

Human Parvovirus B19, Cytomegalovirus Infections and Thyroid Autoimmunity in Women with Recurrent First Trimester Abortion

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Abstract

OBJECTIVE: The goal of this study was to modify and optimize the screening and diagnostic procedures of unexplained recurrent abortion. Antithyroid antibodies, parvovirus B19 (B19V) and cytomegalovirus (CMV) infections, which were usually overlooked in clinical practice of handling cases of recurrent abortion, were studied to evaluate their role in the pathogenesis of recurrent first trimester abortion. Also , we tried to elucidate the importance of detection of these agents and whether it should be routine prenatal investigations of women with unexplained recurrent abortion.

STUDY DESIGN: sixty women with unexplained recurrent first trimester abortion were the study group and thirty term healthy pregnant women, were selected as a control. Placental and fetal tissues were analyzed for B19V and CMV deoxyribonucleic acids using nested polymerase chain reaction (PCR) assay. Also sera were analyzed for T3, T4 and TSH levels, the presence of antithyroid antibodies (thyroglobulin and thyroid peroxidase), CMV specific IgM antibodies and parvovirus B19-DNA by dot blot hybridization assay.

RESULTS: Parvovirus B19-DNA was demonstrated in nearly one third of the aborted products (19/60 - 31.67 %) and 6.67% of the placentas of the control group, that represent highly significant difference (P <0.001). Whereas, serum samples of the two groups were negative for parvovirus B19 viral DNA by dot blot hybridization. Cytomegalovirus – DNA was demonstrated in 7/60 aborted tissues (11.67 %) and one placenta of the controls (3.33 %), that represent non significant changes (P > 0.05). In contrast, only 5 aborting women (8.33 %) and a woman of the control group (3.33%) were CMV-IgM seropositive, that also represent non significant changes (P > 0.05). Antithyroglobulin antibody levels were significantly higher in aborting women (7/60) than control (P < 0.05), whereas there was no significant changes in antithyroid peroxidase antibody levels between the two groups. Nine aborting women (15%) were seropositive for one or both of the thyroid autoantibodies compared with two (6.67%) of the control group, that represent non significant changes (P>0.05). We did not find any significant relation between thyroid autoimmunity and viral infections (B19V & CMV) in women with unexplained recurrent first trimester miscarriage.

CONCLUSION: Parvovirus B19 infection was found to be an important pathogenic agent in recurrent first trimester abortion. It is essential to investigate for B19V infection among pregnant women with recurrent abortion. This significant finding demonstrates the usefulness of a sensitive molecular tool, PCR assay of viral DNA to aid in the diagnosis. However, testing for cytomegalovirus infection and antithyroid antibodies are not essential as routine prenatal investigations and should be restricted to certain patients with unexplained recurrent pregnancy loss.

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Introduction

Recurrent pregnancy loss is an intriguing problem in obstetric practice. Over the last decade, many etiologic factors and several treatment regimens have been reported. However, there is no definite evidence for most causes of recurrent miscarriage and therapeutic interventions of any kind can be considered as merely empirical (Stirrat 1990).

Evidence supporting the autoimmune concept is now extensive. Triggering circumstances such as infection, endocrine, genetic, environmental, and cultural mechanisms, or ingestion of drugs as well as aging process appear to participate in the development of autoimmune diseases (Geva et al 1997). Abnormal autoantibody levels can result in clinical, subclinical, or preclinical autoimmune conditions. Muller et al (1999) reported that the presence of a large variety of autoantibodies were associated with repeated pregnancy loss. This association was first made with reference to lupus anticoagulant and other antiphospholipid antibodies (Lubbe and Liggins 1988). Thereafter, Stagnaro-Green et al (1990) were the first to describe the association between antithyroid antibodies and pregnancy loss.

On the other hand, many viral infections appear to be involved in the etiology of spontaneous abortion: cytomegalovirus, rubella, herpes simplex, mumps and Epstein Barr virus (Brown et al 1987; Stagno 1995). Although human cytomegalovirus (CMV) infection is the most common viral infections transmitted via the placenta (Baumann et al 2000), parvovirus B19 can also be transmitted from the infected mother to the fetus.

Therefore, spontaneous abortion, fetal anemia, nonimmune hydrops and stillbirth could result (Harger et al 1998).

The present study reports the results of our investigations in apparently healthy women with at least two or more unexplained first trimester pregnancy losses. These women were screened for certain factors that are not routinely investigated in clinical practice of handling a case of miscarriage, aiming at assessing its clinical importance and demonstrating whether it should be routine prenatal investigations in recurrent first trimester pregnancy losses. These women were screened for:

- (1) Antithyroid autoantibodies in serum,
- (2) Human parvovirus B19 (B19V) infection: viral DNA was detected in serum and aborted products.
- (3) Cytomegalovirus (CMV) infection: specific- IgM antibodies in maternal serum and viral DNA in the placenta and products of conception.

