Treatment Planning Steps in Oral Implantology

A Color Atlas

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Foreword

Since the term osseointegration was first coined over 50 years ago by Professor Branemark, Implant Dentistry has advanced by leaps and bounds and even more so in the past two decades.

We have seen a vast increase in scientific knowledge about biological and biomechanical factors relating to the success or failure of implant therapies.

Over the years, significant advances in the evolution of Bone Grafting, Guided Bone Regeneration (GBR) and Sinus Augmentation techniques have changed the face of contemporary tooth replacement dentistry.

This book nicely demonstrates this journey through the eyes of many regarded clinicians featuring most aspects of implant therapeutics with clear illustrations of various clinical situations showcasing the most modern biomaterials, instruments, and implant systems used in implant dentistry today.

It is my pleasure to have participated in this journey with my dear friend, Dr Lanka Mahesh. I have known him to be one of the finest gentlemen and most dedicated clinicians and implantologists I have had the pleasure to interact with. I wish him and all the contributing clinicians good luck with this effort in bringing out this well designed Color Atlas of Oral Implantology which should be enjoyed by all clinicians interested in modern implant dentistry.

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Foreword

I have had the privilege to write forewords for many books on different subjects but this one is special to me, as it is for my son. It gives me immense pleasure in writing this foreword on the Color Atlas of Oral Implantology, authored by Dr Lanka Mahesh, Dr Praful Bali, Dr Craig M Misch and Dr David Morales Schwarz. This publication covers almost all aspects of advanced Implantology, beautifully photographed and illustrated with each and every procedure simplified. I congratulate the authors and all the contributors, who have looked into each and every minor details of each case presented.

I am confident that this Atlas will be of immense help, for both budding and practicing implantologists, as they can appreciate specialized cases of different genre compiled in one time.

The photographs of this Color Atlas show that the authors are thorough clinicians and have put in a lot of hardwork, skill, experience of many many years and time to achieve such good clinical results. I congratulate them for bringing out this unique collection of their clinical work which is surely an educational resource and valuable publication.

RK Bali
Padmashree Awardee
Dr BC Roy National Awardee

Preface

"If the doors of perception were cleansed, everything would appear to man as it is, infinite."
—William Blake, The marriage of Heaven and Hell, 1793.

The information technology boom has seen the coming of age of Dentistry in general and Implant Dentistry in particular. While the burgeoning growth of social media has meant that a new type of learning, known as crowd learning has emerged, it has also meant that the control over the information transfer has been lost, and along with the good information, there is a whole lot of misinformation, anecdotal information which is contrary to the principles of evidence based dentistry as practiced today. It was this that led us, a group of conscientious clinicians from around the globe, to come together and collectively publish this *Treatment Planning Steps in Oral Implantology: A Color Atlas* with the aim of showcasing the spectrum of procedures which have shown predictable outcomes in the hands of innumerable clinicians. This is a book aimed at clinicians who are already in the practice of Implant Dentistry, to enable them to stay abreast with the latest in surgical and restorative protocols, as well as a must read for the students of Implant Dentistry, to understand the scope of the science, from procedures for developing optimal aesthetics, to managing deficient bone in the posterior maxilla and mandible, to various fixed and removable prosthetic options for full arch reconstructions and bone regeneration techniques and finally, a section on complications and their management.
Here's wishing you an enjoyable and informative reading.

Lanka Mahesh
Praful Bali

Acknowledgments

Sana and Saisha my little girls for keeping me going in this chaotic world and making life worth living.

The toughest part in writing a book is probably the acknowledgment, apart from getting a great publisher and recruiting some of the world's best known clinicians and researchers.

When there are so many people to thank one is sure to forget a name. Therefore, I would like to acknowledge the thousands of patients who reposed their faith in me, all my contributing authors, team of Jaypee Brothers Medical Publishers, New Delhi, India especially Ms Chetna Malhotra Vohra (Associate Director–Content Strategy) and Ms Nedup Bhutia (Development Editor) for their untiring effort and tolerating me when I kept breathing down their neck at all given times, thank you for tolerating me.

To my father who made me what I am and taught me life more than medicine and who taught me it is better to have a helping hand than a praying hand. I hope I have lived upto his expectations.

My teachers, colleagues and all the good human beings I interact with daily who help me keep the faith.

My special thanks to Mr Nayak for giving me most of his waking hours over the last twenty years and having helped me in hundreds of surgeries all over the country, I can never thank you enough. Mr Suresh Kumar for all his help with the photography and everything else he does for me.

To the Almighty for His constant blessings.

And to “someone somewhere” who's watching over me.

Lanka Mahesh

Acknowledgments

I share my happiness and excitement in making of this Color Atlas of Oral Implantology. This book had been a challenging job and an eye-opener for me. I bow down to all the previous authors who have taken out books, which we as budding implantologists read through. Each page, every picture, every thought that has gone into the book has taken shape very well and I am overjoyed and satisfied with the end result.

Words cannot express my love and gratitude for my parents because of whom I am what I am today. They have been the source of encouragement and support throughout my career by helping me at each stage. My father, Dr RK Bali being one of the eminent dental surgeons in the country has been one of the earliest dentists to start implantology in India and he has shared and taught me implantology at many stages during my initial days. I cannot thank enough my wife, Dr Dildeep Bali, who stood by me in tough times and had been a source of encouragement to complete this book.

My respect and gratitude to my mentor and guide, Prof Dr N Sridhar Shetty, who awakened the interest for implants during my postgraduation period.

The Basic Implantology training that I did in Manipal has been a stepping stone and has gone a long way in my overall grooming as a successful Implantologist and Dr Rudd Hertel was instrumental in the whole process.

I express my sincere thanks Dr Shahvir Nooryezdan for constant support and encouragement.

I also express my gratitude to Dr Sascha Jovanovic, Dr Egon Ewue and Dr Istvan Urban. The Masters Clinical Program, conducted by them has helped me improve my skills as an esthetic implant specialist tremendously and I consider their work a bench mark, a true inspiration for me.

I thank Dr Ruhani Cheema, Dr Radhika Chawla and Ms Jaspreet Oberoi for helping me with the book.

Lastly, my sincere thanks to Dr Lanka Mahesh to have made me do this, he pushed me to complete the book.

Love to my sister, Dr Stutee Grewal and my children Ahan and Amaiyra.

Praful Bali

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SECTION 1

Anterior Esthetics

CASE STUDY 1

Praful Bali

Hard and Soft Tissue Augmentation to Achieve Optimal Anterior Esthetics. Tissue Engineering and Fine Tuning done with Set of Prototypes

Fig. 1

Preoperative—facial view—missing tooth no #11 (right upper central incisor) **(Fig. 1)**.

Fig. 2

Preoperative—occlusal view, note the facial dip indicating the deficiency of buccal bone. Still, there seems to be adequate bone to place a good size implant and do grafting in the same surgical visit **(Fig. 2)**.

Fig. 3

Full thickness flap reflection done exposing the site of osteotomy. Note the buccal plate deficiency **(Fig. 3)**.

Fig. 19

Preoperative intraoral view **(Fig. 19)**.

Fig. 20

Provisional crowns on tooth #11 and tooth #21 **(Fig. 20)**.

Fig. 21

Final restoration in place **(Fig. 21)**.

Fig. 23

Intraoral picture post cementation of the Veneer **(Fig. 23)**.

Fig. 24

Occlusal view **(Fig. 24)**.

Fig. 25

Smile. Postoperative with prosthesis in place **(Fig. 25)**.

Fig. 4

Maryland temporary prosthesis **(Fig. 4)**.

Fig. 5

After five months, 2nd stage done **(Fig. 5)**.

Fig. 6

Milled abutments for temporary prosthesis **(Fig. 6)**.

Fig. 7

Temporary prosthesis as received from lab **(Fig. 7)**.

Fig. 8

Temporary prosthesis modifications **(Fig. 8)**.

Fig. 9

Temporary prosthesis modifications **(Fig. 9)**.

Fig. 10

Temporary prosthesis on implants **(Fig. 10)**.

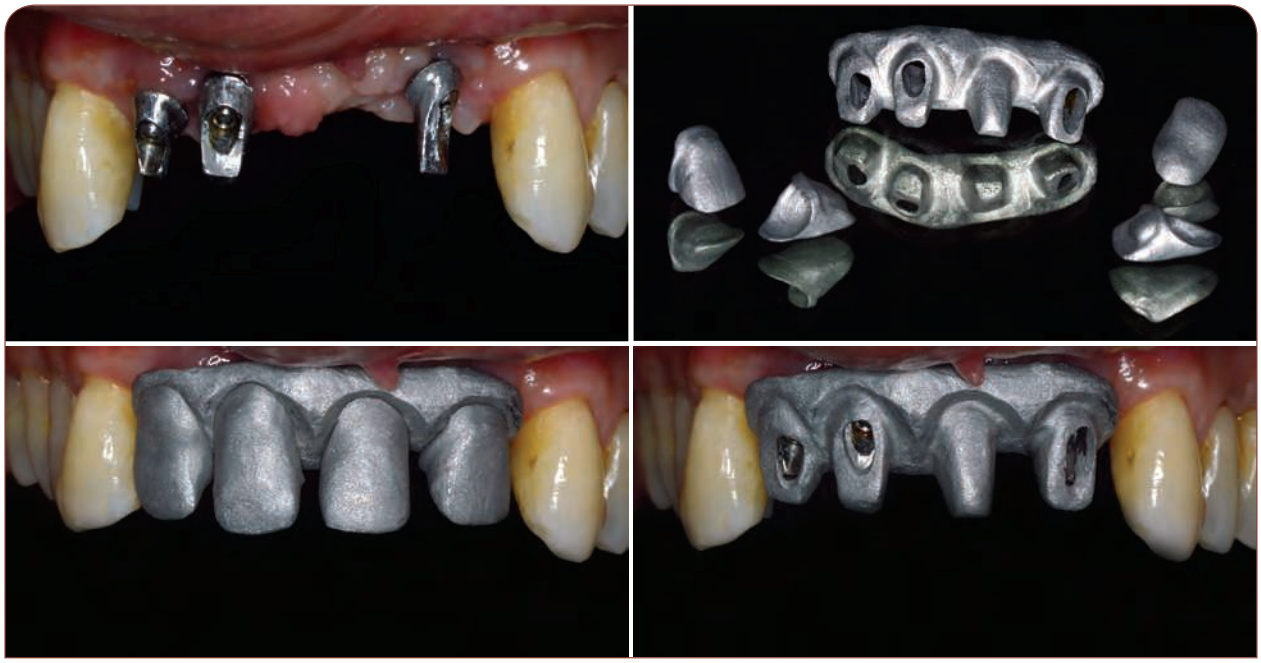

Fig. 11

Final prosthesis–coping trial, segmental procera Implant Bridge type **(Fig. 11)**.

