ADRENAL MYELOLIPOMA MIMICS ECTOPIC ADRENAL OR RENAL TISSUE: AN INCIDENTAL FINDING DURING CADAVERIC DISSECTION

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Abstract

Context. On naked eye examination adrenal myelolipoma (AML) tissue appears to be an ectopic adrenal or renal tissue, based on the similarity to their external texture. This necessitates a histo-pathological study for confirming the origin of the tissue.

Objective. To establish the origin and histological features of the incidental AML tissue found during cadaveric dissection and review the literature for similar findings with clinical picture and treatment description.

Subjects and Methods. Unilateral adrenal gland obtained from cadaveric dissection was subjected to histological study by H & E staining of the slides prepared. The literature review was done from articles published in PubMed indexed journals.

Case report. A case of an incidental finding of AML during cadaveric dissection is presented which on naked eye examination was appearing to be an ectopic adrenal or renal tissue, based on the similarity to their external texture. On histological examination, a thin rim of adrenocortical tissue, surrounding the mature adipose tissue, and attenuated by islets of myeloid, erythroid and megakaryocytic cell lines in varying proportions, resembling the mature bone marrow morphology, was observed. The literature review on PubMed explains similar incidental post-mortem autopsy findings due to the asymptomatic nature of the tumor. The incidence of AML varied between 0.08% and 0.2% in the last decade of the 20th century, which increased up to 10 – 15% of incidental adrenal masses due to the widespread use of non-invasive imaging modalities leading to an increase in the diagnosis of the pathology.

Conclusion. Before considering the ectopic incidence of tissue during cadaveric dissection, a histo-pathological examination is mandatory for confirmation. Adreno-myelolipoma is an asymptomatic post-mortem finding in 10-15% of cases of adrenal tissue which mimics ectopic adrenal gland or renal tissue due to its external texture.

Keywords: Adrenomyelolipoma, myeloid, erythroid, megakaryocytic.

INTRODUCTION

A rare, non-functional, benign neoplasm affecting the adrenal gland with a picture of mature adipose tissue and scattered islands of hematopoietic elements pushing the normal adrenal cortex aside is termed as adrenal myelolipoma or adrenomyelolipoma (1-5). Due to its asymptomatic nature, the diagnosis was made mostly on post-mortem autopsy (3-7). On naked eye appearance, the mass can be confused with an ectopic adrenal or renal tissue based on its similarity to their external texture. Thus, a histological study becomes mandatory to confirm the diagnosis. The era of premortem diagnosis of adrenal myelolipoma can be distinguished from that of the previous incidental detection on autopsy by the prevalent application of imaging modalities like ultrasonography (USG), computed tomography (CT), and magnetic resonance imaging (MRI). Very rarely, but when symptomatic, they present with chronic abdominal pain, and their predominant association with common conditions of obesity, hypertension, diabetes have all been found incidental. The asymptomatic masses do not require any treatment, but those presenting with symptoms of pain due to large size, or those which are prone to rupture and haemorrhage are to be treated by surgical excision of the mass (1-9).

CASE PRESENTATION

An abnormal enlarged bilobed mass (Fig. 1) was observed above of the left kidney while dissecting an adult female cadaver in the Department of Anatomy, All India Institute of Medical Sciences, Patna. No clinical data were available. On naked eye examination, the texture of the tissue was similar to that of a kidney without the renal capsule and hence the mass was confused with an ectopic adrenal or renal tissue. The tissue was receiving three arterial

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branches, each one from the inferior phrenic artery, the descending aorta and the left renal artery respectively. The arterial supply proved that the structure must be the adrenal gland. To confirm the tissue origin and the abnormality seen, histopathology was done by making haemotoxylin and eosin slides. The result of the histopathology slides showed a picture of mature fat cells mixed with hematopoietic elements pushing the adrenal tissue, this is homogeneous to the picture seen in adrenal myelolipoma.

