

# Occurrence of Retrorenal Colon in the Indian Population – A Significant Finding from Urological Perspective

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## Abstract

**Introduction:** Ascending and descending coli normally are located anterolateral to kidneys. Retrorenal position of the colon has a reported prevalence of 10%–20% in the general population. Its occurrence is of significant while performing percutaneous nephrolithotomy (PNL) which is a routine management procedure for patients showing clinical disease associated with renal calculus. PNL in patients with retrorenal colon can lead to colonic perforation which is associated with significant morbidity and mortality related to septicemia, peritonitis, formation of abscess, and nephro-colic and/or colo-cutaneous fistulae. Hence, the preoperative information about the presence of retrorenal colon is essential for the prevention of surgical complications. **Materials and Methods:** Our retrospective study included patients who underwent computed tomography (CT)/magnetic resonance (MR) abdomen in our department of radiodiagnosis. All the scans were evaluated for the presence of retrorenal colon. The persistence of retrorenal colon was also observed with change in posture among those with prone scans. **Results:** The retrorenal colon was present in 130 out of 669 patients included in the study, with an occurrence rate of nearly 20%. Alteration in the position of retrorenal colon was noted with prone position in approximately 79%. **Conclusion:** The occurrence of retrorenal colon is high in the Indian population being approximately 20% without change with prone position in one-fifth. Thus, to reduce the risk of complication related to colonic perforation during PNL, all patients must be subjected to CT/MR abdomen to detect retrorenal colon followed by scan in the prone position, if retrorenal colon is present, to evaluate the alterations in colonic position with prone posture.

**Keywords:** Colon, Indian, retrorenal, urological

## INTRODUCTION

Both ascending and descending coli are located anterolateral to the kidneys on both sides of midline. Colon lying posterior to the line joining the renal hilum and anterolateral margin of corresponding vertebra on any side of midline is referred to as retrorenal colon. It has a reported prevalence of 10%–20% in the general population.<sup>[1,2]</sup> Position of the colon is particularly important while performing percutaneous nephrolithotomy (PNL), a common surgical option in patients with various clinical presentations secondary to renal calculus. PNL in patients with retrorenal colon can result in colonic perforation leading to significant morbidity secondary to septicemia, inflammation of peritoneum, formation of pus/abscess and fistulous tracts between the collecting system of kidney and colon (nephrocolic) or skin (colocutaneous) and even mortality. Hence, determining retrorenal colon

is imperative for preventing colon-related, complications during PNL and other operative procedures performed through the same approach.<sup>[3,4]</sup> In this study we evaluate the occurrence of retrorenal colon during routine computed tomography (CT)/magnetic resonance (MR) abdomen and to determine the percentage of persistence of retrorenal colon in prone position.

## MATERIALS AND METHODS

### Study settings and design

This retrospective, observational study was conducted in our institution over a period of 12 months including 669 CT/MR

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abdomen scans performed in the Department of Radiodiagnosis following approval from Institutional Review Board using the strict criteria. (IRB No. 68/2022).

### Study period

Twelve months.

All the scans were evaluated for the presence of retrorenal colon. The persistence of retrorenal colon was also evaluated in these scans with images available in prone posture.

The CT abdomen scans were performed on 128-slice whole-body CT scanner while MR abdomen scans were performed on 1.5T whole-body MR scanner.

The methodology followed by us was described by Prassopoulos *et al.* according to which the retrorenal colon refers to the position of colon lying posterior to the line joining the middle part of the renal hilum with the anterolateral margin of the vertebral body at that level<sup>[5]</sup> [Figure 1].

### Inclusion criterion

Patients with CT/MR abdomen scans of optimal quality.

### Exclusion criteria

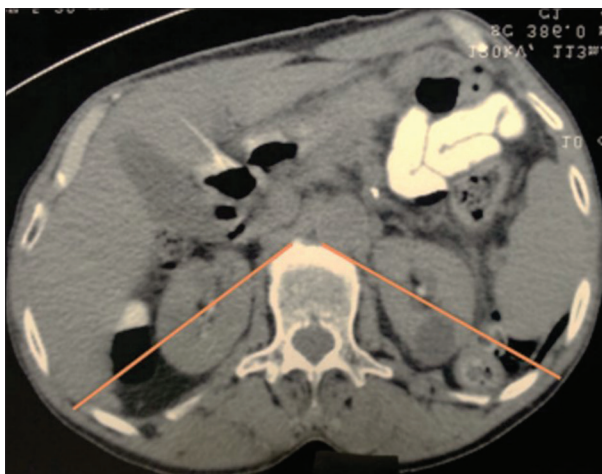
- Any condition interfering with the line to be drawn for determining the retrorenal position especially the spinal abnormalities
- Any mass or history of operative procedure in the region of interest
- Congenital renal anomalies
- Gross ascites.

### Statistical analysis

All the quantitative variables were expressed in number and percentages.

## RESULTS

Our study included 669 patients with a mean age of



**Figure 1:** Axial computed tomography scan image in the supine posture with lines drawn from anterolateral border of vertebral body to renal hilum. Colon lying posterior to this line is regarded as retrorenal colon. In this scan both ascending and descending colon are posterior to these lines

45 ± 6.7 years with male-to-female ratio of more than 2:1. Out of 669 scans, 638 were CT scans while 31 were MR abdomen scans [Table 1].

