| 31.01.20 - 20:41

Contents

TPS 23 x 31 - 2 | 31.01.20 - 20:40

Foreword

The adverse prognostic impact of cervical lymph node metastases in head and neck cancer was appreciated by several pioneering surgeons in the first half of the 19th century. To address this problem, many attempts were made by Maximillian Von Chelius, J. C. Warren, Richard Von Volkmann, Theodor Kocher, and other noted persons to excise these metastatic lymph nodes; all unsuccessfully. At the turn of the 19th century, Sir Henry Trentham Butlin, in his Hunterian lecture, emphasized the need to excise upper cervical lymph nodes in the surgical treatment of tongue cancer. Franciszek Jawdynski from Poland has been credited with publishing the first report on neck dissection, in the Polish gazetta. However, the credit for reporting a systematic technique of excision of cervical lymph nodes from all levels in the neck for treatment of cancers of the head and neck goes to George Crile Sr., who published in the *Journal of the American Medical Association* in 1906 details of the operation of "radical neck dissection" based on his personal experience of 132 operations. Hayes Martin later popularized the operation and established it as the standard of surgical care for cervical lymph-node metastasis, and it remained in vogue for nearly three quarters of the 20th century. Although the operation was oncologically effective and considered the gold standard, it also caused significant esthetic and functional morbidity.

The authors of the second edition of this book bring a perspective from the experience of several generations of Latin surgeons largely influenced by the pioneering work of Oswaldo Suárez from Argentina and subsequent adoption of Suárez's system by César Gavilán in Spain and Ettore Boca in Italy, for the surgical management of cervical lymph nodes in head and neck cancer. The philosophy, goals, and principles of functional neck dissection and the technical details of respecting fascial planes form the backbone of the entire concept of functional and selective neck dissections. As the authors point out, selective neck dissections are a logical sequel to the concept of functional neck dissection, based on the knowledge of patterns of neck metastases. The concept of cervical lymphatics contained within the fascial compartments of the neck, initially developed and applied to surgical techniques by Dr. Suárez, is appropriately credited in this work. Subsequent promulgation of his concepts and techniques in Europe by César Gavilán and Ettore Bocca led to the accumulation of significant surgical experience, particularly in cancers of the larynx, to justify the validity of the concept and its surgical application with convincing outcomes. The authors propose functional neck dissection as a concept and not a modification of the standard radical neck dissection. To that end, the historical perspective detailed in this textbook is impressive.

Understanding of the patterns of cervical lymph-node metastasis has further advanced the concept of functional neck dissection to the development and clinical applicability of selective neck dissections. Thus, the varieties of selective neck dissections currently in vogue are called extensions of the concept, and a logical extension of the concept of functional neck dissection, as proposed in this book.

The authors are to be commended for putting together a fine contribution to the literature in the field of head and neck surgery and oncology. This book is a classic tour through the history of surgical management of neck metastasis and is a meticulous and outstanding treatise on the anatomy of the fascial planes in the neck, the cervical lymphatics, well illustrated with beautiful anatomic drawings by Laura Rodrigáñez and the technical aspects of the operation, its complications and their management. The years of experience amassed by the authors is reflected in the chapter on "Hints and Pitfalls." The addition of a chapter on frequently asked questions and answers is a refreshing nuance, which gives the impression of an interactive dialogue between the reader and the authors.

This opus from the surgical dynasty of the Gaviláns, now with support from Jesús Herranz and enhanced by contributions from Alejandro Castro and Dr. Rodrigáñez, representing the new generation of head and neck surgeons in Spain, is truly a monumental work on the history, development, philosophy, practice, and outcomes of functional neck dissection.

Jatin P. Shah, MD, PhD, DSc, FACS, FRCS(Hon), FRCSDS(Hon), FDSRCS(Hon), FRCSI(Hon), FRACS(Hon)
E W Strong Chair in Head and Neck Oncology
Professor of Surgery
Memorial Sloan Kettering Cancer Center
New York, New York

TPS 23 x 31 - 2 | 31.01.20 - 20:40

Preface

The present book represents the philosophy and surgical technique of neck dissection used by the authors. It is based on the experience of several generations at La Paz University Hospital in Madrid, Spain, where functional neck dissection was introduced in Spain and in Europe in the late 1960s. It also describes the evolution of neck dissection during the 20th century, from George Crile to the surgery of the new millennium. Last but not least, it relates the transition from radical neck dissection to other less aggressive, but equally effective, procedures, which have been designed to manage the neck in patients with head and neck cancer.

