Does three-dimensional prenatal ultrasound necerrasy: pregnant women's point of view

Rola ultrasonografii trójwymiarowej z punktu widzenia kobiety ciężarnej

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Abstract

Objectives: *The role and applicability of three-dimensional ultrasound (3D-US) in perinatology has been repeatedly discussed in the literature. Regardless, our knowledge about patient expectations remains limited. We aimed at determining the expectations, perception and knowledge of pregnant women about 3D-US.*

Material and Methods: *Upon admission to the labor unit, the women filled out a questionnaire, with the help of a doctor, investigating sociodemographic data, pregnancy and delivery history, previous experiences and expectations for US imaging.*

Results: *A total of 644 pregnant women were included in the study. Respondents declared that approximately 70% of all kinds of structural abnormalities could be detected by 3D-US and estimated its reliabilityat nearly 70%. While 60% of the participants underwent 3D-US, 70% of them believed that every pregnant woman should undergo such test. Also, 457 (70.9%) of the participants were of the opinion that every pregnant woman must undergo 3D-US imaging, whereas 173 (26.8%) did not think 3D-US imaging was necessary.*

Conclusions: *To the best of our knowledge, this has been the first study on patient opinions regarding the need for 3D-US imaging during pregnancy. Although the participants were not certain about the harmful effects of 3D-US, the majority believed that it was necessary for every pregnant woman to undergo such testing. Obviously, patients must be instructed on the limitations of US imaging before the examination to clarify any misunderstandings about the possibilities such a technique may offer.*

Key words: **three-dimensional ultrasound** / **pregnancy** / **prenatal diagnosis** /

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Streszczenie

Cel: *Rola i zastosowanie ultrasonografii trójwymiarowej (3D-US) w perinatologii jest częstym tematem dyskusji w literaturze. Mimo to nasza wiedza na temat oczekiwań pacjentek pozostaje ograniczona. Naszym celem było określenie oczekiwań, spostrzegania i wiedzy kobiet ciężarnych na temat 3D-US.*

Materiał i metoda: *Podczas przyjęcia do oddziału porodowego pacjentki wypełniały kwestionariusz, z pomocą lekarza, dotyczący ich danych socjodemograficznych, wywiadu odnośnie ciąż i porodów, poprzednich doświadczeń i oczekiwań w związku z badaniem US.*

Wyniki: *Do badania włączono 644 ciężarne. Kobiety oceniły, że około 70% wszystkich anomalii strukturalnych może być wykrytych w trakcie badania 3D-US i oszacowały ich wiarygodność na blisko 70%. Około 60% ciężarnych przeszło badanie 3D-US, z czego 70% uważa, że każda kobieta w ciąży powinna mieć takie badanie wykonane. Również, 457 (70,9%) respondentek uważało, że każda ciężarna powinna przejść badanie 3D-US, podczas gdy 173 (26,8%) nie uważa aby takie badanie było konieczne.*

Wnioski: *Według naszej wiedzy jest to pierwsze badanie na temat opinii pacjentek na temat potrzeby wykonania badania 3D-US podczas ciąży. Chociaż pacjentki nie miały wiedzy na temat bezpieczeństwa 3D-US w ciąży, większość z nich uważała, że istnieje konieczność aby każda ciężarna przeszła takie badanie. Oczywiście pacjentki muszą być informowane o ograniczeniach badania US aby wyjaśnić nieporozumienia dotyczące możliwości jakie niesie ze sobą ta technika.*

Słowa kluczowe: **USG 3D** / **ciąża** / **badania prenatalne** /

Introduction

Advances in technology and medical science allowed for new imaging systems to be introduced into the field of perinatology. Three-dimensional (3D) and four-dimensional (4D) ultrasound testing havebeen applied there for a considerable length of time already. Potential benefits and disadvantages of 3D- and 4D-US on prenatal monitoring have been a source of much debate for equally long [1]. Some studies defending 3D-US mostly emphasize that the examination strengthensthe bond between the parents and the baby [2, 3], while others report nothing of the kind [4, 5].

While authors try to determine the best perinatal screening strategy, expectations of future parents for imaging modalities continue to increase. Although ultrasound imaging during pregnancy is recommended only for medical purposes, in reality expectations of patients go beyond these guidelines.

Objectives

The role and applicability of three-dimensional ultrasound (3D-US) in perinatology has been repeatedly discussed in the literature. Regardless, our knowledge about patient expectations remains limited. We aimed at determining the expectations, perception and knowledge of pregnant women for 3D-US.

Materials and methods

The study was conducted at the Obstetrics Departments of Afyon Kocatepe University Hospital and Istanbul Bezm-i Alem University Hospital, between January and December 2011.

The local ethical committee approved of the study.

