Prostate cancer: Simultaneous integrated boost with Radixact® System, about a series of 74 patients.

M.CHABANI[1], I. ARAREM[2], S. CHAMI[1]
M.AOUNI[2], C. TAYEB[1]
[1]Central Hospital of The Army, Radiation Oncology, Algiers, Algeria.
[2]Central Hospital of The Army, Epidemiology and Public Health, Algiers,Algeria.
Email address of Corresponding Author(s): mohammed chabani chabanim.ad2016@gmail.com, samcschami@gmail.com,cheikh tayeb <tayebcheikh72@yahoo.fr>

BACKGROUND AND OBJECTIVE

Prostate cancer is the second most frequent cancer and the fifth leading cause to death in men category [1]. It is the most diagnosed cancer in over one-half of the countries of the world [1].

Several randomized trials have demonstrated a significant benefit of an increased radiation dose for the treatment of prostate cancer. However, dose escalation is associated with an increased risk of acute and late toxicity [2-4].

This retrospective study was done to assess the impact of **intensity modulated radiotherapy (IMRT)** with helical Radixact® (**HR**) on frequency and severity of **acute gastrointestinal** (**GI**) and **genitourinary** (**GU**) toxicity in prostate cancer.

METHODS AND MATERIALS

Between May 13th,2019 and May 25th,2020, a total of 74 patients who were diagnosed with localized and locally advanced prostate cancer were the first to be treated with (IMRT-HR) radiotherapy in our department. We treated these patients with Simultaneous integrated boost (SIB).

All patients were classified according to the national comprehensive cancer network classification (NCCN):14 patients (18.93%) were classified as intermediate risk,50 patients (67,57%) either high or very high risk and 8 patients (10.8%) as regional risk.

Among 74 patients, 70 (94.5%) underwent either a short- or long-term androgen deprivation therapy (ADT): neoadjuvant, concomitant and more or less adjuvant hormone therapy. The margins for defining the planning target volume were 5 mm in all directions. The therapeutic dose for those patients was 52.7 Gy (in four fractions of 1.7 Gy per day) to pelvic lymph node (LN) area when the risk of positive LN was greater than 10% according the Roach formula, while seminal vesicles and prostate received a SIB to a dose of 62 Gy (in four fractions of 2 Gy per day) and 71.3 Gy (in four fractions of 2,3 Gy per day). The dose constraints used during inverse planning are shown in the table1. Radiation was delivered with 6-MV photon beams of HR.

Acute toxicity scores were recorded and evaluated weekly and after 3 months of radiotherapy (RT) using the common terminology criteria of adverse events V 4.03 (CTCAE).

RESULTAS:

The mean age and median were 70.72 and 72 years old respectively; The incidence of both acute grade 1 and 2 GI toxicity was (31.10%) and (12.20%). Acute Grade 1 and 2 GU effects were observed in (27%) and (31.10%) of patients respectively. No side effects were noticed for grade 3 or higher. According to table 2 the present study depicts much lower occurrence of side effects comparatively to the previous studies in other areas of the world. That is mainly due to Image guided radiation therapy that was performed daily (before every session). Other reasons for the dropped numbers are: strict dose constraints, dietary and water instructions given by our department.

Conclusion:

The main purpose of our department is to improve the management of patients by increasing the doses of radiotherapy in prostate cancer and reduce side effects to improve the quality of treatment.

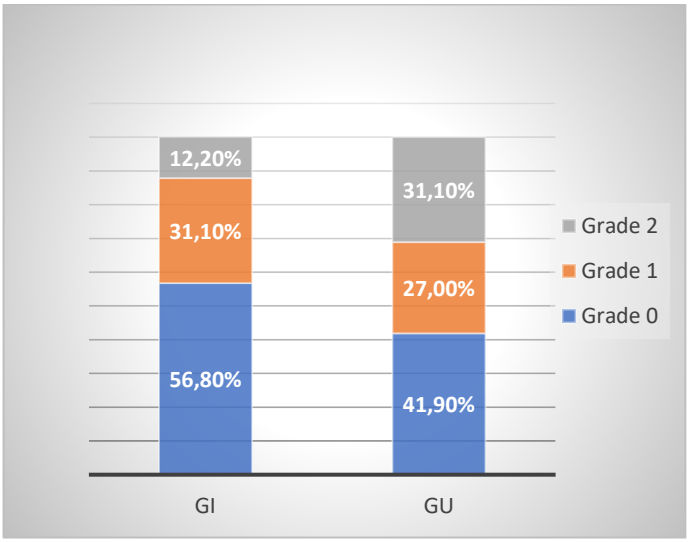

Figure 1: Acute toxicity

OAR	Dose Constraint (2 GY per fraction)	Max Vol (% or cc)
Rectum	V30 V40 V50 V60 V70 V74 V74	80% 70-65% 50% 35% 15% 5% 3%
Bladder	V45 V50 V60 V74	39% 50% 25% 5%
Femoral Heads	V43	50%
Bowel	V30 V35 V45 V50	200 150 20cc 1-10cc
Penile bulb	V50 V60	50% 10%

