Vasilios K. Thomaidis

Cutaneous Flaps in Head and Neck Reconstruction

From Anatomy to Surgery

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Cutaneous Flaps in Head and Neck Reconstruction

This book is dedicated to the memory of my father Kyriakos Thomaidis
To my mother Zoi Thomaidou
I owe them what I am

To my wife Athanasia and my daughter Zoi-Maria

Foreword 1

When Dr. Vasilios Thomaidis informed me of his venture to prepare a publication regarding the anatomy of head and neck with an application to flap surgery, I was intrigued to see how he would illuminate the anatomy of the head and neck using his experience as a surgeon. Such an approach is not typical in classic textbooks of anatomy. I regarded this effort to be challenging.

The anatomical presentation takes place in a layered manner, providing systematic steps at understanding the topographical anatomy of the various layers of tissues in the head and neck area. Furthermore, various controversial issues concerning relative anatomical structures are reviewed; in all such cases, Dr. Thomaidis states his own attitude, both as an anatomist and as a surgeon. In my opinion, this is what modern anatomy is.

It is my personal belief that Dr. Thomaidis accomplished his initial aim with the wise use of remarkable anatomic drawings, which are unique because they display anatomical structures that are usually overlooked by classic anatomical textbooks but are extremely important in flap surgery.

Being a Professor of anatomy for more than 35 years, I acknowledge another function of this book, beyond its obvious benefit to surgeons. Medical students will treasure the exceptional quality of the drawings, in which they will find a clear depiction of the various complicated layers of the head and neck and the muscular, vascular and neural structures found within them. This book is valuable as a supplementary tool in the study of anatomy and surgery since it enables the illustration for students annotating important anatomical structures and their relationships as well as clarifying elusive points and modern controversial issues, addressed in a way that is not always possible in the classroom.

Thespis Dimitriou, MD, PhD
Professor of Anatomy
Alexandroupolis, Greece

Foreword 2

It is my great pleasure to write a preface for this anatomical and surgical atlas for flaps in head and neck reconstruction published by Dr. Vasilios Thomaidis.

Dr. Thomaidis' attitude to recognize the need of a tie between head-neck anatomy and flap surgery is valuable. His dual background as maxillofacial surgeon and anatomist gives him the capacity to extract from his anatomy lab experience that provides a unique insight to the structures of all regions and to correlate them with surgical techniques. As a practicing surgeon, he presents the anatomic concepts of the region, paying special attention to sidelined anatomic structures that are necessary in practice. His work reflects why a practicing surgeon needs a detailed knowledge of anatomy. A thorough understanding of surface anatomy in a layered manner is depicted and simplified by beautifully composed anatomical drawings.

For those who study head and neck surgery, this book is a valuable resource, since it is a step-by-step approach to performing flap procedures as it also acts as a surgical atlas. The numerous colored illustrations of cases depict the vast majority of local and regional cutaneous flaps that are used in head and neck reconstruction, and step-by-step instructions in flap design and harvesting techniques are a valuable asset to the book.

To the practicing surgeons: the significance of being aware of the anatomical structures in the area in which we work is imperative and is a crucial part in the success of our work. This textbook distills the anatomical knowledge of each area, simplifying preoperative assessment and making planning much easier. In addition, the text juxtaposes old techniques with new ones, giving the reader the information needed to take the appropriate steps for success.

Nikolaos Lazaridis, MD, DDS, PhD
Professor of Maxillofacial Surgery
Thessaloniki, Greece

Preface

It is said, "fear in surgery is fear of anatomy." Unfortunately there is a chasm between the anatomy learned in the traditional way and what we see during surgery. The aim of this work is to offer the means to resolve this in a comprehensive way, by bridging relative anatomy straight to the surgical use of cutaneous flaps in head and neck reconstruction, which is not normally found in a single text. Cutaneous local and regional flaps still remain a basic tool in the armamentarium of surgeons coming from different specialties that work in the head and neck area. These flaps are used even for very large defects, despite the ever-growing utilization of free flaps, due to the fact that they are time consuming, not cost effective, they do not require special microsurgical training, and represent the first choice of novice surgeons. My experience taught me that thorough knowledge of anatomy enables navigation between tissues and spaces with safety and ease, preserving important anatomical structures, and minimizes operational stress.

