Associazione Italiana Radioterapia e Oncologia clinica

Società Italiana di Radiobiologia

CORRELATION BETWEEN RADIATION DOSE TO BONE MARROW SUBREGIONS AND ACUTE HEMATOLOGIC TOXICITY IN ENDOMETRIAL CANCER TREATED WITH EXTERNAL BEAM RADIOTHERAPY

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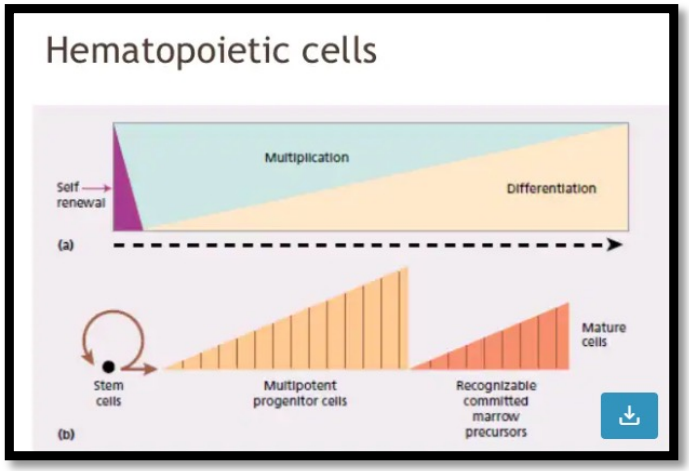
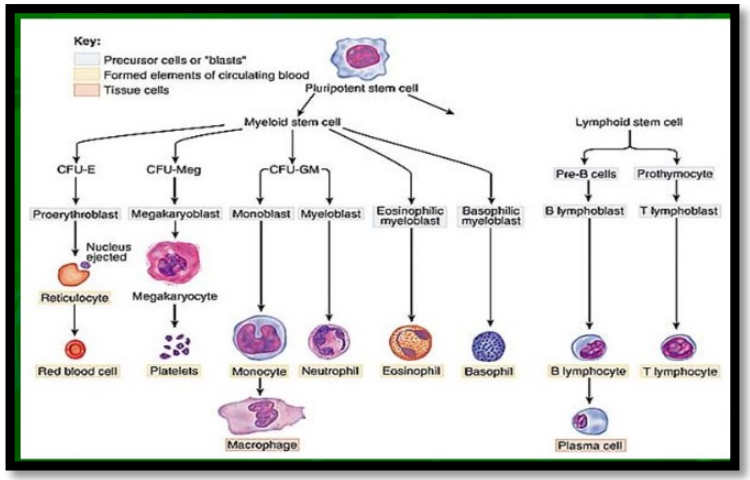
BACKGROUND

STRUCTURE OF BONE MARROW:
-VASCULAR COMPARTMENT
-HEMATOPOIETIC COMPARTMENT
Hemapoietic Cells
Stromal Cells

Yellow Marrow	Red marrow
• Presence of Adipocytes	• Consists of Stroma, Hemopoitic cord, Sinusoidal capillaries

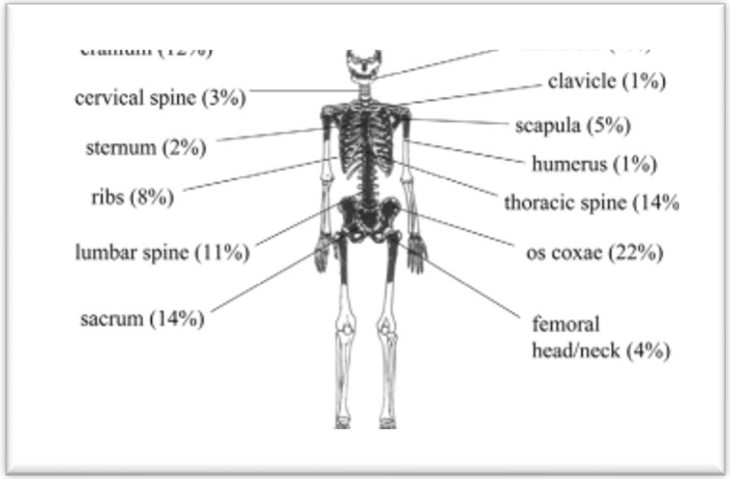




BONE MARROW ANATOMY

BACKGROUND

Half of the total hematopoietically active bone marrow is comprised within the pelvis and the lumbar vertebral tract

