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*Short communication*

# Serum L-selectin and P-selectin levels in lymphomas

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**Abstract**—The migration of normal and malignant lymphoid cells is governed by specific adhesion molecules. Selectins comprise a family of adhesion receptors expressed by leukocytes, platelets and endothelial cells. In this study, the serum levels of soluble L-selectin and P-selectin were measured in patients with non-Hodgkin's lymphoma and Hodgkin's disease and found to be significantly elevated in both patient groups compared to healthy controls. This result provides evidence that alterations in the expression and function of adhesion molecules may play an important role in the progression of lymphomas. Further studies are awaited to establish the exact roles of these adhesion molecules in distinct patterns of growth and spread of lymphomas.

*Key words*: L-selectin; P-selectin; Hodgkin's disease; non-Hodgkin's lymphoma.

## INTRODUCTION

Adhesion of lymphocytes to endothelium is essential in lymphocyte trafficking [1, 2]. Lymphocytes migrate from the circulation by selective attachment to specialized endothelial cells lining the postcapillary high endothelial venules (HEV) in organized lymphoid tissues, lymph nodes and Peyer's patches. Selectins comprise a family of adhesion molecules which have been demonstrated to participate in the initial tetherting/rolling of leukocytes on activated endothelium [3]. L-selectin (CD62L, LAM-1, LECAM-1) mediates the binding of lymphocytes to HEV of peripheral lymph nodes through interactions with corresponding endothelial ligand and therefore also known as the lymphocyte homing receptor [4]. P-selectin (CD62P, PADGEM, GMP-140) is stored both in the alpha granules in platelets and Weibel-Palade bodies of endothelial cells [5] and involved in the stabilization of

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platelet aggregates and in the interaction of leukocytes with activated platelets or endothelial cells [6].

Lymphoma cells represent immortalized counterparts of normal lymphocytes. A similar adhesion mechanism is also utilized by malignant lymphoid cells during dissemination [7, 8]. Altered expression patterns of adhesion molecules appear to be involved in the spread of lymphoid malignancies and Hodgkin's disease (HD) [7–10]. In this study, serum levels of soluble L-selectin and P-selectin were determined in patients with HD and non-Hodgkin's lymphoma (NHL) and in normal healthy individuals.

## PATIENTSANDMETHODS

The study group consisted of 17 patients (10 NHL, 7 HD; 11 men, 6 women; median age 35 years, range 19–70) and 15 healthy volunteers (11 men, 4 women; median age 49 years, range 36–67). Out of 10 NHL patients, 5 were classified as lowgrade, 1 intermediate, and 4 high-grade according to the Working Formulation. Four patients out of 7 with HD had mixed cellularity, 1 nodular sclerosis, and 2 lymphocyte predominance type. Staging was performed according to the Ann Arbor system. In NHL, 2 patients had stage III and 8 patients had stage IV disease, and in HD 1 patient had stage II, 2 stage III, and the remaining 4 stage IV disease. All patients with HD and 3 out of 10 with NHL had B-symptoms. Serum L-selectin and P-selectin levels were determined using a commercially available ELISA kit (Bender MedSystems, Vienna, Austria) according to the manufacturer's instructions. Data are presented as mean ± SD. Mann–Whitney U test was used for statistical analysis.

## RESULTS

Adhesion molecule levels were significantly higher in lymphoma patients compared to healthy controls (Table 1) (Fig. 1). Serum levels of sL-Selectin (1137 ± 428 ng/ml vs 625 ± 159 ng/ml; $p = 0.0023$ and sP-Selectin (610 ± 211 ng/ml vs 178 ± 48 ng/ml; $p = 0.0001$) were significantly increased in patients with non-Hodgkin's lymphoma compared to the control group. In HD, serum soluble L-selectin (1140 ± 498 ng/ml; $p = 0.0082$) and P-selectin (875 ± 370 ng/ml; $p = 0.0002$) concentrations were significantly elevated also compared to healthy controls (625 ± 159 ng/ml and 178 ± 48 ng/ml for L-selectin and P-selectin, respectively).

