Zuspan & Quilligan's

MANUAL OF OBSTETRICS AND GYNECOLOGY

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Second Edition

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Preface

The first edition of the *Practical Manual of Obstetric Care* was published in 1982. There were 12 contributors and 136 illustrations in this 414-page handbook.

This second edition contains information that is needed to treat both the obstetric and gynecologic patient. Information regarding gynecology has been added. The book is not intended to replace other texts whose reference lists and contents are extensive. It is intended to supply information that will assist the clinician in arriving at a diagnosis by the application of deductive reasoning and by the application of tests and procedures. The dosages of commonly used drugs are provided, but the drug list is not meant to be inclusive nor overly extensive.

The make-up of this book is different since Dr. Jay Iams and I serve as editors of the book and we called upon many collaborators to assist us. Most of the collaborators are from either The Ohio State University College of Medicine or the University of California at Irvine, where Dr. Quilligan resides.

Each chapter identifies the author of the text, and an extensive index and cross references are provided to assist the reader to quickly find the information.

This edition differs from the last edition in that we have limited the number of references to those we think are most useful; thus the reference lists are not intended to be all inclusive. Additionally, we have included National Board or CREOG-type questions at the end of each chapter, with appropriate indexing of answers. The illustrations and tables have been expanded, and this edition is written in a more abbreviated outline form instead of a totally narrative form, as was the first text.

The editors and authors hope that this manual will be useful in direct patient care. Every effort has been made to make the text error-free. Comments regarding format, usefulness, and other information are welcomed by the editors and the authors.

Frederick P. Zuspan, M.D.

Contents

Anatomy and Physiology

Michael Foley
William Dodds

An understanding of reproductive medicine begins with a base of knowledge about the anatomy and physiology of the female reproductive system. The anatomy will be extensively reviewed here, along with an introduction to physiology, which is discussed further in Chapters 3 (maternal physiology in pregnancy), 20 (lactation), 21 (contraception), 27 (abnormal uterine bleeding), 28 (amenorrhea), and 32 (menopause).

ANATOMY

External Genital Organs

Mons pubis (mons veneris)

The *mons pubis* is situated in the lower abdomen just above the symphysis pubis. It is covered with a thick tuft of hair, the distribution of which differs in males and females (Fig. 1-1). The female pattern is more sharply demarcated on the upper border than the male pattern.

Labia majora

The *labia majora* form the lateral boundaries of the pudendal cleft, the area into which the urethra and vagina open. The labia themselves consist of an outer pigmented layer of skin covered with hair and an inner smooth layer that contains large sebaceous follicles. Areolar and adipose tissues are sandwiched between these layers, as are blood vessels and nerves.

Labia minora

The *labia minora* form a bilateral cutaneous fold that unites anteriorly to split and ensheathe the clitoris. The anterior fold forms the prepuce and the posterior fold forms the frenulum of the clitoris. Posteriorly, the labia minora unite to form the posterior commissure, or fourchette. It is devoid of hair follicles and rich in sebaceous glands. The labia minora correspond morphologically with the proximal part of the corpus cavernosum urethrae of the male.

Clitoris

The *clitoris* is situated between the anterior ends of the labia minora and consists of two corpora cavernosa that are structured primarily of erectile tissue enclosed in a fibrous membrane. These unite along their medial surfaces in an incomplete fibrous septum, forming the body of the clitoris. The posterior extensions of the corpora cavernosa form two crura, which compose the root of the clitoris and anchor it to the inferior rami of the pubic ischium. The free end of the clitoris (the glans) is richly supplied

