

Evaluation of liver metastases from colon and rectal cancer



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Discussion

WHO, RECIST1.1 and 3D volumetry are the three criteria used for evaluation of liver metastases from colon and rectal cancer patients pre and post chemotherapy for evaluation of tumor and also for assessment of efficacy of the three standard criteria for oncology follow up by CT scan.

The study found that WHO, RECIST1.1 and 3D volumetry standard measurements for solid tumor evaluation exist to assess the consistency of the efficacy of chemotherapy on liver metastases patients. There is good agreement between the WHO standards and RECIST1.1 standard criteria as assessed and evaluated by statistics and shown in table 1 and table 2. The objective evaluation results Kappa value of 0.839, while the number of PR differ with each other. According to the WHO standard PR is 48, according to RECIST1.1 standard is 40, but the response rate is very close, according to the WHO standard is 42.48 percent and according to RECIST1.1 standard the response rate is 35.40% but PD% by WHO is 30.97% whereas PD% by RECIST1.1 is 38.05%. This difference is due to the measurement criteria of WHO and RECIST as WHO measures cross sectional area whereas RECIST measures the longest diameter. As for progressive disease WHO requires 25% increase in total areas whereas RECIST1.1 requires 20% increase in diameter or 5mm increment in baseline measurement of the tumor. The criterion for PD is not equivalent between the two systems as 20% in the diameter by RECIST is 44% increase in total cross sectional diameter of the tumor. According to our study there was no notable difference between the one dimensional and bidimensional measurement as CR, PR, SD and PD were very close. This comparative study between WHO and RECIST1.1 indicates <https://assignbuster.com/evaluation-of-liver-metastases-from-colon-and-rectal-cancer/>

that by WHO criteria, response rate of chemotherapy seems apparently higher and progressiveness of the disease is less compared to RECIST1.1. It can be concluded that WHO might have missed very small change or increment in size of tumor.

According to WHO and 3D standard measurements, $\kappa = 0.814$. The correlation efficacy has good agreement though less than that between WHO and RECIST1.1. WHO calculated PR as 48 and 3D volumetry calculated PR as 36. The response rate also differs. According to WHO standard the response rate (RR) is 42.48% and by 3D standard RR is 31.86% and PD% by WHO is 30.97% whereas PD% by 3D volumetric is 43.36%. Thus, there is also difference in the PD%. For any structure that alters in size volume change is usually larger than cross sectional area change. So, it would not be appropriate to compare the calculated volume measurement with 2D cross section area measurement. The difference between the fractional change (%) in volume is always less than 15% of the tumor mass that reduce uniformly in size. In this comparative study 3D study clearly shows low response rate of the chemotherapy with high progressive disease percentage (PD%) which WHO criteria has missed as WHO calculates the cross-sectional diameter of the tumor and changes in thickness or height of the tumor had been missed where the changes had occurred. This study proves the high effectiveness of three dimensional measurement upon WHO two dimensional study.

According to RECIST1.1 and 3D standard measurements, $\kappa = 0.919$. There was very good agreement compared to study of both these methods with WHO criteria. PR by RECIST1.1 is 40 and PR by 3D is also 36 thus the <https://assignbuster.com/evaluation-of-liver-metastases-from-colon-and-rectal-cancer/>

response rate between the two systems is also close. By RECIST1.1 RR is 35.40% and by 3D volumetry RR is 31.86% and PD% by RECIST1.1 is 38.05% and by 3D volumetry is 43.36%. Thus, the response rate and PD% as evaluated by recist1.1 and 3D is close but the difference occurred as the tumor we measured for the study is not nodular in shape. RECIST is study of change in longest diameter of tumor whereas by 3D volumetry the summation of the area along with the thickness (height) of tumor is also calculated. If the tumor is expected to be exactly cubical in shape then the difference would have been less as the change in tumor size detected by Recist would have been almost similar to that calculated by 3D manual measurement. But the metastatic tumor sizes vary in each case and response of tumor is also seen in different planes and different diameter. Human error should also be considered in these cases as all the measurements have been measured manually and in different time span so there is place for small mistakes in measurement. For RECIST1.1 criteria, for a disease to be progressive (PD) needs at least 20% increase in size or has to increase by 5mm either the tumor or in lymph nodes, but for a disease to be PD by 3D volumetry the overall volume of the tumor should increase by 44%.

According to this study, WHO and RECIST1.1 criteria are good for measurement of nodal masses and tumors of uniform shape. For non uniform larger masses 3D proves to be the best alternative for assessment and evaluation of tumor size as response to chemotherapy.

There are now many reports describing the feasibility of quantifying liver metastases tumor volumes with CT. Volumetric measurements of solid
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tumors can be accurate in the proper setting. The precision of measurement is continuously improving, and usually higher than for corresponding measurements of longest diameter. The sensitivity of volumetric for distinguishing measurement error and medically meaningful changes in tumor biology is dependent on context. The literature shows that the context is understandable, common, and relevant to areas where there are still intense needs for more sensitive biomarkers of response.

The semiautomatic and automatic measurements are more accurate and reproducible for larger tumors but they are time consuming compared to manual measurements by 1D, 2D and 3D. For semiautomatic and manual measurements according to WHO standards, kappa= 0. 933, with RECIST1. 1 standards Kappa= 0. 973 and with 3D volumetry standard kappa= 0. 986. Comparison of semiautomatic measurement with manual one-dimensional, two-dimensional and three dimensional measurements also shows good correlation and the small difference in the CR, PR, SD and PD value is due to the standard error by manual measurement. Even though the measurements are made by expert and experienced Radiologists, error occur due to long term follow up of the lesion. Small variation in the diameter may often be miscalculated by manual measurement especially in case of irregularly shaped tumors due to subjective variability in measurement technique. Thus, compared to manual measurements, semiautomatic measurements of the tumor is more specific by oncology software as it is more objective than subjective and less chance of variance, especially the components due to judgments made by the image analysts.