Studying of these viral infections was selected because the infected patients are frequently asymptomatic or exhibited symptoms commonly associated with pregnancy, such as fatigue and joint pain. We tried to clarify whether there will be any association between viral infections (CMV and parvovirus B19) and presence of thyroid autoimmunity to determine their roles in the pathogenesis of recurrent first trimester pregnancy loss.

Subjects and Methods

One hundred pregnant women, the subjects of this study, were selected from the obstetrics and emergency departments of Al-Zahraa University hospital in the period from December

1998 and December 1999. They were classified into two groups:

Group I : thirty term pregnant women (37 – 41 weeks gestations) attending the delivery department with uncomplicated pregnancy and with no history of pregnancy loss (control group).

Group II: seventy pregnant women in the first trimester of pregnancy were admitted to the hospital with history of two or more recurrent abortions and presented with spontaneous abortion, missed or inevitable abortion, diagnosed by history, examinations and confirmed by ultrasound scanning (study group).

Most of the participants of the study group were selected from a larger pool of repeated aborters after women with obvious other causes of pregnancy loss had been excluded. Patients with significant uterine anomalies, uterine myomas, parental chromosomal abnormalities that were detected previously from peripheral blood, patients with possible luteal phase defect and autoimmune abnormalities among phospholipid antibodies were excluded. The majority of pregnancy losses in the final study group had not undergone prior chromosomal evaluation of products of conception. Chromosomal abnormalities in such pregnancy losses could therefore not be ruled out.

The patients age, parity, occupation, obstetric history, date of last menstrual period, and description of any symptoms (fever, rash, or arthralgias), or history of exposure to a child with erythema infectiosum were recorded. All women were subjected to the following:

A-Blood was drawn on admission and serum was stored at -50°C for determination of:

1. TSH, T3 and T4 levels by ELISA
2. Thyroid autoantibodies: thyroid Peroxidase (TPO) and

thyroglobulin (TG)

3. determination of CMV specific IgM antibody, and parvovirus B19 DNA by dot blot hybridization assay.

B-The products of conceptions of the miscarried women and the placenta of the delivered women were collected and stored at -70°C for nested PCR assay of:

- 1- Parvovirus B19 - DNA.
- 2- Cytomegalovirus (CMV) - DNA.

NB: we preferred to study B19V viral DNA in the aborted materials by PCR assay as Peters and Nicolaides (1990) demonstrated that IgM antibody determination is less sensitive than PCR assay and hence less useful tool for diagnosing intrauterine B19V infection. We also studied B19V viral DNA in the serum by hybridization technique.

Laboratory evaluation:

Active total T3 and thyroxin (T4) were determined by using enzyme linked immunosorbent assay method (Diagnostic System Laboratories , Inc, Texas , USA. Gruhn et al 1987). The procedure of ELISA followed the basic principle of enzyme immunoassay where there was competition between an unlabeled antigen and an enzyme labeled antigen for a fixed number of antibody binding sites. The amount of enzyme labeled antigen bound to the antibody was inversely proportional to the concentration of the unlabeled analyte present. Unbound materials were removed by decanting and washing the wells. The absorbance measured was inversely proportional to the concentration of T3 and T4 present in the serum. A set of T3 & T4 standards were used to plot a standard curve of absorbance versus T3& T4 concentration and the unknowns can be

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calculated. The normal range for active T4 is defined as 4.5 – 11.3 µg / dl and for total T3 as 69 – 202 ng / dl.

Thyroid peroxidase antibodies (TPO) were assayed using Quanta Litc™ TPO kit (Inova Diagnostics, INC, San Diego, calculated, Feldt- Rasmussen 1996). Purified human TPO antigen was bound to the wells of a polystyrene microwell plate under conditions that will preserve the antigen in its native state. Prediluted controls and diluted sera were added to bind to the immobilized antigen. Unbound sample was washed away and an enzyme labeled antihuman IgG antibody was added to each well. A second incubation allows the enzyme labeled to bind to any patient antibodies that had become attached to the microwell. After washing away any unbound enzyme conjugate, the remaining enzyme activity was measured by adding a chromogenic substrate and measuring of the color that developed. The assay can be evaluated by comparing the color that developed in the patient wells with the color in the central wells. Negative values range from 0-100 units, positive results are > 100 units.

Thyroglobulin Antibodies by chemiluminescent EIA: Serum thyroglobulin Antibodies were measured by IMMULITE Automated Analyzer (Spencer et al 1996). This method is a solid phase, two step chemiluminescent enzyme immunoassay for use with the immulite for the quantitative measurement of antibodies against thyroglobulin. The solid phase, a polystyrene bead enclosed within an Immulite test unit, is coated with highly purified thyroglobulin. The prediluted patient sample and the buffer matrix were simultaneously introduced into the test unit, and incubated for 30 minutes at 37°C with intermittent agitation. During this time, thyroglobulin autoanti-

-bodies in the sample bind to the thyroglobulin coated bead. The serum / buffer mixture was then removed by a centrifuge wash. An alkaline phosphatase-labeled antihuman IgG antibody was introduced, and the test unit was incubated for another 30-min. cycle. The unbound enzyme conjugate was removed by a centrifugal wash, after which substrate was added, and the test unit was incubated for a further 10 min. the chemiluminescent substrate, a phosphate ester of adamantyl dioxetane, under hydrolysis in the presence of alkaline phosphate to yield a stable intermediate. The continuous production of this intermediate resulted in the sustained emission of light, thus improving precision by providing a window for multiple readings. The bound enzyme conjugate and thus also the photon output, as measured by the luminometer was proportional to the concentration of thyroglobulin autoantibodies in the sample. The detection limits of the assays defined as the concentration two standard deviations above the response at zero dose, is approximately 3 IU/ml.

