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# CLINICAL AND HEMATOLOGICAL EVIDENCE OF A RARE CASE OF POLYCYTHEMIA VERA BY CONVENTIONAL CYTOGENETICS

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**ABSTRACT**

The authors report a case of polycythemia vera (PV) in a 61-year-old Chinese man. Cytogenetic studies revealed t (1;12)(p36;q13) along with del(16)(q21) in hematopoietic cells. This seems to be a rare clinical event.

## INTRODUCTION

Polycythemia vera (PV) [synonyms: splenomegalic polycythemia, Vaquez-Osler syndrome, erythremia, primary polycythemia erythrocytoses or polyglobulia] is a rare clonal, progressive disorder originating in a single aberrant hematopoietic precursor cell (stem cell) in the bone marrow. It is a chronic blood disorder marked by an abnormal increase and accumulation of red blood cells (RBCs), white blood cells (WBCs), and platelets. PV is called a myeloproliferative disorder (MPD), which means that the bone marrow is producing too many cells too quickly. Most of the symptoms of PV are related to the increased volume of the patient's blood and its greater thickness (high viscosity). PV sometimes evolves into a different myeloproliferative disorder or into AML (Acute Myeloid Leukemia) and MDS (Myeloid Dysplastic Syndrome). Both these conditions are known as precursors of Blood leukemia that leads to chronic stage that is CML - chronic myeliod leukemia.[1] It is a relatively common progressive disorder that develops over a course of 10-20 years. Older age is the only established risk factor. Peak incidence occurs between the ages of 50 and 70 years with a mean age of onset is 60 years. PV shows chromosomal abnormalities in their myeloid cells. These are similar to the abnormal karyotypes observed in patients with myelodysplastic syndromes and other MPDs. The most frequently reported cytogenetic alteration in PV includes 20q deletion (8.4%), 13q deletion (3%), trisomy 9 (7%) and 9p alterations, Trisomy 8 (7%), Trisomy of 1q (4%), 5q deletion or monosomy 5 (3%), 7q deletion or monosomy 7 (1%), JAK2 (V617F) mutation (50-70%)[2] and *TET2* mutation (16%). So far there are 3 cases described in the literature.[3,4,5] Here we are reporting a different kind of chromosomal abnormality which has not been reported earlier.

## CASE PRESENTATION

The present case study was done on a 61 year old Chinese man. In our case presentation, we had rare aberrant chromosomes and chromosomal karyotypes previously not reported worldwide. Metaphases obtained were from unstimulated cultures from bone marrow aspirate and harvested as per standard protocol which includes 24hr culture with over night colchicine treatment and 72 hour culture with overnight colchicine treatment after 48 hours of incubation at 37˚C with 5% $CO_2$.

## DISCUSSION

Cytogenetics is essential in the routine diagnostic setting of CMPD (chronic myeloproliferative disorders) or cases suspicious for CMPD. In CMPD, recurrent cytogenetic abnormalities occur. Thus the value of conventional cytogenetics in the routine diagnostic setting of CMPD remains crucial. The disease was first described in 1882 [6] and further elaborated in 1903.[7] William Dameshek included PV as one of the 'myeloproliferative disorders' in 1951.[8.] In 1976, the clonal nature of PV was deciphered [9], but it took another 20 years before William Vainchenker discovered its signature mutation (*JAK2*-V617F).[10] In 2008, the World Health Organization reclassified MPDs to "myeloproliferative neoplasms" (MPNs) to reflect the consensus that these diseases are blood cancers (neoplasms)[11]. Here, results are reported using the International System for Human Cytogenetic Nomenclature. Cytogenetic results were considered pathologic when at least two abnormal metaphases were identified to carry a

structural abnormality or a chromosome gain, or when at least three metaphases with the same chromosome loss were identified. The entire analysis was done with 25 metaphases available, the chromosome analysis revealed two clones; the first set of clone represented a translocation between 1st and 12th chromosomes in all metaphases analysed - 46,XY,t(1;12)(p36.1;q13)[21] (**Fig 1 and Fig 3**, partial karyotypes of chromosomes 1 and 12 with respective ideograms) and second subset of clone revealed a karyotype which included t(1:12) along with del(16q21) onwards- 46,XY,t(1;12)(p36.1;q13),del(16)(q21)[4] (**Fig 2 and Fig 4** partial karyotype of chromosome 16 with ideogram). The entire karyotype 46,XY,t(1;12)(p36.1;q13)[21]/46,XY,t(1;12)(p36.1;q13),del(16)(q21)[4] (Fig 2).

