*Original Article*

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# Autopsy findings in Kidney- A Plethora of Lesions for A Histopathologist

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**Abstract**

*Introduction:* Autopsy studies aid to the knowledge of pathology by unveiling some of rare lesions which are a source of learning from a pathologist's perspective. Perinatal autopsies form an integral part in providing a clue to ascertain the cause of perinatal deaths and to study the congenital anomalies. Kidneys being important organs in maintaining the homeostasis, are affected by a variety of lesions like congenital anomalies, neoplasms and infections apart from being secondarily involved by diabetes, poisoning and other systemic diseases.

*Aims and objectives:*

1. To determine the spectrum of histopathological findings of kidney in medicolegal autopsies.

2. To study the congenital anomalies and other lesions of kidney in perinatal autopsies.

*Materials and Methods:* A retrospective study of medicolegal cases (269) and perinatal autopsies (100) for six years were included. The gross and microscopic findings of the specimens were taken into consideration.

*Results:* Acute tubular necrosis (ATN) (51.16%) was the commonest histopathologic finding with the next common being changes secondary to diabetic nephropathy (16.27%). Others include hydronephrosis (13.9%), pyelonephritis (9.3%), multilocular cystic renal cell carcinoma (MCRCC), adult polycystic kidney disease (ADPKD), a case of coexisting pulmonary tuberculosis with liver cirrhosis and renal cell carcinoma (RCC) and a case of tumor to tumor metastasis. Perinatal autopsies showed cystic renal dysplasia, renal agenesis, autosomal recessive polycystic kidney disease (ARPKD) and a hybrid lesion.

*Conclusion:* This study highlights the various incidental findings in medicolegal autopsies, which are imperative in academic and research purposes. Despite the growing complexity and dependence on newer diagnostic methodologies, the traditional role of histopathology in autopsy remains the gold standard.

**Keywords:** Autopsy; Cystic renal dysplasia; Hybrid lesion; Renal cell carcinoma; Tumor to tumor metastasis.

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## Introduction

Post-mortem examination also known as autopsy, is a specialized surgical procedure consisting of thorough examination of a corpse to detect the manner and cause of death and also to evaluate any disease/injury if present. The purpose of autopsy is for either legal or medical reasons. Giovanni Morgagni first introduced the concept of clinicopathological correlation (CPC) and professor William Boyd in his unimitable style wrote

"Pathology had its beginning on the autopsy table".[1] Post-mortem examination aid to the knowledge of pathology by revealing few of the rare lesions and kidneys being important organs in maintaining the body's homeostasis, are affected by a variety of lesions like congenital anomalies, neoplasms and infections apart from being secondarily involved by diabetes, poisoning and many other systemic diseases. Perinatal autopsies form an integral part of autopsy by providing a clue to ascertain the cause of perinatal deaths and also to study various congenital anomalies.[2,3] This study describes the spectrum of kidney lesions encountered during medicolegal and perinatal autopsies.

*Aims and objectives*

1. To determine the spectrum of histopathological findings of kidney in medicolegal autopsies related or unrelated to the cause of death.
2. To study the congenital anomalies and other lesions of kidney in perinatal autopsies.

## Materials and Methods

A retrospective study of medicolegal and perinatal autopsies for six years from 2008-2013 was conducted in the Department of Pathology, JSS Medical College, Mysuru, Karnataka. A total of 269 medicolegal autopsies and 100 fetal autopsy cases were received for histopathologic examination. Kidney specimens were received either as a part of examination of multiple viscera/fetus, or only kidney was sent for pathological examination in 10% formalin. Representative bits were processed in a routine manner. All sections were stained with hematoxylin and eosin (H & E) and special stains were used as and when required. The gross and microscopic findings of the specimens were taken into consideration to establish the presence of lesions and also to type them in relation to the age and sex of the cases.

