

Case Report

Extra-pelvic endometriosis presenting as recurrent hepatic cyst: case report and literature review

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ABSTRACT

Hepatic endometriosis is a very rare form of endometriosis first described by Rokitansky in 1986. To our knowledge, 42 cases of hepatic endometriosis have been reported in the literature till date. The condition offers a diagnostic challenge owing to its variable presentation on imaging and the need for histological and immunohistochemical evidence for a definite diagnosis. We hereby present the 43rd case of ectopic endometrium in the liver of a 30 years old, multiparous female who presented with fever and pain in the right hypochondrium. Radiological imaging suggested a cystic lesion which was managed laparoscopically. Histopathology and immunohistochemistry findings came out to be consistent with endometriosis. The case highlighted the importance of considering endometriosis as a differential in all women irrespective of age and previous history of endometriosis.

Keywords: Endometriosis, Cyst, Hepatic endometriosis, Liver endometriosis, Case report

INTRODUCTION

Endometriosis is a benign gynecological disorder first described in 1860. It is characterized by the presence of uterine endometrial tissue outside of normal location mainly on pelvic peritoneum, in ovaries and fallopian tubes. Endometriosis usually affects 5-10% of women of reproductive age out of which extra-pelvic type of endometriosis is extremely rare. Extra-pelvic endometriosis refers to the presence of ectopic endometrium in extra-pelvic locations such as lungs, pleura, kidneys, bladder, abdominal wall, umbilicus, and cesarean section scar among others. Gastrointestinal tract is the most common location of extra-pelvic endometriosis while urinary tract is the second one. Extra-pelvic endometriosis usually affects a slightly older population of women compared to pelvic endometriosis.¹ Involvement of almost every organ has been described except the spleen.² Hepatic endometriosis is an extremely rare form

of extra-pelvic endometriosis. There is a very limited data available on hepatic form of extra-pelvic endometriosis and our review is an addition to the available data. This form of endometriosis presents as a diagnostic dilemma because the only form of definitive diagnosis is via postoperative histopathology of the tissue. The aim of the review was to highlight rare form of extra-pelvic endometriosis so that it is kept as a differential in any woman presenting with hepatic cystic lesion. A thorough review of the literature showed that till now only 42 cases of hepatic endometriosis have been discovered making our case the 43rd case.

CASE REPORT

A 30-years-old multiparous woman presented with a one-month history of abdominal pain. Her past surgical history included an appendectomy performed at 12 years of age. At the age of 22 years, she got her first pregnancy, during

which a hepatic cyst was found as an incidental finding. Its ultrasonographic findings suggested a hemangioma of 3.3×2.5 cm in segment 8 and another 6×4.5 cm cystic lesion in the right lobe of the liver (segment 5-6). There were multiple cysts within the cyst suggestive of hydatid cyst of the liver, which was asymptomatic and hence, left untreated. She had history of regular menstruation of 6/28 days and normal flow. There was no history of animal contact, smoking or any other addiction. Her physical examination demonstrated right hypochondrial tenderness and a palpable mass of about 18×15 cm in right hypochondrium almost occupying whole of the abdomen. Rest of systemic examination was unremarkable.

Blood complete picture, liver and renal function tests levels were normal. Viral serology for hepatitis B, C and HIV were negative and alpha feto-protein levels were within normal limits. ELISA for IgG antibodies against echinococcus granulosus was negative.

Computed tomography scan of the abdomen showed a 29×18×18 cm cyst with its main bulk occupying the right lobe of liver and protruding into the abdomen, replacing the left lobe of liver. The cyst displaced the right kidney inferiorly and posteriorly. The features were suggestive of a hydatid cyst or cystadenoma (Figure 1 and 2).

Per-operative findings included a 38×21 cm hepatic cyst and 4500 ml fluid with contents evacuated with a 10 mm trochar. Laparoscopic subtotal hepatic cystectomy was performed along-with saucerisation of the cavity. Omentum was placed over the remaining wall. Biopsies were taken from the cyst wall and fluid was sent for cytology. Post-operative biochemical parameters were normal and patient was sent home on 3rd post-operative day. Histopathological analysis of the cyst wall showed denuded epithelium. No evidence of hydatid cyst was found and cytology was normal.

2 weeks later, patient presented again with pain, fever and drain collection of 100ml per day throughout the post-operative period. On repeat CT scan, a large multiloculated hypodense lesion in the right lobe of liver occupying segment 5, 6, 7 and 8 measuring 12×9×19 cm and had internal septations. CT guided drain was placed, pus aspirated and sample sent for culture and sensitivity. Patient's pain did not improve and laparoscopic hepatic cyst excision was planned. Per-operatively multiple hepatic cysts involving segments 5 and 6 of the liver were found. Cystic cavity was entered, contents evacuated and complete excision of cyst wall was done working on liver parenchyma. Drain was placed in the cavity of the excised cyst. Pus was sent for culture and sensitivity and sample of cyst wall along with liver parenchyma for histopathology and immunohistochemistry. Histopathology of the sample showed underlying stroma with focal areas of glands lined by cuboidal epithelium with hemosiderin laden macrophages in surrounding stroma. Occasional foci of hemorrhage were also seen (Figure 3).

Immunohistochemistry showed CD10 and ER positivity of stroma cells (Figure 4). This gave a definitive diagnosis of hepatic endometriotic cyst. The patient was given oral contraceptives for 2 months and became completely asymptomatic later on.

