

Analysis of correlation between ECP, IgE, allergic hypersensitivity and eczema severity in atopic dermatitis and non-atopic eczema

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❖ LEARNING OBJECTIVE

- This study aimed to identify the biomarker characteristics of AD, Allergic Contact Dermatitis (ACD), and Nummular Eczema (NE) by studying allergy tests and their correlation with eczema severity.

❖ TAKEAWAY MESSAGE

- In extrinsic AD, both total IgE and the level of sensitization were directly proportional to disease severity. In NE, eczema severity showed a positive correlation with ECP, highlighting the role of eosinophilic inflammation in its pathogenesis.

❖ CONFLICT OF INTEREST: NONE

Background

❖ Biomarkers in atopic dermatitis (AD)

- **Biomarkers in AD** are crucial for **diagnosing** and **monitoring progression**, and **advancing our understanding** of its underlying mechanisms.

Biomarkers correlating with clinical severity		Biomarkers of inconsistent correlation with severity	
Eosinophil activation markers (e.g. ECP..)	markers related with allergy	Serum total IgE	elevated in AD, but correlation with severity is on debate
IL-13	the key Th2 marker	Predictive biomarkers	
IL-22	the key Th22-related cytokine	Dipeptidyl peptidase-4	potential response biomarker for IL-13 inhibition
CCL17/CCL26/CCL27/CCL22	Th2-related chemokines	CXCL9/CXCL2	treatment-specific predictive biomarkers for cyclosporine/dupilumab

Table 1. Various biomarkers in atopic dermatitis

❖ Biomarkers in non-atopic eczema

Chronic hand eczema (CHE)		Allergic contact dermatitis (ACD)	Nummular eczema (NE)
Immunity type	Th1 ↑, Th2 ↑	hapten-specific	Th2 ↑, Th17 ↑
Correlating with severity	CCL17/CCL13 (Th2 markers) CXCL11, MCP-2, MCP-4, MMP12	tissue VEGF	

Table 2. Various biomarkers in non-atopic eczema

Methods

❖ Retrospective study

❖ Patients

- 103 patients with AD and 53 patients with non-atopic eczema at the Pusan National University Hospital (Busan and Yangsan)
- Patients were divided into subgroups based on clinical manifestations and laboratory findings

AD		Non-atopic eczema	
(based on Hanifin-Rajka criteria)		-	
Intrinsic AD	Extrinsic AD	Allergic contact dermatitis (ACD)	Nummular eczema (NE)
IgE < 200 kU/L IgE ≥ 200 kU/L		typical lesions at the site of contact with an allergen of positive patch test	typical itchy discoid eczematous lesions

❖ Assessment

- Eczema area and severity index (EASI) and body surface area (BSA)
- Total Immunoglobulin E (IgE)*
- Eosinophil cationic protein (ECP)†
- Multiple allergen simultaneous test (MAST)‡
: the results ranged from 2+ to 6+, and the sum of the values was presented as “the level of sensitization.”

*measured by *CLIA (Chemiluminescent Immunoassay); †FEIA (Fluorescence enzyme immunoassay), ‡IB (Immunoblot) assay

❖ Statistical analysis

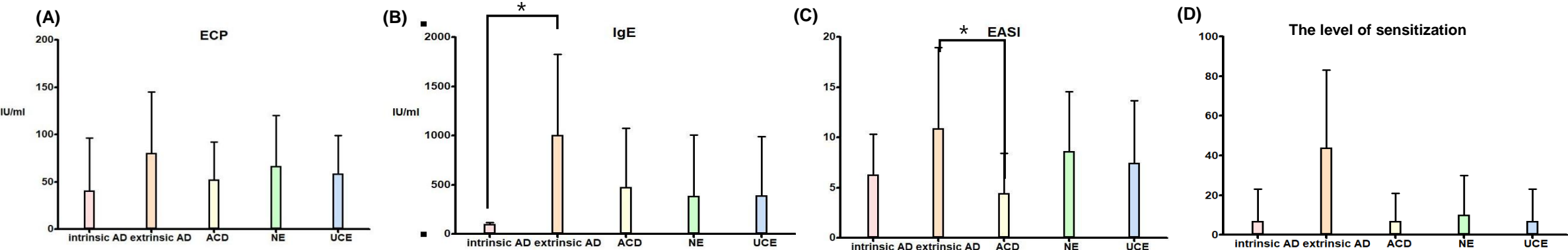
- SPSS software version 26.0, SPSS, USA
- The Student t test / Pearson correlation coefficients
- P-value < 0.05: statistically significant

