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WORK, PRODUCTIVITY AND PROSPERITY

The year 2021 was scientifically very productive at SBUS, evidencing, once again, our commitment to the scientific quality and continuing education of the Brazilian sonographer. We held another successful edition of the Brazilian Congress of USG; the International Web Symposium on Fetal Medicine, in partnership with SOBRAMEF; three federated events; more than 40 webinars; the proof of qualification in USG from SBUS; we launched two scientific books, in addition to carrying out scientific and social campaigns. All scientific events complying with the strictest preventive measures against Covid-19 recommended by the World Health Organization (WHO).

The Revista Brasileira de Ultrasonografia – RBUS, our Revista Azul, the main tool for publicizing USG scientific research in the country, won two new editions last year, in three languages. And this year will be one of more work, productivity and prosperity at SBUS. To this end, we count on your participation in these pages that contribute decisively to the sharing of knowledge and the appreciation of Brazilian Ultrasonography.

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REVIEW ARTICLE

BRAZILIAN JOURNAL OF ULTRASONOGRAPHY 2022; 32: 07-13 - DOI - 10.29327/261922-1

CORRELATION BETWEEN ABDOMINAL CIRCUMFERENCE AND CIRCUMFERENCE OF THE THIGH FOR CALCULATION OF FETAL WEIGHT IN FETUS WITHOUT ULTRASONOGRAPHIC EVIDENCE OF MALFORMATION

JORGE ALBERTO BIANCHI TELLES, ELOÁ SACHET NUERNBERG

ABSTRACT

Introduction: Fetal growth disorders are an important chapter of maternal-fetal pathologies and fetal weight estimation is of fundamental importance in the monitoring of obstetric situations associated with abnormal fetal growth. The serial ultrasound measurement of the fetal thigh circumference (CCx) has been shown to be an excellent parameter in the identification of deviations in fetal growth and fetal development after the second trimester of gestation.

Objective: To search for a correlation between the waist circumference and the circumference of the fetal thigh, in view of the estimated fetal weight.

Method: A cross-sectional, descriptive study was performed by assessing the waist circumference and the fetal thigh circumference, seeking a correlation between these parameters, in order to estimate the fetal weight.

Results: A total of 75 pregnant women with a mean age of 24.7 years and multiple comorbidities were evaluated, most of whom were white and non-smokers. A positive correlation was observed in the evaluation of thigh circumference between examiners 1 and 2, but there was a significant difference between the fetal weights estimated by thigh circumference and abdominal circumference.

Conclusion: There is a good correlation between abdominal circumference and fetal thigh circumference. The correction factor between the two measurements of 2.32, previously calculated by our group based on tables in the literature, proved to be reliable in this work, however it was shown that there is a significant change in this correlation after 32 weeks, requiring a correction factor to 2.10 after this gestational age. Fetal thigh measurement appears to be a reproducible and useful biometric parameter in fetuses with pathologies that prevent the measurement of abdominal circumference.

KEYWORDS: THIGH CIRCUMFERENCE, FETAL WEIGHT, GASTROSCHISIS, OMPHALOCELE, FETAL WEIGHT CALCULATION, WEIGHT IN FETAL MALFORMATIONS

INTRODUCTION

Fetal growth disorders are an important chapter among maternal-fetal pathologies[1]. Both macrosomia and fetal growth restriction (FGR) are related to an increased risk of perinatal morbidity and mortality, including late postnatal consequences[2].

Assessing 82,361 full-term newborns (NB), McIntire et al[3] observed that the incidence of neonatal death, Apgar scores below three and umbilical artery blood pH below seven are significantly higher in those with estimated weight below third percentile than in those weighing above this threshold. In a retrospective study involving 1,376 pregnant women, Smith-Bindman et al[4] observed that fetuses below the fifth percentile for gestational age have a higher risk of preterm delivery, extreme prematurity, prolonged stay in the nursery, admission to the intensive care unit and neonatal death.

The estimation of fetal weight is of fundamental importance in the monitoring of obstetric situations associated with abnormal fetal growth[5]. It is essential that this estimate is as accurate as possible, so that better decisions can be taken[6].

Initial attempts to estimate fetal weight using two-dimensional ultrasound (2DUS) were performed using individual fetal measurements such as biparietal diameter (BPD) or abdominal circumference (AC)[7]. Subsequent studies demonstrated that the use of multiple fetal measurements improved the accuracy of fetal weight estima-

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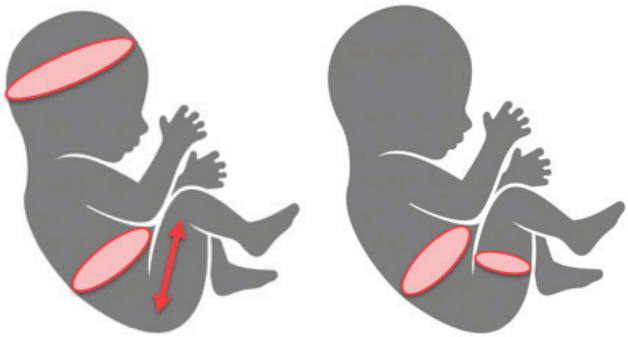
tion. Many formulas with two-dimensional (2D) measurements are proposed to estimate the weight of the conceptus, producing errors that can reach 20% of the real fetal weight. It is known that these errors can be even greater in very low birth weight or macrosomic fetuses[8].

Historically, the most used formulas for predicting fetal weight were those of Shepard et al [9], evaluating the biparietal diameter and abdominal circumference, but the studies led by Hadlock[10,11] are still most credible worldwide, especially regarding the calculation of fetal weight, as its graph and table expressed the result of a specific population sample selected for their studies. Most formulas are based on ultrasound biometrics, which use abdominal circumference as the main element in the calculation, with fantastic accuracy already scientifically proven. The works by Hadlock[10,11] show that at least three fetal measurements are necessary: biparietal diameter or head circumference, as an indicator of head growth; abdominal circumference with trunk growth indicator; and finally, the length of the femur, as an indicator of limb growth and reflecting fetal stature. However, the main indicator of fetal nutrition and, therefore, essential in weight estimation, would be the abdominal circumference. The motivation of this study is due to the need to estimate the real weight of the fetus when the abdominal circumference cannot be evaluated, as in fetuses with gastroschisis, omphalocele and ascites, pathologies that modify the abdominal circumference, resulting in an unreliable estimated weight.

Serial ultrasound measurement of fetal thigh circumference (TCx) has been shown to be an excellent parameter for identifying deviations in fetal growth and development after the second trimester of pregnancy[12]. Its use as a complementary biological parameter in pathologies such as gestational diabetes mellitus (GDM) or in pathologies that cause intrauterine growth restriction (IUGR), especially in the asymmetric type, is well documented. It is based on the inherent ability of the fetal thigh to accumulate soft tissues and its linear growth in volume, area and circumference[13].

The systematization of the technique for measuring the fetal thigh is due to Warda[13,14] who, in 1986, established the specific cut-off plane for this measurement. The most reliable site for this measurement is located at the junction of the upper and middle thirds of the thigh, at the level of the proximal nutritional foramen of the femur and insertion of the adductor longus muscle tendon in the linea aspera. It is at this point that the change from polygonal to oval or round shape of the femur occurs. figures 1 and 2.



Figures 1 and 2. Schematic drawings show the sites used for fetal measurements in order to estimate fetal weight

More recently, the introduction of three-dimensional ultrasonography (3DUS) has triggered the resurgence of volumetric assessment of fetal limbs and, indirectly, fetal growth and nutrition[15]. As the volume of fetal limbs is already well established as markers of growth and nutrition, several studies have used these parameters as predictors of birth weight, obtaining more reliable results than the traditional formulas used by two-dimensional ultrasound[16]. However, the reality of Brazil and other developing countries requires that solutions be of lower cost, even if they are not the best resource from a scientific point of view[17].

The correct identification of fetal growth deviations is essential, which implies better maternal care, a greater number of returns to medical appointments, and even the performance of serial control ultrasounds. Therefore, correctly assessing fetal weight, implies the fetal prognosis of pregnancy.

The purpose of this article is to seek the best correlation between abdominal circumference and fetal thigh circumference, in view of estimating fetal weight. The result of this study supported the development of a protocol by our service for the use of thigh circumference to assess fetal weight.

METHODS

This is a descriptive prospective cross-sectional study. This study was carried out in the Fetal Medicine sector of our hospital. The sample included pregnant women who had fetuses without evident sonographic malformations during pregnancy, and who underwent obstetric ultrasound in the Fetal Medicine sector of our hospital.

Data collection took place from August/2018 to October/2018. The abdominal circumference and the circumference of the fetal thigh were evaluated during the ultrasound examination of the pregnant women and the correlation between these measures was verified to allow an estimate of fetal weight. Patients who underwent ultrasound examination who had fetal ultrasound malformations that modified the outcomes of the assessment of fetal thigh and abdomen circumference were excluded from the study.

The variables collected were the maternal characteristics of the sample, such as: patient's age, gestational age, ethnicity, comorbidities, assessment of abdominal circumference, assessment of fetal thigh circumference, fetal weight estimated by abdominal circumference and fetal weight estimated by fetal thigh.

To assess the circumference of the thigh, a longitudinal image of the femur was obtained, followed by a transverse section of the mid-thigh, and the measurement of the circumference of the fetal thigh was performed (see figures 3 and 4).

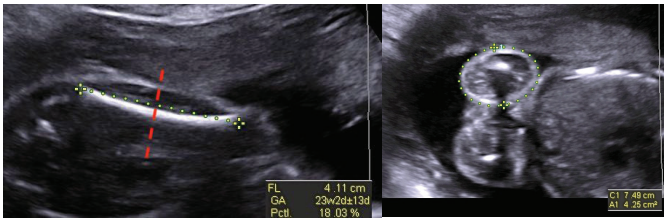


Figure 3 and 4. Ultrasonographic image of the fetal thigh, the first image being the longitudinal plane followed by a transverse section of the mid-thigh.

In a previous study by our group[18], presented in the Jornada Gaúcha de Ultrassonografia, a positive correlation of 0.993 was observed at all gestational ages (GA) between the table that expresses normal reference values for fetal abdominal circumference published by Hadlock[10,11] in 1984 and the table that expresses normal reference values for thigh circumference published by Vitzileos[12] in 1985. The correction factor calculated from one measurement to the other was 2.32 (constant). Thus, fetal weight was calculated by replacing the AC measurement by the result of the formula AC = TCx X 2.32. Then, fetal weight was estimated using the biparietal diameter, skull circumference, femur length and thigh circumference multiplied by 2.32.

Taking into account that the present research was developed with pregnant women who were about to be evaluated by ultrasound for routine fetal assessment, there was no risk for the patients, since no additional procedure was performed.

All data collected were recorded in a Microsoft Office Excel spreadsheet (2007). Descriptive analysis of the sample was carried out, with the presentation of the results in absolute and relative values through tables and graphs. Statistical analysis was performed using Epi Info software version 3.5.1 and the results will be presented in absolute and relative frequencies.

The study was submitted for consideration and evaluation by the Ethics Committee and Research on Human Beings of the hospital and was intended to meet the international standards and national legislation in force and regulating research involving human beings, and all the information obtained was used solely and exclusively for research purposes. In addition, the confidentiality of the participants is guaranteed, with the dissemination of results only collectively and in scientific circles.

Only patients who agreed to participate in this process were included in the study, after being informed and signing the informed consent form.

RESULTS

The final study sample consisted of 75 pregnant women, with a median age of 23 years (standard deviation = 8.3 years) and with a minimum age of 12 years and a maximum age of 40 years (Table 1). The Shapiro-Wilk test was performed to correctly assess the ages of these patients and this test showed a significant result, that is, p-value < 0.05, rejecting the hypothesis of normality. Thus, the median would better represent the age distribution.

			Statistics	Standard Error
AGE	Mean		24.773	0.9643
	95% Confidence interval	Inferior limit	22.852	
		Upper limit	26.695	
	5% Trimmed mean		24.585	
	Median		23.000	
	Variation		69.745	
	Standard deviation		8.3514	
	Minimum		12.0	
	Maximum		40.0	
	Scope		28.0	
	Interquartile Range		14.0	
	Twist		0.218	0.277
	Kurtosis		-1.256	0.548

Table 1 - Assessment of patients' age

Women who had a gestational age between 20 and 40 weeks of gestation were included in the study (Graph 1). (figure 5).

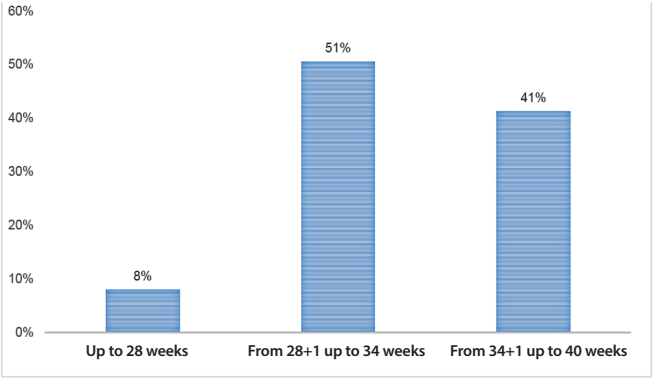


Figure 5. Illustrates the graph according to the assessment of gestational age

The ethnicities of the patients present in the study were also evaluated. Among them, we can verify that 46 patients called themselves white, which corresponded to 61.3% of the cases, 15 patients called themselves of Afro-descendant origin, which corresponded to 20% of the cases, and 14 patients had mixed ethnicity, equivalent to 18, 7 % (table 2).

Another issue observed in the present study was smoking among these pregnant women. It was seen that 67 patients (89.3%) declared that they were not smokers during the study, while eight patients (10.7%) maintained this habit (Table 2).

	Groups		
	Up to 25 years	from 26 to 35 years	more than 36 years
AGE (in years) #	17 [12-25]	31 [26-35]	38 [36-40]
RACE, n (%)			
White	27 (67.50%)	13 (50%)	6 (66.67%)
Non-white	13 (32.50%)	13 (50%)	3 (33.33%)
SMOKER, n (%)			
Yes	2 (5%)	6 (23.08%)	0 (0%)
No	38 (95%)	20 (76.92%)	9 (100%)
PREGNANCIES, n (%)			
1	21 (52.50%)	5 (19.23%)	1 (11.11%)
2	14 (35%)	5 (19.23%)	1 (11.11%)
3	3 (7.50%)	3 (11.54%)	2 (22.22%)
≥ 4	2 (5%)	13 (50%)	5 (55.56%)

Values presented as median [12-40] # and proportions %.

Table 2 – Demographic clinical gestational characteristics of the study (N=75)

Among the patients evaluated, the following comorbidities were present in some pregnant women in this group, such as: bulimia, depressive disorder, placenta previa, gestational diabetes mellitus, systemic arterial hypertension, preeclampsia, epilepsy, hypothyroidism, hyperthyroidism, HIV, drug use, pyelonephritis, syphilis, toxoplasmosis and heart disease.

Approximately 21 patients did not present any comorbidity, which is equivalent to 28% of the evaluated pregnant women. Two patients (2.7%) had hypothyroidism, one patient (1.3%) had hyperthyroidism, one patient (1.3%) had asthma, one patient (1.3%) had bulimia, one patient (1.3%) had %) reported epilepsy, one patient (1.3%) reported syphilis, two patients (2.7%) reported depression, five patients (6.5%) had HIV, seven patients were drug users (9.1%) , seven patients (9.1%) reported chronic arterial hypertension, nine patients (11.7%) had toxoplasmosis, 12 patients (15.9%) reported gestational diabetes mellitus (figure 6).

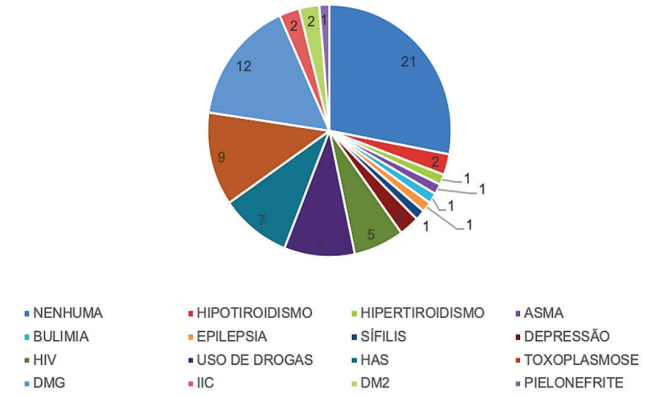


Figura 6. Ilustra o gráfico com as comorbidades materna.

In this study, the estimated fetal weight in healthy fetuses that did not present any apparent sonographic malformation was evaluated. Fetal abdominal circumference and fetal thigh circumference were evaluated and from these data, estimated fetal weights were stipulated by these two items.

When the fetal thigh circumference was evaluated, this data was multiplied by a constant, in this case 2.32 (constant found when dividing the abdominal circumferences by the circumferences of the fetal thighs in the works of Hadlock[10,11] and Vintizileus[12], in order to obtain an abdominal circumference estimated by the thigh and from these data stipulate the estimated fetal weight.

Regarding the assessment of abdominal circumference, the average was 28.5 cm with an estimated average fetal weight of 2130.7 grams, with a standard deviation of approximately 822.43 grams. Fetal weight estimated by thigh circumference assessed by examiner number one presented an average of 2499.66 grams with a standard deviation of 1166.57 grams. The fetal weight estimated by the assessed

thigh circumference observed by examiner number two had an average of 2373.08 grams, with a standard deviation of 1056.31 grams (Table 3).

Tangible Aspects	AC	EFWAC (g)	TCx1	EFWTCx1 (g)	TCx2	EFWTCx2 (g)
Mean	28,5	2130.7	31.1	2499.6	30.2	2373
Median	29.2	2170	31.7	2446	30.3	2296
Mode	29.2	340.0	29.6	2349	27.8	321
25th percentile	26	1595	26.68	1576	26.2	1559
50	29.2	2170	31.7	2446	30.3	2296
75	32.2	2813	37.1	3546	34.9	3133

Table 3 – Evaluation of the sample according to the ultrasound exams with the analysis of abdominal circumference and thigh circumference according to examiners one and two.

AC = Abdominal circumference, TCx1 = Thigh circumference assessed by examiner one, TCx2 = Thigh circumference assessed by examiner two, EFWAC = Estimated fetal weight according to abdominal circumference, EFWTCx1 = Estimated fetal weight according to thigh circumference assessed by the examiner one; EFWTCx2 = Estimated fetal weight according to thigh circumference assessed by the examiner two; g = grams.

The intercalated correlation coefficient was observed in the two groups evaluated by different examiners. This coefficient measures the degree of agreement between observers one and two so that we can assess the reproducibility of the study, and the closer to one, the greater the agreement. We identified that there was a correlation between both examiners, presenting a correlation coefficient of 0.951 (Table 4).

		95% confidence interval		F Test with True Value			
	Interclass correlation	Inferior limit	Upper limit	Value	df1	df2	Sig
Single measures	0.907[a]	0.857	0.941	20.882	75	75	.000
Mean measures	0.951[b]	0.923	0.970	20.882	75	75	.000

Two-way mixed effects model where the effects of people are random and the effects of measures are fixed.

Table 4 - Interclass correlation in the two groups evaluated by different examiners

a. The estimator is the same whether the interaction effect is present or not.

b. This estimate is calculated assuming that the interaction effect is absent, because it is not otherwise estimable.

Based on the assessment of the paired T test, comparisons were made between examiners one and two and it was observed that the average thigh circumference between them was similar, showing 30.84 and 30.38, respectively, for the first and second examiners. As $p > 0.05$, not significant, we do not reject the hypothesis that the means are equal (figure 7).

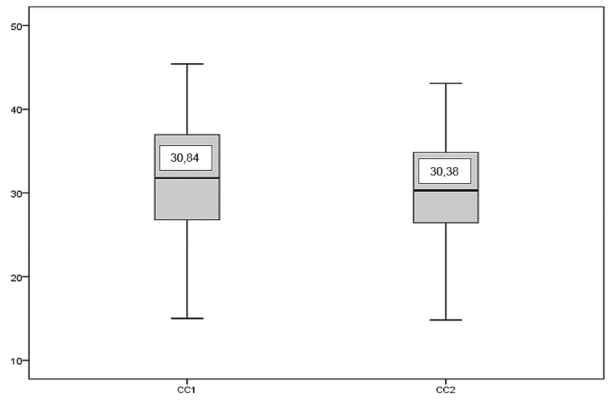


Figure 7. Illustrates the graph with the comparison between the circumference of the fetal thigh according to examiners one and two:
TC1: Thigh circumference assessed by examiner one; TC2: Thigh circumference assessed by examiner two.
For the descriptive analysis and the boxplot evaluation, we can assume that there is not much difference between the median and the variability of the data described according to examiners one and two (figure 7).

We performed a correlation between the thigh estimate assessed by both examiners. This correlation was 0.92, that is, there was a strong and positive correlation, since this value was close to number one and presented a $p < 0.05$, that is, there was significance in this analysis.

When calculating the estimated fetal weight, it was observed that there is a difference between the weight calculations when using thigh circumference and abdominal circumference. This difference may have occurred because the thigh circumference was multiplied by the constant 2.32. However, performing the Shapiro-Wilk test, it can be seen that there is a positive correlation between the fetal weights estimated by the thigh circumference and by the abdominal circumference in both examiners. figure 8.

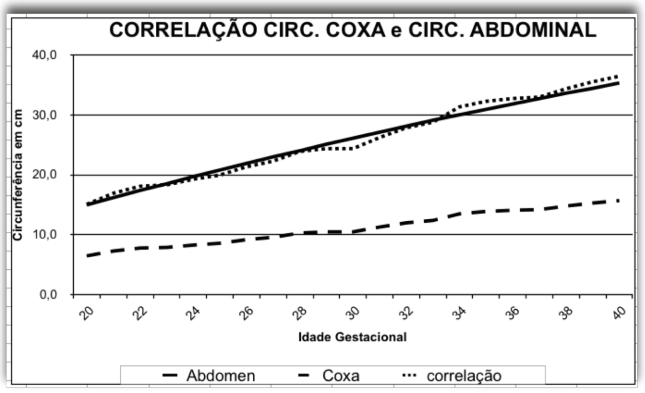


Figure 8. The graph illustrates a positive correlation between abdominal circumference and thigh circumference

To confirm the correlation between fetal weights estimated by abdominal circumference and thigh circumference, the Kappa test was used. This showed a result of 0.93 when related to fetal weight estimated by thigh circumference assessed by examiner one (EFWTCx1) and fetal weight estimated by thigh circumference assessed by examiner two (EFWTCx2). There was also a correlation of 0.96 when correlated EFWTCx1 and fetal weight estimated by abdominal circumference (EFWAC); and a correlation of 0.93 when correlated EFWTCx2 and EFWAC (Table 5).

		N	Correlation	Error
Comparison 1	EFWTCx1 & EFWTCx2	75	0,938	0,000
Comparison 2	EFWTCx1 & EFWAC	75	0,960	0,000
Comparison 3	EFWTCx2 & EFWAC	75	0,937	0,000

Tabela 5 - Correlação de amostras pareadas
Abreviações: PFECCx1 = peso fetal estimado pela circunferência da coxa avaliada pelo examinador um, PFECCx2 = peso fetal estimado pela circunferência da coxa avaliada pelo examinador dois, PFECA = peso fetal estimado pela circunferência abdominal, n = amostra.

In the evaluation of the sample, the general average of the constants obtained through the comparison between the fetal abdominal circumferences and the circumferences of the fetal thighs was also performed. The general average found for this constant was 2.18.

DISCUSSION

The perinatal risks of changes in fetal weights are already well established, both in cases of macrosomia, due to the greater possibility of birth trauma, and in cases of growth restriction, where there is a correlation with fetal hypoxia and aneuploidies[19]. Birth weight is, therefore, an important predictive parameter of neonatal morbidity and mortality, and its correct estimate is a tool in obstetric practice[20].

Errors in fetal weight estimates on two-dimensional ultrasound (2DUS), even under ideal conditions, can range from 7% to 10%, and can reach 14%, which increases the risk of failure in the obstetric evaluation.

There is currently evidence that the use of fetal limbs, associated with two-dimensional measurements, are the best predictors of fetal weight estimation (Lee et al, 2009), with a margin of error of 6% to 7% [21].

Several studies have used limb volume to estimate birth weight, obtaining more reliable results than the traditional formulas used by 2D ultrasound. However, the literature remains controversial on the subject, with studies that do not show improvement in accuracy with the use of fetal volumes in weight estimation.

