

Istvan Urban



Vertical and Horizontal Ridge Augmentation

New Perspectives

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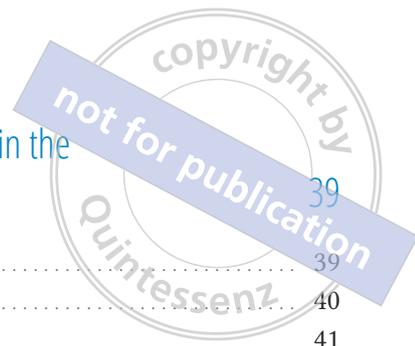
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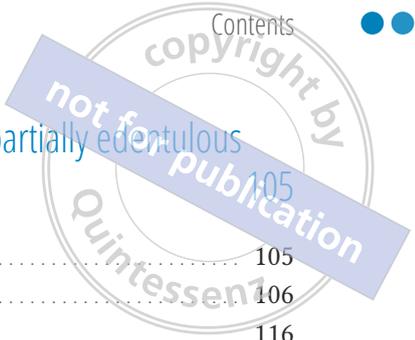
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Abbreviations

ABBM	anorganic bovine-derived bone mineral
AP	anterior–posterior
ACS	absorbable collagen sponge
BMP	bone morphogenetic protein
C&H	Cawood and Howell
CI	confidence interval
CMX	xenogeneic collagen matrix
CT	computed tomography
CTG	connective tissue graft
DFDBA	demineralized freeze-dried bone allograft
d-PTFE	dense polytetrafluoroethylene
e-PTFE	expanded polytetrafluoroethylene
FCF	free curtain flap
FDBA	freeze-dried bone allograft
FGG	free gingival graft
GBR	guided bone regeneration
GTR	guided tissue regeneration
HA	hydroxyapatite
KT	keratinized tissue
LSF	lingually sliding flap
MAPF	modified apically positioned flap
MCBA	mineralized cancellous bone allograft
MGJ	mucogingival junction
OSF	osteoblast stimulating factor
PGA	polyglycolic acid
PST	papilla shift technique
PTFE	polytetrafluoroethylene
RCT	randomized controlled trial
rhBMP-2	recombinant human bone morphogenetic protein-2
rhPDGF	recombinant human platelet-derived growth factor
RP	retromolar pad
SD	standard deviation
SF	safety flap
TCP	tricalcium phosphate
TGF	transforming growth factor
TMC	trimethylene carbonate
TR	titanium-reinforced
VAS	visual analog scale
VRA	vertical ridge augmentation





Introduction

When I was asked by Mr Christian Haase of Quintessence Publishing to write a book on ridge augmentation, I did not hesitate to say yes. I felt that I had so much to say to my colleagues, and that the best platform to say it would be this book. However, it took me about 2 years to think about what I exactly wanted to say, and to prepare for the actual writing. Now that the book has been published, I think that I still have a lot more to say. Despite that, I am very satisfied with the book, believe it may save clinicians many headaches, and wish somebody had given me a book like this 15 years ago. If that had happened, I would have better cases today. I hope that through using some of the information provided in this book you will have better cases tomorrow.

My goal has always been to achieve the best outcome for each patient. Very early on I started to document, organize, and critically analyze the cases I performed. For each case, I was careful to select a biologically sound, scientifically proven treatment option. At the same time, I focused on the development of minimally invasive, simple, and predictable treatment options. A good example of this is the sausage technique™, described in Chapter 11 of

this book. The scientific documentation and publication of the techniques I have adopted has always been very important to me. The development of new methods as well as the progress regarding the stability and predictability of cases is well represented in this book.

Of course, we would all like to select better and better cases for a book, yet the educational part of improving our technique is at least equally important. I agree with the adage that the devil is in the detail; therefore, the details of the cases presented in this book were analyzed from a self-critical perspective.

I think that in regenerative therapy there are three important follow-up dates: 3 weeks, 5 years, and 10 years. It therefore takes a while before we can recognize things that could have been done better.

What did I learn from the cases in this book? How would I better solve them today? Which phase could I have improved upon at the time? I think that the answers to these questions might be the most important resource of this book, and am certain that without the “Lessons Learned” sections, which follow on from each case, the reader would take much

less out of this book. As you read about the cases, you may find that you like or dislike some aspect of a particular case, and may think that you would do it differently. Yet once you have read the lessons that I learned from each case, it is my hope that your ideas may change, and may change permanently.

“Could you please take another look at this photograph of this case?” or “Can you see that had I made a minor change to this or that aspect of the treatment, I may have had better crestal bone preservation?” These types of questions, suggestions, and observations that run through this book make it more educational, and hopefully will remind the reader of the little things; of the places where the devil hides; of the details that make all the difference.

