4.2 Liver case

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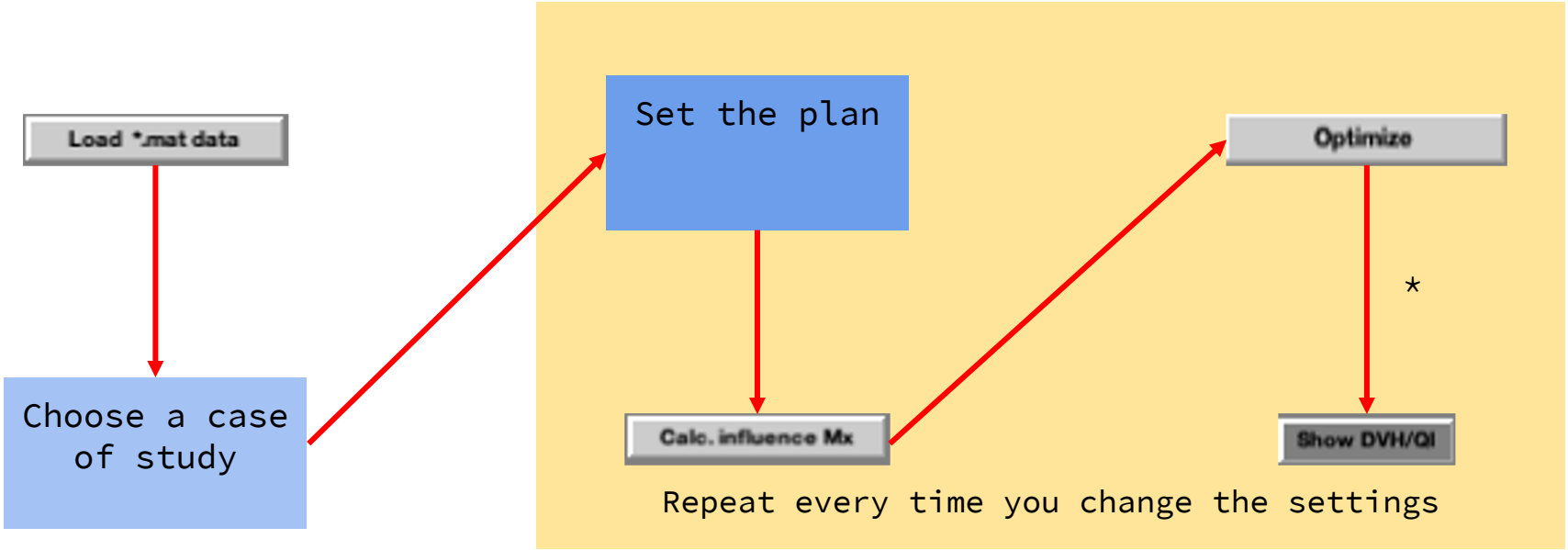
1. Remember the algorithm



*We will give you later a tip to understand the DVH easier.