Patients were asked to participate in the study upon admission into the delivery ward. Written informed consents were obtained before inclusion in the study. A questionnaire on patient sociodemographic data, history of pregnancy and birth, previous experiences with US and expectations forUS imaging was filled out with the help of a doctor.

Data were analyzed with the use of SPSS for Windows 15.0 (Statistical Package for Social Sciences, SPSS Inc. Chicago, IL, United States). Mean ± standard deviation test was used for continuous variables and Chi-square test was used for nominal variables. $P<0.05$ was accepted as statistically significant.

Results

A total of 644 pregnant women participated in the study. Patient sociodemographic data are presented in Table I.

During the check-up visits, 21.9% of the patients underwent US testing because they wished to have the test performed and 16.6% of the participants declared they would not go if the doctor refused to perform US imaging test. Moreover, 81.6% of all participants reported they expected US imaging during every check-up visit in pregnancy. When asked about the hazardous effects of US, 23.9% of the women stated it had some negative effect on the fetus. As far as 3D-US was concerned, 10.5% of the women believed it was not completely safe and 32.4% did not know whether it was hazardous or not.

Participant expectations for 3D-US imaging are summarized in Table II. The patients believed that approximately 70% of all kinds of structural abnormalities could be detected by 3D-US and its reliability was nearly 70%, as well. Although only 60% of the participants underwent 3D-US, 70% of them were of the opinion that every pregnant woman should undergo the 3D-US test.

The respondents were asked about their feelings after the US imaging test (Table III). Half of them were satisfied with the examination.

Patient expectationsforUS imaging were summarized in Table IV. It turned out that 75.3% expected to learn if the baby had any structural abnormalities, 64.8% wanted to find out whether the baby was alive or not, and only1.4% had no expectations for the test.

While 457 (70.9%) of the participants thought that every pregnant women should undergo 3D-US imaging, 173

Table I. Patient sociodemographic characteristics.

Age		26.79±5.59
Gravidity		2.41±1.35
Parity		1.84±1.18
Miscarriage		1.58±1.36
Number of living children		1.83±0.94
Gestational age at first US		8.73±5.90
Formal education ≤8 years		58 (71%)
Formal education of the partner ≤8 years		331 (51.3%)
Low income		318 (49.3%)
Positive high risk pregnancy history		215 (33.3%)
Current high risk pregnancy		164 (25.4%)
Cesarean delivery history		245 (38%)
Undergone US >5 times during pregnancy		5.5 (78.3%)
Visited doctor during pregnancy >5 times		534 (82.9%)
Had the test: - blood pressure		611 (94.7%)
- total blood count		601 (93.2%)
- urine analysis		595 (92.2%)
- oral glucose tolerance		483 (74.9%)
- hepatitis B screening		365 (56.6%)
- NST		567 (87.9%)
- Leopold maneuver		373 (57.8%)
Where they were followed-up	Primary care center Secondary care center Tertiary care center Private center	38 (5.9%) 242 (37.5%) 146 (22.6%) 217 (33.6%)

Table II. Patient knowledge and expectations for 3D-US.

Can and to what extent (expressed in a percentage %)fetal anomalies be detected by 3D-US	66.15±23.14
Is and to what extent (expressed in a percentage %) 3D-US reliable	68.17±22.32
Patients who think that every pregnant womanshould undergo 3D-US imaging	457 (70.9%)
Patients who underwent 3D-US	388 (60.2%)
Gestational age at 3D-US	16.49±6.51

(26.8%) did not find it necessary at all. After comparing their sociodemographic data, the former group turned out to be more educated and to have higher income than the latter (Table V). Patients who declared the need for 3D-US imaging in pregnancy, also believed that 3D-US had higher abnormality detection rate and more reliability (Table VI). Those two groups were also compared according to their expectations for 3D-US imaging (Table VII). Patients in the former group significantly more often underwent 3D-US for detection of fetal abnormalities, whereas the latter group had the 3D test to ease their mind.

Table III. Patient feelings about US.

Satisfied and relieved	336 (52.1%)
Reassured	225 (34.9%)
No change	46 (7.1%)
More anxious	18 (2.8%)
Disappointed	7 (1.1%)
Other	7 (1.1%)

Table IV. Expectations for US imaging.

To see the baby	151 (23.4%)
To see the baby is alive	418 (64.8%)
To find out the sex of the baby	195 (30.2%)
To learn the weight and the development of the baby	341 (52.9%)
To learn if it is a multiple pregnancy	24 (3.7%)
To learn if there is any kind of anomaly	486 (75.3%)
To have a picture of the baby taken	33 (5.1%)
To learn the date of expected delivery	152 (23.6%)
To show the baby to the partner	23 (3.6%)
To ease one's mind	77 (11.9%)
No expectations	9 (1.4%)

Discussion

The majority of the pregnant women from our study underwent the US test to learn about the structural abnormalities of the fetus and two-thirds believed 3D-US was necessary. One fifth of the participants underwent US imaging solely on their own demand and 16.6% of the women declared that they would not visit a doctor if US imaging was not performed.

