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Renal Pelvis Cancer

Renal pelvis cancer is a malignant tumour arising from the lining of the renal pelvis of the kidney. It often presents with haematuria.

The case has, in some respects, been not entirely devoid of interest

SIR ARTHUR CONAN DOYLE 1859 – 1930
SHERLOCK HOLMES A CASE OF IDENTITY 1892

Urine excreted by the kidney collects in the renal pelvis. It is then passed down the ureter to the bladder. The lining of the renal pelvis comprises transitional epithelium similar to that found in the bladder.

Renal pelvis cancer is a transitional cell carcinoma as apposed to an adenocarcinoma that arises from the renal cortex. Similar tumours arise in the ureter.

Incidence

Transitional cell carcinomas account for 8% of all kidney cancers.

	New cases UK
Males	330
Females	200
Total	530

In 2 – 4% of patients the disease is bilateral.

Age

The tumour increases with age. Most patients are over 65 years.



Sex

The incidence of renal pelvis cancer is more common in males than females. The ratio is twice as many men as women.

Predisposing factors

In most cases the exact cause of renal pelvis cancer is unknown.

Smoking is a causative agent in developing renal pelvis cancer. The more cigarettes smoked in a day the higher the risk. The risk is lowered if smoking is stopped.

Workers in the aniline dye industry are at risk. Examples of these dyes include benzidine, α and β naphthylamine. Aniline dyes were used to colour maggots for anglers. Fortunately this practice has ceased. β naphthylamine production ceased in the UK in 1952.

Some occupations have been linked to renal pelvis cancer. These include

- Hairdressers
- Mechanics
- Printing workers
- Cable manufacturing
- Painters and decorators
- Tyre manufacture

Patients with a pre existing carcinoma of the bladder are at risk of developing renal pelvis cancer.

Phenacetin abuse has been associated with these cancers. Phenacetin is an oral pain killing drug.

Renal papillary necrosis predisposes to renal pelvis cancer.

Types

There comprise transitional cell carcinomas. A small percentage will be squamous cell carcinomas due to a process called metaplasia in the lining of the renal pelvis.



Presentation

One of the main presenting symptoms is haematuria (blood in the urine). Up to 50% of these tumours present with this symptom. The blood is usually throughout the stream as the blood has time to mix thoroughly with the urine. It is often painless but occasionally the patient will present with pain if there are clots passing down the ureter. Sometimes the blood is microscopic in which case the patient will not physically see the blood.

Some lesions present with abdominal or loin pain. Ureteric tumours may present with pain due to obstruction of the ureter. This leads to a hydronephrosis where the renal pelvis dilates.

It is not uncommon for kidney tumours to be without symptoms. In these instances the tumour presents incidentally on a scan such as an ultrasound scan or a CT scan. These scans may detect a hydronephrosis.

Other symptoms include tiredness, loss of appetite, loss of weight and a raised temperature (commonly referred to as a PUO – pyrexia of unknown origin). These symptoms are not in themselves diagnostic of kidney cancer. There may be a urinary tract infection.

Screening

At the current time there is no reliable method of screening for kidney cancer.

Investigations

- | | |
|-------------|---|
| Urine tests | Urinalysis is a dipstick test. It will detect the presence of blood and white blood cells in the urine. Urine cytology is a specific test to detect the presence of malignant cells in the urine. A cytologist will detect these cells. |
| Blood tests | A full blood count will detect anaemia. Renal function tests such as urea and creatinine will detect any renal failure. |
| Ultrasound | Ultrasound scans will pick up renal pelvis tumours or hydronephrosis. |



IVU

Intravenous urography is an xray investigation. It is performed by giving the patient contrast dye intravenously. A series of xrays are taken over the next 30 minutes. The contrast medium passes through the kidneys and then down the ureter to the bladder. Filling defects (areas with no contrast medium) may be seen on the kidney views. The calyces (small collecting areas that drain into the renal pelvis) may be distorted or destroyed. Hydronephrosis will be detected. A normal IVU does not exclude the presence of a renal pelvis tumour.



IVU showing tumour in the renal pelvis

CT scanning

Computerised Tomography is an xray examination of the body. It views the body in "slices". Both contrast and non contrast studies are performed. The size and the extent of the tumour can be assessed thus staging it. Any involved lymph nodes will be detected.



