LYMPHATIC SYSTEM OF THE FEMALE GENITALIA

The Morphologic Basis of Oncologic Diagnosis and Therapy

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Foreword

The legacy of an era of experimental clinical investigation and responsible inquiry is contained in this new and unique contribution to the field of gynecological oncology. It has brought together in exquisite detail important features of the anatomy of the lymphatic system of the female genitalia. These features are correlated in lucid fashion with relevant clinical problems for the various types of gynecological cancer. The result of this marriage of anatomical study and clinical expertise will provide an invaluable resource for practitioner and investigator.

The work will be used by the clinical gynecologist faced with the frequently difficult problems that must be met in the management of his individual patients and also by the research oncologist who wishes to have the ready accessibility of its extensive reference material. The student of this discipline, whether undergraduate, resident or fellow in training or physician in practice, will be sure to profit from the depth and detail of the exposition.

The book is not simply a detailed anatomy text. More importantly, the structure of the lymphatic system of the female pelvis is used as one basis for a consideration of principles of diagnosis and therapy. Many of our currently accepted principles are critically reviewed to show their strengths and, more pertinently, the deficiencies of the foundations upon which they rest. Essentially, no presently held doctrine has escaped the spotlight of this inquiry.

Such an analytic treatise is particularly pertinent at this time. Historically, we have arrived at a juncture in time when the advances in clinical oncology, particularly those of the past three quarters of a century as they relate to surgical and radiotherapeutic techniques, seem to have reached a plateau of excellence. The authors have set forth in clear terms the limitations of our current therapeutic means. They have specified those areas in which proof is wanting for popularly held beliefs and in which research is still very much needed. Maximum benefits with available therapeutic techniques are attainable only if they are perfectly applied. It is mandatory that we test all assumptions of efficacy, especially those based on clinical impressions or isolated testimonial reports. This monograph provides a basic fund of accumulated knowledge upon which such clinical investigation can be built.

A sense of vicarious pleasure for me derives from the knowledge that this work was initiated and carried on at Columbia University in the Department of Obstetrics and Gynecology during my tenure as Chairman. It was elaborated in large measure by Albert Plentl, a scholar, master clinician and consummate investigator, whose untimely death cut short his great and incompletely realized potential. I am personally pleased that Emanuel Friedman, Albert's close associate for so many years, has been able to bring this work to its present state of fruition. It stands as a tribute not only to the memory of an admired colleague but also to a friendship.

HOWARD C. TAYLOR, JR., M.D.

New York City

Preface

When Albert Plentl died on January 11, 1968, at age 54, the embryonic elements of this work were in massive disarray. Although it represented one of his major interests, the subject of pelvic lymphatics had been neglected by him over the years because of the press of more urgent and challenging activities and, in the final six months of his life, as a result of his devastating illness. He had earlier attacked the problem in a characteristic manner, excruciatingly and exhaustingly thorough, collecting data and reference material from the widest possible variety of sources. The basic bibliography from which the material presented in this book was culled, for example, exceeds 2000 titles and dates back centuries. The investigative aspects cover a period of about 15 years at Columbia University, during most of which I was privileged to work closely with him as pupil and colleague.

Through the good offices of Howard C. Taylor, Jr., then Chairman of the Department of Obstetrics and Gynecology, and with the enthusiastic consent and support of Albert's brother, Richard Plentl, I inherited the task of effecting completion of this work for him posthumously. In the honored role of professional heir, I have pursued the undertaking in the vain hope of producing a magnum opus worthy of Albert Plentl, the opus he once secretly confessed regrets over never having accomplished. I know full well that he would have been highly critical of the result, possibly even disapproving, particularly where I have boldly excised intricately embroidered sections, grossly oversimplified detailed analytic discourses and cavalierly destroyed his especially grandiloquent prose. I believe I have retained the essence nevertheless, adding only that which had not yet been considered or completed at the time of his death.

The following remarks, excerpted from the eulogy I delivered on March 28, 1968, at the Society for Gynecologic Investigation, of which he was a Founding Member, may be of some relevance to the reader. They should help to provide a degree of understanding of the man, his attitudes and motivation. Unlike most eulogies, these words are not merely embellished praise but offer an inner view—as interpreted by me, of course, but evolved during the years of our close contact, a relationship that was usually amiable, frequently trying, but always enlightening and edifying.