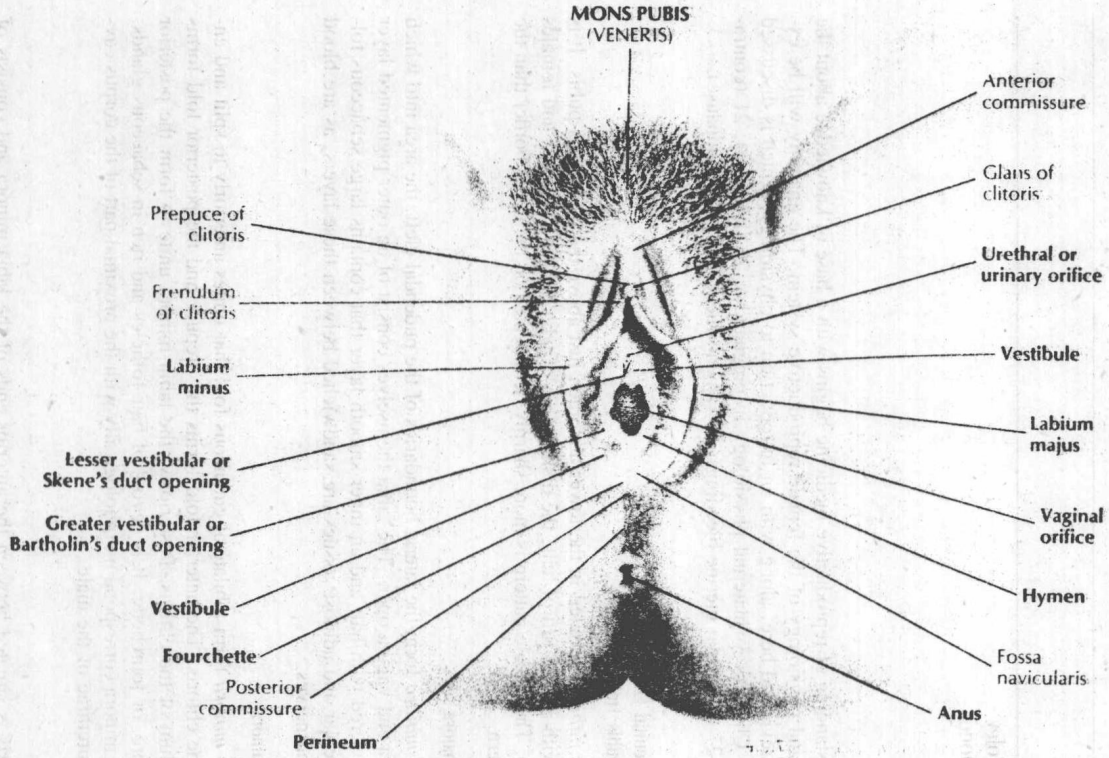

Fig. 1-1
External female genitals.
(From Bobak IM: Maternity and gynecologic care, ed. 4. St. Louis, 1989. The CV Mosby Co.)

with nerve endings and is extremely sensitive. It is composed of erectile tissue and covered by squamous epithelium. The clitoris corresponds morphologically with the male glans penis.

Vestibule of the vagina

The *vestibule of the vagina* is a shallow depression bounded on either side by the labia minora and posteriorly by the vaginal orifice. The opening of the ducts of the greater vestibular (Bartholin's) glands drain into the vestibule.

External urethral orifice

The *external urethral orifice* is located in the anterior vestibule, and the vagina is located below and behind the opening of the urethra. The orifice opens in the midst of the vestibule of the vagina about 2.5 cm posterior to the base of the clitoris and is bordered bilaterally by two small paraurethral (Skene's) ducts, which are rudimentary homologs of the prostate gland in the male.

Bulb of vestibule

The *bulb of the vestibule* consists of two erectile bodies lying on either side of the vaginal orifice in contact with the inferior surface of the urogenital diaphragm and covered by the bulbocavernosus (sphincter vaginae) muscles. Each structure is 3 to 4 cm long and 1 to 2 cm wide. The bulb of vestibule is the homolog of the bulb and the adjoining part of the corpus cavernosum urethrae of the male.

Greater vestibular glands (Bartholin's glands)

Bartholin's glands are a pair of compound glands located on either side of the vaginal orifice, each under cover of the corresponding bulb. They are small round bodies ranging in size from 0.5 to 1 cm. Each gland opens by means of a duct (Bartholin's gland duct), is approximately 2 cm long, and drains between the labia minora in the vaginal orifice. The gland is a homolog of the bulbourethral (Cowper's) gland in the male.

Vaginal orifice

The *vaginal orifice* is located below and posterior to the urethral orifice. The contour and degree of the opening depends on virginity, age, and parity of the woman. In nulliparous women, the vaginal orifice is usually partially occluded by the hymen.

Hymen

The *hymen* is a thin fold of mucous membrane attached around the circumference of the vaginal orifice. There are various types of openings in the hymen: annular, crescentic, cribriform, septate, and imperforate. It is invariably ruptured during coitus or after first parturition, and the shrunken nodular hymenal tags remaining at the margins of the vaginal orifice are called the *carunculae hymenales* (Fig. 1-2).

The Perineum and Pelvic Diaphragm

The perineum

The *perineum* is bounded by the mons pubis in front, the buttocks behind, and the thighs laterally.

The perineal floor

The *floor of the perineum* is composed of skin and two layers of superficial fascia: a superficial fatty layer (fascia of camper) and a deeper membranous layer limited to the anterior half of the perineum (Colles' fascia).