Therefore, this book is not only about how to regenerate lost hard and soft tissue. More importantly, it is also about how to preserve the regenerated crestal bone and soft tissue contours, often the most demanding part of the treatment.

I believe that the right education and one’s internal focus are of primary importance. Allow me in

this book to share some of my experience, which might be a good example, especially for the very young clinician. When I graduated from dental school I was not completely satisfied. At that time, we learned a lot about repairing and restoring teeth and less about the biological principles governing the potential of maintaining and regenerating lost tissue, which was already then my main interest. I had two choices: quit, or progress further with my education. I chose the latter, and today feel that I was born to do what I am doing, and enjoy every minute of it.

I like to keep procedures simple, repeatable, and biologically sound. Overcomplicated treatment strategies have higher complication rates and less predictability in the final outcome. Therefore, I would like to welcome you and thank you for reading this book, and to remind you of a quote by Leonardo da Vinci: “Simplicity is the ultimate sophistication.”

Dr Istvan Urban

Acknowledgments

I would like to thank my wife, Judit, for her love and endless support, and our two sons, Isti and Marci, for their existence, spirit, and positive outlook on life. You make our life complete. As a child (and ever since), my parents never interfered in any of the decisions I made, as they believed in the development of the individual with only minimal guidance. I believe they were right, and I thank them for that.

My teachers were my teachers, continue to be my teachers, and will remain my teachers. Special thanks to Dr Henry Takei for his inspiration and unsurpassed qualities as a humanitarian, both as an educator and as a periodontist. Special thanks also to Dr Jaime Lozada for his belief in me as a student at Loma Linda University and that I would go on to do vertical ridge augmentation. I would also like to thank Dr Sascha Jovanovic for introducing me to guided bone regeneration in a biologically sound way.

Thanks also to Dr Joseph Kan, Dr Perry Klokkevoold, Dr Anna Pogany, Dr Lajos Patonay, Dr Paul Gerloczy, and to all my other teachers. Without meeting all of you and being your student, there would be much less to say in this book.

I also thank CDT Nicola Pietrobon for the excellent ceramic restorations he made for many of the cases presented in this book.

I would like to express my appreciation to Quintessence Publishing, specifically to the management, Horst Wolfgang Haase and Christian Haase, as well as to Johannes Wolters and Avril du Plessis for editing, and to Janina Kuhn for the layout and production of this book.

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Finally, my thanks go to Ms Jacqueline Kalbach of The Avenues Company, for her support in the preparation of my manuscripts and of this book.



The intraoral harvesting of autogenous bone

Autogenous particulated bone is still utilized for vertical and horizontal augmentation using guided bone regeneration (GBR). However, the amount of necessary graft has been reduced by half, since the mixture with bone graft filler materials has proven to be successful. This has also changed the location and methods available for bone harvesting. Less-invasive techniques are preferred today for harvesting autogenous bone.

In this chapter, traditional harvesting techniques as well as less-invasive techniques are described.

4.1 Bone harvesting from the mandibular symphysis

Until a decade ago, the chin area was the most widely used harvest site. In the author's practice, this site is very rarely used today. Burs, trephines, or a piezo saw can be utilized in the chin area for bone harvesting.

Since paresthesia has been associated with this harvest site, the clinician has to be careful about the location and depth of harvesting bone in this sensitive area.

Before any harvesting is performed, the clinician should visualize the symphysis area three dimensionally with a cone beam computed tomography (CBCT) scan. It has been recommended to maintain a distance of 5 mm anteriorly from the mental nerve, 5 mm apically from the root tips of the teeth, and 5 mm coronally from the inferior border of the chin.¹ It is also advisable for the depth of harvesting not to be deeper than 2 to 3 mm into the cancellous bone (Fig 4-1).¹

