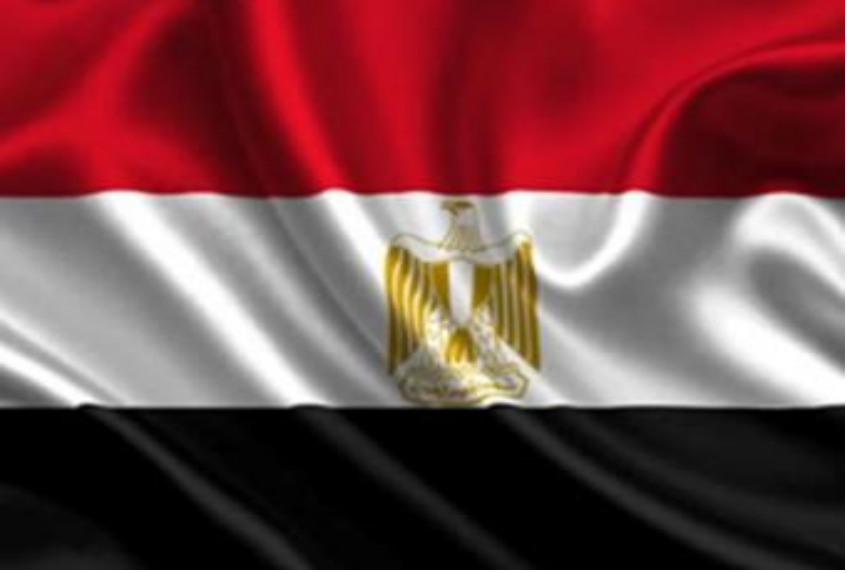
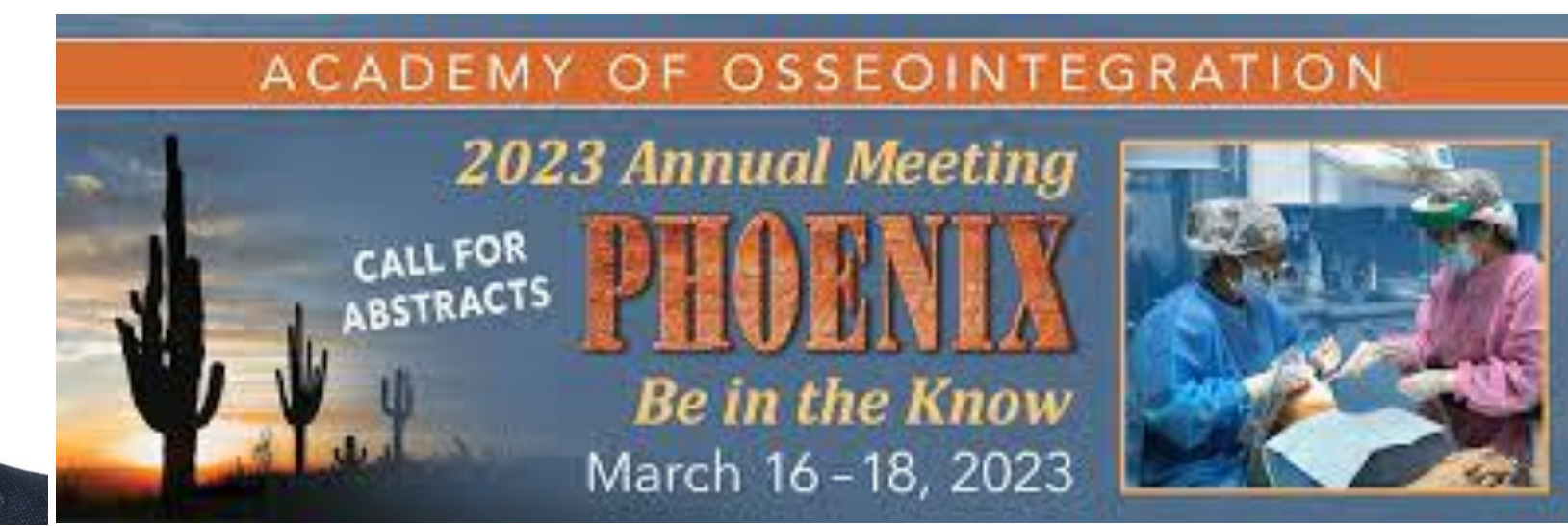




Maxillary Vertical Alveolar Ridge Augmentation Using Sandwich Osteotomy Technique With Simultaneous Versus Delayed Implant Placement

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BACKGROUND

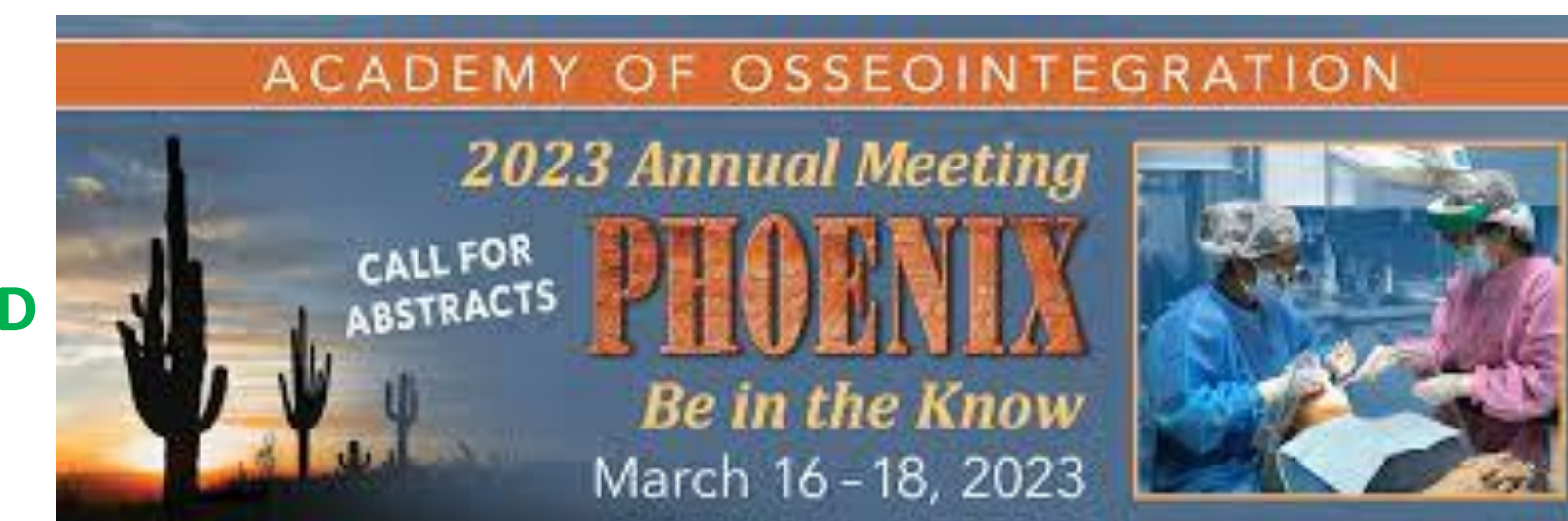
- Sandwich osteotomy technique usually requires high surgical skills, prolonged intraoperative time and had some technical drawbacks with subsequent deficient amount of vertical bone gain.
- The aim of this study was to evaluate the final vertical bone gain using sandwich osteotomy with simultaneous versus delayed implant placement in the anterior maxilla.



