Granulosa tumors cells of the ovary: Radiologic pathologic correlations

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Purpose

The aim of this scientific exhibit is to describe the imaging findings in 8 cases of patients with granulosa cell tumor of the ovary, giving emphasis on both specific imaging features and imaging correlation with gross pathologic and histologic examination features.
Methods and Materials

Our study is based on a retrospective group of clinical and radiological observations of patients referred to our institution; the ages ranged between 32 and 70 years; the imaging investigation consisted of US (7 cases), CT scan (4 cases), and RMN (4 cases) with T1 and T2 weighted, fat-saturated and Gadolinium enhanced images. Imaging features were analyzed giving emphasize to radiologic pathologic correlation.
Results

In our 8-patients study (table 1) on page , mean patient age was 52.6 years for the adult type (ranging between 38-70 years) and 29 years for the juvenile type; one patient out of 8 was nulliparous while 5 were multiparous (para#3).4 patients(50%) were menopausals at the moment of the diagnosis. One patient had an history of previous right adnexectomy for adult GCT of ovary. Most common circumstances of diagnosis were irregular bleeding (50%), pelvic pain (50%) and the discovery of a pelvic mass (25%). Clinical exam showed in most of the cases an iliac or pelvic mass (62%), prolabed or not in the cul-de-sac of Douglas; in one case, the exam showed a large pelvi-abdominal mass; clinical examination was strictly normal in one case (patient 5). No laboratory results of specific hormonal markers (oestrogen, androgen, or inhibine) was found through clinical documents.

The imaging features (table 2) on page showed a tumor of the right ovary in 4 cases, a bilateral tumor in 1 case and a peritoneal recurrency (tumor in the cul-de-sac of Douglas) in one case. Ultrasound exam mistaked the diagnosis of ovarian mass in patient 5 and the granulosa cell tumor of the right ovary was diagnosed on the histological exam. Mean tumoral size in imaging evaluation was 15.9 cms. In all cases, ovarian masses appeared to have both cystic and solid components (figures1 on page 6, 2 on page 6, 3 on page 7 and 4 on page 7) and imaging evaluation showed a large peritoneal solid mass in the patient with GCT recurrency after oophorectomy. Imaging exploration showed signs of extratumoral seeding in 2 cases, with peritumoral spread in both patients (retro-peritoneum and uterus infiltration); ascites, peritoneal implants and nodal spread were seen in patient with recurrence.

In patient 8, MRI showed a predominantly multi-septate cyst with solid tissular and fat small components. Intracystic septations and the homogeneous solid component were moderately enhanced after intra-venous injection of gadolinium complex. This feature was related with a composite pluri-tissular teratoma and granulosa-cell tumor (figure 5) on page 8. Endometrium appeared thick in 2 cases.

Concerning surgical data of granulosa-cell tumors (table 3) on page , 4 patients out of 8(50%) had undergo laparotomy immediately while 2 patients had a laparoscopic approach before laparotomy and one patient had adnexectomy with vaginal hysterectomy. The external appearance of the mass was smooth without any papillary projections on its surface. Extra-ovarian spreading and local infiltration were seen in only one case with seeding to the uterus, bladder, omentum, as seen in preoperative imaging (juvenile type: patient 1 on page 7). Findings of the extemporaneous examination found a granulosa-cell tumor in 6 cases 85(%) and concluded in a non epithelial tumor.
in one case. Surgical treatment was radical immediately in 5 patients; 2 women had only an adnexectomy and underwent another operation for a radical treatment.

In gross pathology examination (table 4) on page , mean tumoral size was 10 cm; hemorrhagic reorganization was found in 37% of the tumors; internal necrosis was found in the case of the juvenile GCT and bleeding foci in intra-tumoral cavities was showed in four cases in correlation with specific MRI signals (figures 3 on page 7, 4 on page 8); Rupture of the capsule was seen in one case; in spite of their big size, in most cases tumorgrowth was limited to the ovary.

Concerning histological data (table 4) on page , 6/8 were adult granulosa cell tumor and 1/8(Patient 1 on page 7) was juvenile and one case (patient 8 on page 8) was composite pluritissular teratoma and granulosa-cell tumor (figure 4). In patient 7 on page 6, a large para-ovarian cyst adjacent to the GCT was discovered and was mistooked for a large macrocystic component of the GCT.

Predominant architectural pattern of growth were macrofollicular (42%), microfollicular (28%) and trabecular (28%); in most of cases, those patterns were present in combination. Macrofollicular architectural pattern was correlated with macrocystic component of the GCT. Mixed architectural pattern of growth was showed in homogenous solid component and septa.

