

Intact Prostate Contouring Guide

eContour Team

You want to contour: **Intact Prostate**

What now?

- Find your references
 - RTOG normal male pelvis contouring atlas
 - <https://www.rtog.org/CoreLab/ContouringAtlases/MaleRTOGNormalPelvisAtlas.aspx>
 - RTOG trials with contouring descriptions for IMRT described in the protocol
 - RTOG 0815
 - RTOG 0126
 - Link to [UCSD video](#) of how to contour intact prostate slice-by-slice (website login is free)

**eContour.org aims to be your one-stop shop for contouring guidelines, with hyperlinks to above high-yield references!*

Let *eContour.org* help you!

1. Select CASES

2. From dropdown case list:
GU → **Prostate** → **intact**
(not post-prostatectomy)

3. Review anatomy

4. Draw OARs (rectum and penile bulb)

5. Draw the GTV and CTV

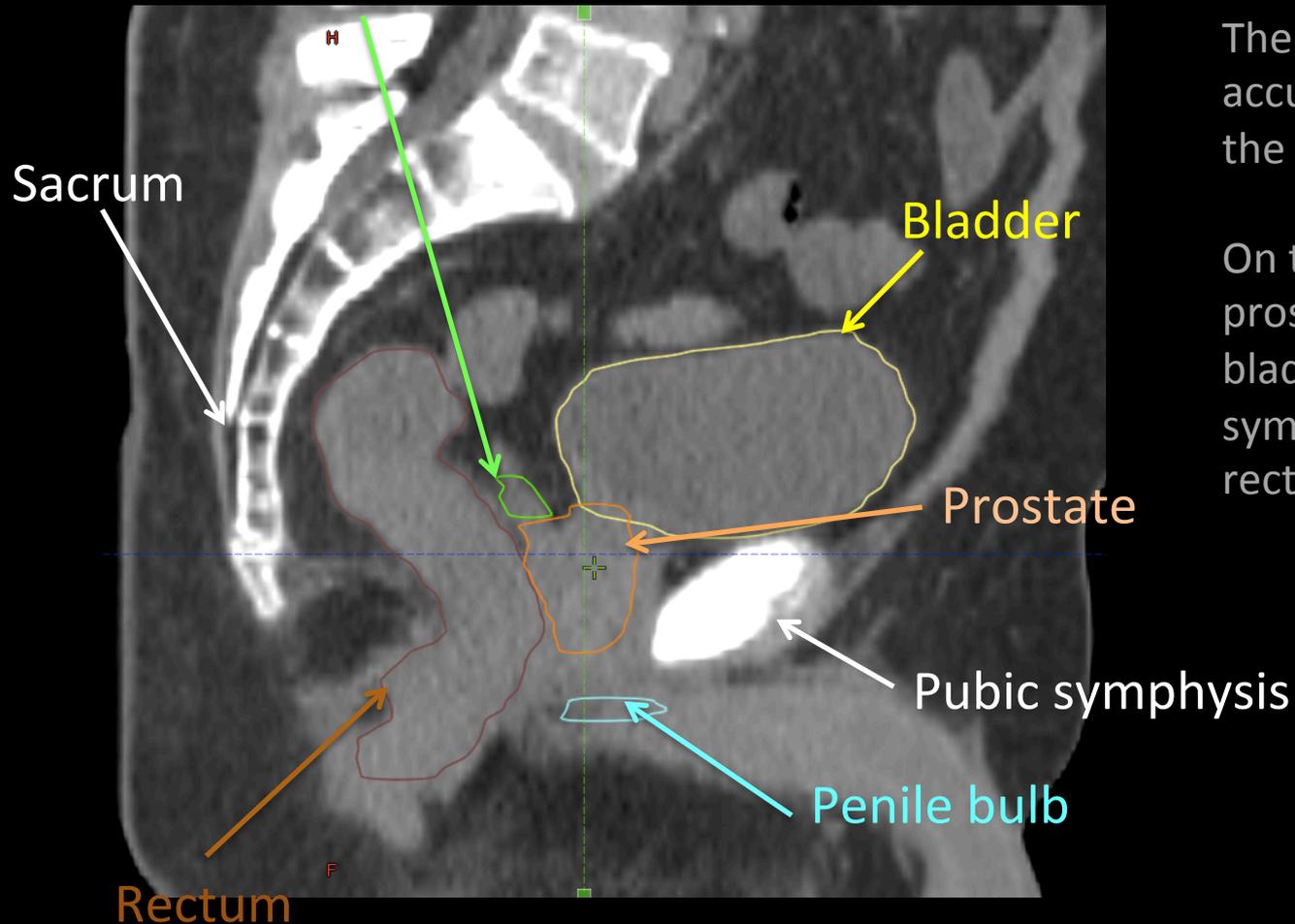
6. Add margin/expansion to create final PTV for treatment planning.

The screenshot shows the eContour.org website interface. The navigation bar includes 'eContour', 'Home', 'Cases' (highlighted with a red box), 'About', 'Contact', and 'Glossary'. Below the navigation bar is a list of cases, each with a colored icon representing the organ system (GI, GU, GYN) and a purple 'A' icon. The 'Prostate [intact]' case is highlighted in blue.

Organ System	Case Name	Stage	Risk
GI	Pancreas	[post-op]	IIB (pT3N1M0)
GI	Rectal	[pre-op]	IIIA (uT2N1M0)
GU	Bladder	[preservation]	II (T2bN0M0)
GU	Prostate	[intact]	intermediate risk
GU	Prostate	[post-prostatectomy]	III (pT3aN0M0R1)
GU	Testicular	[dog-leg]	IIA (T1N1M0S1)
GYN	Cervical	[post-op (pelvis alone)]	FIGO IB1
GYN	Endometrial	[post-op (VB alone)]	FIGO IB (G2)

Quick review of basic anatomy of prostate/pelvis

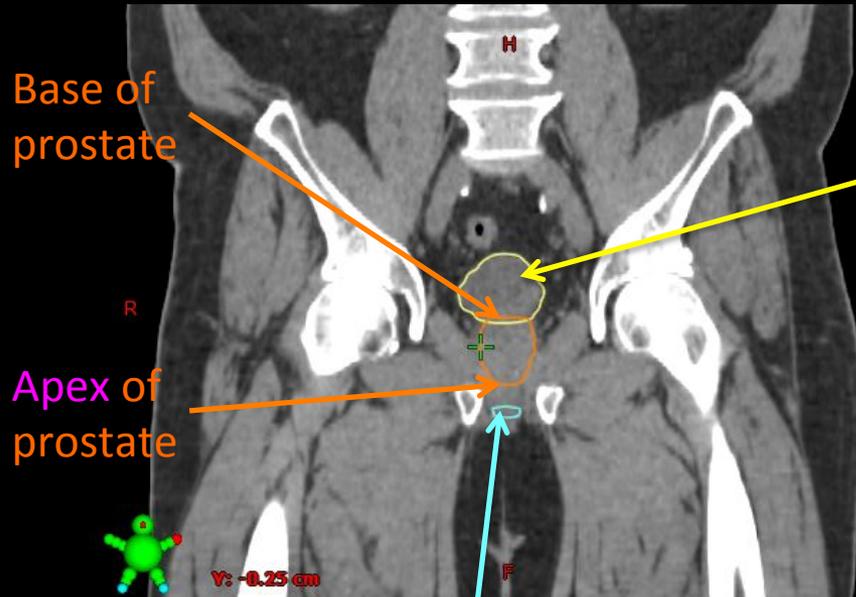
Seminal Vesicle (SV)



The first step in contouring accurately is to understand the pertinent anatomy.

On this sagittal image, the prostate is bordered by the bladder superiorly, the pubic symphysis anteriorly, and the rectum posteriorly.

Coronal



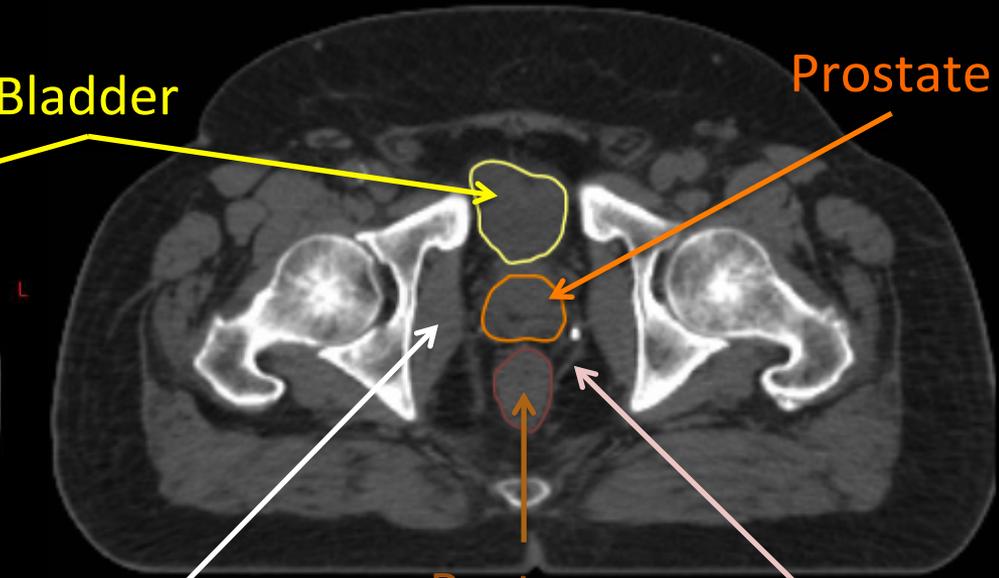
Base of prostate

Apex of prostate

Penile bulb

Bladder

Axial



Prostate

Rectum

Obturator Internus

Levator Ani

On coronal slice, the bladder is superior to the prostate.

