Formation of ADAMTS13-specific ICs capturing all freely available ADAMTS13 should be particularly considered in patients who are refractory to treatment. Future studies on a representative cohort of patients with acquired TTP will show whether our observation of an inverse correlation of free and IC-sequestered anti-ADAMTS13 antibodies in a single patient is a general phenomenon.

Disclosure of Conflict of interests

S. Ferrari, B. Plaimauer, P.L. Turecek, K. Varadi, H. Rottensteiner and F. Scheiflinger are full-time employees of Baxter Innovations GmbH, Vienna, Austria. The other authors state that they have no conflict of interest.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Figure S1. Detection of circulating ADAMTS13-specific ICs at different time points by co-immunoprecipitation and Western blotting.

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Incidental diagnosis of a deep vein thrombosis in consecutive patients undergoing a computed tomography scan of the abdomen: a retrospective cohort study

W. AGENO,* A. SQUIZZATO,* A. TOGNA,* F. MAGISTRALI,* M. MANGINI,† C. FUGAZZOLA† and F. DENTALI*

**Research Center on Thromboembolic Disorders and Antithrombotic Therapies, Department of Clinical Medicine; and †Department of Radiology, University of Insubria, Varese, Italy*

Correspondence: Walter Ageno, U.O. Medicina 1, Ospedale di Circolo, viale Borri 57, Varese 21100, Italy.
Tel.: +39 332 278 831; fax: +39 332 393640.
E-mail: agewal@yahoo.com

DOI: 10.1111/j.1538-7836.2011.04565.x

Received 2 October 2011, accepted 10 November 2011

To cite this article: Ageno W, Squizzato A, Togna A, Magistrali F, Mangini M, Fugazzola C, Dentali F. Incidental diagnosis of a deep vein thrombosis in consecutive patients undergoing a computed tomography scan of the abdomen: a retrospective cohort study. *J Thromb Haemost* 2012; **10**: 158–60.

Over the past years, there has been an increasing interest in the clinical relevance of an incidentally detected venous thrombosis. A number of studies have reported on the prevalence of an incidental pulmonary embolism (PE) in patients undergoing a chest computed tomography (CT) for reasons other than the investigation of a suspected PE. We recently published a systematic review and a meta-analysis of these studies, and found a weighted mean prevalence of incidental, asymptomatic PE of 2.6% (95% confidence interval [CI] 1.9–3.4) [1]. Independent predictors of incidental PE were hospitalization at the time of the CT (odds ratio [OR] 4.27; 95% CI 2.60–7.00) and cancer (OR 1.91; 95% CI 1.26–2.90). To our knowledge, little information is currently available on the prevalence and predictors of an incidentally detected deep vein thrombosis (DVT) in patients undergoing an abdominal CT scan. In a retrospective chart review of 1921 consecutive cancer patients on chemotherapy, Di Nisio *et al.* [2] found a 0.58% incidence (95% CI 0.44–0.74) of an incidental venous thrombosis after reviewing all CT scans performed during follow-up. Of these, only 16% occurred in the abdominal veins, including the splanchnic veins, renal veins and inferior vena cava. Conversely, in a retrospective chart review of 1466 staging CT scans in patients with cancer, Douma *et al.* [3] reported a prevalence of an incidental abdominal deep vein thrombosis (ADVT) of 1.1% (95% CI 0.6–2.0), and this rate was similar to that of a PE or DVT of the lower limbs (1.3%, 95% CI 0.7–2.3).

To provide an estimate of the prevalence of an incidental ADVT in a general, an unselected population of patients undergoing an abdominal CT, we carried out a retrospective chart review of consecutive scans performed at the Ospedale di Circolo, Varese, Italy over a 6-month period between 1 September 2009 and 31 March 2010. To identify predictors of an ADVT, we performed a case–control study comparing the characteristics of the patients with an incidental ADVT with those of the patients without an ADVT.

