Textbook of obstetrics

John C. Ullery

Zeph J. R. Hollenbeck

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John C. Ullery, M.D.
Chairman and Professor of Obstetrics and Gynecology,
The Ohio State University College of Medicine,
Columbus, Ohio

Zeph J. R. Hollenbeck, M.D.
Professor of Obstetrics and Gynecology,
The Ohio State University College of Medicine,
Columbus, Ohio

and thirty-one contributors

Foreword by
Richard L. Meiling, M.D.
Dean, The Ohio State University College of Medicine,
Columbus, Ohio

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Contributors

Lloyd W. Barnes, B.A., M.D., M.M.Sc.
Clinical Assistant Professor of Obstetrics and Gynecology

Paige K. Besch, B.S., M.S., Ph.D.
Assistant Professor of Obstetrics and Gynecology; Assistant Professor of Pharmacology

Basil V. Bisca, A.B., M.D., M.M.Sc.
Instructor in Obstetrics and Gynecology

John G. Boutselis, B.A., M.D., M.M.Sc.
Assistant Professor of Obstetrics and Gynecology

William E. Copeland, B.S., M.D.
Associate Professor of Obstetrics and Gynecology

Dana W. Cox, A.B., M.D.
Clinical Associate Professor of Obstetrics and Gynecology

Robert F. Daly, A.B., M.D.
Clinical Professor of Obstetrics and Gynecology

Jacoba C. de Neef, M.D., Ph.D.
Assistant Professor of Obstetrics and Gynecology

Keith DeVoe, Jr., B.A., M.D.
Assistant Professor of Obstetrics and Gynecology

Harry E. Ezell, B.S., M.D., M.M.Sc.
Clinical Associate Professor of Obstetrics and Gynecology

Fred B. Hapke, B.S., M.D.
Clinical Associate Professor of Obstetrics and Gynecology

Zeph J. R. Hollenbeck, B.A., M.D.
Professor of Obstetrics and Gynecology

John H. Holzaepfel, A.B., M.D., M.M.Sc.
Associate Professor of Obstetrics and Gynecology

Ben E. Jacoby, A.B., M.D.
Clinical Assistant Professor of Obstetrics and Gynecology

Norloso B. Livingston, Jr., M.D., M.M.Sc.
Formerly Instructor in Obstetrics and Gynecology

Richard L. Meiling, A.B., M.D., D.Sc.
Dean of the College of Medicine; Professor of Obstetrics and Gynecology

William B. Merryman, B.A., M.D., M.M.Sc.
Clinical Assistant Professor of Obstetrics and Gynecology

Thomas S. Morse, B.A., M.D.
Assistant Professor of Surgery

Thomas K. Oliver, M.D.
*Formerly Associate Professor of Pediatrics**

James B. Patterson, A.B., M.D.
Clinical Assistant Professor of Obstetrics and Gynecology

Charles W. Pavey, B.Sc., M.D.
Clinical Professor of Obstetrics and Gynecology

Philip J. Reel, D.V.M., M.D.
Clinical Professor Emeritus of Obstetrics and Gynecology

William C. Rigsby, B.S., M.D., M.M.Sc.
Assistant Professor of Obstetrics and Gynecology

Anthony J. Ruppersberg, Jr., B.S., M.D.
Clinical Associate Professor of Obstetrics and Gynecology

Wendell P. Scott, B.S., M.D.
Clinical Associate Professor of Obstetrics and Gynecology

Wynne M. Silbernagel, B.S., M.D.
Clinical Assistant Professor of Obstetrics and Gynecology

Vernon C. Stevens, B.S., M.S., Ph.D.
Assistant Professor of Obstetrics and Gynecology

Nicholas J. Teteris, B.A., M.D., M.M.Sc.
Assistant Professor of Obstetrics and Gynecology

John C. Ullery, B.A., M.D.
Professor and Chairman of the Department of Obstetrics and Gynecology

Nichols Vorys, B.A., M.D., M.M.Sc.
Assistant Professor of Obstetrics and Gynecology

C. Merle Welch, M.D.
Assistant Director of the Department of Anesthesia; Instructor in Surgery (Anesthesia)

James Hutchison Williams, A.B., M.D., M.M.Sc.
Assistant Dean of the College of Medicine; Associate Professor of Obstetrics and Gynecology

Edwin R. Zartman, B.A., M.D., M.M.Sc.
Clinical Assistant Professor of Obstetrics and Gynecology

*Presently Associate Professor of Pediatrics, University of Washington, Seattle, Wash.

