Facts about Artemisia in cancer treatment

Cancer remains as a life-threatening disease and a leading cause of death as its control has been difficult. Although a range of conventional therapies based on radiotherapy, chemotherapy and surgery are available, these approaches are in many cases of limited efficacy [1].
Development of new efficient therapeutics for the treatment of cancer is an important endeavor, but for most patients, access to these advanced treatment modalities is lacking, too expensive to be widely available, or associated with significant morbidity thereby further compromising the patients' survival. For this reason, Artemisia is of great interest. Multiple molecular studies have shown promising effects of *Artemisia* regarded to cancer and these findings are supported by positive results in human case-reports.

In 2015 *Das AK* reviewed 127 papers regarding antimalarial drugs effects, including artemisinins ability to kill cancer cells in molecular studies. Interestingly it was found that Artesunate impeded growth in severeal different cancer-cell-lines.

"*In a study, testing 55 cell lines, artesunate showed inhibitory effects against leukemia, colon, melanoma, breast, ovarian, prostate, central nervous system, and renal cancer cells "*[2]

These findings suggest that artemisinin compounds may be a therapeutic alternative in highly aggressive cancers, a theory which is supported by the following humane case-report findings.

Artesunate prevents recurrent colorectal cancer after resection

In 2004 *Krishna et al* compared treatment of oral artesunate (a derivate om artemisinin) with placebo. Both groups consisted of patients with colorectal cancer who were awaiting curative resection. One group received artesunate while the other group received placebo before resection. After resectioin development of recurrent colorectal cancer was registred. Interestingly it was found that less patients developed recurrent colorectal cancer in the group who received artesunate, compared to the group who received placebo.

"During follow up of 42 months 1 patient in the artesunate and 6 patients in the placebo group developed recurrent colorectal cancer"[3]

These results indicate that Artesunate may have a protective effect against recurring cancer.

Artesunate - prolongs life in patients with metastatic uveal cancer

In 2005 two patients diagnosed with eye-cancer spread to other organs (=metastatic uveal melanoma) were treated with a combination of artesunate and chemotherapy. Chemotherapy alone was ineffective in stopping tumor growth. Both patients

experienced an effect of the additional artesunate and one patient experienced a particularly good response.

"This patient is still alive 47 months after first diagnosis of stage IV uveal melanoma, a situation with a median survival of 2-5 months"[4]

Treatment with Artemether results in 1) reduction of tumorsize and 2) remission of symptoms, in patients with pituitary tumor

In 2006 *Singh et al* revealed beneficial effects of artemether (an Artemisinin analogue) in a 75- year old male patient presented with a pituitary benign tumor. Artemether was administered orally to the patient over a period of 12 months.

"CT scan showed a reduction in its density, and clinically, his symptoms (vision, hearing, and locomotion-related problems) resolved significantly as therapy progressed. Overall the artemether treatment was beneficial in improving the patient's quality of life."[5]

Beneficial effect of Artesunate in patients with lung cancer; Prolongs time to tumor progression and short-term survival

In 2008 *Zhang et al* compared the effect of artesunate combined with traditionally chemotherapy with chemotherapy given alone, in patients with lung cancer (NSCLC). Patients treated with additionally Artesunate showed advantageous outcome with elevated short-term survival and prolonged time to progression of the cancer. They concluded that artesunate can be used in the treatment of NSCLC.

"Artesunate combined with chemotherapy can elevate the short-term survival rate and prolong the time to progression of patients with advanced NSCLC without extra side effects."[6]

Artesunate reduces tumor size after only two months treatment

Another report describes the treatment of a laryngeal cancer patient. The patient had a progressed tumor with metastases in lymfnodes. Injections and tablets of Artesunate were administered to the patients over a period of nine months.

"The tumor was significantly reduced (by 70%) after two months of treatment."[7]

To sum up, analogues of - and derivates of - artemisinin have shown promising effects in cancer treatment, holding up hopes for patients diagnosed with cancer.

[1] Singh, N.P.; Panwar, V.K. Case report of a pituitary macro adenoma treated with artemether. *Integr. Cancer Ther.* **2006**, *5*, 391–394

[2] Das AK. Anticancer effect of antimalarial artemisinin compounds. Ann Med Health Sci Res 2015;5:93-102

[3] *Krishna S, Ganapathi S, Ster IC, Saeed ME, Cowan M, Finlayson C, Kovacsevics H, Jansen H, Kremsner PG, Efferth T, Kumar D (2015) A randomised, double blind, placebo-controlled pilot study of oral artesunate therapy for colorectal cancer. EBioMedicine 2:82–90*

[4] Berger TG, Dieckmann D, Efferth T, Schultz ES, Funk JO, Baur A, et al. Artesunate in the treatment of metastatic uveal melanoma – first experiences. *Oncol Rep* (**2005**) 14(6):1599–603.

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[7] Singh and Verma. Case report of a laryngeal squamous cell carcinoma treated with artesunate. Arch. Oncol, 10 (**2002**), pp. 279-280