A DOSIMETRIC COMPARISON OF THE PREDICTIVE VALUE OF TWO RECTAL REFERENCE POINTS FOR LATE RECTAL COMPLICATIONS FOLLOWING THE TREATMENT OF CERVICAL CANCER BY HIGH-DOSE-RATE BRACHYTHERAPY

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Purpose **:** This study aimed to compare the predictive value of ICRU (International Committee on Radiation Units and Measurements) and conventional rectal reference point with the risk of late rectal sequelae in patients with carcinoma of the uterine cervix treated with high-dose-rate intracavitary brachytherapy (HDRICB).

Materials and Methods **:** From September 1992 to December 1997, 181 cases (32 IB, 23 IIA, 102 IIB, 3 IIIA, 21 IIIB) who survived more than 12 months after treatment and the long-term survivors should receive a minimum 3 years of follow-up, were entered in our study. Initially, they were treated with 10 MV X-rays for 44 - 45 Gy / 22 - 25 fractions over 4-5 weeks to whole pelvis. Radiation dose for patients with FIGO Stage IIB-III bilateral parametrial disease was boosted to 54-58 Gy, with a central shielding. After the completion of whole-pelvis radiotherapy, HDRICB was performed using an Ir-192 remote after-loading technique at one-week intervals. Fifty-one patients received three insertions, while 130 patients had four insertions. The prescribed dose for each HDRICB was 7.2 Gy to Point A for three insertions (before July 1995), or 6.0 Gy for four insertions (after July 1995). HDRICB dosimetry was calculated using orthogonal films exposed during each insertion. Doses to both ICRU and conventional rectal reference points were calculated for each patients. The overall duration of treatment ranged from 47-90 days (median, 60). Patient and treatment related factors were evaluated for late rectal complication using logistic regression model.

Results **:** Median follow-up of these patients was 58 months (range: 38-110 months). Forty-five patients (24.9%) had late rectal complications (27 Grade 1, 13 Grade 2, 5 Grade 3-4). The probability of rectal complications shows a better correlation of dose-response with increasing total brachytherapy ICRU rectal dose. Multivariate logistic regression analysis demonstrated a high risk of late rectal sequelae in patients who had Stage IIB-III disease (p = 0.002, relative risk, 3.66, 95% CI 1.82-6.45) and total ICRU rectal dose greater than 20 Gy (p = 0.005, relative risk, 1.62, 95% CI 1.03-3.21).

Received: 2002, 5, 14. Accepted: 2002, 8, 6.

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Conclusions : This study confirms the value of ICRU rectal reference point in the prediction of late rectal sequelae. Patients who have Stage IIB-III disease, or a total ICRU rectal dose greater than 20 Gy, have a higher risk of late rectal sequelae.
[Therapeut Radiol Oncol 2002; 9(1): 41-51]

Key words: Cervical cancer, Brachytherapy, Rectal sequelae, Radiation dose

INTRODUCTION

Radiotherapy (RT) plays an important role in the treatment of patients with carcinoma of uterine cervix. The treatment involves a combination of external beam irradiation (EBRT) and intracavitary RT (ICRT). High-dose-rate intracavitary brachytherapy (HDRICB) has been widely used in Asia, despite its questionable radiobiological disadvantage [9]. The risk of late rectal complications shortens the therapeutic window of the radiation treatment by EBRT plus HDRICB. In the analysis of the outcome of RT, it is important to assess not only local tumor control, but also the incidence of late sequelae caused by the treatment. Among such sequelae are rectal complications that include proctitis and fistulae [2, 16]. The risk factors of late rectal sequelae in patient undergoing definitive RT have been evaluated, including age, stage, EBRT dose, number of HDRICB treatments, point A dose and rectal dose.

There are two methods of calculation for rectal reference dose during ICRT. They are conventional and ICRU (International Committee on Radiotherapy Units and Measurements) reference points. The selection of conventional rectal points were determined by insertion of a radio-opaque plastic tube into the rectum, the point closest to the cervical orifice was selected as dose-point for conventional rectal reference dose. The ICRU rectal points were determined according to guidelines set out in Report 38 [12]. In the HDRICB series, there were some investigations to correlate the dosage of ICRU rectal point with the probability of rectal complications [3-6,14,16], but none have evaluated the role of conventional rectal doses, or compare the two points simultaneously.

This study aimed to compare the predictive value of ICRU and conventional rectal reference points with the risk of late rectal sequelae in patients with carcinoma of the uterine cervix treated by EBRT and HDRICB.

MATERIALS & METHODS

Patient selection

From September 1992 to December 1997, 255 patients with uterine cervical cancer completed RT at Shin Kong Memorial Hospital and China Medical Hospital. The enrolling criteria for dosimetric analysis were as following:

1) Patients had 3 or 4 sessions of HDRICB.

2) Patient who had 44 to 45 Gy of EBRT to pelvis (no central shielding).

3) Patients who survived more than 12 months after treatment and the long-term survivors had at least 3 years of follow-up.

4) Patients who underwent surgery as part of their initial therapy were excluded from this study.

Because the HDRICB rectal reference points usually received larger dose fractions than the external radiation dose, simple addition of two doses may not represent the cumulative effect [3]. To avoid the effect that higher EBRT may compromize the tolerance of rectum, only patients receiving uniform dose of EBRT to rectum (without central block) were enrolled in the current study.

A total of 181 cases (32 IB, 23 IIA, 102