

Spontaneous abortion and psychosomatics. A prospective study on the impact of psychological factors as a cause for recurrent spontaneous abortion*

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A group of 36 patients who had had at least two consecutive spontaneous abortions and who desired to have children was subjected to a psychosomatic investigation before a biomedical diagnostic screening programme was started. A semi-structured interview regarding sociodemographic data, current relationship, social support, education, occupation and medical anamnesis was carried out. In addition, all women completed four standardized questionnaires on the topics of anxiety, somatization disorder, life satisfaction and depression. A control group of 36 women, matched for age and occupation, was subjected to the same psychosomatic investigation. The findings of the diagnostic screening programme showed that 16 women had abortions because of physical abnormality, and 15 women had no physically confirmed cause (in five women, the investigations were not completed). Following recurrent spontaneous abortion, 18 women had a successful pregnancy within 2 years, and 18 women were still childless. The comparison between patients and the control group revealed that patients with recurrent abortion were significantly more satisfied with their life quality regarding leisure time, financial situation and occupation. No significant differences were observed in any other variables. Patients who suffered spontaneous abortions due to a physical disorder showed relationship of longer duration, and more frequent miscarriages. Women with successful pregnancy within 2 years after recurrent miscarriage were significantly younger and had fewer physically related abortions compared with women who remained childless. In summary, psychological factors seem to be of subordinate importance as a cause for recurrent spontaneous abortion. Moreover, physical abnormalities in the reproductive system have a predominant impact on the prediction of a future successful pregnancy.

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Introduction

Recurrent pregnancy loss is a frustrating and discouraging problem for patients and physicians alike. Unfortunately, the cause(s) of repeated pregnancy loss cannot be explained for all couples. The definition of recurrent spontaneous abortion is not fully agreed upon between clinicians and investigators. Some authors maintain that only couples with three or more spontaneous abortions should be included in the definition, but most studies include couples with two consecutive pregnancy losses (Harger *et al.*, 1983).

The incidence of early loss of pregnancy for both overall loss and clinically detectable loss may be lower than suggested for a long time, 42 and 12% respectively (Hertz-Picciotto and Samuels, 1988; Wilcox *et al.*, 1988). The theoretical risks of second, third and fourth miscarriages, taking a loss rate for each clinically recognized pregnancy of 15%, are 2.3, 0.34 and 0.05% respectively (Stirrat, 1990a). In Regan's (1988) prospective Cambridge Early Pregnancy Study the risk of another loss after one, two or three consecutive losses was 11.5, 29.4 and 36.4% respectively.

Although psychological stress is an accepted risk factor for preterm labour (Mamelle *et al.*, 1984; Homer *et al.*, 1990), there is much controversy concerning its impact upon spontaneous abortion. In 1984 Stray-Pedersen and Stray-Pedersen reported an improved pregnancy success rate (86%) among couples (with prior history of habitual abortion) with no abnormal findings, who received specific antenatal counselling and psychological support ('tender loving care') compared to a success rate of 33% observed in women without specific antenatal care. The study design, especially the practice restricting this 'tender loving care' to women living within a reasonable distance of the hospital, was criticized by Stirrat (1990b). Läßle and Lukesch (1988) tried to explain the influence of psychological stress upon pregnancy outcome, as elevated stress hormones (catecholamines, cortisol) are able to reduce fetal vascularization and oxygen supply and possibly induce abortions. Brandt and Nielsen (1992) found an increased risk for spontaneous abortion as a consequence of high job demand and low job control, but these results have to be interpreted with caution, because a recall bias is one possible explanation.

In review articles Stirrat (1990b) concludes that psychological factors are probably not relevant and Brockington

(1996) states that stress and anxiety are not likely to be major factors as a cause for spontaneous abortion.