N. B: Elevated levels of antibodies to thyroid peroxidase (TPO antibodies) occurred more frequently than high anti-thyroglobulin levels in autoimmune thyroid disease, however, anti-thyroglobulin determination therefore did not seem to add to the diagnostic information provided by anti-TPO results.

Cytomegalovirus IgM antibodies by chemiluminescent EIA:

Qualitative detection of IgM antibodies to cytomegalovirus (CMV) in human serum by Immulite Automated Analyser Immulite CMV IgM is a solid phase, two step chemiluminescent enzyme immunoassay (Baltz and Searcy 1994). The solid phase, a polystyrene bead enclosed within an Immulite test unit,

is coated with partially purified CMV antigen. The procedure of detection is the same as that of antithyroglobulin. A qualitative result was obtained by comparing the patient result to an established cut off. The volume of sample required was 10 µl of the prediluted patient samples.

Dot blot hybridization assay of parvovirus B19 DNA in sera:

The assay was performed according to Yoto et al (1995). In brief, 20 µl of each serum mixed with 180 µl of distilled water, were filtered with manifold apparatus (Biometra,) onto a treated nylon membrane (genescreen, BRL, USA). After the samples were filtered the nylon membrane was air dried and baked for 2 hours under a vacuum at 80°C. The specimens on the filters were then alkali denatured, neutralized, treated with proteinase K and washed in 2×SSC buffer (0.3 M NaCl plus 0.03 M sodium citrate; pH 7.0). After prehybridization at 65°C for 2 hours in mixture (5×SSC, 250 µg of sheared denatured salmon sperm DNA per ml, 25mM NaPO₄ (pH 6.5), 5× Denhardt's and 50% formamide). The prehybridization mixture was removed and replaced with hybridization mixture containing 1 µg of biotin- labeled DNA probe 5'- Biotin-labeled AACTG TC TGGAAAATGTACAAGTTACAGAG TTAGCACTA-3'. The reaction was allowed to proceed at 65°C for 16 hours. Then the membrane was washed in 250 ml of 2×SSC- 0.1% (wt/vol) SDS for 5 min at room temperature (RT); 250 ml of 0.2×SSC- 0.1% SDS for 5 min at RT; and 250 ml of 0.16×SSC- 0.1% SDS for 15 min at 50°C twice. For colourimetric DNA detection, filter was washed for 1 min in 0.1M Tris- HCl (pH 7.5)- 0.15 M NaCl and non specific binding sites were blocked by immersion in a 3% solution of bovine serum albumin in the same buffer for 40 min at 65°C.

Streptavidin- peroxidase conjugate (1µg/ml in the same buffer) was added for 10 min with gentle agitation. The filter was washed twice in 250 ml of 0.1 M Tris HCl (pH7.5)-0.15M NaCl for 15 min at RT. Filter was sealed in polypropylene bag with freshly prepared substrate solution containing 6 mg of 3,3 diaminobenzidine tetrahydrochloride in 10 ml of 0.05 M Tris- HCl pH 7.6 and 0.1 ml of 3% hydrogen peroxide. Development of a brown colour with +ve reference was allowed to proceed for 10- 60 min in dark, then terminated by washing the filter in 20 mM Tris HCl (pH 7.5) and 0.5 mM disodium EDTA, then air dried.

Detection of Parvovirus B19 - DNA in tissues by nested PCR:

DNA was extracted from aborted products and placental tissues by using DNA high pure PCR template preparation kit (Boehringer mannheim, Germany) as instructed by manufacture. **Nested PCR assay:** the nested PCR was performed according to Zerbini et al (1996). In brief, 7 µl of extracted DNA was added to PCR mix for a total volume of 50 µl containing 5µl of 10 x PCR buffer, 3µl of 25mM MgCl₂, 2.5 U of Taq DNA polymerase (Promega, UK) , 200 µ M each deoxynucleotide triphosphate (Stratagen) and 300ng of each primer. After an initial denaturation step of 5 min at 95°C, the first- round PCR amplification was performed. Then 3 µl first- round product was transferred to a second 50-µl PCR mix. The second – round reaction mix contained the same constituents as the first- round mix, but 300 ng of each second primer was substituted for each first primer.

The oligonucleotide primers used in the first round of amplification were 5'-CTTTAGGTATAGCCAAGTGG-3'and 5'-ACACTGAGTTTACTAGT GGC-3', yielding a product of 1,112 bp.

