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Angiomyolipoma with epithelial cysts, an unexpected discovery in a gunshot abdomen: a single case report

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Abstract

Background Angiomyolipoma with epithelial cysts is a rare variant of an angiomyolipoma that typically occurs sporadically. Patients with pre-existing kidney lesion or disease have significantly increased risk of morbidity and mortality associated with trauma. Abnormal and diseased kidneys are frequently injured by low or insignificant velocity impacts. The vulnerability of these kidneys is related to the type of pathology. However, cystic or hydronephrotic kidneys are more susceptible to trauma. Recent studies have shown an association of this rare entity with tuberous sclerosis complex. Despite the rarity of genetic association of Angiomyolipoma with epithelial cysts and tuberous sclerosis, the emerging findings raise the necessity of genetic testing of these lesions to confirm a remote possibility of tuberous sclerosis complex.

Case presentation We report a case of a 38-year-old male patient who sustained a right renal injury as a result of a gunshot to the abdomen and underwent an emergency nephrectomy due to hemodynamic instability. A grossly looking shattered kidney was surgically removed. The morphology in conjunction with immunohistochemistry of the specimen favoured a diagnosis of Angiomyolipoma with epithelial cysts.

Conclusion This is the first reported case of angiomyolipoma with epithelial cysts diagnosed on a nephrectomy specimen from renal trauma. We aim to highlight an approach to renal trauma on a kidney with pre-existing AMLEC as well as an approach to adult cystic renal neoplasms and to propose the importance of genetic testing for Tuberous Sclerosis.

Keywords Angiomyolipoma with epithelial cells, Renal trauma, Gunshot abdomen, Renal cell carcinoma, Tuberous sclerosis, Kidney, Eosinophilic solid and cystic renal cell carcinoma, Renal trauma, Nephrectomy

1 Background

Angiomyolipoma with epithelial cysts (AMLEC) was described by Fine and Colleagues and it was termed as "cystic angiomyolipoma" (cystic-AML) by Davis et al. [1]. AMLEC is a rare variant of Angiomyolipoma (AML), with a slight female predilection, which typically occurs sporadically [2, 3].

However, there has been a report of one case of AMLEC which occurred in the context of TSC and 9 more cases in TSC and RCC [1, 4]. Recently, a co-occurrence of an AMLEC with an Eosinophilic Solid and Cystic renal cell carcinoma (ESCRCC) was reported. Interestingly, this case was reported in a female patient with confirmed Tuberous Sclerosis [2].

AMLEC has no specific clinical or radiological characteristic features and due to the paucity of cases, the clinical behaviour of this rare AML variant is not well

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established [5]. In reported cases, clinical features include flank pain, haematuria, proteinuria, retroperitoneal haemorrhage, and hypertension. Affected patients ages ranged from 20 to 76 years [5, 6]. AMLEC is a unique cystic variant of AML which is characterized by epithelial cysts, subepithelial stroma with a cambium-layer like appearance, and a rim of muscle-predominant AML [2, 7]. There is also evidence of thick-walled blood vessels.

The exact aetiopathogenesis of AMLEC is not known [8]. The AMLEC can masquerade itself as a cystic renal carcinoma, and it is pivotal to accurately assign a correct diagnosis to this lesion [9]. The cystic nature of this tumour opens up a wide range of a differential diagnosis and has to be differentiated from tumours that have a potentially aggressive outcome such as cystic renal cell carcinoma (RCC), Cystic nephroma (CN), mixed epithelial and stromal tumour (MEST) [8].

However, kidneys with AMLEC or any other pre-existing renal pathologies are prone to injuries even of low velocity impacts. A liquid-filled non-compressible compartment amplifies the force of the trauma impact and increases the vulnerability of these abnormal kidneys [10, 11].

This case report endeavours to discuss renal trauma on a kidney with pre-existing AMLEC and the distinctive histological features of this rare entity, to highlight an approach to adult cystic renal neoplasms and to advocate for a genetic workup in such patients.

2 Case presentation

A 38-year-old male patient previously well and unaware of any pre-existing renal pathology was brought in by paramedics at the emergency department after sustaining a medium velocity gunshot abdominal injury from a handgun fired from close range.

