Textbook of Sexual Medicine

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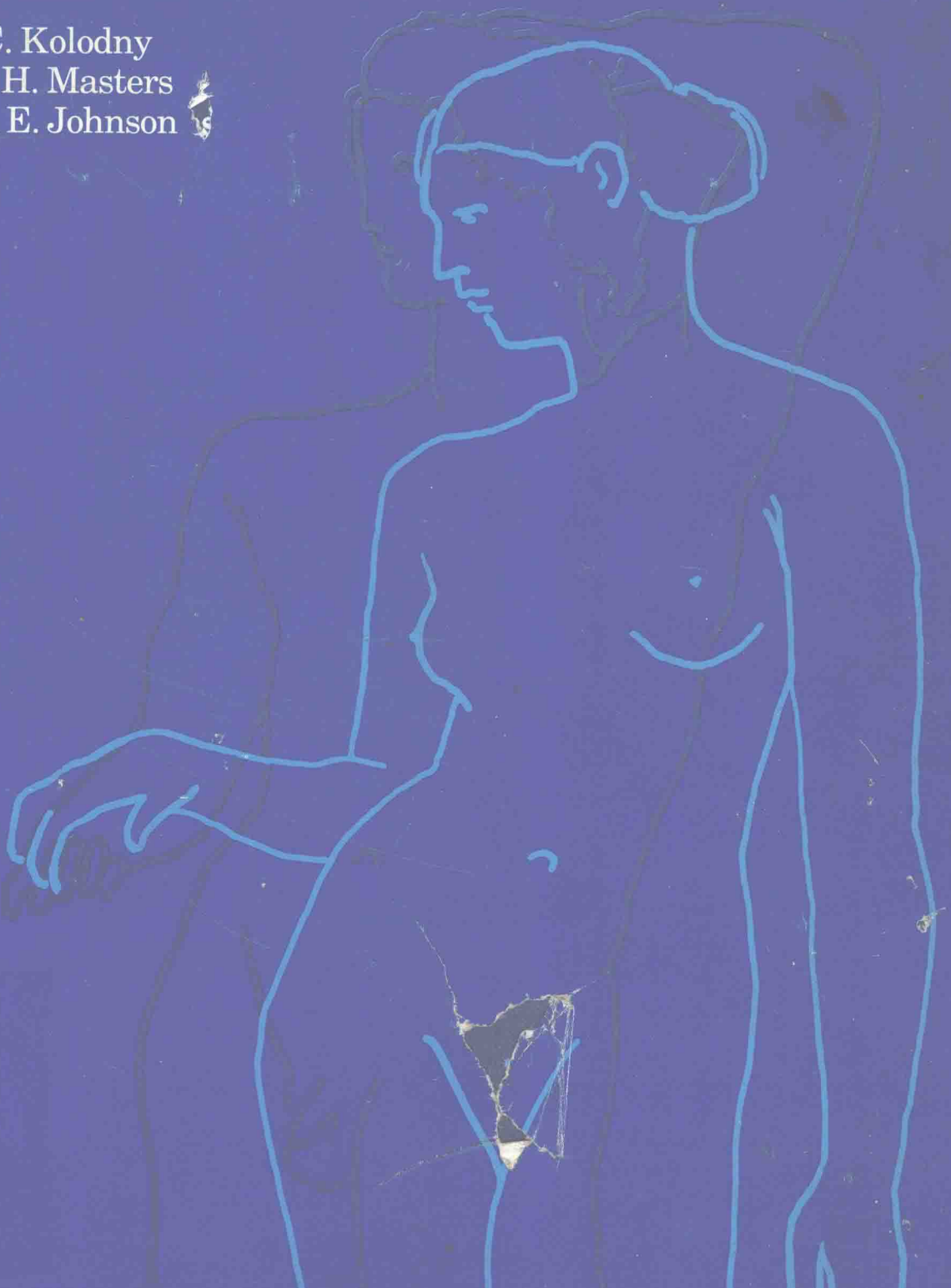

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Preface

The past decade has seen a remarkable degree of public and professional acceptance of sexual health as a legitimate and necessary aspect of modern health-care delivery. Most medical schools now give courses about human sexuality, prestigious journals publish reports of investigations on the subject of sexuality, and hundreds of conferences and workshops are held each year on various aspects of sexual behavior, sexual rehabilitation, and sexual problems. All this is in sharp contrast to the earlier prevailing atmosphere of disinterest, ignorance, or professional disdain.

