

Detection and management of retroperitoneal cystic lesions: A case report and review of the literature

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Received April 12, 2016; Accepted November 4, 2016

DOI: 10.3892/ol.2017.6323

Abstract. The identification of cystic lesions within the retroperitoneal space is a rare event that poses clinicians the challenge of a difficult diagnosis and disease management. Retroperitoneal cystic lesions account for a group of lesions that range from common benign lesions (e.g., lymphoceles developing as a surgical complication) to rare aggressive malignant neoplasms. Currently, in the majority of cases, image-guided procedures allow for a pathological diagnosis to be achieved in these challenging lesions, thus offering the chance of an appropriate treatment; however, the overall clinical assessment of retroperitoneal cysts is highly demanding. The present study reports the management of a representative clinical case, presenting with a voluminous cystic mass able to dislocate cave vein, whose diagnosis was preceded by a deep vein thrombosis. Computed tomography-scan and ultrasound guided percutaneous drainage were performed to achieve the diagnosis. Following the discussion of the current case report, a review of the pathological and radiological characteristics of retroperitoneal cystic lesions is presented.

Introduction

The present review will discuss the cystic lesions of the retroperitoneum, an uncommon and heterogeneous group of lesions that originate behind the retroperitoneum. Lesions that occur in the retroperitoneal space are divided into solid masses and cystic lesions, as previously described, and classified (1,2). The precise incidence of these lesions is difficult to define, as the neoplastic lesions are of rare occurrence and

the non-neoplastic lesions, such as postsurgical lymphoceles, are more frequent (1,2). Even if rarely identified in the retroperitoneal space (1,2), cystic lesions are highly challenging regarding the clinical presentation, the diagnostic and the choice of therapeutic approaches (3). Similar masses may be discovered during routinely performed examinations, including abdominal sonography, or may present with symptoms associated with compression of other bodily structures. Computed tomography (CT) scan and Nuclear Magnetic Resonance (NMR) represent the standard imaging approaches to evaluate these lesions (1). Due to anatomical complexity of the retroperitoneal space, the diagnostic procedures may include ultrasound-guided drainage or surgical removal. To introduce the clinical diagnostic approach and management, the present study will discuss a representative patient who presented with a cystic retroperitoneal mass.

Case report

A 68-year-old man was admitted to the Emergency Department of San Luigi Hospital (Orbassano, Italy) in December 2014 with abdominal discomfort, nausea, vomiting and oedema of the left inferior leg. The patient had a past medical history of hypertension, diabetes mellitus, hepatic steatosis and cholelithiasis, with a recent (~three months prior to admission) diagnosis and treatment for a deep venous thrombosis of the left leg. No previous history of trauma or pancreatitis was reported. No significant abnormalities were observed in blood tests (normal complete blood count; normal renal and hepatic functions; normal pancreatic enzyme and lactate dehydrogenase levels). As part of the original examination, an abdominal ultrasound was performed revealing a voluminous cystic lesion (maximum diameter, 14 cm) in the abdomen. The patient was transferred to the Division of Internal Medicine (San Luigi Hospital, Orbassano, Turin, Italy) for appropriate diagnosis and treatment. A computed tomography (CT) scan was performed, which confirmed the presence of a voluminous retroperitoneal cystic lesion (diameter, 15x7.5 cm) in the perivascular retroperitoneum, occupying the space between the aorta and inferior vena cava, causing its compression and lateral deviation (Fig. 1A). Three-dimensional rendering of the CT scan image allowed the extension of the lesion and its interaction

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Key words: retroperitoneal masses, cystic lesions

