

Prevalence of the Retro-Renal Colon: A Systematic Review and Meta-Analysis with Implications for Percutaneous Nephrolithotomy

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Background: This systematic review and meta-analysis aims to determine the prevalence of the retrorenal colon (RRC) and its implications in percutaneous nephrolithotomy with the overall objective of promoting the prevention of associated iatrogenic complications.

Methods: A systematic search of literature was conducted on the electronic databases PubMed, ScienceDirect, and Hinari to identify studies eligible for inclusion. Search results were screened by title and abstract, and those potentially relevant were evaluated by full text. Studies were deemed eligible for inclusion if they reported clear extractable data regarding the prevalence of the retro-renal colon. A meta-analysis was completed using MetaX1 to calculate the pooled prevalence of the retro-renal colon. Sub-group analysis was performed based on geographical regions from which the studies originated, imaging modality, and patient position.

Results: 174 records were screened and a total of 10 records included in the analysis with retrospective cohort studies being the most common study design. A male predominance was seen in most sample sizes that had reported data on gender demographics ranging from 41.5–62%. The most common imaging modality utilized was computerized tomography (CT) scan followed by ultrasound. The range of the unweighted prevalence of retro-renal colon across all studies that had absolute numbers reported was from 3.5–25%. One of the studies reported a colonic perforation rate of 0.3% in patients without CT images.

Conclusion: The retro-renal colon is a relatively common finding with observed preponderance to females and left lateralization. The presence of RRC increases the likelihood of colon perforations while gaining percutaneous access to the kidney. Pre-procedural imaging can help detect its presence and choose an appropriate route of entry. USG and CT have both been found useful as a modality to pick up RRC.

Keywords: colon, nephrolithotomy, retro-renal, urolithiasis

Introduction

Minimally invasive percutaneous procedures form a vital component in the management of patients with renal calculi.¹ Percutaneous nephrolithotomy (PNL), in particular, has currently replaced open surgery and is now considered the gold standard in the treatment of complex renal calculi (>2cm).^{2,3} Recent trends in energy and optics, as well as miniaturization of instruments, have however rendered PNL additionally useful in the treatment of medium and small renal stones with concomitantly lower morbidity and higher stone clearance rates.^{1,4} The dawn of minimally invasive endourology has seen several refinements and subsequent adoption of PNL in routine management of nephrolithiasis, a global problem with lifetime prevalence ranging up to 25%, owing to its association with reduced morbidity, convalescence, as well as recovery.⁵ Furthermore, PNL, being minimally invasive, is considered a safe and reliable technique.⁶