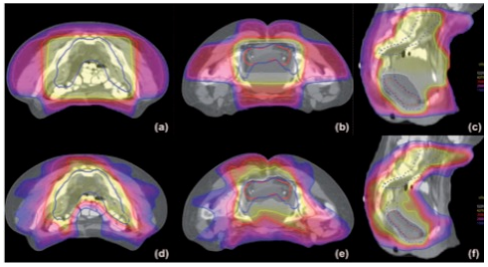


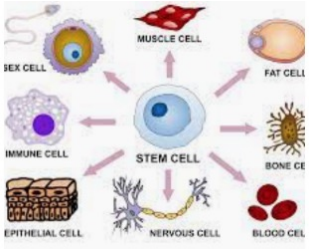
Ellis 1961 and Mauch

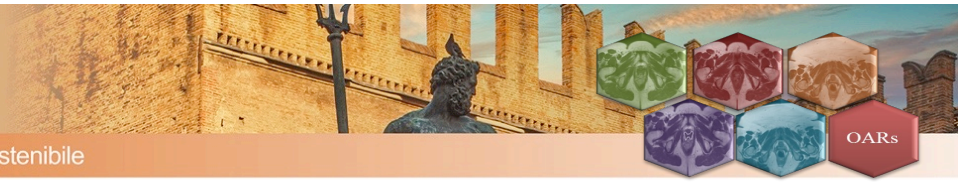
BACKGROUND

RTCT → STEM CELLS DAMAGE → HT

30-40%







BACKGROUND

Bone Marrow Sparing:

- Improve the tolerance to chemotherapy
- Prevent hospitalizations
- Decrease the need for trasfusions or growth factors
- Reduce the chronic effects of RT on BM suppression, improving chemotherapy tolerance in the recurrence setting

AIM

To identify dosimetric parameters associated with acute hematologic toxicity (HT) in endometrial cancer treated with volumetric modulated arc therapy (VMAT-RT).

MATERIALS & METHODS

March 2019 – November 2021

74 patients with endometrioid uterine cancer

Treatment:

✓**Surgery**: total hysterectomy (TH) and bilateral salpingo-oophorectomy (BSO) +/- pelvic and/or para-aortic lymph node dissection

✓**Adjuvant radiotherapy**:

- External Beam Radiotherapy (EBRT): 45Gy

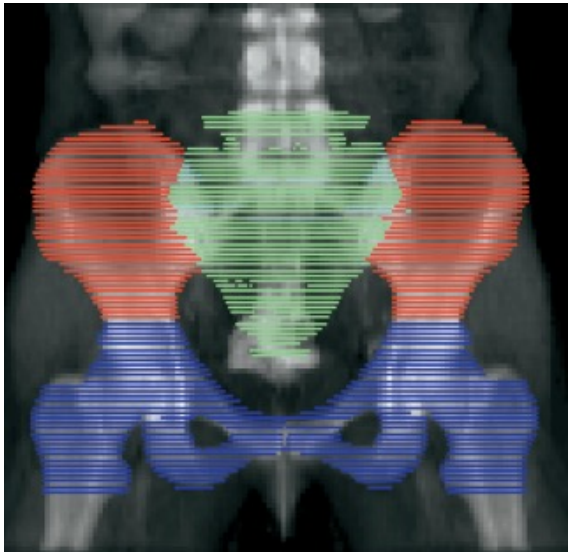
+

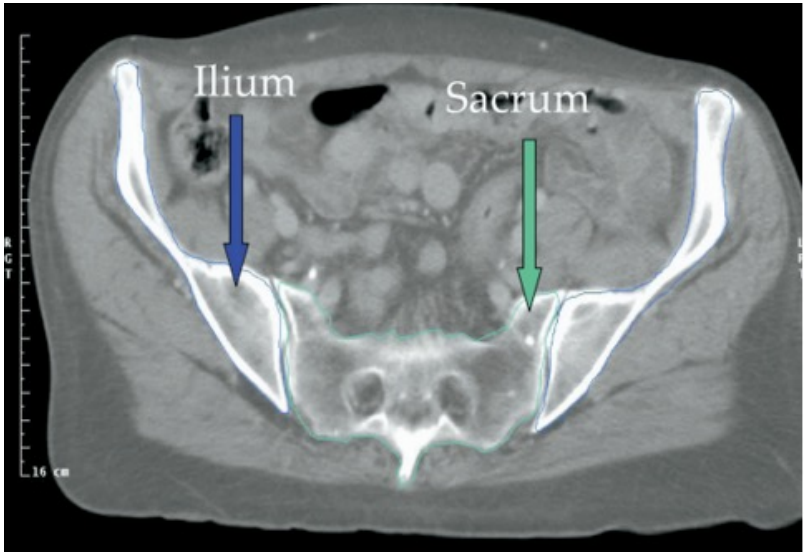
- Vaginal Brachytherapy (VBT): 10Gy HDR in 2fr

Adjuvant platin-based chemotherapy was administered after surgery in upfront or sandwich setting

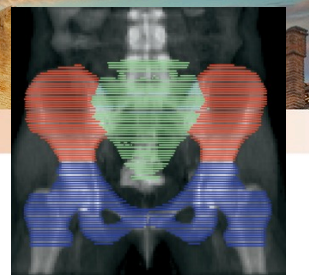
MATERIALS & METHODS

The external contour of all bone within the pelvis was delineated on the planning CT scan:





Mell et al, 2006

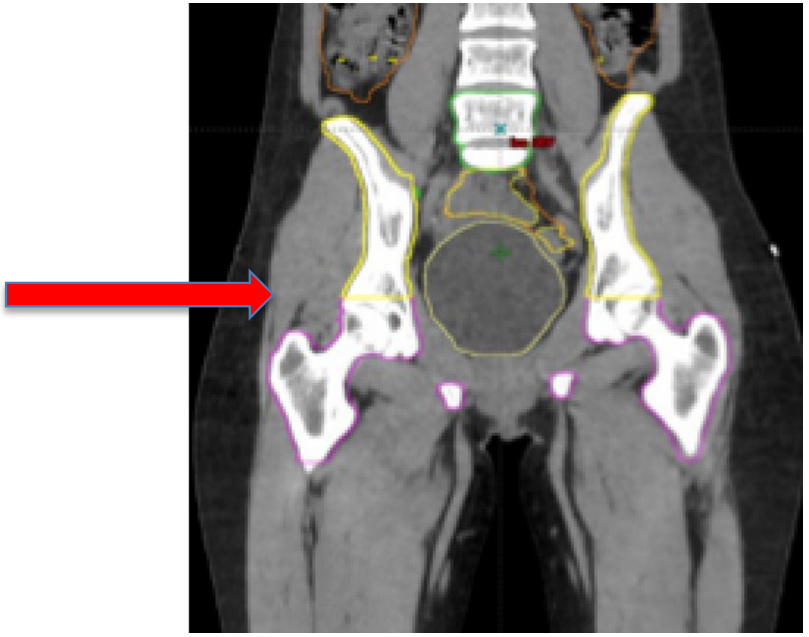


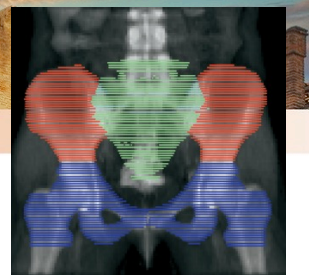
MATERIALS & METHODS

Pelvic BM was divided into three subsites:

ILIAC BM (IBM)

including the iliac crests extending to the superior border of the femoral heads

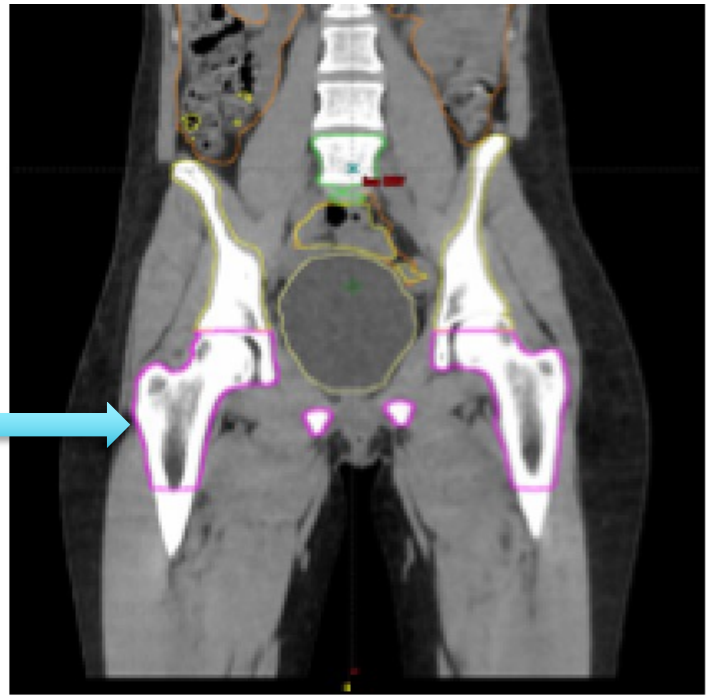


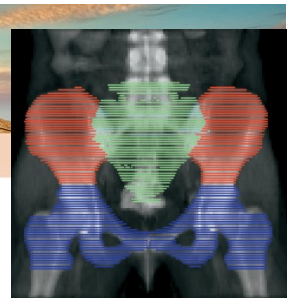


MATERIALS & METHODS

LOWER PELVIS BM (LPBM)

consisting of the pubes, ischia, acetabula, and proximal femora extending from the superior border of the femoral heads to the inferior border of the ischial tuberosities