Having analysed the earlier controversial results concerning the relationship between psychological and physical impact on spontaneous abortions, we decided to investigate this phenomenon using a new design. Therefore the present study attempted to separate psychosocial factors as a cause for recurrent spontaneous abortion (RSA). We assume that most women suffering RSA and seeking treatment are experiencing psychological stress secondary to their 'abortional' conditions. However, if psychosocial alterations have evolved to be an important cause of RSA, such distress should be most evident by comparing it to a control group without consecutive spontaneous abortions (hypothesis A, comparison modality A). Women without a physically confirmed cause for RSA are predicted to report more psychosocial alterations than women with abortions due to physical abnormalities (hypothesis B, comparison modality B). Finally, we assume that higher psychosocial impairment after recurrent abortion negatively influences the probability of a later successful pregnancy (hypothesis C, comparison modality C).

Materials and methods

The study was carried out at the Department of Obstetrics and Gynaecology at the University of Innsbruck. Over a period of 15 months (May 1991 to July 1992), 36 women desiring children were studied. Inclusion criteria were: 6–8 weeks after at least the second consecutive spontaneous abortion, German mother tongue, no pregnancy and no chronic psychiatric disease. All women gave informed consent and none refused participation. Thirty-six women (matched for age and occupation), who visited the hospital for a preventive check-up and without recurrent consecutive abortions in the medical anamnesis served as a control group. The women from the control group were not subjected to the biomedical screening programme applied to the women after spontaneous abortions.

After 2 years, each of the women with spontaneous abortions was interviewed by telephone about their present situation and the time period since the first meeting (successful pregnancy, any medical treatment inducing or maintaining pregnancy, repeated abortions, desire for further offspring). None of these women received stimulation treatment. Progesterone (hydroxyprogesterone caproate, 500 mg twice/week as an i.m. injection) was administered preventively to those who suffered from corpus luteum insufficiency.

Before starting a diagnostic screening programme, a semi-structured interview to gather information on marital status, current relationship, social support, level of education, occupation, obstetric, physical and psychiatric anamnesis, housing conditions, nicotine abuse and psychopharmaceutical intake was conducted by a psychiatrist.

From previously published psychosomatic investigations, we chose particular assessments relevant to spontaneous abortion. Questionnaires were selected from the literature to obtain quantitative measures of anxiety (state–trait anxiety inventory; Laux *et al.*, 1981), somatization disorder (Giessener Beschwerdebogen; Brähler and Scheer, 1983), life satisfaction (Life Satisfaction Questionnaire; Fahrenberg *et al.*, 1986) and depression (Beck Depression Inventory; Hautzinger *et al.*, 1992), traits which can be found in these patients.

The State–Trait–Anxiety Inventory (German version of the original by Spielberger *et al.*, 1970) has 40 items, each of which is measured on a scale from 1 to 4 points. The questionnaire consists of two dimensions, scale X1 (state-anxiety, 20 items, answers ranging from

Table I. Diagnostic screening programme for women attending the unit for recurrent spontaneous abortion

	Abnormal findings* <i>n</i> = 16
Full blood count	
Blood group and antibody screen (incl. antinuclear, mitochondrial, and smooth muscle antibodies)	
Thyroid function test (TRH stimulation test)	4
Oral glucose tolerance test	2
Chromosomal analysis (woman and partner)	1
Anticardiolipin antibodies	
Anatomical investigation (hysterosalpingography, hysterocontrast sonography, hysteroscopy, laparoscopy)	8
Hormone profile (LH, FSH, oestradiol, progesterone, testosterone, DHEA-S, prolactin)	6
Infection-antibody screen (toxoplasmosis, rubella, herpes simplex virus, cytomegalovirus, lues, listeriosis, chlamydia)	
Cervical swabs for urea, mycoplasma, chlamydia	
Sperm investigation of partner (morphology and hygiene)	

*Five women had two abnormalities.

LH = luteinizing hormone, FSH = follicle stimulating hormone, DHEA-S = dihydroepiandrosterone sulphate.

'not at all' to 'very much') for actual anxiety and scale X2 (trait-anxiety, 20 items, answers ranging from 'almost never' to 'almost always') for general anxiety.

