Small renal masses – diagnosis and management

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Renal cancer is the eighth most common cancer in the UK and accounts for about 3% of all new cancer diagnoses [1]. The incidence rates are steadily rising, with the highest rates being in older men and women. This rise is largely due to the increasing detection of incidental small renal masses (SRMs) [2]. SRMs are defined as enhancing tumours within the kidney that are up to 4cm in maximal diameter with characteristics consistent with stage T1a renal cell carcinoma (RCC) [3]. With technological advances and widespread use of imaging techniques such as CT and MRI, renal masses are being diagnosed at much earlier stages in asymptomatic patients. Most small renal masses have a slow growth rate (less than 3mm/year) and a low risk of metastasis [4]. The increased detection of SRMs has therefore led to a paradigm shift in treatment strategies and now poses significant dilemmas to urologists with regard to the choice of the most appropriate management option for these patients.

Natural history

Although the incidence of renal cancer is rising, the mortality rates have not changed significantly. This is partly because most RCCs which are being detected incidentally as small renal masses are found to be of low grade [5]. At least 20% of SRMs presumed to be RCC are found to be benign when biopsied [6]. The majority of these SRMs are being diagnosed in older people with multiple co-morbidities who are undergoing abdominal CT or MRI scans for abdominal symptoms. For many of these patients, radical surgery may therefore not be needed as they are more likely to die of other causes. Most SRMs grow slowly even if they are malignant and rarely progress to metastatic disease. A lack of growth, however, does not prove that a small renal mass is benign. Studies have shown that a 1.0cm increase in diameter correlates to a 16-17% increase in the risk of the mass being malignant [7,8]. It is important to note that although the risk is low, SRMs can progress and develop metastatic disease. Approximately 1% of SRMs on active surveillance will therefore metastasise [9] and nearly 10% of SRMs less than 3cm will become stage pT3a [10]. A complete evaluation with lung imaging is therefore essential at the time of diagnosis.

Diagnosis

Imaging

Nowadays, patients with renal tumours rarely present with an abdominal mass, loin pain and visible haematuria. With advances in imaging modalities, most cases are now being diagnosed incidentally in otherwise asymptomatic patients. All enhancing renal masses are suspicious for renal cell carcinoma. A triple-phase CT scan, with images taken before and after the administration of contrast, remains the gold standard in renal imaging. In patients with renal impairment or who are allergic to contrast agents, a MRI scan can be performed. Classically, an enhancement of more than 15 Hounsfield units (HU) on CT is suggestive of renal cell carcinoma and renal masses with less than 10HU enhancement are considered to be benign [11]. However, these current imaging modalities cannot differentiate between malignant and benign tumours for an enhancing small renal mass. Other possible pathology that should be considered include oncocytomas, fat-poor angiomyolipomas, lymphomas, renal abscesses or vascular malformations.

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Percutaneous renal biopsy can help to provide a definitive diagnosis in cases of uncertainty.

Role of biopsy

Historically, percutaneous renal biopsy (PRB) was limited to patients with a history suggestive of renal lymphoma, primary renal abscesses or secondary metastases. There were some concerns over the possible risks of bleeding, tumour seeding and inadequate tissue sampling leading to false negative biopsies and therefore PRB was not routinely performed. However, more recent studies have shown that it is an accurate and safe diagnostic tool [6]. It can differentiate benign from malignant tumours with a accuracy of more than 95% [12]. There is a well-defined role for renal biopsy in the management of SRMs where histological diagnosis would likely change clinical management such as in cases where a diagnosis of oncocytoma would obviate the need for surgery. Percutaneous renal biopsy can be done by fine needle aspiration and sent for cytology or by core biopsy for analysis by a histopathologist. Its use in the management of SRMs is therefore expected to grow in the future.

Treatment modalities

There are several treatment options for the management of small renal masses suspicious for renal cell carcinoma, which include active surveillance, open or minimally invasive surgical approaches. There is currently no consensus on the ideal management of SRMs in different age groups. Urologists should therefore inform patients of the advantages and limitations of the different treatment modalities and choose the most appropriate option based on their age, life expectancy and suitability for surgery.