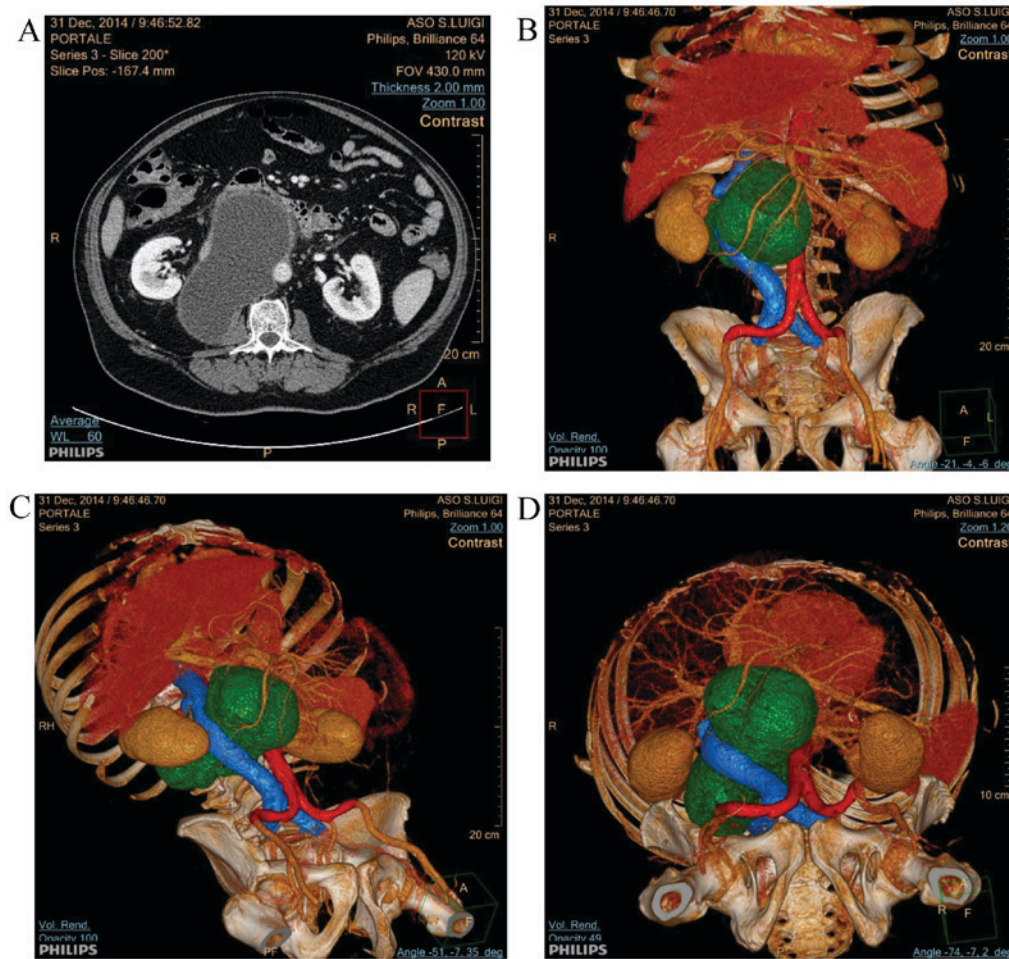


Figure 1. Retroperitoneal lesion. (A) Computed tomography scan; (B-D): Three-dimensional rendering of the retroperitoneal lesion (green) at different angles, showing clear dislocation of the vena cava.

with vessels to be described more clearly (Fig. 1B-D). The lesion appeared isolated from the pancreas and the posterior pararenal space, where it almost reached the psoas muscle. No other pathological repertoires were found at the CT scan. Based on the CT scan findings, the patient underwent ultrasound-guided drainage of the lesion. A total of 800 ml of clear liquid was removed, causing a marked improvement in the patient's level of discomfort. The liquid was examined to assess the levels of amylase and lipase, to perform microbiological analysis and to exclude the presence of neoplastic cells. All tests were found to be negative. In the absence of any CT scan elements suggestive of the neoplastic origin of the cystic lesion, and due to the lack of any significant abnormalities in the liquid examinations, the patient was discharged and a close follow-up of the retroperitoneal space was performed by abdominal ultrasound and CT. After a 3-month follow-up period, the patient did not present with any signs of relapse (the abdominal CT confirmed the absence/disappearance of any lesions), supporting the non-neoplastic origin of the cystic lesion.

Discussion

The present case prompted a review of the diagnostic approaches and clinical management of retroperitoneal cystic lesions. In

order to describe these lesions, we here summarize the most comprehensive classification and review published by Dr Yang and colleagues (1). These masses arise within the retroperitoneal space, which is a complex region located behind the peritoneum (1,4,5). This region houses few organs (such as the adrenal glands and kidneys, portions of the duodenum, pancreas and colon, and the esophagus), major vessels (the aorta and inferior cava vein), deep lymphatic vessels and structures, ligaments and fatty tissues (6). Among those diseases that originate in the retroperitoneal space, neoplasms are uncommon (2). Although they are rare, retroperitoneal masses are a challenging dilemma to clinicians, either due to the lack of specific symptoms or the difficult diagnostic approach. Almost 80% of retroperitoneal masses display malignant features, but no clear diagnostic flow charts have been proposed thus far. As reported in the present clinical case, neither radiological imaging or drainage are able to clearly rule out a malignant nature, imposing the challenging decision to propose surgical diagnostic investigations of the lesion vs. an appropriate radiological follow-up. Following on from the present case report, the current study reviews the biological, clinical and radiological features of retroperitoneal cystic lesions.

As reviewed and classified elsewhere (1), benign neoplastic lesions include neoplasms with biologically benign behavior, including cystic lymphangioma, cystic teratoma,

mucinous cystadenoma, pseudomyxoma retroperitonei, cystic mesothelioma, tailgut cysts, epidermoid cysts and bronchogenic cysts. Cystic lymphangiomas are generally benign congenital malformations characterized by abnormal lymphatic tissues unable to develop normal lymphatic vessel communications (7). Cystic lymphangiomas are more common in men and can occur at any age, even though ~90% are found in children <2 years of age (7-10). Frequently, these lesions involve the head and the neck (11), while they are unusual in retroperitoneal locations (1,12-15). When they develop during the first two trimesters of pregnancy, cystic lymphangiomas are associated with genetic disorders such as Noonan syndrome (16) and chromosome 21 trisomy (17). By contrast, acquired forms may result from trauma, inflammation or lymphatic obstruction. Clinically, most cystic lymphangiomas result only in a soft, slow-growing mass, but they can eventually compress their surrounding structures, causing significant clinical consequences (1,18). Generally, cystic lymphangiomas are unilocular or multilocular cysts that contain a clear or milky fluid, with a single flattened endothelial layer lining them. Upon NMR, cystic lymphangioma typically demonstrates low T1 and high T2 signal intensity, with no significant enhancement on post-contrast images (1,19). Wall calcifications are rare.

