INTRODUCTION

The success of implantation is governed by the linear and direct interactions of three basic components which are crucial to the physiological procedure: endometrial competence with enough progesterone priming, a viable fetus, and immunological regulatory mechanisms, some of which have been controlled genetically by ovarian hormones.  

The mechanism of placental localization is not fully known since placental development is a complicated process. The invading blastocyst interacts with the uterine wall tissue to form the placenta. The formation of the placenta encompasses a number of critical phases and processes, such as uterine receptivity, implantation, and placentation, which is the construction of the ultimate vascular configuration, in humans, a hemochorial placenta.  

As the placenta grows in size and complexity, this is a dynamic stage of gestation. As a result, a suitable endometrial environment is required to ensure the formation of an acceptable fetal–maternal interaction. The placenta itself does not move; however, the tissue in which it is implanted swells, giving the impression that the placenta is moving up and away from the cervix. This procedure occurs in a normal, intact uterus, although it is unknown whether the same mechanism operates as efficiently in a scarred uterus.  

Despite the absence of data confirming significant maternal and perinatal advantages with CS rates above a certain threshold, and some research demonstrating a correlation between increasing CS rates and poorer outcomes, cesarean section births have increased rapidly globally in recent decades, especially in middle- and high-income nations.  

The aim of the research is to determine the effect of the cesarean section scar on gestational sac implantation site and its relation to future placental location (An ultrasound and retro-chorionic Doppler velocimetric study).

PATIENTS AND METHODS

A Prospective case-control study that includes 100 pregnant women with singleton pregnancy, half of them with a history of previous CS and the other half with no history of CS was conducted from October 2020- September 2021 at El-Hussein Hospital Department of Obstetrics and Gynecology Outpatient Clinic and Inpatient.
Inclusion criteria
Intraterine pregnancy with a singleton, gestational age less than 10 weeks by LMP and CRL, and with or without a history of one or more previous cesarean sections.

Exclusion criteria
Absence of fetal heart activity, uterine cavity abnormalities such as uterine myoma, uterine cavity malformations, multifetal gestation, and any medical indication for pregnancy termination that interferes with the patient’s complete follow-up.

Ethical consideration:
All of the participants have been volunteers. An informed written consent was signed by all of them and the purpose of the research prior the start of the research was clarified. Approval was received from the ethical committee at Al Azhar University, Faculty of Medicine.

Statistical analysis:
The statistical package for social sciences, version 20.0, was used to analyze the collected data (SPSS Inc., Chicago, Illinois, USA). The mean±standard deviation (SD) was used to express quantitative data. Qualitative data were expressed as frequency and percentage.

The following tests were done:
When comparing two means, an independent-samples t-test of significance has been used. When comparing more than two means, a one-way analysis of variance (ANOVA) has been used. Least Significant Difference (LSD) has been employed for numerous comparisons between different variables in the post-hoc test. Comparing proportions between qualitative parameters has been done using the Chi-square (χ²) test of significance. If one or both of the variables have been skewed, Spearman’s rank correlation coefficient (r) was employed to evaluate the degree of relationship between them. The margin of error accepted was set to 5%, with a 95% confidence interval. Thus, a P-value of <0.05 was regarded as significant, a P-value of 0.05 was regarded as extremely significant, and a P-value of >0.05 was regarded as insignificant.

RESULTS

<table>
<thead>
<tr>
<th>Variable</th>
<th>CS (n=50)</th>
<th>Non CS (n=50)</th>
<th>Test value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>29.66±2.85</td>
<td>28.84±5.13</td>
<td>0.821</td>
<td>0.414</td>
</tr>
<tr>
<td>Gravidity</td>
<td>3.07±1.17</td>
<td>2.55±1.71</td>
<td>1.775</td>
<td>0.079</td>
</tr>
<tr>
<td>BMI [wt/(ht)^2]</td>
<td>28.61±3.35</td>
<td>28.23±3.67</td>
<td>0.541</td>
<td>0.590</td>
</tr>
</tbody>
</table>

Using: Independent Sample t-test; p-value >0.05 NS

Table 1: Age distribution of the studied population

As shown in the above table, average age was 29.66 years in CS group with SD 4.85 and ranged 24-43 years, and was 28.84 years in non-CS group with SD 5.13 and ranged 23-42 years; the P-value was 0.414 that means no significant difference between the two groups indicating that the sample is not biased regarding age towards any group.