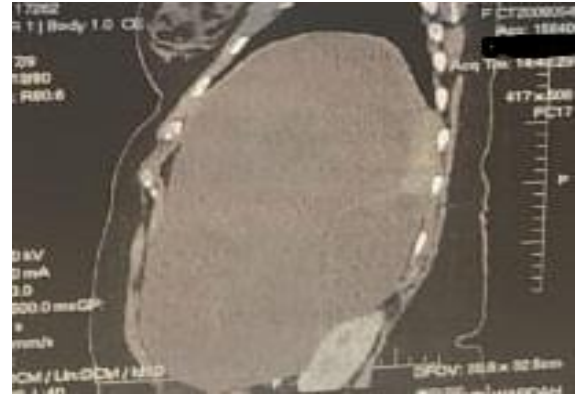


Figure 1: CT scan showing cyst occupying right lobe of liver.

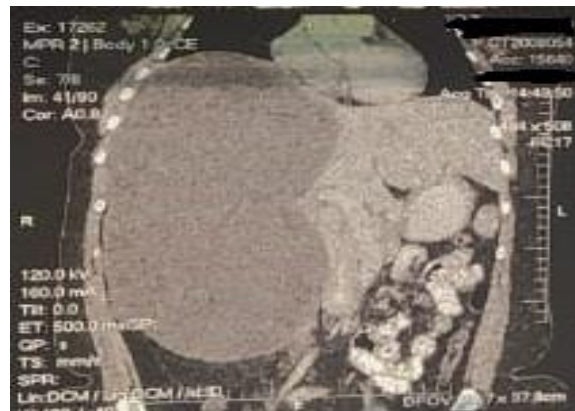


Figure 2: CT scan image showing the hepatic cyst occupying right lobe of liver.

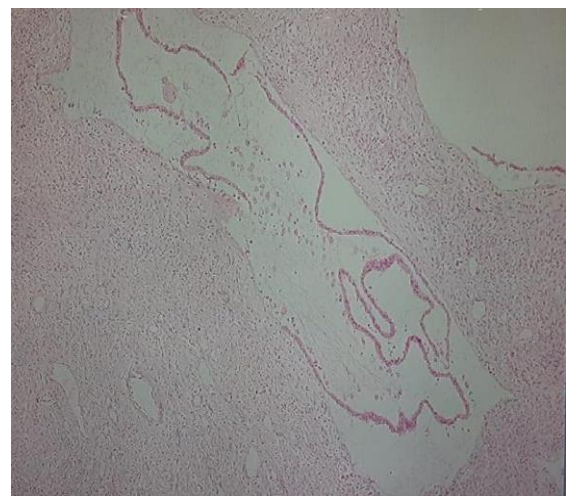


Figure 3: Histopathology section of the specimen demonstrating stroma with focal areas of glands. Occasional foci of hemorrhage are also seen.

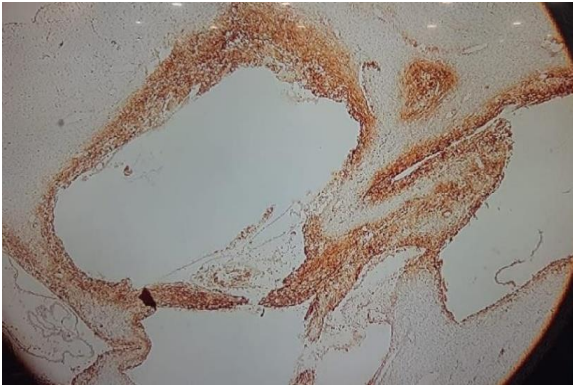


Figure 4: Immunohistochemistry section showing CD10 and ER positivity of stromal cells.

Search strategy

Three electronic databases (Pubmed, Google scholar and Pascal and Francis bibliographic database) were searched. 110 articles on Pubmed, 220 articles on google scholar and 10 articles were found in Pascal and Francis bibliographic databases. Existing literature for articles was reviewed with no date restrictions. The following keywords were used; 'hepatic endometriosis', 'endometrial liver cyst', 'endometrial hepatic cyst', 'atypical endometriosis' and 'extra-pelvic endometriosis'. Search was limited to studies conducted in humans.

Inclusion criteria

All types of publications on women presenting with hepatic endometriosis were included. The titles and abstracts of all identified articles were screened. Articles consisting of reviews and animal studies were not included in the analysis and tabulation. Articles in languages other than English were excluded. Articles reporting hepatic metastasis of endometrial stromal sarcoma or malignant transformation of hepatic endometriosis were also excluded. Articles that reported the relevant cases regarding the presentation, history, management and outcomes of hepatic endometriosis were further screened. Of the 42 cases of hepatic endometriosis, a total of 30 articles are included in the tabulation. Among the 12 excluded articles, 4 were excluded because of language restrictions, 2 on the basis of insufficient data on the basis of being metastatic or malignant disease and one because of duplicate publication.³⁻⁷

Data extraction

Full text articles of the studies fulfilling the inclusion criteria were retrieved. The parameters included in the study were age, parity, pre/post-menopausal status, previous history of endometriosis, past surgical history, duration and presentation of complaints, surgery performed, per-operative findings and histopathological/immunohistochemical findings of the specimen, and outcome if mentioned. Moreover, the

radiological imaging findings including ultrasonography, computed tomography scan (CT scan) and magnetic resonance imaging (MRI) were studied and tabulated.

DISCUSSION

Endometriosis is a common gynecological disease characterized by the presence of endometrial glands and stroma outside the location i.e.; the uterus. Atypical endometriosis is the presence of ectopic endometrial tissue on structures outside the pelvis such as the lungs, gastrointestinal tract, urinary system and the brain. Hepatic endometriosis is a very rare condition and presents as a diagnostic dilemma.

