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Aetiology Simple goitre may develop as a result of stimulation of the thyroid gland by TSH, either as a result of inappropriate secre tion from a microadenoma in the anterior pituitary (which is rare) or in response to a chronically low level of circulating thyroid hormones. The most important factor in endemic goitre is dietar y deficiency of iodine (see Iodine deficiency but defective hormone synthesis probably accounts for many sporadic goitres (see Dyshormonogenesis). TSH is not the only stimulus to thyroid follicular cell pro liferation as other growth factors, including immunoglobulins, exert an influence. The heterogeneous structural and func tional response in the thyroid resulting in characteristic nodu larity may be due to the presence of clones of cells particularly sensitive to g rowth stimulation. Hakaru Hashimoto , 1881–1934, Director, The Hashimoto Hospital, Mie, Japan, described chronic lymphocytic thyroiditis in 1912. Friedrich Joseph de Quervain , 1868–1940, Professor of Surgery , Berne, Switzerland, described this form of thyroiditis in 1902. Bernhard Riedel , 1846–1916, Surgeon, University of Jena, Thuringia, Germany Struma . The River Struma arises in the mountains of Bulgaria and flows into the Aegean Sea. Along its banks and those of its tributaries dwell peoples of several nationalities, among whom endemic goitre has long been prevalent. Struma is a European continental term for goitre. /uni25CF - /uni25CF /uni25CF - Iodine deficiency The daily requirement of iodine is about 0.1–0.15 /uni00A0 mg. In nearly all districts where simple goitre is endemic, there is a very low iodide content in the water and f ood. Endemic areas are in the mountainous ranges, such as the Rocky Mountains, the Alps, the Andes and the Himalayas, and in the UK areas of Derbyshire and Y orkshire. Endemic goitre is also found in lowland areas where the soil lacks iodide or the water supply comes from far away mountain ranges, e.g. the Great Lakes of North America, the plains of Lombardy , the Struma Valley , the Nile Valley and the Congo. Calcium is also goitrogenic and goitre is common in low-iodine areas on chalk or limestone, for - example Derbyshire and southern Ireland. Although iodides in food and water may be adequate, failure of intestinal absorption may produce iodine deficiency . Dyshormonogenesis), Enzyme deficiencies of varying severity may be responsible for many sporadic goitres, i.e. in non-endemic areas (Figure 55.9). - There is often a family history , suggesting a genetic defect. Environmental factors may compensate in areas of high - iodine intake; for example, goitre is almost unknown in Iceland - where the fish diet is rich in iodine. Similarly , a low intake of iodine encourages goitre formation in those with a metabolic predisposition.

Simple goitre Diffuse Physiological (euthyroid) hyperplastic Pubertal Pregnancy Multinodular goitre Toxic Diffuse (Graves’ disease) Multinodular Toxic adenoma Neoplastic Benign Malignant In /f_l ammatory Autoimmune Chronic lymphocytic thyroiditis Hashimoto’s disease Granulomatous de Quervain’s thyroiditis Fibrosing Riedel’s thyroiditis Infective Acute (bacterial thyroiditis, viral thyroiditis, ‘subacute thyroiditis’) Chronic (tuberculous, syphilitic) Other Amyloid

Goitrogens Well-known goitrogens are the vegetables of the brassica family (cabbage, kale and rape), which contain thiocyanate, drugs such as para-aminosalicylic acid (PAS) and the antithyroid drugs. Thiocyanates and perchlorates interfere with iodide trapping; carbimazole and thiouracil compounds interfere with the oxidation of iodide and the binding of iodine to tyrosine. Surprisingly , iodides in large quantities are goitrogenic because they inhibit the organic binding of iodine and produce an iodide goitre. Excessive iodine intake may be associated with an increased incidence of autoimmune thyr oid disease. The natural history of simple goitre Stages in goitre formation are: /uni25CF Persistent growth stimulation causes di ff use hyperplasia; all lobules are composed of active follicles and iodine uptake is uniform. This is a di ff use hyperplastic goitre, which may persist but is reversible if stimulation ceases. /uni25CF Later, as a result of fluctuating stimulation, a mixed pat tern develops with areas of active lobules and areas of inactive lobules. /uni25CF Active lobules become more vascular and hyperplastic until haemorrhage occurs, causing central necrosis and leaving only a surrounding rind of active follicles. /uni25CF Necrotic lobules coalesce to form nodules filled either with iodine-free colloid or a mass of new but inactive follicles. /uni25CF Continual repetition of this process results in a nodular goitre. Most nodules are inactive, and active follicles are present only in the internodular tissue. Diffuse hyperplastic goitre Di ff use hyperplasia corresponds to the first stages of the natu ral history . The goitre appears in childhood in endemic areas; in sporadic cases, it usually occurs at puberty , when metabolic demands are high. If TSH stimulation ceases the goitr regress, but tends to recur later at times of stress such as preg nancy . The goitre is soft, di ff use and may become large enough to cause discomfort. A colloid goitre is a late stage of di ff use many follicles are inactive and full of colloid (Figure 55.10). Nodular goitre Nodules are usually multiple, forming a multinodular goitre (Figure 55.11). Occasionally , only one macroscopic nodule is found, but microscopic changes will be present throughout the gland; this is one form of a clinically solitary nodule. Nodules may be colloid or cellular, and cystic degeneration and haem - orrhage are common, as is subsequent calcification. Nodules appear early in endemic goitre and later (between 20 and 30 years) in sporadic goitre, although the patient may be unaware of the goitr e until his or her late forties or fifties. All types of simple goitre are more common in the female than in the male owing to the presence of oestrogen receptors in thyroid tissue. Diagnosis Diagnosis is usually straightforward. The patient is euthyroid and the nodules are palpable and often visible; they are smooth, usually firm and not hard and the goitre is painless and moves - - e may -

