action. An absence of androgen receptors causes the syndrome of *testicular feminization*, a form of male pseudohermaphroditism. These genetic males have cryptorchid testes but appear to be phenotypic females. Because androgens are inactive during embryogenesis, the labial-scrotal folds fail to fuse, and a short vagina results. The fallopian tubes, uterus, and upper portion of the vagina are absent because the testes secrete müllerian duct inhibitory factor during early fetal development. At puberty, these patients have breast enlargement because the testes secrete a small amount of estradiol and the peripheral tissues convert testosterone and adrenal androgens to estrogens. Axillary and pubic hair does not grow because androgen action is required for their development. The serum testosterone concentrations are elevated as a result of continuous stimulation by elevated concentrations of LH. LH is high because of the inability of the testosterone to act in a negative feedback fashion at the hypothalamus. Patients may have incomplete forms of androgen insensitivity caused by point mutations affecting the androgen receptor gene, and clinically these patients show varying degrees of male pseudohermaphroditism.

Patients who lack the 5α-reductase enzyme that is required to convert testosterone to DHT are born with a *bifid scrotum*, which reflects abnormal fusion of the labial-scrotal folds, and *hypospadias*, in which the urethral opening is in the perineal area or in the shaft of the penis. At puberty, androgen production is sufficient to partially overcome the defect; the scrotum, phallus, and muscle mass enlarge, and these patients appear to develop into physiologically normal men.

Diagnosis

Figure 65-2 illustrates an algorithm for the laboratory evaluation of hypogonadism in a phenotypic man. Serum concentrations of LH, FSH, and testosterone should be obtained, and a semen analysis should be performed. A low testosterone level with low concentrations of gonadotropins indicates a hypothalamic-pituitary abnormality, which needs to be evaluated with serum prolactin determination and radiographic examination. Elevated concentrations of gonadotropins with a normal or low testosterone level reflect a primary testicular abnormality. If no testes are palpable in the scrotum and careful *milking* of the patient's lower abdomen does not bring retractile testes into the scrotum, an HCG stimulation test should be performed. A rise in serum testosterone concentrations indicates the presence of functional testicular tissue, and a diagnosis of cryptorchidism can be made. Absence of a rise in testosterone suggests bilateral anorchia. Small, firm testes in the scrotum are highly suggestive of

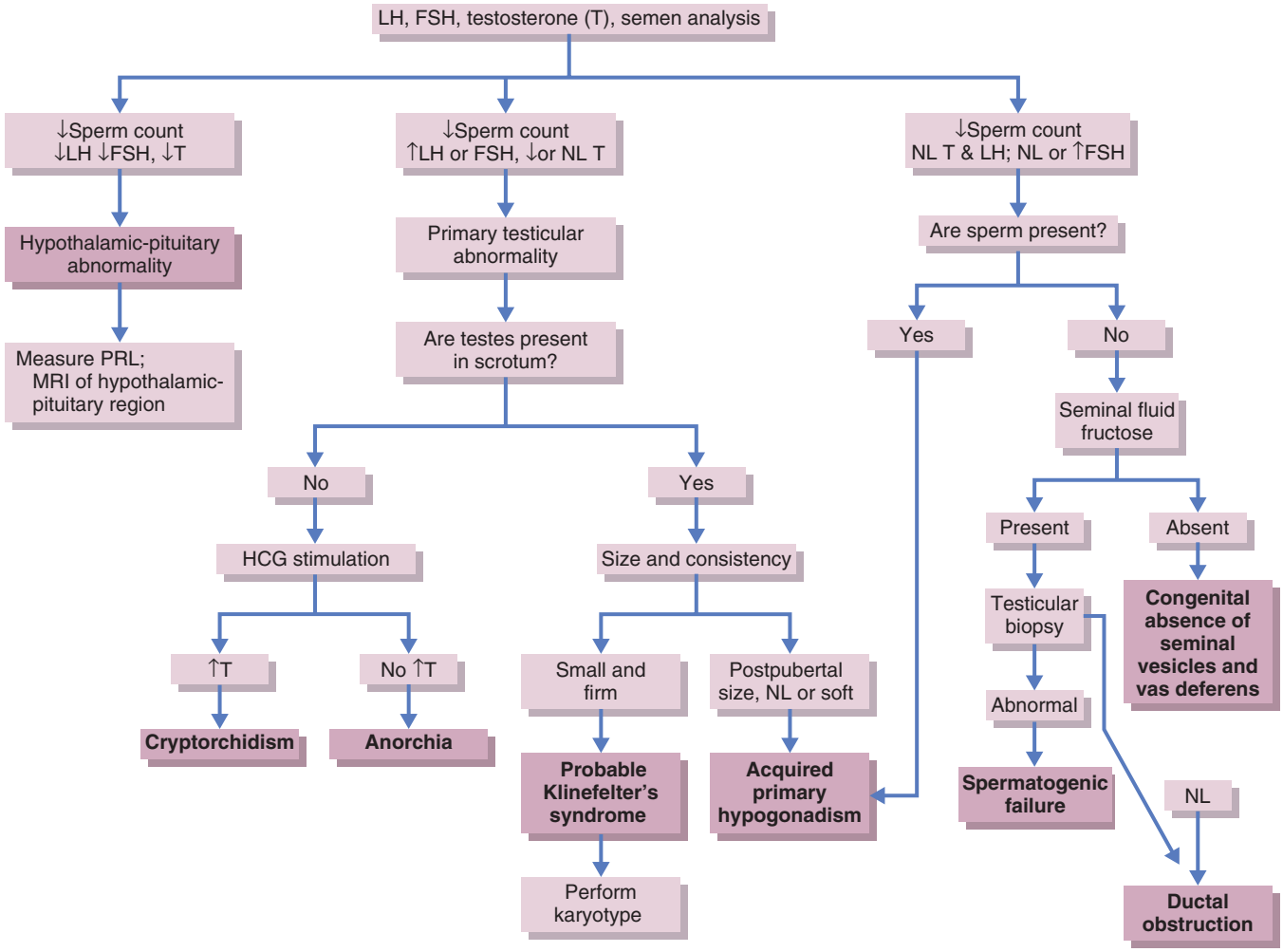

FIGURE 65-2 Laboratory evaluation of hypogonadism. ↑, Elevated; ↓, decreased or low; FSH, follicle-stimulating hormone; HCG, human chorionic gonadotropin; LH, luteinizing hormone; MRI, magnetic resonance imaging; NL, normal; PRL, prolactin.