The sample of this study consisted of 75 pregnant women, which can be compared with the study by Nardozza[19], which involved 81 pregnant patients to assess fetal weight estimation using ultrasound.

Compared to the study by Cavalcante[22], in which healthy pregnant women between 20 and 37 weeks of gestation were evaluated, this study observed pregnant women between 20 and 40 weeks of gestation. The mean gestational age was 32.2 weeks, which disagrees with most of the studies observed, as in the study by Nardozza[19], which found an average of 38.5 weeks.

In this study, we proved the high interobserver reproducibility of the measurement of the mid-third of the fetal thigh by means of obstetric ultrasound, which evaluated a very similar measure between observers. This technique was also observed in the study by Cavalcante[22], where it showed equivalence between the measurements of the fetal thigh between different observers.

The estimated fetal weight was similar between the examiners when performing the assessment by thigh circumference. We compared fetal abdominal circumference with thigh circumference, multiplying the latter by the constant 2.32. However, it can be observed that there is a difference between the estimated fetal weights when comparing the thigh circumference with the abdominal circumference.

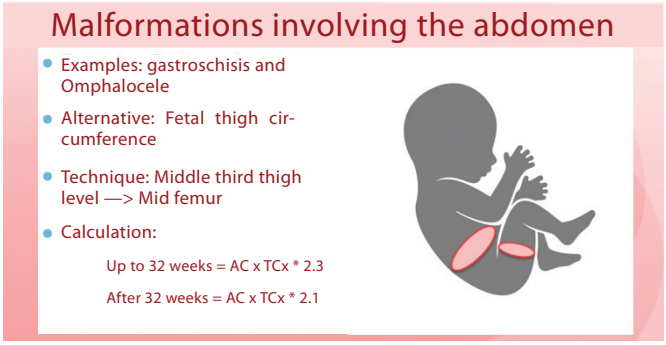
What may have caused this disparity is that the thigh circumference was multiplied by a constant of 2.32 in an attempt to obtain an estimated abdominal circumference. Perhaps this disparity in the assessment of weights occurred because this factor used (2.32) was not the ap-

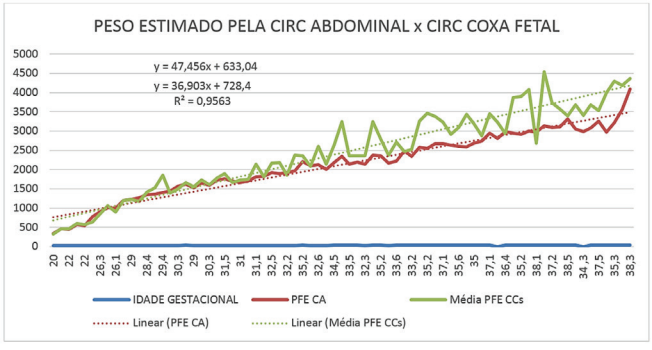
propriate number to propose this estimate.

The mean value found for this constant in this study was 2.18, so it appears that fetal weights estimated by thigh circumference would be more similar to fetal weight estimated by abdominal circumference if a different constant had been used, especially after 32 weeks, when this error in the estimate is quite evident. Thus, a closer analysis of the numbers shows that there is actually a gradual reduction in this constant, which seems to have a significant change after 32 weeks, so the authors suggest a change in this constant to 2.10 after this gestational age.

CONCLUSION

There was a clear pattern change in the comparative curves of the weights estimated by the abdominal circumference directly and by the abdominal circumference projected through the thigh circumference of the fetuses, shown in in figures 9 and 10, after 32 weeks of gestation. At this point the constant can apparently be corrected to 2.10 to more accurately express the estimate of abdominal circumference.





Figures 9 and 10. The first image shows the correction factor according to gestational age; the second image illustrates the comparison between weight estimation curves by AC x TCs (Average).

Our data indicated that there is a correlation between abdominal circumference and thigh circumference and this knowledge can be used to calculate fetal weight in a simple way, without 3D or MRI resources.

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ORIGINAL ARTICLE

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PRENATAL DIAGNOSIS OF CONGENITAL HEART DEFECT IN TWINS - EXPERIENCE OF A FETAL MEDICINE REFERENCE SERVICE

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ABSTRACT

OBJECTIVE: Congenital heart defects represent the most frequent malformation at birth. In twin pregnancies, specific findings increase the risk of cardiac complications for the fetus. Due to the scarcity of data on Brazilian patients, the objective was to determine the incidence of cardiac alterations and their associations in this sample.

METHODS: Observational, cross-sectional and retrospective study in a public hospital. Multiple pregnancies were evaluated through the application of a clinical protocol with data collection from the medical records of patients treated at a reference Fetal Medicine Service in southern Brazil from November 2008 to September 2019

RESULTS: 225 multiple pregnancies were included, of which 221 (98.2%) occurred spontaneously. Maternal mean age 27.5 (+or- 6.5) years. Median of 2 previous pregnancies. Most pregnancies were two fetuses (96.4%), dichorionic (64%) and diamniotic (93.3%). In 157 pregnancies (69.8%), the diagnosis of twins was made in the first trimester. Fetal echocardiography was performed in 56.9% of pregnancies. Heart defects were classified according to Botto et al. Cardiac alterations occurred in nine pregnancies (7%). Most pregnancies ended preterm (65%)

CONCLUSIONS: It is necessary to recognize multiple pregnancy as a high-risk situation for fetal cardiac compromise and, from there, to increase the awareness of the general population and health professionals about the importance of prenatal diagnosis of congenital heart disease in these situations.

KEYWORDS: TWINS, FETAL HEART, PREGNANCY, CONGENITAL HEART DEFECTS, PRENATAL CARE

INTRODUCTION

Congenital heart diseases represent the most frequent malformation at birth and are the main cause of death from a congenital defect in childhood [1-3].

In twin pregnancies, in addition to the occurrence of structural heart diseases, other particularities are observed that increase the risk of cardiac involvement, such as: diagnosis of heart disease in one of the conceptuses increasing the risk of the other twin, functional alterations secondary to monochorionic pregnancy and imperfect twinning with cardiac involvement [4,5].

While non-cardiac congenital malformations can be suspected on obstetric ultrasound, most congenital heart defects are diagnosed after birth. Newborns with critical heart disease, characterized by ductus arteriosus dependence, present early decompensation, with cyanosis, metabolic acidosis and death within a few hours [1-3].

These alterations have high morbidity and mortality which, associated with the difficulty in accessing specialized services, characterizes a serious public health problem, both in Brazil and in other less developed countries [3,6].

The association between twins and congenital heart disease is established, as well as the variation in the incidence of twins among different ethnicities [7,8]. However, Brazilian studies are needed to demonstrate the correlation between twins and cardiac involvement in this population.

OBJECTIVE

The association between twins and cardiac involvement results in high morbidity and mortality for the conceptuses. Due to the scarcity of data in the Brazilian population, the objective was to evaluate the incidence of cardiac alterations and their associations in the prenatal period in twin pregnancies in southern Brazil, as well as to evaluate the indication for fetal echocardiography.

METHODS

This is an observational, cross-sectional and retrospective study carried out in a public fetal medicine service.

Patients with twin pregnancies referred by the munici-

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palities of Rio Grande do Sul and attended in the prenatal period at Hospital Materno Infantil Presidente Vargas, a reference public service of Fetal Medicine in southern Brazil. Clinical protocols were applied with data collection from the pregnant women's medical records. The inclusion of cases followed the following criteria: Multiple pregnancies attended at this service from November 2008 to September 2019. Patients who presented incomplete medical records were excluded from the study.

This study was approved by the Ethics Committee of Hospital Materno-Infantil Presidente Vargas and Universidade Federal de Ciências da Saúde de Porto Alegre under protocol number 2.465.950. All procedures involved in this study are in accordance with the Declaration of Helsinki of 1975, updated in 2013.

The clinical protocol considered the following variables: maternal age at pregnancy, number of previous pregnancies, number of fetuses, spontaneous twin pregnancy or use of "in vitro fertilization" (IVF), chorionicity, amnionicity, obstetrical gestational age at the time of the diagnosis of twins, obstetric gestational age at delivery, fetal echocardiography, diagnosis of heart disease, preterm delivery and fetal death.

STATISTICAL ANALYSIS

Data was entered into the Excel program and later exported to the IBM SPSS version 20.0 program for statistical analysis. Categorical variables were described by frequencies and percentages. The normality of quantitative variables was evaluated using the Kolmogorov-Smirnov test. Quantitative variables with normal distribution were described by the mean and standard deviation and those with asymmetric distribution by the median and the interquartile range (25th and 75th percentiles)

RESULTS

Data were collected from 225 patients, with a mean age of approximately 28 years. The median number of previous pregnancies was two pregnancies. Table 1 presents the characteristics of the sample.

Characteristics	Evaluated number	Descriptive measures
Pregnant woman's age in years, mean±SD	225	27.5±6.5
Number of pregnancies, median (IQR)	225	2 (1-3)
Diagnosis age of twin pregnancy, median (IQR)	225	11 (8-15)
Absolute gestational age at birth, median (IQR)	225	36 (34-37)
Preterm		145 (65.0)
Term		78 (35.0)
Death Absolute gestational age, mean±SD	22	23.2±8.4

SD: standard deviation; IIQ: interquartile range (25th and 75th percentiles)

Tabela 1 - Características das pacientes.

Regarding the characteristics of pregnancy, most were two fetuses, dichorionic and diamniotic. In eight cases, spontaneous triplet pregnancy occurred. In 221 of the 225 pregnancies, spontaneous multiple pregnancy occurred. In the four cases in which pregnancy occurred through "in vitro" fertilization, these were paid for by the Unified Health System (SUS) in the following situations: after tubal ligation, after bilateral oophorectomy, female homosexual relationship, HIV serodiscordant couple (seropositive man) and resulted in diamniotic dichorionic pregnancies.

In this study, two cases of imperfect twins and two pregnancies with an acardiac fetus were recorded.

In more than two thirds of the sample, the diagnosis of twins was made in the first trimester.

Other characteristics are presented in Table 2.

Characteristic	Evaluated	n(%)
Absolute number of fetuses in the current pregnancy	225	
2 fetuses		217 (96,4)
3 fetuses		8 (3,6)
Chorionicity	225	
Monochorionic		77 (34,2)
Dichorionic		144 (64,0)
Trichorionic		4 (1,8)
Amnionicity	225	
Monoamniotic		7 (3,1)
Diamniotic		210 (93,3)
Triamniotic		8 (3,6)
Acardiac fetus twinning	225	2 (0,9)
Imperfect twinning	225	2 (0,9)
Gestational age at diagnosis of twin pregnancy	225	
First trimester		157 (69,8)
Second trimester		66 (29,3)
Third trimester		2 (0,9)

Table 2 - Table of pregnancy characteristics.

FREQUENCY OF PERFORMANCE OF ECHOCARDIOGRAM

More than 50% of patients underwent a fetal echocardiogram in the second trimester and most were normal. In cases where more than one echocardiogram was performed, the diagnosis remained unchanged in subsequent examinations.

Most pregnancies ended preterm (65% of cases).

One of the fetuses died in 18 pregnancies (8%) and two fetuses died in four pregnancies (1.8%). Deaths occurred in 14 dichorionic and eight monochorionic pregnancies. In the four pregnancies in which both twins died, two were dichorionic-diamniotic and two were monochorionic dichorionic.

Table 3 A and B detail these results.

Echocardiograms	Evaluated number	n(%)
Number of fetal echocardiograms	225	
0 fetal echocardiograms		97 (43,1)
1 fetal echocardiogram		122 (54,2)
2 fetal echocardiograms		4 (1,8)
3 fetal echocardiograms		2 (0,9)
Echocardio fetus 1	128	
Normal fetal echocardio		122 (95,3)
Altered fetal 1 echocardio		4 (3,1)
Imperfect twins		1 (0,8)
Acardiac fetus		1 (0,8)
Echocardio fetus 2	128	
Normal fetal echocardio		121 (94,5)
Altered fetal 2 echocardio		4 (3,1)
Imperfect twins		1 (0,8)
Acardiac fetus		1 (0,8)
Death fetus 2		1 (0,8)
Echocardio fetus 3	128	
Normal fetal echocardio		4 (3,2)
There is no fetus 3		124 (96,8)
Trimester of performance of the first echocardiogram	128	
Second trimester		71 (55,5)
Third trimester		57 (44,5)

Table 3A - Descriptive table of gestational echocardiograms.

Echocardiograms and evolution	Evaluated number	n(%)
Prenatal congenital heart disease	128	9 (7)
Group classification according to Botto		9 (7)
Heterotaxis		1 (11,1)
Right-sided obstructive defects		1 (11,1)
Left-sided obstructive defects		1 (11,1)
Septal Defects		5 (55,6)
Other major heart defects		1 (11,1)
Classification Type according to Botto		9 (7)
Heterotaxis		1 (11,1)
Tricuspid atresia		1 (11,1)
Left heart hypoplasia		1 (11,1)
Ventricular Septal Defect		5 (55,6)
Other Major Heart Defects		1 (11,1)
Fetal death	225	
Yes		22 (9,8)
No		201 (89,3)
Acardiac fetus		2 (0,9)

Table 3B.- Table of altered fetal echocardiograms and deaths.

In the evaluation of fetal echocardiograms, the following findings were observed:

Nine pregnancies (7%) had fetal heart disease, and in seven only one fetus was affected. In two pregnancies, both fetuses had heart disease (one with concordant and one discordant congenital heart disease), totaling 11 affected fetuses.

In two pregnancies (0.9%) there was twin reversed arterial perfusion (TRAP) / acardiac fetus with a viable twin without signs of cardiac involvement.

Figure 1 illustrates the case of feto-fetal transfusion syndrome in which the recipient fetus presented pathological tricuspid regurgitation (-90cm/s) on pulsed Doppler, evidencing fetal heart failure.

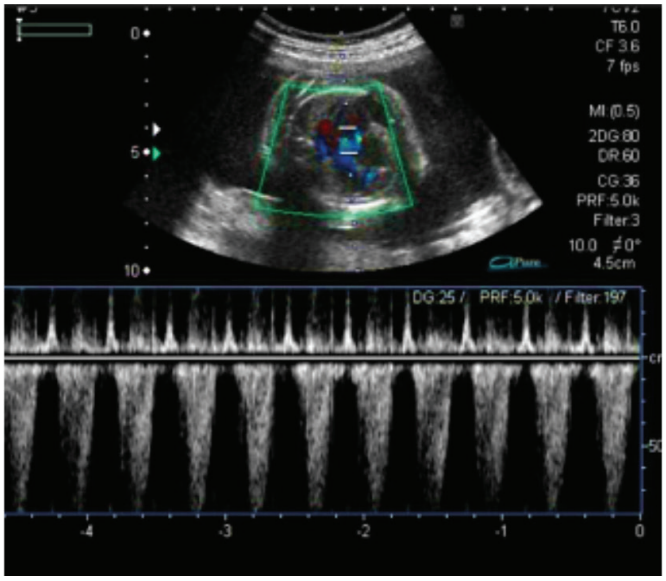

Figure 1. Recipient fetus presents pathological tricuspid valve regurgitation.

In cases of imperfect twinning, thoracopagus twins had complex heart disease, sharing pericardium and atrial wall. Imperfect pygopagus twins did not show cardiac involvement. Figure 2 shows a fetal echocardiogram performed on thoracopagus twins which on color Doppler examination demonstrates flow through the four atrioventricular valves of both fetuses.

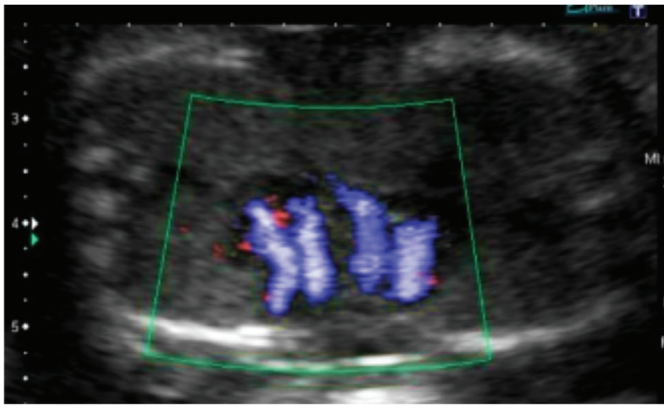

Figure 2. Color Doppler on atrioventricular valves in thoracopagus twins.

As for chorionicity and amnionicity among fetuses with heart disease, we had the following distribution: one monochorionic-monoamniotic pregnancy, four monochorionic-diamniotic pregnancies and four dichorionic-diamniotic pregnancies

DISCUSSION

In the last two decades, there has been an increase in the

frequency of multiple pregnancies associated with advanced maternal age and the use of assisted reproduction techniques. Factors such as ethnicity, frequency variation over time, parity, nutritional status and use of ovulation inducers, have also been associated, as reported in countries such as the United States, Austria, Finland, Norway, Sweden, Canada, Australia, Hong Kong. , Israel, Japan and Singapore [9].

The Brazilian medical literature is scarce regarding the characteristics of twin pregnancies.

Initially, there is a need to know the epidemiological profile of twin pregnancies in the public service in our country, as well as the characteristics of prenatal care offered. In this study, the mean maternal age was 27.5 years and most twin pregnancies occurred spontaneously, without reproductive techniques, unlike international studies.

The performance of obstetric ultrasound before thirteen weeks and six days is of great value in twin pregnancies. Through this test, it is possible to reliably calculate the gestational age and identify chorionicity and amnionicity, significantly impacting the follow-up of twin pregnancy[10].

In our work, we evaluated structural congenital heart diseases.

In singleton pregnancies, these same heart diseases are six times more frequent than chromosomal disorders and four times more frequent than neural tube alterations. Its incidence varies between 0.8% in developed countries and 1.2% in underdeveloped countries[11]. In our study, an incidence of 7% of congenital heart disease (CHD) was recorded in multiple pregnancies.

In Belgium, there was an incidence of 8.3% of CHD in live births and stillbirths with a gestational age equal to or greater than 26 weeks without chromosomal alterations[12]. The fetal incidence of CHD varies between different studies and ethnicities. This has led to different guidelines regarding the forms of diagnosis and policies to improve access to treatment, especially in less developed countries. In population studies, the frequency of diagnosis of CHD ranges from 8.5% to 25%. Due to the complexity and cost of the fetal echocardiogram exam, the identification of risk factors is crucial for its indication[13]. According to Donofrio et al, in a study published in 2014, the risk of heart disease among siblings is greater than the risk of incidence when one of the parents is affected. This study reinforces the indication of fetal echocardiography in twin pregnancies.

In our study, nine pregnancies (7%) had congenital heart disease, and in seven they affected a fetus. In two pregnancies, both fetuses had congenital heart disease, one pregnancy with concordant and one discordant congenital heart disease, totaling 11 fetuses with congenital heart disease. As for chorionicity and amnionicity among fetuses with heart disease, we had the following distribution: one monochorionic-monoamniotic pregnancy (imperfect twinning), four monochorionic-diamniotic pregnancies and four dichorionic-diamniotic pregnancies.

According to Herskind, in a study published in 2013, evaluating a sample of 41,525 twins in Denmark, there was an increase in the incidence of congenital heart disease in both monozygotic and dizygotic twins compared to single twins [14].

In Brazil, most of the population with congenital heart disease is assisted by the Unified Health System (Sistema Único de Saúde - SUS). It is estimated that 20-30% of patients with congenital heart disease have complex heart disease and of these, 2-3% die in the neonatal period. Approximately 30% of newborns with critical heart disease are discharged from the hospital without a diagnosis and progress to shock, hypoxia and early death, before receiving adequate treatment[15].

Patients with acyanotic heart disease with increased pulmonary blood flow undergo definitive surgical correction in the first years of life. Patients with critical heart disease, after palliative procedures in the first month of life, need staged, palliative or corrective surgical correction. These corrections eventually present residual defects, which lead to the need for new procedures throughout life, with indication for heart transplantation in some cases[15].

When evaluating the association between congenital heart disease and twins, it is recognized that structural heart diseases are more common in monochorionic pregnancies, with a prevalence of 7.5%, increasing to 25% risk when a twin is affected. Although controversial, there are studies suggesting that twins conceived by assisted fertilization have an increased risk of heart disease, regardless of chorionicity. In our study, the incidence of structural heart disease was equal between monochorionic and dichorionic pregnancies. In in vitro fertilization pregnancies, no heart disease was recorded. In monochorionic, diamniotic pregnancies, the most frequent lesion is ventricular septal defect, although all lesions are present with agreement in 25-46% of cases. In monoamniotic monochorionic pregnancies, the risk is even greater for all types of heart disease, including changes in laterality and heterotaxis[5]. In the same case series study, published by Weber and Sebire in 2010, one third of the cases presented heterotaxy[5]. In imperfect twins, thoracopagus are the most common type, occurring in 40% of cases and cardiac involvement is more common, with 90% sharing the pericardium and 75% having structural heart disease. Heart disease is also present in other forms of imperfect twins, which influences the feasibility of postnatal separation. Laterality is altered in thoracopagus and parapagus (side by side). Imperfect twins mainly affect girls at a ratio of 3:1 [5,16]. In our study, we observed two cases of imperfect twins (0.9%), being one case of pygopagus, without cardiac involvement and one case of thoracopagus with complex heart disease, characterized by sharing the pericardium and atrial wall.

As for the typical alterations of twin pregnancies, it is important to emphasize that all monochorionic conceptuses have transamnionic connections. These anastomosis can be of three types: arteriovenous, venovenous and arterioarterial. The imbalance between these communications results in the feto-fetal transfusion syndrome and, in extreme cases, culminates in the reversed arterial fetal perfusion sequence,

also called TRAP (Twin reversed arterial perfusion) or fetal acardia. In our sample, there were two cases of TRAP (0.9%), and the viable fetuses did not present heart disease in any of the cases[4].

Twin pregnancies have an increase in maternal complications when compared to singleton pregnancies: increased risk of pulmonary edema, hypertensive diseases, preeclampsia and eclampsia, altered liver function and platelet count, uterine overdistention with urinary tract compression, diabetes mellitus, kidney and heart failure, infection, respiratory distress, placental abruption, premature rupture of membranes, preterm labor and preterm delivery. In relation to the fetus, there is a greater risk of prematurity, intrauterine growth restriction, feto-fetal transfusion syndrome and extra-cardiac malformations, with low birth weight and prematurity being largely responsible for morbidity and mortality [9,10,17]. In the indication of the mode of delivery, the predominance of cesarean sections is observed. In the postpartum period, there is an increase in the incidence of uterine atony and hemorrhage. The occurrence of maternal death is 2.5 times more frequent in twin pregnancies when compared to singleton pregnancies[18].

According to Beiguelman and Franchi-Pinto, in a study carried out in Campinas, São Paulo, involving 116,699 deliveries, published in 2000, despite the incidence of twins of 0.9%, 10.7% of early neonatal deaths and 3.5% of all stillbirths were twins [19].

The postnatal evolution of twins presents particularities in relation to single fetuses, due to the increased risk of prematurity and its consequences, such as increased morbidity and mortality[20]. Premature or preterm births are defined as births that occur before 37 weeks of gestation. Worldwide, around 15 million children are born with this condition each year, accounting for 11.1% of births according to the World Health Organization (WHO). Preterm labor, premature rupture of membranes, induction of labor due to maternal or fetal causes are some of the related causes [21,22]. The WHO considers prematurity as a global problem and Brazil is among the 10 countries with the highest rates, which are responsible for 60% of premature births in the world. In 2018, prematurity remained the leading cause of death for children under five. In Brazil, neonatal mortality accounts for almost 70% of deaths in the first year of life, and newborn care remains challenging [23].

When performing the fetal echocardiogram, the time and place for termination of pregnancy in fetuses affected by cardiac alteration can be more securely defined. The diagnosis of cardiovascular alterations in twin pregnancies can be performed even in the intrauterine period, and its identification allows these patients to be referred during pregnancy to reference services, thus receiving adequate follow-up and treatment, avoiding neonatal complications and improving the prognosis. .

In this study, we recorded a 65% incidence of premature births. In pregnancies with fetuses with critical heart disease, in our country, elective cesarean section is indicated, allowing the team, including neonatologists, pediatric cardiologists and pediatric hemodynamicists, to prepare to receive the newborn.

In this study, we emphasize the association between prematurity, twins and heart disease in the population of southern Brazil.