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Second – round PCR was performed with primers 5'-CAAAAGCATGTGGAGTG AGG-3' and 5'- CCTTATAATGG TGCTCTGGG –3'to give a product of 104 bp. Thirty – five cycles of both first and second – round amplification were performed under the following conditions : 95°C for 1 min, 55 °C for 1.5 min, and 72°C for 1 min, then final extension at 72°C for 7min for one cycle. Ten – microliter samples of second -round PCR products were then analyzed by electrophoresis in a 2% agarose gel. Bands were visualized by ethidium bromide staining.

Detection of CMV – DNA in tissues by nested PCR:

Two pairs of primers were used according to Krajden et al, (1996). The outer primer set consisted of upstream primer JC, 5'- CATAATCTCATCA GGGGAGC- 3', and downstream primer JD, 5'-TTGGGCTAACTATGC AGAGC- 3', which generated a 305-bp. The inner primer set consisted of upstream primer JB,5'-GAAGGCTGA GTTCTTGGTAA-3', and downstream primer JA, 5'-AGCTGCATGATGTGA GCAAG-3'. First PCR was performed by adding 5 µl of 10x reaction buffer containing 10 mM Tris, 50 mM KCl (pH 8.3); 3 µl of 25 mM MgCl₂; deoxynucleoside triphosphate (dNTP) mix containing 10 mM (each) dATP, dCTP, dGTP and dTTP; 50 pmol of each primer; 2 U of Taq polymerase (Promega) and 7 µl of sample DNA (total volume, 50 µl). Samples were denatured at 95°C for 5 min and subjected to 30 amplification cycles as followed: denaturation for 1 min at 94°C, annealing for 1 min at 55°C, and extension for 1.5 min at 72°C, with a final extension for 7 min at 72°C in a Perkin-Elmer 4800 thermocycler. Three microliters of PCR products from the first PCR was reamplified by using the

same amplification protocol with 50 pmol of each inner primers. PCR products of 168- bp were detected by 2% agarose gel electrophoresis. Multiple negative controls, aerosol-resistant- tips, and separate processing areas were used to minimize the risk of amplicon contamination.

Statistical analysis: Demographic, medical and laboratory information were entered concurrently into a custom- designed database. Descriptive statistics were calculated using student's t test, the X² test, crosstab / Chi-square tests. The results were expressed as mean value ± SD. P value <0.05 and < 0.01 were considered significant.

Results:

The results of this study were recorded in six tables and three figures. Ten cases (10/70) were excluded from the aborted group because of hemolysis of the blood samples of some and autolysis of tissue specimens of others. Therefore only 60 miscarried women were studied in group II. There was no history of risk factors for CMV or B19V infections in pregnant women of this study and we suspected exposure to their own children at home may be the only risk factor, as most infected children are asymptomatic. Further, we could not demonstrate a significantly greater risk by any maternal occupation. Table (1) showed that women in both groups were matched in maternal age. The results of thyroid autoantibodies were recorded in tables (2) and (3). Whereas thyroglobulin antibodies levels were significantly higher in the aborted women than control (p < 0.05), there was no significant changes in the thyroid peroxidase antibodies levels between the two groups (P>0.05). Summation of the results of both thyroid antibodies were not significantly changed between the two

groups. Patients were determined to be euthyroid by demonstrating normal levels of thyroid-stimulating hormone (TSH), T4 and T3. Analysis of the thyroid hormonal levels revealed that 56 women were euthyroid (mean T4 = 4.85 µg/dL and mean T3 = 163.691 ng/dL), four women were hyperthyroid and none were hypothyroid in the recurrent miscarried group. Whereas in the control group only one woman was hyperthyroid and 29 were euthyroid (mean T4 = 6.44 µ/dL and mean T3= 150.02 ng/dL). These results were not statistically significant.

Table (4) and figure (1) showed that detection of parvovirus DNA was significantly higher in the aborted tissues than in the placentas of the control group ($P < 0.01$). Of the women infected by B19V no one reported recent signs or symptoms consistent with parvovirus infection (fever, rash, or arthralgias), and none recalled exposure to a child with erythema

infectiosum and ultrasound scans showed no evidence of hydrops fetalis.

Table (5) showed the results of serum CMV IgM and tissues CMV-DNA. Figure (2) demonstrated CMV viral DNA by PCR assay.

Table (6) showed that, among the aborted women, DNA amplification by PCR for parvovirus B19 was strongly positive in 19 women (31.67 %) ($P < 0.01$), 5/29 (26.32 %) of these women were seropositive for thyroid antibodies, 2 (10.53%) women were seropositive for CMV IgM and only one (5.26 %) demonstrated CMV - DNA in the products of conceptions. This represents statistically non-significant changes ($P > 0.05$) and revealed that there was no relationship between viral infections and thyroid autoimmunity in the studied groups.

figure (3) is a chart demonstrating the percentage of parvovirus B19 and CMV viral infections and antithyroid antibodies seropositive in both groups.