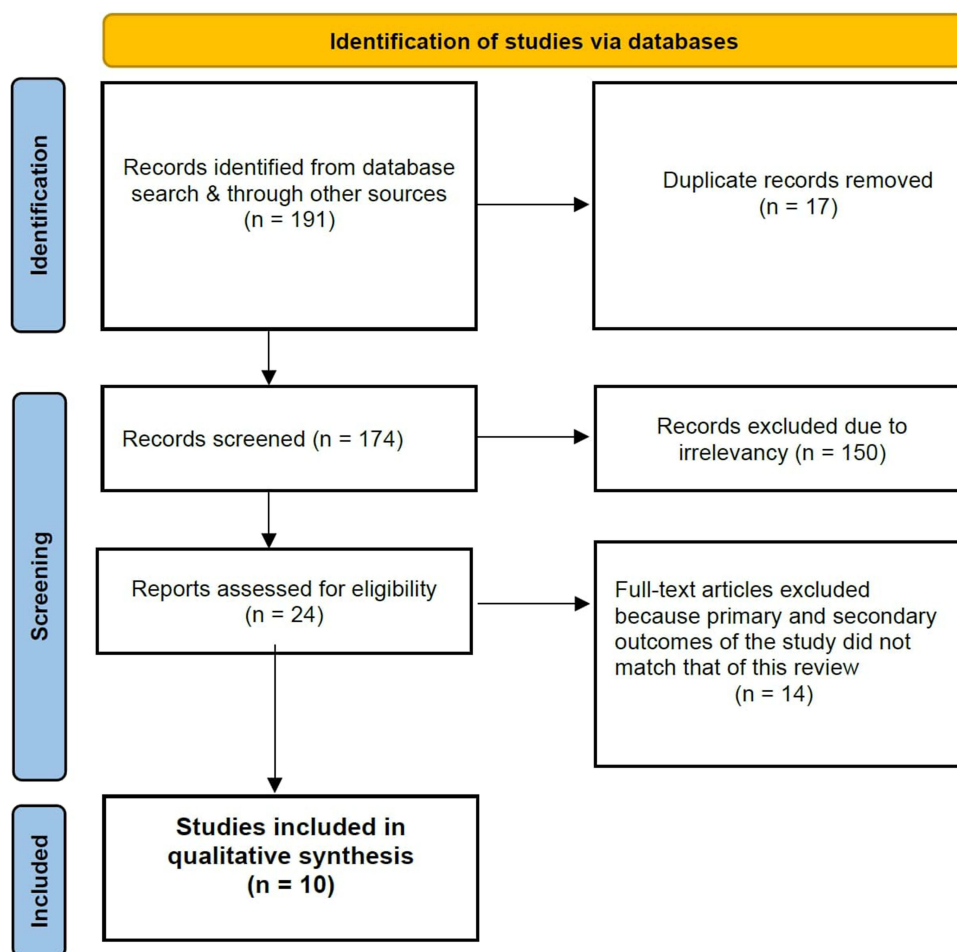


Figure 1 PRISMA flow diagram provides a visual depiction of the sourced records.

Notes: PRISMA figure adapted from⁷ Liberati A, Altman D, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *Journal of clinical epidemiology*. 2009;62(10). Creative Commons.⁴⁰

Though safe and reliable, complications following PNL interventions have been reported in about 15.6–83% of patients and are classified using the modified Clavien grading system with increasing severity from grade 1 to grade 5.⁷ Of these, iatrogenic perforations of the colon, classified as grade 4a (single organ dysfunction), constitute one of the most serious complications in 0.2–1% of cases and are primarily attributed to the presence of a retrorenal colon.⁷ These colonic perforations have also been reported to complicate peritonitis and sepsis, as well as increase the risk of mortality if discovered late in its course.⁶ However, most colonic perforations go unreported in the literature, suggesting an even higher incidence.^{1,8}

Previous studies report prevalence of retro-renal colon in about 1–14% of the population with higher incidences observed in females, on the left side, in relation to the lower pole of the kidney and in the prone position of the patient which is preferred for PNL procedures.⁹ Despite the infrequency of complications, sequelae after colon perforation are associated with significant morbidity and mortality and require not only conservative management but also open surgical intervention in patients with peritonitic and septic diseases.^{6,8} Therefore, knowledge on the prevalence of a retrorenal colon and its relationship with the kidney is vital in preoperative planning and prevention of iatrogenic injury to the colon during PNL. The prevalence of retrorenal colon is reported in the literature with heterogeneous results, and its implications on percutaneous nephrolithotomy have not been thoroughly assessed in a systematic review and meta-analysis of the literature. Therefore, the objective of this systematic review and meta-analysis is to determine the prevalence of the retrorenal colon and its implications in percutaneous nephrolithotomy with the overall objective of promoting the prevention of associated iatrogenic complications.

Methods

Study Protocol and Registration

This systematic review and meta-analysis were conducted in strict conformity with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.^{10,11} The protocol for this study has been reported in the International Prospective Register of Systematic Reviews (PROSPERO identifier: CRD42020186060).

