

A Study On Culprit Factors, Ultimately Demanding Nephrectomy.

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Citation

V Popat, M Kumar, D Udani, M Mundra, D Vora, M Porecha. *A Study On Culprit Factors, Ultimately Demanding Nephrectomy.*. The Internet Journal of Urology. 2009 Volume 7 Number 1.

Abstract

Nephrectomy is a major operation requiring skilled and experienced hands to perform. AIMS AND OBJECTIVES: This study was performed to identify major culprit factors, which demands nephrectomy, at all. And to identify association between renal stone and squamous cell carcinoma, if any. MATERIALS AND METHODS: 78 cases of nephrectomy were collected over a two year study period. All cases were examined for their gross pathology and histopathological examination was done using H& E staining. CONCLUSION: We found chronic pyelonephritis to be the most common lesion, followed by renal cell carcinoma and pyonephrosis next in frequency. A statistically significant association was found between renal stone and squamous cell carcinoma of kidney ($p=0.1814$).

INTRODUCTION

Different types of nephrectomies can be performed for varying indications which depend on the type and site of the lesion. It can be of the following types¹:

- 1) Simple Nephrectomy: It is indicated in irreversible kidney damage due to chronic infection, obstruction, calculus disease, severe traumatic injury and selective neoplastic conditions. It is also indicated to treat reno-vascular hypertension due to non-correctable renal artery disease or severe unilateral parenchymal disease due to nephrosclerosis, pyelonephritis, reflux dysplasia and congenital dysplasia.
- 2) Radical Nephrectomy: it is indicated in localized Renal Cell Carcinoma.
- 3) Partial Nephrectomy: it is indicated for those cases of malignancy where radical nephrectomy renders patients anephric with subsequent immediate need for dialysis, or the patient is diabetic/atherosclerotic. It is also indicated in malignant lesions < 4 cms in size.

A Brief account on the aetiological factors are as follows,

1) Chronic Pyelonephritis:

There are three peaks of incidence: infancy and early adulthood, women of childbearing age, and both men and women older than 60 years². Most of the patients are asymptomatic, although some have history of frequent UTI,

and still others are diagnosed incidentally on radiological investigation in patients of renal.² Grossly, the kidneys are atrophic and show coarse fibrosis. Histology shows tubular damage, inflammation and fibrosis, with changes of thyroidisation in tubules noted frequently.

2) Pyonephrosis:

Patients usually present with high grade fever, chills and rigor. Urine may or may not show presence of pyuria and bacteriuria. Imaging studies show persistent echo in the inferior portion of collecting system, fluid debris level with dependent echoes that shift with positional changes. Grossly, kidneys are mildly enlarged and irregular, Cut surface shows multiple cystic spaces. Microscopically, extensive acute inflammatory infiltrate and areas of necrosis are seen.⁴

3) Tuberculous Kidney:

Usually occurs in young adult males (20-40 years). Most patients are asymptomatic, on occasion have dull aching flank pain and passage of blood clot, secondary calculi or mass/debris. Grossly, the kidneys are normal on the outer surface (usually surrounded by perinephritis), which on sectioning show involved areas filled with cheesy material. Histologically, parenchyma shows fibrosis with tissue destruction and presence of epithelioid granulomas with areas of caseation necrosis.⁵

4) Xanthogranulomatous Pyelonephritis:

Patients are usually females in the 5th to 7th decades. Urinary obstruction is invariably present, usually due to stones and the patients usually present with high grade fever, chills and flank pain. Grossly, mass occupying nature of this lesion often mimics RCC. Histologically, there is diffuse granulomatous inflammation with many foamy histiocytes and multinucleated cells.⁶

5) Angiomyolipoma:

Most patients are adults. Usually, it is an incidental finding. Larger tumors can cause gastrointestinal symptoms and may be associated with retroperitoneal bleeding which is an indication for nephrectomy. Approximately, one third cases are associated with Tuberous Sclerosis. Grossly, kidneys are unencapsulated yellow to gray lesions, causing capsule elevation. Histologically, it is characterized by the presence of 3 components- mature fat cells, smooth muscle and blood vessels in varying proportions.⁷

