

## Case Report Section

Paper co-edited with the European LeukemiaNet

# Unbalanced rearrangement der(9;18)(p10;q10) in a patient with polycythemia vera

Xinjie Xu, Xueyan Chen, Elizabeth A Rauch, Eric B Johnson, Kate J Thompson, Jennifer JS Laffin, Gordana Raca, Daniel F Kurtycz

University of Wisconsin-Madison, School of Medicine and Public Health, Department of Pediatrics, University of Wisconsin Cytogenetic Services, Wisconsin State Laboratory of Hygiene, Madison, WI, USA (XX, JJS); University of Wisconsin-Madison, Department of Pathology and Laboratory Medicine, Madison, WI, USA (XC); University of Wisconsin Cytogenetic Services, Wisconsin State Laboratory of Hygiene, Madison, WI, USA (EAR, EBJ, KJT); University of Wisconsin-Madison, School of Medicine and Public Health, Department of Pathology and Laboratory Medicine, University of Wisconsin Cytogenetic Services, Wisconsin State Laboratory of Hygiene, Madison, WI, USA (GR); University of Wisconsin-Madison, School of Medicine and Public Health, Department of Pathology and Laboratory Medicine, Wisconsin State Laboratory of Hygiene, Madison, WI, USA (DFK)

Published in Atlas Database: April 2010

Online updated version : <http://AtlasGeneticsOncology.org/Reports/der0918XuID100044.html>

DOI: 10.4267/2042/44952

This work is licensed under a Creative Commons Attribution-Noncommercial-No Derivative Works 2.0 France Licence.  
© 2011 Atlas of Genetics and Cytogenetics in Oncology and Haematology

### Clinics

#### Age and sex

69 years old female patient.

#### Previous history

No preleukemia ; no previous malignancy ; no inborn condition of note.

#### Organomegaly

no hepatomegaly , splenomegaly , no enlarged lymph nodes , no central nervous system involvement (there was no apparent central nervous system involvement at diagnosis).

### Blood

WBC : 15.2X 10<sup>9</sup>/l

HB : 11.7g/dl

Platelets : 894X 10<sup>9</sup>/l

Blasts : 0% peripheral

Bone marrow : 2% blasts

### Cyto-Pathology Classification

#### Cytology

NA

#### Immunophenotype

NA

#### Rearranged Ig Tcr

NA

#### Diagnosis

Polycythemia vera

### Survival

Date of diagnosis: 03-2005

Treatment: Phlebotomy

Complete remission : NA

Treatment related death : no

Relapse : NA

Status: Alive. Last follow up: 03-2010

Survival: 62 months

### Karyotype

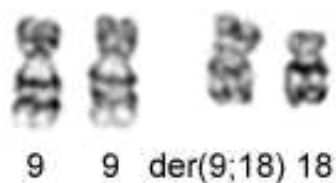
Sample: Bone marrow biopsy Sep 17th 2009.

Culture time: analysis was performed on overnight colcemid and 24-hour cultures.

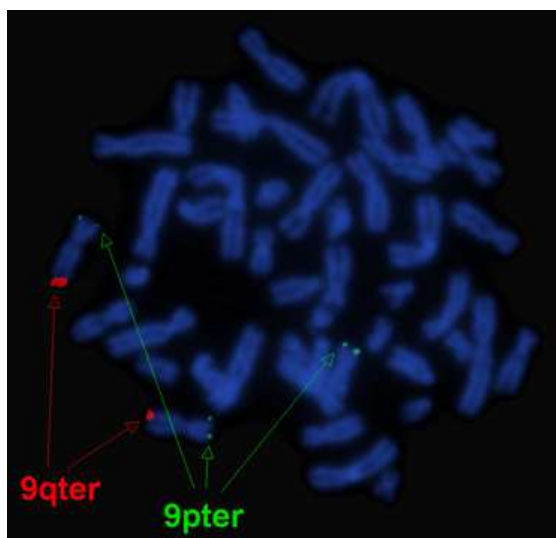
Banding: 400 band level.