Two authors (A. Togna and F. Magistrali) independently reviewed the reports of all consecutive abdominal CT performed at the Division of Radiology of our hospital during the selected study period and collected the following data: age and gender, inpatient or outpatient status, department that ordered the CT scan in case of inpatient status, the reason for requesting the CT, relevant patient clinical history described by the ordering physician, the presence of cancer, site of cancer, the presence of thrombosis and site of thrombosis and the presence of liver cirrhosis. The diagnosis of venous thrombosis was checked and confirmed by experienced radiologists: incidental ADVT was defined by the presence of an intraluminal filling defect on the CT scan. For all patients with an incidental ADVT, the medical records were searched and information on the clinical conditions at the time of the test and on the management of the unsuspected thrombotic event was gathered. Data extraction was performed using selection criteria and data collection forms that were prepared before the chart reviews. All CT scans were performed with a Toshiba Aquilion 64 slice machine (Toshiba Medical Systems, Rome, Italy) (Kv 120, rotation time 0.5 s, pitch 0.828 and a slice thickness of 0.5 mm × 64). The prevalence of an incidental ADVT was reported as a proportion with the 95% CI. The baseline characteristics of cases with an incidental ADVT and controls without an ADVT were compared using Student's *t*-test (for continuous variables) and the χ^2 or Fisher's exact test (for dichotomous variables). Odd ratios and 95% CI were calculated to test the association with potential predictors of an incidental ADVT. Binary logistic regression analysis was performed to verify the independence of the associations after univariate analysis. The data were analyzed with the use of SPSS software, version 19.0. The present study was approved by the local ethics committee.

During the study period, a total of 2619 abdominal CT scans were performed. Baseline characteristics of the study population are reported in Table 1. Of these CT scans, 28 were specifically requested for a suspected ADVT or were performed in patients with an known ADVT. Forty-five of the remaining 2591 CT scans were positive for an incidental ADVT, corresponding to an estimated prevalence of 1.74% (95% CI 1.29–2.34). Information on the site of ADVT is reported in Table 2. Medical records of all cases with an incidental ADVT were reviewed: none of the patients had a previous history of a VTE; 21 patients were asymptomatic at the time of the test, whereas the remaining patients had symptoms which apparently did not lead to a suspicion of an ADVT including abdominal pain (n = 19), nausea and/or vomiting (n = 8), diarrhoea (n = 1) or fever (n = 1). When we assessed the prevalence of an ADVT in specific patient subgroups, this was 1.80% (95% CI 1.24–2.59) in outpatients; 1.63% (95% CI 0.95–

Table 1 Baseline characteristics of the study population

Total abdominal CT scans reviewed	2619
Abdominal CT scans not requested for a suspected or known ADVT	2591
Mean age (years) (± SD)	65.1 ± 14.7
Age range (years)	7–99
Male gender	1536 (59.2%)
Outpatients	1669 (64.3%)
Inpatients, medical departments	376 (14.5%)
Inpatients, surgical departments	256 (9.8%)
Inpatients, other departments	289 (11.1%)
CT scan requested for the staging of cancer	1353 (52.2%)
Patients with cancer	1442 (55.6%)
Patients with liver cirrhosis	97 (3.7%)

CT, computed tomography; ADVT, abdominal deep vein thrombosis.

Table 2 Patients with an abdominal venous thrombosis

Number of patients	45
Male gender	27
Age (years) (mean ± SD)	67.42 (12.93)
Single site	31
Multiple sites	14
Suvra-hepatic vein	3
Portal vein	26
Splenic vein	10
Superior mesenteric vein	8
Inferior mesenteric vein	1
Renal vein	7
Inferior vena cava	9

Table 3 Comparison between patients with an abdominal venous thrombosis and patients without an abdominal venous thrombosis: results of the univariate analysis

	ADVT	No ADVT	*P*
Age (years) (mean ± SD)	67.4 (12.9)	65.0 (14.7)	0.23
Male gender (%)	60	59	0.92
Outpatients (%)	66	64	0.75
Medical inpatients (%)	27	26	0.92
Cancer (%)	80	55	0.0009
Liver cirrhosis (%)	33	3	< 0.0001

ADVT, abdominal deep vein thrombosis.

