Induced Abortion as a Risk Factor for Perinatal Complications: A Review

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Past and continuing studies of the influence of a prior induced abortion on subsequent perinatal complications are reviewed. Many definitive conclusions are precluded because of design problems in the extant studies and these methodological issues, therefore, form the focus for the current review. The available studies do suggest that abortion by vacuum aspiration is not a risk factor for complications of subsequent pregnancies, labor, delivery, or of newborns. Abortion by dilatation and curettage, however, may increase the risk of subsequent spontaneous abortion, low birth weight, and prematurity but these findings need to be confirmed. The impact of other abortion techniques on perinatal complications has not been studied. The more common design problems in the extant literature include: (1) failure to control for confounding maternal factors; (2) problems in reliability of reporting previous abortion; and (3) nonspecific measurement of abortion techniques. Since approximately three-quarters of all abortions performed annually in the United States are on young never-married women who may eventually wish to bear children, further rigorous research to define the risks of induced abortion is urgently required.

INTRODUCTION

Over one million abortions were performed in the United States in 1975, a rate of 22.1 abortions per 1,000 women aged 15 to 44 [1]. Despite recent United States Supreme Court decisions affecting the provision of abortion [2] it is likely that this number of abortions will continue to be performed annually in the United States. The annual world-wide incidence of abortion has been estimated between 30 and 55 million [3]. The Center for Disease Control reported that in 1975, among women for whom abortion histories were known, 15.8% of women aborting had experienced one or more previous induced abortions [4]. In New York City 21.5% of abortions on 85,898 city residents in 1974 were to women seeking repeat abortion. In the same population 18% of women seeking repeat abortion were aborting for a third or subsequent time [5].

In spite of high prevalence of induced abortion its possible effect as a risk factor for subsequent reproductive events is only now becoming more fully understood. Two earlier reviewers of the relevant literature concluded: "no definitive conclusions can be drawn from the diverse data obtained from the studies cited above about the long-term complications of legal abortion in the United States" [6], and "we still have very little knowledge of the types of sequelae that may or may not occur" [7]. The present
review indicates that recent and more rigorously designed studies are providing some firmer evidence as to the effect of abortion on subsequent reproductive events although much definitive work still needs to be done. More recent data comes primarily from countries other than the United States, for example: Taiwan [8], Greece [9], Yugoslavia [10], Hungary [11], Israel [12], and Britain [13]. At the time of writing only one study has published data from the United States concerning this question [14], although other studies, included in the review, are in progress.

Since many of the conflicting results in the literature are due to methodological difficulties in studying the effect of abortion on subsequent pregnancies the review focuses on this issue. The findings for specific perinatal complications are reviewed first.

Induced Abortion as a Risk Factor for Perinatal Complications

Perinatal complications following abortion might result from the technique itself or as a result of sequelae to abortion procedures. Serious complications to abortion are known to be relatively rare [3,6] and include perforation of the uterus and laceration of the cervix. Other complications that might influence subsequent pregnancy are retention of placental or fetal parts leading to endometritis, severe pelvic inflammatory disease, generalized peritonitis, and septicemia. Post abortion infection may effect peristalsis in the oviducts leading to a higher rate of extra uterine pregnancies and scar tissue following infections could be detrimental to future pregnancies. Sensitization of Rh-negative women by erythrocytes from an Rh-positive fetus may occur if Rh immune globulin has not been injected.

Excessive dilatation of the cervix during the abortion procedure has been suggested as a possible mechanism for subsequent pregnancy complications as has "placental insufficiency resulting from too vigorous curettage of the basal layers of the endometrium" [15]. The development of uterine synechiae and Asherman's syndrome are other possible mechanisms. Since abortion is performed when the cervical wall is still rather rigid and dilatation applies a force quickly and directly to the wall the risk of rupture and tear is enhanced, which might lead to cervical incompetence. This may be particularly true for pregnancies of eleven and twelve weeks gestation when vaginal abortions are still performed [7]. There is some evidence that the risk of cervical laceration requiring sutures is greater for abortions performed in young teenagers pregnant for the first time [16].

a. Complications of Pregnancy

Extrauterine Pregnancy. Relatively early studies from Eastern Europe reported an increase in extrauterine pregnancy which correlated with increased rates of induced abortion [7,17]. These studies, however, simply correlated changes in the frequency of two events occurring over the same time period (termed "ecological correlations") and failed to account for other temporal trends that might equally explain the observed associations. Moreover, results using national data have not been consistent and similar analyses in Hungary [11] and Yugoslavia [18] failed to show any increase in extrauterine pregnancy with increasing utilization of abortion. More recent and carefully controlled studies in Japan [19-21], Seattle [14], and Hawaii [22], have not found any association between prior abortion and subsequent ectopic pregnancy.