Table 1. dose constraints

Study	Method	Acute toxicity GU by grade (%)			Acute toxicity GI by grade (%)		
		2	3	4	2	3	4
Present study(n=74)	Radixact® System 71.3Gy (EQD2 77.41)	31.10	00	00	12.12	00	00
Lips et al. (6) (n = 331)	IMRT fiducials 76 Gy	47	3	00	30	00	00
Soete et al. (7) (n = 238)	IG Arc therapy	37	16	00	19	6	00
Ghadjar et al. (8) (n = 39)	IMRT fiducials 80 Gy	56	8	00	3	00	00
Cheng et al. (9) (n = 76)	Tomotherapy 78.9 Gy	38	00	00	25	00	00
Martin et al. (10) (n = 259)	87% conformal RT fiducials 79.8 Gy	33	00	00	10	00	00

Table 2. Comparison to results from other studies using IGRT-IMRT for prostate cancer

REFERENCES

1: Global Cancer Statistics 2018: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries

2: Peeters ST, Heemsbergen WD, Koper PC, van Putten WL, Slot A, Dielwart MF, Bonfrer JM, Incrocci L, Lebesque JV: Dose-response inradiotherapy for localized prostate cancer: results of theDutch multicenter randomized phase III trial comparing 68 Gy of radiotherapy with 78 Gy. J Clin Oncol 2006, 24:1990-1996

3: Pollack A, Zagars GK, Starkschall G, Antolak JA, Lee JJ, Huang E, von Eschenbach AC, Kuban DA, Rosen I: Prostate cancer radiation dose response: results of the M. D. Anderson phase III randomized trial. Int J Radiat Oncol Biol Phys 2002, 53:1097-1105.

4: Zietman AL, De Silvio ML, Slater JD, Rossi CJ Jr., Miller DW, Adams JA, Shipley WU: Comparison of conventional-dose vs high dose conformal radiation therapy in clinically localized adenocarcinoma of the prostate: a randomized controlled trial. JAMA 2005, 294:1233-1239

5:M Roach 3rd 1, C Marquez, H S Yuo, P Narayan, L Coleman, U O Nseyo, Z Navvab, P R Carroll:Predicting the risk of lymph node involvement using the pre-treatment prostate specific antigen and Gleason score in men with clinically localized prostate cancer. nt J Radiat Oncol Biol Phys 1994 Jan 1;28(1):33-7.doi: 10.1016/0360-3016(94)90138-4.

6. Lips IM, Dehnad H, Van Gils CH, Kruger B, Arto E, Van Der Heide UA, Van Vulpen M: High-dose intensity-modulated radiotherapy for prostate cancer using daily fiducial marker-based position verification: acute and late toxicity in 331 patients. Radiat Oncol 2008, 3:15.

7. Soete G, Verellen D, Michielsen D, Rappe B, Keuppen F, Storme G: Imageguided conformation arc therapy for prostate cancer: Early side effects.Int J Radiat Oncol Biol Phys 2006, 66:S141-S144.

8. Ghadjar P, Vock J, Vetterli D, Manser P, Bigler R, Tille J, Madlung A,Behrensmeier F, Mini R, Aebersold DM: Acute and late toxicity in prostate cancer patients treated by dose escalated intensity modulated radiation therapy and organ tracking. Radiat Oncol 2008, 3:35.

9. Cheng JC, Schultheiss TE, Nguyen KH, Wong JY: Acute toxicity in definitive versus postprostatectomy image-guided radiotherapy for prostate cancer. Int J Radiat Oncol Biol Phys 2008, 71:351-357.

10. Martin JM, Bayley A, Bristow R, Chung P, Gospodarowicz M, Menard C, Milosevic M, Rosewall T, Warde PR, Catton CN: Image guided dose escalated prostate radiotherapy: still room to improve. Radiat Oncol 2009,4:50