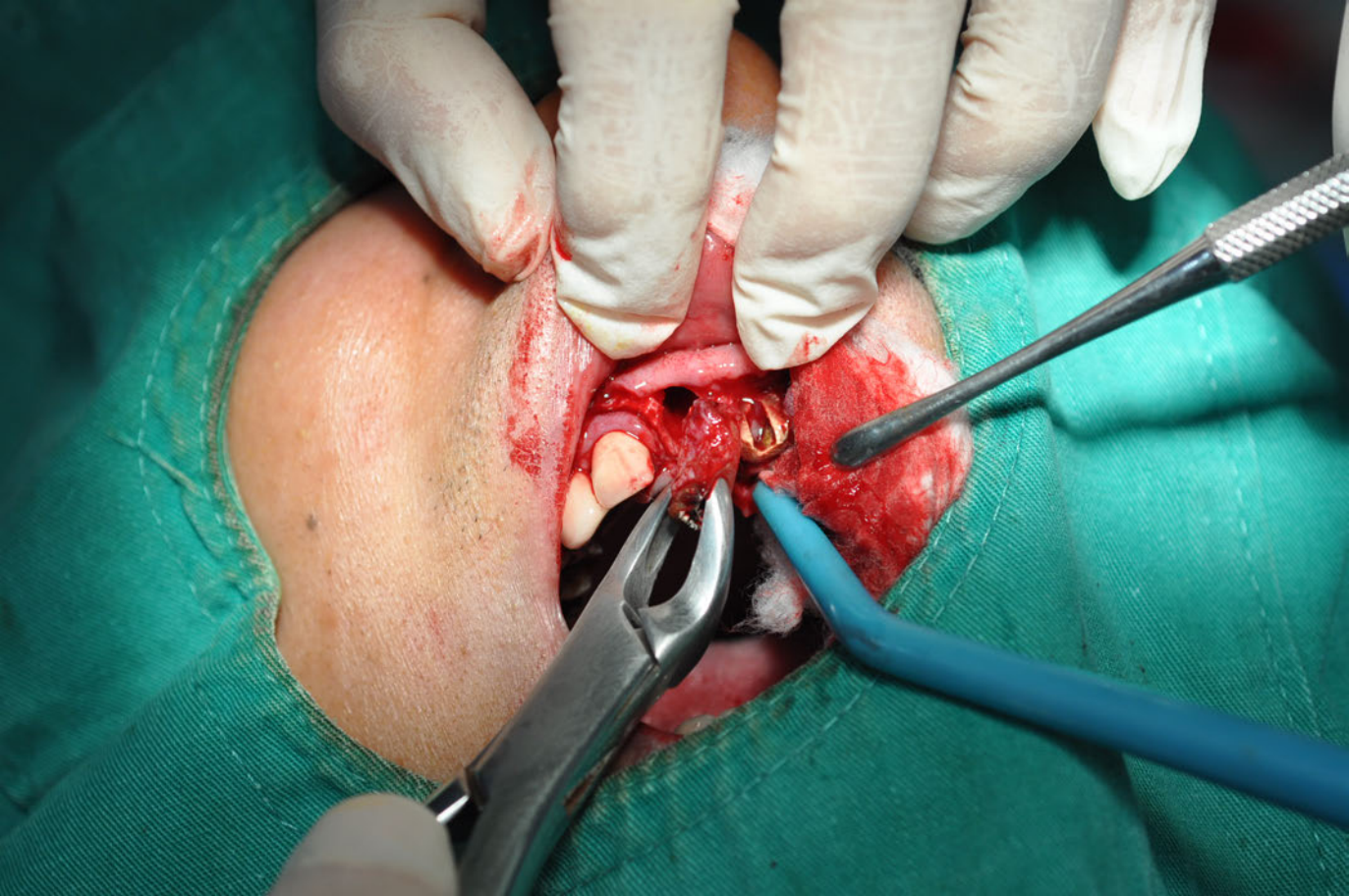

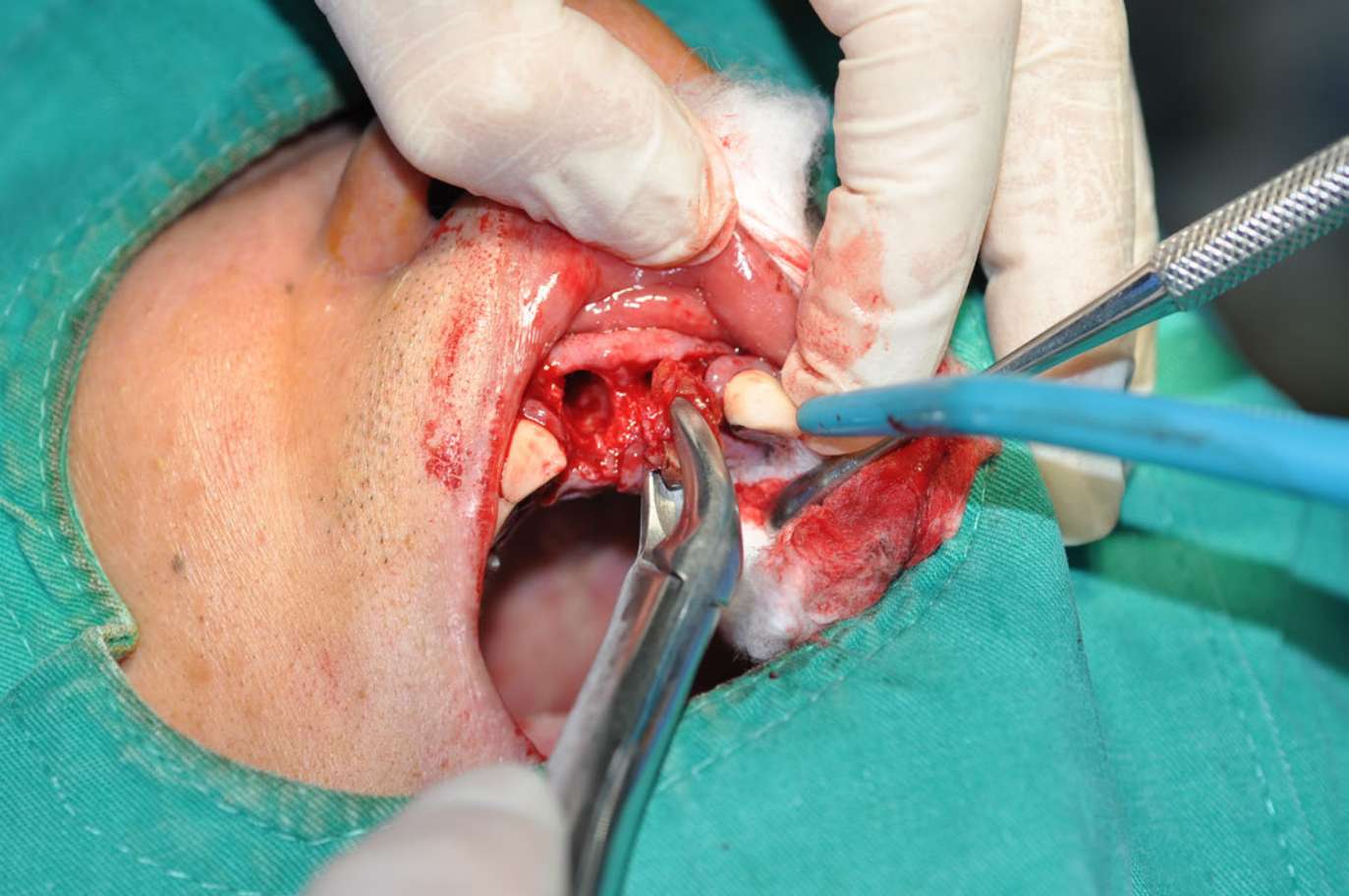