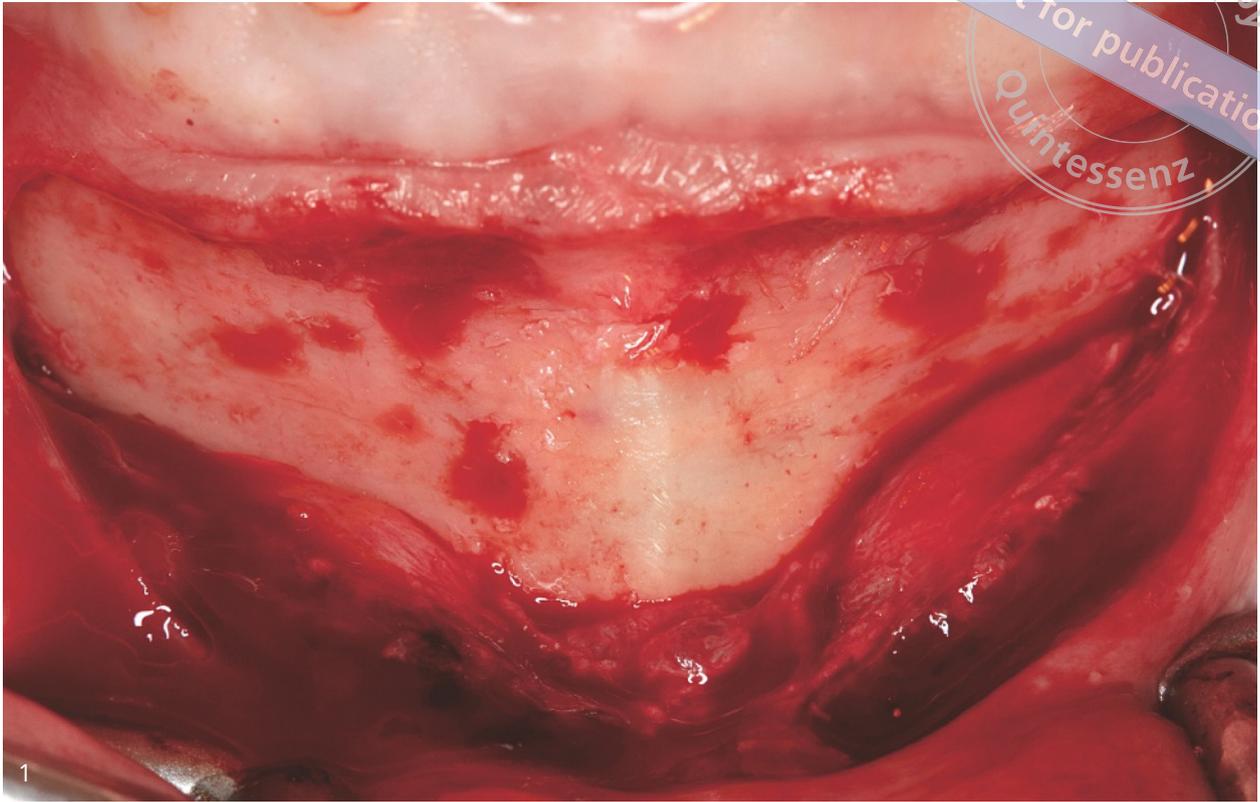


Fig 4-1 (1 to 9) Representative case of autogenous bone harvesting from the mandibular symphysis. In this case, a large amount of bone was harvested to treat a severely atrophied edentulous maxilla. For more details, see Fig 20-7. **(1 and 2)** Five large trephines (8 mm) were initially used in this procedure. **(3)** Four smaller trephines (6 mm) were then used coronally.

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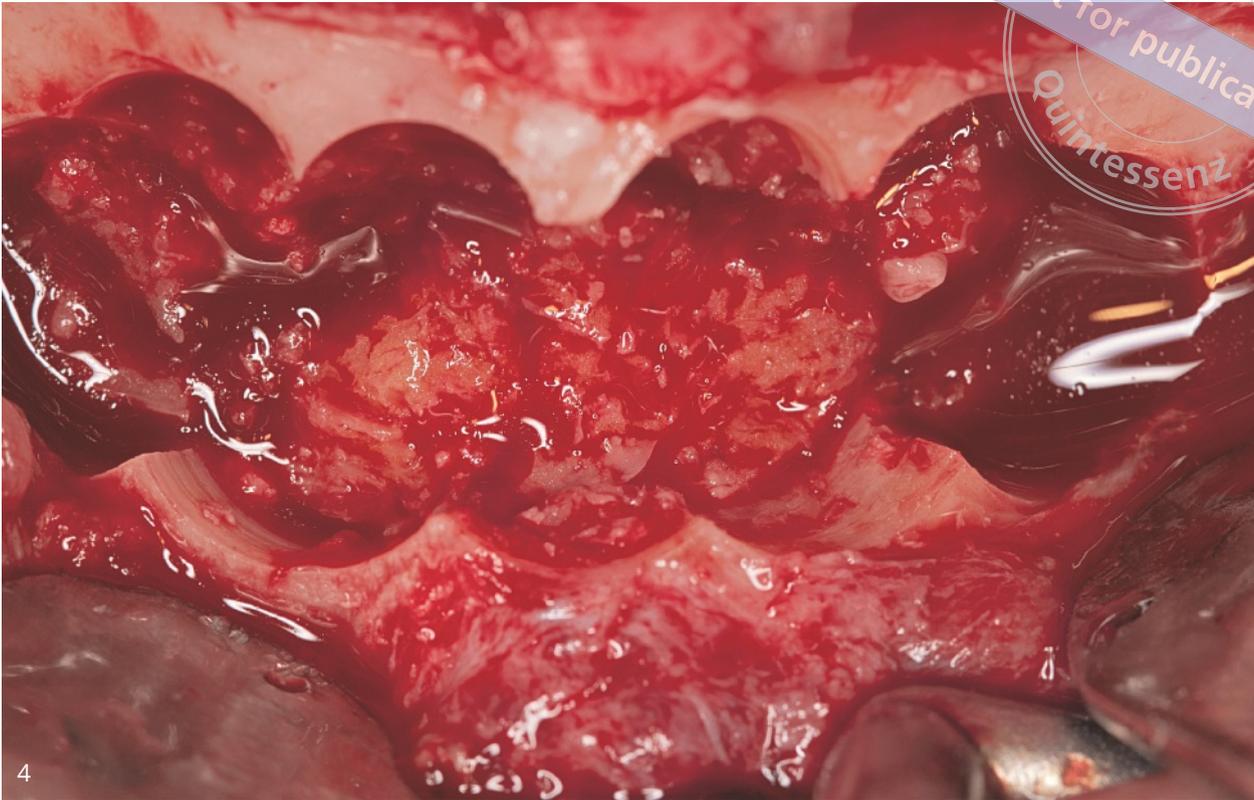