6) Oncocytoma:

Usually occurs in adult males. Patients are usually asymptomatic with most patients discovered incidentally but infrequently for gross hematuria, and flank mass. Angiography shows 'spoke wheel sign'. Grossly, the kidneys are solid and mahogany brown often with a central stellate scar. Microscopically, these are composed of cells with abundant acidophilic granular cytoplasm growing in nesting or tubular fashion.^{8,9}

7) Wilm's tumor:

Usually occurs in third year of life (1- 6 years). Classic presentation is in the form of an abdominal mass felt by the mother. Hematuria, pain and hypertension are rare. IVU shows an intrarenal mass that displaces and distorts the pelvis. Grossly, tumors are solitary, well circumscribed, without section predominantly solid and pale gray or tan. Microscopically, three major components are identified: undifferentiated blastema, mesenchymal (stromal) tissue and epithelial tissue.¹⁰

8) Renal Cell Carcinoma:

Patients are usually adult males (average age – 55-60 years). Cigarette smoking and high BP are usually considered risk factor. Patients usually present with classic triad of hematuria (59%), flank pain (41%) or abdominal mass (45%), although other symptoms may be present in some patients – weight loss, anemia, fever. Grossly, the RCCs are

well delineated and centered on the cortex. Cut surface shows solid, golden yellow tumor, sharply demarcated variegated appearances due to hemorrhage, necrosis, calcification and cystic change is characteristic of this lesion. Microscopically, tumor cells are large with optically clear to granular cytoplasm arranged in tubular or papillary patterns.

a) Papillary RCC (45%)

These occur usually in patients on chronic hemodialysis. Microscopically, complex papillary formations are often seen accompanied by stromal infiltration by neutrophils and foamy macrophages.

b) Collecting duct carcinoma (1-2%)

Occurs commonly in males, are centered in medulla, and have tubule-papillary architecture with surrounding desmoplastic reaction.

c) Chromophobe RCC (5%)

Grossly, well circumscribed solitary with homogenous gray brown cut surface. Microscopically, shows characteristic nesting arrangement. The cells have abundant, pale, acidophilic cytoplasm often with a clear perinuclear region.

d) Sarcomatoid RCC

Occurs in adults and are composed of spindle and / or pleomorphic tumor giant cells.

e) Renal Medullary Carcinoma

Very rare, occurs in young black patients with sickle cell disease. It is usually centered in medulla and exhibits reticular, or yolk-sac like appearance microscopically¹¹.

9) Traumatic Injuries:

Patients present with microscopic/ gross hematuria, pain localized usually to one flank and abdominal distension. Patients are diagnosed by abdominal CT scan which can identify the extent of retroperitoneal hematoma.

Injury to the kidney result most often from either blows or falls on the loin or crushing injury to the abdomen, typically in road traffic accidents. In young children who have very little extraperitoneal fat, the peritoneum which is closely applied to the kidney.¹²

10) Squamous cell carcinoma of kidney:

Patients usually present in 6th to 7th decade. On cut surface,

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tumors are large, necrotic and ulcerated.

Microscopically, it shows invasion of renal parenchyma, is usually high grade features. Extensive areas of necrosis may be seen.

AIMS AND OBJECTIVES

The aim of this curious retrospective study was:

1. To evaluate the most common pathological processes leading to nephrectomy.
2. To evaluate the incidence of squamous cell carcinoma in patients of long standing pyelonephritis.

MATERIAL AND METHODS

This study was conducted on patients admitted and operated at Guru Gobind Singh Hospital, Jamnagar in various surgical units between June 2007 to May 2009. This is a study of 78 cases operated on elective basis. All cases of nephrectomy were included in the study. The specimens of nephrectomy were processed in the Department of Pathology. Slides for histopathological examination were prepared by sequential processes of clearing in xylene, hydration in increasing grades of absolute alcohol, dehydration in decreasing grades of absolute alcohol, paraffin wax embedding, and finally casting of blocks. Multiple sections were given with the microtome of uniform thickness measuring 3-5 μ m. Sections were stained with Hematoxylin and Eosin and Papanicolaou stain.

