Benign renal tumor prevalence and its correlation with patient characteristics and pathology report data.

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Abstract

Objectives: To correlate the incidence of benign renal tumours with parameters associated with patient characteristics and pathology.
Materials and Methods: The files of 192 patients who underwent radical or partial nephrectomy were reviewed. The investigated variables consisted of tumour size, kidney and renal pole location, age and gender. Tumour size was categorized according to the TNM system. The incidence of malignant renal tumours and their subtypes was also calculated. Results: We recorded 31.5% of benign and 69.5% of malignant tumours with a diameter < 4cm (p<.001). Between 4.1-7 cm, 90% were malignant and 10% were benign. For tumours measuring 7.1-10 cm, 94.4% were malignant and 5.6% were benign. For tumours larger than 10cm, the percentages were 92.3% and 7.7%, respectively. No other variable was presented as a considerable independent factor.
Conclusions: 30% of the renal lesions measuring < 4 cm proved to be of benign histology. Tumour size seems to be correlated with benign renal tumour frequency, assisting the physician, along with the surgical experience and the imaging modalities, in deciding the optimum management.

INTRODUCTION

The improvement of diagnostic imaging has led to an increased frequency of incidental renal lesions up to 71% [1]. Despite the enhanced current imaging of ultrasonography, computed tomography (CT) and magnetic resonance imaging (MRI) [2], it is not always possible to distinguish a renal lesion and especially oncocytoma from renal cell carcinoma. Additionally, radical nephrectomy is overly done, since it is advocated that the majority of incidental renal neoplasms are renal cell carcinomas. However, this paralleled increase, especially of small renal tumours and surgical treatments have no effect on mortality rates, suggesting that smaller lesions may not merit surgical removal [3].

On the other hand, novel promising, but still experimental surrogates of surgical management, such as radiofrequency ablation (RFA), cryoablation, chemoablation and cryosurgery are gaining ground as minimally invasive procedures, especially in laparoscopic or percutaneous approaches [4, 5]. Active surveillance of small renal masses, combined with renal core and fine-needle aspiration (FNA) biopsy, molecular, genomic and proteomic methods is, at the present time, under evaluation, but could be possibly offered in the future [6]. Thus, it would be of great importance for the urologist to know the incidence of benign renal tumours, in order to counsel the patient and plot the optimum strategy, which might favor a sparing management.

Aim of this study was to correlate the incidence of benign renal tumors with parameters associated with patient characteristics and pathology, in an effort to assist diagnosis in borderline cases and stimulate an extended application of non- or minimally-invasive techniques for the management of small renal tumors.

METHODS

The files of 192 consecutive patients who underwent radical or partial nephrectomy were reviewed. All the tumours included in the study were managed as renal cell carcinomas. Mean patient age was 61.5 years (range 26-86). The variables that were investigated for their potential correlation

with the incidence of benign renal tumours consisted of tumor size, kidney and renal pole location, age and gender. Tumor size was categorized according to the renal TNM system. Lesions > 7 cm were further subdivided to 7.1-10 cm and > 10 cm categories. We also subcategorized tumors measuring < 4cm, in an effort to establish a possible cut-off point of increased incidence of benign lesions. Tumors < 2 cm, 2-2.9 cm and 3-3.9 cm categories were included. The incidence of malignant renal tumors and their subtypes was also calculated.

Statistical analysis was performed using the chi-square test for the rates of categorical variables, while the distributions of continuous variables were compared using the Mann-Whitney test.

RESULTS

Of the 192 nephrectomies performed, 155 were radical nephrectomies and 38 were partial nephrectomies. Patient baseline characteristics are demonstrated in Table 1.

Figure 1

Table 1: Clinical and pathological data in 192 patients.

