Immediate Dentoalveolar Restoration:

Immediately Loaded Implants in Compromised Sockets, Second Edition

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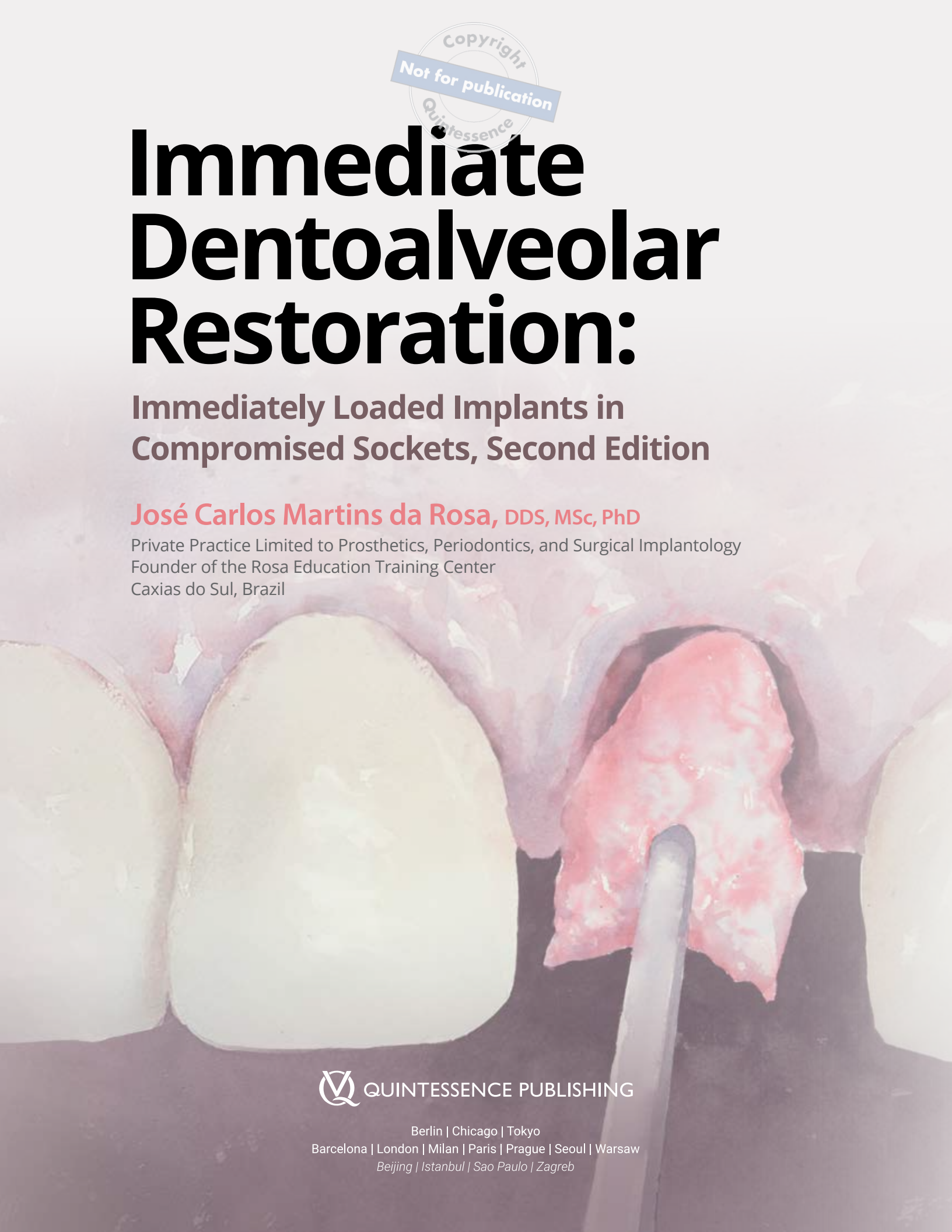

QUINTESSENCE PUBLISHING

Berlin | Chicago | Tokyo
Barcelona | London | Milan | Paris | Prague | Seoul | Warsaw
Beijing | Istanbul | Sao Paulo | Zagreb

First published as *Restauração Dentoalveolar Imediata—Implantes com provisionalização imediata em alvéolos comprometidos* in Portuguese in 2022 by Editora Napoleão in Nova Odessa, Brazil.

Library of Congress Control Number: 2024936079

A CIP record for this book is available from the British Library.
ISBN: 978-1-64724-171-1

Quintessence Publishing Co, Inc
411 N Raddant Road
Batavia, IL 60510
www.quintessence-publishing.com

5 4 3 2 1

Editors: Bryn Grisham and Leah Huffman
Production: Tracy Tomkowiak
Design: Sue Zubek
Watercolor Illustrations: Antônio Julio Giacomin
Photographic Treatment: Daniel Guimarães
Clinical Illustrations: Reynaldo Uezima

Printed in Croatia

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Preface

With the perspective of almost 20 years since the first case using the immediate dentoalveolar restoration (IDR) technique, I can say that this subject has reached clinical and scientific maturity. There have now been more than 600 clinical cases performed alongside various research projects and publications, and countless trained professionals all over the world report the same level of satisfaction with the results. This second edition of the IDR book, released more than a decade after the first, is an invitation to review the state of modern implantology, which searches for the best biologic answers and challenges itself more every day.

