

Textbook of Oral and Maxillofacial Surgery

Gustav O Kruger

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Fifth Edition

**To Simon P Hullihen, 1810-1857
The first oral surgeon in the United States**

Preface

This text was written to provide a concise description of principles and procedures in each important aspect of oral and maxillofacial surgery in a logical sequence, as it may be presented to students in the lecture course.

The book is designed to fit the needs of the undergraduate student, but general practitioners, residents, oral surgeons, and other specialists will also find it useful. Emphasis has been placed on the fundamentals of judgment and technique. Even if the reader does not perform all the procedures described, he or she should have a clear idea of what is done, how it is done, and why it is done.

The first edition was published in 1959. In the four revisions since then considerable change in philosophy, materials, and technique reflects the progress that the specialty of oral surgery has achieved. The health sciences in general, and oral surgery in particular, have made rapid and substantial advances based on basic research, clinical investigation, and worldwide clinical experience.

Comprehensive review has been undertaken in this fifth edition. Major revision has been completed in many chapters, and many new photographs and drawings have been added. I welcome two new authors in this edition, one writing on principles of surgery and the other on hemorrhage and shock. Both chapters have been rewritten completely.

The contributors have been selected because of their competence in the field. Each has devoted his efforts to one chapter. It is to them that any credit for this work is due. Without exception, they have been generous with their time and efforts.

I should like to thank B. John Melloni, Director of Medical-Dental Communications, Georgetown University Medical Center, for his generous guidance and supervision of the art work. Peter Stone of his department made the new drawings and put together the photographs for this edition in a superb manner. He is a meticulous illustrator, a talented artist, and a most cooperative collaborator.

Gustav O Kruger

Chapter 1

Principles of surgery

H David Hall

Oral surgery is unique among surgical specialties in that it identifies strongly with dentistry. This is a proper relationship since a thorough knowledge of dentistry is a prerequisite for the well-qualified oral surgeon. But oral surgery is no less a surgical specialty than urology, for example. The common link between oral surgery and other surgical specialties is that the same surgical principles apply to therapy. Thus the principles that guide the general surgeon in treating appendicitis are the same as those that guide the oral surgeon in treatment of an odontogenic cellulitis. The fact that details of application of surgical principles may differ to accommodate local peculiarities sometimes obscure this relationship.

However, the casual observer may think that some surgical principles do not apply to a particular surgical specialty such as oral surgery. An example is the principle of asepsis, because aseptic technique clearly is different for abdominal operations and oral operations. Aseptic technique has been modified to take into account differences in the response of a wound in each area; the general principle of asepsis is the same. Thus the challenge for each surgical specialist is not only to know surgical principles but also to know how they apply to a particular area of interest.

Asepsis

Prior to the mid-nineteenth century, surgeons made no specific efforts to reduce bacterial contamination of the wound. Yet wounds often healed after primary closure. As hospitals became more prevalent, patients with septic conditions were housed with other patients, since isolation procedures had not been developed. With increased opportunities for wound contamination, especially from these patients, wound infection became commonplace. Even before Lister made his contribution to antisepsis, Semmelweis and O W Holmes observed that puerperal fever was spread from infected to uninfected parturient women in the obstetrical wards by their doctors. The simple act of washing hands between patients, thereby reducing the number of virulent bacteria introduced into wounds, greatly reduced puerperal sepsis. Although these doctors did not know what it was that caused the infections, they clearly understood the nature of the transfer. A few years later Pasteur developed the germ theory of disease. This concept provided a basis for understanding wound sepsis. Lister grasped the significance of Pasteur's work and began development of aseptic surgical technique.