On an axial slice, the prostate is bordered by the bladder and pubic symphysis anteriorly, the rectum posteriorly, and levator ani/obturator internus muscles laterally.

Not all cases of intact prostate cancer are created equal!

GU → Prostate → intact (not post-prostatectomy)

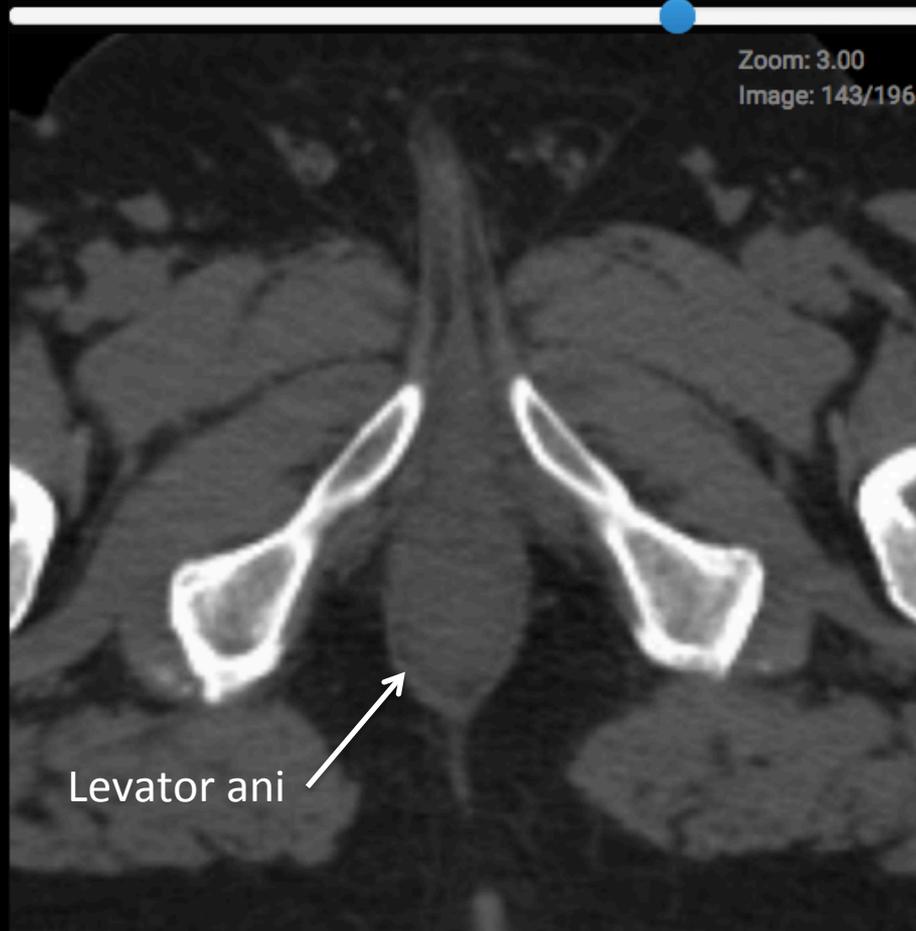
- NOTICE the **STAGE/RISK SCORE!** This is an intermediate risk case in which *prostate and proximal seminal vesicle (SV) only* are treated.
- Patients with low-risk prostate cancer are often put on *active surveillance*. However, if treating, consider *prostate only* (no SV).
- Patients with high risk prostate cancer raise more contouring questions...
 - Treat pelvic nodes? Data is controversial. RTOG 0924 is ongoing.
 - How much seminal vesicle (SV) to treat? Also controversial.

There are **no** consensus guidelines

- ...but there are several protocols defining target volumes and PTV
- eContour uses the most recent trials: RTOG 0126 and RTOG 0815**

Protocol / reference(s)	GTV and CTV	PTV
MD Anderson: RCT of 70 Gy vs 78 Gy Kuban, 2008 [14]	<ul style="list-style-type: none"> CTV = prostate and SVs 	<ul style="list-style-type: none"> Conventional 4-field box, 11 × 11 cm for AP/PA fields, 11 × 9 cm for lateral fields, then reduce all fields to 9 × 9 cm On 70-Gy arm, CT performed to confirm that margins from CTV to block edge were 1.25 to 1.5 in ant and in dimensions and 0.75 × 1.0 cm in post and sup dimensions
PROG 9509 RCT of 70.2 Gy vs 79.2 Gy Zietman, 2010 [24]	<ul style="list-style-type: none"> CTV = prostate + 5-mm margin 	<ul style="list-style-type: none"> CTV + 7–10 mm
GETUG: RCT of 70 vs 80 Gy Beckendorf, 2004 [25]	<ul style="list-style-type: none"> CTV = prostate ± SVs 	<ul style="list-style-type: none"> Phase I: prostate and SVs + 10-mm margin, reduced posteriorly to 5 mm Phase II: prostate alone with same margins
RTOG 0126 [29]: RCT of 70.2 Gy vs 79.2 Gy	<ul style="list-style-type: none"> GTV = prostate CTV = prostate and proximal SVs (up to 10 mm); may be reduced to prostate only after 55.8 Gy 	<ul style="list-style-type: none"> CTV + a minimum of 5 mm in all directions. Superior and inferior margins should be 5–10 mm depending on spacing of planning CT

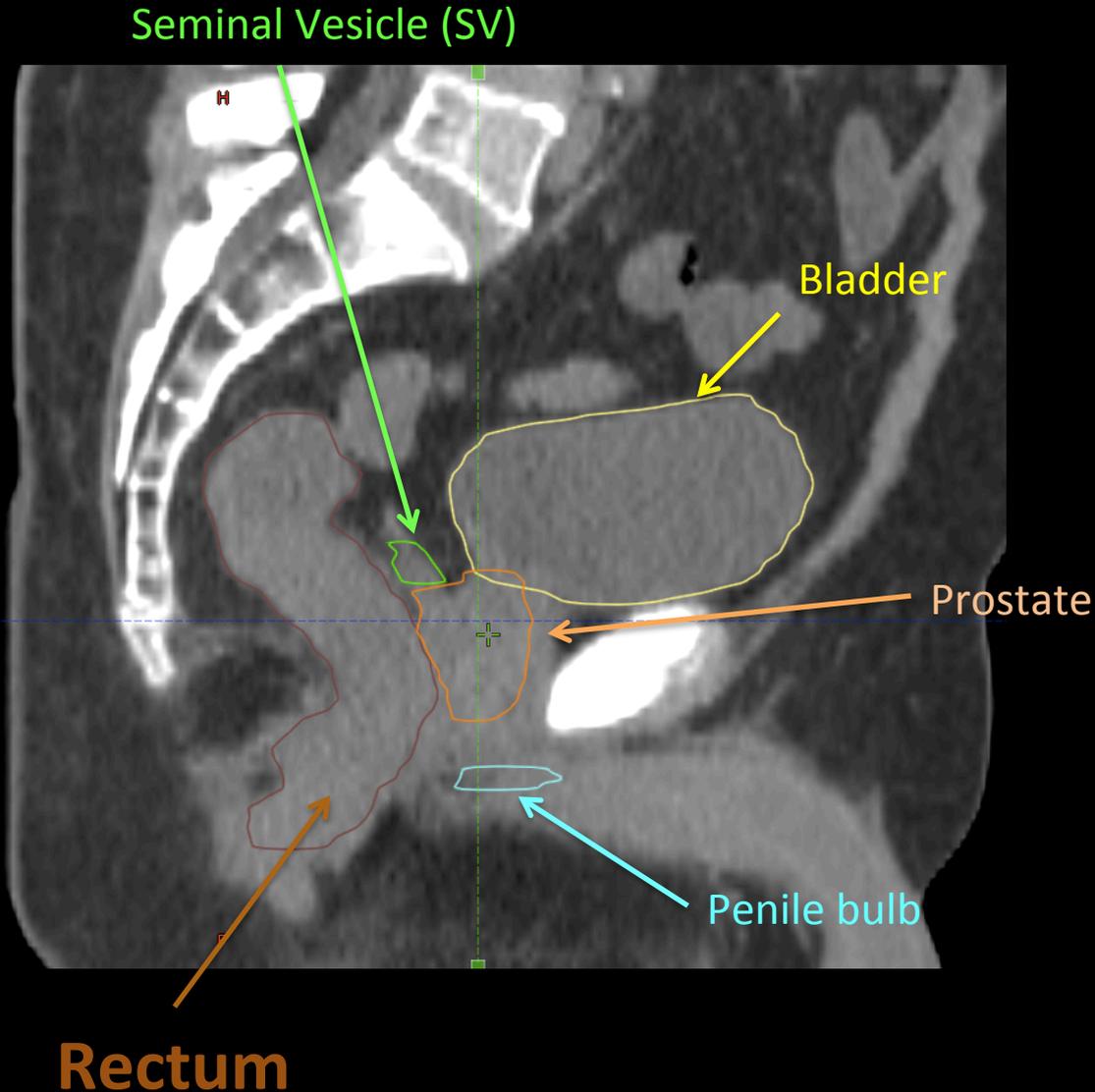
Start with OARs: Rectum



- Contouring **rectum** can help define the posterior border of the **prostate**. (*Sagittal on next slide*)
- The **levator ani** is a thin broad muscle that is part of the pelvic floor which surrounds the anal canal (at this level). The anal canal is often included in the rectal contour.
- The **levator ani** also supports the prostate.

