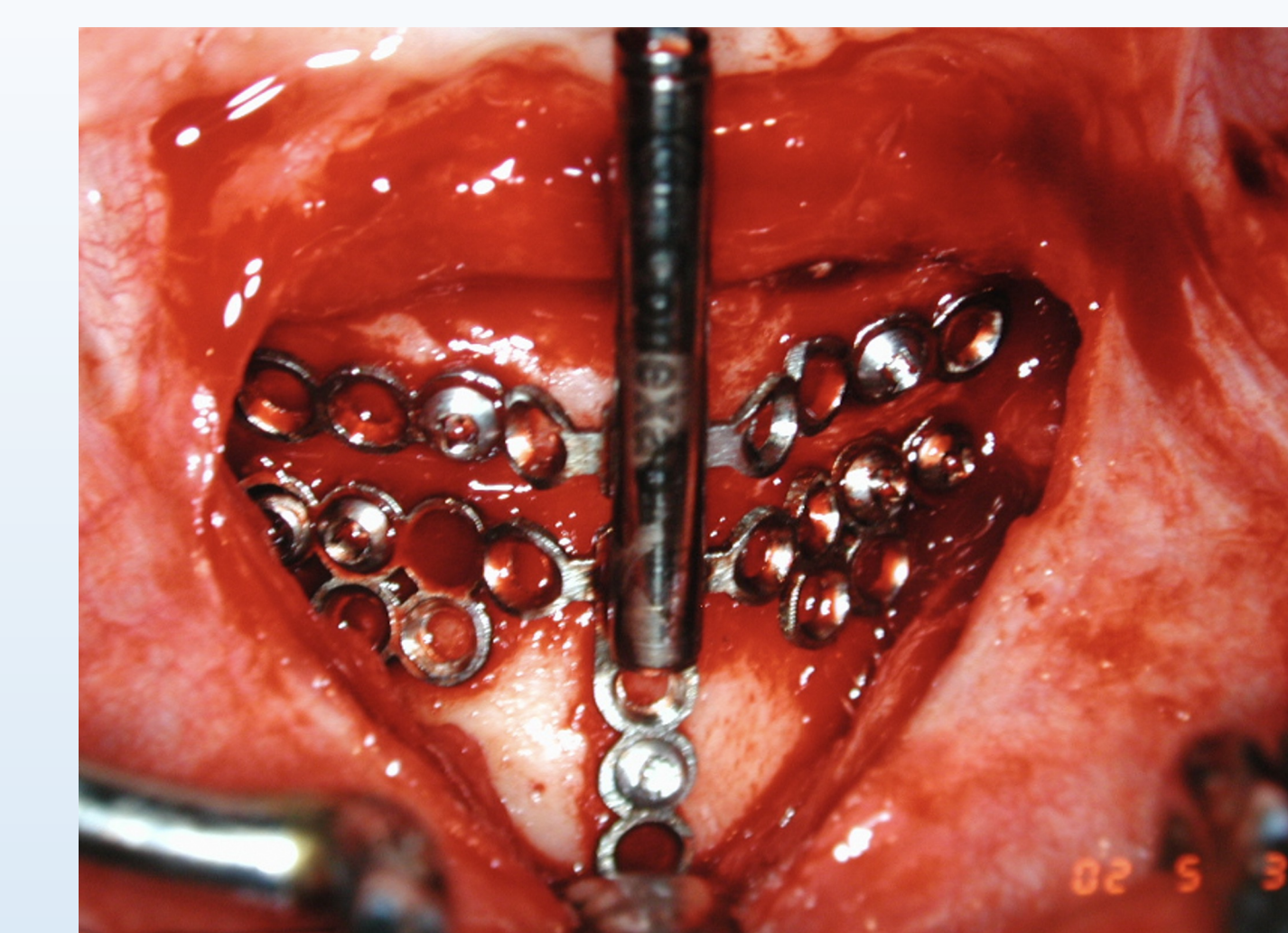




Implant Rehabilitation Combined With Alveolar Distraction Osteogenesis After Hard Tissue Loss Due To A Car Accident: A Case Report

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Introduction

The fundamentals of distraction osteogenesis are based on dynamic forces applied to a bone segment after corticotomies that creates a space where new bone matrix will be deposited. This space is lengthened in a paced and continuous movement by the activation of a device called distractor. The tension forces applied to the bone segment induce tissue neovascularization, proliferation and cellular differentiation. There is an increase of undifferentiated mesenchymal cells that will create new fibroblasts initially, inducing new potential osteogenic cells at the site. The osteogenic distraction treatment consists basically in 5 phases: distractor placement, latency period, distractor activation, activation end/beginning of consolidation period and distractor removal, following some principals of Ilizarov ^{14, 15, 16}. In this case report, the creation of a new ridge anatomy, both in height and width, developed a new hard and soft tissue topography that consequently created a more predictable esthetic and functional result in the implant rehabilitation.

Materials and Methods

After a parasymphseal fracture and five teeth loss due to a car accident, a 28 years old male patient underwent to fracture reduction with osteosynthesis miniplates. An unsuccessful graft attempt with iliac bone crest left a U-shaped defect in the anterior mandible. As a result, it left a seriously compromised alveolar ridge both in width and height to give a predictable esthetic and functional result for an implant rehabilitation. As the patient was uncomfortable with this situation and was wearing a RPD, he went to the practice to find a solution. After a thorough examination, it was noticed that any treatment with dental implants would be an esthetic challenge since the clinical crown of the missing teeth would be longer than the adjacent teeth and the patient didn't want pink gingiva in the final prosthesis. After a study of casts, CBCT and oral examination, the alveolar distraction osteogenesis technique with a unidirectional extra osseous distractor (Conexao-Brasil) was selected as an alternative for hard tissue augmentation. After 12 weeks of last distractor activation with consequent consolidation of the bone, three Lifecore Biomedical 3,75 X13mm implants were surgically placed simultaneously to the distractor removal. Three months later⁹, a screw retained implant bridge was designed and successfully produced. Satisfactory results were achieved.



Fig. a - Fracture consolidation with rigid miniplates for osteosynthesis.

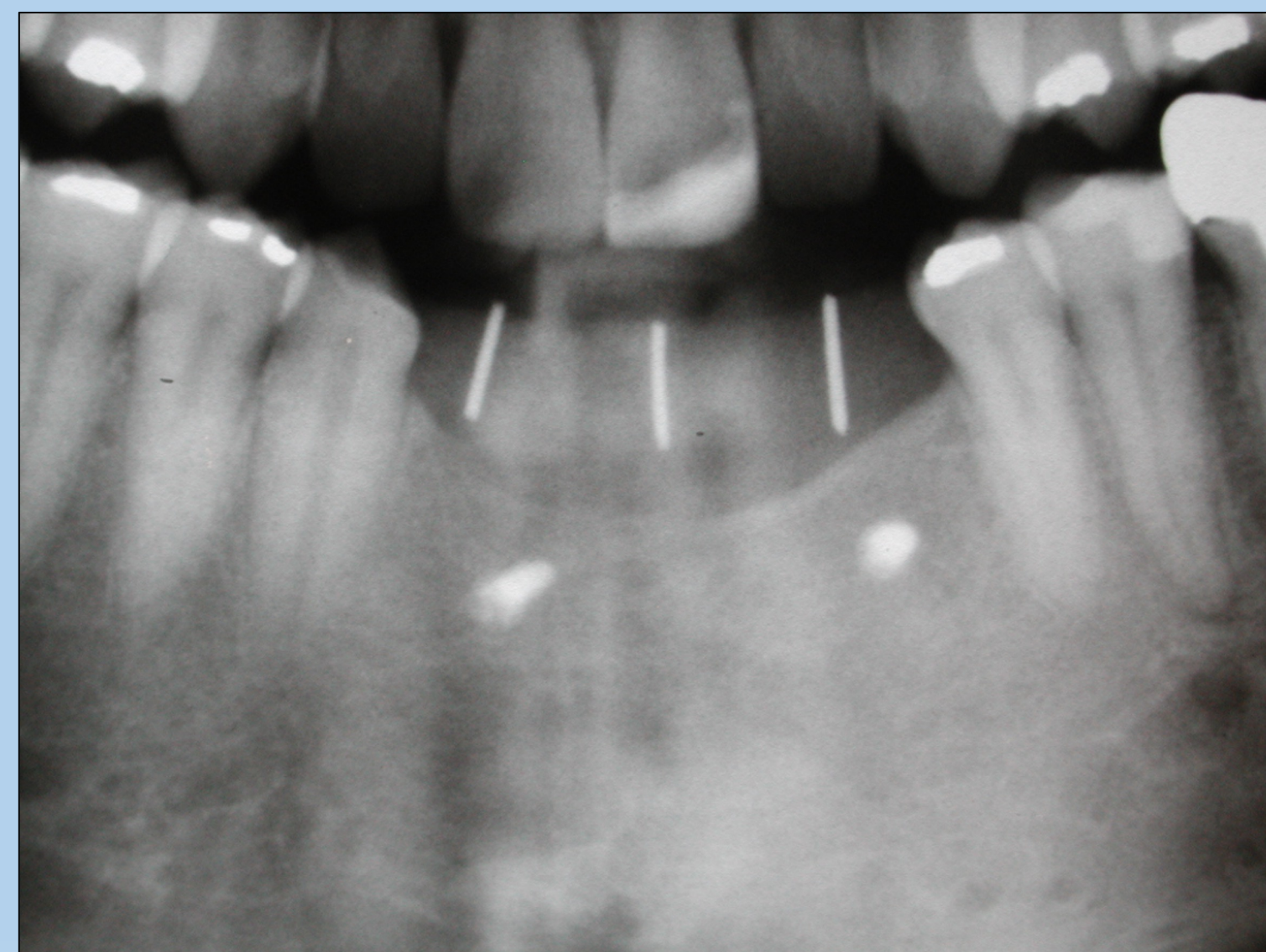


Fig. b - Seven months after plates removal and iliac crest onlay graft when patient came to the practice.



Fig. c - Post op image after distractor device placement and beginning of latency period.



Fig. d - Final distractor activation with a radiolucent area between the bone segment and mandibula. End of distraction period and beginning of consolidation period