Although the essence of IDR remains the same, the indications for IDR in compromised sockets have evolved, and significant improvements have been made to its protocols. Today, there is a deeper knowledge of the biologic foundations of flapless surgeries, immediate provisionalization, and above all, the use of autogenous bone from the maxillary tuberosity as a primary source for grafts. The superiority of autogenous bone for bone reconstruction is echoed across the international scientific community with full force, which reinforces the pertinence of this publication. Furthermore, the maxillary tuberosity has additional osteogenic properties that allow for more efficient graft revascularization and incorporation with low complication rates.

IDR is certainly a sensible technique, but it requires training to develop skills for its application. Some steps of the IDR protocol have been updated in this edition, with a focus on accelerating the learning curve for clinicians eager to obtain the best results in the treatment of compromised sockets. In sharing my clinical experience and knowledge acquired over the years, I want to offer a simple, fast, predictable, and cost-efficient treatment to patients. After all, they are the true beneficiaries of this work and the reason why we do it in the first place.

I wish you all great reading.

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Esthetics in Implantology and the Postextraction Socket

Dentistry in the esthetic zone is always a challenge. Treatment with implants, especially in the anterior maxilla, is complex and requires careful evaluation and planning and invariably involves different specialists.

Current knowledge of the esthetics, functions, and biology of tissues means that surgical and prosthetic principles can go beyond simply performing restorations that are similar to the original elements. The esthetic aspects of the face, the smile, and the teeth themselves can undergo rigorous evaluation. A clinician's ability to visualize the results before intervention is the centerpiece for success in implant dentistry, guaranteeing a balance between the final restoration and the adjacent teeth, as well as the health of hard and soft peri-implant tissues.

To achieve a balance, use a rigorous esthetic analysis for diagnostic purposes and to guide surgery. Collecting the necessary information and determining what should be done are essential to carrying out a procedure. An adequate surgical guide should be obtained via analog or digital means, and it should inform the ideal implant positioning, both for the osseous (in the buccopalatal and mesiodistal direction) and subgingival (in the apicocoronal direction) positioning.

Another factor for previsualization of the results is the preservation of the alveolar ridge after extraction. It is necessary to maintain the architecture of the bone and gingiva in the treatment of esthetic areas. In this context, studies about immediate loading implants advocate preserving the architecture of future peri-implant tissues.[1] Immediate postextraction implantation has been a reality for single implants since 1994, when Becker et al[2] affirmed that wherever possible, the implant should substitute the dental root in the same procedure in which the tooth is extracted to avoid the additional bone loss that can occur in vertical and horizontal directions.

The consensus is that the technoscientific development of "implantdontics" has resulted in a reduction in the waiting time between the surgical steps and the number of clinical sessions needed for prosthetic rehabilitation with implants. In this research field, the objective is to provide predictable clinical, esthetic, and functional results in a shorter period of time; studies about immediate loading on fresh and intact sockets have evolved, yielding a favorable prognosis for such procedures.[1,3–6]

Wöhrle[3] initially cited that the main advantage of placing immediate postextraction implants in the maxilla is maintenance of the existing hard and soft tissues, leading to esthetically positive results without the need for subsequent procedures to augment these tissues. The idea has come to be accepted that a two-stage surgical protocol could be changed, considering the morphologic tissue changes observed after dental loss.

Immediate esthetic recuperation after extraction is possible when all the surgical, prosthetic, and biologic principles are rigorously respected.[4] Care in terms of correctly selecting the patient to receive immediate placement is as important as the precise surgical execution.

There are obvious advantages to simplifying the surgery and eliminating the second stage of surgery. After many years of research and development of the immediate postextraction implant technique, we have also seen a significant improvement in postoperative symptoms because there is no need to open the flap. Immediate replacement of a tooth helps alleviate the psychologic impact of removing a damaged tooth. The healing and maturing of soft and hard peri-implant tissues and maintenance of the marginal gingiva, including the interdental papilla, occurs with the process of osseointegration, thanks to the immediate support lent by the provisional restoration.[7]

And what about cases of compromised fresh extraction sockets? The challenge is greater in the presence of bone defects caused by root fractures, causing periodontal and/or periapical compromise to the teeth involved. The development of new materials and methods has modified the approach to treatment and widened its possibilities of use. Innovation in implant design that allows for an increase in primary stability, new ways to connect prosthetics, and the application of technology in surface treatment have all encouraged immediate implant placement to be performed safely and with predictable results.