The 'Giessener Beschwerdebogen' (short version) registers somatization complaints and has 24 items, each of which is measured on a scale from 1 to 5 points (with answers ranging from 'not at all' to 'very much'). The test consists of four symptomatological dimensions: general exhaustion, cardiovascular impairment, aching in the joints, and gastro-intestinal complaints.

The Life Satisfaction Questionnaire of Fahrenberg *et al.* (1986) has 56 items, each of which is measured on a scale from 1 to 7 points (with answers ranging from 'very satisfied' to 'not at all satisfied'). The test consists of eight dimensions: psychological disposition, somatization complaints, occupational condition, financial situation, leisure time, partner compatibility and sexual behaviour (the last dimension 'relationship to one's own children' was eliminated for our investigation).

The Beck Depression Inventory (German version of the revised original by Beck and Steer, 1987) has 21 items with four possible graduated answers to each (0–3 points). A total score registers the severity of depression.

The biomedical diagnostic screening programme and the diagnoses of the 16 women with physical abnormalities are listed in Table I.

Statistics

For statistical analysis, the SPSS for Windows 6.0 statistics package was used. Group comparisons were calculated using the Mann–Whitney test for continuous variables and Pearson χ^2 test for categorical variables. Prognostic variables for a successful pregnancy after recurrent spontaneous abortion were evaluated by a logistic regression analysis.

Results

The results are presented as three subgroups that correspond to: A – comparison between women with recurrent spontaneous abortion (RSA) versus control group; B – comparison between

Table II. Standardized questionnaire scores of the three comparison modalities: (A) comparison between women with recurrent spontaneous abortion (RSA group) versus control group; (B) comparison between women with physical abnormalities versus women without physical abnormalities after RSA; (C) comparison between women with successful pregnancy versus women without successful pregnancy after RSA within 2 years

	A			B			C		
	RSA group (n = 36)	Control group (n = 36)	P-value	Women with physical abnormalities (n = 16)	Women without physical abnormalities (n = 15)	P-value	Women with successful pregnancy (n = 18)	Women without successful pregnancy (n = 18)	P-value
<i>State-trait anxiety inventory</i>									
State-anxiety	44 (33–56)*	46 (37–63)	NS	45 (38–56)	44 (33–55)	NS	44 (36–55)	44.5 (33–56)	NS
Trait-anxiety	46 (34–57)	45 (36–71)	NS	46 (36–51)	45 (34–57)	NS	47.5 (36–57)	44.5 (34–54)	NS
<i>Giessener Beschwerdebogen</i>									
General exhaustion	11 (6–22)	11 (6–24)	NS	9.5 (6–19)	11 (6–22)	NS	11 (6–22)	10.5 (6–20)	NS
Cardiovascular impairment	8 (6–18)	7 (6–13)	NS	8 (6–12)	8 (6–14)	NS	8 (6–14)	8 (6–18)	NS
Aching in joints	10 (6–22)	11.5 (6–21)	NS	10 (6–13)	10 (6–20)	NS	10 (6–15)	10 (6–15)	NS
Gastrointestinal complaints	8 (6–15)	8 (6–16)	NS	7.5 (6–12)	7 (6–15)	NS	8 (6–15)	7 (6–15)	NS
<i>Life-satisfaction questionnaire</i>									
Psychological disposition	13 (7–21)	14 (9–26)	NS	13 (7–11)	13.5 (10–21)	NS	14 (9–21)	12 (7–18)	NS
Somatization complaints	13.5 (7–31)	13 (7–24)	NS	13.5 (7–31)	12 (8–28)	NS	12.5 (8–31)	15.5 (7–27)	NS
Occupational conditions	12 (7–28)	14 (7–30)	<0.05	10 (7–28)	13 (7–18)	NS	12 (7–18)	12 (7–18)	NS
Financial situation	12.5 (7–25)	14 (7–27)	<0.05	10 (7–22)	15 (7–22)	NS	13 (7–22)	10.5 (7–22)	NS
Leisure time	13.5 (7–30)	16 (7–43)	<0.05	11.5 (7–30)	14 (7–27)	NS	14 (7–30)	12 (7–22)	NS
Couple compatibility	9 (7–19)	10 (7–36)	NS	9 (7–16)	8 (7–19)	NS	9 (7–16)	8.5 (7–19)	NS
Sexual behaviour	13.5 (7–21.5)	13 (7–36)	NS	13 (7–17)	14 (7–19)	NS	13 (7–19)	14 (7–21)	NS
<i>Beck depression inventory</i>									
	3.5 (0–18)	3 (0–14)	NS	4 (0–13)	3 (0–15)	NS	3 (0–15)	4 (0–18)	NS