On examination, He had 3 actively bleeding bullet wounds on the right flank. His blood pressure was 89/51 mm Hg dropped to 73/43 mm Hg and a Haemoglobin of 6.9 g/dL on venous bloods gas. He was hemodynamically unstable, not responding to fluid resuscitation. Thus, he was taken to the operating room for an emergency exploratory laparotomy with no prior imaging. An expanding retroperitoneal zone II hematoma was found, a right nephrectomy was performed for a shattered kidney or AAST grade V, intraoperative diagnosis and more than 3 L of retroperitoneal hematoma was removed. The specimen was sent for histopathology analysis.

Grossly, the kidney showed marked disruption of the anatomy with concerning multiple cystic lesions. A well-circumscribed, firm, and pale nodule was noted upper pole within which multiple cysts were noted. The nodule measured 25 mm from the vascular margin and 30 mm from the ureteric margin. Multiple cysts containing haemorrhage were noted. No perinephric fat infiltration was seen.

The histology showed a well-circumscribed unencapsulated neoplasm composed of multiple epithelial cysts lined by cuboidal cells with hobnailing cells with an eosinophilic cytoplasm, resting on a cellular spindle cell stroma imparting a "cambium-like layer" (Fig. 1A, B). There was a cellular fascicular arrangement of spindle smooth muscle cells as well as thick-walled tortuous blood vessels (Fig. 1C). A focal representation of adipocytes was noted in the tumour. There were no atypical mitosis or necrosis seen. Mild inflammatory cell component was seen, predominantly showing lymphocytes. The immunohistochemistry showed positive spindle-cell staining with HMB45 (Fig. 2A), microphthalmia associated transcription factor (MITF) (Fig. 2B); actin, alpha smooth muscle type (SMA) (Fig. 2C); muscle specific actin MSA; H-caldesmon. The Epithelial Membrane Antigen (EMA), Cytokeratin 7 (CK7) (Fig. 3A), PAX8 were positive in the epithelial cells lining the cystic spaces. The Oestrogen receptor (ER), Progesterone receptor (PR) and CD10 were positive in the subepithelial

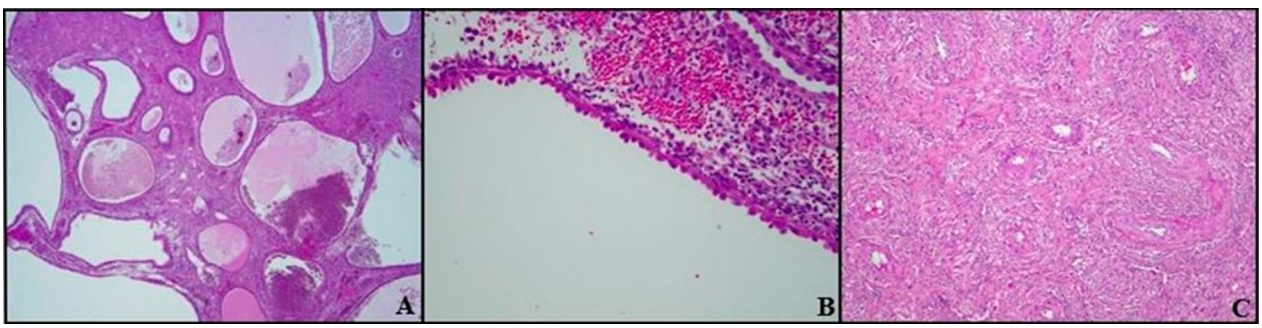

Fig. 1 AMLEC (Hematoxylin and Eosin). **A** Multilocular cysts, lined by cuboidal epithelial cells H&E X20. **B** Hobnailing cells with an eosinophilic cytoplasm H&E X20. **C** Thick-walled dysmorphic blood vessels H&E X100