Thus, there are 3 cases with a t(1;12)(p36;p13) described in the literature. In the first reported case, a 50-year-old smoking patient suffered from CML. Cytogenetic abnormalities (Ph 1 chromosome, t(1;12) (p36;p13), and trisomy of chromosome 20) were found in hemopoetic cells[3]. The second patient, a 66-year-old female, showed MDS – subtype refractory anemia with excess blasts in transformation (RAEB-T) revealed a t(1;12)(p36;p13) involving ETV6 and rapidly proceeded to secondary AML [4], the third case- a 46-year-old male had MDS –subtype refractory anemia cytopenia with mutilineage dysplasia (RCMD) in an initial stage revealed a t(1;12)(p36;p13) involving ETV6.[5]

## CONCLUSION

In the present study a 61 year old male is suspected with polycythemia vera. In this case along with translocation of chromosome 1 and 12, the arms involved are 1p and 12q respectively which are different from cited literatures. This is a novel observations and important confirmations. There is a deletion on chromosome 16q in some cells which is basically a subclone from the main clonal cell line of translocation 1 and 12. As per the mentioned abnormalities cited in various literatures from worldwide study we have not come across a similar abnormality reported. Hence this finding of 46,XY,t(1;12)(p36.1;q13)[21]/46,XY,t(1;12)(p36.1;q13),del(16)(q21)[4] may be crucial and adding value to the current diagnosis and ongoing large scale research on PV.

