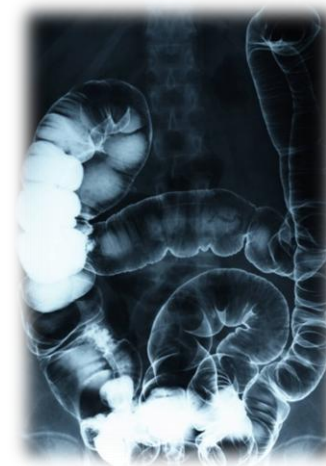


Set-up deviations in prone versus supine position for rectal cancer patients

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Purpose

- Retrospective study
- To evaluate setup deviations found when localizing the treatment isocentre.
- Comparison between two positioning options:
 - Prone position
 - Supine position

Materials and Methods

Samples

- 41 patients with rectal carcinoma
 - 30 patients – prone position
 - 11 patients – supine position
- Data collected from February 2009 to February 2010 at Quadrantes Funchal.
- **RADIOTHERAPY**
 - Different modalities:
 - Pre-op RT : 31 patients
 - Post-op RT: 6 patients
 - QT/RT: 4 patients
 - Potential side effects - acute/late reactions
 - Nausea
 - Vomiting
 - Diarrhoea
 - Bloody stools
 - Rectal leakage
 - Urinary discomfort
 - Gastrointestinal perforation

Materials and Methods

Positioning and Immobilization

- Patients were positioned wearing their own shirts and naked below the waist.
- **Prone position**
 - Normal-sized pillow
 - Combifix Civco[®]
- **Supine position**
 - Two thin foam pillows
 - Leg support Civco[®]
- **Prone position**
 - Advantage: decreases the percentage of irradiated bowel volume, which decreases some side effects.
 - Disadvantage: less comfortable positioning, and higher probability of body movements.
 - It cannot be applied for patients in a lot of pain; old aged; with massive abdomens; or with colostomy bags.
- **Supine position**
 - Advantage: more comfortable and reproducible.
 - Disadvantage: higher percentage of irradiated bowel volume.

Materials and Methods

Setup errors

- **Random errors**
 - Can be minimized or corrected, but not completely eliminated.
 - Random and unpredictable causes:
 - Treatment equipment requiring recalibration;
 - Individual staff subjectivity during image matching;
 - Reproducibility of patient's positioning and immobilization;
 - Patient's stress or anxiety;
 - Any change in patients behaviour;
 - Changes in patient's food intake;
 - Intestinal changes;
 - Unanticipated occurrences.
- **Systematic errors**
 - Once detected, its correction prevents any continuing error. That correction can be made according to the centre portal vision protocol.
 - It occurs as a constant and unchanging error.
 - Causes:
 - Involuntary patient changes: internal organ movement, or weight variation.

Materials and Methods

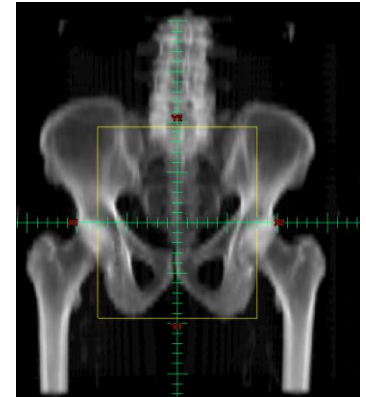
Treatment technique

- CT scan: SPECT-CT Symbia[®]
- Plan: box technique
- Energy: 15 MV
- Total dose: 45 Gy
- Fractionation: 1.8Gy/day, 5days/week
- Treatment: linear accelerator Clinac 2100 C/D Varian[®]

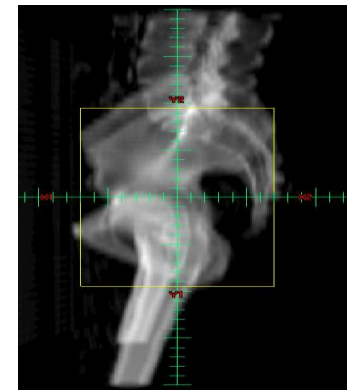
Materials and Methods

Portal imaging data

- Match between acquired images and Eclipse[®] DRR's.
- A/P and lateral field images.
- Relevant portal imaging:
 - 2nd treatment day;
 - Once every 6 working days;
 - As a validation in case of any perceived doubts (no simulator available).
- Matching was performed online with Treatment 4DTC[®] and/or with Offline Review[®] software.
- Data to analyse: data prior to correction.
- Set-up deviations collected:
 - X axis
 - Average between Y axis value from A/P and lateral fields
 - Z axis.