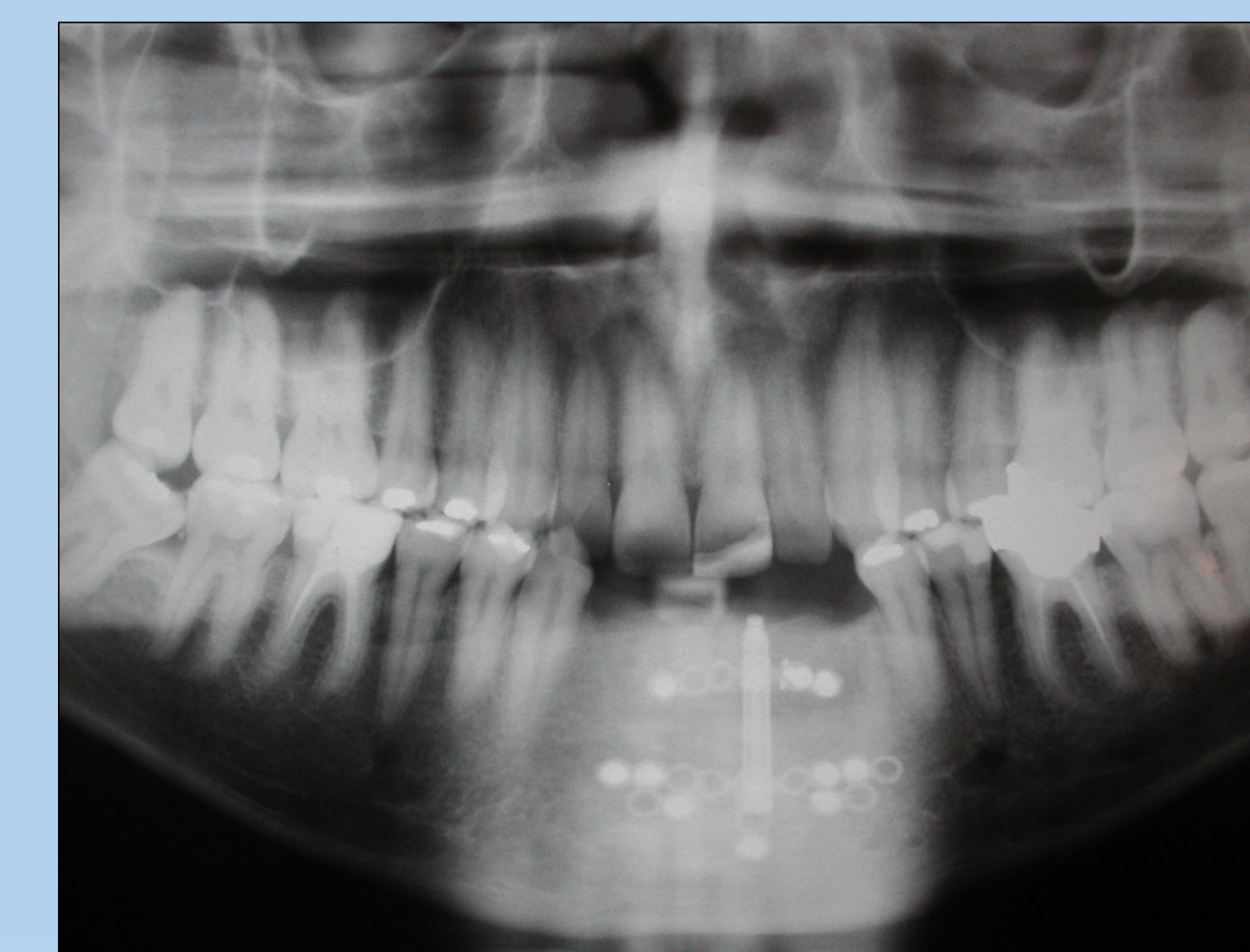


Fig. e - 12 weeks post op after last activation with a radiopaque area between the bone segment and mandibula. End of consolidation period

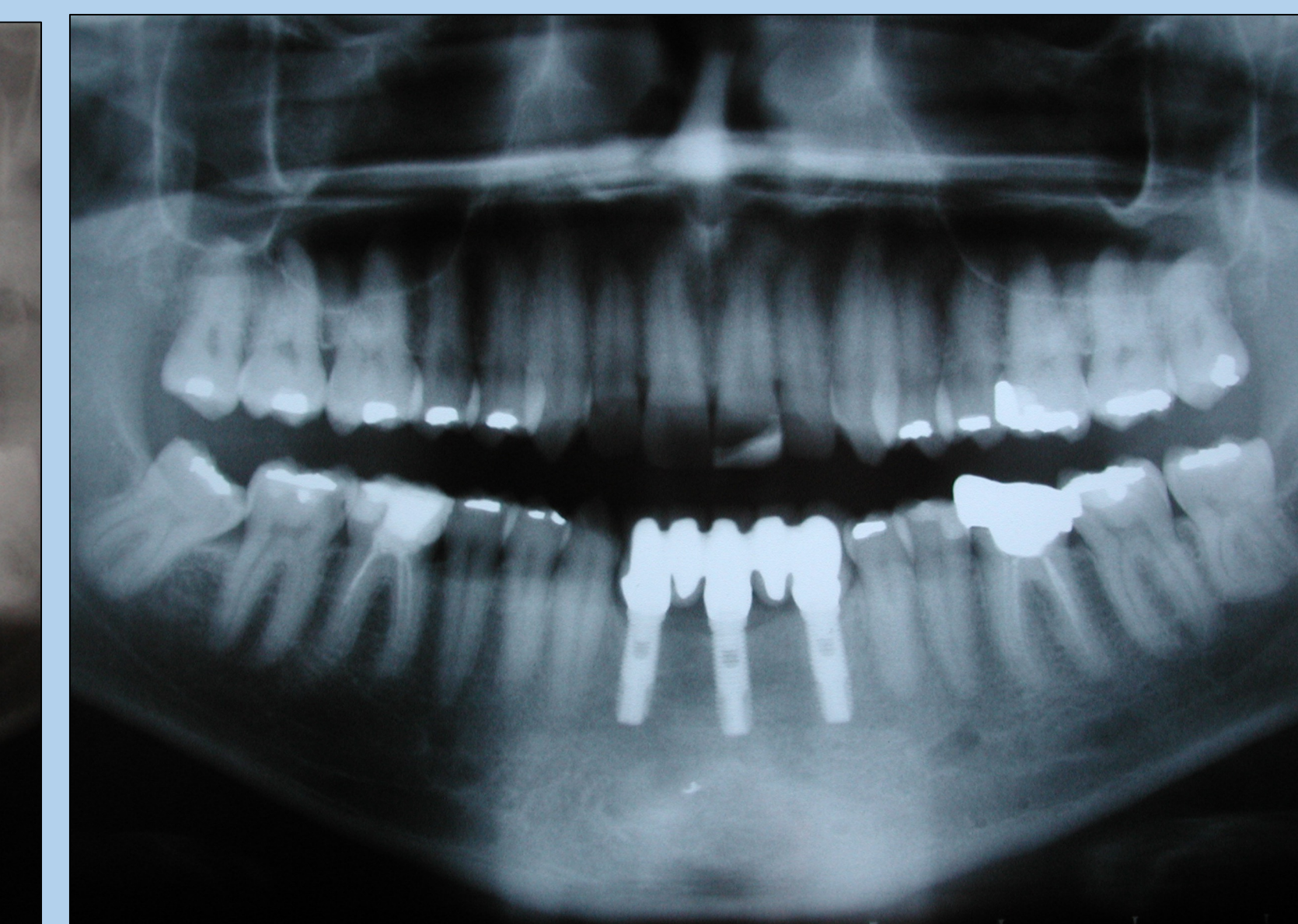


Fig. f – Final panoramic radiograph with final screw-retained FPD

I- Screw removal



Fig. 1 - Iliac crest onlay graft and miniplates removal surgery

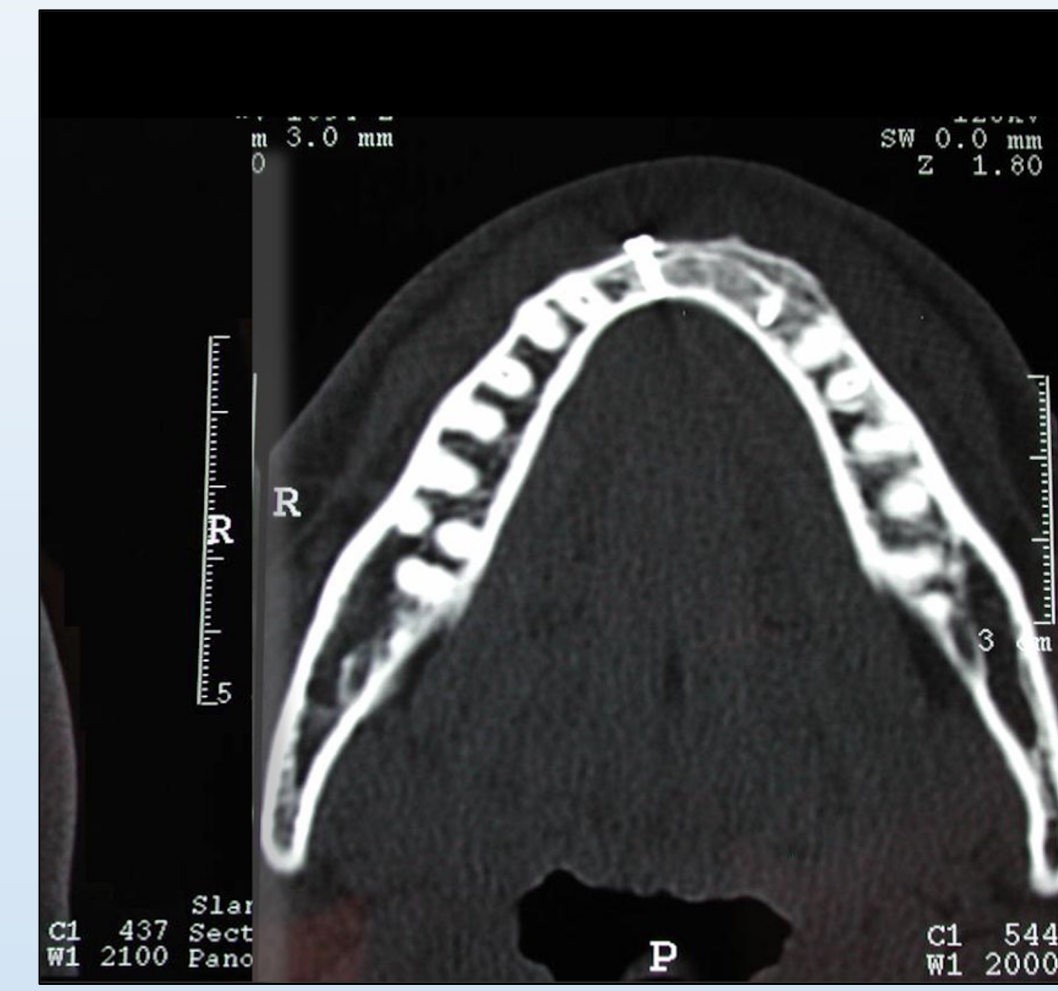


Fig. 2 - CT scan image of the graft before screws removal.



Fig. 3 - Two screws and a piece of plastic material remaining from the accident were removed.

II- Pre-op after 3 months of screws removal



Fig. 4 - Severe bone loss showing a U-shaped alveolar ridge (Siebert Class III).

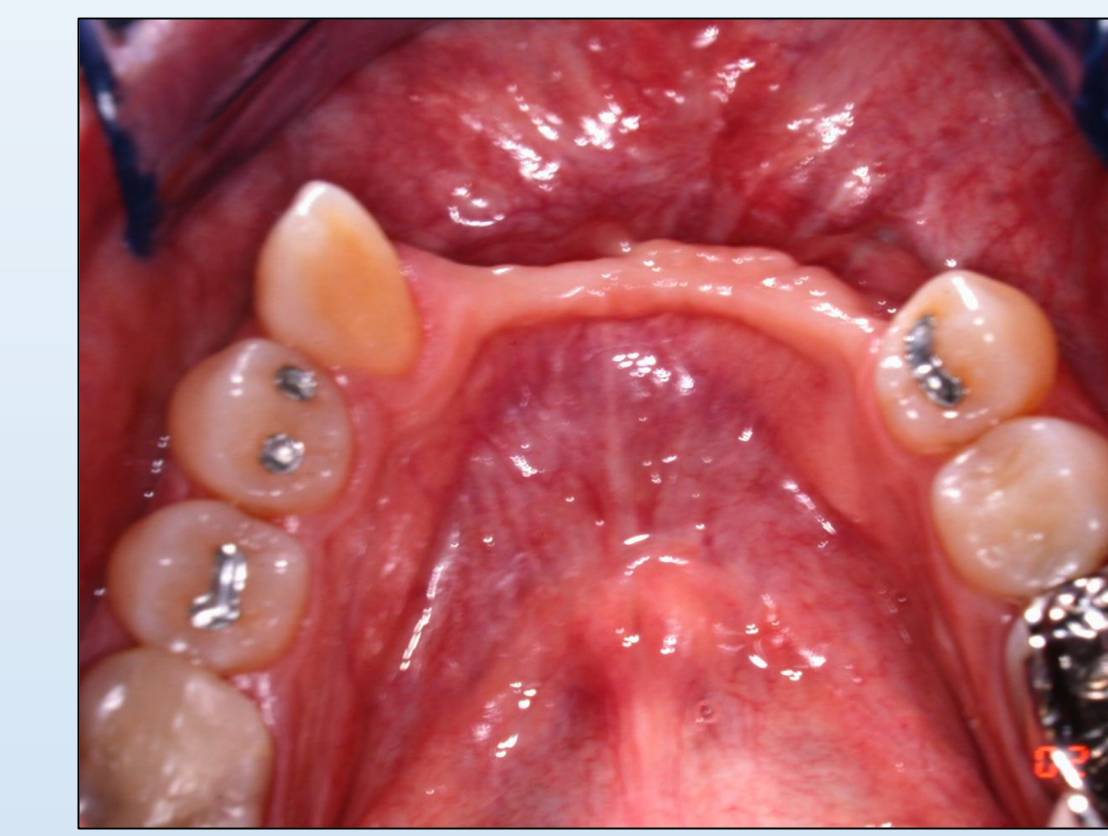


Fig. 5 - Occlusal view of bone defect with lost of arch contour.