US imaging for non-medical reasons is criticized because of its potential disadvantages such as emotional attachment to an abnormal fetus [6]. While majority of the guidelines recommend US during pregnancy for medical reasons only, some studies were carried out to figure out the expectations of the parents-to-be for US imaging. Ekelin showed that US decreased the anxiety of the future parents, particularly the mothers [7].

In a study conducted in 2002,Whynes et al. [8], followed-up 384 pregnant women and found that they underwent US imaging 2.6 times during pregnancy and the majority was satisfied with the test. In our study, 78.3% of all patients underwent US imaging more than 5 times during their pregnancy.

Obviously, the number of US tests performed during pregnancy hasincreased greatly. It might be either due to easy accessibility of US or the medico-legal pressure put on doctors. Although the number of imaging tests increased, patient satisfaction rate notably decreased. Only half of the patients participating in our study were satisfied with the US imaging.

Basama et al. [9], conducted a survey on 385 pregnant women about their expectations for the 20-week anomaly scan. The participants expected to find out the following: health condition

Table V. Sociodemographic characteristics of participants according to belief to 3D-US necessity.

	3D-US is necessary (n:457)	3D-US is not necessary (n: 173)	P
Age	26.68±5.47	27.09±5.88	0.414
Gravidity	2.42±1.36	2.40±1.37	0.880
Parity	1.80±1.14	1.95±1.33	0.284
Miscarriage	1.52±1.22	1.79±1.77	0.254
Number of living children	1.80±1.14	1.92±0.91	0.194
Gestational age at first US	9.01±6.03	8.14±5.64	0.119
Formal education ≤8 years	**314 (69%)**	**136 (78.6)**	**0.017**
Formal education of the partner ≤8 years	229 (51.7%)	96 (57.1%)	0.228
Low income	**215 (47.3%)**	**98 (56.6%)**	**0.04**
Positive high risk pregnancy history	161 (39.5%)	54 35.8%)	0.594
Current high risk pregnancy	121 (27%)	41 (24.7%)	0.697
Cesarean delivery history	181 (46.4%)	60 (44.1%)	0.167
Undergone US >5 times during pregnancy	356 (78%)	137 (79.6%)	0.112
Visit doctor during pregnancy >5 times	375 (82%)	146 (84.4%)	0.177

Table VI. Patient knowledge and expectations for 3D-US in relation to the need for 3D-US.

	3D-US is necessary (n: 457)	3D-US is not necessary (n: 173)	P
Can and to what extent (expressed in a percentage %) fetal anomalies be detected by 3D-US	**68.33±22.80**	**60.26±23.57**	**0.0001**
Is and to what extent (expressed in a percentage %) 3D-US reliable	**69.84±21.69**	**63.68±23.91**	**0.002**
Patients who underwent 3D-US	308 (68.3%)	73 (43.7%)	0.0001
Gestational age at 3D-US	**15.93±6.32**	**17.97±6.83**	**0.001**

Table VII. Expectations forUS imaging in relation to the need for 3D-US.

	3D-US is necessary (n: 457)	3D-US is not necessary (n: 173)	P
To see the baby	114 (25.3%)	36 (21.2%)	0.287
To check if baby is alive	297 (65.9%)	110 (65.5%)	0.930
To find out the sex of the baby	137 (30.4%)	56 (33.1%)	0.509
To learn the weight and the development of the baby	234 (52%)	95 (56.2%)	0.349
To learn if it is a multiple pregnancy	18 (4%)	6 (3.6%)	0.806
To learn if there is any kind of anomaly	**355 (78.4%)**	**121 (70.8%)**	**0.046**
To have a picture of the baby taken	28 (6.2%)	5 (3%)	0.110
To learn the date of expected delivery	109 (24.2%)	42 (25%)	0.841
To show the baby to the partner	20 (4.4%)	3 (1.8%)	0.120
To ease my mind	**44 (9.8%)**	**31 (18.5%)**	**0.003**
No expectations	3 (0.7%)	6 (3.6%)	0.007

of the baby (76%), structural abnormalities (95%), chromosomal abnormalities (32%), the sex of the baby (22%), or they wished to have a photograph of the baby (17%) and to look at the baby with the partner (25%). The authors concluded that only 8% of patients were realistic in predicting the pick-up rate of anomaly scanning.