## Results

Our study included a series of 269 medicolegal and 100 perinatal autopsies from JSS Academy of Higher Education and Research, Mysuru, conducted over a period of six years. A total of 76 kidney specimens were studied, out of which 19 (25%) were normal and 14 (18.4%) were autolysed. Histopathological lesions were seen in 43 (56.5%) kidney specimens (Table 1 ), out of which 22 cases (51.16%) showed features of acute tubular necrosis, 7 (16.27%) cases showed changes secondary to diabetic nephropathy, 5 (11.6%) cases of hydronephrosis, 4 (9.3%) cases of pyelonephritis, one case each of renal cell carcinoma and multilocular cystic renal cell carcinoma, a case of coexisting pulmonary tuberculosis with liver cirrhosis, one case of adult polycystic kidney disease, one case of renal cell carcinoma and a case of tumor to tumor metastasis (adenocarcinoma of stomach metastasising to oncocytoma kidney).

Out of 100 cases of perinatal autopsies, 57 were normal, 35 were autolysed and 8 cases showed renal lesions. Among 8 cases with renal lesions 4 cases were showing features of cystic renal dysplasia, two cases of autosomal recessive polycystic kidney disease, one case each of renal agenesis and a case of hybrid lesion.

Among 43 cases with kidney lesions, 28 specimens were from males (65.1%) and 15 (34.9%) from females in adult autopsies (Table 2), and age group ranged from 19 years to 81 years.

Among perinatal autopsies, there were 5 male and 3 female fetuses with gestational age ranging from 20 weeks to 32 weeks. All 8 cases of perinatal autopsies were performed following pregnancy termination due to prenatal detection of congenital anomalies.

Causes of death in adult autopsies were road traffic accident (RTA) in 61 cases, poisoning in 13 and hanging in 11 cases. There were 1 case each of burns and myocardial infarction, 2 cases of unidentified bodies. Cause of death was not established in 2 cases.

**Table 1:** Showing various kidney lesions in medicolegal and perinatal autopsies.

| S. No. | Histopathological Findings | Indication for autopsy | No.of cases |
|---|---|---|---|
| 1 | Acute Tubular necrosis | RTA, poisoning, snake bite | 22 |
| 2 | Diabetic Nephropathy | RTA, hanging, myocardial infarction | 7 |
| 3 | Pyelonephritis | RTA, hanging, burns | 4 |
| 4 | Hydronephrosis | RTA, hanging, unidentified body | 5 |
| 5 | Tumor to tumor metastasis Gastric adenocarcinoma metastasizing to oncocytoma of kidney | Poisoning | 1 |
| 6 | Lungs- Tuberculosis Kidney – Clear cell RCC Liver cirrhosis | RTA | 1 |
| 7 | RCC | RTA | 1 |

| | | | |
|---|---|---|---|
| 8 | MCRCC | Organophosphorus Poisoning | 1 |
| 9 | ADPKD | RTA | 1 |
| **Perinatal Autopsy** | | | |
| 1 | ARPKD | Termination of pregnancy | 2 |
| 2 | Cystic Renal Dysplasia | Termination of pregnancy | 4 |
| 3 | Hybrid Lesion | Termination of pregnancy | 1 |
| 4 | Renal agenesis | Termination of pregnancy | 1 |

**Table 2:** Showing sex incidence of renal lesions.

| | Male | Female | Total cases |
|---|---|---|---|
| Adult autopsy with kidney lesion | 28 (65.1%) | 15 (34.9%) | 43 |
| Perinatal Autopsy with kidney lesion | 5 | 3 | 8 |

## Discussion

The incidental renal masses in our study comprised of oncocytoma, adult polycystic disease of kidney, multilocular cystic renal cell carcinoma and two cases of renal cell carcinomas. The incidentally discovered oncocytoma was a rare case of tumor to tumor metastasis in a 68 year old male, with history of snake bite. The patient had nodular lesions of adenocarcinoma in the stomach metastasizing to oncocytoma of kidney confirmed by histopathology and immunohistochemistry. Although the coexistence of two or more primary neoplasms in the same patient is sometimes observed, tumor-to-tumor metastasis is a rare phenomenon with less than 100 cases being reported in the English literature.[4] Campbell et al., described four criterias for the diagnosis of a tumor-to-tumor metastasis: a) there should be more than one primary tumor, b) the recipient tumor should be a true benign or a malignant neoplasm, c) the metastatic neoplasm should be a true metastasis with established growth in the host tumor, not the result of contiguous growth (collision tumor), and d) neoplasms that have metastasized to the lymphatic system where lymhoreticular tumors already exist are excluded.[4] The above case fits all the four criterias. Several properties of the host, such as its anotomical place, its vascularity and the local potential for immune reaction against the metastasizing cells, may play a significant role.[5] (Fig. 1).