In Brazil, in 2016, Salim et al, published a population-based study evaluating mortality from malformations of the circulatory system in children and adolescents in the state of Rio de Janeiro. Among the 115,728 deaths that occurred between 1996 and 2012, mortality from malformation of the circulatory system was 7.5/100,000 in males and 6.6/100,000 in females. In this study, acquired diseases of the circulatory system and malformations of the circulatory system were evaluated separately. Regarding the higher mortality rate from malformations of the circulatory system, these are described as unspecified malformations of the circulatory system in all ages and sex. It was concluded that these are more marked in the first years of life, while diseases of the circulatory system are more relevant in adolescents. Limited access to prenatal care and adequate birth conditions probably make it impossible to adequately treat these pathologies [24].

According to Gomes et al, in 2013, the deficit of pediatric cardiac surgery in Brazil was 65%, which reinforces the need for early diagnosis for adequate and timely treatment[6]. In 2017, the Ministry of Health, through the publication of the "Synthesis of evidence for health policies: Early diagnosis of congenital heart diseases" reviews actions that allow the early diagnosis of critical heart diseases, emphasizing the importance of performing obstetric ultrasound, fetal echocardiography, neonatal pulse oximetry and neonatal echocardiogram[25].

CONCLUSION

We are aware of possible biases related to retrospective studies and the sample of a reference service. However, we believe that, based on these data, it is possible to outline strategies that favor the early diagnosis of congenital heart diseases in multiple pregnancies, leading to adequate clinical management and referral to specific services in situations that require interventional treatments available in the Brazilian reality. Such measures allow greater effectiveness, reducing morbidity and mortality.

We believe that it is necessary to recognize multiple pregnancy as a risk situation for fetal cardiac involvement and, from there, to raise the awareness of health professionals about the importance of prenatal diagnosis of congenital heart disease in this situation.

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ORIGINAL ARTICLE

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THYROID NODULES CLASSIFIED AS ACR TI-RADS 4 AND 5 - A PICTORIAL ESSAY

MELISSA PEREIRA LOPES VIEIRA PINTO , THATIANY PASLAR LEAL, LEONARDO DE SOUZA PIBER

ABSTRACT

OBJECTIVE: The Thyroid Imaging Reporting and Data System, published by the American College of Radiology (ACR TI-RADS) is a risk stratification and categorization system for ultrasound (US) findings of thyroid nodules. By this system, the nodules are classified into five categories, according to morphological characteristics, the last one having the greatest potential for risk of malignancy, that is, it has an increasing pattern of severity. The objective is to present sonographic images of thyroid nodules classified as moderately and highly suspected of malignancy, ACR TI-RADS 4 and ACR TI-RADS 5, respectively.

METHOD: This is a pictorial essay with a collection of original images from the database of a diagnostic imaging center in the city of São Paulo. Eligibility criteria were: nodules classified as ACR TI-RADS 4 and 5, therefore, with moderate and high degree of suspicion for malignancy and recommendation of aspiration puncture for cytological evaluation.

RESULT: The evaluation of the nodules and their characteristics evidences the morphological variability of thyroid nodules whose ACR TI-RADS classification can be moderately and increasingly suspicious of malignancy.

In this way, it helps the attending physician to take the most appropriate course of action, which can be: expectant in relation to the nodule; perform ultrasound control or indicate a fine needle aspiration for cytological analysis of the nodule.

CONCLUSION: This system seeks to simplify the interpretation of images obtained by radiologists, which is a valuable, safe and widely available imaging tool, in addition to being easily reproduced to stratify the risk of thyroid injury and help to avoid unnecessary invasive procedures.

KEYWORDS: ACR TI-RADS, TI-RADS 4, TI-RADS 5, THYROID NODULES, THYROID ULTRASOUND

INTRODUCTION

The thyroid is an endocrine gland, with the characteristic of capturing iodine. The microscopic architecture of the thyroid gives it the ability to secrete and store hormones, called thyroid hormones. This has a conformation of spheres or acini, each one composed of a single layer of cells around the lumen filled with colloid, which has, inside, mainly thyroglobulin. Thyroglobulin (Tg) is a glycoprotein produced by the thyroid follicle, from the stimulus of TSH (thyroid-stimulating hormone), which acts as a "support" for the production of thyroid hormones, that is, acting as a form of storage of these and their precursors. (MANFRO, 1999; OLIVEIRA, 2009).

Among the diseases that affect the thyroid, thyroid nodules are frequent, with a prevalence of 4 to 7% in the adult population. Its detection has increased [2-4] times in the last three decades, mainly due to the increased use and advancement of ultrasound. According to recent reported guidelines and recommendations, ultrasound remains the most important tool in the initial evaluation of thyroid nodules, having the ability to detect and diagnose potentially malignant nodules. However, less than 5.0 – 6.5% of discovered thyroid nodules are malignant. Thus, it is important to establish criteria for selecting thyroid nodules for fine needle aspiration (FNA) according to their risk of malignancy (HEEP, 2018).

In 2017, the American College of Radiology (ACR) established a system for stratifying and categorizing the risk of ultrasound findings of thyroid nodules, called: Thyroid Imaging Reporting and Data System (TI-RADS), which aims to group the nodules into different categories. Nodules are classified into five categories, according to morphological characteristics, composition, echogenicity, shape, margin and calcifications, if any, must be evaluated. Sonographic features predict greater or lesser probability of benign or malignant nodules. The last category, TI-RADS 5, is the one with the greatest potential for risk of malignancy, that is, the system has an increasing pattern of severity, and until the TI-RADS 3 classification, the nodule is considered non-suspicious. When classified in TIRADS 4, there is a wide variety of morphological possibilities for the nodules, and these are considered moderately suspicious (HEEP, 2018; PIRES, 2021; RAHAL JUNIOR et al., 2016; ZHANG et al., 2020).

The characteristics that give the highest score seen on ultrasound are: solid or almost totally solid nodular composition, being markedly hypoechoic, having irregular margins or

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extrathyroidal extension, taller than wide shape, presence of microcalcifications or intermingled echogenic foci (RAHAL JUNIOR et al., 2016; ZHANG et al., 2020; PIRES, 2021).

The TI-RADS aims to classify the risk of the nodule being malignant, in order to help the attending physician to take the most appropriate course of action, which can be: expectant in relation to the nodule; perform ultrasound control or indicate a fine needle aspiration (FNA) for cytological analysis of the nodule (RAHAL JUNIOR et al., 2016; ZHANG et al., 2020).

This system seeks to simplify the interpretation of images obtained by radiologists, which is a valuable, safe and widely available imaging tool, as well as being easily reproduced to stratify the risk of thyroid injury and help to avoid unnecessary invasive procedures such as fine needle aspiration aspiration (FNA) in a significant number of patients.

OBJECTIVE

Show sonographic images of thyroid nodules classified by ACR TI-RADS 4 and 5, moderately and highly suspicious, respectively.

METHODS

This is a pictorial essay, that is, a collection of original images from the database of a diagnostic imaging center in the city of São Paulo. Eligibility criteria were: nodules classified as ACR TI-RADS 4 and 5, therefore, with moderate and high degree of suspicion for malignancy and recommendation of aspiration puncture for cytological evaluation depending on their dimensions, according to ACR TI-RADS 2017.

This research is part of the Research Project "Thyroid Ultrasound Findings", which is approved by the Research Ethics Committee of Universidade Santo Amaro, whose CAAE is 33383220.0.0000.0081.

RESULTS AND DISCUSSION

The characteristics that contributed to the score that determined the TI-RADS classification for each nodule will be highlighted.

In the variability of nodules classified as TI-RADS [4], hypoechogenicity and solid or predominantly solid composition stand out, as shown in figures 1 and 2.

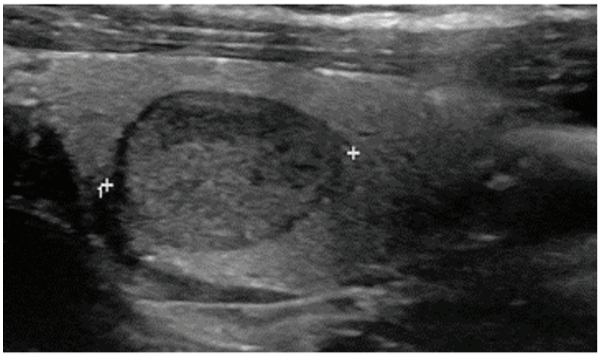

Figure 1 – Hypoechogenic nodule, almost completely solid, regular, measuring 1.4 cm. ACR TI-RADS [4]

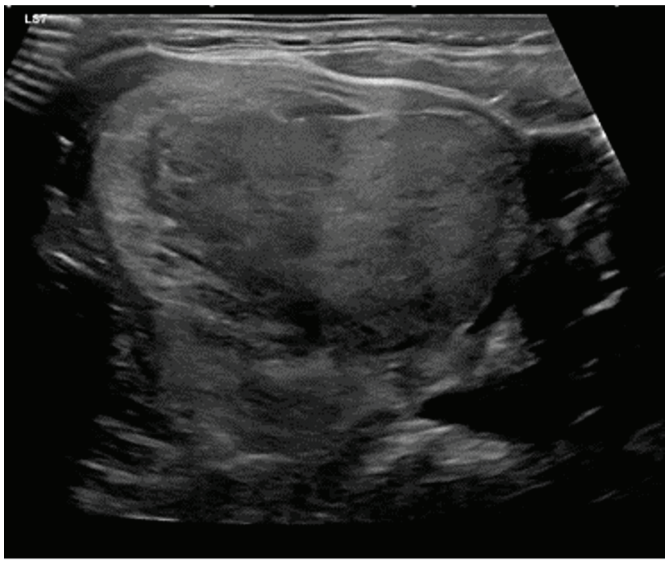

Figure 2 – Hypoechogenic nodule, almost completely solid, regular, wider than high, measuring 2.2 cm. ACR TI-RADS [4].

However, there are characteristics that may or may not be associated, despite the maintenance of the same ACR TI-RADS 4 classification. These may be irregular margins and calcifications, predominantly.

In figures 3 and 4 it is possible to observe irregular margins in the nodules classified as TI-RADS 4.

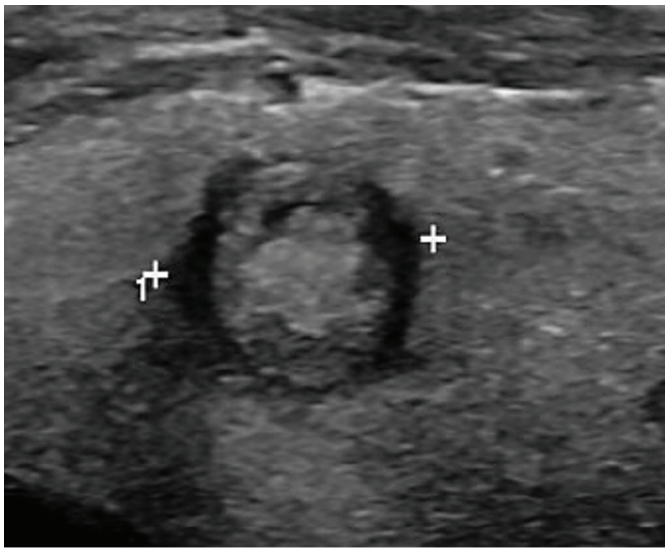

Figure 3 – Isoechogenic, solid, irregular nodule, measuring 0.9 cm. ACR TI-RADS 4 and Bethesda II.

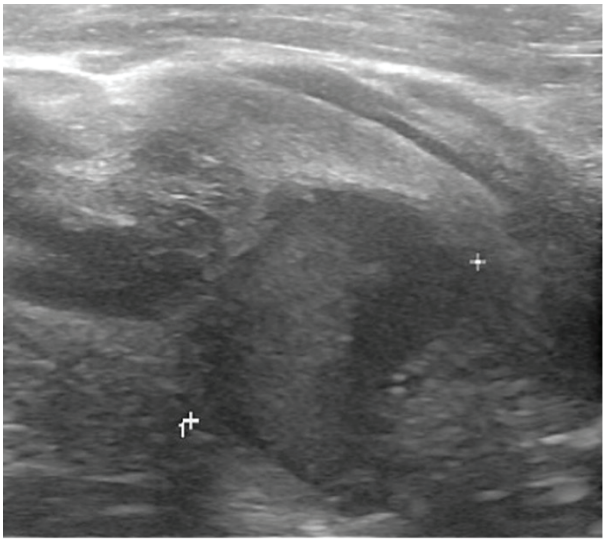

Figure 4 – Hypoechogenic, solid, irregular nodule, measuring 2.2 cm. ACR TI-RADS [4].

In figures 5, 6 and 7, it is possible to observe calcifications, also one of TI-RADS 4 characteristics.

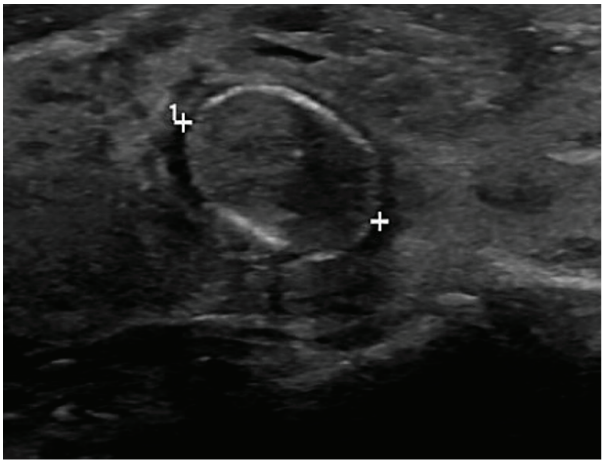

Figure 5 – Hypoechogenic, solid, regular nodule, with peripheral calcification, measuring 1.0 cm. ACR TI-RADS [4].

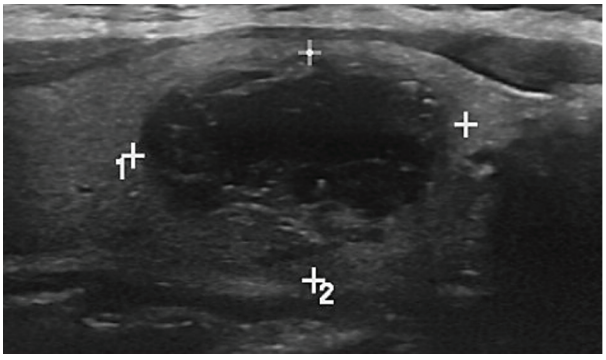

Figure 6 – Hypoechogenic, mixed, regular nodule, with punctate echogenic foci, measuring 2.2 cm. ACR TI-RADS [4].

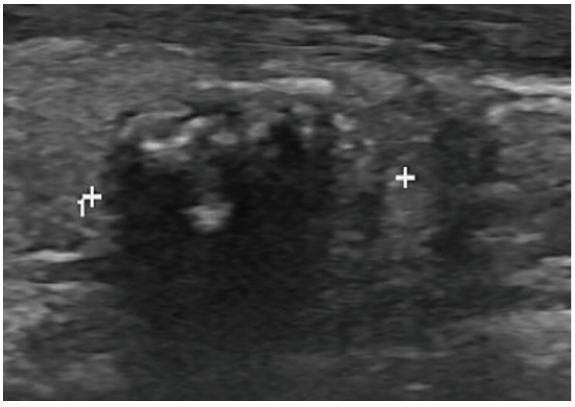

Figure 7 – Solid hypoechoic nodule with macrocalcifications and posterior acoustic shadow, measuring 1.2 cm. TI-RADS 4 and Bethesda II

Regarding the ACR TI-RADS [5] nodules, the evaluation of the selected images shows that they can also be hypoechogenic nodules, with solid composition, irregular margins. However, the taller-than-wide shape and the presence of punctate echogenic foci stand out. See figures 8 to 19.

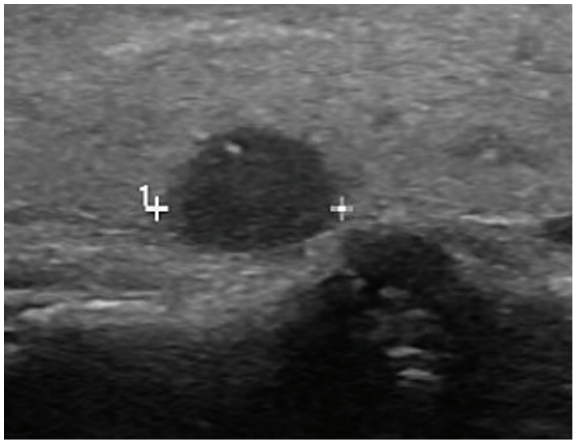

Figure 8 – Markedly hypoechogenic, solid, irregular nodule, measuring 0.7 cm. ACR TI-RADS [5].

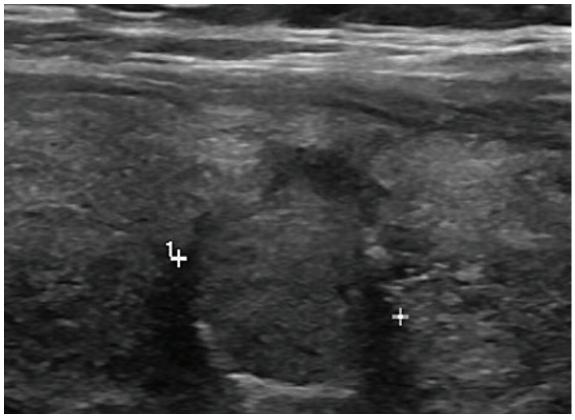

Figure 9 – Hypoechogenic, solid, irregular nodule, with thin peripheral calcification, measuring 1.0 cm. ACR TI-RADS [5].

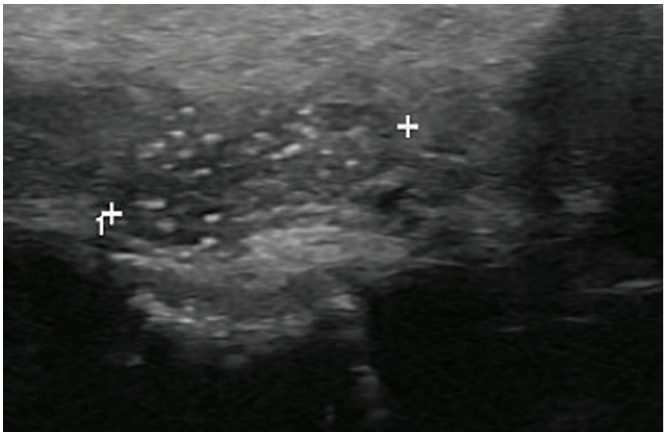

Figure 10 – Solid hypoechoic nodule with punctate echogenic foci, measuring 1.3 cm. ACR TI-RADS [5], Bethesda II (benign).

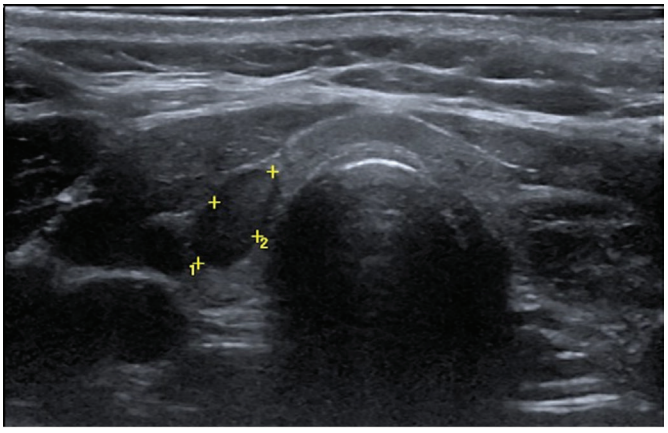

Figure 11 - Solid, markedly hypoechogenic nodule, height greater than width, on the right isthmus. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

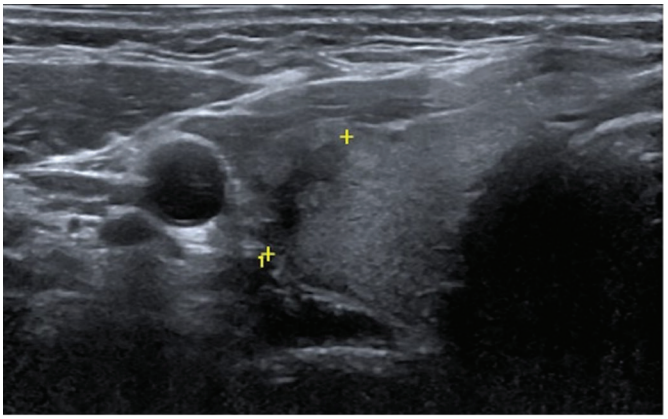

Figure 12 - Solid, markedly hypoechogenic, irregular nodule, height greater than width, in the middle third of the right lobe. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

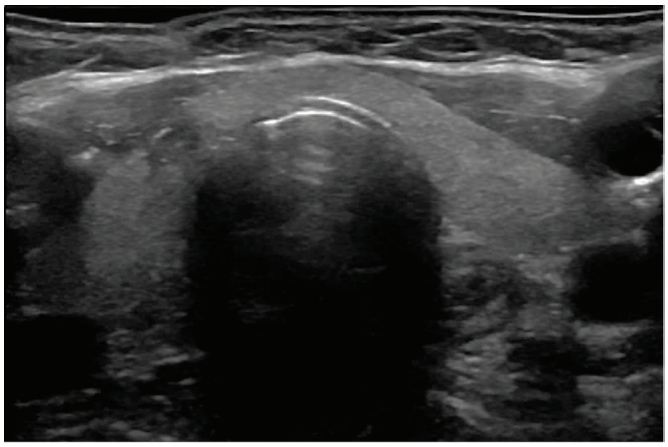

Figure 13 - Solid, hypoechogenic, irregular nodule, height greater than width, in the right isthmus. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

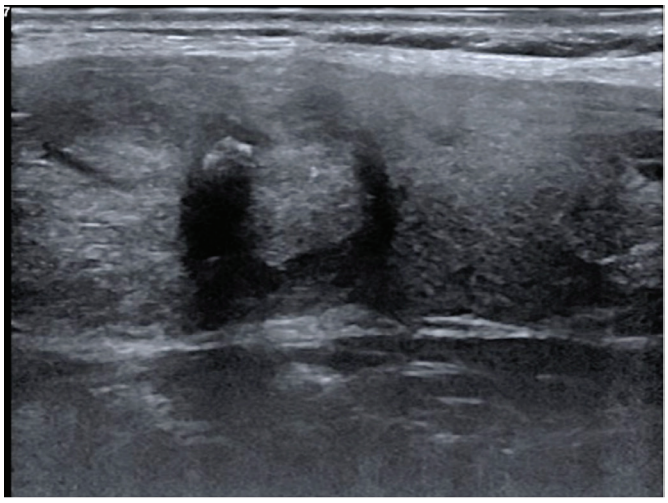

Figure 14 - Solid, heterogeneous, hypoechogenic, irregular nodule, with macrocalcification, in the middle third of the right lobe. ACR TI--RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

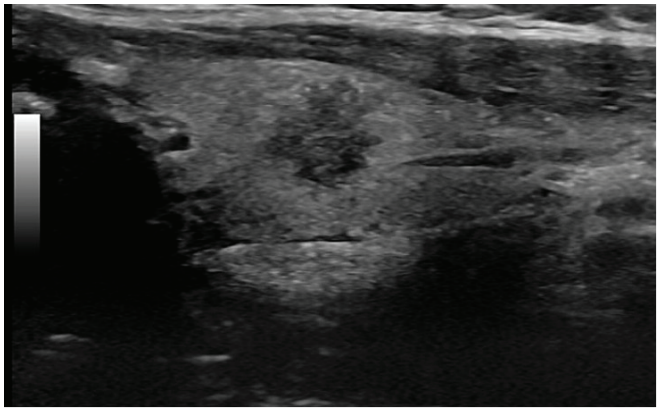

Figure 15 – Hypoechogenic, solid, irregular nodule, with punctate echogenic foci, measuring 1 cm. ACR TI-RADS [5].