A cystic teratoma is a neoplasm composed of different tissues that are not native to the region where it is generated. The neoplasm is composed of tissues that are derived from three germinal layers: the endoderm, the mesoderm and the ectoderm (20-22). These lesions can be classified as mature (benign) or immature (malignant), with cystic lesions being more likely to be benign and solid lesions generally associated with an immature and malignant behavior. Cystic teratomas generally arise within the gonadal and sacrococcygeal regions of adults and children, while they are much more infrequent at the retroperitoneum (23). The majority of cases are asymptomatic or associated with non-specific manifestations. The definitive diagnosis requires surgical excision of these lesions, with a curative intent in the case of mature (benign) teratoma (24). At the histopathological analysis, teratomas are easily recognized due to the mixture of mature components, including bone, squamous epithelium, glandular epithelium, stroma and muscle cells. At CT scan, a mature teratoma of the retroperitoneum manifests as a well circumscribed mass containing a fluid component, adipose tissue and calcifications (25). The presence of hypo-attenuating fat tissues within the cyst is considered highly suggestive of a cystic teratoma.

Mucinous cystadenomas are homogenous and well-defined unilocular cysts found in women with normal ovaries (26-29). The pathogenesis is unclear, although it has been suggested that these lesions arise from invagination of the peritoneum, with consequent mucinous metaplasia and cyst formation. The mucinous cystadenoma cysts are lined by a single layer of tall columnar epithelial cells, with pale cytoplasm and basal nuclei (30-32). Notably, even if benign per se, these lesions could transform into malignant cystadenocarcinoma (33-36). Upon CT scan, mucinous cystadenoma does not display specific characteristics over the other cystic retroperitoneal masses (37). Due to the potential differential diagnosis with other ovarian lesions, to rule out malignant lesions, exploratory

laparotomy with complete excision of the cysts should always be proposed (38).

Pseudomyxoma retroperitonei is a rare clinical condition that is often associated with the development of mucinous ascites as the consequence of a rupture of mucinous lesions (39,40). These lesions generally originate from the appendix and ovary, and, more rarely, from other primary sites, including the colon, stomach, pancreas and urachus (41). Pseudomyxoma of the retroperitoneum, also known as pseudomyxoma retroperitonei and pseudomyxoma extraperitonei, is extremely rare (42,43). Clinically, pseudomyxoma retroperitonei usually presents with abdominal or lumbar pain and the presence of a palpable mass. Occasionally, the formation of abscess, with a high fever, or discharge is possible and weight loss can also be observed. At CT, pseudomyxoma retroperitonei appears as masses that are usually multicystic and are characterized by the presence of septa or thick walls. Calcifications, either single spot or curvilinear, may be discovered (1).

Although the name evokes an image of malignant cancer, cystic mesotheliomas are mostly benign neoplasms that originate in the serous lining of the pleural, pericardial or peritoneal spaces (44). Peritoneal mesotheliomas affect mainly young women, and are characterized by cysts of variable size and number, with a single layer of benign mesothelial cells. With regard to causative factors, this lesion appears to be unrelated to asbestos exposure. The life expectancy of affected patients is normal due to the low occurrence of malignant transformation (45-47). The radiological appearance may be indistinguishable from lymphangiomas and other retroperitoneal cysts, with the lesions generally appearing as thin-walled multilocular cysts (48,49).

Tailgut cysts are rare congenital malformations that may present in the presacral space. The tailgut normally regresses by the 6th week of gestation, but if the mucous-secreting remnants fail to regress, a tailgut cyst is formed. These lesions are more frequently identified in middle-aged women (50), are generally asymptomatic and are only occasionally associated with symptoms due to compression (51,52). The major complication of tailgut cysts is the infection of the cysts themselves, leading to a condition that mimics perianal or pelvic abscesses (53). During pathological examination, tailgut cysts are typically lined by different types of epithelium, including columnar, transitional and squamous epithelium. The identification of glandular or transitional epithelium aids in the differential diagnosis with epidermoid and dermoid cysts. These lesions are mostly benign, but certain cases of malignant transformation have been reported (54). CT examination shows a well-defined multicystic mass, with values of density varying from that of water to that of soft tissues (55). On NMR, a tailgut cyst typically demonstrates low signal intensity on T1-weighted images and high signal intensity on T2-weighted images (56).

Epidermoid cysts are frequently occurring benign cutaneous tumors, however, they also rarely present as retroperitoneal cysts (57). One case has even been reported in the round ligament (58). At the histological analysis, the hallmark of epidermoid cysts is the presence of a squamous epithelium, with a mixture of desquamated debris, cholesterol, keratin and water. Upon CT scan, these lesions appear as unilocular cysts. The location in the presacral space can facilitate the differentiation from other pelvic masses (59). Notably, these lesions can be

better identified by MRI as hypo-intense on T1-weighted imaging and hyper-intense on T2-weighted imaging.

The bronchogenic cyst is a spherical cyst that originates as an embryonic out-pouching of the foregut or trachea during the fifth week of gestation. The cyst is generally found in the mediastinum or lungs and is usually asymptomatic. The major risk associated with these lesions is infection. However, it should be noted that these lesions may migrate to an atypical location. The occurrence of such cysts inside the retroperitoneal space is extremely rare, with a consequent highly challenging differential diagnosis (60-62). Upon histopathological analysis, bronchogenic cysts are mainly unilocular or oligolocular, with a pseudostratified ciliated columnar epithelial lining, and mucoid material, bronchial glands, smooth muscle and cartilage. Upon CT scan, bronchogenic cysts usually present as spherical lesions, with well-circumscribed smooth or lobulated borders. These lesions lack enhancement following intravenous contrast administration, while the occurrence of hyperattenuation should suggest concomitant hemorrhage or proteinaceous secretions inside the lesions (63). On MRI, bronchogenic cysts usually display an intermediate to high signal intensity on T1-weighted images and an high signal intensity on T2-weighted images (64,65). Even if generally asymptomatic, these lesions could eventually transform into malignant lesions (66), and should therefore always be removed (60).