> His passing leaves a chasm that cannot be filled. A gifted, singular, intellectual giant, he was a tribute to his academic heritage. Born in Cairo, educated as a chemical engineer in Vienna and at Amherst, he obtained his M.A. degree from Princeton in 1935, his Ph.D. in chemistry from Columbia in 1940, and his M.D. from Cornell in 1948. He completed the five-year residency program in obstetrics and gynecology at the Sloane Hospital for Women before joining its faculty at Columbia University, where he attained the rank of Associate Professor in 1956. His intensive training in the two disciplines of chemistry and medicine made him especially qualified for his life's work, which for all his splendid accomplishments remains incomplete, tragically cut short by his death.

Albert Plentl perhaps represented one of the last in a long unbroken line of academic aristocrats, schooled in arduous discipline and tenacious perseverance, with unbridled enthusiasm, infectious dynamism and determination. He was overtly intolerant of faults in others, especially those dealing with inadequacies in conceptualization, logical thinking, or intellectual grasp; but in this regard he was far more critical of and impatient with himself. No pursuit was too expansive, no challenge too great for him. He excelled not only as an academic leader, but he also possessed unsurpassed surgical skills. Little known to many, he was an accomplished pianist, a connoisseur of art and literature, a gourmet, and delighted in elegant living. Analogous to his approach to science, his extracurricular tastes and interests were studied and honed to a fine-edged state of perfection. His keen and cutting sense of humor, bordering on the sardonic, was a constant source of admixtures of pain and pleasure to everyone around him. Those of us who were privileged to walk in his shadow learned quickly to respect and admire him both for himself and for his burgeoning capabilities. No one with whom he came into contact remained unaffected.

Although his enormous potential will never be fully realized, his significant accomplishments are legion. His interests and depth of knowledge ranged widely. Early work in organic and biochemistry delved into renin-angiotensin systems and amino acid metabolism. In applied medical research, he investigated water and electrolyte distribution in pregnancy, amniotic fluid formation and exchange mechanisms, and the physiopathology of hydramnios. In the clinical area, he reintroduced the Bracht maneuver, perfected and taught radical surgical approaches to gynecological cancer, and studied their complications. He championed the use of sparteine as a uterotonic agent in this country. Perhaps most significantly, he introduced and developed the art of intrauterine fetal surgery in the primate, producing an unparalleled research tool for the long-term study of pregnancy physiology.

Never could it more correctly be said than now that "any man's death diminishes me, because I am involved in mankind." This man's death has diminished us all.

This book is dedicated to the memory of Albert Plentl. Beyond this, acknowledgment is due those individuals who stood by him to the end. Some would prefer not to be mentioned publicly and out of deference to their sensitivity and real altruism, I shall respect their wishes. They have my sincere appreciation, needless to say a mere shadow of Albert's. I cannot allow to go unrecorded a warm note of recognition and sincerest thanks to Miss Carolyn Mathis and Harry Manis, both stalwart supporters, admirers and confidants, without whom much of Albert's creative productivity would have been considerably diminished and this book never done at all. Expressions of appreciation are due Miss Marlene R. Sachtleben for her devotion to the memory of a great man, expressed in her indefatigable approach to reassembling the unbelievably diffuse fragmentary shards of the original data and the massive supporting documents and in preparing the final manuscript. The special, personalized attention to detail and the cooperative spirit of our excellent, talented illustrator, Robert J. Demarest, are noted with gratitude. His manifest accomplishments in profusion speak quite eloquently for him. I wish also to thank John L. Dusseau of W. B. Saunders Company, whose confidence in me and whose critical editorial comments, advice and aid were invaluable.

EMANUEL A. FRIEDMAN, M.D.

Contents

Chapter One

INTRODUCTION

The importance of the anatomical organization and physiological function of the lymphatic vessels and nodes of the human female pelvis is well recognized by gynecological oncologists. Current-day treatment regimens reflect detailed knowledge of these areas; and undoubtedly future therapeutic modifications and innovations will arise from the firm foundation of such understanding.

As we peruse the large numbers of relevant but diverse studies concerning the anatomy of pelvic lymphatics, we are impressed by apparent discrepancies and quickly uncover large and small differences. These appear to be based not only on expected variations in anatomical configuration from individual to individual, but on observations or deductions from human versus animal preparations, *in vitro* versus *in vivo* investigations, and diseased versus normal states. Additionally, the wide spectrum of techniques applied to these studies compounds the confusion.

In the material set forth herein, we have attempted to gather information from all available sources, weigh each carefully, exercise critical judgment, justify discrepancies where possible, and draw discriminating conclusions concerning the niceties of the anatomy of the lymphatic system. Where such conclusions cannot be made definitively, we have steadfastly resisted the temptation to be dogmatic.