In cases in which the socket has a bone and/or gingival defect, there is a consensus[8–11] that two-stage surgery should be used to solve the problem. The first surgical period involves extraction, curettage of the lesion, the immediate placement of an implant, and the restoration of peri-implant bone defects via bone graft, with or without guided regeneration. The second surgical period involves reopening the implant, managing the soft tissues, and constructing a provisional prosthesis. The results are unpredictable in terms of the positioning on the gingival margin and the interproximal papilla.

In delayed loading with stage-two surgery, it is common to observe the recession of the buccal gingival margin, with the apical movement of the biologic width due to excessive manipulation of the tissues and repeated sessions of gingival conditioning.

Tracking various cases through radiographic imaging also suggests using the immediate placement technique in fresh extraction sockets with bone and/or gingival defects in a single surgical stage. Even in cases requiring a significant bone graft, this can be performed at the same time that the implant is placed without opening a flap. Placing the implant in the fresh extraction socket and immediately placing the provisional restoration does not impede blood supply to the graft tissue, thus allowing for bone reconstruction during the same procedure.[12]

Preserving the mucogingival line and other anatomical structures, thanks to the absence of flaps, is essential to obtain functional and esthetic results in treating intact and/or compromised fresh extraction sockets. Bone and gingival defects can be corrected at the same time as immediate implant placement by using a strict protocol that makes it possible to perform various procedures in a single surgical stage, immediately restoring the dentoalveolar defect.

The Relationship Between Peri-implant Esthetics and the Biologic Width

The presence of a papilla between teeth and implants and between implants is fundamental to an acceptable esthetic result. When single implants are placed between healthy teeth, the interproximal soft tissues are maintained by adjacent bone crests. The position of the bone crest must be analyzed through an ultrasound

and periapical radiography to determine how difficult it is to obtain or maintain the papilla.[13]

With this objective in mind, Tarnow et al correlated the presence and/or absence of the papilla between the tooth and the implant with the existing distance between the interproximal bone crest and the interdental point of contact. When the distance was 5 mm or less, the papilla completely filled the interproximal space in 100% of the cases. When the distance was 6 mm, the papilla filled the space in 55% of the cases, and when it was 7 mm, it filled the interproximal space in only 25% of the cases.[14,15]

The ideal profile of the crown on the implant is directly related to the distance between the implant platform and the gingival margin, according to the tooth to be substituted. The implant should be positioned 3 mm apically from the free gingival margin or on the level of the surgical collar of the tooth to be extracted, ending with the cervical area of the buccal cortex.[13] This positioning allows adequate conditioning of the transmucosal gingiva, so as to recreate or maintain a profile of natural emergence for the restoration. If an implant with an ideal diameter cannot be used and a smaller one is required, this should be placed discretely more apical with respect to the gingival margin to encourage a restoration with a more gradual progression for the emergence profile.[16]

Therefore, the ideal implant position together with the correct emergence profile for the crown are important factors in obtaining and maintaining the esthetics of the soft tissues, especially for immediate placement postextraction. Moreover, other factors, such as selection of the implant design and the presence or absence of keratinized mucosa can also influence the response of peri-implant tissues. All these areas of knowledge apply when thinking about rehabilitating sites with defects, including decisions about the appropriate technique for the reconstruction.

The Importance of Identifying the Periodontal Phenotype

Evaluation of the periodontal phenotype helps in the selection of the safest and most predictable surgical procedures to solve the problems associated with extraction and placement of implants subject to immediate loading. The evaluation should cover the quality of the periodontium, presence of keratinized tissue, gingival thickness, and the type of alveolar bone.[17]

Knowledge of the different phenotypes can indicate the quality of the tissues involved and the expected scar response to the surgical procedure, including postoperative tissue contraction and risk of gingival recession.[17–19]

A periodontium with a thick phenotype has a flat tissue architecture, as well as fibrous and dense soft tissue, a broad band of attached gingiva, thick subjacent bone, and resistance to mechanical trauma. This periodontium is more resistant to gingival recession and bone resorption and reacts to periodontal disease with the formation of a pocket and intraosseous defect.[20]

A peridontium with a thin phenotype has a scalloped tissue architecture, as well as friable and delicate soft tissue, a narrow band of attached gingiva, and thin subjacent bone subject to fenestration or dehiscence. Opening flaps should be avoided, as this periodontium requires careful manipulation during surgery so as to reduce the possibility of bone resorption and avoid recession. This phenotype generally reacts to disease and trauma with recession of the marginal tissue.[20]

Maynard and Wilson[21] offer a more complete classification, which covers four different periodontal phenotypes:

