with imatinib, and found nilotinib to be superior in efficacy. Jabbour et al. (243) described the uses and limitations of the BCR-ABL assay, as a prognostic tool.

f. Cytogenetics for Diagnosis and Prediction—CLL

In CLL, the most frequent aberrations are represented by 13q-, 11q-, +12, 6q-, 17p-, and 14q32/IGH translocations (244). Some of these forms of abnormal cytogenetics, as well as certain gene mutations, serve as prognostic markers in CLL. The 17p deletion (17p-), the 11q deletion (11q-), and the TP53 mutation, indicate a negative prognosis for CLL. Over 80% of CLL patients with the 17p deletion also carry a TP53 mutation. The 17p deletion and the TP53 can occur independently of each other, and both predict poor outcome (245). According to Badoux et al. (246), deletions of 17p or mutations of TP53 indicate a very poor prognosis, being predictive of a short time for disease progression, lack of response to therapy, and short overall survival.

In a study of 268 CLL patients, TP53 mutations occur in 3.7% of patients ($n = 10$), where 7/10 cases showed a concomitant 17p-deletion (247). Thus, there is a high prevalence of TP53 mutation in 17p-deleted patients. Only three (1.1%) of the newly diagnosed patients carried TP53 mutations without 17p-deletion.

A totally separate study of CLL found TP53 mutations in 8.5% of patients (28 of 328 patients), where TP53 mutations in the absence of 17p deletions were found in 4.5% of patients (248). The *TP53* gene is located on chromosome 17p13.1 (249). This gene encodes a transcription factor known as *p53*.

This introduces the biology of *p53*, and of *p53* mutations. The p53 protein is a tumor suppressor protein. This protein normally blocks tumor formation by triggering apoptosis (250). But various kinds of tumors encode a mutated *p53* that prevents *p53* from binding to DNA, prevents *p53* from regulating target genes, and allows tumor formation. Mutations in *p53* occur in a great variety of cancers, including cancer of the breast, head and neck, liver, bladder, brain, lung, colorectum, esophagus, ovary, and

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