A calcific pelvic mass in a woman with chronic spinal pain: a case of mature cystic teratoma

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Abstract

Objective: The purpose of this case is to describe findings of a mature cystic teratoma and to further provide differential diagnoses for ovarian pelvic masses and calcifications.

Clinical Features: A 27-year-old woman presented to a chiropractic teaching clinic with a chief complaint of chronic multilevel spinal pain. During a full spine radiographic examination, radiopaque densities were incidentally identified in the pelvic bowl visualized through a gonad shield. Follow-up pelvic radiography revealed several radiopacities of uniform density localized in the pelvic bowl.

Intervention/Outcomes: Medical (gynecological) consultation led to ultrasonography of the pelvis that revealed a mature cystic teratoma. The patient underwent complete excision of the mass through a laparotomy procedure. The patient continued to receive chiropractic treatment of her original cervical and lumbar spine complaints, further suggesting that the pelvic mass was not a source of her musculoskeletal complaints.

Conclusion: This case demonstrates the detection and proper referral of a patient with a calcific mass. The presence of a pelvic mass, suspected of arising from the ovary, requires additional diagnostic imaging and careful clinical correlation.

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Introduction

Calcifications located within the pelvic bowl are frequent findings on radiography. Differential diagnos-

tic considerations (listed in alphabetical order) are included in Fig 1.¹ Characteristic plain film findings of cystic teratomas include teeth, bone, and/or fat, with 40% of these masses solely confirmed by plain film radiography.² Mature cystic teratomas are classified as ovarian teratomas. Zagame et al³ divide ovarian teratomas into 2 groups, mature (99% of all ovarian teratomas) and immature (1%), depending on their characteristics. Mature cystic teratomas of the ovary

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Appendiceal calculus (fecalith)
Dermoid cyst
Foreign material
Leiomyoma or leiomyosarcoma of uterus
Lithopedion
Lymph node
Pregnancy
Urinary tract calculus
Fallopian tube calcification
Vascular (arteries, phleboliths)

Fig 1. Pelvic or lower quadrant calcification (in women).¹

make up 10% to 25% of ovarian neoplasms.⁴ Mature cystic teratomas, the most common germ cell neoplasm, are collections of well-differentiated derivations from at least 2 of 3 germ cell layers: ectoderm (skin, brain), mesoderm (muscle, fat), and endoderm (mucinous or ciliated epithelium).⁵ The components of the cyst may include hair, sebum, and teeth.⁶ Mature teratomas are principally cystic and lined by epithelium.⁷ Because of the predominance of skin elements, mature cystic teratomas are also referred to as *dermoid cysts*.⁴ Mature cystic teratomas, in their pure form, are always benign, although they may rarely undergo malignant transformation. The prevalence of mature cystic teratomas undergoing malignant transformation is 1% to 2%, with a subsequent poor prognosis due to the delay in identifying the transformation before metastatic spread. Malignant degeneration, most commonly to squamous cell carcinoma, tends to occur in postmenopausal women.⁴

Mature cystic teratomas often occur in younger patients, with an average age of 30 years. These teratomas are usually asymptomatic⁸ and grow slowly, averaging 1.8 mm of growth per year. Mature cystic teratomas are typically evident within the pelvic bowl on radiographic examinations because of their fat and calcific density. Given that most of these tumors are asymptomatic,^{5,8} they are often incidental findings on lumbar or pelvic radiography.⁸ Treatment of mature cystic teratomas depends on the size, with nonsurgical management for smaller tumors, less than 6 cm, or cystectomy when larger.⁵

Immature teratomas contain tissues derived from the 3 germ cell layers; but unlike mature teratomas, they demonstrate malignant behavior. Histologically, immature teratomas have components of immature or embryonic tissues. In comparison to mature teratomas, immature teratomas are characteristically

larger, 14 to 25 cm, as compared with mature teratomas averaging 7 cm. In addition, immature teratomas have a prominent solid component and a less prominent cystic component, with a less-defined capsule in comparison to a mature cystic teratoma.⁵ Radiography is unable to differentiate the mature from the immature teratoma. This limitation demands the use of additional diagnostic imaging techniques such as sonography, computed tomography (CT), or magnetic resonance imaging (MRI).