Table (1) Clinical characteristics of the studied women [mean ± SD (range)].

Items	Control group (I)	Study group (II)
Age(Years)	31 ± 3.1(25-41)	32 ± 2.1(27-42)
*GA (W) at collection	39 ± 1.2 (37 -41)	12 ± 7.8 (7 - 20)
No. of prior abortions	0	3.6 ± 1.1 (2-8)
No. of primary aborters	0	50
No.of Secondary aborters	0	10

* GA= gestational age in weeks

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Table (2) Thyroid autoantibodies in the studied women .

Antithyroid antibodies	Control group (n=30)		Study group (n=60)		P value
	+ve	-ve	+ve	-ve	
TG IU /ml (+ve > 40IU /ml) Number of cases Mean ± SD Range	0	30	7 64.92 ± 50.01 44 - 150	53 21.83±11.5 11 -33	< 0.05 S
TPO units (+ve > 100 units/mL) Number of cases Mean ± SD Range	2 228.82±150.32 110.2 - 346.2	28 31.45± 15.93 1.3 - 61	2 400.2± 196. 52 132 - 667	58 17.88±10.5 6.5 – 75.5	NS

TG =Thyroglobulin antibodies
+ve = antibodies positive
S= significant

TPO = Thyroid peroxidase antibodies
-ve =antibodies negative
NS = non significant

Table(3) Antithyroid antibodies (TG +TPO) in the studied women.

Groups	Antibodies–Positive group		Antibodies–Negative group	
Control group (n = 30)				
Number %	2	6.67 %	28	93.33%
Age (year mean ± SD)	32 ± 3.1		30 ± 3.1	
N of prior abortions (mean ± SD)	0		0	
Study group (n =60)				
Number %	9	15%	51	85 %
Age (year mean ± SD)	33 ± 2.9		34 ± 3.4	
N of prior abortions (mean ± SD)	4.5 ± 1.6		3.6 ± 0.93	
P values	NS		NS	

Table (4) Parvovirus B19 -DNA in sera; placentas; and products of conceptions of the studied groups

Items	Control group (N=30)		Study group(N=60)		p value
	N	%	N	%	
Serum B19 –DNA by hybridization:					
Positive	0		0		
Negative	30	100	60	100	
Tissues B19 –DNA by PCR assay:					
Positive	2	6.67	19	31.67	(p<0.001)
Negative	28	93.33	41	68.33	HS

HS= highly significant

Table (5) Repeated miscarriage versus normal delivery: Serum CMV specific IgM antibodies and CMV - DNA in the products of conceptions and placentas by PCR.

Items	Control group(N=30)		Study group(N=60)		p value
	N	%	N	%	
Serum CMV specific IgM					
Positive	1	3.33	5	8.33	>0.05 (NS)
Negative	29	96.67	55	91.67	
CMV DNA in the Tissues					
Positive	1	3.33	7	11.67	>0.05(NS)
Negative	29	96.67	53	88.33	

Table (6) The frequency of CMV infection and thyroid autoantibodies in women with evidence of B19V infection by PCR

Items	Control group (n=30) Placenta B19V PCR				Study group (n=60) Products of conception B19V PCR				p value
	*+ ve(n =2)		- ve (n =28)		*+ ve (n =19)		- ve (n =41)		
Serum CMV IgM									
+ve	0		1	3.56 %	2	10.53%	3	7.32%	NS
-ve	2	100%	27	96.44%	17	89.47 %	38	92.68%	
Tissues CMV PCR:									
+ve	0		1	3.56 %	1	5.26 %	6	14.63 %	NS
-ve	2	100 %	27	96.44 %	18	94.74 %	35	85.37 %	
Thyroid autoantibodies:									
+ve	0		2	7.14 %	5	26.32 %	4	9.76 %	NS
-ve	2	100 %	26	92.86 %	14	73.68 %	37	90.24 %	
total	2	6.67 %	28	93.33 %	19	31.67 %	41	68.33%	

*+ ve = women demonstrated B19 V DNA in the placenta or products of conceptions

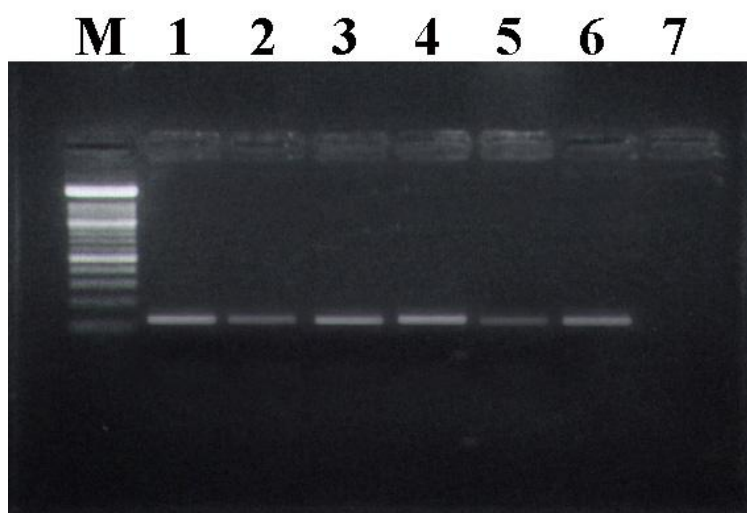


Fig. (1): Agarose gel electrophoresis of PCR amplification products of parvovirus B19 DNA, M : 100 bp DNA molecular size marker, positive samples (104 bp),(lanes:1-6), negative control, lane (7).