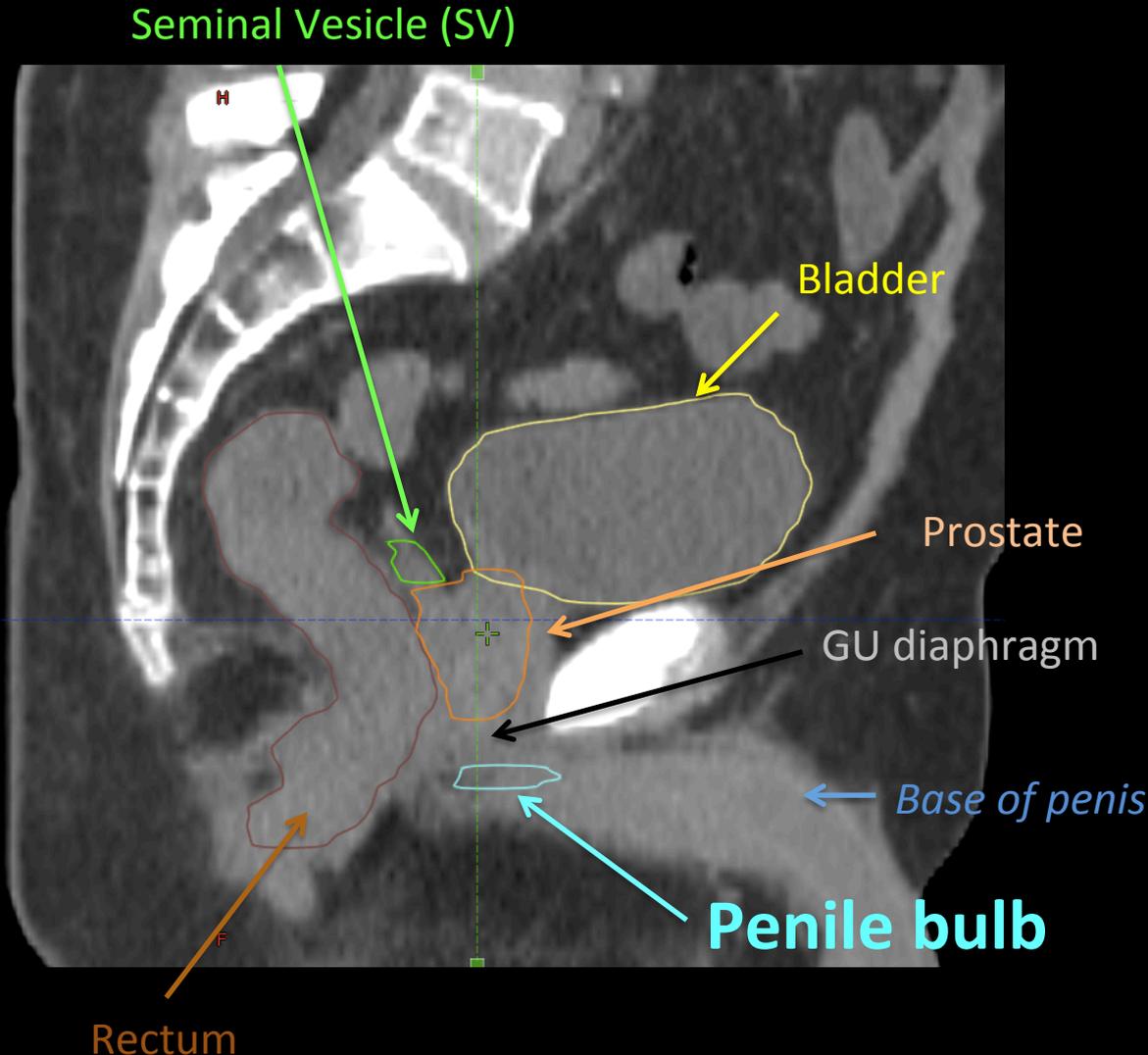
We are scrolling superiorly through the CT slices

Start with OARs: **Rectum**



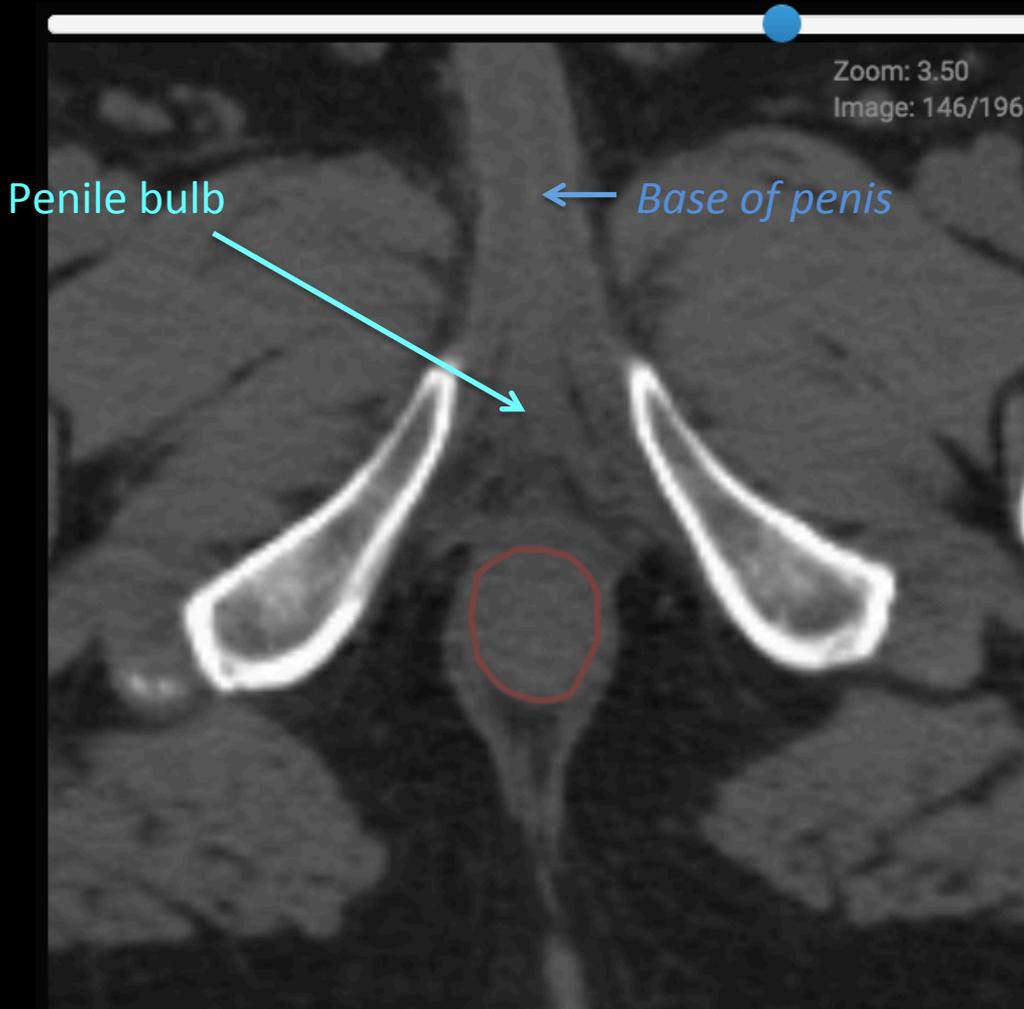
- Use the SAGITTAL view to make sure you are following the contour of the **rectum!**

Next OAR: Penile Bulb



The SAGITTAL view can also help identify the **penile bulb**, as it is usually at the level of the **base of the penis**.
(Axial on next slide)

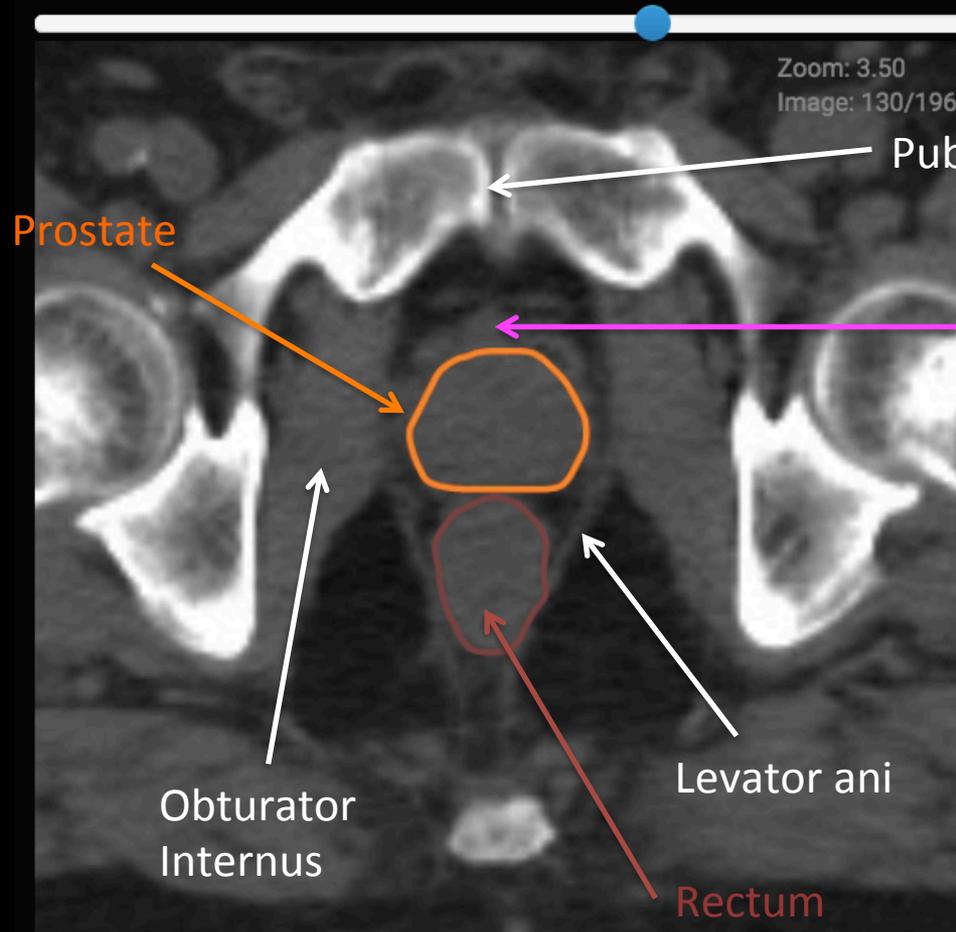
Next OAR: Penile bulb



The penile bulb is often teardrop-shaped, located posterior to the base of the penis.

