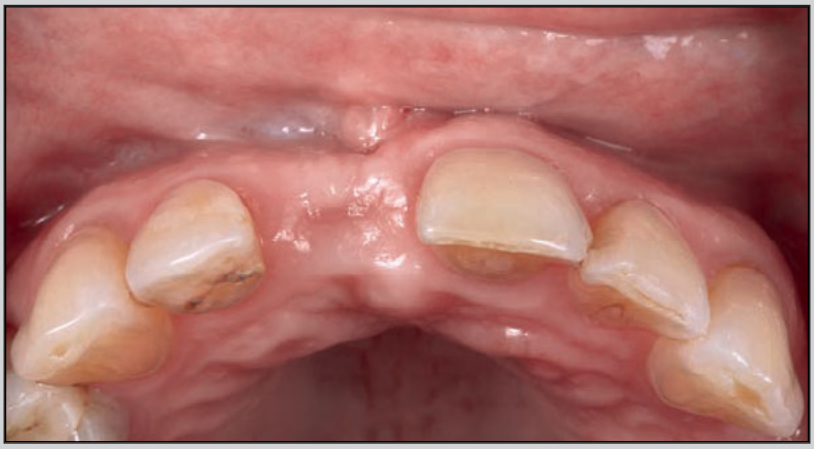
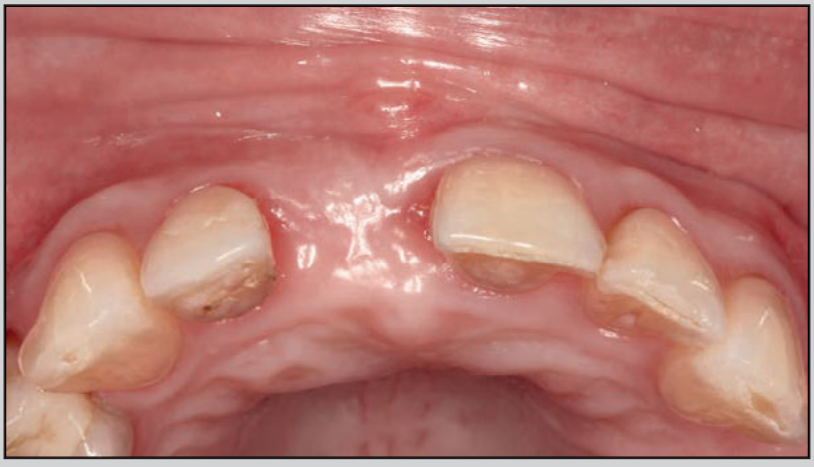
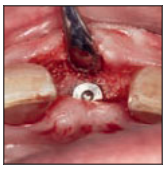




Retrospective Outcomes of Horizontal Guided Bone Regeneration at Partially Edentulous Sites with a Facially Oriented Crestal Incision (FOCIS) Design



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This retrospective study aimed to describe the facially oriented crestal incision (FOCIS) and assess the incidence of flap dehiscence and its efficacy in simultaneous and staged guided bone regeneration (GBR) procedures. The data of 41 patients treated with FOCIS GBR were analyzed. The primary outcome analyzed was the rate of initial wound closure. Secondary outcomes were related clinical parameters, including mean resolution of dehiscences and fenestrations, crestal buccal bone thickness (BBT), and bone width (BW) increase. A total of 53 implants were placed. The initial wound closure rate was 92.7% (38/41) and 94.3% (50/53) at the patient and implant levels, respectively. The complete dehiscence resolution rate was 79.31%, and the mean dehiscence reduction was 3.12 ± 2.46 mm (95% CI: 2.19 to 4.06 mm). BBT had a mean increase of 1.22 ± 1.07 mm (95% CI: 0.86 to 1.59 mm), and the final BBT was an average of 1.56 ± 0.79 mm (95% CI: 1.32 to 1.80 mm). Lastly, BW increase averaged 3.38 ± 1.49 mm (95% CI: 2.58 to 4.17 mm) for the staged cases. Utilizing FOCIS at partially edentulous sites can help achieve and maintain wound closure in horizontal GBR procedures. Int J Periodontics Restorative Dent 2022;42:771–780. doi: 10.11607/prd.6004

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Guided bone regeneration (GBR) basically consists of using a membrane to provide stability to the bone graft while functioning as a barrier to impede migration of competing nonosteogenic cells to the site aimed for bone regeneration.[1,2] Satisfactory success rates have been reported for GBR procedures, especially when only horizontal augmentation is required.[3,4] However, complications are frequently encountered. Up to 17.6% of soft tissue complications (eg, tissue dehiscence, acute infection, abscess, and membrane exposure) were associated with the use of a nonresorbable membrane for horizontal GBR.[5] The aforementioned complications can result in an insufficient ridge for implant placement[6,7] or impaired defect resolution in cases of simultaneous implant placement.[8,9]

Flap design and its management play an essential role for uneventful wound healing after GBR.[10] Different flap and incision designs have been proposed in the literature. In 1998, Cranin et al suggested that crestal incisions create the most predictable levels of primary soft tissue healing.[11] A more buccal incision can present a vertical increase in the palatal flap to cover the new amount of grafted bone for maxillary cases.[12] On the other hand, several clinical trials revealed no significant clinical differences in