Foreword

The responsibility of medical faculties to present learning experiences to medical students, to postdoctoral medical students (interns, residents, trainees, scholars, and fellows) and, through programs of continuing medical education, to members of the profession in active practice is of gigantic proportion today because of the rapidly increasing volume of scientific knowledge.

To solve this issue the faculty today must prepare students at all levels of academic attainment to solve problems rather than to treat disease entities.

The members of the faculty of the Department of Obstetrics and Gynecology of The Ohio State University College of Medicine who have prepared this concise *Textbook of Obstetrics* have emphasized "the problem-solving" approach to the care of the obstetric patient.

This book has not neglected the presentation of fundamental methodology by which students gain basic understanding of the principles that will be supplied in problem solving.

A textbook is, after all, a guide into the known and accepted clinical care of patients. With this background the student is provided with a tool with which to develop his own experience in problem solving for the benefit of his patients.

The joint cooperative effort of members of the Department of Obstetrics and Gynecology in the preparation of this textbook attests to their interest in the student and his patients and to their desire to provide a constant elevation of the standards of medical education, research, and patient care.

Richard L. Meiling, M.D.
Dean, The Ohio State University
College of Medicine

Preface

Our aim in the preparation of *Textbook of Obstetrics* is to offer concise but adequate presentation of the proper management of the pregnant patient from conception through involution. In the contents of this book a sequential pattern has been followed. Discussions of the problems involving the pregnant woman, and therefore confronting her physician, have been included where and when they seemed most applicable. The same obtains for detailed descriptions of anatomy, physiology, pharmacology, and pathology. Normal and abnormal obstetrics presented together emphasize that early recognition of abnormal conditions goes far in their prevention.

Experiences reported by outstanding authorities and clinics are included in this book, but no attempt has been made to make this coverage all-inclusive. Whereas the general philosophy and specific methods described are widely accepted in this country and are integral parts of the curricula of most medical schools, they represent primarily those currently in use at The Ohio State University College of Medicine. We have endeavored to correlate our clinical experiences with the pathologic entities seen in a large institution such as ours so that those who wish to learn more about the subject in residency training and in practice may be stimulated to do so.

Specific bibliographic references in the text are omitted for the most part in order to simplify and clarify the subject matter as much as possible. Reference lists are included at the end of each chapter for the convenience of those who wish to make a detailed study of a specific entity.

The members of the teaching staff of the Department of Obstetrics and Gynecology have given generously of their time in the preparation of this book. This has been primarily a departmental project in scope and contribution. However, equally valuable contributions have been made by a member each of the Department of Anesthesiology, Department of Pediatrics, and Department of Surgery. Flexibility in the presentations has been achieved by incorporating the basic ideas of the methods of diagnosis and treatment of each contributor. It has been found most helpful to have and to develop ideas from the younger staff members of the department. This attitude has encouraged them to question the efficacy of time-worn methods, to think as individuals, and to bring forward important and sound changes in teaching and techniques.

Certain gynecologic problems in diagnosis and treatment are presented as they relate to obstetrics. Frequently, obstetrics and gynecology cannot be separated. It has often been said that the gynecologists should write the textbooks on obstetrics and that the obstetricians should write the textbooks on gynecology so that a better understanding of each specialty could be accomplished. By a departmental effort we have tried to accomplish this end. We have found the methods given in this textbook to be quite satisfactory in our experience. There are those who will disagree with us in some of the details, but this will serve to demonstrate that there are many, and equally good, approaches to certain problems. In general, our philosophy has been to confine our teaching to one good method and to have the student understand it clearly.

We wish to thank all who have contributed to this book: the contributors, those who have helped us gather material, those who have typed the manuscript, and those who have helped with the proofreading. Especially do we thank the members of the Department of Medical Illustration of The Ohio State University College of Medicine.

