Parathyroid Histology

14

Parathyroid glands are derived from the endodermal third and fourth branchial pouches and are involved in the regulation of serum calcium and bone metabolism. Calcium-sensing receptors on the surface of parathyroid cells sense serum calcium levels. When serum calcium levels are low, parathyroid hormone (PTH) is secreted. Most individuals have four parathyroid glands, but 5–13 % have five or more and 2 % have fewer than four parathyroid glands [1–3]. Normal parathyroid glands measure 3–6 mm in length, 2–4 mm in width, and 0.5–2 mm in thickness [4]. Normal parathyroid glands each weigh 20–40 mg; those weighing more than 50–60 mg usually are abnormal. Parathyroid glands are composed of parathyroid parenchymal cells and adipocytes. Stromal fat constitutes 10–30 % of normal parathyroid glands. Parathyroid glands are composed of chief cells, transitional cells, oxyphilic cells, and adipose tissue. Normal and pathologic parathyroid tissue may show one or more parenchymal cell types. Parathyroid cysts and inflammation also are important to recognize in diagnostic parathyroid pathology. Parathyroid tissue is immunoreactive with parathyroid hormone, chromogranin, synaptophysin, and keratin (Cam5.2).

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Normal Parathyroid Histology

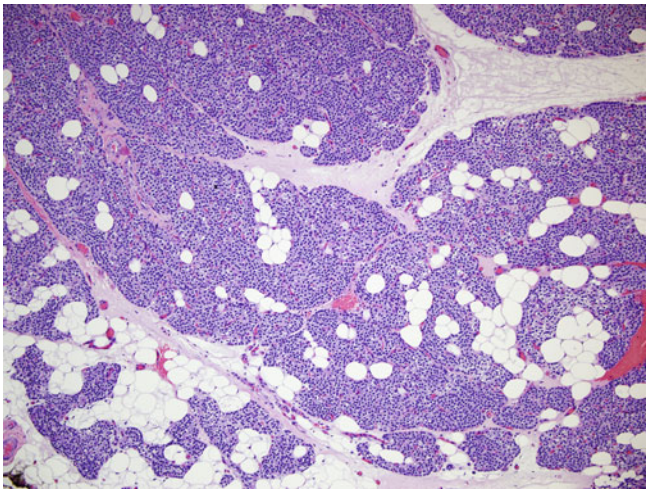

Fig. 14.1 Normal parathyroid histology. Normal parathyroid glands are composed of parathyroid parenchymal cells, which predominantly are chief cells but may be mixtures of chief, oxyphilic, transitional, and clear cells. Stromal fat also is present

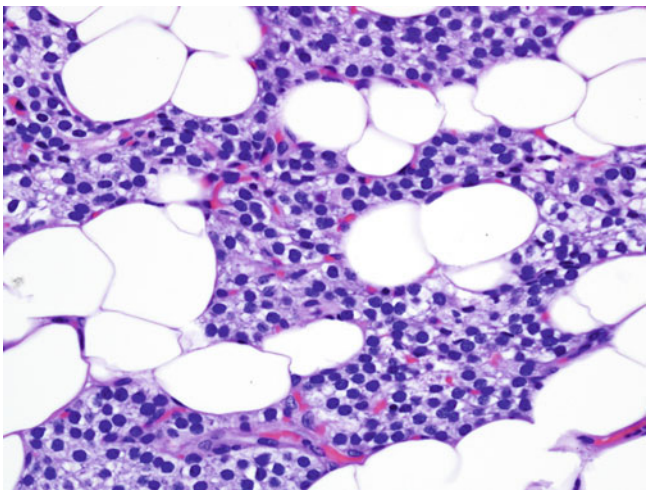

Fig. 14.3 Normal parathyroid histology. Chief cells are polyhedral and measure approximately 8 μm, with round central nuclei comprising more than half the cell, eosinophilic to amphophilic cytoplasm, and well-defined cytoplasmic membranes [1, 4]. The well-defined cytoplasmic membranes are helpful in differentiating parathyroid from thyroid. Fat droplets are identified in parathyroid chief cells in adults and are helpful in differentiating parathyroid from thyroid