Fig. 6 - Interim partial denture.

III-Distractor placement surgery (phase 1)

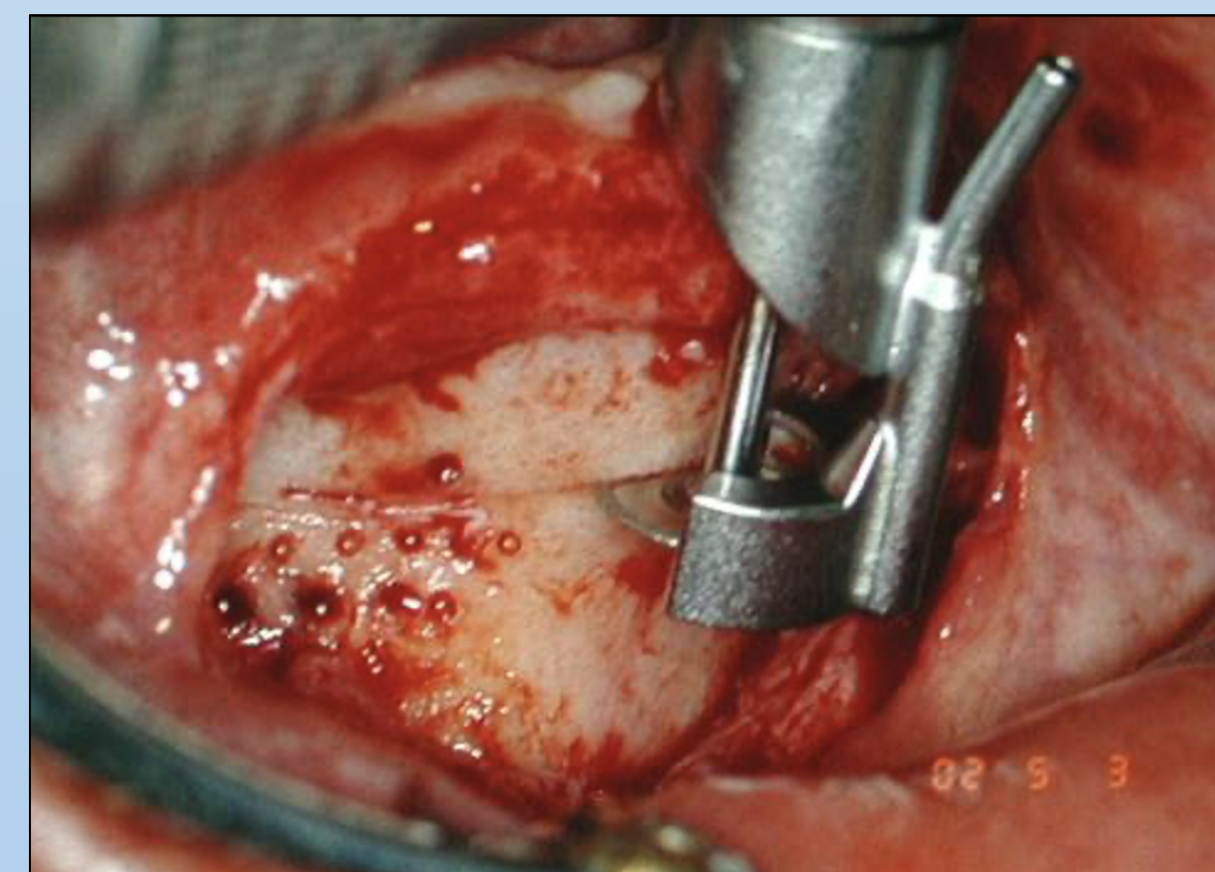


Fig. 7 - After distractor customization, a facial corticotomy was performed with a diamond disc.

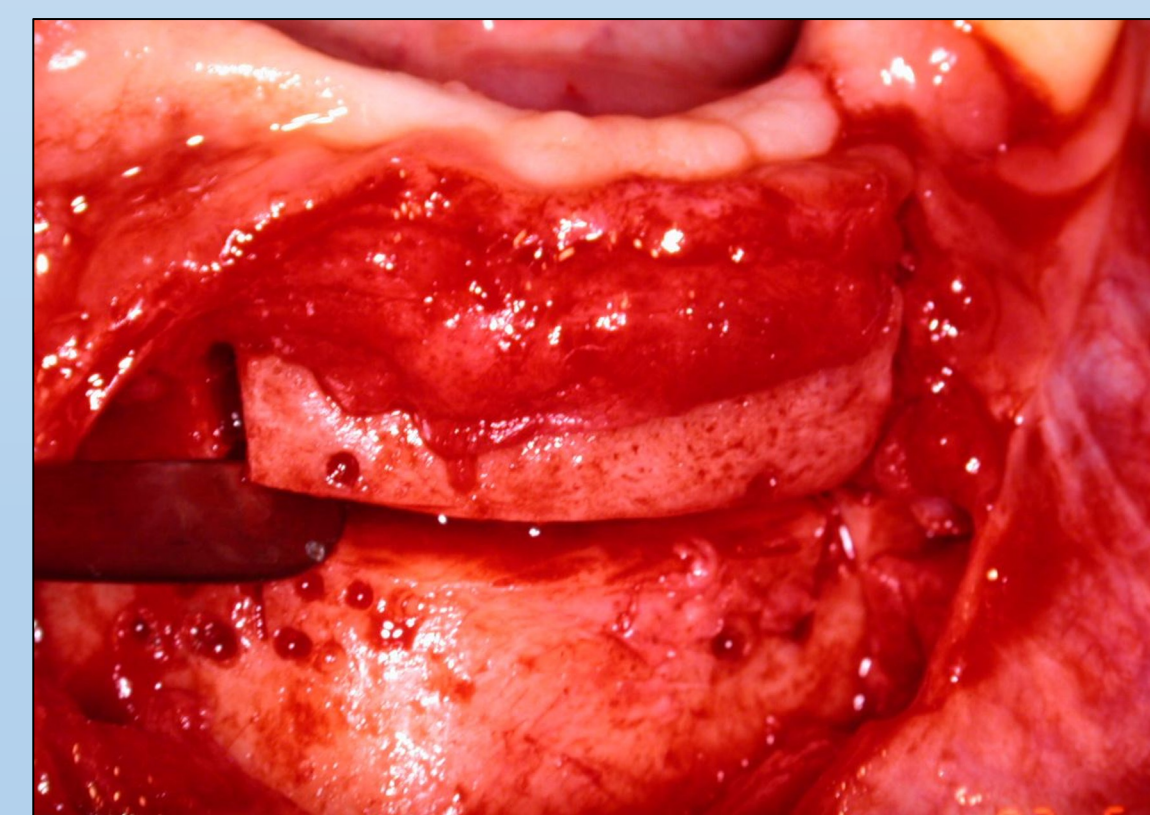


Fig. 8 - Surgical chisels were used for lingual and cancellous bone osteotomy.

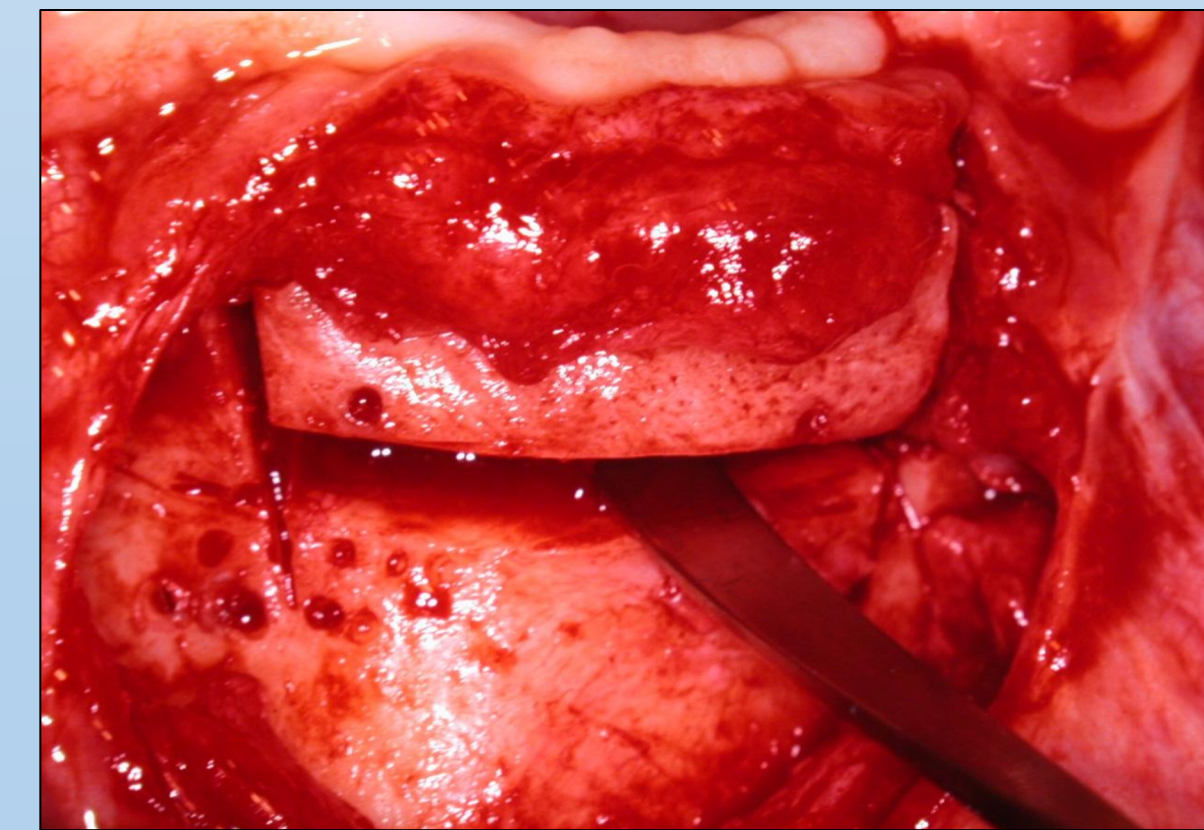


Fig. 9 - Bone segment mobility to confirm complete osteotomy.

