Predictive value of fetal nuchal translucency in the screening of chromosomal aberrations

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Abstract

In search for specific early ultrasound signs that could indicate an increased risk of hereditary or acquired disorders of the fetus, scientific research confirms the value of exceptional ultrasound findings nuchal translucency (NT). The aim of the study was to determine the predictive value of the diameter of fetal NT in the detection chromosomopathy. The investigation included 317 pregnant women with monofetal pregnancies gestational age of 11 to 14 weeks. The control group consisted of pregnant women in whom amniocentesis was recognized after a neat result of fetal karyotype. We determined the limit of physiological and pathological findings of the value of NT, but we used the diameter of NT that we get in pregnant women with pathological score of amniocentesis as a potentially pathological values. Mean value of NT in the control group was 1.92 ± 0.39 mm, and the group with pathological findings karyotype fetus was 2.49 ± 0.37 mm, which is a statistically significant difference ($p<0.05$). Mean value of distance issues coccyx in the control group was 64.83 ± 8.23 mm, and the group with pathological karyotype 60.12 ± 8.48 mm, gestational age in the control group was 7.10 ± 87.40 days, and pathologic 85.69 ± 3.98 days, which speaks of homogeneity of the investigated sample ($p> 0.05$).The probability that a patient with negative findings to be healthy is NT 1.0. NT sensitivity as a marker for chromosomopathy was 1.0. The rate of false positive findings of the 0.026. Specificity of NT as a marker for chromosomopathy is 0.97. The probability that a patient with positive findings NT really be sick is 0.5. Valid findings NT can be considered safe ultrasonographic markers in the assessment of absence chromosomopathy. Pathological finding, given the low positive predictive value of NT must be amended and other prenatal tests before pregnant invasive give advice on prenatal diagnosis.

Index terms— nuchal translucency, ultrasonography, chromosomopathy, predictive statistics

1 INTRODUCTION

n the antenatal protection -monitoring growth and development of the unborn child in most European countries, standard is recommended to do three ultrasound: between 9 -12 week, and 19th -22 and 29 weeks as -32 weeks (1). In any irregularities or the occurrence of complications in pregnancy an additional ultrasound provides additional safety to pregnant women, and gynecologists to monitor pregnancy. In search for specific early ultrasound signs -markers that could indicate an increased risk of hereditary or acquired disorders -chromosomopathy fetus, scientific studies confirm the exceptional value of ultrasound findings nuchal fold (nuchal translucency, NT) (2).

Author : GOC, CC Kragujevac, Serbia Nuchal crease ultrasound findings indicate fluid accumulation (lymph) between the skin and subcutaneous fascia in the neck or the back door and embryos, which reveals the ultrasound between the 11th -14 week of pregnancy, or when the distance between threads coccyx (CRL-crown to rump length) between 45 to 84 mm (3).Usually tolerate less than the thickness of folds 99 th percentile for CRL.

Numerous studies show a connection between the findings of the ultrasound markers (nuchal crease > 3 mm) with specified chromosomal aberrations, especially with aneuploidy and Down syndrome. Correlation of findings with Down syndrome is the most important measure by which to study this phenomenon classified ultrasound findings vratnog folds in screening procedures for Down syndrome. In most of these studies (King's group) in over 96,000 pregnancies (22 perinatal center, 306 gynecologists) is the ultrasound findings revealed 82% of fetuses with Down syndrome (frequency of false positives: 8.3%).

In addition to connections with chromosomal aberrations, there vratnog folds also a marker for other genetic syndromes, where usually a heart anomalies. Fetal NT increases with CRL and therefore is very important to take into account the gestational period when it is determined whether the measured NT increased or not (4). The study involving 96,127 pregnancies, the mean value and 95 percentile of the NT CRL of 45 mm were 1.2 and 2.1 mm, and the CRL of 84 mm 1.9 and 2.7 mm (5). In pregnancies with fetal NT below the 99th Percentile (3.5 mm), the decision of parents about whether the fetal karyotype to work will depend on individual risk, which is made from a combination of mother's age, ultrasound findings and free ?-HCG and PAPP-A in the serum of mothers between 11-13 +6 weeks (6).

2 II.

3 AIM

The aim of this study was to determine the predictive value of fetal diameter nuchal translucency in detecting chromosomopathy.

4 III.

5 METHODS

The study was conducted at the Clinic for Gynecology and Obstetrics, Clinical Center of Kragujevac monofetal intrauterine pregnancies in the first trimester of pregnancy in peroid 2007-2009. year. During the research we use clinical experimental model I studies. Each patient in the planned inclusion in the Global Journal of Medical study, we thoroughly explain the plan and purpose of the review, all tests included in the study gave their voluntary written consent for testing after the read information to the patient. The investigation included 317 pregnant women with monofetal pregnancies observiranih by the Commission genetic counseling GAK KC Kragujevac.