Now ...contour the GTV: Prostate

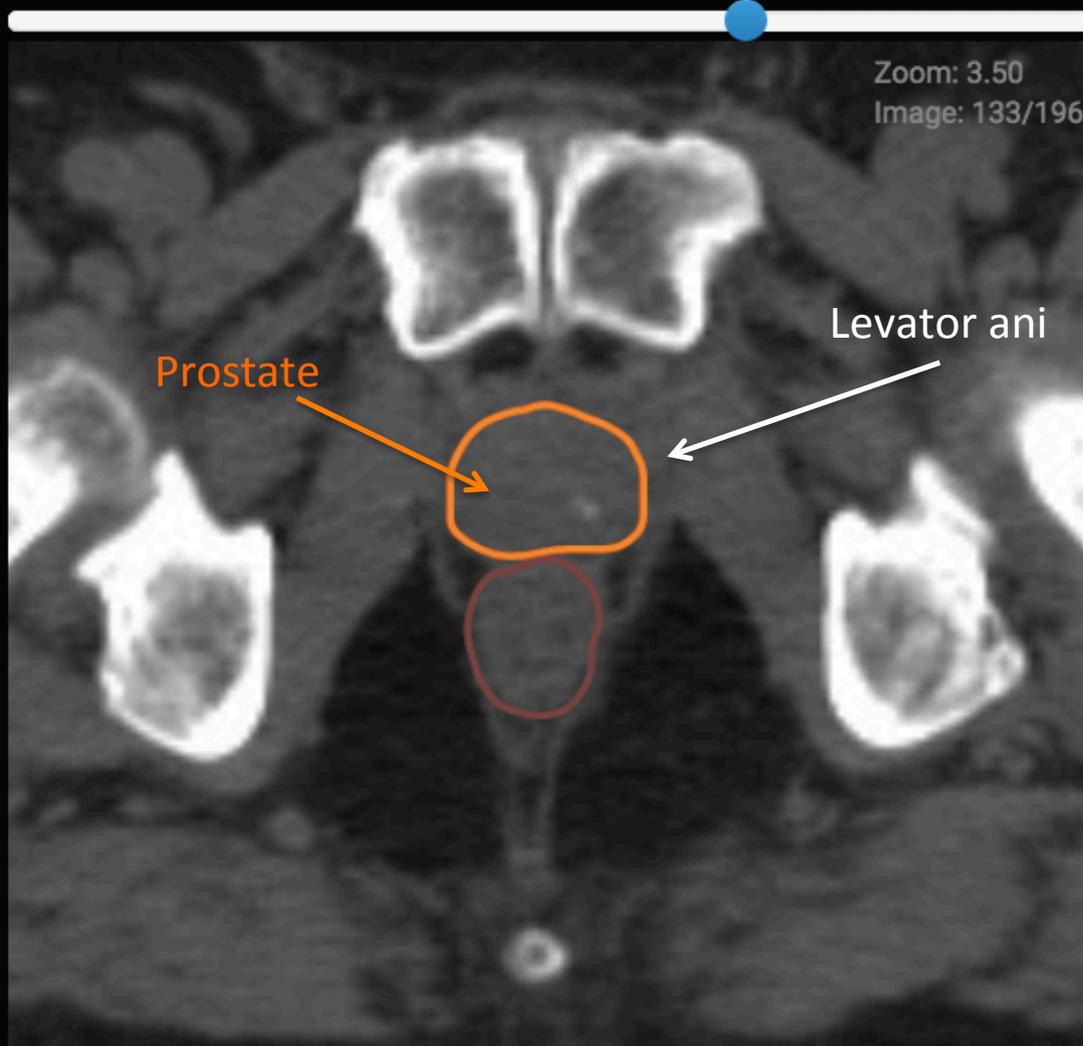
TIP: Consider starting your contour at the middle of the prostate (where the borders are well defined).



These are **blood vessels!** Be careful not to include these in your **prostate** contour. MRI makes them easier to see.

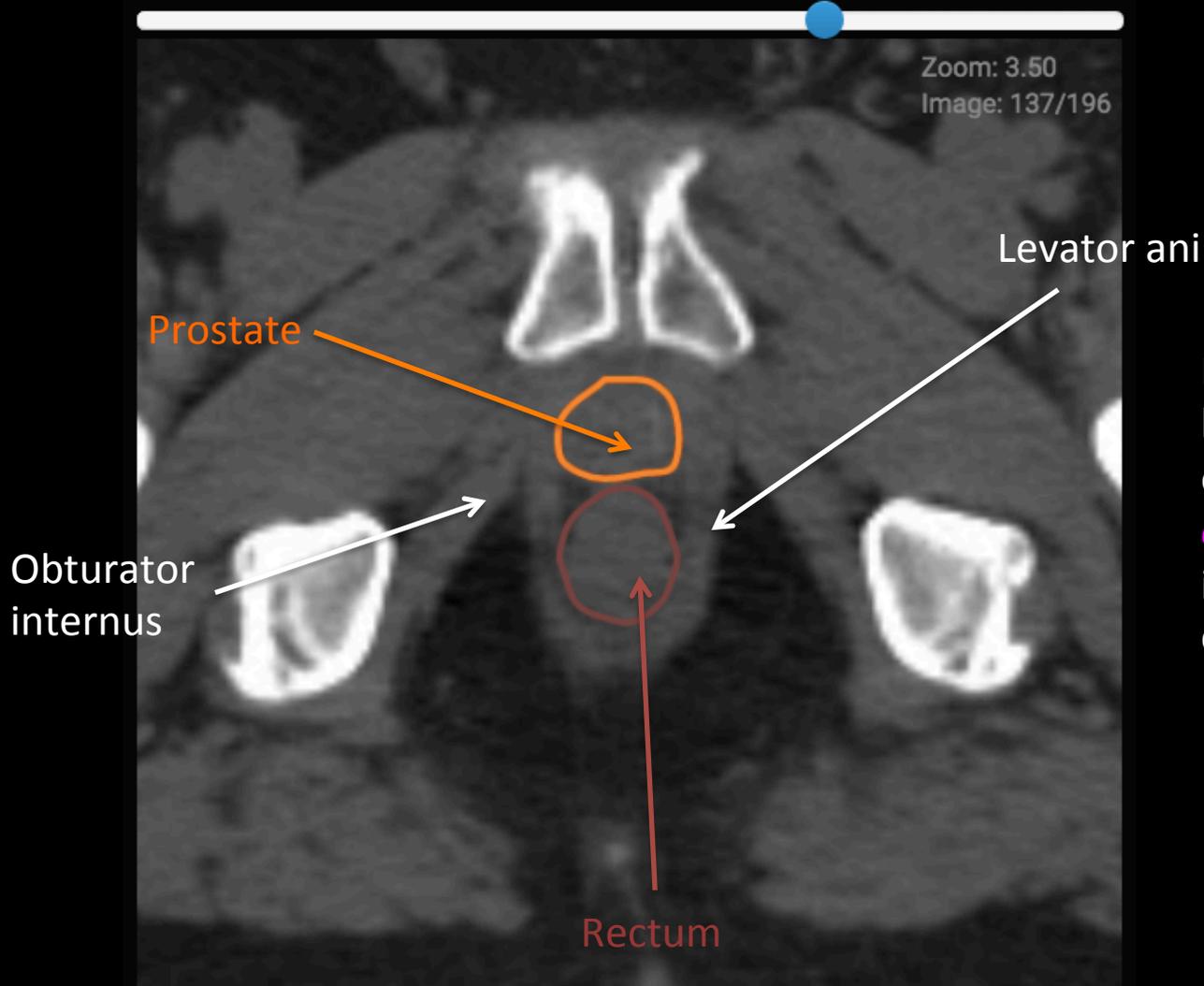
NOTE: Calling the prostate a "GTV" is a bit of a misnomer...the entire prostate is not gross tumor. But we will go with it per the protocols.

Contour the GTV: Prostate



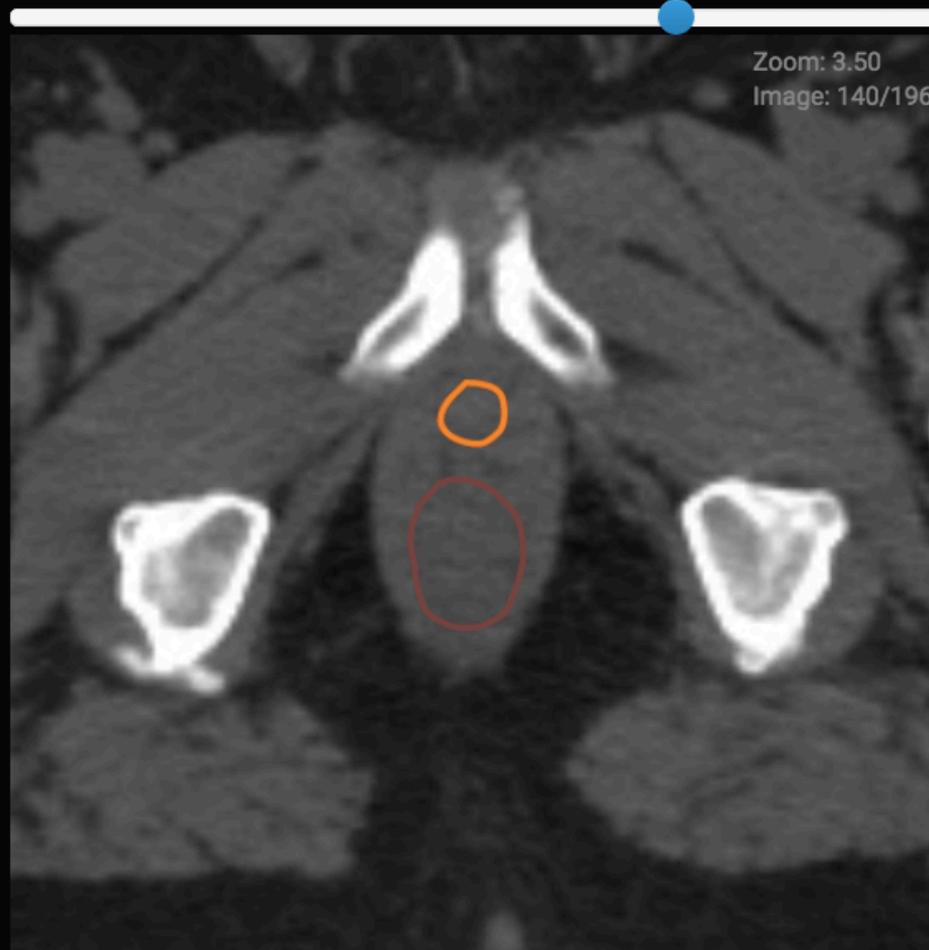
Avoid including levator ani in your prostate contour.

