than that of VMAT group. But the VMAT group CTV's CI; spinal's D2,V40; lung's V3,V5 and machine's MU superior to that of CDR-CAS-IMAT group. There were no significant differences between CDR?CDR-CAS-IMAT and VMAT in the average dose of PTV, CTV, GTV, heart, spinal cord, double lung and the gamma?±3mm,±3%? pass rate.

Conclusions: CDR-CAS-IMAT in the treatment of time and tissue of high dose irradiated area is less than that of VMAT; MU on machine and tissue of low dose irradiated area is higher than that of in VMAT. These two treatment methods can meet the clinical demand, can be selected according to the actual situation of the patient treatment.

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Comparing four dosimetric techniques for postoperative radiotherapy in breast cancer

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Purpose/Objective: To compare the dosimetric results of treatment plans using 3DCRT, IMRT linac-based, with helical tomotherapy (HT) and direct tomotherapy (DT) in breast cancer patients, who required irradiation of the chest wall/breast and draining nodes after mastectomy or breast conserving surgery.

Materials and Methods: 15 breast cancer patients (7 right, 8 left) were enrolled. The chest wall/breast, suvra- and infra-clavicular nodes and OARs were contoured. Breast and nodal CTVs were expanded to obtain a PTV. Four plans (3DCRT, IMRT linac-based, HT and DT) were created for each patient. Dose prescription was 50 Gy to the PTV minus 2 mm from the skin surface (PTV eval). In the 3DCRT plan for each patient a mono-isocentric technique was used: ¼ of beam treated the breast/chest wall with two opposed wedged tangential beams and ½ of beam treated the lymph nodes with three wedged beams. In the IMRT plan 6 beams were equally spaced throughout the 180° sector angle in the axial plane. The HT plan parameters consisted of a 5 cm field width (FW), 0.287 pitch, and a 2.7 modulation factor (MF). The spinal cord and contralateral breast were spared by a directional block. The DT plan consisted of the same 6 beam angles as the IMRT linac-based, with the same plan parameters as the HT. The low level optimization goal was to protect lungs, heart and right breast. Dose constraints were also applied to the spinal cord, esophagus, larynx, thyroid, and ipsilateral humeral head with IMRT, HD and DT.

Results: Plans were compared in terms of doses to the PTV, homogeneity index (HI) and doses to OARs. A Friedman test assessed dosimetric differences. $D_{98\%}$, $D_{95\%}$, $D_{50\%}$ and mean doses (D_{mean}) of target increased significantly for IMRT techniques particularly for tomotherapy treatments (P<0.0001). Homogeneity was significantly increased (P<0.0001) in HT and DT, compared with 3DCRT and IMRT. V_{5Gy} and V_{20Gy} of the ipsilateral lung and V_{5Gy} of the contralateral lung increased significantly with the IMRT techniques, although respecting the dose constraints. The heart received significantly lower mean and maximum doses ($D_{2\%}$) with 3DCRT for right-sided treatment; significantly better $D_{2\%}$ results were achieved with HT techniques in left-sided treatments. The contralateral breast was better spared in 3DCRT. Dosimetric parameters (mean and standard deviation) are shown in the table below.

		3DCRT		IMRT linac-based		TOMO H		TOMO D	
		DOSE (Gy)/volume(%)		DOSE (Gy)/volume(%)		DOSE (Gy)/volume(%)		DOSE (Gy)/volume(%)	
		MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD
PTV eval	$D_{90\%}$	43.7	2.2	46.6	0.54	48.0	0.5	47.8	0.4
	$D_{95\%}$	37.7	5.9	45.0	0.8	46.6	0.8	46.6	0.7
	$D_{98\%}$	24.7	12.4	42.7	1.3	44.8	1.3	43.9	2.5
	$V_{107\%}$	1.7	1.6	1.20	1.02	0.4	0.4	0.8	0.8
	$D_{2\%}$	52.9	1.3	53.2	0.6	52.7	0.4	52.8	0.4
	$D_{50\%}$	46.5	11.4	49.5	0.9	50.3	0.2	50.3	0.2
	D_{mean}	47.3	1.2	49.3	0.3	50.0	0.2	50.0	0.3
	HI	1.1	1.9	0.19	0.06	0.16	0.03	0.18	0.05
Ipsilateral lung	V_{20Gy}	21.7	6.4	29.3	2.3	27.7	1.8	27.2	1.4
	V_{30Gy}	17.3	6.2	17.4	1.5	14.1	1.6	15.1	2.3
	V_{5Gy}	39.2	9.2	74.4	5.9	70.9	2.7	69.0	2.9
Contralaral lung	V_{15Gy}	0.3	0.8	1.2	1.8	1.9	1.3	0.5	0.6
	V_{5Gy}	6.1	5.2	38.8	12.0	24.5	5.4	21.7	3.3
Heart (right-sided treatment)	D_{mean}	1.0	0.5	7.2	3.3	7.5	0.6	6.47	1.04
	$D_{2\%}$	5.3	3.6	19.3	3.7	18.6	2.1	16.6	2.7
	V_{15Gy}	0.7	1.8	4.7	3.6	4.3	2.4	3.5	1.8
Heart (left-sided treatment)	D_{mean}	5.5	1.8	9.1	1.8	10.8	1.3	8.9	1.3
	$D_{2\%}$	41.8	6.8	30.4	12.1	30.2	1.9	33.5	6.1
	V_{25Gy}	8.0	3.8	8.4	3.5	4.4	2.3	6.3	2.4
Contralateral breast	D_{mean}	0.7	0.3	3.4	0.7	4.6	0.5	3.7	0.6
	$D_{2\%}$	3.1	3.7	9.2	1.9	9.7	0.9	8.4	1.7

Dosimetric results were not significantly different for other OARs (spinal cord, esophagus, larynx, thyroid, and ipsilateral humeral head).

Conclusions: IMRT techniques significantly improved the HI and the minimum doses to the target. However, this result was achieved at the cost of a greater OARs (lungs, heart in right-sided treatment and contralateral breast) exposure to low and medium doses.

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A pre-treatment verification method for intensity-modulated photon beams using VERO machine EPID

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Purpose/Objective: The delivery of intensity modulated radiation therapy (IMRT) using Vero machine has given us the need to use the electronic portal imaging device (EPID) to perform pre-treatment verifications. A method to analyze EPID images has been implemented thanks to a program developed with Matlab (MatImrt-QA) and results comparison has been performed with an independent commercially fluoroscopic EPID ('I'mRT-QA'-IBA) to test the new method accuracy.

Materials and Methods: In October 2010 at St.Anna Hospital in Como has been installed a new linear accelerator (VERO), it has an O-Ring shape and the EPID is located under the cover on the opposite side from the beam source at 221,2cm distance. The EPID is an array of photodiode detectors on an amorphous silicon (a-Si) glass substrate, the pixel size is 0,18mm at isocenter. The images are acquired in *free*