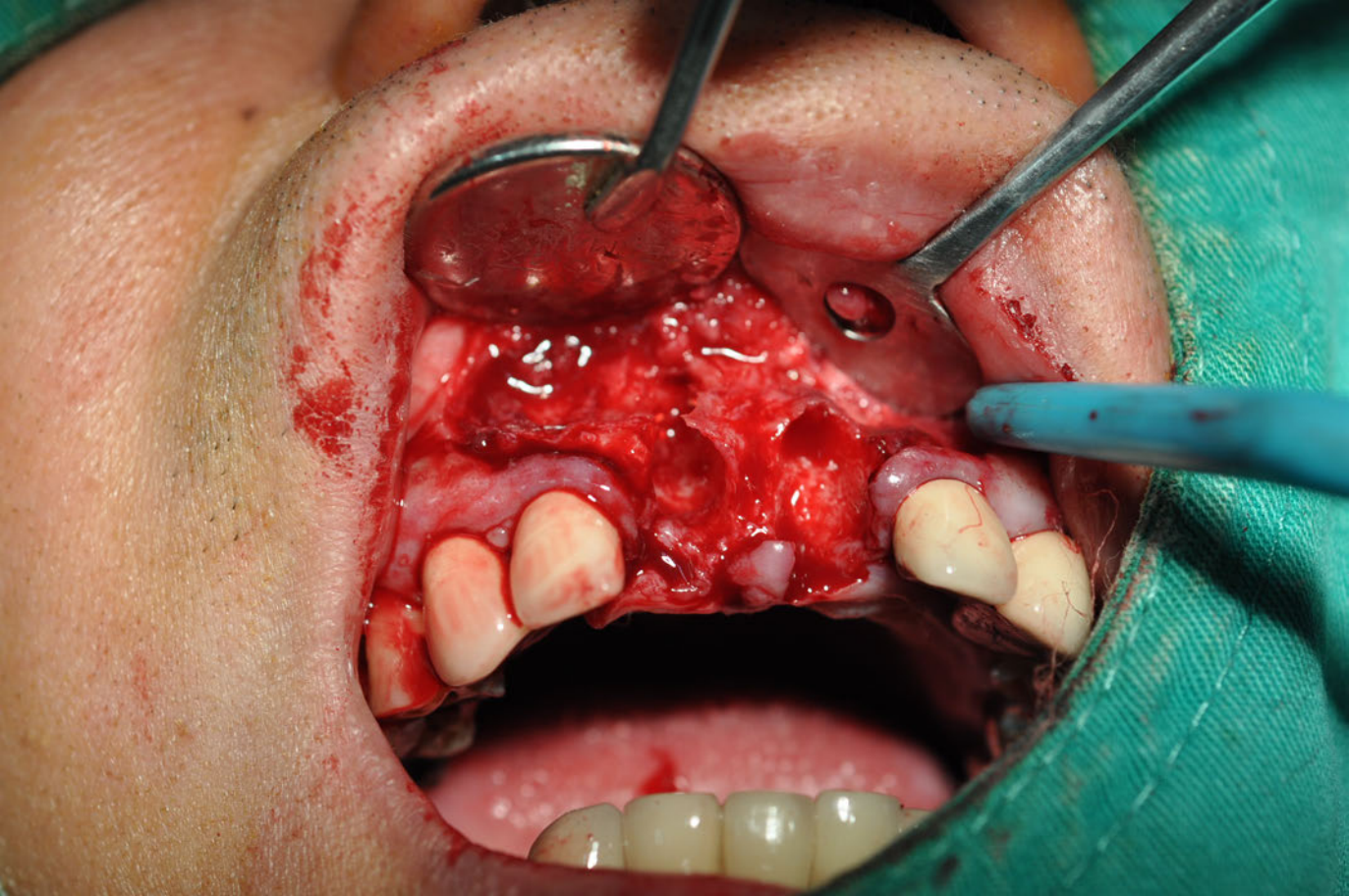

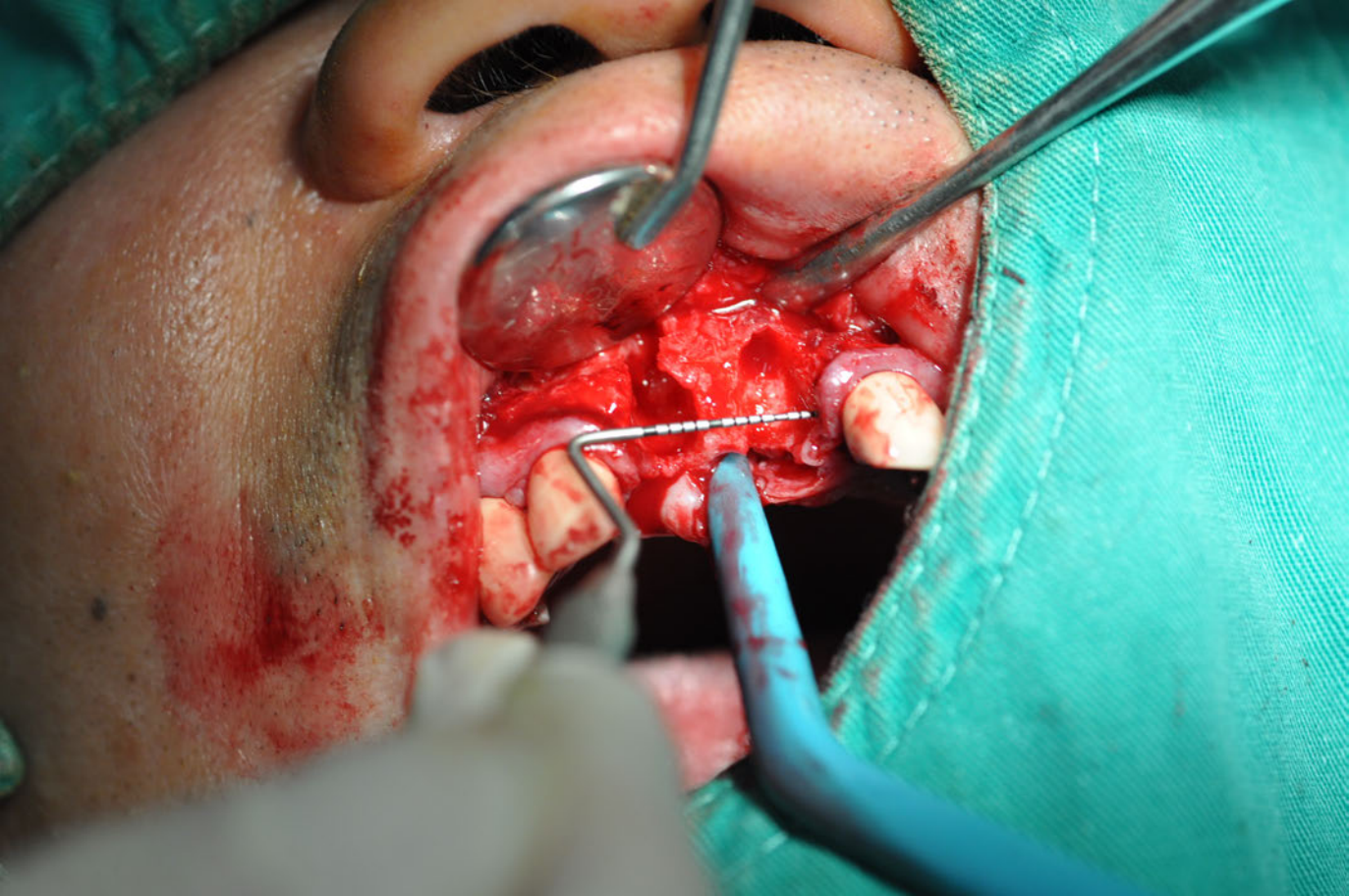

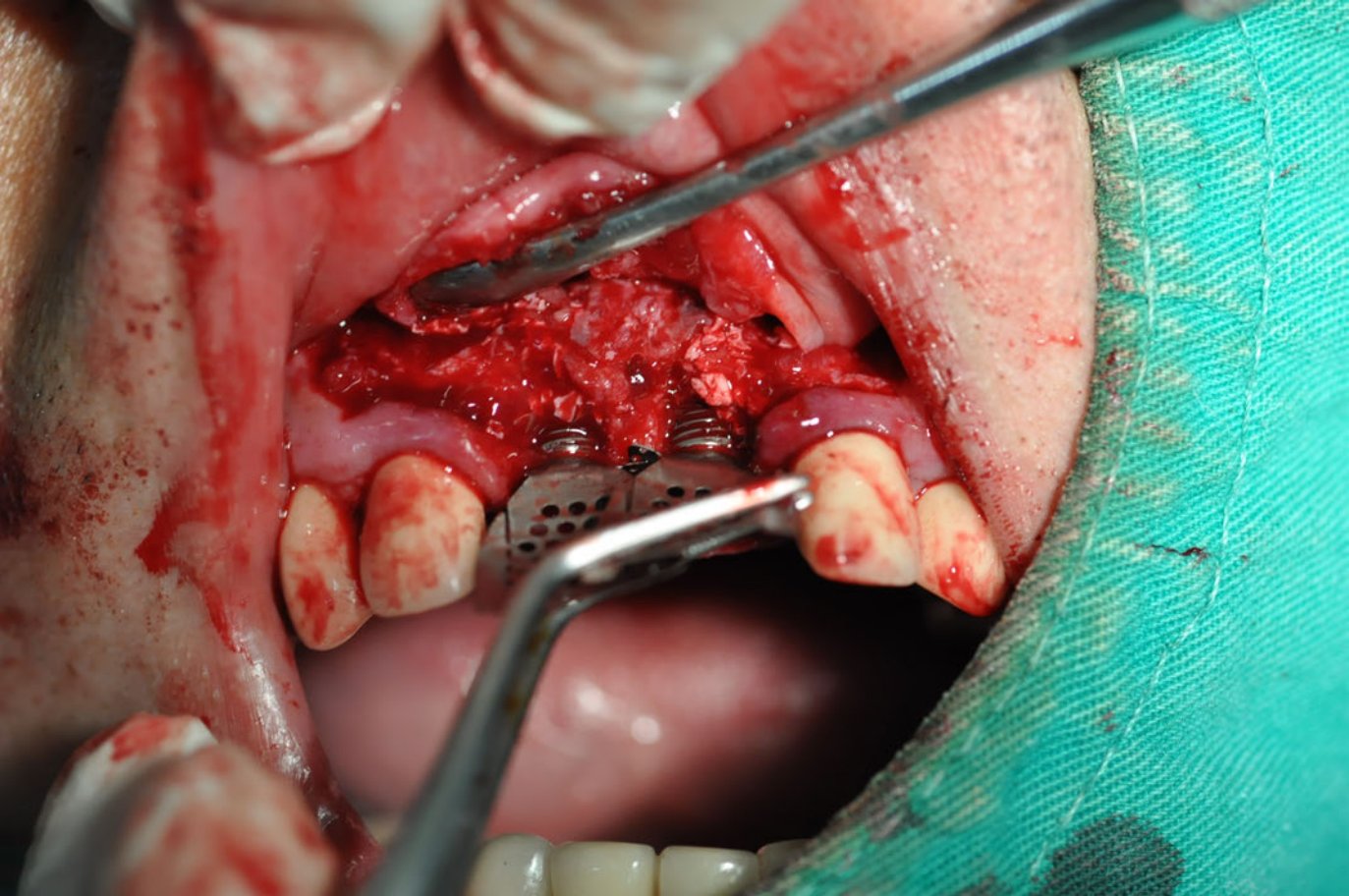