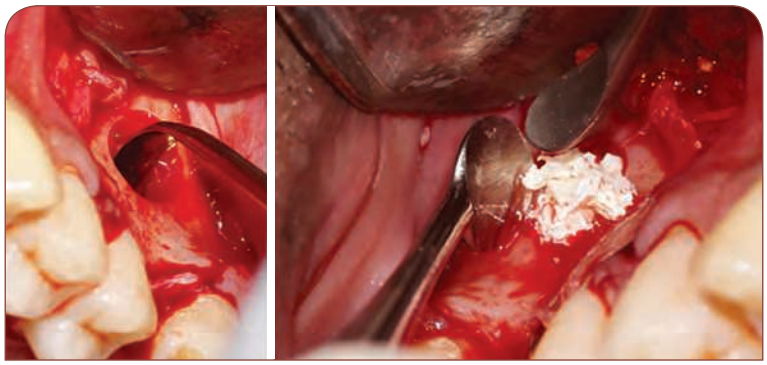

Fig. 4

A sinus curette (Osung), is introduced into the floor of the sinus and the sinus membrane is gently elevated. Bone substitute material is introduced into the sinus, cerabone (Botiss) **(Fig. 4)**.

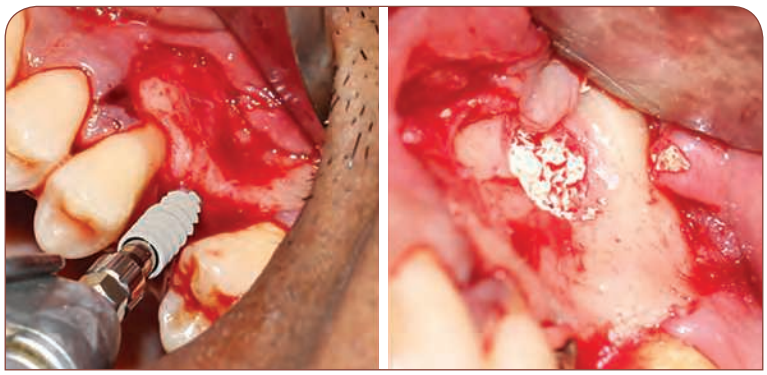

Fig. 5

A 4/11, 5 mm DM implant (Bioner) is placed at 40 ncm and more graft is placed over the lateral osteotomy to achieve a sandwich effect **(Fig. 5)**.

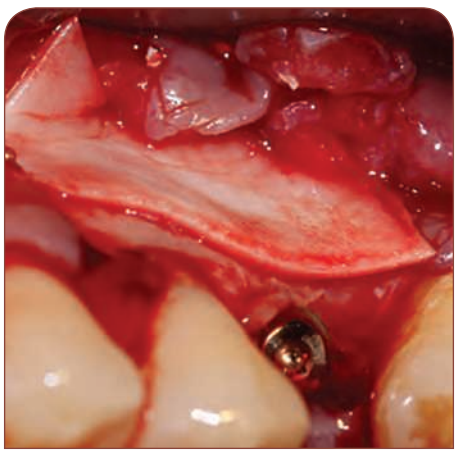

Fig. 6

The lateral window is covered with a resorbable collagen membrane (conform, ACE Surgicals) **(Fig. 6)**.

Fig. 7

Immediate postoperative X-ray demonstrates good bone fill of the sinus. The implant is placed parallel to 25 therefore allowing for sufficient restorative space **(Fig. 7)**.

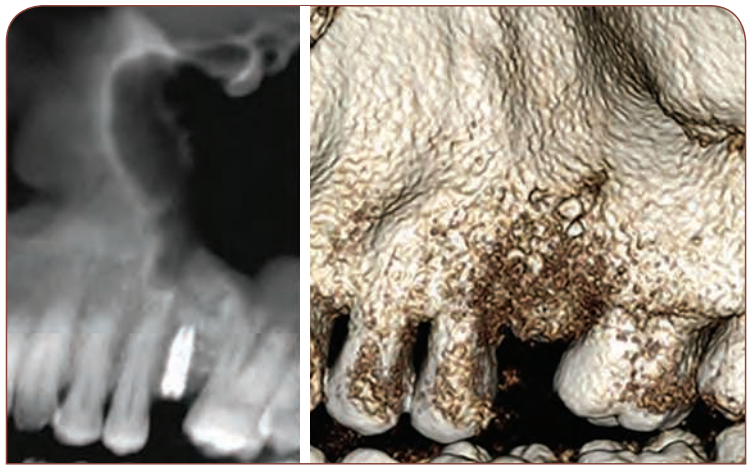

Fig. 8

A 6-month postoperative CBCT views show excellent graft consolidation and a lift that is higher than the length of the fixture placed is evident. 3D volume rendering shows complete closure of the lateral window osteotomy **(Fig. 8)**.

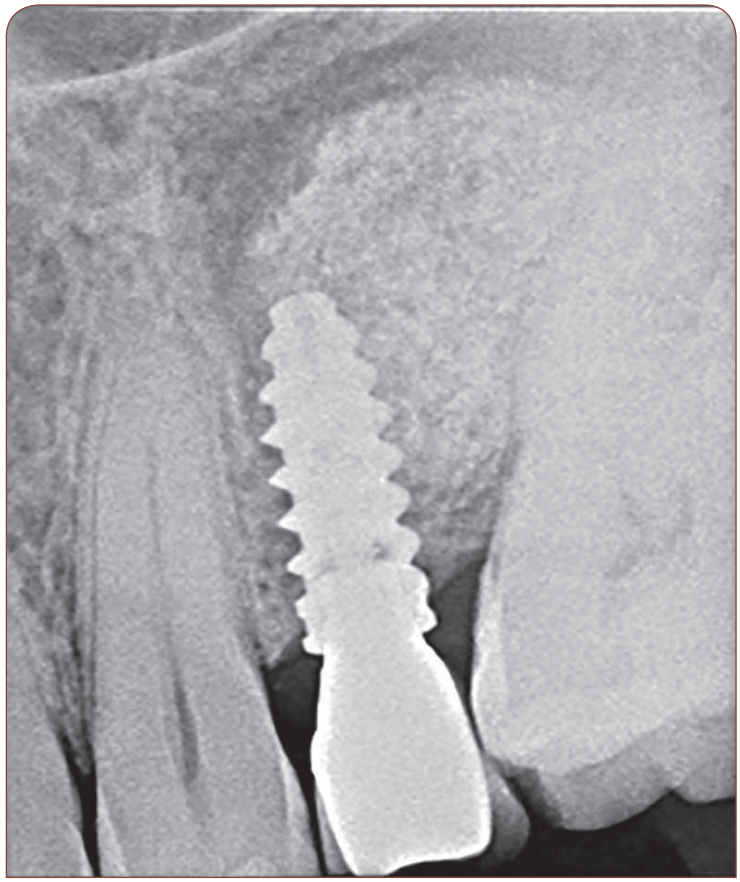

Fig. 9

A 2-year recall IOPA X-ray and clinical picture show an excellent and stable graft material and a PFM crown in a stable environment **(Fig. 9)**.