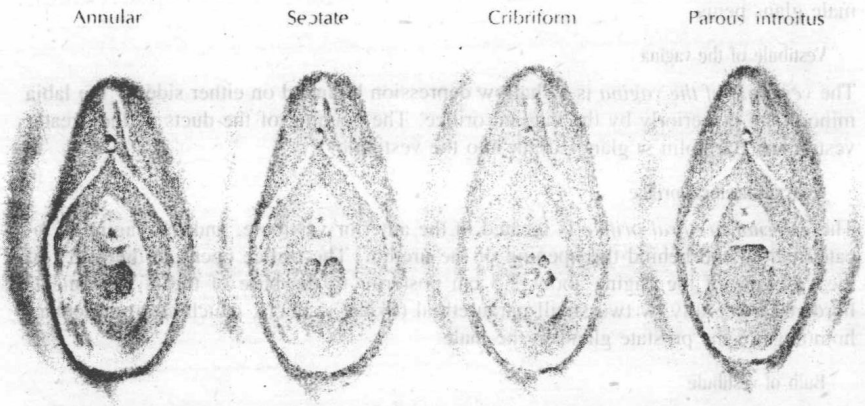

Fig. 1-2
Hymen and parous introitus.
(From Bobak IM: Maternity and gynecologic care, ed. 4, St. Louis, 1989, The CV Mosby Co.)

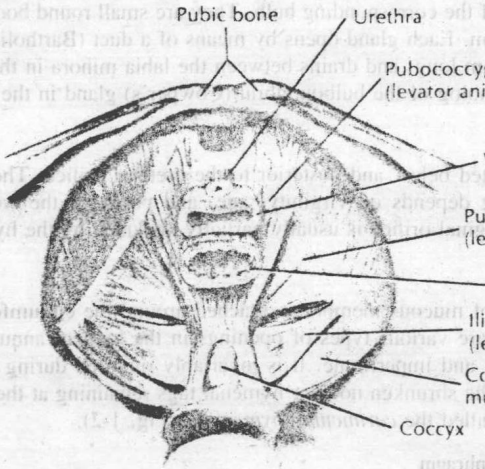

Fig. 1-3
Upper pelvic diaphragm viewed from above.
(From Bobak IM: Maternity and gynecologic care, ed. 4, St. Louis, 1989, The CV Mosby Co.)

The urogenital diaphragm

The *urogenital diaphragm* is a strong musculomembranous partition stretched across the anterior half of the pelvic outlet between the ischiopubic rami. There is a superior and inferior fascial layer, between which are the deep perineal muscles, sphincter of the membranous urethra, and the pudendal vessels and nerves.

The muscles of the perineum include the bulbocavernous, the ischiocavernous, and the superficial and deep transverse perineal muscles, the sphincter muscle of membranous urethra, and the external sphincter muscle of the anus. The central point of the perineum lies at the base of the urogenital diaphragm between the vaginal and anal orifice. It is a common place of attachment for the bulbocavernous, the superficial and deep transverse perineal, and the levator ani muscles and the external sphincter muscle of the anus.

The pelvic diaphragm

The *pelvic diaphragm* is a musculotendinous funnel-shaped partition between the pelvic cavity and the perineum and serves as one of the principal supports of the pelvic viscera. It is composed of the levator ani (anterior pubococcygeal and posterior iliococcygal) and coccygeal muscles sheathed in a superior and inferior layer of fascia. The muscles of the pelvic diaphragm extend from the lateral walls downward and medially to fuse with each other and are inserted into the terminal portions of the urethra and anus (Fig. 1-3).

Internal Genital Organs

Vagina

The *vagina* is a musculomembranous canal that extends from the vestibule to the uterus. The anterior wall of the vagina is usually about 6 to 7.5 cm long, with the posterior wall extending 1.5 to 3 cm longer. The cervix projects into the upper portion of the vagina, forming a circular cul de sac, the *fornix*, which is arbitrarily divided into four regions: anterior fornix, posterior fornix, and two lateral fornices. The vagina is bordered anteriorly by the bladder and trigone and posteriorly by the rectum. The vaginal wall behind the posterior fornix is covered by the peritoneum of the rectovaginal pouch of Douglas and may be in contact with coils of intestine entering this pouch. Laterally, the lateral fornix lies just under the root of the broad ligament and is 1 to 1.5 cm from the point where the uterine artery crosses the ureter. The middle half of the vagina lies in close apposition to the ampulla of the rectum. In this area the contents of the rectum can be easily palpated through the vaginal wall. The wall of the vagina consists of a lining of stratified squamous epithelium, a muscular coat, and an outer layer of connective tissue. The muscular coat consists of two layers: an outer layer composed of longitudinal fibers and an inner circular layer.