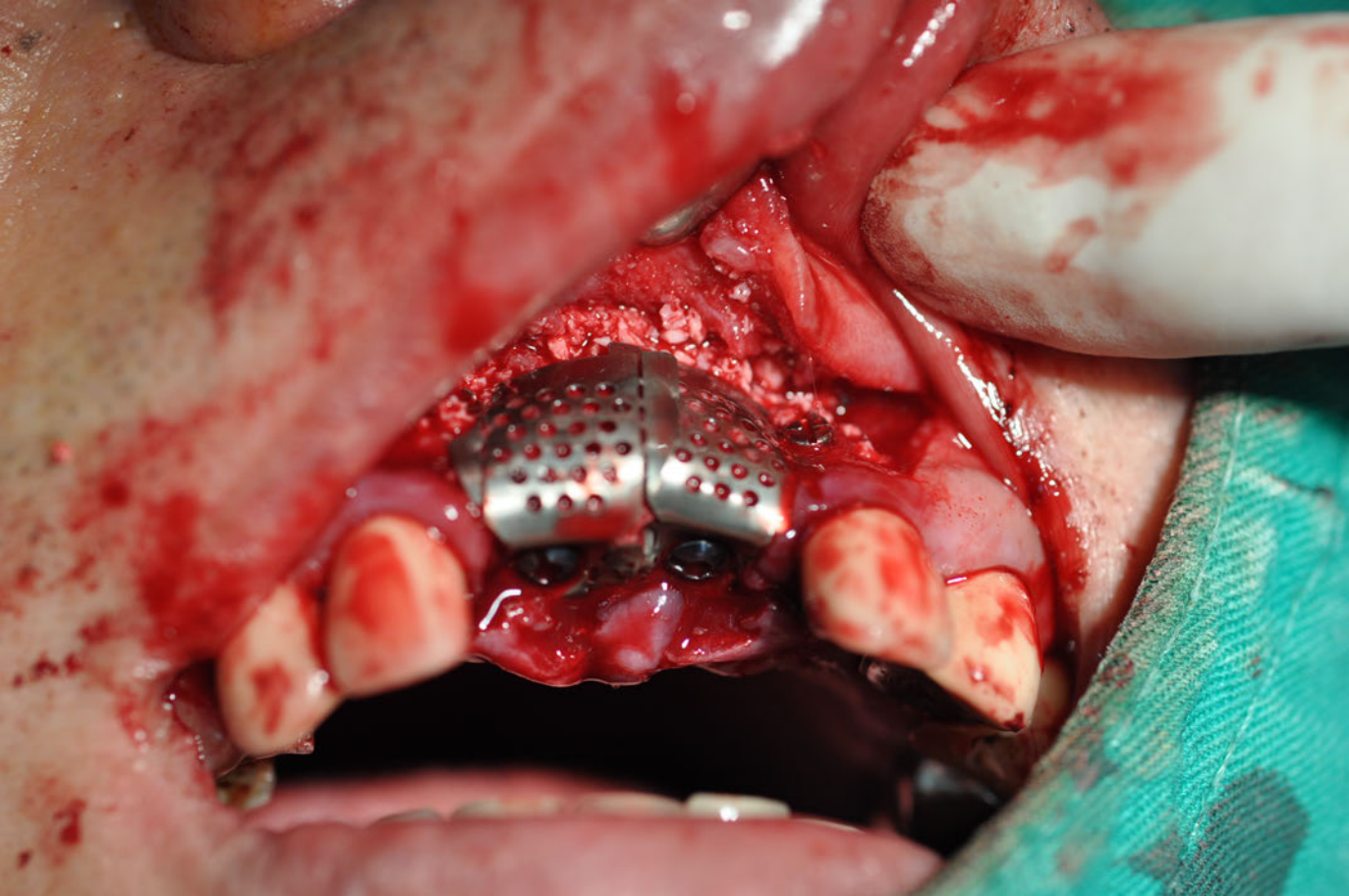

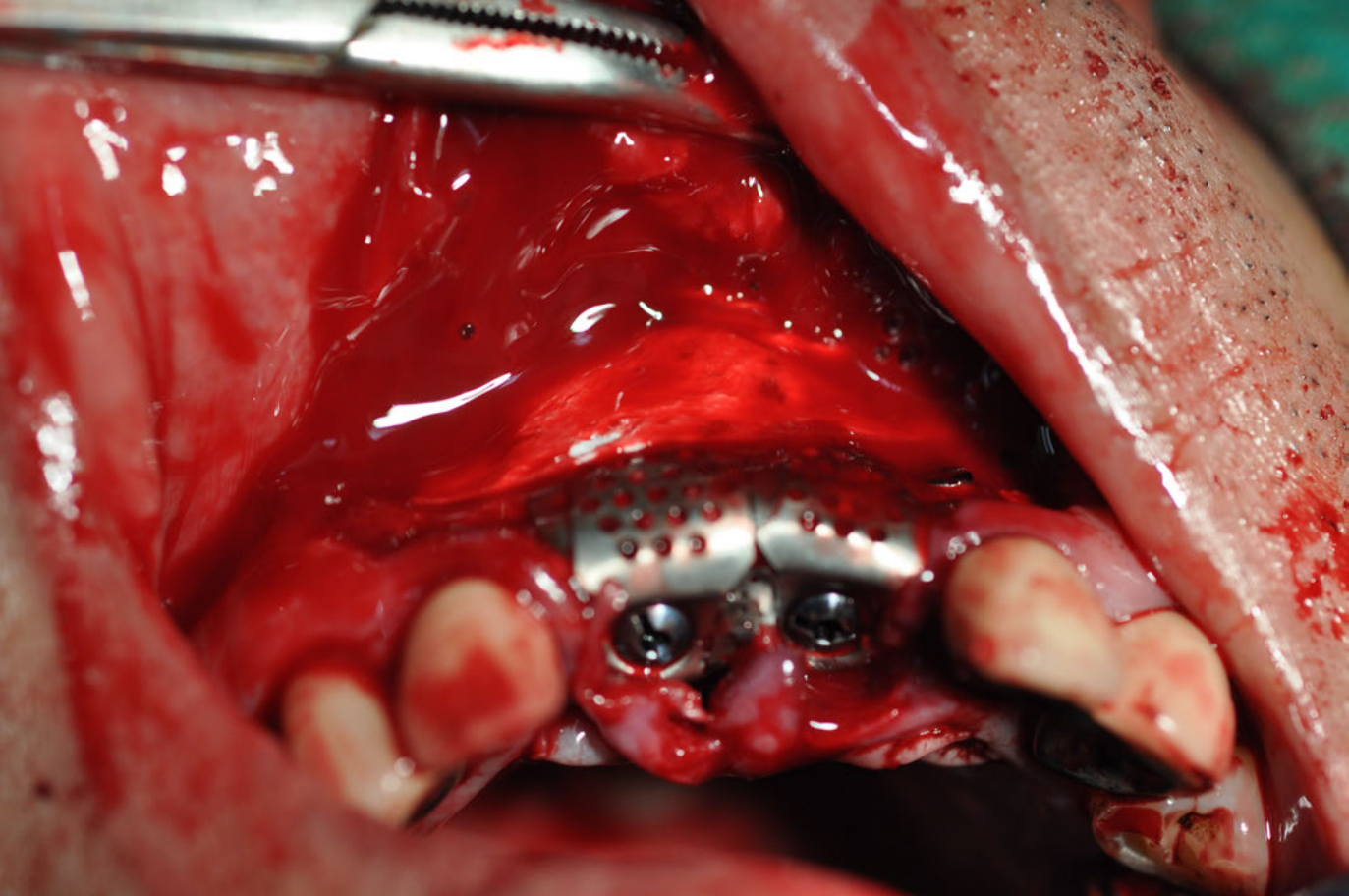