Malignant neoplastic cysts include neurilemmoma, paraganglioma (only rarely cystic) and perianal mucinous carcinoma. Neurilemmoma is mostly a benign encapsulated tumor of the nerve sheath. This tumor is rarely found in the retroperitoneum, where it represents 0.3-3% of all Schwannomas. This disease presentation peaks at the fifth to sixth decades and can occur as part of neurofibromatosis type 2. While it is commonly a solid tumor, neurilemmoma can also undergo cystic degeneration, therefore posing as a cystic lesion (67-69). The cellular origin of this tumor is the Schwann cells, which originate from the neural crest. The lesions are generally well encapsulated, eccentric from their parent nerve, with a unique histological presentation that is characterized by Antoni A and B cells, and positivity for the S-100 antigen. Up to 60% of retroperitoneal Schwannomas display cystic degeneration, while 1% of retroperitoneal Schwannomas can behave with malignant features and be associated with cystic degeneration. Hemorrhage can occur in 5% of the cases, while calcification is rare. Upon CT scan, the lesions can be isodense to hypodense, with contrast enhancement (70,71).

Paragangliomas are rare neuroendocrine tumors originating from the autonomic ganglia, with pathological features indistinguishable from pheochromocytomas (72,73). Generally, these lesions are associated with hormone secretion (catecholamines), with a high rate of malignant behavior (up to 25%) (74,75). The occurrence of paraganglioma peaks at the third to fifth decades, with a higher female incidence. Clinically, these lesions may be totally asymptomatic, particularly if non-functional, or occur with abdominal pain, nausea, emesis, abdominal distension and weight loss. By contrast, secreting forms may occur with paroxysmal hypertension, palpitations and profuse sweating. Paragangliomas are mostly benign tumors with an overall good prognosis, but almost one-third of cases can be locally invasive and metastatic. Upon CT scan, paragangliomas are well-circumscribed masses,

with contrast enhancement due to increased vascularization. Upon MRI, paragangliomas are hypointense or isointense to the liver parenchyma on T1-weighted images and markedly hyperintense on T2-weighted images (76,77). In certain cases, scintigraphy with iodine-123-labeled metaiodobenzylguanidine can facilitate the diagnosis due to its superior specificity compared with CT and MRI imaging (78).

Perianal mucinous carcinoma is a rare carcinoma characterized by abundant mucin production (79,80). Perianal involvement constitutes ~2% of colorectal cancer and is more prevalent in middle-aged men. Notably, mucinous adenocarcinoma appears to either cause fistulation or be a potential consequence of a chronic fistula (81,82). At the pathological examination, these lesions are characterized by well-differentiated neoplastic glands associated with large lakes of mucin. On CT scan, perianal mucinous adenocarcinoma typically presents as a multiloculated cystic mass, with the possible presence of septal calcifications. Upon MRI, these lesions appears as masses filled with a markedly hyperintense content on T2-weighted images (83,84).

Non-neoplastic lesions are a group of retroperitoneal lesions composed of pancreatic pseudocysts, non-pancreatic pseudocysts, lymphoceles, urinoma and hematoma. Pancreatic pseudocysts are well described and well known among clinicians (85,86). These lesions collect pancreatic secretions, including pancreatic amylases and lipases. The identification of these enzymes inside the cysts allows an easy diagnosis (87). The lesions commonly originate as extensions from the diseased pancreas, but could also migrate to different sites of the retroperitoneal space (88). Generally, these lesions are identified simultaneously with the diagnosis of pancreatic inflammation.

Non-pancreatic pseudocysts originate from the mesentery and/or the omentum, and are characterized by a fibrous wall (5,89,90). As an important diagnostic element to differentiate them from pancreatic pseudocysts, these lesions do not contain amylase.

Lymphoceles are a common consequence of a lymphadenectomy and/or urological surgery (91,92). These lesions are generated due to the disruption of normal lymph flow channels, causing the accumulation of the liquid in anatomical spaces without epithelial delimitation.

Urinomas are characterized by encapsulated extravasated urine (93). As a consequence of surgery, trauma or invasive procedures, urine can extravasate and accumulate in anatomical spaces.

Blood extravasation in the retroperitoneal space in the form of a hematoma is generally a consequence of trauma (94), the rupture of aneurisms and/or anticoagulation.

