

Pathology and Surgery of THYROID DISEASE

by

JOSEPH L. DECOURCY, M.D.

Senior Surgeon, Good Samaritan Hospital

Director, DeCourcy Clinic

Cincinnati, Ohio

and

CORNELIUS B. DECOURCY, M.D.

Member, DeCourcy Clinic Surgical Staff

Cincinnati, Ohio



CHARLES C THOMAS PUBLISHER

Springfield • Illinois • U. S. A.

CHARLES C THOMAS • PUBLISHER
BANNERSTONE HOUSE
301-327 EAST LAWRENCE AVENUE, SPRINGFIELD, ILLINOIS

Published simultaneously in the British Commonwealth of Nations by
BLACKWELL SCIENTIFIC PUBLICATIONS, LTD., OXFORD, ENGLAND

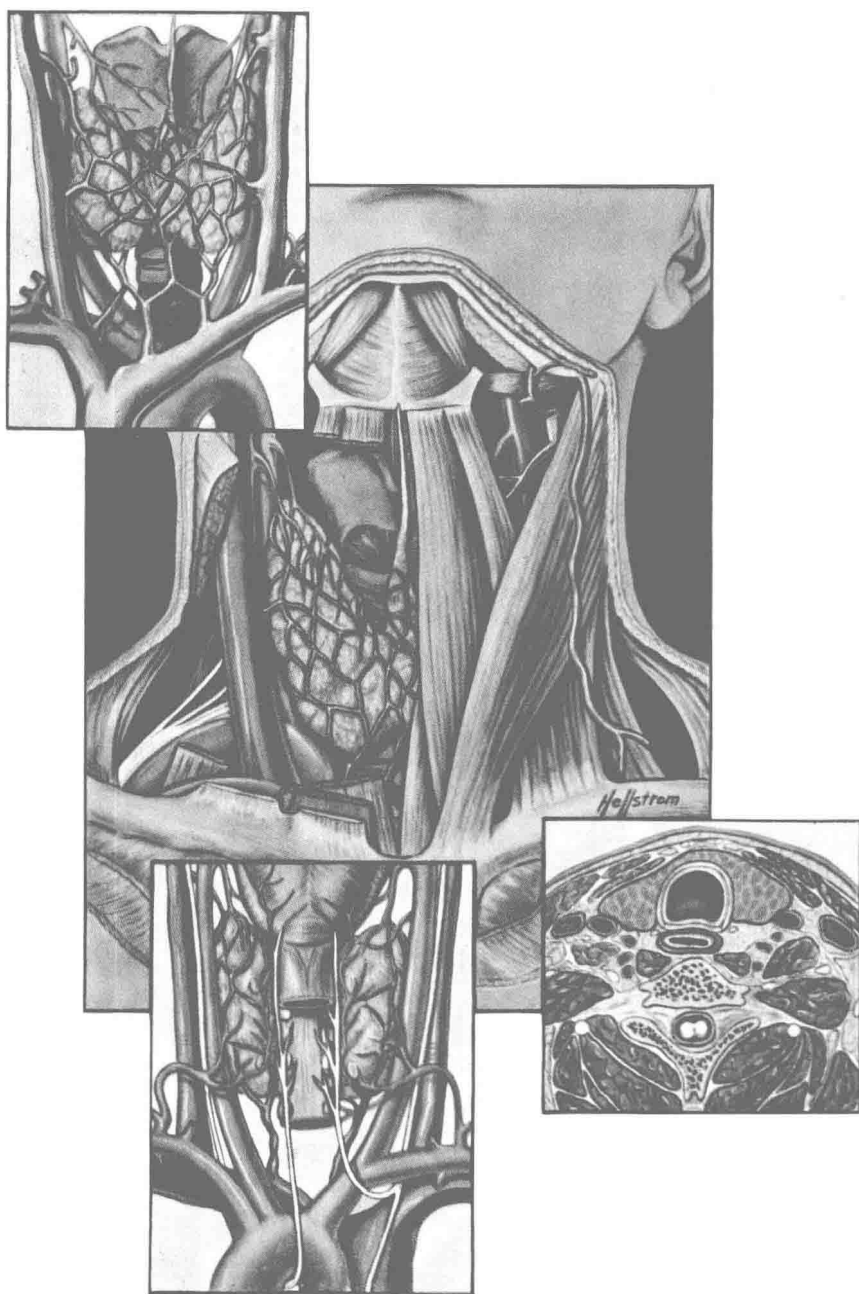
Published simultaneously in Canada by
THE RYERSON PRESS, TORONTO

This book is protected by copyright. No
part of it may be reproduced in any manner
without written permission from the publisher.