- **Type I:** Normal keratinized tissue (3 to 5 mm in height), with a good buccolingual thickness for the alveolar process, providing good blood supply for the tissues involved in the surgical procedure (Fig 1-1).
- **Type II:** Narrow keratinized tissue (up to 2 mm in height), requiring delicate handling. The buccolingual thickness of the alveolar process is normal, providing good blood supply for the flaps (Fig 1-2).
- **Type III:** Normal keratinized tissue (> 2 mm in height), with thin buccolingual thickness of the alveolar process and not a lot of spongy bone. The roots are palpable from the mucogingival line, and the blood supply of this periodontium is mainly furnished at the expense of the soft tissue (Fig 1-3).
- **Type IV:** Narrow keratinized tissue (less than 2 mm in height) and thin buccolingual thickness of the alveolar process, with visualization of the roots' convexity and with a strong tendency for gingival recession because of the scant blood supply of the tissues involved (Fig 1-4).

Fig 1-1 Periodontal phenotype: Type I.

Fig 1-2 Periodontal phenotype: Type II.

Fig 1-3 Periodontal phenotype: Type III.

Fig 1-4 Periodontal phenotype: Type IV.

In the presence of fresh intact sockets of phenotypes I and II, the possibility of gingival recession is rare because of the thickness of the remaining cortical bone, even without using bone fillers during implant placement. On the other hand, because of the fragility of the buccal cortex of phenotype III, there is a greater risk of bone resorption, which may or may not be associated with gingival recessions. In these cases, depending on the space between the implant and the buccal cortex, bone fillers are indicated. In cases of phenotype IV, bone filler is always recommended in conjunction with implant placement.

In people with a thin gingival phenotype, a subepithelial connective tissue graft can be done at the same time as placement of the immediate implant. The objective is to create thicker gingival tissue and maintain the gingival margin, minimizing the risk of recessions.[7] However, the approach should be conservative, avoiding vertical incisions and flap elevation.

When the bone wall is compromised, bone grafting is needed to obtain favorable esthetic and functional results. Identification of the periodontal phenotype is essential to choosing the correct approach to immediate dentoalveolar restoration (IDR), which is implant placement with immediate loading and simultaneous bone grafting.

In clinical situations involving bone defects associated with phenotypes I and II, the quality of the blood supply favors a more rapid incorporation of the bone graft. The remaining buccal bone wall, being thicker, encourages a better adaptation of the graft.

In phenotype III, the quality of the gingiva minimizes the risk of graft exposure or of bone spicules, despite the fragility of the buccal cortex and therefore the greater difficulty in the adaptation of the corticocancellous bone graft.

In cases of phenotype IV—poor quality gingiva and local bone—care must be taken when adapting the bone graft. Affiliated edges and the superimposition of the graft should be avoided, as the surgeon cannot count on internal resistance of the very thin soft tissue on the bone graft.

When performing a bone graft at the same time as implant placement and fabrication of the provisional crown, the manipulation and transfer of the graft to the site should be quick to maintain viable bone cells, especially in situations involving phenotypes III and IV, where there is a deficiency in local blood supply.

Morphologic Changes of the Alveolar Bone

Understanding the biologic phenomena in dental extraction will contribute to the choice of preservation or reconstruction of the alveolar ridge.

Progressive involution of the alveolar bone starts shortly after tooth loss, with a reduction both in the quality and quantity of hard and soft tissue[22,23] (Fig 1-5). Cancellous bone replaces most of the cortical bone, with a marked reduction in buccolingual and apicocoronal bone.[24] This change occurs more in the anterior maxilla because of the thickness of the buccal cortical bone, which can create an unfavorable gap between the implant and the prosthesis.[23]

When implant placement is delayed after the extraction, soft tissue healing can cause an increase in volume to provide adequate flap adaptation. However, this advantage is counterbalanced by bone resorption.[25] Subsequent implant placement can result in prostheses with long clinical crowns and wide areas of contact to minimize possible deficiencies in the height of the interproximal papilla and the gingival countour[26] (Fig 1-6).

Healing of the sockets

The external portion of the socket reflects morphologic changes to the bone and suprajacent mucosa, which occur during the healing period. There is an approximate 50% horizontal reduction in the crest (4 mm, on average) over the 12 months after extraction, with the majority of the reduction occurring during the first 4 months of healing. A vertical reduction (2 to 3 mm, on average) accompanies this horizontal change. We see larger vertical changes in places where there are multiple adjacent extractions.[23,27–29]

Healing in the internal portion of the socket can result in dimension reduction. Six months after extraction, there can be a reduction of 4 to 5 mm in the socket's internal length, or approximately 50% of its initial length. A 2-mm reduction in height can also occur during the same period. Bone formation within the socket occurs at the same time as a loss in the alveolar crest height, especially during the first 3 months after extraction.[23,27–29]