Overall, the identification of retroperitoneal cystic lesions is always a challenging diagnostic dilemma. As has been reviewed in the present study, following a previously reported classification and review (63), cystic lesions of the retroperitoneal space include either non-neoplastic lesions, or benign and malignant neoplasms. CT and/or MRI are mandatory to achieve a putative diagnosis (95). However, a dilemma exists as to whether clinicians should always further investigate the lesions with biopsy and/or surgical removal. The present study also described the management of a single patient who presented with a cystic mass of the

retroperitoneum and signs/symptoms due to compression of vessels and abdominal structures. The original diagnostic approach consisted of sonography-guided drainage of the lesion. This approach allowed a reduction in the compression of the surrounding structures and the analysis of the nature of the cystic liquid. Notably, no neoplastic cells, bacteria or pancreatic enzymes were detectable. In the absence of these elements, the precise diagnosis of this lesion was only speculative. Upon consideration of the risks of surgical examination of this region, which was located between the aorta and cava, it was decided that the evolution of the residual lesion should be monitored only. Notably, after 3 and then 6 months, no relapse of the cystic lesion was observed. As time has passed, a lack of relapse has confirmed the benign nature of the cystic lesion. The present study described this clinical case and reviewed the literature to emphasize how retroperitoneal cystic lesions must be managed case by case, based on surgical removal risks, CT scan data and percutaneous interventional drainage procedures. Not all lesions should undergo invasive diagnostic procedures, and therefore, a challenging close follow-up approach may be mandatory.

Acknowledgements

The authors would like to thank all the members of the Division of Internal Medicine and the Department of Radiology of San Luigi Hospital (Orbassano, Italy), for providing assistance and useful discussions.

References

1. Yang DM, Jung DH, Kim H, Kang JH, Kim SH, Kim JH and Hwang HY: Retroperitoneal cystic masses: CT, clinical, and pathologic findings and literature review. *Radiographics* 24: 1353-1365, 2004.
2. Scali EP, Chandler TM, Heffernan EJ, Coyle J, Harris AC and Chang SD: Primary retroperitoneal masses: What is the differential diagnosis? *Abdom Imaging* 40: 1887-1903, 2015.
3. Renzulli P and Candinas D: Symptomatic retroperitoneal cyst: A diagnostic challenge. *Ann R Coll Surg Engl* 91: W9-W11, 2009.
4. Osman S, Lehnert BE, Elojeimy S, Cruite I, Mannelli L, Bhargava P and Moshiri M: A comprehensive review of the retroperitoneal anatomy, neoplasms and pattern of disease spread. *Curr Probl Diagn Radiol* 42: 191-208, 2013.
5. Tan JJ, Tan KK and Chew SP: Mesenteric cysts: An institution experience over 14 years and review of literature. *World J Surg* 33: 1961-1965, 2009.
6. Tirkas T, Sandrasegaran K, Patel AA, Hollar MA, Tejada JG, Tann M, Akisik FM and Lappas JC: Peritoneal and retroperitoneal anatomy and its relevance for cross-sectional imaging. *Radiographics* 32: 437-451, 2012.
7. Ha J, Yu YC and Lannigan F: A review of the management of lymphangiomas. *Curr Pediatr Rev* 10: 238-248, 2014.
8. Gümüştas OG, Sanal M, Güner O and Tümay V: Retroperitoneal cystic lymphangioma: A diagnostic and surgical challenge. *Case Rep Pediatr* 2013: 292053, 2013.
9. Makni A, Chebbi F, Fetirich F, Ksantini R, Bedioui H, Jouini M, Kacem M and Ben Safta Z: Surgical management of intra-abdominal cystic lymphangioma. Report of 20 cases. *World J Surg* 36: 1037-1043, 2012.
10. Waldhausen JH, Holterman MJ and Tapper D: Identification and surgical management of cystic retroperitoneal lymphangioma in children. *Pediatr Surg Int* 11: 283-285, 1996.
11. Adams MT, Saltzman B and Perkins JA: Head and neck lymphatic malformation treatment: A systematic review. *Otolaryngol Head Neck Surg* 147: 627-639, 2012.
12. Nuzzo G, Lemmo G, Marrocco-Trischitta MM, Boldrini G and Giovannini I: Retroperitoneal cystic lymphangioma. *J Surg Oncol* 61: 234-237, 1996.
13. Bhavsar T, Saeed-Vafa D, Harbison S and Inniss S: Retroperitoneal cystic lymphangioma in an adult: A case report and review of the literature. *World J Gastrointest Pathophysiol* 1: 171-176, 2010.
14. Richmond B and Kister N: Adult presentation of giant retroperitoneal cystic lymphangioma: Case report. *Int J Surg* 7: 559-560, 2009.
15. Hauser H, Mischinger HJ, Beham A, Berger A, Cerwenka H, Razmara J, Fruhwirth H and Werkgartner G: Cystic retroperitoneal lymphangiomas in adults. *Eur J Surg Oncol* 23: 322-326, 1997.
16. Zarabi M, Mieczkowski GC and Mazer J: Cystic hygroma associated with Noonan's syndrome. *J Clin Ultrasound* 11: 398-400, 1983.
17. Gedikbasi A, Gul A, Sargin A and Ceylan Y: Cystic hygroma and lymphangioma: Associated findings, perinatal outcome and prognostic factors in live-born infants. *Arch Gynecol Obstet* 276: 491-498, 2007.
18. Umap PS: Intra-abdominal cystic lymphangioma. *Indian J Cancer* 31: 111-113, 1994.
19. Hayami S, Adachi Y, Ishigooka M, Suzuki H, Sasagawa I, Kubota Y and Nakada T: Retroperitoneal cystic lymphangioma diagnosed by computerized tomography, magnetic resonance imaging and thin needle aspiration. *Int Urol Nephrol* 28: 21-26, 1996.
20. Ashley DJ: Origin of teratomas. *Cancer* 32: 390-394, 1973.
21. Gatcombe HG, Assikis V, Kooby D and Johnstone PA: Primary retroperitoneal teratomas: A review of the literature. *J Surg Oncol* 86: 107-113, 2004.
22. Gschwend J, Burke TW, Woodward JE and Heller PB: Retroperitoneal teratoma presenting as an abdominal-pelvic mass. *Obstet Gynecol* 70: 500-502, 1987.
23. Sasi W, Ricchetti GA, Parvanta L and Carpenter R: Giant mature primary retroperitoneal teratoma in a young adult: Report of a rare case and literature review. *Case Rep Surg* 2014: 930538, 2014.
24. Liu H, Li W, Yang W and Qi Y: Giant retroperitoneal teratoma in an adult. *Am J Surg* 193: 736-737, 2007.
25. Davidson AJ, Hartman DS and Goldman SM: Mature teratoma of the retroperitoneum: Radiologic, pathologic, and clinical correlation. *Radiology* 172: 421-425, 1989.
26. Yan SL, Lin H, Kuo CL, Wu HS, Huang MH and Lee YT: Primary retroperitoneal mucinous cystadenoma: Report of a case and review of the literature. *World J Gastroenterol* 14: 5769-5772, 2008.
27. Matsubara M, Shiozawa T, Tachibana R, Hondo T, Osasda K, Kawaguchi K, Kimura K and Konishi I: Primary retroperitoneal mucinous cystadenoma of borderline malignancy: A case report and review of the literature. *Int J Gynecol Pathol* 24: 218-223, 2005.
28. Tapper EB, Shrewsbury AB, Oprea G and Majmudar B: A unique benign mucinous cystadenoma of the retroperitoneum: A case report and review of the literature. *Arch Gynecol Obstet* 281: 167-169, 2010.
29. Bortolozzi G, Grasso A and Zasso B: Mucinous cystadenoma of the retroperitoneum. A case report and review. *Eur J Gynaecol Oncol* 16: 65-68, 1995.
30. Demirel D, Gun I, Kucukodaci Z, Balta AZ and Ramzy I: Primary retroperitoneal mucinous cystadenoma with a sarcoma-like mural nodule: An immunohistochemical study with histogenetic considerations and literature review. *Int J Gynecol Pathol* 32: 15-25, 2013.
31. Papadogiannakis N, Gad A and Ehliar B: Primary retroperitoneal mucinous tumor of low malignant potential: Histogenetic aspects and review of the literature. *APMIS* 105: 483-486, 1997.
32. Hart WR: Mucinous tumors of the ovary: A review. *Int J Gynecol Pathol* 24: 4-25, 2005.
33. Lee IW, Ching KC, Pang M and Ho TH: Two cases of primary retroperitoneal mucinous cystadenocarcinoma. *Gynecol Oncol* 63: 145-150, 1996.
34. Tangjitgamol S, Manusirivithaya S, Sheanakul C, Leelahakorn S, Thawaramara T and Kaewpila N: Retroperitoneal mucinous cystadenocarcinoma: A case report and review of literature. *Int J Gynecol Cancer* 12: 403-408, 2002.
35. Pearl ML, Valea F, Chumas J and Chalas E: Primary retroperitoneal mucinous cystadenocarcinoma of low malignant potential: A case report and literature review. *Gynecol Oncol* 61: 150-152, 1996.
36. Nelson H, Benjamin B and Alberty R: Primary retroperitoneal mucinous cystadenocarcinoma. *Cancer* 61: 2117-2121, 1988.
37. Zaheer A, Pokharell SS, Wolfgang C, Fishman EK and Horton KM: Incidentally detected cystic lesions of the pancreas on CT: Review of literature and management suggestions. *Abdom Imaging* 38: 331-341, 2013.