There are no true glands in the vagina. The mucus lubricating the vagina originates from vaginal wall transudate and cervical secretions. The acidic nature of the mucus results from fermentative action of bacteria on glycogen from vaginal epithelium. The normal pH of the vagina is 3.5 to 4.5, with a tendency in pregnancy to move in an alkaline direction. The vagina functions as the female copulatory organ, a passageway for drainage from the uterus (i.e., menses), and the birth canal.

Uterus

The *uterus* is a thick, hollow, muscular organ situated between the bladder anteriorly and the rectum posteriorly. The uterine cavity extends from the vagina below to the fallopian tubes above, which open into its upper portion on either side at its lateral

superior angle. The main function of the uterus is to serve as a receptacle for the fetus. The fertilized ovum becomes embedded in the uterine wall where it is retained until prenatal development is completed. The uterus, meanwhile, undergoes changes in size and structure to accommodate itself to the needs of the embryo. The uterus is about 7.5 cm in length, is 4 to 5 cm at its widest point, and weighs about 60 g on average.

The uterus has three physiologic demarcations: the cervix at its most distal end, the body or fundus proximally, and an area of constriction situated between the cervix and body, the *isthmus*. The uterus is usually inclined forward so that the body is in intimate relation with the upper surface of the bladder—a pouch of peritoneum intervenes between them. This is the normal anteversion and anteflexion position. Numerous variations in position and flexion exist. Thus, the uterus may be displaced backward (retroversion) or to one side (lateral version). There also may be forward flexure in the region of the isthmus (anteflexion). Correspondingly, there may be retroflexion or lateral flexion.

The *cervix*, as noted, extends from the inferior end of the body of the uterus at the constricted isthmus to the upper part of the vagina, into which it protrudes and forms an angle that varies from 45 to 90 degrees. Important relationships to the cervix include the paracervical nerve plexus on either side of the cervix; the uterine arteries, which run along the margins of the cervix in the parametrium; and the ureters, which course downward and forward approximately 2 cm from the cervix. The internal os is the opening of the cervix into the uterine cavity at the area of the uterine isthmus. The external os opens into the vagina at the most distal portion of the cervix. The cavity between these openings is called the cervical canal and is approximately 2 cm in length. The mucous membrane of the cervix is composed of cylindrical and ciliated epithelium in its upper two thirds, or supravaginal portion, but below this it looses its cilia and changes abruptly to stratified squamous epithelium close to the external orifice.

In the mucosa of the cervix, numerous large glands are present. These glands are extensively branched and lined with mucus-secreting tall columnar epithelium. Frequently, some of the cervical glands become obstructed and are transformed into cysts, the *nabothian follicles*.

The muscle layer of the cervix consists chiefly of circular bundles. An outer longitudinal layer is continuous with the smooth muscle of the vagina. The serous coat derived from the peritoneum covers the anterior surface of the uterus only as far as the junction of the uterine body and cervix (isthmus). The anterior surface of the cervix is not covered and is therefore functionally retroperitoneal. The structure of the uterus is composed of three coats: the external serosa derived from the peritoneum, the muscular layer, and the endometrium.

The muscular coat forms the chief bulk of the uterine structure. It has three layers—external, middle, and internal:

1. The external layer, beneath the peritoneum, consists of fibers that pass transversely across the fundus and converge at each lateral angle of the uterus, forming extensions into the tubes and the ovarian and round ligaments and to each side of the broad ligament.
2. The middle layer consists of fibers that are circularly arranged and include the most vascular layer of the muscular coat.
3. The internal layer consists mainly of longitudinal fibers, occasionally with circular and oblique bundles.

These three muscle layers of the myometrium often are not sharply demarcated because fibers frequently pass from one layer into another (Fig. 1-4).