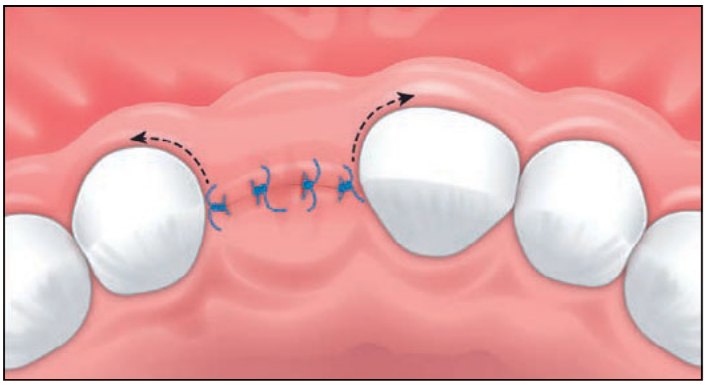


Fig 1 *Tension forms at the facial line angle of the adjacent teeth when the flap moves coronally as a whole during wound closure. This is partially responsible for the commonly observed wound opening in vicinity to the adjacent teeth.*

the outcomes of implant therapy when a midcrestal or labial incision was performed.[13–16] Histologic studies on animal and human cadavers demonstrated an avascular zone in crestal soft tissue overlying the edentulous ridge and highlighted that incision design could further impair the vascular circulation, which maintains the viability of soft tissue segments.[11,17] Alternatively, another histologic study emphasized that even if the surgical areas have inadequate macrovascular blood supply, the adjacent territory of the flap area can support wound healing via microanastomoses.[18] Moreover, those authors stated that in the assessment of the area's regeneration potential and healing process, experimental animal models or clinical data are imperative as opposed to cadaver results.[18]

For GBR, incisions are commonly placed midcrestally[10,19] or palatally, followed by intrasulcular incisions at the adjacent teeth, with vertical releasing incisions on adjacent areas as needed for flap release.[20] After the biomaterials are placed, the tension within the flap increases; therefore, a tension-releasing procedure is required to achieve passive flap closure, most frequently performed on the facial flap. While vertical releasing incisions are used to allow flap advancement and reduce tension,[20] they also considerably compromise blood supply and should be avoided when possible.[17,18,21] In the posterior mandible, the lingual flap could be released for primary closure. Even with an adequate tension release, wound opening is a common occurrence, especially at the site and in vicinity to the adjacent teeth. It is hypothesized that the added bone graft increases the surface area in both the apicocoronal and mesiodistal dimensions, which later have to be covered by the flap. Because the bone graft is primarily placed in the defective edentulous ridge rather than in the dentate region, there is a disproportional apical displacement of the facial flap. The edge of the crestal incision is displaced more than the edge of the intrasulcular incision. To approximate the crestal incision edges, the facial edge of the intrasulcular incision has to rotate around the line angle of the adjacent teeth, resulting in undue stress within the facial flap at the line angle (Fig 1). This phenomenon may be partially responsible for the observed wound opening at the line angle. Therefore, a modified incision—the facially oriented crestal incision (FOCIS)—was designed and has been used in a series of patients needing GBR in order to alleviate the abovementioned challenge. FOCIS has been shown to help achieve and, perhaps more importantly, maintain primary closure of the flap over the membrane used in GBR procedures. Thus, the present study aims to describe FOCIS and to assess the incidence of flap dehiscence and its efficacy in simultaneous and staged GBR procedures.

Materials and Methods

Study Design

The current investigation was conducted in accordance with the principles presented in the 1975 Declaration of Helsinki (as revised in 2000) for biomedical research involving human subjects. The Institutional Review Board (IRB) for Human