38. Bakker RF, Stoot JH, Blok P and Merkus JW: Primary retroperitoneal mucinous cystadenoma with sarcoma-like mural nodule: A case report and review of the literature. *Virchows Arch* 451: 853-857, 2007.
39. Harshen R, Jyothirmayi R and Mithal N: Pseudomyxoma peritonei. *Clin Oncol (R Coll Radiol)* 15: 73-77, 2003.
40. Sherer DM, Abulafia O and Eliakim R: Pseudomyxoma peritonei: A review of current literature. *Gynecol Obstet Invest* 51: 73-80, 2001.
41. Niwa H, Hiramatsu T and Ishihara Y: Clinical challenges and images in GI. Pseudomyxoma retroperitonei. *Gastroenterology* 133: 14, 372, 2007.
42. Smeenk RM, Verwaal VJ and Zoetmulder FA: Pseudomyxoma peritonei. *Cancer Treat Rev* 33: 138-145, 2007.
43. Ioannidis O, Cheva A, Paraskevas G, Papadimitriou N, Konstantara A, Chatzopoulos S, Kotronis A, Makrantonakis A and Kakoutis E: Pseudomyxoma retroperitonei: Report of 2 cases and review of the literature. *Rev Esp Enferm Dig* 104: 268-275, 2012.
44. Wang TB, Dai WG, Liu DW, Shi HP and Dong WG: Diagnosis and treatment of benign multicystic peritoneal mesothelioma. *World J Gastroenterol* 19: 6689-6692, 2013.
45. Murro D, Harbhajanka A, Mahon B and Deziel D: Benign cystic mesothelioma associated with ipsilateral renal agenesis: A case report and review of literature. *Pediatr Dev Pathol* 17: 487-490, 2014.
46. Park JY, Kim KW, Kwon HJ, Park MS, Kwon GY, Jun SY and Yu ES: Peritoneal mesotheliomas: Clinicopathologic features, CT findings, and differential diagnosis. *AJR Am J Roentgenol* 191: 814-825, 2008.
47. Pickhardt PJ and Bhalla S: Primary neoplasms of peritoneal and sub-peritoneal origin: CT findings. *Radiographics* 25: 983-995, 2005.
48. O'Neil JD, Ros PR, Storm BL, Buck JL and Wilkinson EJ: Cystic mesothelioma of the peritoneum. *Radiology* 170: 333-337, 1989.
49. Li YP, Guico R, Parikh S and Chiu S: Cystic mesothelioma of the retroperitoneum. *J Clin Ultrasound* 20: 65-68, 1992.
50. Haydar M and Griepentrog K: Tailgut cyst: A case report and literature review. *Int J Surg Case Rep* 10: 166-168, 2015.
51. Hansen NH and Qvist N: Tailgut cyst prolapsing through the anus. *Eur J Pediatr Surg* 23: e3-e4, 2013.
52. Leo JM, O'Connor KM, Pezim M, Nagy A and Schaeffer DF: Benign tailgut cyst masquerading as a hemorrhoid. *Can J Gastroenterol Hepatol* 28: 183, 2014.
53. Johnson KN, Young-Fadok TM, Carpentieri D, Acosta JM and Notrica DM: Case report: Misdiagnosis of tailgut cyst presenting as recurrent perianal fistula with pelvic abscess. *J Pediatr Surg* 48: e33-e36, 2013.
54. Graadt van Roggen JF, Welvaart K, de Roos A, Offerhaus GJ and Hogendoorn PC: Adenocarcinoma arising within a tailgut cyst: Clinicopathological description and follow up of an unusual case. *J Clin Pathol* 52: 310-312, 1999.
55. Johnson AR, Ros PR and Hjermstad BM: Tailgut cyst: Diagnosis with CT and sonography. *AJR Am J Roentgenol* 147: 1309-1311, 1986.
56. Afalo-Hazan V, Rousset P, Mourra N, Lewin M, Azizi L and Hoefel C: Tailgut cysts: MRI findings. *Eur Radiol* 18: 2586-2593, 2008.
57. Fdili Alaoui FZ, Oussaden A, Bouguern H, El Fatemi H, Melhouf MA, Amarti A and Ait Taleb K: Giant pelvic retroperitoneal epidermoid cyst: A rare case report. *Case Rep Med* 2012: 981387, 2012.
58. Kim T and Feranec JB: Epidermoid cyst of round ligament: Case report and review of literature. *J Minim Invasive Gynecol* 18: 126-127, 2011.
59. Yang DM, Yoon MH, Kim HS, Oh YH, Ha SY, Oh JH, Chung HS and Kim HS: Presacral epidermoid cyst: Imaging findings with histopathologic correlation. *Abdom Imaging* 26: 79-82, 2001.
60. Govaerts K, Van Eyken P, Verswijvel G and Van der Speeten K: A bronchogenic cyst, presenting as a retroperitoneal cystic mass. *Rare Tumors* 4: e13, 2012.
61. O'Neal PB, Moore FD, Gawande A, Cho NL, King EE, Moalem J and Ruan D: Bronchogenic cyst masquerading as an adrenal tumor: A case of mistaken identity. *Endocr Pract* 18: e102-e105, 2012.
62. Liang MK, Yee HT, Song JW and Marks JL: Subdiaphragmatic bronchogenic cysts: A comprehensive review of the literature. *Am Surg* 71: 1034-1041, 2005.
63. Dong B, Zhou H, Zhang J, Wang Y and Fu Y: Diagnosis and treatment of retroperitoneal bronchogenic cysts: A case report. *Oncol Lett* 7: 2157-2159, 2014.