Spontaneous Abortion. Data on spontaneous abortion early in pregnancy is difficult to obtain since it may occur without a woman being aware of it. In the Jerusalem perinatal project women who had previously aborted were significantly more likely to report bleeding in the first, second, and third months of pregnancy.
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compared with women reporting no previous induced abortions [12]. At the Boston Hospital for Women patients who aborted their first pregnancy but carried the second pregnancy to term were compared to women delivering their first or second birth and with no previous abortion. Bleeding in the second trimester was reported to be more frequent following induced abortion [23].

A study by Wright at a London hospital found that women having a second trimester spontaneous abortion had a ninefold greater likelihood of experiencing a previous vaginal induced abortion than women not spontaneously aborting [24]. Although this study has been criticized for using an unrepresentative sample of patients [6], another more recent British study also found a previous induced abortion significantly increased first and second trimester spontaneous abortion rates compared with women who had experienced a previous spontaneous abortion (fetal loss rates of 17.5% and 7.5%, respectively) [13].

Women who aborted at Kandang Kerbau Hospital in Singapore had a higher, but not statistically so, risk of spontaneously aborting the subsequent pregnancy than women delivering in the same hospital. If the abortion had been by D&C spontaneous abortion occurred in 10% of subsequent pregnancies compared with 8% when prior abortion was by vacuum aspiration and 5% when previous pregnancy was delivered [25].

The observation that abortion by D&C may particularly increase the risk of spontaneous abortion was made in preliminary analyses of a World Health Organization International study. Spontaneous abortion was significantly more common following induced abortion and two and one half times more frequent following D&C procedures compared with suction (spontaneous abortion occurring in 8.2% and 3.3% of subsequent pregnancies, respectively) [26]. A higher rate of spontaneous abortion at 16–20 weeks gestation was also significantly more common following abortion, particularly among unmarried women in Hawaii [22].

Other investigators have not found an association between spontaneous abortion and previous induced abortion in Japan [21], Taiwan [8], or Seattle [14]. Women being treated in 1974–1976 at three New York hospitals for spontaneous abortion were not found to have a higher rate of previous induced abortion than women in the prenatal service when matched on age, socioeconomic status, and history of previous spontaneous abortions. This result also held when only abortion of the preceding pregnancy was considered and for all abortion techniques used [27].

Rhesus Isoimmunization. Evidence of the risk of Rh immunization due to transplacental hemorrhage because of induced abortion was more widely reported in the early literature [28–35], especially for abortions in the second trimester [29,34]. Harlap, however, did not find evidence to support the association in Jerusalem [12]. Many recent studies have not reported whether any possible increased risk of Rh immunization was investigated.

b. Complications of Labor and Delivery

Analysis of data from Hungary has shown a correlation between an increased rate of induced abortion and increasing rates of placenta previa and premature separation of the placenta [11]. In Yugoslavia pregnancy complications were five times more common among women with previous abortion, particularly bleeding and toxemia [36]. Neither of these studies controlled for other risk factors for complications of labor and delivery and more recent investigators have not supported their findings.

The Jerusalem perinatal project found no relationship between induced abortion and the incidence of breech, premature rupture of membranes, placenta previa,
placental abruption, cord prolapse, other cord anomalies, fetal distress and asphyxia, post-partum hemorrhage, induction of delivery, use of forceps or vacuum, and the need for cesarean section. Women with a previous induced abortion, however, were significantly more likely to require some intervention in the third stage of labor \( (p < 0.05) \) including manual removal of the placenta [12]. At the Boston Hospital for Women a history of previous induced abortion was unrelated to presence of toxemia, premature labor, placenta previa, or placental abruption [23]. No increased risk of complications of labor and delivery following induced abortion were found in Hawaii [22]. In an early Japanese study Furusawa and Koyo [37] matched on age and civil status a large group of women delivering their second pregnancy after aborting their first with women delivering their first pregnancy. No differences were found in rate of instrumental deliveries, amount of bleeding, or length of the third stage of labor.

c. Complications in the Outcome of Pregnancy

Stillbirths. In a relatively early study in a prenatal clinic in Greece Pantelakis found an increased risk of stillbirths among women who reported previous induced abortions [9]. In Hungary, however, the rate of stillbirths declined despite a corresponding rise in the incidence of induced abortion [11]. Better controlled studies in Japan [20,21], Jerusalem [12], Taiwan [8], Seattle [14], Boston [23] and Singapore [25] have all failed to show an increased risk of stillbirth in pregnancies following induced abortion.