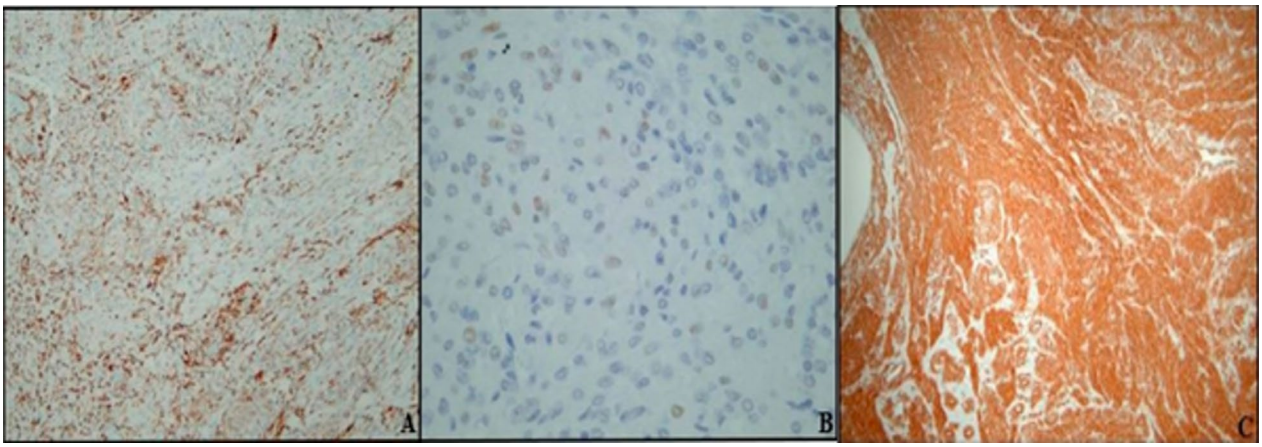

Fig. 2 AMLEC (IHC: Immunohistochemistry). **A** HMB45 positive staining in the spindled cells × 100. **B** MiTF1 weak nuclear positive staining in the spindled cells × 400. **C** SMA staining the spindled cell × 40

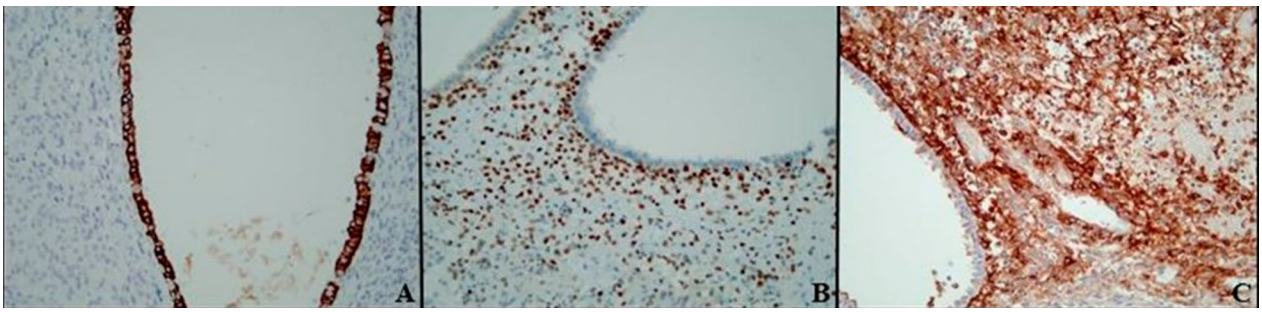

Fig. 3 AMLEC (IHC: Immunohistochemistry). **A** CK7 positive in the epithelial cells lining the cystic spaces X200. **B** ER nuclear positivity in the subepithelial stromaX200. **C** CD10 staining the subepithelial stroma X200

stroma (Fig. 3B, C). The features were compatible with a diagnosis of AMLEC.

The patient fully recovered, however, was lost to follow-up and as such subsequent genetic testing could not be undertaken.

3 Discussion

AMLECs are rare variants of AML usually encountered in middle-aged patients, with a debatable pathogenesis [5]. However, several theories have been put forward to explain possible pathogenesis, such as entrapped native collecting ducts with secondary cystic dilatation [12]. The second hypothesis is that the cysts represent the true differentiation of the epithelial component of the tumour [1].

AMLEC's present as unilocular or multilocular, well delineated tumours with a maximum diameter of 7 cm [3]. They contain serous fluid or blood, and the wall can have a mural nodule [1]. They can rarely infiltrate the perinephric fat [3, 9]. Our case showed a typical multilocular appearance with haemorrhagic contents which could be explained by the gunshot injury. We can speculate that the patient did not present himself to the hospital prior to the gunshot injury because the condition was asymptomatic.

The AMLEC is differentiated from its counterpart, angiomyolipoma, by the presence of an epithelial cystic structures and the rare occurrence of adipocytic component, however, with our case there was a sparse adipocytic component, further posing a diagnostic dilemma [1, 3].

An approach to adult cystic renal tumours is pivotal, especially with the newer entities emerging.