Fig 4-1 cont. (4) Labial view after removal of the bone rings. The depth of the preparation was 3 mm into the cancellous bone. (5) In this case, ABBM was used to fill the defect, since dental implants were to be placed in the anterior mandible. (6) Two collagen membranes were placed to cover the site.



Fig 4-1 cont. (7) The site was sutured first with horizontal internal mattress sutures (5-0 Monocryl, Ethicon). (8) Five internal mattress sutures were used to approximate the flap. (9) Continuous interlocking sling sutures were used for final closure.

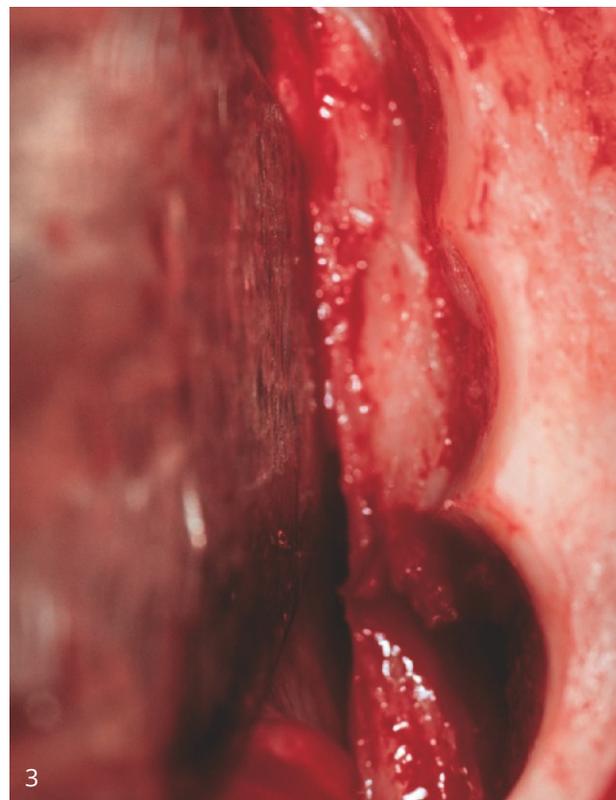
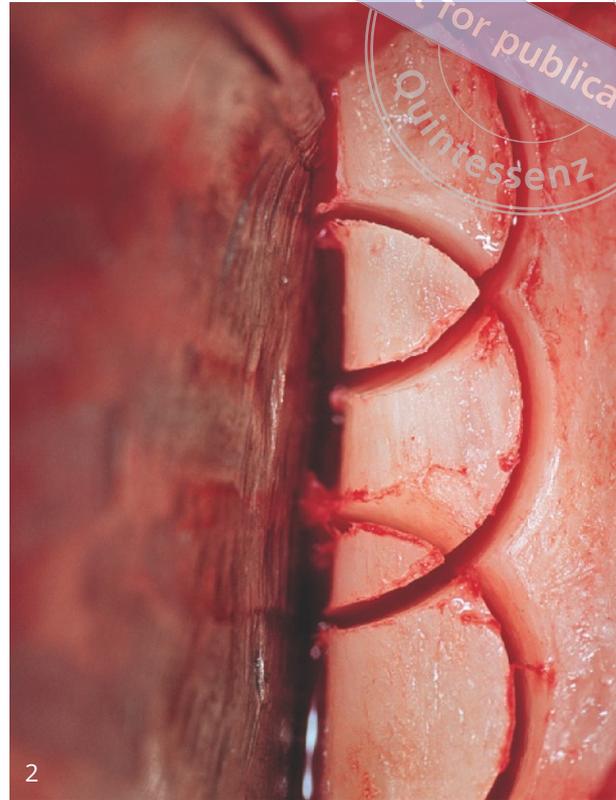
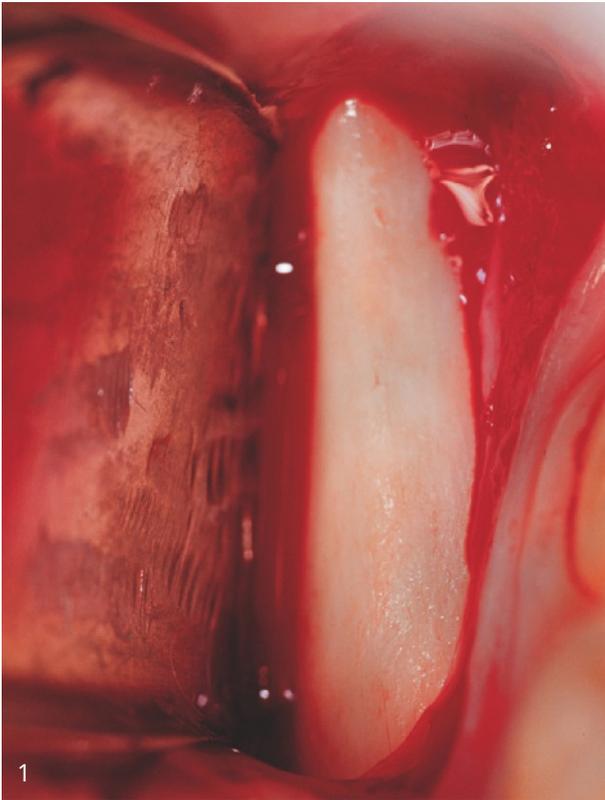


