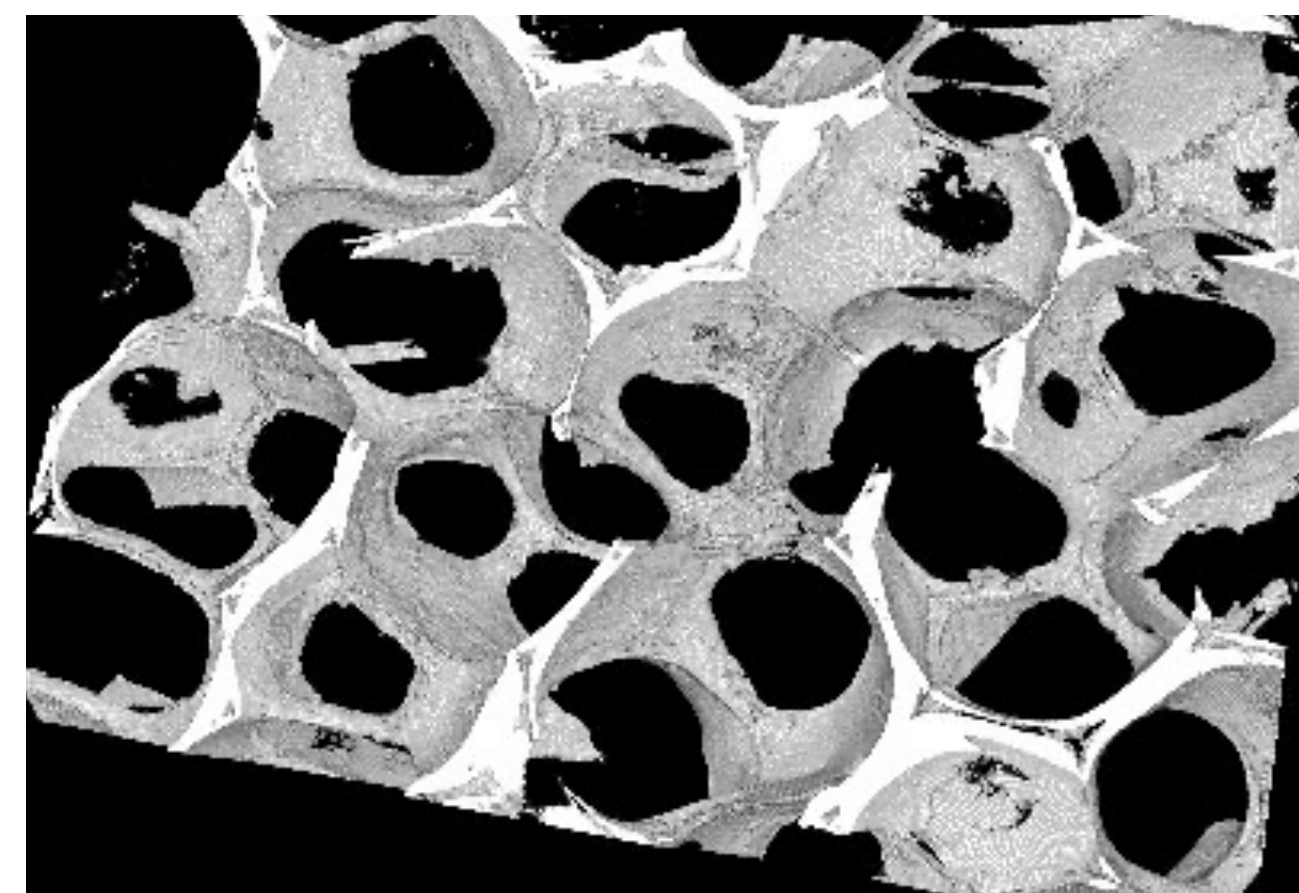


SYNTHETIC BONE GRAFTS

HIGHLY FUNCTIONALIZED IN SUCTION AND CIRCULATION OF BLOOD FOR BONE REGENERATION

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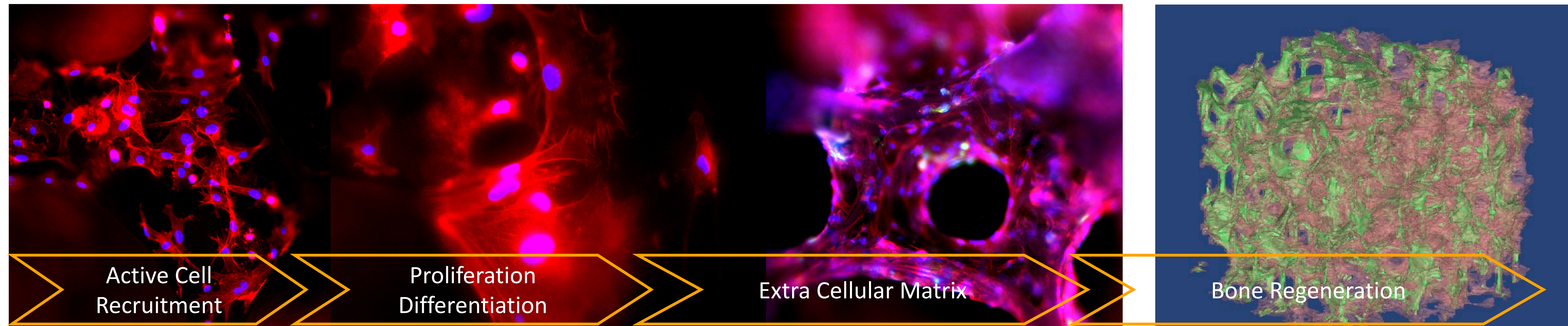




INTRODUCTION

To secure an implant placement, the generation of a solid bone is essential. When a rapid blood suction and uniform blood circulation follows on implant bone graft, there is a high expectation for healthy and solid bone regeneration. Many of the bone grafts used in the clinic include allo-, xeno-, and synthetic-grafts, but a shortcoming for blood suction and circulation throughout the grafts resulted in unpredictable and poor bone regeneration. In this study, a synthetic bone grafts (SBG) named InRoad®, highly effective in suction and circulation of blood, is introduced to ensure solid bone regeneration for implant placement.