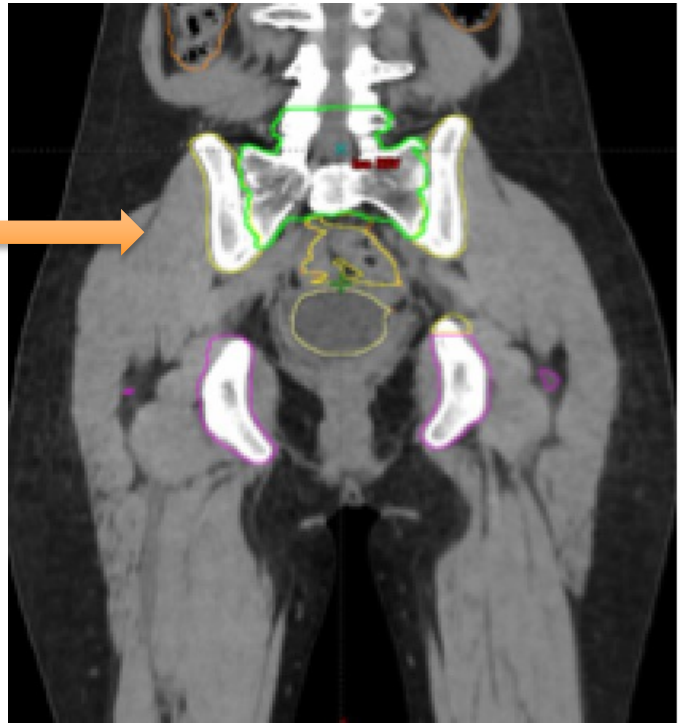




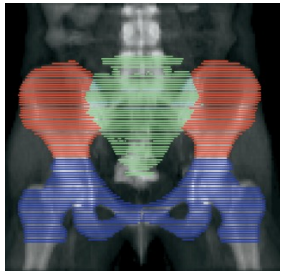
MATERIALS & METHODS

LUMBOSACRAL BM (LSBM)

extending from the most superior vertebral body contained in the planning treatment volume (usually L5) inferiorly to include the entire sacrum



MATERIALS & METHODS



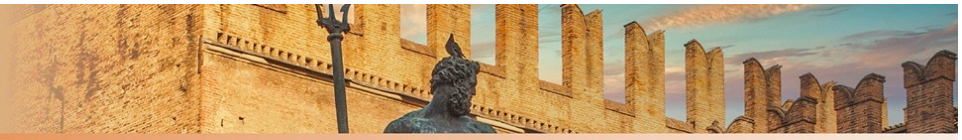
ILIAC BM (IBM)

LOWER PELVIS BM (LPBM)

LUMBOSACRAL BM (LSBM)

V10
V20
V30
V40
D mean

HEMATOLOGICAL TOXICITY: CTCAE V 5.0



RESULTS

Patients' characteristics		N°
Age (median)	55 ys (48-80)	74
Histology		
	Endometrial Endometrioid Adenocarcinoma	59
	Sarcoma	1
	Other	14
Grading		
	G1	2
	G2	34
	G3	21
	NA	17
Stage		
	IA	3
	IB	25
	IC	1
	II	7
	IIIA	1
	IIIB	3
	IIIC1	33
	IV	1
ADJ CT		
	YES	54
	NO	20

74 patients were retrospectively analysed

RESULTS

BM

ILIAC BM (IBM)

LOWER PELVIS BM (LPBM)

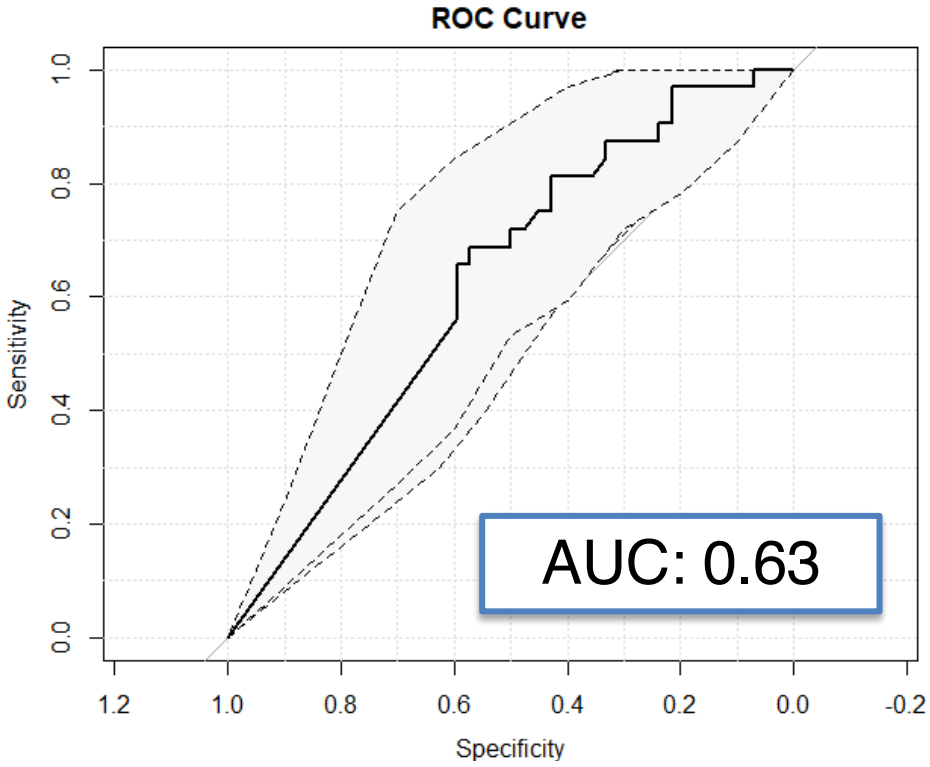
LUMBOSACRAL BM (LSBM)