Literature Search Strategy

A comprehensive and systematic search of literature was conducted by three authors (B.N, E.O and V.K) on the electronic databases PubMed, ScienceDirect and Hinari to identify studies eligible for inclusion. The electronic search was carried out using the strategy as follows: 1) “Anatomy” OR “Prevalence” OR “Incidence” OR “Ultrasonography” OR “computed tomography” OR “percutaneous access” OR “Percutaneous nephrolithotomy” 2) “Retrorenal colon” 3) 1 AND 2. No language restriction was made. For articles published by the same study group and having an overlap of the search period, only the most recent article was included to avoid duplication of data. The PubMed function “related articles” was used to extend the search and a reference list of all the included studies was analyzed. A search on google scholar and Google’s book was done for the analysis of the gray literature (<https://books.google.com>). We then performed a hand-search (through forward and backward citation tracking) of the bibliography of included studies, to detect other potentially eligible studies.

Eligibility Criteria

All studies were screened and assessed for eligibility by two independent reviewers (I.O, F.N). Search results were screened by title and abstract. Duplicate articles and those irrelevant to the study were excluded and those potentially relevant evaluated by full text. Studies were deemed eligible for inclusion if they reported clear extractable data regarding the prevalence of the retro-renal colon. Letters to the editor, reviews, and studies with incomplete or irrelevant data were excluded as well as any studies that did not meet the primary and secondary outcomes of the present review. Any disagreements between reviewers arising during the eligibility assessment were settled by a consensus with a third reviewer (I.C).

Data Extraction and Quality Assessment

Data extraction was conducted by two independent reviewers (F.N and I.O). For each study, the following information was extracted: the surname of the first author and the year of publication, the geographical region where the study was performed, imaging modality, patient position (prone vs supine), sample size, mean age and % of male patients, as well as the prevalence of the retro-renal colon. Any variances were resolved by a consensus with a third review author (E.O). Quality assessment and analysis of the risk of bias of all selected full-text articles were performed (B.N and B.S) using the Anatomical Quality Assurance (AQUA) tool from the International Evidence-Based Anatomy (iEBA) working group.¹¹ The AQUA tool probes for potential risk of bias in five study domains namely; objective and subject characteristics, study design, methodology characterization, descriptive anatomy and reporting of results. The risk of bias within each domain is then categorized as either “Low”, “High”, or “Unclear”.

Outcomes of Interest

The outcome of interest was the prevalence of the retro-renal colon.

Meta-Analytical Synthesis Methods

Analysis of the extracted data was performed using MetaXL to calculate the pooled prevalence of the RRC. DerSimonian-Laird model with a Freeman-Tukey double arcsine transformation was used to combine the summary data. A random-effects model was applied due to the high levels of heterogeneity displayed by anatomical data. The data reported here have been back transformed. The magnitude of heterogeneity among the included studies was assessed using the chi-squared test (Chi2) and I-squared statistic (I2). For the Chi2 test, a Cochrane’s Q p-value of <0.10 was considered significant. The values of the I2 statistic were interpreted as follows at a 95% confidence interval: 0–40% might not be important, 30–60% might indicate moderate heterogeneity, 50–90% may represent substantial heterogeneity, and 75–100% may represent significant

heterogeneity (37). Sub-group analysis was performed based on geographical regions from which the studies originated, imaging modality and patient position. Additionally, a leave-one-out sensitivity analysis was performed to assess the robustness of the results and to further probe the sources of inter-study heterogeneity.

Results

Literature Search

Three databases were searched (PubMed, Hinari, and ScienceDirect) and a total of 188 records were identified (Figure 1). Three additional records were sourced from the gray literature. A total of 174 records were identified after the removal of duplicates. A total of 174 records were screened and 150 were excluded based on exclusion criteria. 24 articles were assessed for eligibility and 14 were excluded based on study outcomes. A total of 10 records were included in the analysis.

