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CASE REPORT

A Rare Abnormal Male Karyotype with 46,X,DER(Y)(YQTER→P11.3::2Q2.1→QTER),DEL(2)(2PTER→11.3:)

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Abstract

Objective: *Structural chromosomal abnormalities such as translocation in males and y deletions in the molecular missile cause infertility and related azoospermia. The aim of this study was to perform the karyotype analysis of a 51-year-old male patient who was referred to Dicle University Faculty of Medicine, Department of Medical Biology and Genetics for karyotype analysis due to primary infertility.*

Methods: *Chromosome analysis was performed in peripheral blood culture by applying conventional cytogenetic method and GTG banding technique.*

Results: *Chromosome analysis a rare abnormal karyotype with 46, X, der(Y) (Yqter→p11.3::2q2.1→qter), del(2pte2q 11.3:) chromosomal structure was observed. In thıs study we report a case with balanced translocation between chromosomes 2 and Y.*

Conclusion: *The causes leading to male infertility may be later, and some of them are of genetic origin. While chromosomal abnormalities are seen in 0.5% of the healthy population, this rate increases to 5.8% in infertile men, so it is recommended to genetically investigate all individuals with azoospermia in semen analysis.*

Key Words: balanced translocation, chromosome anomalies, infertility.

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Introduction

The rate of numerical and structural chromosomal anomalies in men who have been diagnosed with semen anomalies due to infertility, such as azoospermia and oligospermia, was approximately 20%. The majority of chromosome anomalies associated with infertility include sex chromosomes 1. Among the structural changes, the most common ones are translocations and are seen at 1/500 frequencies 2. The absence of pregnancy despite a regular and unprotected relationship for one year is defined as infertility and occurs in 15% of couples 3. Genetic and non-genetic factors are involved in the etiology of infertility. Half of the cases of infertility are caused by male reproductive insufficiency . Genetic disorders play an important role in the etiology of azoospermic and severe oligospermic patients. When compared to the normal population (0.5%), chromosome anomalies (5.8%) are much higher in infertile men (5%) 4. The most common chromosome anomaly in the presence of azoospermia severe male infertility is 47, XXY (10-20%), but 45, X monosomia and Y chromosome structural anomalies are also seen 4. These stuation are significantly higher in azoospermic men (10-15%) than oligospermic men (5-7%) 5. When the number of sperms drops, the incidence of anomalies increases. Autosomal anomalies (3%) are the most common in the oligospermic group, while sex chromosome anomalies (12.6%) are predominant in azoospermic men 6.

Translocations; is one of the common chromosomal arrangements.Translocations have seen on gonosomes are frequently seen in azoospermic, oligospermic patients. Translocations are divided into two as balanced and unbalanced according to the decrease and increase in the rate of genetic material.When there is loss or gain in the genetic material, translocation it is considered unbalanced. However, if there is no gain or loss in the genetic material, the translocation is considered to be balanced 7,8. Balanced translocations are the most common structural chromosomal anomalies in humans, with an incidence of 1 in 1175 newborns 9. Balanced translocation carriers generally have normal phenotype. However, unbalanced gametes may appear as a result of the pairing between derivative chromosomes and their normal homologs. Genetic disorders associated with azoospermia and severe oligospermia can cause infertility in the male by creating problems in the sperm formation stage or in the sperm transport stage. Y-chromosome microdeletions capable of isolated spermatogenesis defect, cystic fibrosis gene mutations causing congenital vas deferens agenesis, sperm anomalies that disrupt testicular function, genetic factors that directly affect sperm functions are known related to male infertility 10.

Materials and Methods

Case

A 51-year-old male patient was referred to our Dicle University Medical Faculty Medical Biology and Genetics Department for karyotype analysis due to primary infertility from the outer center. The patient has a history of failure to have a child with microinjection therapy.. He was 176 tall and weighed 88 kg. He had the appearance of light gynecomastia. Azospermia was observed as a result of semen analysis of the patient.In ultrasonographic examination, both testicles are in normal size and consistency. The right testicle volume was approximately 22 ml and the left testicle volume was 9 ml. In sperm analysis, no spermatozoa was observed. Blood analysis laboratory values; follicle-stimulating hormone level (FSH) is 20.58 mlU / ml (normal range, 1.5-12.4 mlU / ml) and is high. Plasma luteinizing hormone level (LH) is 7.18 mlU / ml (normal range, 1.7-8.6 mlU / ml) and testosterone hormone level is 3.64 ng / ml (normal range, 2.18-9.05 ng / ml). Glucose level is 207 mg/dl (normal range,70-109 mg/dl).High insulin level was compatible with diabetes mellitus. Growth hormone level was low. The consent of the patient was obtained for this study to be a case.