Enhanced Cellular Response for Bone Regeneration





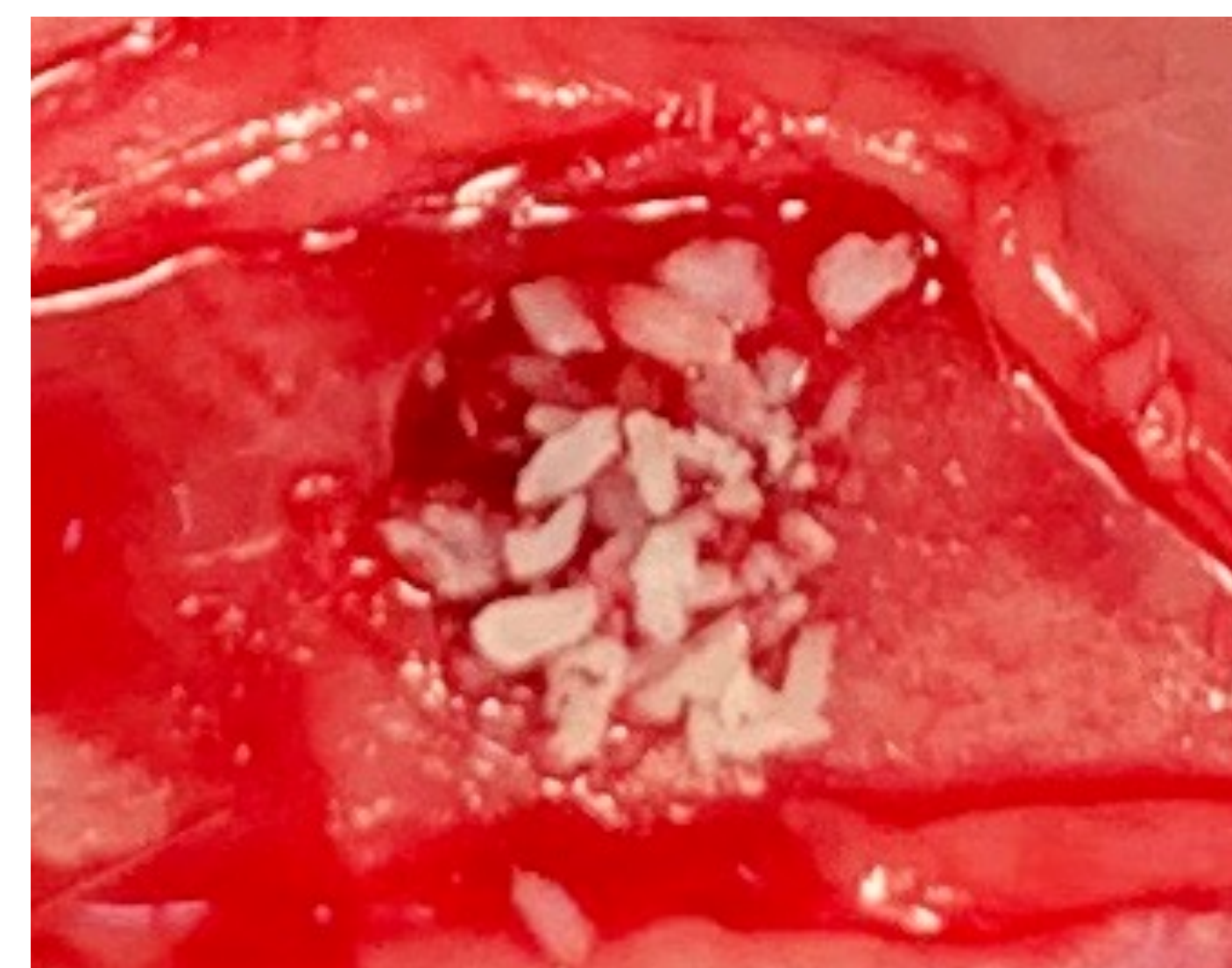
MATERIALS AND METHODS

As a starting material, $90 \pm 5\%$ of hydroxyapatite and $10 \pm 5\%$ beta-tricalcium phosphate powder was synthesized using direct chemical reaction. SBG was fabricated using sponge template coating technology. With this technology, embedding of the tunnel-like structure (micro-channel) into each column of SBG body was obtained. The submicron-pore structure on the surface was acquired simultaneously. SBG of 0.3 – 1.0 mm in diameter was mixed with homologous fibrin glue (HFG) and placed at bony defect area. Not all the grafts were covered by membranes, since both the HFG adhesive properties and the capillary action of the grafts enhance a natural bone regeneration cascade. Clinical and radiographic outcomes were evaluated.

