Clinical Success

in

Bone Surgery with
Ultrasonic Devices

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Foreword

I am delighted to be asked to write the foreword for this impressive book on the use of ultrasonic devices for bone surgery. The authors are timely in presenting this information for clinicians who are active in periodontal, oral and maxillofacial, and implant surgery. The reader is thoughtfully instructed in this new technology such that one quickly develops an appreciation of the science behind the device and the possible clinical applications of the device. What comes through loud and clear throughout this book is that piezosurgery is a true advance in the surgical management of bony tissues. The book nicely illustrates the many applications of piezosurgery in periodontal, oral, and implant surgery. The book further helps the reader to examine and treatment plan various clinical situations. The inclusion of contraindications for piezosurgery should be useful to early learners of this technology and ensure appropriate planning and use. The section on intraoral and extraoral donor sites is a useful reminder for the experienced surgeon and an excellent guide for the developing surgeon. Cases are well used to teach the reader the nuances of piezosurgery techniques in a variety of clinical situations.

All in all, I view this book as a tremendous resource for surgeons, for residents in graduate training, and for students. As an academician involved in the day to day training of young dental students and residents, this book will be a wonderful resource for me in educating these individuals in surgical applications. As a practitioner, this book will teach me new techniques for managing a variety of osseous and implant surgical situations. Recognizing that the field of implant dentistry has exploded, it is timely to have surgical technologies such as ultrasonic devices to accompany the placement of dental implants. But recognizing that this area of dentistry is never content, I expect the advances in osseous surgery detailed in this book to be quickly followed by the next generation of ultrasonic devices. I look forward to the ever emerging new possibilities for improved and advanced patient care utilizing ultrasonic devices.

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Introduction

Managing the periodontal environment is a permanent challenge for the periodontist. The periodontium is an entity wherein the superficial periodontium is closely related to the deep periodontium. The alveolar bone partially determines the stability of the periodontal attachment and thus contributes to the periodontal health as far as esthetics and function are concerned. Different techniques and surgical protocols have been proposed to treat bone loss, be it during periodontal disease, after extractions, infections, or trauma, or within the context of placing osseointegrated dental implants. Most of these protocols involve bone surgery techniques.

Success in the practice of bone surgery requires the evaluation of more than 50 criteria (Misch 1987). The essential criteria are of course the long-term stability of the tissues surrounding the implant(s), the absence of inflammation or infection, and the prosthodontic needs and expectations of the patient. The dental implant possibilities will then be subjected to the anatomic criteria of the bone in the concerned area. When there is a pre-existing bone defect, bone grafting should be considered. Bone resorption is a natural physiologic phenomenon after the loss of teeth. Local or general resorptions may be the result of pathologic processes such as the evolution of untreated aggressive periodontitis or an endodontic or endoperiodontal infection. In addidtion resorption may be of traumatic, tumoral, or iatrogenic origin, and the alveolar bone can also be partially or totally destroyed at the moment of the tooth extraction.

Studying the morphology of the bone defect is essential for selecting the method of reconstruction (Mattout and Mattout 2003). If the volume of the defect is significant, we need to use a technique that is osteoinductive (Misch et al, 1992). The progress on alloplastic materials, allogenic materials (Deep et al, 1989; Nique et al, 1987), and guided bone regeneration techniques (Buser et al, 1993; Nyman et al, 1990) has reached a relatively high level of predictability. However, compared with an autogenous bone graft, these techniques lack the capacity of healing and the ability to provide a predictable prognosis. ***From the biologic and immunologic points of view, autogenous bone has demonstrated its superiority over all other materials.***

The treatment success in oral surgery, periodontology, and implant dentistry must take into account more precise biologic criteria. These criteria include: using atraumatic surgical procedures; limiting risks to the surrounding tissue; and improving visibility, hemostasis, and postoperative conditions. Most of the instruments available so far have allowed rapid sampling but have not met all of these criteria. As far as bone grafts are concerned, most of the cutting instruments are modifications of instruments used decades ago in oral and maxillofacial surgery, ie, manual and mechanical instruments like saws, burs, and/or mallets and chisels.