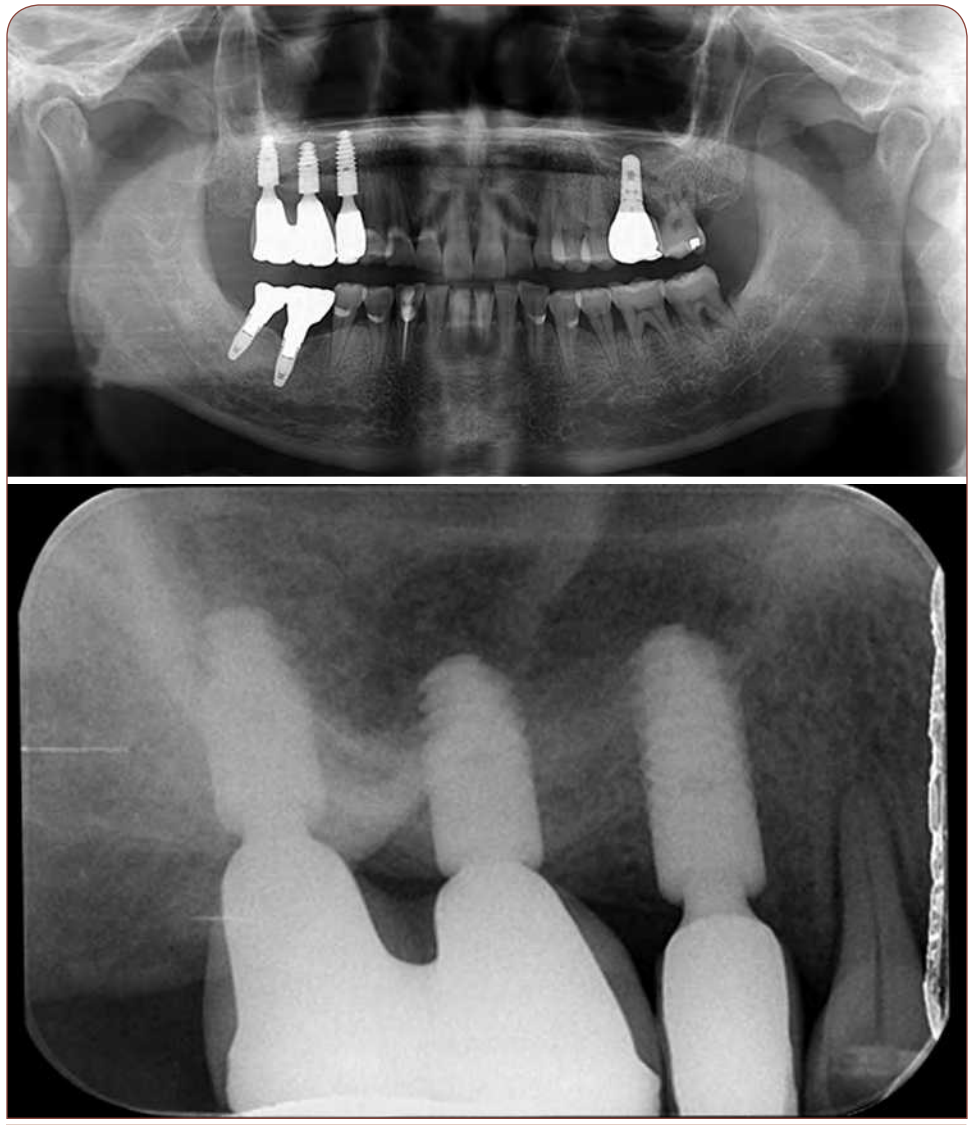

Fig. 10

Final ceramic restoration was cemented after 5 months healing. Periapical radiogram shows 5 years in function **(Fig. 10)**.

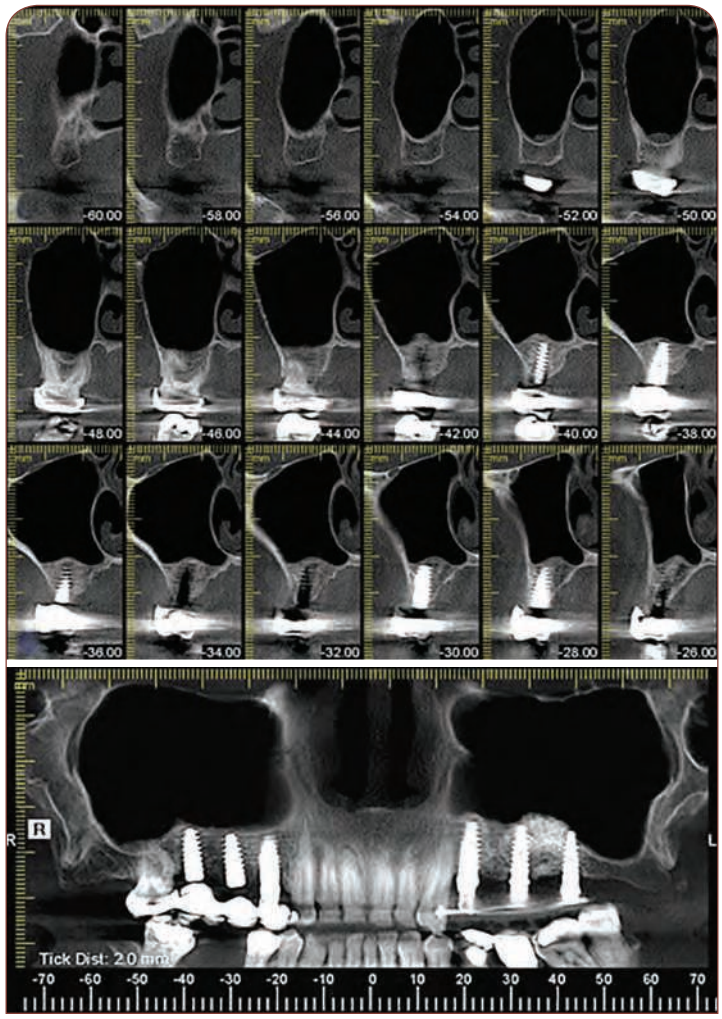

Fig. 14

Five months postoperative CBCT showing bone regeneration **(Fig. 14)**.

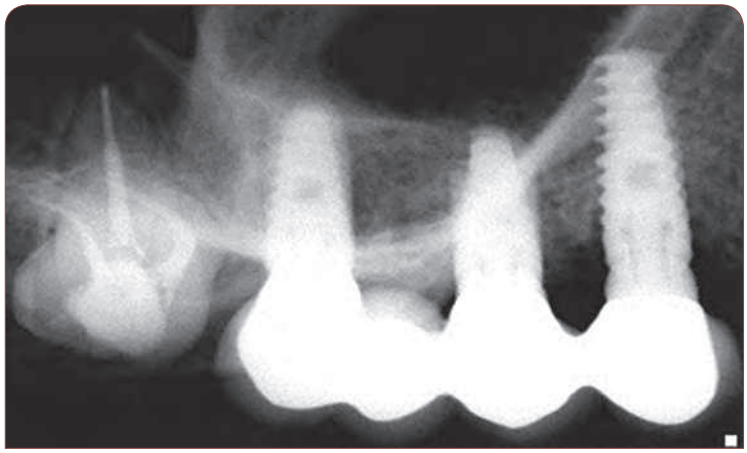

Fig. 15

Two years postoperative radiograph **(Fig. 15)**.

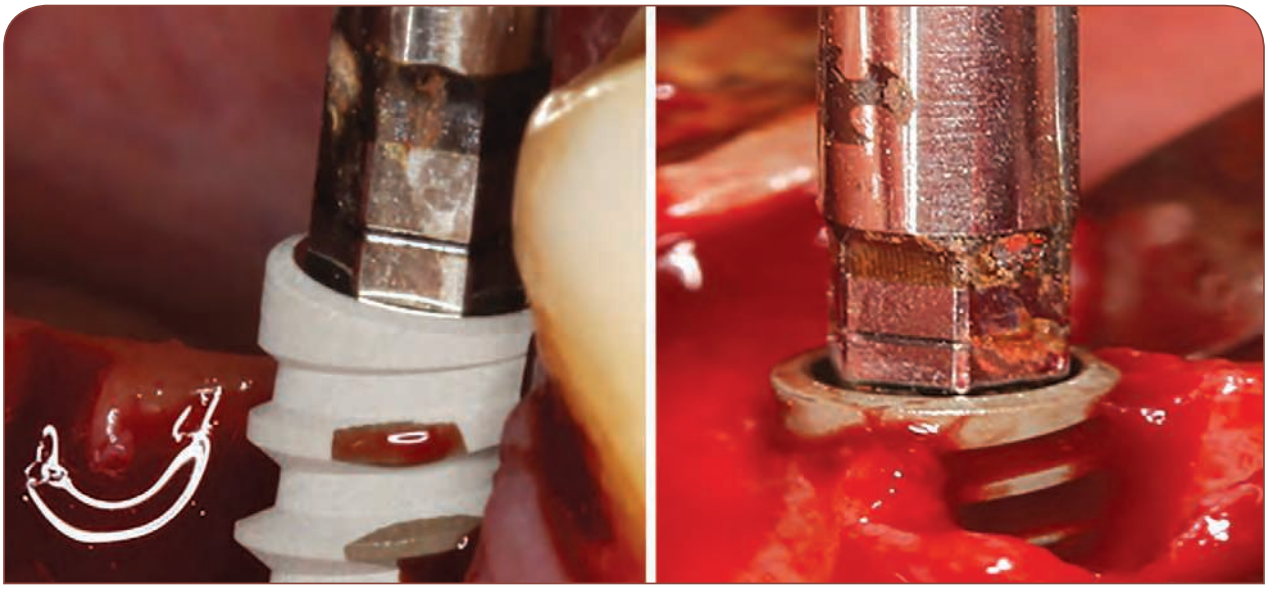

Fig. 3

2 Top DM (Bioner) implants of 4/11.5 mm are placed in the sites of 46 and 47. The 47 implant is placed in a conventional manner. Tooth number 48 is extracted in the same operative appointment **(Fig. 3)**.

Fig. 4

Healing collars are placed at 3 months healing. Food debris tend to accumulate in the well of the collars and this picture is used most often to show the patient the importance of oral hygiene maintenance **(Fig. 4)**.

Fig. 5

The healthy and thick peri implant tissue around the implants is clearly visible **(Fig. 5)**.

Fig. 6

The final splinted screw retained prosthesis **(Fig. 6)**.

Fig. 7

After final torquing of the abutments the access holes are sealed with flowable light cure composite material (Filtek Flow, 3M) **(Fig. 7)**.

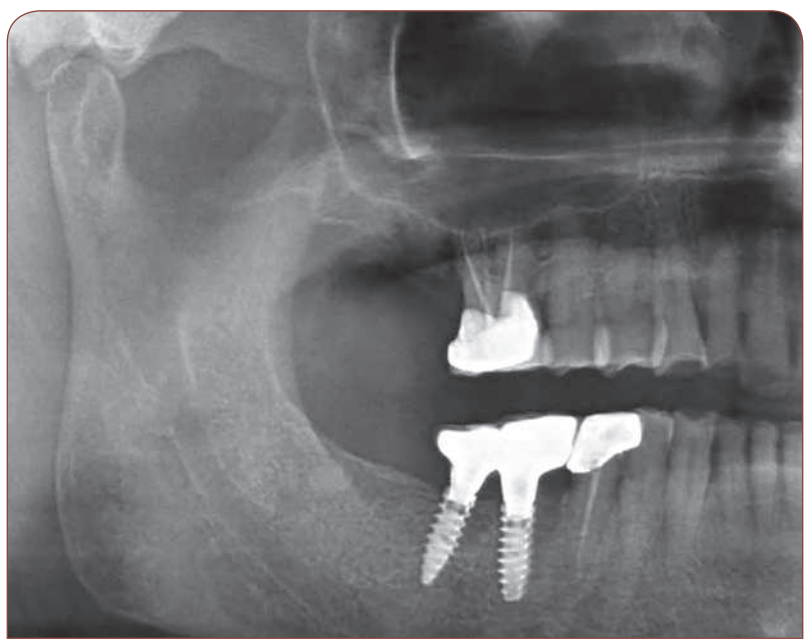

Fig. 8

Two years postoperative panorex shows extremely stable bone level maintenance. The endodontic therapy on 45 is also evident **(Fig. 8)**.