In a study from Sweden, 303 women and their partners were asked to fill outa questionnaire on their opinions, expectations and to what extent those expectations were fulfilled by the second trimester US. The majority (89%) thought that US could detect every kind of malformation of the fetus. Approximately 13% of women underwent US to find out the sex of the baby and out of those participants 16% expected a sharp picture of the fetus, 40% expected to know the baby's health status, 64% expected to grow more attachedto the fetus and 99% thought that US was harmless for the baby [10].

Gudex et al. [11], evaluated 370 pregnant women with no risk factors with regard to their expectations for US. The participants wanted to: learn if the baby had any abnormalities (60%), check if the baby was fine (54%), feel reassured (44%), have a picture of the baby taken (4%), find out the sex of the baby (4%), check if baby was alive (10%), know the exact date of the pregnancy (10%), monitor if the baby was growing as expected or not (24%).

Larsen et al. [12], surveyed 493 pregnant women (between 16-20 weeks gestation) and their partners before a 2D-US examination. Only 33% expected to exclude fetal malformations, 16% to learn the sex of the baby, 4% to have a picture of the baby and 95% of the participants were satisfied with the US examination.

While our patients believed that US could detect nearly two-thirds of anomalies, 75% of the participants expected to find out whether the fetus had any anomaliesduring US imaging. The above mentioned studies were conducted before the anomaly screening but our study evaluated the entire pregnancy period sothe expectations of our participants shifted to the baby's well-being and development. Also, the expectation of our respondents concerning anomaly detection were more realistic than the majority of other studies mentioned above.

There is an ongoing debate on the role and need of 3D-US in low-risk patients. In their review, Merz et al. [1], concluded that 3D/4D-US improved the diagnostic capacity in obstetrics but not the fetal outcome as yet. While the professionals expect little from 3D-US, expectations of the patients continue to grow.

Lee et al. [13], conducted a study on non-pregnant female and male sonographers, sonologists and undergraduate students. After a brief lecture on 3D-US, the participants filled out a questionnaire on the subject. The majority of the respondents declared that 3D-US was necessary and they would undergo 3D-US for their own baby, either due to medical reasons (i.e. high detection rate of abnormalities) or social reasons (detailed picture and curiosity).Pretorius et al.[2],investigated 124 mothers and 65 fathers and their feelings about 3D-US and concluded that 3D-US increased the maternal-fetal attachment. Edwards et al. [3], conducted a study evaluating maternal reactions to see the face of their baby in 2D and 3D-US. They concluded that seeing the baby's face in 3D-US elicited better and stronger maternal reactions. Sedgmen et al. [4], performed a trial on 68 pregnant women. The participants filled out a questionnaire before and 1 week after US imaging. They concluded that 2D-US and 3D-US had a positive impact on maternal-fetal attachment, particularly in the first trimester. Lapaire et al. [5], evaluated 60 pregnant nulliparas in two groups. The first group underwent 2D-US and the second group 3D-US imaging. Although the patients who underwent 3D-US were able to see the face of the baby better, no statistically significant differences in maternal-fetal bonding was observed between the groups. Rustico et al.[14], compared 2D and 4D US for their effects on maternal satisfaction and attachment to the fetus. A total of 100 patients were evaluated and there were no statistically significant differences between the groups, either in satisfaction or attachment. Righetti et al. [15], conducted a survey among 44 couples before and after the US assessment and discovered that the test increased the attachment but found no significant differences between 2D and 4D-US. Leung et al. [16], evaluated 124 high risk pregnant women for the anxiety either before and after 2D-US alone or before and after 3D/4D-US and 2D-US and found no significant anxiety reduction caused by 3D/4D-US.

We did not evaluate the attachment between the fetus and the mother-to-be due to the fact that the study was carried out in the last trimester. Many factors might have affected the attachment by that time and it would have been difficult to attribute it solely to 3D-US or anything else. Instead, we tried to determine the opinions of the pregnant women about the role and need for 3D-US.

Conclusions

To the best of our knowledge, this has been the first study on patient opinions regarding the need for 3D-US imaging during pregnancy. Although the participants were not certain about the harmful effects of 3D-US, the majority believed that it was necessary for every pregnant woman to undergo such testing. Large sample size is the major strength of our study, whereas recall bias is its major limitation. Although US during pregnancy is recommended only for medical reasons, patients expect more than a mere diagnosis. Therefore, patients must be instructed on the limitations of US imaging before the examination to clarify any misunderstandings about the possibilities such a technique

Authors' Contribution

1. Gulengul Koken – analysis, assumptions, study design, interpretation of data.
2. Ayse Nur Cakir Gungor – analysis and interpretation of data, article draft, corresponding author.
3. Fatih Celik – study design, acquisitation of data.
4. Gonca Batmaz – acquisitation of data.
5. Serdar Unlu – interpretation of data, revised article critically.
6. Dagistan Arioz - revised article critically.
7. Mehmet Yilmazer - revised article critically.

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