Pictorial essay

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Ovarian dermoid cysts: ultrasonographic findings

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Abstract

Dermoid cysts or mature cystic teratoma present various and complex ultrasonographic aspects. That is why the ultrasonographic diagnosis may be difficult and lead to confusion. Yet, a thorough analysis of all ultrasound features that characterize dermoid cysts can lead in the vast majority of the cases to an exact diagnosis. The purpose of this paper is to present the ultrasonographic findings of the dermoid cysts.

Key words: ovarian dermoid cyst, mature cystic teratoma, ultrasonography

Rezumat

Chistele dermoide sau teretoamele chistice mature au de cele mai multe ori un aspect ecografic foarte variat şi complex. Din această cauză în diagnosticul ultrasonografic pot să apară dificultăți.şi confuzii. Totuşi o analiză atentă a tuturor aspectelor ecografice care caracterizează chistele dermoide poate să ducă în marea majoritate a cazurilor la un diagnostic exact. Scopul acestui pictorial este de a prezenta modificările ecografice care caracterizează chistele dermoide.

Cuvinte cheie: chist dermoid ovarian, teratom chistic matur, ecografie

Ovarian germinal tumors have various histological origins. They classify into: dermoid cyst, monodermal teratoma, struma ovarii and immature teratoma. Out of all these the dermoid cyst or the mature cystic teratoma represents the most frequently encountered, the most often operated and the most known ovarian neoplasm [1,2].

Dermoid cysts originate in the pluripotent germ cells [3]. They form from a single germ cell after the first meiotic division [4]. Dermoid cysts are composed of well -differentiated tissues of at least two of the three types of germinal cells (ectoderm, mesoderm and endoderm). They always contain mature ectodermal tissues (skin, brain), in over 90% of cases they contain mesodermal tissues (muscles, fat, bone, cartilage), and in most cases they also contain endodermal tissues (ciliated, gastrointestinal mucinous or bronchial epithelium, thyoridian tissue) [3,5,6].

On the surface dermoid cysts are covered by compressed ovarian stroma, usually hyalinized. The cyst wall is made of squamous epithelium. In this epithelium hair follicles, sweat glands, muscles and other tissues can be found [7,8]. Inside the cyst there could be identified fat, sebaceous secretions, hair follicles, hair, and in about 30% of cases organ-like structures (teeth, bone fragments) [9].

The size of a dermoid cysts may be extremely variable. They can be found accidentally when they measure just around 1 cm and are situated inside the ovary without causing ovarian distortion (fig 1) [10]. But they can also have gigantic dimensions of up to 30-40 cm (fig 2). Usually, when they are discovered, dermoid cysts measure under 10 cm. Often times they are asymptomatic and have a slow growth rate of 1,8 mm/year. That is why some authors recommend a non-surgical management if size is not over 6 cm [11].

In approximately 80% of the cases dermoid cysts occur in young patients between 20 and 30 years of age [12]. Ovarian dermoid cysts are also the most frequently encountered ovarian neoplasms in children [13]. They represent about 18-20% of all benign ovarian tumours. The tumours are usually unilateral, but in 10-15 % of the situations they can be bilateral (fig 3) [5,6].

Due to the fact that they are often pediculate and because of their rich content in fat, dermoid cysts are frequently situated superior to the uterine fundus [14,15].

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Fig 1. Hyperechoic, small ovarian dermoid cyst. Near the dermoid cyst there is an ovarian follicle present.

