# Prediction of Surgical Outcomes and Quality of Life after Percutaneous Nephrolithotomy through Guy's Score and Nephrolithometric Nomogram

Thesis

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By

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بسم الله الرحمن الرحيم

وَقُلِ اعْمَلُواْ فَسَيَرَى اللّهُ
عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ

صدق الله العظيم

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# INTRODUCTION

The diagnosis and initial management of urolithiasis have undergone considerable evolution in last decade. Initial management is based on three concepts: the recognition of urgent need for urologic consultation, the effective pain control using either narcotic and/or non-narcotic analgesics and understanding the impact of stone location and stone burden on definitive management ***(Portis and Sundaram, 2001).***

Renal stone major cause of patients' presentation to urology clinics worldwide and Percutaneous nephrolithotomy (PCNL) has emerged as the treatment modality of choice for large and complex renal stones. Like any other surgical procedures, this procedure is not without complications. The outcome of PCNL is measured in terms of stone free rate and complications and the goal of this surgery is to provide maximum stone clearance with minimal morbidity ***(Poudyal et al., 2017).***

Currently there is no consistence on the gold standard tool for predicting success and complications associated with this surgery. Several preoperative nomograms have been proposed for prediction of success rates of PCNL and also for correlating with the complication rates to standardize the reporting of procedural success, interobserver reliability and to aid in evaluating training programs. These include Guy's Stone

Score (GSS), Clinical Research Office of the Endourological Society (CROES) nomogram, STONE score, and Seoul National University Renal Stone Complexity ***(Kumar et al., 2018).***

# Aim of the Work

Currently, there is no single agreement upon an ideal predictive model that characterizes the complexity of renal stones and predicts surgical outcomes following percutaneous nephrolithotomy (PCNL).

**Our main objective of the study is to:**

1- Evaluate the accuracy of the GSS and Nephrolithometric Nomogram. Scoring system in predicting PCNL outcomes in terms of stone-free rate (SFR), operative time (OT), length of hospital stay (LOS), and complications.

2- Evaluate the ability of the GSS and STONE score to correlate with the post-operative change in the quality of life.

Chapter 1

# RENAL ANATOMY

### *Endourologic Considerations*

Given that the visualization of the kidney and surrounding structures during standard percutaneous entry guided by fluoroscopy or ultrasonography is limited, understanding of the renal and perirenal anatomy is critical for obtaining access that is effective and safe.

Even armed with this knowledge, variations in anatomy can make access challenging for the experienced surgeon and prohibitive for the inexperienced one. The urologist must have a thorough knowledge of the renal anatomy and the relationship to the surrounding structures. A dynamic perception of the stereotactic configuration is considered necessary to avoid complications during percutaneous renal surgery ***(Wolf et al., 2012).***

### *Anatomy and Kidney relationships as applied to minimally invasive surgery*

The kidneys are paired organs that rest in the retro peritoneum on the posterior abdominal wall. Each kidney is of a characteristic shape, having a superior and inferior poles, a convex border placed laterally, and a concave medial border. The medial border has a marked depression, the hilum, which contains the renal vessels and the renal pelvis ***(Skandalakis et al., 2004).***

### *i) Renal Morphometry*

Grossly, the kidneys are bilaterally paired reddish brown organs ***(fig. 1)***. Typically each kidney weighs 150 g in the male and 135g in the female. The kidneys generally measure 10 to 12cm vertically, 5 to 7cm transversely, and 3 cm in the antero-posterior dimension. Because of compression by the liver, the right kidney tends to be somewhat shorter and wider ***(Anderson et al., 2012).***

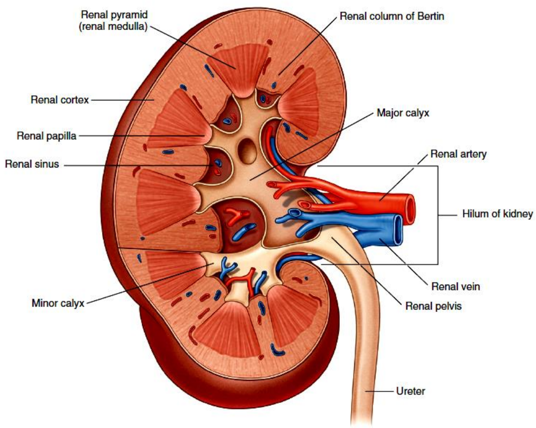


**Figure (1):** Internal structure of the kidney. ***(Drake RL, Vogl W, Mitchell AWM. Gray's anatomy for students. Philadelphia: Elsevier; 2005. p. 323.***

### *ii) Position of the kidneys:*

The kidneys lie adjacent to the vertebral bodies, usually extending from the 11th or 12th thoracic to the 2nd or 3rd lumbar vertebrae ***(fig. 2)***. The right kidney is displaced a few centimeters inferior to the left kidney. The longitudinal axis of the kidneys parallels the lateral edges of the psoas muscles, about 30 degrees from vertical, with the lower poles lateral to the upper poles. The kidneys are also tilted 30 degrees off the frontal plane, with the lower poles anterior to the upper poles. Finally, the kidneys are rotated out of the frontal plane as well, with the lateral aspect of the kidney posterior to the medial aspect, such that each kidney is rotated 30 degrees posteriorly from the renal hilum ***(Wolf et al., 2012).***

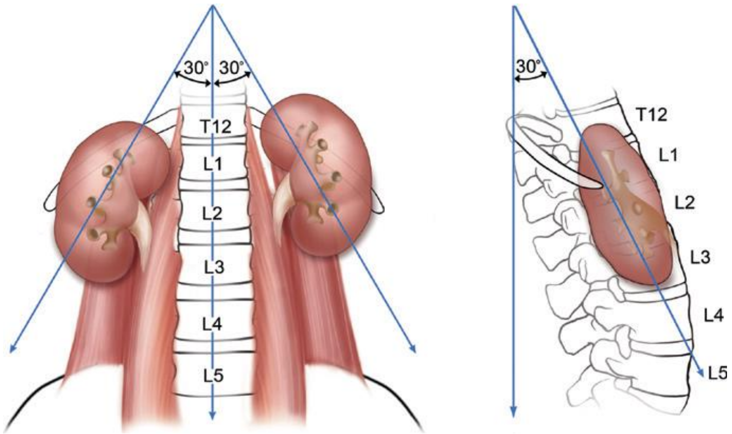


**Figure (2):** Location of kidneys in the retroperitoneum. ***(J. StuartWolf, Jr., MD, FACS: Percutanous Approaches to the upper urinary tract collecting system. Campbell- Walsh urology 11th edd.2016 p.154).***

### *iii) Perirenal Coverings:*

The kidney surface is enclosed in a continuous covering of fibrous tissue, the renal capsule. Each kidney in its capsule is surrounded by a mass of adipose tissue called perirenal fat, which lies between the peritoneum and the posterior abdominal wall ***(fig. 3)***. The perirenal fat is enclosed by the renal fascia (i.e.Gerota's fascia). The renal fascia is enclosed anteriorly and posteriorly by another layer of adipose tissue called the pararenal fat, which varies in thickness ***(Elspeth et al., 2002).***