Fig. 5

Immediate postoperative photograph **(Fig. 5)**.

Fig. 6

Immediate postoperative radiograph **(Fig. 6)**.

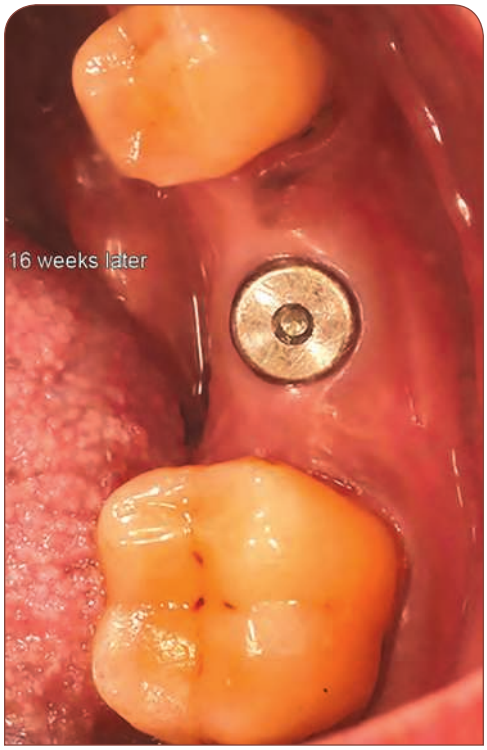

Fig. 7

16 weeks recall photo **(Fig. 7)**.

Fig. 8

16 weeks recall radiograph **(Fig. 8)**.

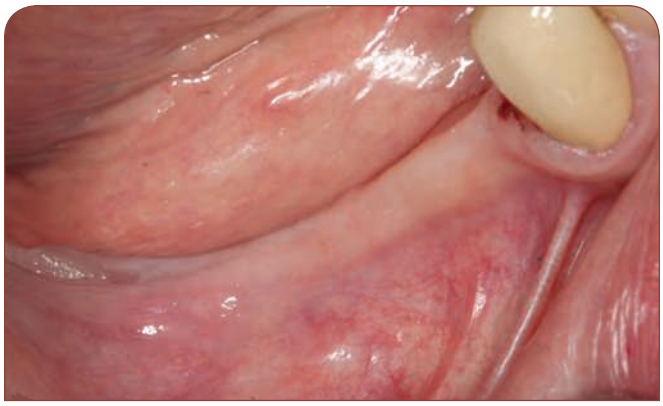

Fig. 1

A fifty three years old lady with bilateral atrophic posterior mandible. After discussing possible alternatives such as bone augmentation with guided bone regeneration or block graft, finally the decision was made a bilateral inferior alveolar nerve transposition **(Fig. 1)**.

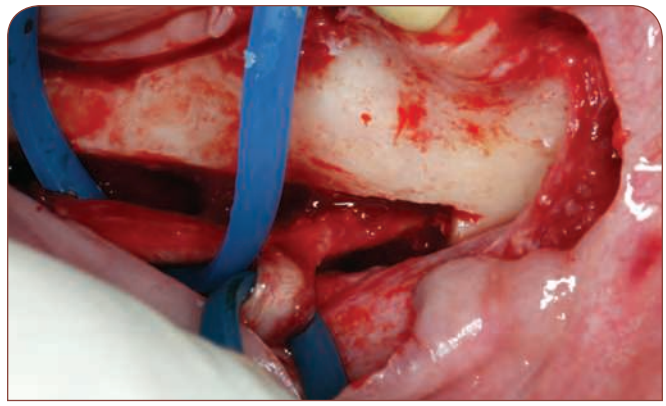

Fig. 2

After performing a rectangular osteotomy with a piezosurgery device the inferior alveolar nerve (IAN) was exposed and isolated with a silicone vessel band **(Fig. 2)**.

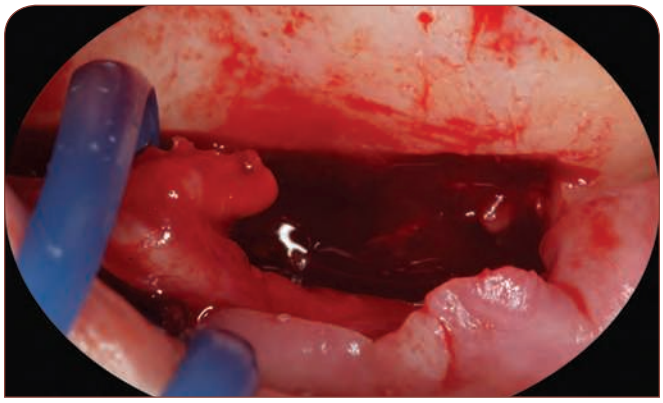

Fig. 3

The incisive branch was cut off so the entire IAN inferior alveolar nerve can be mobilized **(Fig. 3)**.

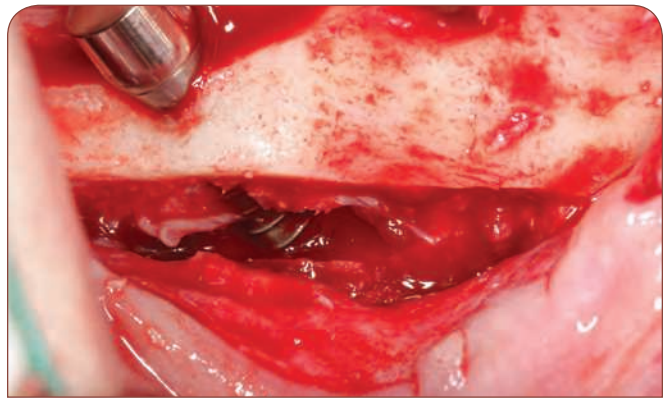

Fig. 4

Two implants were inserted and the IAN inferior alveolar nerve was mobilized distal to the last implant **(Fig. 4)**.

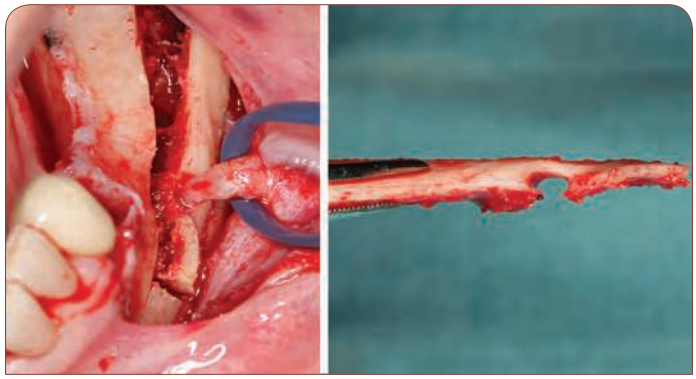

Fig. 5

Appreciate the nerve mobilization **(Fig. 5)**.

Fig. 11

Interim crowns were appended for an amiable gingival fringe **(Fig. 11)**.

Fig. 12

The final prosthesis in place, exhibiting an ideal osseogingival set off, congruent to our intention **(Fig. 12)**.

Female patient, 22 years of age reported with the chief complaint of missing upper right front tooth and wanted replacement for the same. There was no contributory past medical and dental history.

The treatment plan included ridge augmentation using autogenous block graft harvested from the chin, followed by placement of implant after 4 months of grafting post.

Fig. 1

Preoperative labial view of the surgical site—view of the edentulous gap and the soft tissue condition **(Fig. 1)**.

Fig. 2

Preoperative occlusal view of the surgical site tooth #11 **(Fig. 2)**.