But the main disadvantage of semiautomatic measurement is more time consuming compared to manual measurement and more irregularly shaped lesion measured by semiautomatic measurement shows larger change in volume/area of the tumor than the real change. So, the use of semiautomatic or manual measurements needs to be chosen according to the shape of the lesion.

In our study, consistent replication in larger samples and whole clinical trials will be required to qualify the methodology; the findings suggest that volumes might be more precise than 1D and 2D as inputs for RECIST1. 1 and especially when tumor morphology and contrast are favorable. This study suggests that value is reproducible with a variety of software tools. Using volumes as the basis for RECIST should improve decision making, both in the care of individual patients and in the management of clinical trials. The increased sensitivity provided by whole tumor volumes could lead to an important paradigm shift.

RECIST 1. 1 Work Group alluded to a future state in which the variability in tumor measurements could be decreased by software tools that calculate the maximal diameter for a perimeter of a tumor [41]. In theory, demarcating the boundary of a mass on every slice so that it is visible, and then interrogating every slice to find the greatest distance between any two in-plane pixels, could improve both repeatability and reproducibility. It could eliminate some of the subjectivity in selecting the sole slice for measurement, decrease the judgment associated with how to draw the line, and reduce some of the factors that regulatory authorities have noted can adversely influence the placement of the calipers tips, such as display <https://assignbuster.com/evaluation-of-liver-metastases-from-colon-and-rectal-cancer/>

contrast, ambient room light, viewing angle, and others [42]. Moreover, although automation might not eliminate the variability associated with selecting the edge between neoplastic and normal tissue, it could stabilize the bias over time to facilitate the assessment of change.

Monitoring response of tumors to treatment is an integral and increasingly important function of radiologists working in oncological imaging. Imaging studies play a pivotal, objective role in quantifying tumor response to a variety of physical and pharmaceutical treatments. Objective tumor shrinkage has been widely adopted as a standard end-point to select new anti-cancer drugs for future study, as a prospective end-point for definitive clinical trials designed to estimate the benefit of treatment in a specific group of patients, and is widely used in everyday clinical practice to guide clinical decision-making. It is important to note that the RECIST and 3D manual measurement criteria still rely on size change of lesions to make response assessments. 3D and Recist acknowledges that tumor shrinkage may not be an appropriate end-point in the investigation of new cytostatic agents currently in phase 1 and 2 clinical trials. Thus, in this research by 3D criteria, enhanced CT scan can not only diagnose colorectal liver metastasis but can also follow up patient undergoing chemotherapy regarding the tumor response to the treatment. Thus these 3D manual measurement and RECIST criteria have important implications for imaging departments in cancer centers.

However, even with revised RECIST questions would still remain about how well any single line reflects the true tumor burden, particularly when the geometries of tumor masses are complex. Thus, many investigators have <https://assignbuster.com/evaluation-of-liver-metastases-from-colon-and-rectal-cancer/>

suggested that measuring the volume of the whole tumor could solve some of these problems and have clinically significant effects on patient management [10, 11]. Indeed, a few studies have shown that volumetric image analysis (VIA) can add value [12, 13]. However, technical problems have delayed the adoption of VIA. Historically, substantial amounts of effort in time and man power have been required for VIA. And some reports about the precision and accuracy of volume measurements have led to concerns that variability in volume measurements can be mistaken for medically meaningful changes, leading to errors in management.

Recent assessments of VIA technology are more optimistic . One reported suggested that intrarater and interrater variability can be as little as 1% when analyzing well-demarcated tumors with simple geometric shapes in a single image set. For more complex tumors, new algorithms can produce and inter rater measurements of change with reliabilities of about $\pm 5\%$ on serially acquired. If a high level of reproducibility can be regularly achieved, then for many tumor morphologies, VIA would be substantially more sensitive than the current practice of using relatively large changes in LDs. As encouraging as these results are, they do not directly address the question of whether VIA is a better method than LDs or automated measurements for managing individual patients with liver metastases or for making decisions in clinical trial settings. Also, most studies comparing the precision of LDs to VIA were done within single centers, were limited to three or fewer image analysts, and used manually placed electronic calipers to measure LD [41-43]

Accordingly, International investigations were designed as a proof-of-concept study. A head-to-head comparison between semi automated diameter measurements was conducted called auto-LDs, and VIA. With a small subset of the data from a multinational clinical trial of an investigational new drug in which image quality tends to be variable and often less than ideal. In conformance with current standards for evaluating novel diagnostic technologies value was defined as the theoretical potential for a method to have a unique and meaningful effect on clinical trials or on individual patient management. ^[46] Measurements were made to support or disprove several key hypotheses, which included these negative claims: inter rater reliability is higher for auto-LDs than whole tumor volumes, VIA fails more often than auto-LDs because not all tumors have adequately demarcated boundaries on every slice, VIA increases costs, effort, and the amount of time required to analyze the images but has no added impact on patient management when compared to auto-LDs.

Thus, compared to WHO criteria of cross sectional measurement and Recist1. 1 criteria of one dimensional measurement 3D measurement proves to be more precise and efficient. Even compared to semiautomatic measurements and VIA which are more costlier, time consuming and software dependent techniques three dimensional manual measurement to tumor is feasible.