	Malignant	Benign	
Total N (%) patients	164(85.4)	28(14.6)	
Tumour size N(%)			*p<0.001*
< 4 cm	37(22.5)	17(60.7)	
4.1-7 cm	80(48.8)	8(28.6)	
7.1-10 cm	34(20.7)	2(7.1)	
> 10 cm	13(8)	1(3.6)	
Mean age (range)	63(35-86)	60(26-79)	*p=0.26*
Gender N(%)			*p=0.83*
Male	111(67.7)	18(64.3)	
Female	53(32.3)	10(35.7)	
Tumour location N(%)			
Right kidney	85(51.8)	18(64.3)	*p=0.31*
Left kidney	79(48.2)	10(35.7)	
Upper pole	67(40.9)	11(39.3)	*p=0.97*
Middle pole	49(29.9)	9(32.1)	
Lower pole	48(29.3)	8(28.6)	

The majority (85.4%) of the total number of tumors was malignant and 14.6% were benign. Mean tumor size ± standard deviation (S.D) was 5,85 ± 2,8 cm (range 0.7-16 cm). After the evaluation of the pathology reports and stratification of the tumors by size, we recorded 31.5% of benign and 69.5% of malignant tumors with a diameter < 4cm. Between 4.1-7 cm, 90% were malignant and 10% were benign. For tumors measuring between 7.1-10 cm, 94.4% were malignant and 5.6% were benign. Finally, for tumors larger than 10cm, the percentages were 92.3% and 7.7%, respectively. The above results were statistically significant (p<0.001).

The subcategorization of smaller renal masses resulted in a high percentage of benign tumors, especially for tumors between 2 to 2.9 cm (40%), without however exhibiting statistical significance (p=0.567).

Tumor location comprised right or left kidney and the upper, middle or lower pole of the kidney. Of the 192 tumours, 53.6% were located in the right kidney and 46.7% in the left. Additionally, 40.6% were upper pole tumors, 30.2% were middle pole tumors and 29.2% were lower pole tumors.

134 male (69%) and 58 female (31%) suffered from a renal tumor irrespectively of the pathology report.

Apart from tumor size, no other variable served as a significant independent factor. Table 1 summarizes the clinicopathological data of our sample.

The prevailing histological subtypes for malignancy and non malignancy were clear-cell carcinomas and oncocytomas. Histological subtypes stratified by tumor size are presented in Table 2.

Figure 2

Table 2: Histological subtypes stratified by tumor size

	Tumour size (cm)						
	<2	2-2.9	3-3.9	<4	4.1-7	7-10	>10
Histological subtypes	(N=6)	(N=15)	(N=33)	(N=54)	(N=88)	(N=36)	(N=14)
Malignant	5(83.3%)	9(60%)	23(69.7%)	37(68.5%)	80(91%)	34(94.5%)	13(93%)
Conventional (clear-cell)	3(60%)	6(66.7%)	16(69.6%)	25(67.6%)	57 (71.2%)	23(67.6%)	6(46.2%)
Chromophobe	0	1(11.1%)	3(13%)	4(10.8%)	8(10%)	4(11.8%)	4(30.7%)
Papillary	2(40%)	2(22.2%)	2(8.7%)	6(16.2%)	12(15%)	4(11.8%)	3(23.1%)
Collecting duct	0	0	0	0	1(1.25%)	1(2.95%)	0
Other	0	0	2(8.7%)	2(5.4%)	2(2.5%)	2(5.9%)	0
Benign	1(16.7%)	6(40%)	10(30.3%)	17(31.5%)	8(9%)	2(5.5%)	1(7%)
Oncocytoma	1(100%)	3(50%)	7(70%)	11(64.8%)	6(75%)	2(100%)	1(100%)
Angiomyolipoma	0	1(16.7%)	2(20%)	3(17.6%)	2(25%)	0	0
Cystic	0	2(33.3%)	1(10%)	3(17.6%)	0	0	0
Other	0	0	0	0	0	0	0

DISCUSSION

Over-treatment of renal lesions was never debatable, since every solid mass detected was treated as renal cell carcinoma either with radical or partial nephrectomy. However, the current trend of minimally invasive and nephron sparing techniques have resurrected the skepticism about radical surgical management. Additionally, an argue concerning the accuracy of contemporary imaging modalities, and especially CT, which is a widely used diagnostic tool in renal pathology has been raised [7]. Indeed, interobserver and intraobserver variability does occur when one estimates tumor volume using CT [8], while other authors have suggested that CT has a 60% sensitivity and a disappointing 20% specificity [9]. Focus is nowadays given in other complementary diagnostic methods, such as percutaneous or

intraoperative renal fine-needle biopsy [10, 11], as well as expectant management in comorbid, high-risk patients [3].