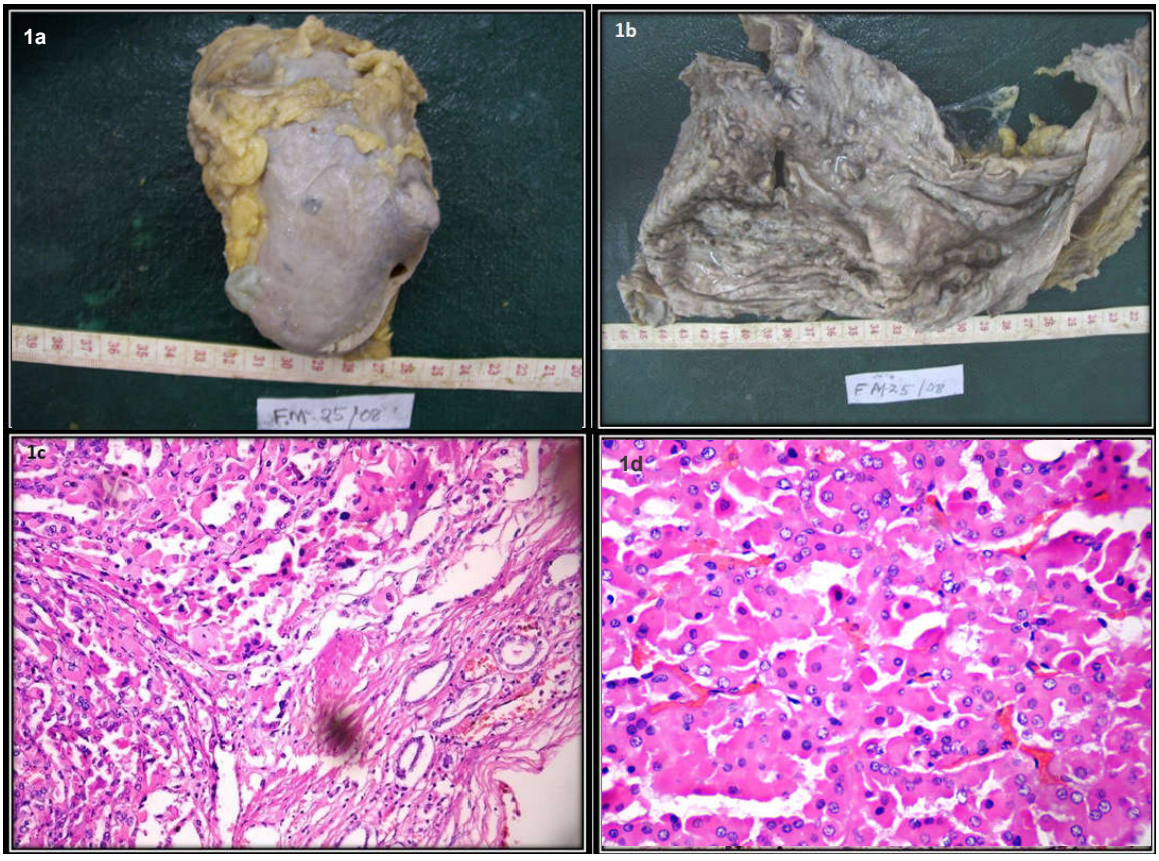


**Fig. 1: a)** Left kidney with a nodule on the surface(arrow), **b)** Cut section of stomach displaying grey white nodular lesions, **c)** Sections from kidney showing metastatic adenocarcinoma (H&E, x100), **d)** Sections showing oncocytoma (H&E, x 200).