We decided several years ago that these changes created an obvious place for a textbook oriented primarily toward the needs of clinicians working with patients who have sexual problems. Thus, in the preparation of this book, we incorporated many subjects that we had been asked about in our teaching of physicians and other health-care professionals across the country. The final product, which we believe to be comprehensive and clinically relevant throughout, is a text that we hope will be of equal use to the primary-care provider, the medical or surgical specialist, and the sex therapist. We have deliberately avoided an encyclopedic treatise that would be cumbersome in size, readability, and cost, and for that reason readers will find little mention of data involving animal research, sociologic or cross-cultural aspects of sexuality, and details of general psychotherapeutic theory or technique. On the other hand, the thoroughly referenced chapters of this text provide the reader with an opportunity to acquire a familiarity with our approach to the subject of sexual health. We hope that clinicians and educators will integrate the material presented here—including a substantial amount of previously unpublished data—into their own practices.

Although this book is called a *Textbook of Sexual Medicine*, it is not written for physicians alone. We are often asked by psychologists, social workers, nurses, counselors, and other health-care professionals for information to assist them in working with patients with a wide variety of medical or surgical problems. The detailed discussions of these topics—such as heart disease, drugs, cancer, mutilative surgery, obesity, alcoholism, arthritis, and pulmonary disease—are presented in a fashion that we hope will foster better cooperation and interaction among all members of the health-care team.

We gratefully acknowledge the valuable research assistance of Gail Tullman and Nancy Kolodny in the preparation of this book. Doctors Ira Kodner, Raymond Waggoner, George Murphy, Edward Dietiker, and Mark Schwartz provided considerable help through their critical

comments on selected portions of the manuscript. The Washington University School of Medicine's Department of Medical Illustration, directed by Kramer Lewis, supplied proficient technical support. As always, the highly competent editorial services of our friends at Little, Brown and Company were of great assistance—our particular thanks to Christine Ulwick and Jacqueline Cohen. Throughout the many drafts and stages of the writing, Sarah Weems provided expert editorial vigilance, organizational skills, and general enthusiasm. Finally, we are indebted to the countless patients and research subjects who have participated in our work—they are our greatest source of encouragement.

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Textbook of Sexual Medicine

Contents

1 Sexual Anatomy and Physiology

Throughout the medical sciences, it is recognized that a detailed understanding of anatomy and physiology is a prerequisite to considerations of pathology or treatment. This recognition is based on the premise that effective therapy of any disordered body system hinges on an attempt to restore the equilibrium of normal function, although this goal may not always be attainable. Sexual behavior and sexual function are not, of course, only biologic in nature. The interaction of *psyche* and *soma* is nowhere more plainly illustrated than in the area of sexuality, where factors such as ego strength, social learning, personality, and values clearly combine with fundamental mechanisms of physiologic function in a highly complex system. In this chapter, discussion focuses on the biologic components of sexual response, with only brief commentary on pertinent psychological aspects.

Female Sexual Anatomy

The External Genitals

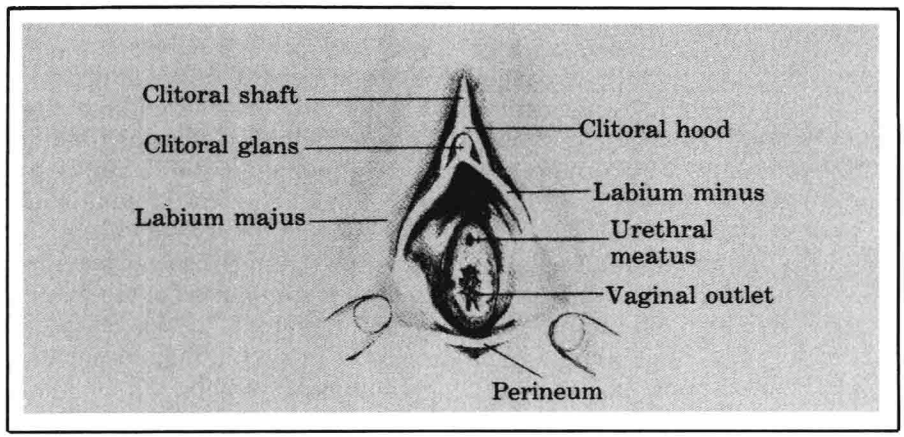
The external genitals of the female consist of the labia majora, the labia minora, the clitoris, and the perineum. Bartholin's glands, which open on the inner surfaces of the labia minora, may be considered functionally within the context of the external genitals, although their anatomic position is not in fact external.