Contour the GTV: Prostate



Levator ani can help visualize apex of prostate, but *avoid* including it in your prostate contour.

Contour the GTV: Prostate



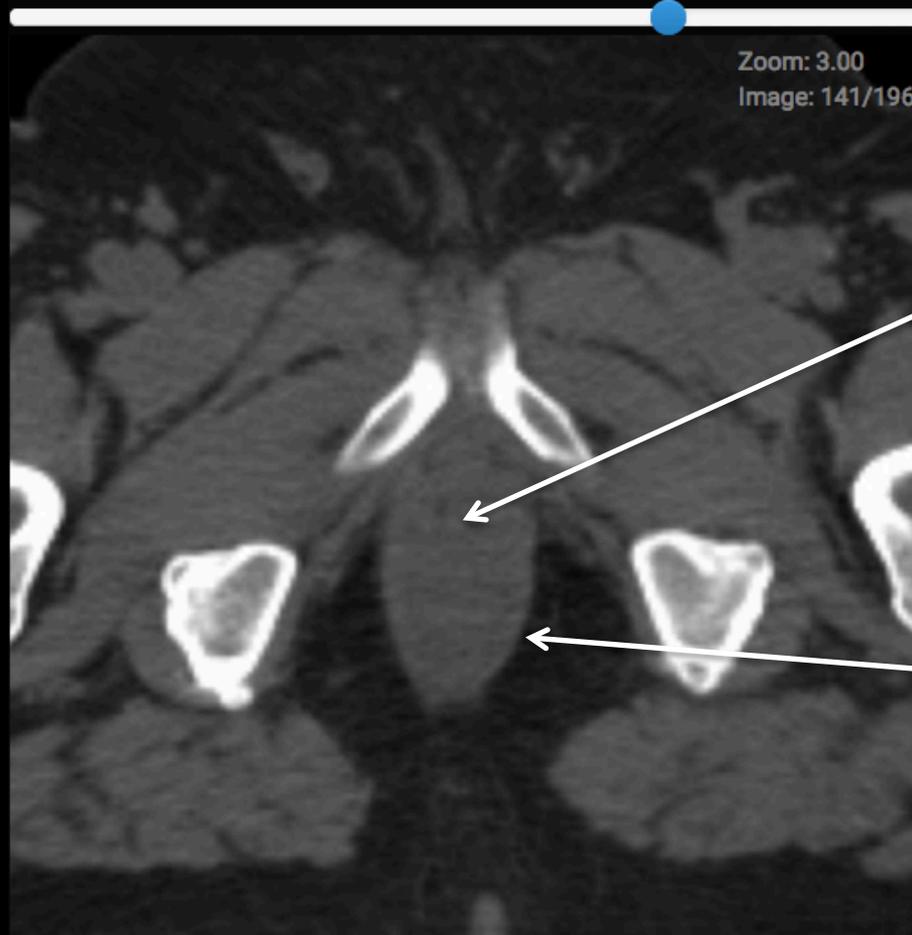
The most inferior **prostate** contour should be one slice above the GU diaphragm.

Genitourinary Diaphragm (GUD) as a landmark?

The **prostate** sits just above the GU diaphragm which sits just above the **penile bulb**.

Problem is...the GUD is hard to see on CT!

An **MRI** obtained prior to treatment can be fused to the sim CT and aid contour delineation. MRI enhances subtle differences between these soft tissues.



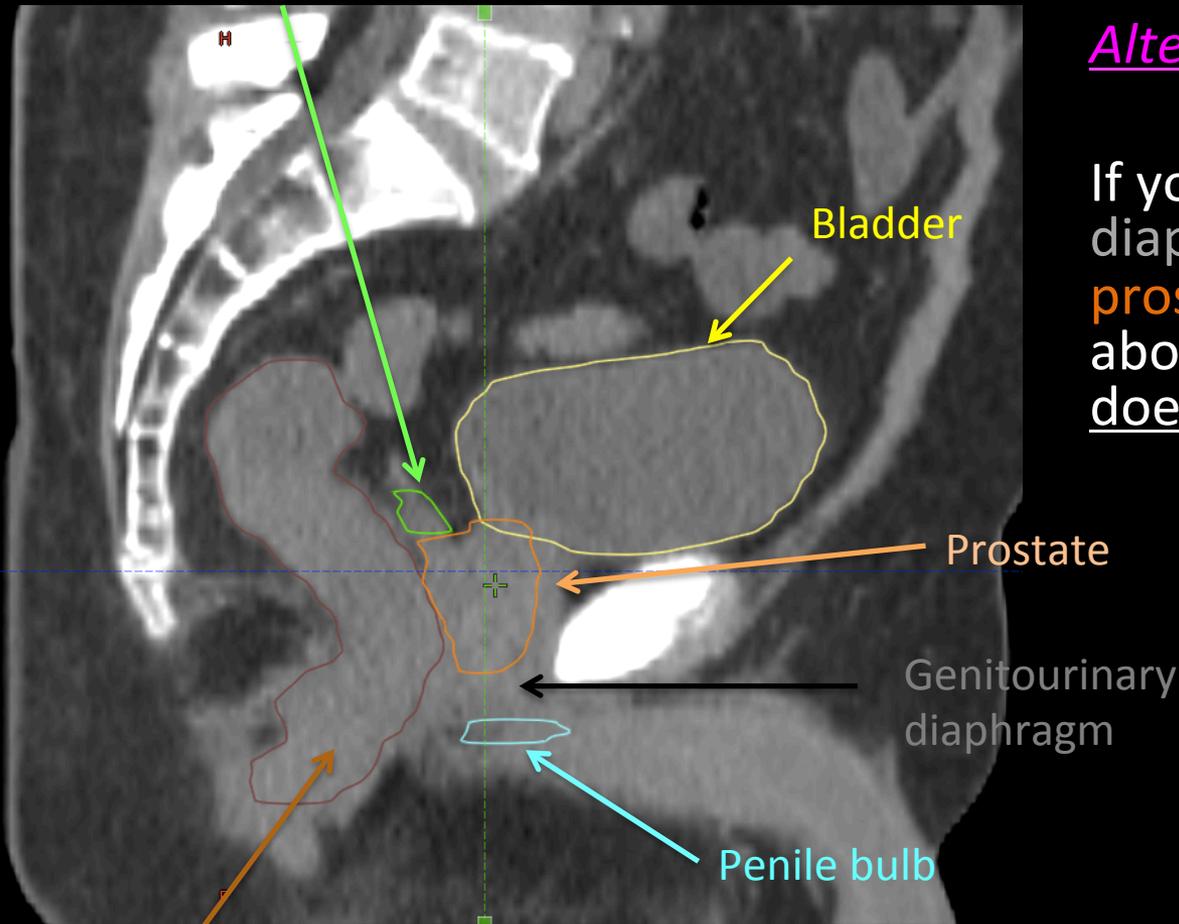
Genitourinary diaphragm = hourglass shape, located at convergence of levator ani

Levator ani

Aka "urogenital diaphragm" outside rad onc

Contour the GTV: Prostate

Seminal Vesicle (SV)