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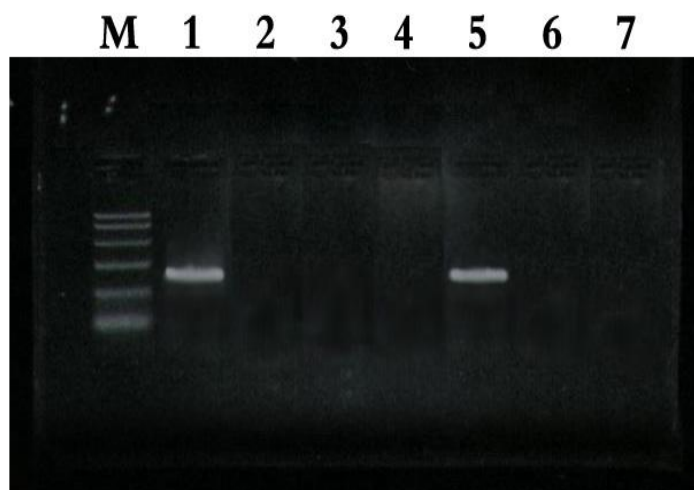


Fig.(2): Agarose gel electrophoresis of PCR amplification products of Cytomegalovirus DNA, M : DNA molecular size 50 bp marker, positive samples (168 bp)(lanes: 1,5), lane (2), negative control, lanes (3,4,6,7) were negative samples.

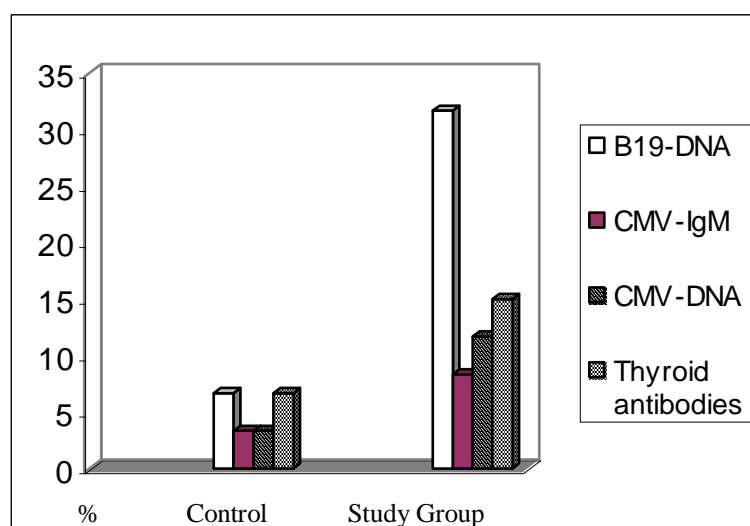


Figure (3) The percentage of positive parvovirus B19 – DNA and CMV – DNA in tissues , CMV- IgM seropositive and antithyroid antibodies seropositive results in the studied women .

Discussion

Antithyroid antibodies are known to occur in apparently healthy populations and are more frequently observed in women during their reproductive years. One or both of the antithyroid antibodies (thyroid

peroxidase and thyroglobulin) were demonstrated in 15% of the patients with recurrent spontaneous abortions compared with 2% of the control group. This result is not statistically significant. Whereas, 85% of the miscarried women in the present study did not demonstrate thyroid

antibodies in their sera, 2% of the control group, that were antithyroid seropositive, had delivered healthy babies. In spite only thyroglobulin levels were significantly higher in women with recurrent abortion than control. Stagnaro-Green *et al* (1990) reported that the individual levels of antithyroid peroxidase and antithyroglobulin autoantibodies were similarly related to the increased rate of miscarriage, with no evidence of autoantibody specificity.

On the contrary, Pratt *et al.* (1993) reported a higher incidence of antithyroid antibodies in women with a history of three or more consecutive pregnancy losses as compared with a control population (31% versus 19%). Singh *et al* (1995) also found that thyroid antibodies might be useful markers for identifying women at risk of clinical miscarriage. In the antibody-positive group they found that there was 32 % clinical miscarriage rate in comparison to 16% in the antibody-negative group. They reported a strong association between antithyroid autoantibodies and spontaneous abortion.