Average of gravidity was 3.07 in CS group with SD 1.17, and 2.55 in the non-CS group with SD 1.71; P-value was 0.079 that means a significant difference between the two groups exist. As there is a restriction on the CS group to be gravidity 2+ as a selection criteria, and the non CS group may be primigravida. These selection criteria enhanced a shift in the CS group gravidity mean. To ensure that gravidity deviation has no effect on the study objectives, a correlation analysis between gravidity and implantation site is presented in the analysis section.

Average of BMI was 28.61 in CS group with SD 3.35, and 28.23 in the non-CS group with SD 3.67; P-value was 0.590 that means no significant difference between the two groups and indicating that the sample is not biased regarding BMI.

<table>
<thead>
<tr>
<th>GS Diam.</th>
<th>CS (n=50)</th>
<th>Non CS (n=50)</th>
<th>Test value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>25.25</td>
<td>24.98</td>
<td>0.177</td>
<td>0.860</td>
</tr>
<tr>
<td>SD</td>
<td>6.60</td>
<td>8.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Using: Independent Sample t-test; p-value >0.05 NS

Table 2: Gestational sac diameter in the studied population

The results showed that the average of GS diameter was 25.25mm for the CS group with SD 6.60, and 24.98 for the non-CS group with SD 8.51; P-value was 0.860 indicating insignificant difference between the two groups.

<table>
<thead>
<tr>
<th>Distance from GS to IO</th>
<th>CS (n=50)</th>
<th>Non CS (n=50)</th>
<th>Test value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>30.33</td>
<td>29.04</td>
<td>0.877</td>
<td>0.383</td>
</tr>
<tr>
<td>SD</td>
<td>6.68</td>
<td>7.97</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Using: Independent Sample t-test; p-value >0.05 NS

Table 3: Distance from GS to IO in the two studied groups

Average of Distance from GS to IO was 30.33 for the CS group with SD 6.68, and 29.04 for the non-CS group with SD 7.97; P-value was 0.383 indicating insignificant difference between the two groups.

<table>
<thead>
<tr>
<th>Retrochorionic RI</th>
<th>CS (n=50)</th>
<th>Non CS (n=50)</th>
<th>Test value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.51</td>
<td>0.50</td>
<td>0.981</td>
<td>0.329</td>
</tr>
<tr>
<td>SD</td>
<td>0.04</td>
<td>0.06</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Using: Independent Sample t-test; p-value >0.05 NS

Table 4: Retro-chorionic Doppler RI in the two studied groups

Average of Retro chorionic RI was 0.51 for the CS group with SD 0.04, and 0.50 for the non-CS group with SD 0.06; P-value was 0.329 indicating insignificant difference between groups.
Uterine Relatio Chi
Mid to square test Total
value and 3 cases belong to non percent 6%, from which Gestational Sac was at the uterine midpoint, with 44 cases belong to non percent 89%, 45 cases belong to CS group and 9 cases belong to non-CS group. Using: Chi

up is no statistically difference.

Table 5: Implantation site in the two studied groups

Between the 100 cases, 15 cases were found with implantation site Fundal with percent 15%, from which 7 cases belong to CS group and 8 cases belong to non-CS group. 32 cases were found Anterior with percent 32%, from which 15 cases belong to CS group and 17 belong to non-CS group. 49 cases were found Posterior with percent 50%, from which 27 cases belong to CS group and 22 cases belong to non-CS group. 34 cases were found Anterior with percent 34%, from which 16 cases belong to CS group and 18 cases belong to non-CS group. 50 cases were found Posterior with percent 50%, from which 27 cases belong to CS group and 23 cases belong to non-CS group. 0 cases were found Low lying anterior with percent 0%, from which 1 case belongs to CS group and 23 cases belong to non-CS group.

Table 6: GS midpoint in relation to uterine midpoint in the two studied groups

The results showed 89 cases out of 100 having Gestational Sac above the uterine midpoint, with percent 89%, 45 cases belong to CS group and 44 cases belong to non-CS group. In 6 cases Gestational Sac was at the uterine midpoint, with percent 6%, from which 3 cases belong to CS group and 3 cases belong to non-CS group. In 5 cases Gestational Sac was below the uterine midpoint, with percent 5%, from which 2 cases belong to CS group and 3 cases belong to non-CS group. Among all Gestational Sac positions, it was most likely to be above the uterine midpoint, midsection being the highest value among all sites, from which 49 cases were found Posterior with percent 49%, that belongs to CS group. 15 cases were found Anterior with percent 15%, from which 7 cases belong to CS group and 8 cases belong to non-CS group.