There are several theories explaining the pathogenesis of endometriosis. Oldest accepted theory is that of retrograde menstruation, initially proposed by Sampson in the 1920s. Retrograde flow of sloughed off endometrial tissue through the patent fallopian tubes and its subsequent implantation to extrauterine sites explains most cases of pelvic endometriosis. But this theory doesn't explain the endometriosis found in distant sites as in our case. According to coelomic metaplasia theory, specialized cells from the mesothelial lining of visceral and abdominal peritoneal tissue can transform into endometrial tissue under the influence of certain endogenous stimuli including hormones and immunologic factors. In our case of intraparenchymal location of hepatic endometriosis, this theory doesn't explain the pathogenesis. The induction theory says that defective embryogenesis leads to endometriosis. According to this concept, residual embryonic cells of Wolffian or Mullerian ducts origin develop into endometriotic tissue later in life when exposed to estrogen. These theories do not account for the disseminated spread of endometriotic tissue to rare sites such as thoracic cavity, lymph nodes and in our case, in the liver. Another theory of benign metaplasia suggests the dissemination of endometrial cells via hematological and lymphatic routes.⁸⁻¹⁰ This might explain the occurrence of endometrial tissue in the hepatic parenchyma. Environmental toxins like dioxin may mimic estrogen and interact with estrogen receptors leading to endometriosis. There is a positive association between environmental exposure to dioxins, organochlorine pesticides, bisphenols, phthalates and endometriosis. These chemicals are disruptors of endocrine function.¹¹ Our patient had exposure to environmental pollutants and the water supply in her house had been contaminated with nuclear toxins from a nuclear plant in the vicinity. But this positive association still needs more evidence.

Of all the cases studies till now, pre-operative diagnosis was very difficult to be made since the history, examination and radiographic findings suggest a mixed picture that mimics an echinococcal cyst, abscess, hematoma, cystadenoma, cystadenocarcinoma or cystic metastasis in the liver lobes. Gold standard to diagnose is the postoperative histopathology of the tissue. The purpose of our study was to review the cases already present in the

literature and to add in it our rare case. A thorough review of the literature showed very little evidence of the coincidence of symptoms with the menstrual cycle nor a definitive association with previous history of pelvic endometriosis hence a significant gynaecological history might not be very helpful in the preoperative diagnosis of hepatic endometriosis. In any case, whenever a woman presents with a cystic liver mass, irrespective of past history of endometriosis or previous history of gynaecological surgery or pre/post-menopausal status, differentials should always include hepatic endometriosis.

There was yet more data to be collected on whether surgery serves as the only treatment or hormonal therapy can be chosen as an alternative but owing to the risk of malignant transformation, first line treatment of such lesions is surgical resection with adequate safety margins.

The occurrence of endometriosis in postmenopausal women can be explained in the women with a previous history of endometriosis or who received hormone replacement therapy by the presence and activation of endometrial implants. The cases with no prior history of endometriosis might have been asymptomatic in the reproductive age.¹²

Our review covers all possible aspects of the cases studied till now. Table 1 and 2 includes details of presentation, history, treatment and outcome and Table 2 is a thorough summary of the radiographic imaging details of all the cases. Our review included patients ranging from age group 21 to 70 years with a mean age of 42.5 years. Both nulliparous and multiparous women presented with the condition. 13 of the 30 (43%) cases reported were postmenopausal showing that the condition cannot be ruled out in menopausal age group. 12 of the 30 cases (40%) had a prior history of endometriosis. About the past surgical history, like in our case 19 women (63%) had a previous history of surgical intervention. Majority of the cases presented with an average of 12 months history of epigastric or right upper quadrant abdominal pain but only

1 patient had its association with menstruation. 2 cases presented with hepatic cyst as an incidental finding like our case. Among all the cases studied, the right lobe was involved in the majority (66%) of the cases. Among the cases that mentioned the details regarding lab values, the majority including our case had liver tests in the normal range. Radiographic studies showed the use of ultrasound, CT and MRI as the frequently used modalities. Typical ultrasound findings included well-defined cystic masses in the liver lobes with septations. CT findings included low density lesions that are non-enhancing or poorly enhancing. MRI findings were variable depending on the various degrees of hemorrhage due to hormonal stimulation in endometrial implants. However, the common MRI findings demonstrated signal intensity on T1 and T2 weighted images similar to that of normal endometrial tissue.

Most of the patients underwent surgical procedures for treatment except 2 cases who just went for hormonal therapy with danazol. Our patient underwent surgery followed by hormonal contraceptive therapy after surgery the tissue excised was analyzed histo-pathologically and the findings were consistent with endometriosis. Typical findings were stroma with focal areas of glands lined by simple cuboidal epithelium. Hemosiderin laden macrophages and occasional foci of hemorrhages were also seen. We also performed immunostaining of the tissue in our patient and like 12 other cases it came out to be positive for CD10 and estrogen receptors that is consistent with endometriosis.

Our study is the first one to analyze in detail all the possible parameters that could be studied in relevance to hepatic endometriosis. We went through the per-operative findings in the surgeries performed in all the cases and enlisted the details in the tabular form, moreover the presence of findings not found in the prior radiographic images were also mentioned in the per-operative findings. They also describe whether the disease was found elsewhere or not.

Table 1: Summarising the details of presentation and history of previously studied cases.