Stagnaro – Green *et al* (1992) supported the concept that the basic immunologic defect in autoimmune diseases probably lies at the T-lymphocyte level. Pratt *et al.* (1993) supported the hypothesis that antithyroid antibodies may serve as peripheral markers for abnormal T-cell function that, in turn, may be responsible for pregnancy loss and demonstrated that detection of thyroid antibodies before conception carries an increased risk of pregnancy loss. It is then tempting to speculate that abnormal T-lymphocyte function, and not abnormal autoantibodies *per se*, is responsible for pregnancy loss. Under such a concept, they reported that

organ-specific autoantibody abnormalities, such as thyroid antibodies and non organ-specific autoantibodies, can be expected to have similar prognostic significance for impending pregnancy loss. Muller *et al* (1999) concluded that successful treatment of autoantibody-associated pregnancy loss should concentrate on attempts to modulate T-cell function rather than the customary treatment options of antibody suppression and/or modulation of antibody effects.

Whereas B19 viral DNA was detected in fetal and placental tissues, by PCR, nearly in one third of the miscarried women and 6.67% of the control group, viral DNA was not detected directly in sera by dot blot hybridization in the two groups. This finding could be explained on the basis of less sensitivity of hybridization technique than PCR. On the other hand it may be attributed to less viral concentrations in peripheral blood. In fact, the nested PCR can disclose a single copy of B19 –DNA (Zakryewska *et al*, 1992), while dot blot hybridization technique have been shown to detect more than 10^4 viral particles (Musiani *et al*, 1993). In the present study, the total number of tested sera was 90 samples which are considered less than that tested by Mori *et al* (1989) and Yoto *et al* (1995) who used hybridization technique for detection of B19 -DNA in the serum and found positive reactions in 48/4895 (0.9%) and 15/7969 (0.2%) respectively. Polymerase chain reaction-based assay was shown to be a more sensitive and accurate means of diagnosing B19 V infection. The problem with polymerase chain reaction-based methods is not their lack of sensitivity but rather their extraordinary sensitivity.

Gratacos *et al* (1995) and Harger *et al* (1998) reported that the overall

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incidence of fetal loss linked to parvovirus B19 infection was 1.66 % and 8.3 % of B19- IgM-positive pregnant women respectively. The figures considerably lower than that reported in the present study. Gratecos et al (1995) findings provided evidence that parvovirus infection during pregnancy is a rare cause of fetal morbidity and mortality and they suggested that adverse outcomes are infrequent even in a population with a high incidence of infection. On the contrary Jordan (1996) reported that B19V infection of pregnant women have been associated with poor fetal outcomes, including fetal anemia, nonimmune hydrops, spontaneous abortion, and stillbirth. However, transplacental transmission rate of B19V has been estimated to be about 33 %, indicating that this virus could be more fetotropic and fetotoxic than either rubella or cytomegalovirus. Therefore, it is important for the physician to have accurate clinical data regarding the immune status of a pregnant woman when an exposure to or infection by B19V is suspected. Adults may have no clinical evidence of disease even though serologic studies, IgM and IgG antibodies would indicate recent infection. Jordan (2000) concluded that fetuses should be monitored for up to 14 weeks after maternal exposure to B19V infection.

Cytomegalovirus infection during pregnancy is far more complex than other infections, such as rubella and toxoplasmosis, which occur only with primary infections, because of the ability of this virus to become reactivated frequently during the childbearing years and to be transmitted to the fetus in spite of maternal immunity (Stagno 1995). Of all investigate miscarried women in our study the percentage of seropositive and

seronegative mothers did not differ significantly. This result was in agreement with that of Stagno (1995).

Early diagnosis of CMV leads to dramatically better prognosis; a hypothesis that has to be examined (Stagno 1995). However, this still leaves the problem that there is no specific and effective therapy for congenital CMV infection that can be administered during pregnancy. This leads to the phenomenon that most clinicians do not screen at all. In order to overcome these problems a step-wise screening of CMV to avoid a false positive result is needed. This is necessary because a mother expressing CMV-IgM does not necessarily transmit the virus to the child as observed in our results. Positive IgM anti-CMV results may furthermore be false-reactions with other substances, such as rheumatoid factor, or nonspecific reactions. Baumann et al(2000) reported a low specificity of IgM anti-CMV test. However, in a screening program false positive results can be rather accepted than false negative results, since the positive serological result has to be confirmed by a specific and sensitive methods as virus isolation by shell vial cell culture assay and by PCR for CMV - DNA detection (Revello et al, 1999). In order to verify whether the serological screening of mothers in the present study really detected transplacental transmission and hence detection of congenitally infected fetuses, CMV specific IgM levels were compared with screening for CMV - DNA in fetal and placental tissues. We found only two out of the 5-CMV - IgM positive miscarried women demonstrated viral DNA in the products of conceptions. So that not all CMV - IgM seropositive miscarried women transmitted the virus to their fetuses. Although the etiology of autoimmune

diseases is unknown, there are some clues as regards the predisposing factors: genetic factors, certain HLA class I and II alleles or invading microorganisms may be involved in the early stage of the disease and T-cells are often involved in the etiology and pathogenic process, in fact the etiology is likely to be multifactorial (Peakman and Vergani, 1997) . In the current study we did not find any significant association between thyroid autoimmunity and viral infections in women with unexplained recurrent miscarriage.