The relation between functional neck dissection and selective neck dissection is approached from a pragmatic nonconventional perspective, which does not always follow the guidelines of the classifications currently used in the literature. However, by no means should this book be regarded as a proposal for a new classification of neck dissection. In fact, there is not even a chapter dedicated to the issue of neck dissection classification. Our main purpose is to clarify the connection between functional and selective neck dissection from historical, anatomic, and surgical standpoints. However, rest assured that this book is not limited to the history and philosophy of neck dissection; surgical technique constitutes a fundamental part of this volume. Surgical details are extensively demonstrated with sequential operative photographs of actual operations performed by the authors. Where necessary, line drawings are used to complement the details of the surgical field. The number of illustrations reflects the detail of the description provided.

A separate chapter on "hints and pitfalls" has been designed to provide the reader with technical guides and warnings that reflect the personal experience of the authors acquired through decades of practice. They are shared here to avoid repetition of previous mistakes. Many years ago, when I was in training, I learned from the late Antonio de la Cruz, MD, that to make science move forward you must be original in your own errors—this is the reason for this chapter.

Over the last 30 years we have been lecturing on neck dissection around the world. This has provided us with rich input from a variety of audiences concerning the most frequent doubts, problems, and demands regarding the various surgical techniques that are currently available. A separate chapter has been designed to answer the most frequently asked questions and to thereby make available to the reader a somehow more direct communication with the authors.

The conceptual approach to functional and selective neck dissection, the surgical indications for these procedures, and the operative technique demonstrated in this book express the ideas and opinions of the authors—a very small group of persons. Thus, the book should be regarded as a single-author work rather than as a multiauthored volume. Whereas there are many advocates for multiauthored books—as proven by their widespread diffusion in recent years—the clarity and uniform methodology of a surgical concept does not develop in a multiauthored book. To that extent, there is an obvious advantage in following the approach developed by one individual—or a small uniform group of experts—with years of authority in the field.

This book is primarily addressed to practicing head and neck surgeons involved in the management of malignant tumors. However, surgeons training in otorhinolaryngology, general surgery, or plastic surgery will also find it an interesting and valuable source of information. The graphic information included in the book will serve as a highly useful tool to familiarize readers with the procedure.

A major change can be found in the authors of this second edition of the book. César Gavilán, MD, my father, teacher, and faithful fellow for many years is no longer among us. My good old friend Lawrence W. DeSanto, MD, is retired and stays away from the field of science. Their place has been taken by the new ENT generation at La Paz University Hospital.

I emphasize that this book was written with the intention to clarify concepts and approximate postures in the controversial and sometimes contentious field of neck dissection. As often happens with conciliatory postures, the final result may be worse than the original situation. However, we assume the risk with the hope that the synthesizing approach to neck dissection that is given in this book may shed some light upon the field.

Prof. Javier Gavilán, MD
Professor and Chairman
Department of Otorhinolaryngology
La Paz University Hospital
Madrid, Spain

TPS 23 x 31 - 2 | 31.01.20 - 20:40

Introduction to the Second Edition

Functional and Selective Neck Dissection: the first thing a title like this would bring to my mind would be something like, "What is this book about?"; "What will I get from it?"; "Is this worth the try (money)?" More than 30 years ago we started to share our experience with functional neck dissection in head and neck cancer patients. At first, we were criticized for not being radical enough. Functional neck dissection was less than the standard cancer operation described by Crile; thus, its oncological safety was disputed. The years went by and we gradually witnessed a global shift toward less aggressive operations for early N stages. It seemed that the time for functional neck dissection had come. However, there was still criticism—now we were being too aggressive. It was time for selective neck dissections.

Throughout this period—when functional neck dissection was less than needed and when it apparently became more than required—we suspected that the problem was merely due to a lack of understanding of the concept of functional neck dissection. The operation is neither less aggressive than radical neck dissection nor more aggressive than selective neck dissection. It is simply different from radical neck dissection, and the basis for all types of selective neck dissections. Proving this is one of the main goals of this book.