Calculated by Mann-Whitney U-test. *Results are given as median (min.–max.). NS = not significant.

women after RSA with physical abnormalities versus women without physical abnormalities; C – comparison between women after RSA with successful pregnancy versus women who remained childless within 2 years.

Comparison between women after recurrent spontaneous abortions (RSA group, n = 36) versus control group (n = 36)

According to the match criteria, both samples were identical regarding age (median: 31 years, range: 19–42 years) and occupation. From the RSA group, 22 women had two consecutive spontaneous abortions and 14 women had three consecutive spontaneous abortions. In the control group, 29 women had no abortion, five women had one spontaneous abortion and two women had two (not consecutive) spontaneous abortions ($P < 0.0001$). In contrast, only seven couples from the RSA group and 24 couples from the control group had one or more children ($P < 0.001$). In addition, there was a significant difference in marital status (within the RSA group, the percentage of married women was higher, $P < 0.02$).

Both groups were quite homogeneous at the semi-structured interview regarding couple compatibility, duration of partnership, social support, housing conditions, medical anamnesis, nicotine and psychopharmaceutical consumption (tranquilizers, antidepressants and neuroleptics) ($P = NS$).

The results of the standardized tests (comparison A) are listed in Table II. Women after RSA expressed a significantly

higher life satisfaction regarding occupational conditions, financial situation and leisure time (each $P < 0.05$). All other results showed no significant difference between the two groups.

Comparison between women (after RSA) with physical abnormalities (n = 16) versus women (after RSA) without physical abnormalities (n = 15)

A total of 31 women was subjected to the whole screening programme. Five women had incomplete investigations. None of these five patients had a successful pregnancy within 2 years.

Age, marital status, couple compatibility, occupational situation, social support, housing conditions, nicotine abuse, psychopharmaceutical consumption and general medical anamnesis showed no significant difference between the two groups. Women with abnormal physical findings had a significantly longer partnership duration ($P < 0.05$).

Patients with physical abnormalities had more previous spontaneous abortions when compared to those without physical abnormalities (seven with two and nine with three versus 13 with two and two with three consecutive spontaneous abortions; $P < 0.05$). After a period of 2 years, six women from the group of organic abnormalities had a successful pregnancy, whereas 12 women out of 15 with no abnormal findings had a successful pregnancy ($P < 0.05$).

The standardized tests (Table II, comparison B) showed no significant results between the two groups.

Comparison between women (after RSA) with successful pregnancy ($n = 18$) versus women (after RSA) without successful pregnancy ($n = 18$) within 2 years

Women with a successful pregnancy after RSA were significantly younger (median: 27 years versus 33 years; $P < 0.01$) and had a shorter duration of the partnership ($P < 0.05$). Marital status, partner compatibility, social support, occupational situation, housing conditions, nicotine and psychopharmaceutical consumption showed no significant differences between the two groups.

The results of the standardized tests are listed in Table II (comparison C); no significant differences were observed.