Figure 1-1 presents a schematic depiction of the external genitals of the adult female. The appearance of the genitals varies considerably from one woman to another, including: (1) marked variation in the amount and pattern of distribution of pubic hair; (2) variation in size, pigmentation, and shape of the labia; (3) variation in size and visibility of the clitoris; and (4) variation in the location of the urethral meatus and the vaginal outlet. In the sexually unstimulated state, the labia majora usually meet in the midline, providing mechanical protection for the opening of the urethra and the vagina.

Histologically, the labia majora are folds of skin composed of a large amount of fat tissue and a thin layer of smooth muscle (similar to the muscle fibers present in the male scrotum). Pubic hair grows on the lateral surfaces; both the medial and lateral surfaces have many sweat and sebaceous glands. The labia minora have a core of vascular, spongy connective tissue without fat cells; their surfaces are composed of stratified squamous epithelium with large sebaceous glands.

The clitoris, which is located at the point where the labia majora meet anteriorly, is made up of two small erectile cavernous bodies enclosed in a fibrous membrane surface and ending in a glans or head. Histologically, the tissue of the clitoris is very similar to that of the penis. The

Figure 1-1. The human female external genitalia. (From Masters and Johnson [1].)



clitoris is richly endowed with free nerve endings, which are extremely sparse within the vagina [1], and is not known to have any function other than serving as a receptor and transducer for erotic sensation in the female.

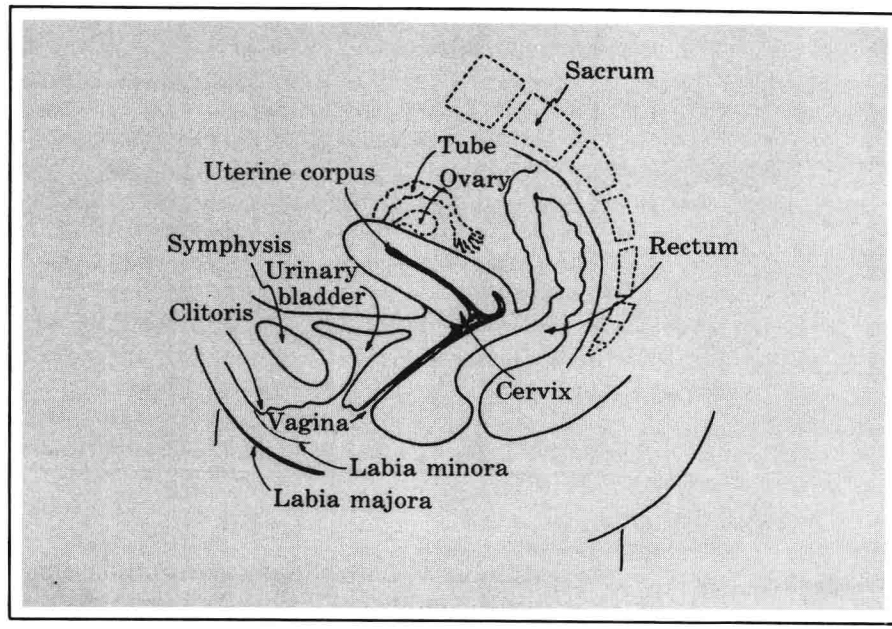
The Internal Genitals

The internal genitals of the female include the vagina, cervix, uterus, fallopian tubes, and ovaries (Fig. 1-2). These structures may show considerable variation in size, spatial relationship, and appearance as a result of individual differences as well as reproductive history, age, and presence or absence of disease.

