

High energy shock waves (HESW) enhance 5- aminolevulinic acid and paclitaxel cytotoxicity in anaplastic thyroid cancer cells.

Author:

Maria Graziella Catalano¹, Laura Berta¹, Mariateresa Pugliese¹, Nicoletta Fortunati², Pietro Tizzani¹, Roberto Frairia¹

Institutions:

1) Department of Clinical Pathophysiology, University of Turin, Via Genova 3, Turin, Italy
2) Oncological Endocrinology, ASO San Giovanni Battista, Via Genova, 3 Turin, Italy.

Device and producing company:

Piezoson 100; Richard Wolf, Knittlingen, Germany

Introduction:

The use of paclitaxel for the treatment of anaplastic thyroid cancer (ATC) is under clinical investigation; it determines about 50% response rate, but it is not able to alter the fatal outcome of patients with this aggressive carcinoma. High energy shock waves (HESW) have been shown to cause a transient increase in the permeability of cell membranes thus allowing higher intracellular drug concentrations. 5-Aminolevulinic acid (ALA), a precursor of the endogenous photosensitizer protoporphyrin IX, is used in the photodynamic therapy (PDT) of cancer. HESW are under evaluation for their use as activator in ALA-PDT.

The aim of the present study was to investigate the effect of HESW produced by a piezoelectric generator on anaplastic thyroid cancer cells' viability and sensitivity to paclitaxel and ALA.

Methods:

Two different anaplastic thyroid cancer cell lines (ARO and CAL-62 cells) treated sequentially with ALA and paclitaxel were exposed to HESW. After treatment, cell viability and apoptosis induction were evaluated.

Results:

Combined exposure to ALA, paclitaxel and shock waves resulted in a significant enhancement of cytotoxicity and induction of apoptosis in thyroid cancer cells with respect to cells treated with paclitaxel alone.

Discussion:

HESW enhances cytotoxicity of paclitaxel and activates ALA-PDT, inducing cell damage. Moreover, the combined treatment with ALA, HESW and paclitaxel results in a further increase of cell death.

Conclusion: These data suggest the possibility to use HESW and ALA in combination with paclitaxel as a new promising therapy in the treatment of anaplastic thyroid cancer.