Characteristics of the Included Studies

A total of ten studies were identified. Studies ranged from the year 1985 to 2020. Retrospective cohort studies were the most common study design followed by cross-sectional, descriptive observational, and then prospective. A total of 13 study groups are identified based on the included studies. Alma et al reported two study groups with different imaging modalities (ultrasound vs ultrasound and CT).¹² Onder et al reported two separate cohorts.¹³ Sharma et al reported two study groups with different positions reported (supine vs prone).¹⁴ The most common imaging modality utilized was computerized tomography (CT) scan followed by ultrasound. A male predominance was seen in most sample sizes that had reported data on gender demographics ranging from 41.5–62%. Geographical distribution was as follows: United States (n=3), Turkey (n=5), India (n=3), South Africa (n=1), France (n=1), Greece (n=1). The baseline characteristics of the trials are summarized in Table 1.

Prevalence of Retro-Renal Colon (RRC)

A total of six groups provided gender-specific (male vs female) data on the prevalence of the retro renal-colon. A total of ten groups provided information on the laterality (right vs left) of the prevalence of the retro-renal colon. The range of the unweighted prevalence of retro-renal colon across all studies that had absolute numbers reported was from 3.5–25% (Table 2). A greater prevalence of RRC was seen in females in comparison to males in three groups.^{13,18,19} A greater prevalence of left sided retro-renal colon (RRC) was reported in nine groups.

Quality Assessment & Risk of Bias

Quality assessment and the risk of bias was inspected using the Anatomical Quality Assurance (AQUA) checklist for anatomical studies. Tabular display of the AQUA tool questionnaire and summary is provided in Tables 3 and 4 respectively. The greatest risk of bias was found to be in domain III methodology characterization.

Discussion

Percutaneous nephrolithotomy, introduced in 1976, is a procedure that is performed to gain access to the upper urinary tract. It typically is done under general anesthesia and requires hospital stay usually for about one to three days.²¹ PNL was initially reserved for large stones but recent developments in its technique such as “mini” or “micro” PNL has made it possible for it to access and fragment smaller renal stones.^{22–24} That said, the primary aspect of PNL is gaining access to the renal calyx for visualization and extraction of the stone. Due to this, PNL has a higher complication rate compared to other procedures like ureteroscopy and shock wave lithotripsy.²⁵

Owing to the sheer number of PNLs performed, a deeper look into its complications and ways to prevent them is required. Complications after PNL interventions have been reported in approximately 15.6–83% of patients and are classified using the modified Clavien classification system with increasing severity from grade 1 to grade 5. Of these, perforations of the colon, classified as grade 4a (neighboring organ injury), constitute one of the most serious complications.⁷ Factors that predispose to colon perforation include age of the patient, horseshoe kidney, previous kidney surgery, access to the inferior location of the left kidney, access to the lateral posterior axillary line, hypermobile kidney, and the existence of a retrorenal colon (RRC), among others.^{26,27} Knowledge of the position of the ascending and descending colon and its

Table 1 Overview of Trial Characteristics

	Author & Year	Country/Region	Imaging Modality	Position	Sample Size	Study Design	% Male	Mean Age
1	Alma 2020 ¹²	Adana, Turkey	Ultrasound+CT	Prone	310	Cross-sectional	62	44+-16.1
2	Alma 2020 ¹²	Adana, Turkey	Ultrasound only	Prone	310	Cross-sectional	62	44+-16.1
3	Balasar 2015 ¹⁵	Konya, Turkey	CT	Prone	394	Retrospective	54.8	42.2
4	Boon 2001 ⁸	Pretoria, South Africa	CT	Supine	301	Cross-sectional	41.5	-
5	Faure 2001 ¹⁶	Poitiers Cedex, France	CT - Contrast	Supine	100	Prospective	50	(20 to37)
6	Hopper 1987 ¹⁷	Bethesda, USA	CT	Prone	90	Cross-sectional	50	-
7	Hopper 2022 et al ¹⁸	Bethesda, USA	CT	Supine	500	Retrospective	-	-
8	Onder 2013 ¹³	Diyarbakir, Turkey	CT	Supine	550	Retrospective	-	46 +- 8 years (7 to 98)
9	Onder 2013 ¹³	Diyarbakir, Turkey	CT	Supine	200	Retrospective	-	46 +- 8 years (7 to 98)
10	Prassopoulos 1990 ¹⁹	Athens, Greece	CT - Oral contrast	Supine	1708	Retrospective	61.8	-
11	Sharma 2014 ¹⁴	Jaipur, India	CT - Contrast and non-contrast	Supine	350	Descriptive observational	62	-
12	Sharma 2014 ¹⁴	Jaipur, India	CT - Contrast and non-contrast	Prone	350	Descriptive observational	62	57.3
13	Sherman 1985 ²⁰	Washington DC, USA	CT	Not indicated	200	Retrospective	-	-