Nowadays, it seems desirable to have at one's disposal precision instruments tailored to every aspect of periodontal and implant surgery of hard tissues. Moreover, the narrow access to the sites of the oral cavity, efforts by the practitioner, and trauma inflicted on the patient (immediate and mediate postoperative conditions) are difficulties that at present cannot be ignored. Piezosurgery is an innovative technical approach to hard tissue surgery that was developed in the 1980s. It was derived from the basic principles of "piezoelectricity," which was discovered by Jacques and Pierre Curie in the late 19th century. The idea of being able to cut through the bone using ultrasounds has been published since the 1970s (Horton et al. 1975). This surgical technique is assisted by an ultrasonic modulated frequency allowing precise and safe cutting of hard tissue. The tip selectively cuts the mineralized tissues without cutting the soft tissues. It therefore limits the risk of damage to the bloodvessels and nerves during bone harvesting. Moreover, visibility is increased, owing to physiologic saline solution irrigation that flows at the working end of the tip. The piezoelectric surgery accordingly offers comfort, safety, and precision to the surgeon during delicate interventions. ***The surgical indications for powerful ultrasounds using a piezoelectric device differ from all other bone surgery techniques*** (eg, rotary instruments).

This more precise and less traumatic technique for the tissues has a learning curve that requires prior training in order to understand the perfect balance between the pressure exerted by the hand of the practitioner and the movement of the tip.

This book presents the practical applications of powerful ultrasonic devices through their technical and surgical aspects. It aims to inform practitioners on the indications, effects, and limitations of this technique by including new protocols. It also provides the guiding principles in using these devices for optimal clinical application. Finally, it presents clinical cases illustrating the proposed indications.

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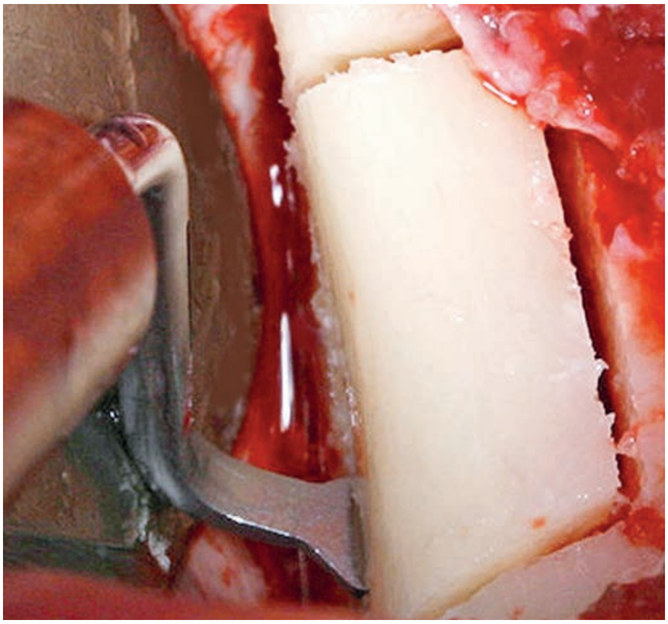
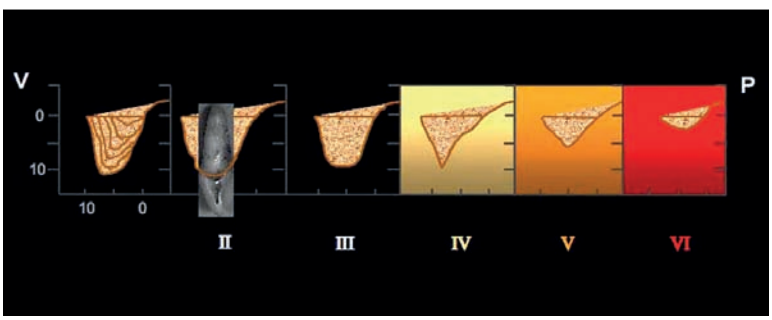
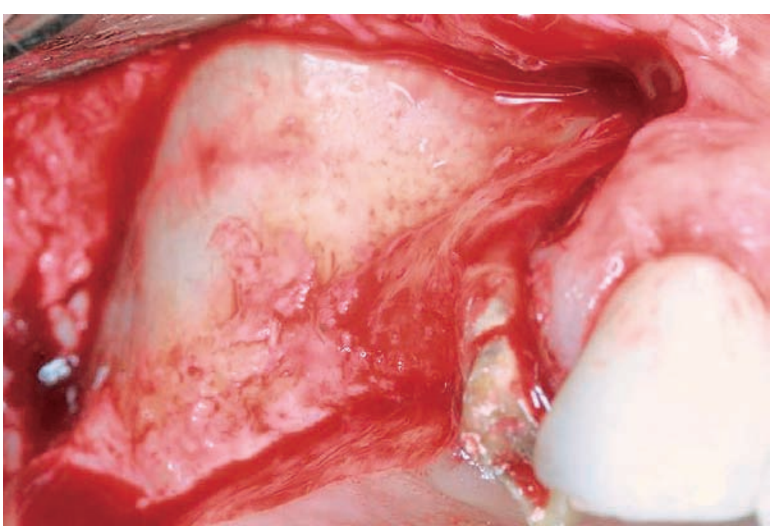