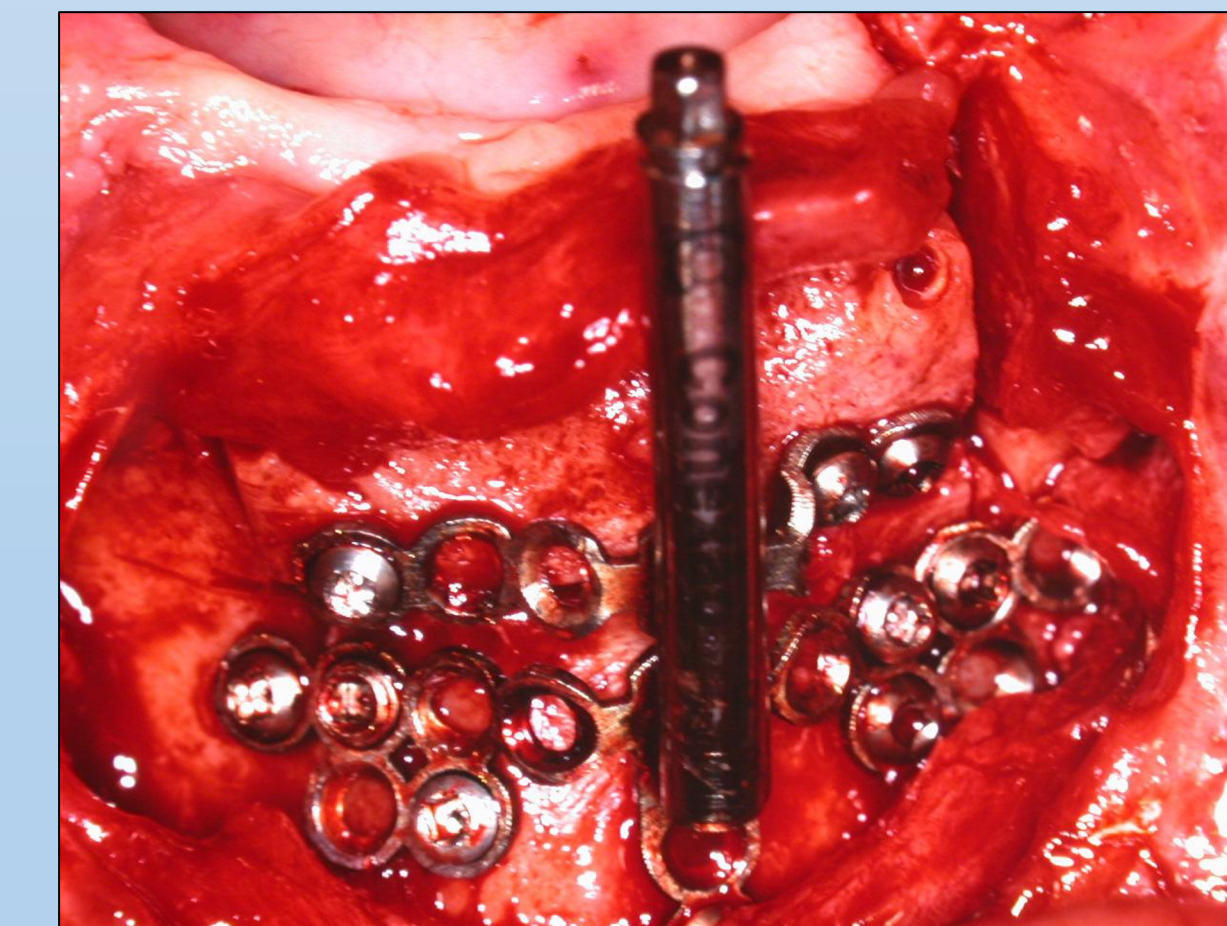


Fig. 10 - Distractor was screwed on mandibula facial surface.

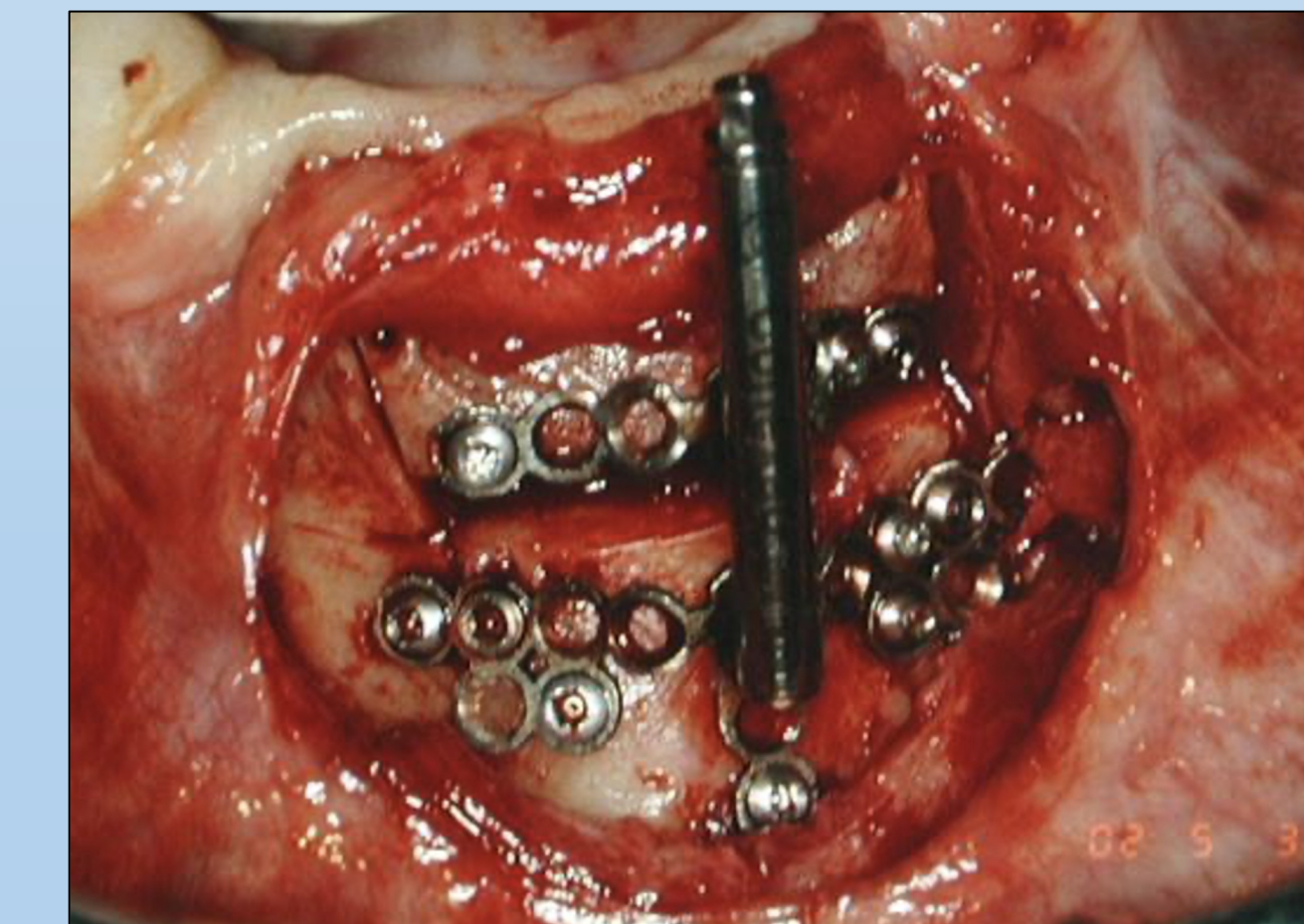


Fig. 11 - Direction of the central distractor screw and stability check. No interference was detected.

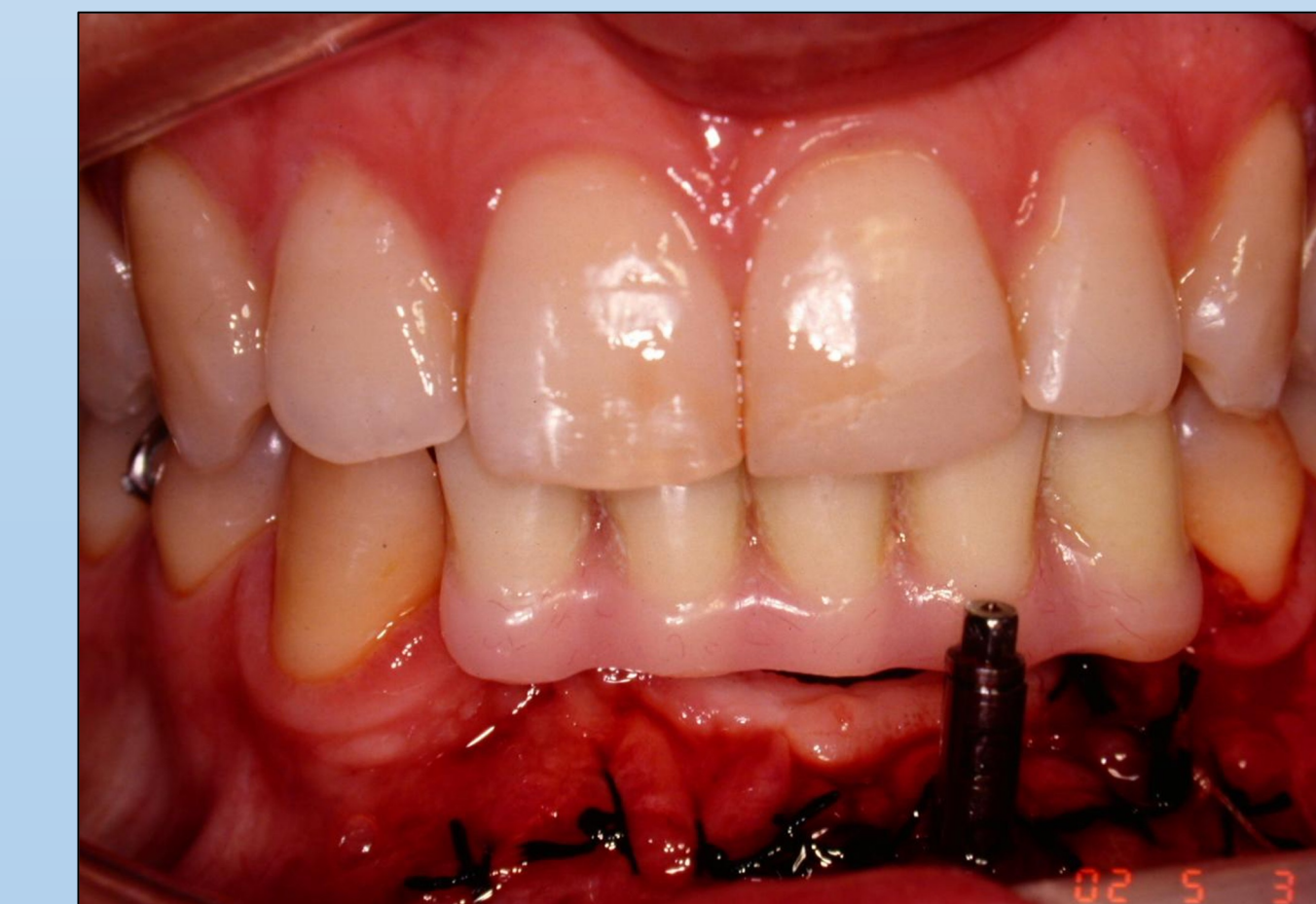


Fig. 12 - Internal relief of the partial for no tissue trauma for the latency period.

IV- 7 days latency period (phase 2), suture removal, distraction period (phase 3) and beginning of consolidation period (phase 4)



Fig. 13 - Facial view after a 7 days latency period.



Fig. 14 - Suture removal and beginning of distraction period.

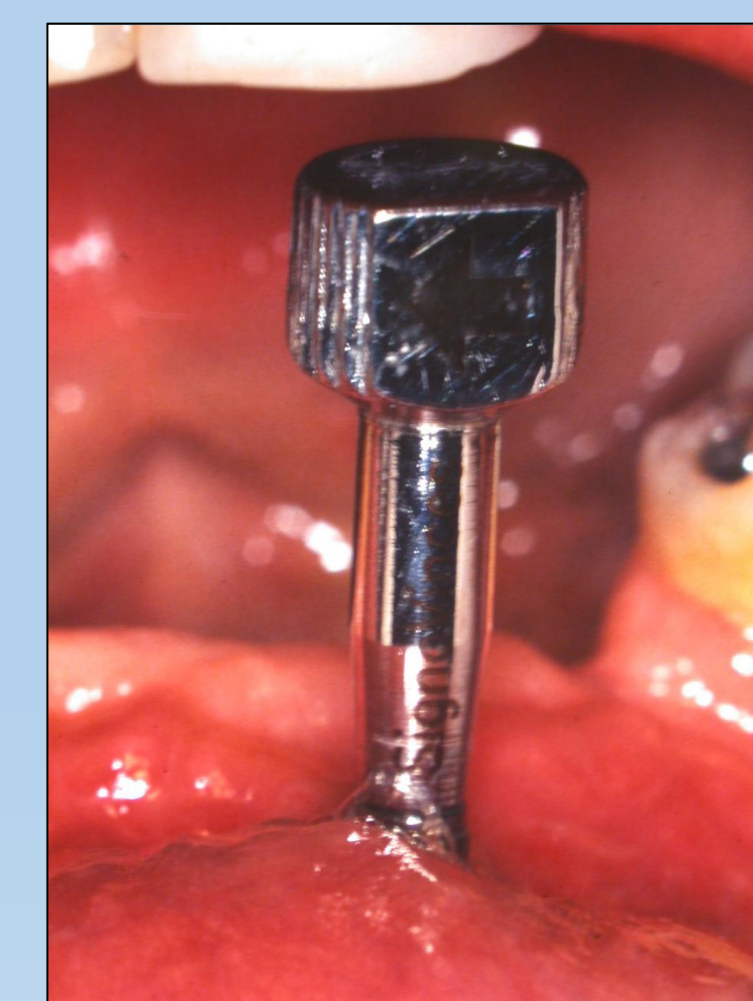


Fig. 15 - Torque screwdriver for daily 1mm distractor activation (3 turns).



