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Ultrasound, Mother-attachment, and the Quickening Fetus

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Abstract

Ultrasound examination of the fetus during the various stages of pregnancy is employed as a routine tool for the follow up and assessment of pregnancy. The psychological impact of US on the pregnant woman, and specifically, its effect on the emotional attachment between the expectant mother and the fetus are still controversial. We have investigated the effect of ultrasound on the maternal-fetal attachment in 112 pregnant women undergoing routine ultrasound examination. Our results indicate that ultrasound examination during pregnancy is associated with a significant increase in maternal-fetal attachment as measured by comparing the pre- and post-US MFA scores. This change was mainly induced by the effect of ultrasound on a subgroup of women who had experienced quickening before being subjected to the examination, while no significant effect of ultrasound on maternal-fetal attachment was detected in the subgroup of women who had not experienced quickening prior to examination. These findings support the assumption that quickening is a significant factor enhancing the woman's perception and attachment to the growing fetus while no detrimental effect to attachment is observed when viewing the fetus precedes quickening.

Zusammenfassung

Die Ultraschalluntersuchung des Föten während der verschiedenen Abschnitte der Schwangerschaft wird als eine Routineuntersuchung zur Beobachtung und Einschätzung der Schwangerschaft verwendet.

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Die psychologische Wirkung der Ultraschalluntersuchung auf die schwangere Frau und besonders die Auswirkung für die emotionale Bindung zwischen der werdenden Mutter und dem Föten wird noch kontrovers diskutiert. Wir haben die Wirkung der Ultraschalluntersuchung auf die Bindung zwischen Mutter und Föten bei 112 schwangeren Frauen untersucht, die die routinemäßige Ultraschalluntersuchung durchliefen. Unsere Ergebnisse zeigen an, daß die Ultraschalluntersuchung während der Schwangerschaft eine signifikante Intensivierung der Beziehung zwischen Mutter und Föten bedeutet, wie man sie an den Meßwerten einer Fragebogenbefragung vor und nach der Untersuchung ablesen kann. Diese Veränderung der Meßwerte war vor allem durch die Wirkung der Ultraschalluntersuchung auf eine Subgruppe der Frauen verursacht, die vor der Untersuchung Kindsbewegungen gespürt hatte, während keine signifikante Wirkung der Ultraschalluntersuchung auf die Subgruppe von Frauen zu beobachten war, die vor der Untersuchung noch keine Kindsbewegungen gespürt hatten. Diese Befunde unterstützten die Annahme, daß die Kindsbewegungen ein bedeutender Faktor zur Förderung der Wahrnehmung des Föten durch die Frau und für die Beziehung zwischen beiden sind. Ein negativer Effekt auf die Beziehung zwischen Mutter und Föten, wenn noch keine Kindsbewegungen erlebt waren, war nicht zu beobachten.

Introduction

Ultrasound (US) is an important screening device used routinely during pregnancy for determination of pregnancy age and detection of fetal malformations. Almost every pregnant woman undergoes at least one routine US procedure during her pregnancy.

Ultrasound examination during pregnancy allows direct viewing of the fetus and is thought to exert a modulating effect on the maternal fetal attachment (MFA) which is an important prerequisite to successful maternal-fetal adaption [1,2]. It has long been suspected that visualization of the fetus during an US examination may evoke a significant emotional response by the expectant mother. However, the nature of such a response and its potential benefits or detrimental effects, are still controversial [3–5].

Quickening appears to be an important psychological factor in pregnancy. Accordingly, special emphasis was given in the psychiatric and obstetric literature to the influence of quickening on the MFA [1,6–8]. Most authors believe that quickening improves the MFA and some even hold the assumption that viewing the fetus during US may be acknowledged as being equivalent in importance to quickening, although some suggest that viewing the fetus before quickening may cause a traumatic experience to the pregnant woman [4].

In order to investigate the inter-relationship between the effects of US and quickening on the MFA during pregnancy, we studied the short term effect of a single routine US procedure on MFA in a heterogeneous group of healthy preg-

nant women. Multiple demographic and obstetric variables were analyzed in an attempt to identify modifiers of the US effect on attachment.