## DISCUSSION

Disseminating malignant lymphoma cells and lymphocytes share several characteristics, including migration and extravasation involving adhesive interactions [7, 8].



**Table 1.**
Serum soluble P-selectin and L-selectin levels in the study group

| Patients | P-selectin (ng/ml) | | p* | L-selectin (ng/ml) | p* |
|---|---|---|---|---|---|
| HD | 875 | 370 | 0.0002 | 1140 | |
| HNL | 610±211 | | 0.0001 | ± 498 | 0.0082 |
| | ± | | | ± 428 | 0.0023 |
| | ± | | | ± 159 | |
| | | | | 1137 | |
| Controls | 178 | 48 | | 625 | |

* Compared with healthy controls.

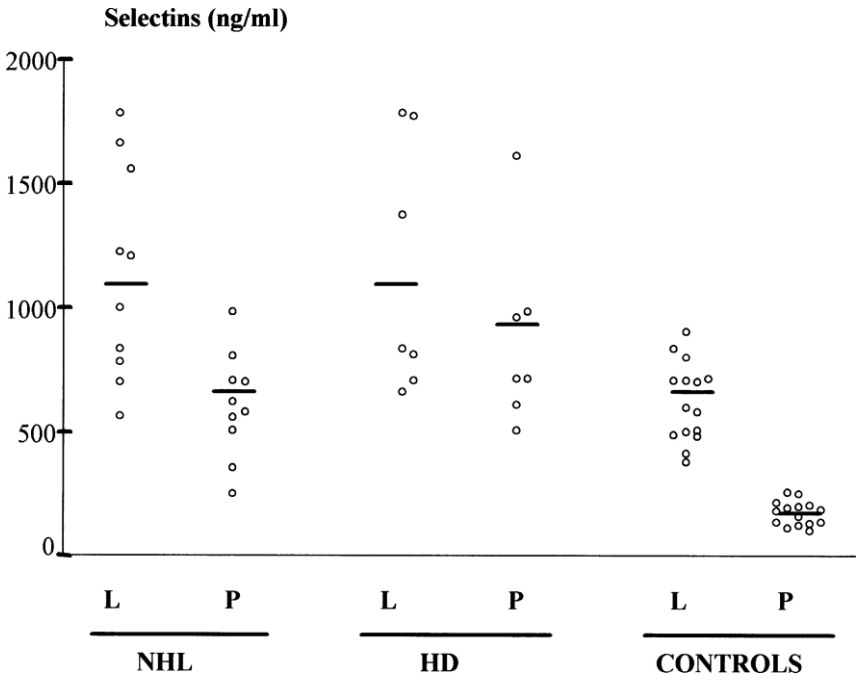


**Figure 1.** Circulating soluble P-selectin and L-selectin levels in the study group.

Emerging evidence indicates that the adhesion molecules governing the homing of normal lymphocytes also mediate the dissemination of their neoplastic counterparts. Adhesion molecules have also been demonstrated to function in the

spread of HD [9, 10]. Therefore, we determined serum levels of soluble adhesion molecules, L-selectin and P-selectin as indicators of distinctive clinical and biological behaviour of lymphoid malignancies. In this report we demonstrated that serum concentrations of these adhesion receptors are increased in patients with HD and NHL. Our results confirm and extend data published previously on the role of distinct adhesion molecules in lymphomas. Elevated levels of circulating intercellular adhesion molecule-1 were reported in various hematologic malignancies including HD [9, 10], acute lymphoblastic leukemia [10], chronic lymphocytic leukemia [11] and NHL [12, 13], and non-hematologic malignancies [10, 13]. To our knowledge,



this report is the first investigating the levels of circulating L-selectin and P-selectin in NHL and HD.

Differential expression of these adhesion molecules may account for diverse patterns of growth and dissemination of lymphomas. The study of adhesion molecule expression and function may allow a better understanding of the malignant behavior of lymphoid cells. Our data need to be validated and extended in a more homogenous patient series in order to elucidate the clinical and prognostic significance of L-selectin and P-selectin in lymphomas.

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