STATISTICAL METHODS USED

Chi-square method was used to establish the correlation between the incidence of squamous cell carcinoma of kidney and its possible association to renal stones. (Table 1)

Figure 1

Table 1:-2x2 Contingency Table for the Chi – Square test

	Squamous cell carcinoma	Other carcinomas
Associated with stone	4	39
Not associated with stone	0	35

OBSERVATION

The present series of 78 patients at GGH, Jamnagar was observed to have the following details :

Chronic pyelonephritis was found to be the most common etiological agent leading to nephrectomy, to be followed in frequency by renal cell carcinoma and pyonephrosis.(Table

2)

Figure 2

Table 2:- Frequency Table of the Lesions involving the Kidney

LESIONS	Total no.
Chronic Pyelonephritis	32
Tuberculous Kidney	04
Pyonephrosis	06
Xanthogranulomatous Pyelonephritis	02
Trauma	04
Angiomyolipoma	02
Oncocytoma	02
Wilm's tumor	02
Renal Cell Carcinoma (conventional)	12
Sarcomatoid RCC	02
Papillary RCC	04
Collecting duct carcinoma	02
Squamous Cell Carcinoma	04

AGE DISTRIBUTION (Table 3)

Figure 3

Table 3:- Age Distribution of the Lesions of the Kidney

LESIONS	<20 years	20-40 yrs	40-60 yrs	>60 yrs
Chronic Pyelonephritis	2	12	16	2
Tuberculous Kidney		4		
Pyonephrosis		2	4	
Xanthogranulomatous Pyelonephritis		2		
Trauma		4		
Angiomyolipoma			2	
Oncocytoma				2
Wilm's tumor	2			
Renal Cell Carcinoma (conventional)		2	7	3
Sarcomatoid RCC			1	1
Papillary RCC			4	
Collecting duct carcinoma				

The age distribution of Chronic Pyelonephritis was spread throughout all ages with maximum propensity in the 3rd to 5th decade of life. All patterns of the RCC presented mostly in the elderly. Oncocytoma was present in subjects >60 years in age. Tuberculous kidney, trauma and xanthogranulomatous kidney occurred in the younger age groups.

PRESENTING COMPLAINTS (Table 4)

Figure 4

Table 4:- The Frequency table for the presenting complaints

COMPLAINT	Frequency
Flank pain	56
Hematuria	29
Fever	22
Headache	9
Lump in abdomen	49
Burning Micturition	28
Difficulty in Urine	16
Lumbar Pain	10
Vomiting	55
Bone Pain	05
Chest Pain	06

Flank pain came up as the commonest complaint with which patients of the various kidney disorders presented, followed by a lump in abdomen, episodes of vomiting, hematuria and burning micturition being the other common presenting complaints.

GENDER DISTRIBUTION

There was a slight male preponderance in our study.

Males – 46

Females – 32

M: F = 1.43:1

RELATION WITH STONES(Table 5)

Figure 5

Table 5 :- Association of the kidney disorders with presence of renal stones

LESIONS	
Chronic Pyelonephritis	28/32
Tuberculous Kidney	02/04
Pyonephrosis	03/06
Xanthogranulomatous Pyelonephritis	02/02
Trauma	01/04
Angiomyolipoma	01/02
Oncocytoma	00/02
Wilm's tumor	00/02
Renal Cell Carcinoma (conventional)	01/12
Sarcomatoid RCC	01/02
Papillary RCC	00/04
Collecting duct carcinoma	00/02
Squamous Cell Carcinoma	04/04

Chronic pyelonephritis and Squamous cell carcinoma showed a significant association with the presence of renal stones. Also Xanthogranulomatous pyelonephritis although being a rare finding is mostly associated with the presence of a renal stone too.

PATHOLOGY

1. Chronic Pyelonephritis:

It is a destructive, irreversible process centered in the pelvicalyceal region. All patients had the history of recurrent UTI and 22 (68.5 %) patients had the history of hypertension.