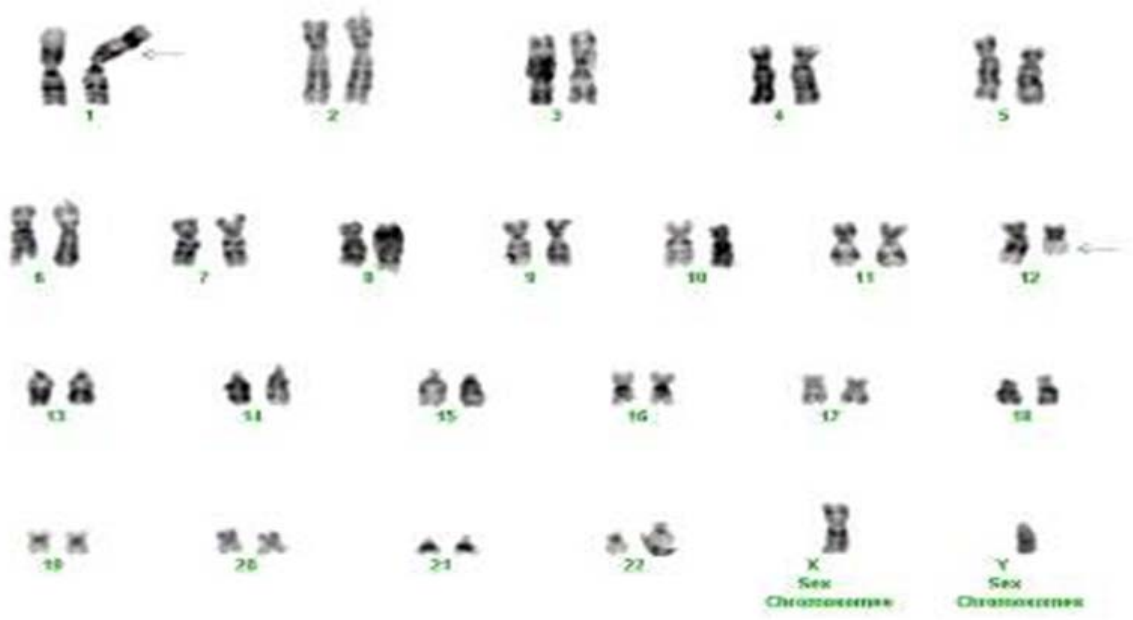


**Figure 1.** Giemsa Trypsin Banded Karyotype from Bone Marrow cells 46,XY,t(1;12)(p36.1;q13).

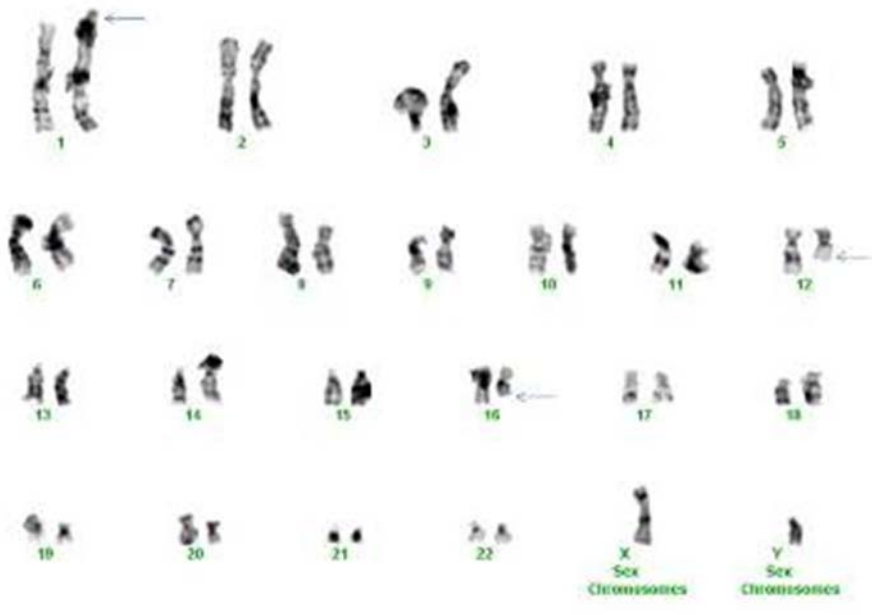


**Figure 2.** Giemsa Trypsin Banded Karyotype from Bone Marrow cells 46,XY,t(1;12)(p36.1;q13),del(16)

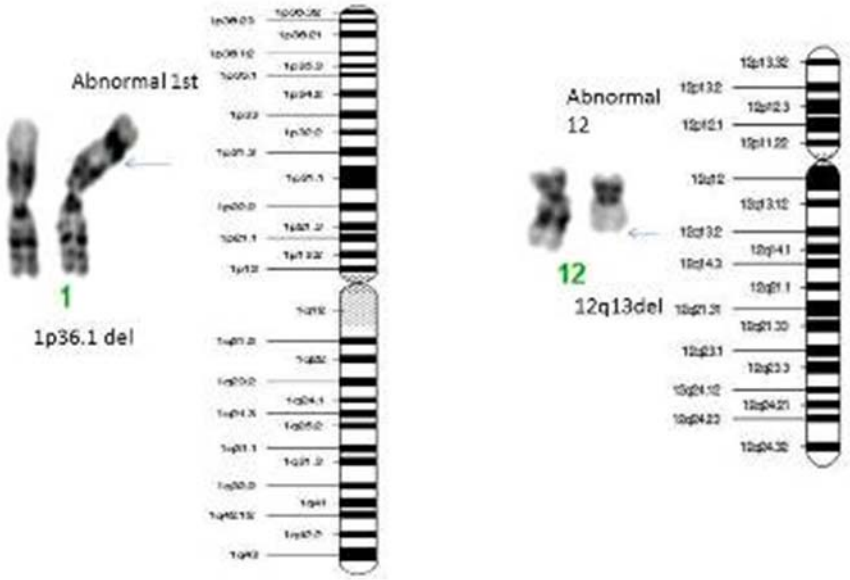


**Figure 3.** Giemsa Trypsin Banded partial karyotypes of 1st and 12th chromosome showing break points and their corresponding ideograms

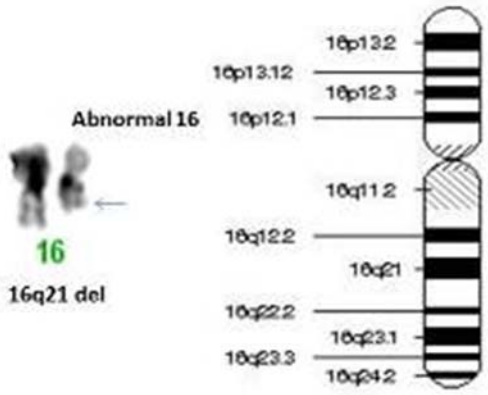


**Figure 4.** Giemsa Trypsin Banded partial karyotypes of 16th chromosome showing deletion region and their corresponding ideogram.

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