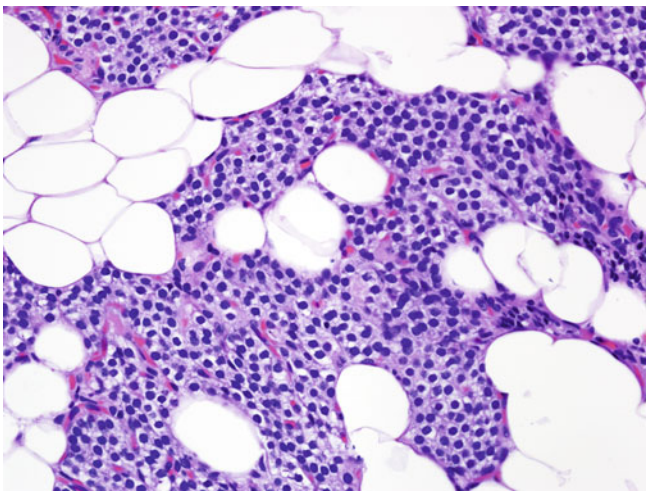

Fig. 14.2 Normal parathyroid histology. Understanding the variability in cellularity of normal parathyroid tissue is helpful, particularly in evaluating small biopsies. The cellularity of normal parathyroid glands is quite variable within and among glands in an individual, as well as among individuals. Stromal fat constitutes 10–30 % of normal parathyroid glands. The cellularity may be distributed unevenly, and there may be more stromal fat in the polar regions of a parathyroid gland than centrally [2]. Cellularity also varies with age and is high in infants and children, with adipocytes appearing in puberty and increasing in number until 25–40 years of age [1, 4]. Constitutional factors also affect cellularity [1]

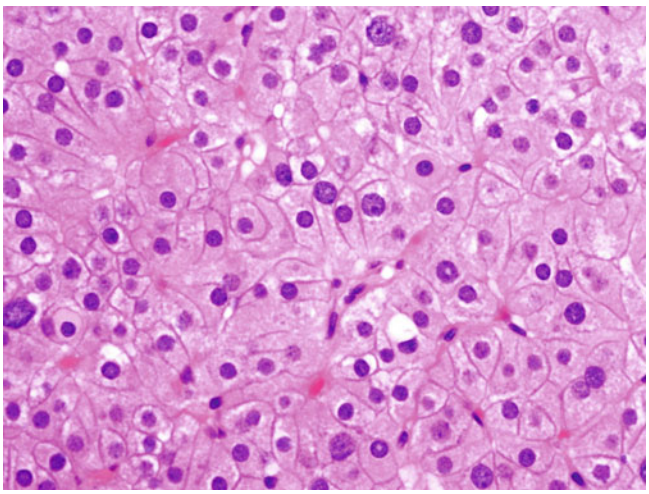

Fig. 14.4 Normal parathyroid histology. Oxyphilic cells measure 12–20 μm and are larger than chief cells [1, 5]. Oxyphilic cells have abundant eosinophilic cytoplasm reflecting numerous mitochondria. Oxyphilic cells are not present at birth or seen in parathyroid glands in small children; they appear at puberty and increase with age [1, 4]

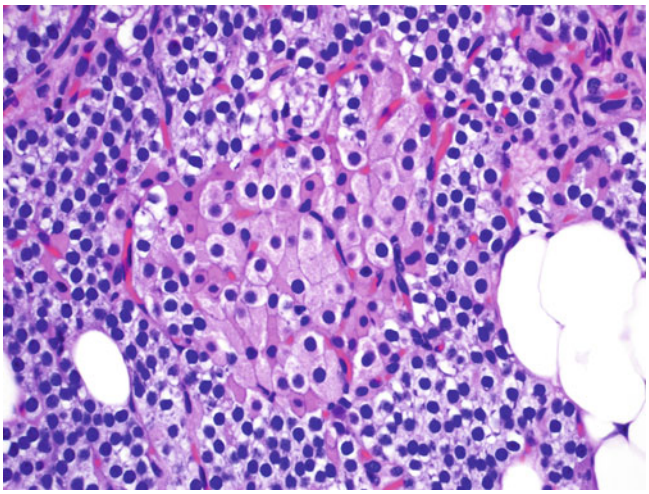

Fig. 14.5 Normal parathyroid histology. In older patients, oxyphilic cells may appear as nodular aggregates and be mistaken for parathyroid disease