Neonatal Death. Both early and late neonatal deaths were significantly greater (twofold and threefold, respectively) in women with previous induced abortion in Jerusalem but this association was lost when the effect of other confounding variables was controlled [12]. Similarly early neonatal death was more common in the Taiwan women with previous abortion (22.7/1,000 versus 13.8/1,000 with no previous abortion) but was not significant when matching of maternal factors was taken into account [8]. Neonatal death was also unrelated to previous abortion in Seattle [14] and Boston [23]. In the Boston study it is interesting to note that one minute Apgar scores were also unrelated to previous abortion [23].

Other investigators have reported a reduction in infant mortality among countries with, versus those without, liberalized abortion. Thus, of 16 countries reporting the lowest infant mortality rates for 1973–1974, 14 had liberal abortion status or rarely enforced restrictions [38]. These observations, however, are also based on ecological correlations and may result from high risk infants being aborted or they may be spurious associations due, for example, to superior obstetric care being more common in countries where abortion is legal. In any event, they cannot be taken as evidence that induced abortion decreases the risk of neonatal death in subsequent pregnancies.

Low Birth Weight and Prematurity. Low birth weight is usually defined as less than 2,500 grams in the studies reviewed here. A positive relationship between prior induced abortion and low birth weight or prematurity in subsequent deliveries has been reported from studies in Hungary [39], Czechoslovakia [40], Greece [9], and Britain [13]. In the Jerusalem perinatal study women with a previous induced abortion were significantly more likely to deliver babies of less than 2,500 grams and also less than 2,000 grams. When the mean birth weight of babies born to the two groups of women were compared, however, the abortion group was lower but not significantly so (3,368 grams versus 3,283 grams, respectively) [12].

Roht and Aoyama, however, did not find any of these relationships in their Japanese sample [20,21], nor did Hogue in her study of Yugoslav women [10].
Daling and Emanuel examined low birth weight and prematurity (<37 weeks gestation) as two distinct measures, a distinction which makes a better epidemiological criterion. Neither measure, however, was influenced by previous abortion in their Taiwan [8] or Seattle samples [14]. Low birth weight was also unrelated to previous abortion experience in Boston [23], Hawaii [22], and Singapore [25].

In the Singapore [25] and WHO [26] studies a history of abortion by D&C appeared to increase the risk for lower birth weight babies. In Singapore it was estimated that a birth preceded by a D&C terminated abortion weighs 21.9 grams less than a birth preceded by delivery and a birth following aspiration abortion weighs 128.2 grams more, on average, than a birth preceded by delivery [25].

**Congenital Malformations.** In Jerusalem the rate of both major and minor malformation were significantly higher in women with a history of previous induced abortion [12]. The studies in Taiwan [8], Seattle [14], and Boston [23] however, did not show any increased risk, following abortion, for congenital malformations in later offspring. In a case-control study in Connecticut, delivery of a malformed infant was also unrelated to previous abortion with several maternal factors controlled. This finding held when fifteen specific diagnostic malformations were considered and for (1) only abortion of the previous pregnancy, (2) abortion of first pregnancy when the index pregnancy was the second, and (3) multiple previous abortions. It was found, however, that non-white women aged 25–29 who delivered a malformed child were 2.6 times more likely to have previously aborted (\( p < 0.05 \)) than non-white women of the same age who delivered a healthy infant. This may be due to illegal or septic abortion being possibly experienced more frequently in the past by these women [41].

**Methodological Issues**

a. **Confounding Maternal Factors**

One principal problem with many investigations of the relationship between previous induced abortion and subsequent perinatal complications is a failure to control for confounding maternal variables. Since many studies have a retrospective case-control design, confounding variables associated with the prevalence of induced abortion rather than with complications of pregnancy and delivery are of particular concern [42–44].

In many countries women obtaining abortion in the second trimester are significantly more likely to be young, single, from lower socioeconomic groups and pregnant for the first time than women aborting in the first trimester [45–49] which increases the difficulty in interpreting the results of some studies. An even greater problem lies in comparing studies from different countries which have different characteristics of women seeking induced abortion.