The findings of the diagnostic screening programme (Table I) showed that six women with successful pregnancy had physical abnormalities (four had corpus luteum insufficiency; two had a uterus bicornis, which were treated surgically by the Strassmann operation). In 12 women no abnormalities were found. In contrast to this, ten women without successful pregnancy had physical abnormal findings (two with uterus bicornis, one of which was treated by Strassmann operation; four with uterus arcuatus, two with a corpus luteum insufficiency, one with a genetic translocation), three women were without any abnormalities and five patients had incomplete screening investigations ($P < 0.01$). Regarding the previous spontaneous abortions, 13 women with successful pregnancy had two consecutive spontaneous abortions and five women had three consecutive spontaneous abortions. Nine women without successful pregnancy had two and nine women had three consecutive spontaneous abortions (P value is not significant). The medical anamnesis showed that six further childless patients had a chronic disease (diagnoses: two had chronic allergies, one had systemic lupus erythematosus, one had an abdominal aneurysm operation, one had a recurrent leg vein thrombosis and one had a vertebral column disease) and only one woman (chronic lymphadenopathy) had a successful pregnancy ($P < 0.05$).

The logistic regression analysis supported statistical significance only for the variable abnormal findings in the diagnostic screening programme ($P < 0.05$; odds ratio = 2.86).

Discussion

The present prospective study was designed to elucidate the question of whether psychological factors have an impact on recurrent spontaneous abortion. Before starting diagnostic investigations, 36 women suffering from recurrent spontaneous abortion underwent a semi-structured interview and four different standardized questionnaires with the topics somatization disorder, life satisfaction, anxiety and depressive mood. After 2 years, all 36 women were interviewed by telephone focusing on possible pregnancies and parturitions, repeated abortions, and further desire for children.

The women participating in our study were recruited from a special out-patient unit for spontaneous recurrent pregnancy loss, where a biomedical diagnostic screening programme is

offered. Therefore, our patient group was a selected population with desire for children and not quite representative of all patients with spontaneous abortions. Perhaps for this reason we cannot confirm previous results from Seibel and Graves (1980) and Laple and Lukesch (1988), who reported that unmarried young women with low social level and higher partnership problems had an increased risk of pregnancy complications. In our study, the majority of women after RSA were on average 31 years old, married (78%) or lived in a solid partnership where couple compatibility was well appreciated. Younger women after RSA had a significantly higher chance for a successful pregnancy than older women after RSA. Altogether, our sociodemographic data gave no guidelines for characterizing patients after recurrent pregnancy loss compared with a control group.

The higher incidence of somatization disorders after spontaneous abortion (Cain *et al.*, 1964) was interpreted by Wehkamp *et al.* (1989) to be a consequence of grief reaction. Stack (1984) reduced the period of somatization to 1 month after abortion. At 6–8 weeks after pregnancy loss, our group showed no increased somatization disorders in the ‘Giessener Beschwerdebogen’ compared to the control group. Compared to the reference population of the ‘Giessener Beschwerdebogen’ (used for test validation) the results of the RSA group are placed near below the average and, compared with a group of patients with psychosomatic disorders, the results are well below the average. Following these results, the factor somatization disorder does not seem to influence pregnancy risk in any way, either for women with or without further successful pregnancy or for women with or without miscarriage due to physical alterations.

Life satisfaction is an essential aspect of illness experience and illness behaviour and as such a basic condition of psychosocial rehabilitation (Fahrenberg *et al.*, 1986). Even though patients with recurrent spontaneous abortion have an unfulfilled desire for offspring their life satisfaction regarding leisure time, financial situation and occupational conditions is rather satisfying when compared to the control group. Considering the fact that women from the control group have more children ($P < 0.001$), this could be the consequence of the triple strain of child rearing, being a housewife and working in the professional world (occupation was a match criterion). Vaskovics *et al.* (1994) reported an inverse relationship between life satisfaction and family size, where life satisfaction decreased when family size increased. In a larger context, it was argued that the cause of infertility may be linked to the high cost of reproduction as postulated in the Reproductive Filtering Model (Wasser *et al.*, 1993).

Raised anxiety and depressive mood were frequently observed by many authors after spontaneous abortion (Seibel and Graves, 1980; Stack, 1984; Friedman and Gath, 1989; Prettyman *et al.*, 1993). Wall-Haas (1985) reported increased depression after recurrent spontaneous abortion compared to a control group after one abortion. Neither the state–trait anxiety questionnaire nor the Beck-depression inventory revealed elevated scores, for patients 6–8 weeks after RSA as well as for the control group. Our results confirm the data from Nielsen *et al.* (1996), which showed no increased

anxiety or depressive reactions 2 weeks after a first trimester spontaneous abortion compared with a non-pregnant control group. Similarly, women with or without successful pregnancy and women with or without physically caused abortion had no elevated scores. Regarding the life satisfaction questionnaire, both patients and women from the control group also showed a good psychological disposition. There was no difference between early pregnancy loss and late abortion (data not shown), which agrees with the results of Kennell *et al.* (1970).