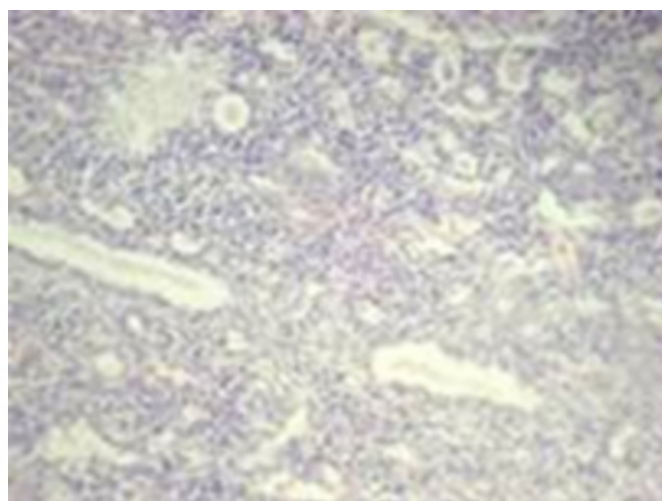
Grossly, all kidney were shrunken and atrophic and 18 of them (56.2 %) showed broad scars, while 12 of them (37.5 %) showed U-shaped scars, 87.5% cases showed stone present in them.

Microscopically, fibrosis and inflammation around the pelvis

was seen in all the cases, with parenchymal changes of interstitial scarring (70%), tubular atrophy(30%), changes of thyroidisation i.e. dilated tubules with associated casts were seen in 80% of cases. Most cases showed arterial hyalinization.

Figure 6

(Figure 1) Microphotograph- Chronic Pyelonephritis showing changes of thyroidisation.



2. Pyonephrosis:

Grossly, all cases showed mild to moderately enlarged kidneys with irregular outer surfaces.

Cut surface showed grossly cystic areas in all cases which were of varying sizes. 5 cases (84%) showed presence of calculi in the lumen,3 of which (50%) staghorn calculi. All cases showed dilated calyceal system.

Microscopically, all cases showed extensive acute inflammatory infiltrate mainly neutrophils. Areas of widespread necrosis were seen in all cases.

3. T.B. Kidney: All cases were normal in appearance on outer surface.

Cut surface showed areas of necrosis with cheesy material. Parenchymal destruction was seen in 3 cases (75%).

Microscopically, caseating necrosis was seen in all cases along with well formed epithelioid granulomas. Foci of varying degrees of fibrosis was seen in all cases. One case (25%) showed areas of extensive scarring.

4. Xanthogranulomatous Pyelonephritis:

Calculi were associated with both the cases.

Grossly, the kidneys were enlarged which showed yellowish nodular scars near the pelvis (one each of about 1X1 cm and 3X1 cm in size respectively)

Figure 7

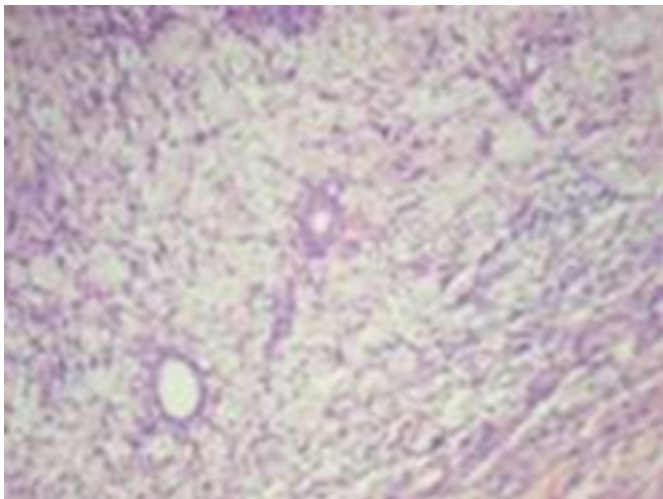
(Figure 2) Gross photograph- Xanthogranulomatous pyelonephritis.



Microscopically, the yellowish areas corresponded to aggregates of macrophages alternating with MNC giant cells in a background of lymphocytes and plasma cells. One case showed isolation of E. Coli.