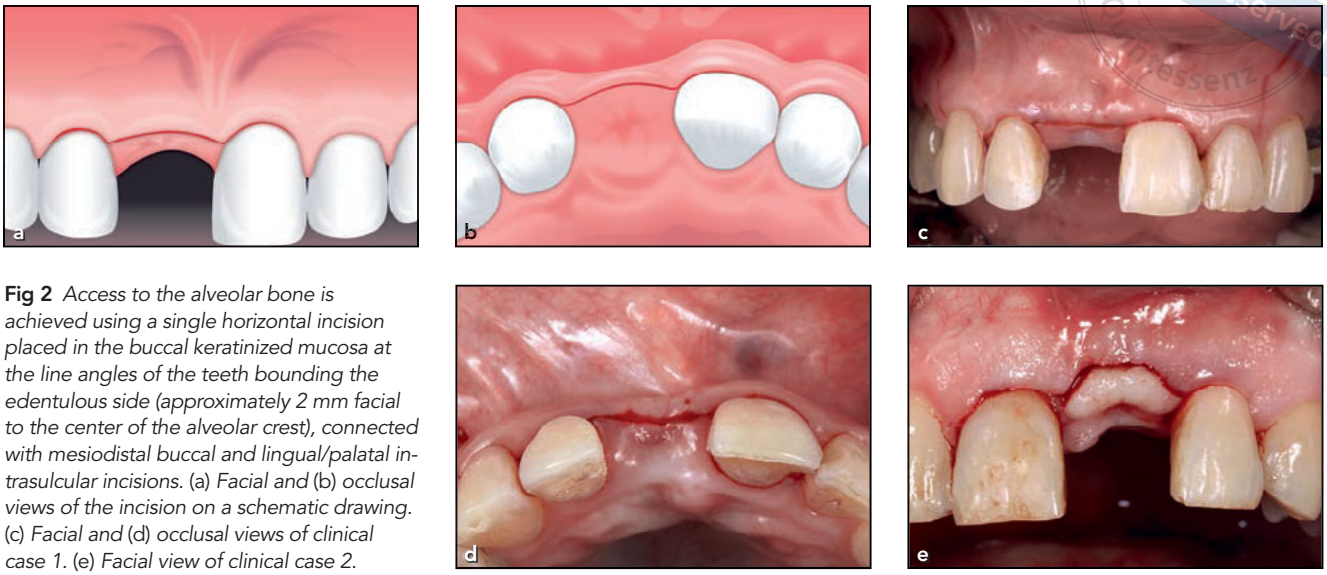


Fig 2 *Access to the alveolar bone is achieved using a single horizontal incision placed in the buccal keratinized mucosa at the line angles of the teeth bounding the edentulous side (approximately 2 mm facial to the center of the alveolar crest), connected with mesiodistal buccal and lingual/palatal intrasulcular incisions.* (a) *Facial and* (b) *occlusal views of the incision on a schematic drawing.* (c) *Facial and* (d) *occlusal views of clinical case 1.* (e) *Facial view of clinical case 2.*

Studies (HUM00183005; University of Michigan School of Dentistry) reviewed the study and determined that it was exempt from IRB review because the study only involved information collection and analysis under the HIPAA (Health Insurance Portability and Accountability Act) Privacy Rule. This retrospective study selected patients who had undergone GBR treatment using the FOCIS technique, performed by single periodontist (H.L.C.) at three private dental offices. All paper files and digital charts of consecutive patients treated with GBR using the FOCIS technique were reviewed.

Patient Selection

Patients were included in the study if they met the following criteria: *(1)* having received a comprehensive periodontal treatment (including oral hygiene instructions, scaling/root planing, prophylaxis, etc) prior to the GBR FOCIS procedure; *(2)* having at least 6 months of follow-up after GBR treatment recorded in patient records; and *(3)* having the complete required clinical data (medical history, GBR procedure performed and materials utilized, implant characteristics, and measurements of clinical parameters) recorded in patient charts.

Patients were excluded from the study if they met the following conditions: *(1)* absence of postsurgical follow-up data reaching 6 months; *(2)* use of barrier membranes for procedures other than GBR (sinus lift, guided tissue regeneration, socket augmentation, etc); *(3)* keratinized mucosa width < 3 mm, measured from the center of the alveolar crest to the buccal/facial mucogingival junction; and *(4)* being medically compromised or taking medications known to interfere with the normal healing response process (eg, bisphosphonates, anticancer therapy, etc). The last day of periodontal treatment was considered to be the baseline.

Surgical Intervention

FOCIS was the surgical intervention tested in this study. It was developed to alleviate the anatomical limitations existing when performing GBR procedures in partially edentulous sites. All surgical procedures were performed by a single experienced surgeon (H.L.C.). Briefly, access to the alveolar bone was achieved using a single horizontal incision in the buccal keratinized mucosa at the line angles of the teeth bordering the edentulous side (approximately 1 to 2 mm facial to the center of the alveolar crest), connected to mesiodistal buccal and lingual/palatal intrasulcular incisions (Fig 2). A full-thickness mucoperiosteal flap was then reflected, and all granulation tissues were removed. Implant osteotomy was then prepared