HISTORICAL BACKGROUND

Based on the writings of Galen, it has been determined that at the beginning of the third century B.C. Erasistratus (perhaps the first experimental physiologist) and Herophilus (considered the father of scientific anatomy), both accomplished anatomists, originators of cadaver dissection (Garrison, 1929), and physicians of the Alexandrian School of ancient Greece, observed lymphatic vessels during their anatomical dissections. They appear to have considered them to be veins. Nodal enlargements on the lymphatic vessels were also seen and termed glandulae. Mesenteric lymph nodes were recognized by Marinus around 50 A.D. and by various Arabian authors (Skinner, 1961). Galen, while alluding to a separate vascular system in 168 A.D. (Perrott, 1954), denied the existence of lymphatics, thereby suppressing any further inquiry into the matter in his role as the leading medical authority of the Christian world for 1400 years beginning in the second century A.D.

As the Galenical tradition was being broken at the beginning of the Renaissance in the sixteenth century, Vesalius (1543), Fallopius and Eustachius (1564) recognized and described lymphatics. The term lacteal vessel was first applied to the lymphatic vessels in the mesentery by Gasparo Aselli in 1622. This Italian anatomist, who

was Professor of Anatomy and Surgery at Pavia, observed the white milky liquid that issued from the incised distended mesenteric lacteals of a recently fed dog, a finding he confirmed in other mammals as well. Aselli's detailed descriptions were published posthumously in *De Lactibus Sive Lacteis Venis* (1627), the first anatomical treatise containing colored illustrations. His observations were confirmed in 1634 by Veslingius, whose work was continued following his death by Thomas Bartholin (father of Kaspar Thomeson Bartholin Secundus of gynecologic eponymic importance). Simultaneously, Jean Pecquet, French anatomist at Dieppe, Olaus Rudbeck, then a student of anatomy at Uppsala, J. Van Horne, Professor of Anatomy at Leyden, and an English physician named Jolyffe studied and described the thoracic duct and the cisterna chyli during the years 1651–1653. Bartholin, at the time prestigious Professor of Anatomy (earlier, of Mathematics) at Copenhagen, appears to have won the challenge of historical priority with the acceptance of his term vasa lymphatica as contrasted with Rudbeck's vasa serosa. Bartholin's term (1653) was derived from the Latin *lympha*, a mutation from the Greek *νυμφη* referring to clear, clean, transparent spring water, the watery fluid found within lymphatic vessels. Rudbeck's terminology (1653) was based on his observation that the fluid in these vessels was salty to the taste and was able to coagulate like blood.

Although lymph nodes were recognized in Greco-Roman times as nodal enlargements adherent to and superimposed upon the lymphatic vessels, their structure was first detailed independently by the Englishman Thomas Wharton (1656) and the Italian father of histology Marcello Malpighi (1659). The valves within lymphatic vessels were first described by Rudbeck (1653) and later rediscovered by Frederick Ruysch, Professor of Anatomy at Amsterdam, in 1665.

In the eighteenth century, attention was directed toward careful experimental mapping out of the lymphatic topography using heavy metal salt injections (Mascagni, 1787), a method that had been introduced and perfected nearly 100 years earlier by Anton Nuck (1692). A reproduction of the title page and one of the superb plates from Paolo Mascagni's notable work are shown in Figures 1–1 and 1–2, respectively. Some of his original carefully injected preparations are still preserved at the anatomical museum at Siena University (Lenzi, 1962). Almost concurrently, William Hunter, Scottish anatomist and obstetrician esteemed for his splendid atlas on the anatomy of the human gravid uterus (1774), and William Hewson (1774), renowned British physiologist, elaborated upon the superficial and deep groups of the lymphatics in the human, also based upon cannulation and injection of mercury or colored molten wax. Further elaboration and definitive study by William Cruikshank (1786), an assistant of Hunter's, established the foundations of the morbid anatomy of the lymphatic system to remain essentially unchallenged until the dawn of the modern era of *in vivo* observations.