Fig. 16 - Distraction period ended after 9 days of activation.



Fig. 17 - Additional internal relief of the partial at the end of distraction period.

V- Consolidation period (phase 4)



Fig. 18 - Facial view after 90 days of consolidation period showing a new alveolar ridge topography. with flat anatomy.

VI a - Distractor removal (phase 5) and implant placement surgery after phase 4

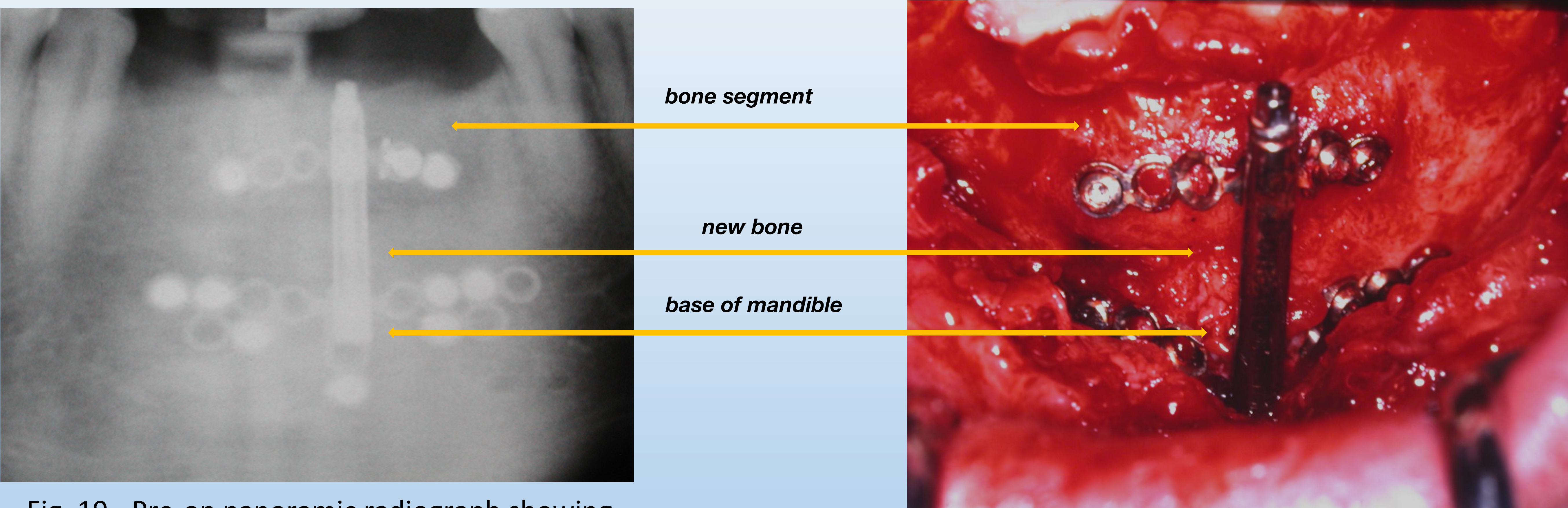


Fig. 19 - Pre-op panoramic radiograph showing the hard tissue gain. A CBCT was taken for implant selection.

Fig. 20 - Alveolar distraction osteogenesis outcome with 7mm of ridge height gain

VI b - Distractor removal (phase 5) and implant placement surgery after phase 4

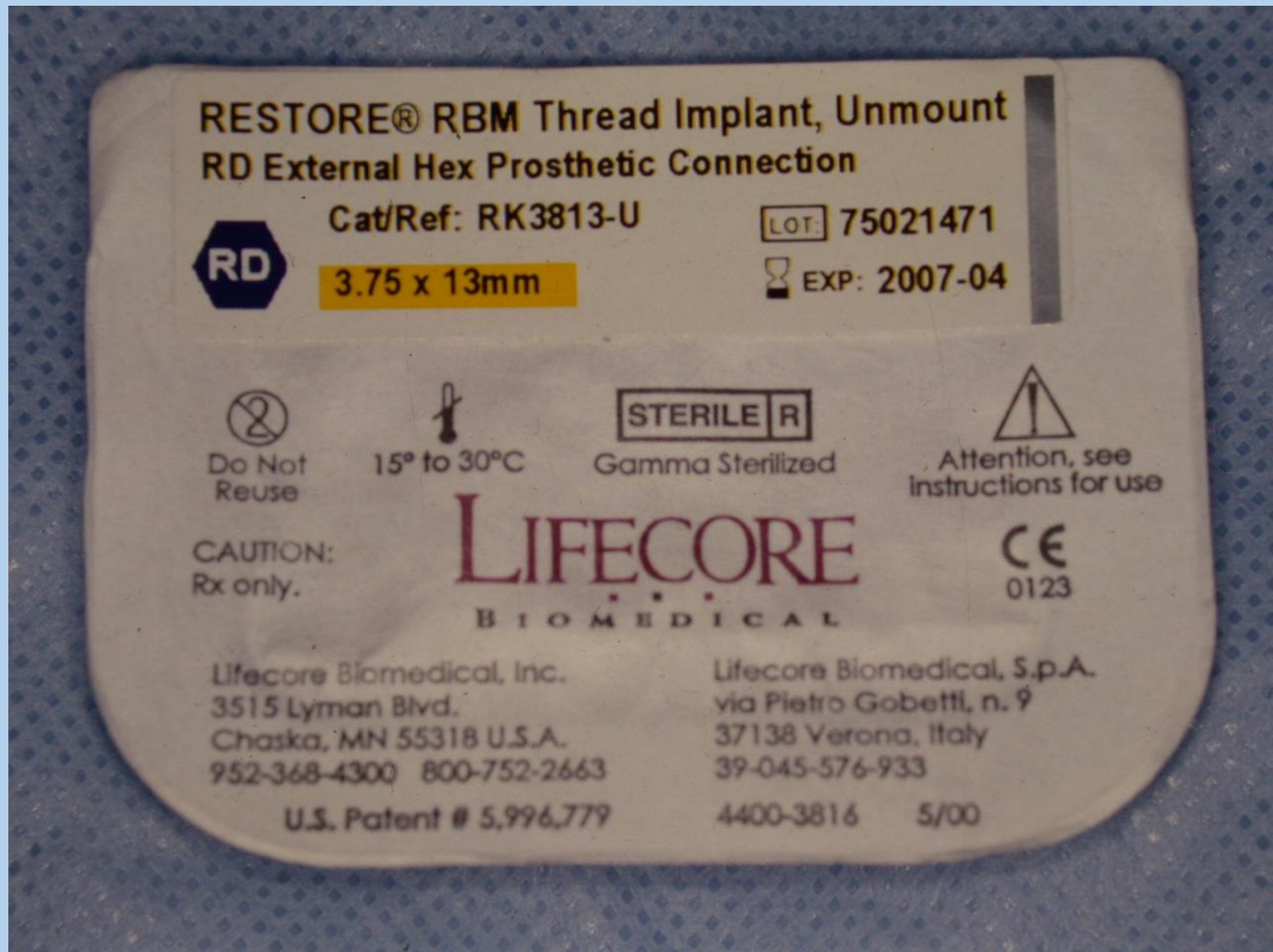


Fig. 21 - Three 3,75 X 15mm fixtures were installed at #22, #24, #26 sites.

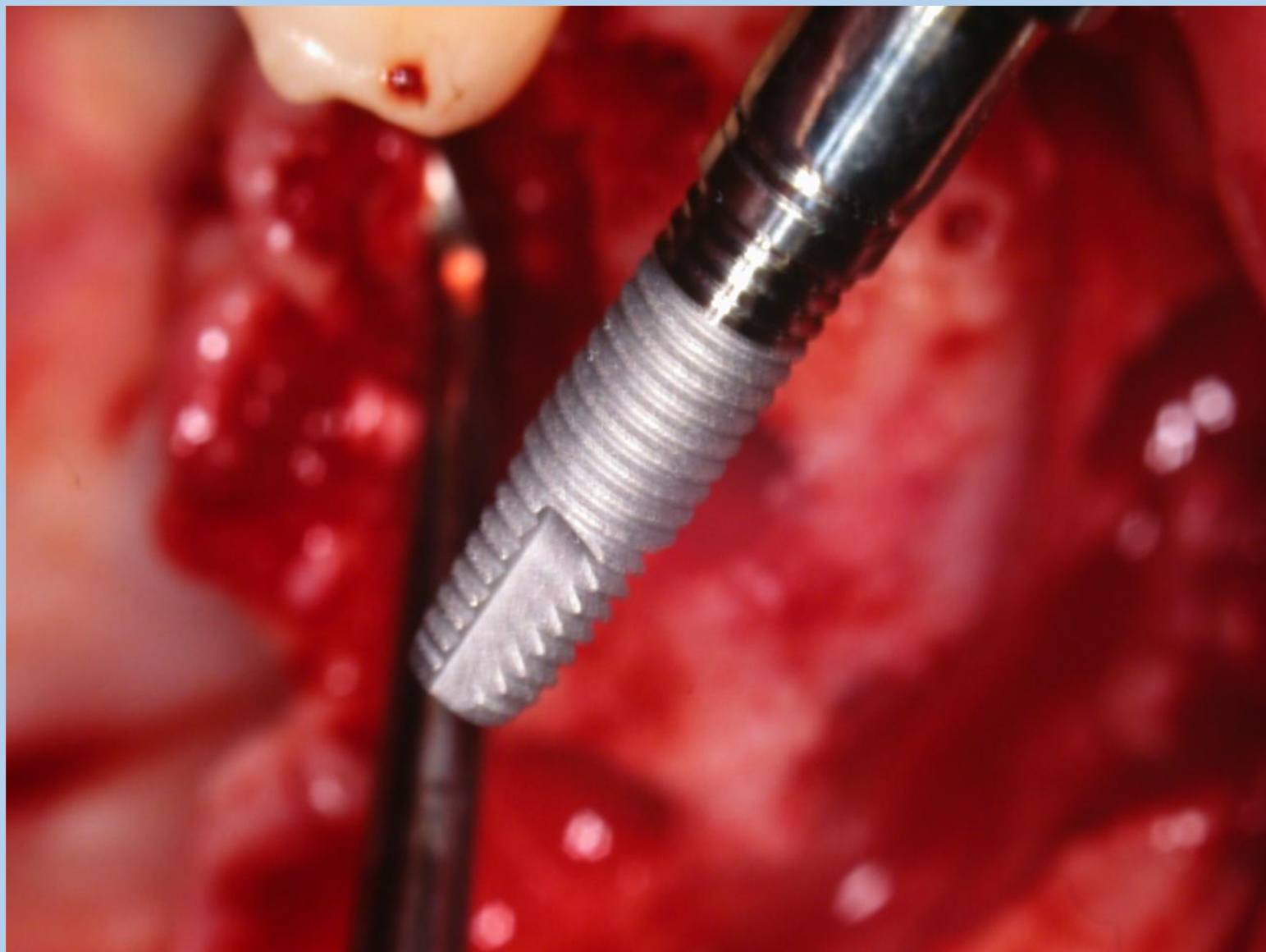


Fig. 22 - Detail of RBM surface implant placed with the help of a surgical guide.



Fig. 23 - Implants placed with implant mount to check parallelism.