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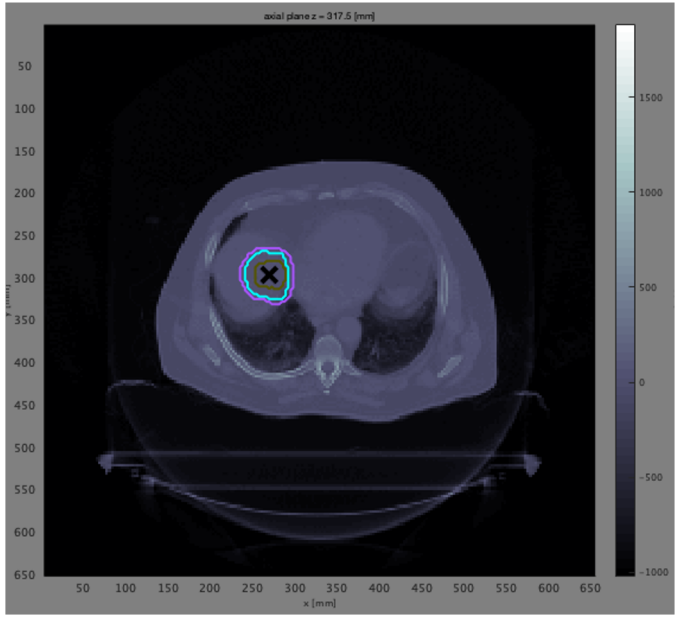
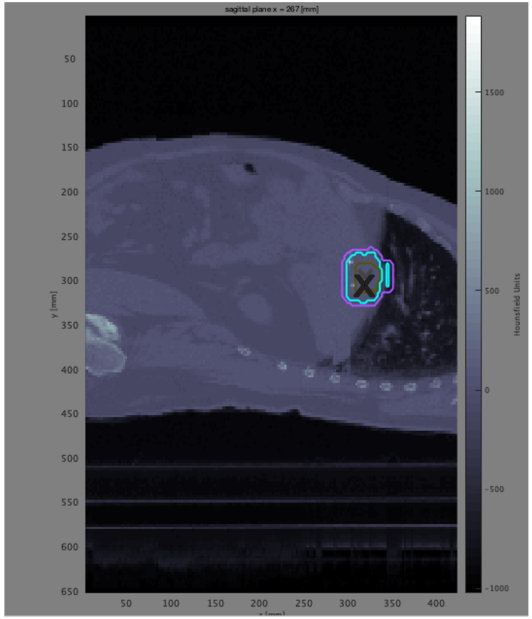
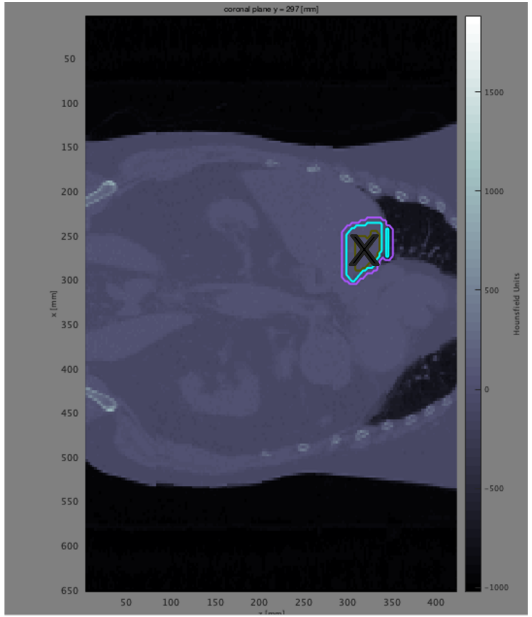
2. MEET THE CASE: LIVER



Axial



Sagital



Coronal

The graph displays only GTV, CTV and PTV.
On visualization panel, change the “plane selection” to change the views.

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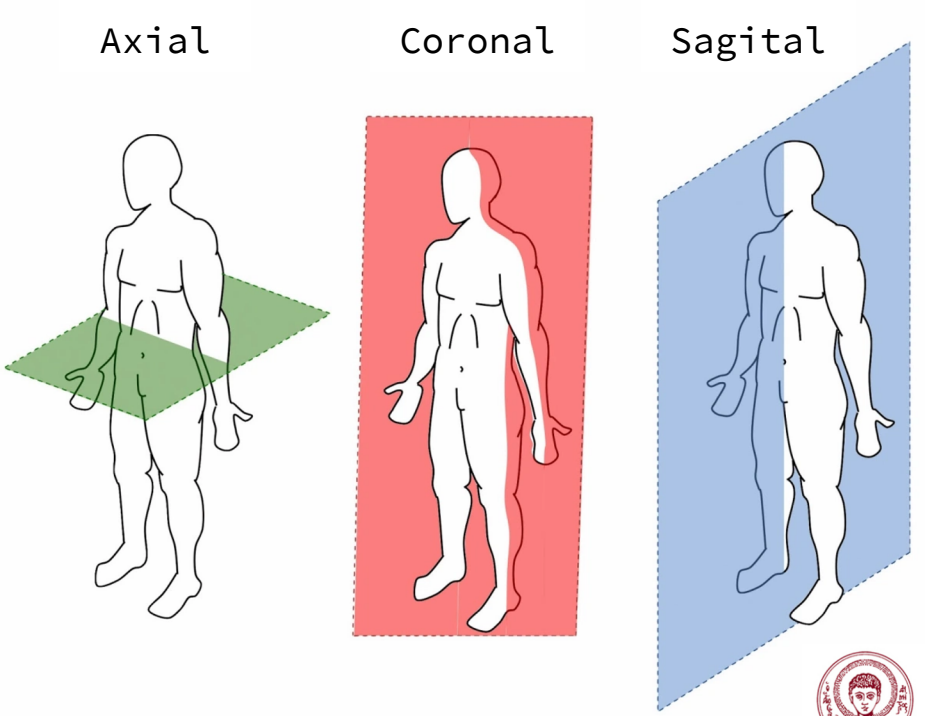
(ANATOMY REMINDER: ANATOMICAL PLANES)