Cytogenetic analysis

Chromosome analysis was performed in peripheral blood culture by applying conventional cytogenetic method and GTG banding technique. In the chromosome analysis, 50 metaphase plates were examined and karyotypes of 30 metaphase plates were made and reported according to an international system for human cytogenetic nomenclature (ISCN) 2005 (Shaffer & Tommerup, 2005).

In the cytogenetic examination of the case, it was observed that there was 46, X, der (Y) (Yqter → p11.3 :: 2q2.1 → qter), del (2) (2pter →2q11.3:) chromosome structure.

Polymerase chain reaction (PCR) method was applied to detect microdeletions in the Y chromosome. No deletion was found in the patient whose AZFa, AZFb and AZFc gene regions were examined.

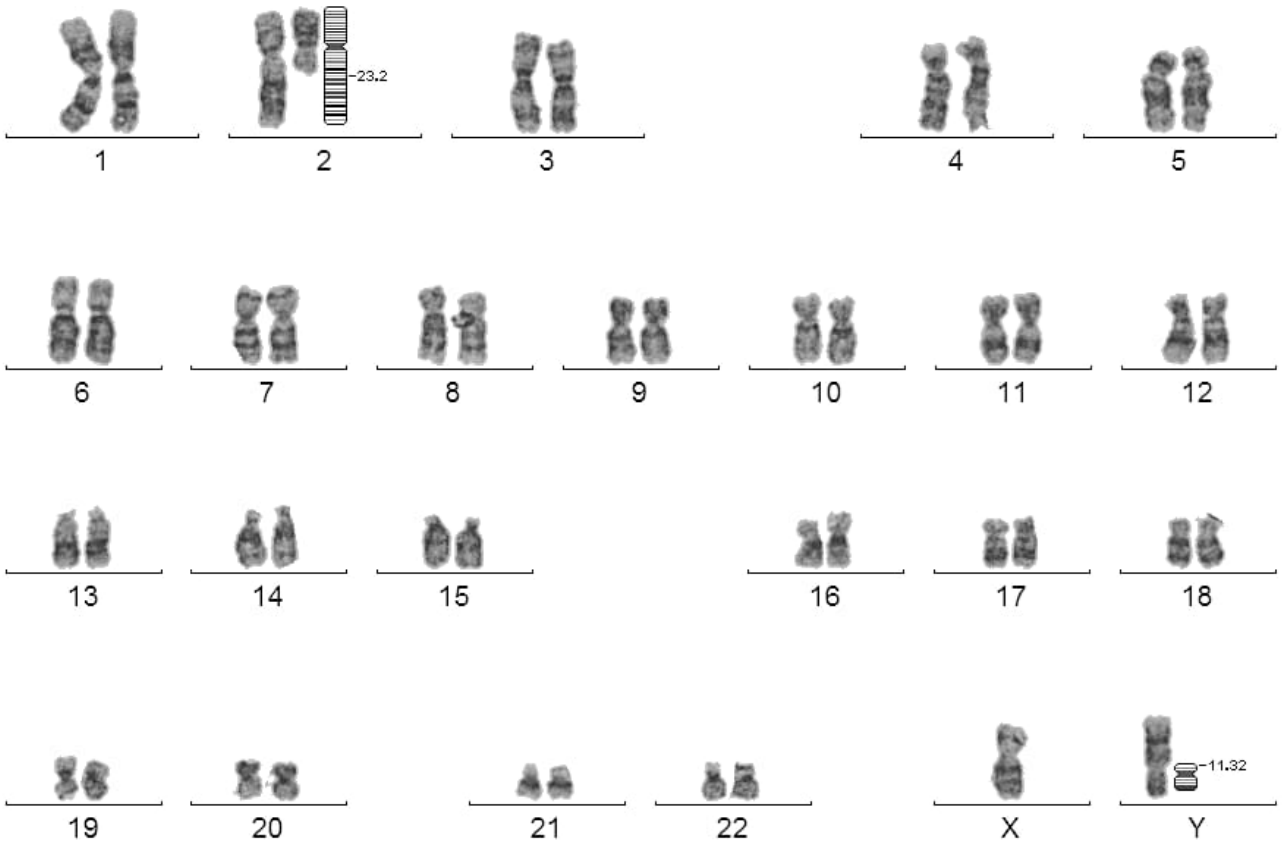

Figure 1. 46,X,der(Y)(Yqter→p11.3::2q2.1→qter), del (2) (2pter→.11.3:)