Year of publication, author	Age (years)	Parity/ gravidity	Pre/post-menopausal status	Past-surgical history	Duration of symptoms	Known case of endometriosis	Presenting complaints	Liver lobe involved
Grabb et al (1986)¹³	21	Uniparous	Pre-menopausal	N/A	1 year	No	Epigastric pain, nausea and vomiting. Pain was not associated with menses.	Left
Rovati et al (1990)¹⁴	37	Nulliparous	Pre-menopausal	No	1 year	Yes	Chronic acyclic epigastric pain	Left
Cravello et al (1996)¹⁵	34	Nulliparous	Pre-menopausal	N/A	2 years	No	Cyclic right subcostal pain	Right
Verbeke et al (1996)¹⁶	34	N/A	N/A	N/A	N/A	No	Acute abdomen.	Right
Verbeke et al (1996)¹⁶	62	N/A	Post-menopausal	Resection of an invaginated Meckel's	N/A	No	Right sided epigastric pain.	Left

Continued.

Year of publication, author	Age (years)	Parity/ gravidity	Pre/post-menopausal status	Past-surgical history	Duration of symptoms	Known case of endometriosis	Presenting complaints	Liver lobe involved
				diverticulum in childhood.				
Weinfeld et al (1998)¹⁷	60	N/A	Surgical postmenopausal	Hysterectomy and bilateral oophorectomy 23 years ago.	N/A	Yes	Right upper quadrant tenderness.	Right
Chung et al (1998)¹⁸	40	Multiparous	Pre-menopausal	Left ovarian cystectomy for endometriosis 10 years ago.	Incidental finding in the liver.	Yes	Known case of pelvic endometriosis for 10 years. Incidental septated cyst discovered in the left lobe of the liver in a follow up sonogram.	Left
Inal et al (2000)¹⁹	25	N/A	Pre-menopausal	Surgically treated twice for pelvic endometriosis.	N/A	Yes	Presented with pelvic endometriosis and diagnostic workup showed a 5cm liver mass, also had rectal hemorrhage.	Right
Huang et al (2002)²⁰	56	N/A	Surgical post-menopausal	Hysterectomy and bilateral salpingo-oophorectomy 8 years ago.	Many years	Yes	Intermittent dull epigastric pain not associated with menstruation.	Left
Jeanes et al (2002)²¹	31	N/A	Surgical post-menopausal	Laparotomy, left cystectomy and right oophorectomy, followed by another laparotomy a year later in which hysterectomy and a left oophorectomy were performed.	3 months	Yes	Cachexia, malaise, jaundice, weight loss and abdominal distension.	Right
Jacques et al (2003)²²	42	Nulligravid	Pre-menopausal	Nil	N/A	N/A	Chronic acyclic epigastric pain and a right subcostal mass.	Right
Reid et al (2000)²³	46	Nulliparous	Pre-menopausal	Laparoscopy in 1987, Endometriotic nodule removal in 1988, subtotal hysterectomy in 1990, bilateral oophorectomy and resection of	N/A	Yes	Diagnosed case of pelvic endometriosis presented later with right upper quadrant pain.	Right

Continued.

Year of publication, author	Age (years)	Parity/ gravidity	Pre/post-menopausal status	Past-surgical history	Duration of symptoms	Known case of endometriosis	Presenting complaints	Liver lobe involved
				endometriotic bowel lesion in 1992.				
Julie et al (2003)²⁴	70	N/A	Post-menopausal	Transabdominal hysterectomy for endometriosis 15 years prior followed a year later by salpingo-oophorectomy. Underwent Mastectomy for breast cancer	N/A	Yes	Right upper quadrant pain	Right
Ashley et al (2003)²⁵	52	N/A	Surgical Postmenopausal	Hysterectomy/oophorectomy 15 years prior	N/A	N/A	Right upper quadrant pain	Right
Girlanda et al (2005)²⁶	34	N/A	Surgical Postmenopausal	Laparotomy and adhesiolysis, followed by emergency right oophorectomy 6 months later. Another 6 months later she underwent total hysterectomy and left salpingo-oophorectomy. Sigmoid resection was done later.	N/A	Yes	Recurrent right upper quadrant abdominal pain and two perihepatic cystic lesions.	Right
Goldsmith et al (2009)²⁷	48	Nulliparous	Surgical post-menopausal	Abdominal hysterectomy and bilateral salpingo-oophorectomy	1.5 years	Yes	Relapsing and remitting chronic right upper quadrant pain.	Both lobes.
Asran et al (2010)²⁸	61	N/A	Surgical Postmenopausal	Hysterectomy 21 years ago, Right salpingo-oophorectomy 14 years ago and bowel loop resection 9 years ago.	Several days.	N/A	Epigastric pain especially after eating.	Both
Dietlan et al (2011)²⁹	25	Nulliparous	Pre-menopausal	N/A	8 months	No	Relapsing and remitting RUQ pain	Right
Jochen et al (2011)³⁰	39	Monoparous	Pre-menopausal	N/A	N/A	No	Irregular pain in right upper abdomen and	Right

Continued.