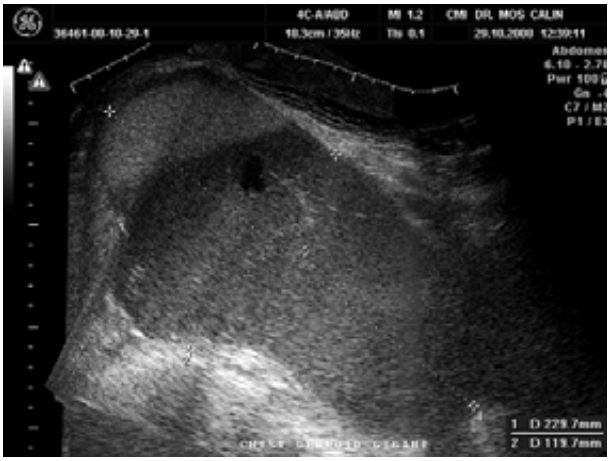

Fig 2. Panoramic view of an over 20 cm gigantic dermoid cyst.

Fig 3. Bilateral dermoid cysts.

The most typical ultrasonographic aspects of dermoid cysts are:

1. **The dermoid plug** (**Rokitanski nodule)** is probably the most characteristic aspect of the dermoid cysts [16]. It consists of nodular, pediculate, dense, parietal structure that forms on the cyst's interior surface and which bulges inside it [5]. A dermoid cyst may contain one or more Rokitanski nodules. The dermoid plug may contain bones, teeth, but also hair that can extend into the cyst's cavity. The ultrasound appearance is that of an hyperechoic nodular structure, usually with distal acoustic shadow, situated near the cyst wall (fig 4-9) [5,14,17,18].

The shadowing may be caused by a calcification or by a sebum and hair conglomerate [5,17,18]. After puberty both Rokitanski nodule and the acoustic shadow appear in over 70% of the cases. Before puberty the echoic nodule appears in about 40% of casese and the acoustic shad-

Fig 4. Calcified parietal nodule with acoustic shadowing determined by the Rokitanski nodule (dermoid plug) inside a transonic dermoid cyst.

Fig 5. Rokitanski nodule inside a complex dermoid cyst.

Fig 6. Delicate calcifications in a dermoid plug with fine, echoic lines emerging from it (dermoid mesh).

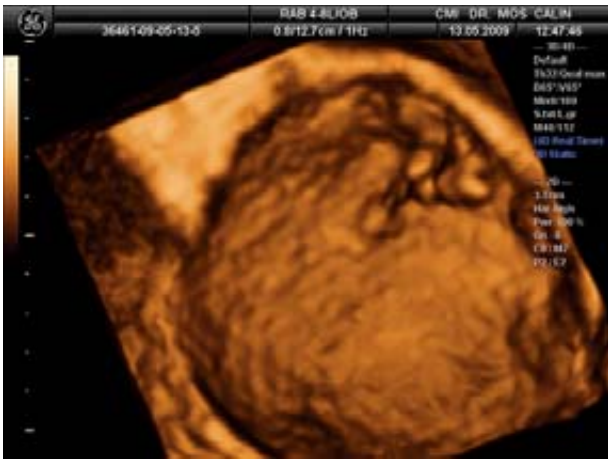

Fig 9. Several dense irregularities in the dermoid plug demonstrated on a 4D ultrasound image of a mature cystic teratoma.

Fig 7. Several ultrasonographic sections through a dermoid cyst, demonstrating it's polymorphic structure.

ow in only 15 % of the dermoid cysts [14]. The dermoid plug may be found as a single manifestation of a dermoid cyst in 16% of the situations [18].

(2.) The **dermoid mesh** corresponds to the presence of hair inside the cyst. The ultrasonograhic appearance may be that of long, echoic lines or that of point-like echoic images inside the lesion depending on the view (fig 10-13) [5,16,17,18].

The fibrin threads inside of hemorrhagic cysts could mimic this aspect. But only in 1% of the cases this finding appears isolated, without being accompanied by other signs characteristic to dermoid cysts [18].

(3.) "**Tip of the iceberg" sign –** in some cases only the contour of the cyst may be seen because of the distal acoustic shadow. In these circumstances an accurate measurement of the cyst is difficult or impossible to determine (fig 14,15).

