oct. 2026.

ZHAO, H.; ZHANG, L.; LI, H.; HIEAWY, A.; SHEN, Y.; LIU, H. Gingival phenotype determination: cutoff values, relationship between gingival and alveolar crest bone thickness at different landmarks. **Journal of Dental Sciences**, v. 18, n. 4, p. 1544-1552, 2023. Available at: <https://pubmed.ncbi.nlm.nih.gov/37799899/>. Accessed on: 26 Oct. 2026.