Out of the 669 patients, total 130 patients had retrorenal colon including 128 CT scans and 02 MR scans corresponding to 19.4% [Table 2].

Out of 128 cases of retrorenal colon on supine CT abdomen, the position of the colon did not change in 27 subjects corresponding to 21.1% [Figure 2, Table 3]. MR abdomen scan in prone position was not available.

Hence, we observed retrorenal colon in 130 of 669 patients enrolled in our study (19.4%). After prone position, there was change in the position of the retrorenal colon in 101 out of 128 patients (78.9%).

## DISCUSSION

In our study, we found retrorenal colon in 130 out of 669 scans (19.4%) included in our study. This is in contrast to the study performed by Balasar *et al.*, who reported retrorenal colon in 6.9% of 394 patients in their study.<sup>[3]</sup> The occurrence of retrorenal colon in our study was also much higher than 7.5% observed in the study by Abdulkareem *et al.*<sup>[6]</sup> The results of our study are comparable with studies published in the medical literature quoting 10%–20% incidence of retrorenal colon even in prone posture.<sup>[1,2]</sup> To the best of our knowledge, only few studies in India with a large sample size as our study have been performed.

**Table 1: Distribution of the study population according to imaging modality**

Characteristics	Frequency (n)
Sample size	669
CT scan	638
MR scan	31

CT: Computed tomography, MR: Magnetic resonance

**Table 2: Distribution of study population with retrorenal colon**

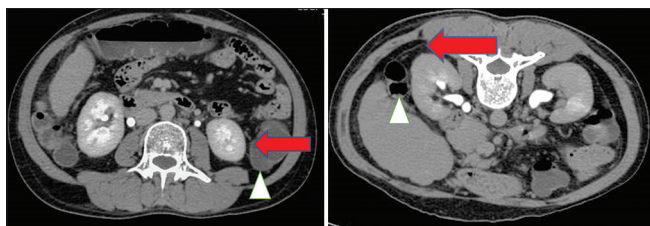
Imaging modality	Number of subjects	Subjects with retrorenal colon
CT	638	128
MRI	31	2

CT: Computed tomography, MRI: Magnetic resonance imaging

**Table 3: Distribution of the study population based on retrorenal colon on prone scan**

Characteristics	Frequency (n)
Number of subjects with retrorenal colon on CT	128
Alteration in position on prone scan	101
Retrorenal colon on prone scan	27

CT: Computed tomography



**Figure 2:** Axial computed tomography scan image showing retrorenal, fluid-filled descending colon (white arrowhead, red arrow indicates left kidney) with no change in position with prone posture, air-filled retrorenal descending colon (white arrowhead, red arrow indicates left posterior pararenal fascia)

After prone position, there was change in the position of the colon with respect to one or both kidneys in 78.9% of patients. This change occurred due to gravitational effect. This is important as most of the PNL procedures are carried out with patients in prone posture. Thus, the results of our study are very different from those by Sharma *et al.* who found the occurrence of retrorenal colon in 2% patients against 19.4% in our study in supine scans and 6.8% patients against 21.1% in our study on prone position.<sup>[4]</sup> The anterior shift of colon along with other organs in prone posture has been described by Dodo *et al.*<sup>[7]</sup>

Risk of colonic perforations in patients undergoing PCNL is about 0.25%.<sup>[8]</sup> Colonic injury has been categorized as IVa by the Clavien–Dindo classification of surgical complications. However, this incidence is very low as compared to occurrence of retrorenal colon partly because the definition of retrorenal colon is very broad and improved competence and maneuvering by the urological surgeons. Early recognition is a key to improving prognosis in cases of colonic perforation by preventing severe sepsis. Unexplained fever in addition to diarrhea or hematochezia in immediate postoperative state, peritonitis, or signs of nephro-colocutaneous fistula have been described as warning signs of colonic perforation.<sup>[9]</sup> However, 0.6%–1.5% PCNL patients develop fever and sepsis even without colonic injury.<sup>[10]</sup> Failure of recognition of injury to colon may result in anaerobic pus formation; formation of fistulous tracts between kidney and colon or colon and skin or kidney, colon and skin; injury can result in abscess formation, nephro-colic or colo-cutaneous fistulae, variable degree of peritonitis, or signs of diffuse sepsis.<sup>[11]</sup>

The incidence of retrorenal colon increases in patients with advanced scoliotic deformity (25%).<sup>[12]</sup> PCNL could not be performed by Skoog *et al.* due to the risk of colonic perforation in a case of renal stones in horse-shoe kidney.<sup>[13]</sup>

Based on the preoperative detection of the retrorenal colon, a safer approach can be adopted for PNL to avoid any injury to gastrointestinal tract.<sup>[14-19]</sup>

### Limitations of the study

- Hospital-based study
- Single-center study.

### CONCLUSION

The higher occurrence of retrorenal colon (19.4%) in our study

with persistence in prone position in approximately one-fifth makes preoperative CT/MR abdomen scan imperative to reduce the risk of colon-related complications during and after PNL. However, we recommend multicenter studies for further assessing the occurrence of retrorenal colon.

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### Conflicts of interest

There are no conflicts of interest.

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