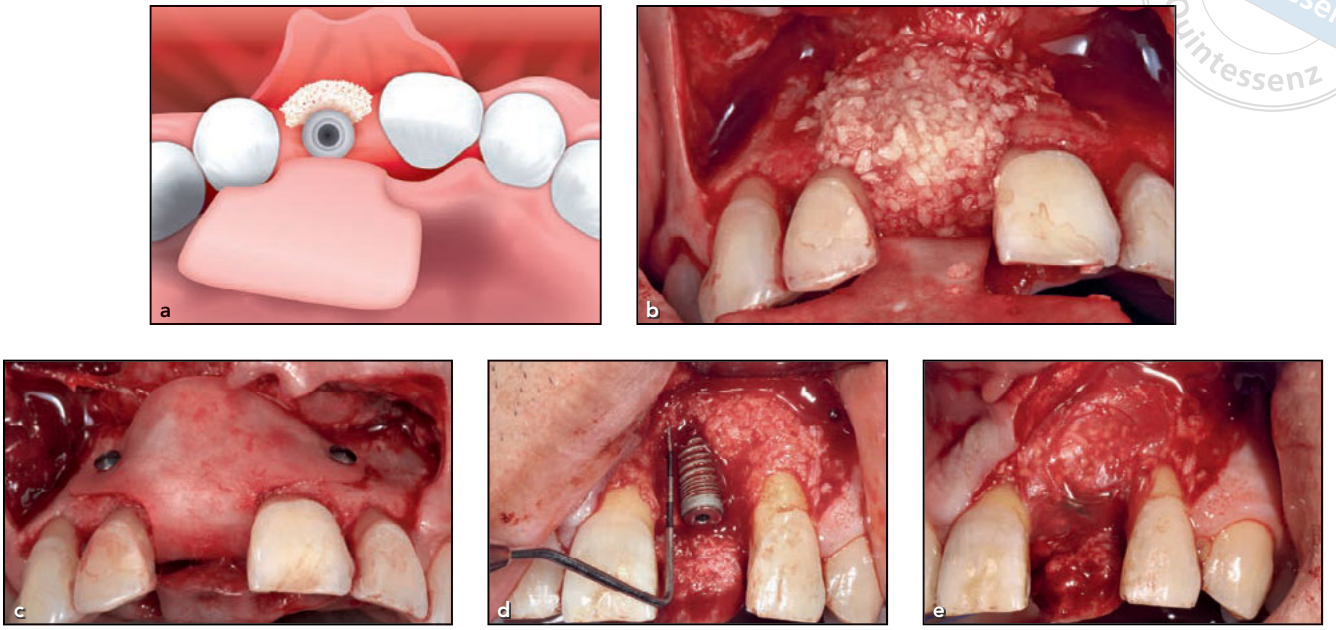


Fig 3 *Clinical sequence of implant placement and/or bone grafting procedure.* (a and b) *In clinical case 1, bone graft substitute was placed and* (c) *covered with a barrier collagen membrane that extended a minimum of 3 mm beyond the augmented area.* (d and e) *Clinical case 2 shows buccal dehiscence after implant placement and simultaneous GBR. For the bone graft substitute, Puros Mineralized Cortical Allograft (Zimmer Biomet) and Mineralized Cortical Allograft (Maxxeus) were used in Figs 3b and 3e, respectively. For the barrier collagen membrane, BioMend Extend (Zimmer Biomet) and BioXclude (Snoasis Medical) were used in Figs 3c and 3e, respectively.*

for cases of simultaneous GBR and implant placement. Bone graft substitute (Puros Mineralized Cortical Allograft, Zimmer Biomet; or Mineralized Cortical Allograft, Maxxeus) was placed and covered with a barrier collagen membrane (BioMend Extend, Zimmer Biomet; or BioXclude, Snoasis Medical) that extended 3 mm beyond the augmented area (Fig 3). Afterwards, the buccal flap was mobilized, including periosteal incisions or the pouch approach, if needed. A horizontal internal crossed mattress suture was then placed beneath the mucoperiosteal flaps, between the base of the palatal flap and the facial flap, combined with single interrupted sutures for flap approximation and closure (Fig 4). Figure 5 shows the final outcome of a staged GBR procedure prior to implant placement. The bone formation around the implant at the uncovering surgery of a clinical case is shown in Fig 6a, and the final outcome after implant restoration is shown in Fig 6b.

Outcome Measurements

The following information was obtained from all patients included in the study: *(1)* patient-related factors (age, gender, etc); *(2)* complete medical history, including the presence/absence of diabetes, smoking habits, medication intake, etc; *(3)* location of the treated area (mandible/maxilla and anterior/posterior site); *(4)* occurrence of postsurgical complications (flap dehiscence, membrane exposure, etc); *(5)* related clinical parameters, such as bone dehiscence height (DH) (Fig 7a), bone fenestration size (FS) (Fig 7b) for cases of GBR with simultaneous implant placement, flap dehiscence (when present), crestal buccal bone thickness (BBT) at uncovering surgery (Figs 7c and 7d), and bone width (BW) before and after surgery, in cases of staged GBR; *(6)* follow-up time; and *(7)* the type of surgical technique used (traditional/microsurgical). The clinical parameters DH, FS, and BBT were measured with a North Carolina probe (Hu-Friedy), rounded to the nearest millimeter. BW was measured via CBCT before and 5 to 6 months after the bone augmentation surgical procedure.

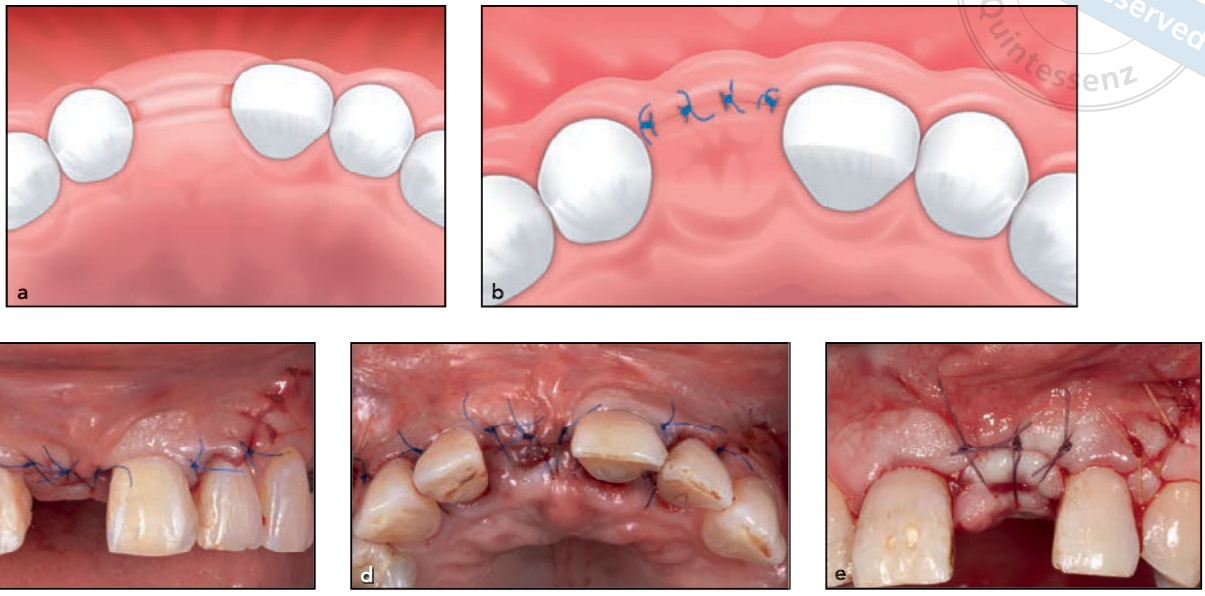


Fig 4 (a and b) *Schematic drawing of the facial flap mobilization and sutures for achieving primary closure. There is reduced tension of the facial flap in the line angle of adjacent teeth due to the facially oriented crestal incision.* (c) *Intraoral facial and* (d) *occlusal views of clinical case 1.* (e) *Sutures were used to achieve primary closure in clinical case 2.*