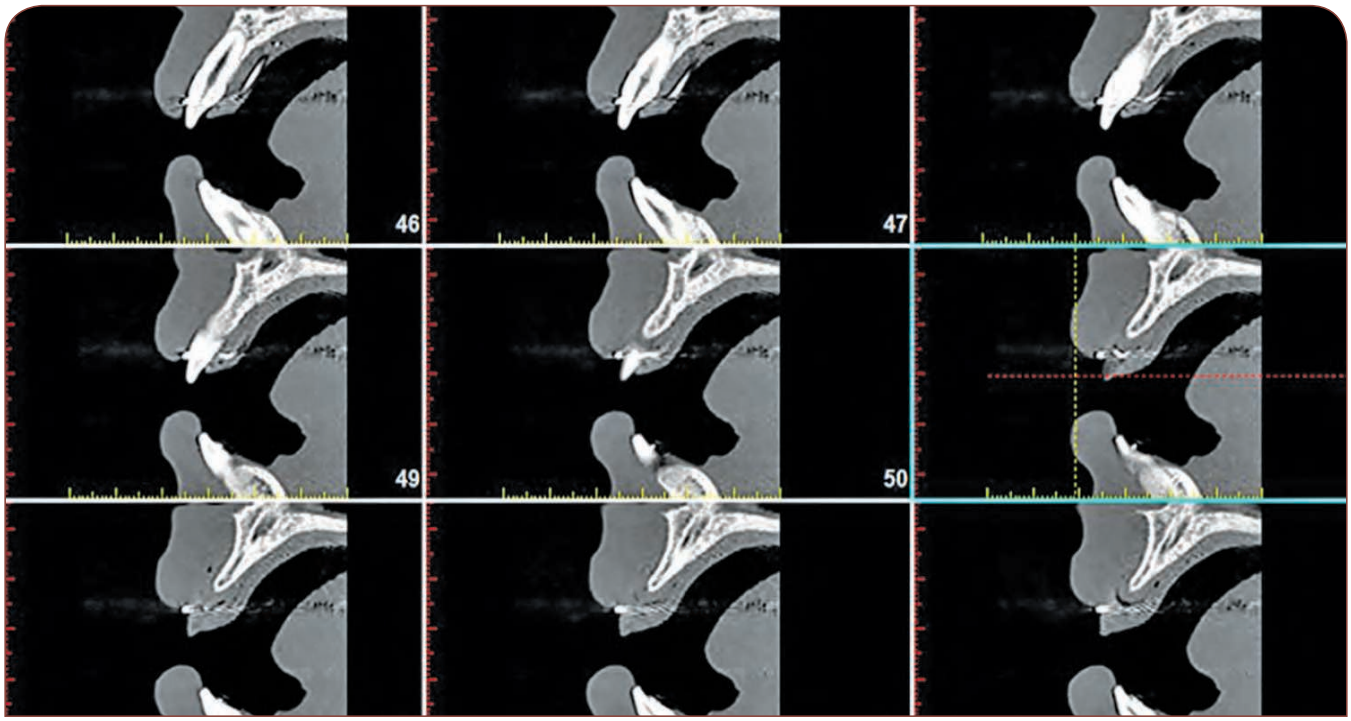

Fig. 3

CBCT showing Seibert's class I deficiency **(Fig. 3)**.

Fig. 5

Periapical X-ray verifies bone loss. Radiograph shows missing height of bone and area where the buccal plate is missing in the area of the distal root **(Fig. 5)**.

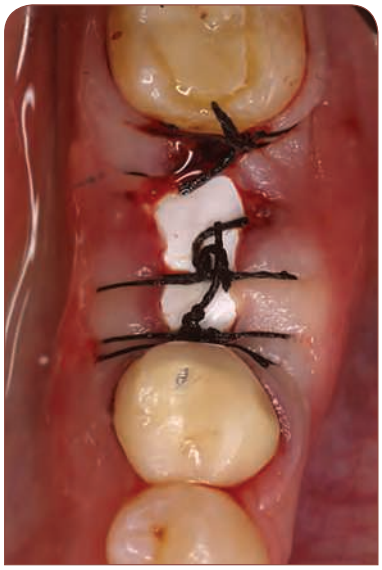

Fig. 6

Five months later, minimal flap elevation reveals a healed ridge with bleeding bone and sufficient width to enable placement of a wide diameter implant **(Fig. 6)**.

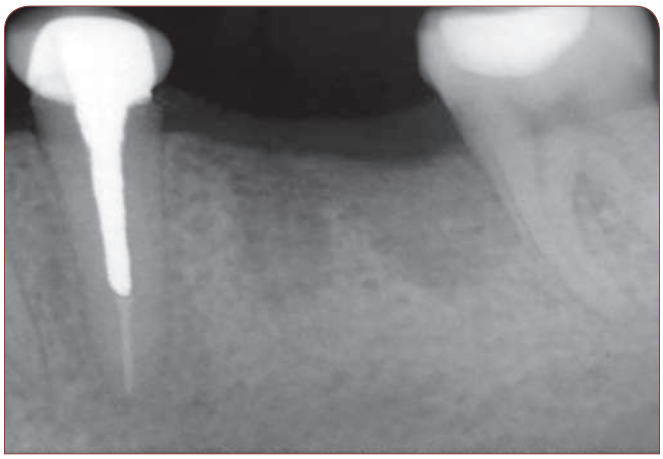

Fig. 7

Mineralized bone at 5 months. The periapical radiograph at the time of implant placement shows no graft remnants and mineralized bone in the entire area of the extraction **(Fig. 7)**.

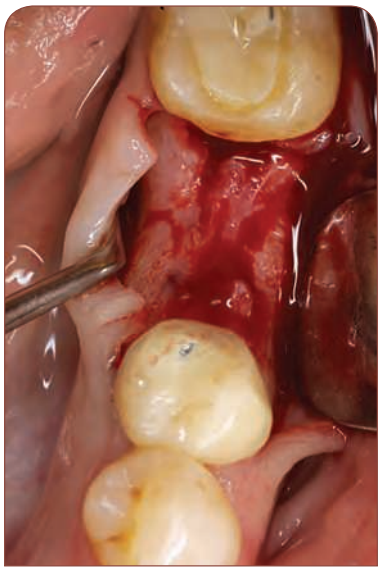

Fig. 8

Cytoplast over a blood clot. In site—3 weeks. Implant planned after healing period. This quick regeneration of alveolar bone and preservation of the ridge width were accomplished by placement of a Cytoplast (Osteogenics, Lubbock, TX) dense PTFE barrier over a blood clot. No attempt for primary closure was made as this barrier is designed to remain in an exposed manner for 3–4 weeks after insertion **(Fig. 8)**.

Fig. 1

A view of the upper right central incisor region 6 months after extraction. A 47-year-old Caucasian man was referred for an implant to replace the upper right central incisor. The tooth #11 had historically undergone a root canal treatment and restored with a post core crown approximately 20 years ago. The patient developed an abscess with the tooth which was subsequently extracted by his dentist **(Fig. 1)**.

Fig. 2

Periapical radiograph of the upper right central incisor showing the evidence of root resection, a root canal treatment with a large post in the root canal. Evidence of periapical pathology can also be seen **(Fig. 2)**.

Fig. 3

Circumvestibular incision for exposure of the donor site (mandibular symphysis) **(Fig. 3)**.

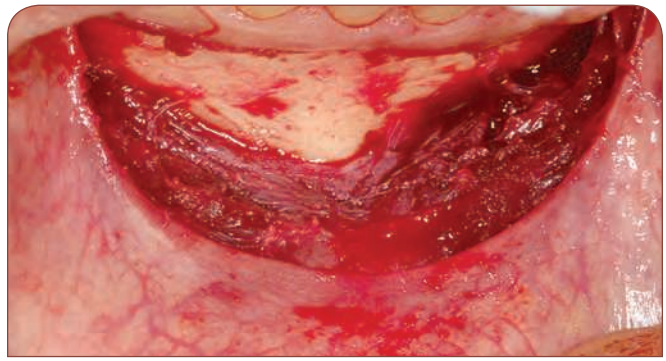

Fig. 4

Postage stamp outline for a symphysis graft **(Fig. 4)**.

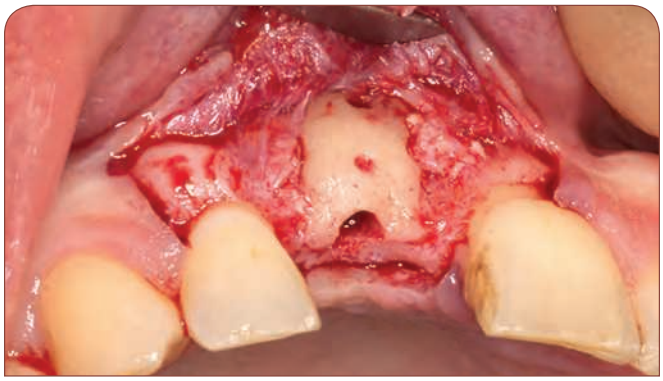

Fig. 15

Healed grated site, reopened after 6 months and implant osteotomy prepared **(Fig. 15)**.

Fig. 16

Periapical of a guide pin in the initial osteotomy **(Fig. 16)**.

Fig. 17

An ankylos 3.5 × 11 mm (DENTSPLY) implant being placed into the osteotomy **(Fig. 17)**.

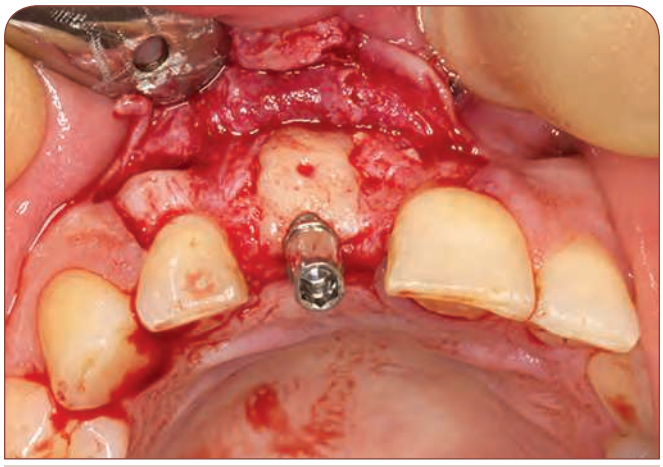

Fig. 18

Implant in situ emergence in line with the cingulum of the tooth #21 **(Fig. 18)**.

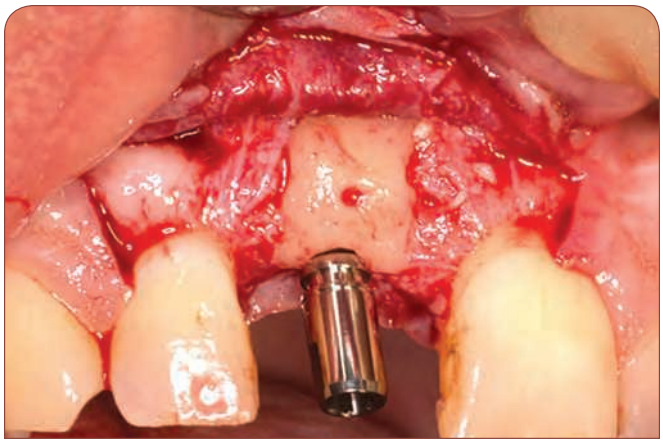

Fig. 19

Implant in situ **(Fig. 19)**.