Figure 8

(Figure 3) Microphotograph- Xanthogranulomatous pyelonephritis showing granuloma formation and aggregates of macrophages.



5. Angiomyolipoma:

It is a benign tumor of kidney characterized by admixture of smooth muscle, fat and thick walled blood vessels. None showed features of Tuberous Sclerosis.

Grossly, kidneys were enlarged with lesions well circumscribed.

On cut section, it has variegated appearance corresponding to the constant elements.

Microscopically, the cases showed typical pattern of smooth muscle, adipose tissue and thick walled blood vessel. One case each showed predominance of adipose tissue and smooth muscle respectively.

6. Oncocytoma:

Oncocytoma account for 4-5 % of kidney tumors in adults. Both the cases were discovered incidentally and were admitted for abdominal pains and generalized body aches each. None had any renal complaints.

Grossly, it showed to be a circumscribed mass of dark brown (typically called mahogany brown) colour. A stellate scar was not noted in any of the cases.

On cut section the mass was homogenous and bulging above the cut section.

Microscopically, cells were columnar and had abundant eosinophilic cytoplasm, having coarse granularity. There cells were arranged in well defined nests separated centrally by loose areas. Occasional areas showed tubular/microcystic changes.

7. Trauma:

Grossly, varying lacerations were seen on the surface of the kidney which were irregular in shape. Three cases (75%) showed gross hematomas on to surface, while one case (25%) showed totally avulsed kidney.

Microscopically, no preservation of kidney architecture was seen in any cases.

8. Clear Cell Carcinoma:

It is the most common type of RCC accounting for approximately 70% of all adult epithelial kidney tumors in surgically resected kidneys. It is thought to originate from proximal tubule.

Grossly, the majority of cases (except 2) were situated at the upper pole. They were all well circumscribed and varied in size from 2X2 cm to 10X8 cm . All showed at least focal areas of yellow colored tissues while most had variegated appearance. Three cases showed cystic change.

Microscopically, all cases were well circumscribed and encapsulated, lesions showed presence of nest, alveolar, tubular pattern (and occasionally papillary pattern) of cells having abundant clear cytoplasm and nuclei with Fuhrman Grade 2-3. Areas of hemorrhage and necrosis were commonly seen interspersed between these tumor foci. 8 cases (56%) showed benign lesions. situated at the periphery of the malignant lesion and included chronic pyelonephritis, tubular atrophy and tubular dilation. 3 cases(31%) showed cystic changes.

Figure 9

(Figure 4) Gross photograph- Renal cell carcinoma(clear cell type).



9. Sarcomatoid carcinoma:

It accounts for 1-6 % of all RCCs. Most develop in association with clear cell RCC, although they may develop with Papillary, chromophobe or Collecting Duct carcinoma.

Grossly, the cases showed fleshy soft areas alternating with yellowish areas.

Microscopically, all the cases were associated with clear cell RCC. Spindle cell component showed moderate to severe degree of atypia which alternated with areas of clear cell RCC. Areas of florid necrosis were seen in some foci.

10. Papillary RCC:

Thought to arise from distal convoluted tubule, these constitute 15% of RCCs in surgical series.

Grossly, it is presented as a well circumscribed mass at the upper poles of the slightly enlarged kidneys.

On cut surface, one case showed areas of extensive necrosis

and hemorrhage.

Microscopically, all cases showed papillary/tubule-papillary architecture, with presence of macrophages in their stalks. Hemorrhage was a common feature.

11. Collecting Duct Carcinoma:

These are a rare group of neoplasms accounting for approximately 1% of total RCCs, occur in younger age group and have a very aggressive course.

Grossly, the specimen showed a medullary location.

On cut surface, it showed variegated appearance.

12. Squamous cell carcinoma:

All cases were associated calculi in the renal pelvis. Grossly, it showed only thickened calyceal lining. Microscopically, all showed invasion of the kidney parenchyma.

(Figure 5) Microphotograph- Squamous cell carcinoma kidney showing keratinisation and nests of malignant squamous cells.