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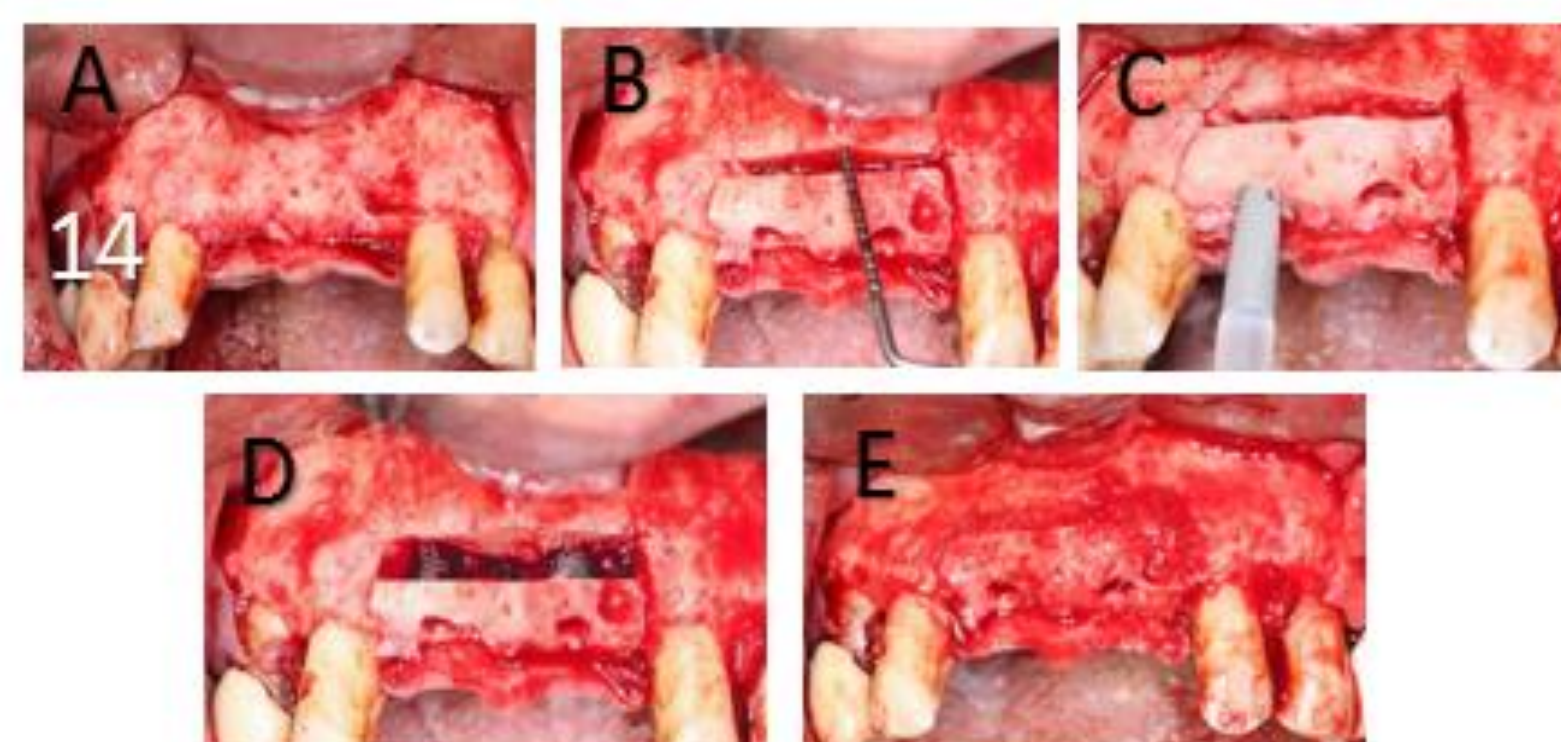
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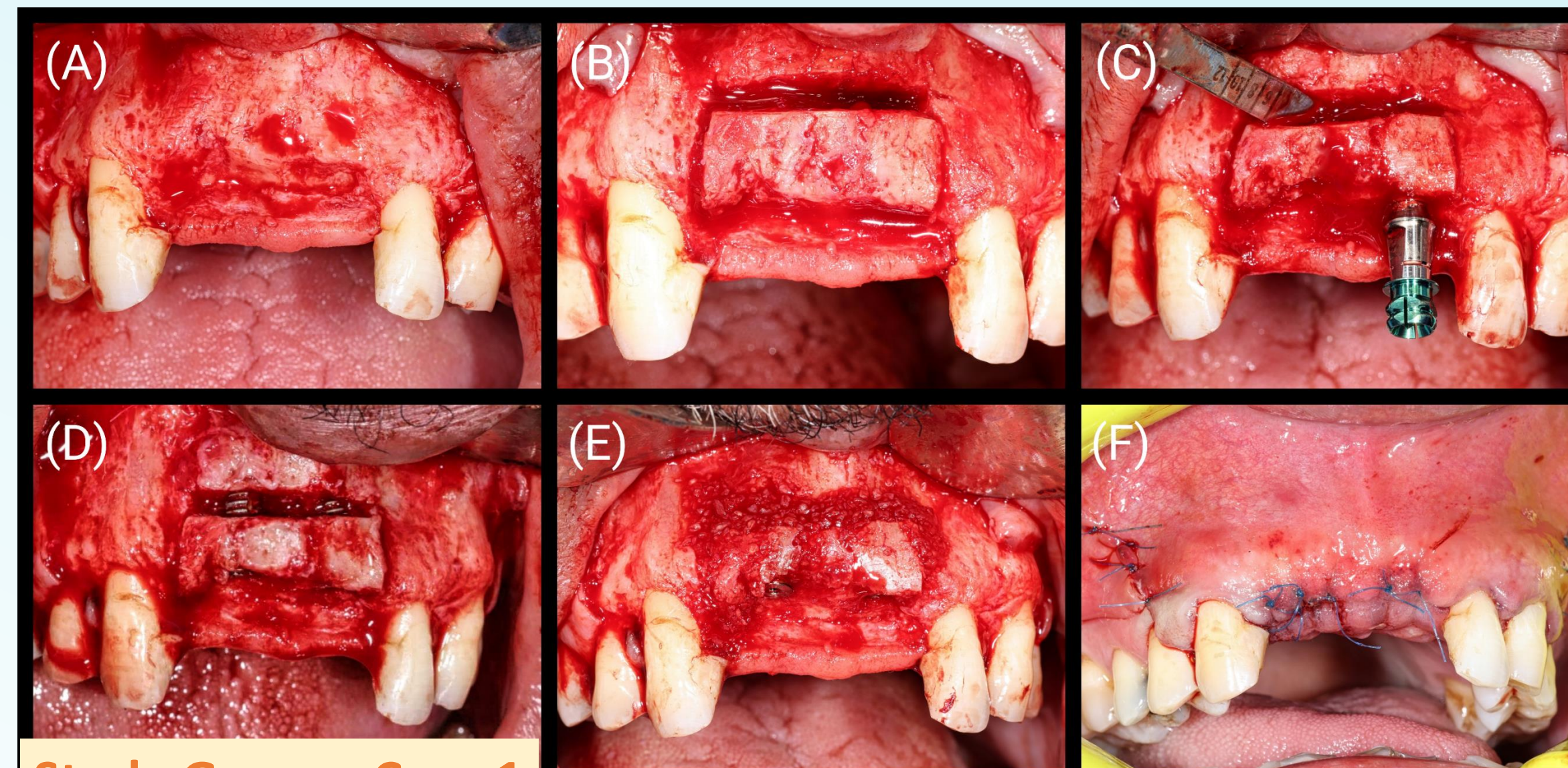