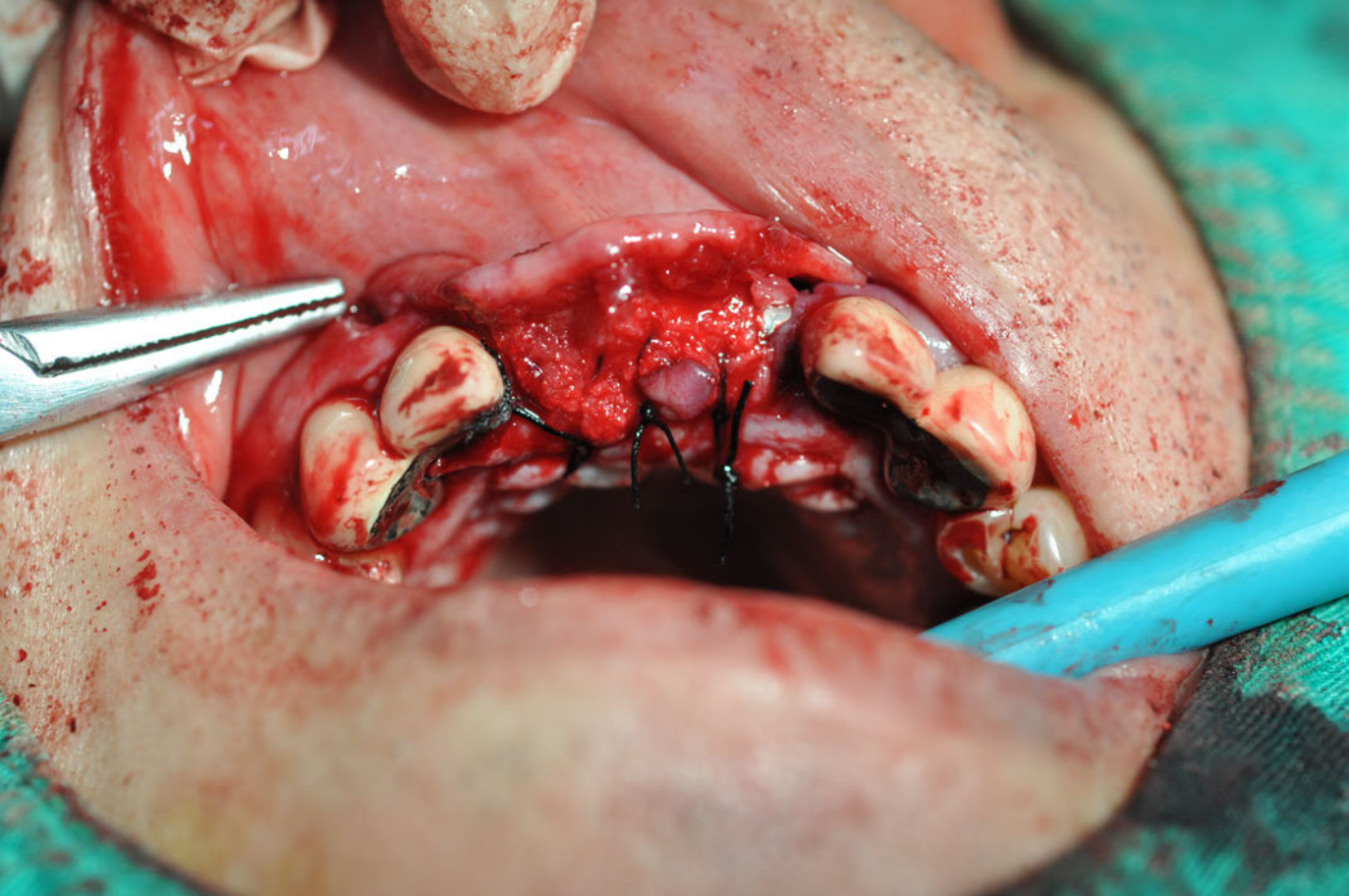

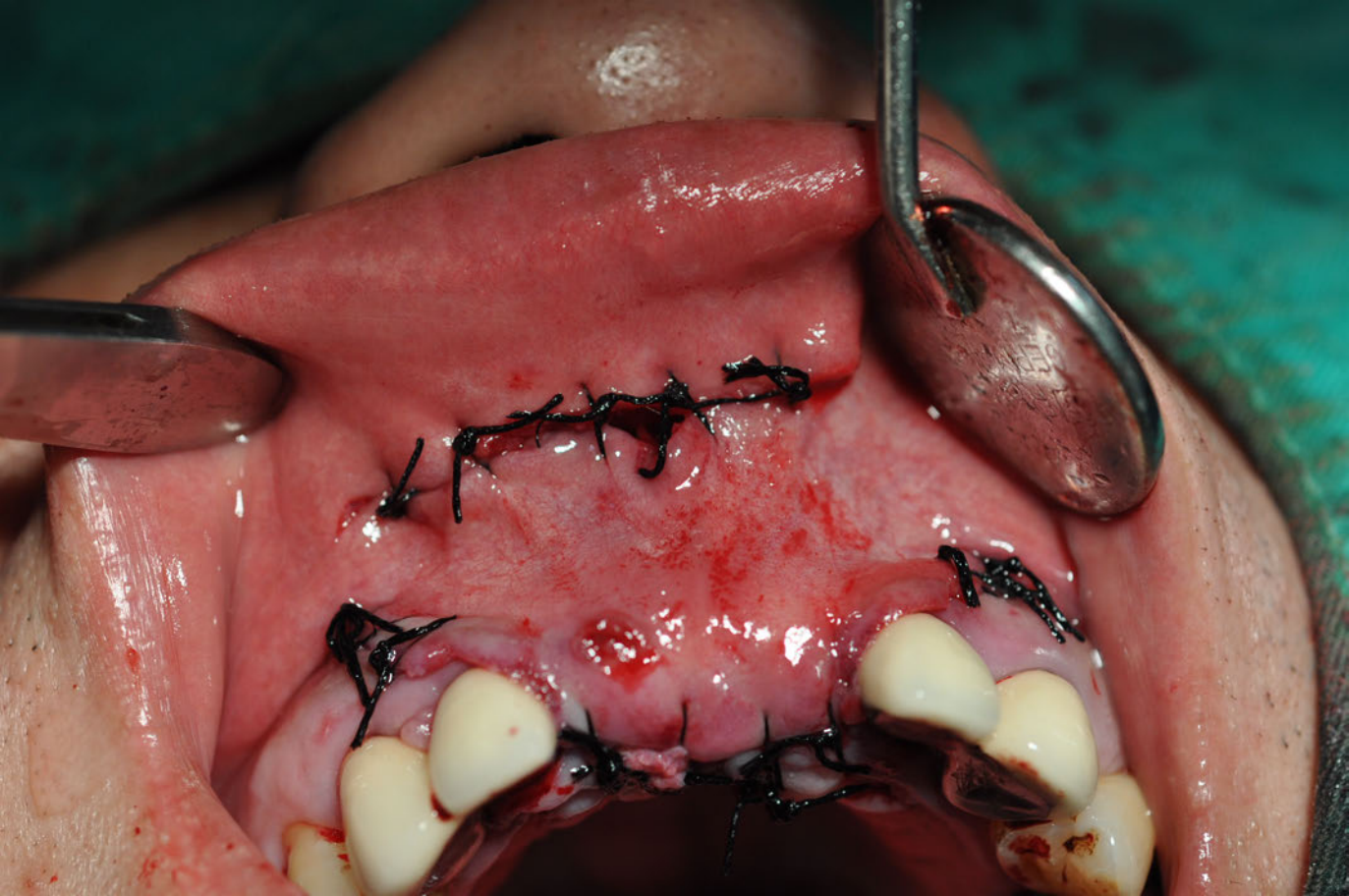

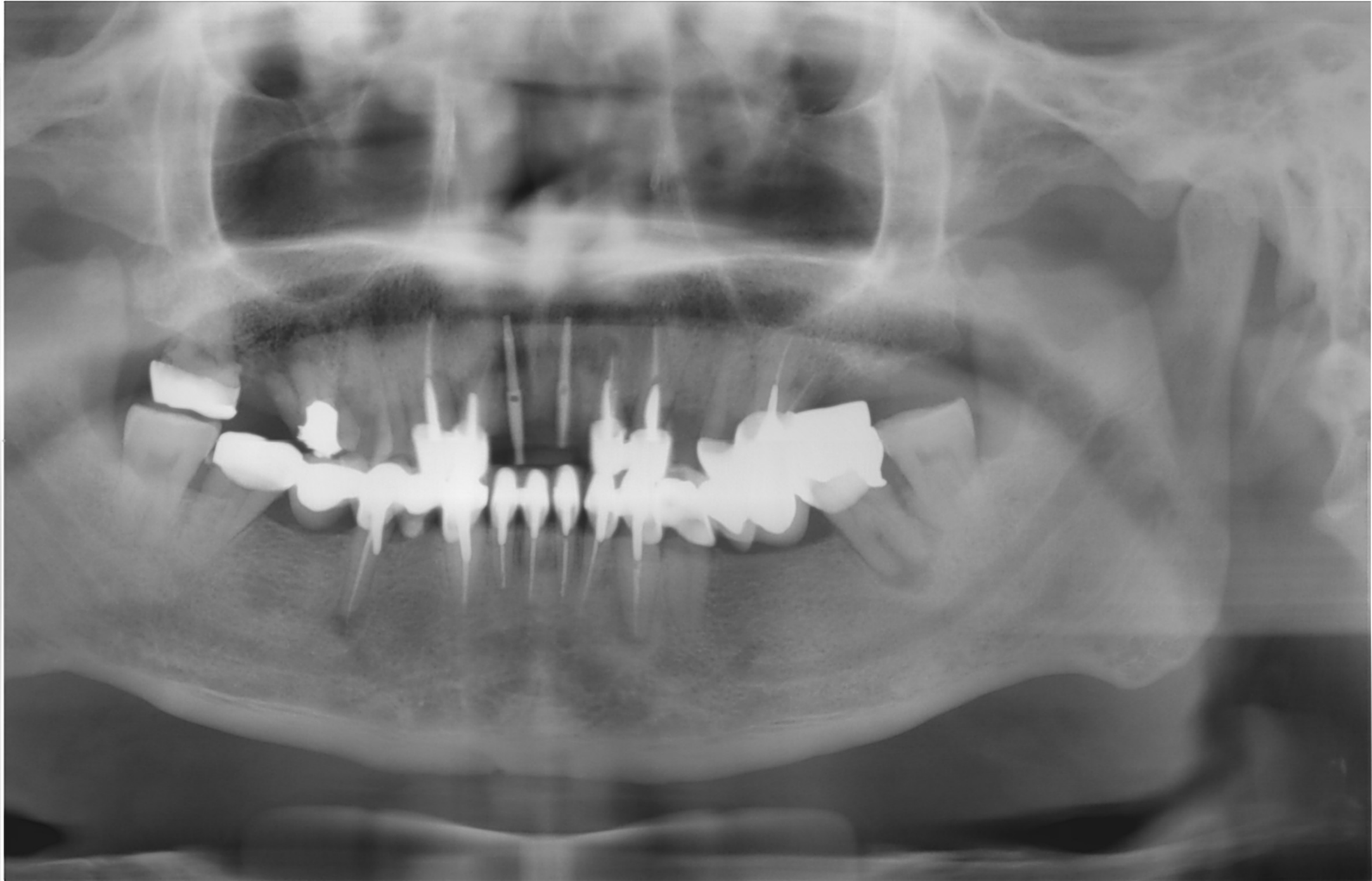
