Increased total serum IgE concentration in patients who have undergone splenectomy after trauma

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SUMMARY Serum immunoglobulin and complement concentrations were evaluated in 20 patients who had undergone splenectomy after trauma. The concentrations of IgE and IgA in the patients were significantly increased compared with those in controls. The IgE values were not correlated with the time after splenectomy or IgA, IgG, IgM, IgD, C3, and C4 values.

Different clinical conditions, including parasitic diseases, liver cirrhosis, neoplasia, β thalassaemia, and other disorders, seem to influence total serum IgE concentrations in non-atopic subjects.^{1–6} We found a considerable increase of IgE in the serum of patients who underwent splenectomy after trauma and in whom there was no evidence of previous immunological or haematological abnormalities. This observation was made during a comprehensive study of the effect of splenectomy on humoral immune responses.

Material and methods

All patients studied had undergone splenectomy after trauma five to 89 months earlier (mean 38.2 months). The group consisted of 20 male patients aged 7–76 years (mean 29.3 years). In none of the patients was there evidence of immunological or haematological dysfunction before the operation. Patients were not positive for hepatitis B surface antigen, suffering from atopic or parasitic diseases, or receiving immunosuppressive drugs or pneumococcal vaccine when investigated. Twenty healthy volunteers matched for age and sex and tested in parallel to the patients served as normal controls.

DETERMINATION OF SERUM IMMUNOGLOBULIN AND COMPLEMENT VALUES

IgG, IgA, IgM, and IgD, as well as C3 and C4 values were determined by kinetic nephelometry using a Beckman analyser rate nephelometer. Total

serum IgE values were measured by an enzyme immunoassay method using commercial kits (Enzygnost-IgE, Behring).

The following statistical methods were used to analyse the various results: arithmetical mean and standard error (SE); Student's *t* test; and correlation coefficient for linear regression.

Results

The Table shows that serum IgE and IgA values after splenectomy were higher than those in the controls ($p < 0.01$ for IgE, and $p < 0.02$ for IgA). In contrast, serum IgG, IgM, IgD, C3, and C4 showed no significant changes (Table). Linear regression analysis indicated that IgE concentration was not correlated with the concentration of IgA, IgG, IgM, IgD, C3, and C4 or with the months elapsed after splenectomy.

Discussion

Several studies have shown that splenectomy is associated with changes in both humoral and cell mediated immunity, including decreased serum IgM

Mean (SE) immunoglobulin and complement values in patients who have undergone splenectomy and controls

	Patients (n = 20)	Controls (n = 20)	p
IgE (IU/ml)	207.30 (43.14)	76.05 (20.61)	< 0.01
IgA (mg/100 ml)	279.70 (23.53)	194.60 (21.68)	< 0.02
IgG (mg/100 ml)	1502.30 (93.80)	1283.65 (93.49)	NS
IgM (mg/100 ml)	124.10 (14.88)	171.80 (16.10)	NS
IgD (mg/100 ml)	8.12 (1.46)	7.25 (0.56)	NS
C3 (mg/100 ml)	82.40 (4.22)	83.15 (2.33)	NS
C4 (mg/100 ml)	33.35 (2.07)	29.85 (1.35)	NS

concentrations,⁷⁻⁹ raised serum IgA concentrations,^{7 10 11} and an increase in the absolute numbers of total peripheral blood lymphocytes and T and B cells.^{9 12} We were able to show a significant increase in total serum IgE concentrations in our patients.

As the observed changes in immune responses after splenectomy can depend on the underlying disease we excluded patients who had undergone splenectomy because of haematological disorders and limited our study to patients whose spleens were removed because of trauma. Our results confirm the postsplenectomy increase in the concentrations of IgA. Changes in IgM concentration, however, were not consistently noted in this study.

Little is known about the effect of splenectomy on the production and kinetics of IgE. Okumura and Tada¹³ and Vierucci *et al*⁶ found that splenectomy caused a significant enhancement of IgE formation in adult rats and patients with β thalassaemia, respectively. They suggested that the spleen has a role in regulating the synthesis of IgE. The nature of this regulatory activity of the spleen, however, remains obscure.

Our results show a substantial increase in the concentration of IgE in the serum of patients who have had a splenectomy after trauma and indicate that, whatever role the spleen may have in regulating the synthesis of IgE, its removal is a further factor influencing total serum IgE values.

References

- ¹ Bennich H, Johanson SGO. Structure and function of human immunoglobulin E. *Adv Immunol* 1973;11:1-55.
- ² Blöndal T, Nöu E. Circulating IgE levels in patients with bronchial carcinoma. *Br J Dis Chest* 1981;75:77-80.
- ³ Kojima S, Yokogawa M, Tada T. Raised levels of serum IgE in human helminthiasis. *Am J Trop Med Hyg* 1972;21:913-8.
- ⁴ Peters CJ, Johnson KM. Serum immunoglobulin levels in Australia antigen positive and Australia antigen negative hepatitis. *Clin Exp Immunol* 1972;11:381-91.
- ⁵ Schlegel G, Lüthgens M. Serum-IgE-Spiegel bei Tumorerziden im HNO-Bereich. *Tumor Diagnostik* 1980;2:101-6.
- ⁶ Vierucci A, De Martino M, Rossi ME, *et al*. Raised IgE levels in β -thalassaemia: correlation with splenectomy and hepatitis B virus infection. *Clin Exp Immunol* 1984;58:199-205.
- ⁷ Andersen V, Cohn J, Sörensen SF. Immunological studies in children before and after splenectomy. *Acta Paediatr Scand* 1976;65:409-15.
- ⁸ Drew PA, Kiroff GK, Ferrante A, Cohen RC. Alterations in immunoglobulin synthesis by peripheral blood mononuclear cells from splenectomized patients with and without splenic regrowth. *J Immunol* 1984;132:191-6.
- ⁹ Winkelmeyer M, Littmann K, Thraenhart O, Tichy G, Kuwert EK, Eigler FW. Veränderungen des humoralen und zellulären Immunsystems nach Splenektomie. *Klin Wochenschr* 1981;59:485-93.
- ¹⁰ Schumacher MJ. Serum immunoglobulin and transferrin levels after childhood splenectomy. *Arch Dis Child* 1970;45:114-7.
- ¹¹ Wasi C, Wasi P, Thongcharoen P. Serum immunoglobulin levels in thalassaemia and the effects of splenectomy. *Lancet* 1971;ii:237-9.
- ¹² Millard RE, Banerjee DK. Changes in T and B blood lymphocytes after splenectomy. *J Clin Pathol* 1979;32:1045-9.
- ¹³ Okumura K, Tada T. Regulation of homocytotropic antibody formation in the rat. III. Effect of thymectomy and splenectomy. *J Immunol* 1971;106:1019-25.

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