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- Cystoscopy** If the patient presented with haematuria then this investigation is performed in order to exclude any bladder pathology. A retro grade ureterogram is an xray examination of the ureter and renal pelvis performed by passing xray contrast medium up the ureter. This is performed at the time of cystoscopy. It will identify filling defects in the ureter and renal pelvis.
- Ureteroscopy** Ureteroscopy is an endoscopic examination of the ureter and renal pelvis. Both rigid and flexible telescopes can be passed up the ureter. Tumours are then identified under direct vision.
- Biopsy** If the diagnosis is still in doubt after the above investigations then a percutaneous biopsy or a ureteroscopic biopsy may be indicated.
- MRI scan** This scan is not routinely performed as CT scans are the preferred method of scanning kidneys. This scan may be useful when the diagnosis is uncertain.

Grades

Renal pelvis tumours are graded into three grades

Grading of Renal Pelvis Cancer

G1	Well differentiated	Low grade
G2	Moderately differentiated	Intermediate grade
G3	Poorly differentiated	High grade

The number of mitoses (cell divisions) helps to assess the degree of differentiation.



Staging

The TNM classification system is commonly used to stage tumours.

The “T” refers to the primary **T**umour

The “N” refers to the lymph **N**odes draining the bladder

The “M” refers to all other distant **M**etastases

The primary renal tumour is staged as follows:

Stages of Renal Pelvis Cancer - Tumour

T _x	Primary tumour not evaluated
T ₀	No evidence of primary tumour
T _a	Papillary non invasive carcinoma
T ₁	Tumor invades subepithelial tissue
T ₂	Tumour invades muscular layer
T ₃	Renal pelvis – tumour invades peripelvic fat
T ₃	Ureter – tumour invades periureteric fat
T ₄	Tumour invades adjacent organ
T _{is}	Carcinoma in situ

Secondary node involvement is staged as follows:

Stages of Renal Pelvis Cancer - Nodes

N _x	Lymph node status unknown
N ₀	No lymph node metastases
N ₁	Metastasis in single lymph node < 2 cms
N ₂	Metastases in 1 or more lymph nodes 2 – 5 cms
N ₃	Metastases in lymph nodes > 5 cms



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Distant metastases are staged as follows:

Stages of Renal Pelvis Cancer - Metastases

M _x	Metastatic status unknown
M ₀	No distant metastases
M ₁	Distant metastases

Renal carcinoma often spreads to lymph nodes. In the later stages it can spread to lung, bone and liver.

An alternative staging system is used. It is called the AJCC staging (American Joint Committee on Cancer). However the TNM classification is becoming the more popular method of staging.

Alternative AJCC staging of renal pelvis cancer

Stage	Criteria	TNM equivalents
O _a	Non invasive carcinoma	T _a ; N ₀ ; M ₀
O _{is}	Confined to kidney > 7 cms	T _{is} ; N ₀ ; M ₀
1	Tumor invades subepithelial tissue	T ₁ ; N ₀ ; M ₀
2	Tumour invades muscular layer	T ₂ ; N ₀ ; M ₀
3	Tumour invades peripelvic fat	T ₃ ; N ₀ ; M ₀
4	Tumour invades adjacent organ	T ₄ ; N ₀ ; M ₀ Any T; N ₁ ; M ₀ Any T; N ₂ ; M ₀ Any T; N ₃ ; M ₀ Any T; Any N; M ₁



Patients may also be localised, regional or metastatic

Localised

- Group 1 Low grade tumour confined to the Urothelium
- Group 2 Grade 1 – 3 with invasion of the sub epithelium
- Group 3 High grade tumour invading renal pelvic wall but still confined to the kidney

Regional

- Group 4 Extension of tumour beyond renal pelvis invading perirenal fat, lymph nodes and adjacent organs

Metastatic

Spread to distant organs

Treatment

Surgery

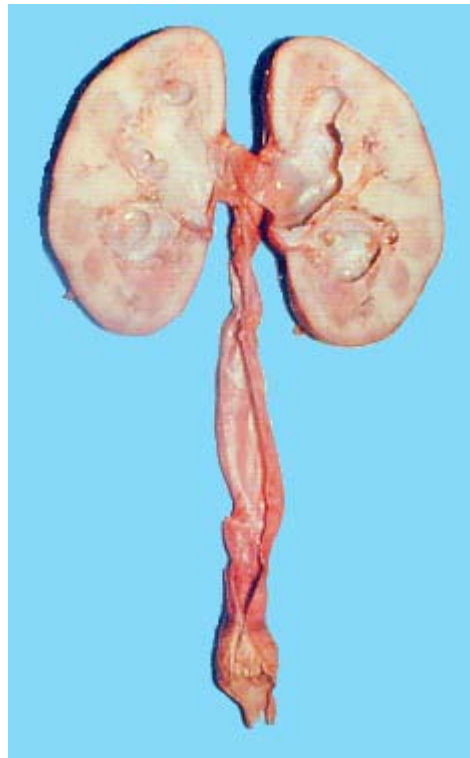
Surgery offers the best chance of curing the condition. Nephroureterectomy is the surgical removal of the kidney with the entire ureter.