2-9 Ramus harvesting with the Piezotome using a BS2L saw tip (Satelec).

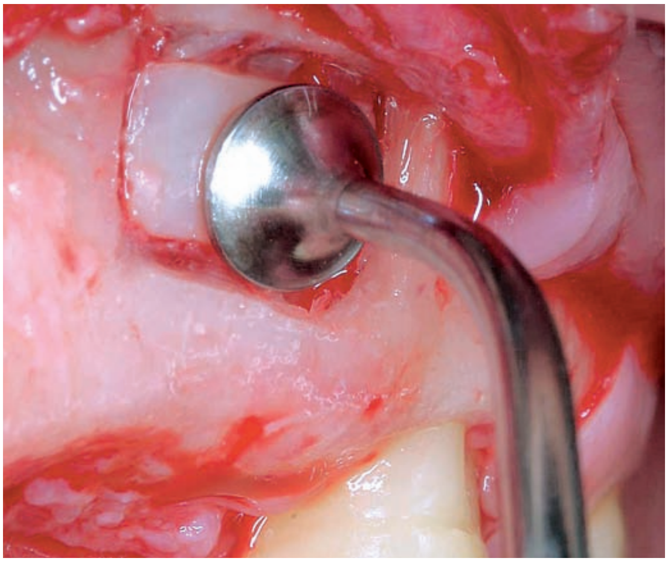
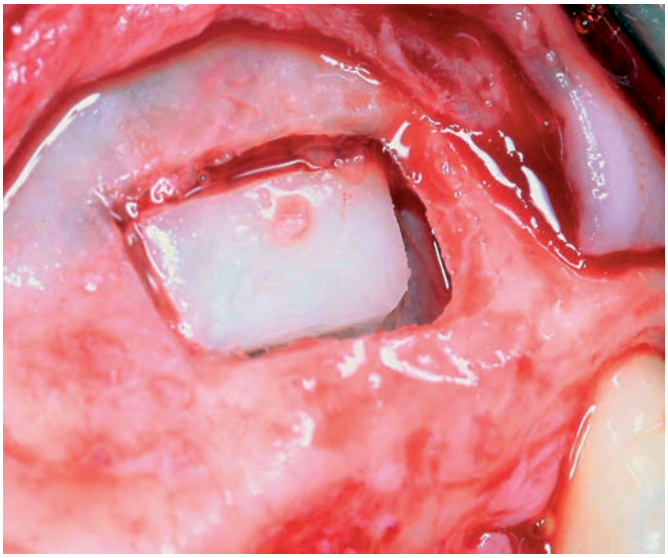
2-10 Harvesting of autogenous bone chips with the BS4 and BS6 saw tips (Satelec).



2-11 Classification of the loss of substance in the maxilla according to Cawood and Howell (1988). Classes IV, V, and VI require sinus floor augmentation prior to dental implant placement.