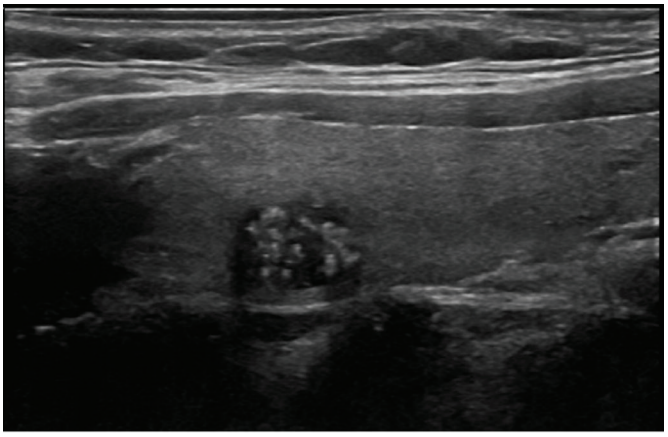

Figure 16 - Solid, markedly hypoechogenic, irregular nodule, with punctate echogenic foci, in the middle third of the right lobe. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

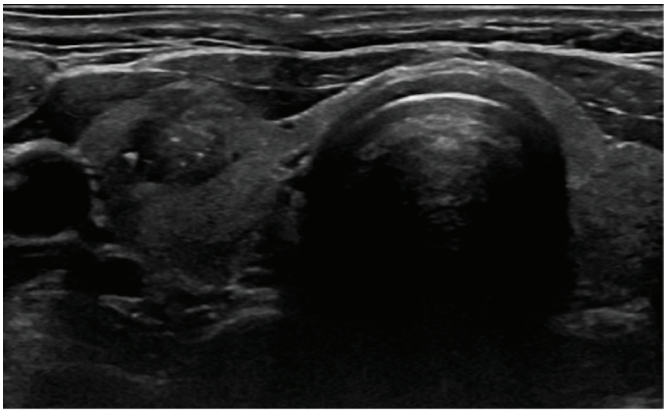

Figure 17 - Solid, hypoechoic, irregular nodule, with punctate echogenic foci, in the middle third of the right lobe. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

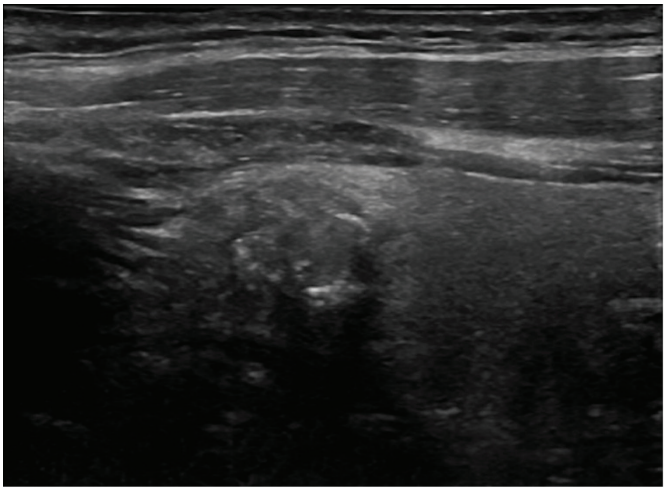

Figure 18 - Solid, hypoechoic, irregular nodule, with punctate echogenic foci and macrocalcifications, in the upper third of the right lobe. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

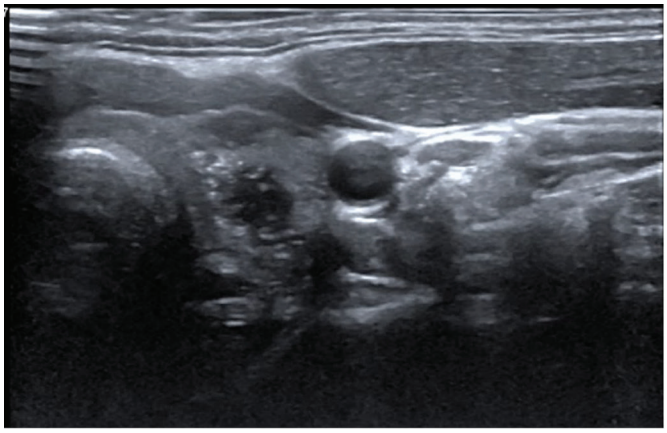

Figure 19 - Solid, markedly hypoechogenic nodule with punctate echogenic foci, height greater than width, in the middle third of the left lobe. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

CONCLUSION

It is up to the imaging specialist to know how to recognize the morphological variety of the nodules, regardless of their ACR TI-RADS classification. With regard specifically to level [4], moderately suspect, there is a range of morphological variations, whose hypoechogenicity and solid composition are common features.

On the other hand, ACR TI-RADS [5] nodules are highly suspicious of malignancy, with striking features, such as the presence of punctate echogenic foci or a taller than wide shape.

Thus, the ability to recognize the sonographic characteristics of these nodules has an influence on early diagnosis, keeping a direct relationship with the evolution and prognosis of this prevalent focal thyroid disease.

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ORIGINAL ARTICLE

FETAL MORPHOLOGICAL ULTRASOUND AND THE MAIN FINDINGS OF THE CENTRAL NERVOUS SYSTEM

EDLON LUIZ LAMOUNIER JÚNIOR[1], PATRÍCIA GONÇALVES EVANGELISTA[2], WALDEMAR NAVES DO AMARAL[2]

ABSTRACT

Introduction: Prenatal diagnosis of malformations is an important method of prevention and control of congenital anomalies. Central nervous system (CNS) malformations among these are the most common. Ultrasound during pregnancy plays a prominent and influential role in prenatal assessment of the central nervous system.

Objectives: to analyze the main findings of central nervous system alterations in fetal morphological ultrasound.

Methods: This is a cross-sectional, descriptive, retrospective and quantitative study, with secondary data collection. The sample consisted of 929 second-trimester morphological ultrasounds performed from January 2020 to January 2021, at Clínica Fértile.

Results: 929 reports were registered, of which 667 (71.8%) correspond to women under 35 years of age and 262 (28.2%) women over 35 years of age. Of these, 56 (6.0%) reports showed some type of morphological change and changes in the central nervous system were found in 15 reports with a prevalence of 1.61%. In women under 35 years, the prevalence of alterations in the central nervous system was 1.18%, the main alteration being hydrocephalus. in women over 35 years, the prevalence of alterations in the central nervous system was 0.43%, the main alteration being ventriculomegaly.

Conclusion: The prevalence of alterations in the central nervous system is 1.61%. In women under 35 years, the prevalence of alterations in the central nervous system was 1.18%, the main alteration being hydrocephalus. In women over 35 years, the prevalence of alterations in the central nervous system was 0.43%, the main alteration being ventriculomegaly.

KEYWORDS: CENTRAL NERVOUS SYSTEM, MALFORMATIONS, ULTRASONOGRAPHY

INTRODUCTION

Prenatal diagnosis of malformations is an important method of preventing and controlling congenital anomalies. Central nervous system (CNS) malformations among these are the most common. Neural tube defects are responsible for most congenital anomalies of the central nervous system (CNS) and result from the failure of the neural tube to close spontaneously between the 3rd and 4th weeks of embryonic development [1,2].

Congenital malformations of the central nervous system are related to alterations in the neural tube formation, including most neurosurgical management entities, dysraphism, and craniosynostosis; changes in neuronal proliferation; megalencephaly and microcephaly; neuronal migration disorders, lissencephaly, pachygyria, schizencephaly, agenesis of the corpus callosum, heterotopia and cortical dysplasia, spinal malformations and spinal dysraphism [3].

Globally, the incidence of congenital anomalies has been shown to vary from one geographic region to another, affecting about 3-7% of all newborns. Most causes of congenital anomalies are uncertain. However, evidence suggests that in about 25% of cases where causes are known, they appear to be multifactorial, involving a complex interaction between genetic and environmental factors. Likewise, morphogenesis errors that result in congenital malformations have been associated with some recognized genetic causes, including mutations in a single gene, chromosomal imbalances, and the action of teratogens. Folate deficiency has a recognized teratogenic effect, resulting in an increased risk of neural tube defects. Observational and interventional studies have also shown a protective effect of 50-70% in women who consume adequate amounts of folate in the neural tube[4].

The International Society of Ultrasound in Obstetrics and Gynecology (ISUOG) has published guidelines for the ultrasound study of the brain and spine in fetuses. The ISUOG guidelines are divided into two categories: basic CNS assessment; and neurosonographic assessment. The aim of this review was to describe, based on the ISUOG guidelines, how the ultrasound assessment of the fetal CNS should be performed. Ultrasound during pregnancy plays a prominent and influential role in prenatal assessment of the central nervous system. It provides an excellent window for viewing and evaluating the fetal central nervous system during the second trimester through the lateral ventricles and transthalamic view, effectively contributing to the diagnosis and treatment of congenital anomalies[5-7].

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Information on the prevalence and spectrum of malformations detected during prenatal care is crucial for genetic counseling and the design of population-based preventive programs[1].

The objective here is to analyze the main findings of central nervous system alterations on fetal morphological ultrasound.

METHODOLOGY

This is a cross-sectional, descriptive, retrospective and quantitative study, with secondary data collection. The research was carried out at the Fértile Clinic, which is private, located in Goiânia, Goiás.

The sample consisted of 929 second trimester morphological ultrasounds performed from January 2020 to January 2021, at Clínica Fértile. Ultrasounds with missing and/or inconclusive information were excluded.

Data were obtained from data contained in second trimester morphological ultrasound reports performed at Clínica Fértile, with the authorization of the institution.

The ultrasound report was considered a dependent variable. The independent variables were: maternal age (in years), gestational age (in weeks).

For the statistical analysis, an electronic spreadsheet was prepared in the program Microsoft Office Excel® 2010. The quantitative data were analyzed descriptively through the distribution of absolute and relative frequencies.

The present study was approved by the Research Ethics Committee (CEP) of Hospital e Maternidade Dona Iris, according to opinion number 5.002.479.

RESULTS

A total of 929 reports were recorded, of which 667 (71.8%) correspond to women under the age of 35 years and 262 (28.2%) to women aged 35 years or over. Of these, 56 (6.0%) reports showed some type of morphological alteration and anomalies in the central nervous system were found in 15 reports with a prevalence of 1.61%. In women under 35 years of age, the prevalence of central nervous system alterations was 1.18%, the main alteration being hydrocephalus. In women over 35 years old, the prevalence of central nervous system alterations was 0.43%, the main alteration being ventriculomegaly. With 80% of cases with multiple alterations.

Tables 1 and 2 and figures 1 and 2 illustrate the findings for patients aged < 35 and > 35 years, respectively.

Maternal Age	Gestational Age		Description of alterations
20	22	Multiple	Achondroplastic dwarfism / Dandy-Walker syndrome / Moderate hydrocephalus / Pyelectasis
20	23	Multiple	Cerebellar vermis agenesis / polyhydramnios / bilateral pleural effusion / amniocentesis indicated for karyotype
22	22	Multiple	Proboscis / nasal bone agenesis / choroid plexus cyst / omphalocele
24	23	Multiple	Dandy Walker disease / moderate hydrocephalus / 15mm posterior fossa cyst
25	23	Multiple	Neural tube defect / lumbosacral meningocele + mild hydrocephalus 15mm
27	33	Multiple	Cerebellar vermis agenesis / 14mm dilation of the cisterna magna and ventriculomegaly 14mm on the right and 11mm on the left
28	24	Multiple	Neural tube defect = lumbosacral spina bifida (5 vertebrae) + hydrocephalus + clubfoot
29	20	Multiple	Body stalk anomaly / second papyraceus conceptus
31	26	Multiple	Cerebral abnormality = posterior fossa cyst (28mm) with cerebellar vermis agenesis/mild hydrocephalus (Dandy Walker disease) - 17mm lateral ventricle
32	34	Single	13mm cerebral ventriculomegaly
33	27	Single	Neural tube defect/lumbosacral meningocele

Table 1 – Description of alterations in the central nervous system of morphological ultrasounds performed in the second trimester in women under 35 years old at Clínica Fértile, Goiânia, Goiás.

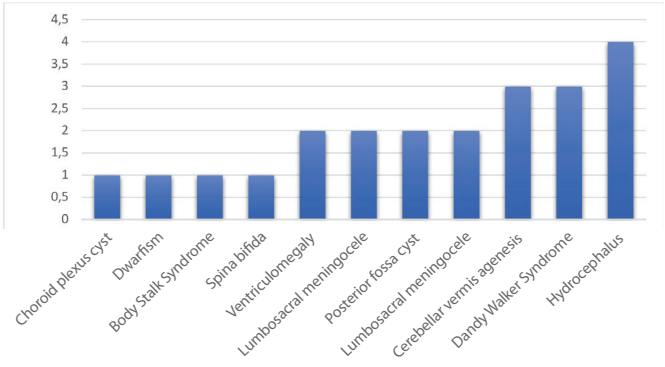

Figure 1 – Description of the main alterations in the central nervous system of morphological ultrasounds performed in the second trimester in women under 35 years old at Clínica Fértile, Goiânia, Goiás.

Maternal Age	Gestational Age		Description of alterations (Report)
35	23	Single	Choroid plexus cyst in regression (4mm)
39	24	Multiple	Neural tube defect (lumbosacral myelomeningocele 26mm / cranial deformity / ventriculomegaly 11mm / Chiari malformation type 2
41	23	Multiple	Holoprosencephaly / nasal bone absence / complex heart disease / pyelectasis / polyhydramnios / placental thickening
57	24	Multiple	15mm cisterna magna dilatation / cerebellar vermis agenesis / 11mm ventriculomegaly / mild hypoplasia of the left heart chambers / renal dysplasia / umbilical artery / fetal trisomy

Table 2 – Description of alterations in the central nervous system of morphological ultrasounds performed in the second trimester in women over 35 years old at Clínica Fértile, Goiânia, Goiás.

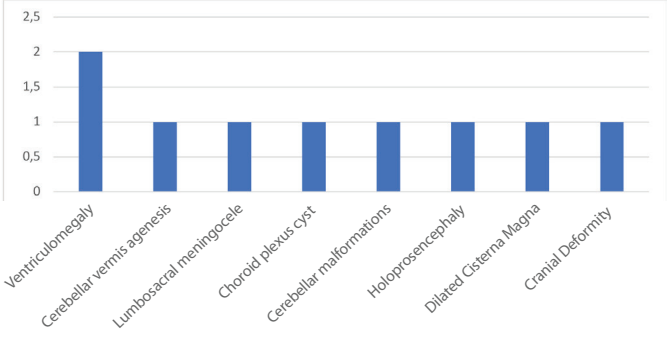

Figure 2 – Description of the main alterations of the central nervous system of morphological ultrasounds performed in the second semester in women over 35 years old at Clínica Fértile, Goiânia, Goiás.

DISCUSSION

Intracranial congenital malformations are anomalies of brain development caused by genetic and environmental influences. Advances in neuroimaging techniques and genetic research have led to a better understanding of the pathogenesis of many congenital malformations, adding insight into their clinical relevance and the intricate relationship between critical developmental periods, genetic predisposition, and environmental factors. When a malformation is discovered, there is a high probability of more malformations, which corroborates this study, which found 80% of cases of multiple alterations[8].

In this study, 56 (6.0%) reports showed some type of morphological alteration and anomalies in the central nervous system were found in 15 reports with a prevalence of 1.61%. In women under 35 years of age, the prevalence of central nervous system alterations was 1.18%, the main alteration being hydrocephalus. In women over 35 years old, the prevalence of central nervous system alterations was 0.43%, the main alteration being ventriculomegaly.

A retrospective study performed in a tertiary hospital in northern India from January 2007 to December 2013. Details of cases with prenatally detected CNS malformations were collected and related to fetal chromosome analysis and autopsy findings. Among 6,044 prenatal ultrasound exams performed; 768 (12.7%) had structural malformations and 243 (31.6%) had CNS malformations. Neural tube defects were responsible for 52.3% of CNS malformations and 16.5% of all malformations. The other main groups of CNS malformations detected prenatally were ventriculomegaly and midline anomalies[1] in agreement with the findings.

When evaluating 2,701 pregnant women in ultrasound exams, the sensitivity, specificity, positive predictive value and negative predictive value of the diagnosis of fetal CNS malformation were 85.7%, 100%, 100% and 99.9%, respectively[9].

In a retrospective cohort study, 47 patients were diagnosed with fetal CNS anomalies at a median gestational age of 31.1 weeks (range 24-38). The four most common anomalies found included intracranial cysts (19%), mild ventriculomegaly (15%), absence or dysgenesis of the corpus callosum (10%), and intracerebral hemorrhage (10%). Other CNS anomalies detected in this group of patients included hydrocephalus, Dandy walker malformation, dilated cisterna magna, microcephaly with lissencephaly, craniosynostosis, periventricular pseudocysts, global cerebral ischemia, cerebellar hypoplasia and subependymal nodule[10].

Knowledge of congenital malformations and their appearance in imaging sequences is essential to improve clinical outcomes and patients' quality of life[11].

Twins are about four times more likely to have congenital malformations than single children[12].

Each type of nervous system malformation is relatively uncommon, but collectively they constitute a large population. Treatment primarily consists of supportive therapies for developmental delays and epilepsy, but prenatal surgery for myelomeningocele offers a glimpse of future possibilities. The prognosis depends on several clinical factors, including examination findings, imaging features, and genetic findings. Treatment is best conducted in a multidisciplinary setting with neurology, neurosurgery, developmental pediatrics, and genetics working together as a comprehensive team[13].

Fetal structural abnormalities are found in up to 3% of all pregnancies and ultrasound screening has been an integral part of routine prenatal care for decades. Prenatal detection of fetal anomalies allows for optimal perinatal management, providing prospective parents with opportunities for additional imaging, genetic testing, and providing information about prognosis and management options[14].

It can be concluded that standardized structural ultrasound screening during pregnancy can early detect fetal

CNS malformations and has important clinical value in reducing the birth rate of malformed fetuses and in guiding obstetric treatment[15].

Congenital malformations are not uncommon and the central nervous system is the most commonly affected system. Health managers should emphasize primary prevention in the form of vaccination, nutrition and medication to reduce the avoidable participation of congenital malformations[15].

CONCLUSION

The prevalence of central nervous system alterations is 1.61%.

In women under 35 years of age, the prevalence of central nervous system alterations was 1.18%, the main alteration being hydrocephalus.

In women over 35 years old, the prevalence of central nervous system alterations was 0.43%, the main alteration being ventriculomegaly.

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ORIGINAL ARTICLE

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ULTRASOUND SIGNS OF ADENOMYOSIS: PICTORIAL ESSAY

MICHEL SANTOS PALHETA [1], ANA ROBERTA GOMES SEVERIANO [2], SIDNEY WENDELL GOIANA DA SILVA [1], FRANCISCO DAS CHAGAS MEDEIROS [1]

ABSTRACT

Adenomyosis is defined as the presence of ectopic endometrial glands and stroma within the myometrium. It is a disease of the inner myometrium and results from infiltration of the basal endometrium into the underlying myometrium. Transvaginal ultrasound and magnetic resonance imaging are the main imaging modalities for the diagnosis of this disease. The asymmetry of the thickness of the uterine walls, intramyometrial cysts, hyperechogenic intramyometrial islands, myometrium with a shading fan shape, signs of interruption of the junctional zone are the most frequent ultrasound findings to establish the presence of adenomyosis. Adenomyosis can appear as a diffuse or focal form. In this article, ultrasound findings of adenomyosis were illustrated in order to disseminate the importance of these signs for the diagnosis of this disease.

KEYWORDS: DIFFUSE ADENOMYOSIS, FOCAL ADENOMYOSIS, ADENOMYOSIS, TRANSVAGINAL ULTRASOUND

INTRODUCTION

Adenomyosis is a common benign gynecological disorder, defined as the presence of ectopic endometrial glands and stroma within the myometrium . Transvaginal ultrasound (TVUS) is a method present in most diagnostic imaging services and has become a first-line diagnostic imaging method for the detection of adenomyosis. Thus, the recognition of characteristic TVUS findings in adenomyosis is essential to clarify the current clinical approach to patients with suspected adenomyosis [1-4].

In the present essay, the main findings of adenomyosis in TVUS are presented.

METHODS

The findings described in this study were obtained from confirmed cases (surgically and/or histologically) of adenomyosis, following the rules of conduct and ethical principles, according to the Declaration of Helsinki (1975) – 6th revision, and developed in a diagnostic imaging service in the city of Sobral and Fortaleza – Ceará, Brazil.

TVUS PROTOCOL

The technique used was based on the protocol defined by the consensus opinion of the Morphological Uterus Sonographic Assessment (MUSA)[2,6]. The examinations were performed by a radiologist specializing in women's imaging and with a specialist title from the Brazilian College of Radiology. The ultrasound equipment used were HS40 (Samsung®), HS70A Prime (Samsung®) and NX3 (Simiens®), using an endocavitary transducer with a frequency of 9 MHz.

ADENOMYOSIS FINDINGS ON TVUS

In the present study, the sonographic characteristics of the myometrium and myometrial lesions related to adenomyosis are described according to the terms and definitions published in the MUSA consensus [2,6,7]. The typical findings of adenomyosis identified on TVUS are:

Thickening or irregularity of the junctional zone

The junctional zone (JZ) is visible as a hypoechogenic subendometrial halo [2,5,6]. This layer is composed of smooth muscle fibers compacted longitudinally and circularly [2,5,6]. To recognize, on ultrasound, the pathological aspects of the JZ, it is necessary to recognize the normal echographic appearance of it. Figure 1 shows the uterus in cross-section with a well-defined JZ surrounding the echogenic endometrium.

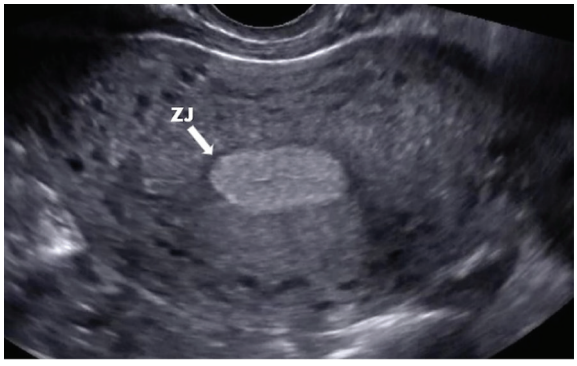

Figure 1. Cross-sectional view of the uterine body obtained by ultrasound in B-mode. The junctional zone (JZ) can be visualized as a dark line just below the endometrium (white arrow)

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Figure 2 demonstrates an echographic appearance with changes in the JZ with irregularity and discontinuation in the anterior wall of the endometrium.

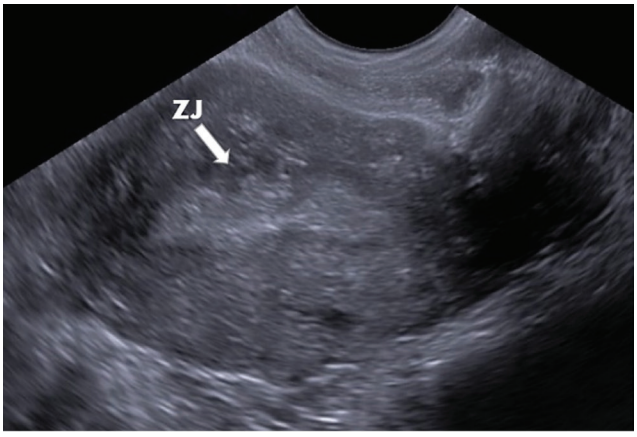

Figure 2. Longitudinal view of the uterus obtained by ultrasound in B-mode. The irregular and discontinuous junctional zone (JZ) in the anterior wall of the endometrium (white arrow).

Asymmetric thickening of the myometrial walls

The extent of myometrial lesion can be estimated subjectively as a percentage according to the volume of myometrium involved. If less than 50% of the myometrium is involved, the lesion is reported as focal, if more than 50% of the myometrium is involved, it is reported as diffuse[2,4,5,7]. The myometrial lesions of adenomyosis determined asymmetry of the uterine walls, as shown in figure 3.

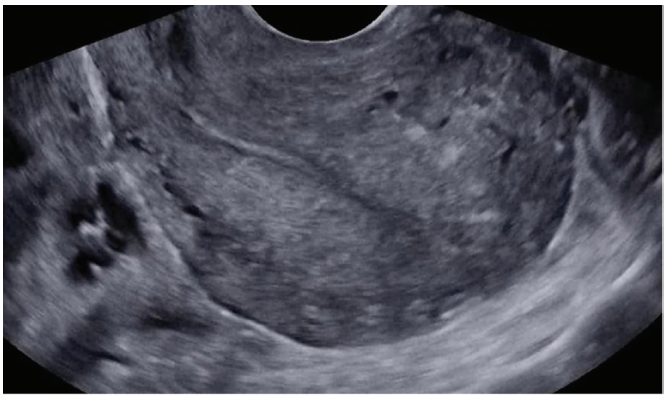

Figure 3. Longitudinal view of the uterus obtained by ultrasound in B-mode. Asymmetry of myometrial walls due to involvement of more than 50% of the posterior wall in the retroverted uterus.