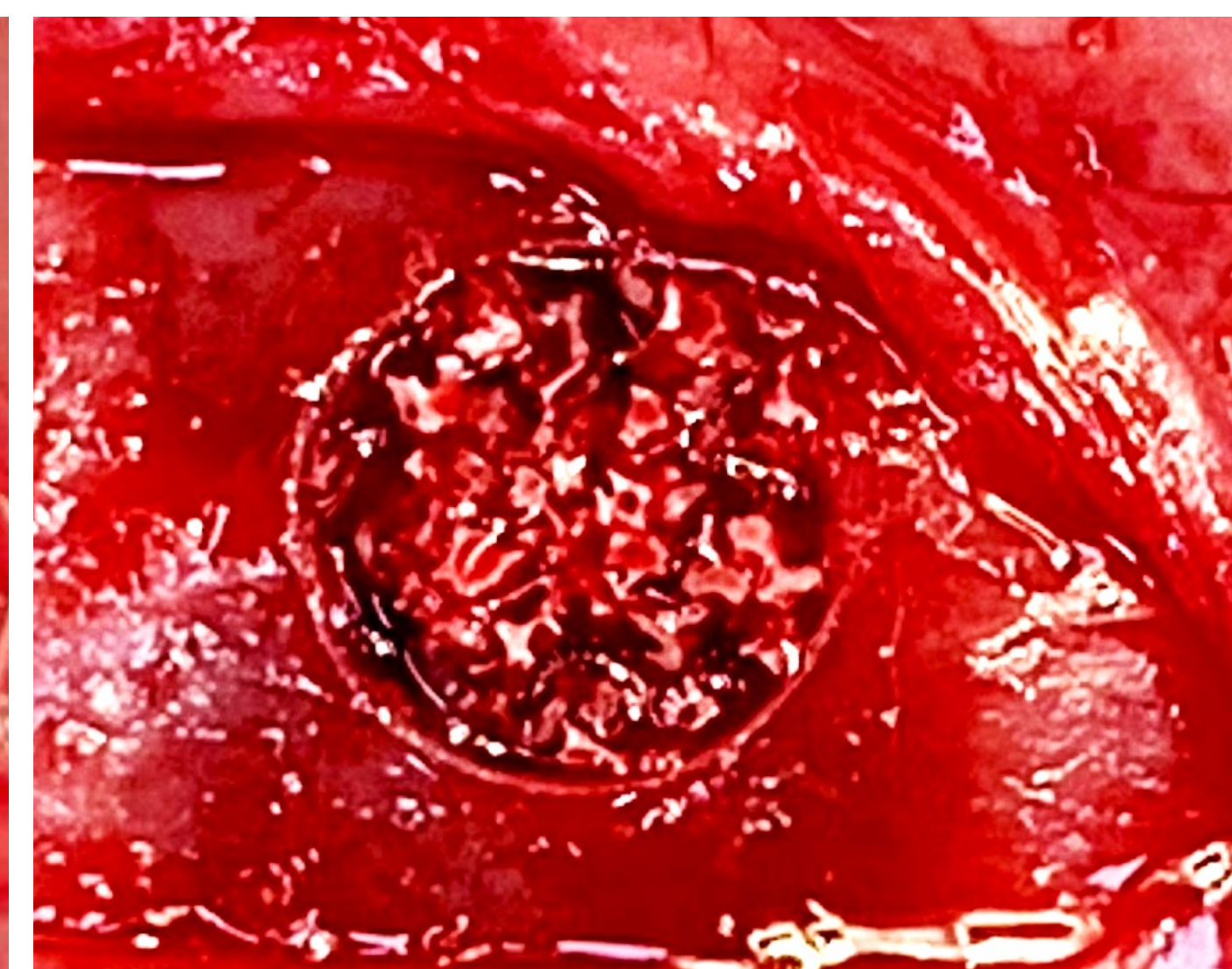
Absorption Characteristic via Capillary Action