This book is organized in chapters according to the anatomic areas, which represent the various donor sites from which flaps are derived and used in head and neck defects. These donor sites are present separately in each chapter of the book and include: scalp, temple, posterior neck, forehead, nose, cheek, lips, chin, auricle, anterior neck, and deltopectoral region. In each chapter, firstly, I portray the superficial anatomy of each region in a layered manner, and how nerves and vessels travel through these layers. Secondly, the widely used local and regional cutaneous flaps that are derived from each donor site are demonstrated in the reconstruction of various surgical defects. Thus, I incorporate classic and modern anatomic issues and my personal experience as an anatomist and surgeon, to accomplish the above.

Special attention should be paid to the iconography of this work. I wanted to supplement the text with many illustrations so as to clearly define the areas described with as much detail as possible, without overcomplicating the anatomical aspects. Thus, this work serves as a reference to fashion a better understanding. The anatomic part is thus followed by drawings, designed and based not only on classic depictions but also on the experience of everyday surgical practice. Step-by-step photos of cases that I completed, presenting the procedure to be followed in flap surgery on the other hand, accompany the surgical part.

My hope is that this book serves as a guide and tool for new surgeons to increase their confidence in flap surgery, and to resolve possible anatomical discrepancies for seasoned surgeons.

Alexandroupoli, Greece — Vasilios K. Thomaidis, MD, DDS, PhD

Acknowledgments

Although many people have indirectly contributed to the creation of this atlas, I would like to thank those who played key roles in its preparation. First of all, I would like to thank Professor Thespis Demetriou, Director of Anatomy of the School of Medicine in Democritus University of Thrace, who encouraged me to take up to this venture and helped me clear many ambiguous points in the anatomic description of the head and neck area.

I would like to thank Dr. Konstantinos Seretis, Plastic Surgeon, and Dr. Konstantinos Dimakis, General Surgeon, who, during their residency, assisted me in many of the operations included in this book. The cases presented were operated in the University Hospital of Alexandroupolis, the Medical Center of Thrace, and the General Clinic "Kyanous Stavros": I would like to thank the anesthesiologists and staff for their loyal teamwork. I wish to thank my colleague Dr. Ioannis Tsamis, for our cooperation. Additional thanks to Dr. Theodosis Birbilis, Assoc. Professor of Neurosurgery, Dr. Konstantinos Ioannakis, Assoc. Professor of Ophthalmology, Dr. Anastasios Bounovas, Assoc. Professor of Surgery, and Dr. Antonios Karpouzis Assoc., Professor of Dermatology, for their long-time partnership and referral of patients, many of whom have been included in this book. I shall not forget to thank my assistant nurses Ms. Sotiria Karafylidou and Ms. Alexandra Alexandrou.

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Special thanks and eternal gratefulness are owed to Dr. Manos Mazinis, gifted medical artist and friend, for his tolerance, enduring my continuous corrections and objections and for spending innumerable hours creating the astonishing drawings included in this atlas.

This project would have no end without the support from my wife, Athanasia, and my daughter, Zoe. I was unavailable for long periods of time, during evenings, weekends, and vacation to work on the manuscript. I am grateful to them for granting me the time and space I needed to complete this work.

Finally, the creation of this book would not have been possible without the kind support of Dr. Inga von Behrens and Desk Editor Rosmarie C. Unger from Springer for their continual aid in bringing this book together. I owe an enormous thank you to all my patients, who trusted me in a difficult period of their life and for whom I always do the best I could.

Contents

General Considerations

1

The skin is the outer covering of the entire external surface of the human body. It is regarded as the largest organ of the body with a complicated structure that performs a great number of functions. It acts as a protective barrier preventing the internal environment against infection, trauma, ultraviolet radiation, and heat. In addition, it plays an important role in thermoregulation, stores water and fat, prevents and controls fluid loss, and constitutes the largest sensory organ.

1.1 Skin Anatomy

The skin exhibits a surface area that in the adult ranges from 1.6 to 2.0 m^2 with the surface area of head and neck in the adult occupying approximately the 9 %. Its thickness varies among gender, age, and anatomic location. Male skin is thicker than female skin in all anatomic regions. The skin becomes thinner in elderly individuals through changes that occur during the aging process. The thickest skin is found on the palms of the hands and soles of the feet and the thinnest on the eyelids. This depends primarily in the varying thickness of the dermis and in a lesser degree in the varying thickness of the epidermis.

