Rules for early diagnosis of ovarian tumors according to IOTA

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Abstract

Introduction: Early diagnosis of malignant appendage lesions is extremely important for both preoperative and postoperative management. A significant part of the lesions visible on the ovaries are benign and are recognized accidentally during a routine gynaecological examination. This paper presents the principles of early detection of ovarian tumours based on the guidelines of the International Ovarian Tumour Analysis Group (IOTA). The paper is illustrative and can be used in the daily provision of health services by gynaecologists in the classification of tumours into groups with probably mild or high oncological risk.

Aim: To present the basic principles of early detection of ovarian tumours according to the International Ovarian Tumour Analysis Group (IOTA) in outpatient and clinical practice.

Summary: Early detection and proper classification of lesions on the appendages is the basis for their rapid and effective treatment, as well as further prognosis in the case of malignant lesions.

Key words:

ultrasound, tumour, ovary, diagnosis

Introduction

Diagnostics based on early preoperative differentiation of the type of lesions on the uterine appendages, as well as methods of calculating the likelihood of malignant lesions in the tumour subject to research today are most often based on ultrasound examination and assessment of tumour marker expression. This paper characterizes the principles of early detection of ovarian tumours according to the International Ovarian Tumour Analysis Group (IOTA). Ovarian cancer called the "*silent killer*" is recognized less frequently in Poland than breast cancer. It is characterized, despite its rarer detection, with about 2-fold higher mortality (at the level of around 70%) than breast cancer. In the United States and industrialized European countries, it is one of the main causes of death for women suffering from malignant genital cancer [1,2].

In the event of: flatulence, abdominal pain, epigastric fullness or urinary bladder, as well as irritable bowel syndrome and pollakiuria, a diagnostic process should be carried out for ovarian cancer [3].

Symptoms that indicate the development of the disease such as ascites, shortness of breath, abnormal vaginal bleeding, weight loss, jaundice and cachexia usually appear at a later stage of the disease, causing significant difficulties in curing it [4,5].

Rules for the detection of ovarian tumour according to iota

The method used in gynaecology and oncological gynaecology for the initial diagnosis and differentiation of ovarian tumours is transvaginal ultrasound. In addition, in the presence of large-sized tumours, ultrasound examination is performed with transabdominal probes. In most cases, the detected lesions are mild in nature. During ultrasound examination, the ovarian tumour detected should be examined from one pole to the other, then the dimensions of the lesion should be documented in 3 perpendicular planes. In addition, it is recommended to provide the approximate volume of the adnexal tumour calculated automatically using ultrasound apparatus software, or on a calculator using, e.g.: the formula for the rotational ellipsoid:

$$V = D \times S \times W \times 0.532$$

(where: V – volume in cm, D – length in cm, S – width in cm and W – height in cm). The classification created by DePreist et al. recognizes the limit values of ovarian volume as 20 cm^3 in pre-menopausal women, while 10 cm^3 in post-menopausal women [1,6].

Doppler ultrasound is also used to diagnose ovarian tumours. This is a complicated study and required high skills and extensive experience from a diagnostician. For proper performance, change the camera settings to the most sensitive. The IOTA group created a point classification (from 1 to 4) defining tumour vasculature or by giving them the "COLOUR" feature:

- "COLOUR" feature 1 - for changes without the Doppler colour revealed during the study;
- "COLOUR" feature 2 - for tumours in which only minimal flow and colour intensity was detected in the stroma or inside the partitions (up to 2 vessels in one section);
- "COLOUR" feature 3 - when the tumour flow is moderate to average in severity;
- "COLOUR" feature 4 - when the adnexal tumour contains abundant vascularization [1].

Adnexal tumours in a sonographic examination can be simply characterized as:

A. single-chamber, completely cystic, without partitions and solid elements;
B. multi-chamber, completely cystic;
C. single-chamber, cystic with solid elements;
D. multi-chamber, cystic with solid elements;
E. solid, more than 80% of the largest tumour cross-sectional area are solid elements [7,8].

Criteria presented for the first time by Granberg et al. transformed by the International Ovarian Tumour Analysis (IOTA), called the Simple Rules method, use the assessment of 5 ultrasound change features assigned as benign (B), as well as M features – malignant. The occurrence of a lack of M features and a minimum of one B feature during the study is defined as a benign lesion, while at least one M feature and a lack of B feature is identified as malignant [9,10,11].