The vagina exists functionally more as a potential space than as a balloonlike opening. In the sexually unstimulated state, the walls of the vagina are collapsed together. The opening of the vagina (vaginal introitus) is covered by a thin membrane of tissue called the hymen, which has no known function; rather than being a solid band of tissue blocking the vaginal orifice, the hymen typically has perforations in it that allow menstrual flow to be eliminated from the body at the time of puberty. The walls of the vagina are completely lined with a mucosal surface that is now known to be the major source of vaginal lubrication; there are no secretory glands within the vaginal walls, although there is a rich vascular bed. The vagina is actually a muscular organ, capable of contraction and expansion; it can accommodate to the passage of a baby or can adjust in size to accept a much smaller object.

The cervix is a part of the uterus that protrudes into the vagina. The

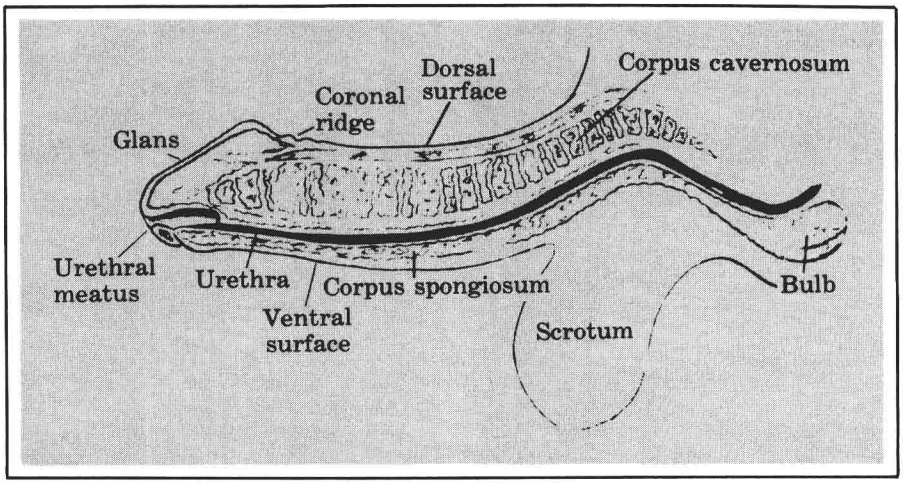
Figure 1-2. Female pelvis: normal anatomy (lateral view). (From Masters and Johnson [1].)



mouth of the cervix (cervical os) provides a point of entry for spermatozoa into the upper female genital tract and also serves as an exiting point for menstrual flow. The endocervical canal (a tubelike communication between the mouth of the cervix and the uterine cavity) contains numerous secretory crypts ("glands") that produce mucus. The consistency of cervical secretions varies during various phases of hormonal stimulation throughout the menstrual cycle: Just prior to or at the time of ovulation, cervical secretions become thin and watery; at other times of the cycle, these secretions are thick and viscous, forming a mucus plug that blocks the cervical os.

The uterus is a muscular organ that is situated in close proximity to the vagina. The lining of the uterus (the endometrium) and the muscular component of the uterus (the myometrium) function quite separately. The myometrium is important in the onset and completion of labor and delivery, with hormonal factors thought to be the primary regulatory mechanism. The endometrium changes in structure and function depending on the hormonal environment. Under the stimulus of increasing estrogenic activity, the endometrium thickens and be-

Figure 1-3. The penis: normal anatomy (lateral view). (From Masters and Johnson [1].)



comes more vascular in preparation for the possible implantation of a fertilized egg. If the fertilized ovum implants, the endometrium participates in the formation of the placenta. When fertilization and implantation do not occur, the greatly thickened endometrium begins to break down, resulting in menstrual flow as a means of shedding the previously proliferated endometrial tissue, which will regenerate under appropriate hormonal stimulus in the next menstrual cycle. Endometrial biopsy may be undertaken as part of an infertility evaluation to determine if ovulation has occurred and to observe whether appropriate progesterone secretion has been present.