Cellular atypias were found in 2 cases (25%), bodies of Call-Exner were seen in 3 tumors (37%), characteristic nuclear grooves in 4 tumors (50%) (figure 6 on page 9) and the mitotic rate was < 5 mitose/10 HPF in 75% of cases. Histology confirmed extra-ovarian spreading in one case (patient 1 on page 7).

Finally, 6 tumors were at stage IA (FIGO) and 2 patients with stage III
Fig. 0: Patient 3: Adult granulosa cells tumor in a 71-years old patient admitted for a pelvis mass with post menopausal bleeding; trans abdominal sonogram (A) revealed an heterogeneous solid-cystic mass with large solid component, thick wall and septations in the right adnexal region. Pelvic MRI showed a large right adnexal mass predominantly cystic with solid peripheric component in T1 (B) and T2 (C)-weighted images and Gadolinium enhanced MR images (D).

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**Fig. 0:** Patient 7: Adult GCT in a 40-years-old patient with a mass of the right iliac fossa discovered fortuitously; the appearance at US exam appearance was a solid and cystic mass. The CT scan showed a bilobated cystic mass filling the right iliac fossa with a macrolocular part and a second part presenting thick septa slightly enhanced and a wall highly enhanced in its right part: There was no evident sign of extra-ovarian extension. At the histological analysis, the granulosa-cell tumor was associated with a large paraovarian cyst corresponding in the macrolocular part.

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**Fig. 0:** Patient 1: Juvenile GCT of the ovary in a 29 years-old patient, nullipara, referred for a large pelvi-abdominal mass. The US exam showed an appearance of enlarged myomatous uterus. The MR Imaging showed a large lobulated solid mass of the right ovary with large cystic cavities, highly enhanced after intravenous injection of gadolinium. Some cavities had a high signal intensity indicating hemorrhage in T1-weighted images and a characteristic « spongelike » appearance in T2-weighted images. This mass was associated with endometrial thickening and ascites. Fig 3 bis: Photograph of the specimen of gross pathology (A, B) shows necrotic and hemorrhage-filled cystic...
spaces in the solid component corresponding to the macrofollicular pattern of growth correlated to the spongelike appearance in T2-weighted images (C). Histologic findings in juvenile GCT (D) shows large cells with hyperchromatic nuclei (arrow).

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**Fig. 0:** Patient 2: Bilateral adult GCT in a 38-years old women referred for exploration of a pelvic pain and irregular bleeding. US examination showed bilateral adnexal masses both solid and cystic, the right mass contained calcifications and suggested the diagnosis of mature teratoma. MRI showed bilateral solid and cystic masses: -predominantly solid in the right side with little cystic component; solid and cystic with hemorrhage in the left side. Endometrium thickening / Absence of pelvic spread.

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**Fig. 0:** Patient 8: Composite pluritissular teratoma and granulosa-cell tumor in a 37-years old women referred for exploration of a pelvic pain with laterouterine mass in the clinical examination. MRI examination showed the retrouterine mass containing small homogeneous tissular component (enhanced after Gadolinium) and a predominantly cystic multisepolated component; furthermore, it contained a small fatty part (withdrawed in...
fat-saturated sequences), thus highly suggesting the diagnosis of teratoma. Photograph of the specimen of gross pathology shows liquid-filled cystic spaces in the solid component corresponding to the macrofollicular pattern of growth correlated to the multiseptated cystic component in T2-weighted images.

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**Fig. 0:** Histologic findings in adult GCT. A: Photomicrograph (hematoxylin-eosin stain) shows numerous Call-Exner bodies, correlated with microfollicular pattern of growth. Blue-staining nuclei of granulosa cells are seen, round and oval, rich with mitosis. B: Positivity in immunohistochemistry for vimentine, CD99 and inhibin.

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Conclusion

In the GCT of our series, some imaging features were found in correlation of the underlying histopathological changes:

Macrocystic component giving a "sponge-like" aspect, well identified in T2 weighted MRI images, was correlated to macro-follicular architectural pattern of growth and the solid component was correlated with trabecular or mixed architectural patterns;

A characteristic feature of GCTs is multiple blood-filled cysts within the tumor revealed par MRI, per operatory puncture of intratumoral cavities and gross pathological analysis;

Absence of papillary projections and regularity of the tumor surface

Endometrial hyperplasia related to the estrogen production.

Appreciation of these imaging features with pathologic correlation can help for the diagnosis of this group of ovarian tumors.
References