Progressive involution of the alveolar tissues after dental loss

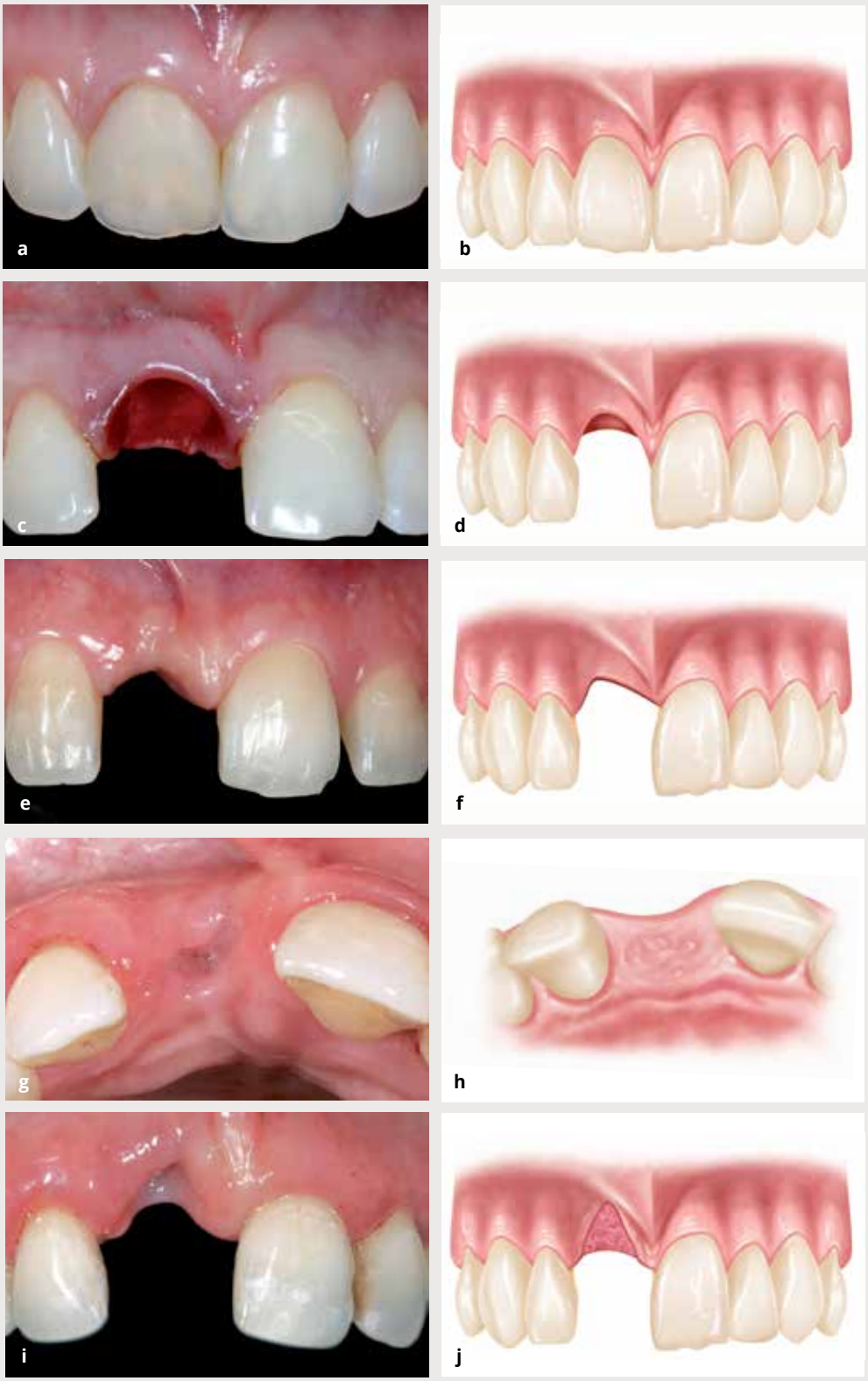

Fig 1-5 *(a and b)* Intact periodontal tissues. *(c and d)* Intact alveolar outline, shortly after extraction. *(e to j)* When filling procedures and/or implant placement do not immediately follow extraction, a progressive involution of the tissues occurs, dependent on the level of bone loss and the inflammation involved.