V10
V20
V30
V40
D mean

20 VARIABLES

HEMATOLOGICAL TOXICITY ≥ G2

RESULTS

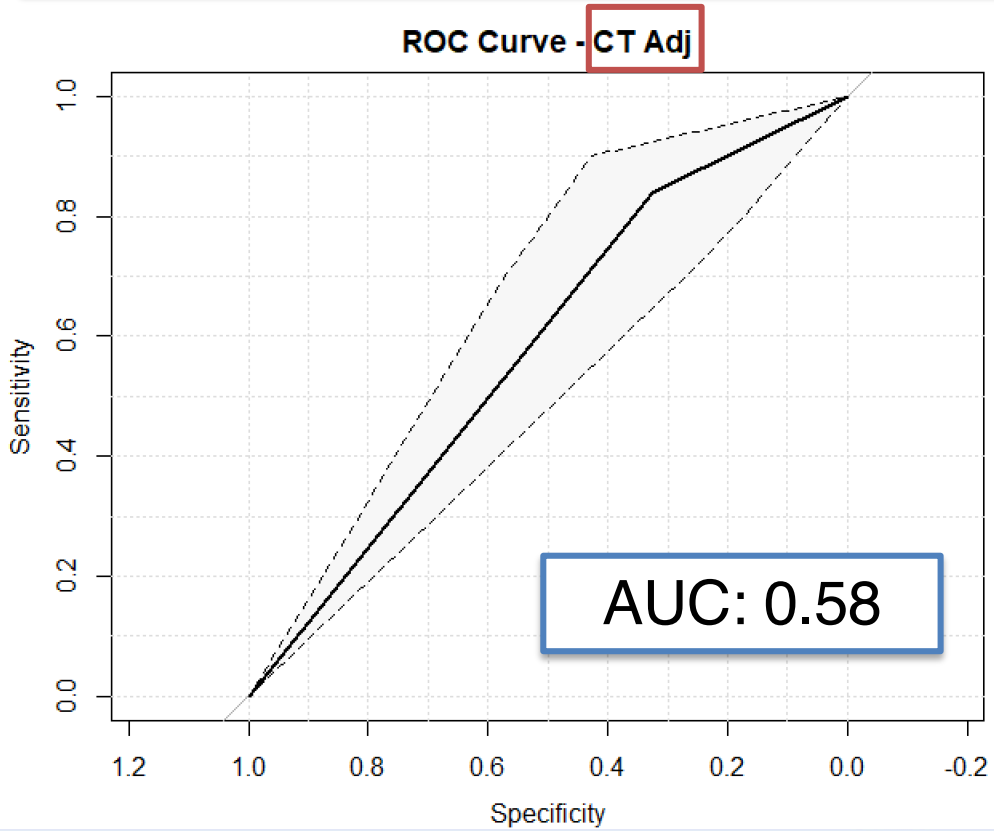


p=0.049

CI= 0.50-0.74

V20 LSBM > 96%

RESULTS


ROC Curve - CT Adj
Sensitivity
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
Specificity
AUC: 0.58

The volume of lombo-sacral pelvis receiving low-dose radiation (V20 LSBM >96%)

seems to be associated with HT.

"Active" BM Delineation through FUNCTIONAL IMAGING

Dosimetrics Parameters: whole pelvic bone contouring to develop normal tissue complication probability models