Fig. 20

Ankylos (DENTSPLY) implant in situ **(Fig. 20)**.

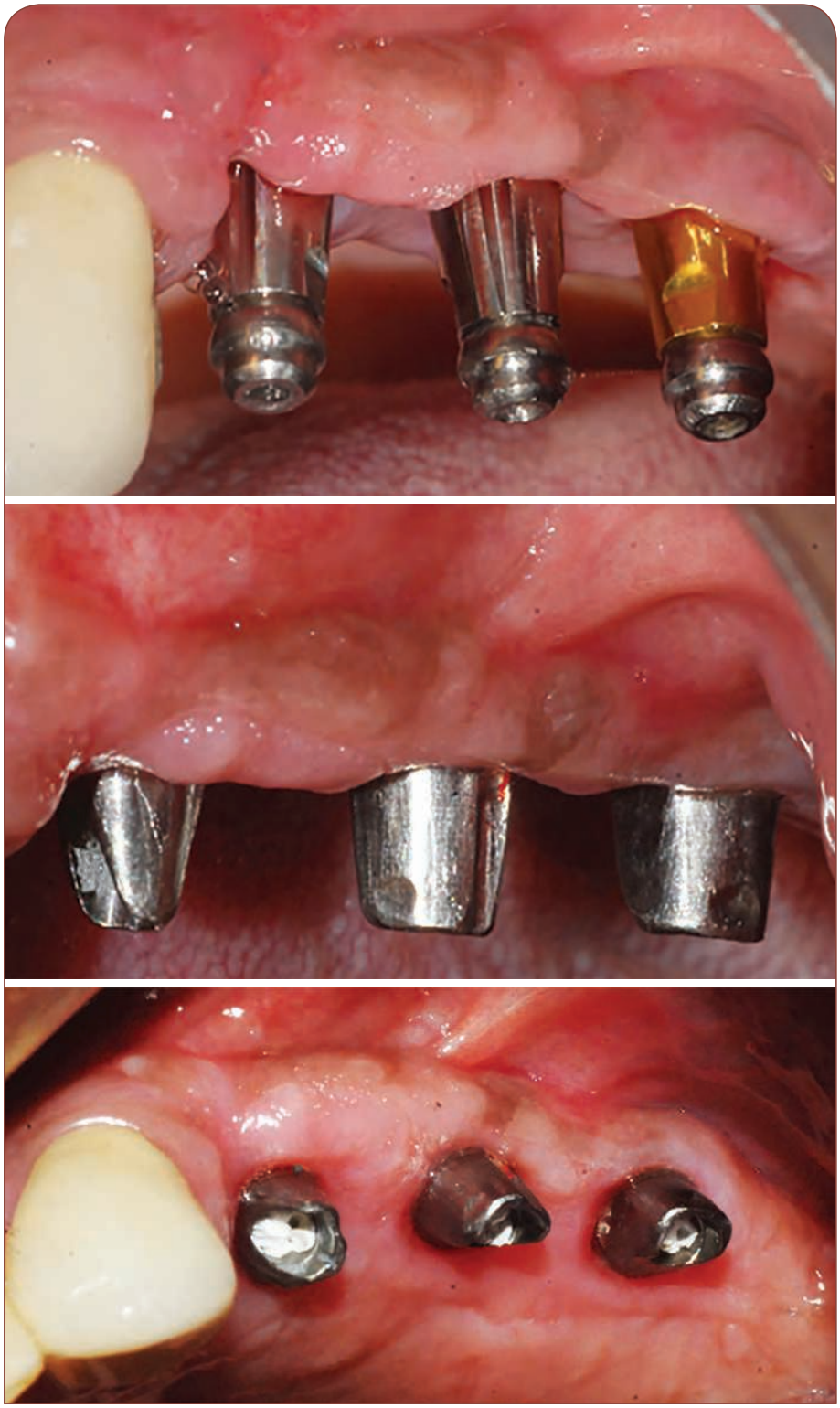

Fig. 3

Palatal tissue displacement. Well-healed tissue healing at impression. Final abutments for cemented prosthesis. Palatal view—note the scar line on the palatal side **(Fig. 3)**.

Fig. 1

Palatal roll and finger split. Preoperative **(Fig. 1)**.

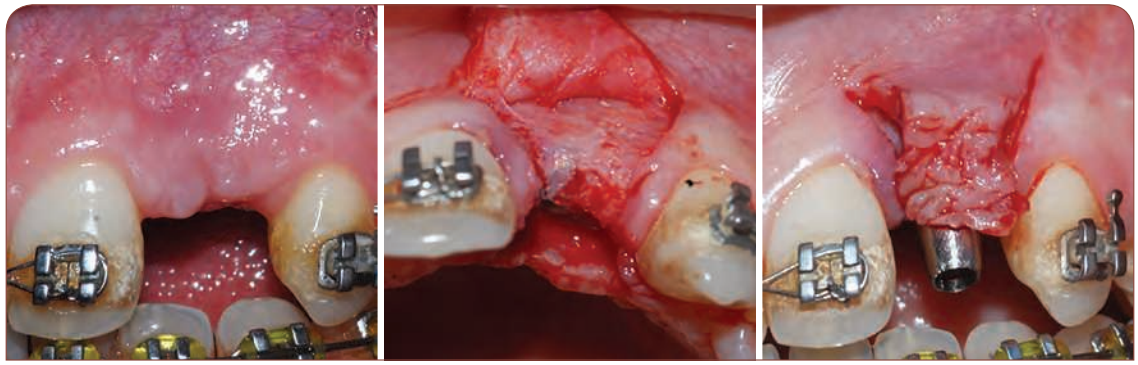

Fig. 2

Lack of contour. Note the buccal contour deficiency with tooth #22 area. Deep palatal flap elevated and de-epithelialized. Flap reflected, with a split-full-split incision. The buccal periosteum is left intact. The palatal tissue is now de-epithelialized and rolled under the buccal flap **(Fig. 2)**.

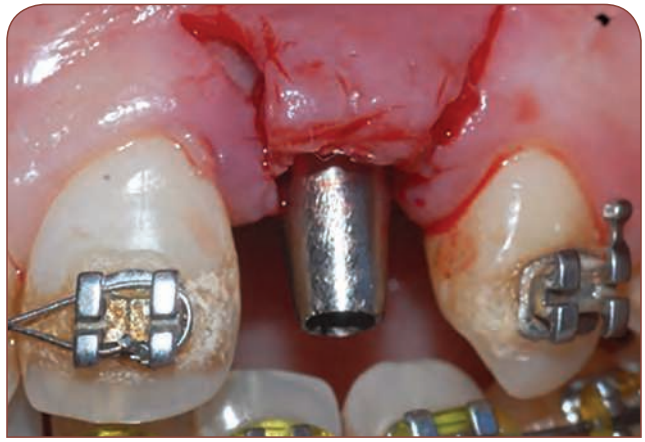

Fig. 3

Flap rolled into the pouch. The de-epithelialized part is tucked underneath the buccal flap. Abutment is placed to temporize the site **(Fig. 3)**.

Fig. 7

Screw access holes sealed with composite **(Fig. 7)**.

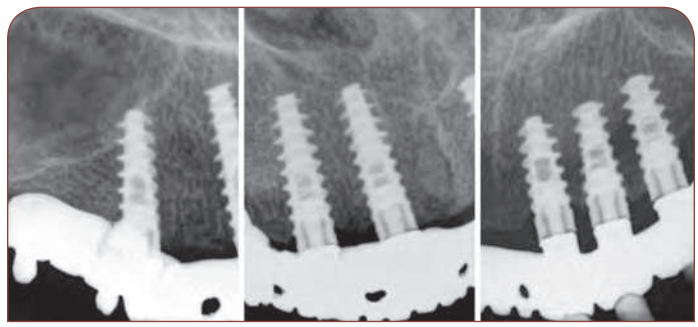

Fig. 8

Immediate postoperative **(Fig. 8)**.

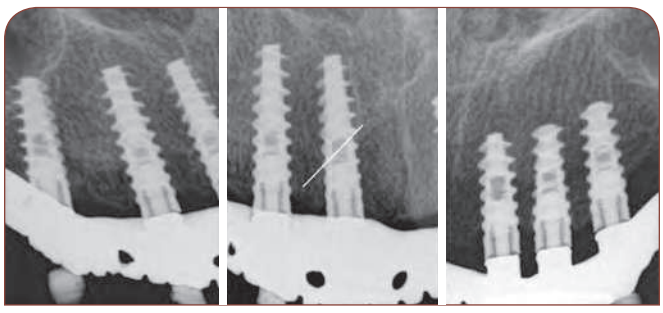

Fig. 9

Five months recall **(Fig. 9)**.

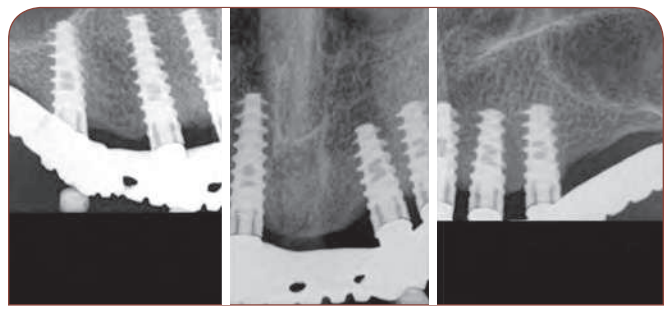

Fig. 10

Two years recall **(Fig. 10)**.