#### Results:

46,XX,+9,der(9;18)(p10;q10)[11]/46,XX[9]



Karyotype of a metaphase from the follow up specimen from September 2009 (four years after the initial diagnosis), 24-hour culture.



FISH confirmation for an extra copy of 9p.

## Comments

We describe a new case of *der(9;18)(p10;q10)* detected in a patient with polycythemia vera (PV). This rare rearrangement has been reported in five cases of PV and one case of therapy associated acute myeloid leukemia (t-AML) after essential thrombocythemia (ET). Two of the five cases of PV showed progression from PV to post-polycythemic fibrosis, suggesting an association between this cytogenetic abnormality and disease progression.

The patient presented in this report was diagnosed with PV in 2005. Fluorescence In Situ Hybridization (FISH) testing for the BCR/ABL translocation was performed at diagnosis and was negative. Subsequent molecular analysis detected the presence of the JAK2 V617F mutation. The patient had a bone marrow biopsy in September of 2009, due to worsening anemia which was at that time attributed to excessive phlebotomy. Cytogenetic analysis showed the presence of the *der(9;18)(p10;q10)* in eleven out of twenty analyzed cells. At the later follow-up visit in February 2010, progression to the spent phase of PV was suspected,

based on the worsening of the patient's clinical presentation. However, the next bone marrow biopsy from March 2010 only revealed mildly increased reticulin fibrosis. In summary, although the patient currently does not have pathohistological signs of progression, clinically she is exhibiting worsening of the disease.

Gain of function of the JAK2 gene at 9p24 has a crucial role in the pathogenesis of myeloproliferative neoplasms. It has been proposed that the *der(9;18)(p10;q10)* contributes to the pathogenesis of PV through the gain of 9p, leading to an extra copy of the JAK2 gene. For the patient presented in this report the clinical significance of the *der(9;18)(p10;q10)* cannot be fully interpreted due to the absence of the cytogenetic results at diagnosis. However, concurrence between the detection of this cytogenetic abnormality and worsening of the patient's symptoms suggests that the *der(9;18)(p10;q10)* may have been an early marker of the disease evolution.

Gain of 9p resulting from *+i(9)(p10)* has been reported in two cases of PV, further indicating this gain as a recurrent finding in PV. Our patient is known to carry the activating JAK2 V617F mutation. One can hypothesize that in combination with this mutation, gain of an extra copy of either the mutated or the normal JAK2 allele through formation of the *der(9;18)(p10;q10)* contributed to the progression of the patient's disease. Our report therefore further suggests the association between the unbalanced rearrangement *der(9;18)(p10;q10)* and an advanced stage of polycythemia vera.

## References

- Chen Z, Notohamiprodjo M, Guan XY, Paietta E, Blackwell S, Stout K, Turner A, Richkind K, Trent JM, Lamb A, Sandberg AA. Gain of 9p in the pathogenesis of polycythemia vera. *Genes Chromosomes Cancer*. 1998 Aug;22(4):321-4
- Bacher U, Haferlach T, Schoch C. Gain of 9p due to an unbalanced rearrangement *der(9;18)*: a recurrent clonal abnormality in chronic myeloproliferative disorders. *Cancer Genet Cytogenet*. 2005 Jul 15;160(2):179-83
- Ohyashiki K, Kodama A, Ohyashiki JH. Recurrent *der(9;18)* in essential thrombocythemia with JAK2 V617F is highly linked to myelofibrosis development. *Cancer Genet Cytogenet*. 2008 Oct;186(1):6-11

*This article should be referenced as such:*

Xu X, Chen X, Rauch EA, Johnson EB, Thompson KJ, Laffin JJS, Raca G, Kurtucz DF. Unbalanced rearrangement *der(9;18)(p10;q10)* in a patient with polycythemia vera. *Atlas Genet Cytogenet Oncol Haematol*. 2011; 15(1):115-116.