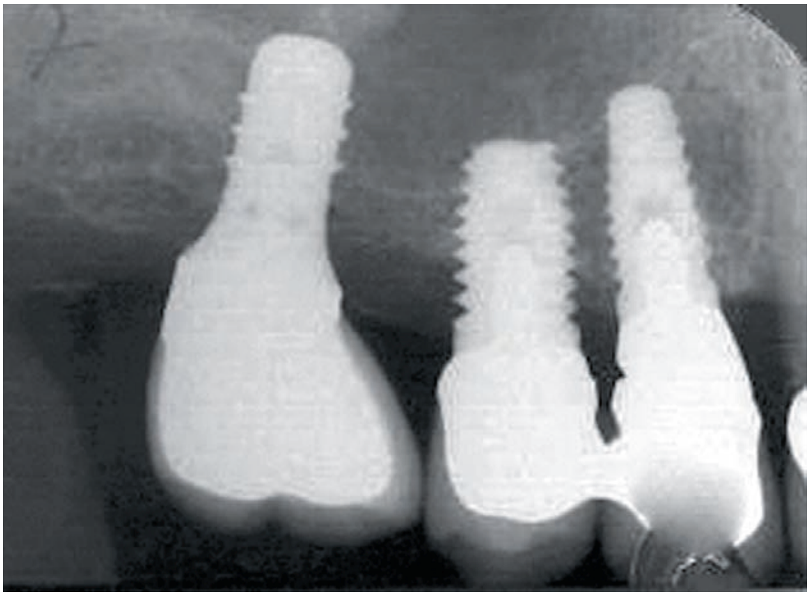


2-12 A flap exposing the anterolateral wall of the maxillary sinus.

2-13 and 2-14 Caldwell-Luc technique followed by immediate dental implant placement.

2-15 Follow-up of a Caldwell-Luc procedure after a year. The sinus floor augmentation was elevated with a resorbable bone substitute biomaterial (Cerasorb® [Curasan]).



Extraction of impacted and ankylosed teeth and excision of cysts

The benefits of this type of intervention can be significant because the volume of bone tissues may allow immediate placement of dental implants, which would be impossible with a conventional technique (Siervo et al 2004; Leclercq and Dohan 2004).

Ultrasonic tips such as the LC (Satelec) or ES009 (Esacrom) can be used to perform delicate tooth extractions that respect the alveolar bony walls.

Extraoral donor sites

Extraoral donor sites include cranial and iliac bone. Tibia bone grafts are no longer performed, owing to pain and risk of fracture *(Fig 5-20)*.

Cranial bone

The cranial bone graft is parietal and has many advantages, including *(1)* minimal postoperative pain, *(2)* an invisible scar, *(3)* good bone quantity, and *(4)* high bone density *(Figs 5-21 and 5-22)*.

A preoperative CT scan and a standard profile and facial teleradiogram are indispensable. However, this type of bone harvesting also has many disadvantages such as *(1)* neurologic risks, *(2)* weakening of the cranial vault, and *(3)* the need for general anesthesia. Because clinicians are not authorized to perform this technique, it is not discussed further in this book.

Iliac bone

The iliac bone is widely used in bone surgery. It provides a voluminous graft that is particularly useful when there is a significant loss of bone. Clinicians are not authorized to perform this type of extraoral harvesting, so a maxillofacial surgeon must do the harvesting.

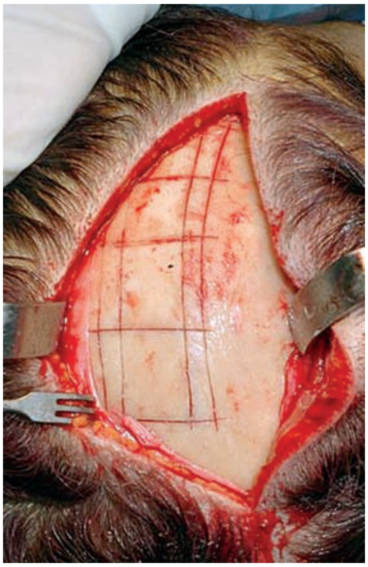
The harvesting zone comprises the anterior part of the iliac crest, posterior to the anterosuperior iliac spine *(Fig 5-23)*. Abundant cancellous bone is obtained with large quantities of primarily cortical bone. Risks include:

- Neurologic complications at the harvested site (eg, femorocutaneous nerve lesion). Nevertheless, this risk is less than that associated with a cranial graft.
- High resorbability, particularly in onlay grafts.