Even with modern aseptic surgical technique, some bacteria get into wounds. But wounds are able to tolerate a limited number of bacteria without becoming infected. Several factors determine the maximum number of bacteria that a wound will tolerate. One very important factor is local immunity, and this varies with the area of the body. The oral and maxillofacial region and perineum, for example, have a greater resistance to infection than other regions of the body. Relatively large numbers of indigenous bacteria can be introduced into oral or perineal wounds and rarely cause infection. This is fortunate since it is virtually impossible to reduce bacterial contamination in the mouth or perineum to levels common for other areas of the body. The current aseptic techniques for the oral and maxillofacial area rely principally on prevention of wound contamination by foreign and especially more virulent bacteria.

There are also other factors that determine the maximum number of bacteria with which wounds can become contaminated before developing infection. The body's general resistance to infection is clearly an important factor. Diabetes is an example of a common condition in which there is an increase in susceptibility to infection. Other less common but by no means rare examples are suppression of immunity by corticosteroids or other drugs, leukemia, and uremia. Local wound factors also influence susceptibility to infection. Wound infection is more common after devitalization of tissue, as can occur with accidental injury or careless surgical technique. Thus although aseptic technique is an important factor in reducing wound infections, other factors also have an important influence on the problem. The surgeon who understands these interrelationships is able to make appropriate adjustments in patient management and maintain a low infection rate in most circumstances.

Analytic Approach to Surgical Care

One of the more important contributions to the care of the surgical patient was appreciation of the value of an analytical approach. The essence of an analytical approach to a clinical puzzle is separation of the various problems and establishment of the relationships of the individual problems to each other. The solution often is evident at this point, or a possible solution is suggested that can be tested.

The first step in the analysis of any situation is to obtain accurate data. The traditional means of establishing these data is by historical, physical, and laboratory examination of the patient. Skill in application of examination technique is essential in order to obtain accurate data. For example, a common tendency of the less experienced clinician is to establish a tentative diagnosis early in the historical evaluation of a patient and then to ask leading questions in an effort to support the diagnosis. Open-ended questions would clearly provide more accurate information even if they might cause some discomfort to the clinician looking for support for an early impression. Similarly, a thorough, careful physical examination of a patient will often yield information missed by a more hurried, less orderly examination. Detection of a small sinus tract in the sulcus overlying a fracture site in a patient with delayed union is an easily missed but very important finding. In particularly difficult diagnostic problems, the more famous surgeons have been noted for the unhurried, careful, and thoughtful examinations they perform.

In addition to being accurate, the information must also be pertinent. This aspect of patient evaluation probably requires the greatest amount of experience for perfection. With increased knowledge of a condition, one begins to recognize which information is particularly pertinent for its diagnosis and treatment. The practitioner can then probe the more relevant areas with greater care. For example, determining that a patient with bleeding from the gingival crevice recently began taking quinidine, which can cause thrombocytopenia, has greater significance in this patient than in a patient who has an infected tooth. Thus skill in patient evaluation requires not only a knowledge of the technique of evaluation but also a knowledge of specific conditions.

Analysis of the information obtained from patient evaluation may readily yield a diagnosis but often does not. A system that lists problems based on the level of information available has a clear advantage over a system that tends to force a premature diagnosis. The problem-oriented medical record is an example of the former system. This method of recording data, which allows identification of discrete problems and their relationships to one another, is especially useful in sorting out complex situations. It also has the advantage of reducing the chances that some problems will be ignored in developing a coordinated