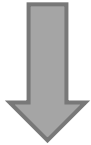


Anterior/Posterior



Results

- Data collection – frequency tables for each observed deviation value.
- Data analysis.



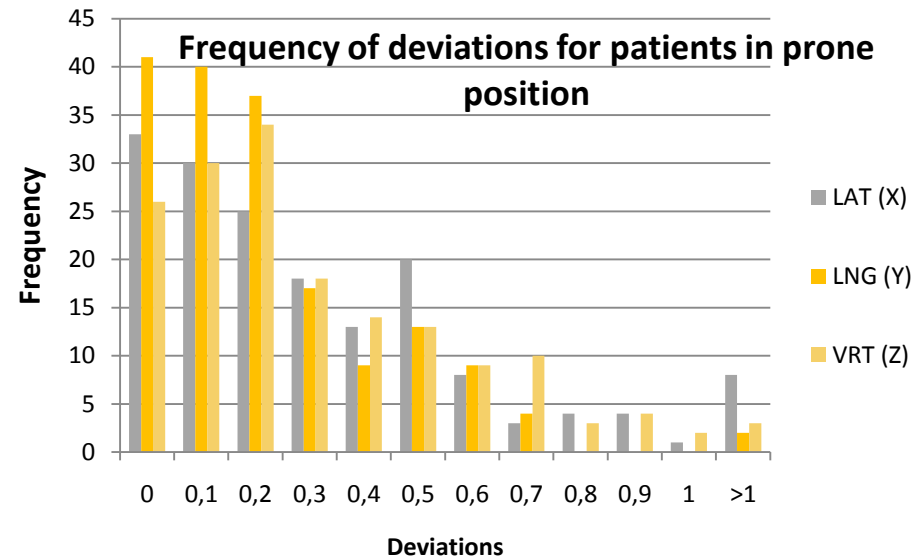
- Most deviations represent random errors.
- There were only a few systematic errors requiring correction.

Results

Prone position

- 30 patients.
- 505 images.
 - 69.1 % errors of 3 mm or less
 - 30.9% errors above 3 mm

		Frequency			Total	Total	Total %
		X	Y	Z			
Deviations	≤ 3 mm	33	41	26	100	349	69,1%
		30	40	30	100		
		25	37	34	96		
		18	17	18	53		
	> 3 mm	13	9	14	36	156	30,9%
		20	13	13	46		
		8	9	9	26		
		3	4	10	17		
		4	0	3	7		
		4	0	4	8		
	1	0	2	3			
	8	2	3	13			
Totals					505	505	100



Graph 1. Frequency graph: deviations for patients in prone position.

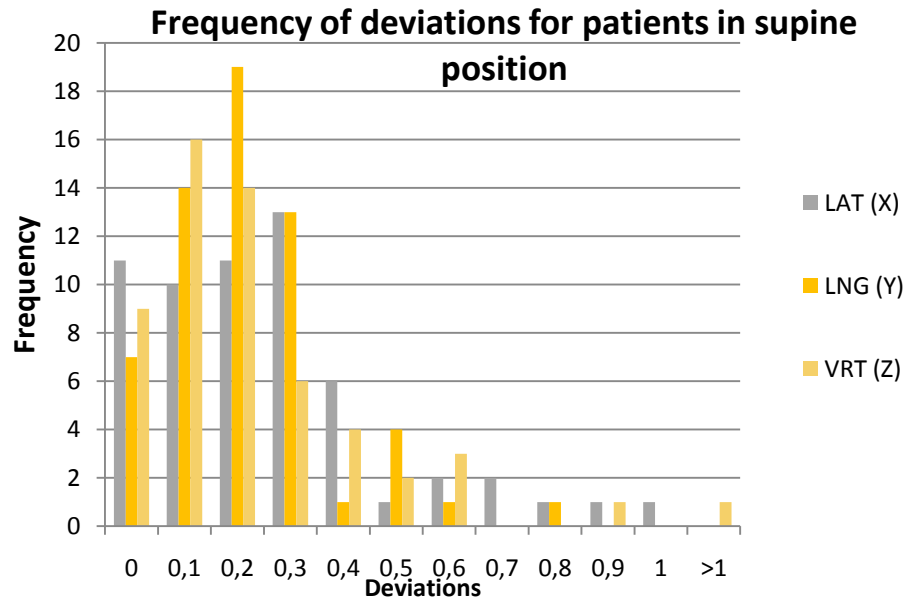
Table 1. Frequency and percentage table: deviations for patients in prone position.