Throughout the anatomic regions, the characteristics of skin vary significantly not only in thickness but also in color and in texture. All these characteristics constitute factors that have to be scrutinized when choosing the ideal donor site of a flap.

The skin consists of two interrelated layers, the epidermis and dermis, which along with the underlying subcutaneous fatty layer cover the entire body (Fig. 1.1).

1.1.1 Epidermis

The epidermis is the outermost thin layer of the skin. Its mean thickness is 0.1 mm but varies greatly, depending upon the type of skin, age, gender, and location. At the palms of the hands and the soles, it is 1.6 mm thick, while it can become very thin like in the eyelids where it is 0.04 mm. The epidermis is a stratified squamous epithelium consisting of five distinct layers. These layers from top to the bottom are the stratum corneum, the stratum lucidum, the stratum granulosum, the stratum spinosum, and the stratum basale. The epidermis contains primarily keratinocytes in progressive stages of differentiation. Starting from the cells of the stratum basale (basal cells), new keratinocytes are formed (squamous cells), through continuous mitosis, maturate, and move up, changing shape and composition. They replace the old ones that are dead and discarded. This process is called keratinization. Specialized epidermal cells as melanocytes, Merkel cells, and Langerhans cells are also contained in the epidermis. The epidermis contains no blood vessels, and its deepest layers are nourished by diffusion from the underlying dermis.

1.1.2 Dermis

The dermis consists of connective tissue and is tightly connected to the overlying epidermis through the basal membrane. It is much thicker than the epidermis (15–40 times) and also shows a variable thickness in different locations (e.g., 0.3 mm on the eyelid). The structural components of the dermis are primarily collagen and also elastic and reticular fibers. It is divided into a superficial region called the papillary and a deep region called the reticular dermis.

The upper papillary dermis contains a thin random arrangement of collagen fibers. The deeper reticular dermis is thicker and is made of coarse collagen fibers that are arranged parallel to the surface of the skin. The dermis contains capillaries at the papillary dermis and larger blood vessels at the reticular dermis, lymphatic vessels, hair follicles with the erector pili muscle attached to each follicle, sebaceous and sweat glands, nerve endings, and sensory