Progressive involution of the alveolar tissues after dental loss (cont)

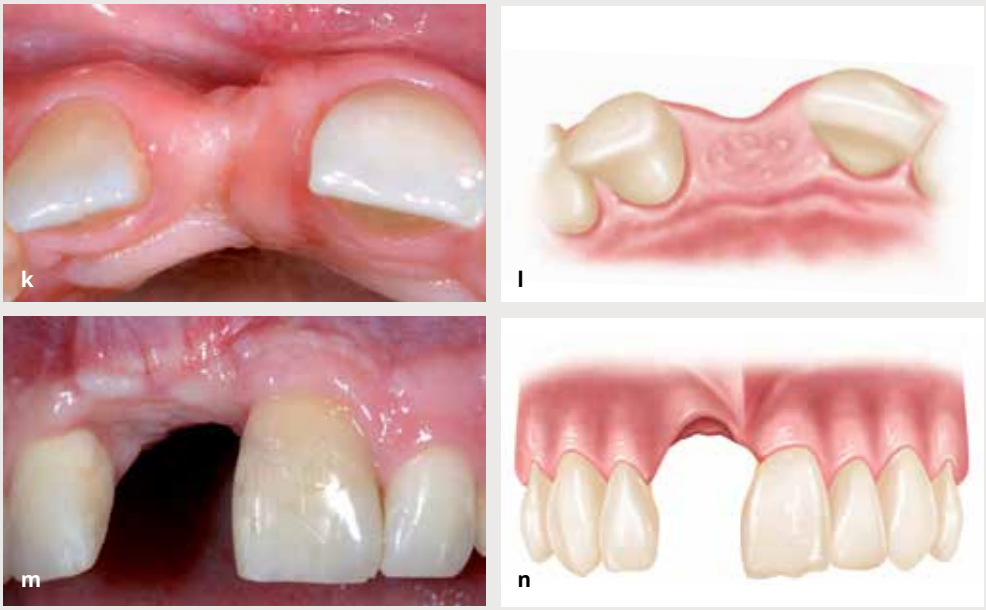

Fig 1-5 cont *(k to n)* The progressive involution of the tissues.

Fig 1-6 *(a to c)* Esthetic outcomes resulting from later intervention to place implants and preserve the sockets. Deficiencies in the gingival height and papillae result in long clinical crowns with wide areas near the contact points.

The biologic responses after extraction go through the following stages:

- Formation of a coagulum.
- Substitution of the coagulum with granulation tissue over 4 to 5 days. Endothelial cell filaments start to form capillaries.
- Substitution of the granulation tissue with connective tissue by day 16, characterized by the presence of fibroblasts and collagen fibers. Endothelial tissue migrates inside the socket, which can cause esthetic defects.
- Calcification of the osteoid, from the base and from the periphery of the socket, in 7 to 10 days. Bone trabeculae partially fill the socket in about 6 weeks.
- Complete epithelial closing of the socket after 24 to 35 days.
- Resorption of the original cortical alveolar bone, giving rise to a thin cortical bone from lack of function.
- Maximum osteoblastic activity between 4 to 6 weeks after extraction, slowing down after the eighth week. At around 16 weeks, there is already little sign of osteogenic activity; bone fill is complete. Nonfunctional spongy bone forms with a lot of trabeculae and no organization.[30–32]

Fig 1-7 *(a to c)* Different gaps between the implant surface and alveolar bone, mainly on the buccal wall.

Socket healing after immediate placement of an implant

Delaying implant placement in the anterior maxilla by 3 months or more after extraction can result in resorption so advanced that we can use only narrow implants. Immediate implant placement has advantages for tissue healing, as it reduces the loss of bone volume through resorption.[25]

However, this occurs only with placement of an implant in a fresh socket.[33] Results of clinical, radiographic, and histologic studies show that bone healing in postextraction sites with implant placement leads to external resorption of the original alveolar walls, which can cause changes to the gingival margin, especially in the presence of a thin periodontal phenotype.[34]

In some situations, the socket can experience about 2.5 mm of bone loss around the implant and about 3 mm of loss in the buccal volume. The height of the socket's proximal walls is generally maintained, and bone reduction remains limited to the buccal cortical bone when teeth adjacent to the site of the extraction have intact interproximal bone crests. The periodontal ligament on adjacent teeth preserves the height of the interproximal bone crest. However, in the absence of adjacent teeth significant apicocoronal resorption occurs during healing, which can compromise the result of implant treatment.[24]

Depending on the combination of the socket's anatomical condition and the dimensions of the chosen implant, there may be a gap between the implant surface and the socket bone walls (Fig 1-7). In these cases, there are two kinds of bone formation: *(1)* direct on the surface of the implant, in areas in which it is in contact with the remaining bone (osteogenic contact), and *(2)* appositional, in which new bone forms from the socket surface and reaches the surface of the implant (osteogenic jump).[35]

Thus, implants with a treated or rough surface increase the surface contact area available to the fibrin network in the fresh socket and can lead to greater bone conduction, accelerating the process of bone formation and bone integration.[35–37] Depending on the gap at the time of implant placement, there is still a risk of alveolar contraction. A gap greater than 1.5 mm can interfere unfavorably in bone deposition, damaging the functional and esthetic results.[34,38]

Preservation of the Socket

When a tooth has to be extracted, planning must be performed to prevent site collape, which would cause a functional-esthetic compromise.[39] The extraction should be as minimally invasive as possible to ensure the maximum preservation of the socket and interproximal and buccal gingival contours.