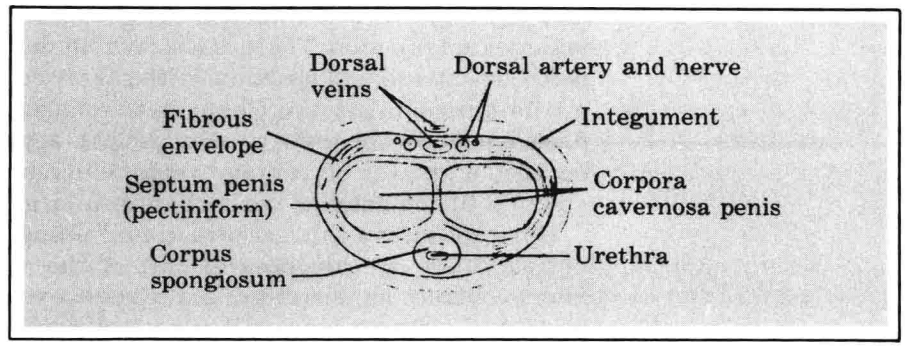
The fallopian tubes or oviducts originate at the uterus and open near the ovaries, terminating in fingerlike extensions called fimbriae. The fallopian tube is the usual site of fertilization; the motion of cilia within the tube combined with peristalsis in the muscular wall results in transport of the fertilized ovum to the uterine cavity.

The ovaries are paired abdominal structures that periodically release eggs during the reproductive years and also produce a variety of steroid hormones. Discussion of ovarian structure and function is beyond the scope of this volume; interested readers are referred to the reference list at the end of this chapter [2, 3].

Male Sexual Anatomy

The penis consists of three cylindrical bodies of erectile tissue (Figs. 1-3 and 1-4): The paired corpora cavernosa lie parallel to each other and

Figure 1-4. The penis: normal anatomy (transverse section). (From Masters and Johnson [1].)



just above the corpus spongiosum, which contains the urethra. The erectile tissues consist of irregular spongelike networks of vascular spaces interspersed between arteries and veins. The distal portion of the corpus spongiosum expands to form the glans penis. Each cylindrical body is covered by a fibrous coat of tissue, the tunica albuginea, and all three corpora are enclosed in a covering of dense fascia. At the base of the penis the corpora cavernosa diverge to form the crura, which attach firmly to the pubis and ischium (the pubic arch). The blood supply to the penis derives from terminal branches of the internal pudendal arteries.

Erection occurs as a result of vasocongestion within the spongy tissue of the penis. When the penis is flaccid, the vascular spaces in the erectile tissue are relatively empty; with arteriolar dilatation, blood flows into the network of sinuses in the spongy tissue and increased hydraulic pressure results in enlargement and hardening of the penis. When the rate of arterial inflow of blood is matched by the rate of venous return, a state of equilibrium is reached and the erection is maintained. The role of venous blockade in the process of erection is uncertain; detumescence occurs as a result of venous outflow exceeding arterial input.

The vascular events that produce erection are under the control of neural impulses. Although it has been speculated that parasympathetic fibers in sacral cord roots S2, S3, and S4 mediate erection, this theory is a matter of some controversy.

The skin that covers the penis is freely movable and forms the foreskin or prepuce at the glans. Inflammation or infection of the foreskin or glans may cause pain during sexual activity. There is much controversy

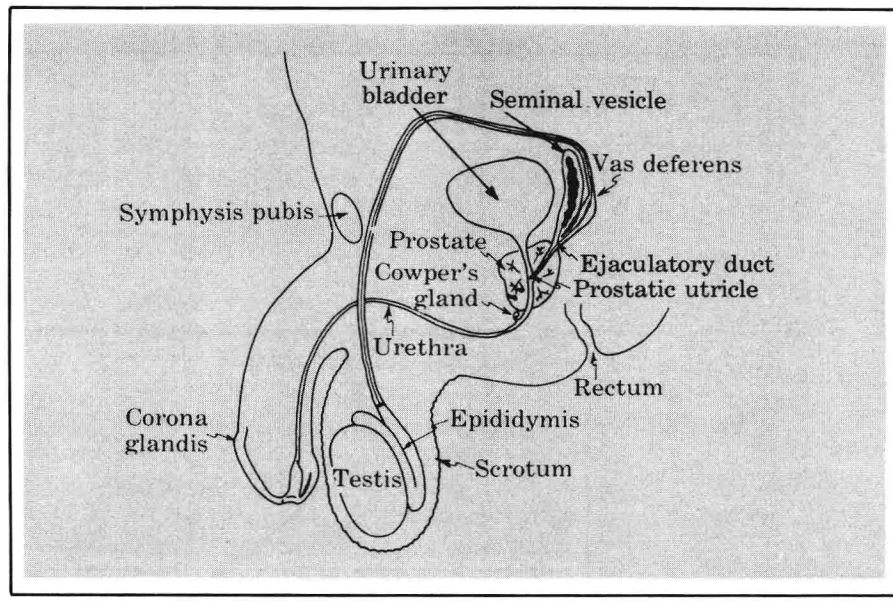
and little data surrounding the question of the effect of circumcision on male sexual function. There is also a great deal of confusion in regard to penis size and sexual function. With rare exceptions due to conditions of a true microphallus (see Chap. 9), the marked variation in size of the flaccid penis from man to man is less apparent in the erect state, because a greater percentage volume increase typically occurs during erection in the smaller penis than in a larger one.