There has been so much written about neck dissection in recent years that one can hardly believe there is still something new and interesting to add to the field. Thus, before we proceed, let us explain what we intend to present in this book, that is, what you can expect to find and what you will not find here.

What This Book Is About

Neck dissection has been evolving since 1906 when George Crile described the so-called radical neck dissection. From the very beginning it became evident to many surgeons that the procedure was adequate for advanced disease in the neck but was too aggressive for early N stages. Thus, to avoid the unnecessary removal of some neck structures, several conservation procedures were designed since the 1920s. This book will present the evolution of these "less than radical" operations from two different perspectives: the American and the Latin. The reason for this duality must be sought in the evolution of neck dissection. Over the years, this surgery has experienced the influence of two simultaneous tendencies, separated only by a language factor. This factor has produced a misunderstanding of ideas leading to a mismatch between concepts and surgical techniques.

The concept of a functional approach to the neck, materialized in the so-called functional neck dissection, has not been fully apprehended in the English literature. As a result, a new original idea has been identified as just another technical modification, which is included in a vast classification as just one more item.

This book tries to differentiate between conceptual approaches and surgical techniques. The former constitute keystones in the evolution of scientific knowledge. The latter are only technical variations of a standard procedure, designed to solve the problem using the most effective approach. Functional neck dissection belongs to the first group because it reflects a new original approach to the problem of lymph node metastases in head and neck cancer. On the other hand, selective neck dissections should be included within the group of surgical techniques because they share with functional neck dissection the same rationale and indications. Selective neck dissections constitute only technical variations of the functional concept, designed to fit the operation to the patient on a more individualized basis. The problem of functional and selective neck dissection will thus be addressed in this book from a different, nonconventional perspective: functional refers to a concept, and selective refers to surgical techniques included within this concept.

However, we do not intend this book to be merely a summary of the history and philosophy of neck dissection. We would like to bring this book to the medical shelves, not to the libraries of history. Therefore, we provide a detailed description of the anatomical basis and surgical technique of the functional approach to the neck. And by "functional approach to the neck" we mean any type of neck dissection that uses the basic principles of fascial dissection. Fascial spaces and barriers of the neck hold the rationale for functional neck dissection. This idea will be repeatedly emphasized throughout the text.

Finally, we include a comprehensive list of technical hints and pitfalls that the authors have learned through the years. These details, along with the answers to the most frequently asked questions regarding functional neck dissection, complete the contents of this book and contribute to the book's general purpose.

What This Book Is Not About

Now that you know what this book is about, we would like to make a few comments on the things that you will not find in the following pages. This book does not contain a detailed description of the surgical technique for all types of selective neck dissection. This is precisely what we try to avoid in an effort to stop further misunderstanding of the problem. Because selective neck dissections are regarded as technical modifications to the functional approach, they are all included in the general operative description. The step-by-step

TPS 23 x 31 - 2 | 31.01.20 - 20:40

description of the complete surgical technique of functional neck dissection contains all the modifications that may be designed to treat the neck in patients with primary tumors from different sites, as long as these modifications follow the same rationale and basic indications of the original procedure. By describing the complete basic operation, all variations are included. Only specific surgical details of different types of selective operations will be mentioned in the text.

This book does not include an exhaustive discussion about the indications and usefulness of different types of selective neck dissection. History has proved the oncological safety of the concept of functional neck dissection for head and neck cancer. The nodal metastatic pattern for different head and neck primary tumors is well known, and some selective neck dissections have also proved to be totally safe. However, reducing the field of surgery creates a greater potential risk for leaving metastatic nodes behind. We cannot assure the oncological safety of all types of selective neck dissection on the basis of our own personal experience. Preserving some nodal groups in carefully selected patients has been demonstrated to be oncologically safe in our hands (e.g., not including area I in patients with cancer of the larynx). However, we have not sufficiently tested other selective operations. Thus, extensive discussion about the indications for different types of selective neck dissection according to the location of the primary tumor will not be included in this book.

