## Angiotensin-converting enzyme and subclinical atherosclerosis in psoriasis: Is there any association? A case-control study

*To the Editor:* Psoriasis is an inflammatory skin disease that may be associated with cardiovascular diseases even without conventional risk factors, so the role of various inflammatory factors has been investigated.[1] Angiotensin-converting enzyme (ACE) is a potent vasoconstrictor agent and degrades bradykinin as a vasodilator.[2] It plays an important role in normal cutaneous homeostasis and is a regulatory factor in controlling cutaneous inflammatory responses. Studies have found an increased level of serum ACE in patients with psoriasis.[3] On the other hand, some studies showed a positive association between the ACE polymorphism and mean carotid intima-media thickness (M-CIMT).[4] These findings suggest that this enzyme may play a role in the pathogenesis of psoriasis and also subclinical atherosclerosis. Increased CIMT can be considered an indicator of generalized atherosclerosis independent of conventional cardiovascular risk factors.[5] In this case-control study, we evaluated the association between serum ACE level and subclinical atherosclerosis in psoriatic patients without underlying cardiovascular risk factors.

M-CIMT and the serum ACE levels of 61 patients with moderate to severe plaque type psoriasis and 61 healthy control subjects who were frequency-matched for age and sex were measured. Subclinical atherosclerosis was assessed using high-resolution B mode duplex ultrasonography and defined as having an M-CIMT ≥0.8 mm. Serum ACE was measured by the kinetic method (Cobas Mira Plus biochemistry analyzer, ACE kit; reference value 8-52 U/L).

Baseline demographics, clinical features, laboratory findings, and M-CIMT of the 2 groups are presented in Table I. The median serum ACE levels in psoriatic patients were higher than in healthy controls ($P < .05$). In addition, psoriatic patients had significantly greater M-CIMT than healthy subjects (Table I). Serum ACE level was positively correlated with M-CIMT (Table II). Correlation between M-CIMT and all other variables are shown in Table II. Twenty-seven patients (44.3%) and none of the healthy control subjects had subclinical atherosclerosis. Eight (13.11%) patients had psoriatic arthritis. In this group, serum ACE level (45.11 ± 19.01) and M-CIMT (0.4-1.1 mm) were higher than psoriatic patients without psoriatic arthritis, but it was not significant (Supplemental Table I, available online at www.jaad.org).

Some studies have shown that the mean serum ACE activity is significantly increased in patients with psoriasis compared with healthy subjects.[3] Similarly, our study showed that serum ACE level is significantly increased in psoriasis. Consistent with previous studies, we reported an increased serum ACE level and M-CIMT in patients with chronic plaque type psoriasis.[3,5] Interestingly, our results showed a

**Table I.** Demographics, clinical features, laboratory findings, and mean carotid intima media thickness in patients with psoriasis and healthy controls

| Characteristics | Patients with psoriasis (n = 61) | Healthy controls (n = 61) | *P* value |
|---|---|---|---|
| Gender, n (%) | | | |
| Male | 43 (70.5) | 43 (70.5) | 1.00 |
| Female | 18 (29.5) | 18 (29.5) | |
| Age, years | | | |
| Mean ± SD | 40.23 ± 12.21 | 39.31 ± 11.74 | .673 |
| Median range | 19-66 | 19-66 | |
| Body mass index, kg/m$^2$ | | | |
| Mean ± SD | 25.6 ± 4.16 | 25.11 ± 3.77 | .494 |
| Median range | 17-35 | 17.68-35.11 | |
| Duration of disease, months (range) | 137.52 (1-480) | — | — |
| PASI score | | | |
| Mean ± SD | 34.65 ± 15.25 | — | — |
| ACE, U/L (range) | 34.48 (10-88.4) | 16.65 (6.91-33.2) | <.0001 |
| M-CIMT, mm | | | |
| Mean ± SD | 0.75 ± 0.20 | 0.51 ± 0.09 | <.0001 |
| No. of carotid plaques (%) | 2 (3.3) | — | |

*ACE*, Angiotensin-converting enzyme; *M-CIMT*, mean carotid intima media thickness; *PASI*, Psoriasis Area and Severity Index; *SD*, standard deviation.

**Table II.** Correlation between mean carotid intima media thickness and all other variables

| | M-CIMT (mm) | | | |
|---|---|---|---|---|
| | Patients with psoriasis (n = 61) | | Healthy controls (n = 61) | |
| Variable | r | *P* value | r | *P* value |
| ACE, U/L | 0.637 | <.0001 | 0.389 | .02 |
| Age, years | 0.495 | <.0001 | 0.597 | <.0001 |
| Body mass index, kg/m$^2$ | 0.069 | .598 | 0.305 | .017 |
| Duration of disease | 0.327 | .01 | — | — |
| PASI score | 0.39 | .002 | — | — |

*ACE*, Angiotensin-converting enzyme; *M-CIMT*, mean carotid intima media thickness; *PASI*, Psoriasis Area and Severity Index.

significant correlation between ACE and M-CIMT. Huskic et al[3] suggested that damage to the blood vessel endothelium in psoriasis can contribute to a higher release of ACE from the vessels. Considering the changes caused by ACE and the renin–angiotensin system, as well as the metabolic changes in vascular endothelium, atherosclerosis may be accelerated in patients with psoriasis. To our knowledge, this investigation is the first study to evaluate the relationship between subclinical atherosclerosis and serum level of ACE in patients with psoriasis.

Finally, along with M-CIMT, serum ACE level can be considered an indicator of subclinical atherosclerosis in patients with psoriasis, particularly in those with severe skin disease, but extensive studies are needed to clarify this issue.

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## Do patients clinically diagnosed with vascular malformations of 1 lower extremity benefit from imaging of both legs from pelvis to toe? A prospective MRI study

*To the Editor:* The extent of vascular malformations (VMs) varies and can be underestimated by clinical examination.[1] We performed a prospective study to determine the value of magnetic resonance imaging (MRI) of both legs in patients with a manifest VM affecting 1 lower extremity.

All patients who visited our tertiary care Vascular Anomalies Center during January 2012-October 2013 for interventional therapy of a VM involving a single lower extremity were eligible for this institutional review board-approved study. An interventional radiologist with 16 years' experience specializing in VMs clinically examined the 100 enrolled patients. An MRI (3.0 Tesla, Skyra, Siemens Healthcare, Erlangen, Germany) was performed on both legs from pelvis to toe according to a predetermined protocol,[2] and 2 radiologists (who were blinded to the clinical data) evaluated these MRI images and determined a consensus.

Patient groups and VM types were classified according to the International Society for the Study

**Supplemental Table I.** Correlation between mean carotid intima media thickness and serum angiotensin-converting enzyme level in patients with psoriatic arthritis and psoriatic patients without arthritis

| | Patients with psoriatic arthritis (n = 8) | Psoriatic patients without arthritis (n = 53) | *P* value |
|---|---|---|---|
| ACE level, U/L | | | .084 |
| Mean ± SD | 40.11 ± 12.07 | 33.63 ± 18.40 | |
| Range | 23.40-60.20 | 10-88.40 | |
| M-CIMT, mm | | | |
| Mean ± SD | 0.8 ± 0.26 | 0.74 ± 0.2 | .542 |
| Range | 0.4-1.1 | 0.4-1.28 | |

*ACE*, Angiotensin-converting enzyme; *M-CIMT*, mean carotid intima media thickness; *SD*, standard deviation.