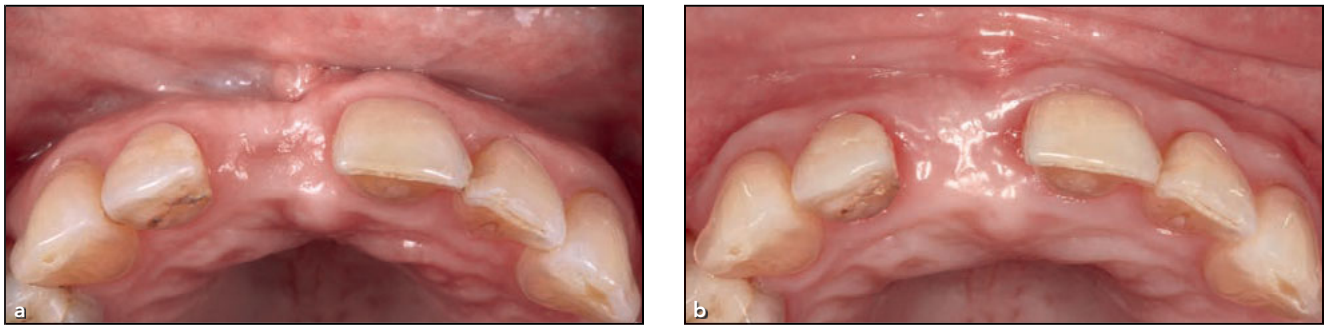
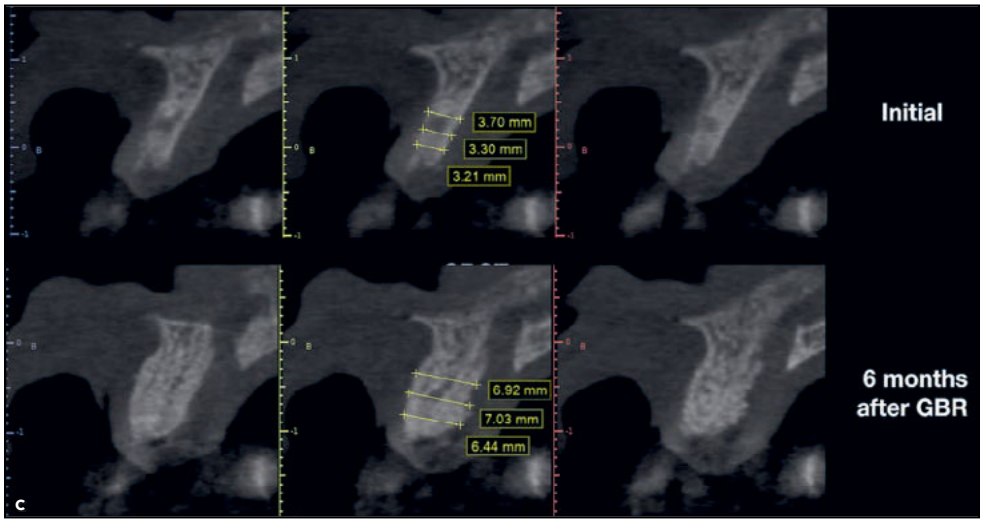


Fig 5 (a) *Occlusal view before and* (b) *6 months after GBR, prior to implant placement.* (c) *Cross-sectional CBCT scans, with measurements comparing baseline bone width (top) with final bone width after 6 months of GBR.*



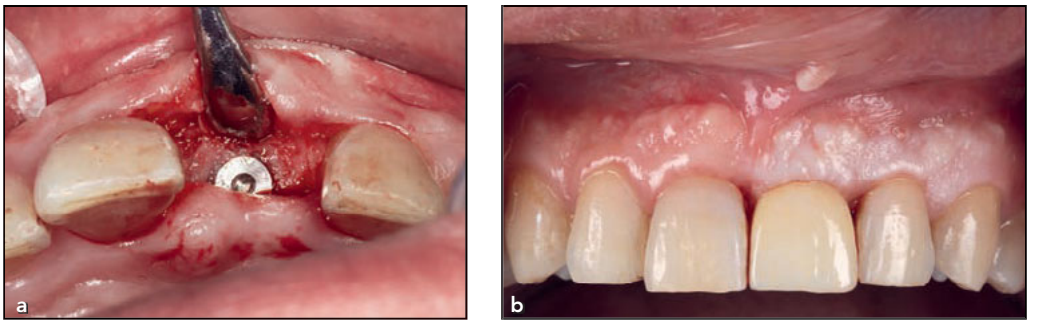


Fig 6 (a) *Bone formation around the implant at the uncovering surgery of clinical case 2.* (b) *Final outcome after implant restoration.*