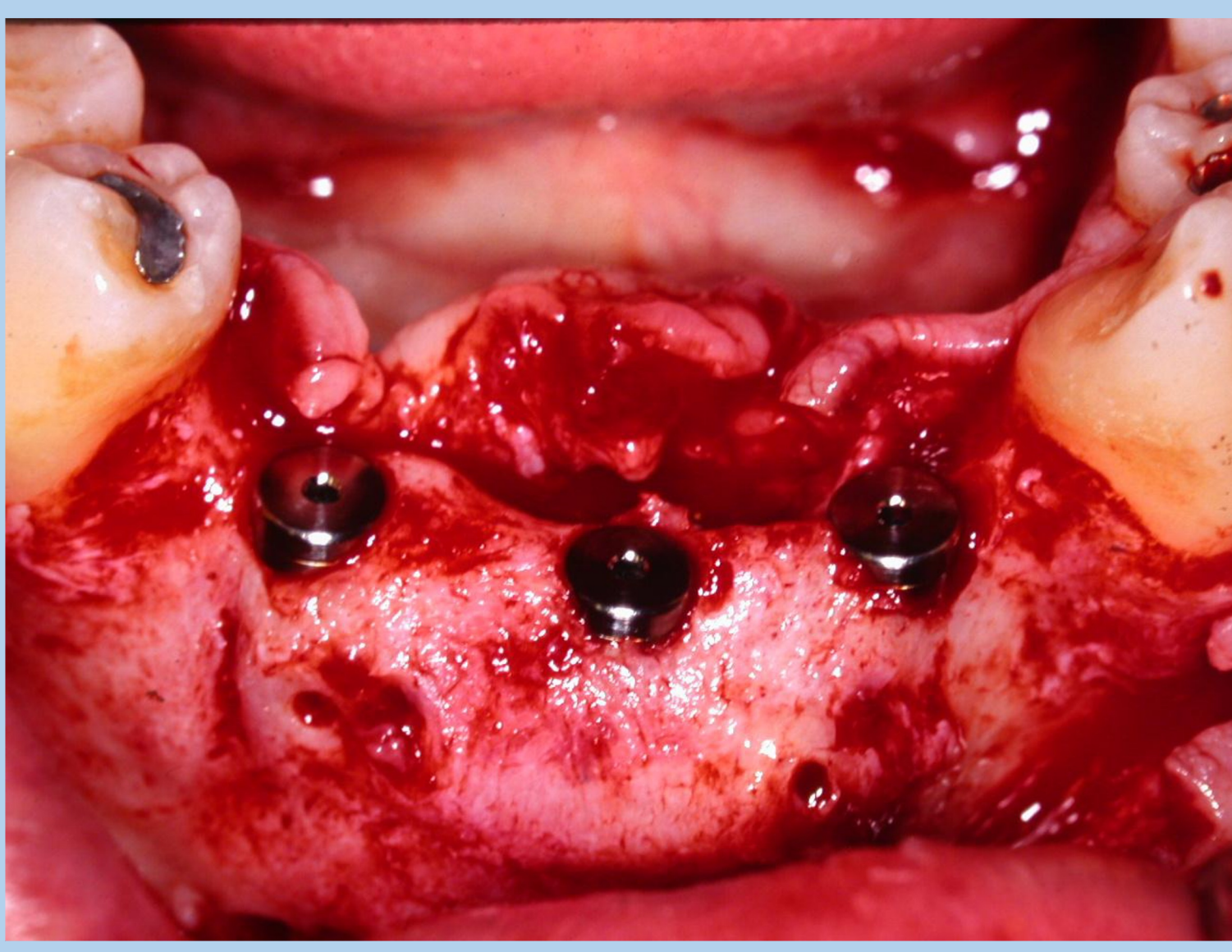


Fig. 24 - Cover screws prior to suture

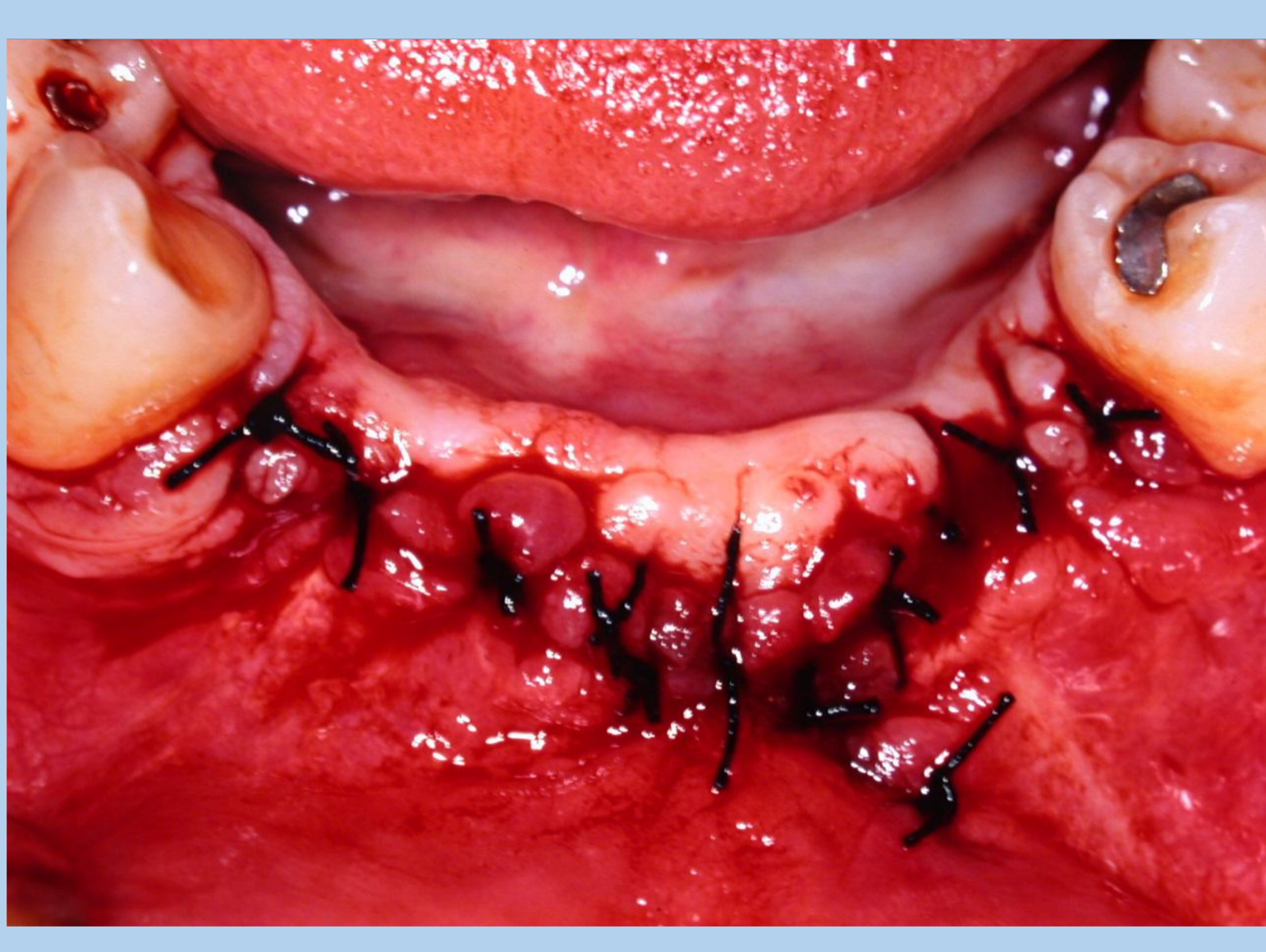


Fig. 25 - Modified incision for distractor removal and implant placement was sutured

VII- Prosthetic procedures

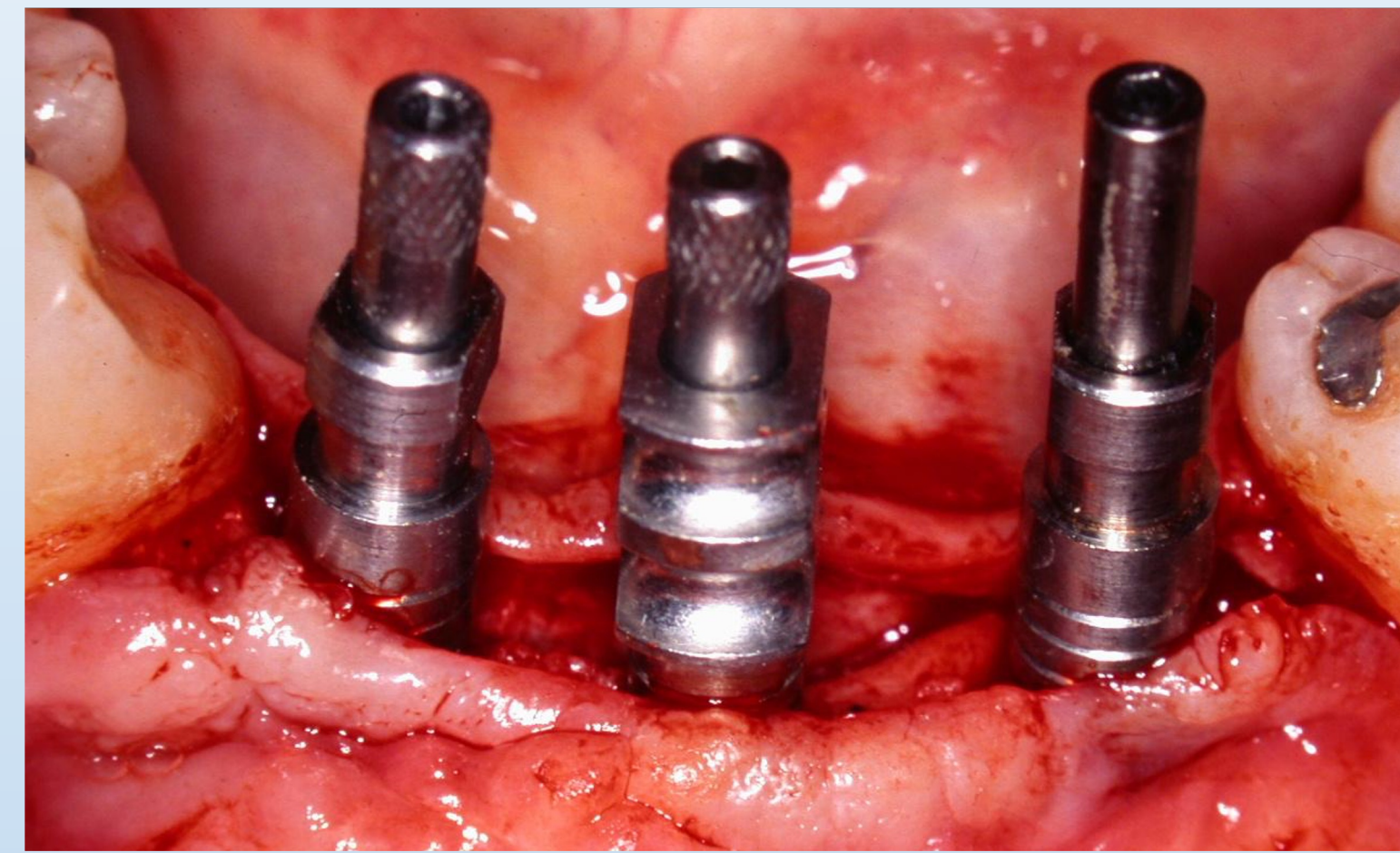


Fig. 26 - Open tray impression was taken during the second stage surgery.



Fig. 27 - Screwed temporary FPD was installed for soft tissue conditioning.