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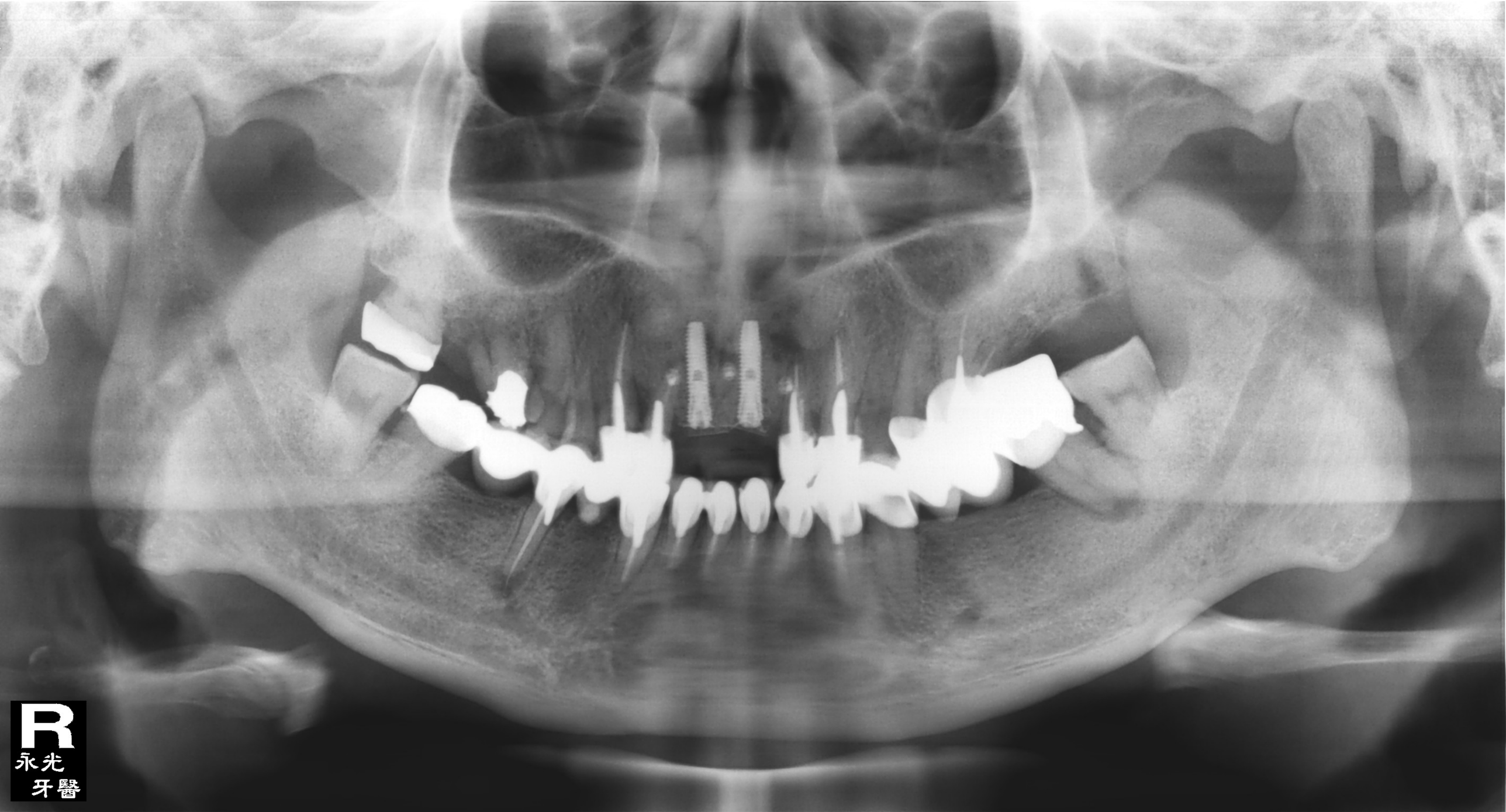