The logistic regression analysis must be interpreted with caution, because the variables in relation to the sample size ($n = 36$) are too numerous. After stepwise reducing and compressing (use of sum-scales) the variables, only physical causes for spontaneous abortion remained as a significant result. Despite medical therapy, only 37.5% of our patients with physical abnormalities, compared with 75% of the patients without physical abnormalities, had surviving pregnancies within 2 years. Quenby and Farquharson (1993) reported that the highest risk factor for subsequent pregnancy loss was an oligomenorrhoeic cycle and isolated deficiency of oestradiol in the luteal phase of the menstrual cycle. With regard to the debate as to whether or not corpus luteum insufficiency is a cause of miscarriage (Coulam and Stern, 1994), this was the most frequently observed hormonal disorder of our patients (six times). Thyroid dysfunction was observed in four patients and an abnormal glucose tolerance test in two patients of our group, but these findings are considered to be an uncorroborated cause of recurrent abortion (Stirrat, 1990b).

In summary, all the three hypotheses failed by evaluation with our assessment protocol. The absence of any significant difference regarding psychosocial variables – between women with or without successful pregnancy within 2 years and women with or without physically confirmed cause of spontaneous abortion – revealed that psychological factors do not have an impact on recurrent spontaneous abortion for our collective. This conclusion confirms the data reviewed by Stirrat (1990b) and Brockington (1996). Moreover, biological risk factors were found to be of predominant importance for recurrent spontaneous abortions.