The scrotum is a thin sac of skin containing the testicles. Involuntary muscle fibers are an integral part of the scrotal skin; these muscle fibers contract as a result of exercise or exposure to cold, causing the testes to be drawn upward against the perineum. In hot weather, the scrotum relaxes and allows the testes to hang more freely away from the body. These alterations in the scrotum are important thermoregulators: Since spermatogenesis is temperature-sensitive, elevation of the testes in response to cold provides a warmer environment by virtue of body heat, whereas loosening of the scrotum permits the testes to move away from the body and provides a larger skin surface for the dissipation of intrascrotal heat. The scrotum is divided into two compartments by a septum.

Although the testes differentiate embryologically as intra-abdominal organs, they ordinarily descend to their scrotal position prior to birth. The testes function as the site of spermatogenesis and also play an important role in the production of sex steroid hormones. Spermatozoa are produced in the seminiferous tubules of the testes, while steroid hormone production occurs in the Leydig cells located in the interstitial tissue. Although architecturally these tissues are admixed within the testis, the two functions are under separate control from the pituitary gland. Hormone synthesis may proceed in a completely normal fashion even if the seminiferous tubules are dysfunctional, but spermatogenesis is generally disrupted if testosterone synthesis is seriously impaired.

The prostate gland, which is normally about the size of a chestnut, consists of a fibrous muscular portion and a glandular portion. The prostate is located directly below the bladder and surrounds the urethra as it exits from the bladder. The rectum is directly behind the prostate, permitting palpation of this gland by rectal examination. The prostate produces clear alkaline fluid that constitutes a portion of the seminal fluid; the prostate also is a major site of synthesis of chemical substances, known as prostaglandins, which have a wide variety of metabolic roles. Prostatic size and function are largely androgen-dependent. Cancer of the prostate arises in the glandular portion,

Figure 1-5. Male pelvis: normal anatomy (lateral view). (From Masters and Johnson [1].)



whereas benign prostatic hypertrophy usually results from enlargement of the fibromuscular component of the prostate.

The seminal vesicles (Fig. 1-5) are paired structures that lie against the posterior aspect of the base of the bladder and join with the end of the vasa deferentia (the tubelike structures that convey spermatozoa from the testes) to form the ejaculatory ducts. The ejaculatory ducts open into the prostatic urethra; the major fluid volume of the ejaculate derives from the seminal vesicles. Cowper's glands, which may produce a pre-ejaculatory mucoid secretion, are otherwise of unknown function.

The Sexual Response Cycle

Masters and Johnson introduced the idea of a human sexual response cycle on the basis of extensive laboratory observations [1]. Understanding the anatomic and physiologic changes that occur during sexual functioning is facilitated by consideration of this model. However, it is important to recognize that the various phases of the response cycle are arbitrarily defined, are not always clearly demarcated from one another, and may differ considerably both in one person at different times and between different people. The diagrams of female and male sexual response cycles (Figs. 1-6 and 1-7) are only schematic concep-

Figure 1-6. The female sexual response cycle. (From Masters and Johnson [1].)