Finally, this book does not intend to propose a new classification of neck dissection. Our purpose is to present the rationale, surgical technique, and evolution of "less than radical" neck dissection from a historical perspective, emphasizing a conceptual approach over technical considerations. We seek to connect and unify the American and Latin points of view and thereby to clarify the confused field of nonradical neck dissection.

| 31.01.20 - 20:26

1 The Historical Outlook of Neck Dissection

1.1 Crile and the Radical Neck Dissection

The "grandfather" of neck dissection is George Crile, Sr., of the Cleveland Clinic. In 1906, Crile portrayed the field of head-and-neck surgery as being behind the times in terms of interest and progress. Crile believed that, if the neck lymphatics could be removed in a "radical" manner and "en bloc," more cures could be accomplished. The oncological approach to the neck proposed by Crile was strongly influenced by the oncologic principles used by Halstead for breast cancer. The concept of the "bloc" that was in vogue for the treatment of breast cancer required removal of the primary site with draining lymphatics and nodes in continuity. In breast surgery, the pectoralis muscle and the axillary vein were part of the "bloc," as were all other structures surrounding the tumor. No oncological benefits beyond access were claimed.

Following these principles, Crile designed a similar operation to remove the lymphatic system of the neck in patients with head-and-neck tumors. Here, the sternocleidomastoid muscle and the internal jugular vein suffered the same fate as the pectoralis muscle and the axillary vein in breast cancer surgery. Crile's procedure allowed a systematic removal of the lymphatic tissue of the neck, along with the surrounding structures. Only the carotid artery and some "lucky" nerves survived the Halstedian concept of oncological surgery. This operation received the name of "Radical Neck Dissection" and was popularized by Hayes Martin.

The work of Martin completely changed the world of neck dissection. Radical neck dissection became the standard procedure for patients requiring surgical treatment of the lymphatics of the neck in combination with removal of the primary tumor. The lymphatic tissue had to be removed from the neck and the best way to do this was by removing almost every single structure within the cervical area.

1.2 Time to Change

The analogous thinking between general surgery and head-and-neck surgery persisted until the early 1960s when general surgeons began to reconsider the usefulness of the "*bigger is better*" concept in breast cancer. Head-and-neck surgeons had a similar evolution. It was evident to all those involved in the management of patients with head-and-neck cancer that the radical operation was adequate for the treatment of large palpable masses. But two new issues gained importance in the field of head-and-neck cancer surgery: the need for treatment of the N0 neck, and the need for simultaneous bilateral neck dissection.

The need to treat the neck in patients without palpable disease became evident at the light of the knowledge of the biological behavior of the lymphatic metastases. Some primary tumors were associated with a high rate of false clinical and radiological N0 necks, leading to a high incidence of neck recurrences that could be prevented by neck dissection. The radical operation was considered too aggressive for these patients. The concept "elective neck dissection" became soon a matter of debate. Some authors refer to elective neck dissection as prophylactic neck dissection. This is a clear misuse of the term "*prophylactic*." Prophylaxis implies prevention of something to happen. In Martin's time, there was the subtle suggestion that a prophylactic dissection actually prevented something, but what that something was is not clear. Neck dissection does not prevent either neck relapse or anything: it either treats existing neck metastases (evident or occult) or provides valuable information about the actual absence of metastases. Nowadays, the concept of *prophylactic* neck dissection is clearly faulty. From an oncologic standpoint, a neck dissection is either therapeutic, when positive nodes are found in the specimen, or oncologically useless, when positive nodes are not identified in the surgical specimen. However, there are other nononcological advantages of neck dissection. Namely, prognostic information—a true N0 patient has around 50% more chances of survival than an N+ patient—and postoperative treatment planning.

Another argument in favor of less aggressive neck dissections was the possibility of bilateral neck metastasis that some head-and-neck tumors have. Multiple studies about cervical lymph flow demonstrated that head-and-neck midline structures could metastasize with similar probabilities to both sides of the neck. It was noteworthy that radical neck dissection was not practical as a simultaneous bilateral procedure. The need for less aggressive types of neck dissection became evident also in these cases.

1.2.1 Changing the Paradigm

Changes in life can be made using two different approaches: modifying what needs to be changed, or creating something new to replace the old element. The end result may look similar—something new taking over the place of the old concept—but the approach to change is radically different.

There is an easy example of what we try to explain. Imagine you live in the 1960s and have one of these big black telephones at home with a large dial full of numbers. Now, you want to create a new telephone that you can take with you in your pocket. You can modify what you have at home and design a small device with a keypad that

| 31.01.20 - 20:26

can be used to talk to distant people. Nokia did that for you. That was a modification of the classic telephone. Now, imagine that you design something different. Something that has a camera, can play music, has an agenda, connects to internet, allows you to pay, and you move items on the screen by touching them with your fingers. Steve Jobs did this. And this is, by no means, a modification of the old phone we had at home. This is a completely new idea.