Fig 4-2 (1 to 3) Representative case of bone harvesting in the mandibular ramus. **(1)** Occlusal view of the initial incision that is made parallel to the external oblique line in the mucosa about 3 mm from the mucogingival junction. **(2)** Occlusal view of overlapping semicircular bone rings prepared with a 6-mm trephine. **(3)** Occlusal view of the site after removal of the semicircular bone rings. Final closure is achieved using continuous interlocking sutures.

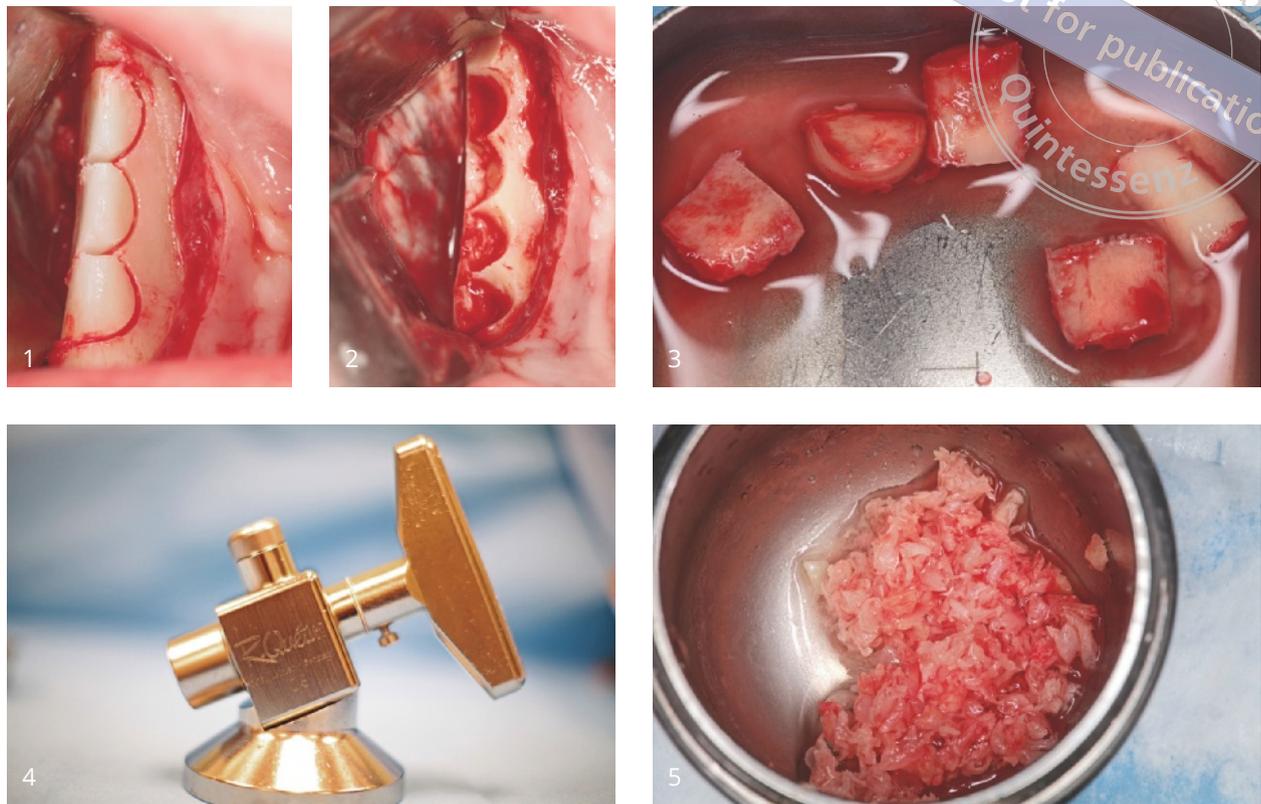


Fig 4-3 (1 to 5) Representative case of non-overlapping semicircular bone ring technique. This is the author's preferred technique. (1) Occlusal view of non-overlapping semicircular bone rings prepared with a 6-mm trephine. (2) Occlusal view of the site after the removal of the semicircular bone rings. (3) A large quantity of bone was collected from this site. (4) The harvested bone is particulated in a bone mill (Quétin, Leimen, Germany). (5) Particulated autogenous bone chips.

4.2 Bone harvesting from the mandibular ramus