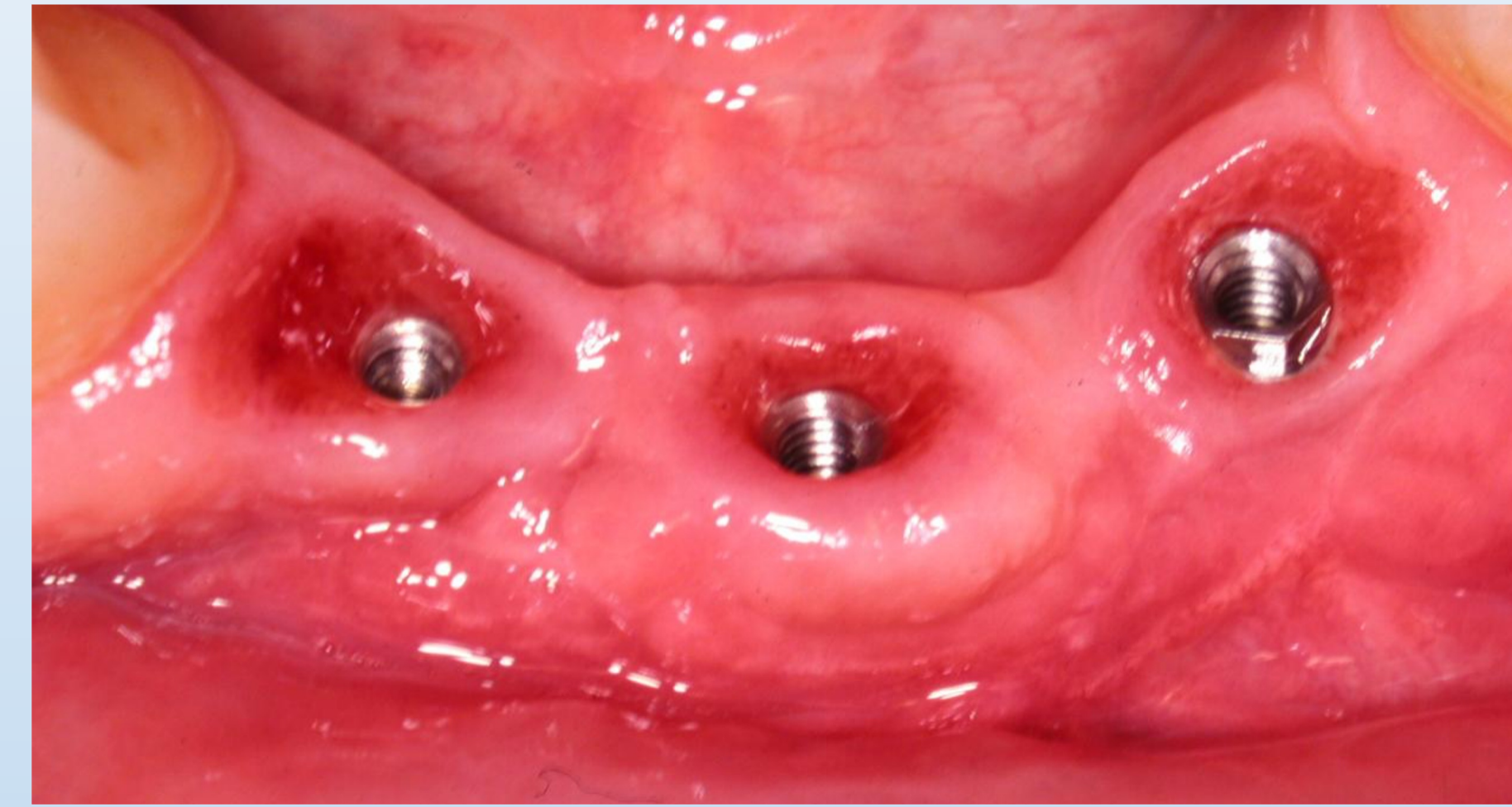


Fig.28 - Emergency profile after soft tissue conditioning.



Fig.29 - Metal framework on the cast for try-in.



Fig. 30 - Metal framework try-in and bite registration.

VIII- Final prosthesis delivery



Fig. 31 - Occlusal view of the FPD.



Fig. 32 - Intraoral try-in and contact points check.

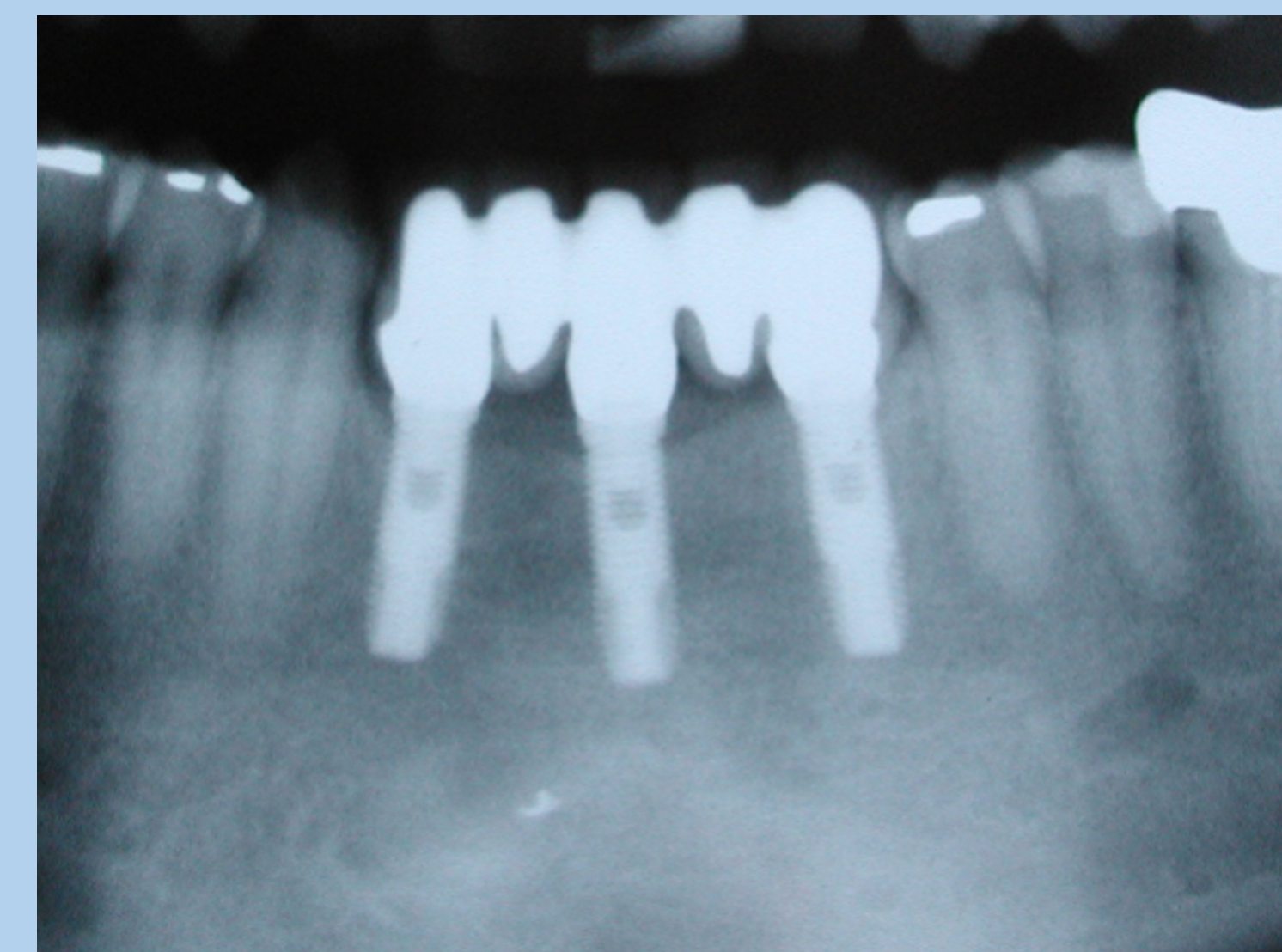


Fig. 33 - Final radiograph for platform seat check.



Fig. 34 - Screw retained PFM FPD buccal view.



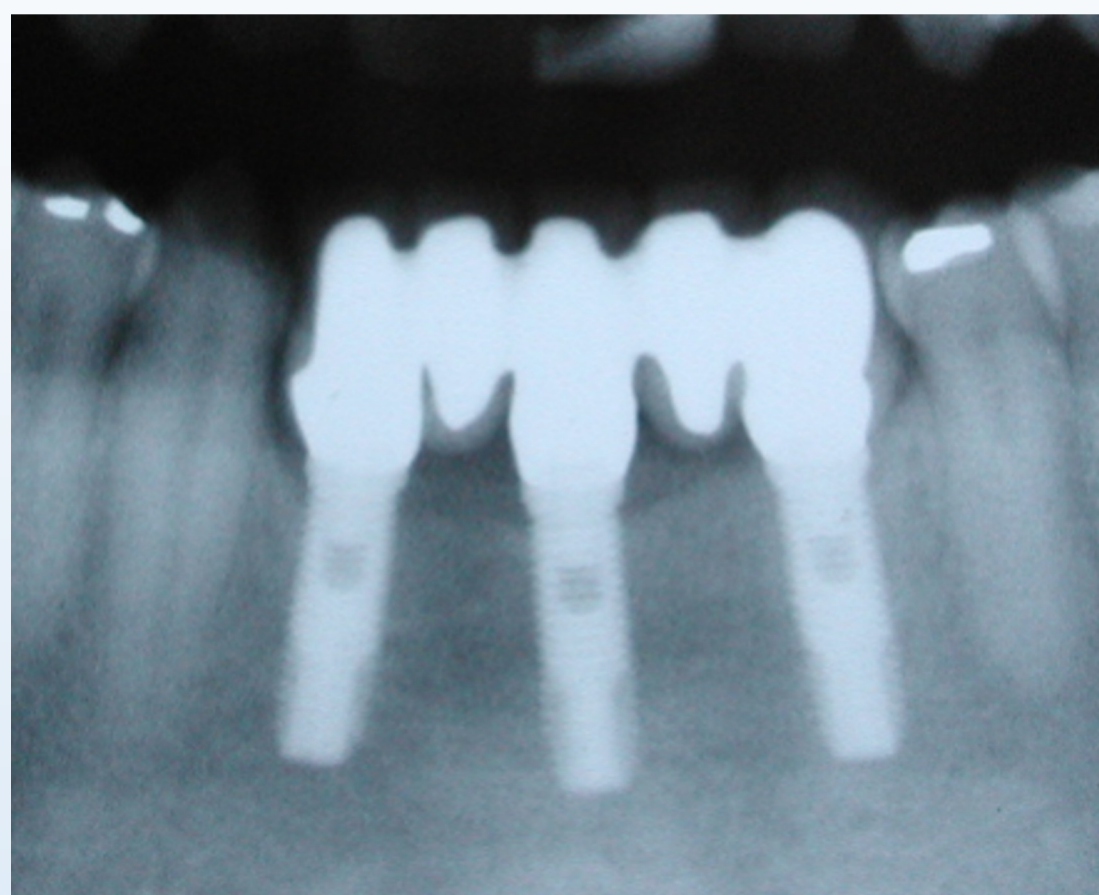
Fig. 35 - Patient smile after FPD delivery.