Results

❖ Demographics of AD patients and non-atopic eczema patients

Parameter	Patients with AD (N=103)	Patients with non-atopic eczema (N=56)	Parameter	Patients with AD (N=103)	Patients with non-atopic eczema (N=56)	p-value
Subgroup, n(%)			Male, n (%)	68 (66.0)	26 (46.4)	0.363
Intrinsic AD	12 (11.7)	0 (0)	Age (yr)	17.1 ± 10.3	30.2 ± 22.1	<0.001
Extrinsic AD	91 (88.3)	0 (0)	EASI, mean±SD	10.4±7.8	7.0±5.6	0.002
ACD	0 (0)	21 (37.5)	BSA, mean±SD	8.5±5.2	5.1±6.9	<0.001
NE	0 (0)	35 (62.5)	Total IgE (IU/mL), mean±SD*	891.5±832.8	422.1±604.6	<0.001
<div><div>No significant differences among the subgroups excluding some exceptions</div><div>- total IgE between intrinsic and extrinsic AD</div><div>- EASI between extrinsic AD and ACD</div><div>- The level of sensitization in extrinsic AD</div></div>			ECP, mean±SD	76.0±64.3	61.5±48.8	0.121
			The level of sensitization, mean±SD	35.2±42.0	10.7±20.6	0.001

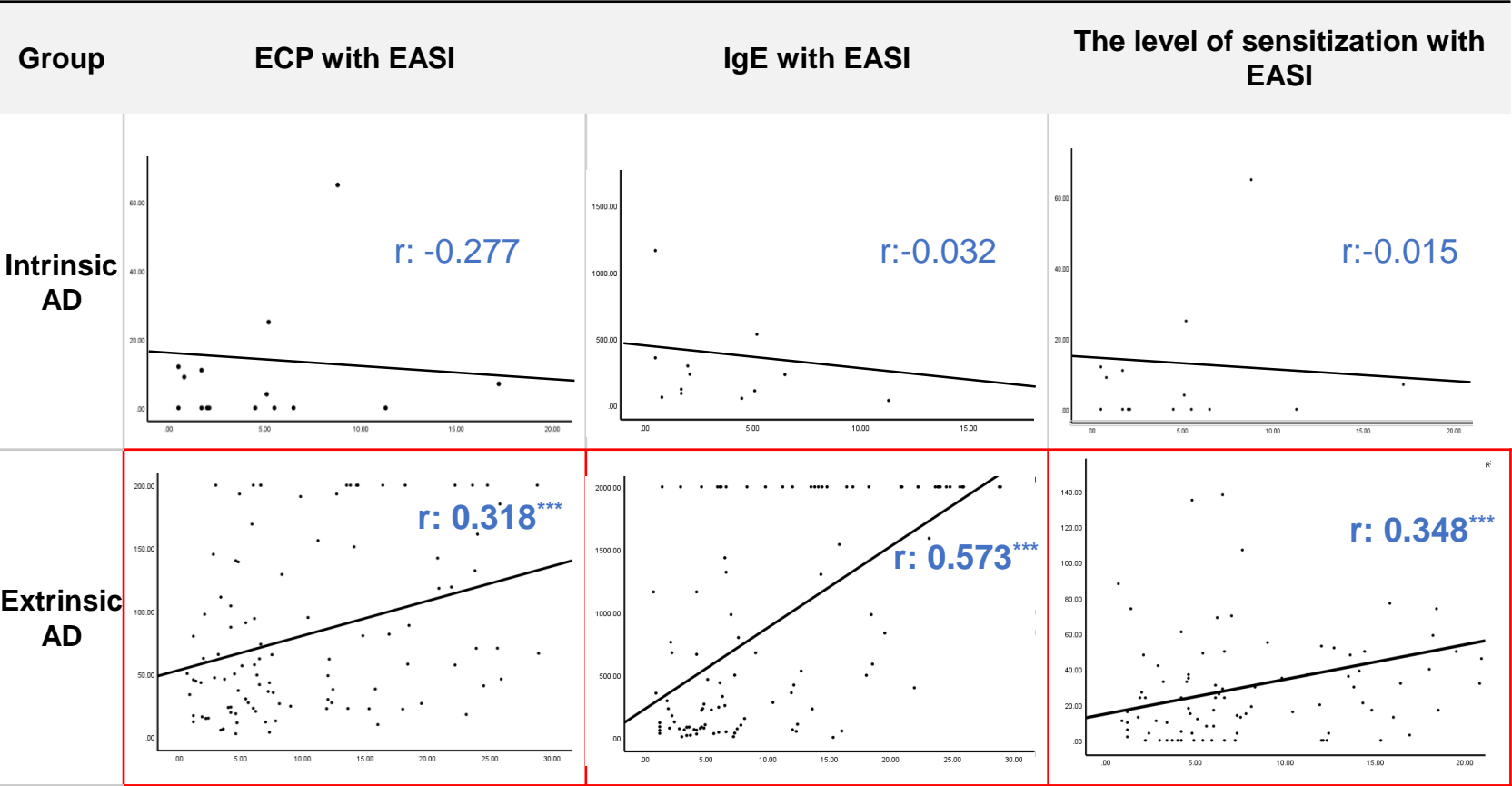
❖ Comparison of ECP (A), total IgE (B), EASI (C), and the level of sensitization (D) among subgroups