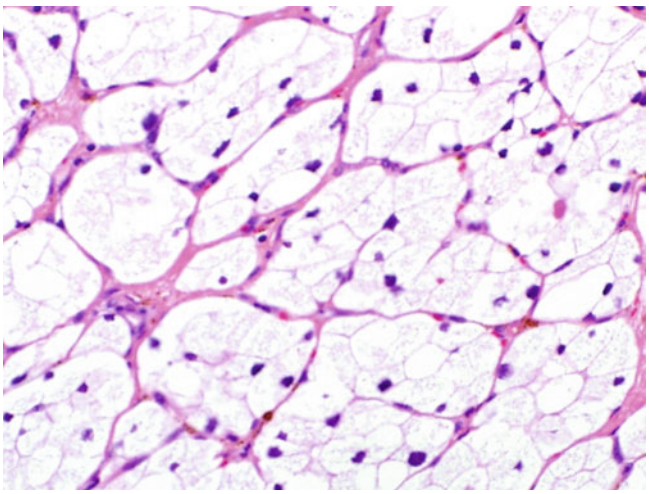

Fig. 14.6 Normal parathyroid histology. Clear (water-clear/Wasserhalle) cells measure 10–15 μm and have clear cytoplasm and pyknotic nuclei [4, 5]. The clear cytoplasm has been attributed to possible vacuolization of other cells, and in some types of parathyroid disease, such as clear cell parathyroid hyperplasia, a technical artifact has been suggested

Parathyroid Cysts

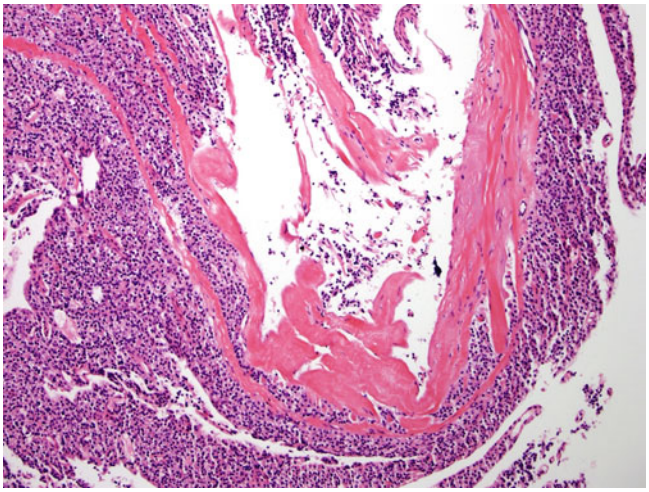

Fig. 14.7 Parathyroid cyst. Parathyroid cysts are uncommon, representing only 0.5–1 % of parathyroid lesions and less than 1 % of neck masses [6]. Among 6,621 patients undergoing neck ultrasound, five parathyroid cysts were identified [6]. The mean diameter was 3.6 cm and ranged from 2.5 to 8.1 cm [6]. Serum PTH was elevated in all five cysts (mean, 221 pg/mL), but serum calcium was elevated in only three of the five cases (9.2–12.9 mg/mL) [6]. In a study of 325 patients undergoing parathyroid operations, 11 parathyroid cysts were identified, ranging in size from 1.6 to 10 cm and occurring in men and women over a broad age range [7]