The nineteenth century added histological investigations developing the microscopic details of lymphatic vessels (Weber, 1837; His, 1861). Wilhelm His expounded, but could not prove, that the vasculature of the lymphatic system formed a completely closed system. Prior to that time, direct connection between blood and lymph was assumed to exist and to account for the origin of lymph. The physiologic study of lymphatic function, matters conjectured about by earlier anatomists, were investigated experimentally and correlated with anatomy and histology by the great French anatomist Philibert Sappey (1874) and the English physiologist, whose heritage we revere, Ernest Starling (1894, 1895). Starling clearly demonstrated that lymph and interstitial fluid were derived from blood capillaries by filtration. Needless to say, anatomical studies were pursued as well (Gerota, 1896). The modern era may be said to have been initiated by Karl Ludwig (1861) with the development of lymph-collection techniques in the living subject (Yoffey and Courtice, 1956). This permitted direct observation of the relevant physiological processes in lieu of foregoing deductive suppositions based upon indirect, incomplete, and often faulty evidence. Rhythmic contractions of lym-

VASORUM LYMPHATICORUM

CORPORIS HUMANI

HISTORIA

ET

ICHNOGRAPHIA

AUCTORE

PAULO MASCAGNI

IN REGIO SENARUM LYCEO

PUBLICO ANATOMES PROFESSORE.

SENIS

EX TYPOGRAPHIA PAZZINI CARLI

MDCCLXXXVII.

SUPERIORUM PERMISSU.

Figure 1–1. Title page of Mascagni's historic work on lymphatic typography published in 1787.

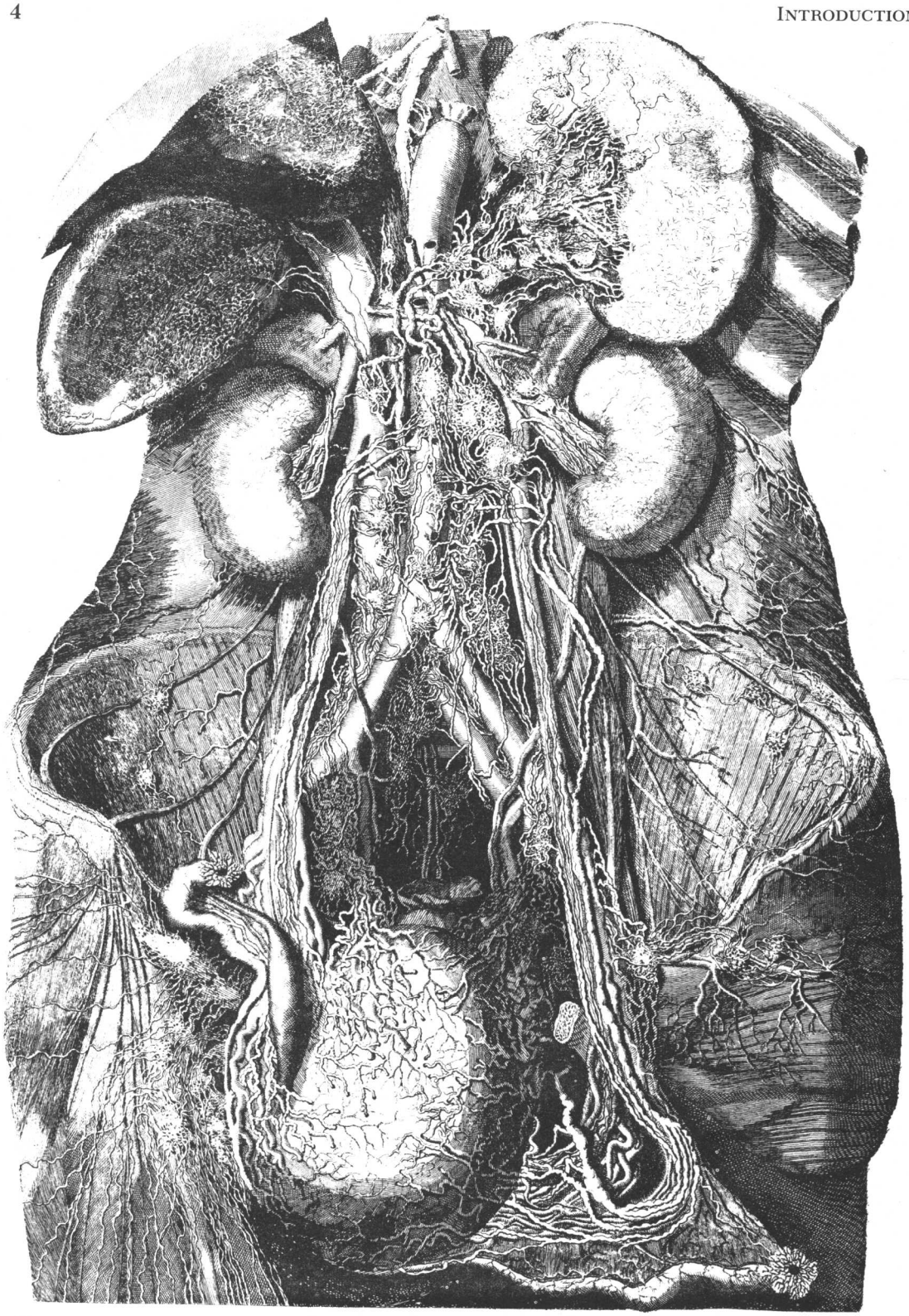

Figure 1–2. Plate XIV from Mascagni's *Vasorum Lymphaticorum Corporis Humani* showing details of the collecting channels of the internal genitalia.