*Statistically significant value: $p < 0.05$ AD: atopic dermatitis; ACD: allergic contact dermatitis; BSA: body surface area; ECP: eosinophil cationic protein; IgE: immunoglobulin E; EASI: eczema area and severity index; NE: nummular eczema

Results

❖ Correlation coefficients for the relation of ECP, total IgE and the level of sensitization with eczema severity in AD



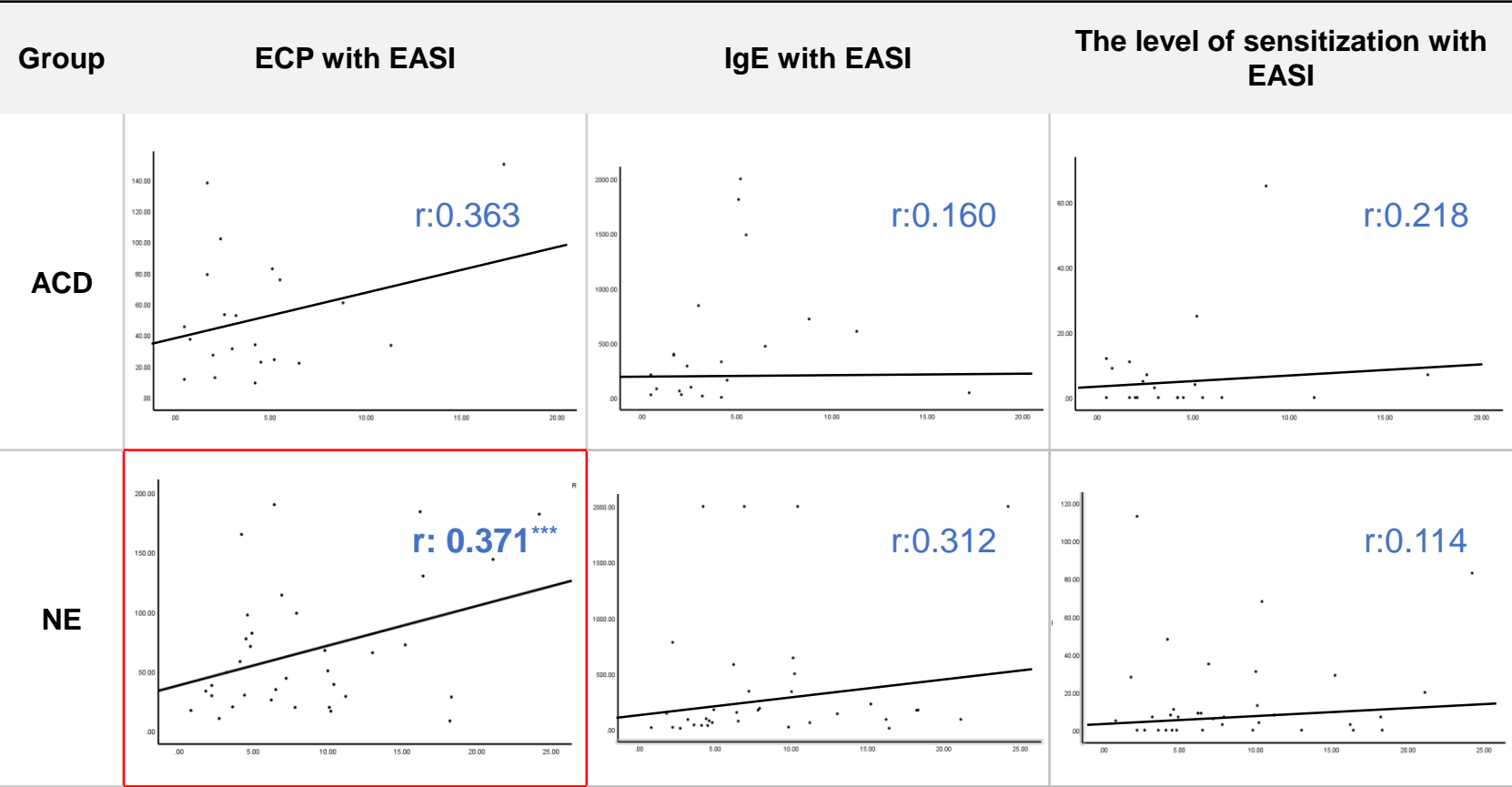
Group		level	Correlation with severity
Intrinsic AD	ECP	-	-
	IgE	-	-
	The level of sensitization	-	-
Extrinsic AD	ECP	-	+
	IgE	↑	+
	The level of sensitization	↑	+