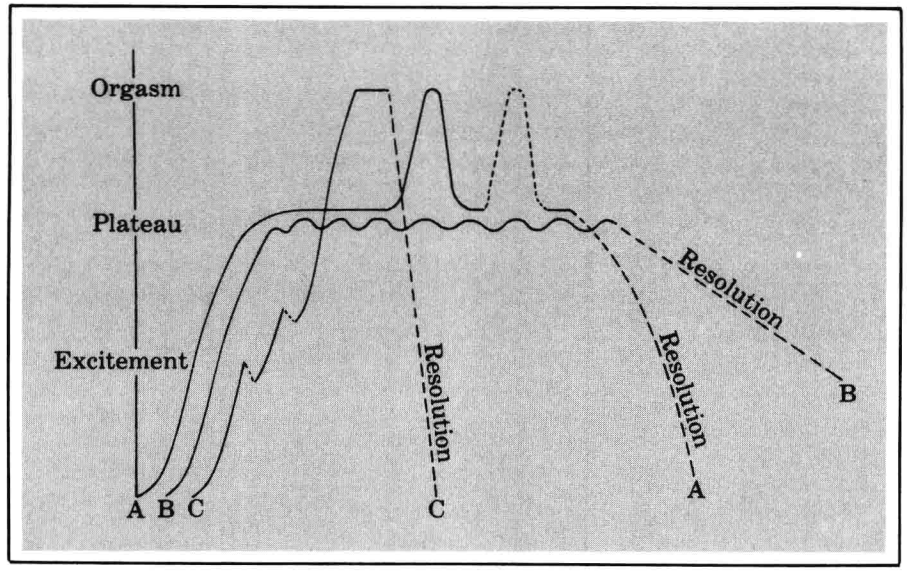


Figure 1-7. The male sexual response cycle. (From Masters and Johnson [1].)

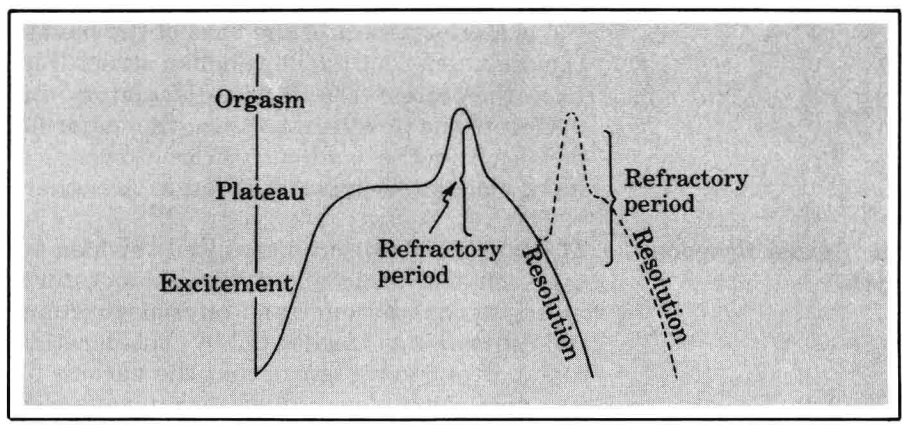
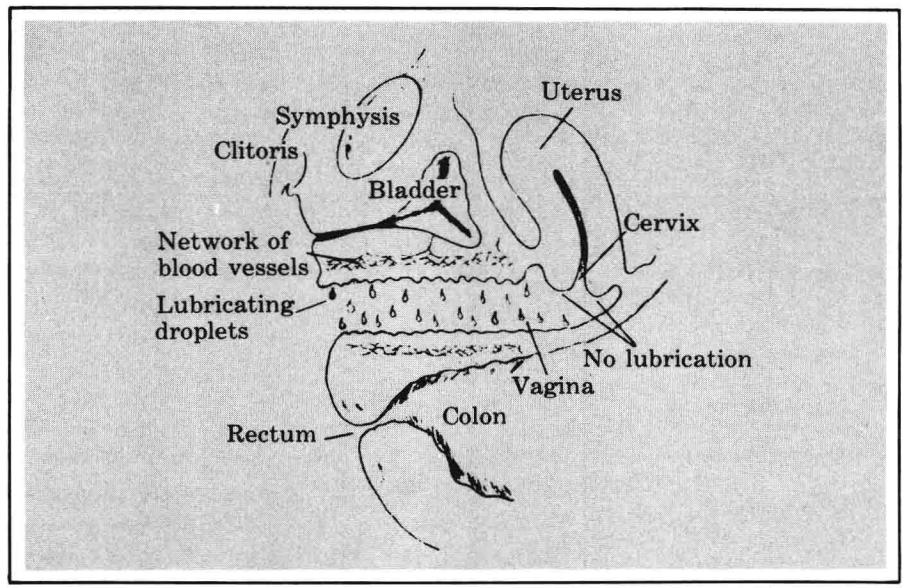


Figure 1-8. Vaginal lubrication.
(From Masters and Johnson [1].)