Pathology Findings

The dissected specimen was 4.6 x 2.4 x 1.2 cm in size and weighed 23g. The surface of the mass comprised of a smooth capsule, forming a thin membrane that could be readily peeled off. The mass had rubber like consistency. On gross examination of the section, the mass showed haemorrhagic foci consistent with degenerative tissue. Microscopic examination from the periphery of the tumor revealed a thin rim of adrenocortical tissue surrounding the mature adipose tissue, and attenuated under pressure exerted by the mass. Also islets of myeloid, erythroid and megakaryocytic cell lines were observed in varying

proportions, resembling the mature bone marrow morphology. The areas with adipose appearance consisted of mature adipose tissue with haemorrhagic foci (Figs 2a & 2b). Based on the gross and microscopic findings, the diagnosis of myelolipoma was made.

DISCUSSION

The first description of adrenal myelolipoma was given by Arnold as “adrenal lipoma” in 1866, description of its myeloid component was given by Gierke in 1905, and the term “formations myelolipomatoses” was coined by Oberling in 1929 (1,2,7). The incidence of adrenal myelolipoma varied between 0.08% and 0.2% in the last decade of the 20th century, which increased up to 10 – 15% of incidental adrenal masses due to the widespread use of non-invasive imaging modalities leading to an increase in diagnosis (10 -15).

Adrenal myelolipoma does not have specific sex predilection, though Chen *et al.* reported the pathology to be predominant in females (9). The incidence is higher in the fifth to seventh decades of life (12-17), though cases with individuals getting afflicted at a young age were also being reported (4, 15). As can be observed from Table 1, the unilateral occurrence is mostly reported on the right side. An interesting relation of laterality was seen in patients afflicted with congenital adrenal hyperplasia (CAH), as most of the bilateral adrenal myelolipoma cases were seen in them, while the unilateral ones were mostly seen to have the left adrenal affected (18). The size of tumour varied from 2 mm to 34 cm. In the literature, the largest myelolipoma by weight (6000 g, diameter 31 cm) was described by Akamatsu *et al.*, and by size (diameter 34 cm, weight 5900 g) was described by Boudreaux *et al.*

Figure 1. Bilobed Left adrenal gland in an autopsied sample.

Figure 2 A. Microscopic section showing hematopoietic cells, fat cells and compressed adrenal cortex (H & E, 10X magnification).

Figure 2 B. Microscopic section showing hematopoietic cells, fat cells and haemorrhagic foci (H & E, 40X magnification).

Table 1. Reviews and case reports on adrenal myelolipoma in the 21st century

Author	Year	No. of cases	Age & Sex	Laterality	Symptoms	Associated condition	Diagnostic test	Treatment
Yildiz <i>et al.</i>	2000	1	54 Y/ F	U/L, R	Dependent oedema for 2yrs	--	CT scan	Surgical resection
Lam <i>et al.</i>	2001	11	41 - 81 (M -8; F - 3)	U/L, R = 6, L = 5	--	--	Incidental CT/ USG findings = 3; Finding on autopsy = 8	Surgical resection
Osborn <i>et al.</i>	2002	1	47y/ F	U/ L, R	Frequent urination	--	FNAC	Follow-up
Bhansali <i>et al.</i>	2003	6	26 - 60 y (M -3; F - 3)	U/ L, R = 5, L = 1	2= asymptomatic; 2 = Rt. Flank pain; 1= Oliguria, Anasarca; 1= Headache, sweating, palpitation	4= Obesity + HTN; 1= Obesity + CAH 21 Ohlase deficiency; 1= Obesity	CT / MRI	4 = Surgical resection; 2 = Follow-up
Akamatsu <i>et al.</i>	2004	1	51y/ M	U/ L, R	Huge abdominal mass with pain	--	CT/ MRI	Surgical resection
Cobanoglu <i>et al.</i>	2005	1	14y/ F	U/ L, L	Abdomen pain	Ovarian Cyst	USG	Surgical resection
Kalidindi <i>et al.</i>	2006	1	42 y/ M	B/ L	Obesity, Tanning	CAH	USG/ CT/ MRI	Surgical resection
Nishio <i>et al.</i>	2007	1	38y/ M	U/ L, R	Rt. Flank pain	Spinal cord injury	USG/ CT	Surgical resection
Song <i>et al.</i>	2008	68 (retrospective)	--	--	--	--	CT/ CECT/ MRI	--
Doddi <i>et al.</i>	2009	1	72y /F	U/L, R	Dysuria	--	USG/ CT/ MRI	Surgical resection
Wani <i>et al.</i>	2010	2	52y & 48y/ M	U/L, R	1= Abdomen pain; 1= Hypertension	1= Left Bochdalek hernia	USG/ CT	Surgical resection
Mondal <i>et al.</i>	2011	1	40y/ F	U/L, R	Rt upper abdomen pain		USG/ CT	Surgical resection
Bano <i>et al.</i>	2012	2	1= 65y/ F; 1= 33y/ F	U/L, R	Rt upper abdomen pain	1= Post-Colecystectomy	USG/ CT/ MRI	Surgical resection
Yalagachin <i>et al.</i>	2013	1	38y/ F	U/L, R	Rt upper abdomen pain	--	USG/ CT/ MRI	Surgical resection
Zorgdrager <i>et al.</i>	2014	3	43 - 60y/ M	1= B/L; 2=U/L, R	1= Abdominal pain, dysuria and haematuria; 2= Rt upper abdomen pain	Cholelithiasis, H/O severe trauma	USG/ CT/ MRI	Surgical resection
Sajjanar <i>et al.</i>	2015	1	58y/ F	U/L, R	Rt. Flank pain	--	USG/ CT/ MRI	Surgical resection
Anis-Ul-Islam <i>et al.</i>	2016	1	19y/ M	U/L, R	Rt. Flank pain	--	CECT	Surgical resection
Jeon <i>et al.</i>	2017	1	38y/ F	U/L, R	--	Breast Carcinoma	CT	Surgical resection
Manov <i>et al.</i>	2018	1	66y/ F	U/L, R	--	Lt. Breast Ca	PET - CT	Follow-up
Suchartlikitwong <i>et al.</i>	2019	1	39y/ M	B/ L	--	Untreated congenital adrenal hyperplasia (CAH)	CT	Follow-up