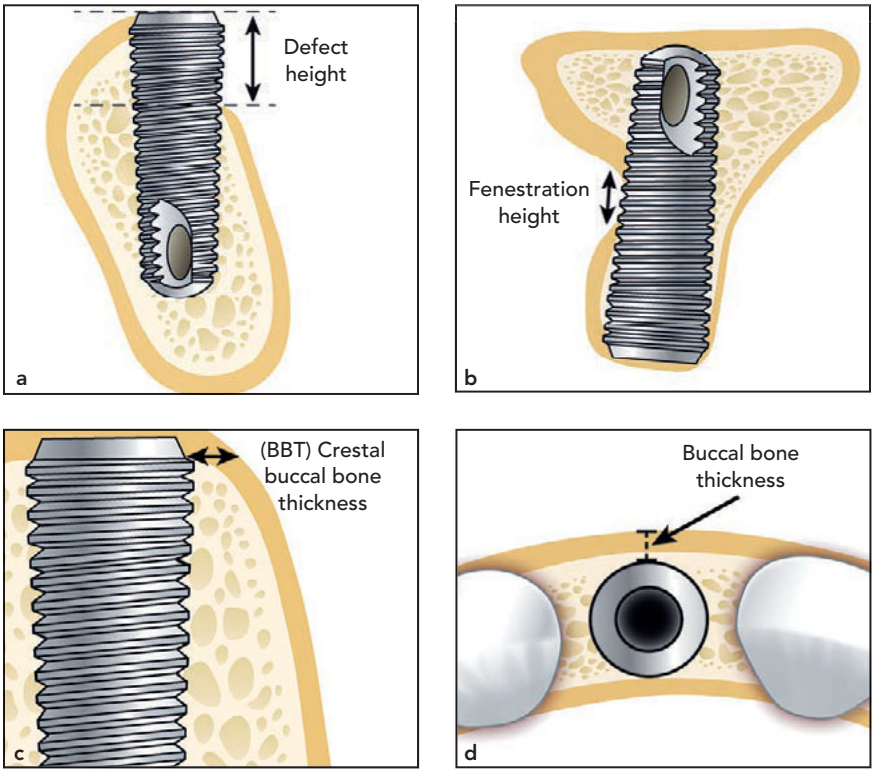


Fig 7 *Schematic drawings illustrating the assessment of* (a) *defect height,* (b) *fenestration, and* (c) *sagittal and* (d) *occlusal views of buccal bone thickness at the implant uncovering surgical procedure.*

Statistical Analyses

Descriptive analysis of demographic data, including patient age, gender, medical history, hard tissue characteristics at baseline, and surgical- and implant-related parameters (such as microsurgery or GBR approaches) were presented as counts (n) and frequency (%). Continuous variables were presented as mean ± standardized deviation. The primary outcome was the frequency (percentage) of wound closure, calculated as the number of cases with wound closure/the total number at the patient and implant levels. Secondary outcomes were the percentage of complete resolution and reduction of dehiscence and the final bone volume increase (BW and BBT). A binominal logistic regression analysis was conducted to evaluate the potential influence of explanatory variables on the frequency of wound closure at the implant level. A hierarchical multiple regression was performed to asses all relevant predicting variables for bone volume increase and dehiscence reduction. Only statistically significant predictors were included in the final regression model, and the significance level was set at $P < .05$. All statistical analyses were performed using SPSS software (version 25.0 for Mac, IBM).

Results

A cohort of 41 patients (19 women, 22 men) was treated with FOCIS GBR from August 2018 through January 2020. The mean patient age was 57.7 ± 12.4 years. Most surgeries were performed in the maxilla (n = 30; 73.2%), with 17 in anterior sites and 13 in posterior sites. In the mandible, 2 surgeries were

performed in anterior sites and 9 in posterior sites. A total of 53 implants were placed with a simultaneous (n = 37; 69.8%) or staged (n = 16; 30.2%) approach. Microscopic magnification was used in 34% of surgical procedures. The 53 implants were evenly distributed in anterior (50.9%) and posterior (49.1%) regions. Of the implants placed, 31 (58.5%) were narrow (between 3 and 3.74 mm), and 22 (41.5%) were standard width (3.75 to 5 mm), according to the classification proposed by Al-Johany et al.[22] Baseline patient and implant characteristics are presented in Appendix Table 1 (available in the online version of this article at quintpub.com/journals). In the simultaneous GBR cases, there were 4 cases of FS (mean size: 4 mm), 4 implants presented a BBT < 0.5 mm but no dehiscence, and 29 implants in 25 patients presented a mean baseline DH of 3.35 ± 2.65 mm. The mean initial BW for staged cases (8 patients) was 3.25 ± 1.51 mm.

The primary outcome (initial wound closure rate; Appendix Table 2) was 92.7% (38/41) and 94.3% (50/53) at the patient and implant levels, respectively. In other words, frequency of flap dehiscence was 7.3% (3/41) at the patient level and 5.7% (3/53) at the implant level. For the secondary outcomes (Appendix Table 3), the dehiscence resolution rate, mean dehiscence reduction, final BBT, and fenestration resolution were determined in the second stage surgery, after implant placement with a simultaneous GBR procedure. The BW increase was measured after a staged approach. Complete dehiscence resolution was achieved in 23 out of 29 implants (79.31%), and the mean dehiscence reduction was 3.12 ± 2.46 mm (95% CI: 2.19 to 4.06 mm). BBT had a mean increase of 1.22 ± 1.07 mm (95% CI: 0.86 to 1.59 mm), and the final BBT was 1.56 ± 0.79 mm (95% CI: 1.32 to 1.80 mm). Data on fenestration resolution were only available in 4 implants, with a mean improvement of 4 mm. Lastly, BW increase was 3.38 ± 1.49 mm (95% CI: 2.58 to 4.17 mm) for the staged cases.