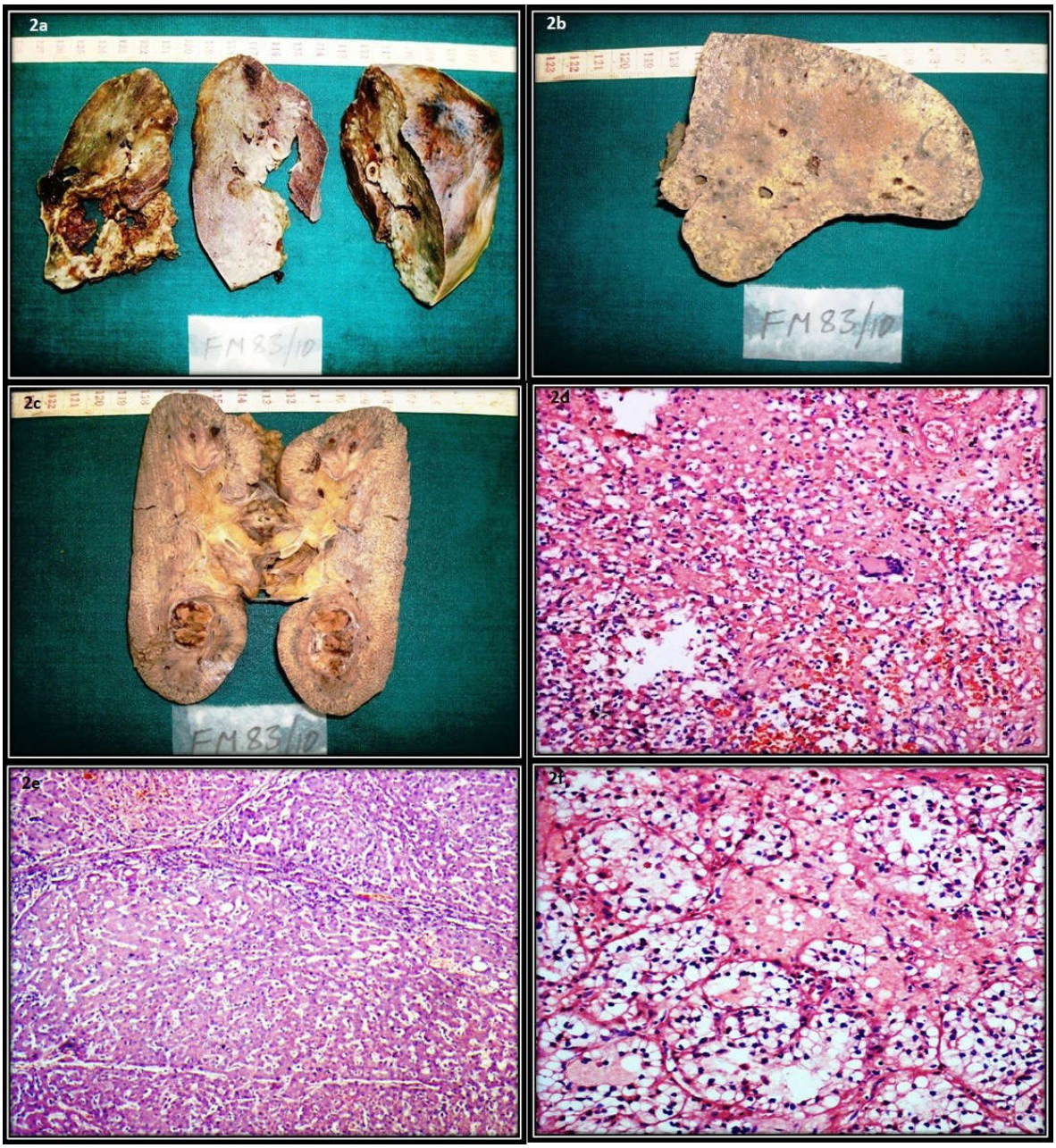


**Fig. 2: a)** Showing cavitatory lesions in both the lungs, **b)** Showing nodular liver, **c)** Showing well circumscribed lesion in lower pole of Rt. Kidney, **d)** Showing caseating granuloma with Langhan's giant cell (H&E, x100), **e)** Showing cirrhotic parenchymal nodules with bridging septae (H&E, x100), **f)** Showing features of clear cell RCC (H&E, x 200).

Another case was a 40 year old male, admitted in a private hospital with the history of massive hemoptysis while riding a motor cycle. He died two days after admission and was subjected to postmortem examination in our hospital. On Autopsy, Cavitatory lesions were seen in both the lungs with a nodular liver and a right kidney with grey white well circumscribed lesion m/s 2.5 x 2.0 cm in the lower pole. Microscopy revealed tuberculosis of lungs with cirrhosis of liver and clear cell renal cell carcinoma of kidney.[6] (Fig. 2).