This will help you distinguish what you see on the graphical display and how to change views.

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Liver case optimization

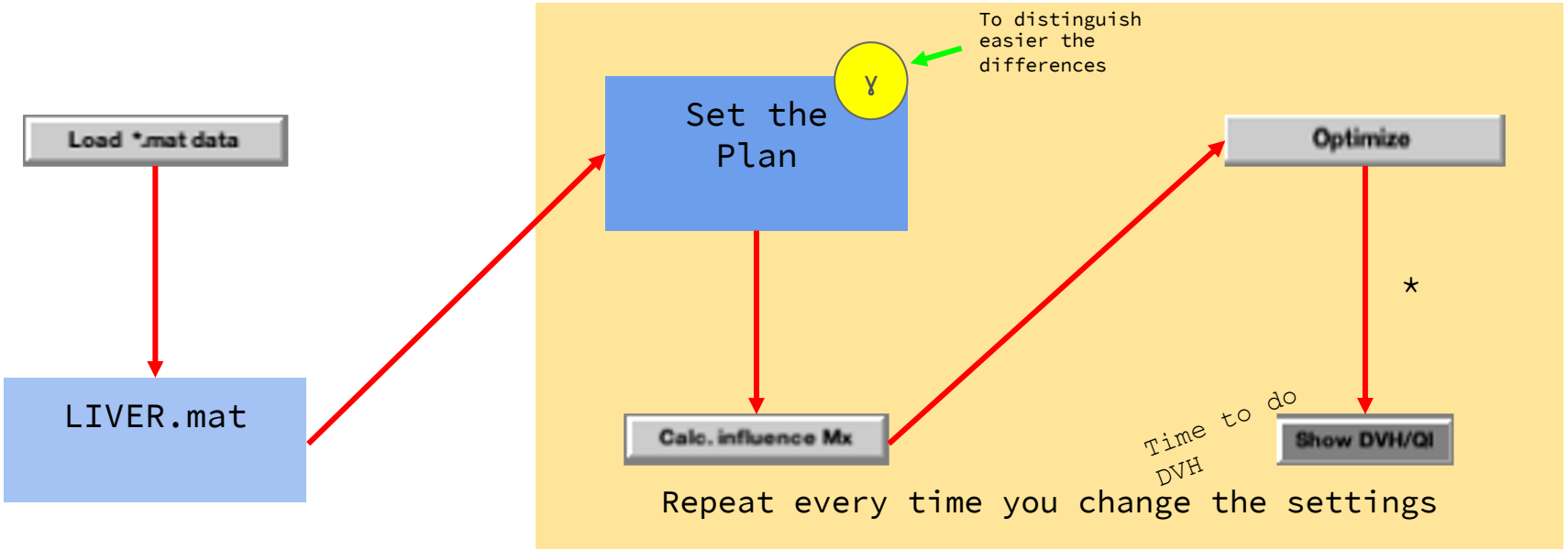
1) Define your own photon treatment plan with approx. 4-5 beam directions. (e.g degrees:0,180,225,270,315)

1) Define your own proton treatment plan with one beam from e.g. 315°.

1) Create a carbon ion treatment with the exact same settings as used for the proton treatment plan.

1) What difference can now be observed?