The result of the binominal logistic regression testing the effects of clinically relevant covariates—including diabetes, age, gender, surgical region (anterior/posterior), arch position, surgical approach (staged/simultaneous), and implant-related parameters (diameter/length)—on the frequency likelihood of flap dehiscence (primary outcome) was not statistically significant. Sequential multiple regression was conducted to examine the effect of potential explanatory variables on the BW increase. Statistically significant predictors that were used to predict the BW increase, including the surgical region, were included in the hierarchical model. The final model was statistically significant: $R^2 = 0.45$; $F(2,13) = 5.24$; $P = .02$; adjusted $R^2 = 0.36$ (Appendix Table 4). Similarly, sequential multiple regression was used to determine the potential variables to predict dehiscence reduction. The final model with significant predictors (implant diameter and region) was statistically significant: $R^2 = 0.21$; $F(2,26) = 3.53$; $P = .04$; adjusted $R^2 = 0.15$ (Appendix Table 5). There were no significant predictors for BBT increase. Finally, it was not possible to perform regression analysis for the fenestration resolution due to the limited sample size.

Discussion

Soft tissue complications following GBR procedures are frequent.[5] Wound healing associated with tissue contraction and muscle pull can result in flap dehiscence during the postoperative period. This might be due to the tension created at the tooth line angles when placing a midcrestal incision during traditional GBR techniques. Therefore, appropriate flap design and delicate atraumatic management of soft tissues are major requirements for improved regenerative outcomes. Based on these observations, the FOCIS technique was developed to achieve and, perhaps more importantly, maintain primary closure of the flap over the membrane used in GBR procedures.

This retrospective study indicates that FOCIS can be utilized safely and effectively with GBR to reconstruct horizontal bone defects. A low incidence of wound dehiscence (5.7% and 7.3% at the implant and patient levels, respectively) was encountered when utilizing FOCIS. Previous randomized clinical trials have reported soft tissue complication rates ranging from 21.7%[23] to 34.5%.[24] Primary wound closure is essential for adequate bone regeneration.[25] In the present study, wound dehiscence occurred in three patients (all were simultaneous GBR cases) and were considered to

be minor biologic complications, as the sites showed gradual second-intention healing without creating infection or jeopardizing implant survival. None of the cases presented with exposure > 3 mm and purulent exudate. This may be due to the fact that resorbable membranes undergo fast enzymatic resorption when exposed to the oral cavity and therefore present a lower chance of being colonized by bacteria, leading to a process of infection.

A recent systematic review evaluated the efficacy of GBR in terms of defect resolution when performed simultaneously to implant placement in cases of horizontal ridge deficiency.[4] A mean defect resolution of 81.3% (range: 56.4% to 97.1%) was reported, which is similar to the rate found in the present study (79.31%). Differently from the present study, which used a combination of particulate allograft and collagen membrane, the type of intervention most often observed in the systematic review[4] utilized xenogeneic particulate grafting material and a resorbable collagen membrane. Two previous randomized controlled trials[8,9] evaluated defect height changes in cases of bone augmentation with simultaneous implant placement utilizing a treatment protocol for the test groups (allograft + collagen membrane) that is similar to the present protocol. Mean changes in defect height for their test groups (allograft + collagen membrane) were 4.81 ± 2.4 mm[8] and 6.01 ± 1.07 mm,[9] which were greater than the change encountered in the present study (3.12 ± 2.46 mm). However, if the baseline dehiscence height is taken into account (6.23 ± 3.51 mm for Park et al,[9] 7.62 ± 1.2 mm for Fu et al,[8] and 3.35 ± 2.65 mm in the present study), the percentage of dehiscence reduction was slightly higher for the FOCIS cases than the previous randomized controlled trials.

The mean BBT increase in simultaneous GBR cases (1.22 ± 1.07 mm) was verified at second-stage surgery when the implants were uncovered, revealing a final average BBT of 1.56 ± 0.79 mm. Adequate peri-implant BBT has been shown to be essential for peri-implant health.[26,27] In a retrospective study of 3,061 implants, Spray et al observed that a facial bone thickness of 1.8 to 2 mm during implant placement showed minimal bone loss at the second-stage surgery.[26] In an animal study, Monje et al reported that a thicker peri-implant buccal bone wall (≥ 1.5 mm) was exposed to significantly less physiologic and pathologic bone loss compared to a thinner buccal bone wall (< 1.5 mm).[27] In both studies,[26,27] BBT was evaluated at implant placement to account for the remodeling that happens after surgical trauma. Although the final BBT observed in the present study (1.56 ± 0.79 mm) was considered favorable compared with the previous literature, the present authors are unaware of any literature supporting a specific threshold of buccal thickness at the second-stage surgery that can predict long-term bone remodeling at the buccal site.

