

INDEX*

Thyroid Gland

A

Adamantinoma-like Ewing sarcoma, 284
 Adenolipoma, 83
 American Joint Committee on Cancer (AJCC)
 staging system, 515
 Amyloid goiter, 380
 Anaplastic (undifferentiated) thyroid carcinoma,
 201, 481
 BRAF V600E-mutated anaplastic thyroid carcin-
 oma, 215
 Cytopathology, 481
 Epithelial pattern, 206
 Giant cell pattern, 206
 Osteoclast-like giant cell-rich pattern, 209
 Paucicellular pattern, 210
 Pleomorphic pattern, 206
 Rhabdoid pattern, 210
 Spindle cell pattern, 204
 Squamoid pattern, 206
 Anatomy, normal, 4
 Angiolipoma, 281
 Angiosarcoma, 285

B

Benign cellular nodules, 425
 Beta-catenin/APC/Wnt signaling, 36
 Bethesda system for reporting thyroid cytopath-
 ology, 407
 Black follicular adenoma, 85
BRAF genes, oncogenic, 32
BRAF V600E-mutated anaplastic thyroid carcin-
 oma, 215

C

C cell, 13
 C-cell carcinoma, 241
 C-cell hyperplasia, 267
 Calcitonin, 16, 508
 Calcitonin gene-related peptide, 16
 Carcinoma, thyroid, **65**, 105, 125
 Childhood, 66
 Etiology, 65

Follicular thyroid carcinoma (FTC), 105
 Incidence, 65
 Molecular classification, 72
 Papillary thyroid carcinoma (PTC), 125
 Chronic lymphocytic (Hashimoto) thyroiditis,
 371, 433
 Cytopathology, 433
 Classification of thyroid tumors, 71
 Molecular classification, 72
 World Health Organization classification, 71
 Clear cell follicular adenoma, 83
 Clear cell papillary thyroid carcinoma, 172
 Columnar cell papillary thyroid carcinoma, **167**,
 474
 Copy number alterations in DNA, 37
 Cribriform-morular papillary thyroid carcinoma,
 173, 336
 Cystic colloid nodules, 425
 Cystic papillary carcinoma, cytopathology, 468
 Cytopathology of thyroid tumors, 395
 Anaplastic (undifferentiated) thyroid carcinoma,
 481
 Diffuse hyperplasia (Graves disease), 425
 Fine-needle aspiration, 395
 Clinical context, 395
 Complications, 498
 Histologic alterations, 497
 Pitfalls, 495
 Role and value, 395
 Techniques for aspiration, 406
 Follicular-patterned tumors, 443
 High-grade nonanaplastic thyroid carcinoma of
 follicular cells, 472
 Lymphoma, 486
 Medullary thyroid carcinoma, 483
 Molecular pathology, 412
 Normal thyroid gland, 415
 Oncocytic neoplasms of follicular cells, 451
 Papillary thyroid carcinoma and subtypes, 457
 Pitfalls of fine-needle aspiration, 495
 Preoperative cytologic diagnosis, 406
 Reporting thyroid cytopathology, the Bethesda
 system, 407
 Secondary tumors, 491
 Thyroglossal duct cysts, 441

*In a series of numbers, those in boldface indicate the main discussion of the entity.

Thyroid follicular nodular disease, 421
Thyroiditis, 433
Ultrasound appearance, 398

D

De Quervain thyroiditis, 375, 437
 Cytopathology, 437
DICER1 gene, 35
Diffuse hyperplasia (Graves disease), 367, 425
 Cytopathology, 425
Diffuse large B-cell lymphoma, NOS (DLBCL), 293, 303, 486
 Cytopathology, 486
Diffuse large B-cell lymphoma transformed from EMZL, 300
Diffuse sclerosing papillary thyroid carcinoma, 163
Dyshormonogenetic goiter, 367

E

Ectopia, 385
 Lingual thyroid tissue, 385
 Thyroglossal duct cyst, 386
EIF1AX gene, 42
Embryology, normal, 1
Embryonal thyroid neoplasms, 344
Encapsulated follicular subtype papillary thyroid carcinoma, 155, 443
 Cytopathology, 443
Epigenetic dysregulation, 43
Epithelial anaplastic thyroid carcinoma, 206
Extranodal marginal zone lymphoma of mucosa-associated lymphoid tissue (EMZL), 293, 298, 486
 Cytopathology, 486
EZH1 gene, 35