Table 7: Placental location distribution in the two studied groups

Thirty cases were found with placental location Fundal, with percent 15%, from which 7 cases belong to CS group and 8 cases belong to non-CS group. 34 cases were found Anterior with percent 34%, from which 16 cases belong to CS group and 18 cases belong to non-CS group. 50 cases were found Posterior with percent 50%, from which 27 cases belong to CS group and 23 cases belong to non-CS group. 26 cases belong to CS group and 23 cases belong to non-CS group. 2 cases were found Low lying posterior with percent 2%, that belongs to non-CS group, and 1 case continued with Low lying anterior. Only 1 case continued with Low lying posterior with percent 2%, that belongs to non-CS group, there is no statistically difference, there is no statistically difference.
It was found that all fundal placentae were fundal implantation site, in case of 34 cases of anterior placentae, about 32 were anterior implantation and 2 cases were low anterior implantation. In case of 50 of posterior placentae, about 49 were posterior implantation site and 1 was low posterior implantation. Only one case of low lying posterior placenta was low lying posterior implantation site. There was a highly statistically significant relation with p-value <0.001.

**DISCUSSION**

Although a lack of data indicates significant maternal and perinatal advantages with CS rates beyond a specific threshold, as well as some studies demonstrating a connection between rising CS rates and poorer results, the usage of CS has expanded considerably globally in recent decades, especially in middle- and high-income nations. According to WHO, no country's cesarean section (CS) rate ought to be more than 10% to 15%. The cesarean birth rate has risen considerably in recent years around the world, with several nations exceeding the WHO's recommended rates.

Until date, there has been little debate about the impact of CS scars on early gestation processes, including implantation and the developing placenta. So a case-control study that include 100 pregnant women with singleton pregnancy, half of them with a history of previous CS and the other half with no history of CS was conducted at El-Hussein Hospital Department of Obstetrics and Gynecology Outpatient Clinic to detect effect of cesarean section on implantation site and future placenta.

The present study found that:

There were no significant differences in age and BMI between the two groups, indicating that the two groups of the study were matched in age and BMI. The results are analogous to those of a study conducted by Naji et al. wherein 738 women who had had one or more prior cesarean sections and 1856 women who had not had prior cesarean births were recruited, and a comparison analysis of placental placement was conducted among the two groups, as well as an assessment of the placental migration in those categorized as reduced lying at 20 and 32 weeks of pregnancy. There was a link between increasing women's age and the presence of cesarean scars (p<0.001).

Also, in contrast to the findings of Timofeev et al., a major prospective study in 12 obstetric centers in the United States found a link between prior cesarean section scars and increasing maternal age. There was a significantly high gravidity in the CS group (P-value was 0.011) as there is a restriction on the CS group to be gravidity 2+ as a selection criteria, and the non CS group may be primigravida.

These selection criteria enhanced a shift in the CS group gravidity mean. This is consistent with the findings of Al-Rowaily et al., a Saudi Arabian study that identified a high prevalence of cesarean among pregnant women with a history of many births and large parity, as well as the results of Mohamedsalih et al. who discovered a considerable correlation between women's high gravidity history and CS (p<0.001). Average of Distance from GS lower edge to IO was 29.79±6.63 mm for the CS group, and 28.81 ±7.91 mm for the non-CS group; with insignificant difference between the two groups. This result doesn’t Mohamedsalih et al., which revealed that women with CS had a significantly shorter mean distance between GS and IO (p<0.001) as the distance between GS and IO (cm) was 2.9±0.6 cm in the CS group and 3.4±0.5 8.5 cm in the non-CS group.

Also not coinciding with the results of Naji et al. which revealed a strong correlation between the mean distance between the implantation site and the internal OS of the cervix, and the occurrence of CS scars (P, 0.0001).

Women with prior CS had a mean distance of 26.6 mm, whereas those without had a distance of 35.3 mm. Evaluating the relation of midpoint of the GS to the midpoint of the uterine cavity (GS location) in the two groups of the study, Chi-Square test indicated Independence between the two groups, that means classification under CS and Non-CS groups has no effect on GS site. (P-value was 0.948).
CONCLUSION

Doppler indices but retro-chorionic Doppler was valuable in color mapping and confirmation of chorio-decidual reaction site for easy detection of early implantation site. Relation of gestational sac midpoint to uterine midpoint is a better and easy method of locating the gestational sac site than measuring distance from lower edge of gestational sac to internal OS due to different gestational sac size.

There is a relation of early gestational sac site in the first trimester and future placental location in second and third trimester so early first trimester gestational sac site will help in predicting future placental site.

REFERENCES