AMLEC is a benign tumour with an indolent behaviour, and therefore, it is crucial to differentiate it from the other cystic renal neoplasms and potentially nonbenign tumours. It must be differentiated from tumours that have a potentially aggressive outcome such as cystic renal cell carcinoma (RCC,) Cystic nephroma (CN), mixed epithelial and stromal tumour (MEST), cystic partially differentiated nephroblastoma (CPDN), and Eosinophilic solid and cystic renal cell carcinoma (ESCRCC).

The ESCRCC is a recent entity that has a classic solid and cystic growth pattern with epithelioid cells

possessing a voluminous eosinophilic and coarsely granular cytoplasm, and occasional nuclear pseudoinclusions [2].

Cystic variants of RCC often show apparent nuclear features of a renal cell carcinoma, necrotic debris, calcification and clefts which lack in AMLEC [3].

Cystic nephroma shows cystic structures with cellular ovarian-type stroma, however, they lack the dysplastic, thick-walled vessels [13].

MEST has overlapping histological morphology with AMLEC, but they lack staining with melanocytic markers [14].

CPDN shows undifferentiated blastematous component and stain with Wilms Tumour 1 (WT1) [15]. Our case had clear and distinct features supporting the diagnosis of AMLEC and excluding above differential diagnoses.

There have been a few published findings of coexistence or association between AMLEC and TSC [1, 2, 4]. Despite the rarity of an association with TS, there is still a need to rule this distant possibility out clinically and genetically in the quest to better understand this entity. We were unable in this case to undertake any genetic testing or imaging as the patient was lost to follow-up.

The diagnosis of AMLEC prior to histopathologic assessment is difficult as there are no specific clinical or imaging features. The tumour is discovered incidentally on imaging or for non-specific clinical features including flank pain, haematuria, proteinuria, and hypertension [3, 5, 6]. Interestingly, the present case was incidentally found on a nephrectomy specimen from renal trauma and not on imaging nor as a result of work up for any symptoms.

Kidneys with pre-existing lesions are vulnerable to trauma even of a minor force or intensity. This anatomical weakness does not only affect the physiological aspect of the kidney but also enhances the force of the trauma impact. AMLEC specifically, seems to have a benign course as there have been no documented cases of metastasis or recurrence in the available literature [3, 5]. Wei et al., based on their series, stated that there is no standard treatment for AMLEC, complete surgical excision of the tumour, partial nephrectomy for AMLEC < 5 cm in size or radical nephrectomy for larger tumours (> 5 cm) may be the only potential cure [6]. In a trauma setting, hemodynamically stable patients can benefit from selective renal angioembolization, whereas those with hemodynamic instability may benefit from surgical options [16].

4 Conclusions

Renal trauma patients with hemodynamic instability should be promptly managed. A life-saving emergency nephrectomy may be required based on the intraoperative findings. Pre-existing renal conditions such as AMLEC increase vulnerability of the kidneys to trauma.

We need to bring awareness and strengthen our knowledge base regarding the rare cystic renal neoplasms as there can be an overlap in the morphology. Despite rarity of genetic association of AMLEC and TS, the emerging findings raise the necessity of genetic testing of these lesions to rule out or confirm a remote possibility of tuberous sclerosis complex. Multidisciplinary approach is advised as it can aid in the swift arrival at the correct diagnosis and inform appropriate therapeutic interventions.

Abbreviations

AMLEC	Angiomyolipoma with epithelial cysts
AML	Angiomyolipoma
TSC	Tuberous sclerosis complex
ESCRCC	Eosinophilic solid and cystic renal cell carcinoma
RCC	Renal cell carcinoma
CN	Cystic nephroma
CPDN	Cystic partially differentiated nephroblastoma
MEST	Mixed epithelial and stromal tumour
HMB45	Human Melanoma Black 45
MITF	Microphthalmia associated transcription factor
SMA	Smooth muscle type A
MSA	Muscle specific actin
EMA	Epithelial membrane antigen
CK7	Cytokeratin 7
ER	Estrogen receptor
PR	Progesterone receptor

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Author contributions

NZM: primary author Guarantor of the manuscript and responsible for the integrity of the data; and drafting, writing, revision, and approval of final version of manuscript; NS: contributed to drafting and writing; AMM: senior author contributed to drafting, writing, incorporation of co-author feedback, revision, editing and final submission composition. All authors read and approved the final manuscript.

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Availability of data and materials

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Declarations

Ethics approval and consent to participate

The Wits Human Research Ethics Committee approved this study (reference: M220165).

Consent for publication

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Competing interests
The authors declare that they have no competing interests.

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