In the staged GBR cases, a mean BW increase of 3.38 ± 1.49 mm was achieved, which is in line with outcomes reported in a recent systematic review.[3] Overall BW gains measured clinically and radiographically were 3.45 ± 1.18 mm and 2.90 ± 0.83 mm, respectively. The authors also reported that sites augmented with xenogeneic graft materials revealed significantly less resorption compared to sites augmented with autologous grafts alone.[3] The likely explanation for this finding might be the slow resorption rate and thus long standing time of the xenogeneic graft material.[28,29] FOCIS helped achieve outcomes that were comparable with the previously mentioned results[3] but had the advantage of using an allograft bone substitute, which has a faster resorption rate and yields higher bone vitality and fewer residual particles compared to xenograft materials.[30] These factors, though not fully scientifically investigated, are believed to contribute to optimized osseointegration. No wound dehiscence occurred in the staged-approach cases, and this likely explains the successful outcomes. Moreover, implants could be placed in the grafted areas without needing further bone augmentation. It is worth mentioning that 60.4% of the implants in the present study were classified as narrow,[22] but only five implants actually had a diameter < 3.7 mm. One must bear in mind that the definition of a narrow implant is inconclusive in published studies, and many times a narrow implant is reported when having a diameter ≤ 3.5 mm.[31] The feasibility of implant placement is the most important and clinically relevant parameter in weighing the success of primary bone augmentation.[3]

Additional bone augmentation at the time of implant placement is often necessary.[32,33]

Despite the successful outcomes achieved using FOCIS for horizontal bone augmentation, the present study has some limitations. Due to the retrospective design, it was not possible to address other clinical parameters that are important for wound opening, including vestibulum depth and flap stiffness, quality, and thickness, etc. Furthermore, FOCIS cannot be applied in areas with a narrow band of keratinized tissue and when vertical bone augmentation or lingual/palatal bone augmentation is required in more advanced cases, as these augmentation situations displace the palatal/lingual flap and contradict the rationale of FOCIS, which is centered on reducing the flap stress at the facial line angle of adjacent teeth. Lastly, survival of the "longer" palatal/lingual flap, especially the zone beyond the midcrestal region, is compromised because the major blood supply stops at the midcrestal line. The survival of the flap relies heavily on microcirculation and perfusion from the underlying bone. Moreover, the positive results of FOCIS might be partially explained by the clinical expertise of the operator, and the technique must be further tested in controlled clinical trials.

Conclusions

This retrospective study utilized a FOCIS design at partially edentulous sites, contributing to satisfactory wound closure and horizontal bone augmentation in staged or simultaneous GBR procedures.

Acknowledgments

The authors declare no conflicts of interest.

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Appendices

Appendix Table 1 Patient- and Implant-Related Characteristics at Baseline	
Patient characteristics	n/total (%)
Gender	
Female	19/41 (46.3%)
Male	22/41 (53.7%)
Age, y	
Mean	57.7
SD	12.4
Range	21–85
95% CI	53.8, 61.6
Diabetes mellitus	3/41 (7.3%)
Controlled hypertension	4/41 (9.8%)
Implant Characteristics	
Implant diameter	
Narrow (> 3 mm, < 3.75 mm)	31/53 (58.5%)
Standard (≥ 3.75 mm, < 5 mm)	22/53 (41.5%)
Wide (≥ 5 mm)	0/53 (0%)
Implant length	
10 mm	22/53 (41.5%)
11.5 mm	31/53 (58.5%)
GBR location	
Anterior maxilla	17/41 (41.5%)
Posterior maxilla	13/41 (31.7%)
Anterior mandible	2/41 (4.9%)
Posterior mandible	9/41 (21.9%)
GBR approach	
Simultaneous	33/41 (80.5%)
Staged	8/41 (19.5%)
Implant location	
Anterior	27/53 (50.9%)
Posterior	26/53 (49.1%)

GBR = guided bone regeneration.
Baseline is the last day of periodontal treatment.

Appendix Table 2 Primary Outcome for FOCIS GBR

Initial wound closure	Success	Failure
Implant level	50 (94.3%)	3 (5.7%)
Patient level	38 (92.7%)	3 (7.3%)

FOCIS = facially oriented crestal incision; GBR = guided bone regeneration.
Values are presented as n (%).

Appendix Table 3 Secondary Outcomes for FOCIS GBR

	Mean	SD	Range	95% CI
Simultaneous GBR cases				
Dehiscence reduction, mm	3.12	2.46	–0.5 to 10 (10.5)	2.19, 4.06
Buccal bone thickness increase, mm	1.22	1.07	–2 to 3 (5)	0.86, 1.59
Final buccal bone thickness, mm	1.56	0.79	0 to 3 (3)	1.32, 1.80
Fenestration resolution, mm	4	0	4 to 4 (0)	4, 4
Staged GBR cases				
Bone width increase, mm	3.38	1.49	2 to 6.5 (4.5)	2.58, 4.17

FOCIS = facially oriented crestal incision; GBR = guided bone regeneration.
Complete dehiscence resolution was achieved in 23 of 29 implants (79.31%).

Appendix Table 4 Multiple Regression Results for Bone Width Increase

	Model 1		Model 2	
Variable	B	β	B	β
Constant	4.31*		4.94*	
Region			–0.63	–0.19
R^2	0.42		0.45	
F	10.26*		5.24*	
ΔR^2	0.38		0.36	

B = unstandardized regression coefficient; β = standardized coefficient; R^2 = coefficient of determination; ΔR^2 = adjusted R^2;
F value = the overall significant of linear regression model.
*$P < .05$.

Appendix Table 5 Multiple Regression Results for Dehiscence Reduction

	Model 1		Model 2	
Variable	B	β	B	β
Constant	6.72*		7.54*	
Implant diameter	–1.71*	–0.39	–0.99	–0.23
Region			–1.47	–0.30
R^2	0.15		0.21	
F	4.77*		3.53*	
ΔR^2	0.12*		0.15	

B = unstandardized regression coefficient; β = standardized coefficient; R^2 = coefficient of determination; ΔR^2 = adjusted R^2;
F value = the overall significant of linear regression model.
*$P < .05$.