In the United States, for example, approximately one-third of all abortions are performed on teenagers, only about one-quarter on married women and almost half on women who have never delivered at full term [4]. In Asia, however, abortion clients are much more likely to be older multiparas [3]. In a study comparing the characteristics of women aborting with those who had never aborted in Jerusalem Harlap and Davies found that abortion was more common in women who had previously delivered and increased with higher birth order up to the fourth, after which it declined [50]. Among women aborting in New York an increase in the mean number of abortions per women with increasing age up to the age of 31 and then a decrease was also found [51]. In the Jerusalem [50] and Japanese [20] studies abortion history was correlated negatively with age at marriage and women who had
aborted were also more likely to have had a previous stillbirth or child death; to be smokers or former smokers; and to report vomiting, bleeding, and taking medication in early pregnancy. In Yugoslavia Hogue found women aborting their first pregnancy, when compared to women delivering, were almost three times as likely to smoke at time of interview or to have ever smoked [10]. In Connecticut women with a history of induced abortion were also significantly \((p < 0.001)\) more likely to have smoked during pregnancy than women without prior abortion [41].

Harlap and Davies controlled for confounding maternal factors by using multiple regression analyses to compute standardized rates for each pregnancy complication in women with and without previous induced abortion [12]. Daling and Emanuel controlled on maternal factors in their Taiwan [8] and Seattle [14] data by individually matching mothers with a history of abortion against a control group of mothers without prior abortion. Other investigators controlled for confounding variables by using discriminant function [10] or loglinear [41] analysis while yet others did not take the effect of maternal factors into account at all.

Hogue has examined the effect of the time interval between induced abortion and subsequent pregnancy and whether or not contraception was used during that interval [52]. Pregnancies at the highest risk of being spontaneously aborted or terminated with a low birth weight infant, were to women who had aborted their previous pregnancy, used contraception immediately prior to conceiving the subsequent pregnancy, and who had an interpregnancy interval greater than two years. While this observation is based on only eight pregnancies with this combination of risks and is difficult to interpret, the analysis does indicate the importance of measuring maternal factors so that possible interactive, as well as confounding, characteristics can be identified.

Other variables which should be considered as possible confounding variables because they may correlate with the incidence of induced abortion are: severe co-morbidity such as hypertension and diabetes, previous infections including venereal disease, use of alcohol in pregnancy, complications of previous pregnancies, and poor previous obstetrical outcomes.

b. Reliability of Reporting Previous Abortions

The problem of biased recall plagues many retrospective studies. Patients who have experienced some trauma are more likely to recall the use of a suspected etiological agent than are members of a control group. Whether the presence of a more serious traumatic event triggers the memory or whether the respondent is simply more inclined to report being exposed to the agent is unclear. In any event there is a possibility of finding an association between the putative agent and the trauma when none, in fact, might exist. When the risk factor under consideration is induced abortion this problem is particularly acute. Abortion is only recently legal in many countries and previous abortions may have been performed "illegally." Moreover, abortion still does not receive general social approval and may be the object of denial and repression. A complicated pregnancy may prompt a more honest positive response to a question concerning previous abortion than would a normal pregnancy or, on the other hand, it may cause a previous abortion to be more strongly denied.

In Hogue's study of Yugoslavian women 63% of women who were known from hospital records to have aborted their first pregnancy denied having done so at a later interview. Moreover, women who delivered normal birth weight babies were somewhat more likely to deny their previous abortion than were women delivering low
birth weight babies [10]. In New York, however, where a validity check on interview responses was also possible, only 1.6% of both cases and controls denied a prior abortion at interview when a prior abortion at the same hospital was noted on the hospital records [27].

Some studies used record linkage on available hospital records [22,23,25] and while this eliminates response bias it does not permit collection of detailed information concerning abortion procedures performed at facilities not included in the recording system, which is probably most of the previous abortions in any one population of hospital patients. Another more useful study technique is to obtain abortion histories at the first prenatal visit and thereby avoid any biased recall [14].

c. Problems in Measuring the Abortion Variable

If abortion is related to subsequent pregnancy complication the technique used to induce abortion will influence the nature of the complication. Very few studies have obtained adequate data on the abortion procedure. In Hogue's study the majority of abortions were by vacuum aspiration (64.2%) followed by dilatation and curettage (23.5%), saline instillation (5.3%), and other procedures (7.0%). The type of procedure was uncorrelated in this study with low birth weight [10]. In Daling and Emanuel's study of women from Taiwan it is assumed on the basis of inquiry among local physicians that all the abortions were performed by dilatation and curettage [8]. In their Seattle study the type of abortion procedure was known for less than half of the sample but in this group it did not correlate with low birth weight or prematurity [14]. Roht and Aoyama concluded on the basis of national statistics that over 90% of abortions in their sample would have been in the first trimester and by dilatation and curettage [21].