The mandibular ramus has been the most frequently used intraoral harvest site in ridge augmentation. It is very important that the clinician visualizes the location of the mandibular ramus three-dimensionally using a CBCT scan before any harvesting is performed.

The author's preferred technique is demonstrated in the cases in Figures 4-2 and 4-3. With the evolution of predictable, non-autogenous graft ma-

terials and the need for less autograft quantities, different bone scrapers have been developed for this purpose. With the use of these instruments, autogenous cortical bone chips can be harvested less invasively (Figs 4-4 to 4-6).

Harvesting autogenous intraoral bone has become less invasive in the past decade. The clinician needs to recognize that bone should be harvested in the safest and least invasive way. In most cases, the mixture of autogenous bone with bone filler materials has decreased the necessity for harvesting large quantities. The use of bone scrapers should be considered in most cases.

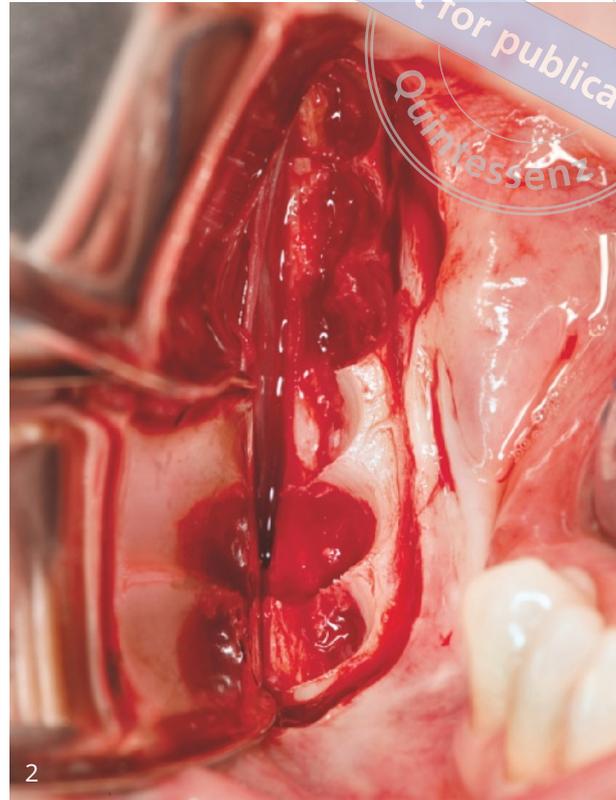
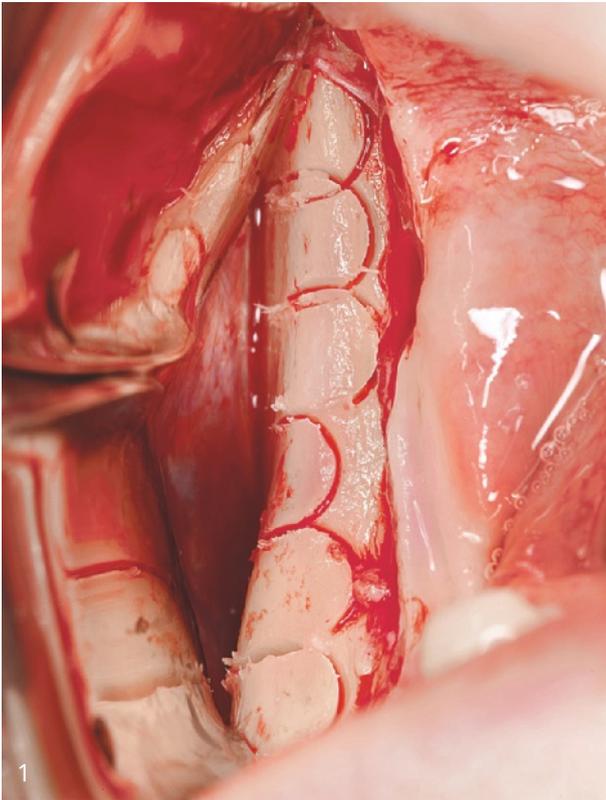