MATERIAL & METHODS

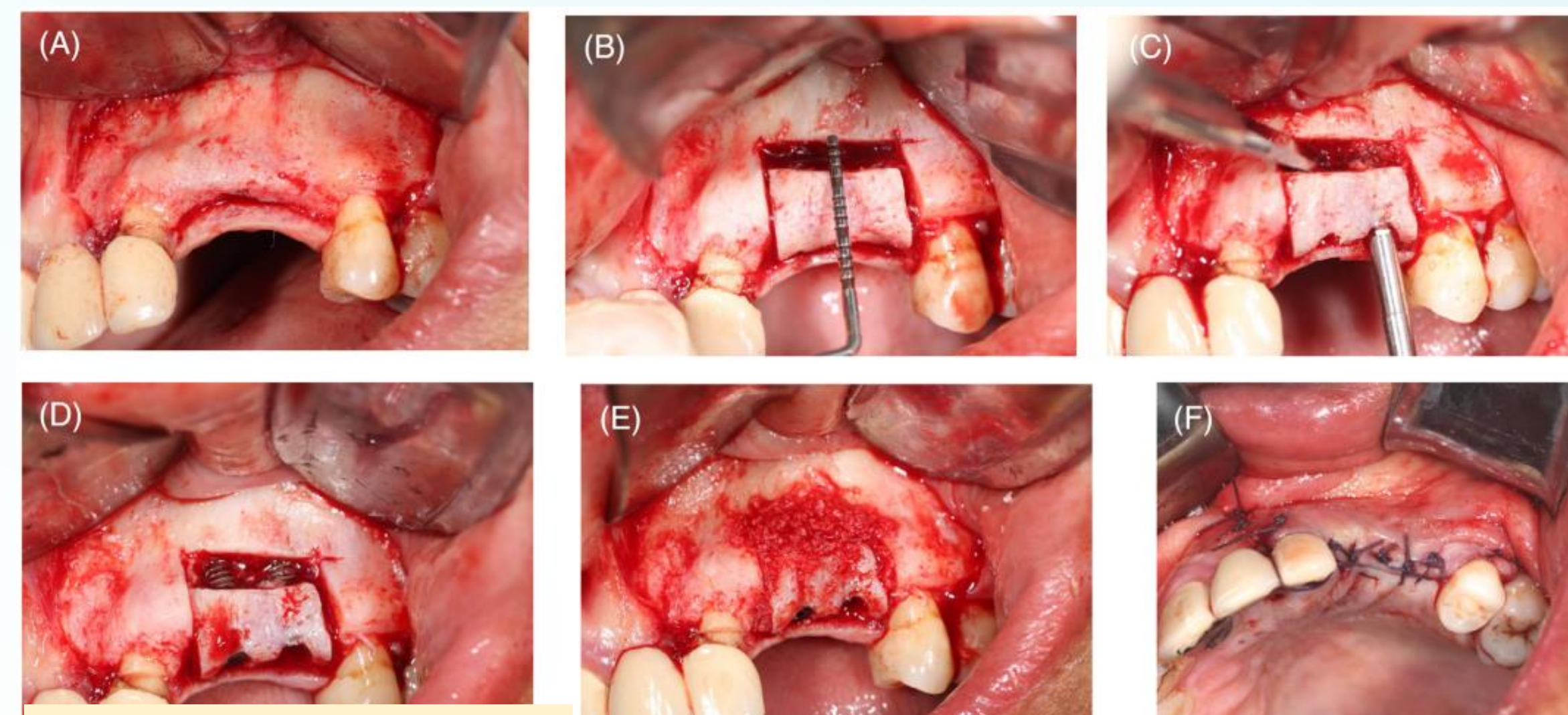
- This study included 16 patients having multiple missing maxillary anterior teeth with vertically deficient alveolar ridge.
- Patients were randomly assigned into two equal groups. Both groups were treated using sandwich osteotomy with intrapositional particulate bovine bone graft.
- In the study group (8 patients, 17 implants), the transport mobilized bone segment was fixed in position using simultaneous implant placement.



Study Group - Case 3



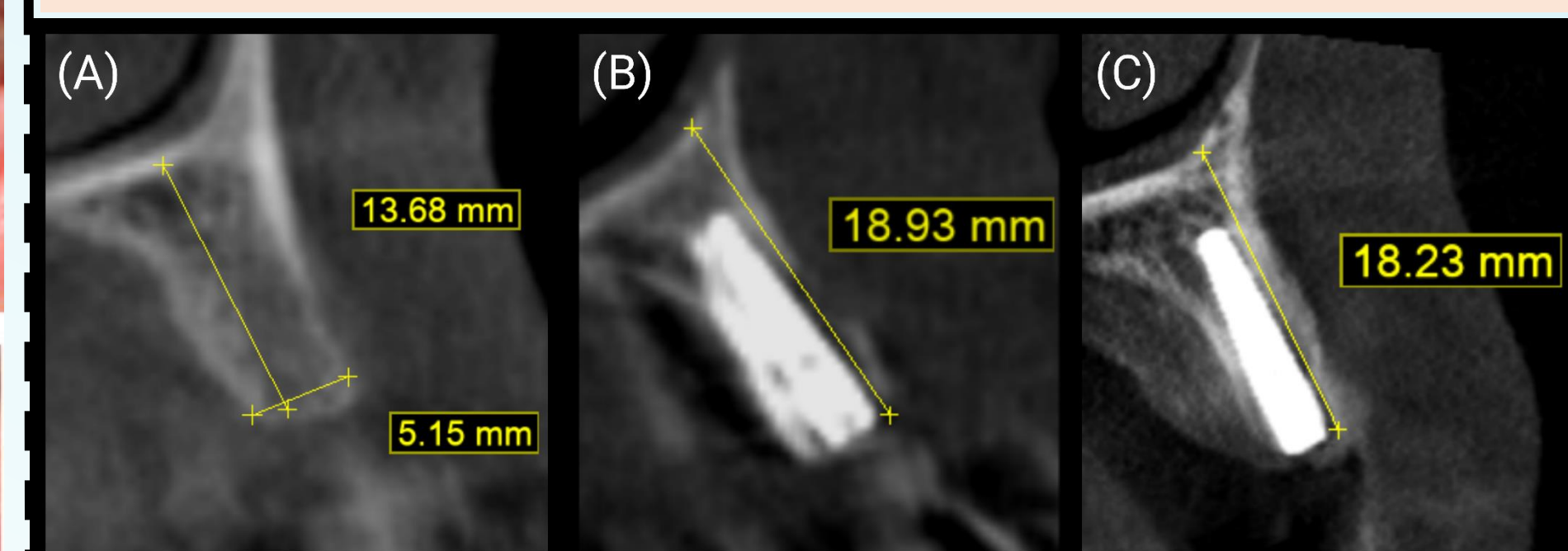
Study Group - Case 1



Study Group - Case 2

Steps for surgical procedures in Study Group.