3. Plan A: your best previous plan



The results will be displayed as if you were in front of the patient's feet (axial).

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3. Plan A: your best previous plan

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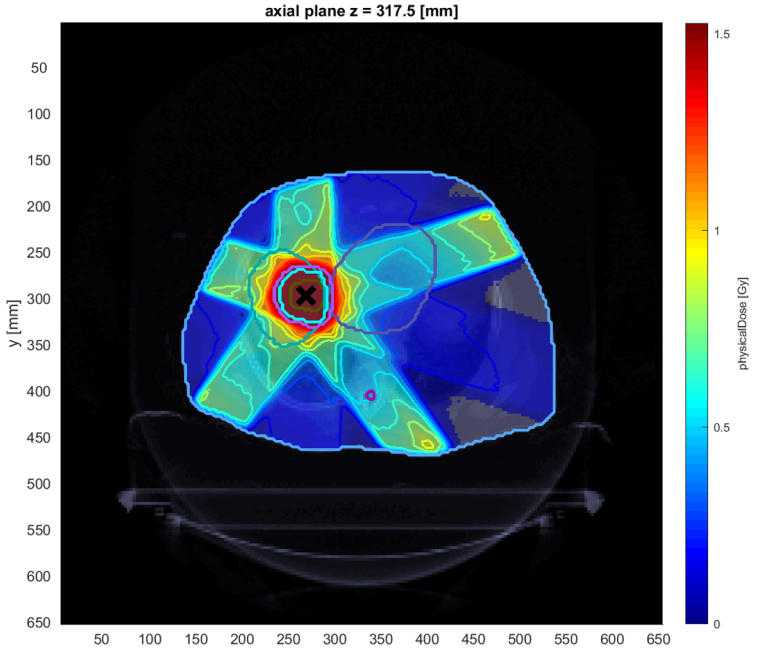
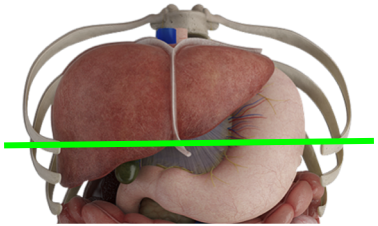
3. Plan A: your best previous plan (example)



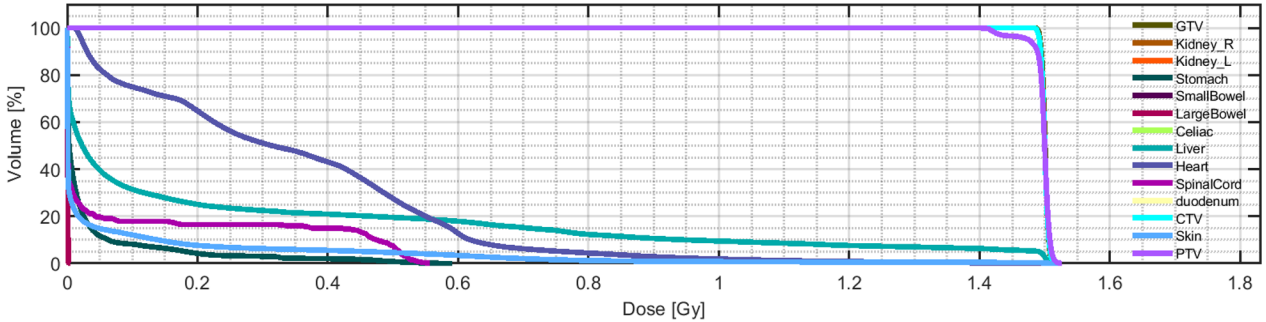


Remember there are many organs near the target. Now this is not such good plan, is it?

One plan cannot solve every case.