phatic vessels were described by Heller (1869) about the same time. Injection techniques for the study of growth of the lymphatics in the tail of the living frog larva have been used since 1846 (Koelliker). By refinements of injection study, much information concerning embryologic development (Sabin, 1902, 1913), structure, and function of lymphatic vessels was evolved early in this century.

The natural extension of these studies was the injection of dye in the living organism, either into tissues for the purpose of indirect examination of the draining lymphatic channels and lymph nodes or directly into the lymphatic system. With the availability of x-ray visualization at the dawn of the twentieth century, use of radiopacification by injection methods became possible and was accomplished. Rapid technological developments followed in succession from direct injection for x-ray visualization in human cadavers (Zolotukhin, 1934; Zdanow, 1932) to injection in living animals (Menkes, 1932) and humans (Funaoka et al., 1930; Carvalho et al., 1931, 1934) by direct intranodal injection and finally by direct intralymphatic injection (Kinmonth, 1952).

TECHNOLOGICAL DEVELOPMENT

Although dissection has been the backbone of anatomical study of the lymphatic system, the relative invisibility of the lymphatics, because of their thin walls and colorless contents, has impeded detailed elaboration until techniques of visualization were developed. Utilizing mercury and heavy metal salt injection techniques, since lost, developed by Nuck (1692) and Mascagni (1787), lymphatic topography was first put on a firm basis. Major atlases employing modifications of such injection methods have included the great works of Cruikshank (1786), Teichmann (1861), Sappey (1885), Bartels (1909), Jossifow (1930), and Rouvière (1932). The exquisite detail of which these masters were capable is demonstrated in the accompanying illustration taken from Teichmann's book (Fig. 1–3), showing lymphatic intercommunications.

Vital dye injections opened new vistas. Braithwaite (1923) injected indigo carmine into the cecal wall to visualize collecting nodes. Zolotukhin (1926; cited in Ruszynak et al., 1967) injected radiopaque dyes to opacify lymphatics, and later (1936; cited in Rusznyak et al., 1967) experimented with many different materials, including bromine, strontium, Lipiodol, collargol, in attempts to improve visualization. Meanwhile, Defrise (1929) used silver nitrate and Ottaviani (1930) injected mercury, hydrobarium and sulfide of mercury for the same purposes. Meller (1931) and Zdanow (1932) injected thorium compounds with very good results. Use of thorium was expanded to produce lymphangiograms in living animals (Menkes, 1932; Menville and Ané, 1932; Servelle, 1934) and humans (Carvalho et al., 1931) before the destructive and granuloma-producing effects of this material were fully appreciated.

The development of suitable selective intravital staining of lymph vessels (Hudack and McMaster, 1933), coupled with the feasibility of injecting iodine-containing contrast materials *in vivo* (Funaoka, 1930), allowed the evolution and critical development of lymphangiography as we know it today by Kinmonth in 1952. By this approach, it was possible to inject watery radiopaque medium directly into lymphatics previously stained by intradermal injection of vital dye. Perfection of the technique for dissection of such prestained lymphatic-collecting trunks for cannulation and subsequent injection followed quickly (Kinmonth, 1954). Direct intranodal injection was introduced in 1956 (Bruun and Engeset), utilizing oil-based radiopaque medium. The physical and physiological characteristics of various dye media have been studied extensively (Fischer, 1959; Threefoot, 1960).

