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Sonographer Scanning Cheat Sheet: Renal Artery Doppler US

Procedure Overview: A retroperitoneal ultrasound assessment can be utilized to evaluate the renal parenchyma, aorta, and its vascularity to detect the presence, severity, and location of any retroperitoneal pathology or stenosis.

Required Pre-Procedure Prep:

- Patient needs to be NPO 8-10 hours prior to exam
- Obtain patient verbal consent.
- Obtain patient history including, but not limited to symptoms, medication usage, and previous retroperitoneal surgery.
- Instruct the patient to lie supine or in the right/left lateral decubitus position based on his/her body habitus.

Proper Probe: Convex or sector probe with a frequency of 2.5 - 5 MHz that has tri-duplex capabilities.

Protocol for Retroperitoneal Ultrasound (76770 and 93975 combined)

****Document pathology with and without measurement in two planes, Sag and Trv measuring the length, height, & width. Be sure to also include images with and without color Doppler.**

Cine Clips should be taken to help prove pathology and provide context for Remote Radiologists when appropriate. Please be mindful of not taking too many cine clips, just show what's most important.

1. Prox Aorta Sag (above the SMA)
2. Prox Aorta Sag with A/P measurements (be sure to INCLUDE WALL in measurement)
3. Prox Aorta Sag with Color
4. Prox Aorta Sag with Color and PW - Measure PSV and EDV
5. Mid Aorta Sag (between SMA and Renal Arteries)
6. Mid Aorta Sag with A/P measurements (be sure to INCLUDE WALL in measurement)
7. Mid Aorta Sag with Color
8. Mid Aorta Sag with Color and PW - Measure PSV and EDV
9. Distal Aorta Sag
10. Distal Aorta Sag with A/P measurements (be sure to INCLUDE WALL in measurement) *(note: If any level of the Aorta is dilated, suspend protocol and take additional images and measurements in TRV and with color)*
11. Distal Aorta Sag with Color
12. Distal Aorta Sag with Color and PW - Measure PSV and EDV
13. Rt Kidney Sag Mid
14. Rt Kidney Sag Mid with measurements (length and height, & Cortex)
15. Rt Kidney Sag Mid Add COLOR (adjust color scale or PRF to show good perfusion)
16. Rt Kidney Sag Medial
17. Rt Kidney Sag Lateral
18. Rt Kidney TRV Mid
19. Rt Kidney TRV Mid w/measurement (width)
20. Rt Kidney TRV Mid w/color flow over hilum
21. Rt Kidney TRV Upper Pole
22. Rt Kidney TRV Lower Pole
23. Rt Main Renal Artery Origin

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24. Rt Main Renal Artery Origin with color
25. Rt Main Renal Artery Origin with Doppler - measure PSV and EDV
26. Rt Main Renal Artery Mid Segment
27. Rt Main Renal Artery Mid Segment with color
28. Rt Main Renal Artery Mid Segment with Doppler - measure PSV and EDV
29. Rt Main Renal Artery Distal
30. Rt Main Renal Artery Distal with color
31. Rt Main Renal Artery Distal with Doppler - measure PSV and EDV
32. Rt Segmental Arteries with Color Superior Pole
33. Rt Segmental Arteries Superior Pole with Color and Doppler - Measure PSV and EDV, RI
34. Rt Segmental Arteries with Color Mid Segment
35. Rt Segmental Arteries Mid Segment with Color and Doppler - Measure PSV and EDV, RI
36. Rt Segmental Arteries with Color Inferior Pole
37. Rt Segmental Arteries Inferior Pole with Color and Doppler - Measure PSV and EDV, RI
38. Lt Kidney Sag Mid
39. Lt Kidney Sag Mid with measurements (length and height, & Cortex)
40. Lt Kidney Sag Mid Add COLOR (adjust color scale or PRF to show good perfusion)
41. Lt Kidney Sag Medial
42. Lt Kidney Sag Lateral
43. Lt Kidney TRV Mid
44. Lt Kidney TRV Mid w/measurement (width)
45. Lt Kidney TRV Mid w/color flow over hilum
46. Lt Kidney TRV Upper Pole
47. Lt Kidney TRV Lower Pole
48. Lt Main Renal Artery Origin
49. Lt Main Renal Artery Origin with color
50. Lt Main Renal Artery Origin with Doppler - measure PSV and EDV
51. Lt Main Renal Artery Mid Segment
52. Lt Main Renal Artery Mid Segment with color
53. Lt Main Renal Artery Mid Segment with Doppler - measure PSV and EDV
54. Lt Main Renal Artery Distal
55. Lt Main Renal Artery Distal with color
56. Lt Main Renal Artery Distal with Doppler - measure PSV and EDV
57. Lt Segmental Arteries with Color Superior Pole
58. Lt Segmental Arteries Superior Pole with Color and Doppler - Measure PSV and EDV, RI
59. Lt Segmental Arteries with Color Mid Segment
60. Lt Segmental Arteries Mid Segment with Color and Doppler - Measure PSV and EDV, RI
61. Lt Segmental Arteries with Color Inferior Pole
62. Lt Segmental Arteries Inferior Pole with Color and Doppler - Measure PSV and EDV, RI

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Anatomy	Normal Measurements
Kidney Length	9-13 cm females to 10-14 cm males
Kidney Height	1.3 to 1.8 cm
Kidney Width	1.0 to 2.5 cm
Renal Cortex	>1.0 cm
Prostate Volume	< 30 ml

Calc	Normal Measurements
RI	<0.70
PSV	<180cm/s
RAR	<3.5
AI	>300cm/s ²
AT	<0.07sec

How to calculate RAR:

$$\text{RAR} = \frac{\text{Peak systolic velocity (renal artery- highest velocity)}}{\text{Peak systolic velocity (mid aorta)}}$$

Classification of Stenosis:

ACR supports diagnosing ≥60% (hemodynamically significant) RAS when ONE OR BOTH of the following are present:

1 Renal Artery Peak Systolic Velocity (PSV)

- ≥180–200 cm/s
- Many ACR-referenced labs use ≥200 cm/s for better specificity

2 Renal–Aortic Ratio (RAR)

- ≥3.5
- Calculated using mid-aortic PSV

Classification	ACR Concept
No significant stenosis	Normal velocities, RAR <3.5
Hemodynamically significant stenosis	PSV ≥180–200 cm/s and RAR ≥3.5
Severe stenosis	Markedly elevated PSV (often ≥300 cm/s), turbulence, post-stenotic changes

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Common Pathologies

- Nephrolithiasis: Presents as an echogenic foci with posterior shadowing artifact. Document the nodule's location and if it is non-obstructing or obstructing in nature.
- Renal Cysts: Commonly present as hypoechoic lesions with well defined borders and posterior enhancement artifacts. Document the location and cyst classification as simple or complex.
- Hydronephrosis: Appears as a dilated fluid filled renal pelvis. Confirm by verifying the absence of blood flow through power Doppler evaluation. Examine the renal pelvis again post void to rule out pseudo-hydronephrosis.
- Renal Carcinoma: Appears with a taller-than-wider presentation, microcalcifications, irregular borders, and internal vascularity. Most commonly located on the left side.