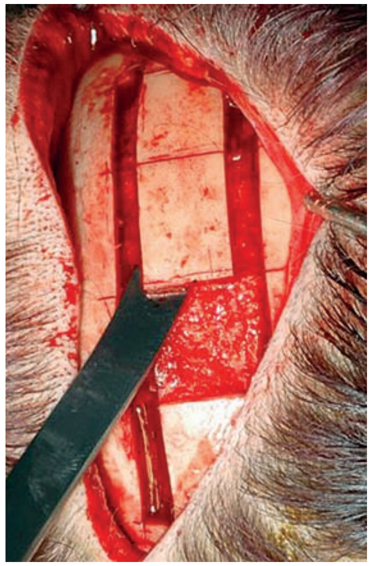
Although the harvesting of iliac bone is considered a delicate technique, stable long-term results can be obtained in certain cases, and it enables the dental implant to be placed after 4.5 months *(Figs 5-24 to 5-26)*.

5-20 Harvesting zone for the tibia.

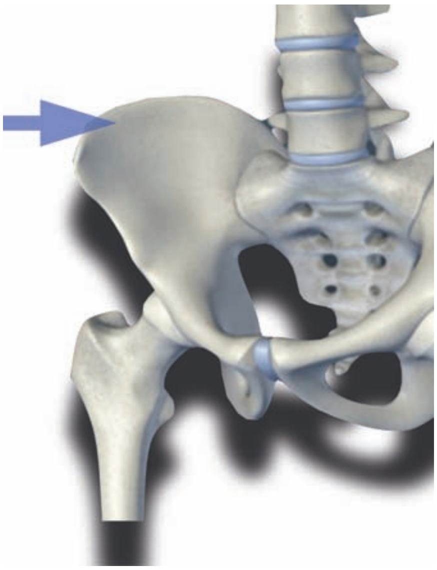
5-21 Harvesting zone for the cranial bone.



5-22a Cranial bone harvesting (photo courtesy of Dr P. Huet).

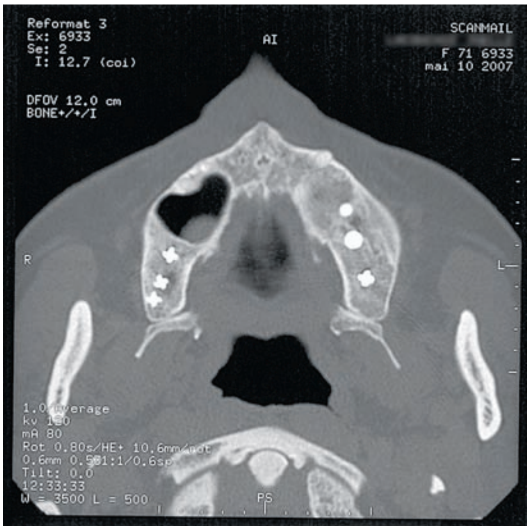


5-22b Cranial bone harvesting showing the lifting of the graft using a bone chisel (photo courtesy of Dr P. Huet).

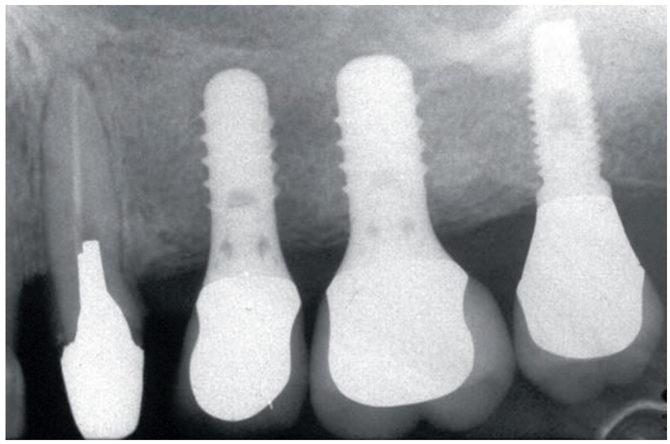


5-23 Harvesting zone for the iliac bone.

5-24 Aspect of an oral reconstruction: implant-supported prosthesis after iliac bone graft. Result after 3 years (bone graft by Dr N. Bedhet).



5-25 CT scan horizontal slice showing the position of the implants on the iliac graft.



5-26 View of the second quadrant showing the integration of the dental implants (SLA [Straumann]) in the iliac graft.