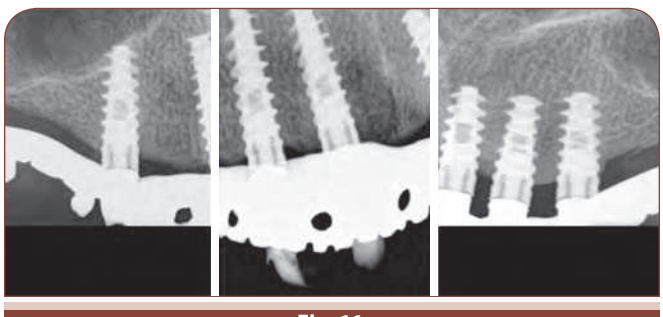

Fig. 11

Three years recall **(Fig. 11)**.

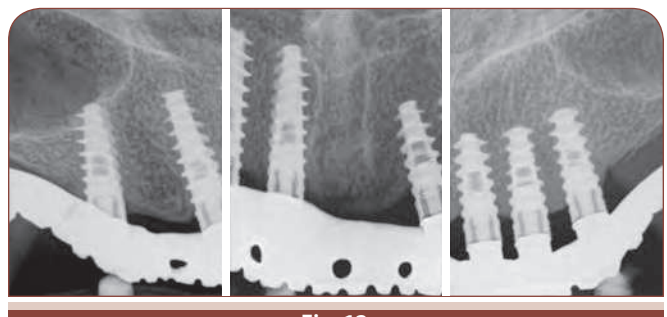

Fig. 12

Four years recall **(Fig. 12)**.

Fig. 17

Canine guided occlusion was planned during all lateral movements as the implants were splinted and any contact in the posterior teeth would result in unwanted interference. Canine guided occlusion on lateral movement **(Fig. 17)**.

Fig. 18

Maximum intercuspation position and centric relation position were synchronized and a tripodal point contact between all maxillary and mandibular teeth were established. Lateral view in centric relation **(Fig. 18)**.

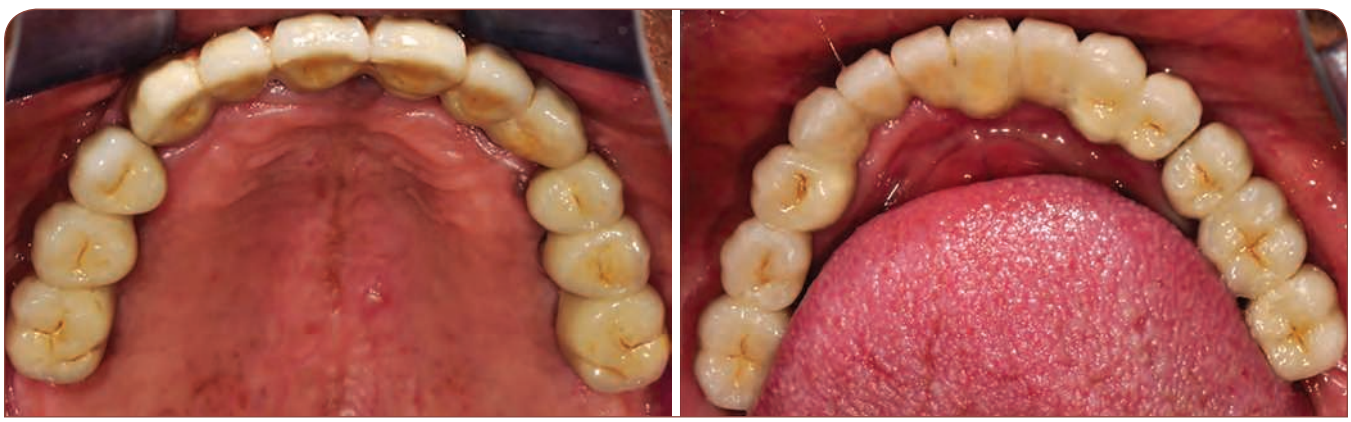

Fig. 19

Maxillary and mandibular occlusal view **(Fig. 19)**.

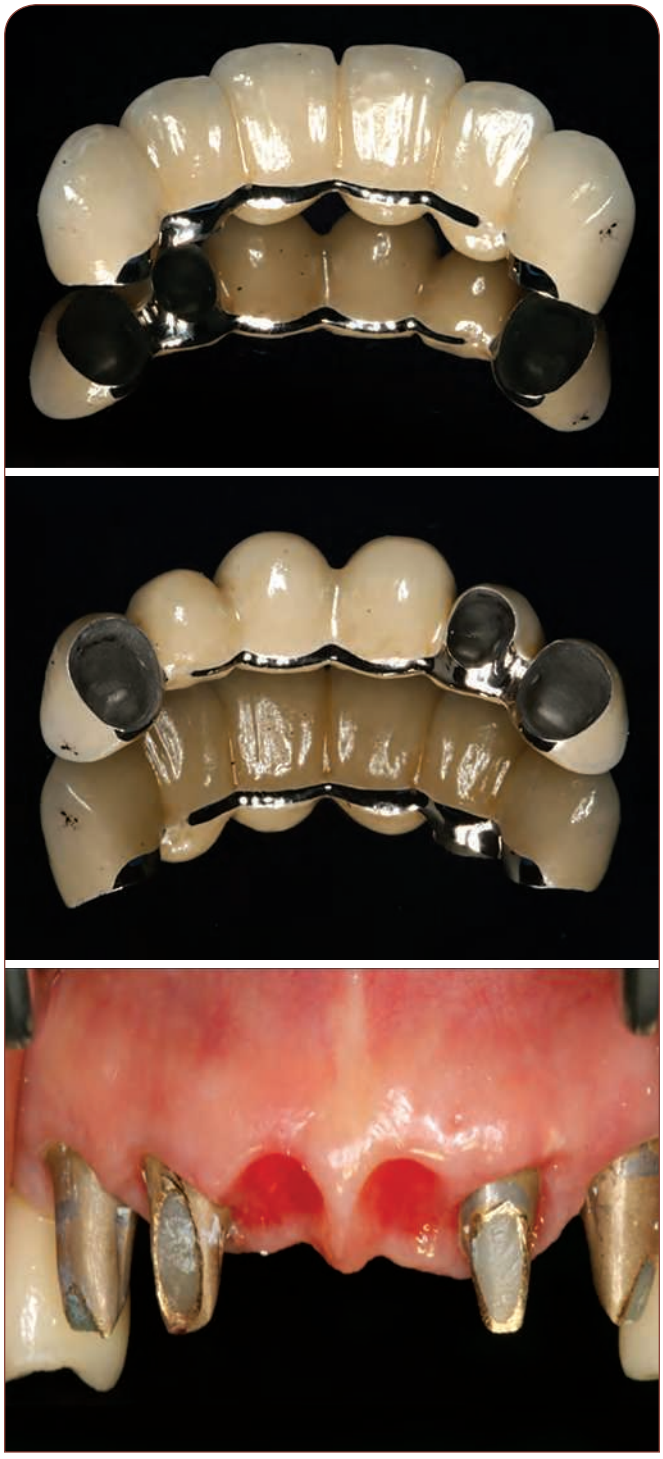

Fig. 16

Definitive cementable ceramo-metal restoration was fabricated with ovate pontics in the central incisor region **(Fig. 16)**.

Fig. 17

Day of delivery of definitive prosthesis (2008) **(Fig. 17)**.

Fig. 15

3D printed - Laser sintered maxillary framework in 3 segments **(Fig. 15)**.

Fig. 16

3D printed—Laser sintered mandibular framework in 3 segments **(Fig. 16)**.

Fig. 17

3D printed frameworks on working models **(Fig. 17)**.

Fig. 10

The A-P spread of the implants is adequate to have the prosthesis accommodate a single molar on each side as a cantilever extension **(Fig. 10)**.

Fig. 11

An adequate band of keratinized tissue is evident around the implants **(Fig. 11)**.

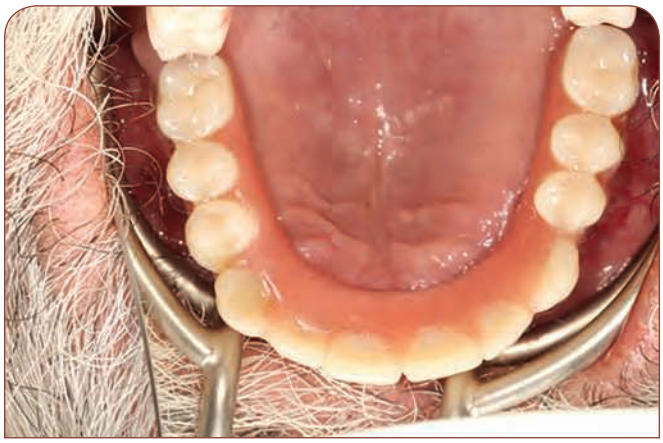

Fig. 12

The upper prosthesis at insertion **(Fig. 12)**.

Fig. 13

Low attachments for the mandibular prosthesis. The implant positions are ideal to resist force from the opposite fixed dention, without getting dislodged **(Fig. 13)**.

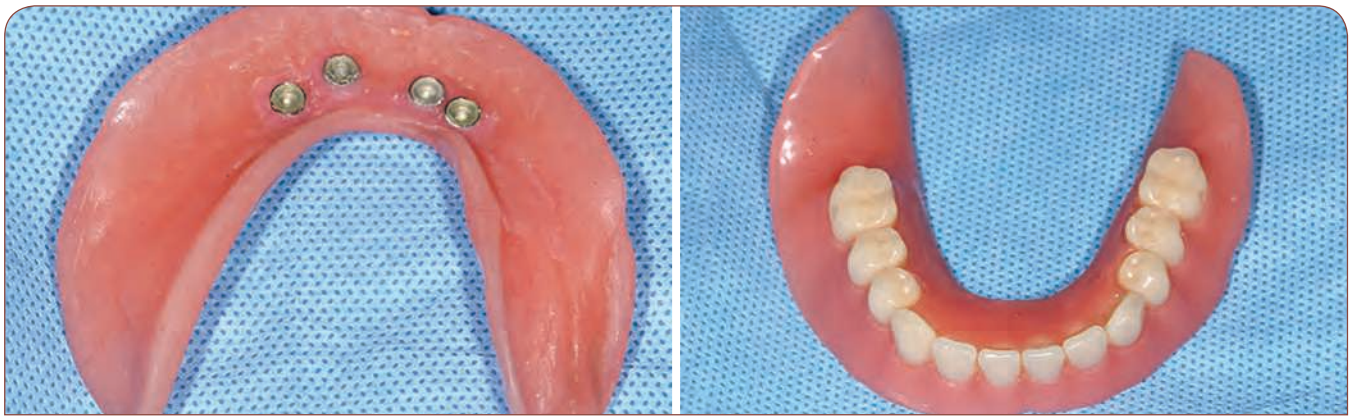

Fig. 14

Mandibular prosthesis: tissue surface and occlusal view **(Fig. 14)**.