Copyright, 1949, by CHARLES C THOMAS • PUBLISHER

Printed in the United States of America

Pathology and Surgery
of
THYROID DISEASE



Anatomy of the thyroid gland and adjacent structures.

Dedicated
to
Cornelia Bickett DeCourcy

INTRODUCTION

IN PRESENTING this work, the authors acknowledge the principal sources, the thousands of cases, and years of experience at the DeCourcy Clinic. The work brings to date our more recent concepts of the thyroid gland and its pathology, as well as its surgical treatment. It is our aim to present this subject as a composite whole rather than as many unrelated facts.

The thyroid gland is a small organ with large potentialities. It is intimately connected with our bodily metabolism directly and, through metabolism, to the other endocrine factors of the body. Imbalance of one very often leads to imbalance of other glands.

We are concerned with both the hypo and hyper functions of the thyroid gland. To consider it either purely medically or purely surgically is not tenable. We must consider both aspects of therapeutics, especially in view of the more recent developments in this field, i.e., relationship of thiourea and thiouracil to the surgical approach.

We feel that in attempting to cover a subject of many ramifications, it is well not to assume that all readers have a common denominator of understanding and definition. We believe a brief review of anatomical and physiological principles to be in order and thus avoid later confusion. A consideration of this topic is also not complete without relating the historical background — the development of the subject over a period of time.

The section on surgical indications is followed by the surgical approach and the reader is given a complete view of its development through the years, particularly via the experiences and findings of the DeCourcy Clinic. These findings are the fruit of much mature thinking and experience. It is therefore hoped that our experiences will be of value and, if this be so, then the extensive labors expended in the creation of this work are justified.

PREFACE

THE great and, in notable instances, definitely revolutionary advances that have been made within the past few years in the fields of thyroid gland pathology and therapy would seem to justify the evolvment of a new and comprehensive treatise not only incorporating the various phases of recent progress but also essaying a conservative and sound evaluation of them. The introduction of antithyroid drugs constitutes in itself one of the major developments in the long and complicated history of the treatment of hyperthyroid conditions. Indeed, some of the pioneer workers with the newer chemotherapeutic agents predicted that thyroidectomy for hyperthyroidism would become unnecessary in most cases. Of course, this early enthusiasm has been proved premature, and the thyrotoxic patient remains primarily a surgical problem. Nevertheless, the preoperative management of such patients has been modified and improved greatly and most gratifyingly; new methods have been generally adopted. Radio-iodine also has its place in the clinic — but not as a "cure" for any thyroid condition or even a satisfactory substitute for roentgen irradiation in the treatment of thyroid cancer. Radio-iodine would appear most useful in the location of aberrant thyroid tissue or metastases from cancerous glands. The setting forth of conservative conclusions — as justified by present evidence — along these lines should be widely helpful. Further, there is much that is new and enlightening to the clinician who encounters hypothyroidism in its varied manifestations, aberrant thyroid tissue, adenomatous glands, intrathoracic thyroids, and above all, incipient or frank carcinoma of the thyroid. In short, thyroid pathology and surgery have of late undergone marked changes, which — taken all together — signify practically a renaissance, of vital import to the clinician. Such considerations have been repeatedly brought to the attention of the authors by colleagues, including both physicians and surgeons, who have pointed out the need for a volume dealing with the newer knowledge of the thyroid gland, with special reference to the requirements of the clinician and surgeon.

The first suggestion that such a book be written by us was made by

Donald J. Lyle, M.D., formerly of the DeCourcy Clinic and now Professor of Ophthalmology at the University of Cincinnati Medical School. His encouragement has meant much to us. It is also a genuine pleasure to acknowledge our deep gratitude to William McKee Germaine, M.D., Pathologist of the Good Samaritan Hospital, for his guidance and material assistance in the preparation of the chapter on Pathology.

Carroll DeCourcy, M.D., brother of the senior author, has been an inspiration not only in the writing of this book but also throughout our entire surgical career.