The same happened with neck dissection. In the United States, the old radical neck dissection was modified to make it less aggressive. In some Latin countries (Argentina, Spain, Italy) a new way to approach the neck was designed. It was called "functional neck dissection," and it was not a modified radical neck dissection. It was a completely new way to remove the lymphatic tissue of the neck.

1.3 Modified Radical Neck Dissection

From Martin's time, surgeons recognized that the Crile operation was not always necessary and was unwarranted in some cases of head-and-neck cancer. Data assured surgeons that neck recurrence rates with pathologically negative necks and low-staged clinically positive necks were similar regardless whether the accessory nerve was sacrificed or not. The long-term functional consequences of accessory nerve sacrifice were described in the 1960s as the shoulder syndrome. Shoulder droop, diminished range of motion, shoulder abduction, and external rotation and pain led to reconsideration of routine nerve sacrifice. Modified neck dissection that preserved the accessory nerve was a logical first modification. It later became obvious that preserving the nerve, by dissecting it free, was not always followed by normal nerve function. Surgical trauma during dissection left some with variations of the shoulder syndrome. Questionnaires about shoulder function were reassuring but electromyography and careful clinical evaluation by experts documented that preserving the accessory nerve is not always enough. However, careful nerve preservation is more rational than routine sacrifice of the nerve.

The loss of contour after removal of the sternocleidomastoid muscle led also to reconsideration of that practice. The muscle does not contain lymphatics or lymph nodes, but its removal does make neck dissection easier. Routine sacrifice of the jugular vein adds no oncological safety in the clinically negative and low-stage clinically positive neck situations. For surgeons who favored elective and bilateral dissections, it was evident that the radical operation was excessive when no metastases were found in the neck.

The team at UT MD Anderson Cancer Center, including Richard H. Jesse and Alando J. Ballantyne, pioneered modified neck dissections in the United States, and they first reported their results in the American Journal of Surgery in an article titled "Radical or modified neck dissection: a therapeutic dilemma" in 1978. Soon surgeons in the United States accepted that "less than radical neck dissection" was a good option in selected patients and the terms *modified, supraomohyoid, upper, midline* were used to describe these lesser operations.

The nomenclature became confusing to teach and lacked standardization for reporting. The American Academy of Otolaryngology—Head and Neck Surgery convened a special task force to address the terminology problems. The group was tasked to (1) recommend terminology that adhered to the more traditional words as radical and modified radical; (2) define which lymphatic structures and other nonlymphatic structures would be removed relative to the radical dissection; (3) provide a standard nomenclature for lymph node groups and nonlymphatic structures; (4) define the boundaries for resection of lymph node groups; (5) use terms for neck dissection procedures that are basic and easy to understand; and (6) develop a classification based on the biology of cervical metastases and the principles of oncological surgery.

Some of these goals were accomplished. Terminology was fashioned, and lymph node groups were defined, as were the boundaries of the groups. Whether these accomplishments created a system, basic and easy to use, is in doubt. The Academy classification was based on the rationale that (1) radical neck dissection is the standard reference procedure; (2) when one or more nonlymphoid structures are preserved, the term *modified neck dissection* is preferred; (3) when one or more lymphoid groups are preserved, the term *selective dissection* is recommended; and (4) when a procedure removes other lymph node groups or nonlymphoid structures different from those removed in the radical neck dissection, the recommended term is *extended neck dissection.*

The Academy classification defined seven different neck dissections (▶ Table 1.1). Other classifications are cited in the literature and preferred by their authors' institutions, so the classification issue is not unanimously agreed upon. For example, Spiro from Memorial Hospital offers a list of 11 neck dissections (▶ Table 1.2). Medina modified the Academy classification with eight different types of comprehensive neck dissection, seven selective operations,

Table 1.1 The American Academy of Otolaryngology—head-and-neck surgery classification of neck dissection

Radical neck dissection
Modified radical neck dissection
Selective neck dissection
Supraomohyoid neck dissection
Lateral neck dissection
Posterolateral neck dissection
Anterior neck dissection
Extended neck dissection