Human Pathology (2016) **58**, 41–46

ELSEVIER

Human PATHOLOGY

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Original contribution

Pathological features and clinical associations of 58 small incidental angiomyolipomas of the kidney☆,☆☆

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Received 18 May 2016; revised 25 July 2016; accepted 28 July 2016

Keywords:
Angiomyolipoma;
Kidney;
Sporadic;
Small tumor;
Autopsy

Summary Although angiomyolipoma (AML) of the kidney is a well-described and broadly studied neoplasm, little is known about clinical and morphological features of small incidental tumors occurring sporadically. Sections from 58 small AMLs found in 37 patients from 402 consecutive unselected autopsies were studied. A female predominance and a bimodal age distribution (30-50 and >70 years) were observed. No AML was found in a prepubertal patient. Six patients had multiple and bilateral AMLs (2-8 tumors per patient). Overall, the tumors ranged in size from 0.1 to 10 mm (mean = 1.5 mm) and were variably composed of smooth muscle and fat. Abnormal blood vessels were seen in only 4 tumors (7%). Most AMLs were located just beneath the renal capsule or at the corticomedullary junction. Pure leiomyoma-like (25 tumors) and lipoma-like (1 tumor) AMLs were found in patients younger than those with AMLs consisting of a mixture of components (P = .03). AMLs located in the subcapsular and cortical parenchyma were mainly composed of smooth muscle (P = .004), whereas fat predominated in AMLs in the medulla and corticomedullary junction (P = .004). No correlation between morphology and size was found. In summary, this study demonstrates that 9% of an unselected population had AMLs. Their frequent location just beneath the capsule and in the corticomedullary junction suggests that these areas might promote their development. Finally, the proportions of smooth muscle and fat appear to be associated with their location in the renal parenchyma and with the patients' ages.

1. Introduction

Angiomyolipoma (AML) is the most common mesenchymal neoplasm of the kidney [1]. As the name indicates, it is composed of vessels, smooth muscle, and adipose tissue in variable combinations. Most of the studies describing the morphological features of AML are based on surgical series and so are studies of tumors sufficiently large to be clinically significant. Features of small AMLs have been described in patients with tuberous sclerosis [2], but there is little information

☆ Competing interests: the authors disclose any conflict of interest.
☆☆ Funding/Support: this work was supported solely by internal departmental resources.
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http://dx.doi.org/10.1016/j.humpath.2016.07.024
0046-8177/

about small AMLs arising sporadically. The purpose of the present study is to describe the morphological characteristics and clinical associations of 58 incidental small AMLs in 37 patients from an autopsy series.

2. Material and methods

A series of 402 consecutive unselected autopsies were performed at Indiana University Medical Center between 1980 and 1981. Age, sex, and clinical information regarding history of hypertension, tobacco smoking habits, diabetes mellitus, and renal function based on serum creatinine levels were collected. The clinical information was not available in all cases, and it was reported as dichotomous variables. This study was conducted according to the principles expressed in the Declaration of Helsinki.

Each kidney was weighed and manually serially sectioned at 1- to 2-mm intervals, with sharp knives by 2 of the authors (K.A.W. and J.N.E.). Both sides of each slice were inspected, and all visible lesions were submitted for histologic processing and microscopic examination. Glomerulosclerosis was evaluated histologically and scored as negative (normal renal parenchyma), slight, moderate, and severe.

Statistical analysis was performed: Pearson correlation analysis was used for comparing continuous variables, Fisher exact test was used to compare categorical data for clinicopathological characteristics, and Student *t* test to compare continuous data. All *P* values are based on a 2-sided hypothesis. The results were considered statistically significant if the *P* was less than .05.

3. Results

3.1. Clinical findings

The autopsied patients included 106 females and 296 males. Their ages ranged from newborn to 92 years (mean = 49, median = 56). A total of 58 AMLs were found in 37 patients (9%). These patients ranged in age from 23 to 89 years (mean = 60, median = 63). A bimodal age distribution was observed: first peak of incidence was found in patients from 30 to 50 years, and a second peak in patients around 70 years (Fig. 1). Seventeen of the patients with AMLs were women, and 20 were men. No statistically significant difference in age was observed between the women and men. Six patients had more than 1 tumor. Of these, 5 had bilateral tumors. Three patients had 2 tumors, 1 had 4 tumors, and 2 had 8 tumors. Five of these patients were women, and their ages ranged from 51 to 89 years (mean = 71, median = 73). The 2 patients with 8 AMLs were 74-year-old and 76-year-old women. Autopsy found no other signs of tuberous sclerosis in these patients. In addition to the AMLs, 23 (62%) patients had renomedullary interstitial cell tumors, 13 (35%) had papillary adenomas, an adrenal rest was found in 5 patients, and in 9 patients, AML was the only renal lesion.

Comparing the clinical characteristics between patients with AMLs and those without, patients with AMLs were more frequently women ($P = .002$) and nonsmokers ($P = .005$). No significant difference was observed in age ($P = .23$), history of hypertension ($P = .8$) or diabetes mellitus ($P = .13$), renal function ($P = .13$), heart weight ($P = .17$), or weight of the right and left kidneys ($P = .64$ and $P = .51$, respectively)

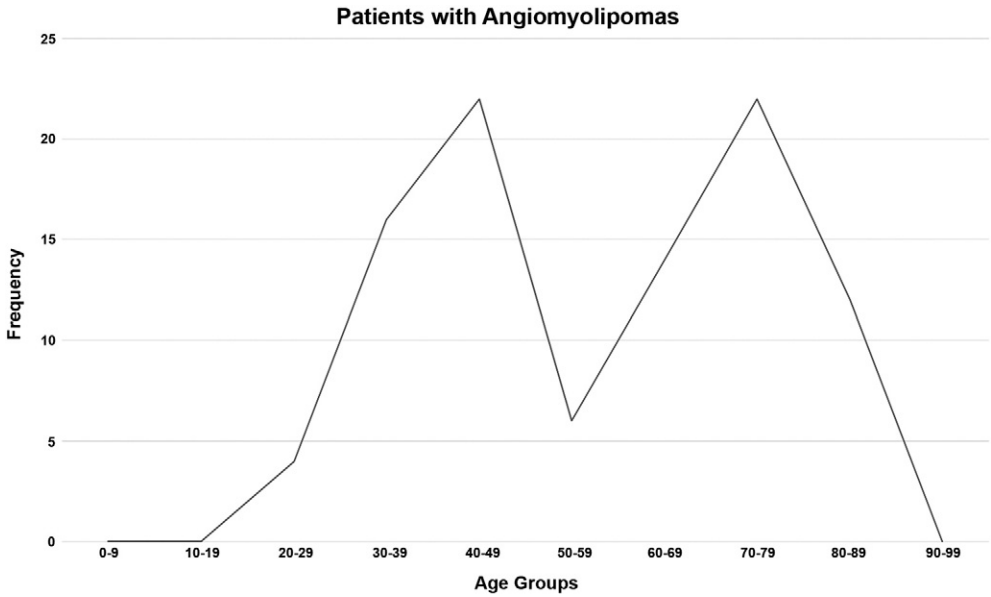

Fig. 1 A bimodal distribution of ages, showing a first peak of incidence in the third and fourth decades and a second peak around 70 years. The frequency was calculated as the number of patients with AML divided by the total number of patients in the age group.