Acoustic bands present in the myometrium (myometrial stratification in "sunbeams")

Acoustic shadows may arise from the margins of lesions. Reported in many works as myometrial stratification in "sunbeams" (figure 4) they are defined by the presence of hypoechoic linear acoustic bands, sometimes alternating with linear hyperechoic stripes[2-6]. This type of acoustic bands can be caused by superimposed microcystic structures.

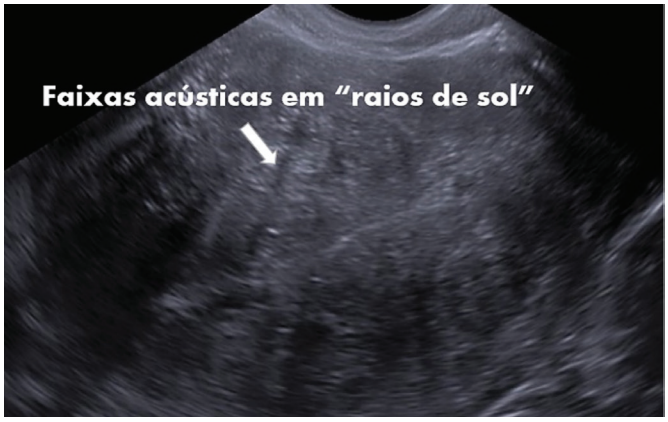

Figure 4. Longitudinal view of the uterus obtained by ultrasound in B-mode. Acoustic bands present in the myometrium (myometrial stratification in "sunbeams") in the anterior wall of the myometrium (white arrow).

Subendometrial echogenic lines and echogenic islets in the myometrium

Echogenic islands are hyperechoic areas within the myometrium and may be regular or irregular. Islands can be distinguished from small echogenic lines seen in the subendometrial halo [2,5-7]. Figure 5 illustrates the echographic appearance of the myometrial echogenic islands, represented by an irregular hyperechoic area in the anterior wall of the myometrium.

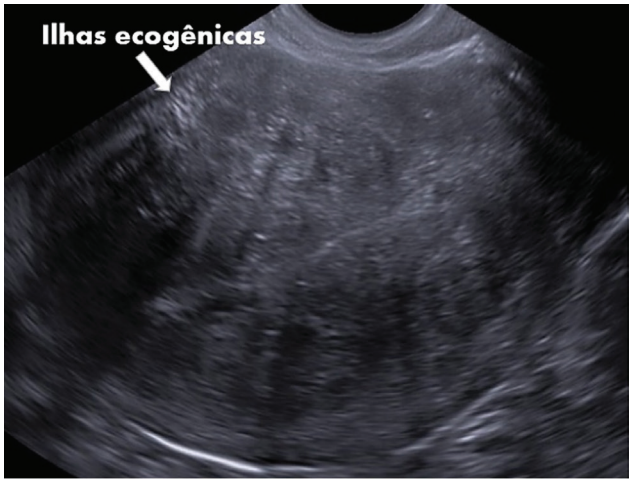

Figure 5. Longitudinal view of the uterus obtained by ultrasound in B-mode. Echogenic islands in the anterior wall of the myometrium (white arrow).

Small cystic formations in the myometrium

Myometrial cysts are rounded lesions within the myometrium and the content of these cysts can be anechoic or of mixed echogenicity [2-4,7]. A cyst may be surrounded by a

hyperechoic rim and some cysts may form aggregates of tiny hypoechoic microcysts in the myometrium [2,4-6].

Figure 6 illustrates the characteristic appearance of clustered cysts in the anterior wall of the myometrium.

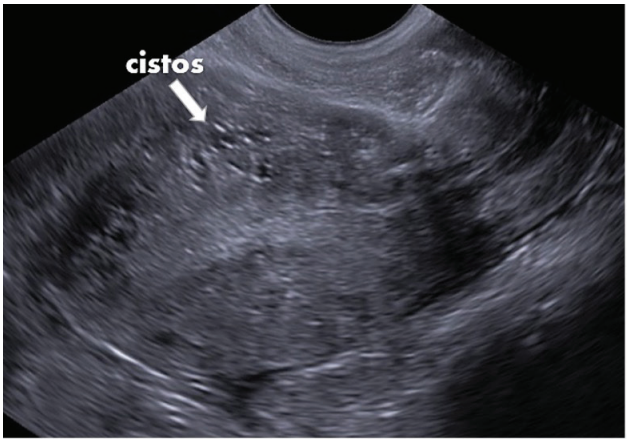

Figure 6. Longitudinal view of the uterus obtained by ultrasound in B-mode. Cysts clustered in the anterior wall of the myometrium (white arrow).

Increased vascularity on Doppler with penetrating vessels in the affected area

In areas affected by adenomyosis, translesional myometrial vascularization, defined as vessels perpendicular to the endometrium crossing the lesion, is increased on color Doppler or Power Doppler (figure 7)[2,3,5-7].

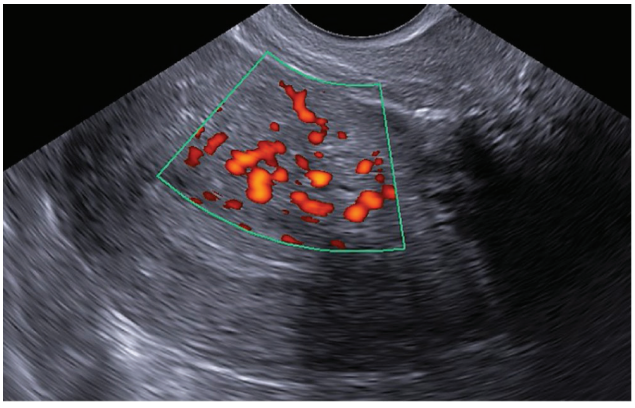

Figure 7. Longitudinal view of the uterus obtained by ultrasound in Power Doppler mode. Translesional vascularization, defined as vessels perpendicular to the endometrium crossing the lesion.

Report

Structured ultrasound assessment report for adenomyosis is strongly recommended[8], and a description of standard reporting recommendations for endometriosis has recently been published[9]. For this study of TVUS in adenomyosis, we suggest a reporting template to be used in addition to the standard TVUS report (Table 1). This systematic report is currently used in our diagnostic imaging center and incorporates all relevant structures respecting the terms and definitions described in the literature [2,4,6,7].

Uterus
Biometrics_x_x_cm (volume: _ cm ^{3})
Position: ( ) anteversoflexion ( ) retroversion ( ) retroflexion
External contours: ( ) regular
endometriosis in the anterior uterine serosa endometriosis in the posterior uterine serosa
Myometrial echotexture: ( ) regular
( ) adenomyosis ( ) focal ( ) diffuse

( ) anterior wall ( ) involvement more than 50% ( ) less than 50%

( ) posterior wall ( ) involvement more than 50% ( ) less than 50%

Signs of adenomyosis:

( ) thickening or irregularity of the junctional zone
( ) Asymmetry of the myometrial walls
( ) Acoustic bands in the myometrium (myometrial stratification in "sunbeams")
( ) Subendometrial and myometrial echogenic lines
( ) myometrial cysts
( ) increased vascularity on Doppler with penetrating vessels in the affected area
( ) myometrial infiltrating endometriosis ( ) anterior wall ( ) posterior wall

Table 1 - Structured TVUS report in patients with suspected adenomyosis (in addition to the standard report)

CONCLUSION

The echographic findings described demonstrate the usefulness of ultrasonography for the diagnosis of adenomyosis. In clinically suspected cases of adenomyosis, TVUS may be the initial tool for diagnostic imaging. These ultrasound signals should be relevant to physicians performing TVUS examinations in everyday practice and for clinical research.

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ORIGINAL ARTICLE

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FREQUENCY OF ENDOMETRIOSIS FINDINGS IN TRANSVAGINAL ULTRASOUND WITH INTESTINAL PREPARATION ACCORDING TO THE UBESS AND ASRM CLASSIFICATION

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ABSTRACT

Introduction: Endometriosis is characterized by the presence of endometrial tissue outside the uterus. The gold standard test to establish its diagnosis is laparoscopy, but transvaginal ultrasound has become the main diagnostic tool in the diagnosis of endometriosis.

Objectives: To analyze the frequency of endometriosis findings on transvaginal ultrasound with bowel preparation according to the Ultrasound-Based Endometriosis Staging System (UBESS) and American Society for Reproductive Medicine (ASRM) classification.

Methods: This is a cross-sectional, descriptive, retrospective and quantitative study, carried out at Clínica Fértile, where 413 examinations were analyzed. transvaginal ultrasound with bowel preparation in women aged 18 to 60 years, performed from January 2020 to December 31, 2020 in Goiânia, Goiás.

Results: In total, 413 reports were evaluated, 272 normal and 141 with endometrial changes, representing 34% changes. The average age was 34 years old, ranging from 18 to 59 years old. In the studied group, in relation to ASRM stages, the frequency was higher in severe cases of endometriosis with 36%, whereas in UBESS the frequency was higher in stage II with 50% of cases. In both classifications, the most affected age group were women between 20 and 40 years old, as they are still of reproductive age.

Conclusion: The frequency of alterations is 34%. ASRM the frequency was higher in severe cases of endometriosis with 36%. UBESS frequency was higher in stage II with 50% of cases. In both classifications, the most affected age group were women between 20 and 40 years old, as they are still of reproductive age.

KEYWORDS: ULTRASONOGRAPHY, ENDOMETRIOSIS, DIAGNOSIS

INTRODUCTION

Endometriosis is characterized by the presence of endometrial tissue outside the uterus. When endometrial implants penetrate more than 5 mm into the peritoneum, they are defined as deep pelvic endometriosis [1]. Endometriosis is a common disease, but due to the wide spectrum of symptoms, diagnosis can take 8 to 12 years[2].

Endometriosis has a prevalence of up to 70% in patients with pelvic pain and infertility. Intestinal involvement occurs between 3 and 37% of women in whom gynecological endometriosis is detected, whose site of greatest involvement is the rectosigmoid (73%) and the rectovaginal septum (13%) [3].

Transvaginal ultrasound has excellent sensitivity and specificity in the diagnosis of ovarian endometrioma, especially in lesions larger than 2 cm. Histologically, deep endometriosis is defined as foci more than 5 mm deep in the peritoneum or in some organ[4].

The disease can be found at many sites throughout the pelvis, in particular the ovaries, pelvic peritoneum, pouch of Douglas (PD), rectum, rectosigmoid, rectovaginal septum (RVS), uterosacral ligaments (USL), vagina, and urinary bladder. . Correct and site-specific diagnosis is critical to defining the optimal treatment strategy for endometriosis. Non-invasive imaging methods are needed to accurately map the location and extent of endometriotic lesions[5].

The gold standard exam to establish its diagnosis is laparoscopy, but transvaginal ultrasound has become the main diagnostic tool in the diagnosis of endometriosis and can contribute to the detection of the disease, as it is an accessible, lower cost, non-invasive exam and allows preoperative planning in cases where surgical treatment is necessary[6].

The inclusion of an evaluation for endometriosis in routine pelvic ultrasound allows for earlier diagnosis[7]. The transvaginal ultrasound procedure for endometrial mapping, also called endovaginal ultrasound with bowel preparation, is a transvaginal ultrasound performed with bowel emptying (bowel preparation) to visualize the involved structures[8].

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The aim here is to analyze the frequency of endometriosis findings on transvaginal ultrasound with bowel preparation according to the Ultrasound-Based Endometriosis Staging System (UBESS) and the American Society for Reproductive Medicine (ASRM) classification.

METHODOLOGY

This is a cross-sectional, descriptive, retrospective and quantitative study, carried out at Clínica Fértile, where 413 transvaginal ultrasound exams with bowel preparation were analyzed in women aged 18 to 60 years, performed from January 2020 to December 31 2020 in Goiânia, Goiás.

Data were obtained through data contained in ultrasound reports.

The UBESS classifications have the power to optimize the screening of women with advanced stages of the disease to choose the best method of laparoscopic treatment. The Ultrasound-Based Endometriosis Staging System (UBESS) consists of three stages correlated with three levels of complexity of laparoscopic surgery for endometriosis, described by the Royal College of Obstetricians and Gynecologists[9].

Estágio UBESS	Achados da USGTV	Níveis
I	Ovários normais móveis, die ausente, BD normal, com/sem SD	Leve
II	Endometrioma, ovários imóveis, EP não intestinal, BD normal	Moderado
III	Ovários imóveis, endometrioma, EP extra-pélvica BD normal	Avançado

BD – bolsa de Douglas, SD – sitio da dor, EP – endometriose profunda

Table 1 - US-based staging of endometriosis and its prediction of surgical complexity level[9]

The ASRM classification system is currently commonly used and is based on the appearance, size and depth of peritoneal and ovarian implants; the presence, extent and type of adhesions; and the degree of obliteration of the Pouch of Douglas. These parameters together reflect the extent of endometriotic disease. Stadiums are score dependent as indicated below:

Stage I (minimal endometriosis): score 1-5, isolated implants and no significant adhesions.

Stage II (mild endometriosis): score 6-15, superficial implants less than 5 cm, no significant adhesions.

Stage III (moderate endometriosis): score 16-40, multiple implants, evident peritubal and periovarian adhesions.

Stage IV (severe endometriosis): score > 40, multiple superficial and deep implants, including endometriomas, dense and firm adhesions.

The ultrasound report was considered a dependent variable. The independent variables were: age and diagnosis.

For the statistical analysis, an electronic spreadsheet was prepared in the program Microsoft Office Excel® 2010. The quantitative data were analyzed descriptively through the distribution of absolute and relative frequencies. The present study was approved by the Research Ethics Committee (CEP) of Hospital e Maternidade Dona Iris, according to the opinion number

RESULTS

In total, 413 reports were evaluated, 272 of which were normal and 141 with endometrial alterations, representing 34% of alterations. The mean age was 34 years, ranging from 18 to 59 years. See figures 1 and 2 and tables 2 and 3.

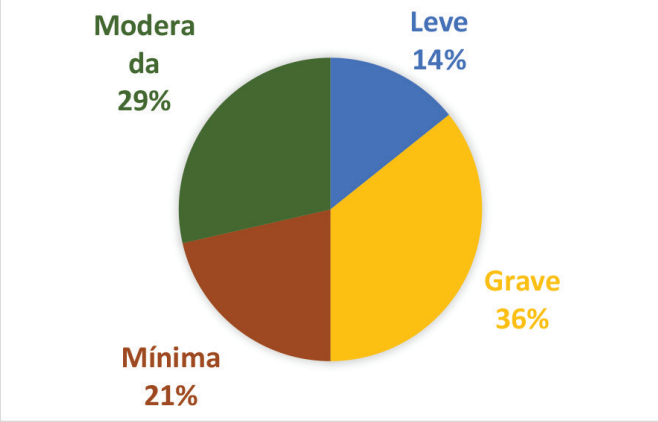

Figure 1. List of findings and stages of asrm

IDADE E GRAU SEGUNDO OS ESTÁGIOS DA ASRM	N	%
Leve		
<20	0	
20-40	16	76,2%
>40	5	23,8%
Mínima		
<20	1	3,3%
20-40	23	76,7%
>40	6	20,0%
Moderada		
<20	0	0,0%
20-40	30	75,0%
>40	10	25,0%
Grave		
<20	1	2,0%
20-40	43	86,0%
>40	6	12,0%

Table 2. Relation of ASRM findings and stages in relation to the age of patients who underwent endovaginal ultrasound with bowel preparation.

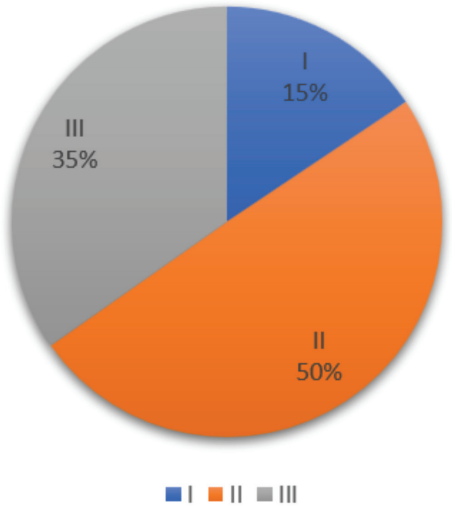

Figure 2. List of findings and UBESS stages

IDADE E GRAU SEGUNDO OS ESTÁGIOS DA UBESS	N	%
Estágio I		
<20	0	0,0%
20-40	17	77,3%
>40	5	22,7%
Estágio II		
<20	1	1,4%
20-40	53	75,7%
>40	16	22,9%
Estágio III		
<20	1	2,0%
20-40	42	85,7%
>40	6	12,2%

Tabela 3. Relação dos achados e os estágios UBESS em relação a idade, das pacientes que realizaram ultrassonografia endovaginal com preparo intestinal.

DISCUSSION

Ultrasound examination is an indisputable imaging method in the diagnosis of endometriosis, as a first step in detection, as a fundamental tool in management planning and as the best diagnostic tool during follow-up[10].

Transvaginal ultrasound has evolved a lot as an essential tool in the investigation of women with pelvic pain and suspected endometriosis. Several studies have demonstrated the accuracy and reliability for diagnosing deep infiltrating pelvic endometriosis and pouch of Douglas obliteration. Assessment of the anterior pelvic compartment for deep urinary endometriosis and utero-vesical adhesions should also be considered for women with suspected pelvic endometriosis/pain. In addition, the use of ultrasound markers, such as ovarian endometriomas and ovarian immobility, also aid in the assessment of disease severity. The ability to map the location and extent of disease preoperatively allows for appropriate screening, surgical planning, and patient counseling and, in turn, improves care for women with severe endometriosis[11].

In total, 413 reports were evaluated, 272 of which were normal and 141 with endometrial alterations, representing 34% of alterations. The mean age was 34 years, ranging from 18 to 59 years.

The stage of endometriosis was based on the revised American Society for Reproductive Medicine (ASRM) classification. In the group studied in relation to the stages of ASRM, the frequency was higher in severe cases of endometriosis with 36%.

There is no clear consensus on defining the severity of endometriosis and the most commonly used classification, the American Society for Reproductive Medicine (ASRM) classification, has both advantages and disadvantages. The advantages of this classification are that it is widely used in clinical practice and provides a formalized systematic approach to documenting the impact of disease on patient fertility. However, many authors recognize that the features of deeply infiltrating endometriosis are often the most symptomatic and difficult to treat. These features are poorly represented in the ASRM classification and therefore need to be documented separately[12].

When evaluating 34 patients using the ASRM classification, endometriosis was not found in 12 (36.4%) patients. One patient (3%) had minimal disease, one (3%) had mild disease, five (15.2%) had moderate disease, and 14 (42.4%) had severe disease[12].

Another study compared preoperative ultrasound reports and surgical operation scores to retrospectively assign an ASRM score and stage in 204 patients with suspected endometriosis. The breakdown of surgical findings was as follows: ASRM 0 (ie, no endometriosis), 24/204 (11.8%); ASRM 1, 110/204 (53.9%); ASRM 2, 22/204 (10.8%); ASRM 3, 16/204 (7.8%); ASRM 4, 32 204 (15.7%). The overall accuracy of ultrasound in predicting the surgical stage of ASRM was as follows: ASRM 1, 53.4%; ASRM 2, 93.8%; ASRM 3, 89.7%; ASRM 4, 93.1%; ASRM pooled 0, 1 and 2, 94.6%; and ASRM pooled 3 and 4 of 94.6%. Ultrasound performed better in the test at higher stages of the disease. When the ASRM stages were dichotomized, ultrasound had a sensitivity and specificity of 94.9% and 93.8%, respectively, for ASRM 0, 1, and 2, and 93.8% and 94.9%, respectively, for ASRM 3 and 4. Concluding, therefore, that ultrasound is highly accurate in predicting mild, moderate, and severe ASRM stages of endometriosis and can accurately differentiate between stages when ASRM stages are dichotomized (null/ minimal/mild vs moderate/ severe). This may have important positive implications for screening patients at centers of excellence in minimally invasive gynecology for

advanced stage endometriosis[13].

In another study with 201 women, preoperative US and laparoscopy were evaluated. The sensitivity and specificity of the US diagnosis of severe pelvic endometriosis were 0.85 (95% CI, 0.716-0.934) and 0.98 (95% CI, 0.939-0.994), respectively, and the positive and negative were 43.5 (95% CI, 14.1-134) and 0.15 (95% CI, 0.075-0.295), respectively. Overall, there was a good level of agreement between ultrasound and laparoscopy in identifying absent, minimal, mild, moderate, and severe disease (quadratic weighted kappa = 0.786)[14].

In the UBESS classification, the frequency was higher in stage II with 50% of the cases. In both classifications, the most affected age group were women between 20 and 40 years old, as they are still of reproductive age. UBESS has the power to optimize the screening of women with advanced stages of the disease to choose the best laparoscopic treatment method.

In evaluating 192 women, with a mean ± SD age at diagnosis of endometriosis of 23.7 ± 9.3 years and a mean duration of symptoms before presentation of 42 months. The predominant sites of pelvic pain reported were left iliac fossa (32%), right iliac fossa (29.5%) and lower abdomen (61%) and predominant symptoms included dyspareunia (57.5%), dysmenorrhea (58.5%). %) and dyschezia (41.5%). The precision, sensitivity, specificity, positive and negative predictive values, and positive and negative likelihood ratios of UBESS I for predicting a need for level 1 laparoscopic surgery were: 87.5%, 83.3%, 91.7%, 90 .9%, 84.6%, 10 and 0.182; those of UBESS II to predict level 2 surgery were: 87.0%, 73.7%, 90.3%, 65.1%, 93.3%, 7.6 and 0.292; and those of UBESS III to predict level 3 surgery were: 95.3%, 94.8%, 95.5%, 90.2%, 97.7%, 21.2 and 0.054, respectively. UBESS can be used to predict the level of complexity of laparoscopic surgery for endometriosis. It has the potential to facilitate the screening of women with suspected endometriosis for the most appropriate surgical experience needed for laparoscopic endometriosis surgery [8]. In another study, when analyzing 33 patients, the UBESS score did not adequately predict the surgical difficulty[15].

Regardless of the classification, the US is a good test to assess the severity of endometriosis, particularly accurate in detecting serious diseases, which could facilitate a more effective screening of women for adequate surgical care[14].

CONCLUSION

The frequency of changes is 34%.

ASRM frequency was higher in severe cases of endometriosis with 36%.

UBESS frequency was higher in stage II with 50% of cases.

In both classifications, the most affected age group were women between 20 and 40 years old, as they are still of reproductive age.

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ORIGINAL ARTICLE

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MAIN ULTRASONOGRAPHIC FINDINGS OF THE UPPER ABDOMEN

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ABSTRACT

Introduction: Ultrasonography of the upper abdomen is widely used in the investigation of abdominal symptoms, it is applied to identify alterations including the liver, bile ducts, gallbladder, pancreas and spleen. Ultrasonography is understood as a safe method and is characterized by being low cost and accessible to all audiences, with high sensitivity for the detection and diagnosis of anatomical diseases and alterations, as it is an imaging test that enables early signs and changes to help in the identification, diagnosis and immediate start of treatment, contributing to the confrontation of the disease in a timely manner for resolution, being important for the detection of injuries or alterations in our organs.

Objectives: To discover the main signs of ultrasonography of the upper abdomen.

Methods: Cross-sectional, observational study carried out at the Fertile Clinic between January 2021 and January 2022.

Results: Of the 415 reports analyzed, the mean age was 39.43 years, age ranging from 14 to 77 years of both sexes. The frequency of altered findings was 16%. Of the suspected diagnostic hypotheses, 1.58% were 98.42% benign diagnoses. The main diagnostic hypothesis found was steatosis with 46.03%, the liver being the most affected organ with 69%.

Conclusion: The main diagnostic hypothesis found was steatosis with 46.03%, the liver being the most affected organ with 69%. The frequency of altered findings was 16%.

KEYWORDS: ULTRASONOGRAPHY, UPPER ABDOMEN, ALTERATIONS

INTRODUCTION

Ultrasonography of the upper abdomen is widely used in the investigation of abdominal symptoms, it is applied in order to identify changes comprising the liver, bile ducts, gallbladder, pancreas and spleen[1].

Conducting a brief analysis of the historical aspects related to the advent of ultrasonography, the literature shows that this exam started to be used in the evaluation of Spiegel's hernia from the pioneering studies of Leif Spangen in 1976[2].

Regarding ultrasound, it is worth noting that it is a fast, non-invasive method that provides good quality images and adequately highlights the structures, even in obese patients, and can be easily performed in emergency situations. This test has also been widely used in the study of hernias and for the differentiation of palpable masses, when there is doubt in the clinical examination [3].