Methods

Population and study design. 137 of 139 consecutive pregnant women undergoing routine ultrasound evaluation during pregnancy in an urban clinic were asked and complied to participate in the study. Pregnant women who referred for US examination for high risk pregnancy (as defined by the referring physician) were excluded from the study.

Before undergoing the US examination the patients were given two questionnaires. The first was comprised of demographic and obstetric parameters and the second was the Maternal Fetal Attachment (MFA) scale [10].

An identical MFA scale questionnaire was given to each women in a self-addressed stamped envelope. The women were asked to complete and mail the second MFA scale three days after the US examination. This was done to assess the short-term effect of the US examination on the MFA score. An informed consent to participate in the study was signed by each participant. Each questionnaire was assigned a number to insure anonymity of the participating women.

112 (81.7%) women, aged 18–40 years (mean ± 4SD, 27.6 ± 4.7 years), returned the second questionnaire and comprised the study group. The mean pregnancy age was 23.2 ± 8.8 weeks (range 6–40 weeks) and the mean number of past pregnancies for each woman was 2.4 ± 1.6 (range 1–10 pregnancies). The demographic variables of our study group are listed in Table 1.

Ultrasound examination. Ultrasound examination was performed by the same technician under the supervision of the same gynecologist. Women were allowed to see the screen of the US and received an explanation of the US image.

Statistical analysis. Data were analyzed by comparing the individual and group means of the pre-ultrasound MFA scores to the post-ultrasound scores and by multiple correlation studies between the various demographic variables listed in Table 1 and the calculated change in MFA score after the US examination. Data were sorted according to various demographic variables and databases of subgroups of patients were created based on these variables. These were then further analyzed. Parametric (paired t-test, regression analysis) and non-parametric (Wilcoxon signed-rank test, Chi-square test) statistical techniques were used.

Results

The mean MFA score for the study group as a whole, increased significantly after the US examination as compared to the pre-US MFA score (51.8 ± 12.6 vs. 48.5 ± 12.5, $p < 0.001$). By analyzing the means of subgroups of women sorted according to a variety of social and obstetric variables we identified the presence of quickening as the most important factor in the observed increase in the MFA score. While a statistically significant increase occurred in the subgroup that had experienced quickening (n = 71) (51.5 ± 12.4 before US vs. 56.2 ± 11.94 post US,

Table 1. Demographic and obstetric variables of the study group (n = 112).

Variables	Mean ± SD	Range
Age (years)	27.6 ± 4.7	18–40
Education (number of school years)	13 ± 2.3	6–19
Duration of marriage (years)	5.3 ± 4.8	0–26
Number of children	1.05 ± 1.2	0–6
Pregnancy age (weeks)	23.3 ± 8.8	6–40
Number of US examinations (past pregnancies)	0.8 ± 1.6	0–12
Number of US examinations (current pregnancy)	0.9 ± 1.2	0–5
Other variables		
Conception difficulties (current pregnancy)	yes	n = 14
	no	n = 98
Country of origin	Israel	n = 96
	Europe	n = 7
	North America	n = 2
	North Africa	n = 2
	South Africa	n = 1
	Asia	n = 4
Religious belief	religious	n = 53
	non-religious	n = 59

$p < 0.0001$), no significant difference was found in the group of women who had not experienced quickening prior to the US examination (n = 41) (43.3 ± 11.1 before US vs. 44 ± 9.8 post US, $p > 0.05$). The characteristics and MFA scores of the two groups of women (with and without quickening) are listed in Table 2 and Table 3.

Comparing the individual scores before and after US examination (t-test for paired samples) for the whole group revealed again a significant difference between the scores ($p < 0.001$) but when the test was applied for each group (quickening vs. no-quickening) it was apparent that this change was only due to the women who had experienced quickening and who had demonstrated significant difference between the scores ($p = 0.02$) while those who had not experienced quickening showed no statistically significant difference (Fig. 1). Subdividing the original group into three subgroups according to the three pregnancy trimesters and comparing the scores in both groups for each trimester again showed significant difference for the quickening group in the second trimester ($p < 0.002$) as well as in the third trimester ($p < 0.02$) while no such difference was observed in the no-quickening group.