For their untiring efforts in our behalf we are indebted further to Robert Mansfield, M.D., whose knowledge and advice were most helpful in the work on Surgery, Embryology, and Anatomy; to Dr. Elbert Ruth, Associate Professor of Anatomy at the University of Cincinnati Medical School, who reviewed the sections on Embryology and Anatomy; to our associates of the DeCourcy Clinic Medical and Surgical Departments, who assisted in many ways; to Miss Wanda Giffin for her excellent secretarial work, in which she was assisted by Mrs. Julia Russell and Bernice Teaney; and to Mrs. John Hellstrom, whose drawings were exceptionally well executed, under the supervision of Mr. Joseph B. Homan, Associate Professor of Medical Art, University of Cincinnati Medical School. Finally, we express our appreciation to Mr. Charles C Thomas and his associates for their counsel and manifold aid.

Cincinnati

The Authors

CONTENTS

DEDICATION	v
INTRODUCTION	vii
PREFACE	ix
I. PREVIEW —SURGICAL ASPECTS OF THYROID DISEASE.....	3
Hypofunction	4
Hyperfunction	5
No Disturbance in Function.....	11
Summary	12
II. HISTORICAL ASPECTS OF THE THYROID GLAND—PAST AND PRESENT—EUROPEAN AND AMERICAN.....	14
III. EMBRYOLOGY	26
Clinical Significance of the Embryology of the Thyroid.....	26
Comparative Embryology	27
Embryology of the Thyroid in Lower Vertebrates.....	27
Embryology of the Thyroid in Man.....	30
Significance of the Ultimobranchial Bodies.....	32
Aberrant (Ectopic) Thyroid Tissue.....	35
Distinction Between "True" and "False" Aberrant Thyroids	36
Locations of Aberrant Thyroids.....	36
Other Developmental Anomalies.....	38
Absence of the Thyroid Gland.....	38
Absence of One Lobe.....	38
Absence of the Isthmus.....	38
Congenital Hypertrophy	38
Pyramidal Process (Lobe).....	38
Anomalies in Relation to the Hyoid Bone.....	39
Thyroglossal Duct Anomalies.....	40
Thyroglossal Cysts and Fistulae.....	40
Intrathoracic Goiter	42
Lingual Thyroid	48
Lateral Aberrant Thyroids.....	51
"Benign" Metastasizing Colloid Goiter.....	55
Struma Ovarii—Ovarian Goiter.....	56
Fetal Adenoma	59
Time of Origin of Function of Thyroid.....	60

IV. ANATOMY, HISTOLOGY, AND CYTOLOGY OF THE THYROID.....	66
Gross Anatomy	66
Weight at Birth.....	66
Weight in Adults.....	67
Relations with Cervical Fascia and Muscles.....	68
Relation to the Parathyroids.....	69
Blood Supply	69
Divisions of the Superior Thyroid Artery.....	70
Inferior Thyroid Arteries.....	71
Thyroidea Ima	72
Arterioles from the Trachea.....	72
Periacinar Capillary Network.....	73
Veins of the Thyroid Gland.....	73
Lymphatics of the Thyroid.....	74
Nerve Supply	75
Histology and Cytology.....	76
The Acini	77
The Acinar Epithelium.....	78
Effects of Thyrotropic Hormone.....	80
Effects of Thiouracil and Related Substances.....	80
Effects of Cold.....	81
Intracellular Granules and Cell Inclusions.....	81
Mitochondria	81
Centrosome	81
Fat Droplets	82
Golgi Net	82
"Secretion Antecedents"	82
Intrafollicular Colloid	83
Interfollicular Cells	85
Interfollicular Epithelial Cells.....	85
Nodules in an Otherwise "Normal" Gland.....	86
V. PHYSIOLOGICAL ASPECTS	92
Physiology of the Thyroid Gland.....	92
Secretory Activity	92
Chemical Nature of Thyroid Hormone.....	92
Calorigenic Action	94
Actions on Growth and Development.....	95
Relation of Thyroid Hormone to Food Factors.....	96
Influence on Carbohydrate Metabolism.....	98
Effects on the Nervous System.....	98
Effects on the Circulatory System.....	99
Hematopoiesis and the Thyroid.....	99
Effect on Serum Cholesterol.....	99