Results

Supine position

- 11 patients.
- 175 images
 - 81.7 % errors of 3 mm or less
 - 18.3% errors above 3 mm

		Frequency			Total	Total	Total %
		X	Y	Z			
Deviations	≤ 3 mm	11	7	9	27	143	81,7%
		10	14	16	40		
		11	19	14	44		
		13	13	6	32		
	> 3 mm	6	1	4	11	32	18,3%
		1	4	2	7		
		2	1	3	6		
		2	0	0	2		
		1	1	0	2		
		1	0	1	2		
1		0	0	1			
0	0	1	1				
Totals					175	175	100%



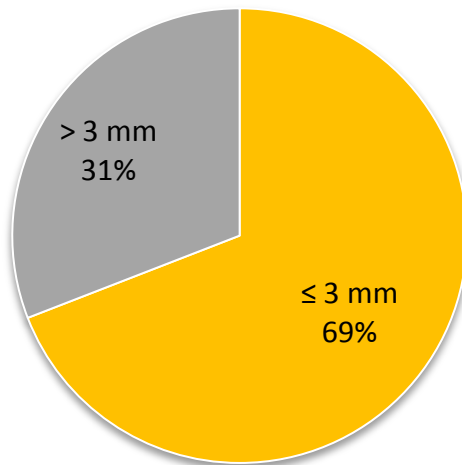
Graph 2. Frequency graph: deviations in patients in supine position.

Table 2. Frequency and percentage table: deviations in patients in supine position.

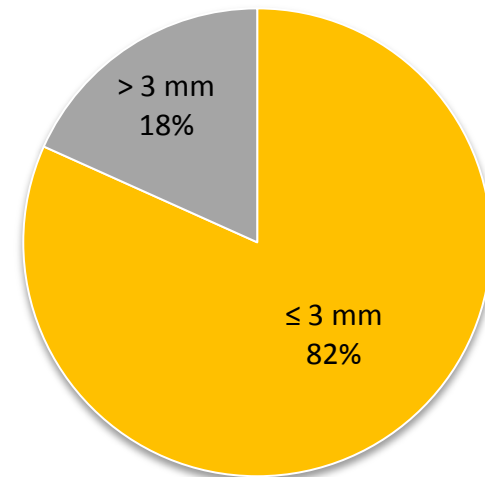
Results

Prone position Vs. Supine position

Frequency of errors in prone position



Frequency of errors in supine position



Results

Prone position Vs. Supine position

	Frequency			actual set-up errors total	actual number of patients	Number of patients ⁽¹⁾	Total set-up errors ⁽¹⁾	Set-up errors (%)
	X	Y	Z					
Supine position	6	1	4	32	11	30	87	35.8%
	1	4	2					
	2	1	3					
	2	0	0					
	1	1	0					
	1	0	1					
	1	0	0					
	0	0	1					
Prone position	13	9	14	156	30	30	156	64.2%
	20	13	13					
	8	9	9					
	3	4	10					
	4	0	3					
	4	0	4					
	1	0	2					
	8	2	3					
	75	44	69	188	41		243	100

Table 3. Comparison of set-up errors for prone and supine positioning.