Fig. 15

The prosthesis in occlusion: left and right side views **(Fig. 15)**.

Fig. 16

Frontal view of the prosthesis **(Fig. 16)**.

Fig. 17

Two years follow-up panorex showing a stable prosthesis and bone levels **(Fig. 17)**.

Fig. 13

Six bone level Straumann implants after 3 months of healing **(Fig. 13)**.

Fig. 14

The new screw retained resin denture **(Fig. 14)**.

Fig. 15

The new screw retained resin denture **(Fig. 15)**.

Fig. 16

The new screw retained resin denture **(Fig. 16)**.

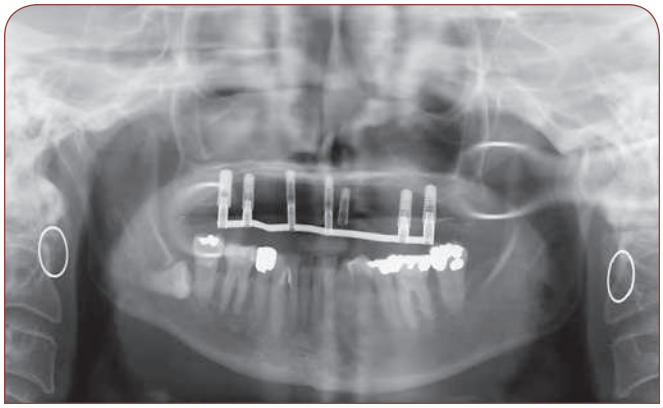

Fig. 17

The new screw retained resin denture bar checking **(Fig. 17)**.

Fig. 18

The new screw retained resin denture in place **(Fig. 18)**.

Fig. 13

CAD CAM E.max crowns where milled and cut back and porcelain added and characterized **(Fig. 13)**.

Fig. 14

Crow on natural-root canaled tooth was resin-bonded while the implant crown was finally cemented and left to set **(Fig. 14)**.

Fig. 15

After complete setting of the final cement, the excess was removed from the access hole and the crown abutment assembly was unscrewed. Now the excess cement is removed from the abutment crown interface, which is usually left under the tissue when cemented **(Fig. 15)**.

Fig. 16

After 3 years of loading **(Fig. 16)**.

Fig. 41

Finished Radica resin to CAD/CAM milled metal hybrid frame with overlay seated to cover the screw access hole emerging on the facial of the left canine **(Fig. 41)**.

Fig. 42

Finished Radica resin to CAD/CAM milled metal hybrid frame with overlay off on the left canine showing the screw access hole emerging on the facial of the left canine seated intraorally **(Fig. 42)**.

Fig. 43

Finished Radica resin to CAD/CAM milled metal hybrid frame with overlay seated to cover the screw access hole emerging on the facial of the left canine seated intraorally **(Fig. 43)**.

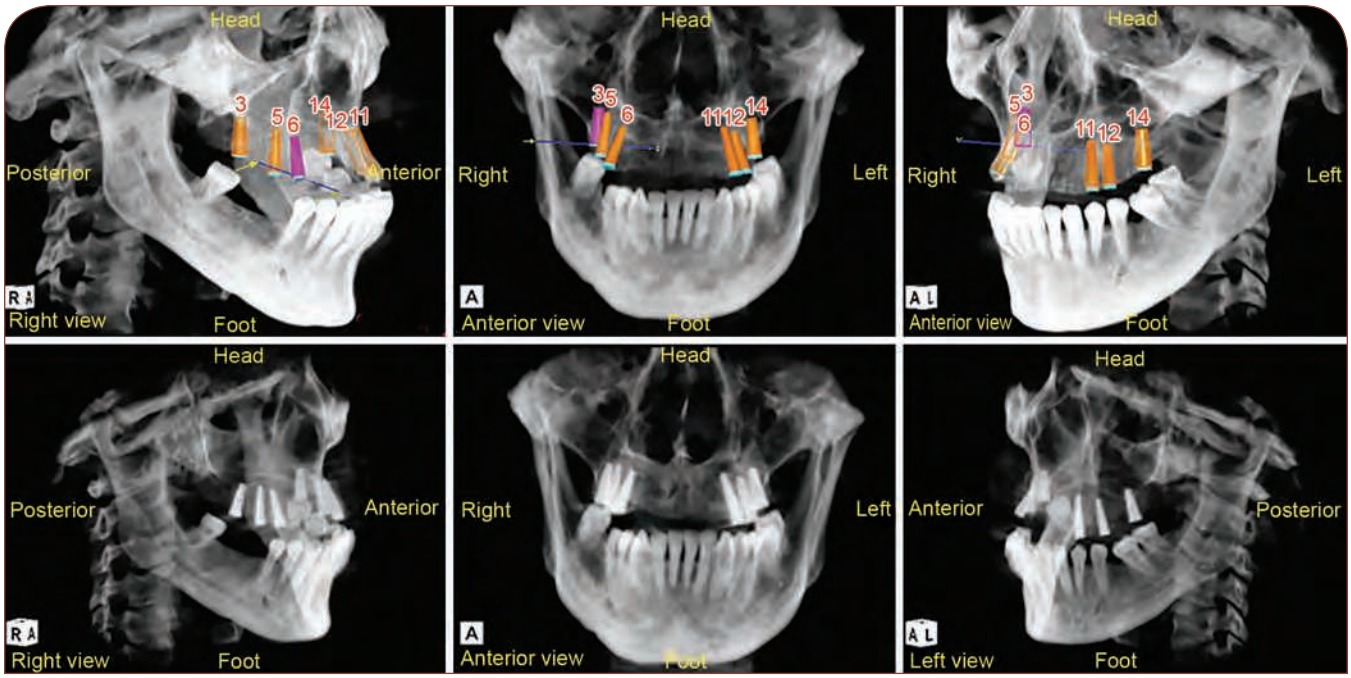

Fig. 19

CBCT comparison of the planned implant positions and implant positioned achieved demonstrating good surgical guidance **(Fig. 19)**.

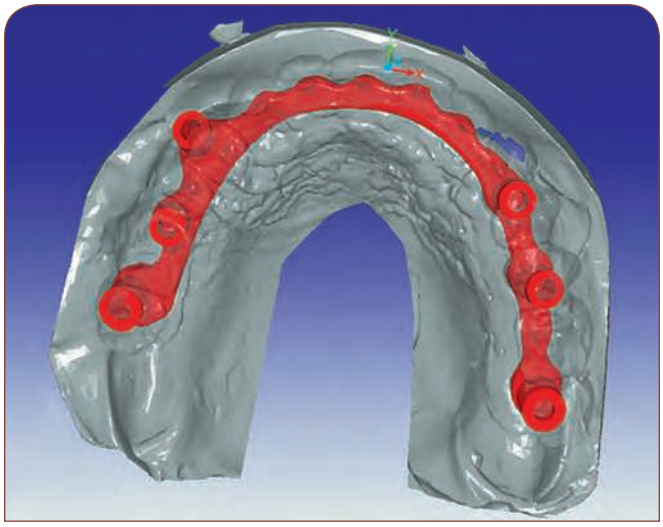

Fig. 20

Occlusal view of a virtual scan of the soft tissue model fabricated from an open tray impression of the implants. The planned prosthesis is shown in red to support a fixed hybrid full arch bridge with denture teeth on the frame. Teeth can be seen from a scan of the wax setup to ensure that the hybrid frame lays within the prosthetically driven restoration **(Fig. 20)**.

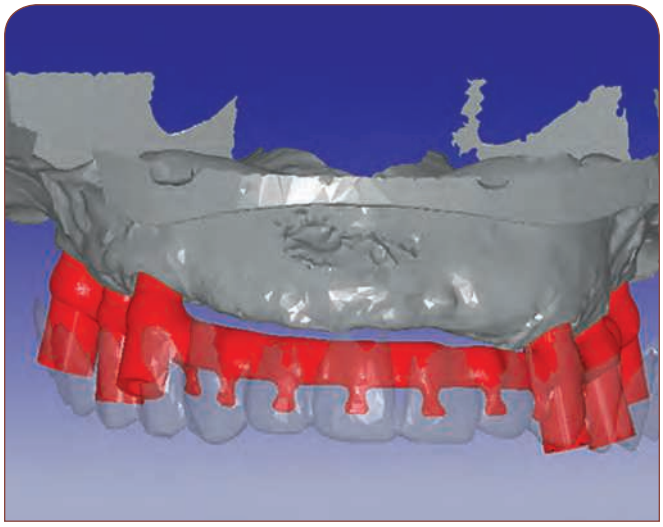

Fig. 21

Buccal view of a virtual scan of the soft tissue model fabricated from an open tray impression of the implants. The planned prosthesis is shown in red to support a fixed hybrid full arch bridge with denture teeth on the frame. Teeth can be seen from a scan of the wax setup to ensure that the hybrid frame lays within the prosthetically driven restoration **(Fig. 21)**.