Year of publication, author	Age (years)	Parity/ gravidity	Pre/post-menopausal status	Past-surgical history	Duration of symptoms	Known case of endometriosis	Presenting complaints	Liver lobe involved
							biliary sputum with cough.	
Fluegen et al (2013)³¹	32	Nulligravida, Nullipara	Pre-menopausal	Two laparoscopic deroofting procedures, one with cholecystectomy. Multiple ERCPs performed and transhepatic drains applied.	3 years	No	Right upper quadrant tenderness.	Both lobes.
Emmanuel et al (2013)³²	51	Multiparous	Surgical Post-menopausal	Hysterectomy for uterine leiomyomas.	6 months	No	Epigastric pain and vomiting.	Left
Hertel et al (2014)³³	44	N/A	Pre-menopausal	Partial hysterectomy for fibroids 9 years prior, oophorectomy for benign ovarian cysts 3 years prior and incisional repair	N/A	No	Presented in emergency with sudden severe upper abdominal pain.	Right
Theodosopoulos et al (2014)³⁴	38		Pre-menopausal	Cesarean section 7 years prior.	1 year	Yes	Intermittent right shoulder pain associated with menstruation	Right
Liu et al (2015)³⁵	36	2015, Kai Liu	Pre-menopausal	N/A	6 months	No	Severe right quadrant pain	Left
Sopha et al (2015)³⁶	47	N/A	Surgical Post-menopausal	Right salpingo-oophorectomy at 18, C section at 26 and hysterectomy at 40 years of age.	Long history	No	Abdominal pain and vomiting.	Right
Riggi et al (2016)³⁷	27	Nulligravida	Pre-menopausal	N/A	3 months	No	Abdominal mass and tenderness on upper and lower left abdominal quadrants.	Left
Sherif et al (2016)³⁸	44	N/A	Surgical Post-menopausal	Hysterectomy and cholecystectomy.	Few months.	Yes	Right upper quadrant pain and vomiting.	Right
Keramidas et al (2018)³⁹	40	Multiparous	Pre-menopausal	Insignificant	N/A	No	No symptoms, incidental finding.	Left
Manwani et al (2018)⁴⁰	34	Multiparous	Pre-menopausal	Cholecystectomy	1 year	N/A	Unremitting right upper quadrant pain.	Left
Camille (2019)⁴¹	67	Multiparous	Post-menopausal	N/A	N/A	No	Incidental finding during workup for lumbar pain.	Right

Table 2: Summarising the treatments, procedures performed, findings observed and outcomes in the previously studied cases.

Year of publication, author	Treat-ment	Procedure	Per-Op findings	Histological findings	Immuno-histo-chemical findings	Outcome
Grabb et al (1986)	Surgery	Aspiration of the cyst followed by cystectomy	Cyst aspiration yielded serous fluid.	Cyst wall partially comprised of endometrial glands and stromal elements. Extensive fibrosis also noted.	N/A	N/A
Rovati et al (1990)	Laparotomy followed by pelvic exploration. Danazol postoperative for 6 months.	Laparotomy for left lateral segmentectomy with removal of entire cyst. Second laparotomy and left adnexectomy	Left liver lobe had a hard elastic mass on the parenchymal surface, connected to diaphragm by adhesions. Pelvic exploration showed a left ovarian endometrioma.	Gross; multilocular formation of endometriotic type with chocolate coloured content. Histologically cyst wall was lined by endometrial glands and stroma in secretory phase.	N/A	Asymptomatic at 26 months of follow up.
Cravello et al (1996)	4 week GnRH agonist therapy followed by laparotomy	Exploratory laparotomy and conservative tumorectomy with a 2cm safety margin	A hard nodule adhesive to diaphragm on segment 6.	Large areas of endometrium with cystic glands and stroma. Hemorrhage of different periods seen.	N/A	Asymptomatic by 10 months.
Verbeke et al (1996)	Surgery	Right hemihepatectomy.	Hemihepatectomy specimen showed a single endometriotic cyst in its lateral and caudal part.	Gross; cyst filled with blood coagula and fresh blood with a largely ragged wall. Light microscopy showed the cyst to be lined by a highly proliferative endometrium containing typical glands admixed with cellular spindle cell stroma.	Immunohistochemical investigations using the APAAP method showed a strong reaction with a pan cytokeratin marker and CA19-9.	N/A
Verbeke et al (1996)	Surgery	Surgery	Surgical specimens consisted of a gallbladder with velvety surface and gray brown spotted hepatic cystwall.	Inner surface of the cyst was lined by an atrophic endometrium consisting of a single layer of epithelial cells and spindle cell stroma.	Not performed.	N/A
Weinfeld et al (1998)	Surgery	Left hepatectomy, cholecystectomy and excision of	Perihepatic mass	Pathologic findings consistent with endometriotic cyst	N/A	N/A

Continued.

Year of publication, author	Treat-ment	Procedure	Per-Op findings	Histological findings	Immuno-histo-chemical findings	Outcome
		right diaphragmatic/p erihepatic mass was performed.		with a spectrum of glandular changes.		
Chung et al (1998)	Surgical exploration.	Cyst was enucleated. A track was discovered at the base of cyst communicating with intrahepatic bile ducts. Peri Operative cholangiogram was performed and track ligated.	Intraparenchymal multiseptated cyst located just to the right of the falciform.	Gross; 4×3.2×3 cm multiloculated cystic structure with a tubular stalk at the base. Chocolate coloured, hemorrhagic-like content. Histologically the cyst wall was lined by a single layer of cuboidal cells with occasional endometrial glands, admixed with stroma.	N/A	Recovered smoothly.
Inal et al (1999)	Danazol therapy.	Percutaneous tru-cut biopsy was done under CT control.	No surgery performed.	Histopathology results suggested endometriosis externa.	N/A	N/A
Huang et al (2001)	Surgery	Fine needle aspiration biopsy followed by laparotomy.	A cystic mass was found occupying segment 4 of the liver.	9×9×6 cm well circumscribed cystic mass containing dense chocolate coloured fluid. Inner surface was yellow/white, uneven and nodular. Microscopically the cyst wall was partially composed of endometrial glandular and stromal elements characteristic of endometriosis.	Positive immunostaining for estrogen and progesterone receptors and vimentin in both glandular and stromal components.	N/A
Jeans et al (2002)	Surgery followed by Postoperative oral ciprofloxacin and intranasal goserelin. Liver abscess formed 13 months later was percutaneously drained under CT guidance. Intranasal goserelin continued.	Percutaneous ultrasound guided biopsy of right lobe revealed endometrial tissue. Laparotomy to remove the cystic mass was performed.	At laparotomy majority of the cystic mass extending to the right lobe was found to be encapsulated.	Biopsy of the mass showed endometrial tissue.	N/A	Post operative course was complicated by bile leak, closed endoscopically by stent insertion. 13 months later liver abscess formed which was percutaneously drained. Got free of disease 3 years post-presentation.