Table 2 Tabular Representation of the Prevalence of Retrorenal Colons Based on Included Studies

Group	Study	Males	Females	Right	Left	Both sides	Combined Prevalence	Complication(s)
1	Alma 2020 ¹²	-	-	9(8%)	32(18%)	-	42 (13.5%)	No interventions
2	Alma 2020 ¹²	-	-	10 (8%)	31	1	42 (13.5%)	No interventions
3	Balasar 2015 ¹⁵	-	-	4 (1.0%)	18 (4.6%)	5 (1.3%)	27 (6.9%)	Colonic perforation rate 0.3% (in patients without CT images)
4	Boon 2001 ⁸	-	-	-	-	-	-	No interventions
5	Faure 2001 ¹⁶	-	-	-	-	-	-	-
6	Hopper 1987 ¹⁷	11.80%	9.50%	6.00%	6.20%	-	10%	-
7	Hopper et al ¹⁸	1.80%	2.10%	1.10%	1.30%	-	0.10%	-
8	Onder 2013 ¹³	7 (7%)	18 (18%)	8 (8%)	15 (15%)	2 (2%)	25 (25%)	-
9	Onder 2013 ¹³	-	-	6 (3%)	1 (0.5%)	0	7 (3.5%)	-
10	Prassopoulos 1990 ¹⁹	41 (7.6%)	62 (9.4%)	22 (1.2%)	81 (4.7%)	-	103 (6.0%)	-
11	Sharma 2014 ¹⁴	4	3	4	3	0	2%	-
12	Sharma 2014 ¹⁴	15	9	2	17	5	6.80%	-
13	Sherman 1985 ²⁰	-	-	18	21	-	-	-

Table 3 Application of the AQUA Tool

Reference	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Alma 2020 ¹²	Y	Y	Y	N	Y	Y	Y	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	N	N	Y	Y	Y	Y	N
Balasar et al ¹⁵	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Boon 2001 ⁸	Y	Y	Y	N	N	Y	Y	Y	N	Y	N	N	Y	N	N	Y	Y	Y	N	N	Y	Y	Y	N	N
Faure 2001 ¹⁶	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	Y	N	Y	Y	N	N	Y	Y	Y	Y	N
Hopper 1987 ¹⁷	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	Y	Y	Y	N	N	Y	Y	Y	N	N
Hopper et al 2022 ¹⁸	Y	Y	N	Y	Y	Y	Y	Y	N	N	N	N	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N
Onder 2013 ¹³	Y	Y	N	Y	Y	Y	Y	Y	N	Y	N	Y	Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N
Prassopoulos 1990 ¹⁹	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N
Sharma 2014 ¹⁴	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N	Y	Y	N	N	Y	Y	Y	Y	N
Sherman 1985 ²⁰	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N