Thyroid Hormone and Water Metabolism.....	100
Thyroid Hormone and the Metabolism of Inorganic Salts.....	100
Muscular Response to Thyroid Hormone.....	101
The Thyroid and the Endocrine System.....	101
Relation to the Pituitary.....	101
Relation to the Adrenal Cortex.....	102
Relation to the Adrenal Medulla.....	102
Relation to Sterility and Abortion.....	102
Relation to Menstrual Disturbances.....	103
Iodine and Thyroid Physiology.....	104
Substances Having Calorigenic Action.....	105
Hypofunction.....	106
Primary Hypothyroidism.....	106
Cretinism.....	106
Myxedema.....	107
Secondary Hypothyroidism.....	109
Simple Goiter.....	109
Nodular Nontoxic Goiter.....	109
Hyperfunction.....	110
Toxic Goiter.....	110
Symptoms and Signs.....	110
Response to Iodine.....	110
Hyperthyroidism in Pregnancy and Lactation.....	111
Regional Influences.....	111
Great Lakes Region.....	113
Mississippi Basin.....	115
VI. PHARMACOLOGY AND THERAPEUTIC ASPECTS.....	121
A—IODINE METABOLISM AND BLOOD IODINE.....	121
Iodine Metabolism as Affected by Iodine Therapy.....	122
Significance of Blood Iodine Level.....	129
Iodine Metabolism in Relation to Liver Function and the Reti- culoendothelial System.....	136
Iodine Medication in Thyrotoxicosis.....	142
B—THIOURACIL, PROPYLTHIOURACIL AND RELATED DRUGS IN TREATMENT OF THYROTOXICOSIS.....	149
Antithyroid Drugs.....	149
Thiourea.....	150
Thiouracil.....	150
Effects on Animals.....	150
Effects in Human Beings.....	151
Absorption, Distribution and Elimination.....	151

Thyroid Tissue after Thiouracil Therapy.....	152
Clinical Response to Thiouracil Therapy.....	153
Effect of Previous Iodide Therapy.....	154
Dosage	154
Synergistic Agents	155
Duration of Preoperative Medication.....	155
Toxic Effects	156
Theoretical Possibility of Carcinogenesis.....	158
Thiouracil in Hyperthyroidism Associated with Function- ing Metastases of Adenocarcinoma.....	158
Thiouracil in Acute Thyroiditis.....	158
Thiobarbital	159
6-Isobutyl Thiouracil	160
Conclusions Suggested by Available Data.....	160
Propylthiouracil for Thyrotoxicosis.....	161
C—RADIOACTIVE ISOTOPES OF IODINE—USE IN THERAPY OF DIF- FUSE TOXIC GOITER.....	
Biochemical Investigations	169
Tracing Effects of Sulfonamides.....	169
Tracing Effects of Goitrogenic Substances.....	170
Metabolism of Radio-Iodine as Affected by High and Low Temperatures	177
Iodine Metabolism in Graves' Disease.....	177
Iodine Loss (Excretion).....	179
Analysis of Thyroid Tissue After Operation.....	179
Radio-Iodine in Childhood Hypothyroidism.....	180
Thyroid Carcinoma with Metastasis.....	182
Radioactive Iodine Therapy in Hyperthyroidism.....	186
Preliminary Studies	186
Dosage	188
Results Obtained with Radioactive Iodine (130 and 131) in Graves' Disease	190
Side Effects and Possible Delayed Reactions.....	193
Element 85, Eka-Iodine.....	194
VII. PATHOLOGY	201
Diffuse Non-toxic Goiter (Simple Colloid Goiter).....	201
Diffuse Toxic Goiter.....	202
Formation of Nodules.....	206
Significance of the Staining Properties of Colloid.....	207
Adenomatous Goiter	207
Relation of Adenomas to Malignancy.....	210
Malignant Tumors	214

Histopathological Classification	214
Incidence	216
Incidence and Geographical Region	217
Age Incidence	217
Malignant Lesions of the Thyroid Gland in Childhood	218
Sex Incidence	218
Incidence of Different Histopathological Types	219
Malignant Adenomas	220
Papillary Adenocarcinoma	223
Other Types of Adenocarcinoma of the Thyroid	226
Adenocarcinoma Not Originating in Adenoma	226
Diffuse Adenocarcinoma	227
Small Round Cell Carcinoma	228
Scirrhus Carcinoma	229
Epidermoid Carcinoma	229
Carcinoma-Sarcoma (Giant Cell Carcinoma)	229
Sarcoma	230
Operability, Measures of Treatment, and Prognosis	231
Discrete Adenomas	232
Operability	232
Operative Mortality	236
Results of Operation	236
VIII. THYROIDITIS	241
Acute Suppurative Thyroiditis	243
Acute Nonsuppurative Thyroiditis	245
Riedel's Struma	247
Clinical Features	248
Differential Diagnosis	250
Pathologic Features	251
Gross Appearance	251
Histopathologic Features	251
Theories of Etiology	252
Role of Perithyroiditis	254
Hashimoto's Disease (Struma Lymphomatosa)	263
IX. EXOPHTHALMIC GOITER	274
Role of Involuntary Nervous System	274
The Ocular Signs	276
Exophthalmos	276
Signs of Von Graefe, Stellwag, and Moebius	276
The Cause of Tachycardia	278
Why the Basal Metabolic Rate Is Increased	279
Origin of the Tremor	280