Fig 4-4 Representative case of bone harvesting from the mandibular ramus for the reconstruction of an edentulous resorbed maxilla. Refer to Chapter 20 for more information on edentulous maxillary reconstruction. **(1 and 2)** Multiple cores were harvested from the mandibular ramus. Mixing the harvested autogenous bone with ABBM provided an amount of graft material that was sufficient to reconstruct a severely resorbed maxilla.

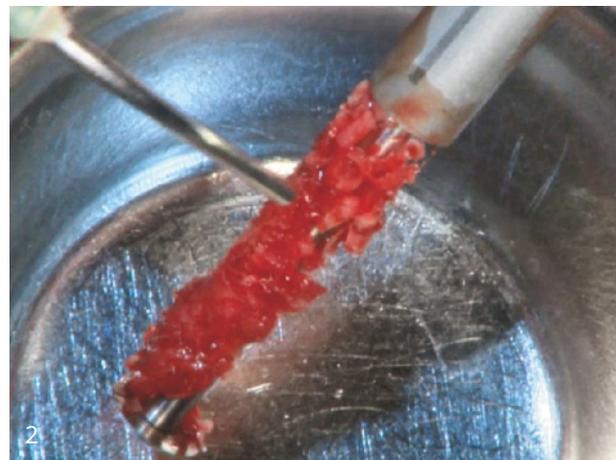
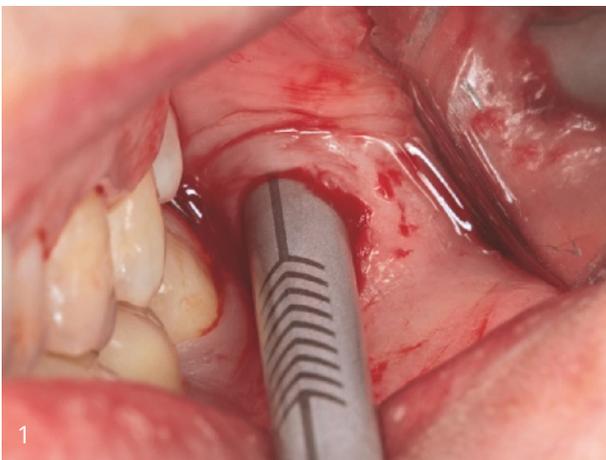


Fig 4-5 (1 and 2) Representative case of a mini bone scraper (Micros, Meta, Germany) used to harvest bone from the mandibular ramus using a tunnel preparation. **(1)** Labial view of a bone scraper that is introduced into the tunnel. **(2)** Note the amount of bone chips harvested using this mini scraper.