References

- Beck, A.T. and Steer, R.A. (1987) *Manual for the Revised Beck Depression Inventory*. Psychological Corp., San Antonio, TX.
- Brähler, E. and Scheer, J.W. (1983) *Giessener Beschwerdebogen (GEB)*. Huber, Bern.
- Brandt, L.P.A. and Nielsen, C.V. (1992) Job stress and adverse outcome of pregnancy: a causal link or recall bias? *Am. J. Epidemiol.*, **135**, 303–311.
- Brockington, I. (1996) *Motherhood and Mental Health*. Oxford University Press, Oxford, pp. 78–79.
- Cain, A.C., Erickson, M.E., Fast, I. and Vaughan, R.A. (1964) Children's disturbed reactions to their mothers miscarriage. *Psychosom. Med.*, **26**, 58–66.
- Coulam, C.B. and Stern, J.J. (1994) Endocrine factors associated with recurrent spontaneous abortion. *Clin. Obstet. Gynecol.*, **37**, 730–744.
- Fahrenberg, J., Myrtek, M., Wilk, D. and Kreutel, K. (1986) Multimodale Erfassung der Lebenszufriedenheit: Eine Untersuchung an Herz-Kreislauf-Patienten. *Psychother. Med. Psychol.*, **36**, 347–354.
- Friedman, T. and Gath, D. (1989) The psychiatric consequences of spontaneous abortion. *Br. J. Psychiatry*, **155**, 810–813.
- Harger, J.H., Archer, D.F., Marchese, S.G. *et al.* (1983) Etiology of recurrent pregnancy losses and outcome of subsequent pregnancies. *Obstet. Gynecol.*, **62**, 574–581.
- Hautzinger, M., Bailer, M. and Keller, F. (1992) *Beck-Depressions-Inventar (BDI)* from A.T.Beck. Huber, Bern.
- Hertz-Picciotto, I and Samuels, S.J. (1988) Incidence of early loss of pregnancy. *N. Engl. J. Med.*, **319**, 1483–1484.
- Homer, C.J., Sherman, J.A. and Siegel, E. (1990) Work-related psychosocial stress and risk of preterm, low birth weight delivery. *Am. J. Public Health*, **80**, 173–177.
- Kennel, J.H., Slyter, H. and Klaus, M.H. (1970) The mourning response of parents to the death of a newborn child. *N. Engl. J. Med.*, **283**, 344–349.
- Läpple, M. and Lukesch, H. (1988) Psychische und psychosoziale Faktoren sowie relevante therapeutische Massnahmen bei Spontanaborten (SA) und rezidivierenden Spontanaborten (HA). *Zentbl. Gynäkol.*, **110**, 1185–1194.
- Laux, L., Glanzmann, P. and Schaffner, P. (1981) *State-Trait-Angstinventar (STAI)* from C.D.Spielberger. Beltz Testgesellschaft, Weinheim.
- Mamelle, N., Laumon, B. and Lazar, P. (1984) Prematurity and occupational activity during pregnancy. *Am. J. Epidemiol.*, **119**, 309–322.
- Nielsen, S., Hahlin, M., Möller, A. and Granberg, S. (1996) Bereavement, grieving and psychological morbidity after first trimester spontaneous abortion: comparing expectant management with surgical evacuation. *Hum. Reprod.*, **11**, 1767–1770.
- Prettyman, R.J., Cordle, C.J. and Cook, G.D. (1993) A three month follow-up of psychological morbidity after early miscarriage. *Br. J. Med. Psychol.*, **66**, 363–372.
- Quenby, S.M. and Farquharson, R.G. (1993) Predicting recurring miscarriage: what is important? *Obstet. Gynecol.*, **82**, 132–138.
- Regan, L. (1988) A prospective study of spontaneous abortion. In Beard, R.W., Sharp, F. (eds), *Early Pregnancy Loss: Mechanism and Treatment*. Royal College of Obstetricians and Gynaecologists, London, pp. 23–27.
- Seibel, M. and Graves, W.L. (1980) The psychological implications of spontaneous abortions. *J. Reprod. Med.*, **25**, 161–165.
- Spielberger, C.D., Gorsuch, R.L. and Lushene, R.E. (1970) *STAI, Manual for the State-Trait-Anxiety-Inventory*. Consulting Psychologists Press, Palo Alto, CA, USA.
- Stack, J.M. (1984) The psychodynamics of spontaneous abortion. *Am. J. Orthopsychiatry*, **54**, 162–167.
- Stirrat, G.M. (1990a) Recurrent miscarriage I: definition and epidemiology. *Lancet*, **336**, 673–675.
- Stirrat, G.M. (1990b) Recurrent miscarriage II: clinical associations, causes, and management. *Lancet*, **336**, 728–733.
- Stray-Pedersen, B. and Stray-Pedersen, S. (1984) Etiologic factors and subsequent reproductive performance in 195 couples with prior history of habitual abortion. *Am. J. Obstet. Gynecol.*, **148**, 140–146.
- Vaskovics, L.A., Buba, H.-P., Rost, H. *et al.* (1994) Optionen der Lebensgestaltung junger Ehen und Kinderwunsch. In *Tätigkeitsbericht über den Forschungsschwerpunkt Familienforschung der Universität Bamberg 1992/1993*. Otto-Friedrich Universität Bamberg, pp. 38–41.
- Wall-Haas, C. (1985) Women's perception of first trimester spontaneous abortion. *J. Obstet. Gynecol. Neonatal Nurs.*, **14**, 50–53.
- Wasser, S.K., Sewall, G. and Soules, M.R. (1993) Psychosocial stress as a cause of infertility. *Fertil. Steril.*, **59**, 685–689.
- Wehkamp, K.-H., Scheffler, A., Zubke, W. and Langnickel, D. (1989) Psychosomatic impact of stillbirth and abortion. *J. Psychosom. Obstet. Gynaecol.*, **10**, 186.
- Wilcox, A.J., Weinberg, C.R., O'Connor, J.F. *et al.* (1988) Incidence of early loss of pregnancy. *N. Engl. J. Med.*, **319**, 189–194.

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