SPOILER ALERT

3. Plan A: your best previous plan (example)



	max	min	mean	std
GTV	1.5172	1.4871	1.5005	0.0044
Kidney_R	0	0	0	0
Kidney_L	0	0	0	0
Stomach	0.5919	0	0.0308	0.0836
SmallBowel	0	0	0	0
LargeBowel	0.0051	0	9.4490e-06	1.5622e-04
Celiac	0	0	0	0
Liver	1.5270	0	0.2438	0.4349
Heart	1.5090	0.0085	0.3399	0.2584
SpinalCord	0.5577	0	0.0851	0.1779
duodenum	0	0	0	0
CTV	1.5198	1.4840	1.5000	0.0049
Skin	1.5270	0	0.0569	0.1822

The DVH displays a big (maybe excessive) number of organs, making it difficult to see the target.

The data table is also very important, observe and remember them.

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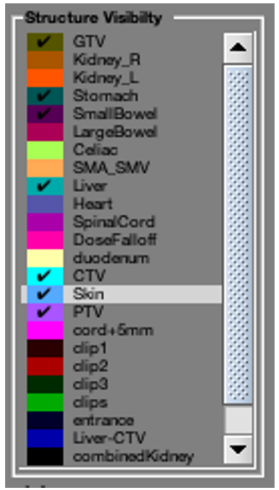
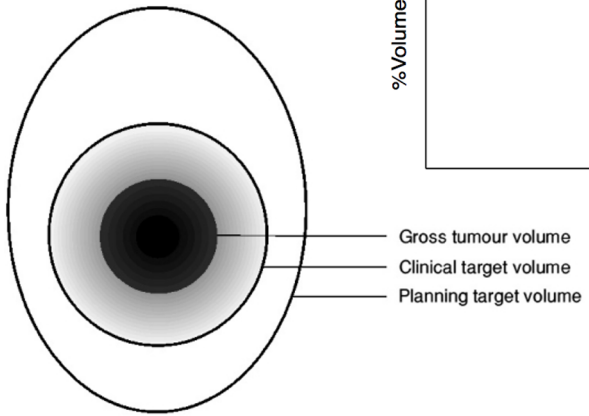
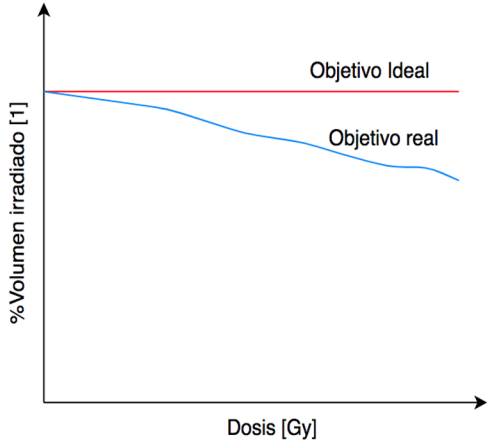
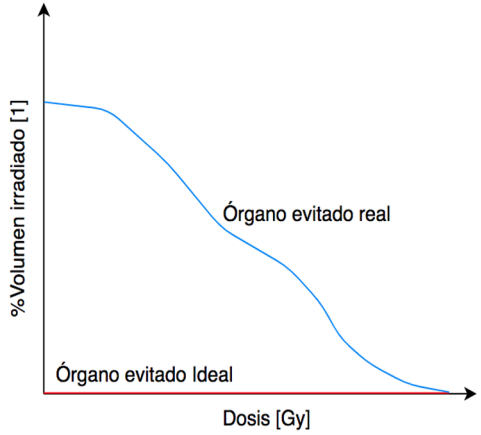
3. Plan A: your best previous plan (DVH)

In Structure Visibility, set to True only: the tumorous organ, PTV, CTV, GTV, 1 or 2 nearby organs, spine and skin. Load the DVH again, you will understand it better now.









