Original Article

ABO Bloods group incompatibility in recurrent abortion

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Abstract

Background

A vast variety of factors may cause recurrent pregnancy loss. Blood group incompatibility of parents could cause abortion. The examination of couples or twins, blood groups showed that the blood group incompatibility can affect adversely the outcome of pregnancy. Couples with blood group incompatibility are more involved in spontaneous miscarriage. Antigenes in two different blood groups could disorganize implantation. Aborted embryos with normal karyotype showed more frequently blood group incompatibility with their mother. Abnormal newborn and stillbirth were observed more frequent in couples with incompatible blood groups than without.

Methods

This study investigates relationship between blood groups incompatibility and recurrent miscarriage in couples who were referred to genetic counseling clinic of Yazd Research & Clinical Center for Infertility. The blood group of 100 couples with recurrent miscarriage was evaluated using slide test method. Their abortions were unknown after possible evaluation. One hundred and twelve fertile couples entered to this study as control group, which have at least two normal children without any abortion.

Results

The results showed blood group incompatibility was more frequent in couples with recurrent abortion than fertile couples.

Conclusion

Blood group incompatibility of parents could causes antigen-antibody interaction between mother and fetus, which ended with abortion. In previous study it was believed that blood group incompatibility cases fetal anemia and stillbirth.

Keywords

Blood groups incompatibility, Recurrent miscarriage, Antigen-antibody

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Introduction

Recurrent pregnancy loss (RPL) could happen for some couples, which is not rare. Antigen antibody interaction could be one of the RPL cases. Blood groups define as antigen on the surface of the cells, which express by genes inherited from parents. Four phenotypes usually were found in ABO blood group antigens, which three alleles express them. These phenotypes are A, B, AB and O. If a person is inherited allele A (AA or AO), N-acetyl-galactosaminyl transferase adds N-acetyl-galactosamin on to protein H. If a person is inherited allele B (BO or BB), galactosyl transferase adds D-galactose to protein H. If a person inherited both alleles, A and B (AB), both enzyme act and make blood group AB with two antigens. However, no enzyme is produced if a person inherited only allele O from both parents (1-3).

Blood groups study showed that an incompatibility of the blood groups can affect reproduction. Those couples with incompatibility blood groups' experiences spontaneous miscarriage or stillbirth more frequently (4-6). In addition, the mortality of mothers in pregnancy was higher in couples who had blood group incompatibility (7).

Among aborted embryos with normal karyotype, ABO incompatibility between mother and embryo can cause premature birth. The widely repeated delivery of abnormal newborn and stillbirth were more frequent in couples with incompatible blood group than others (8-11).

The available studies showed the relationship between blood groups and recurrent abortion. Blood group incompatibility could cause intra uterine fetal death or severe fetal hemolytic anemia (12-13).

The study on a considerable number of women affected by miscarriage showed that the mothers with blood group O and fetus with blood group B could cause spontaneous abortion. This incompatibility could interrupt any phase of fertilization to the end of pregnancy (14-15). Study the couples affected by habitual miscarriage showed that the incompatibilities of ABO blood groups could probably cause antigen and antibody interaction and then disrupted implantation (6). Premature delivery was seen in mother with incompatible ABO blood group with her fetus (11).

Infertility could happen in couples with incompatible blood groups (16-17). However, some studies did not agree with this idea (18-20). There was a relationship between incompatible blood group in couples and molar pregnancy and implantation was not mostly success in those couples (11, 17).

Present study evaluated the frequency of ABO blood group incompatibility in couples with recurrent abortion and compared with fertile couples without any abortion.

Materials and Methods

This is a case-control study, which evaluate the blood groups of 100 couples with recurrent abortion in compare with fertile couples without abotion. They had recurrent miscarriage (two or more) with unknown reason, who admitted to genetic counseling clinic of Yazd Research and Clinical Centre for infertility. The control group was 112 cases of fertile couples, who had at least two children without having any miscarriage. All blood groups revealed by slides agglutination test using ABO study kit (Blood Research and Fractionation Company, Iran) after they signed informed consent papers. Blood drop was taken by needle bite on 4th hand finger. For the ABO test, a drop of blood was placed on clean slides. A drop of each of the antisera, anti A, anti B was added and mixed with each blood sample. Blood groups were determined on the basis of agglutination.

