Renal cell carcinoma (RCC) represents around 3% of all cancers and is the most common solid lesion within the kidney, accounting for approximately 90% of all kidney malignancies. Highest incidence in Western countries. 1.5:1 male predominance. Higher incidence in the older population.

AETIOLOGY: Risk factors: smoking, obesity, hypertension, diabetes, first-degree relative with kidney cancer.

HISTOLOGICAL DIAGNOSIS:
1. CLEAR-CELL RCC (ccRCC): Well circumscribed and a capsule is usually absent. Often with haemorrhage and necrosis. Loss of chromosome 3p and mutation of the von Hippel Lindau (VHL) gene at chromosome 3p25 are frequently found. Worse prognosis compared to pRCC and chRCC, but this difference disappears after adjustment for stage and grade.

2. PAPILLARY RCC (pRCC):
   - Type I: associated with activating germline mutations of MET. Narrow papillae without any binding and a tough pseudocapsule. More frequent exophytic, with extrarenal growth and with low malignant potential. Type I is more common and generally have a better prognosis than Type II.
   - Type II: Heterogeneous group associated with activation of the NRF2-ARE pathway.

3. CHROMOPHOBCE RCC (chRCC): Loss of chromosomes Y, 1, 2, 6, 10, 13, 17 and 21 are typical genetic changes. Prognosis relatively good. Relatively homogenous, well-demarcated mass without a capsule. It cannot be graded by the Fuhrman grading system because of its nuclear atypia.

4. OTHER RENAL TUMOURS
   - Renal medullary carcinoma: very rare (< 0.5% of all RCCs). Young adults with sickle haemoglobinopathies. One of the most aggressive RCCs.
   - Carcinoma associated with end-stage renal disease; acquired cystic disease-associated RCC: 4% of these patients. Generally multicentric and found in younger patients (mostly male). Less aggressive. More frequent pRCC. Specific subtype occurring only in end-stage kidneys: Acquired Cystic Disease-associated RCC with indolent clinical behaviour.
   - Papillary adenoma: papillary or tubular architecture of low nuclear grade and may be up to 15 mm in diameter, or smaller.
   - Hereditary kidney tumours: 5-8% of RCCs. There are ten hereditary RCC syndromes associated with specific germline mutations, RCC histology, and comorbidities. Median age at diagnosis 37 years. Patients may require repeated surgical intervention (generally surveillance until the largest tumour reaches 3 cm and nephron-sparing approaches are recommended).

STAGING (TNM, 2017) AND CLASSIFICATION SYSTEMS:

ANATOMICAL CLASSIFICATION SYSTEMS:
- Preoperative Aspects and Dimensions Used for an Anatomical (PADUA) classification system (Radius, Exophytic/Endophytic, Nearless to collecting system/sinus, Anterior/Posterior, location relative to polar lines)
- R.E.N.A.L. nephrometry score (radius, Exophytic/Endophytic, Longitudinal location in relation to sinus line, Relationship to renal rim, sinus and collecting system)
- C-index (numerical score based on the combination of tumor diameter and distance from tumor edge to the kidney center)
- Arterial Based Complexity (ABC) Scoring System (relationship of the tumor and arterial vasculature)
- Zonal NePhRO scoring system (Nearness to collecting system, Physical location of the tumor, Radius of the tumor and Organization of the tumor)

The use of such a system is helpful as it allows objective prediction of potential morbidity surgery and tumour ablation techniques and provides information for treatment planning and patient counselling.