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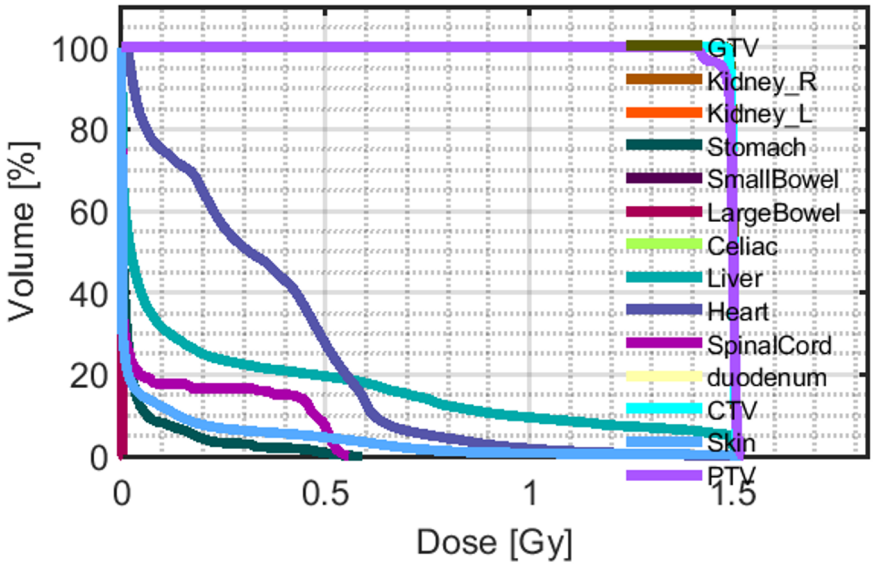
3. Plan A: your best previous plan (DVH)

We can see the radiation arriving in doses:

1. Low in most of the skin.
2. Strictly low over most of the spinal cord.
3. Strictly low in stomach (lower than medulla).
4. GTV, PTV and CTV are overlapped although only one corner of the CTV is noticeable. The radiation is intense throughout the planned volume.



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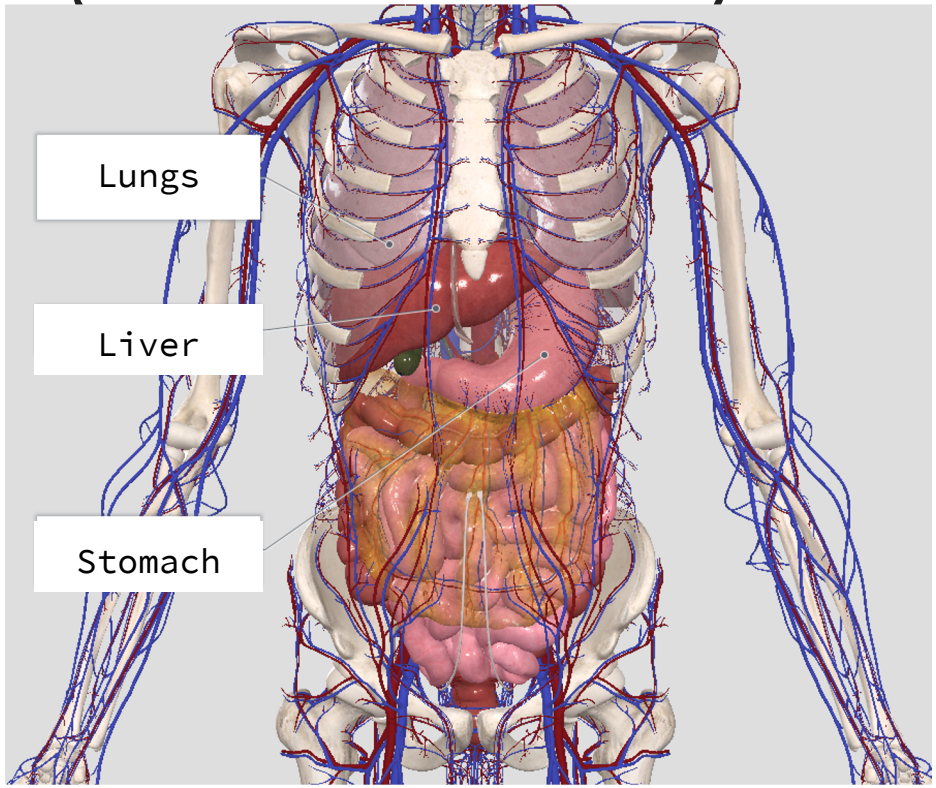
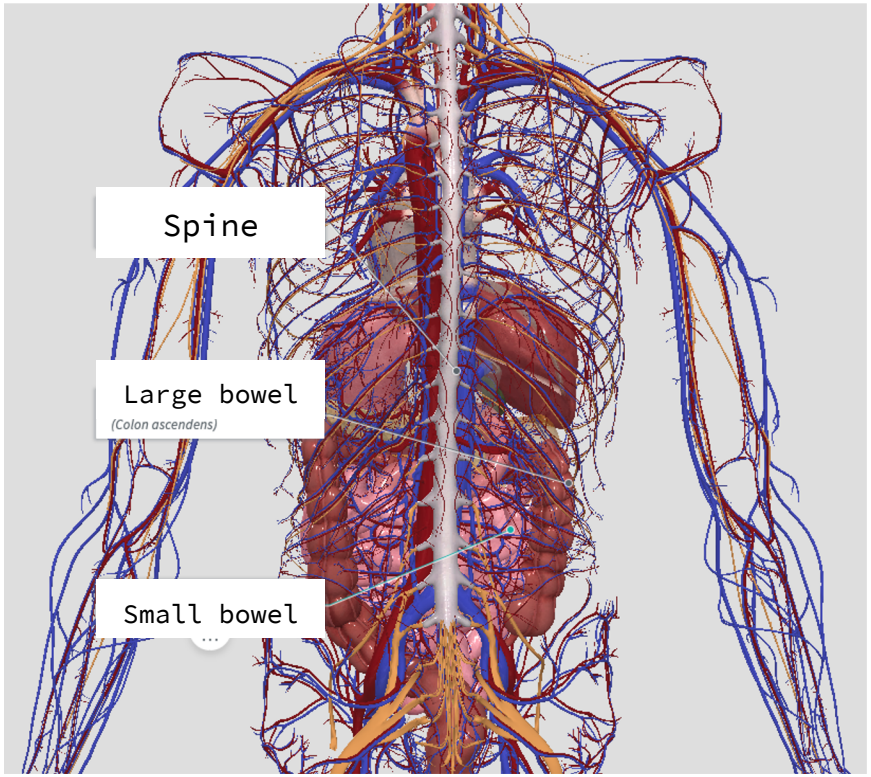
(Anatomy reminder)