After extraction, the surgeon should take steps to maintain the gingival contour and keep the bone walls intact. When a tooth is extracted and the interdental embrasures cease to exist, the interproximal papilla flattens over time to around 3 mm away from bone level. To prevent interproximal tissue from flattening and to preserve the bone's height and length, it is necessary to fill the socket gaps.[8,25,28,40]

This filling can be performed to preserve the socket for the future implant placement. However, the most effective means of preserving the structures is immediate implant placement and filling the resulting gap with bone. Aside from reducing the number of surgical interventions and the treatment time, implant placement in the fresh socket can promote faster and more effective healing.[8,12,23,28,40,41] If immediate loading cannot be performed, a connective and/or epithelial graft can be harvested from the palate or maxillary tuberosity and placed into the alveolar opening to promote primary

closing.[42] The ideal maintenance for adjacent tissues is always more effective when associated with implant placement, bone filling, and immediate loading using the correct anatomical profile for the crown.

The literature describes various filler materials, such as autogenous bone, biomaterials, and synthetic substitutes. All these fillers yield good results when the integrity of the socket walls are maintained.[8,28,40] Nontraumatic techniques and respect for the biologic principles are fundamental.

Alternatives for filling intact sockets

Autogenous grafts

Wherever possible, an autogenous graft should be the first choice, as various studies have shown that it demonstrates the best results. Postextraction filling of the socket can be performed using bone collected from the maxillary tuberosity or the mandibular retromolar area. Where immediate loading is not performed, a graft of connective and epithelial tissues should be harvested from the palate area or tuberosity itself to promote the primary closure of the socket. A rotational flap from the palate can also be used.[43–46]

Xenografts

These are inorganic grafts of animal origin. The most commonly used is deproteinized bovine bone mineral (Bio-Oss, Geistlich), which has a crystalline and calcium phosphate architecture similar to that of natural human bone. The resorption rate is low, and it can remain present in the graft area after 4 months, without signs of resorption or substitution. Even though its histologic results are inferior to autogenous bone,[47,48] this biomaterial can be used to preserve alveolar bone postextraction,[49,50] mainly to fill small gaps between the implant and socket.[51]

Allografts

These are demineralized and frozen human grafts. They can be used to fill spaces in sites immediately after extraction thanks to their bone induction and conduction properties. Removal of the inorganic content of the bone liberates their proteins to allow for quicker osteogenic potential. Demineralized freeze-dried bone allograft (DFDBA) is prepared with different forms and shapes of particles and can be mixed with saline or blood.[52] These grafts are resorbed and substituted in a short amount of time and can be used to preserve bone height and length for future or immediate implant placement.[53,54]

Alloplastic grafts

These are synthetically produced materials. Among the materials for bone substitution, beta-tricalcium phosphate can be used for postextraction bone defects, for both resorption and bone neoformation. The granules are applied after mixing them with blood. When placed on bone, the granular structure increases mechanical stability. There are no potential risks of immunologic response or infection, as is the case with grafts of biologic origin.[55–58]

Compromised Sockets

Some clinical situations are not ideal for immediate implant placement. This situation can arise because of the presence of fracture, root resorption, perforation, or periodontal or endodontic disease that cause partial or total alveolar bone resorption. Often, these lesions are associated with an additional loss, leading to gingival recession or to a compromise of the bone crest of adjacent teeth involving the papillae. The characteristics of the lesions, namely their acute or chronic nature, determine the severity of the esthetic risk, which is higher when there are acute infections with suppuration and local edema.[9]

Examples include pathologic periapical resorption, which can damage one or more of the socket bone walls. When this resorption occurs, fibrous tissue can occupy part of the socket, impeding normal healing and bone regeneration.[59] In esthetic areas, the most common type of defect is buccal vertical bone loss, caused either by root fracture or by endoperiodontal infections. In these cases, a change to the cortical bone is followed by a significant change to the mucosa[23,27–29] (Figs 1-8 to 1-11). In areas of vertical bone loss around adjacent teeth, there can be a loss of support for the interproximal papilla and a black space in the region of the embrasures[60,61] (Figs 1-12 and 1-13).

Whatever the etiology of the tooth extraction, horizontal and/or vertical deficiencies in the alveolar bone structure can be present, resulting in less bone and a compromise in the primary stability of the implant.[8,11] For such sites, the literature notes that the risk of long-term complications is greater with immediate implants.[44] Therefore, immediate implant placement

Changes in mucosa detected during clinical examination

Fig 1-8 *(a and b)* Abscess present in the right central incisor.

Fig 1-9 *(a and b)* Erythematous aspect and edema showing an abscess in the area of the left lateral incisor, with dental extrusion already present.

Fig 1-10 *(a and b)* Presence of edema and suppuration in the right lateral incisor, indicating a loss of proximal bone crests as well as the buccal wall.