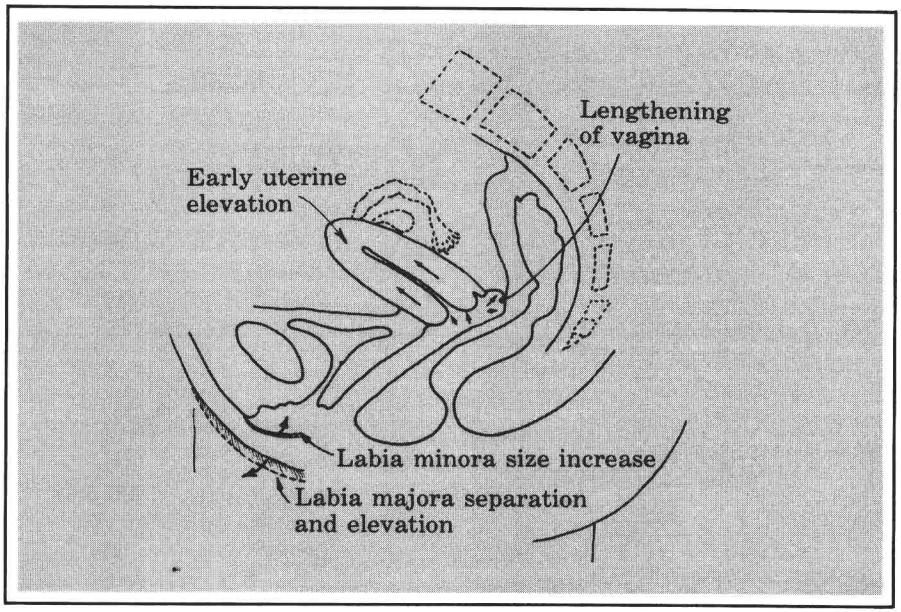
tualizations of commonly observed physiologic patterns. The clinical implications of disruptions of these patterns are discussed in greater detail in Chapters 20 and 21.

Excitement Phase

Excitation occurs as a result of sexual stimulation, which may be either physical or psychic in origin. Stimulation arising in situations without direct physical contact is neither unusual nor unexpected, since activation of many physiologic processes of the body occurs as a result of thought or emotion (for example, salivation and gastric acid production may be initiated by thinking about food; sweating, tachycardia, and palpitations may be precipitated by fear or anger). At times, the excitement phase may be of short duration, quickly merging into the plateau phase; at other times, however, sexual excitation may begin slowly and proceed in a gradual manner over a long time interval.

Sexual excitation in the female is characterized by the appearance of vaginal lubrication, which is produced by vasocongestion in the walls of the vagina leading to a transudation of fluid (Fig. 1-8). It is important to recognize that there are no "secretory glands" producing lubrication within the vagina and that the secretory glands lining the cervix do not

Figure 1-9. Female pelvis: excitement phase. (From Masters and Johnson [1].)



contribute meaningfully to vaginal lubrication. Other genital changes that occur during excitation in the female include expansion of the inner two-thirds of the vaginal barrel, elevation of the cervix and the body of the uterus, and flattening and elevation of the labia majora (Fig. 1-9). The clitoris increases in size as a result of vasocongestion, although a true erection does not occur. Erection of the nipples is characteristic of the excitement phase for the woman, although both nipples may not achieve full erection simultaneously. In the late excitement phase, surface venous patterns of the breast become more visible and there may be an increase in the size of the breasts as well.

Sexual excitation in the male (Fig. 1-10) is usually characterized by penile erection, which occurs as a direct result of vasocongestive changes within the spongelike tissue of the penis. It is helpful to realize, however, that physical as well as psychological arousal may be present without a firm erection, particularly when anxiety or fatigue are present. The normal appearance of the scrotum begins to change as vasocongestion produces a smoothing out of skin ridges on the scrotal sac; the scrotum also flattens because of an internal thickening of the