- Full thickness flap reflection without palatal tissue and exposing facial cortical bone,
- Bone segment mobilised crestally while pedicled on the attached palatal tissues,
- A chisel is placed during drilling and implant insertion to stabilize the mobilized bone segment,
- Implant threads clearly visible through the gap,
- Particulate bone xenograft filling the interpositional gap between mobilised segment and basal alveolar bone,
- Suturing of the flap using absorbable Polyglycolic Acid interrupted sutures.



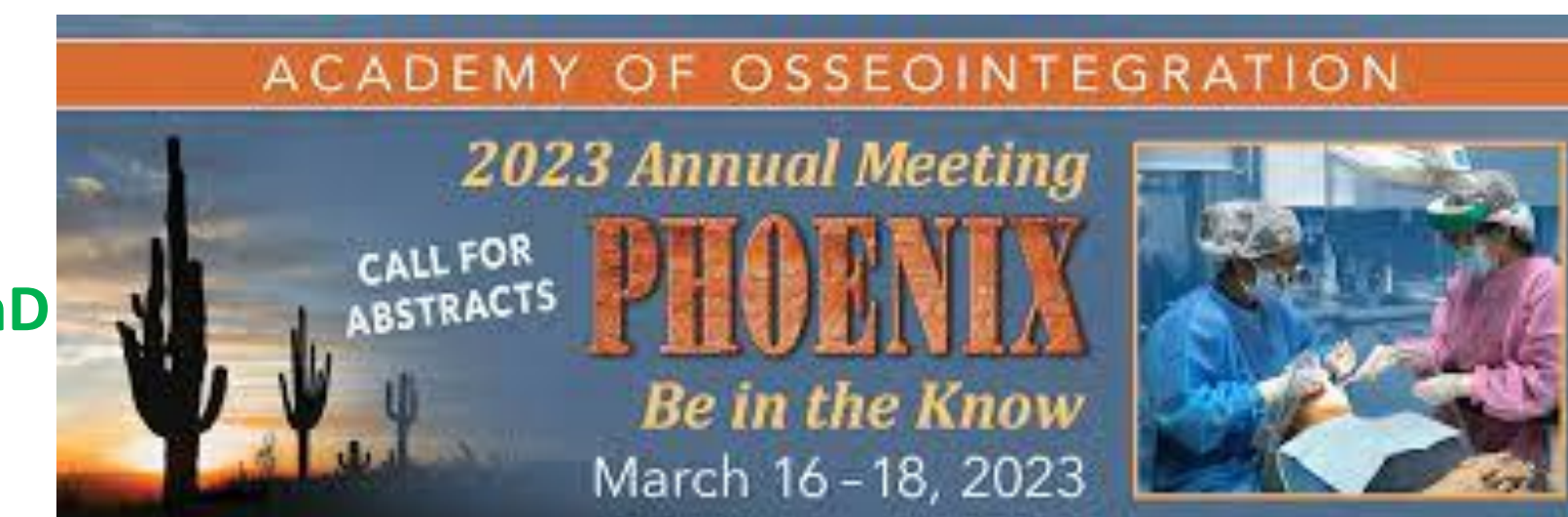
Alveolar Bone Height Measurement of Study Group.

- Preoperative height, B) Immediate post-operative,
- 4-Months post-Operative.



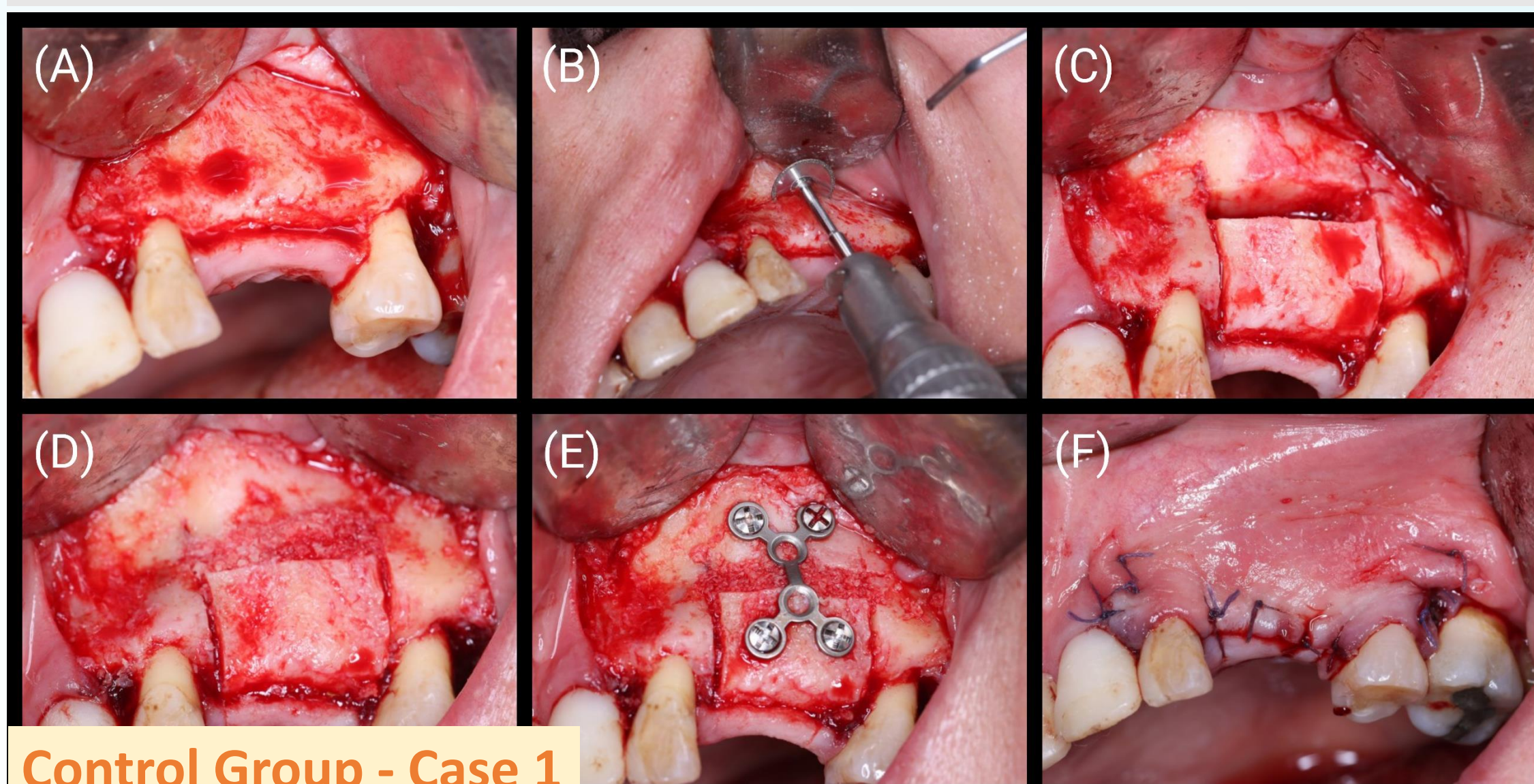
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MATERIAL & METHODS