And remember there are also the muscles...

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4. Plan B: right side of the abdomen

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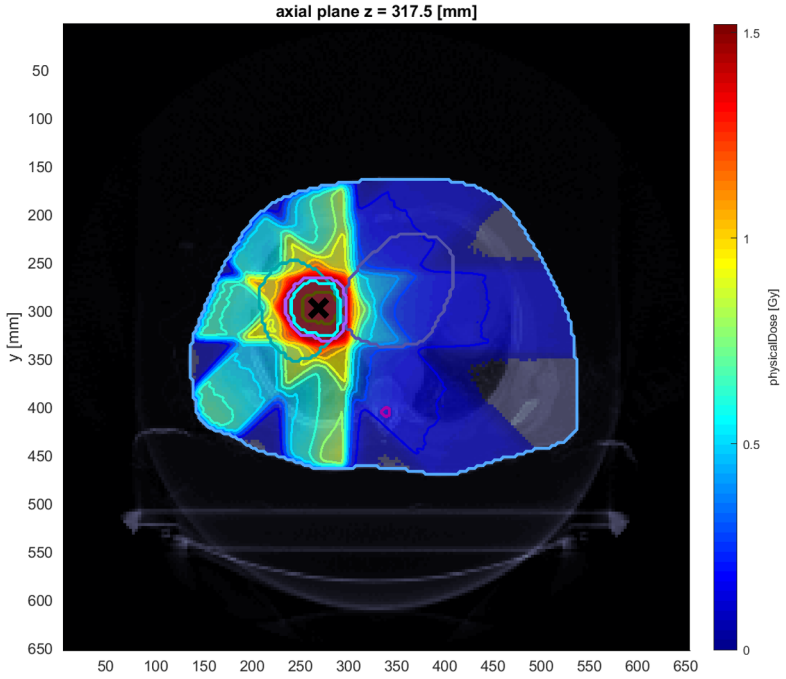
4. Plan B: right side of the abdomen



