THE PHAGOCYTIC FUNCTION OF REGENERATED SPLENIC TISSUE

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Abstract

The phagocytic function of regenerated splenic tissue has been studied to determine its potential for protection against overwhelming post-splenectomy infection.

An *in vivo* model was established in rats. Splenic autotransplantation was performed and the ability of the regenerated splenic tissue to phagocytose a radiolabelled colloid was investigated and compared to normal controls and spleens which had been rendered avascular by ligation. Autotransplanted and devascularised spleens regenerated and increased in weight over the following 3 months, and did not further increase in weight over the next 3 months. Technetium-99m stannous fluoride colloid was injected *i.v.* into the rats which were allowed 3 to 15 months to recover after surgery, colloid was measured in splenic tissue in all surgical groups. Both forms of regenerated splenic tissue demonstrated only 10% of uptake when compared to normal controls. When the uptake per gram of splenic tissue was calculated to allow for differences in splenic weight, the regenerated spleens recorded only 20% of normal splenic clearance. Autoradiographic and *i.v.* colloidal carbon studies isolated uptake of colloid to the inner layer of the marginal zone. Digitiser measurement of the size of the marginal zone in all groups demonstrated significant reduction of this compartment in regenerated splenic tissue and a direct correlation between the amount of marginal zone and the phagocytosis of radiolabelled colloid was identified.

Phagocytosis by regenerated and normal splenic tissue of rat red blood cells coated with rabbit anti-rat red blood cell IgG was studied. Normal splenic tissue cleared 10 times more red cells but on a per gram basis there was no significant difference. Autoradiographic studies identified the red pulp as the region for uptake of the red cells. Digitiser measurement of this compartment demonstrated a significant increase of this compartment in regenerated splenic tissue and a direct correlation between the amount of red pulp and the phagocytosis of radiolabelled red cells was identified.

Histological examination of regenerated splenic tissue demonstrated a significant reduction in the amount of white pulp and marginal zone. In addition, a central arteriole was often absent in those areas of white pulp that were present.

The vascular supply of autotransplanted spleens was studied using methyl methacrylate corrosion casting. The vasculature of the transplants were abnormal with dilation of the red pulp cords. Areas of white pulp and marginal zone were rare and the capillary system traversing these was also abnormally dilated. Central arterioles were rarely found.

The marginal zone was studied using immunohistochemical stains. It was abnormal with the thin inner layer of $\mu^+\delta^+$ B lymphocytes and outer layer of $\mu^+\delta^-$ B lymphocytes invariably replaced by a narrow, single layer of $\mu^+\delta^-$ cells. A significant reduction in the T cell region within regenerated spleens was also noted with white pulp reconstituted by predominantly B cells.

These studies on the phagocytic function of regenerated splenic tissue indicate that this form of spleen has markedly reduced phagocytic function due to abnormal cellular regeneration with disorganisation of the lymphoid compartments, principally impaired white pulp and marginal zone reconstitution in association with an abnormal blood supply.