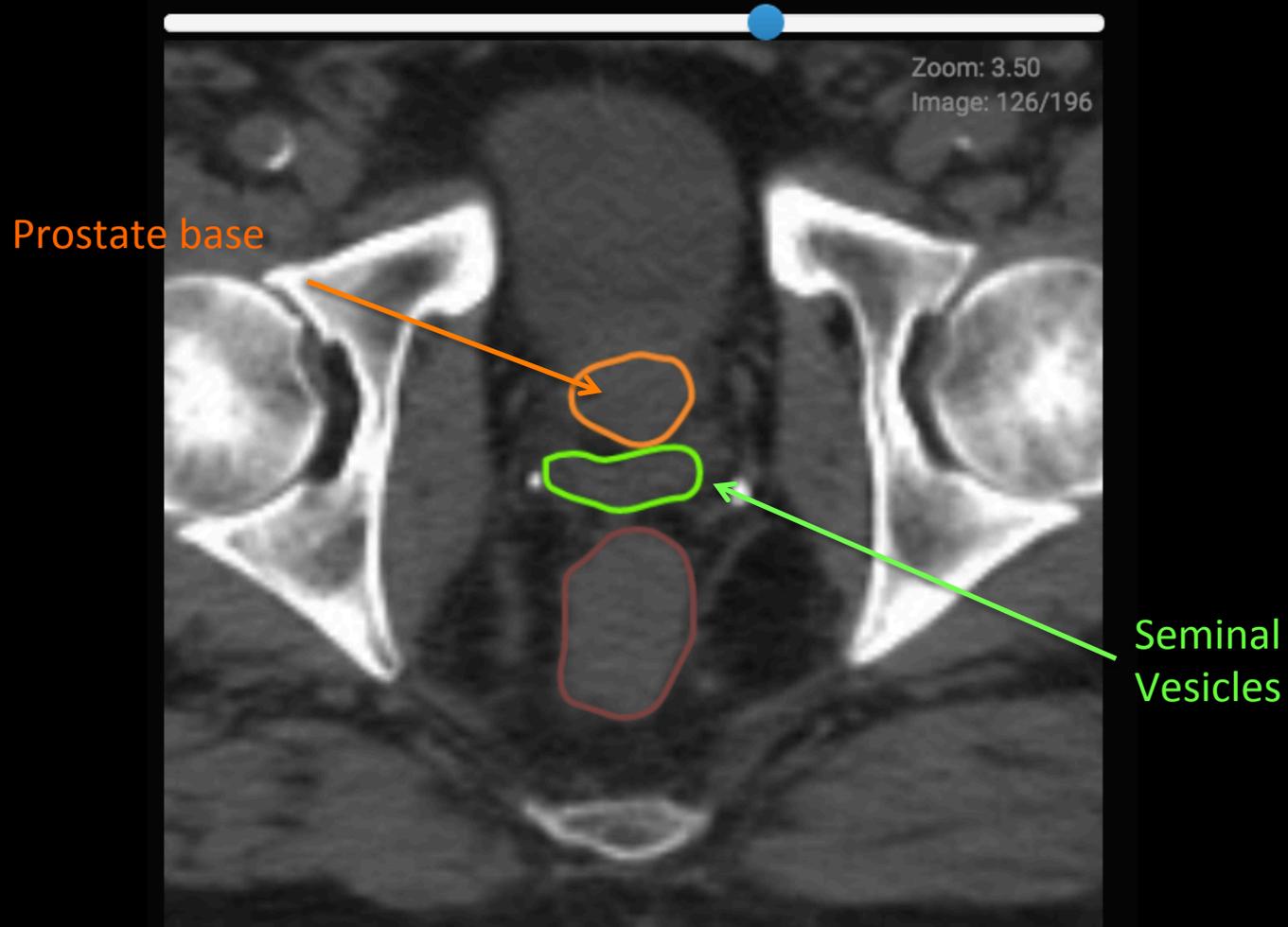


Alternative inferior border...

If you can't find the GU diaphragm, just end your **prostate/GTV** at least 0.7cm above **penile bulb** (ensures PTV does not overlap **penile bulb**).

Rectum

Now contour the Seminal Vesicles



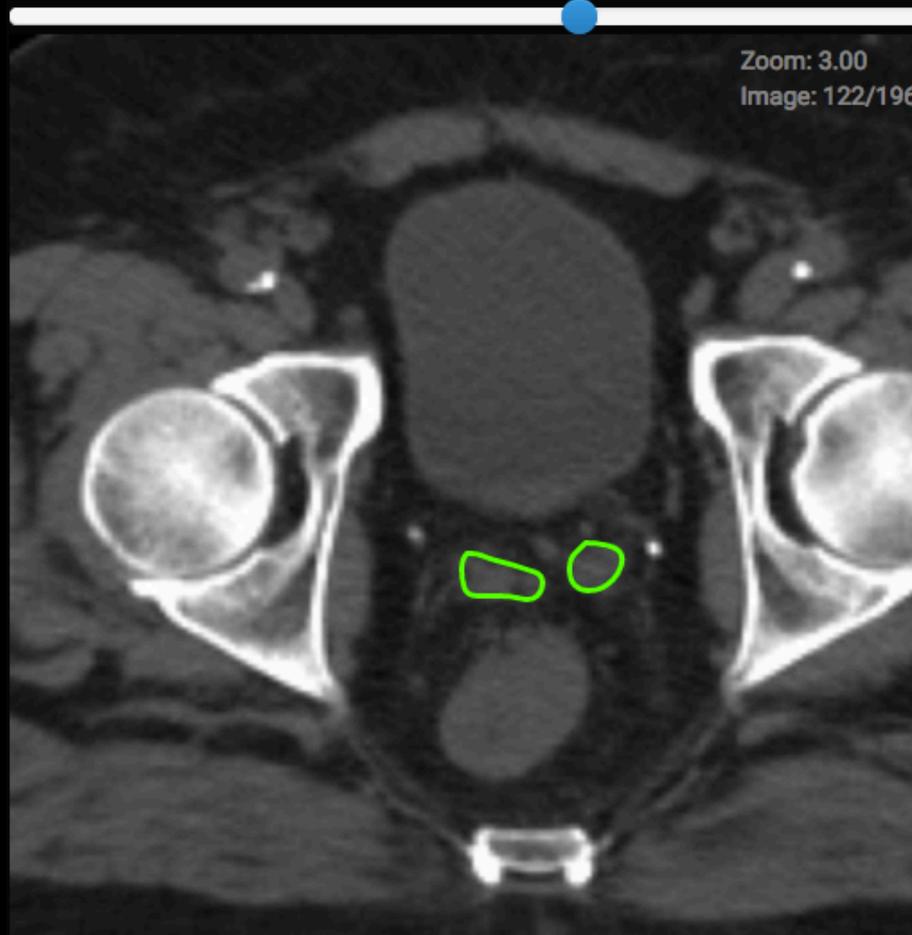
The inferior seminal vesicles (SVs) are in the same axial plan as the base of the prostate – include in CTV!

Superior border of SV

When to treat SV?

This is often based on clinical judgment (likelihood of involvement based on extent of disease, relative risk/benefit since treating SV increases dose to rectum).

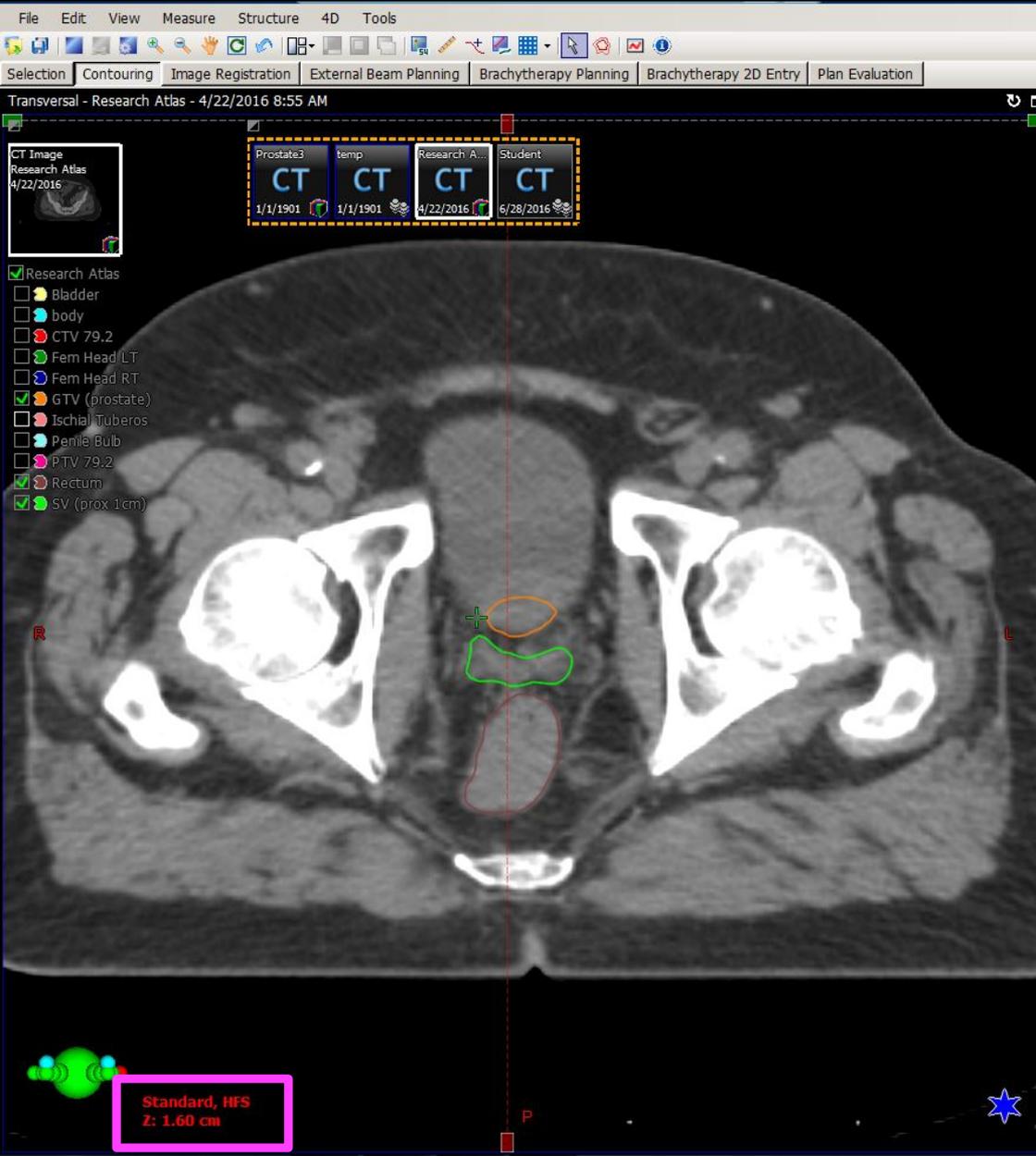
In the RTOG 0126, the proximal 1cm is included in all patients.



Contour the the proximal 1cm of the SV (proximal meaning closes to PROSTATE)

...how do I know 1cm? Next slide...