Discussion

The reasons leading to male infertility may be later, and some are of genetic origin. While chromosome anomalies are observed in 0.5% of healthy population, this rate rises to 5.8% in infertile men, so it is recommended to investigate all individuals with azoospermia in semen analysis 11. Balanced translocation was the cause of infertility in our patient who had azoospermia in semen analysis.

Infertility based on sperm factor can be treated with intracytoplasmic sperm injection (ICSI) technique. However, before ICSI, every couple should be informed about the risk of genetic damage, existing infertility and other changing phenotypic symptoms present to the child. A fetus with unstable chromosomal abnormality resulting in miscarriage was detected in our patient who was treated with ICSI. Balanced chromosal irregularity constitutes an important group among prenatal cytogenetic diagnostic indications, since the risk of fetus with unbalanced chromosal irregularity is 10-15% in parents with this irregularity 12. Sperm anoploidies are frequently seen in

azoospermic patients. Therefore, the risk of transmission of karyotype anomaly is high in pregnancies with ICSI 13. For this reason, amniocentesis or chorionic villus sampling should be recommended for prenatal genetic diagnosis in the genetic counseling given to patients with a numerical or structural chromosomal anomaly prior to ICSI treatment.

References

1. DÜNDAR M, ed. *Tibbi Genetik ve Klinik Uygulamaları*. Akademisyen Kitabevi; 2016.

2. Sago H. Prenatal diagnosis of chromosomal abnormalities through amniocentesis. *J Mamm Ova Res*. 2004;21(1):18-21.

3. Gallagher JA, Ranganath LR, Zatkova A. Alkaptonuria. In: Maloy S, Hughes K, eds. *Brenner's Encyclopedia of Genetics*. 2nd ed. Elsevier Science; 2013:71-75. https://books.google.com.tr/books?id=4cj64BhrnjcC.

4. Dündar M. Kromozom Yapi, Organizasyonu ve Sitogenetik Analizler. In: *Tıbbi Genetik ve Klinik Uygulamaları*. 1st ed. ; 2016:134.

5. Suganya J. Chromosomal Abnormalities in Infertile Men from Southern India. *J Clin diagnostic Res*. 2015. doi:10.7860/JCDR/2015/14429.6247

6. Erol D, Yüce H. *Oligospermik İnfertil Bir Erkekte Resiprokal Translokasyon t(1;5)(P33;Qter)*., 204-206 (2009).

7. Mcinnes RR, Nusbaum RL, Willard HF. *Tıbbi Genetik*. 6th ed.; 2005.

8. Tobias ES, Connor M, Ferguson-Smith M. *Tıbbi Genetiğin Esasları*. 1st ed. (Uğur Ö, ed.). İstanbul Tıp Kitabevi; 2014.

9. Morel F, Douet-Guilbert N, Le Bris MJ, et al. Meiotic segregation of translocations during male gametogenesis. *Int J Androl*. 2004. doi:10.1111/j.1365-2605.2004.00490.x

10. Krausz C, Hoefsloot L, Simoni M, Tüttelmann F. EAA/EMQN best practice guidelines for molecular diagnosis of Y-chromosomal microdeletions: State-of-the-art 2013. *Andrology*. 2014. doi:10.1111/j.2047-2927.2013.00173.x

11. Shah K, Sivapalan G, Gibbons N, Tempest H, Griffin D. The genetic basis of infertility. *Reproduction*. July 2003:13-25. doi:10.1530/rep.0.1260013

12. Franssen MTM, Korevaar JC, van der Veen F, Leschot NJ, Bossuyt PMM, Goddijn M. Reproductive outcome after chromosome analysis in couples with two or more miscarriages: case-control study. *BMJ*. 2006;332(7544):759-763. doi:10.1136/bmj.38735.459144.2F

13. Burrello N, Vicari E, Calogero AE. Chromosome abnormalities in spermatozoa of patients with azoospermia and normal somatic karyotype. *Cytogenet Genome Res*. 2005;111(3-4):363-365. doi:10.1159/000086912