DISCUSSION

In Chronic Pyelonephritis 56.2% cases presented with shrunken and atrophic kidney and most showed scarring.80% cases showed clusters of thyroidisation which was compatible with other studies.²

Compatible with other studies, necrosis was seen in most cases of Tuberculous Kidney both grossly (75%) and microscopically (100%).⁵

Xanthogranulomatous Pyelonephritis showed kidneys' enlargement associated with stones and microscopically showing aggregates of macrophages.⁶

All cases of angiomyolipoma showed a mixture of smooth muscle, fat and thickened blood vessels and microscopically one case each showing predominance of adipose tissue and smooth muscle respectively. This was compatible with other studies too.⁷

Oncocytoma kidneys were mahogany brown in colour with all the cases showing oncocytic cells which is compatible with other studies.^{8,9}

In Renal Cell Carcinoma clear cell carcinoma appeared as the most common type with Sarcomatoid, papillary and collecting duct carcinoma being other variants as has been

mentioned in other studies too.¹¹

All cases of squamous cell carcinoma were associated with calculi in the renal pelvis with two cases showing invasion of the kidney parenchyma by frankly malignant squamous cells. Two cases showed early changes of malignancy with no evidence of invasion. Limited data are available showing association of renal stone with squamous cell carcinoma.

Statistical data were applied to evaluate the association of renal stone to squamous cell carcinoma of kidney.

Chi-square method was applied to the data (Table 1) and it showed:

Chi-square value - 1.786

DF - 1

P value - 0.1814

Contingency coefficient - 0.150

The p value of < 0.5 indicates significant correlation (in this case it is 0.1814).

CONCLUSION

From this study we came to the conclusion that following are the major etiological factors leading to nephrectomy,

So, from this study, we concluded that above mentioned factors are the major culprits, leading to nephrectomy. Each and every case of nephrectomy should be investigated to find out the aetiology, leading to nephrectomy.

Nephrectomy, done for stone should also be investigated to rule out presence of malignancy in presence of stone. As per the statistical calculation applied (chi-square test), it has

shown significant association of squamous cell carcinoma with renal stone. (p value 0.1814).

SUMMARY

To summarize,

Chronic glomerulonephritis was the most common etiological reason leading to nephrectomy.

Every patient with a history of long-standing renal stone should be followed-up closely for the likelihood of developing a serious complication of renal squamous cell carcinoma.

References

1. Adrenal C Nooik MD, Stevan B Stream MD: Surgery of the Kidney; Campell's urology: Seventh edition; 2903-3061
2. Nelson G Oedonez, Juan Rosai: Urinary Tract; Rosai and Ackerman's Surgical Pathology: Ninth edition; 1226-1227
3. Hiep T Nyugen MD: Bacterial Infections of the Genitourinary Tract; Smith's General Urology: Seventh edition; 201-202
4. Hiep T Nyugen MD: Bacterial Infections of the Genitourinary Tract; Smith's General Urology: Seventh edition; 204-206
5. Emil A Tanagho MD, Christopher J Kane MD: Specific Infections of the Genitourinary Tract; Smith's General Urology: Seventh edition; 219-221
6. Nelson G Oedonez, Juan Rosai: Urinary Tract; Rosai and Ackerman's Surgical Pathology: Ninth edition; 1227-1228
7. Nelson G Oedonez, Juan Rosai: Urinary Tract; Rosai and Ackerman's Surgical Pathology: Ninth edition; 1267-1277
8. Badrinath R Konety MD, Richard D Williams MD: Renal Parenchymal Neoplasm; Smith's General Urology: Seventh edition; 328-329
9. Nelson G Oedonez, Juan Rosai: Urinary Tract; Rosai and Ackerman's Surgical Pathology: Ninth edition; 1264-1265
10. Nelson G Oedonez, Juan Rosai: Urinary Tract; Rosai and Ackerman's Surgical Pathology: Ninth edition; 1240-1244
11. Nelson G Oedonez, Juan Rosai: Urinary Tract; Rosai and Ackerman's Surgical Pathology: Ninth edition; 1251-1260
12. Jack W McAninch MD: Injuries to the genitourinary tract; Smith's General Urology: Seventh edition; 281-285.

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