64. McAdams HP, Kirejczyk WM, Rosado-de-Christenson ML and Matsumoto S: Bronchogenic cyst: Imaging features with clinical and histopathologic correlation. *Radiology* 217: 441-446, 2000.
65. Murakami R, Machida M, Kobayashi Y, Ogura J, Ichikawa T and Kumazaki T: Retroperitoneal bronchogenic cyst: CT and MR imaging. *Abdom Imaging* 25: 444-447, 2000.
66. Sullivan SM, Okada S, Kudo M and Ebihara Y: A retroperitoneal bronchogenic cyst with malignant change. *Pathol Int* 49: 338-341, 1999.
67. Dede M, Yagci G, Yenen MC, Gorgulu S, Deveci MS, Cetiner S and Dilek S: Retroperitoneal benign schwannoma: Report of three cases and analysis of clinico-radiologic findings. *Tohoku J Exp Med* 200: 93-97, 2003.
68. Goh BK, Tan YM, Chung YF, Chow PK, Ooi LL and Wong WK: Retroperitoneal schwannoma. *Am J Surg* 192: 14-18, 2006.
69. Fass G, Hossey D, Nyst M, Smets D, Saligheh EN, Duttman R, Claes K and da Costa PM: Benign retroperitoneal schwannoma presenting as colitis: A case report. *World J Gastroenterol* 13: 5521-5524, 2007.
70. Li Q, Gao C, Juzi JT and Hao X: Analysis of 82 cases of retroperitoneal schwannoma. *ANZ J Surg* 77: 237-240, 2007.
71. Hughes MJ, Thomas JM, Fisher C and Moskovic EC: Imaging features of retroperitoneal and pelvic schwannomas. *Clin Radiol* 60: 886-893, 2005.
72. Verma A, Pandey D, Akhtar A, Arsia A and Singh N: Non-functional paraganglioma of retroperitoneum mimicking pancreatic mass with concurrent urinary bladder paraganglioma: An extremely rare entity. *J Clin Diagn Res* 9: XD09-XD11, 2015.
73. Lee KY, Oh YW, Noh HJ, Lee YJ, Yong HS, Kang EY, Kim KA and Lee NJ: Extraadrenal paragangliomas of the body: Imaging features. *AJR Am J Roentgenol* 187: 492-504, 2006.
74. Kiernan CM and Solórzano CC: Pheochromocytoma and Paraganglioma: Diagnosis, genetics, and treatment. *Surg Oncol Clin N Am* 25: 119-138, 2016.
75. Burnichon N, Buffet A and Gimenez-Roqueplo AP: Pheochromocytoma and paraganglioma: Molecular testing and personalized medicine. *Curr Opin Oncol* 28: 5-10, 2016.
76. Nishino M, Hayakawa K, Minami M, Yamamoto A, Ueda H and Takasu K: Primary retroperitoneal neoplasms: CT and MR imaging findings with anatomic and pathologic diagnostic clues. *Radiographics* 23: 45-57, 2003.
77. Rha SE, Byun JY, Jung SE, Chun HJ, Lee HG and Lee JM: Neurogenic tumors in the abdomen: Tumor types and imaging characteristics. *Radiographics* 23: 29-43, 2003.
78. Srirangalingam U, Khoo B, Walker L, MacDonald F, Skelly RH, George E, Spooner D, Johnston LB, Monson JP, Grossman AB, *et al*: Contrasting clinical manifestations of SDHB and VHL associated chromaffin tumours. *Endocr Relat Cancer* 16: 515-525, 2009.
79. Deruyter L, Venken R and Maetens M: Perianal mucinous adenocarcinoma arising from a chronic fistula-in-ano. *Acta Chir Belg* 114: 410-413, 2014.
80. Hongo K, Kazama S, Sunami E, Kitayama J and Watanabe T: Perianal adenocarcinoma associated with anal fistula: A report of 11 cases in a single institution focusing on treatment and literature review. *Hepatogastroenterology* 60: 720-726, 2013.
81. Yang BL, Shao WJ, Sun GD, Chen YQ and Huang JC: Perianal mucinous adenocarcinoma arising from chronic anorectal fistulae: A review from single institution. *Int J Colorectal Dis* 24: 1001-1006, 2009.
82. Ho CM, Tan CH and Ho BC: Clinics in diagnostic imaging (143). Perianal mucinous adenocarcinoma arising from chronic fistula-in-ano. *Singapore Med J* 53: 843-849, 2012.
83. Hama Y, Makita K, Yamana T and Dodanuki K: Mucinous adenocarcinoma arising from fistula in ano: MRI findings. *AJR Am J Roentgenol* 187: 517-521, 2006.
84. Santos MD, Nogueira C and Lopes C: Mucinous adenocarcinoma arising in chronic perianal fistula: Good results with neoadjuvant chemoradiotherapy followed by surgery. *Case Rep Surg* 2014: 386150, 2014.
85. Gumaste VV and Aron J: Pseudocyst management: Endoscopic drainage and other emerging techniques. *J Clin Gastroenterol* 44: 326-331, 2010.
86. Brugge WR: Diagnosis and management of cystic lesions of the pancreas. *J Gastrointest Oncol* 6: 375-388, 2015.
87. Ngamruengphong S and Lennon AM: Analysis of pancreatic cyst fluid. *Surg Pathol Clin* 9: 677-684, 2016.
88. Karoumpalis I and Christodoulou DK: Cystic lesions of the pancreas. *Ann Gastroenterol* 29: 155-161, 2016.

