Radiometabolic therapy at the Alessandria Hospital

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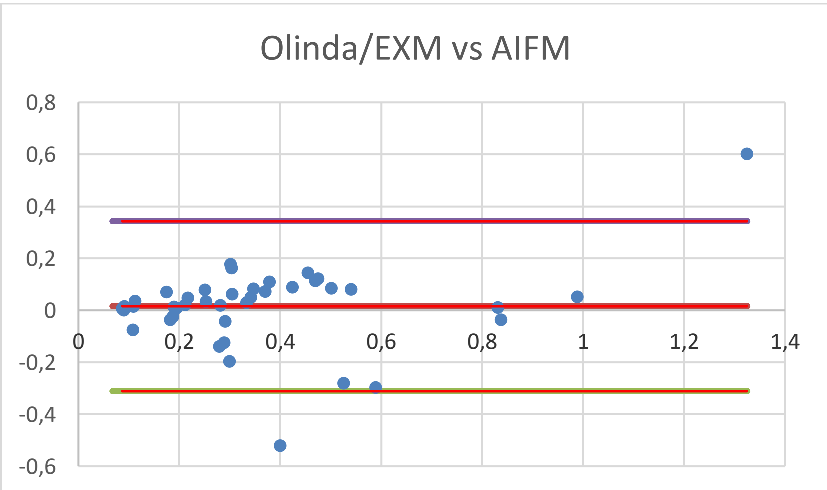
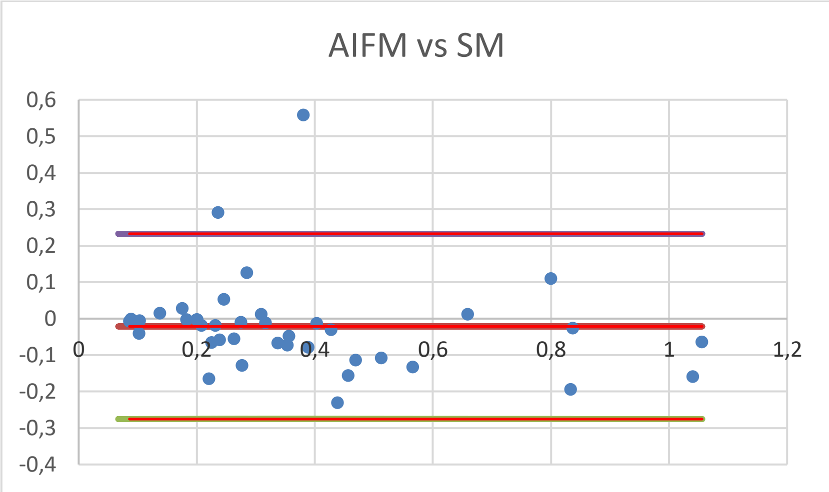
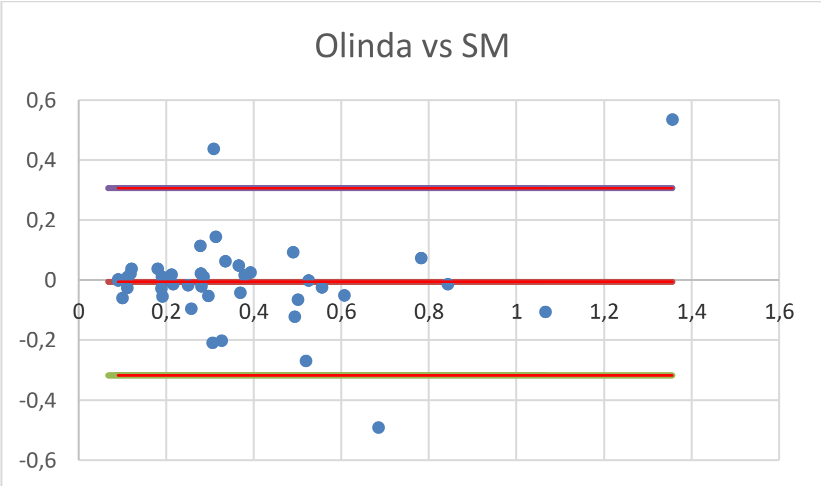
Purpose Red Marrow toxicity, due to the 2 Gy dose limit, restricts the ^{131}I activity used for the Thyroid cancer. To pass over the empirical fixed-activity method and to aim to an optimized dosimetric approach, suggested by the EU Directive 2013/59, the accuracy of dose calculation plays a fundamental role. To this purpose different methods were employed. The most used methods (OLINDA and AIFM) were compared with the one considered the least invasive for patients, involving a single external measurement of whole body retention 1 or 2 days after ^{131}I administration (SM). Aim of this study was to verify the agreement among these protocols.

Materials and Method Dosimetry was performed in this pilot study on 41 patients at SS Antonio e Biagio Hospital of Alessandria after the ^{131}I therapeutic administration (mean±dev.st, range) 4.2±2.7 GBq [1.2 ÷ 10.6 GBq]. Blood samples (2,24,48 and 96 h.) allowed the estimation of blood residence time (τ_{bl}), while residence times (τ_{WB}) were evaluated from whole-body measurements (@ 2,6, 12, 24,36,48 and 96 h). Using τ_{bl} and $\tau_{WB,}$ red marrow dose was estimated with OLINDA/EXM and AIFM methods. In SM the red marrow dose was estimated by a single whole-body measurement 24 or 48 hour after ^{131}I administration. Bland-Altman analysis were performed to evaluate the agreement among different methods

Results Average doses were 0.34±0.22, 0.32±0.22 and 0.33±0.21 with OLINDA, AIFM and SM methods respectively carefully respecting the 2 Gy dose limit. The bias, lower and upper LAs were [0.016; -0.32-0.36 Gy] when comparing OLINDA and AIFM, [-0.005; -0.32-0.31 Gy] when comparing OLINDA and SM, [-0.021; -0.28-0.23 Gy] when comparing AIFM and SM







Conclusions The SM provided bias and limits of agreement of the same order of magnitude of the ones obtained comparing the two reference methods for estimating red marrow dose. Based on this pilot study, a sample size of N=41 patients have been calculated in order to estimate the 95% confidence intervals for the upper and lower LAs of the red marrow dose within 10% of the mean red marrow dose observed in the sample. Should the results of this pilot study be confirmed in the definitive study including N=41 cases, the SM method could be considered as interchangeable with both OLINDA and AIFM methods concluding that the specific absorbed dose to the blood per unit of radioiodine administered to a thyroid carcinoma patient could be determined from a single total-body retention measurement.

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