Regression analysis between multiple demographic and obstetric variables and the change in MFA scores (expressed as % change from pre-US MFA score) showed that the level of education (expressed as the number of school years attended by the pregnant woman) was negatively associated with the change in score, i.e., the less the number of school years a woman had, the more was the increase in MFA score after US ($p < 0.01$, $r = -0.283$).

Table 2. Demographic and obstetric variables of women experiencing and not experiencing quickening.

Variables	Quickening present (mean ± SD/range)	Quickening absent (mean ± SD/range)
Age (years)	28 ± 4.9 (18–40)	26.9 ± 4.2 (19–38)
Education (number of school years)	12.6 ± 2.3 (6–19)	13.4 ± 2 (10–18)
Duration of marriage (years)	5.7 ± 4.6 (0–20)	4.6 ± 5 (0.4–26)
Number of children	1.2 ± 1.1 (0–6)	0.9 ± 1.4 (0–6)
Pregnancy age (weeks)	27.8 ± 6.7 (13–40)	14.7 ± 5.3 (6–28)
Number of US examinations (past pregnancies)	0.6 ± 1.2 (0–6)	1.2 ± 2.1 (0–12)
Number of US examinations (current pregnancy)	1.1 ± 1.3 (0–5)	0.5 ± 0.9 (0–4)
Other variables		
Trimester of pregnancy		
First trimester	n = 1	n = 22
Second trimester	n = 38	n = 18
Third trimester	n = 32	n = 1

Table 3. MFA scores for the study group and subgroups according to the presence of quickening.

Timing of MFA assessment	All group	Quickening group	No-quickening group
Before ultrasound	48.5 ± 12.5	51.5 ± 12.4	43.3 ± 11.1
After ultrasound	51.8 ± 12.6	56.2 ± 11.9	44.0 ± 9.8
Fraction*	+1.1 ± 6.2	+1.136 ± 0.297	+1.037 ± 0.176

*Calculated as pre-US MFA score/post-US MFA score.

The age of the women, duration of marriage, religious belief, number of children in the family, conception difficulties, number of past pregnancies, and the number of ultrasound examinations a woman had during past or current pregnancies were not significantly associated with the change in MFA score. When correlation studies between the change in MFA score and these variables were applied independently to the quickening and no-quickening groups, no effect was observed in the no-quickening group, but the negative association between level of education and score change was maintained in women who had experienced quickening ($p < 0.005$, $r = -0.343$, 95 % confidence limits 6.97–20.3) (Fig. 2). In addition, conception difficulties in the past were associated with a larger positive change in MFA score in women who had experienced quickening ($p < 0.01$, Chi-square test).

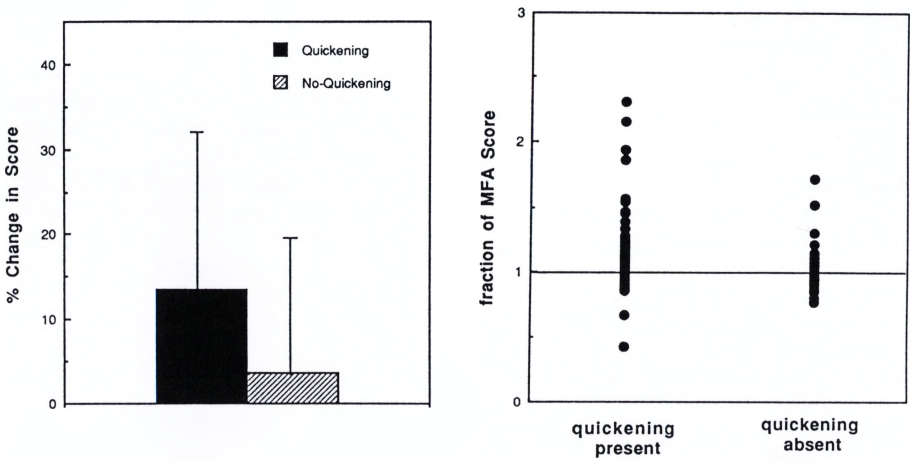

Fig. 1a,b. (**a**) The mean ± SD change in MFA score (in %) after ultrasound examination in the groups of women who had and hat not experienced quickening. (**b**) Scattergram of the individual fraction (calculated as post-US MFA score divided by the pre-US MFA score) for the groups of women who had and had not experienced quickening.