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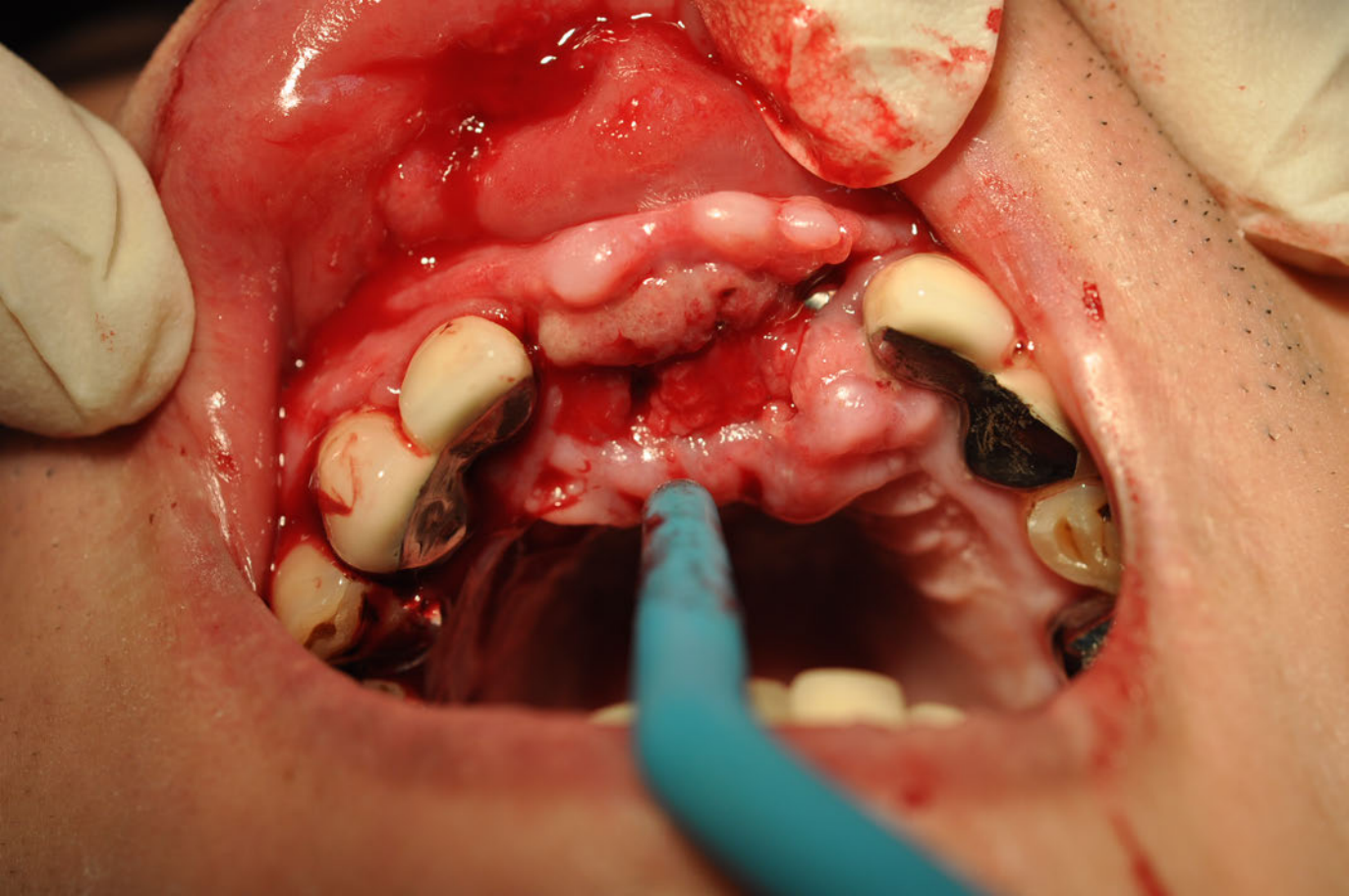