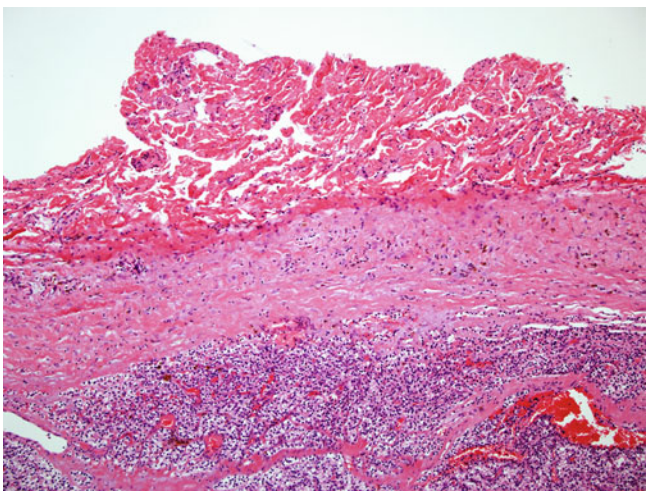

Fig. 14.8 Parathyroid cyst. Parathyroid cysts occur in the neck, within the thyroid, or in the mediastinum. Cysts may be functional or nonfunctional. Nonfunctional cysts may present as a mass, but clinically apparent cysts are quite rare. A study of 12 nonfunctional symptomatic parathyroid cysts, diagnosed on the basis of whether the aspirated fluid was colorless and clear and had elevated PTH, reported that aspiration was successful in treating four cysts; the eight recurrent cysts were ablated with ethanol [8]. Functional cysts also may be multiple [9]. Parathyroid adenoma or hyperplasia also may be associated with a cyst or cystic degeneration

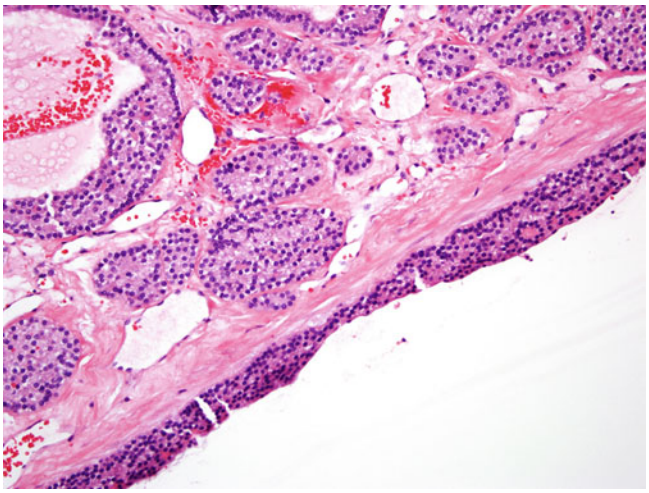

Fig. 14.9 Parathyroid cyst. Parathyroid cysts may be lined by epithelium but often have fibrotic walls. Different elements may be present in the wall, including parathyroid tissue, muscle, lymphoid, thymic tissue, and adipose tissue

Parathyroiditis

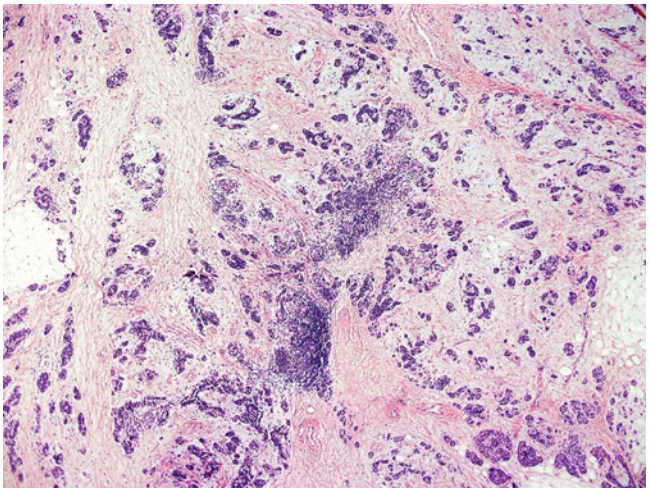

Fig. 14.10 Parathyroiditis. This parathyroid gland affected by chronic parathyroiditis shows atrophic nests of remaining parathyroid parenchyma and extensive fibrosis, which has replaced much of the parenchyma. Chronic parathyroiditis is considered an autoimmune condition that may result in hypoparathyroidism or hyperparathyroidism, although most cases are asymptomatic [10, 11]. A lymphocytic infiltrate is found in parathyroid glands at autopsy in patients without known clinical parathyroid dysfunction, but clinically evident parathyroiditis is extremely rare. Chronic parathyroiditis also may be associated with adenomas and hyperplasia [12, 13]

