

# UNDETERMINED VS OTHER DETERMINED ETIOLOGIES OF ISCHEMIC STROKE: RESULTS FROM A POPULATION-BASED REGISTRY

C. TISEO, D. DEGAN, R. ORNELLO, F. PISTOIA, A. CAROLEI, S. SACCO

Department of Neurology and Stroke Unit, Avezzano Hospital, University of L'Aquila, 67100 L'Aquila, Italy

**BACKGROUND:** Up to one third of ischemic strokes (IS) are of undetermined (UND) cause, affecting the choice of adequate preventive measures.

**METHODS:** Prospective population-based registry including all patients with a first-ever ischemic stroke (FEIS) residing in the L'Aquila district. TOAST criteria were used to determine IS subtypes. Clinical features, risk factors, and prognosis of UND strokes were compared with those of CE and LAA strokes to evaluate if UND strokes were more frequently caused by an occult cardiac or arterial source of embolism. For comparative analyses Pearson  $\chi^2$  test, Student's *t* test, and Mann-Whitney U test were used.

**RESULTS:** Among 634 FEIS, 207 (32.6%) were UND for negative or incomplete evaluation, 220 (34.7%) CE, and 73 (11.5%) were LAA strokes. Thirteen (2.1%) patients with UND strokes for two or more possible causes were excluded from the analyses. Mean age  $\pm$  SD at onset in UND stroke was  $75.7 \pm 11.9$  years, lower than in CE and similar to LAA strokes (Table 1). Compared with CE stroke, UND had lower proportions of hypertension, and coronary heart disease. With respect to LAA stroke, UND had lower proportions of diabetes mellitus and cigarette smoking, and similar proportions of hypertension, CHD, and hypercholesterolemia (Table 1). TACI were less common in UND than in CE and LAA; POCI were more common in UND than in CE, and LAA, whereas the proportion of PACI was similar in the three groups (Figure 1 and 2). Stroke severity at onset in UND stroke was lower than in CE, and similar to LAA (Table 1). The proportion of patients with functional dependence (modified Rankin scale 3-5) at discharge in UND was lower than in CE, and similar to LAA stroke (Table 1). With respect to CE, UND stroke had lower 30-day and 1-year case-fatality rates (CFRs), while UND and LAA had similar 30-day and 1-year CFRs (Table 1). The proportion of stroke recurrences in UND stroke was lower than in CE, and similar to LAA stroke.