Over the years, the quality of the images has improved, with the use of high-frequency transducers, the possibility of dynamic evaluation and the detailed study of muscle planes, allowing this exam to be increasingly indicated [4].

Ultrasonography is a technique that does not emit radiation, unlike most exams that perform diagnostic imaging. In addition, it is a low cost safe method with high sensitivity that does not use ionizing radiation [5].

Ultrasonography is understood as a safe method and is characterized by being low cost and accessible to everyone, it has high sensitivity for the detection and diagnosis of diseases and anatomical alterations, as it is an imaging test that enables early signs and changes to help in the identification, diagnosis and immediate start of treatment, contributing to the fight against the disease in a timely manner to resolve it, being important for the detection of diseases or even changes in the organs, justifying the importance of this subject for the accomplishment of this work [6].

In the present study, the objective is to report the main findings of upper abdominal ultrasound.

MATERIALS AND METHODS

Cross-sectional, observational study in which the researcher does not interact with the sample population directly, but through analysis and evaluation achieved through observation. It is also descriptive, analytical and quantitative.

The sample population is patients from clinics who underwent imaging exams defined by ultrasound of the upper abdomen aged between 14 and 77 years of both genders, between the months of January 2021 and January 2022.

The period of data collection and analysis took place between November 2021 and January 2022. The data collection instrument was the Clínica Fértile database, specifically in the files and records for ultrasound results for the upper abdomen performed

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at the clinic in the established period in the study sample.

The sample consisted of 415 exams, which were analyzed and selected in a table in order to demonstrate the quantity for each finding.

Regarding ethical aspects, the research project that precedes this article was submitted to the Ethics Committee through the Brazil platform, respecting the ethical principles that regulate research on human beings (Resolution 466/12).

RESULTS

A total of 415 reports of ultrasounds of the upper abdomen performed at Clínica Fértile between January 2021 and January 2022 were analyzed. The mean age of the studied group was 39.43 years, age ranging from 14 to 77 years of both sexes.

The findings are presented in figure 1 and tables 1 and 2.

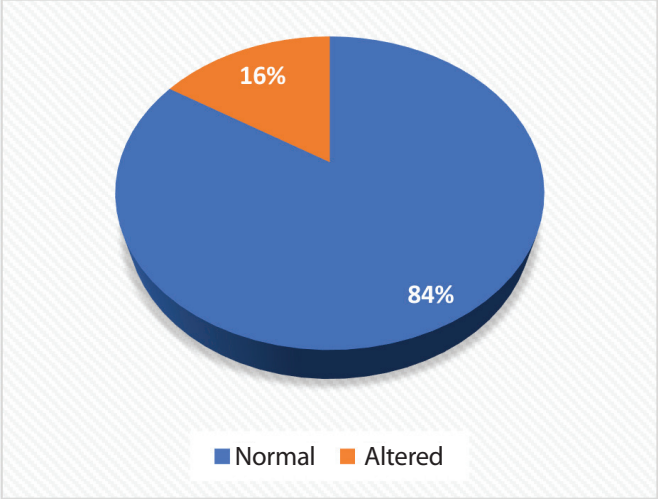

Figure 1 – Distribution of upper abdominal ultrasound findings performed at Clínica Fértile between January 2021 and January 2022, Goiânia, Goiás

The main diagnostic hypothesis found was steatosis with 46.03%, the liver being the most affected organ with 69%.

Diagnostic hypothesis	N	%
Grade I steatosis	29	46,03%
Grade II steatosis	13	20,63%
Hepatic hemangioma	11	17,46%
Cholecystolithiasis	5	7,94%
Grade III steatosis	3	4,76%
Amorphous area of the hepatic hilum of 5.4 cm	1	1,59%
TOTAL	63	100%

Table 1 – Distribution of diagnostic hypotheses of upper abdomen ultrasound findings performed at Clínica Fértile between January 2021 and January 2022, Goiânia, Goiás

Location	n	%	Changes	N	%
Liver	57	69%	Steatosis	45	78,9%
Gallbladder	5	6%	Cholecystolithiasis	5	100%
Pancreas	1	1%	Solid nodule	1	100%

Table 2 – Distribution of location and main diagnostic hypotheses of upper abdomen ultrasound findings performed at Clínica Fértile between January 2021 and January 2022, Goiânia, Goiás

DISCUSSION

Non-traumatic abdominal pathology is one of the most common reasons for consultation in emergency services. Abdominal pain is the presenting symptom of many diseases, which often require urgent care. Clinical history and physical examination are rarely sufficient to establish a definitive diagnosis, and imaging tests are usually necessary[7].

Some authors claim that the location of pain is a useful starting point and will guide an assessment. However, some causes are more frequent in the pediatric population or are strictly related to sex. It is also important to consider special populations, such as the elderly or cancer patients, who may have atypical symptoms of a disease. These considerations also reflect a different diagnostic approach. However, for the evaluation of the acute abdomen, ultrasound (US) remains the main imaging technique in most cases, especially in young and female patients, when limiting radiation exposure should be mandatory[8].

Of the 415 reports analyzed, the mean age was 39.43 years, age ranging from 14 to 77 years of both sexes. The frequency of altered findings was 16%, which differs from a study with 138 patients in which the diagnosis was altered in a small proportion 7.8%[1].

Of the suspected diagnostic hypotheses, 1.58% were 98.42% benign diagnoses. The main diagnostic hypothesis found was steatosis with 46.03%, the liver being the most affected organ with 69%.

Fatty liver disease (hepatic steatosis) has an overall prevalence of 25.24%, with 40.76% progression to fibrosis. Fatty liver, or hepatic steatosis, refers to the abnormal accumulation of triglycerides within the hepatocytes, which may have mainly a metabolic (MAFLD) and/or alcoholic cause. The more intense the fat deposition, the more hyperechoic the liver parenchyma, the more accentuated the hepatorenal contrast and discrete irregularities can be observed on the organ surface and edges, which become progressively more blunt. Steatosis can be graded by US as: - Mild: there is a slight and diffuse increase in hepatic echogenicity, and it is possible to normally visualize the diaphragm and the borders of the portal vein and intrahepatic vessels; - Moderate: moderate and diffuse increase in hepatic echogenicity, making it possible to visualize the diaphragm and the borders of the portal vein and intrahepatic vessels with little difficulty; - Marked: marked increase in hepatic echogenicity, making it very difficult or practically impossible to visualize the hepatic vessels, the portal vein wall, diaphragm and posterior

part of the right hepatic lobe [9,10].

In a study to investigate the accuracy of ultrasound in the assessment of hepatic steatosis compared to magnetic resonance imaging (MRI) a total of 2783 volunteers (1442 females, 1341 males; mean age, 52.3 ± 13.8 years) underwent liver MRI; MRI revealed hepatic steatosis in 40% of participants (n=1,112), which was mild in 68.9% (n=766), moderate in 26.7% (n=297), and severe in 4.4% (n=49) of patients. Ultrasonography detected hepatic steatosis in 37.8% (n=1,052), corresponding to 74.5% sensitivity and 86.6% specificity. The ultrasound sensitivity increased with the amount of liver fat present and was 65.1%, 95% and 96% for low, moderate and high fat; while specificity was consistently high at 86.6%. The diagnostic accuracy of ultrasound for detecting hepatic steatosis did not vary significantly with the amount of hepatic iron present. Ultrasonography is an excellent tool to assess hepatic steatosis in the clinical setting with some limitations in patients with low liver fat[11].

CONCLUSION

The main diagnostic hypothesis found was steatosis with 46.03%, the liver being the most affected organ with 69%. The frequency of altered findings was 16%.

Ultrasonography is widely used for the screening of abdominal changes and allows an effective, complete, cheap and safe evaluation of all organs.

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CASE REPORT

RENAL INCIDENTALOMA: A CASE REPORT

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ABSTRACT

Incidentaloma is a medical term that designates asymptomatic benign and malignant tumors found on imaging tests such as ultrasound, MRI, and CT SCAN. We will present a case of malignant renal tumor, diagnosed on ultrasound examination and confirmed by magnetic resonance imaging.

KEYWORDS: RENAL INCIDENTALOMA; ULTRASOUND; MAGNETIC RESONANCE

INTRODUCTION

We will present a case of malignant renal tumor, which was diagnosed in a routine ultrasound examination and was confirmed by magnetic resonance imaging.

The significant increase in incidental diagnosis of small malignant and benign renal tumors in recent decades is due to the great improvement in ultrasound devices and the increase in requests for preventive abdominal exams 1-6.

Currently, ultrasound has become the main method of initial diagnosis of renal tumors 5.

90% of malignant renal tumors are renal cell carcinomas, mainly with clear cell histological type 1-3. However, in most cases patients are asymptomatic 6.

CASE REPORT

A 57-year-old patient attended a routine ultrasound on 08/19/2021, with no symptoms and no history. A hypoechoic image in the right kidney was diagnosed. being referred to the urologist, who requested an abdominal magnetic resonance imaging (MRI). With the MRI result, the patient was referred for radical nephrectomy, which was performed on 10/15/2021.

The patient underwent postoperative control ultrasound on 01/11/2022, with no changes.

Total abdomen ultrasound

Topical liver, with regular contours and homogeneous sonic texture, without echographic alterations. The right and left lobes measure 12.24 x 7.14 cm respectively. The intra and extrahepatic bile ducts are not dilated. The common bile duct measures 3.6mm with a normality value (NV) up to 06mm. Suprahepatic veins are of normal caliber. The portal vein measures 8.8mm (NV up to 14mm).

Physiologically distended gallbladder with anechoic content.

Pancreas with usual morphology and echogenicity.

Topical spleen, with regular contours and homogeneous sonic texture, measuring 9.27 cm in its largest diameter (NV up to 13 cm.).

Kidneys with normal topography and dimensions, regular contours and preserved cortical and medullary echogenicity. In the right kidney, a hypoechoic image was observed in the middle third and pelvis, measuring 4.00 x 3.74 cm., compatible with a solid nodule – figure 1.

Kidney dimensions:

Bipolar diameter of the right kidney = 11.62 cm. (NV 9 to 12 cm.).

Right kidney parenchyma thickness= 1.52 cm. (NV > 1.0cm.).

Bipolar diameter of the left kidney = 11.39 cm.

Left kidney parenchyma thickness= 1.90 cm.

Absence of free fluid in the peritoneal cavity.

Full bladder, without ultrasound changes.

Diagnostic impression: Ultrasound images often associated with:

Hypoechoic image in the right kidney.

Obs.: At clinical criteria, I suggest MRI for diagnostic complementation.

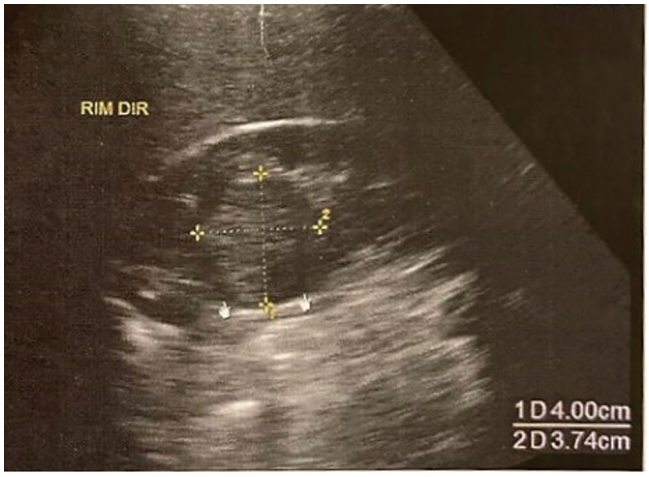

Figure 1. Nodular ultrasound image in the right kidney.

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Abdominal magnetic resonance

Solid mesorenal vascularized renal lesion on the right, suggestive of a primary neoplasm (Figures 2-4).

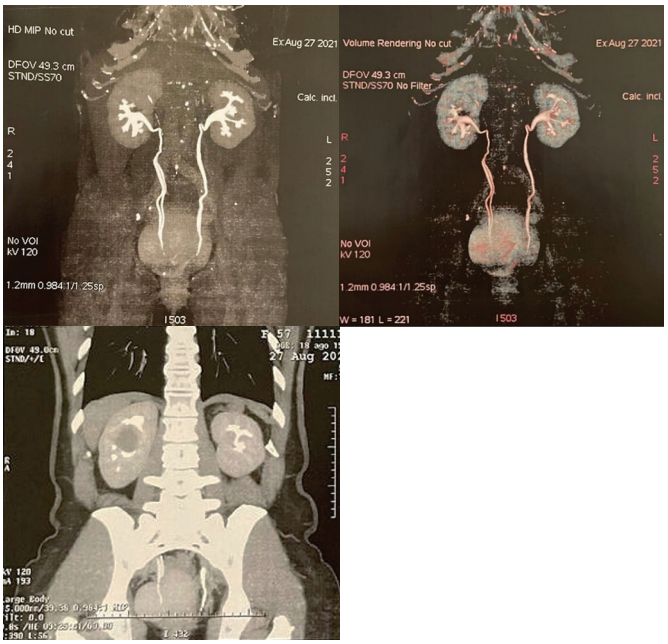

Figure 2-4. Abdominal magnetic resonance image of vascularized renal nodule in the right kidney.

Pathology report - diagnosis:

Right nephrectomy product. Chromophobe renal cell type carcinoma.

CONCLUSION

Lumbreras et al 3 performed a systematic review of the literature in which 44 articles were selected for analysis. The mean frequency of incidentaloma findings was 23.6% (CI 15.8-31.3%), being higher in studies with computed tomography (mean 31.1%, 95% CI 20.1-41.9%). About 64.5% (95% CI 52.9-76.1%) of patients had clinical follow-up and in 45.6% (95% CI 32.1-59.2%) there was clinical confirmation. The authors stated that there is no defined strategy for these incidentaloma findings. However, the follow-up of these patients is essential.

Hitzeman & Cotton 4 reported the Bosniak classification as a well-accepted method for screening for kidney injuries. Lesions classified as category I (benign simple cyst) or II (benign cystic lesion with some complex features) do not need to be followed up. Complex cysts, without CT enhancement, larger than 3 cm (category IIF) have a risk of malignancy of 5% to 10% and should be followed up with imaging studies, although the frequency of monitoring is not well defined. The risk of malignancy approaches 50% in similar lesions that are more complicated and increasing (category III). Category IV lesions include more clearly malignant cystic masses. Suspicious complex renal cysts or masses are usually not biopsied due to the risk of sampling error (exceptions are suspected abscess, lymphoma, or metastatic lesions). Surgical resection is the rule. However, surgery can be avoided in the case of solid lesions containing fat with the appearance of benign angiomyolipomas.

In the case presented, a complementary examination (MRI) was essential for decision-making in the approach to the patient, collaborating for an early intervention, aiming at an improvement in the prognosis.

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REVIEW ARTICLE

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ULTRASOUND FINDINGS IN ECTOPIC PREGNANCIES: AN ICONOGRAPHIC ESSAY

DIEGO MANZAN[1], ARIELA MAULLER VIEIRA PARENTE[1,2], PATRÍCIA GONÇALVES EVANGELISTA[2], WALDEMAR NAVES DO AMARAL[2]

ABSTRACT

The objective of the present work is to identify the markers and sonographic aspects of an ectopic pregnancy and trace the main types of ectopic pregnancy found.

Ectopic pregnancy is a known complication of the pregnancy that can carry a high rate of morbidity and mortality if not recognized and treated promptly.

It is essential that healthcare providers maintain a high index of ectopic suspicion in their pregnant patients, as they may experience pain, vaginal bleeding or more vague complaints such as nausea and vomiting. Although the clinical triad of pain, vaginal bleeding and amenorrhea is considered very suggestive of an ectopic pregnancy, ultrasonography has become essential in the detection, confirmation and exact location and provides information for the treatment and its therapeutic options.

Therefore, it is essential for a sonographer to recognize all ultrasonographic markers.

KEYWORDS: ECTOPIC PREGNANCY, ULTRASOUND, DIAGNOSIS

INTRODUCTION

Ectopic pregnancy is a known pregnancy complication that can carry a high rate of morbidity and mortality if not recognized and treated promptly. It is essential that healthcare providers maintain a high index of ectopic suspicion in their pregnant patients, as they may experience pain, vaginal bleeding, or more vague complaints such as nausea and vomiting.

Fertilization and embryo implantation involve an interplay of chemical, hormonal, and anatomical interactions and conditions to allow for a viable intrauterine pregnancy. Ovaries are the female reproductive organs located on both sides of the uterus, in the lower pelvic region. The ovaries have several functions, one of which is to release an egg each month for potential fertilization. The fallopian tubes are tubular structures that serve as a conduit to allow the transport of the female egg from the ovaries to the uterus.

When sperm is introduced, it fertilizes the egg, forming an embryo. The embryo will then implant itself in the endometrial tissue inside the uterus. An ectopic pregnancy occurs when this fetal tissue implants somewhere outside the uterus or attaches to an abnormal or scarred portion of the uterus[1].

The most common site of adhesion in ectopic pregnancies is in the ampullary region of the fallopian tube. About 95% of ectopic pregnancies develop in the ampullary, infundibular, and isthmic portions of the fallopian tubes. In pregnancies with a cesarean scar, there is a migration of the blastocyst into the myometrium due to the residual defect in the scar from the previous cesarean. The depth of implantation determines the type of cesarean scar in pregnancy, with type 1 being close to the uterine wall and type 2 being implanted closer to the urinary bladder [2].

The estimated rate of ectopic pregnancy in the general population is 1 to 2% and 2 to 5% among patients using assisted reproductive technology. Ectopic pregnancies with implantation occurring outside the fallopian tube account for less than 10% of all ectopic pregnancies [3].

Ectopic pregnancy is a very challenging diagnosis. An estimated 40% of ectopic pregnancies are undiagnosed at initial presentation. Ectopic pregnancy is also a very difficult condition to identify based on the history and physical examination features because neither are sensitive nor specific for the diagnosis. The data suggest that even experienced gynecologists are unable to detect more than half of the masses created by ectopic pregnancy on physical examination. Due to these natures of the condition, laboratory data and diagnostic imaging are essential components of the diagnosis of ectopic pregnancy.

Ultrasonography is the diagnostic imaging study of choice for ectopic pregnancy. Even though an ectopic pregnancy cannot be visualized on ultrasound, the diagnosis of an intrauterine pregnancy greatly reduces the risk of an ectopic pregnancy being present. There are two sonographic approaches to the evaluation of ectopic pregnancy. The first is the less invasive transabdominal ultrasound and the second is the more invasive but more diagnostic endovaginal ultrasound [4].

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Given the above, the objective of this study is to identify the markers and ultrasound aspects of an ectopic pregnancy and trace the main types of ectopic pregnancy found.

ULTRASOUND FINDINGS IN ECTOPIC PREGNANCIES

Ectopic pregnancy occurs when the blastocyst implants in a location other than the endometrium of the uterine cavity. Unusual implantation sites for ectopic pregnancy include the cervix, interstitial segment of the fallopian tube, scar from a previous cesarean section, uterine myometrium, ovary and peritoneal cavity (figure 1). Heterotopic and ectopic twin pregnancies are other rare manifestations. Ultrasonography (US) plays a central role in the diagnosis of uncommon ectopic pregnancies [5].

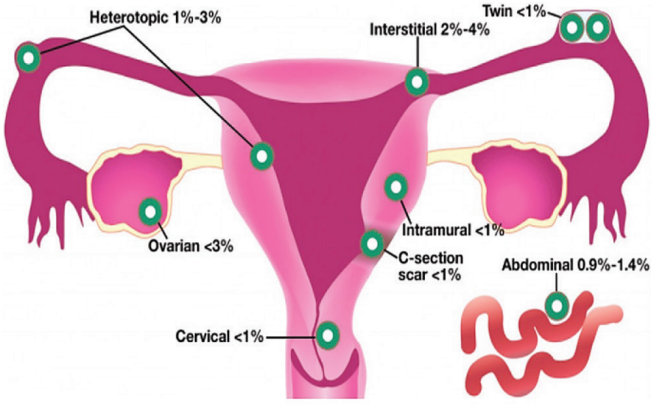

Figure 1 – Diagram showing the locations and incidence rates of uncommon ectopic pregnancies [5]

Ectopic pregnancy accounts for approximately 2% of all pregnancies and is the most common cause of pregnancy-related mortality in the first trimester. Initial evaluation consists of hormone measurements and pelvic ultrasound. A history of pelvic pain along with an abnormal level of human chorionic gonadotropin beta should trigger an evaluation for an ectopic pregnancy [6].

ABDOMINAL PREGNANCY

Abdominal ectopic pregnancy is an extremely rare entity, representing 1% of all ectopic pregnancies and is associated with high maternal and fetal morbidity and mortality. The risk of maternal mortality from an abdominal ectopic pregnancy is seven to eight times greater than the risk from a tubal ectopic pregnancy and 90 times greater than the risk from an intrauterine pregnancy. It is a modality of difficult diagnosis that usually occurs late [7] – figure 2.

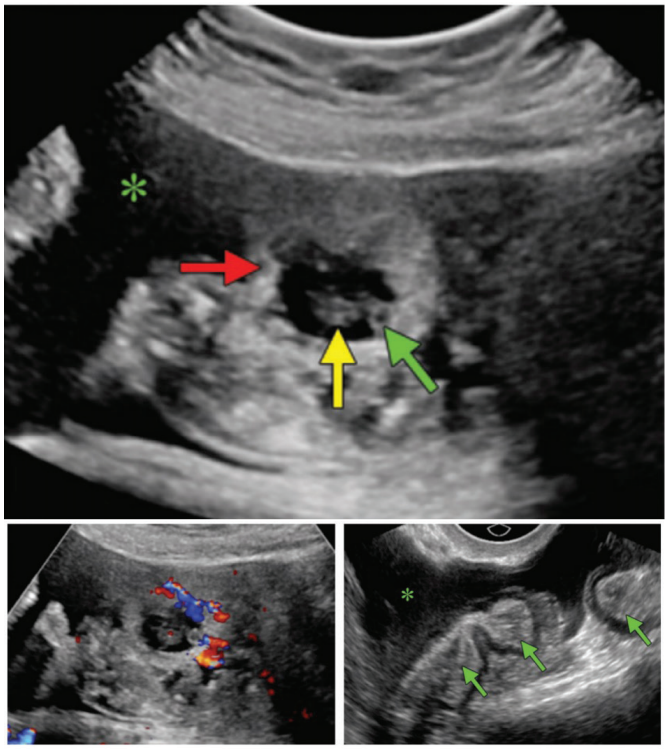

Figure 2 - Abdominal ectopic pregnancy. (a) Sagittal transabdominal grayscale US image shows a fetal pole (yellow arrow) and yolk sac (green arrow) in an intra-abdominal gestational sac. Note the peripheral echogenic margins (red arrow) around the gestational sac. Hemoperitoneum (*) is also seen. (b) Sagittal transabdominal color Doppler US image shows peritrophoblastic flow flowing around the gestational sac. (c) Sagittal transvaginal grayscale US image shows intestinal loops (green arrows) and hemoperitoneum (*) around the abdominal gestational sac [5]

A reported case illustrates a patient with diarrhea and mild abdominal cramping. On transvaginal ultrasound, the uterus was empty with an identified extrauterine sac containing a yolk sac and a fetal pole with cardiac activity. Diagnostic laparoscopy was performed, which confirmed an abdominal pregnancy with implantation in the rectum [8,9] – figure 3.

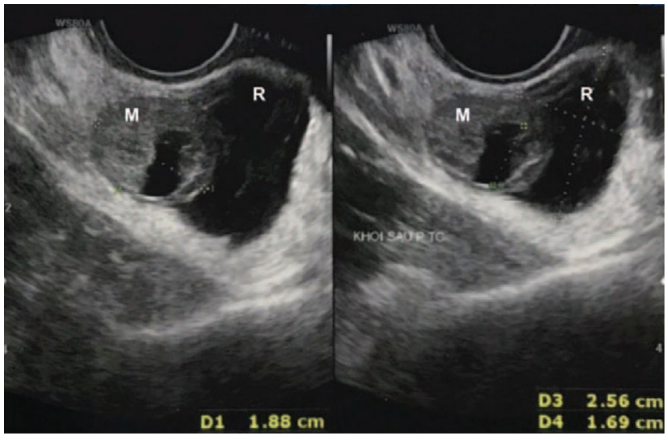

Figure 3 – Rectal ectopic pregnancy [8]

Features of abdominal ectopic pregnancy: Absence of a gestational sac in the endometrium or cervix; Absence of tubal or ovarian pregnancy; Intraperitoneal gestational sac with echogenic margins; Peritrophoblastic flow around the gestational sac; Placenta outside the limits of the uterine cavity; Hemoperitoneum or pelvic hemorrhage and fetal heart activity in the peritoneal cavity [5].