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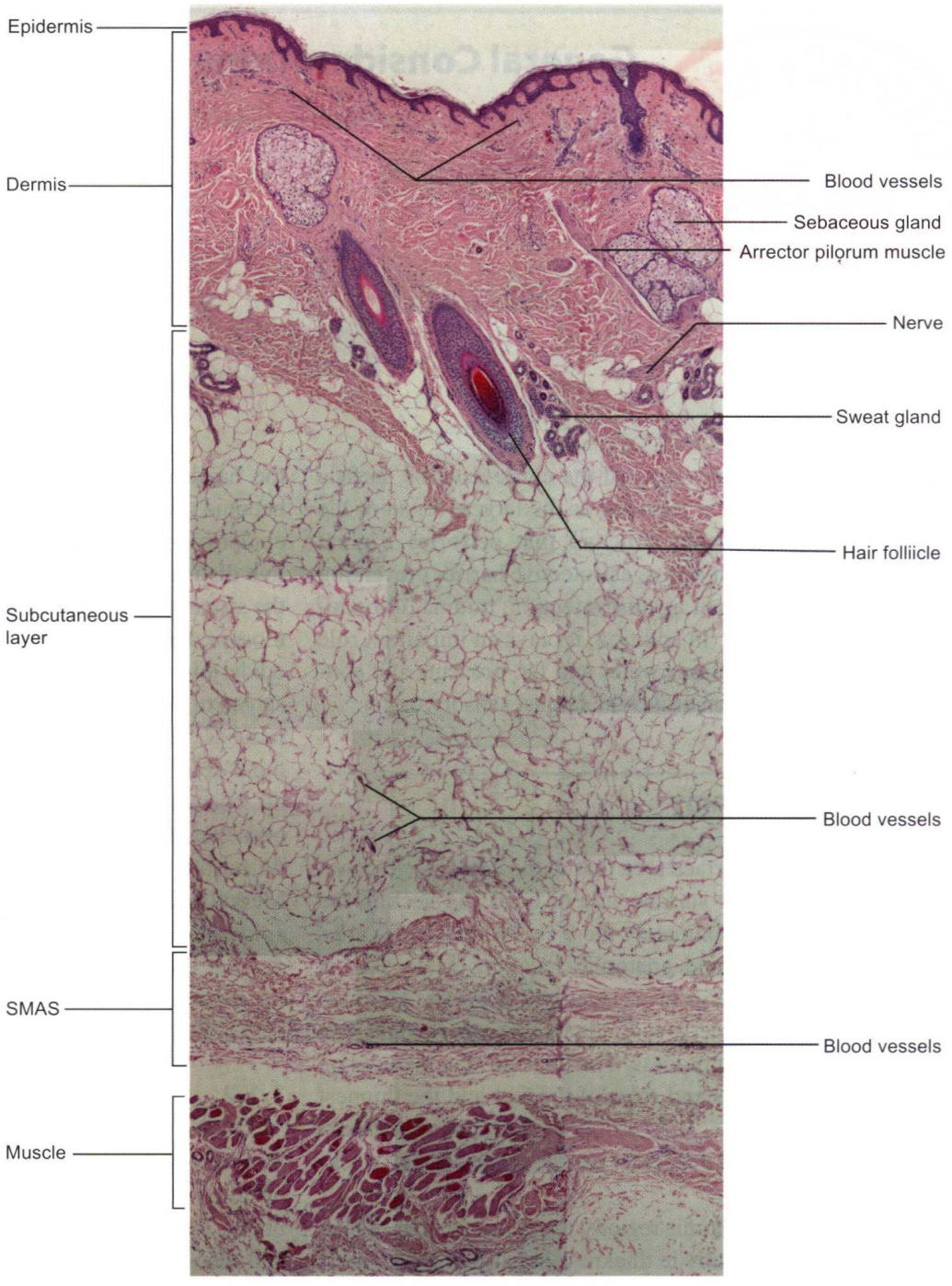

Fig. 1.1 Histologic cross section of the skin (cheek area) (hematoxylin-eosin, original magnification ×10) (With kind permission from Dr. Aliki Fiska)

receptors. Sebaceous glands are encountered over the entire body but in large concentration in the face and the scalp. Sweat glands are absent at the lip vermillion.

Hair follicles change their orientation across different ethnic groups. It is important to know the organization of hair follicles when performing incisions into the skin so as to avoid the onset of alopecia. In Caucasians, the follicles are oriented at an angle with regard to the skin surface. In Africans the follicles are more horizontal and thus run parallel to the sin surface, whereas in Asians the follicles are vertical with regard to the skin.

1.1.3 Subcutaneous Layer

The subcutaneous layer (subcutis, hypodermis, panniculus adiposus), also called subcutaneous fat layer, lies below the dermis. It consists of fat (almost the half of the body fat) and connective tissue and contains larger blood vessels, lymph vessels, and nerves. This layer attaches the skin to the underlying muscles and bones, houses the large vessels and nerves that supply the skin, and plays an important role in regulating body temperature. Its thickness varies considerably from individual to individual and among the different facial areas at the