Continued.

Year of publication, author	Treat-ment	Procedure	Per-Op findings	Histological findings	Immuno-histo-chemical findings	Outcome
Jacques et al (2003)	Surgery	Cyst was unroofed and 6.5 litres chocolate coloured hemorrhagic fluid was drained. Complete excision of cyst done.	A 24×22×30 cm cyst was found in the right lobe of the liver.	Cyst was lined by fibrous tissue containing large areas of endometrium with cystic glands and stroma. Surrounding liver parenchyma was scarred and showed hemosiderin deposits.	N/A	Asymptomatic after 22 months of follow up.
Reid et al (2003)	Laparotomy followed by goserelin therapy for a year. This was followed by another laparotomy.	Lesion was marsupialised in the first laparotomy. In the second laparotomy, hemihepatectomy, cholecystectomy and diaphragmatic resection. (Fibrotic obliteration of the pleural cavity at the lung base noted, so no attempt was made to close the diaphragmatic defect.)	2 nd laparotomy revealed a large multiloculated endometrioma occupying the right lobe of the liver invading through the diaphragm.	Endometrioma showing moderately atypical complex hyperplasia.	N/A	N/A
Julie et al (2003)	CT guided drainage.	CT guided drainage of cystic mass produced 800cc of chocolate brown viscous fluid.	N/A	N/A	N/A	N/A
Ashley et al (2003)	Surgery	Right hemihepatectomy.	Liver lesions appeared like hemangiomas the largest one was hemorrhagic.	Grossly appeared like a hemorrhagic hemangioma. Histologically posterior liver lesion was revealed to be endometrioma.	N/A	N/A
Girlanda et al (2004)	Surgery	Endometrial deposits were resected from the liver lobes, greater omentum and visceral peritoneum.	2 deposits of endometriosis 7 cm and 6.5 cm found.	Findings confirmed perihepatic, omental and peritoneal endometriosis.	N/A	Resolution of symptoms.
Goldsmith et al (2009)	Resection followed by danazol therapy.	Laparotomy performed, cyst opened and biopsies taken. Non Anatomical resection was	A large cystic tumour in segment 4 densely adherent to and	Histology showed an outer wall of fibrofatty tissue, inner wall lined by fragments of endometrial tissue and stroma with	N/A	Patient discharged home 10 days post operation and was asymptomatic

Continued.

Year of publication, author	Treat-ment	Procedure	Per-Op findings	Histological findings	Immuno-histo-chemical findings	Outcome
		performed using a Cavitron Ultrasonic Aspirator (CUSA).	infiltrating the abdominal wall and diaphragm.	hemosiderin laden macrophages.		7 years after surgery
Asran et al (2010)	Percutaneous liver biopsy.	Percutaneous tru-cut liver biopsy under CT guidance was performed.	Biopsy specimens had brown soft tissue aggregates.	Gross; biopsy specimen had multiple brown soft tissue aggregates measuring 1.3×0.5×0.5 cm. Histological evaluation showed sheets of round cells with scant cytoplasm and hyperchromatic nuclei replacing hepatic parenchyma.	Nuclei stained positive for estrogen and progesterone receptors. Cytoplasmic and membranous staining for CD10.	N/A
Dietlan et al (2011)	Danazol	Laparoscopic cholecystectomy	Incidental finding of 6×5 cm irregular hemorrhagic area on the surface of the right lobe of the liver.	Endometrial glands surrounded by non-neoplastic stromal cells.	Positive immunostaining for progesterone receptors in both glandular and stromal components.	Asymptomatic after danazol therapy was started.
Jochen et al (2010)	Surgery	One stage operation for hepatic and pulmonary lesions with an atypical liver resection of segment 8 and a transdiaphragmatic pulmonary wedge resection with open insertion of chest drain and closure of diaphragm was performed.	Bronchobiliary fistula.	Histopathology confirmed Non-malignant nature of the disease and endometrial glands neighbouring the liver. No evidence of such findings in the lung tissue.	Numerous immunohistochemical reactions supplemented the results. For example antiD2-40, anti-WT1, antiCD30, antiCD31 etc.	N/A
Fluegen et al (2010)	Pericystectomy	Ultrasonic pericystectomy.	Cyst.	Histopathology revealed a lobulated cyst filled with old blood and detritus.	Immunostaining showed strong coloring for estrogen and progesterone receptors	Discharged on 11 th postoperative day.

Continued.