TUBAL ECTOPIC PREGNANCY

The fallopian tube is the most common site for an ectopic pregnancy. An adnexal mass separated from the ovary and the tubal ring sign are the most common findings of a tubal pregnancy [6] – figure 4.

An empty endometrial cavity with: (i) an inhomogeneous adnexal mass or (ii) an empty extrauterine gestational sac seen as a hyperechoic ring or (iii) an extrauterine gestational sac with yolk sac and/or fetal pole with or without cardiac activity [6,10].

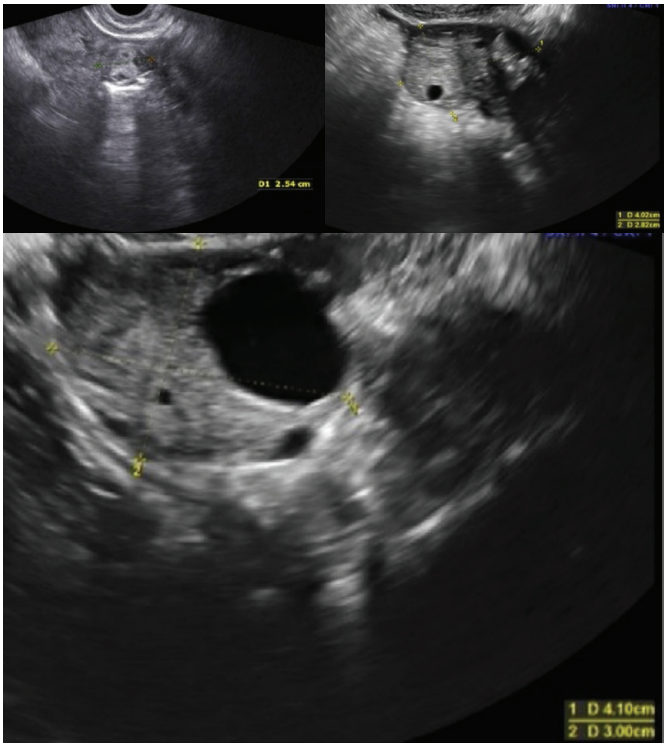

Figure 4 – Tubal ectopic pregnancy

Approximately 1/100 pregnancies are ectopic, with the conceptus usually implanted in the fallopian tube. Some tubal ectopic pregnancies resolve spontaneously, but others continue to grow and lead to tube rupture[12] – figures 5 and 6.

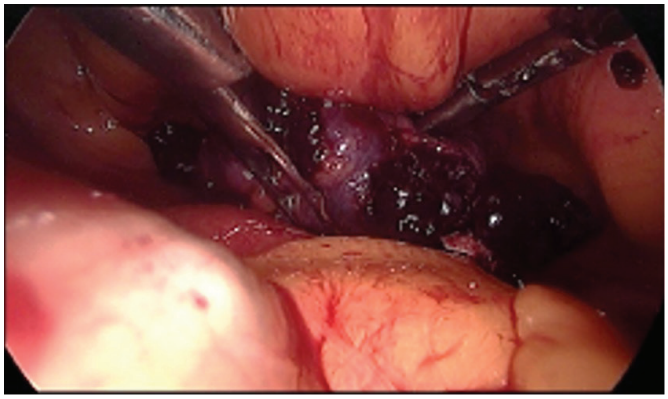

Figure 5 - Integral tubal ectopic pregnancy

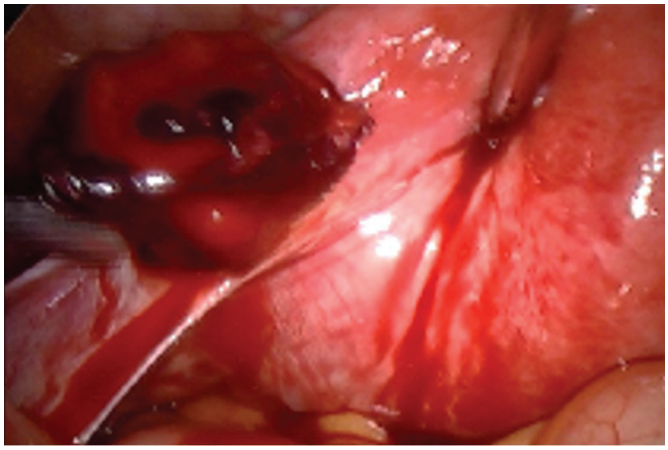

Figure 6 – Ruptured ectopic pregnancy

INTERSTITIAL OR CORNUAL ECTOPIC PREGNANCY

An empty endometrial cavity with products of conception located outside the endometrial echo and surrounded by a continuous border of myometrium, within the interstitial area[10].

Cornual implantation, also called interstitial, occurs at the junction of the tube with the uterine body, and corresponds to 1.9% of tubal pregnancies. Interstitial ectopic pregnancy occurs when implantation occurs in the intramural path of the tube, a proximal portion of the tube about 0.7 mm wide and 2 cm long, surrounded by myometrium. Interstitial or cornual ectopic pregnancy occurs outside the uterine cavity, with implantation and development of the egg within the tube segment that penetrates the uterine wall or between the tubal ostium and the proximal portion of the isthmic segment; and may manifest as an acute abdominal condition, which requires early diagnosis and urgent care [11,12] – figure 7.

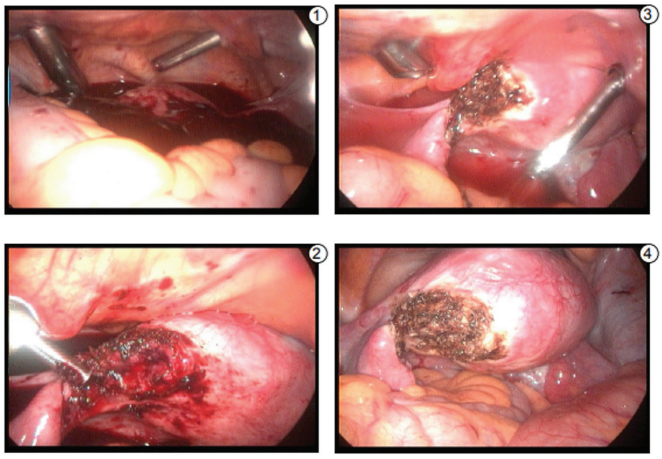

Figure 7 – Laparoscopy images of cornual pregnancy

Features of interstitial ectopic pregnancy: Empty endometrial cavity; Interstitial line sign (echogenic line that extends from the endometrium to the interstitial gestational sac); Myometrial mantle sign (gestational sac surrounded by the myometrium); Bulging sign (gestational sac in the uterine fundus resulting in abnormal bulging of the uterine contour) [5].

CERVICAL ECTOPIC PREGNANCY

Cervical pregnancy is a rare type of intrauterine ectopic pregnancy. The diagnosis and treatment of cervical pregnancy has changed enormously in the last 15 years. Prior to 1980, the diagnosis was made when dilation and curettage for presumptive incomplete abortion resulted in sudden, uncontrollable bleeding. Hysterectomy was performed to save the patient's life. Today, cervical pregnancy is diagnosed by ultrasound during the 1st trimester of pregnancy so that the patient's fertility can be preserved. Therefore, any physician should consider the possibility of a cervical pregnancy in a woman with abdominal pain and vaginal bleeding during the first trimester of pregnancy[13]. Cervical ectopic pregnancy is a rare form of life-threatening ectopic pregnancy, with an incidence of 1 in 9,000 deliveries [14].

An empty endometrial cavity, with a barrel-shaped cervix and a gestational sac present below the level of the uterine arteries. An absent "slip sign" (when pressure is applied to the cervix using the probe in a miscarriage, the gestational sac slides against the endocervical canal, but not in an implanted cervical pregnancy) and blood flow around the gestational sac using color Doppler [10].

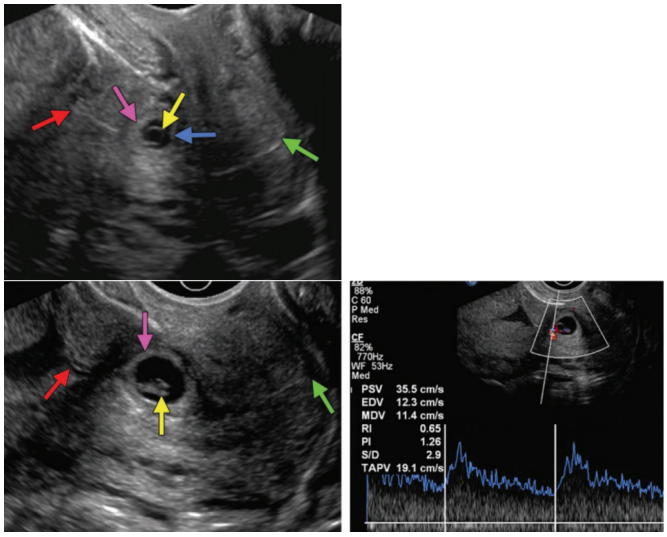

Figure 8. Cervical ectopic pregnancy. (A) Diagram shows a round gestational sac with thick surrounding margins (pink arrow) that are echogenic on US, closed internal and external orifices (red and green arrow), and yolk sac (yellow arrow). (B) Sagittal follow-up US image obtained one week later shows an increased gap in the size of the gestational sac and a distinctive fetal pole (yellow arrow), and absence of blood products in the uterine cavity or cervical canal (red and green arrows). (C) Sagittal transvaginal color Doppler US image shows increased low impedance diastolic arterial flow around the gestational sac[5]

ECTOPIC PREGNANCY IN CESAREAN SCAR

Empty endometrial cavity and cervical canal with gestational sac implanted in the lower anterior segment of the uterine wall, with evidence of myometrial dehiscence in the cesarean scar. Implantation of an embryo within the anterior scar is one of the rare forms of ectopic pregnancy. There are two types of pregnancies: type 1, in which the embryo begins to progress towards the uterine cavity and can result in a live birth, despite the high risk of hemorrhage during delivery, and type 2, which consists of pregnancies in which the fetus the embryo is deeply embedded in the cesarean scar and grows towards the bladder and abdominal cavity, which is very dangerous and needs to be resolved immediately [10,15].

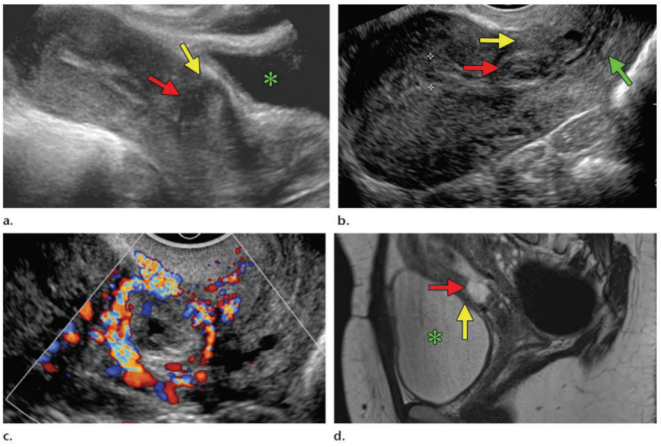

Figure 9 - Ectopic pregnancy in cesarean scar. (a) Sagittal transabdominal grayscale US image in a patient with a previous cesarean section shows a gestational sac (red arrow) on the anterior wall of the lower surface of the uterus anterior to the bladder (*), with thinning of the myometrium (yellow arrow) seen anteriorly to the bag (b) Sagittal transvaginal US image shows the tapered myometrium (yellow arrow) anterior to the gestational sac (red arrow), which is above the closed internal cervical os (green arrow). Note the empty endometrial cavity (between the calipers). (c) Sagittal transvaginal color Doppler image showing peritrophoblastic flow around the gestational sac. (d) Sagittal T2-weighted magnetic resonance image shows the gestational sac (red arrow) in the lower anterior uterine segment and the tapered myometrium (yellow arrow) between the gestational sac and the bladder (*)[5]

Characteristics of ectopic pregnancy with cesarean scar: Uterine cavity empty; Clearly visible empty cervical canal without contact with the gestational sac; No adnexal mass or free fluid in the pouch of Douglas, unless rupture of the gestational sac is present; Gestational sac in the anteroinferior uterine wall (best seen on sagittal images); Gestational sac with echogenic margins and peritrophoblastic flow at the scar site with thinning of the anterior myometrium [5].

ECTOPIC PREGNANCY IN THE OVARY

Ovarian-restricted pregnancy accounts for 0.5 to 1.0% of all ectopic pregnancies and is the most common type of non-tubal EP. Ovarian ectopic pregnancy occurs when a fertilized egg is retained in the ovary. Ovarian pregnancies constitute up to 3% of ectopic pregnancies[16].

Features of ovarian ectopic pregnancy: Empty endometrial cavity; Gestational sac with thick circumferential echogenic margins; Gestational sac inseparable from adjacent ovarian parenchyma; Peritrophoblastic flow around the gestational sac and yolk sac and fetal pole with or without cardiac movement, depending on the gestational age[5].

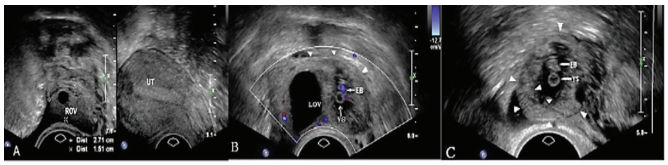

Figure 10 - Transvaginal ultrasound images of ovarian pregnancy (OP) with unruptured embryo sac type. (A) showed normal right ovary (ROV) and uterus (UT). (B) showed the left OP with an embryo sac. The yolk sac (YS), embryonic bud (EB) and color flow signals in the primitive heart were detected. White arrowheads showed the gestational sac and the rest of the ovarian tissue in the same envelope. (C) White arrowheads showed the solid hyperechoic ring characteristic of ovarian pregnancy [18]

Ovarian ectopic pregnancy can present with mild pain and tenderness and very subtle clinical findings and therefore can be easily missed and even released, posing a major diagnostic challenge. A high index of suspicion of ovarian ectopic pregnancy should be present even when the patient has no risk factors. Ovarian ectopic pregnancy may have a late presentation compared to tubal ectopic pregnancy. In the case of an ectopic ovarian pregnancy, the ovary can be preserved in many cases[18].

ECTOPIC PREGNANCY IN UNKNOWN LOCATION

It is characterized by an empty endometrial cavity, with no evidence of an intrauterine gestational sac or retained products of conception and no extrauterine pregnancy seen[10].

FINAL CONSIDERATIONS

Ectopic pregnancy occurs when a fertilized egg implants outside the uterine cavity. The estimated prevalence of ectopic pregnancy is 1% to 2%, and ruptured ectopic pregnancy is responsible for 2.7% of pregnancy-related deaths.

Risk factors include a history of pelvic inflammatory disease, smoking, fallopian tube surgery, previous ectopic pregnancy, and infertility. Ectopic pregnancy should be considered in any patient who presents early in pregnancy with vaginal bleeding or lower abdominal pain in which intrauterine pregnancy has not yet been established.

The definitive diagnosis of ectopic pregnancy can be made with ultrasound visualization of a yolk sac and/or embryo in the attachments.

Most often, the patient's symptoms combined with serial ultrasound and trends in human chorionic gonadotropin beta levels are used to make the diagnosis.

Serial levels of beta human chorionic gonadotropin, serial ultrasound, and sometimes uterine aspiration can be used to arrive at a definitive diagnosis.

Treatment of diagnosed ectopic pregnancy includes clinical treatment with intramuscular methotrexate, surgical treatment via salpingostomy or salpingectomy and, in rare cases, expectant management.

A patient diagnosed with an ectopic pregnancy should be immediately transferred for surgery if she has peritoneal signs or hemodynamic instability, if the baseline human beta chorionic gonadotropin level is high, if fetal cardiac activity outside the uterus is detected on ultrasound.

It is up to the sonographer to be attentive and recognize the signs and markers of ectopic pregnancy.

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REVIEW ARTICLE

BRAZILIAN JOURNAL OF ULTRASONOGRAPHY 2022; 32: 48-51 - DOI - 10.29327/261922-10

ENDOMETRIAL POLYPS DIAGNOSED BY ULTRASONOGRAPHY: NARRATIVE REVIEW

RAFAELA MENDONÇA FRANHANI [1], VITOR FILARDI DE TOLEDO LEME [1], REJANE MARIA FERLIN [1], LEONARDO DE SOUZA PIBER [1], ADILSON CUNHA FERREIRA [2]

ABSTRACT

Introduction: Endometrial polyps are solid or mixed, single or multiple formations found in the uterine cavity of women in reproductive age or postmenopause women. Most endometrial polyps are asymptomatic, but they can be associated with abnormal uterine bleeding and infertility. Its evaluation by ultrasonography is essential, since the characteristics of the lesion can infer benignity or malignancy.

Objective: Review the ultrasound findings of endometrial polyps.

Material and methods: This is a narrative review with an emphasis on the collection of images. The databases were MEDLINE via PubMed, LILACS and Scielo via VHL (Virtual Health Library). Studies published in the last five years were included.

Results and discussion: Endometrial polyps appear as a hyperechoic lesion with regular contours, due to a focal mass or nonspecific thickening. Cystic glands may be visible within the polyp, and favor the diagnosis of benignity. These findings, however, are not specific for polyps, as leiomyomas (fibroids), particularly the submucosal forms, can have the same characteristics.

Conclusion: Endometrial polyps are solid or mixed, iso or echogenic, circumscribed nodules that may show pedicle flow on Doppler, whose main differential diagnosis is submucosal myoma. However, other diagnoses can be considered depending on the appearance of the lesion, especially with regard to contours, when malignancy is suspected.

KEYWORDS: ENDOMETRIAL POLYP, ENDOMETRIUM, ULTRASOUND, ULTRASOUND, DIAGNOSTIC IMAGING

INTRODUCTION

Endometrial polyps defined as localized growths or tumors of the epithelial tissue, containing glands, stroma and blood vessels, are conditions that affect women both in the reproductive period and in menopause, predominantly between 40 and 49 years of age. Polyps may be present without causing symptoms (most) or are recognized when there is abnormal uterine bleeding (AUB), in 68% of patients, and investigation of infertility (because they affect the mechanics of fertilization and the chronic inflammation involved).[1-4]

The prevalence ranges from 8% to 35% and its incidence increases with age. Even though they can progress to malignancy, approximately 95% of symptomatic polyps are benign and the risk of malignancy is lower in premenopausal women. [2,5,6] About 82% of women who had histologically verified polyps were asymptomatic. However, endometrial polyps have been implicated in about 50% of cases of abnormal uterine bleeding and 35% of infertility.[2]

The incidence in primary infertility is 3.8-38.5% and 1.8-17% in secondary infertility. After polypectomy, pregnancy rates increased twice for patients using artificial insemination.[4]

The etiopathogenesis of the disease is still debatable. The risk factors for this pathology are the increase in the concentration of endogenous estrogen or the application of exogenous estrogen.[2,7,8]

Most are located in the uterine fundus, and may vary in size from about 5 mm to fill the entire uterine cavity. If an endometrial polyp is attached to the uterine surface by a narrow, elongated pedicle, then it is known as a pedicle; however, if it has a large and flat base, absence of a pedicle, it is known as sessile. Histologically, they range from normal endometrial tissue to simple or complex hyperplasia, but are rarely malignant.[2]

Transvaginal ultrasound (TVUS) is the main test used in the diagnosis of endometrial polyps, although hysteroscopy visualization is determined to be the gold standard for diagnosis.9,10 TVUS has a reported sensitivity of 19% to 96%, specificity of 53% to 100%, positive predictive value (PPV) of 75% to 100%, and negative predictive value (NPV) of 87% to 97% for diagnosing endometrial polyps. By including color Doppler, sensitivity increases to 97% and specificity to 95%.[11]

Management of endometrial polyps depends on symptoms, risk of malignancy, and fertility problems. It can be grouped into conservative surgery, radical surgery and

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non-surgical conservative surgery. Small asymptomatic polyps may resolve spontaneously, in these cases watchful waiting may be the treatment of choice; when smaller than 10 mm in asymptomatic women may undergo spontaneous regression in up to 27% of cases. However, in women suffering from infertility, most do not appear to spontaneously regress and surgical intervention is usually required.[2,10]

OBJECTIVE

Review the ultrasound findings of endometrial polyps.

MATERIAL AND METHODS

This is a narrative review with an emphasis on the collection of images. The databases were MEDLINE via PubMed, LILACS and Scielo via VHL (Virtual Health Library). The health descriptors (MeSH terms) used were endometrial polyps, ultrasonography, ultrasound, diagnostic imaging, in the following search strategy: (endometrial polyps) AND (ultrasonography OR ultrasound OR diagnostic imaging).

Studies (clinical trials, pictorial essays, literature reviews, case reports, among others) in English, Spanish and Portuguese which had images of diagnostic methods, which were in accordance with the research objective and available online in full text, published in the last five years were included.

RESULTS AND DISCUSSION

Endometrial polyps appear as a hyperechoic lesion with regular contours, due to a focal mass or nonspecific thickening. Cystic glands may be visible inside the polyp. These findings, however, are not specific for polyps, as leiomyomas (fibroids), particularly the submucosal forms, can have the same characteristics. Imaging is best on day 10 of the menstrual cycle, when the endometrium is thinnest, to minimize positive phalluses and false negative results.[2]

Sonographic images 1-12 exhibit the features found in endometrial polyps.