treatment plan. For example, a patient with an open bite may also be found to have increased lower facial height, retruded chin, lip incompetence, increased nasolabial angle, increased maxillary-alveolar bone height, increased backward rotation of the mandible, minor crowding of the dental arch, and increased curve of Spee in the maxilla. Without a listing of all of the problems, it is easy to focus only on the chief complaint of open bite or perhaps some, but not all, of the other problems. In this example, attention only to the open bite could result in a surgical procedure to close the bite by inferior movement of the anterior maxilla to permit occlusion of the maxillary incisors with the mandibular incisors. This approach to treatment, while providing a good occlusion, would fail to correct other problems and would even create a new one - changing a normal maxillary lip-to-tooth relation to one with excessive exposure of the teeth. On the other hand, recognition of the various problems and their relationships to each other would more likely lead to another treatment plan. A better plan would be developed if there was recognition that vertical increase in the maxillary bone rotates the mandible, creating a secondary deficiency of the chin, increasing lower facial height, and causing lip incompetence. Thus segmental maxillary osteotomy, with intrusion of the posterior segments and rearrangement of the anterior segments, would also close the open bite. In contrast to the anterior maxillary osteotomy alone for closure of the open bite, this plan would address the other coexisting problems. Thus the combination of a segmental maxillary osteotomy with intrusion to retain the present adequate lip-to-tooth relationship could correct the open bite as well as other important abnormalities. Specifically the procedure would correct the occlusion and provide some correction for the deficient chin, increased lower facial height, and lip incompetence by allowing the mandible to rotate forward. The need for an orthodontist to align the teeth also would be more obvious with this problem-oriented approach. Thus the competent surgeon not only exercises care and thoroughness in collecting data through the patient evaluation but also organizes these data in a way that encourages an analytical evaluation of problems and, thereby, a more rational approach to surgical therapy.

The analytical approach is also applicable to other aspects of surgical care. Careful assessment of a patient's problems and meticulous planning for the surgical procedure usually eliminate any significant surprises during the operation. But occasional unanticipated findings or events are unavoidable. A few moments of analysis of the situation usually suggest the best course of action. A careful, thorough approach is more important than speed.

Surgeons have an obligation to improve therapy by advancing surgical knowledge. If we do not advance surgical knowledge, our patients will pay the price for our failure to do so. Testing carefully posed hypotheses in the laboratory and evaluating the results of treatment are the two chief means of advancing surgical knowledge. While not all surgeons will have the opportunity or skills required for testing hypotheses in the laboratory, all of us do have the opportunity to learn from the care given our patients. When we evaluate or compare methods of therapy, it is important to make accurate observations. The history of surgery is replete with examples of new operations that, after their initial enthusiastic reception, were found to be ineffective and were therefore discarded. This disservice to patients largely can be avoided by utilizing a study design that minimizes the chances for error in interpretation. Observer bias, placebo effect, individual variability, and comparison of treatment groups with inappropriate controls are well known for their ability to obscure the real effects of therapy.

Response of the Body to Injury

Surgeons, unlike other practitioners, treat patients who have injuries. The injury may be caused by such diverse means as the surgeon's scalpel or a motor vehicle. Francis D Moore and others have elucidated the major features of the metabolic response of the body to an

operation. Knowledge of the characteristics of this response provides the surgeon with a means of assessing the patient's progress after an operation and provides clues for therapy.

The body's response to a surgical procedure, in general, seems to be directed toward maintenance of the internal environment by a process termed homeostasis. That is, an operation activates autoregulatory mechanisms that enhance the ability of a person to withstand the injury. One insult causing this response is hemorrhage. Loss of about 15% of blood volume by venous hemorrhage causes characteristic changes. Typical early changes include increased blood levels of epinephrine, norepinephrine, aldosterone, angiotension, renin, and antidiuretic hormone. These mechanisms promote conservation of body water and sodium and especially intravascular volume. The depression of urine and sodium excretion by hemorrhage is shown. These and other responses restore the intravascular water, electrolytes, and protein content. In fact, the transcapillary filling begins almost immediately after onset of hemorrhage, and volume restoration is complete 18 to 24 hours later.