The examined ovarian tumour cannot be classified in the absence of B features with the lack of M features, and the occurrence of both B and M features, in which case the test should be checked in a centre of appropriate reference or by an expert in ultrasonography. The characteristics of individual features is presented in Table 1 [10,11].

The specificity of the IOTA LR1 model is 85% (68–97), IOTA LR2 83% (77–88) and their sensitivity in the order is 91% [72–94], 92% [88–95], which is why it is characterized by both high specificity and sensitivity. The cut-off point in both cases is 10% [9,12,13].

The model based on mathematical assumptions of IOTA LR1 takes into account 12 parameters, such as: occurrence of ovarian cancer in the family, current hormone therapy, patient's age, largest tumour

Table 1.
Characteristics of the B features (benign) and M features (malignant) according to the simple rule model [10,11]

Feature	Description	Feature	Description
M1	Solid tumour with irregular contours	B1	One-chamber cyst
M2	Ascites	B2	Presence of solid fields with a maximum dimension of <7 mm
M3	Presence of at least four papillary growths ≥3 mm high	B3	Presence of acoustic shadow
M4	Multi-chamber cyst-solid tumour with irregular contours >100 mm	B4	Smooth-walled multi-chamber cyst with a diameter of <100 mm
M5	Intensified vascularization in colour-coded Doppler examination – "colour" feature 3 or 4*	B5	Lack of tumour vascularization in Doppler examination – "colour" feature 1*

* "Colour" feature – vascular flows assessed using the power Doppler option: 1 – no vessels in the tumour, 2 –minimal flow – the presence of up to two vessels on one section of the stroma or septum, 3 – moderate flow – more than two vessels, 4 – high flow – very strong vascularization of the tumour throughout the imaging field of a solid lesion or septum.

size in mm, pain sensation during the ultrasound examination, occurrence of ascites, presence of papillary growth with vascular flow, solid tumour without cystic part, largest dimension of solid part (up to 50 mm), irregular wall of the lesion, presence of acoustic shadow, assessment of vascularization of the lesion by the Doppler method – "colour" feature (from 1–4). The LR2 model (available on the websites of the IOTA group in the form of a mobile application), however, refers to six factors, such as: patient's age, presence of ascites, occurrence of papillary growths with vascular flow, the largest size of the solid part (up to 50 mm), irregular cyst walls, the presence of an acoustic shadow [9,14].

Based on the first model of simple IOTA rules, in 2016 a more detailed model of risk assessment of malignant appendages was created than in the past, in which, depending on the type, as well as the number of B (benign) and M (malignant) features appearing in the tumour, it is classified into a defined risk group (Table 2) [9].

The three-stage scheme for diagnosing changes on the appendages was also created on the basis of the simple rules method:

Table 2.
Classification of simple rules from 2016 [15]

Features	Observed frequency of malignant lesions	Individual risk of malignant lesion	Classification
No M features and more than two B features	0.06%	<0.01–0.29%	Very low risk
No M features and 2 B features No M features and B1 feature present (single-chamber cyst)	1.3%	0.19–2,7% 1.2–3.1%	Low risk
No M features and 1 B feature (except B1 feature)	8.3%	2.4–15.2%	Indirect risk
No B and M features B = M B > M	41.1%	27.5–48.7% 5.6–78.1% 1.3–28.4%	Increased risk
M > B	87.5%	42.0 – >99.9%	Very high risk

1. stage: classification of the lesion on the appendages based on ultrasound as benign or malignant in the screening test,
2. stage: lack of validity of the screening test – application of the simple rules method,
3. stage: no reliable evaluation according to the simple rules method – referral to an ultrasound expert at the third level of reference [9].

During the first stage of diagnosis in screening tests, a benign lesion is recognized in childbearing age: single-chamber tumour with mixed echogenicity with acoustic shadow, single-chamber tumour with intermediate echogenicity, hypoechoic single-chamber tumour with a regular cap with the diameter of <10 cm, single-chamber cysts with regular walls. The features of malignant tumours include: tumours with ascites, with minimal moderate blood flow in post-menopausal women over the age of 50 and with a CA-125 tumour marker concentration over 100 IU/ml [9,16,17].

Summary

Early detection of lesions on the appendages using a simple rule model allows you to classify the lesions visualized in the ovaries during the ultrasound examination in the preoperative period. Determining the nature of the lesion and matching to the individual group of oncological risk (benign or malignant lesion) determines further diagnosis and treatment. Properly conducted examinations during genital ultrasound during a routine examination in a gynaecological office gain particular importance in the practice of a gynaecologist.

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