▪ The increase in eczema severity mediated by IgE can be a characteristic specific to extrinsic AD

*p<.05, ** p<.01, *** p<.001

Results

❖ Correlation coefficients for the relation of ECP, total IgE and the level of sensitization with eczema severity in non-atopic eczema



Group		level	Correlation with severity
ACD	ECP	-	-
	IgE	-	-
	The level of sensitization	-	-
NE	ECP	-	+
	IgE	-	-
	The level of sensitization	-	-

*p<.05, ** p<.01, *** p<.001

Discussion

❖ Biomarkers in extrinsic AD vs. intrinsic AD

Parameter	Intrinsic AD	Extrinsic AD
Immunity type	Th2	Th1, (Th2), Th17
Frequency	16%-45% of AD	55%-84% of AD
Blood eosinophilia	-	↑
Total IgE	< 200 kU/L	≥ 200 kU/L
The level of sensitization	-	↑

- The level of sensitization and eczema severity in extrinsic AD : **number of sensitizing allergens correlating with the severity of IgE-mediated symptoms**

❖ Biomarkers in ACD

Allergens	metals	protein
Immunity type	Th1 ↑, Th17 ↑	Th2 ↑
	intrinsic AD	extrinsic AD

- In this study, the patch test positivity rate is **higher for metals**, which may explain why **the correlation pattern of ACD** is similar to that of **intrinsic AD**.

❖ Biomarkers in NE

- NE shares a similar immunological mechanism with AD
- However, humoral aspects of type 2 immunity were significantly less pronounced in NE compared to AD

Parameter	NE	AD
Immunity type	Th2 ↑, Th17 ↑	Th2 ↑↑
Total serum IgE	-	↑
Blood eosinophilia	↑	↑↑
This study		
Correlation with eczema severity	ECP	ECP total IgE

Conclusion

- ✓ **Extrinsic atopic dermatitis** demonstrated a **positive correlation** between **ECP**, **total IgE**, **the level of sensitization** and **eczema severity**.
- ✓ In non-atopic eczema, **eczema severity in nummular eczema** shows a **positive correlation** with **only ECP**.

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