Tubercular changes in lungs are noticed in 8.89% cases on histopathology. Most of the chronic liver diseases even in advanced stages may cause no prominent clinical signs and symptoms and are diagnosed only during autopsy. The number of renal masses, both benign and malignant discovered only at autopsy is declining and the incidence is 1%.

Yellow phosphorus is a highly toxic substance found in rodenticides and fire crackers which mainly

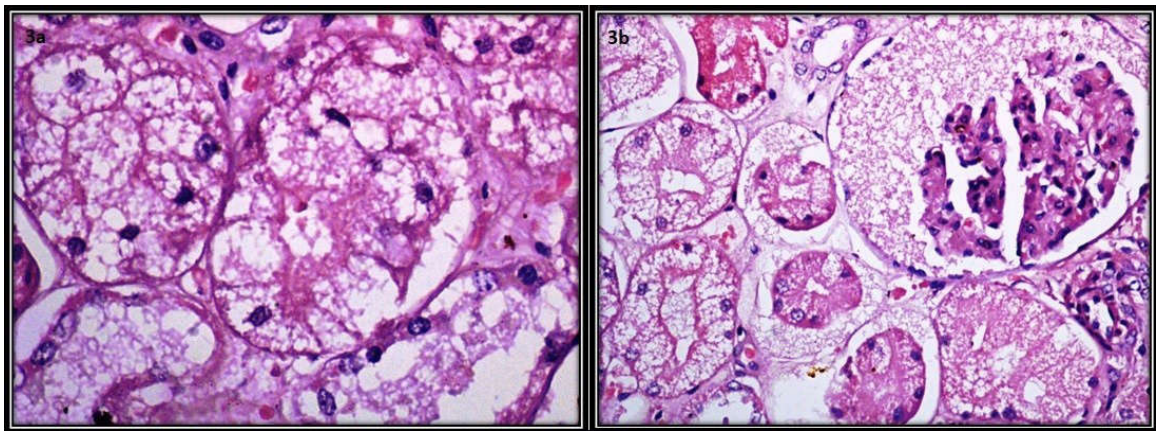


**Fig. 3: a)** Proximal tubular epithelial cells showing diffuse cytoplasmic vacuolation (H&E, x200), **b)** Glomerular epithelial cells displaying cloudy swelling (H&E, x100).

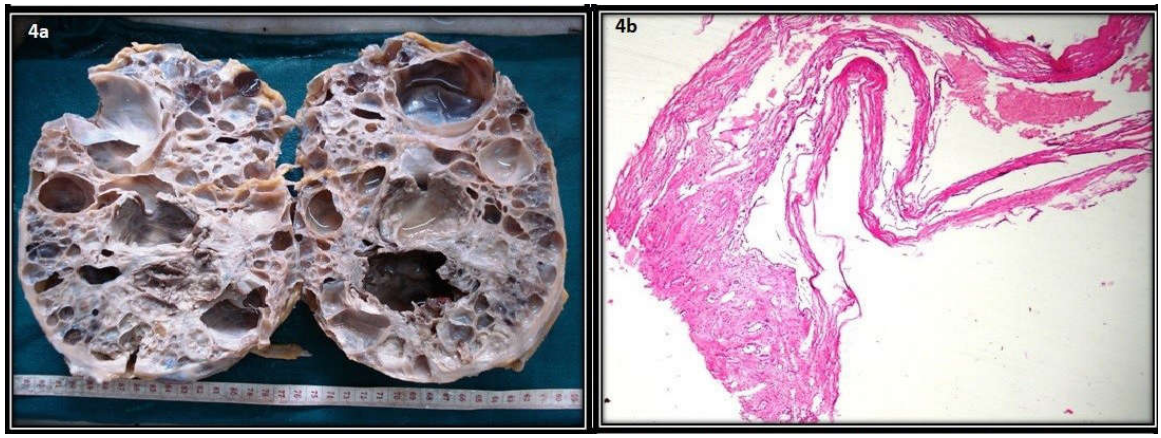


**Fig. 4: a)** Cut section of kidney showing cysts of varying sizes, **b)** Microscopy showing cyst wall lined by flat to cuboidal epithelial cells ((H&E, x100).