Year of publication, author	Treat-ment	Procedure	Per-Op findings	Histological findings	Immuno-histo-chemical findings	Outcome
					as well as CK7.	
Emmanuel et al (2013)	Surgery	Laparotomy for anatomic resection including left lobectomy with diaphragm resection.	A large cystic tumour in segments 2 and 3 with diaphragmatic infiltration.	Frozen section suggestive of endometriosis without malignant transformation.	N/A	Asymptomatic after 6 months of follow up.
Hertel et al (2014)	Surgery	Intraoperative aspiration of the cystic mass followed by cytology. Partial hepatectomy was performed.	Large cystic lesion involving segments 5,6,7 and 8 of the liver.	Cytopathological findings showed tissue fragments containing dilated glands, cuboidal epithelial lined stroma with hemorrhage and hemosiderin laden macrophages typical of endometrial tissue. Histological findings showed a 12cm blood filled thin walled cyst on gross examination and endometriotic tissue histologically.	N/A	N/A
Theodosopoulos et al (2014)	Surgery	Exploratory laparotomy and wedge excision of the tumour was performed with clear margin den bloc with part of right hemidiaphragm	A tumour in the diaphragmatic portion of the liver infiltrating the diaphragm.	A mixed cystic and solid mass with an endometrial type epithelium.	Tissue was positive to estrogen and prostaglandin receptors and cholangian differentiation in some sites	Symptom free 6 months later.
Liu et al (2015)	Exploratory laparotomy and pericystectomy.	N/A	A large cystic tumour occupying segment 3 of the liver.	Histopathology revealed a lobulated cyst with a wall composed of endometrial glands and stroma	Immunostaining of stromal and epithelial cells expressed strong coloring for estrogen and progesterone receptors and positive staining of CD10, CK7 and HepPar-1.	Discharged on 9 th postoperative day, asymptomatic at 3 months follow up
Sopha et al (2015)	Surgery	Laparoscopic segment 7	1.4cm cyst composed of	Intraoperative frozen section suggested	Cyst composed	Asymptomatic on follow up.

Continued.

Year of publication, author	Treat-ment	Procedure	Per-Op findings	Histological findings	Immuno-histo-chemical findings	Outcome
		excisional biopsy	endometrial glands.	endometriosis. Pathological evaluation showed a 1.4cm hepatic nodule composed of endometrial type glands and stroma with associated smooth muscle proliferation around the cystic cavity.	of estrogen and progesterone positive endometrial glands, stroma CD10+ with smooth muscle actin SMA+ arranged in an organoid fashion.	
Riggi et al (2016)	Surgery	Laparoscopy converted to laparotomy. Complete mobilization of the left liver, atypical left hepatectomy was performed.	A giant cystic neoplasm originating from the left liver reached segments 5 and 8 and beneath covered the hepatoduodenal peduncle.	Findings consistent with hepatic endometriosis.	Findings consistent with hepatic endometriosis.	Discharged on 7 th day post op.
Sherif et al (2016)	CT guided core biopsy followed by hepatic segmentectomy.	Biopsy followed hepatic segmentectomy for segment 7.	N/A	Histopathology of the biopsy reported endometrial glands, stroma and smooth muscle consistent with adenomyoma. Post Op histopathology confirmed hepatic endometrioma.	N/A	N/A
Keramidas et al (2018)	Surgery	Laparoscopic cystectomy	Cyst. No evidence of endometriosis elsewhere.	Findings suggestive of endometriosis.	CK+ in glandular tissue and CD10+ and ER+ in endometrial stroma	N/A
Manwani et al (2018)	ERCP followed by laparoscopy. Referred to gynae for hysterectomy and bilateral salpingo-oophorectomy.	Cyst was drained and unroofed.	Laparoscopy showed a large hepatic cyst near the caudate lobe which had close proximity to the hepatic artery.	Suggestive of endometriotic cyst. Cytology showed degenerated RBCs with scattered neutrophils and macrophages.	N/A	Hysterectomy and bilateral salpingo-oophorectomy resolved her symptoms.
Camille et al (2019)	Surgery followed by	Exploratory laparotomy	A voluminous cystic	Cystic hepatic lesion with walls consisting	Glands were	Discharged on 13 th post-op

Continued.

Year of publication, author	Treat-ment	Procedure	Per-Op findings	Histological findings	Immuno-histo-chemical findings	Outcome
	hormone therapy combined with an injection of GnRH agonist.	followed by cholecystectomy .	infiltrating lesion extending to the right lobe of the liver just touching Glisson's capsule.	of fibrous or cellular stroma containing numerous glands that showed mucinous metaplasia.	CK7+, CK20, PAX8+, RE+ and RP+ while stroma was RE+, RP+ and CD10+.	day and had insignificant follow up findings.

Table 3: Summarising the radiographic findings in the previously studied cases.

Year of publication, author	Abdominal Ultrasonography	Computed tomography scan	Magnetic Resonance imaging
Grabb et al (1966)	13.5×12×9.5cm cystic mass involving the left lobe with a septation.	Large unilocular cystic lesion in left lobe of the liver which had a thin smooth wall that enhanced after contrast injection	N/A
Rovati et al (1990)	A septate cystic formation of 10 cm in the left lobe with low level echoes.	A multilocular cyst of 10cm diameter with fine calcifications in the wall.	N/A
Cravello et al (1996)	Heterogeneous nodule of 6 cm diameter in the right lobe.	Low density formation with septations in hepatic segment 6.	6 cm diameter mass. Intermediate intensity signals with peripheral areas of high intensity on T1 weighted sequences.
Verbeke et al (1996)	N/A	Cystic tumour in right lobe of the liver, accompanied by a reactive enlargement of the left hepatic lobe.	Cystic tumour in right lobe of the liver, accompanied by a relative enlargement of the left hepatic lobe.
Verbeke et al (1996)	12×10×7.5 cm cyst in the left liver lobe located near the gallbladder and the liver hilum.	12×10×7.5 cm cyst in the left liver lobe located near the gallbladder and the liver hilum.	N/A
Weinfeld et al (1998)	N/A	3.1×2 cm soft tissue attenuation mass along the right lobe and 2.8×2.8 cm mass in the falciform ligament.	N/A
Chung et al (1998)	6.4×3×2.5 cm septated cyst was found in the left lobe of the liver.	Low density cyst situated in the medial segment of the left lobe with an undulating wall.	N/A
Inal et al (1999)	Round well-defined heterogeneous mass including anechoic cystic, echogenic solid components, septations and fine nodular calcifications.	Round well defined heterogeneous septated heterogeneous mass with calcifications at the periphery.	Lobulated well-demarcated subcapsular mass seen at the posterior segment of the right lobe of the liver. Hyperintense areas on T1 and T2 weighted images suggestive of subacute hemorrhage and enhancing areas considered to be solid.
Huang et al (2001)	Well circumscribed cystic mass of 9×6 cm located in the left lobe of the liver with irregular soft tissue components.	Well circumscribed cystic mass of 9×6 cm located in the left lobe of the liver with irregular soft tissue components.	Well circumscribed cystic mass of 9×6 cm located in the left lobe of the liver with irregular soft tissue components.
Jeans et al (2002)	Ascites, intrahepatic duct dilatation and two large focal	12×10 cm lobulated low attenuation non enhancing retroperitoneal mass	N/A