Vasomotor Symptoms	280
Gastro-Intestinal Symptoms	280
Symptoms Referable to the Thyroid Gland	281
 X. THE THYROID GLAND IN LATER LIFE	284
Changes in Later Life	286
Hypometabolism in Later Life	289
Hypothyroidism in the Elderly Patient	291
Hyperthyroidism in the Aged	291
Treatment of Thyrotoxicosis in the Elderly	294
 XI. PREOPERATIVE CONSIDERATIONS	300
Study of the Patient	301
Other Laboratory Tests	302
Importance of Experience and Judgment	302
Differential Diagnosis	303
Preoperative Treatment	304
Rest and Informal Psychotherapy	305
Diet	306
Treatment of Complicating Disorders	307
Cardiac Conditions	307
Diabetes Mellitus	307
Hepatic Insufficiency	307
Infections	307
Iodinization	308
Iodine in Conjunction with Thio Drug	312
Thio-Drug Therapy	314
Thyroid Crisis	314
Prerequisites for Thyroidectomy	315
Prerequisites for Bilateral Thyroidectomy	315
General Physical and Mental Condition	315
Gain in Weight	315
Basal Metabolic Rate	316
Resting Pulse Rate	316
Complicating Disorders	316
Poor Risk Patients—Unilateral Thyroidectomy	316
Roentgenotherapy	317
Blood Pressure in Disturbances of the Thyroid Gland	318
In Exophthalmic Goiter	318
Relation of Blood Pressure to Basal Metabolic Rate	319
Hypertension and Glycosuria	320
Blood Pressure in Myxedema	321
The Problem of Goiter Heart	322

XII. ANESTHESIA IN THYROID SURGERY.....	329
Intratracheal Anesthesia	331
Preliminary Sedation	332
Anesthesia in Operations Following Treatment with Thiouracil	333
Local Anesthesia	333
Ether	334
Ethylene and Ether.....	335
Cyclopropane	335
Intravenous Anesthesia	336
Tribromethanol in Amylene Hydrate.....	337
Spinal Anesthesia	337
Carotid Sinus Syndrome.....	338
Removal of Excess Mucus.....	338
XIII. OPERATIVE CONSIDERATIONS	340
Technique of Bilateral Thyroidectomy.....	343
Amount of Gland to Remove.....	355
Possible Errors on the Operating Table.....	358
Unilateral Thyroidectomy	359
Removal of Discrete Adenomas.....	361
Removal of Malignant Adenomas.....	365
Removal of An Intrathoracic Goiter.....	368
Substernal Approach—Thoracic Approach.....	371
Thyroglossal Rests	372
Lateral Aberrant Thyroid Tissue.....	374
Ligation of Thyroid Arteries.....	375
XIV. POSTOPERATIVE CARE	382
Care in the Immediate Postoperative Period.....	382
Sedation	383
Dangers of Oversedation.....	383
Iodine Therapy	384
Possible Postoperative Complications.....	384
Nausea and Vomiting.....	384
Hemorrhage	385
Infection	385
Hepatic Difficulties	386
Congestive Heart Failure.....	386
Auricular Fibrillation and Auricular Flutter.....	387
Collection of Mucus.....	387
Injury to the Recurrent Laryngeal Nerves.....	387
Other Causes of Laryngeal or Tracheal Obstruction.....	389
Thyroid Crisis	390
Treatment	395
Parathyroid Tetany	395

XV. POSTOPERATIVE SEQUELAE	400
Postoperative Hypothyroidism	400
Recurrent or Persistent Hyperthyroidism	401
Causes	402
Prevention	404
Treatment	408
Exophthalmos	409
Increased Prominence of the Eyes Following Medical and Surgical Treatment	409
Marked Exophthalmos and Progressive Exophthalmos Fol- lowing Thyroidectomy	411
Causative Factors in Malignant Exophthalmos	413
Disturbances of Ocular Muscles	413
Importance of Periodic Examinations	414
Rehabilitation	414
XVI. FUTURE OF THYROID SURGERY	418
INDEX	425