affects the liver. However, its effects on kidney are not well documented in literature. Ingestion of phosphorus causes osmotic tubular injury, a non specific morphological pattern characterized by cytoplasmic vacuolation and associated with ingestion of hyper oncotic solutions. In addition, it can cause fatty degeneration of tubular epithelial cells, hyaline change in vessels and desquamation of glomerular epithelial cells.[7] An 18 year old male under treatment for jaundice, was admitted with a history of consumption of rat poison. The patient expired after two days where the liver enzymes (SGOT & SGPT) were elevated and serum creatinine was 4%. On autopsy, yellowish discolouration was seen all over the body. Multiple bits of cerebellum, liver and kidney received showed yellowish discolouration with haemorrhagic areas. Microscopy of kidney displayed predominantly affected proximal tublular epithelial cells with diffuse cytoplasmic vacuolation and cloudy swelling of glomerular epithelial cells with no significant interstitial inflammation/tubulitis. (Fig. 3).

Toxic tubular injury can be caused by a number of exogenous and endogenous agents, which result in a more widespread form of injury than the ischaemic form.

A case of Autosomal dominant polycystic kidney disease was identified in the postmortem examination of a 45 year old male after death from road traffic accident who was asymptomatic during his life.(Fig. 4).

The case of MCRCC was identified in a 38 year old male autopsied after alleged consumption of organophosphorus compound where, the right kidney showed an expansile lesion comprising of multiple thick gelatinous fluid filled cysts and septae surrounded by fibrous pseudocapsule and on microscopy, cysts of varying sizes were seen separated by intervening septae, lined by aggregates of epithelial cells with clear cytoplasm characteristic of MCRCC. (Fig. 5)

Another very interesting case of our study was a hybrid lesion,noted in the perinatal autopsy of a fetus of 24 weeks of gestation where pregnancy

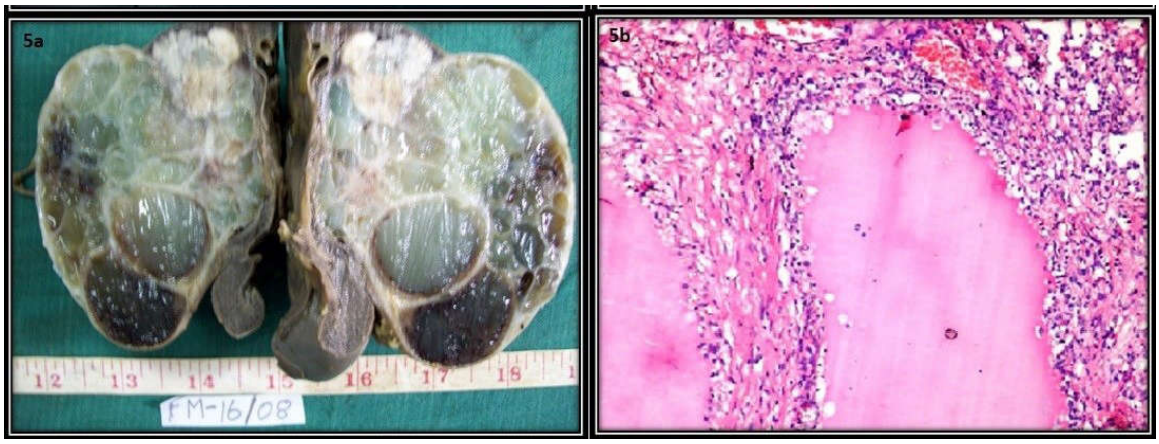


**Fig. 5: a)** Cut section of kidney showing multiple cysts filled with gelatinous fluid, **b)** Microscopy showing cyst wall lined by tumor cells with clear cytoplasm and moderately pleomorphic nuclei (H&E, x 200).