Pelvic masses in the female may invoke a range of differential diagnoses from benign to malignant. To the best of our knowledge, this is the first reported discussion of a benign cystic teratoma in the contemporary chiropractic peer-reviewed literature. These masses/pelvic calcifications are often incidental findings on lumbar or pelvic radiographic examinations, yet it should be acknowledged that incidental findings do not always equate as being inconsequential. Therefore, referral to an obstetrician/gynecologist is warranted when a pelvic mass in a female is identified or suspected. The purpose of this case is to describe findings of a mature cystic teratoma and to further provide differential diagnoses for ovarian pelvic masses and calcifications.

Case report

A 27-year-old multiparous woman presented to a chiropractic clinic with chronic multilevel spinal pain described as neck stiffness/pain, pain between the shoulders, low back pain, and painful joints, most notably the left knee. At presentation, the patient was height/weight proportional and alert to person, place, and time. Her blood pressure was 90/60 mm Hg; respiration, 14 breaths per minute; and pulse, 84. Physical examination demonstrated bilateral suboccipital and lower cervical spine tenderness, hypertonicity of the trapezius muscles, and left sacroiliac joint tenderness and restriction with motion palpation. All active ranges of motion and sensory test results were within reference ranges. Result of Patrick’s Flexion, Abduction, External Rotation, Extension test was positive bilaterally with pain in the hip joints. A complete blood count and urinalysis revealed no abnormal values. She reported a spinal curvature on her health history. On postural examination, a low left shoulder, low right ilium, and minimally posterior right scapula were noted. Full spine radiography was performed to assess for the extent of the scoliosis.

The radiograph demonstrated a broad right convexity in the thoracolumbar spine, negative for scoliosis, and incidentally revealed multiple osseous densities localized within the pelvic bowl. Given that a gonad shield was used, the osseous densities were not clearly identified. A follow-up anteroposterior pelvic radiograph clearly revealed numerous opaque densities clustered within the right aspect of the pelvic bowl, consistent with malformed teeth (Fig 2). The primary radiographic differential diagnosis for the pelvic mass included a teratoma. The patient reported no pelvic pain; therefore, the mass was considered incidental to her musculoskeletal pain. Her multilevel spinal pain, notably in the cervical and lumbar regions, responded well to treatment, including diversified technique and soft tissue manipulation in the chiropractic clinic. Her knee pain was further evaluated with ultrasonography, and a popliteal cyst was noted. A sonographic examination was recommended for additional evaluation of the opaque densities in the pelvic bowl.

The patient was referred to her obstetrician/gynecologist whom she reported to several days later. History and physical examination revealed a normal uterus with an intrauterine device high in the uterine cavity. Transvaginal sonographic examination revealed that the right ovary was composed of 2 masses: a solid 3.9×3.4 -cm mass and a cystic mass with solid components measuring 4.4×3.4 cm (Fig 3). The mass demonstrated increased blood flow on sonography power Doppler, indicating hyperemia.

An option that was presented to the patient was expectant management (follow-up sonography

Fig 3. Transvaginal ultrasonography of the right ovary revealed a 4.4×3.4 -cm hypoechoic cystic mass with echogenic solid components. Through-transmission (black arrow) artifact is noted posterior to the cystic component, and acoustic-shadowing (white arrow) artifact is noted posterior to the calcific density of a malformed tooth. (Color version of figure is available online.)

in 3-4 months) because she was in no pain at the time and the risk of malignancy was felt to be very low. The second option was surgical resection of the mass. Choice of treatment focused on the difficulty of resecting such a large mass laparoscopically, indicating the likelihood of a laparotomy. She chose surgical resection and underwent a laparoscopic cystectomy of 3 separate dermoid cysts on the right ovary. Final pathology revealed multiple mature cystic teratomas.

Fig 2. Anteroposterior pelvic radiograph revealed numerous uniform radiopaque densities in the right pelvic bowl consistent with malformed teeth. Centrally located is an intrauterine device.

Fig 4. Photograph of the gross specimen demonstrated the radiopaque densities noted on the pelvic radiograph. Malformed teeth and hair are clearly noted. (Color version of figure is available online.)