John C. Ullery
Zeph J. R. Hollenbeck

Color plates

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Part one

The conduct of pregnancy

The conduct of pregnancy

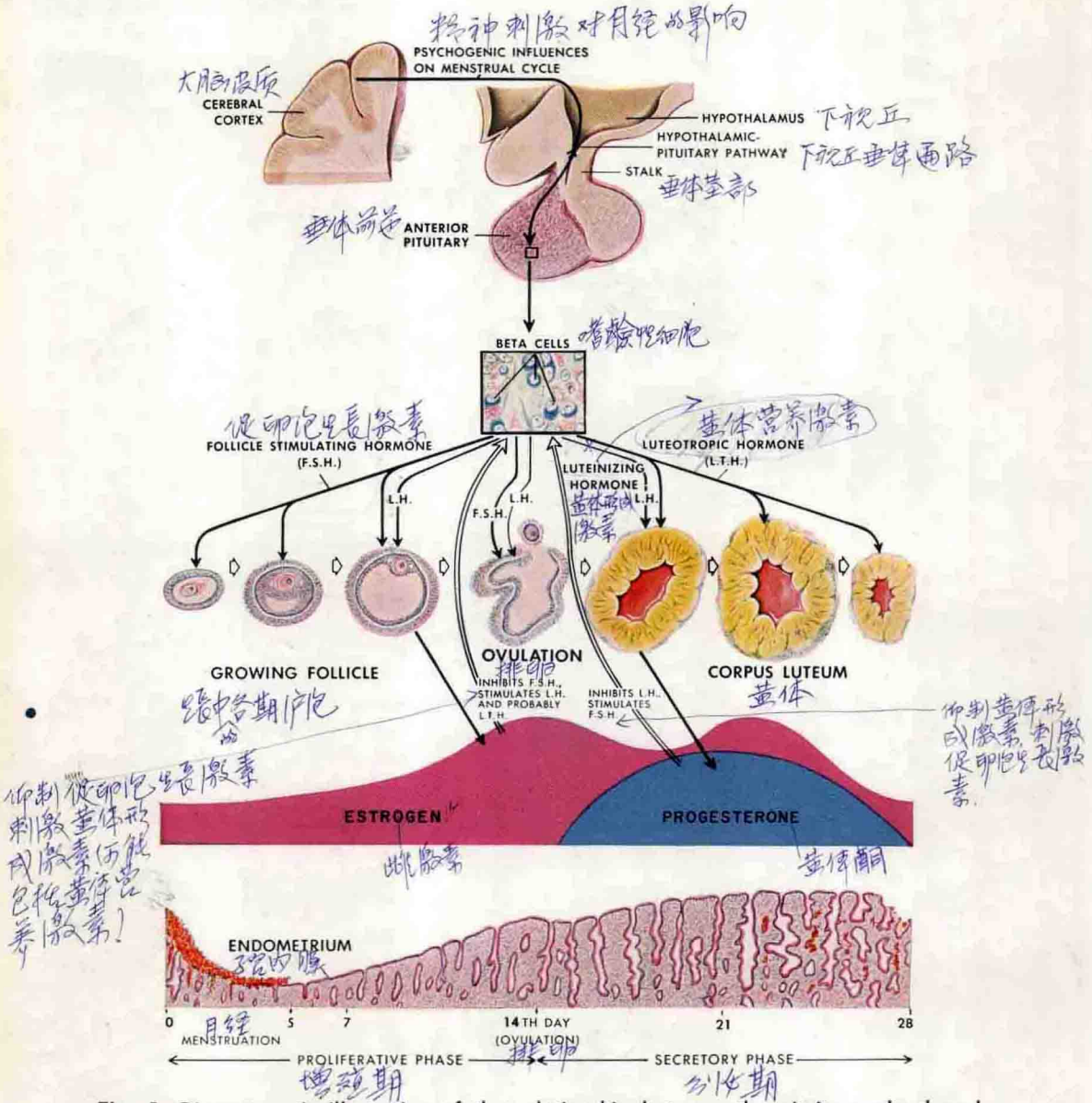

Fig. 1. Diagrammatic illustration of the relationship between the pituitary gland and ovary in regulating the menstrual cycle. (From Research in the service of medicine **47**:2, 1957; G. D. Searle & Co.)