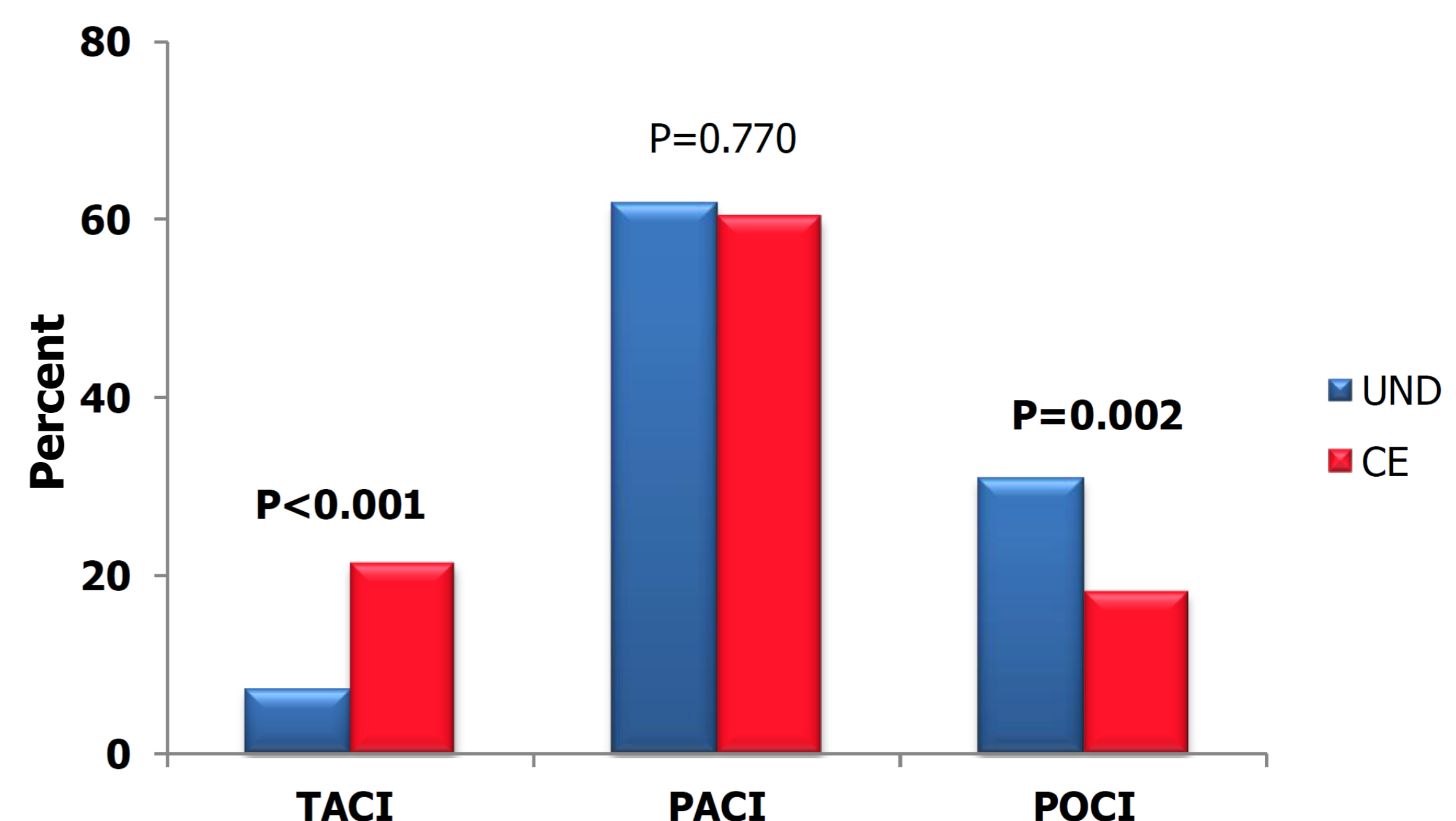
**CONCLUSIONS:** According to our population-based data, UND strokes might prevalently depend on covert atherothrombosis. Indeed, we found in UND patients lower proportions of vascular risk factors than in CE and LAA patients. Therefore, extensive investigations should be performed in UND patients and mostly in those with POCI to confirm the presence of atherosclerotic plaques.

**Table 1.** Baseline characteristics in UND\* versus CE and LAA stroke patients

Baseline characteristics	UND		Pvalue	VS		Pvalue
	n=207	CE n=220		UND n=207	LAA n=73	
Women (n, %)	106 (51.2)	129 (58.6)	0.123	106 (51.2)	31 (42.2)	0.199
Mean age $\pm$ SD at onset (years)	75.7 $\pm$ 11.9	78.9 $\pm$ 12.3	0.006	75.7 $\pm$ 11.9	76.3 $\pm$ 10.9	0.694
NHSS at onset	6 (3-11)	10 (4-18)	<0.001	6 (3-11)	6 (3-12)	0.942
<b>Vascular risk factors (n, %)</b>						
Arterial hypertension	148 (71.5)	180 (81.8)	0.012	148 (71.5)	56 (76.7)	0.389
Hypercholesterolemia	37 (17.9)	41 (18.6)	0.839	37 (17.9)	16 (21.9)	0.448
Diabetes mellitus	37 (17.9)	55 (25.0)	0.073	37 (17.9)	23 (31.5)	0.015
Atrial fibrillation	-	173 (78.6)	-	-	2 (2.7)	-
Coronary heart disease	18 (8.7)	47 (21.4)	<0.001	18 (8.7)	10 (13.7)	0.221
Cigarette smoking	28 (13.5)	19 (8.6)	0.107	28 (13.5)	16 (21.9)	0.008
Alcohol abuse	27 (13.0)	25 (11.4)	0.596	27 (13.0)	14 (19.2)	0.202
<b>Outcomes (n, %)</b>						
Functional dependence (mRS 3-5)	95 (45.9)	126 (57.3)	0.019	95 (45.9)	40 (54.8)	0.191
30-day mortality rate	32 (15.5)	59 (26.8)	0.004	32 (15.5)	10 (13.7)	0.717
1-year mortality rate	47 (22.7)	84 (38.2)	0.001	47 (22.7)	15 (20.5)	0.703
Recurrence rate	2 (1)	10 (4.5)	0.025	2 (1)	1 (1.4)	0.773