Notes: Domain I: objective(s) and subject characteristics. (1) Was (Were) the objective(s) of the study clearly defined? (2) Was (Were) the chosen subject sample(s) and size appropriate for the objective(s) of the study? (3) Are the baseline and demographic characteristics of the subjects (age, sex, ethnicity, healthy or diseased, etc.) appropriate and clearly defined? (4) Could the method of subject selection have in any way introduced bias into the study? Domain II: study design. (5) Does the study design appropriately address the research question(s)? (6) Were the materials used in the study appropriate for the given objective(s) of the study? (7) Were the methods used in the study appropriate for the given objective(s) of the study? (8) Was the study design, including methods/techniques applied in the study, widely accepted or standard in the literature? If “no”, are the novel features of the study design clearly described? (9) Could the study design have in any way introduced bias into the study? Domain III: methodology characterization. (10) Are the methods/techniques applied in the study described in enough detail for them to be reproduced? (11) Was the specialty and the experience of the individual(s) performing each part of the study (such as cadaveric dissection or image assessment) clearly stated? (12) Are all the materials and methods used in the study clearly described, including details of manufacturers, suppliers etc.? (13) Were appropriate measures taken to reduce inter- and intra-observer variability? (14) Identify any potential source of bias and, when present, describe measures implemented to assess the risk of bias (15) Describe all statistical methods for analyzing the data, including those of confounders. Statistical methods for additional analyses (eg, sub-group/sensitivity analyses), when performed, should be described. Domain IV: descriptive anatomy. (16) Were the anatomical definition(s) (normal anatomy, variations, classifications, etc.) clearly and accurately described? (17) Were the outcomes and parameters assessed in the study (variation, length, diameter, etc.) appropriate and clearly defined? (18) Were the figures (images, illustrations, diagrams, etc.) presented in the study clear and understandable? (19) Were any ambiguous anatomical observations (ie, those likely to be classified as “others”) clearly described/depicted? (20) Could the description of anatomy have in any way introduced bias into the study? Domain V: reporting of results. (21) Was the statistical analysis appropriate? (22) Are the reported results as presented in the study clear and comprehensible, and are the reported values consistent throughout the manuscript? (23) Do the reported numbers or results always correspond to the number of subjects in the study? If not, do the authors clearly explain the reason(s) for subject exclusion? (24) Are all potential confounders reported in the study, and subsequently measured and evaluated, if appropriate? (25) Could the reporting of results have in any way introduced bias into the study? (Henry et al)¹¹

Table 4 Anatomical Quality Assurance Checklist

Reference	Study Type	Domain I	Domain II	Domain III	Domain IV	Domain V
Alma 2020 ¹²	Cross-sectional	Low	Low	Low	Low	Low
Balasar et al ¹⁵	Retrospective	Low	Low	High	Low	Low
Boon 2001 ⁸	Cross-sectional	Low	Low	High	Low	Low
Faure 2001 ¹⁶	Prospective	Low	Low	Low	Low	Low
Hopper 1987 ¹⁷	Cross-sectional	Low	Low	High	Low	Low
Hopper et al 1987 ¹⁸	Retrospective	Low	Low	High	Low	Low
Onder 2013 ¹³	Retrospective	Low	Low	Low	High	Low
Prassopoulos 1990 ¹⁹	Retrospective	Low	Low	Low	Low	Low
Sharma 2014 ¹⁴	Descriptive observational	Low	Low	Low	Low	Low
Sherman 1985 ²⁰	Retrospective	Low	Low	Low	Low	Low

Notes: Domain 1: objective(s) and subject characteristics; Domain 2: study design; Domain 3: methodology characterization; Domain 4: descriptive anatomy; Domain 5: reporting of results (Henry et al)¹¹