Pituitary–ovarian–endometrial cycle

John G. Boutselis
Jacoba C. de Neef

Pituitary gland

EMBRYOLOGY

The entire hypophysial body is of ectodermal origin, the anterior lobe arising from the ectoderm of the primitive oral cavity, the posterior lobe from the ectoderm of the neural tube. The posterior lobe develops as a ventral diverticulum of the diencephalon. Through the infundibulum it retains its connection with the hypothalamus. The anterior lobe develops as a dorsal diverticulum from the roof of Rathke's pouch and very soon loses its connection with the oral ectoderm. It then forms a closed vesicle. Remnants of its duct located along the path of the duct in the tissue that later forms the body of the sphenoid bone can be seen for some time and may give rise to accessory glandular nodules, or cysts and tumors, lodged in the sphenoid bone. At least one accessory nodule is often found forming the pharyngeal hypophysis. A persistent canal called the craniopharyngeal canal is occasionally found in the sphenoid bone.

Neither physiologically nor functionally is there any relationship between the anterior and posterior lobes. The structure of the anterior lobe (adenohypophysis) is that of a typical organ of internal secretion. Its influence upon growth and differentiation is well established. In cases of excessive growth of the skeleton and connective tissue (gigantism, acromegaly) and of late epiphysial ossification, as well as in hypoplasia of the sex glands, the function of the anterior lobe of the hypophysis is found to be disturbed. During menstruation, and still more so during pregnancy, a transient hyperplasia of this lobe occurs. Pressure may be exerted on the neighboring optic chiasm, and temporary visual disturbance may follow. The neural portion (neurohypophysis) plays an important role in metabolism (urinary excretion, sugar, and the like) and is capable of stimulating smooth muscle fibers. Anatomically, no basis for any secretions can be detected in the posterior lobe, except in the so-called intermediate portion attached to the glandular lobe and lying between it and the neural lobe proper.

GROSS ANATOMY AND HISTOLOGY

The pituitary gland lies in the sella turcica of the sphenoid bone, where it is roofed by the diaphragma sellae. The latter is pierced by the pituitary stalk.

The pituitary gland is an ovoid reddish gray mass that can be readily separated with the fingers into the anterior and posterior lobes. It weighs about 0.5 gm. and measures 10 × 13 × 6 mm. The weight of the total gland, and especially that of the anterior lobe, is greater in females than in males. However, the posterior lobe is greater in males than in females. The weight of the anterior lobe decreases in men once they have passed middle age, whereas the weight of the posterior lobe tends to increase. In women the posterior lobe increases in size postmenopausally, but the changes in the anterior lobe are variable with different intervals.

With the exception of a few anastomoses the blood supply of the pituitary gland is independent of that of the brain proper. It is derived from the hypophysial arteries, which branch from the internal carotid artery. The circulation of the anterior lobe and hypophysial stalk is separate from that of the posterior lobe. The superior hypophysial arteries form a rich plexus around the stalk and pars tuberalis; blood from the stalk drains into a venous plexus surrounding it. The anterior lobe has a circulation similar to the liver in that it is supplied by portal venules arising from the plexus supplying the stalk, the vessels terminating in its sinusoids as do branches of the superior hypophysial arteries. The blood then drains into the cavernous sinus. The pars nervosa receives its blood supply from the inferior hypophysial arteries.

The pituitary gland receives nerve fibers from the internal carotid plexus. These fibers run along the blood vessels that descend the stalk. Their nuclei are in the superior cervical ganglion. The posterior lobe receives fibers from the hypothalamic nuclei particularly the supraoptic nuclei and paraventricular nuclei. A few fibers arising from hypothalamic nuclei have been traced to the intermediate and anterior lobes. Stimulation of the hypothalamohypophysial fibers causes secretion by the posterior pituitary hormone and probably by other pituitary hormones as well.

Three distinct cell types have been described in the anterior pituitary gland based on their staining characteristics. They are the acidophils or alpha cells; the basophils or beta cells; and the chromophobes or chief, reserve, or mother cells. By means of histochemical methods Burt and Velardo recognized six cell types.