Conditions for the inclusion of pregnant women in the study were related to the pregnancy, the following parameters: 1. Distance CRL (crown to rump length) must range from 45 to 84 mm. 2. Gestational age pregnancy must be of **??**1-13 +6 weeks.

The measurement of fetal NT, we used highresolution ultrasound Aloka Pro Sound 3500 with the option "make loop" for the return of images, which allow caliper measurements to one decimal. The image on the screen to what extent NT included only the head and upper chest. Magnification was maximum, so that little scroll caliper to measure changes only 0.1 mm. Nuchal translucency is measured when the fetus in a neutral position. We measured the maximum thickness of subcutaneous clearing up between the skin and soft tissue that is located above the cervical part of spine. Caliper were placed on the lines that define the crease so that it can hardly see the white border line clusters behind the door. During our review we made more measurements, and taking account of maximum thickness. If the navel cord located around the fetal neck (in about 8% of cases), we measured NT thickness above and below the umbilical cord and used the average of these two measures. For statistical processing were used and non-parametric and parametric tests for testing the significant difference t test, ?2 test, Fisherov exact probability test and contingency tables in the calculation of parameters predictive statistics.

6 IV. RESULTS

This chapter shows the results of our research: Using contingency tables oder?ivali have predictive value nuchal translucency (NT) as a possible marker invasive prenatal screening of pregnant women in gestational age from 11 to 13 +6 weeks. The disease is present The positive predictive value (SP/SP+LP) Negative predictive value (SN/SN+LN)

Positive predictive value shows the number of people with positive findings that have the disease.

Negative predictive value shows the number of people with negative test findings that do not have the disease.

The probability that a patient with positive findings and NT stavrno be ill, or that have numeric aberrations is 0.5.

The probability that a patient with negative findings nuhalne translucence (NT) to be healthy is 1.0.

Sensitivity measurements nuchal translucency (NT) as a marker for chromosomopathy we determined according to the formula:SPP =SP/SP+LN= 1.0

False positive rate is determined by the following formula:SLP =LP/LP+SN= 0.026

The specificity of measuring nuchal translucency (NT) as a marker for chromosomopathy we determined according to the formula: SSN =SN/SN+LP= 0.97.

V.

7 DISCUSSION

More prospective intervention study was concerned with the implementation of NT screening in routine clinical work (7). In some tests, screening positive group was defined by the boundary value of fetal NT or combined risk derived from the mother's age and deviation from the normal median NT for CRL. Important results of these tests were: (1) NT was successfully measured in more than 99% of cases, (2) there is the inevitable variation in false positive rates and detection rates between different studies because of differences in the age of the studied women, age distribution examined population and used the limits NT or risk, and (3) in the combined data of more than 200, 000 pregnancies, including more than 900 fetuses with trisomy 21, screening by NT identified more than 75% of fetuses with trisomy 21 and other major chromosomopathy with rate of false positive findings of 5% and the rate of detection was about 60% of the rate of false positive findings than 1% (7) . The largest study, coordinated by the Foundation for fetal medicine, 306 adequately trained operator monofetal reviewed 100,311 pregnancies in 22 center in the United Kingdom (8). In all cases the measured CRL and NT were calculated and the individual risks based on age of mother, gestational age and fetal NT. Pregnancy outcomes were obtained in 96,127 cases, including 326 cases with trisomy 21 and 325 with other chromosomopathy. Mean gestation at the time of screening was 12 weeks, and the average age of mothers 31 years. Estimated risk for trisomy 21 was above the 1 in 300 or more in 8% of normal pregnancies, 82% trisomy 21 pregnancies and 78% with other chromosomopathy. For screening positive rate of 5%, detection rate was 77% (95% konfidens interval 72-82%). The issue of fetal case fatality has advantages over screening in the second trimester -prenatal diagnosis earlier and consequently less traumatic termination of pregnancy for those couples who opt for this option. Potential lack of earlier screening is that identifying those with pregnancy chromosomopathy to be abortively spontaneously. About 30% of all fetuses with trisomy 21 die between 12 weeks of pregnancy and term deliveries. The issue of spontaneous intrauterine fetal death in thec hromosomopathy, of course, a potential criticism of antenatal screening methods, including biochemical screening in the second trimester, because the fetal mortality rate between 16 weeks gestation and term deliveries about 20%. From prenatal screening studies is not possible to know how to pregnancies with fetuses with trisomy 21 are broken, actually completed live birth children, but it is still possible to assess the impact of prenatal screening on the prevalence of trisomy 21 in live-born children. This can be done by comparison the number of live births with trisomy 21 with the number estimated on the basis of prevalence of trisomy 21 live births by age of mother and age distribution of mothers examined population. In the screening study, the Foundation for fetal medicine, a combination of mother's age and fetal NT, limit the risk of 1 in 300 had a false positive rate of 8% and the detection rate of 82% (8) . It is estimated that prenatal screening followed by invasive diagnostic and selective termination of fetal trisomy 21 with a reduced prevalence of potential live births with trisomy 21 in about 78-82%. The ability to obtain reliable measure NT thickness depends on adequate training, using standard techniques and motivation operators.