Measure SV (Option 1)



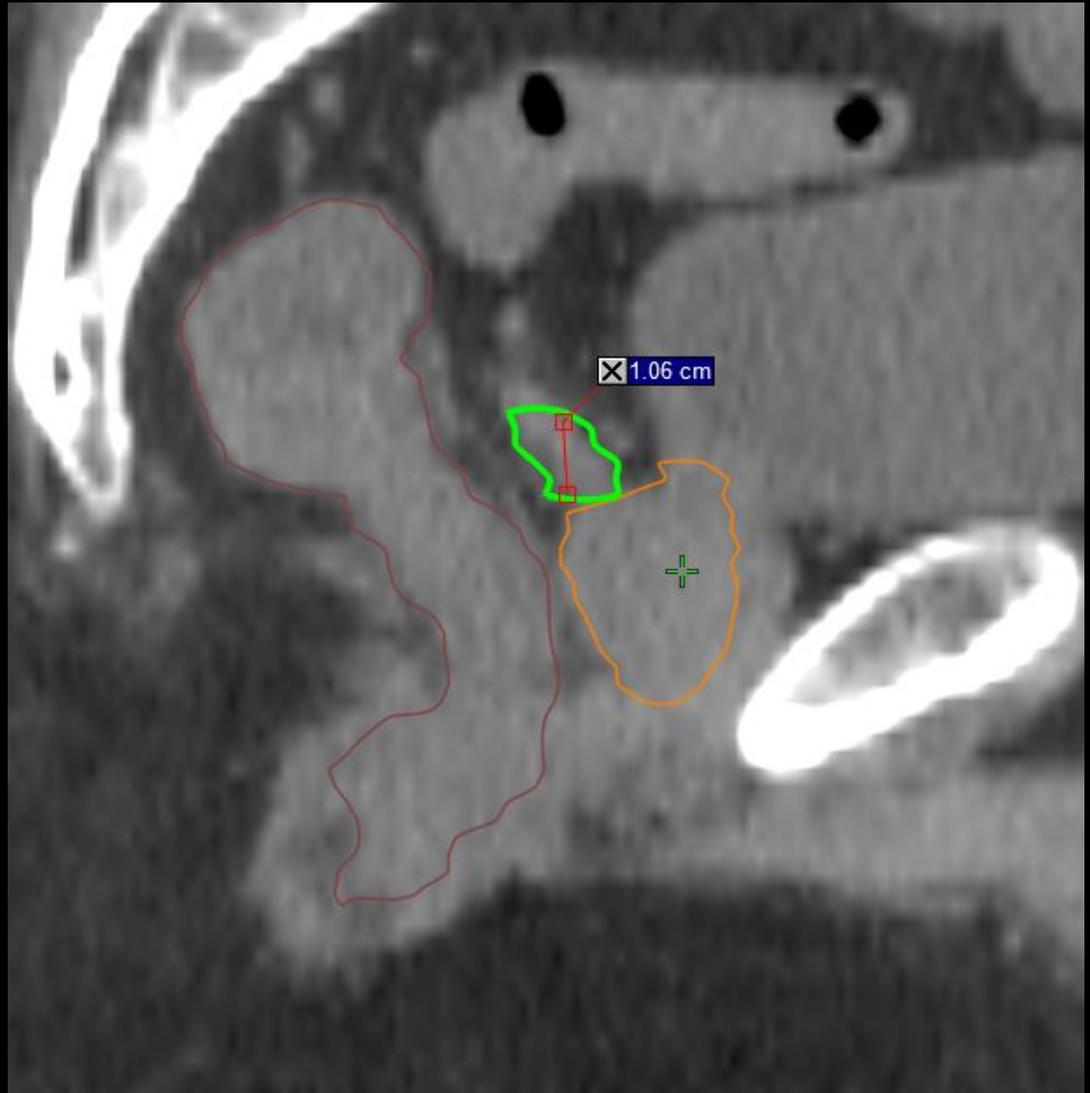
Look in lower left of your screen for the “Z” coordinate. Scroll up or down one slice, and the difference is the **CT slice thickness**.

Then estimate number of slices to contour by 1cm/slice thickness.

Measure SV (Option 2)

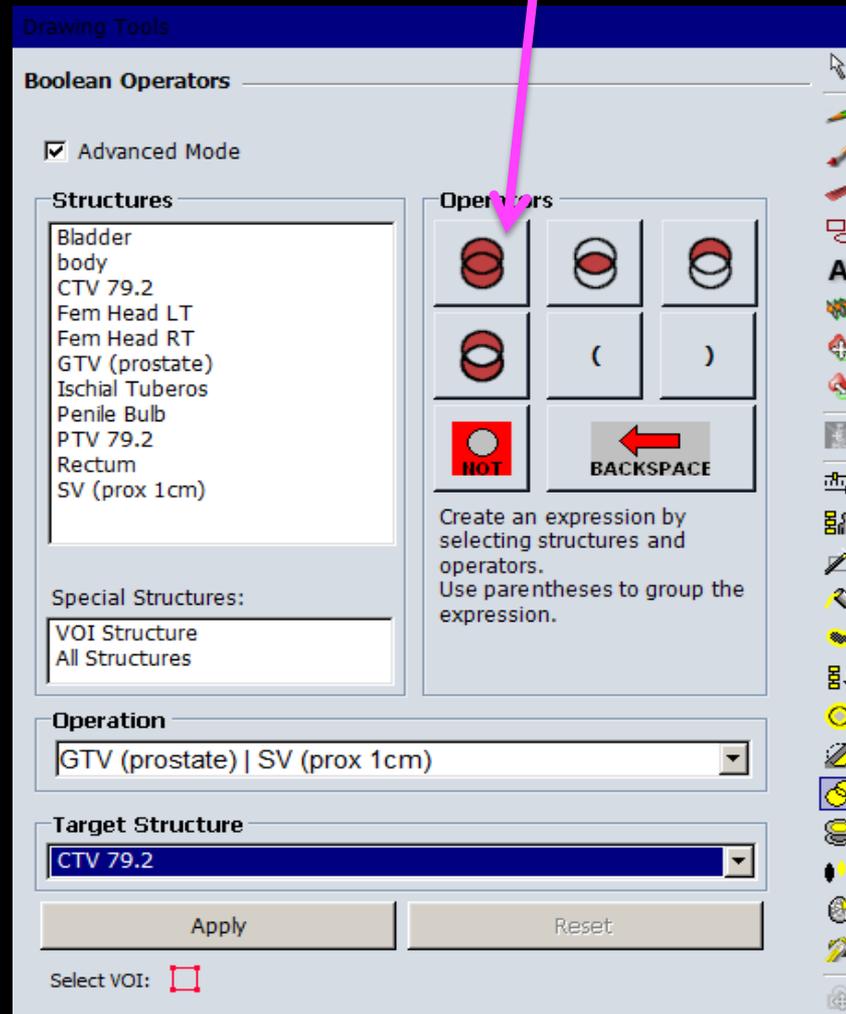
We want to include only the proximal 1cm (meaning proximal or closest to prostate) of SV.

TIP: In the SAGITTAL view, use the measuring tool to check the vertical extent of your contour.



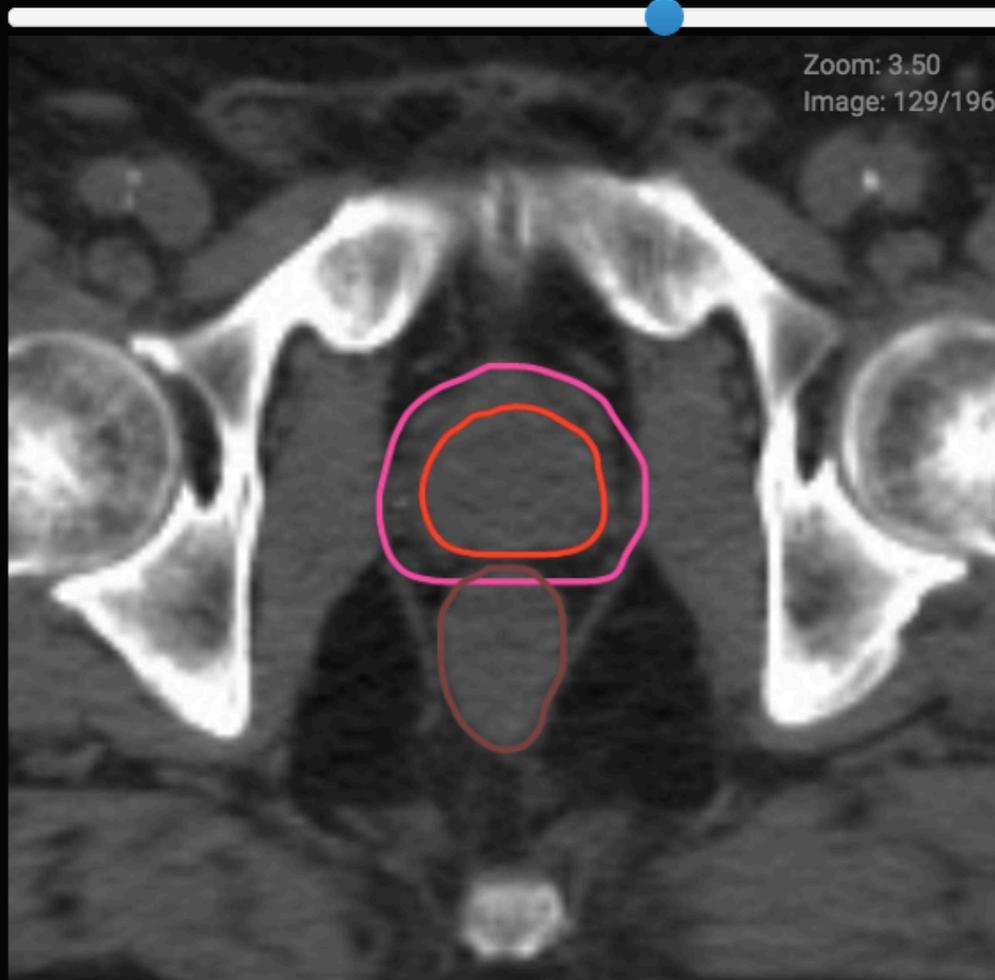
GTV (prostate) + SV = CTV

Use the **boolean tool** to combine prostate/GTV and Seminal Vesicle (SV) into a single CTV.