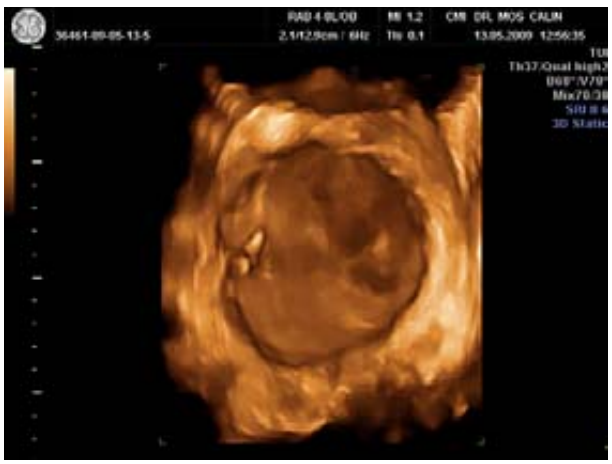

Fig 8. A 4D ultrasonographic image with clear visualisation of a tooth inside the dermoid plug.

Fig 10. Fine, long echoic lines in a dermoid cyst.

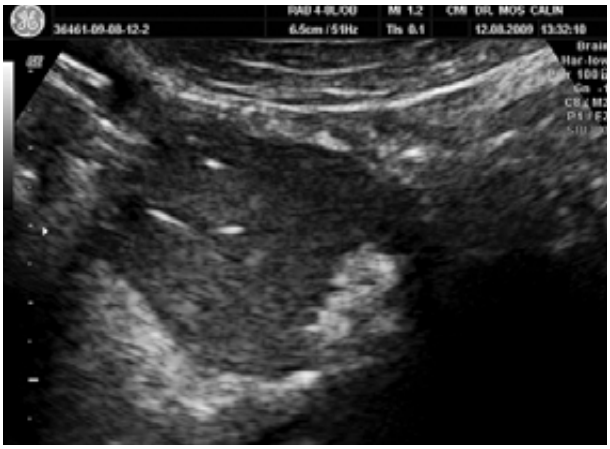

Fig 11. Hyperechoic lines produced by presence of hair.

Fig 12. A dermoid mesh with fine, barely visible lines emerging from the Rokitanski nodule.

In 16% of cases this sign is the only ultrasonographic manifestation of a dermoid cyst [18]. The acoustic shadowing given by the hyperechogenicity of the structures inside the cyst may be diffuse if it involves the whole cyst or it may be limited to a part of the cyst. Only 8% of dermoid cysts contain hyperechoic structures without distal acoustic shadow [14].

There are three types of tissues that can produce acoustic shadowing: calcified structures (bones, teeth), hair conglomerates inside the cyst cavity and the fat within the Rokitanski nodule [17].

(4.) Sometimes a tendency towards **sedimentation** occurs within the serous components of the dermoid cyst and the sebum, producing an ultrasound visible interface that changes position with gravity (fig 16,17) [16,15]. A fluid-fluid level within an adnexal mass does not have diagnostic value for a dermoid cyst. This finding must be interpreted within the context of other associated criteria [18].

Fig 13. Dermoid mesh

Fig 14. The „tip of the iceberg" sign: the anterior wall of the lesion is well visible, but inside the dermoid cyst there is significant acoustic shadowing that makes the posterior wall of the cyst impossible to visualize.

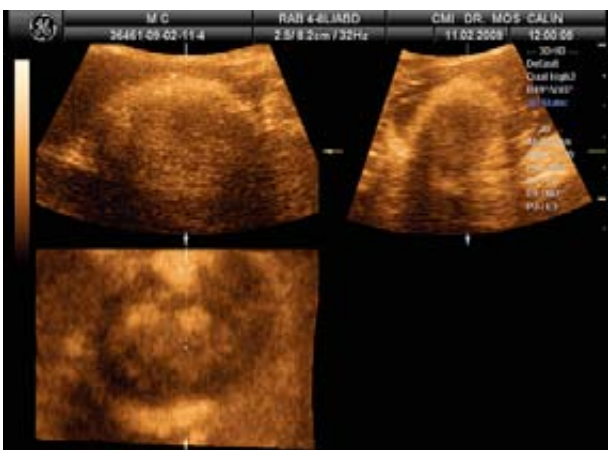

Fig 15. A 3D image in three orthogonal planes. In case of very dense cysts the „tip of the iceberg" sign is noticed when the cyst is visualized in planes A and B, while a plane C reconstruction offers a better view of the external contour of the cyst.