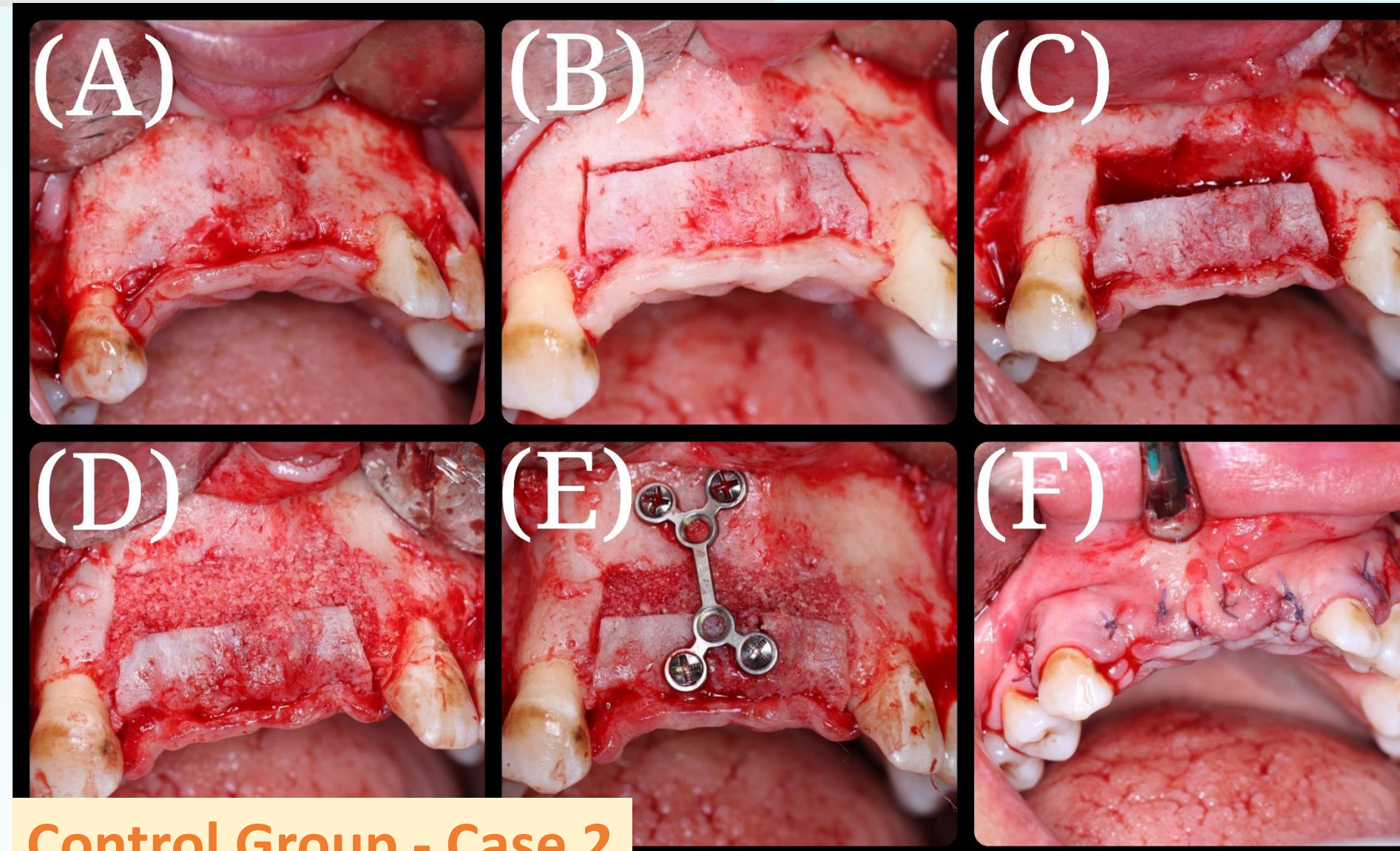
- In the control group (8 patients, 18 implants), micro-plates and screws were used, followed by a second-stage surgery for plates removal and delayed implant placement.
- Radiographic assessment included 4 months postoperative mean of vertical gain in alveolar ridge height, taken from cross-sectional cuts of cone beam CT.