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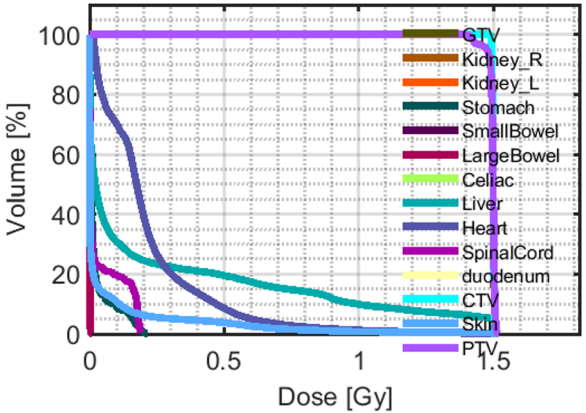
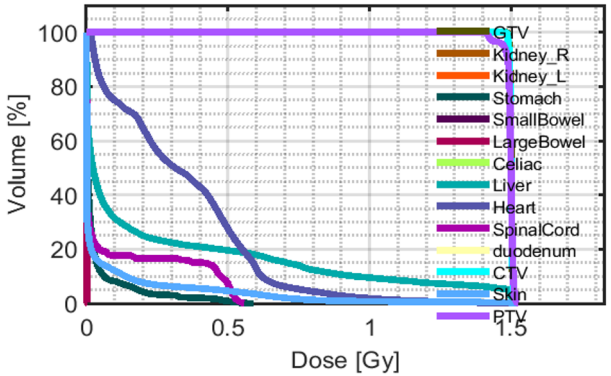
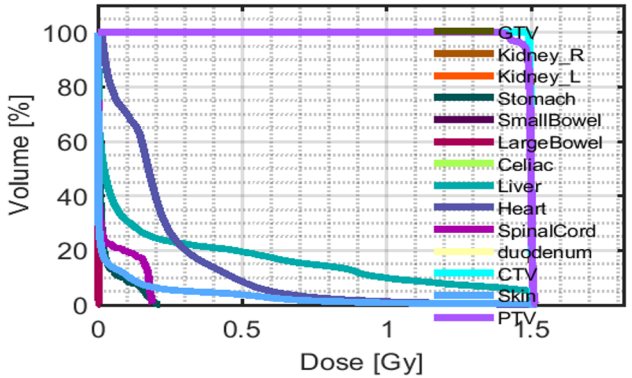


	max	min	mean
GTV	1.5103	1.4874	1.4998
Kidney_R	0	0	0
Kidney_L	0	0	0
Stomach	0.2166	0	0.0232
SmallBowel	0	0	0
LargeBowel	0.0097	0	1.3198e-04
Celiac	0	0	0
Liver	1.5206	0	0.2458
Heart	1.5045	0.0082	0.2159
SpinalCord	0.1910	0	0.0372
duodenum	0	0	0

4. Comparing plans A vs. B





	max	min	mean	std
GTV	1.5172	1.4871	1.5005	0.0
Kidney_R	0	0	0	
Kidney_L	0	0	0	
Stomach	0.5919	0	0.0308	0.0
SmallBowel	0	0	0	
LargeBowel	0.0051	0	9.4490e-06	1.5622e
Celiac	0	0	0	
Liver	1.5270	0	0.2438	0.4
Heart	1.5090	0.0085	0.3399	0.2
SpinalCord	0.5577	0	0.0851	0.1
duodenum	0	0	0	

	max	min	mean
GTV	1.5103	1.4874	1.4998
Kidney_R	0	0	0
Kidney_L	0	0	0
Stomach	0.2166	0	0.0232
SmallBowel	0	0	0
LargeBowel	0.0097	0	1.3198e-04
Celiac	0	0	0
Liver	1.5206	0	0.2458
Heart	1.5045	0.0082	0.2159
SpinalCord	0.1910	0	0.0372
duodenum	0	0	0

The difference between the two plans is the lower absorbed dose of specific organs, due to the irradiation of particular angles on the right side of the abdomen. So by knowing the exact treatment part, one should be able to design a more efficient treatment plan.

Now we can go to the next case!

Go to the subfile “4.3_Head&Neck”