F

Familial medullary thyroid carcinoma (FMTC), 242
Familial nonmedullary thyroid carcinomas (FNMTC), 47
 Nonsyndromic, 47
 Syndromic, 47
Fibrosing (Riedel) thyroiditis, 375, 437
 Cytopathology, 437
Fine-needle aspiration cytology, 395, 508
 Clinical context, 395
 Complications, 498
 Histologic alterations, 497
 Molecular pathology, 412
 Normal thyroid gland, 415
 Pitfalls, 495
 Reporting, the Bethesda system, 407

 Techniques for aspiration, 406
 Ultrasound features, 398
Follicular adenoma, 75, 443
 Black follicular adenoma, 85
 Clear cell follicular adenoma, 83
 Cytopathology, 443
 Hyperfunctioning follicular adenoma, 83
 Lipoadenoma, 83
 Signet ring cell follicular adenoma, 83
 Spindle cell follicular adenoma, 83
Follicular carcinoma, *see* Follicular thyroid carcinoma
Follicular cell, normal, 10
Follicular cell-derived thyroid carcinoma, high grade, *see* High-grade follicular cell-derived thyroid carcinoma
Follicular lymphoma, 304
Follicular nodular disease, 363, 421
 Cytopathology, 421
Follicular subtype papillary thyroid carcinoma (FVPTC), 155
 Invasive encapsulated follicular variant PTC, 156
Follicular thyroid carcinoma (FTC), 105, 443
 Cytopathology, 443
 Subtypes, 116
Follicular tumor of uncertain malignant potential (FT-UMP), 99
Frozen section examination, 508

G

Genotype-phenotype correlation, 45
Giant cell anaplastic thyroid carcinoma, 206
GLIS protein, 37
Granular cell tumor, 281
Granulomatous (De Quervain) thyroiditis, 375, 437
Graves disease, 367, 425
 Cytopathology, 425

H

Hashimoto thyroiditis, 371, 433
 Cytopathology, 433
Hemangioma, 281
High-grade differentiated thyroid carcinoma (HGDTTC), 193, 472
 Cytopathology, 472
High-grade follicular cell-derived thyroid carcinoma, 187, 472
 Cytopathology, 472
High-grade differentiated thyroid carcinoma (HGDTTC), 193, 472
Poorly differentiated thyroid carcinoma (PDTC), 188, 472

Histology, normal, 7
 Hobnail papillary thyroid carcinoma, 169, 475
 Hodgkin lymphoma, 305, 490
 Hormones, thyroid gland, 13, *see also individual entities*
 Hormonogenesis, 14
 Hot follicular adenoma, 83
 Hurthle cell tumors and carcinomas, *see* Oncocytic tumors, Oncocytic carcinomas
 Hyalinizing trabecular tumor (HTT), 317
 Hyperfunctioning follicular adenoma, 83

I

International collaboration on cancer reporting (ICCR) checklist, 510
 Intrathyroid thymic carcinoma, 325
 Invasive encapsulated follicular variant papillary thyroid carcinoma, 156
 Iodine deficiency and follicular thyroid carcinoma, 65

L

Langerhans cell histiocytosis, 310
 Leiomyosarcoma, 283
 Lingual thyroid tissue, 385
 Lipoadenoma, 83
 Liposarcoma, 281
 Lymph node thyroid inclusions, 391
 Lymphangioma, 281
 Lymphoid tumor-like conditions, 309
 Lymphoma, *see* Malignant lymphoma

M

Malakoplakia, 378
 Malignant lymphoma, 293, 486
 Cytopathology, 486
 Diffuse large B-cell lymphoma, NOS (DLBCL), 293, 303
 Diffuse large B-cell lymphoma transformed from extranodal marginal zone lymphoma, 300
 Extranodal marginal zone lymphoma of mucosa-associated lymphoid tissue (EMZL), 293, 298
 Follicular lymphoma, 304
 MALT lymphoma, 305
 Mechanical implantation of thyroid tissue, 389
 Medullary microcarcinoma, 257
 Medullary thyroid carcinoma (MTC), 241, 483
 C-cell hyperplasia, 267
 Cytopathology, 483
 Familial medullary thyroid carcinoma (FMTC), 242
 Hereditary medullary thyroid carcinoma, 244

Medullary microcarcinoma, 257
 Mixed medullary and follicular cell-derived thyroid carcinoma, 265
 Multiple endocrine neoplasia 2 (MEN2) association, 241
 Sporadic medullary thyroid carcinoma, 243
 Mesenchymal thyroid tumors, 281, *see also individual entities*
 Metaplastic thyroid carcinoma, 201
 Metastatic tumors to thyroid gland, *see* Secondary tumors
 Mitochondrial DNA mutations, 37
 Mitogen-activated protein kinase pathway (MAPK pathway), 25
 Mixed medullary and follicular cell-derived thyroid carcinoma, 265
 Molecular alterations in thyroid tumors, 25, 510
 Early pathogenesis, 25
 Environmental and hereditary factors, 46
 Epigenetic dysregulation, 43
 Late pathogenesis, 38
 Molecular testing of FNA, 46, 510
 Targeted therapies, 47
 Mucoepidermoid carcinoma, 328
 Multifocal fibrosis (sclerosing) thyroiditis, 377, 437
 Cytopathology, 437
 Multiple endocrine neoplasia type 2 (MEN2), and medullary carcinoma, 241