Associated conditions such as obesity, CAH, ovarian tumour, hypertension etc., were almost always seen in patients suffering from adrenal myelolipoma, as these conditions were mostly the reason for them to get medical attention in the first place and the radiographic examination led to the incidental diagnosis of adrenal myelolipoma (8, 18 – 19).

Symptoms & associated conditions

Though rarely symptomatic, they present with non-specific abdominal pain, flank pain, anasarca, haematuria, reno-vascular hypertension, and other

symptoms secondary to the mechanical compression of adjacent organs (3, 5, 8). Decmann *et al.* reported prevalence of endocrine disorders in adrenal myelolipoma patients with 10% of their reviewed patients being afflicted with CAH, while the other reported endocrine diseases include Carney's complex, polycystic ovary syndrome, hyper- or hypothyroidism, Multiple Endocrine Neoplasia syndrome type 1, and Nelson syndrome, but were unlikely to be in real association (20). Surgical emergencies such as retroperitoneal haemorrhage may also be encountered (3).

Pathology

The pathology picture of adrenal myelolipoma presents with adipose tissue and small islands of hematopoietic elements, including the myelocytic, lymphocytic, erythrocytic, and megakaryocytic cells (3-9). Myelolipomas are commonly reported in the adrenal gland, but rare extra-adrenal myelolipomas (EMLs) are also well documented. They have been found in various sites, such as the mediastinum, liver, stomach, lungs, pelvis, spleen, retroperitoneum, pre-sacral region, thoracic spine, and mesentery. EMLs must be distinguished from extramedullary haematopoiesis,

Figure 3. Myelolipoma reportings as per PubMed search.

Table 2. Differential Diagnosis of AML

Differential Diagnosis	Pathological findings	Radiological findings
Adrenocortical adenomas	Well-defined, homogenous, sharply marginated masses.	Adenomas are isointense relative to liver and hyper intense relative to spleen on T1 weighted MRI
Adrenocortical carcinomas (ACC)	Usually large, heterogeneous with irregular margins, in many cases lobulated tumours, which often have cystic, necrotic or haemorrhagic parts and can invade adjacent structures like the liver, kidney, inferior vena cava.	On CECT - Peripheral nodular enhancement is typical. On T1 weighted MRI , the tumor gives low signal and heterogeneously high signal on T2 weighted sequence. 18FDG-PET can be considered in the differential diagnosis.
Renal angiomyolipoma	Most common benign mesenchymal tumor of the kidney, which is composed of mature fat, blood vessels, and smooth muscle cells. It is a large necrotic tumor, and in the majority of the cases it extends through the renal capsule	On USG , a homogeneously echodense mass can be seen. CT image gives negative attenuation values. When a fat-containing solid mass growing out of kidney is seen, it is with high probability an angiomyolipoma. On T1 weighted MRI the tumor is hyperintense relative to the renal parenchyma and isointense relative to fat.
Retroperitoneal liposarcoma	Grows slowly, infiltrates the adjacent tissues and rarely gives metastasis. Three grades of aggressiveness are known histologically. The well-differentiated lipogenic type is the most common form and is mostly similar to myelolipoma on radiological images.	CECT - Inhomogeneous and not well-demarcated mass is highly similar to myelolipoma
Adrenal lipoma	Extremely rare, and diagnosis possible only by histological examination of the removed tumor, as it contains no myeloid elements	

