TREATMENT of RADIODERMATITIS by VASCULAR ENDOTHELIAL GROWTH FACTOR LOADED POLY-LACTIC-CO-GLYCOLIC ACID MICROSPHERES

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Objective
Radiation injury deteriorates the elasticity and quality of tissue. The dermal component of the skin is affected and the diameter and the count of the vascular structures in the dermis are decreased after the irradiation. Thus the irradiated tissue sites are prone to bruising and development of open wounds. The surgical repair of irradiated tissue is a challenging problem. Vascular endothelial growth factor treatment for different types of injuries were reported. The effects of VEGF loaded microspheres over the tissue damage at the radiotherapy zone have not been studied before. In this study the effects of VEGF treatment on the radiodermatitis is investigated.

Materials and Method
Left hind leg of the 16 rats were irradiated with a single fraction of 25 Gy dose for achieving radiodermatitis. Two weeks after the irradiation 8 of the rats in the experiment group were treated with subcutaneous injection of vascular endothelial growth factor (VEGF) loaded poly-lactic-co-glycolic acid (PLGA) microspheres. VEGF-loaded PLGA microspheres were spherical in shape and exhibited porous surface morphology. The mean particle size of microspheres was found to be 111±14.5 µm. Controlled release of VEGF was achieved during a 30-day period (Fig. 1).

8 rats in the control group were treated with the same amount of blank PLGA microspheres. Three weeks after the treatment the tissue samples were collected.

Figure 1: Electronmicroscopic appearance of the microspheres.
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Materials and Method
Animals were irradiated, in the supine position with a field size of 3x3 cm at the left hind leg with a 6 MV Electron with linear accelerator unit at a source-skin distance of 100 cm (Fig.2,3). For achieving radiodermatitis, a single fraction of 25 GY dose with 0.5 cm bolus.
Two weeks after the radiotherapy VEGF loaded PLGA microspheres were injected subcutaneously to the experimental group. Control group was treated in the same manner except that Blank microspheres were injected subcutaneously.
Three weeks after the treatment the biopsies were taken.
The tissue samples were stained with HE and CD31 (Fig.4,5). Radiotherapy skin samples were investigated under 40X magnification at 10 zones for vascular count
The dermal thickness: Starting from epidermis to subcutaneous fat
Total subcutaneous tissue thickness: Starting from epidermis to panniculus carnosus
The ratio of the dermis for the groups were compared.
RESULTS

The biopsy materials were investigated for the vascular count and dermis amount in the tissue. The vascular count and the dermis proportion in the experimental group were statistically significantly higher than the untreated control group.

CONCLUSION

The controlled release treatment of VEGF from the PLGA microspheres could efficiently consolidate the dermal component of the skin in the irradiated tissue site. The vascular count of the irradiated tissue in the experiment group was also higher than the untreated control group. The treatment of irradiated tissue by the application of VEGF loaded PLGA microspheres seems to be an efficient treatment modality for radiation injury and radiodermatitis.

In conclusion vascular count and dermal thickness evaluation results of this study confirms that VEGF loaded microsphere treatment has a statistically significant benefit on the radiotherapy applied skin zone (Fig 8,9).

REFERENCES