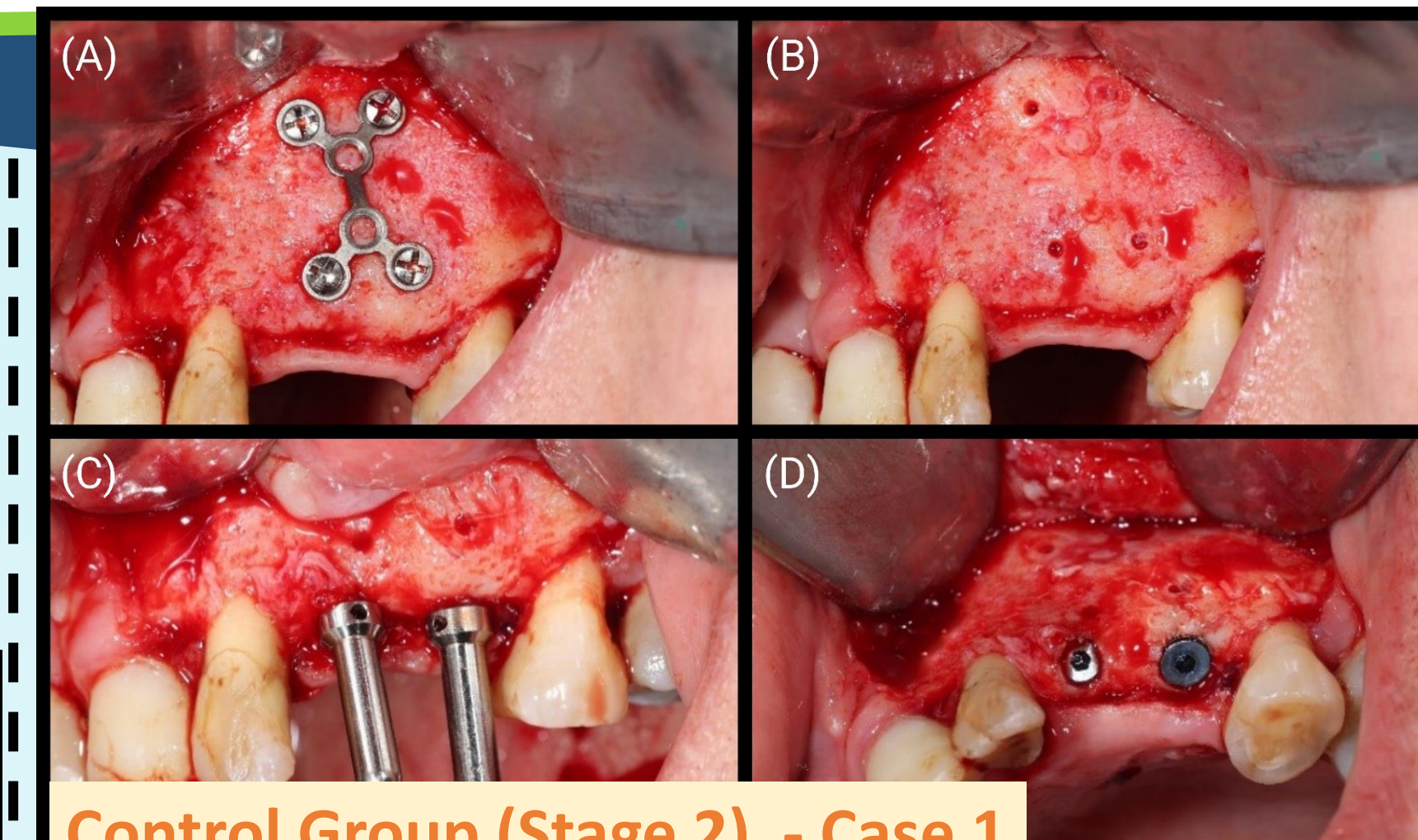
Control Group - Case 1

Steps for surgical procedures in Control Group.

- Reflection of a full thickness mucoperiosteal flap without palatal tissue reflection and exposing facial cortical bone,
- Initial segmentation of alveolar bone using a diamond disc
- Bone segment mobilised crestally while pedicled on the attached palatal tissues,
- Particulate bone xenograft filling the interpositional gap between mobilised segment and basal alveolar bone,
- mobilised segment fixed to basal bone with microplate and micro screws,
- Suturing of the flap using absorbable sutures.



Control Group - Case 2



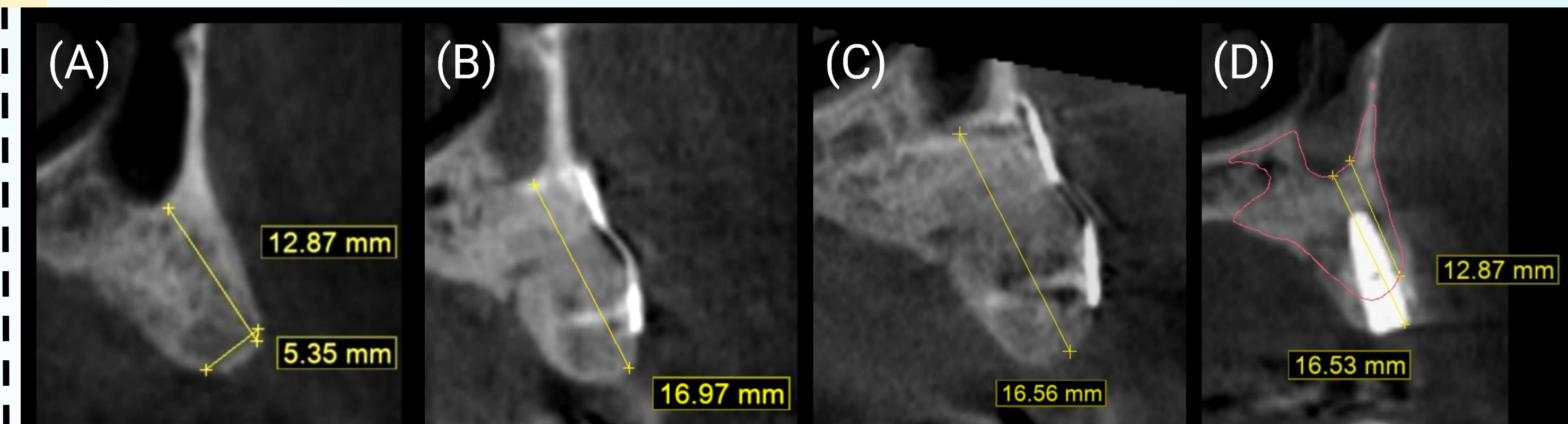
Control Group (Stage 2) - Case 1

second-stage surgical procedures in Control Group

- Flap Reflection & plate exposure, B) Removal of microplates and micro screws, C) Drilling of implant osteotomies and placement of paralleling pins to show final position of implants, D) implants after insertion.

Alveolar Bone Height Measurement of Study Group.

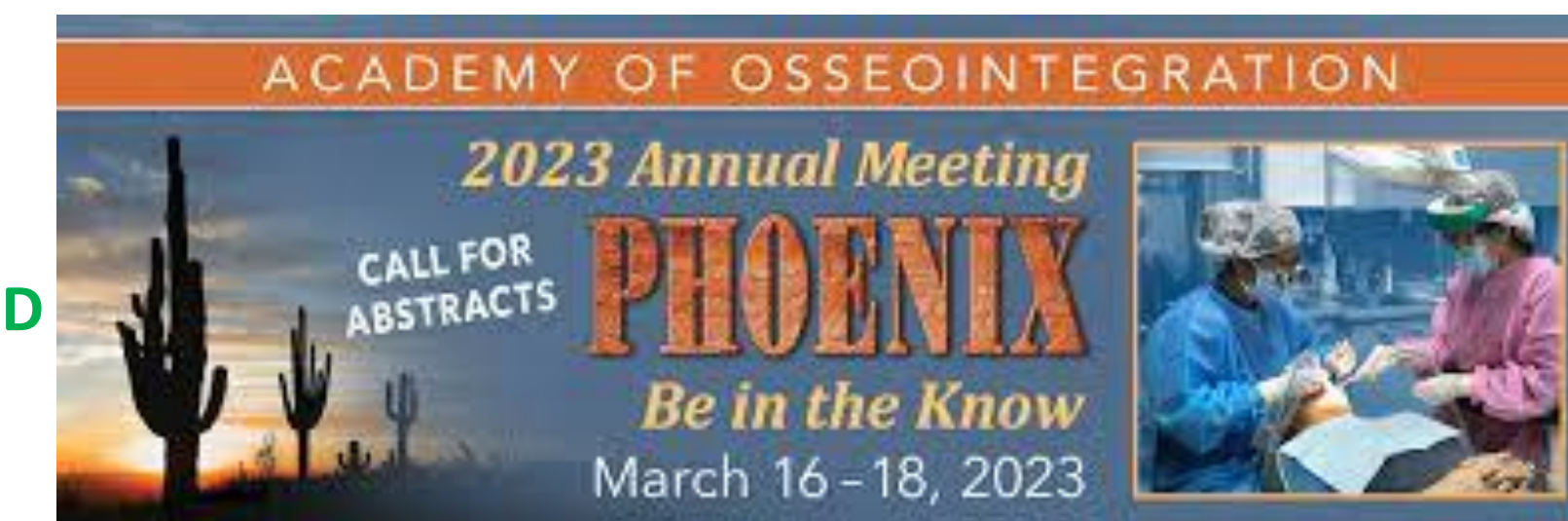
- Preoperative height, B) Immediate post-operative, C) 4-Months post-Operative, Preoperative dataset outlined in Magenta color superimposed over postoperative CBCT of Control Group immediately after implant insertion.