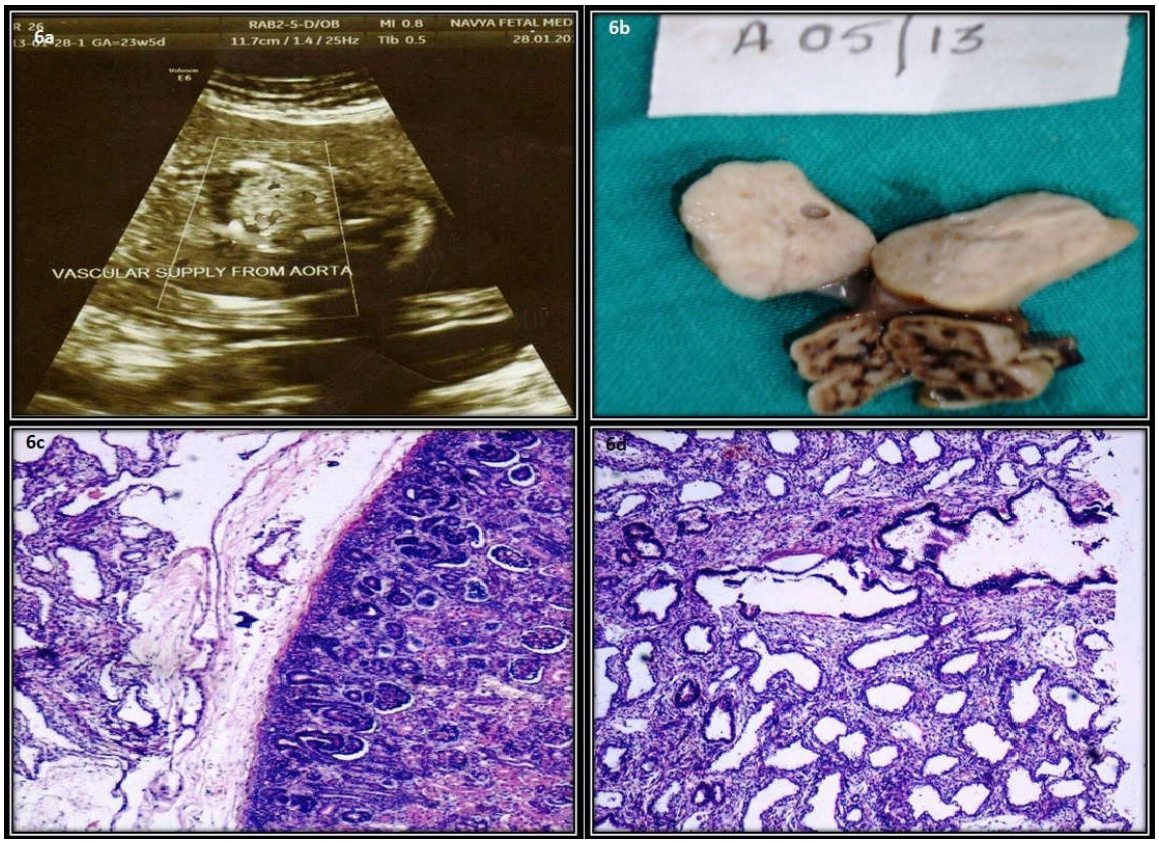


**Fig. 6: a)** USG abdomen showing vascular supply from aorta, **b)** Cut section of supra adrenal mass with tiny cysts, **c)** Normal looking kidney with a cystic lung (H&E, x200), **d)** Lung tissue with numerous cysts and dilated bronchioles (H&E, x100).

was terminated following detection of a left supra adrenal mass by anomalous scan, where it showed a solid homogeneous left supra adrenal mass. Microscopy displayed lung tissue with numerous uniform cystic spaces lined by cuboidal to columnar cells, dilated bronchi and bronchioles, with absence of cartilage and skeletal muscle. Lungs and other organs were normal in location, appearance and on microscopy. It was diagnosed as extralobar intra abdominal, broncho pulmonary sequestration with acystic adenomatoid malformation of the sequestered lung (Hybrid lesion). (Fig. 6).

Cystic adenomatoid malformation of the sequestred lung is defined as a developmental mass of nonfunctioning bronchopulmonary tissue that is separate from the tracheobronchial tree and recieves arterial blood from the systemic circulation that is