Fig 16. Fluid-fluid levels inside dermoid cysts (2D images).

Fig 17. Fluid-fluid levels inside dermoid cysts (3D images).

(5.) **The echoic "white ball" aspect** may occupy sometimes the entire cystic cavity (fig 18) . The histopathologic exam of the entirely echoic dermoid cysts shows a content containing mainly hair, fat and sebaceous material [7,19]. Other times an echoic, relatively homogenous and lobulated mass that fills a part of the cyst cavity is visualised (fig 19). Not so often within the dermoid cyst may be seen echoic spheres produced by fat material conglomerates that float inside the cyst. They do not present acoustic shadow or a tendency towards sedimentation (fig 20) [20,21].

Since 1998 Patel *et al*. described the following ultrasonographic features as being specific for dermoid cysts: a) the presence of an echogenicity with acoustic shadow, b) diffuse or regional shining echoes, c) hyperechoic lines and dots, and d) the presence of a fluid-fluid level. He demonstrated that about ¾ of the dermoid cysts show at least two of the above characteristics, while no other adnexal mass presents more than one of these features. So, the presence of two characteristics indicates a positive predictive value of 100% [18]. Mais *et al*. consider that mature cystic teratomas may be diagnosed through endovaginal ultrasonography with a 99% specificity and only a 50% sensitivity [22].

Fig 18. The echoic „white ball" aspect, filling almost the whole cystic cavity.

Fig 19. Relatively homogeneous, echoic mass, but with polycyclic contour, filling an important part of the cyst's cavity.

Fig 20. Adipose material spheres floating within the cyst.

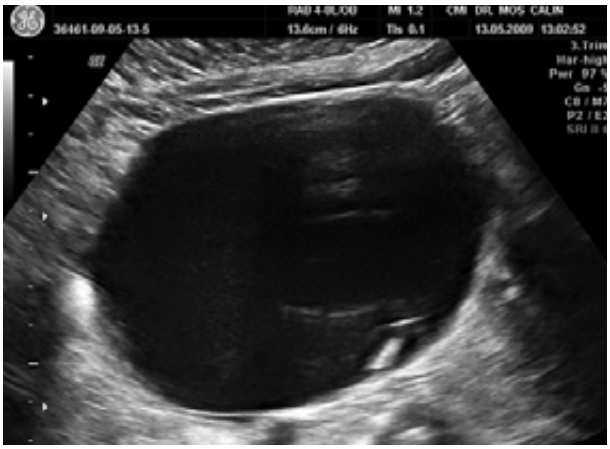

Fig 21. An almost completely transonic dermoid cyst. There is only one small echoic image near the cyst's wall, but without acoustic shadow.

About 2/3 of dermoid cysts are usually easy to recognise on ultrasound because of the polymorph aspect of complex masses that consist of both hyperechoic and hypoechoic components [14]. Most teratomas (about 65%) contain extremely intense echogenicity. No other tumour has this feature [23]. Around 10-15% of the cystic mature teratomas are entirely echoic, but without intense hyperechoic structures [24].

Another 10-15 % of the dermoid cysts are anechoic or show a predominantly cystic pattern and cannot be easily differentiated from other cystic masses (fig 21) [22]. Even transonic lesions contain parietal nodules on the histopathological analysis, but sometimes these nodules are too small (under 3-4 mm) to be detected ultrasonographically. Also even if the cyst has a mixed content the absence of a significant interface between sebum and fluid may represent the explanation of the purely transonic aspect [15].

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