anatomical variations in relation to the kidney prior to attempting PNL is important. A retrorenal colon (RRC) exists when the colon is located posterior to the kidney. This means that in the presence of RRC there is a higher risk of the colon being injured as the colon can be on the line of insertion of a percutaneous nephrostomy tube. Although the presence of RRC does not accurately reflect the chances of a colon injury, it serves as a valuable indicator. This is because of the use of axial CT to judge the presence of RRC rather than multiplanar reformatted CT. Tuttle et al²⁸ demonstrated the overestimation of colon injury by axial CT, but nonetheless, it is an efficient modality to estimate the risk of injury prior to gaining access. The position of the patient during the assessment for RRC is crucial as its incidence can increase up to 20% when CT is performed in the prone position.⁸ Hopper et al demonstrated that CT scans when performed in supine and prone positions resulted in the colon being displaced towards the posterior aspect in 48.5% of the cases, with a mean displacement of 11.9mm.¹⁷ Tuttle et al further performed a study where multiple CT scans were analyzed and the simulated path of the nephrostomy tube determined the risk of an injury to the adjacent organs. This also demonstrated that the prevalence of RRC was 3% ($p < 0.001$) in the prone position and 0% ($p < 0.005$) in the supine position.²⁸ Hopper et al then proposed that the gas-distended bowel displaces the renal fascia in order to obtain a posterior position in the case of a prone patient.¹⁷ Alma et al¹² demonstrated the usefulness of performing prone position ultrasound for detection of RRC and recommended its use to confirm their presence, especially in those patients with suspicion on supine CT. The anatomical reason for the presence of RRC is due to the fusion of the lateroconal fascia (formed by the fusion of anterior and posterior renal fascia) with the transversalis fascia and the parietal peritoneum. The absence of the formation of the lateroconal fascia could also lead to the presence of RRC.²⁰ The other reason could be because of the presence of a short transverse mesocolon. This means that the colon will remain closer to the posterior abdominal wall.²⁹ It could also be due to the presence and the amount of retroperitoneal fat. More fat here equates to less chances of the colon moving to the retro renal position. Keeping that in mind, compared to young people and women, the elderly and men have a higher amount of retroperitoneal fat, therefore the incidence of RRC should be lower in this age group.¹⁷ Hadar et al³⁰ and Prassopoulos et al¹⁹ stated that, as time progresses, the accumulation of perirenal fat is higher in men than in women. This may be a limiting factor in lateral colon displacement, by restricting the angle between the lateroconal and prerenal fasciae. That seems not to be the case as Sharma et al reported that the incidence of RRC increases in patients who are over 50 years (mean age of 57.33, $p < 0.05$).¹⁴ Alma et al reported that the correlation of age with RRC occurred most commonly in the 18–39-year age group, while Hopper et al stated that the incidence increases in patients over 60 years of age.^{12,17}

Most published literature shows no sex predilection among either sex like Sherman et al,²⁰ Atar et al,³¹ and Hopper et al,¹⁷ whereas Prassopoulos et al¹⁹ found that there was a higher rate in females. Maghsoudi et al³² report a retrospective study of 11,376 patients who have undergone PNL, of which 17 had a colon injury. There was a high male preponderance among them

(82.3%, n=14). Multiple studies have reported the prevalence of RRC on the left side compared to the right, and more so on the lower pole of the kidney.^{8,14,17,20,31} Multiple techniques have been described to prevent colon injury in the presence of RRC. CT or USG guidance to puncture the renal pelvicalyceal system is usually recommended.³³ USG guidance can help visualize the adjacent organs also, and therefore safer access can be performed.³⁴ Combined fluoroscopic and USG guidance have been known to be the safest route.^{35,36} Newer navigation access methods, such as fusion imaging and robotic assistance, are still under evaluation.^{37–39}

Strength and Limitations

The present review offers an up to date on the prevalence of the retro-renal colon and insights on its implications in percutaneous nephrolithotomy. It was conducted in strict compliance to PRISMA guidelines to ensure review quality and quality assessment of the studies included was done in order to enable our findings to be objectively interpreted in light of the risk of bias reported in the respective studies. Like most other studies, our study also has some limitations. Very few studies were available which met the inclusion criteria and were analyzed. Moreover, the studies were from similar geographic locations and hence lacked universality. Future studies from diverse geographic locations can assess any variation of the prevalence according to different population cohorts.

Conclusions

The retro-renal colon is a relatively common finding with observed preponderance to females and left lateralization. The presence of Retro renal colon increases the likelihood of colon perforations while gaining percutaneous access to the kidney. Pre-procedural imaging can help detect its presence and choose an appropriate route of entry. USG and CT have both been found useful as a modality to pick up RRC.

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Disclosure

The authors report no conflicts of interest in this work.

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