Aside from the general unavailability of detailed information about the abortion procedure, newer abortion techniques are constantly being developed the long-term effects of which have not been studied. The most noteworthy of these are the use of second trimester dilatation and curettage [53,54], use of laminaria [55], vacuum aspiration (sometimes called menstrual regulation) in the first weeks of pregnancy [56,57], and the use of prostaglandins in several abortion techniques [58–61].

Gestation of pregnancy at abortion has also been rarely measured. In Seattle gestation of previous abortion was known for 83% of the sample and was unrelated to subsequent birth weight or prematurity [14]. Because of the increase in dilatation required to abort a six-week versus a twelve-week pregnancy, for example, this would be an important measure to enter into analysis. No study has examined the methods used or time taken for dilatation. Richardson and Dixon did report that of 11 women with a lacerated cervix 45.5% experienced fetal loss in the subsequent pregnancy. They suggested that routine Shirodkar suture of the cervix might benefit women known to have a previously lacerated cervix [13]. Preliminary data from a World Health Organization project seems to suggest that dilatation over 12 mm during D&C might increase the risk for subsequent prematurity but this observation awaits further analysis [26]. Few existing studies considered the effect of previous multiple abortions on subsequent pregnancies.

A women's abortion history must also be related to other pregnancy outcomes. Thus not only might the presence or absence of abortion be a risk factor for subsequent pregnancies but the point in a woman's pregnancy history at which it occurred would be relevant. An abortion might effect delivery of a pregnancy immediately following the abortion but have no effect on later deliveries. Alternatively abortion might have no effect on subsequent deliveries if the abortion follows
delivery of a previous pregnancy. Possibly only abortions of first pregnancies are a risk factor for subsequent deliveries. The time interval between the abortion and subsequent conception is also a variable to be examined further [52].

CONCLUSION

In spite of methodological difficulties in much of the extant literature on the effect of prior induced abortion on subsequent perinatal complications some consensus has emerged. There is general agreement that ectopic pregnancy is not more common after abortion. The case for spontaneous abortion is less clear since some studies have found an increase in first and second trimester bleeding and spontaneous abortion. However, if the rate of spontaneous abortion is increased following abortion it seems to be after abortions performed by D&C rather than vacuum aspiration. This observation is important in view of recent trends to use D&C as a mid-trimester procedure. Rhesus isoimmunization may have been a complication several years ago but the use of Rhogam at most abortion facilities appears to have alleviated the problem. Neither complications of labor and stillbirth or neonatal deaths appear to increase following abortion of an earlier pregnancy. Low birth weight and prematurity correlate with a prior abortion in earlier studies but not in more recent and better controlled ones. Some of the discrepancy in these observations may be due to differences in the technique used to perform abortion with vacuum aspiration decreasing this risk. Congenital malformations do not appear to be more common in pregnancies following induced abortion.

Of the more than one million abortions performed annually in the United States approximately three-quarters are on single women who are likely to wish to deliver in the future [1]. There is particular need, therefore, to examine the effect of newer abortion techniques and to clarify the impact of D&C procedures. Also of interest is the effect of complications from all procedures (such as sepsis) on later pregnancy. Also still unclear at this time is the effect of prior abortion on secondary sterility [3].

Knowledge of any possible increased risk caused by abortion to subsequent pregnancies is important for both patients and health professionals. For a woman who is deciding whether or not to seek induced abortion, knowledge that the procedure may change her risk status in terms of future pregnancies will be an important consideration in her own decision-making process. More specific information about other characteristics (such as smoking) that may even further elevate her risk status are especially important in making this decision. Studies of this problem will also provide a data base on which physicians and other health professionals may more usefully advise their patients and clients who seek counsel concerning a decision whether or not to seek abortion.

Secondly, knowledge of whether previous abortion is a risk factor for pregnancy is important to the physicians in charge of each woman's perinatal care. If previous abortion (or some more specific abortion experience) is a risk factor for pregnancy complications, either by itself or in combination with other predisposing factors, awareness of this abortion experience would alert the physician to the increased risk status of his patient and allow him to make contingency plans for these risks should they materialize during the perinatal period.

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