Results

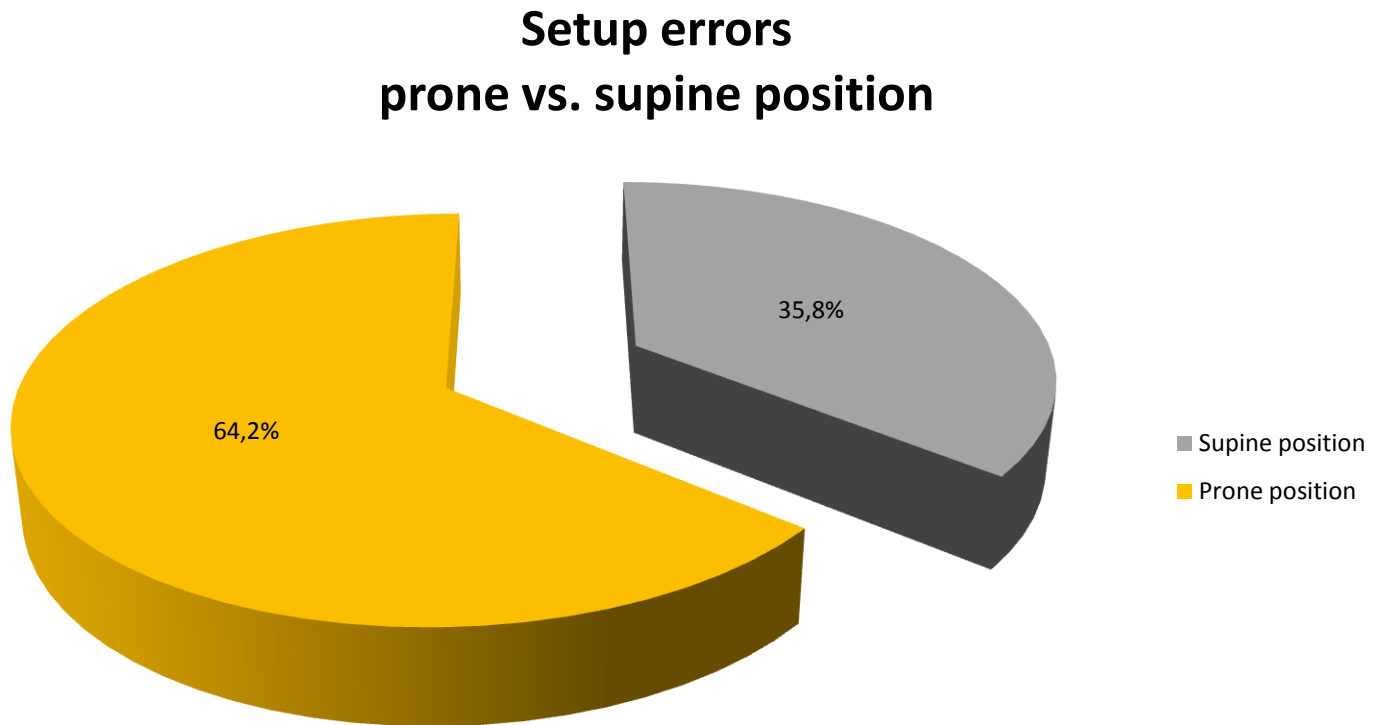
Prone position Vs. Supine position

	Frequency			actual set-up errors total	actual number of images	Number of images ⁽¹⁾	Total set-up errors ⁽¹⁾	Set-up errors (%)
	X	Y	Z					
Supine position	6	1	4	32	175	505	92	37.1%
	1	4	2					
	2	1	3					
	2	0	0					
	1	1	0					
	1	0	1					
	1	0	0					
	0	0	1					
Prone position	13	9	14	156	505	505	156	62.9%
	20	13	13					
	8	9	9					
	3	4	10					
	4	0	3					
	4	0	4					
	1	0	2					
	8	2	3					
	75	44	69	188	680		248	100

Table 4. Comparison of set-up errors for prone and supine positioning.

Results

Prone position Vs. Supine position



Graph 3. Setup errors for prone vs. supine position. Data from Table 3

Conclusion

- Highest percentage of setup errors for prone position.
 - **Causes:**
 - Uncomfortable position
 - Difficulty in positioning
 - Age
 - Amount of abdominal fat
 - Pain
 - Food intake
 - Bowel regulation
- Belly Board –modulates the abdominal area to improve the patient's immobilization and to exclude the bowel from the area to irradiate.
- Better positioning reproducibility for patients in supine position.
- Compromise between better reproducibility and lowest bowel dose.

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Thank you for your time and attention.

Any questions?