Recent exploration of the use of radioactive colloidal gold injection for the purpose of demonstrating location of collecting nodes by scintiscanogram (Málek and Vavrejn, 1960; Lang, 1960) has shown limited promise. Other modifications in technique included visualization of lymph nodes under ultraviolet light using fluorescent dye (Schlegel, 1949), use of radioactive silver chloride colloids for injection

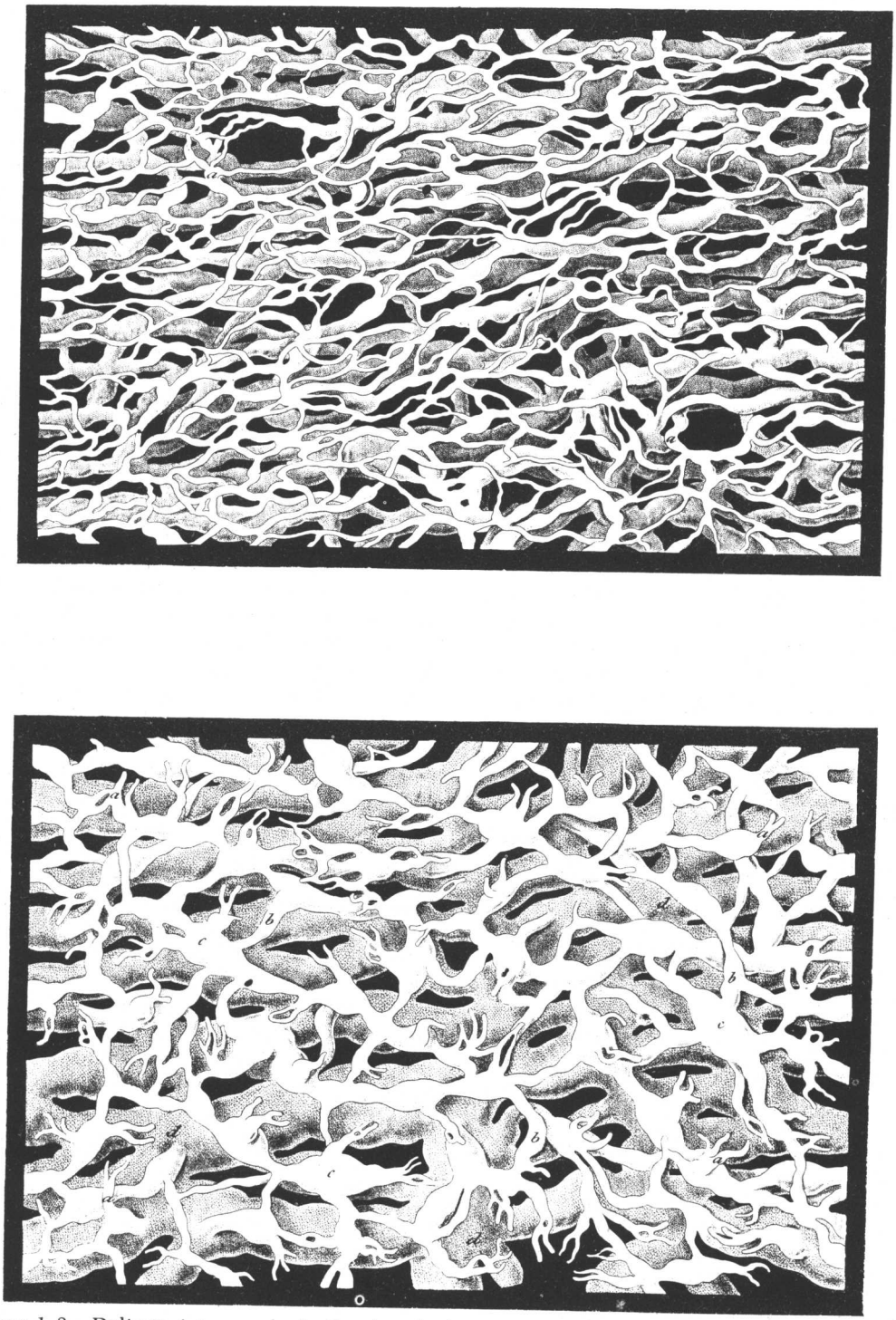

Figure 1–3. Delicate intercommunicating lymphatic anastomosis of the skin, detailed in Teichmann's 1861 atlas.

of lymphatics (Hahn et al., 1952), injection of radiochromate interstitially (Allen et al., 1945), and injection of tissues directly with pontamine sky blue plus hyaluronidase for the purpose of visualizing lymph nodes at time of surgery (Weinberg and Greaney, 1950). A significant new advancement in technology is improved direct magnification lymphography (Ditchek and Scanlon, 1967) which makes visualization of very small lymphatic channels feasible.