Continued.

Year of publication, author	Abdominal Ultrasonography	Computed tomography scan	Magnetic Resonance imaging
	lesions within the right lobe of the liver.	involving segments 5-8 of the right lobe of liver, another mass involving segment 2 and 3 of the left lobe. Anterior deviation of the portal vein, common bile duct and pancreas resulted in biliary tree obstruction.	
Jacques et al (2003)	N/A	A large smooth walled aseptated cystic lesion of 24 cm diameter involving the right lobe of the liver.	N/A
Ried et al (2003)	10 cm lesion with the right lobe of the liver with echogenic margins and internal debris.	A low-density lesion in the right lobe.	N/A
Julie et al (2003)	13cm complex cyst and a necrotic mass involving the right lobe of the liver.	N/A	N/A
Ashley et al (2003)	Mixed reflectivity liver lesions, the largest in the posterior right lobe, measured 12×9 cm.	N/A	MRI of the liver showed this lesion to be an increased signal on T1 and T2 images.
Girlanda et al (2004)	Two cystic masses in the right hypochondrium.	Two large perihepatic masses.	Lesions showed a scalloped appearance indenting the liver surface.
Goldsmith et al (2009)	9×11 cm cystic mass in segment 4 of the liver. The wall appeared thick with complex septae.	N/A	11×13 cm cystic mass in segments 4 and 8, bulging into segments 2 and 3 and abutting the left and middle hepatic veins.
Asran et al (2010)	N/A	Multiple irregular heterogeneous low-density lesions throughout the liver, demonstrated mild enhancement during arterial phase. Additional pelvic and mesenteric masses seen.	N/A
Dietlan et al (2011)	Multiple gallstones	N/A	N/A
Jochen et al (2011)	N/A	N/A	An inhomogeneous mass 6.8×2.3 cm in diameter in the right basal lobe of the lung which showed communication with bile ducts of the right lobe of the liver under gadolinium application.
Fluegen et al (2013)	N/A	N/A	MRI showed a 9.5×12 cm, lobulated cyst in segments 4,5 and 8.
Emmaneul et al (2013)	80×75 mm intraparenchymal hepatic necrotic tumour.	Well limited, hypovascularised cystic mass in the left liver lobe extending to diaphragm with left hepatic vein compression and hemorrhagic contents in the lumen.	Cystic mass in segments 2 and 3 of the liver with a high T1 signal and a heterogeneous T2 signal.
Hertel et al (2014)	N/A	N/A	T2-weighted image showed a large cystic mass of 9.5×9.1×11.2 cm size with a thickened wall located in the right hepatic lobe.
Theodosopoulos et al (2014)	N/A	Mass in the liver	4.4×3.8cm mass of segments 7 and 8 of the

Continued.

Year of publication, author	Abdominal Ultrasonography	Computed tomography scan	Magnetic Resonance imaging
			liver, infiltrating the diaphragm.
Liu et al (2015)	6.5×6 cm cystic mass in segment 3 of the liver.	A well circumscribed 6.5×6 cm cystic lesion located in segment 3 of the liver. The wall appeared thick with complex septae.	N/A
Sopha et al (2015)	N/A	CT demonstrated a 13 mm fluid collection in segment VII in the perirenal retrohepatic space.	N/A
Riggi et al (2016)	30 cm cyst in left lobe that reached segment 4,5 and 8	30 cm cyst in left lobe that reached segment 4,5 and 8	30 cm cyst in left lobe that reached segment 4, 5 and 8
Sherif et al (2016)	3cm complex cystic lesion in right lobe.	3cm well defined hypodense subcapsular lesion in the right lobe.	Subcapsular partially cystic focal lesion with high signal intensity in both T1 and T2 weighted images suggestive of hemorrhagic content.
Keramidari et al (2018)	Large cystic lesion between right and left lobe of the liver.	N/A	Multiseptated cystic lesion 10.3×7.8×7.7 cm in the left liver lobe involving segments 4, 2 and 3.
Manwani et al (2018)	N/A	N/A	8.6 cm complex multilocular cystic lesion with internal debris in the left hepatic lobe. (MRC P)
Camille et al (2019)	N/A	Subhepatic lesion of 86 mm.	Poly-microcystic, septated, calcified and enhanced lesion after injection of contrast product.

Limitations

The true analysis of all the cases of hepatic endometriosis available in the literature could not be done owing to the omission of details about certain parameters in the articles reviewed. Most importantly the outcome needs to be mentioned in detail. The women with this diagnosis need to be followed up and the time period it takes to recover completely should be specified in detail.

CONCLUSION

Though extremely rare, hepatic endometriosis must be included in the differentials in any woman presenting with a hepatic mass irrespective of age and past gynaecological history.

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