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Editorial Open Access

Development of a Cancer Treatment with Low-Intensity Ultrasound

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In recent years, research on the usage of ultrasound for cancer treatment has developed and while high intensity focused ultrasound (HIFU, FUS) has already been clinically applied to several types of cancers, it is not yet considered as an established treatment. On the other hand, studies using ultrasound energy for cancer treatment have advanced, thus revealing the enhancement of drug effects by employing low-intensity ultrasound. Furthermore, anti-angiogenesis against tumors is now attracting attention as a new cancer treatment. Therefore, our research focused on the biological effects and the enhancement of drug effects brought by this low-intensity ultrasound energy and reported on the efficacy against a uterine sarcoma model, by implementing the basic studies, for the first time, including the concomitant use of low-intensity ultrasound irradiation, as an expected new antiangiogenic therapy for cancer treatment. Furthermore, we have succeeded in simultaneously utilizing low-intensity ultrasound in both diagnosis and treatment, upon real time evaluation of the anti-tumor effects and anti-angiogenesis effects using color Doppler ultrasound imaging [1].

The main biological effects of ultrasound energy are currently classified into 3 categories: 1) thermic effect, 2) cavitation effect, 3) non-thermic/non-cavitation effect [2]. Although these effects have not been completely clarified, it is believed that the biological effects of non-thermic and non-cavitation effects occur mainly with low-intensity pulse ultrasound irradiation. It was shown that transient stomas were formed "Sonoporation" in cancer cells irradiated by low-intensity ultrasound and it is believed that the penetration effect of drugs is enhanced due to the drug being more charged inside the cell through these stomas. Particularly because cancer cells definitely have more fragile cellular membranes compared with normal cells, the formation of stomas or lacunars is most likely to happen with low-intensity ultrasound [3,4]. Furthermore, it has become clear that the concomitant therapy of anti-angiogenesis drugs and low-intensity ultrasound blocks the angiogenic factor vascular endothelial growth factor (VEGF) produced by cancer cells, inhibits the induction of circulating endothelial progenitor cells in the bone marrow, and expedites angiogenic inhibitor thrombospondin-1 (TSP-1). Additionally, apoptosis induction by low-intensity ultrasound was clarified, which is a powerful biological effect that can be applied to cancer treatment. Results supporting apoptosis induction were also obtained in our study using a uterine sarcoma model, revealing it as an important biological effect, together with the enhancement effect of drug penetration in our method. Based on research achievements in recent years, we predict that the current diagnostic device for color Doppler ultrasound imaging will be improved in the near future, bringing with it the arrival of an age of "low-intensity ultrasound treatment that simultaneously enables diagnosis and treatment of cancer in real time".

Currently, an approach using a vaginal probe is commonly used for the ultrasonic diagnosis of pathological changes in the uterus. Though my personal opinion, in future ultrasound treatments, even without any manufacturing of new treatment equipment, altering current low-power diagnostic equipment to those of beam diagnostic systems may possibly make treatment available for early pathological changes in the uterine cervix. This approach is advantageous in that we can preserve the uterus, potentially allowing current invasive surgical therapy to be replaced by future ultrasound treatment. Due to the fact that the growth of uterine sarcomas, which are highly malignant, was suppressed even by a single low-intensity ultrasound irradiation in our experiments on animals, it is believed that it can be clinically applied to the treatment of cervical cancer. Furthermore, it is expected that the concomitant use of effective drugs could bring about a certain degree of success, even against advanced cancers.

References

1. Choijamts B, Tachibana K, Emoto M (2011) Metronomic irinotecan chemotherapy combined with ultrasound irradiation for a human uterine sarcoma xenograft. Cancer Sci 102: 452-459.
2. Suslick KS (1990) Sonochemistry. Science 247: 1439-1445.
3. Lejbkowicz F, Zwiran M, Salzberg S (1993) The response of normal and malignant cells to ultrasound in vitro. Ultrasound Med Biol 19: 75-82.
4. Tachibana K, Uchida T, Ogawa K, Yamashita N, Tamura K (1999) Induction of cell-membrane porosity by ultrasound. Lancet 353: 1409.

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