We concluded that parvovirus B19 infection represents nearly one third of the etiology of unexplained recurrent abortions in the present study. Therefore it should be included in routine screening of cases of recurrent abortion. However, the detection of cytomegalovirus infection in aborted women of the present study does not support a role for CMV infection as a major abortion related factor. Thyroid autoimmunity might serve an independent pathogenic risk factor for repeated pregnancy loss. Testing for IgM anti-cytomegalovirus and antithyroid antibodies should be restricted to certain patients with unexplained recurrent pregnancy loss.

We recommend using PCR assay of placenta or fetal blood /tissue samples for screening of potential B19V or CMV infections in utero.

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الملخص العربي

فيروس بارفو بي 19 وفيروس السيتوميكاليو وحدث المناعة الذاتية للغدة الدرقية في حالات الإجهاض المتكرر خلال الثلاث شهور الأولى للحمل

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يعد الإجهاض المتكرر مشكلة هامة فهناك أسباب عديدة له وكذلك سبل علاج مختلفة ولكن لم تثبت دلائل قاطعة على بعض هذه الأسباب وكذلك بعض طرق العلاج تجريبية.

استهدف هذا البحث دراسة بعض الأسباب الغير متداولة في البحث عن أسباب الإجهاض المتكرر مثل حدوث المناعة الذاتية للغدة الدرقية أو الإصابة بفيروس ألبا رفو بي 19 (Parvovirus B19) أو فيروس السيتوميكاليو (CMV) وذلك لتحديد أهمية هذه الأسباب و ضرورة إجراء فحوصها في تناول حالات الإجهاض المتكرر غير معلوم الأسباب.

اشتمل البحث على تسعين سيده حامل قسمن الى مجموعتين :

- 1 - المجموعة الضابطة: 30 سيده أنهت مدة الحمل (ذات حمل طبيعي) ادخلن المستشفى لإجراء عملية الوضع
- 2 - مجموعة الدراسة: 60 سيده حامل (الثلاث شهور الأولى للحمل) وتعانين من إجهاض محتم و قد ادخلن المستشفى لإجراء عملية تفريغ الرحم لإنهاء الحمل. وقد تعرضت هؤلاء السيدات من قبل لإجهاض متكرر غير معلوم الأسباب.

تم اخذ عينات دم وفصل السيرم لعمل التحاليل الآتية:

1. هرمونات الغدة الدرقية (T3, T4, TSH)
2. تحديد وجود الأجسام المضادة للغدة الدرقية : ثيروجلوبولين (TG) و ثيرويد بير اوكسيداز (TPO).
3. تحديد وجود الأجسام المضادة لفيروس السيتوميكاليو (CMV)
4. تحديد وجود الحمض النووي لفيروس بي 19 بالدم

وكذلك تم اخذ المشيمة بعد الولادة من سيدات المجموعة الضابطة و ناتج الإجهاض من أنسجة الجنين والمشيمة بعد عملية تفريغ الرحم من حالات الإجهاض المتكرر. وذلك لدراسة وجود الأحماض النووية لفيروس ألبا رفو بي 19 أو فيروس السيتوميكاليو في هذه الأنسجة باستخدام طريقة اختبار سلسلة البوليميريز (PCR).

وكانت نتائج البحث كالاتي : دراسة وجود الأحماض النووية للفيروسات أثبتت إصابة ثلث حالات الإجهاض المتكرر تقريبا بفيروس ألبا رفو بي 19 (31,67 %) و أما سيدات المجموعة الضابطة فوجدت الإصابة فيهن بنسبة 6,67% فقط وهذه النتيجة ذات دلالة إحصائية عالية . وإصابة 11,66% فقط من حالات الإجهاض المتكرر بفيروس السيتوميكاليو و3,33% في سيدات المجموعة الضابطة وهذه النتيجة ليست لها دلالة إحصائية. في حين أن الأجسام المضادة لفيروس السيتوميكاليو في السيرم وجدت في 8,33% من حالات الإجهاض المتكرر و 3,33% في سيدات المجموعة الضابطة وهذه النتيجة ليست لها دلالة إحصائية. كما وجدت الأجسام المضادة للغدة الدرقية بنسبة 15% من حالات الإجهاض المتكرر و 6,67% من سيدات المجموعة الضابطة وهذه النتيجة ليست لها دلالة إحصائية.

نستنتج من هذه الدراسة أن فيروس ألبا رفو بي 19 يعد من أهم أسباب الإجهاض المتكرر ولذلك يوصى هذا البحث بضرورة إجراء فحوص لتشخيص هذا الفيروس ضمن الفحوص التي تجري لحالات الإجهاض المتكرر ويؤكد أهمية استخدام طريقة (PCR) في التشخيص . اما فيروس السيتوميكاليو والأجسام المضادة للغدة الدرقية فيمكن اختبارها في حالات الإجهاض المتكرر غير معروف السبب .