Cystic structures containing hair and inspissated material were present. The largest of the 3 did contain identifiable teeth (Fig 4). Her perioperative follow-up was unremarkable. The patient continued to receive chiropractic treatment of her original cervical and lumbar spine complaints, further suggesting that the pelvic mass was not a source of her musculoskeletal complaints. The patient gave her consent to have her health information published without divulging personal identifiers.

Discussion

Pelvic masses in the female require methodical clinical evaluation and diagnostic imaging for localization and characterization. The presence of an ovarian tumor usually indicates a mature cystic teratoma, as it is the most prevalent germ cell neoplasm⁵ followed by dysgerminoma/seminoma.⁹ Germ cell tumors are located most commonly in the gonads and are only rarely located in extragonadal tissue. The mediastinum is the second most common site for germ cell tumors. Extragonadal germ cell tumors occur in the median line of the body, with the anterior mediastinum, sacrococcygeal region, pineal gland, and neurohypophysis being common sites.⁷ Mature cystic teratomas are benign teratomas that develop from an individual nontransformed germ cell after the first meiotic division.^{5,9} The cystic component of these masses is commonly a greasy liquid composed of keratin, sebum, and hair encased in a firm capsule of variable thickness. The conglomeration of fatty and sebaceous material, hair, soft tissue, calcifications, and teeth is known as a *dermoid plug* or *Rokitansky protuberance*.⁶ The raised protuberance projects into the cyst cavity, where most of the hair arises.⁵ Togashi et al¹⁰ described protrusions varying from small nodules, or dermoid nipples, to palm tree–like protrusions. The mature cystic teratoma may be multilocular, although it is typically unilocular.¹¹ The fat within the cyst is often a characteristic; however, Yamashita et al¹¹ described a small number of cases in which the tumors contained aqueous fluid and no fat.

Cystic teratomas account for more than 20% of all ovarian neoplasms. They are the most common ovarian tumor found in children and adolescents.¹² These tumors are benign 98% of the time and rarely develop malignancies.¹³ Complications of mature cystic teratomas include rupture; malignant degeneration; or the most common complication, torsion. Torsion is a

complication of larger teratomas, described as 11.0 cm or larger, with the majority averaging 6.0 cm. Ruptured tumors, which occur rarely (1% of cases), can lead to leakage of the liquefied sebaceous contents into the peritoneum and cause granulomatous peritonitis. Malignant transformation of mature cystic teratomas results when differentiated tissues give rise to carcinoma or sarcoma. This transformation occurs in the sixth to seventh decade of life and is a rare complication (1%-2% of cases).⁵

Ovarian masses are divided into 2 categories: nonneoplastic or neoplastic.¹⁴ Fig 5 lists these masses.^{14,15} Immature teratomas are similar in composition to mature cystic teratomas, consisting of tissues derived from the 3 germ layers. Immature teratomas are typically larger (14.0-25.0 cm), display clinically malignant behavior, include less than 1% of ovarian tumors, and affect individuals usually during the first 2 decades of life. Histologically, immature teratomas demonstrate embryonic tissues. Mature teratomas can present with immature teratomas in the same ovary (26%) or in the contralateral ovary (10%). Immature teratomas treated with chemotherapy may transform into more mature tissue and appear as a more typical mature cystic teratoma. This is referred to as *retroconversion*, and these masses may remain stable for a long period.⁵

Diagnostic imaging modalities are quite useful in the identification of mature cystic teratomas. The techniques include radiography, CT, MRI, and sonography. Olson et al¹² report that a combination of sonography, radiography, or CT will suggest the correct diagnosis in most cases, whereas MR images will help to correctly diagnose a cystic teratoma without exposure to ionizing radiation. In this case, the ovarian mass was initially identified on radiography as an incidental finding.

<u>Nonneoplastic</u>
Ovarian functional cysts
Polycystic ovary disease
Ovarian torsion
<u>Neoplastic</u>
Surface epithelial tumor
Sex cord-stromal tumor
Germ cell tumor
Metastatic tumor

Fig 5. Ovarian masses.^{14,15}

Osseous densities were noted within the pelvic bowl consistent with a mature cystic teratoma.