Figure 55.9 Total thyroidectomy for dyshormonogenetic goitre in a 14-year-old girl. Figure 55.10 Colloid goitre. Figure 55.11 Large multinodular goitre.

fication, may simulate carcinoma. A painful nodule, sudden appearance or rapid enlargement of a nodule raises suspicion of carcinoma but is usually due to haemorrhage into a simple nodule. Di ff erential diagnosis from autoimmune thyroiditis may be di ffi cult and the tw o conditions frequently coexist. Investigations Thyroid function should be assessed to exclude hyperthyroid ism, and the presence of circulating thyroid antibodies tested to di ff erentiate from autoimmune thyroiditis. Ultrasonography is the gold standard assessment when undertaken by a suitab trained and experienced operator. FNAC is only required for a nodule within the goitre that demonstrates ultrasonographic features of concern. This may or may not be the largest ‘dominant’ nodule. The biopsy should be performed under ultrasound guidance to ensure that the correct nodule is sampled. If there are swallowing or breathing symptoms then a CT scan of the chest and neck is the best modality to assess tracheal or oesophageal deviation or compression. Complications

Tracheal obstruction may be due to gross lateral displace ment or compression in a lateral or anteroposterior plane by retrosternal extension of the goitre (Figure 55.7). Acute r espiratory obstruction may follow haemorrhage into a nodule impacted in the thoracic inlet. Secondary thyrotoxicosis Transient episodes of mild hyperthyroidism are common, occurring in up to 30% of patients. Carcinoma An increased incidence of cancer (usually follicular) has been reported from endemic areas. Dominant or rapidly growing nodules in longstanding goitres should always be subjected to aspiration cytology . Prevention and treatment of simple goitre In endemic areas the incidence of goitre has been strikingly reduced by the introduction of iodised salt. In the early stages, a hyperplastic goitre may regress if thyroxine is given in a dose of 0.15–0.2 /uni00A0 mg daily for a few months. Although the nodular stage of simple goitre is irreversible, more than half of benign nodules will regress in size over 10 years. Most patients with multinodular goitre are asymptom a tic and do not require operation. Surgery is indicated for nodular goitres with features of underlying malignancy , for pressure symptoms if other causes have been excluded or for cosmetic reasons if the pa tient finds the goitre unsightly . If the goitre is causing tracheal compression then surgery should be considered. Many such patients are found incidentally and are asymptomatic and often very elderly . As these goitres often grow very slowly the risks and benefits of surgery should be considered carefully , particularly if a sternal split may be required for access. Sir Thomas Peel Dunhill , 1876–1957, surgeon, St Bartholomew’s Hospital, London, UK. lar goitre: total thyroidectomy with immediate and lifelong replacement of thyroxine or some form of partial resection to conserve su ffi cient functioning thyroid tissue to subserve nor - mal function while reducing the risk of hypoparathyroidism that accompanies total thyroidectomy . Historically subtotal thyroidectomy involves partial resection of eac h lobe, remov - ing the bulk of the gland and leaving up to 8 /uni00A0 g of relatively - normal tissue in each remnant. The technique is essentially the same as described for toxic goitre, as are the postopera - tive complications. A significant problem with this approach is ly the propensity for regrowth. Therefore, unless there is a local shortage of thyroxine, most sur geons now favour total thyroid - ectomy in the setting of bilateral disease. More often, however, the multinodular change is asymmetrical, with one lobe more significantly involved than the other. In these circumstances, particularly in older patients, total lobectomy on the more a ff ected side is the appropriate management. Although this can be used in combination with subtotal r esection of the con - tralateral lobe (Dunhill procedure), most surgeons now prefer no intervention on the less a ff ected side because of the poten - tial for regrowth and the increased rate of complications asso - - ciated with reoperation. In many cases , the causative factors persist and recurrence is likely . Reoperation for recurrent nodular goitre is more di ffi cult and hazardous and, for this reason, an increasing n umber of thyroid surgeons favour total thyroidectomy in younger patients. Ho wever, when the first operation comprised uni - lateral lobectomy alone for asymmetric goitre, reoperation and completion total thyroidectomy is straightforward if required for progression of nodularity in the remaining lobe. Total lobectomy and total th yroidectomy have the additional advan - tage of being therapeutic for incidental carcinomas. Simple goitre

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