Cell type and function may be summarized as follows: Chromophobes are without secretory activity. Although definite proof is lacking, evidence based on experimental studies and clinical observations suggests that the luteinizing hormone (LH), growth hormone, and lactogenic hormone are elaborated by acidophils; whereas the follicle-stimulating hormone (FSH), adrenocorticotropin (ACTH), and thyroid-stimulating hormone (TSH) are secreted by the basophils.

Gonadotropic hormones

The gonadotropins (from the Greek word *tropein*—to turn), otherwise called the gonadotropic hormones (from the Greek word *trophein*—to nourish), are produced in the anterior lobe of the pituitary gland. Besides the gonadotropic hormones three other hormones are produced by the anterior pituitary gland, namely ACTH, TSH, and the growth hormone.

History. The observation that there is a functional relationship between the pituitary gland and the ovary dates back as far as 1905, when Fichera noticed the hypertrophy of the pituitary gland after castration. In 1910 the Americans Crowe, Cushing, and Homans reported on the result of experimental hypophysectomies.

Carmichael and Marshall observed in

1908 that if one ovary was removed the other ovary showed compensatory hypertrophy. Smith and Engle, in 1927, and independently, Aschheim and Zondek, in 1928, reported on a follicular response to pituitary implants. It was also established that hypophysectomy caused an atrophy of the gonads, which could be treated by implantation of anterior pituitary tissue. In 1928 Aschheim and Zondek postulated the evidence of two separate pituitary hormones (which they named prolan A and prolan B) from their tests with the urine of pregnant women. However, the gonadotropic factor in this urine is produced by the placenta and does not originate in the pituitary gland. In 1929 Fluhmann discovered large amounts of pituitary gonadotropin in the blood of menopausal women.

In 1931, through the work of Fevold and his associates, the chemical separation of two fractions was obtained from the anterior lobe of the pituitary gland. The terms "follicle-stimulating hormone" and "luteinizing hormone," describing their respective properties, were at that time introduced into the literature.

In 1939 Astwood and Fevold, and in 1941 Astwood alone, added knowledge of a third gonadotropic hormone, luteotropin, which they presumed played a role in the regulation of the corpus luteum function. Later it was found that this hormone is identical with prolactin.

It should be remembered that aside from these three pituitary gonadotropins, there is also a chorionic gonadotropin produced by the placenta.

The pituitary hormones are thus three in number: follicle-stimulating hormone, luteinizing hormone, and luteotropic hormone. It has not been proved, however, that the first two are indeed two separate hormones. The possibilities are either that of one gonadotropin with quantitative differences determining whether it is FSH or LH or of two different hormones with a common biologic denominator in large dosages. Since it has not yet been possible to prepare the gonadotropins as pure chemical compounds, this question has not been solved. For practical reasons we will consider the pituitary gonadotropins as three separate hormones.

Terminology and definition. The follicle-stimulating hormone is known as FSH, the luteinizing hormone as LH or ICSH (interstitial cell–stimulating hormone), the luteotropic hormone as LTH, lactogenic hormone, or prolactin. Presumably the FSH is produced by the basophilic cells in the anterior pituitary gland and the LH and LTH are produced by the acidophils.

The FSH, classified as a glycoprotein, produces the growth of graafian follicles in immature hypophysectomized female animals. The resultant increased ovarian weight is not associated with a concomitant increase in uterine weight; this last phenomenon results from contamination with LH. Through the estrogens produced by these follicles the FSH produces the development of secondary sexual characteristics. In the male rat FSH maintains the epithelium of the seminiferous tubules and influences the spermatogenesis. In these male animals there is no effect on the secondary sex characteristics.

The luteinizing hormone, also a glycoprotein, is synergistic with FSH in causing the growth of the follicle, in its producing estrogen, and in the subsequent ovulation. It influences the development of the corpus luteum through luteinization of the follicular elements. In the male animal LH influences the secretion of androgenic hormone and development of secondary sexual characteristics through its effect on the interstitial or Leydig cells.

The luteotropic hormone, identical with the lactogenic hormone or prolactin, is supposed to maintain the corpus luteum and the production of progesterone. This hormone is a homogeneous protein and has been isolated in a pure form. It differs from FSH and LH in that it does not contain