With specific reference to technical development in the anatomy of pelvic and genital lymphatics, outstanding treatises on dissections included those of Cunéo and Marcille (1901), Marcille (1902), and Reiffenstuhl (1957). Elaboration of the radiographic anatomy by means of angiography has resulted in impressive publications by Maneschi and Ragonese (1965), Reiffenstuhl (1967), and the less extensive but equally valuable studies of Herman et al. (1963), Hahn et al. (1963), and Nelson et al. (1964). *In vivo* studies were based on lymphangiographic injections administered by way of the lower extremity channels. That lymph nodes delineated did not necessarily represent direct drainage from pelvic organs was an obvious shortcoming of this approach. Attempts to provide definitive demonstration of specific channels and nodes draining genital organs began with inroads in parametrography, the injection of radiopaque material into parametrial tissue, in 1934 (Gellhorn). Partial success was obtained using radioactive gold by Sherman et al. (1950) and Pattillo et al. (1964). Direct injection of particulate matter such as india ink into the cervix was shown to be effective in demonstrating nodal distribution by Zeit and Wilcoxon (1950). Accidental injection of oily radiopaque material into the uterine lymphatics during the course of hysterographic studies demonstrated draining nodes in parametrium and lateral pelvic areas (Brendler, 1943; Várady, 1947; Leroux, 1950). Lymphangiographic study of the metastases in pelvic nodes using watery media was accomplished by Collette in 1958. Injection of Ethiodol, an oily medium, into cervical tissue was shown to be effective by Howett and Greenberg (1966). Extensive use of clearing techniques for study of lymph-bearing tissues removed surgically has also been quite helpful (Montgomery, 1955).

INVESTIGATIONAL CONSIDERATIONS

It should be quite clear at this juncture, based on the foregoing review of recent developments in the field of anatomical study of the lymphatic system, that many investigative methods are available. Lymphangiography today is a relatively convenient, readily available, and reasonably reliable procedure. Its clinical value has been variously assessed with particular regard for its limited ability to detect nodal metastases from primary cancers of gynecologic origin. Its promise in this regard has not been completely fulfilled in that, as previously indicated, the lymph nodes opacified by the lower extremity approach are not necessarily those of primary interest to the gynecologist. An early presumption that the nodes draining the legs equivalently drain the genitalia is patently false. Furthermore, the capability of lymphangiographic techniques to detect metastases within the lymph nodes is quite limited in that small intranodal tumor deposits may not be detected, whereas large infiltrates may prevent the involved node from taking up any dye at all. Additionally, at the other extreme, false positive evaluations may be made erroneously owing to deposits of fat and fibrous connective tissue within lymph nodes partially visualized during lymphangiography. The real value of such techniques in patients with lymphomas is not mirrored by the results in association with carcinoma of the cervix.

Thus, routine use of lymphangiography in patients with carcinoma of the cervix for preoperative evaluation and staging has been denigrated (Dolan, 1964). Despite this negative attitude, however, injection of chlorophyll-containing radiopaque medium, now unfortunately no longer available in this country, has been shown to be of great aid in helping to locate suspicious nodes for removal at time of surgery. Additionally, x-ray films obtained at surgery following lymphadenectomy for cancer

provide an immediate measure of how thoroughly and completely the dissection has been done.

The clinical limitations and relative advantages aside, information gained by such means has been invaluable when studied in conjunction with comparable data obtained by carefully performed surgical and cadaver dissection, clearance methods, as well as techniques employing injection of vital dye into living tissue for directly tracking lymphatic collecting channels and nodes. Each of these avenues has been pursued in considerable detail in deriving the material set forth in this book. It is clearly beyond the scope of this work to embark on exhaustive discussion and comparative evaluation of the several clinically applicable investigative techniques from the viewpoint of their clinical usefulness. Suffice it to say that, restrictions and distortions notwithstanding, we have taken full advantage of the information derived (albeit perhaps of negligible value in terms of therapeutic or diagnostic usefulness to the given patient under study) for the purposes of anatomical definition herein.

Chapter Two

NOMENCLATURE

Our anatomical description of the lymphatic system in the female pelvis will attempt to trace it from origin to destination. We will outline the parenchymal lymphatics of each organ, the collecting trunks, the drainage channels, and the regional nodes. The pervading confusion in nomenclature, unfortunately, will make this task particularly difficult. Lymphatic pathways tend to be named in accordance with the designations for arteries in their vicinity. Their great variability suggests that this kind of flexibility is quite appropriate. Nodes, on the other hand, tend to be relatively more stable. The number and location does vary greatly between species, but general sites seem to maintain a degree of stability. The concept of more or less constant lymph centers to designate groups of lymph nodes which always occur at precisely defined locations, independent of the number of such nodes existing at any given point, was introduced by Baum (1926). An elaborate morphological classification of these centers has permitted establishment of uniform nomenclature for lymph nodes of various animal species (Grau, 1943; Spira, 1962).