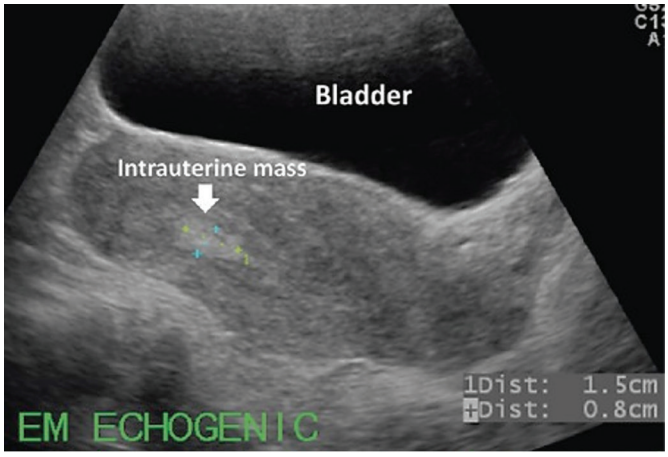

Figure 1 – Transabdominal ultrasound showing a hyperechoic endometrial polyp, measuring 1.5 x 0.8 cm.[13]

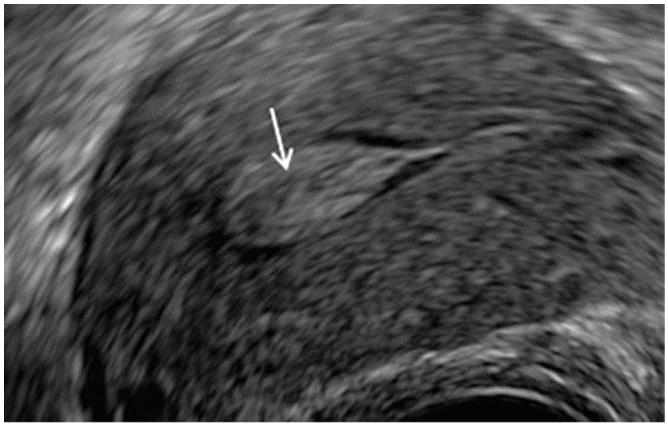

Figure 2 – Transvaginal ultrasound: isoechogenic polyp filling the uterine cavity.[4]

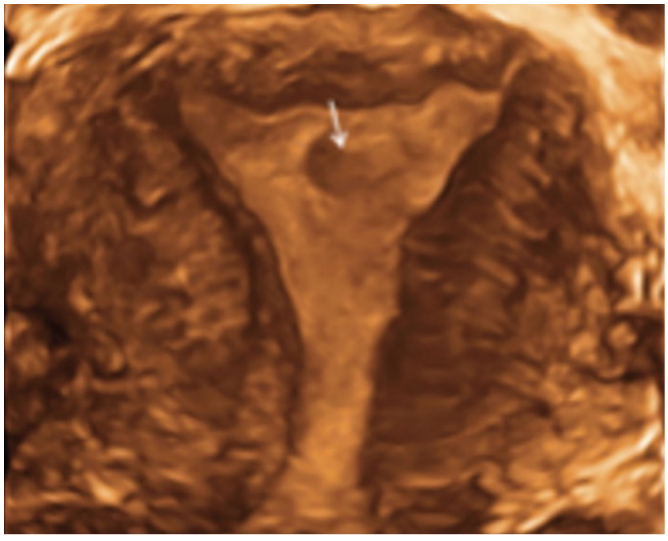

Figure 3 – Three-dimensional ultrasound: finding of endometrial polyp.[4]

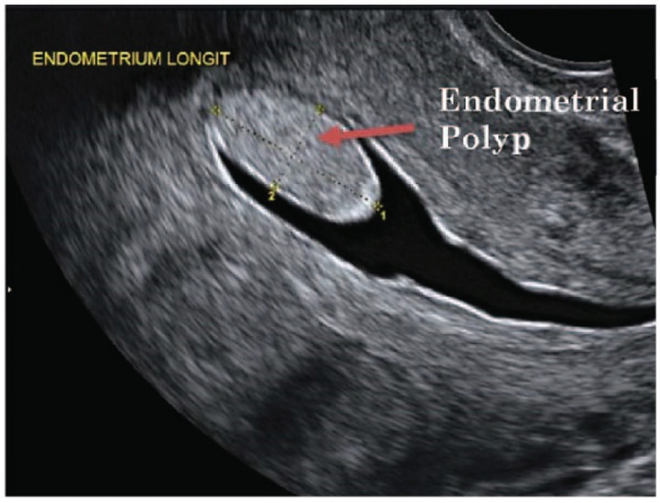

Figure 4 – Transvaginal ultrasound: isoechogenic endometrial polyp. Distention of the uterine cavity produced after saline infusion.[1]

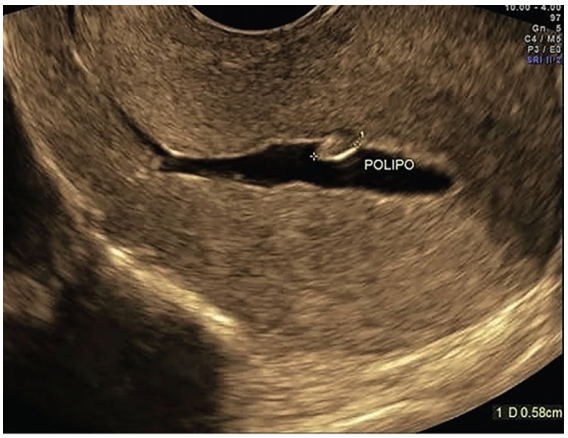

Figure 5 - Image showing distention of the uterine cavity produced after infusion of saline solution, which allows better visualization of the pathologies. An endometrial polyp measuring 5.8mm can be seen on the posterior wall.[11]

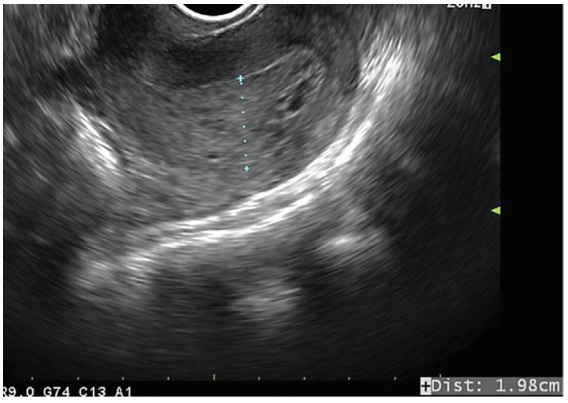

Figure 6 - Transvaginal ultrasound showing a complex heterogeneous tumor in the endometrial cavity. The largest tumor thickness was 1.98 cm. A 66-year-old patient had undergone hormone replacement therapy three years before experiencing postmenopausal vaginal bleeding. Histology: adenomyoma.[13]

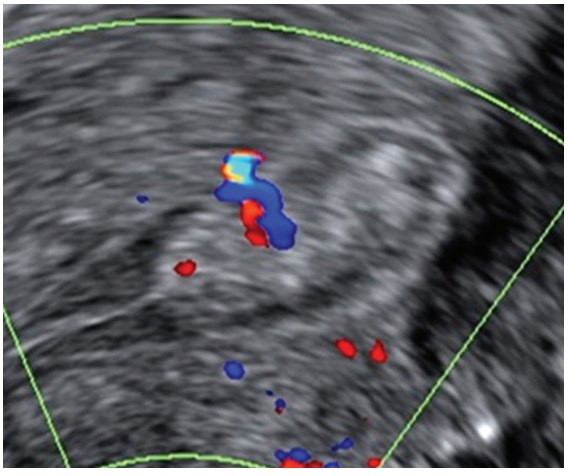

Figure 7 – Doppler ultrasound: solid, isoechogenic, homogeneous endometrial polyp with vascular pedicle. Favorable aspect for benignity.[14]

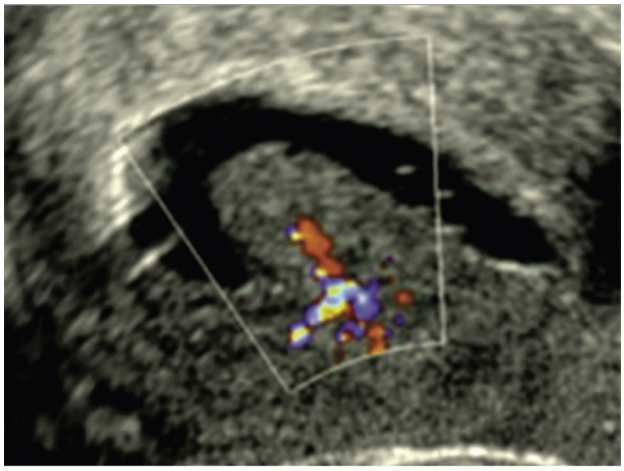

Figure 8 – Doppler ultrasound: solid, isoechogenic, homogeneous endometrial polyp with vascular pedicle. Favorable aspect for benignity. Distention of the uterine cavity produced after saline infusion.[15]

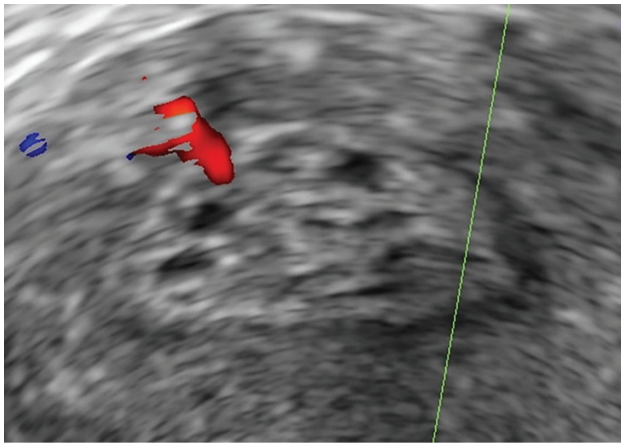

Figure 9 – Doppler ultrasound: solid, isoechogenic, homogeneous endometrial polyp, with vascular pedicle and intermingled cystic areas. Favorable aspect for benignity.[14]

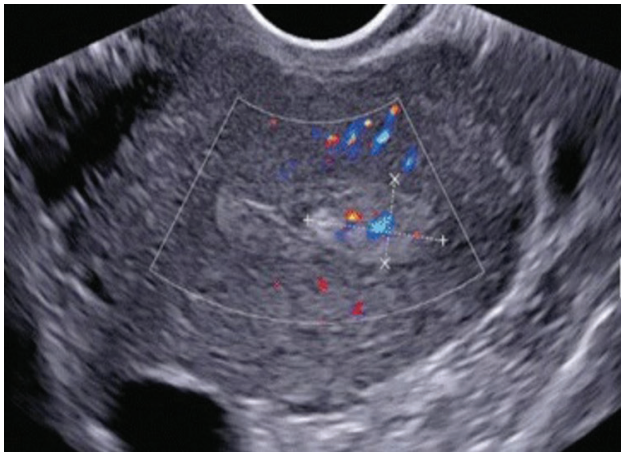

Figure 10 – Doppler ultrasound: solid, hyperechogenic, homogeneous endometrial polyp with vascular pedicle.[16]

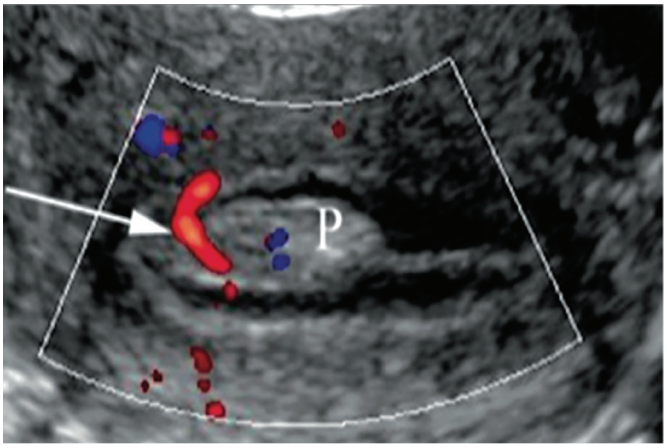

Figure 11 – Doppler ultrasound: solitary, smooth, well-defined and uniformly echogenic pedicled endometrial polyp (P), originating from the anterior wall with vascular pedicle (arrow), in a 40-year-old woman.[17]

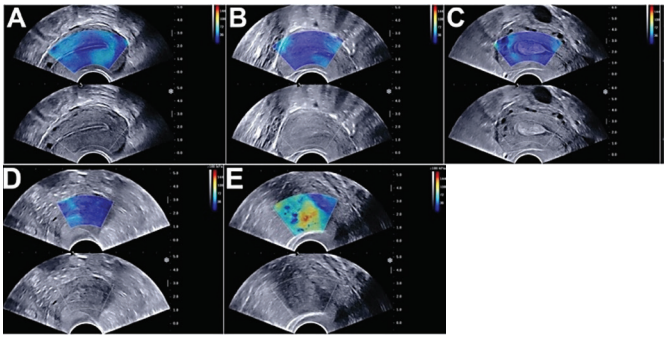

Figure 12 – Transvaginal ultrasound with and without elastography: Ultrasound image of the endometrium (proliferative) in figure A, showing elastography a uniform blue area in the endometrium. (B) Ultrasound image of the secretory endometrium showing a uniform blue area in the endometrium. (C) Pathological findings confirmed an endometrial polyp in the uterine cavity. (D) Pathological results confirmed hyperplastic endometrium in blue. (E) The pathological findings confirmed an endometrial cancer in the uterine cavity. Elastography showed tumor lesions of a mixture of red, yellow and blue.[18]

CONCLUSION

Endometrial polyps are solid or mixed, iso or echogenic, circumscribed nodules that may show pedicle flow on Doppler, whose main differential diagnosis is submucosal myoma. However, other diagnoses can be considered depending on the appearance of the lesion, especially with regard to contours, when malignancy is suspected.

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REVIEW ARTICLE

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SKELETAL DYSPLASIAS

ARIELA MAULLER VIEIRA PARENTE [1,2] , PATRÍCIA GONÇALVES EVANGELISTA[2], WALDEMAR NAVES DO AMARAL[2]

ABSTRACT

The aim of this study is through a literature review to describe the concept, diagnosis and management of skeletal dysplasias. Skeletal dysplasias are a heterogeneous group of disorders that affect bone and cartilage and are characterized by abnormal skeletal shape, growth, and integrity. These disorders can be inherited in a multitude of genetic patterns – autosomal dominant, autosomal recessive, somatic mosaic, metabolism imprinting errors, X-linked, and teratogenic exposure. Most are monogenic diseases.

Prenatal diagnosis is challenging as the first findings are seen during routine ultrasound. Most skeletal dysplasias have an identifiable pattern of skeletal changes comprised of unique and even pathognomonic findings. The use of multigene panels, using state-of-the-art sequence technology, has improved our ability to quickly identify the genetic etiology, which can impact management during pregnancy and/or neonatal period.

KEYWORDS: SKELETAL DYSPLASIA, BONE DYSPLASIA, DIAGNOSIS, MANAGEMENT

INTRODUCTION

Fetal skeletal dysplasia is a group of systemic bone and cartilaginous disorders that develop in the prenatal period and can be detected by fetal ultrasound[1]. Osteochondrodysplasias, or skeletal dysplasias, constitute a genetically heterogeneous group of many different disorders[1,2].

The global incidence is about 2.4 cases per 10,000 births, and the incidence of lethal dysplasias varies between 0.95 and 1.5 per 10,000 births. Regarding mortality, 44% died in the perinatal period. There is no preponderance as to race or sex (except in X-linked recessive diseases, where males are the most affected)[3].

Bone dysplasia is a large group comprising 436 rare diseases. Many of them are characterized by short stature or decreased growth velocity during puberty. However, the genetic basis remains unknown in many additional skeletal diseases, especially local skeletal injuries, suggesting that new genes or non-genetic factors may cause these diseases[4].

The aim of this study is through a literature review to describe the concept, diagnosis and management of skeletal dysplasias.

METHODS

The bibliographic search was carried out between January 10 and February 20, 2021 in Pubmed, Scielo and Medline databases. The keywords were used as search strategies: skeletal dysplasia or bone dysplasia and their respective terms in Portuguese.

FETAL SKELETAL DYSPLASIA

CONCEPT

Skeletal dysplasias are a heterogeneous group of congenital bone and cartilaginous disorders of genetic etiology characterized by abnormalities in the shape, length, number and mineral density of bone. Skeletal dysplasia is often associated with the manifestation of other organs such as the lung, brain and sensory systems. Skeletal dysplasias or dysostosis are classified under several different names.

Endochondral bone formation is a coordinated event of chondrocyte proliferation, differentiation, and exchange of terminally matured chondrocytes with bone. Impaired endochondral bone formation will lead to skeletal dysplasia, especially associated with short long bones. Adequate bone volume and mineral density are achieved by balancing bone formation and bone resorption and mineralization. The gene encoding fibroblast growth factor receptor [3] is responsible for achondroplasia, a representative skeletal dysplasia with short stature. Osteogenesis imperfecta is characterized by low bone mineral density and fragile bone [5,6].

The disorders affect the extremities or parts of them (dysmelia), the entire skeleton (skeletal dysplasia), the skull (craniosynostosis), and the spine (dysostosis, caudal regression). About half of these diseases are complex. In most cases, complex disorders are caused by mutations in a single gene or numerical or structural chromosomal aberrations. The main diagnostic challenge of limb malformations and craniosynostosis is to discover whether they are isolated symptoms or specific syndromes. In skeletal

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dysplasia, it is clinically important to differentiate lethal from non-lethal entities[7].

The type of dysplasia and associated abnormalities affect the lethality, survival, and long-term prognosis of skeletal dysplasias. It is crucial to distinguish skeletal dysplasias and correctly diagnose the disease to establish the prognosis and obtain better management[6].

DIAGNOSIS

Ultrasonographic evaluation of the fetus in the second trimester for the detection of congenital anomalies has become the standard of care in many communities. The fetal skeleton is readily visualized by two-dimensional ultrasound at 14 weeks, and fetal femur and humerus measurements are considered part of any basic ultrasound assessment.

Any fetus with femoral or humeral length measurements of less than the 5th percentile or -2 SD of the mean in the second trimester (<24 weeks) should be evaluated at a center that is experienced in assessing the entire fetal skeleton and has the ability to provide genetic data in counseling this couple.

The following fetal ultrasound parameters should be visualized and plotted against normative values when a fetus manifesting skeletal dysplasia is suspected; fetal skull (biparietal diameter, occipital-frontal diameter and head circumference), abdominal circumference, mandible, clavicle, scapula, chest circumference and all fetal long bones. Comparison of the relative length of all long bones and normative values will determine whether there is primarily rhizomelia, mesomelia, or that both segments are involved.

A useful ratio is the femur-to-foot length ratio, which approaches 1.0 during pregnancy. Many skeletal dysplasias are disproportionate based on these parameters. For example, disorders that manifest mainly with rhizomelia in the prenatal period show a change in the proportion between the femur and the foot (<1)[2].

In addition to the evaluation of long bones, there are other sonographic parameters that must be evaluated and may be useful in these differentiating disorders. These include fetal facial profile (glabellar bulge, flattened nasal bridge, micrognathia), presence and shape of vertebral bodies, and relative appearance of hands and feet (extra, absent, or malformed fingers). There are many prenatal-onset skeletal dysplasias that are associated with relative and equinovarus brachydactyly.

Fetuses with below-average long-bone measurements should be strongly suspected of having skeletal dysplasia, especially if the head circumference is greater than the 75th percentile. Most prenatal-onset skeletal dysplasias have a relative disproportion in skeletal measurements compared with those of the skull. In addition, close attention should be paid to the shape and pattern of mineralization of the fetal calvaria and fetal skeleton (deficient or ectopic mineralization). The determination of abnormal skeletal elements, together with findings of mineralization and bone shape, can help in the diagnosis[2].

The following fetal sonographic measurements should be visualized in relation to normative values: fetal skull (biparietal diameter and head circumference), facial profile, jaw, clavicle, scapula, thoracic circumference, vertebral bodies, all fetal long bones, hands and feet. Fetuses with long bone parameters >3 SD below average should be strongly suspected of having skeletal dysplasia, especially if the head circumference is greater than the 75^{TH2} percentile.

Prenatal ultrasound can be used to look for predictors of lethality, such as bell-shaped chest, short ribs, severe femoral shortening, and decreased lung volume. Individual lethal or life-limiting dysplasias may have more or less specific characteristics on prenatal ultrasound[6].

Lethality should be determined by the ratio of chest circumference/abdominal circumference and/or femur length/abdominal circumference. A chest-to-abdominal circumference ratio of <0.6 or femur length to abdominal circumference of 0.16 strongly suggests a perinatal lethal disorder, although there are exceptions. Findings should be communicated to the physicians caring for the patient and to the patient[2].

A study to assess the diagnostic accuracy of the diagnosis of skeletal dysplasia in a prenatal population from a single tertiary center, including 178 fetuses, of which 176 had a prenatal diagnosis of skeletal dysplasia by ultrasound. In 160 cases the prenatal diagnosis of a skeletal dysplasia was confirmed; two cases with postnatally identified skeletal dysplasias were not diagnosed prenatally, giving 162 fetuses with skeletal dysplasias in total. There were 23 different classifiable types of skeletal dysplasia. Specific diagnoses based only on prenatal ultrasound examination were correct in 110/162 (67.9%) cases and partially correct in 50/162 (30.9%) cases (160/162 in total, 98.8%). In 16 cases, skeletal dysplasia was diagnosed prenatally but not confirmed postnatally (n = 12 false positives) or the case was lost to follow-up (n = 4). The following skeletal dysplasias were recorded: thanatophoric dysplasia (35 correctly diagnosed prenatally out of 40 in total), osteogenesis imperfecta (lethal and non-lethal, 31/35), short rib dysplasia (5/10), Ellis- van Creveld (4/9), achondroplasia (7/9), achondrogenesis (7/8), campomelic dysplasia (6/8), asphyxiating thoracic dysplasia of Jeune (3/7), hypochondrogenesis (1/6), diastrophic dysplasia (2/5), chondrodysplasia punctata (2/2), hypophosphatasia (0/2), as well as 7/21 more cases with rare or unclassifiable skeletal dysplasias. The prenatal diagnosis of skeletal dysplasias can pose a considerable diagnostic challenge. However, a meticulous ultrasound examination yields high overall detection. In the two most common disorders, thanatophoric dysplasia and osteogenesis imperfecta (25% and 22% of all cases, respectively), typical sonomorphology accounts for the high rates of completely correct prenatal diagnosis (88% and 89%, respectively) in the first diagnosis exam[7]. Figure 1 illustrates a case of thanatophoric dysplasia.

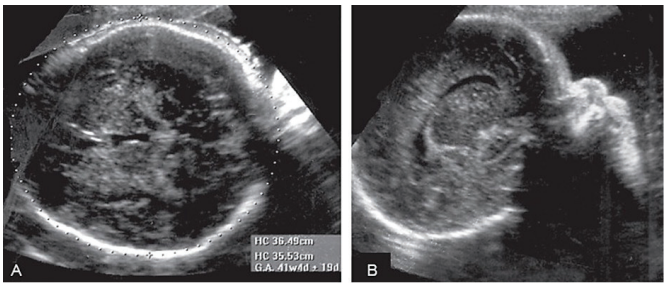

Figure 1 - Thanatophoric dysplasia [10]

The diagnosis of short stature due to skeletal dysplasia is based on:

(i) physical characteristics such as disproportionate trunk/limbs, short limbs or extremities, and/or stocky build,

(ii) adiographic features to analyze bone mineralization, maturation and morphology, and

(iii) whenever possible, genetic characterization [8, 9].

Figure 2 illustrates cases of skeletal dysplasias comparing neonatal photos with postnatal radiological exams.

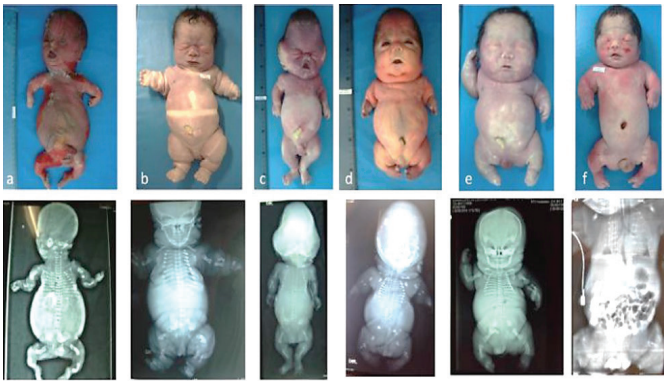

Figure 2. Illustrates photos of fetuses with skeletal dysplasia comparing neonatal images with postnatal x-rays [11]

If a diagnosis of lethal dysplasia or life-limiting dysplasia is suspected prenatally, pediatric evaluation or multidisciplinary clinical evaluation after birth is critical to verify the diagnosis. In all prenatally confirmed cases, genetic counseling for parents is necessary. In the case of lethal dysplasias, all possibilities for further treatment must be presented, both continuation of pregnancy and termination of pregnancy (if this solution is permitted by law). When the pregnancy continues, palliative care after birth is proposed[10].

MANAGEMENT

Differentiating these disorders prenatally can be challenging because they are rare and many of the sonographic findings are not necessarily pathognomonic for a specific disorder. However, differentiating lethal from non-lethal known disorders, providing differential diagnoses before delivery, determining postpartum management plans, and ultimately determining accurate recurrence risks for at-risk couples improves patient care[2].

Bone dysplasia mainly affects many organs and therefore requires multidisciplinary follow-up and care. The role of the pediatric endocrinologist is to assess the growth potential of these patients in coordination with other caregivers, offering the best growth management to limit the psychosocial consequences of extreme short stature and bone deformities[9].

It should be emphasized that genetic counseling of the parents of an affected child or fetus is necessary before the next pregnancy to discuss the risk of recurrence and the possibility of preimplantation or antenatal diagnosis. It should also be emphasized that lethal conditions associated with de novo mutations may have less than a 1% risk of recurrence (not counting the possibility of germline mosaicism), while skeletal dysplasias associated with autosomal recessive inheritance are associated with a risk of recurrence of 25%[10].

All fetuses with suspected skeletal dysplasia should have the diagnosis confirmed by postpartum clinical and radiological evaluation. Postpartum and/or postmortem evaluation includes anteroposterior radiographs of the appendicular skeleton, including hands and feet, and anteroposterior and lateral x-rays of the skull and spine (spinal column). In all appropriate cases, photographs should be taken and autopsies should be offered and encouraged as they provide the most useful information for an accurate diagnosis. Pathologists should collect cartilage and bone, ideally femurs and humerus, for histomorphometric analysis. Tissues (fibroblasts, cartilage and bone) and/or DNA should be saved for molecular analysis whenever possible, because many skeletal disorders are associated with a significant risk of recurrence[2].

FINAL CONSIDERATIONS

Skeletal dysplasias are a heterogeneous group of disorders that affect bone and cartilage and are characterized by abnormal skeletal shape, growth, and integrity. These disorders can be inherited in a multitude of genetic patterns – autosomal dominant, autosomal recessive, somatic mosaic, metabolism imprinting errors, X-linked, and teratogenic exposure. Most are monogenic diseases. Prenatal diagnosis is challenging; findings are first seen during routine ultrasound. Most skeletal dysplasias have an identifiable pattern of skeletal changes consisting of unique and even pathognomonic findings. The use of multigene panels, using state-of-the-art sequence technology, has improved our ability to quickly identify the genetic etiology, which can impact management.

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