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The importance of all three components can be seen in the example of the differences in results between the intervention and observational examination, during which operators measure the thickness of NT, but did not act in case of increased thickness (7). In intervention studies, over 99% of the NT thickness measurement was successful, unlike observational studies, where NT was successfully measured in only 75% of cases. In addition, the intervention studies, NT thickness was increased in 76% of trisomy 21 and 4.2% normal fetal chromosome, compared with 38% and 5.0% of cases in observational studies. In observational studies, ultrasound examinations were often made in inadequate gestation, and the operators or were not properly trained or were not motivated enough to measure the NT. In one of the studies, for example, where the operators told not to spend more time measuring NT than they need to measure the CRL, NT thickness was successfully measured in only 66% of cases (9). In another survey, CRL was less than 33 mm in 54% of the operators, which is said to measure NT within three minutes, it could not do in 42% cases (10) . These methodological problems are highlighted in the study performed monofetal to 47,053 pregnancies examined between 6 and 16 weeks (11). In 23% of the patients was not possible to obtain a valid NT measurement was performed because of inadequate gestation, the operators could not obtain the appropriate measures or any of the pictures was of acceptable quality. An example of the differences between observational and interventional studies and the testing Crosley and associates (12). In this observational survey, examined the 17,229 and fetal NT was successfully measured in 73% of cases. In the following examination of more than 2000 pregnancies in which the results of the examination given to women, fetal NT was successfully measured in 99.8% of cases. The results of our study show that in the total sample 5.04% pathological karyotype, of which 50% of the numerical aberrations, which is in accordance with the above results from the literature. Predictive value of NT ultrasonography as markers for chromosomopathy if used in isolation is questionable, which is also confirmed in the literature. Results statistically significant difference in NT thickness in a group of pregnant women with pathological karyotype was expected ($p>0.05$) in the tested groups which speaks of homogeneity of the sample that we questioned.

8 VI.

9 CONCLUSION

Valid findings nuchal translucency can be considered safe ultrasonographic markers in the assessment of absence chromosomopathy. Pathological finding, given the low positive predictive value must be amended and other prenatal tests before the pregnant woman give advice on the need to undergo prenatal diagnosis invasive.

10 List of Abbreviations

CRL -embryonic crown-rump length NT -fetal nuchal translucency [1] [2] [3] [4]

Figure 1:

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[2] December

[3] DecemberVolume XI Issue IV Version I

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1

Number	result after early amniocentesis Nuchal translucency inn	Crown to rump length inn	Gestational age in days (GS)	Store karyotype after early amniocentesis
evidencionog				
protocol-year	mm (NT)	mm(CRL)		
3-2007	2.2	60	86	46,xy/47xyy
11-2007	3.0	62	88	46,xx/46,xx; del 7t(7;17)
47-2007	2.5	65	88	47,xy +21
151-2007	2.6	63	86	47xy+21
74-2008	1.8	73	90	47, xy+18
76-2008	2.4	72	89	Robertson translocation 45, xy,-14, -21 +t (14q;21q)
158-2008	2.5	56	82	47, xx+21
99-2008	2.6	65	87	Robertson translocation 45,xx,-14,-21+t (14q21q)
161-2008	2.7	48	81	47, xx+21
164-2008	2.0	50	81	46,xy/46, y del(x)t(7;x)q35;q22)
162-2008	1.9	48	78	46,xy/46,xy (-4q3)
167-2008	3.1	48	80	47,xy+21
231-2009	2.8	61	89	47,xx+21
267-2009	2.6	71	91	47,xx+21
237-2009	2.4	56	87	46,xx/47,xx t (9;6)(q31;q14)
271-2009	2.8	64	88	46, xy/47,xy+13

[Note: Predictive value of fetal nuchal translucency in the screening of chromosomal aberrations]

Figure 2: Table 1 :

2

Parameters	Pathological karyotype =16	Control group =311	P
Nuchal Translucency (mm)	2.49±0.37	1.92±0.39	<0.05
Crown to rump length fetus (mm)	60.12±8.48	64.83±8.23	p>0,05
Gestational age in days	85.69±3.98	87.40±7.10	p>0.05

Figure 3: Table 2 :

3

Test score The disease is present		Disease absent	Total
Positive	SP	LP	SP+LP
Negative	LN	SN	LN+SN
Only	SP+LN	LP+SN	N

Figure 4: Table 3 :

4

sample of pregnant women investigated			
Rezultat testa	The disease is present	Disease absent	Total
Positive	8	8	16
Negative	0	301	301
Only	8	309	317

Figure 5: Table 4 :

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