The value of CT and MRI in the diagnosis of renal masses is indisputable. However, in borderline cases, such as differential diagnosis of an oncocytoma or a renal cell carcinoma in a solitary kidney, the knowledge of the incidence of benign tumors and their potential correlation with host related characteristics or pathological features could be helpful.

It is noticeable that the incidence of benign renal tumors has increased steeply during the last decade and regards mainly the smaller lesions. In fact, two studies comprising series of laparoscopic partial nephrectomies have reported 33.6% and 30% of dissected tumors to be of benign histology in the pathology report [12, 13].

To our knowledge, this is one of the few studies investigating several clinicopathological parameters simultaneously, as probable independent factors affecting benign renal tumor incidence, since the majority of studies focuses on a similar analysis for renal cell carcinoma.

The initial inclusion of tumor size in the TNM system defined the prognostic significance of tumor volume in a patient with renal cell carcinoma [14]. Pahernik and associates suggested that the potential aggressiveness of a tumor > 3 cm increases sharply [15]. Tumor size has been previously assessed with controversial results. We recorded a significant 31.5% frequency in renal lesions < 4cm. Tumor size was the only variable associated with benign incidence in our study. Similar results have been reported previously by other authors as well, where the incidence ranged from 16% to 33% [16-18]. In a large series by Frank et al, it was concluded that the increase of tumor size increased significantly the probability of malignancy [19]. On the other hand, Remzi and colleagues and Snyder and associates recorded no statistical significance to this variable, despite their reported high incidence [20, 21].

However, a discrepancy was recorded when we subdivided the smaller renal lesions in <2, 2-2.9 and 3-3.9 cm categories. Even though the incidence of benign masses was greater, reaching a 40%, none of the above categories exhibited statistical significance. Our results are in accordance with the ones reported by Frank et al, who recorded a very high frequency of benign renal solid tumors (46.3%), when the size was less than 1.0 cm [19]. Schachter and associates reported a similar stratification of smaller than 4 cm renal lesions, subdivided in 1-cm increments. The reported frequency of the above categories was > 20%, without, however, any available statistical difference [17]. These observations in parallel to future larger cohorts of patients with a solid renal lesion might establish a cut-off point for significant incidence of benign renal tumors. Nevertheless, another available option could be the application of FNA biopsy for tumors less than 4 cm, since it has been reported that it is a safe diagnostic procedure [22]. On the other hand, it is recorded that the diagnostic accuracy of the FNA is decreased relatively to the tumor size. This high failure rate in small tumors is partly due to more difficult visualization and targeting, and the biopsy needle displacing small masses rather than penetrating them [22]. There is no consensus between urologists on the absolute indications of FNA, but they seem to be expanding with time. The main indications consist of atypical renal masses or secondary metastatic disease in the presence of known extrarenal malignancy. Biopsies have also been performed to confirm the diagnosis of a renal primary tumor in the presence of disseminated metastases or unresectable retroperitoneal masses [23]. However, it is not a procedure recommended by the European Association of Urology (EAU) guidelines [24, 25].

Tumor location was another parameter investigated due to an observation by a series of studies reporting higher incidence of benign adrenal tumors on the right side [26]. Nevertheless, no biological or other explanation has been given to this observation. In our study the predominance of right kidney tumors was not verified statistically. The same applied for the pole location, where the incidence was similar.

No correlation of gender with the possibility of a lesion being malignant or benign was found in our series of patients. However, there are reports suggesting a 2-fold increase in the possibility of a benign renal lesion in females [21, 27]. In general, male or female predominance concerning the diagnosis of a benign renal tumor differs [28]. Finally, in accordance to Snyder et al [21], we observed no correlation of the patient's age at diagnosis with the benign histology incidence.

CONCLUSION

A prediction of the tumor histology when stratified by size might be feasible, when diagnosis prior to the pathology report cannot be reached. Approximately one third of the renal lesions < 4 cm are benign and tumor size might be an

important factor that correlates with the probability of finding a benign renal tumour and might assist the urologist in deciding the optimum management and counseling his patient. The use of this factor, along with the surgeon's experience and the imaging modalities, in evaluating a renal neoplasm, could result in a possible deflation of the rates of aggressive surgical approaches and provide a strong argument for the use of minimally invasive techniques.

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