Fig 1-11 *(a and b)* Another example of an abscess leading to total loss of the buccal bone wall.

Fig 1-12 *(a and b)* Change evident in the coloring and form of the periodontal tissues in the area of the left central incisor, including a significant loss in papilla volume and gingival recession.

Fig 1-13 *(a and b)* Loss of the distal bone crest and extrusion of the right central incisor.

is contraindicated. Instead, dental surgeons should use graft techniques to regenerate the area before placing implants.[62,63] They should identify the patient's susceptibility to periodontal disease, as this factor determines the risk of even greater biologic complications.[9,64,65]

On the other hand, studies comparing sites with periapical infection to intact sites do not show statistical differences in the failure rates for implants and gingival esthetics or bone resorption.[11] Other studies show that the longevity rate for implants inserted in fresh sockets with root fractures, periodontal infections, endoperiodontal infections, periapical lesions, and periodontal cysts is similar to that for implants inserted in healed sites.[10,65] Only a few studies found high failure rates in cases of implants in sites where teeth were affected by chronic periodontitis.[66,67]

In these clinical conditions, most studies in the literature made use of guided bone regeneration (GBR) and membranes. All linked immediate implant placement and reconstruction of compromised sockets with flap opening and two-stage surgery. The results suggest that immediate implant placement in areas with lesions may be indicated, as the protocol includes rigorous debridement of the infected tissue together with an osteotomy on the periphery of the socket, as well as pre- and postsurgical antibiotic therapy.[10,11]

Alternative treatments for compromised sockets involving delayed loading

Various authors have developed procedures to reestablish compromised gingival and alveolar bone architecture, such as forced orthodontic extrusion, GBR, and bone grafting with or without a subepithelial connective tissue graft. These techniques can be used to treat defects before, during, and after extraction and involve two or three surgical stages.

Orthodontic extrusion

Orthodontic extrusion aims to manipulate the gingiva and the bone in the coronal direction before placing an implant. It is often used in correcting infrabony defects and repositioning the marginal gingiva.[68] This technique may be indicated in situations involving bone loss, such as fractures or infrabony caries, teeth with slight periodontal problems, and teeth without a periapical lesion.[69] Aside from being a lengthy treatment, this procedure results in a smaller alveolar opening, which can cause an esthetic problem because of the gap with the mesiodistal diameter of the homologous tooth.

Guided bone regeneration

The GBR technique uses a physical barrier (titanium-reinforced membrane or a collagen membrane) to impede the migration of epithelial cells and connective tissue to the defect area. It can be used with or without an associated bone graft.[70] Filling can be performed with particulate autogenous bone, allogenous bone, xenogenous bone, and even alloplastic grafts. This technique may be indicated for the reconstruction of alveolar defects before or during placement of implants. To completely cover the membrane, it is necessary to use releasing incisions for coronal dislocation of a full-thickness flap, which can change the soft tissue architecture and create vascular compromise in the area, provoking undesirable tissue retractions. Thus, the esthetic results are unpredictable.

Onlay bone graft with or without subepithelial connective tissue graft

In cases where a bone graft is indicated, autogenous bone is the top choice, as it provides bone-conducting, bone-inducing, and osteogenic characteristics.[47] Within the intraoral donor area, the lateral portion of the mandibular body and jawline is the region most often used to harvest onlay-type grafts. Generally, a soft tissue graft is also needed during the procedure or in subsequent steps. In addition to surgical morbidity, this technique requires reintervention to place the implant, reopening surgery, and conditioning of the peri-implant soft tissue, all of which carry high esthetic risks.

Freely collected gingival-bone graft with trephine

Autogenous free gingival-bone grafts involve a single graft of epithelial, connective, and bone tissue harvested with trephines from the posterior regions of the maxilla and palate. These are the areas where these tissues can be easily harvested and are readily available. This technique allows for bone and gingiva augmentation and primary sealing of the socket. The clinical and histologic results reported in the literature suggest that a free gingival-bone graft favors the reconstruction of soft and hard tissue, with esthetic advantages. However, it requires surgical reintervention to place the implant with or without immediate loading.[47,71]

Discussion

The literature has widely documented these treatment alternatives to resolve postextraction alveolar bone defects and seen them as viable solutions before and during implant placement associated with subsequent loading. When combined with additional risk factors, such as a high smile line or a thin gingival phenotype, the esthetic results are even less predictable. These are techniques that require more treatment time and have greater morbidity than situations involving intact sockets.[72,73]

Conclusion

The results of clinical studies performed over 15 years, tracking more than 600 cases of compromised sockets and other related clinical studies, have allowed for a technique to be developed with immediate placement of an implant and provisional crown with bone reconstruction. The main advantages of IDR are the maintenance of the dental architecture, improved quality of the tissues involved, and the resolution of the cases in a single stage.

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