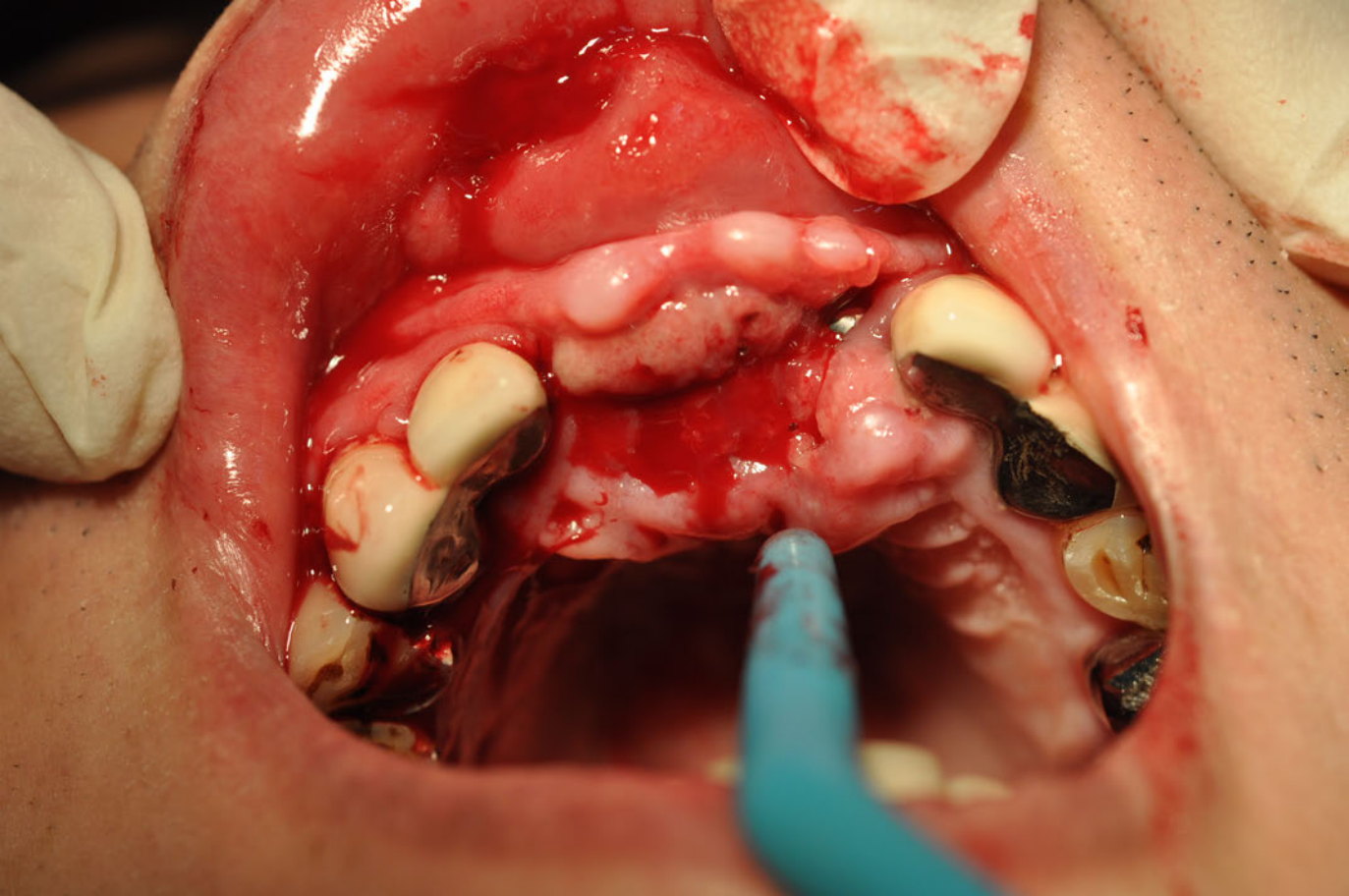


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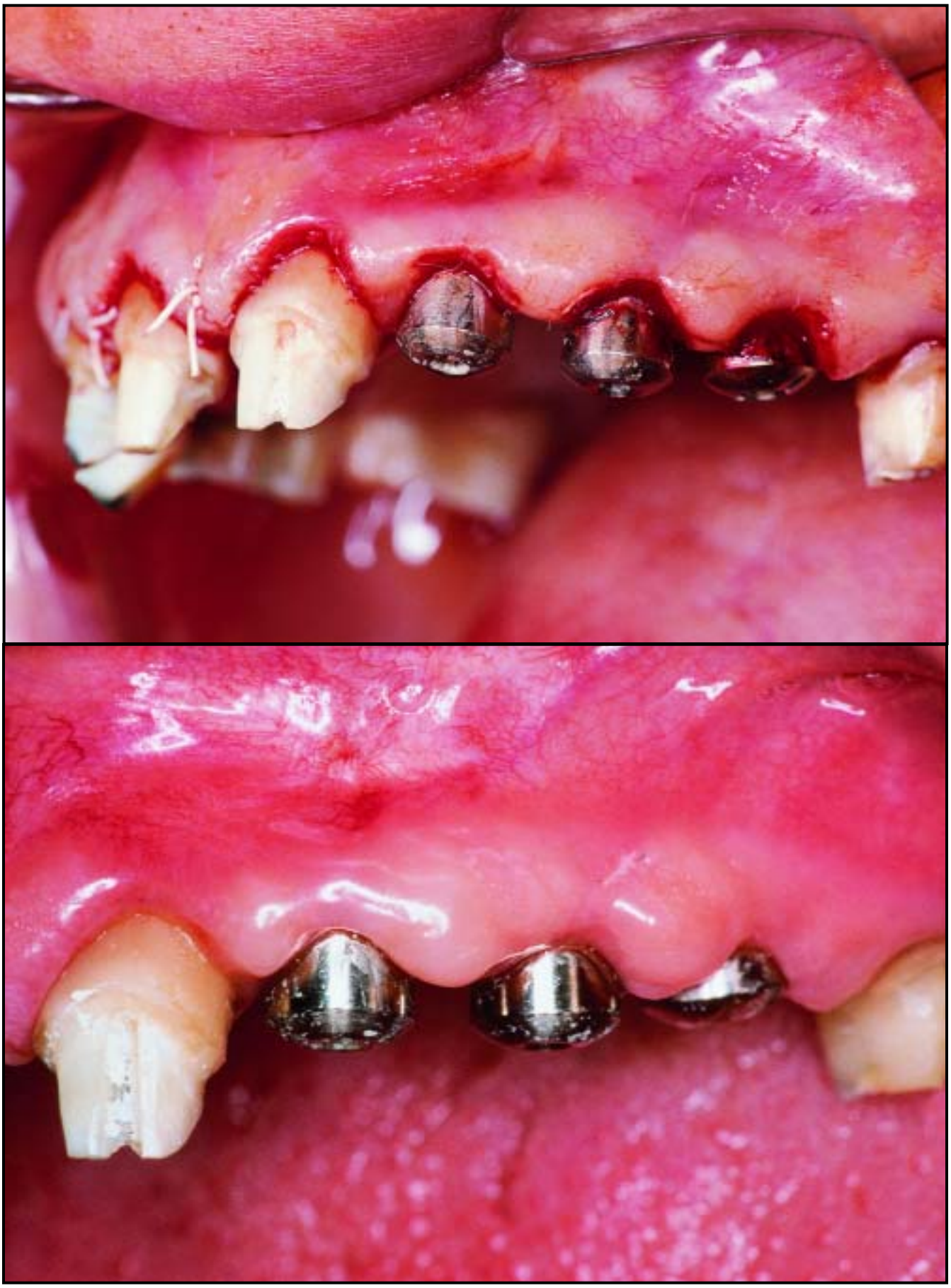

The Ramp Mattress Suture: A New Suturing Technique Combined with a Surgical Procedure to Obtain Papillae Between Implants in the Buccal Area

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*Stefano Parma Benfenati, MD, DDS***

This article has been written to show the opportunity and eventually the predictability to obtain new papillae between implants and a better esthetic result by the use of a new suturing technique. After raising a full-thickness flap from the palatal to the vestibular side, it can be stabilized in such a position using a new suturing technique (ramp mattress suture) to apply pressure and tearing forces on the flap in an apicocoronal direction at the vestibular site and an opposite traction in a coronoapical direction at the palatal site. The ramp mattress suture seems to be capable of pulling the flap in an apicocoronal direction in the vestibular site, as well as in a coronoapical direction in the palatal site. Thanks to such a mattress suture, it will be possible to obtain a more coronal gingival margin. After an adequate healing period of approximately 5 weeks, a vestibular scalloped gingivectomy is performed around the vestibular surface of the abutment to create either a scalloped gingival margin or interproximal papillae only in the vestibular area, forming a gingival ramp in a palatovestibular direction to reasonably reduce the residual increased vestibular depth and optimize the esthetic result. Eight patients, for a total of 56 papillae, were treated with this new suturing technique. The esthetic results satisfied both clinician and patient expectations. (Int J Periodontics Restorative Dent 2002;22:63–69.)

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The esthetic outcome in the reconstruction of the resorbed edentulous maxilla has for years presented surgeons and prosthodontists with a difficult and unique challenge. An advanced maxillary alveolar bone resorption affects the cosmetic result. The objectives of maxillary surgical reconstruction of either the partially or completely edentulous patient with moderate to advanced bone resorption are to *(1)* provide endosseous implants supporting a fixed prosthesis to provide a functional and physiologic reconstruction; and *(2)* replace the lost hard and soft tissues in adequate form, position, and quality to avoid any esthetic compromises and provide a functional and physiologic reconstruction with modern bone augmentation and adequate mucogingival techniques.

Swedish research has revolutionized treatment for those patients who have partially or completely lost their natural dentition and has led to the development of a predictable bone anchorage system of tooth replacement.[1] Subsequently, numerous surgical and bone grafting

procedures have also provided varying degrees of success in improving the previously damaged maxillary ridge form, bulk, and position relative to the mandible.[2–4]

From the beginning, Brånemark and colleagues performed basic research and later clinical trials that were primarily concerned with the osseointegration of the titanium implants, their biomechanical factors, and long-term predictability. On the other hand, esthetic requirements were not taken into consideration for many years. Palacci[5] was one of the first clinicians to consider the esthetic problem related to the interproximal papillae in the anterior region in implant dentistry.

Normally, natural teeth exhibit thin cortical bone buccally, which compromises reparative potential following tooth extraction and produces a resorptive pattern in a more linguopalatal and apical position than that of the normal periodontium. This resorptive pattern results in a loss of the normally scalloped bone architecture and a flat design of the edentulous ridge. Consequently, the esthetic result might be seriously compromised because of a flat interproximal papilla.

Tarnow et al[6] evaluated whether the presence or absence of interproximal restoration or the vertical distance between the contact point and the crest of bone are significant in determining the presence of the interproximal papilla. The presence of adjacent proximal restoration seemed to have no correlation with whether the papilla had formed. On the other hand, when the vertical distance from the crest of the bone to the base of the contact area was 5 mm or less the papilla was almost always present, and when the distance was 7 mm or more the papilla was usually missing.

From Kramer's[7] concept of "the fiber defense principle," a thick, fibrous tissue is normally found on a thick, broad alveolar process and this tissue, thanks to its thickness, may better survive than a thin tissue in a certain mucogingival procedure. From this clinical observation, a new concept has been developed: With a thick palatal flap dislodged in a buccal position and sutured with a new suturing technique, the clinician can obtain new papillae between implants in the buccal area.

Method and materials

Eight adult patients (six women and two men), aged between 37 and 63 years, were selected for this clinical pilot study. Every patient previously received the first surgical phase of implant therapy ad modum Brånemark on the anterior and lateral sextants of the maxilla. After the first healing period for the osseointegration of the implants, the five patients who decided to participate in this clinical study followed an identical surgical protocol. All patients received an extensive explanation of the procedures that would be performed to surgically reconstruct collapsed interdental papillae and signed a consent form.