Discussion

Ultrasound examination of the fetus during the various stages of pregnancy is employed as a routine tool for the follow up and assessment of pregnancy. The psychological impact of US on the pregnant woman, and specifically, its effect on the emotional attachment between the expectant mother and the fetus are still controversial[3,11]. Various factors such as stage of pregnancy, the presence or absence of quickening, and difficulties in conception, are believed to partake in the development of the maternal-fetal attachment and effect some of the emotional changes attributed to US. Our results indicate that ultrasound examination during pregnancy is associated with a significant increase in maternal-fetal attachment as measured by comparing the pre and post-US MFA scores. This change was mainly induced by the effect of US on a subgroup of women who had experienced quickening before being subjected to the US examination, while no significant effect of US on MFA was detected in the subgroup of women who had not experienced quickening prior to US examination. These findings support the assumption that quickening is a significant factor enhancing the woman's perception and attachment to the growing fetus[1,6–8]. However, there are only a few studies that have addressed this hypothesis in small-size study groups[8,12].

Our observation on the effect of quickening may be related to the need of the expectant mother to perceive the physical presence of her baby by quickening before the visual effect of the US image could be integrated with her bodily sensations and enhance her emotional attachment toward her fetus. The absence of quickening interferes with the woman's ability to make the necessary affective connection between ultrasound screen and her pregnancy. The effect of quickening surpassed the expected role of pregnancy age on the MFA score. Comparing women in the same stage of pregnancy (second trimester) still showed the in-

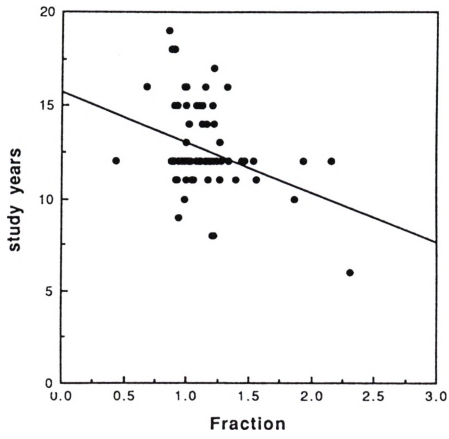

Fig. 2. Linear regression analysis between the level of education of women experiencing quickening and the fraction of MFA score (calculated as post-US MFA score divided by the pre-US MFA score).

crease in MFA score only in women who had experienced quickening, although no traumatic effect was observed when US viewing preceded quickening, as had been suggested by some investigators [4].

Most of the multiple variables that had been analyzed were shown to exert no significant effect on the US-induced change on MFA score. However, previous problems and difficulties in conception were associated with an increase in MFA score after US examination. This was only detected in the subgroup of women who had already sensed quickening. This can be explained by the increased level of anxiety for the well being of the fetus which may limit the woman's attachment to the fetus similar to what had been observed in women who undergo amniocentesis [13]. This phenomenon augmented the effect of quickening on the change in MFA score after US and, again, was not detected in the no-quickening group.

More puzzling is the inverse association between the level of education and the US effect on the MFA score which was observed in our group of women who had experienced quickening prior to the US examination. We were unable to find similar association in the literature although one may speculate that the more educated women is, the more acquainted she is with the expected US image and, accordingly, the less she would be affected by the visual demonstration of her fetus.

We conclude that ultrasound examination enhances the attachment of the pregnant woman to her developing fetus. This effect becomes evident only after quickening is experienced by the woman while no detrimental effect to attachment is observed when viewing the fetus precedes quickening.

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