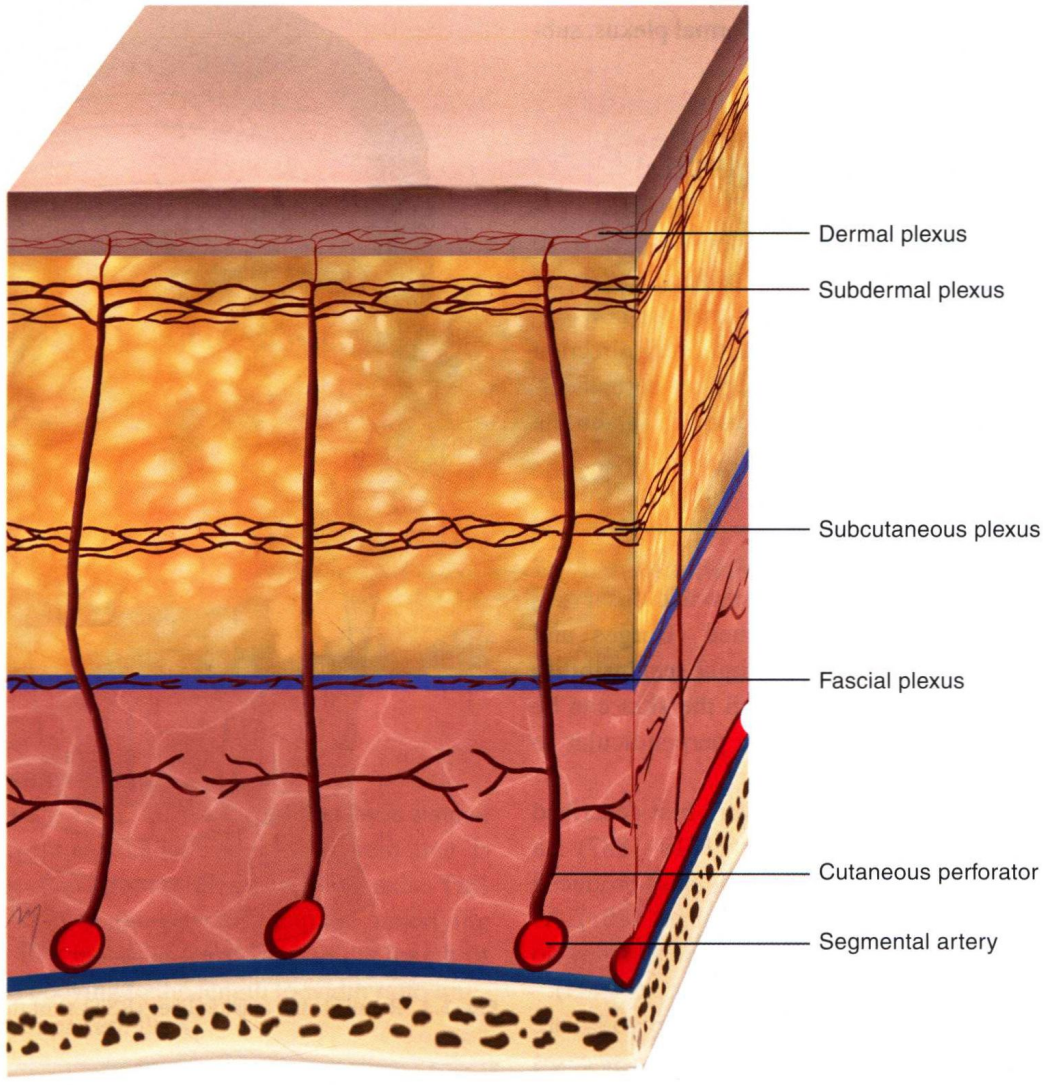

Fig. 1.2 The cutaneous circulation

same individual. It is thick at the cheeks and the neck but very thin or almost absent at the lips and the eyelids. The subcutaneous fat is divided into lobules by the fibrous septa, and in specific locations, it is sequestered in particular compartments forming the superficial fat pads (e.g., malar, submental).

1.1.4 Cutaneous Circulation

Knowing the skins' vascularization (Fig. 1.2) is crucial in the success of all flap designs due to the fact that flap survival is directly associated with adequate blood supply. The cutaneous vessels run from the underlying named vessels to the cutaneous surface as either septocutaneous or musculocutaneous arteries. The septocutaneous arteries (septocutaneous or fasciocutaneous perforators) arise directly from the underlying vessels and ascend through fascia or septa of muscles to the skin. The musculocutaneous arteries (musculocutaneous perforators) pass through the overlying muscle, and after giving small branches within the muscle mass, continue vertically to the skin. Named cutaneous vessels are direct vessels that run on top of muscles and parallel to the skin sending perpendicular branches to it. The portion of skin along with the underlying deep tissues that are supplied by a single segmental vessel, corresponding to a composite anatomic vascular territory, gave rise to the concept of angiosome that was first defined and introduced by Taylor and Palmer (1987).

Running toward the skin, the cutaneous vessels supply branches to each of the tissue layers they run through that anastomose each other forming extensive horizontal plexuses arranged in different levels in a complex network of blood vessels. The fascial plexus is formed at the level of the fascia, the subcutaneous plexus within the subcutaneous fat, and the subdermal plexus at the junction between the dermis and the subcutaneous fat. Within the dermis two plexuses are