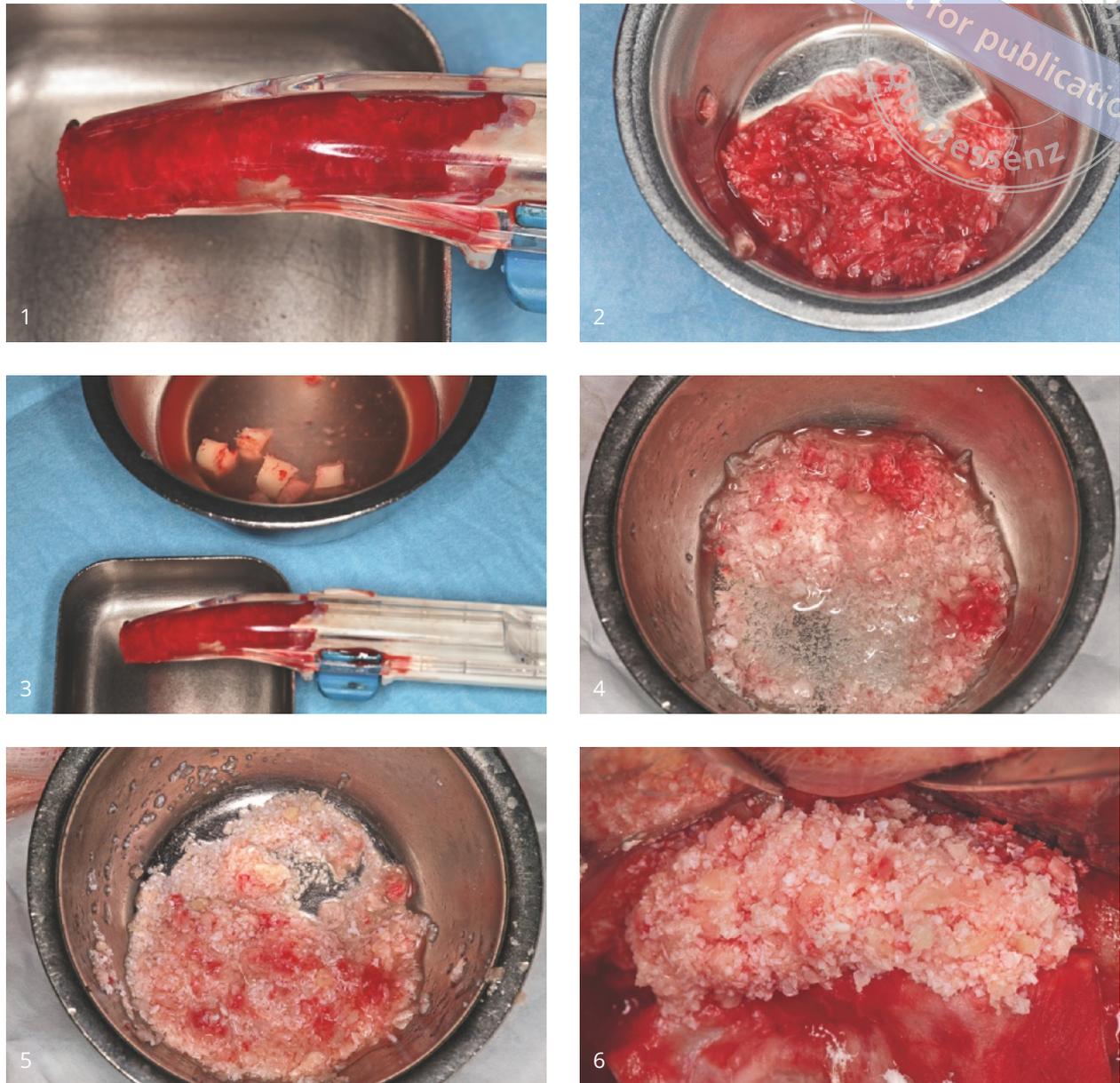


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4.3 Reference

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Chapter 3

Figs 3-1 and 3-2:
 Urban IA, Nagursky H, Lozada JL, Nagy K. Horizontal ridge augmentation with a collagen membrane and a combination of particulated autogenous bone and anorganic bovine bone-derived mineral: a prospective case series in 25 patients. *Int J Periodontics Restorative Dent* 2013;33:299–307.

Chapter 8

Fig 8-1 (1 to 3, 10, and 13):
 Urban IA, Jovanovic SA, Lozada JL. Vertical ridge augmentation using guided bone regeneration (GBR) in three clinical scenarios prior to implant placement: a retrospective study of 35 patients 12 to 72 months after loading. *Int J Oral Maxillofac Implants* 2009;24:502–510.

Fig 8-5 (2, 5, and 9):
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Fig 10-2:
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Fig 10-3:
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Fig 10-4 (1 to 10):
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Chapter 13

Fig 13-1 (3, 5 to 7, and 9):
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Figs 13-2 and 13-3 will be published by the *International Journal of Periodontics and Restorative Dentistry* in January 2017.

Chapter 14

Fig 14-1 (1, 3 to 6, 9, 10, and 12); Fig 14-6 (1); Fig 14-7 (3 and 4); Fig 14-8 (4 to 6, 9 to 11, and 22); Fig 14-9 (1, 2, 4 to 7, 10, 11, and 17); Fig 14-11; Fig 14-12 (1, 5, 6, 12, 14, 15, and 19):
 Urban IA, Monje A, Nevins M, Nevins ML, Lozada JL, Wang HL. *Surgical Management of Significant Maxillary Anterior Vertical Ridge Defects*. *Int J Periodontics Restorative Dent* 2016;36:329–337.

Chapter 15

Figs 15-1 and 15-3:
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Chapter 16

Fig 16-5 (1, 3, 7, and 48):
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Chapter 17

Fig 17-1 (8, 31, 39 to 41, and 45 to 48); Fig 17-3 (3, 4, 7, 9, 11 to 13, 18, 19, and 23):
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Chapter 20

Fig 20-6:

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Fig 20-7 (1, 4, 7, and 14):

Urban IA, Jovanovic SA, Lozada JL. Vertical ridge augmentation using guided bone regeneration (GBR) in three clinical scenarios prior to implant placement: a retrospective study of 35 patients 12 to 72 months after loading. *Int J Oral Maxillofac Implants* 2009;24:502–510.

Fig 20-8 (3, 7, 8, 10, and 14):

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Fig 21-2:

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Chapter 22

Fig 22-1:

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Fig 22-21 (3 and 4):

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