Experimental Studies of Photo Radiation Therapy (PRT) on the Neuroblastoma

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Neuroblastoma is the most common malignant tumor occurring in infancy and childhood. Because of its highly invasive characteristics and metastatic tendency, its eradication has caused considerable difficulty. The prognosis of the advanced stages of neuroblastoma still remains unsatisfactory. An experimental studies of Argon-dye laser photo radiation therapy combined with hematoporphyrin derivatives (HpD) on the neuroblastoma has been initiated. It is hoped that some methodology will be developed for the clinical application of the PRT on Neuroblastoma.

Materials and Methods:

C-1300 mouse neuroblastoma (uncloned, mainly cholinergic) was implanted on the back of A-Jack mice using sterile technique. Ten to fourteen days old non-ulcerated tumors were treated in this study after they had reached, on average, 7x7x4 mm in size. They were treated using a Coherent Innova-CR59 laser delivered to the treatment site using a 400 m quartz fiber. Doses of light of up to 500 joules delivered at a rate of 2 Watt/cm² were used. Rhodamine 610 or LC 6200 were used for the dye. The dosage of HpD was given 50mg/Kg/Wt. HpD was injected into the mice intraperitoneally 24 and 48 hours (one shot) before dye laser irradiation. The effects of PRT was evaluated with light and electron microscopic findings and cytological findings.

Results:

1) The absorption of Hpd by neuroblasts were detected using N₂ dye laser (wavelength:530mm). The blue fluorescence emanated from tumor surface was observed through the image intensifier (Fig. 1).

2) Massive necroses of the neuroblasts were observed by the light microscopy. Neuroblasts, however, spared necrosis from the laser injury. The swelling of the cytoplasm and the pyknosis
of the nucleus were noted in these cells (Fig. 2).

3) The ruptures of cell and nuclear membranes, the swollen mitochondrias and dispersed ribosomes were observed by electron microscope. There were also minimal changes in lysosomes, neurites of the neuroblasts (Fig. 3).

4) The administration of the HpD alone did not accomplish the supression of the tumor growth. The growth curve was almost similar to those of controls. The supression of the tumor growth, however, was attained by PRT in the two of the three cases.

Fig. 1, Laser Fluorescence by N₂ dye laser.

Fig. 2, Islets of neuroblasts after PRT.

Fig. 3, Electron microscopic findings of the neuroblasts after PRT.

Fig. 4, Growth Curve