This study compared the blood groups of couples affected by recurrent miscarriage with those having children but with no recorded abortion.

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The couples with recurrent miscarriage were evaluated for possible reasons for abortion. These evaluations included cytogenetic analysis, anatomical evaluation of uterus, hormonal evaluation and immunological abnormality.
Incompatibility defined as type 1 when wife and husband have two different blood groups. It was type 2 when wife or husband have blood group O and their partner have blood group A, B or AB. It was type 3 when mother has blood group O and her husband A, B or AB. It was incompatibility type 4 when mother is A or B and her husband is opposite B or A.
The obtained data were statistically analyzed by SPSS software (version 15) using Chi-square test. This result is significant, when PV is less than 0.05.

Results

The mean age of women with RM was 27.2 (18 t0 45) and in control group was 29 (19-42). The difference was not significant (PV = 0.239). Nine couples live in Yazd province and the rest from other provinces. The frequency distribution of various blood groups in women and men with RM was the same with control group (table 1). Type 1 incompatible blood groups were more frequent in cases than controls. This incompatibility was the different blood group in husband and wife. It was women with blood group A, B, AB and O and their husband were different with them, which their fetus could be different with mothers (type 1 incompatibility). The frequency of type 2, 3 and 4 incompatibility were not significantly different between cases and controls.
Frequency of different blood groups incompatibility was tested between cases and controls, which was shown in table 2.

Discussion

Many developments were acquired in blood transfusion in medicine, but no complete information had been obtained about its critical dangers on reproduction.
Fetus expresses paternally inherited alloantigens, which mother's immune system reshapes a destructive alloimmune response to a state of tolerance during pregnancy (21-22). However, hemolytic responses after the transfusion of embryos red blood cells to mother circulation could stimulate the anti-bodies against embryo cells. These antibodies could pass to the embryo blood circulation and causes hemolysis. This problem could cause mild to severe hemolytic anemia in fetus and abortion (23-24).
After delivery, neonates admitted with high total serum bilirubin mostly because of ABO incompatibility. ABO incompatibility happens in 20 to 25% of pregnancies and hemolytic disease develops in about 10% of such offspring (25).
Isoimmune hemolytic disease of the newborn mostly caused by ABO incompatibility. This hemolytic disease is clinically milder than that from Rh incompatibility, but severe hemolysis occasionally occurs, and some cases require exchange transfusion (26).
Positive direct combs' test and positive family history of neonatal jaundice or previous abortion are strongly predicted ABO incompatibility. ABO incompatibility is one of the most common causes of bilirubin encephalopathy, and in the uterus could cause impair pregnancy and abortion (27-29). Unsuccessful pregnancy was seen in couples with incompatible blood group more frequent. In addition, mother's death happens more in such pregnancy (7).
Aborted fetuses with normal karyotype clearly had incompatible blood group with their mothers. Affected fetuses and stillbirth also were more frequent in blood group incompatibility of mothers and fathers (8-10).
Blood group antigens were found on the surface of spermatozoa, which could affect fertility of women with incompatible antigens (17, 23).

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However, some investigation found no effect of incompatibility on reproduction or fetal loss (18-20).

In conclusion, evaluation of couples' blood group with RPL showed the incompatibilities are more frequent than normal couples significantly. This was confirmed by other study on women with recurrent abortion and neonates with abnormality.

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Table 1: The frequency distribution of blood group in couples with RPL and without

Blood group	With RPL		Without	
	Male	Female	Male	Female
A	32	28	37	30
B	27	34	32	36
AB	11	10	11	11
O	30	34	32	35
Sum	100	100	112	112

This table show that the frequency distribution of blood group in couples with RPL and without is similar (chi-square test, PV=0.353).

Table2: The frequency distribution of type1,2,3,4 incompatibility blood group in couples with RPL and without

Incompatibility	Type 1		Type 2		Type 3		Type 4	
	with	without	with	without	with	without	with	without
With PRL	72	28	55	45	80	20	38	62
Without	64	48	71	41	95	17	50	62

This table shows that only type1 ABO blood group incompatibility in couples with RPL significantly was more than couples without RPL (chi-square test, PV=0.017).

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