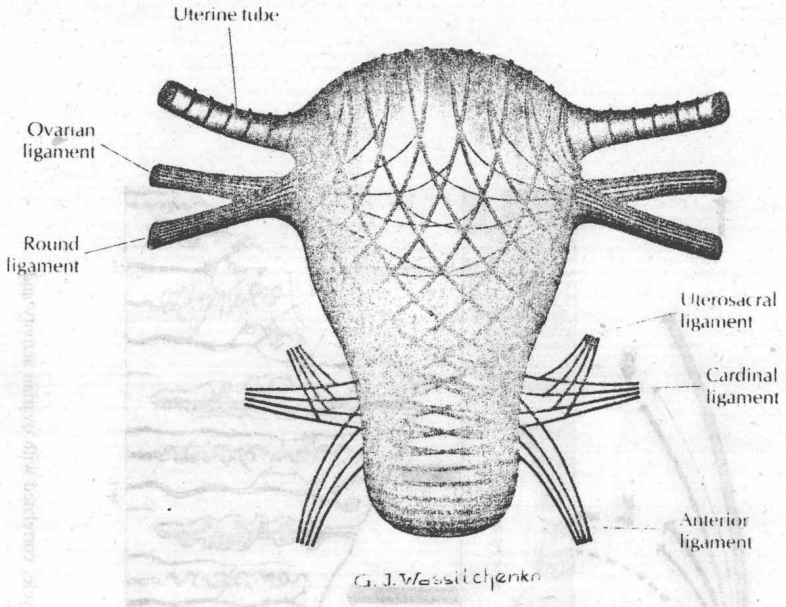

Fig. 1-4
Schematic arrangement of directions of muscle fibers. Note that uterine muscle fibers are continuous with supportive ligaments of uterus.
(From Bobak IM: Maternity and gynecologic care, ed. 4, St. Louis 1989, The CV Mosby Co.)

The endometrium

The *endometrium*, the interior lining of the uterus, consists of a soft spongy layer that contains many tubular glands lined by ciliated columnar epithelium. After menstruation, the layer is only 1 to 2 mm thick, but before menstruation it increases to as much as 4 to 7 mm. In the early phase of the cycle, the glands are straight, the epithelium is low cuboidal, and the stroma is dense. Before menses, the glands are convoluted, the cells are columnar with marked secretory activity, and the stroma is abundant and loose in the superficial layers (Fig. 1-5).

Uterine Ligaments and Supports

There are eight ligaments of the uterus: one anterior (uterovesical fold of peritoneum), one posterior (retrovaginal fold of peritoneum), two lateral (broad), two uterosacral, and two round. In addition, there are also the transverse ligaments of the cervix, *Mackenrodt's cardinal ligaments*. Together with the surrounding retroperitoneal connective tissue, they function to support the uterus and pelvic viscera.

Uterosacral ligaments of the uterus

These *uterosacral ligaments* are suspensory ligaments of the uterus; they are a pair of ligamentous bands, extending in a curve from the posterior lateral surface of the sacrum, suspending the cervix from the sacrum, and forming a modified hammock.

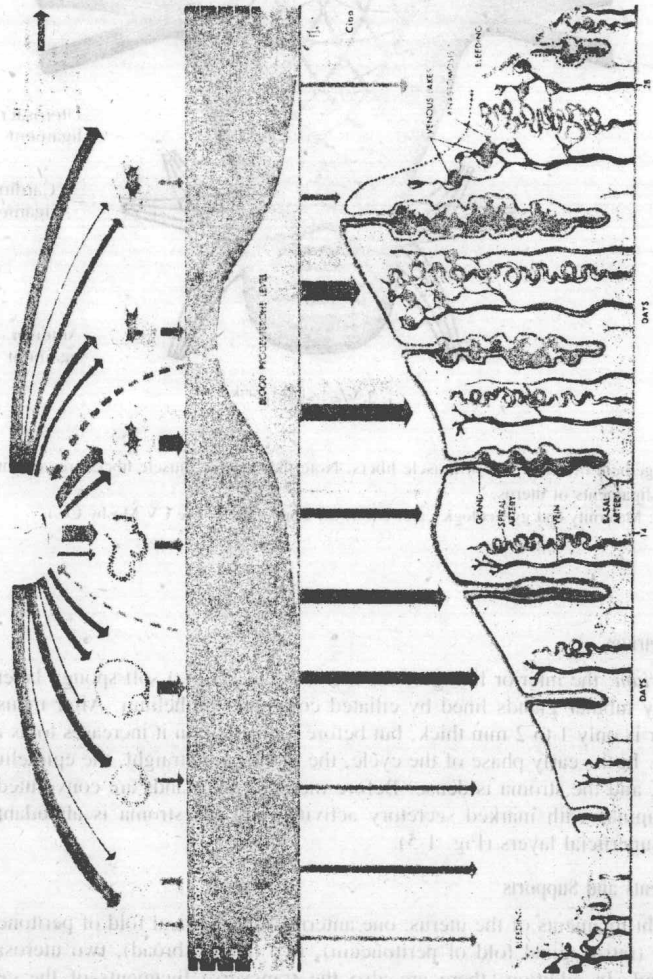

Fig. 1-5
Changes in the endometrium throughout the menstrual cycle, correlated with ovarian activity and blood estrogen and progesterone levels.