Nephroureterectomy

Surgery remains the main treatment for renal pelvis carcinoma. Because of field changes in the renal pelvis and ureter this is the standard treatment. It is commonly performed through 2 incisions. The lower suprapubic incision facilitates the excision of the lower ureter whilst the upper renal incision allows the removal of the kidney. Recurrences at the site where the ureter entered the bladder was very high. McDonald in 1934 showed that these recurrences could be reduced by excising a cuff of bladder with the ureter. This has now become standard practice.



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Nephro ureterectomy specimen
Showing tumour in the ureter



Close up of above



Modified nephroureterectomy

In this procedure the basic principle of removing the kidney and ureter with a cuff of bladder remains. The lower end of the ureter is excised endoscopically from within the bladder. This obviates the need for 2 incisions.

Laparoscopic nephrectomy

This operation is carried out through a telescope called a laparoscope. It is a minimally invasive treatment. Only localised tumours can be dealt with this way. It is only performed in specialised units.

Ureterectomy

If the tumour is confined to a small segment of ureter then it may be possible to excise the tumour locally and anastomosing the ureter to restore ureteric continuity. This allows the patient to keep his kidney. It may also be possible to locally resect a tumour in the lowest part of the ureter in which case the ureter must be re-implanted into the bladder.

Lymphadenectomy

Lymphadenectomy (in conjunction with a nephroureterectomy) is the removal of the regional lymph nodes. It does not convey any advantage to the patient in high grade disease as the prognosis on this group is so poor. Lymphadenectomy in low grade disease is not very common. Therefore this procedure is rarely performed.

Radiotherapy

Radiotherapy kills cancer cells using high energy rays. It can be given as definitive treatment or as adjuvant therapy. It can palliate pain or bleeding in those tumours that are not surgically removed. It may have a role in patients who are unfit for any surgical procedure. Adjuvant radiotherapy is given as an extra treatment prior to nephrectomy.



Embolisation

Arterial embolisation is a procedure that cuts off the blood supply to the kidney. A catheter is passed up the femoral artery from the groin and negotiated into the renal artery. Various coils and balls and foam are injected in the artery to occlude it. Hence the blood supply is cut off. This procedure is used to control bleeding from a tumour or to shrink the tumour. It can also be performed prior to nephrectomy in order to minimise blood loss during surgery. One drawback to the procedure is that once it is done the patient may experience pain for a day or so.

Chemotherapy

Following on from the success of Intravesical chemotherapy for transitional cell carcinoma of the bladder intra-pelvic chemotherapy has occasionally been used. The long term results of this treatment have not been well reported. The same agents have been used. These include thiotepa, Mitomycin-C, Adriamycin (doxorubicin) and 4-epi-rubicin. The long term results of systemic chemotherapy are also poorly documented. Combination chemotherapy has produced the best results. Agents used include Methotrexate, Vinblastine, Adriamycin (doxorubicin) and Cisplatinium. This combination is known as the M-VAC regime. The M-VAC regime offers better response rates than Cisplatinium alone. M-VAC has an overall response rate of 39% in Metastatic disease.

[Follow up](#)

It is imperative that any patient diagnosed with transitional cell carcinoma of the renal pelvis must be followed up with regular bladder cystoscopies. Up to 40% of patients will develop recurrences in the bladder. If the tumour in the renal pelvis and ureter is diffuse then the risk of bladder tumours rises to 75%.



Prognosis

The grading of the tumour affects the prognosis. Grades 1 and 2 have a much better outlook than grades 3 and 4. The median survival for grade 1 and 2 is 67 months compared to 14 months for grades 3 and 4. Medians survival for low stage tumours is 91 months compared to 13 months for high stage disease.

The overall 5 year survival rate is 72% for all tumours. The non bladder recurrence rate is 39%. The tumour stage and grade have a significant effect on survival. Sex age and subsequent bladder recurrences did not affect survival.

Further information

Cancerbackup
0808 800 1234
www.cancerbackup.org.uk

Cancer Research UK
info.cancerresearchuk.org
www.cancerhelp.org.uk

National Cancer Institute
www.cancer.gov