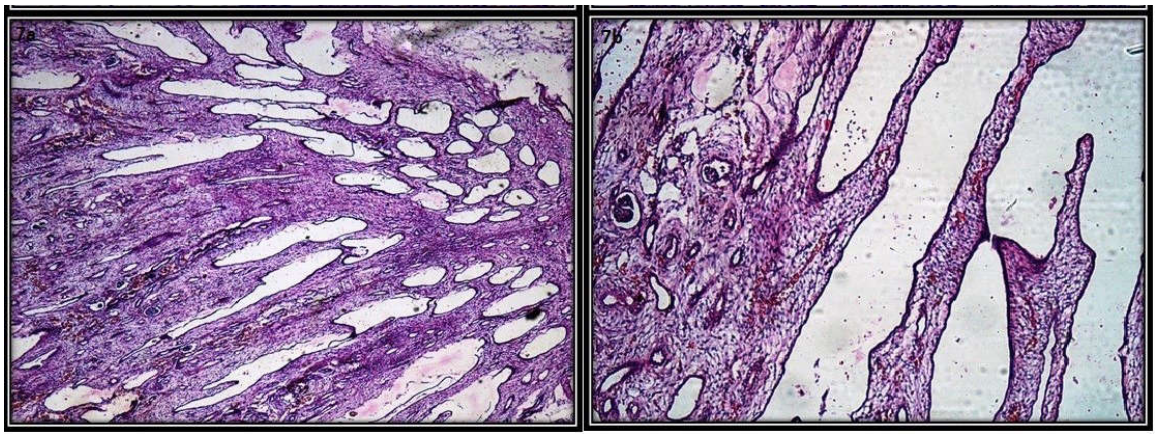

**Fig. 7: a)** Microscopy of kidney showing radiating cysts (H&E, x100), **b)** Microscopy of kidney with cysts lined by flattened to cuboidal epithelium (H&E, x200).

either from thoracic or abdominal aorta. They are of two types: Intralobar (75–85%), usually acquired rather than congenital and Extralobar (15–25%), prenatally diagnosed associated with congenital anomalies. It is a rare lesion with incidence of 0.15 – 6.4% of all congenital pulmonary malformations. Extra lobar sequestration is believed to result from abnormal budding of the primitive foregut. Intralobar sequestration occurs due to bronchial obstruction that results in distal infection and the recruitment of a systemic arterial supply through pleural granulation tissue. Arterial supply is from Thoracic / abdominal aorta and venous drainage is either to azygous system, inferior venacava or to pulmonary veins. Prenatal diagnosis can be made by sonography as early as 16 weeks of gestation, where it appears as solid well-defined triangular echogenic mass and Color Doppler is valuable in visualising the feeding artery. Hybrid lesions as mentioned above are a combination of congenital cystic adenomatoid malformation with bronchopulmonary sequestration and suggest that they share the same developmental ancestry and perhaps represent two ends of a broad spectrum of pathology.[8] (Fig. 7)

Our study revealed five incidental renal masses accounting for 11.3 % of the histopathological findings. In a study of 650 cases of autopsy by Shah VB, 5 cases of renal masses were detected incidentally (less than1%), which included MCRCC.[9] Incidence of MCRCC is very rarely reported in literature. These cases were asymptomatic and had no symptoms related to the masses and the causes of death were unrelated to the renal masses.[9] In a study of incidental renal cell carcinomas (RCC), 110 tumors were diagnosed at autopsy with a rate of 7.1/1000 autopsies.[10] We encountered 2 cases of incidental renal cell carcinomas with a rate of 2/269 autopsies. ADPKD, the most common hereditary kidney disorder, affects approximately 1/1000 living people with an incidence of 1:500 in autopsy series.[11] In our series incidence rate of ADPKD was 1:269.

## Conclusion

From our study we conclude that acute tubular necrosis was the commonest histopathologic finding with the next common being changes secondary to diabetic nephropathy and hydronephrosis. Histopathology in autopsy plays a vital role in the study of some of the rare neoplastic lesions contributing to the knowledge of pathology. This study also highlights the various incidental rare cases in medicolegal autopsies, which are imperative in academic and research purposes. Histopathology would not have been necessary for some of these conditions during a life time but an incidental finding in autopsy has unveiled the histopathological changes that help in the understanding of disease processes which are otherwise rare for a pathologist to encounter in the day to day specimens. Such retrospective and prospective studies also provide an insight into the true prevalence of diseases or lesions. Despite the growing complexity and dependence on newer diagnostic methodologies, the traditional role of histopathology in autopsy remains as important as it had been in the past. A sound knowledge of gross changes in different diseases is essential to request for histopathological examination and a forensic trainee should have basic knowledge of histopathology so that histopathological examination can be asked wherever necessary.

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