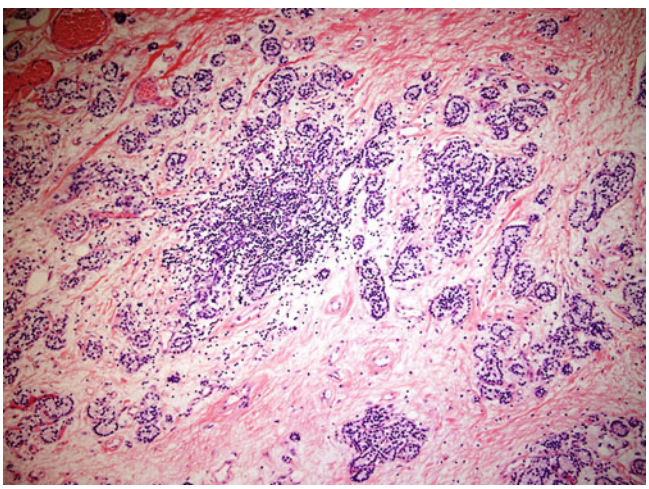

Fig. 14.11 Parathyroiditis. Histologic features of chronic parathyroiditis are variable and range from focal lymphocytic infiltrate to prominent lymphoid follicles with germinal center formation involving one or multiple parathyroid glands. The parathyroid parenchyma in this example has been extensively replaced by fibrous tissue and adipose, with only small nests and islands of parathyroid parenchymal cells remaining

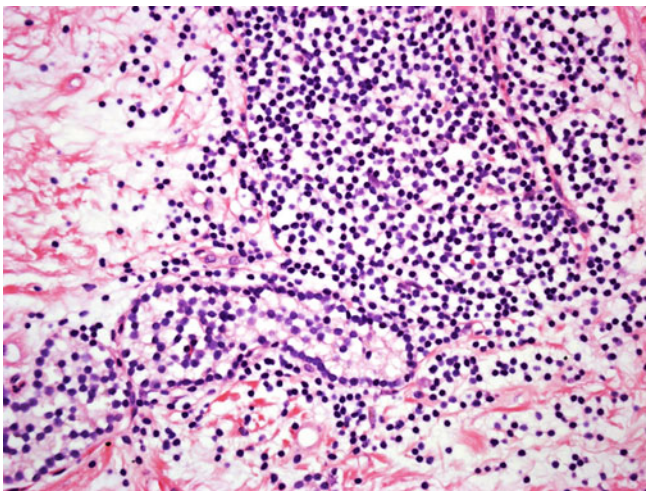

Fig. 14.12 Parathyroiditis. This parathyroid gland shows a diffuse and fairly dense infiltrate of lymphocytes. Prominent lymphoid follicles with germinal centers also may be present. Involvement may be diffuse or patchy and affect one or more glands in parathyroiditis. Autopsy studies have shown focal lymphocytic infiltrate in up to 16 % of cases [14]. Multiple glands may be involved, particularly in patients with autoimmune disorders. When the lymphoid infiltrate is marked, it must be distinguished from involvement by malignant lymphoma, which may occur but is extraordinarily rare

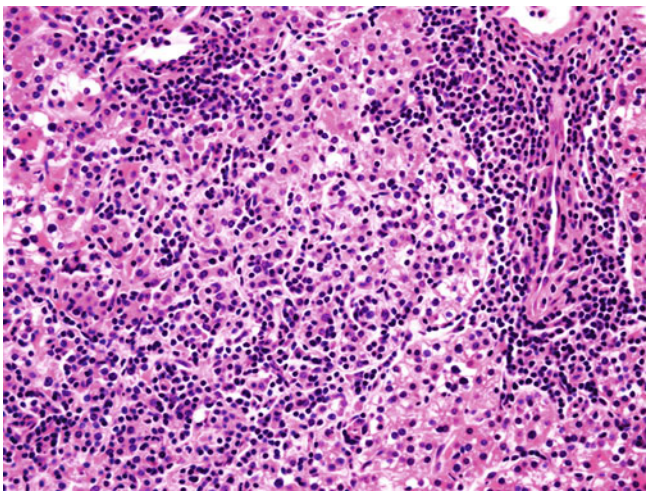

Fig. 14.13 Parathyroiditis. This parathyroid gland parenchyma affected by chronic parathyroiditis shows nodular infiltrates of chronic inflammatory cells and a few nests of residual parathyroid parenchymal cells

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