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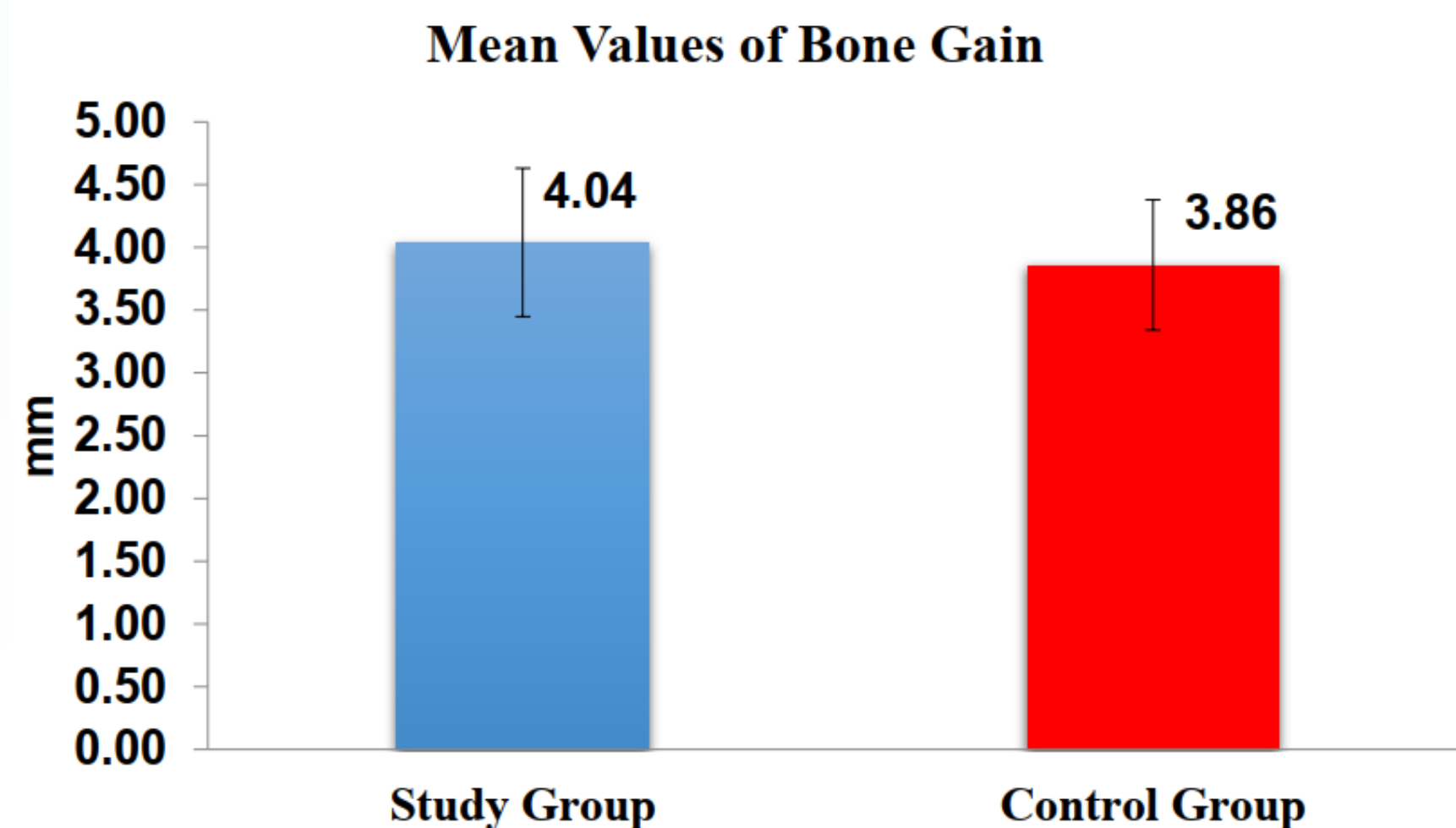
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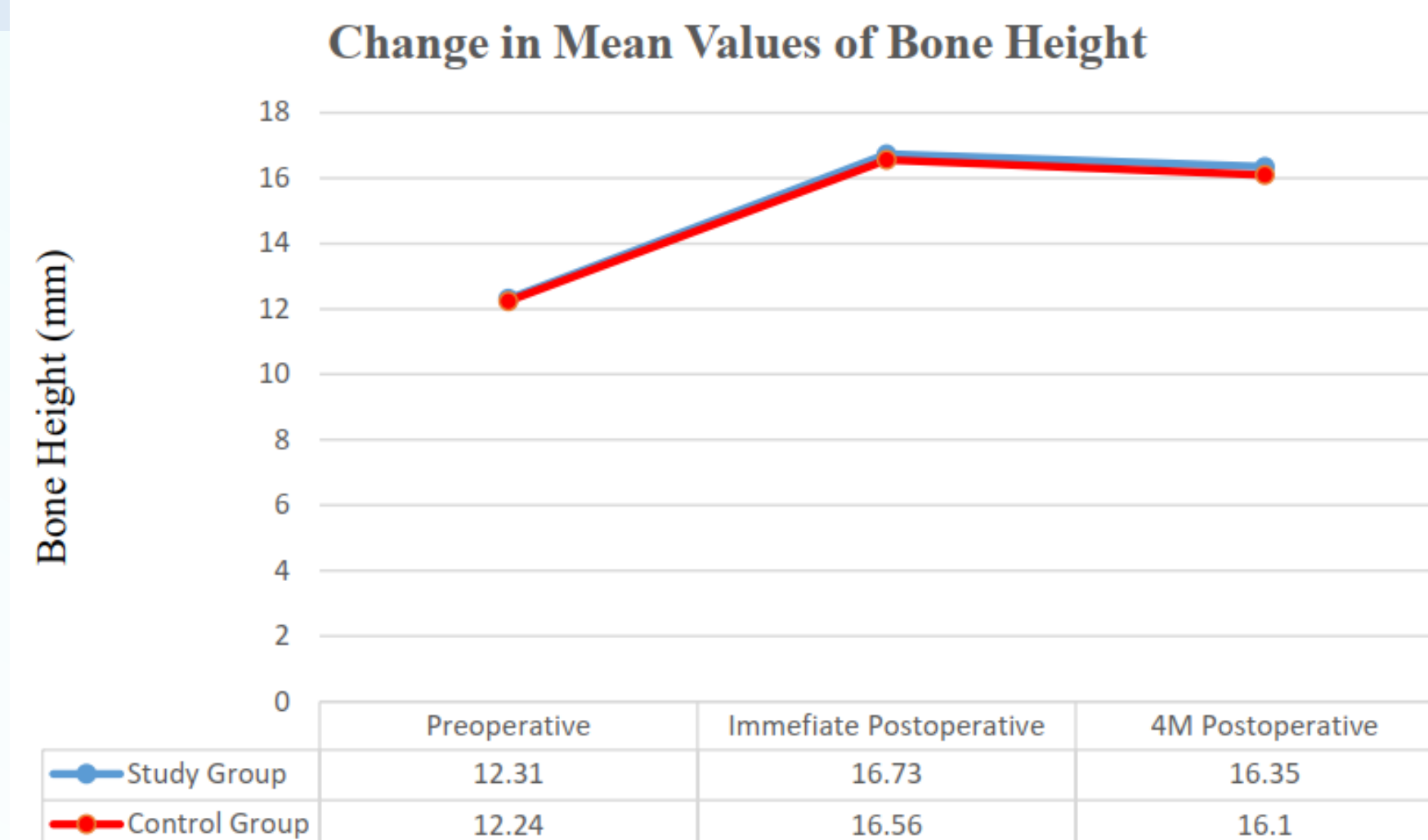
RESULTS