Radical nephrectomy

Radical nephrectomy (RN) was historically the gold standard treatment for all suspicious renal masses. It involved the removal of the entire kidney including the renal mass as well as the surrounding tissue. While technically more challenging, partial nephrectomy (PN) was reserved for solitary kidneys or bilateral tumours. RN can be performed laparoscopically, but it is often unnecessary due to the subsequent loss of renal function. RN is now only indicated for cases where nephron-sparing surgery is not feasible.

Partial nephrectomy

Partial nephrectomy is the current gold standard treatment of all SRMs. It involves only removing the renal tumour and a cuff of normal surrounding tissue with renal reconstruction. PN has equivalent oncological outcomes to RN, with improved preservation of renal function and reduction in cardiac morbidity [13]. Partial nephrectomy can be performed using minimally invasive surgical techniques: laparoscopic or robotic-assisted partial nephrectomy. However, it comes with an increased risk of complications such as urine leak and postoperative bleeding. Another major concern with laparoscopic partial nephrectomy (LPN) is the longer reported warm ischaemia times (WIT) compared to the open technique [14]. Robotic-assisted partial nephrectomy (RAPN) is rapidly revolutionising the surgical management of SRMs. One large study carried out in 2009 reported no significant difference between LPN and RAPN, with much shorter WIT in the RAPN group [15]. The learning curve of RAPN compared to LPN is also shorter, making it increasingly popular among surgeons with little experience in minimally invasive surgery [16]. Long-term data is however lacking.

Ablative therapies

Cryotherapy and radiofrequency ablation (RFA) are alternative minimally invasive treatment options for SRMs and are now widely used. Ablative therapies can destroy the tumour by either freezing (cryotherapy) or burning (RFA) tissue by using temperatures between -50 and -20 and >50 degrees Celsius respectively. They are suitable for patients with significant co-morbidities who are not fit for surgery, but still prefer active treatment. Both techniques can be performed using a percutaneous or laparoscopic approach, with reduced morbidity and faster recovery. Repeat treatment is possible and they can be used as salvage therapy in patients with recurrence after surgical intervention. Long-term follow-up data for ablative therapies is however lacking. A study looking at RFA over a period of seven and a half years has shown a five-year disease-free survival rate of 93% [17]. Another retrospective study following patients for eight years after cryotherapy reported no recurrence after five years [18].

Active surveillance

In elderly patients with significant co-morbidities and reduced life expectancy, surgical treatment might not be an option. For these patients, a more conservative approach is needed and active surveillance (AS) is a reasonable option. As mentioned earlier, SRMs grow slowly with a low risk of metastasis. However, one cannot accurately predict the growth rate of these small renal masses. Active surveillance therefore involves the monitoring of tumour growth by serial radiological imaging typically at six-monthly intervals and initiating treatment in case of progression. As with ablative therapies, long-term oncological outcomes are lacking. The main concern with AS is the risk of tumour progression to metastatic disease, thereby missing the opportunity for potentially curative surgery. Unlike prostate cancer, active surveillance is not recommended for young healthy patients.

Conclusion

The incidence of small renal masses has risen considerably over the last few years with the increase in the use of cross-sectional imaging. They pose an increasingly common therapeutic dilemma. SRMs consist of both benign and malignant tumours and differentiating between the two can be quite difficult. The use of percutaneous renal biopsy is therefore growing to help clinicians tailor their treatment to individual patients. Current treatment modalities include radical or partial nephrectomy, ablative therapies or active surveillance. While partial nephrectomy is considered the current gold standard treatment in the management of SRMs, it might not be suitable for elderly patients with multiple co-morbidities. In these patients, more conservative options such as active surveillance should be adopted. However, in contrast to the surgical options, long-term data for active surveillance is lacking. There is therefore a need for prospective randomised clinical trials to compare the effectiveness of active surveillance with surgery in the management of patients with small renal masses.

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