

LETTER TO THE EDITOR

Chronic Kidney Disease after Myeloablative Allogeneic Hematopoietic Stem Cell Transplantation

To the Editor:

We read the article by Kersting et al [1] on chronic kidney disease after myeloablative allogeneic hematopoietic stem cell transplantation (HSCT) with great interest. The authors reported that 23% of the patients receiving a myeloablative conditioning regimen and total body irradiation (TBI) developed chronic kidney disease. The conditioning regimen consisted of cyclophosphamide (6 mg/kg/day for 2 days), followed by TBI (2×6 Gy in 2 days), with the kidneys shielded to 2×5 Gy. The dose rate was 9 Gy/h. Chronic renal disease after HSCT has been associated with TBI [2-4]. The dose of 2×5 Gy to the kidneys may have been beyond the tolerance dose for kidney failure.

Here we comment on the TBI dose and propose a TBI regimen that possibly could result in a lower frequency of renal disease, but still provide a high antileukemic effect.

Recently, we reviewed the literature, compared the results of treatments with various TBI regimens, and determined a dose-effect relationship for renal dysfunction after TBI [5]. For intercomparison, as used in radiotherapy, the various TBI regimens were normalized (using the linear-quadratic model), and the biological effective doses (BEDs) were calculated [6]. In this way, for each TBI regimen, the total dose, number of fractions, and dose rate could be included in a single BED value. We found a threshold BED of about 16 Gy for late kidney failure [5].

To prevent renal disease, the kidneys of the patients described by Kersting et al. [1] should have been shielded from 2×5 Gy (BED = 28.1 Gy) to 2×3.6 Gy (BED = 16.6 Gy). However, shielding will result in a lower BED not only of the shielded organ, but also of the leukemic cells present in the tissues in the shadow of the shielding block. The BED of the leukemic cells in the region shielded to 2×3.6 Gy was

only 9.1 Gy, whereas in the unshielded tissues it was 17.4 Gy.

With hyperfractionated TBI regimens, a relatively high BED for leukemic cells can be obtained, whereas shielding is relatively limited. For example, with a scheme of 6 fractions of 2.3 Gy given over 3 days at a dose rate of 9 Gy/h, the BED for leukemic cells is 16.6 Gy, and the BED of the kidney tissue is 26.0 Gy (with differences in BED values from tissue-specific parameters [5,6]). With shielding of the kidneys to 6×1.7 Gy, the resulting BED is 16.9 Gy; thus, the kidney dose reduction is only 26%. The BED for leukemic cells behind the shielding block remains 11.8 Gy. Thus, hyperfractionated TBI with proper shielding might be useful in preventing chronic renal dysfunction.

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Biology of Blood and Marrow Transplantation 13:1525 (2007)
doi:10.1016/j.bbmt.2007.09.005