- The mean vertical bone gain in the study group was 4.04 ± 0.59 mm compared to 3.86 ± 0.52 mm in the control group with no statistically significant difference ($p=0.518$).
- The mean value of bone gain percentage in the study group was 33.02% compared to 31.75% in the control group with no statistically significant difference ($p=0.656$).

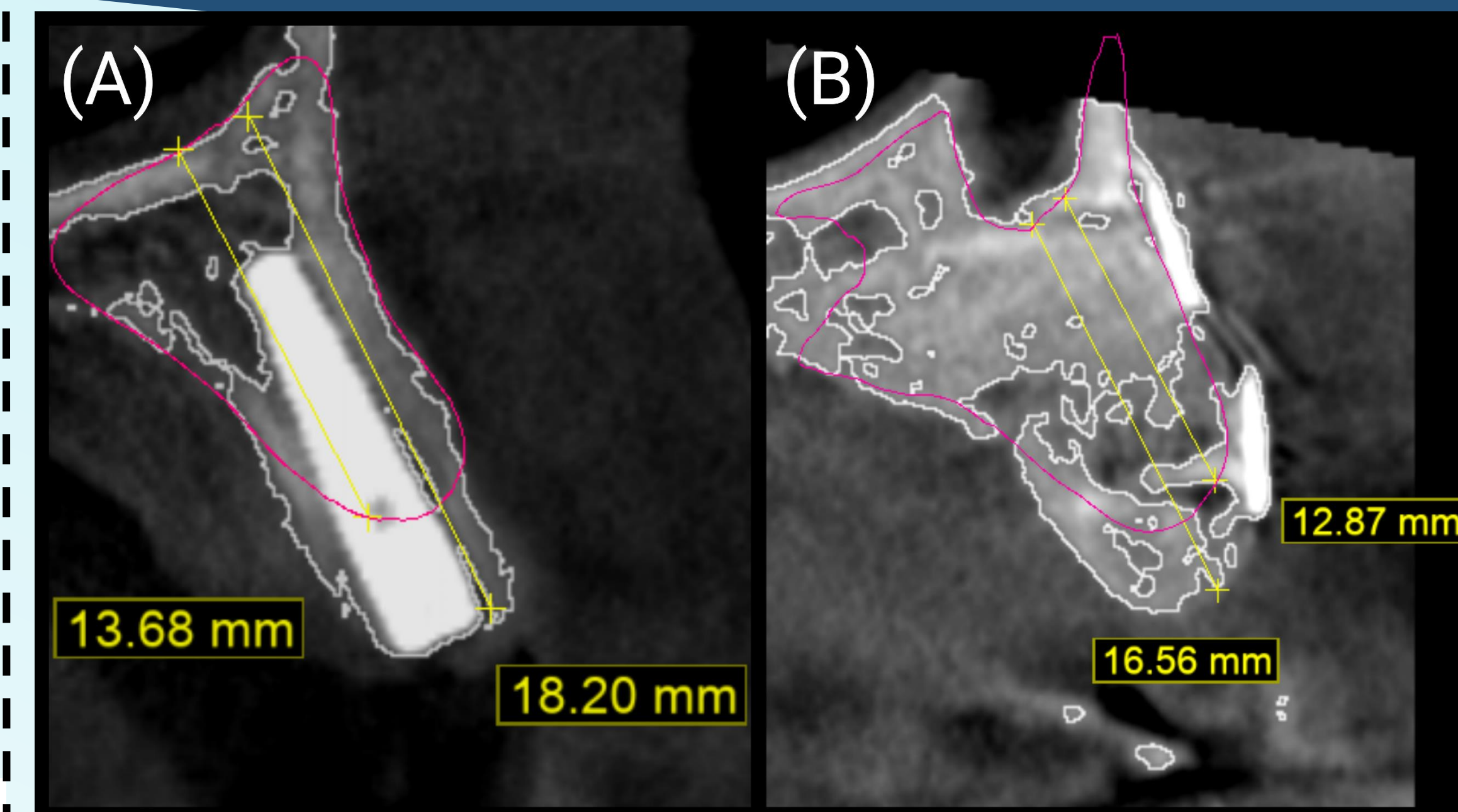
Group	Minimum	Maximum	Mean	SD	95% CI for Mean	Mean difference	p-value
Study	3.17	4.87	4.04	0.59	(3.55, 4.53)	0.18	0.518
Control	2.61	4.51	3.86	0.52	(3.42, 4.29)		



Mean and standard deviation (SD) values for final vertical bone gain measured radiographically in mm in both groups



Line chart showing mean values of preoperative, immediate postoperative and 4 months postoperative of bone height at all intervals of the study in both groups.



Standardization method of calculation of alveolar bone height by superimposition of preoperative and 4-months post-operative CBCT and calculation of the measurements from the nasal or maxillary sinus floor to the alveolar crest.

A) Preoperative dataset of Study Group outlined in *Magenta* color superimposed over postoperative CBCT outlined in *White* color.

B) B) Preoperative dataset of Control Group outlined in *Magenta* color superimposed over postoperative CBCT outlined in *White* color.

CONCLUSION

Sandwich osteotomy technique with simultaneous implant placement is a reliable method for vertical ridge augmentation that eliminate the need for a secondary surgery.