89. Prudnick C, Turnbull J, Jarosz S, Hofeldt M and Richmond B: Benign mesothelial mesenteric cyst: Case report and literature review. *W V Med J* 111: 20-21, 2015.
90. Pozzi G, Ferrarese A, Busso M, Borello A, Catalano S, Surace A, Marola S, Gentile V, Martino V, Solej M and Nano M: Percutaneous drainage and sclerosis of mesenteric cysts: Literature overview and report of an innovative approach. *Int J Surg* 12 (Suppl 2): S90-S93, 2014.
91. Karcaaltincaba M and Akhan O: Radiologic imaging and percutaneous treatment of pelvic lymphocele. *Eur J Radiol* 55: 340-354, 2005.
92. Glass LL and Cockett AT: Lymphoceles: Diagnosis and management in urologic patients. *Urology* 51 (5A Suppl): S135-S140, 1998.
93. Adorisio O, Silveri M, Colajacomo M, Bassani F and Rivosecchi M: The impact of perinatal urinoma formation on renal function: Our experience and review of the literature. *J Paediatr Child Health* 47: 217-222, 2011.
94. Manzini N and Madiba TE: The management of retroperitoneal haematoma discovered at laparotomy for trauma. *Injury* 45: 1378-1383, 2014.
95. Ayyappan AP, Jhaveri KS and Haider MA: Radiological assessment of mesenteric and retroperitoneal cysts in adults: Is there a role for chemical shift MRI? *Clin Imaging* 35: 127-132, 2011.