2.74) in inpatients; 1.17% (95% CI 0.30–3.67) in surgical inpatients; 1.80% (95% CI 0.98–3.21) in medical inpatients; 2.50% (95% CI 1.78–3.48) in cancer patients; and 15.46% (95% CI 9.19–24.54) in liver cirrhosis patients. When we assessed the prevalence of an ADVT in patients without cancer and/or cirrhosis, this was 0.36% (95% CI 0.12–0.99). About half of the patients with an ADVT were treated with anticoagulant drugs, in most cases low-molecular-weight heparin was administered at therapeutic doses. The results of univariate analysis comparing the characteristics of cases and controls are reported in Table 3. After multivariate analysis, cancer (OR 3.17; 95% CI 1.51–6.68) and liver cirrhosis (OR 14.72; 95% CI 7.57–28.63) were independent predictors of a ADVT.

This is, to our knowledge, the first study specifically aimed at estimating the prevalence and predictors of an ADVT in an unselected population undergoing an abdominal CT scan. The results of the present study suggest that the prevalence of an incidental ADVT is not negligible, in particular in patients with underlying major risk factors such as cancer and liver cirrhosis, although less than half of patients with an ADVT were truly asymptomatic at the time of the event. These rates are clinically relevant, in particular in the light of an increasing use of abdominal CT scans in different clinical settings, suggesting these figures may further increase over time. Furthermore, previous studies on an incidental PE have shown that nearly half of the events detected using a chest CT were actually not diagnosed at the time of the test, but were only identified after a retrospective review of the scans for research purposes. Thus, as for an incidental PE, attention to the possibility of the presence of an ADVT, even if clinically silent, should be warranted, especially in higher risk patients.

Cancer patients with a symptomatic venous thromboembolism (VTE) were shown to have a worse prognosis than cancer patients without VTE [4], and previous studies suggest that an incidental VTE may have the same predictive value as a symptomatic VTE [5–7]. In a retrospective, multicenter study, we compared 6-month survival rates in 60 cancer patients with an incidental VTE, in 120 cancer patients with a symptomatic VTE and in 60 cancer patients without a VTE and found similar mortality rates in the two VTE groups [5]. Likewise, in a prospective observational study, Font *et al.* [6] reported a similar overall survival between cancer patients with a symptomatic VTE and cancer patients with an incidental VTE. Finally, in a matched cohort study of cancer patients diagnosed with an incidental PE on routine staging scans, O'Connell *et al.* [7] found a statistically significant 1.51 hazard ratio for death in cases as compared with controls with cancer, but without PE. Unfortunately, patients with an ADVT were not included in these studies, and whether the detection of an incidental ADVT has the same prognostic value as the detection of an incidental venous thrombosis in more usual sites needs to be addressed in future adequately designed clinical studies.

The main limitation of the present study is the retrospective design, which justifies some caution in the interpretation of the data. Information on risk factors was limited to the data available from CT requests and from the results of the scans, thus, we could only include in our analysis those risk factors for a ADVT that were accurately available from these limited sources. For this reason, the association between a ADVT and potential predictors could not be established. Another limitation is the possibility of either false-positive or false-negative diagnoses of an ADVT. However, experienced radiologists carefully checked the images.

In conclusion, nearly 2% of consecutive, unselected patients undergoing an abdominal CT scan were diagnosed with a clinically silent ADVT in the present study. These patients were more likely to have cancer or liver cirrhosis. The prognostic role and the optimal therapeutic management of an incidental ADVT remain unknown, but given the prevalence reported in our study we believe there is a strong rationale to support future studies aimed to specifically address these questions.

Disclosure of Conflict of Interests

The authors state that they have no conflict of interest.

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