

## Leukaemia Section

### Mini Review

# t(2;12)(p12;p13), t(12;14)(p13;q32), t(12;22)(p13;q11)

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### Identity

#### Note

Mantle cell lymphoma are usually associated with a t(11;14)(q13;q32), a CCND1/IgH rearrangement, and cyclin D1 overexpression.

### Clinics and pathology

#### Disease

Mantle cell lymphoma (MCL)

#### Note

This review does not include a case of t(2;12)(p12;p13) found in myeloid malignancy (Lai et al., 1995), a case of acute lymphoblastic leukemia with a t(12;14)(p13;q32) and IgH/ETV6 involvement (Lu et al., 2002); five cases of t(12;22)(p13;q11), not herein included either, have also been described in lymphoid malignancies, but with an unknown CCND2 status (see Mitelman database). Finally, there are a number of chronic myeloid leukemia aberrant translocations with t(12;22), which again represent other diseases.

#### Phenotype/cell stem origin

The cases of mantle cell lymphomas with the above translocations were typical mantle cell cases, with CD5+, CD20+, CD10-, CD23- expression, except for the lack of CCND1 expression.

#### Epidemiology

Five cases are available: 4 cases of MCL (Geske et al., 2006; Herens et al., 2008; Wlodarska et al., 2008), and a case of chronic lymphocytic leukemia (CLL) transforming into a Richter disease (Qian et al., 1999).

### Clinics

The patients are in stage IV of the disease, with a nodular, or nodular/diffuse pattern. There was 3 male and 2 female patients, aged 33, 52, 65, 70, and ? years.

### Prognosis

Data is missing in most cases; the two patients with data on prognosis died: the patient with Richter disease, and a MCL case, who died 64 months after diagnosis.

### Cytogenetics

#### Cytogenetics morphological

There was two cases of t(2;12), one case of cryptic t(12;14), one case of t(12;22), and one case with no metaphase.

#### Additional anomalies

+3 was found in two cases, +21 in one case, a complex karyotype in one case, and +12 and a t(14;19)(q32;q13) in the CLL/Richter case.

### Genes involved and proteins

#### Note

IgH, IgK, or IgL can be alternative partners of CCND2.

#### CCND2 (cyclin D2)

#### Location

12p13

#### Protein

CCND2 promotes cell cycle progression at the G1/S start transition. Interacts with CDK4 and CDK6.

CCND2 is activated through B-cell antigen receptor-induced, and CD19-induced signal transduction

pathways, including the RAS/RAF/MAPK pathway, the PLC gamma pathway, and the IKK/NF-KB pathway. CCND2 is critical in B-cell development (review in Chiles, 2004).

## Result of the chromosomal anomaly

### *Fusion protein*

#### **Oncogenesis**

Overexpression of cyclin D2.

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