Fig 1 (left) *Flat partially edentulous ridge.*

Fig 2 (right) *Flat partially edentulous ridge before second-stage implant surgery abutment connection procedure.*

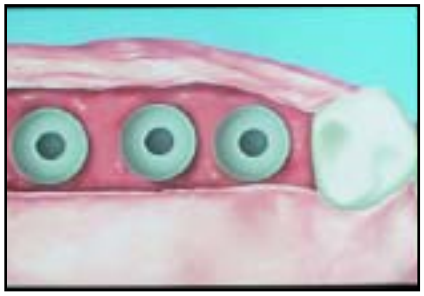

Fig 3 (left) *Sharp linear incision in a distomesial direction is performed with a full-thickness approach slightly palatal to the implants, starting 5 mm posterior to the most distal implant and finishing 5 mm mesial to the most mesial implant.*

Fig 4 (right) *First incision is performed to raise a full-thickness pedicle. No releasing incisions are used.*

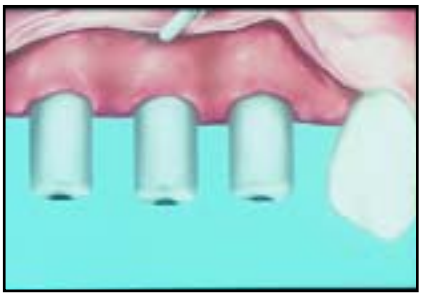

Fig 5 (left) *Long healing abutments are inserted.*

Fig 6 (right) *Healing abutments will be able to keep the full-thickness buccal flap raised during the healing period. The vestibular gingival margin will be in a more coronal position of approximately 5 to 6 mm compared to the palatal gingival margin.*

Abutment connection procedure: First surgical phase

The surgical site is anesthetized (Figs 1 and 2), and a sharp linear incision in a distomesial direction is performed with a No. 15 Kai surgical blade with a full-thickness approach. This first incision must be performed slightly palatal to the implants, starting 5 mm posterior to the most distal implant and finishing 5 mm mesial to the most mesial implant and/or intrasulcularly on the neighboring natural dentition (Figs 3 and 4). No releasing incisions are performed.

Because of the length of this horizontal incision, it is possible to raise a full-thickness palatobuccal flap and keep it dislodged from the bone surface to allow removal of the implant's cover screws and replacement with the desired healing abutments (Fig 5). The inserted healing abutments will be able to keep the full-thickness buccal flap raised during this healing period (Fig 6). The

vestibular gingival margin will be in a more coronal position of approximately 5 to 6 mm compared to the palatal gingival margin (Fig 6).

The ramp mattress suture technique is now performed to stabilize the soft tissue at the new desired position. When the quantity of keratinized gingiva near the implants is not sufficient, it is possible to extend the incision further in the palatal area to obtain more palatal tissue, as described in a previous article.[8]

It is reccomended to use a quantity of masticatory mucosa from the palate that will obtain 30% more than the desired interdental papilla height. An expanded polytetrafluoroethylene (e-PTFE) monofilament suture (Gore-Tex suture, 3i/WL Gore) is used. This suture can be accomplished by passing the needle through the entry point at the vestibular site of the buccal flap in the interproximal area in a vestibulopalatal direction approximately 5 mm apical to the gingival margin.

On the palatal site, the palatal flap has been engaged from its entire thickness and approximately 5 mm apical to the gingival margin by passing it in a palatovestibular direction; the palatal flap has to be immediately repassed in a vestibulopalatal direction, that is, the opposite direction of the previous one, approximately 5 mm distal. At this point, the buccal flap has to be engaged in a palatovestibular direction 5 mm apical to its gingival margin, and the knot is placed on the vestibular site (Fig 7) approximately 3 mm distal to the first entry point.

This suturing technique provides a precise and desired flap edge placement and control: Two tearing forces are directed in opposite directions. The buccal flap will receive a coronal pulling traction, whereas the palatal flap will receive a compression on its underlying layers. From a clinical point of view we can achieve a desired gingival ramp, as it is the goal of resective osseous surgery procedures to optimize the esthetic result (Fig 8). After a 10-day healing period, the sutures are removed and the tissue is allowed to completely heal for the following 4 weeks.

Second surgical phase

All participants were informed that an additional incision would be made prior to the final restoration. After an adequate healing period of approximately 4 to 5 weeks, a vestibular scalloped gingivectomy is performed around the vestibular surface of the abutment to create either a scalloped gingival margin or interproximal papillae only in the vestibular area (Fig 9). The resulting gingival ramp in a palatovestibular direction will reasonably reduce a residual increased vestibular depth and optimize the esthetic result (Fig 10). These newly created papillae will be present only in the vestibular area, allowing more accurate and easy oral hygiene measurements around oral implants (Figs 11 to 14).

Fig 7 *Healing abutments are able to keep the full-thickness buccal flap raised during the healing period. The vestibular gingival margin is in a more coronal position compared to the palatal gingival margin.*

Fig 8 *Occlusal view. It is possible to appreciate the different position of the two flaps. The suturing technique provides a precise and desired flap edge placement and control.*

Fig 9 *Second surgical phase, buccal view. After an adequate healing period of approximately 4 to 5 weeks, a vestibular scalloped gingivectomy is performed around the vestibular surface of the abutment to create either a scalloped gingival margin or interproximal papillae only in the vestibular area. A crown lengthening procedure is performed on the adjacent teeth.*

Fig 10 *Resulting gingival ramp in a palatovestibular direction will reasonably reduce a residual increased vestibular depth and optimize the esthetic result. These newly created papillae will be present only in the vestibular area, allowing more accurate and easy oral hygiene measurements around oral implants.*

Fig 11 *Buccal sextant, buccal view after 8 months of healing. The newly created papillae are present in the vestibular area.*

Fig 12 *Satisfactory esthetic result after 6-month healing period.*

Fig 13 (left) *Panoramic buccal view shows well-formed papillae around a fixed prosthetic reconstruction supported by natural teeth and implants.*

Fig 14 (right) *Detail of left anterior sextant shows the newly created papillae.*

Results

The probing depths in all cases were within normal limits after a healing period of 12 months; they were 2 mm for the buccal sites, 3 mm for the interproximal sites, and 1 mm for the palatal sites. The soft tissue appeared clinically healthy, not inflamed, without any bleeding upon probing. From a radiographic point of view, the interproximal bony crest was unchanged after this first healing period of 12 months. This clinically improved esthetic situation remained stable over the observation period, with undetectable shrinkage. Every patient was able to perform good oral hygiene. The regenerated papillae remained cleansable and free of inflammation over the observation period.

Discussion

A combination of a new surgical procedure with a modified type of mattress suture, a ramp mattress suture, to obtain papillae reformation between implants in the buccal area has been presented, and the esthetic result that can be achieved clinically using this suturing technique has been demonstrated.

In the periodontal literature, the reconstruction of lost or collapsed interdental papilla for cosmetic reasons has not received too much attention. Although several human case reports have showed different periodontal plastic surgical, prosthetic, and orthodontic techniques for correcting lost papillae, no scientific research or reliable data are available for clinicians.[7–15]

In 1999, Blatz et al[16] analyzed anatomic and morphologic charateristics of the interproximal gingival and periimplant tissues and reviewed the literature involving surgical and nonsurgical approaches. They pointed out the possibility that "scar-like" periimplant tissue surrounding implant-supported restorations may not fit in the periodontal concept.

Sharpiro[17] reported the clinical cases of two young women with a dental history of some previous episodes of acute necrotizing ulcerative gingivitis. He proposed a conservative technique to stimulate the reconstruction of the interdental papilla and consequently avoid the need for surgical correction. For the first 3 months following periodic curettage, there are no detectable changes in the gingival architecture. At approximately 9 months, maximum papillae regeneration has usually taken place; however, this result seems quite unpredictable. In some cases, the entire interdental papilla may regenerate because of periodic curettage, which is able to provoke an inflammatory gingival hyperplasia.

In 1992, one case report in a young patient[18] described an interdental papilla reconstruction by combining the basic principle of Abram's roll technique for ridge augmentation and Evians's papilla preservation technique. Tarnow et al[6] did not propose any surgical technique, but examined only one extremely important variable—the effect of the distance from the base of the contact area to the bony crest on the presence or absence of the interproximal papilla in 288 sites. They emphasized the role of this variable, considering it a determining factor on the reformation of the interproximal papilla without underestimating other variables such as degree of inflammation, fibrous or edematous nature of the tissue, presence of proximal restorations, and history of previous nonsurgical and surgical therapy.

Palacci[5] described a step-by-step surgical technique at the second-stage implant surgery to move the keratinized tissue at the top of the ridge in a buccal direction to obtain papilla-like formations. A semilunar beveled incision is performed in the flap in relation to each implant to create a pedicle that is rotated 90 degrees toward the mesial aspect of the abutment. Interrupted mattress sutures stabilize the pedicle in the interproximal area and adapt this moveable soft tissue to the underlying bone.

Conclusion

On reviewing the periodontal and implant literature, it seems clear that the reconstruction of the lost or collapsed interdental papilla is a real challenge in modern esthetic dentistry. Based on the number of treated papillae (56) and on the esthetic success obtained, the authors confirm the filling of the interdental space using a new suturing technique, the ramp mattress suture, combined with a delayed gingivectomy to reconstuct the lost interproximal papillae. The average shrinkage of the buccally displaced palatal tissue was approximately 30%. The clinical results were stable for this first evaluation period (12 months). The esthetic result satisfied both clinician and patient expectations.

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