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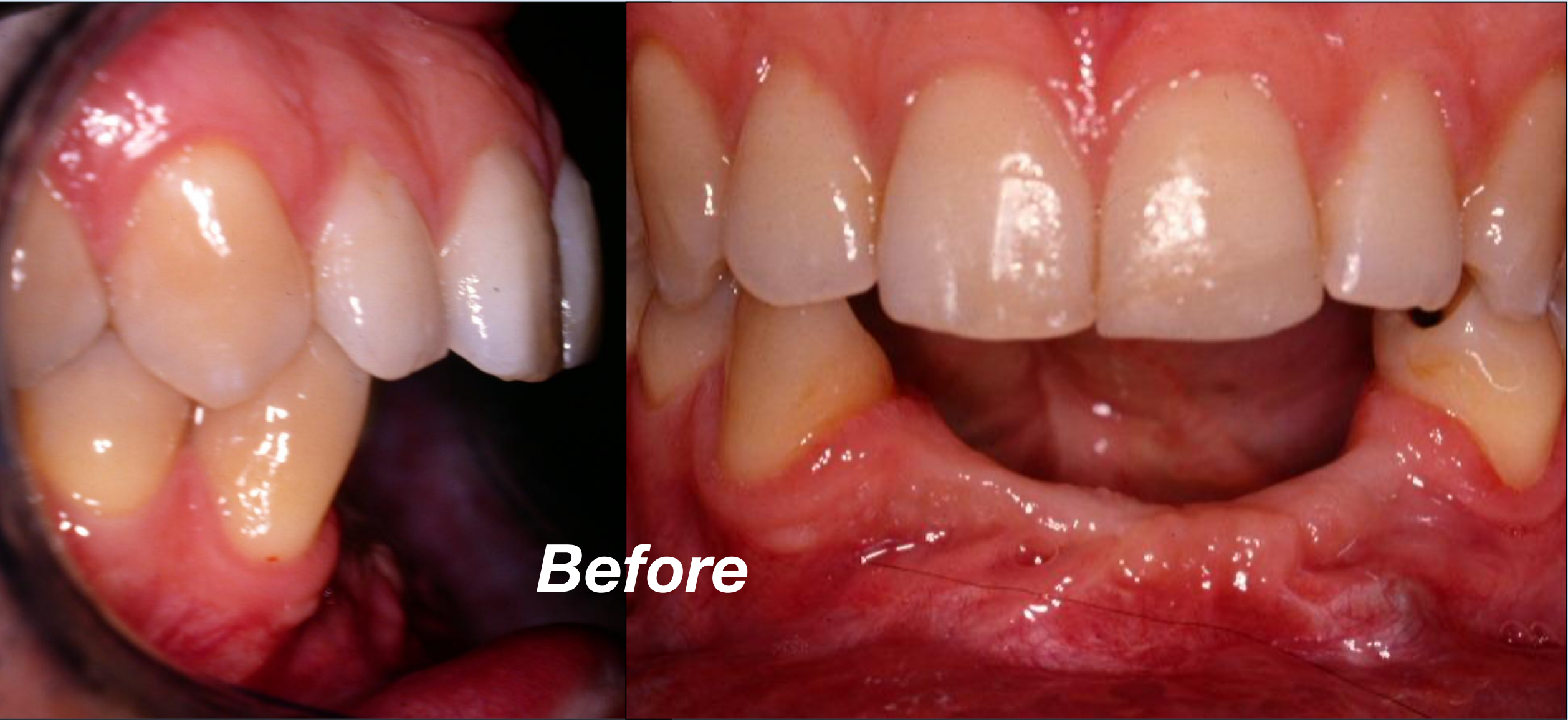
After Hard Tissue Loss Due To A Car Accident: A Case Report

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IX- Results



X- Conclusion

Alveolar distraction osteogenesis is not the first option for bone augmentation. However, it may be effective in areas were GTR or onlay bone graft are not enough for a predictable implant treatment. It is a complex surgical procedure involving risks like infection, bone resorption, exposed plates, edema and pain. This case report illustrates that it can produce good results in some specific alveolar bone conditions when the fundamentals and principles ¹⁴, ¹⁵, ¹⁶ are followed with patient compliance. These principles include: thin corticotomy using diamond discs and thin chisels for maximum preservation of periosteum and endosteum, 1mm daily distractor activation during distraction period and distractor stability. The implants were placed in an optimal position due to the formation of a new ridge anatomy that contributed for a fixed rehabilitation without pink porcelain, which was the patient chief complaint.

XI- Bibliography

1. BELL, W. H., HARPER, R. P., GONZALES, M., CHERKASHIN, M. L., SAMCHUKOV Distraction Osteogenesis to Widen the Mandible British Journal of Oral Maxillofacial Surgery v.35, n.1, p.11-19, 1997.

2. BLOCK, M. S., BRISTER, G. D. Use of Distraction Osteogenesis for Maxillary Advancement: Preliminary Results Journal of Oral And MaxillofacialSurgery v.52, n.3, p.282-288, 1994.

3. BLOCK,M. S., CERVINI, D., CHANG, A., GOTTSEGEN,G. B. Anterior Maxillary Advancement using Tooth-Supported Distraction Osteogenesis Journal of OralMaxillofacial Surgery v.53, n.5, p.561-565, 1995.

4. BLOCK,M. S.,CHANG, A., CRAWFORD, C. Mandibular Alveolar Ridge Augmentation in the Dog Using Distraction Osteogenesis Journal of OralMaxillofacial Surgery v.54, n.3, p.309-314, 1996.

5. BLOCK, M. S., AKIN, R., CHANG, A., GOTTSEGEN, G. B.,GARDINER, D. Skeletal and Dental Movements After Anterior Maxillary Advancement Using Implant-Supported Distraction Osteogenesis in Dogs Journal of Oral Maxillofac. Surgery v.55, n.12, p.1433-1440, 1997.

6. BLOCK, M. S., ALMERICO, B.,CRAWFORD, C., GARDINER, D., CHANG, A. Bone Response to Functionig Implants in Dog Mandibular Alveolar Ridges Augmented with Distraction Osteogenesis The International Journal of Oral & Maxillofacial Implants v.13, n.3, 1998.

7. CHIN, M. Alveolar Distraction Osteogenesis internet1 Web site: HTTP://www.distraction.net Abril, 1999.

8. CHIN, M. Alveolar Distraction Osteogenesis internet2 Web site: HTTP://www.distraction.net Abril, 1999.

9. CHIN, M., TOTH, B. A. Distraction Osteogenesis in Maxillofacial Surgery Using Internal Devices: Review of Five Cases Journal of Oral Maxillofacial Surgery v.54, n.1, p.45-54, 1996.

10. CODVILLA, A. On the Means of Lengthening in the Lower Limbs, the Muscles and Tissues With are Shortened Trough Deformite Am. J. Orthop. Surgery v.2, p.353-368, 1905, APUD SOARES, M. M. Alongamento do Ramo Ascendente de Mandíbula de Coelho por Dispositivo Interno de Distração Osteogênica Dissertação para Mestrado da Universidade Paulista p.1-79, 1998.

11. GONZALES, M. Lengthening the Mandible by Intraoral Distraction Osteogenesis: Histologic and Cephalometric Evaluation Journal of Oral & Maxillofacial Surgery v.55, n.8, p.96, 1997.

12. HARPER, R. P., BELL, W. H., HINTON, R. J., BROWNE, R., CHERKASHIN, A. M., SAMCHUKOV, M. L. Reactive Changes in the Temporomandibular Joint after Mandibular Midline Osteodistraction British Journal of Oral Maxillofacial Surgery v.35, n.1, p.20-25, 1997.

13. ILIZAROV, G. A. Decade of Experience in the Application of the Autor’s Apparatus for Compression Osteosynthesis in Traumatology and Orthopedics Problems of Rehabilitation Surgery, Traumatology and Orthopedics v.8, p.14-22, 1962.

14. ILIZAROV, G. A. Clinical Aplication of the Tension-Stress Effect for Limb Lengthening Cin. Orthop. v.250, n.1, p.8-26, 1990.

15. ILIZAROV, G. A. The Tension-Stress Effect on the Genesis and Growth of Tissues. Part I. The Influence of Stability of Fixation and Soft-Tissue Preservation Clin. Orthop. v.238, n.1, p.249-281, 1989.

16. ILIZAROV, G. A. The Tension-Stress Effect on the Genesis and Growth of Tissues. Part II. The Influence of Stability of Fixation and Soft-Tissue Preservation Clin. Orthop. v.239, n.2, p.263-285, 1989.

17. MAC CARTHY, J. G., SCHREIBER, J., KARP, N., THORNE, C. H., GRAYSON, B. H. Lengthening the Human Mandible by Gradual Distraction Plastic Reconstructive Surgery v.89, n.1, p.1-10, 1992.

18. MAC CARTHY, J. H., STAFFENBERG, D. A., WOOD, R. J., CUTTING, C. B., GRAYSON, B. H., THORNE, C. H. Introducing of na Intraoral Bone- Lengthening Device Plastic and Reconst. Surgery v.96, n.4 p.978-981, 1995.

19. MEYER, U., PIFFKO, J., SZULCZEWSKI, D. H., JONES, D. B., JOOS, U. Bone Cell Stretching as an In-Vitro Model for Distraction Osteogenesis Journal of Oral Maxillofacial Surgery v.26, n.1, Supplement, p.74, 1997.

20. MICHIELI, S., MIOTTI, B. Allungamento Graduale Contollato della mandibola Dopo Osteotomia Min. Stom. v.25, p.77-88, 1976.

21. ODA,T., SAWAKI, Y., OHKUBO, H., YAMAMOTO, H., MIZUTANI, H., UEDA, M. Segmental Mandibular Reconstruction by Distraction Osteogenesis Using Osseointegrated Implants and na Intraoral Device Journal of Oral and Maxillofacial Surgery v.26, n.1, Supplement, p.75, 1997.

22. ODA, T., SAWAKI, Y., UEDA, M. Alveolar Ridge Augmentation by Distraction Osteogenesis Using Titanium Implants: an Experimental Study International Journal of Oral and Maxillofacial Surgery v.2, n.28, p.151-156, 1999.

23. SAWAKI, Y., OHKUBO, H., HIBI, H., UEDA, M. Mandibular Lengthenig by Distraction Osteogenesis Using Osseointegrated Implants and an Intraoral Device: A Preliminary Report Journal of Oral Maxillofacial Surgery v.54, n.5, p.594-600, 1996.

24. SAWAKI, Y., OHKUBO, H., YAMAMOTO, H., UEDA, M. Mandibular Lengthenig by Intraoral Distraction Using Osseointegrated Implants International Journal of Oral Maxillofacial Implants v.11, n.2 p.186-193, 1996.

25. SAWAKI, Y., HAGINO, H., OHKUBO, H., MIZUTANI, H., UEDA, M. The Fate of Developing Teeth in the Region of Distraction Osteogenesis Journal of Oral Maxillofacial Surgery v.26, n.1, p.74, 1997.

26. SCHMELZEISEN, R., NEUMANN, G., FECHT, R. British Journal of Oral Maxillofacial Surgery v.34, n.5, p.375-378, 1996.

27. SNYDER, C. C., LEVINE, G. A., SWANSON, H. M., BROWNE, E. Z. Mandibular Lengthening by Gradual Distraction Plastic and Reconst. Surgery v.51, n.3, p.506-508, 1973.

28. SOARES, M. M. Alongamento do Ramo Ascendente de Mandíbula de Coelho por Dispositivo Interno de Distração Osteogênica Dissertação para Mestrado da Universidade Paulista p.1-79, 1998.

29. SOARES, M. M. Mandibular Augmentation Using Osteodistraction Journal of Oral Maxillofacial Surgery v.26, n.1, Supplement, p.75, 1997.

30. SOARES, M. M., BAUER, J. A., INTERLANDI, F., JORGE, W. A. Increase of the Mandibular Alveolar Ridge with Internal Osteogenic Distraction Device Journal of Oral Maxillofacial Surgery v.26, n.1, Supplement, 1997.

31. STUCKI-McCORMICK, S. U., MIZRAHI, R. D., FOX, R. M., ROMO, T. Distraction Osteogenesis of the Mandible Using a Submerged Intraoral Device: A Report of Three Cases Journal of Oral and Maxillofacial Surgery v.57, n.2, p.192- 198, 1999.

32. UEDA,M. Osteomorphus Control by Distraction Osteogênesis Using Osseointegrated Implants in Maxillofacial Region Journal of Oral Maxillofacial Surgery v.26, n.1, Supplement, p.13, 1997.

33. VAN STUIJEN,P. J., PERDIJK, F. B. T. Mandibular Advancement by Means of Intra-oral Distraction Journal of Oral and Maxillofacial Surgery v.26, n.1,

34. WALKER, D. Sagittal Ramus Osteotomy for Use in Intraoral Distraction Osteogenesis in Primates Journal of Oral & Maxillofacial Surgery v.55, n.8, p.95-96, 1997.

35. WANGERIN,K., GROPP,H. Multidimensional Intraoral Distraction Osteogenesis of the Mandible – 4 Years of Clinical Experience Journal of Oral Maxillofacial Surgery v.26, n.1, Supplement, p.14, 1997 .