Malignant Renal Tumours

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Renal cell carcinoma (RCC) is the most common malignant renal parenchymal tumour, accounting for about 86% of all primary malignant renal neoplasms [1, 2].

Anatomoclinical Aspects

Pathology

Typical RCCs are seen as a solid renal mass with irregular lobulated margins, yellow-orange in colour and heterogeneous in appearance at gross pathological examination because of the presence of necrotic and/or hemorrhagic intratumoral areas [2].

Histologically, RCCs are of the clear-cell type in most cases. Among other categories, tubulopapillary RCCs, which represent about 15% of RCCs, are characterized by their architectural arrangement (tubulopapillary or papillary arrangement of cells) and poor vascularity, whatever their macroscopic appearance: solid or pseudocystic due to massive necrosis.

Cystic RCCs are not uncommon and frequently raise diagnostic problems. Three types of cystic RCCs can be differentiated: unicocular cystic RCC due to extensive necrosis or less frequently intrinsic cystic growth, presenting as fluid-filled nodules often containing old blood delineated by thick vascularized septa; and finally RCC which has developed in a preexisting cyst as a mural nodule, which represents a very unusual and controversial entity.

Clinical Aspects

Incidence rates are closely related to age, with a minimal incidence before the age of 30 and a progressive increase in frequency between 40 and 70 years old. The incidence of RCC is also influenced by some other factors, including sex, with a male-to-female incidence rate of 2.5; environmental, since incidence is higher in industrialized countries; and hereditary, particularly in von Hippel-Lindau’s disease, which is associated with an extremely high incidence of multiple and bilateral RCCs.

Clinical symptoms which can reveal RCCs include haematuria (40%), lumbar pain (10%) or mass (5%) and rare nonurological symptoms such as fever, hypertension, polycythaemia, endocrine manifestations and those related to bone and lung metastases. However, most RCCs are clinically silent and incidentally diagnosed, in 45% of cases because of the wide use of abdominal ultrasonography (US) and computed tomography (CT). As a matter of fact, the discovery of small (<3 cm) RCCs has dramatically increased during the past decade [3]. Such small incidentally detected renal tumours pose diagnostic problems because of their non-specific appearance and the relatively high proportion of small benign tumours (about 20%).

Radiological Diagnosis

The radiological diagnosis of a malignant renal tumour involves three steps: (1) to recognize a tumoural syndrome; (2) to assess its malignancy; and (3) to stage the extent of spread.

Classical Approach Based on Intravenous Urography and Arteriography

The classical approach is based on preliminary intravenous urography (IVU) [4]. The diagnosis of a renal mass is made in association with: (a) deformity of the renal contour (bulging, swelling, diffuse enlargement); (b) spheric nephrographic defect; and (c) deformity of the pelvicalyceal system (displacement, compression, elongation).

The diagnosis of renal cancer is suggested when [4] the mass is calcified, there is a blush at the early nephrographic stage, filling defects are present, indicating invasion of the pelvicalyceal system, and the kidney is silent.

In fact, most of the time, IVU signs of malignancy are absent or difficult to assess. Moreover, IVU is insensitive and particularly small or exophytic anterior/posterior RCCs may be misdiagnosed owing to the absence of deformity. In any case, it is possible to assess the benignity of a mass by IVU.
Renal arteriography using the Seldinger technique is now rarely performed except preoperatively when conservative surgery is being considered. It should always consist in a preliminary, nonselective aortogram followed by selective renal arteriograms. Typically, it exhibits a vascularized, heterogeneous mass, with irregular neovessels and arteriovenous shunts.

This classical approach is rather obsolete because:
- Most of the malignant renal tumours are clinically silent or revealed by atypical clinical patterns (fever, pain, abdominal mass, metastases).
- Conventional IVU is neither sensitive nor specific for the diagnosis of small masses; it cannot assess safely the benignity of a tumoural syndrome (benign tumour or pseudo tumour).
- US has become the most common screening imaging test in uronephrology and therefore detects most of the renal masses, followed by CT, the commonest complementary examination.
- Malignant renal tumours can present as an avascular mass because of minimal nondetectable intratumoural vascularization or extensive necrosis. In contrast, benign nontumoural masses can be vascularized.

Ultrasound: First and/or Only Approach

Using high-resolution, conventional US, it is now possible to detect solid masses, even smaller than 1 cm in diameter. Most of the masses are echogenic (Fig. 1), more or less heterogeneous and poorly delineated, depending on their size. When large enough, they often present with scattered intratumoural calcification, acoustic shadowing and echolucent necrotic areas.

False negatives may result from cystic carcinomas, homogeneous hypoechogenic solid carcinomas (often but not always related to incorrect setting of the beam, mimicking haemorrhagic or superinfected cyst), or egg-shell calcified rim (mimicking hydatic cyst or complex calcified cyst). False positives may result from pseudotumoural Bertin’s column hypertrophy, subacute or chronic renal abscesses, complex cysts, and nonfatty benign tumours such as anocytomias (refer to “Differential Diagnosis”). Fine-needle US-guided puncture can be used to obtain histological data, but there are many pitfalls and so physicians are usually reluctant to use it because of the risk, though rare, of neoplastic spread induced by the capsular rupture in malignant tumours.

If colour Doppler US (CDUS) is available the sensitivity for the diagnosis of a vascularized mass improves; the specificity is also better because of the obviously normal vascularity of the Bertin’s columns, which may help to characterize such pseudotumours. But, it is not possible to differentiate malignant from benign masses using spectral analysis obtained with pulsed Doppler. CDUS is diagnostic when it shows neoplastic thrombus in the renocaval venous system.

CT: First and/or Only Approach

The basic technical rule for successful CT of the kidney is to consistently perform a noncontrast CT scan first, with an excellent control of breathing. This important stage is often lacking when a renal mass is discovered incidently during an abdominal contrast-enhanced CT prescribed for other reasons. A second scan is urged systematically after a large IV bolus injection, with subsequent infusion of iodinated contrast medium using 5-mm-thick contiguous sections.

A renal carcinoma is usually isodense before injection and sometimes calcified. The degree of enhancement obtained after injection reflects the ratio of vascularity to necrosis of the tumour. The enhancement is usually heterogeneous and centripetal and occurs early after injection [1, 5]. Small RCCs (<3 cm) often show a homogeneous pattern, sometimes with delayed and/or slight postcontrast enhancement and especially in tubulopapillary RCC (Fig. 2).

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**Fig. 1.** Ultrasonography of a small renal cell carcinoma (arrow) with homogeneous, slightly hyperattenuating appearance

**Fig. 2.** Postcontrast computed tomographic scan shows a small homogeneous tumour of the left kidney (tubulopapillary renal cell carcinoma at pathology)