N

Neurofibroma, 281
 Nodular hyperplasia, 363
 Nodule-forming acquired MALT tissue, 309
 Noninvasive follicular thyroid neoplasm with papillary-like nuclear features (NIFTP), 91, 156, 443
 Cytopathology, 443
 Nuclear scoring system, 97
 NUT carcinoma, 340

O

Oncocyte, 223
 Oncocytic adenoma, 223
 Oncocytic carcinoma, 231
 Oncocytic neoplasm of follicular cells, 451
 Oncocytic thyroid tumors, 223, 451
 Cytopathology, 451
 Oncocytic adenoma, 223
 Oncocytic carcinoma, 231
 Oncocytic papillary thyroid carcinoma, 170, 469
 Cytopathology, 469

Osteoclast-like giant cell-rich anaplastic thyroid carcinoma, 209

P

P53 protein, 40
Papillary microcarcinoma, 151
Papillary thyroid carcinoma (PTC), 125, 457
 Clear cell papillary thyroid carcinoma, 172
 Columnar cell papillary thyroid carcinoma, 167
 Cribriform morular papillary thyroid carcinoma, 173
 Cytopathology, 457
 Diffuse sclerosing papillary thyroid carcinoma, 163
 Encapsulated papillary thyroid carcinoma, 155
 Follicular variant papillary thyroid carcinoma, 155
 Genetic alterations, 173
 Hobnail papillary thyroid carcinoma, 169
 Invasive encapsulated follicular variant papillary thyroid carcinoma, 156
 Oncocytic papillary thyroid carcinoma, 170
 Papillary microcarcinoma, 151
 Solid papillary thyroid carcinoma, 161
 Spindle cell papillary thyroid carcinoma, 172
 Tall cell papillary thyroid carcinoma, 165
 Warthin-like papillary thyroid carcinoma, 170
Paraganglioma, 320
Parasitic nodule, 390
Parathyroid tumors in thyroid gland, 319
Paucicellular anaplastic thyroid carcinoma, 210
PI3K/PTEN/AKT pathway, 41
Pleomorphic adenoma, 333
Pleomorphic anaplastic thyroid carcinoma, 206
Poorly differentiated thyroid carcinoma (PDTC), 188, 472
 Cytopathology, 472
PPAR γ rearrangement, 33

R

Radiation exposure and carcinoma, 46, 66, 125, 378
 Papillary thyroid carcinoma, 125
RAS genes, oncogenic, 31
Reporting guidelines, 509
 College of American Pathologists (CAP) protocol, 510
 International collaboration on cancer reporting (ICCR), 510
 American Joint Committee on Cancer (AJCC) staging, 510
Riedel thyroiditis, 375, 437

Cytopathology, 437
Rhabdoid anaplastic thyroid carcinoma, 210
Rosai-Dorfman disease, 311

S

Salivary gland-type tumors, 328
Sarcoidosis, 378
Sarcomatoid carcinoma, 201
Schwannoma, 281
Scintigraphy, 507
Sclerosing mucoepidermoid carcinoma with eosinophilia (SMECE), 333
Secondary tumors to thyroid gland, 353, 491
 Carcinoid lung cancer, 359
 Clear cell renal cell carcinoma, 354
 Colorectal adenocarcinoma, 353
 Cytopathology, 491
 Mammary carcinoma, 355
 Pulmonary neuroendocrine carcinoma, 354
Secretory carcinoma, 331
Sequestered nodule, 390
Signet ring cell follicular adenoma, 83
Solid cells nests, 17
Solitary fibrous tumor, 282
Spindle cell anaplastic thyroid carcinoma, 204
Spindle cell follicular adenoma, 83
Spindle cell papillary thyroid carcinoma, 172
Spindle epithelial tumor with thymus-like differentiation (SETTLE), 323
Squamous anaplastic thyroid carcinoma, 206
Subacute granulomatous (De Quervain) thyroiditis, 375
Synovial sarcoma, 284