Bovine Bone



Allograft



Synthetic Bone Graft



Bovine Bone



Synthetic Bone Graft



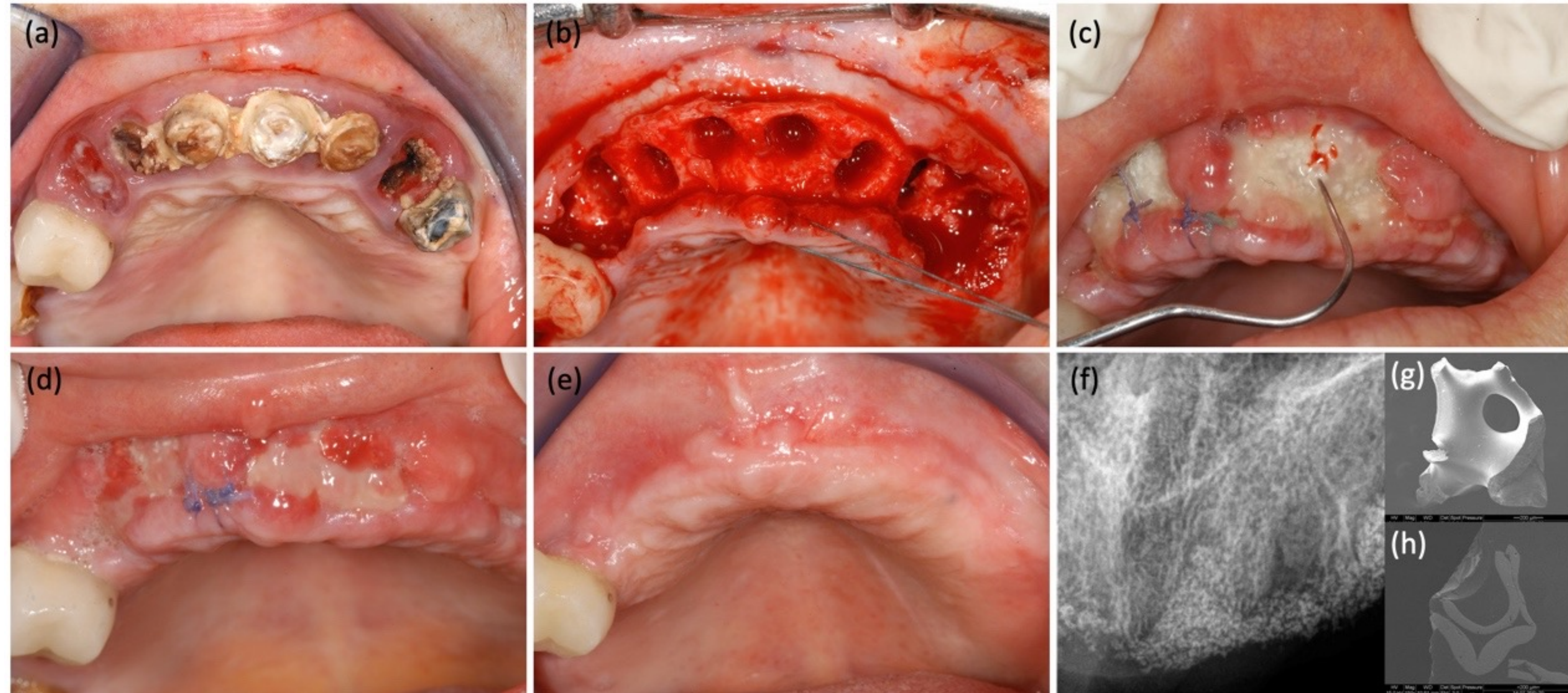
Bovine Bone



Synthetic Bone Graft

RESULTS

The unique structure of novel SBG induced strong suction and circulation of the blood at the surgical site and the host tissue resulted in enhancing bone regeneration. Implanted SBG was well maintained at the bony defect sites even without membrane coverage. No pain or swelling was observed. A pink mucosa covered the surgical area without inflammation within 2-3 weeks following surgery. A progressive increase in bone density was confirmed by X-ray examination. Bone density became similar to that of the surrounded healthy bone at 4–5 months.



(a) before operation, (b) extraction, (c) after surgery – blood circulation through SBG, (d) soft tissue healing after 15 days of surgery, (e) after 28 days of surgery, (f) X-ray evaluation after 28 days of surgery, (g) single granule of SBG, (h) embedded turner-like (micro-channel) inner structure.



CONCLUSIONS

- ✓ A novel Synthetic Bone Graft not only replaces and reconstructs defected parts of the skeleton but also fully carries out the mechanical functions of the reconstructed parts.
- ✓ A successful oral rehabilitation can be achieved with proper preparation of recipient sites and plentiful suction and circulation of blood from surgical sites and host tissue.