Historically, however, designations of regional nodes in man have led to a particularly confusing picture. In both the clinical and the anatomical literature, it is not unusual to find several different nodes bearing the same or similar names; and conversely, specific nodes may be assigned many different names. In the interest of clarity, it seems best for us to begin with a brief review of the nomenclature so that we may define our terms quite specifically and rationalize the classification we have adopted and will adhere to throughout this book.

THE LYMPH NODES OF THE PELVIC WALL

The earliest designations appearing in the gynecological literature were uniform. Cruveilhier (1834), Sappey (1879), Peiser (1898), and others refer to specific nodes according to the anatomical region in which they are found. In brief, the pelvic wall is divided into three triangular areas plus one central area over the sacrum. The central or apical triangle is bounded laterally by the common iliac vessels with its apex at the junction of the iliac vessels and the aorta. The base of the central triangle may be represented by a horizontal line drawn from the origin of one hypogastric artery to the other. Within this area are contained the inferior lumbar glands and the more caudad sacral glands. The lateral paired pelvic triangles are located between the external iliac and hypogastric arteries, respectively. They contain the hypogastric glands.

In 1786, the anatomist Haase developed a system of classifying the pelvic nodes by considering various groups as plexuses. The plexus hypogastricus, according to this approach, included all nodes between the common iliac vessels below the bifurcation of the aorta, encompassing those designated more recently as sacral and either lower or subaortic lumbar nodes. One can readily understand the confusion that must have resulted and undoubtedly still persists in some quarters, with regard to the need to distinguish the hypogastric glands, present in the triangle between the external iliac and the hypogastric arteries, from the hypogastric plexus, referring to nodes located between the common iliac arteries.

With the evolution of time, the tangled nomenclatural dilemma has been compounded by many authors who have used additional and often conflicting designations whenever necessity or convenience demanded it. The resulting multiplicity of names has created a situation with widespread detrimental effects in gynecology.

Analyses of otherwise precise anatomical studies become very involved when attempts are made to compare the findings of different writers on the subject. Even very critical and authoritative anatomists have been guilty of this transgression. To add to the problem, eponymic and structural names have been assigned to nodes that are allegedly constant in location, such as Cloquet's node, obturator node, ganglion prevenieux superieur, ganglion principal, and many others. Such highly specific names imply that these isolated nodes are constant and their locations irrevocably fixed. This view has been refuted frequently. The practice, therefore, should be avoided, and although reference is frequently made to such classic terms, we have not followed suit in this book. Furthermore, we have avoided naming nodes according to the organ or the region from which they receive their afferent lymphatics. It has been shown that this latter approach can be particularly troublesome because many, and perhaps most, of the nodes in the pelvis are regional because, as we shall see, they subserve the function of receiving afferents and of thereby draining lymph fluids from more than one organ

Internationally accepted designations for gynecologically important lymph nodes are remarkably restricted to the recognition of only four broad groups of pelvic nodes. These include iliac, internal iliac, lumbar, and sacral lymph nodes. The official names according to the three major classifications or *Nomina Anatomica*, approved at Basel (BNA, 1895), Jena (JNA, 1935), and Paris (PNA, 1955), respectively, are presented in Table 2–1. One notes substitution of the term nodus for glandula and elimination of the confusing term hypogastrica. Aside from these minor changes, and that referable to the subinguinal nodes which will be discussed later, nothing drastic appears to have occurred in the 60 years covered by these classifications (Leutert, 1963).

Although these classifications tend to be rather realistic in terms of the relative variability of nodal locations within the major areas defined, they cannot be conveniently used without further and more specific explanations. The term iliac, for example, may refer to any lymph node located in the vicinity of the iliac vessels from the region of the femoral ring up to the aortic bifurcation, whereas lumbar may mean any node around the abdominal aorta or inferior vena cava from the sacral promontory all the way to the diaphragm. This situation is evidently inadequate for use in the description of surgical specimens or for analysis of data relative to spread of the cancer.

Of the many attempts that have been made to shed light in this area, the classification proposed by Reiffenstuhl (1957) has much to recommend it. Because of its simplicity and logic, it has been adopted for use herein and will be followed throughout. Reiffenstuhl's nomenclature does not conflict with that of the international *Nomina Anatomica* which it actually supplements by dividing each of the main groups into smaller ones. A correlation of the two systems of designations is given in Table 2–2. The names assigned to the subgroups of nodes within the major divisions are consistent in their relationship to the generally recognized designations for closely situated arteries.

Modifications have been added for the purpose of logical clarification, where nec-