T

Tall cell papillary thyroid carcinoma, 165, 469
 Cytopathology, 469
Targeted molecular therapies, 47
Teratoma, 321, 392
TERT (telomere reverse transcriptase), 38
THADA gene, 36
The Cancer Genome Atlas (TCGA) study, 39
Thymic carcinoma, intrathyroid, 325
Thymic tumors, 323
Thymoma, 323
Thyroid blastoma, 344
Thyroglobulin, 13, 508
Thyroglossal duct cyst (TGDC), 386, 441
 Cytopathology, 441
 TGDC carcinoma, 387
Thyroid function tests, 507

Thyroid-stimulating hormone (TSH), 13, 35
 Thyroid tumor of uncertain malignant potential (TT-UMP), 99
 Thyroiditis, 371, 433
 Chronic lymphocytic (Hashimoto) thyroiditis, 371
 Cytopathology, 433
 Fibrosing (Riedel) thyroiditis, 375
 Malakoplakia, 378
 Multifocal fibrosing (sclerosing) thyroiditis, 377
 Sarcoidosis, 378
 Subacute granulomatous (De Quervain) thyroiditis, 375
 Wegener granulomatosis, 378
 Thyrolioma, 83
 Thyrotropin-releasing hormone (TRH), 13
 Thyroxine (T4), 13
 Toxic follicular adenoma, 83
 Toxic multinodular goiter, 364
 Triiodothyronine (T3), 13
 TSH receptor/cAMP pathway, 35
 Tumor-like lesions with B-cell predominance, 30
 Tyrosine kinase receptors, 25

U

Ultrasound features of thyroid lesions, 398, 507
 Role in diagnosis, 507
 Malignancy risk, 401
 Undifferentiated thyroid carcinoma, *see* Anaplastic (undifferentiated) thyroid carcinoma

W

Warthin-like papillary thyroid carcinoma, 170
 Wegener granulomatosis, 378
 Well-differentiated tumor of uncertain malignant potential (WDT-UMP), 99
 World Health Organization classification of thyroid tumors, 71

Parathyroid Gland

A

Adenoma, 547
 Chief cell adenoma, 552
 Hyalinizing parathyroid adenoma, 557
 Lipoadenoma, 558
 Oncocytic adenoma, 558
 Water clear cell adenoma, 559
 American Joint Committee on Cancer (AJCC) staging system, 588
 Anatomy, normal, 525

Atypical parathyroid tumor, 567

B

Brown tumors, 541

C

Calcium homeostasis, 537
 Carcinoma, 575
 Chief cell adenoma, 552
 Clear cell hyperplasia, 597

E

Embryology, normal, 523

F

Familial hypocalciuric hypercalcemia, 606
 Familial isolated hyperparathyroidism, 607

H

Hereditary hyperparathyroidism, 599
 Familial hypocalciuric hypercalcemia, 606
 Familial isolated hyperparathyroidism, 607
 Hyperparathyroidism-Jaw tumor syndrome, 605
 Multiple endocrine neoplasia (MEN) type 1, 599
 MEN type 2A, 602
 MEN type 4, 603
 MEN type 5, 605
 Neonatal severe primary hyperparathyroidism, 606
 Hyalinizing parathyroid adenoma, 557
 Hypercalcemia, 538
 Hypercalcemia of malignancy, 542
 Hyperparathyroidism, 538, 613, 618
 Bone manifestations, 540
 Primary, 539
 Renal manifestations, 541
 Secondary, 613
 Tertiary, 618
 Hyperparathyroidism-jaw tumor syndrome, 605

I

Immunohistochemical findings, normal, 532

L

Lipoadenoma, 558

M

Metastatic tumors to parathyroid gland, 627
 Microscopic findings, normal, 528
 Multiglandular parathyroid disease, 593
 Primary hyperparathyroidism, 595

Multiple endocrine neoplasia (MEN) type 1, 599
Multiple endocrine neoplasia (MEN) type 2A, 602
Multiple endocrine neoplasia (MEN) type 4, 603
Multiple endocrine neoplasia (MEN) type 5, 605

N

Neonatal severe primary hyperparathyroidism, 606

O

Oncocytic (oxyphil cell) adenoma, 558
Ontogenous parathyromatosis, 626
Osteitis fibrosa cystica, 540

P

Parathyroid carcinoma, 575
Parathyroid cysts, 625
Parathyroid grafts, 622
Parathyroid hormone (PTH), 537

Parathyroid hormone-related peptide (PTHrP), 537
Parathyromatosis, 528, 625
Postsurgical parathyromatosis, 626
Primary hyperparathyroidism, 539

S

Secondary hyperparathyroidism, 613
Secondary parathyroid tumors, 627

T

Tertiary hyperparathyroidism, 618

V

Von Recklinghausen disease of bone, 540

W

Water clear cell adenoma, 559