TIP: Contouring prostate and SV separately affords flexibility in creating your CTV (ie can decrease dose to SV and boost prostate only if rectal dose is too high).

Add a margin for PTV



RTOG 0126 and RTOG 0815 specify 5-10mm for margin from CTV to PTV. This is often institutional, and depends on immobilization and daily imaging (for example, kv X-rays would require a bigger margin than CBCT).

Often the posterior margin on the rectum is less to reduce risk of toxicity, so we used 7mm except 5mm posteriorly.

How do I add an asymmetric margin? (See next page!)

Margin for Structure

Create Margin From

CTV 79.2

Geometry [cm]

Create outer margin

Create inner margin

Use symmetrical margin

0.7

0.7

0.5

0.7

0.7

0.7

Avoid structure

Target Structure

PTV 79.2

Apply

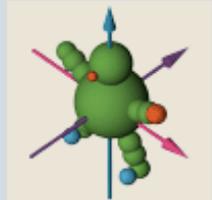
Reset

Select VOI: 

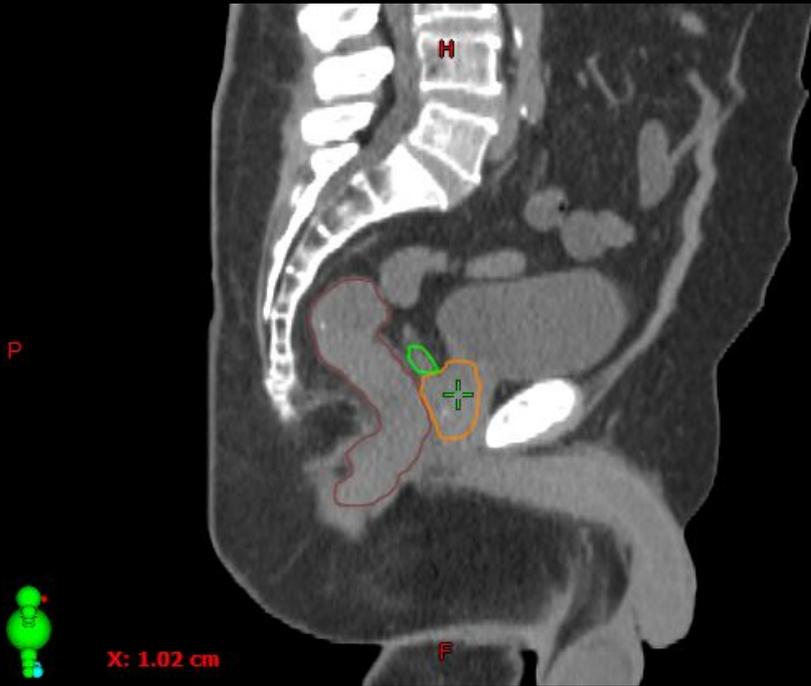
Add a margin for PTV

NOTE: posterior margin is less

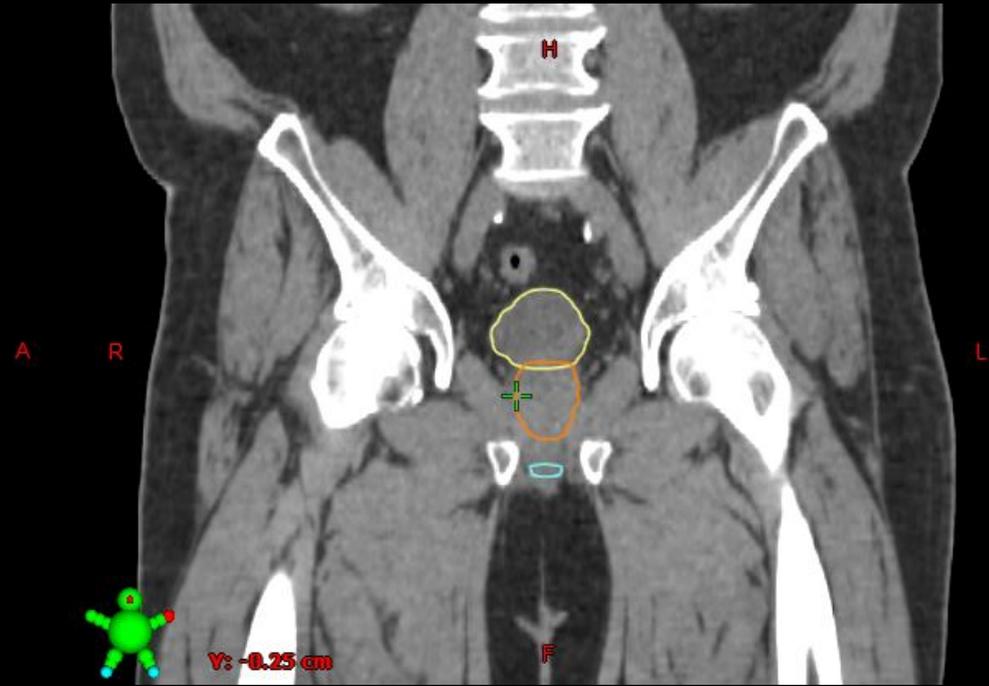
“Margin for structure”



Sagittal

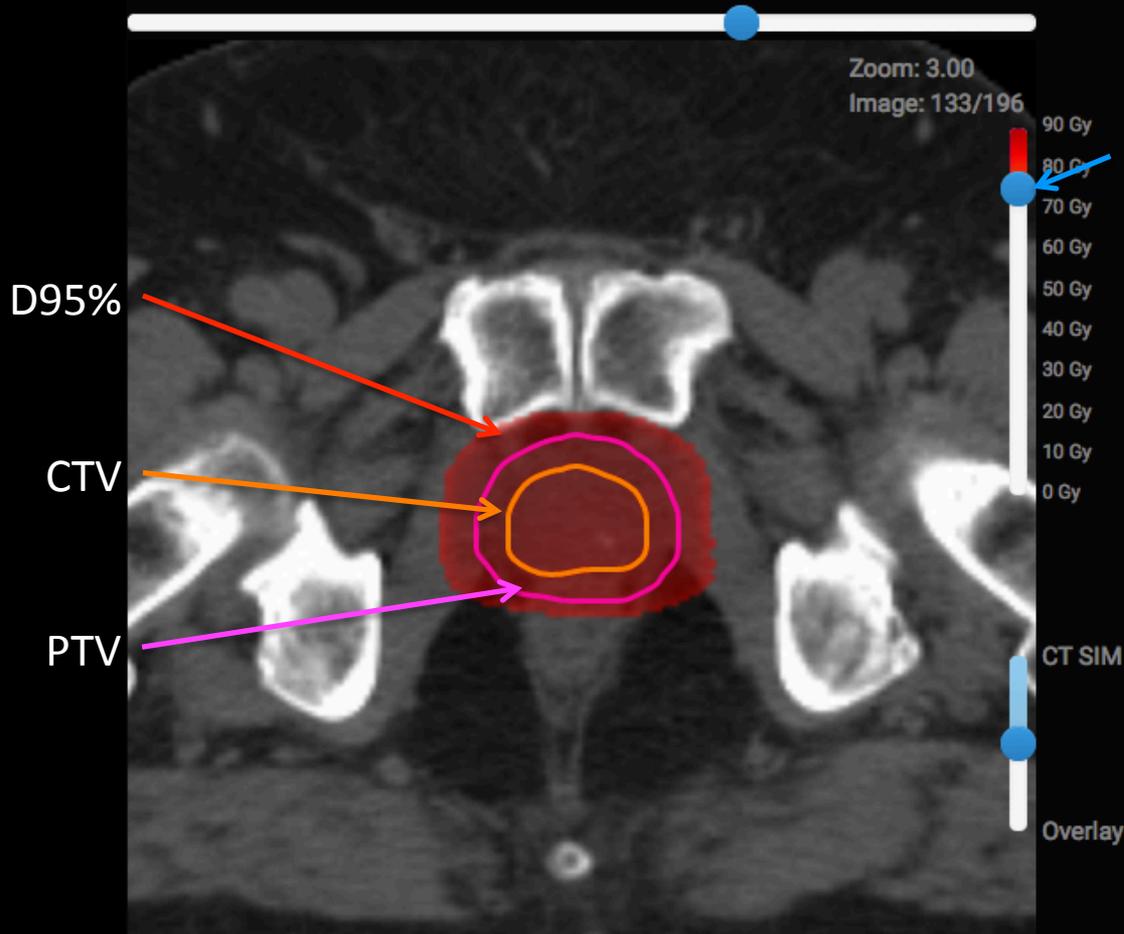


Coronal



Always check your final volumes in *sagittal and coronal views* to make sure you have contoured a volume that makes sense in 3 dimensions!

FOR FUN: Overlay RT Dose in eContour



95% of prescription dose (79.2Gy) = 75 Gy
This allows us to look at the 95% isodose line to assess coverage and conformity.

Once the contours are created, a radiation plan is created by the Dosimetrists. This step is then usually the first step of radiation plan review!

References

- RTOG normal male pelvis contouring atlas
 - <https://www.rtog.org/CoreLab/ContouringAtlases/MaleRTOGNormalPelvisAtlas.aspx>
- RTOG trials with contouring protocols
 - RTOG 0815
 - RTOG 0126
- Link to [UCSD video](#) of how to contour intact prostate slice-by-slice (website login is free)

Think something is missing from eContour? Tell us about it at support@eContour.org