which is mainly composed of hematopoietic elements but lacks adipose ones, and is commonly associated with anaemia and marked bone marrow hyperplasia (1, 12).

Radiological findings

The radiographic picture of adrenal myelolipoma on computed tomography depend on its histological composition (10). The mixture of adipose and myeloid tissue lowers the attenuation values to -20 to -30 Hounsfield unit (HU). In about 1/5th of the patients, the capsule may contain calcification which may be related to haemorrhage. The adipose tissue has high intensity on T1- and T2 - weighted sequences of MRI, while the myeloid elements have low intensity on T1 – weighted images and moderate – intensity image on T2 – weighted sequences. Among the three radiographic techniques, USG is the least specific. The tumor appears uniformly hyperechoic if the component is predominantly fatty and hypoechoic if the component is predominantly myeloid. Adrenal myelolipoma is the second most common primary adrenal incidentaloma following adrenocortical adenomas. The other conditions which are required to be differentiated from adrenal myelolipoma (20) are explained in Table 2.

The PubMed search for keyword adrenal myelolipoma shows 884 articles dating back from 1947. A 10-year distribution chart (Fig. 3) shows a steep rise in reporting of myelolipomas in the ninth decade of the 21st century, by nearly 5-times to those in the eighth decade. This rapid shift can be attributed to the increase in utilisation of imaging investigation techniques.

Treatment

The PubMed search also indicated that before the escalated use of radiographic techniques, adrenal myelolipoma was mostly a post-mortem finding and hence treatment of the ailment was seldom reported. But with an increase in diagnostic incidence of this disorder, treatment guidelines were required to be laid and in the absence of such formal guidelines, the management of the condition varies with the individual representation of the tumor. The general approach is surgical resection with follow-up, but if the diagnosis of an adrenal myelolipoma is unambiguous, and no associated symptoms or hormonal activity are established, surgical intervention is usually not necessary (4, 19). However, follow-up of giant myelolipomas (diameter > 10 cm) with USG may be warranted, but the frequency for follow-up is yet to be determined (3, 4).

Hormonal evaluation in adrenal myelolipoma is

a debated topic, Shenoy *et al.* argued for metabolic work-up in patients with adrenal myelolipoma. According to Decmann *et al.*, 18.3% of all adrenal myelolipomas are associated with some kind of endocrine disorder, including congenital adrenal hyperplasia (in 10%), and others like primary aldosteronism, hypercortisolism or hyperandrogenism. The clinical picture should be considered to be the major factor in determining the necessity for hormonal work-up (20).

Being the second most common primary adrenal incidentaloma, adrenal myelolipoma is rarely being diagnosed because of the symptoms of its own. It was mainly a post-mortem finding till the 1980s, a picture which drastically shifted with the escalated use of radiographic diagnostic techniques from the last two decades of the 20th century. Exceptional data has always inflicted the demography of adrenal myelolipoma, such as reports of young individual being diagnosed when it commonly affects individuals in the fifth to seventh decades of life, its size can be as large as 34 cm with maximum weight of 6000 gm reported till date when commonly the size varies from 2-5 mm weighing few grams attributing to its tag of “incidentaloma”.

In conclusion, the benign capsulated nature and lack of adrenal function disturbances in adrenal myelolipoma enables simple surgical resection as a cure, which nowadays is replaced by simple follow-up of the patient in case of absence of any symptoms.

Conflict of interest

The authors declare that they have no conflict of interest.

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