Radiography may be the imaging modality that initially identifies calcifications within a pelvic mass. Mature teratomas are commonly detected incidentally during routine pelvic imaging studies.⁸ Computed tomographic diagnosis of a benign cystic teratoma is more specific than sonography or radiography. Characteristic findings on CT include a fat-containing mass with Hounsfield units greater than normal fat because of the mixture of fat, hair, debris, and fluid. Also noted are calcifications, including teeth and bone, in the Rokitansky protuberance.² Sheth et al¹⁶ note that CT can precisely display the internal architecture of the mass because of its capacity to discriminate between tissues of subtle attenuations. Fragments of bone or teeth that are clear on CT are not readily depicted on sonography. This may be explained by noting that the calcified elements may be within the adjacent hair or cyst wall or may merge with adjacent bowel.¹⁶

Magnetic resonance imaging is useful in the diagnosis of the benign cystic teratoma given that the fatty component of the mass is isointense in relation to subcutaneous fat. A fat-water interface and a typical pattern of layering or floating debris are common presentations noted on MRI.¹² Torsion is suspected when the uterus is deviated to the twisted side with engorged blood vessels. A high-signal intensity rim on T1-weighted imaging is noted. A low-signal intensity mass (torsion knot) with thick straight blood vessels encircling creates a complete absence of enhancement.⁵ Malignant transformation is depicted on MRI by a sebaceous lipid component of the mass with a heterogeneous solid component projecting into the cyst or extending transmurally into adjacent organs.⁵

Sonography is used to diagnose most mature cystic teratomas. Sonographic diagnosis can be complicated because of the variety of appearances⁵ and their heterogeneous internal structure.¹⁶ Three manifestations of mature cystic teratomas are most common and include a cystic lesion with a densely echogenic protuberance; a diffusely or partially echogenic mass with echogenicity demonstrated by sound attenuation caused by the sebaceous material and hair within the cyst cavity; and a third manifestation consisting of multiple thin, echogenic bands due to hair within the cyst.⁵ Fat demonstrated on CT as low attenuating and homogeneous, representing pure sebum (liquid at body temperature), will have an anechoic appearance sonographically. Fat within the dermoid plug will be considerably echogenic because of the association with soft tissue and hair. A combination of hair and sebum

will demonstrate a highly echogenic signal given the large acoustic impedance differences and variable tissue interfaces.¹⁶ Outwater et al⁵ reported that the combination of hair mixed with the cyst fluid gave a diffuse echogenicity sonographically. A highly echogenic focus with posterior shadowing produced by an ectopic tooth or bone fragment is a specific feature of a mature cystic teratoma.⁶

Three treatment options are available for benign cystic teratomas. These include laparotomy, laparoscopy, and no treatment. Laparotomy is a treatment option that uses a Pfannenstiel or subumbilical midline incision.¹⁷ An abdominal incision is performed to allow adequate intraoperative exposure.¹⁸ In a 1996 article written by Yuen et al,¹⁷ it was reported that laparoscopy was increasing in popularity in the management of benign ovarian masses. Benefits of laparoscopy include reductions in operative morbidity, hospital stay, and recovery time. Worley et al¹⁹ noted other benefits including faster recovery due to decreased analgesic requirements and a decreased time for return of bowel function. Complications of laparoscopy include tumor spillage during the operation in cases of a malignant ovarian tumor being misdiagnosed¹⁷; vascular, bowel, and genitourinary injuries; incisional hernias; port-site metastases; and gas embolism.¹⁹

Limitations

Limitations for this case include no long-term follow-up after surgical excision. Therefore, it is unknown as to whether any related complications/conditions exist currently for the patient. As previously mentioned, the mature cystic teratoma was an incidental finding and likely not related to the patient's clinical presentation of multilevel spinal pain.

Conclusion

Radiography frequently results in the detection of incidental findings, the significance of which may be quite variable. The presence of a pelvic mass, suspected of arising from the ovary, requires additional diagnostic imaging and careful clinical correlation. This case report described an adult female patient who initially presented to a chiropractic teaching clinic with a chief complaint of chronic neck and low back pain. A benign mature cystic teratoma was incidentally discovered at

full spine radiography. Treatment consisted of surgical excision, and there was an uneventful recovery.

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