The response of the patient to an operation may be divided into four phases of convalescence. The first phase is acute injury, and it is characterized by a catabolic state. This phase lasts for 2 to 5 days, depending primarily on the magnitude of the surgical procedure, the quality of care after operation, and the health status of the patient. During this time the patient is apathetic and generally wishes to be left alone. The metabolic response includes negative nitrogen and potassium balances and increased catecholamine and corticosteroid production. Most of the studies concerning the response to injury have been concerned with this first phase. The catabolic phase ends rather abruptly with the "turning point". During this brief phase, the patient begins to expand his concerns from his own small world to the larger events of life. He becomes more active and alert, his appetite increases, and diuresis begins. The major metabolic alterations of the acute injury phase are reversed. The "turning point" phase then passes into an anabolic phase. In this phase the patient experiences a further gain in appetite, gains strength, increases activity, and has a return of sexual function. A positive nitrogen balance continues until the nitrogen losses are restored. The anabolic phase lasts for about 2 to 3 weeks, during which time lean muscle mass is restored. The last phase is characterized by a gain in fat.

There are two chief ways to design surgical care based on these predictable responses to injury. One approach is to alter responses that seem to be at odds with attempts to help patients recover from injury. Excessive amounts of edema, for example, can be reduced by appropriate use of corticosteroids. But, there are other responses that are not modified to any appreciable extent by active treatment. The negative nitrogen balance that follows injury has resisted, with some success, numerous efforts to reverse it. A second and more common way to utilize knowledge of the response to injury is to design therapy to work in concert with these changes. Knowing that for about 2 days after an operation there is significant water and sodium retention is obviously useful in administering intravenous fluids properly during this period. Another factor concerns the severalfold rise in corticosteroid production after an injury. Blood levels become elevated almost immediately and persist for 2 to 3 days after an operation of mild to moderate severity. However, when the adrenal-pituitary axis has been suppressed by the long-term use of corticosteroids, the patient's adrenal gland is unable to respond to increased demands for several months after cessation of steroid therapy. Extraction of teeth in such a patient requires replacement therapy during this period of increased corticosteroid need to avoid the profound shock and death that otherwise can occur. A final factor concerns diet. During the acute injury phase, diet, in contrast to fluid balance, is relatively unimportant. The body shifts to a catabolic state for production of energy during this transient phase of starvation. With the later anabolic phase, however, diet assumes a key

role. A nutritious diet rich in protein and calories is needed for restoration of lean muscle mass.

Management of wounds is a fundamental skill of the surgeon. Wounds, like the body, respond in a predictable manner. While the general status of a patient clearly has an influence on wound response, more often local factors are the major determinants. Nonetheless, a fairly serious derangement of a patient's health can affect the wound response perceptibly. Such factors as poor nutritional status can retard wound healing. In the scorbutic individual, for example, wounds heal poorly and have little tensile strength.

For the majority of patients, the manner in which wounds are made and cared for largely determines how they heal. Even in patients in whom the wound is appreciably influenced by their general status, good operative technique and postoperative care permit optimal healing under the circumstances.

Understanding how different wounds heal is important in planning wound management. An open, soft tissue wound, for example, displays remarkable contraction during healing. The epithelial edges move toward one another with marked diminution in size of a wound scar. This contracture phenomenon can virtually eliminate a sulcus created by a vestibuloplasty procedure that leaves an open wound. The contracture is especially great on the labial side of the mandible but can be inhibited by several methods. One of the most effective ways is to cover the raw surface with an epithelial graft, especially a full-thickness graft. In fact, truly effective vestibuloplasty techniques did not evolve until these methods guided development of the operative procedures.

After the wound has been closed, the care administered until healing has progressed to a scar can greatly influence the course of events. The dressing of wounds and timing of removal of drains or sutures influence the rate of healing as well as the nature of the ultimate scar. For example, improper dressing care that allows a secondary wound infection delays healing and creates a more prominent scar. Immobilization of wounds, such by use of a stent or sutures for graft immobilization in vestibuloplasty procedures, is another instance in which the predictable response of a wound is utilized in planning for optimal care.

Summary

Surgical principles can be grouped into three major areas: asepsis, the analytical approach to surgical care, and the formulation of surgical care based on the response of the body to injury. The best surgeons not only base surgical therapy on these principles but leaven them with a generous portion of humane, compassionate concern for the patient.