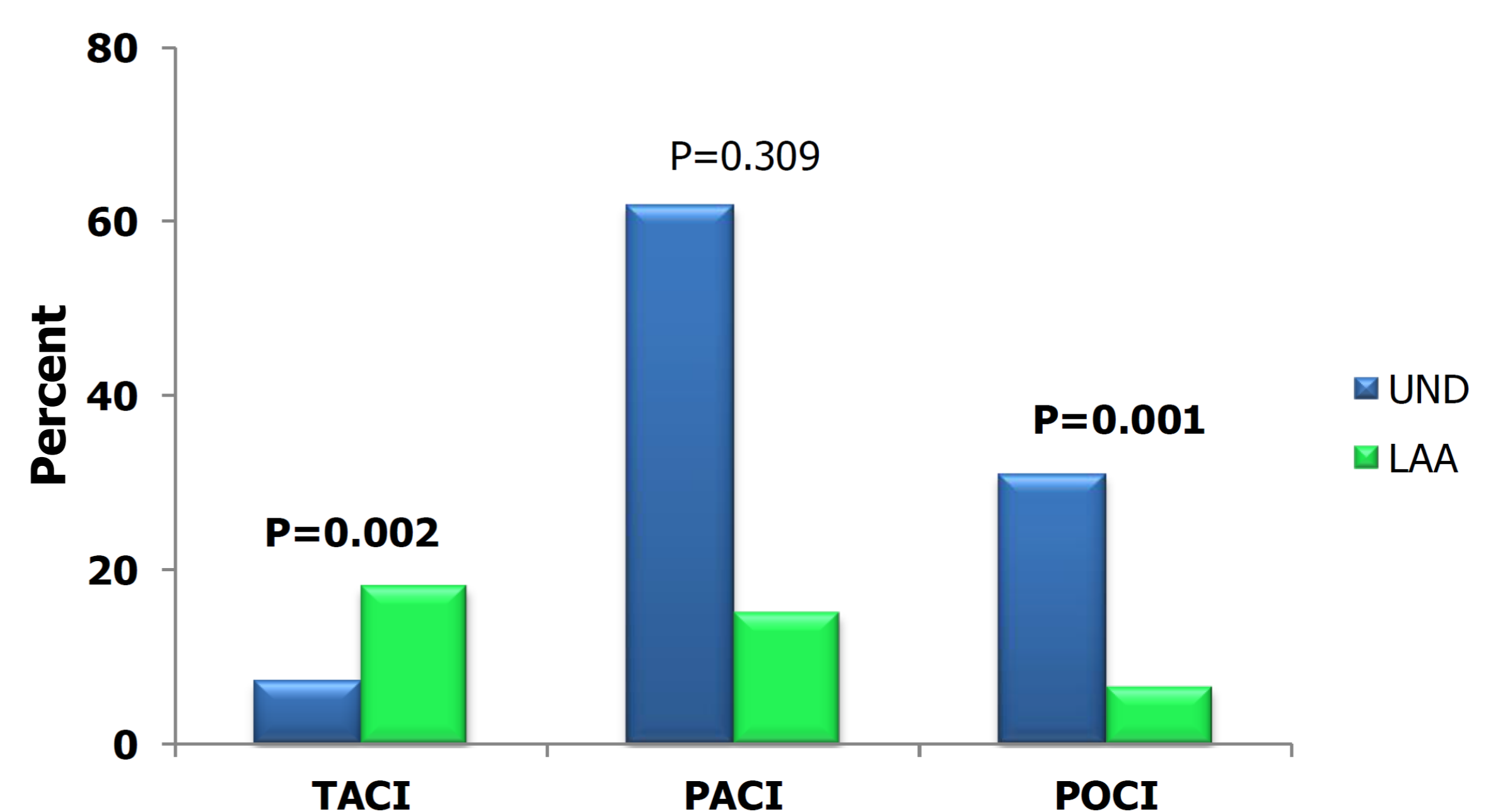
\*UND for negative or incomplete evaluation

**Figure 1.** Differences in clinical presentation according to the OCSP classification in UND and CE ischemic stroke subtypes



\*No LACI was found in UND and CE patients

**Figure 2.** Differences in clinical presentation according to the OCSP classification in UND and LAA ischemic stroke subtypes



\*No LACI was found in UND and LAA patients

## References

Adams HP Jr, Bendixen BH, Kappelle LJ, Biller J, Love BB, Gordon DL, Marsh EE 3rd. Stroke, 1993;24:39-41  
Bamford J, Sandercock P, Dennis M, Burn J, Warlow C. Lancet, 1991;337:1521-6