Methods: Patients with VLU were subdivided into INFL (n = 32) or GRAN (n = 16) on the basis of the clinical examination of an active INFL wound with sloughing, tissue necrosis, lack of granulating ulcer base, or active GRAN wound base. CVUWF was collected by applying cotton gauze to the ulcer bed until saturated. The CVUWF was transferred in a collecting tube without additives or antiproteases and centrifuged at 10,000× *g*, and the supernatant was stored at −80°C. Aliquots were then tested in duplicate, and the concentrations of MMP-1 (collagenase 1), MMP-2 (gelatinase A), MMP-3 (stromelysin 1), MMP-7 (matrilysin 1), MMP-8 (collagenase 2), MMP-9 (gelatinase B), MMP-10 (stromelysin 2), MMP-12 (metalloelastase), and MMP-13 (collagenase 3) were quantified by multiplex enzyme-linked immunosorbent assay. MMP concentration was expressed in pg/mL as mean ± standard error of the mean. To determine pain in INFL and GRAN wounds, a visual analog scale was used. Nonparametric statistical tests were used to determine significance at $P < .05$.

Results: The mean age of the INFL was 69.1 ± 14.8 years (aged 43-91 years), and the GRAN was 77.8 ± 6.5 years (aged 65-85 years). The CVUWF from INFL VLU contained significantly higher levels of MMP-2, MMP-9, and MMP-12, that is, characteristic of MMPs in a degrading wound; however, the CVUWF from GRAN VLU contained higher levels of MMP-1, MMP-7, and MMP-13, which are characteristic MMPs of a reparative and fibroblast proliferating wound (Table). There were no statistically significant differences in MMP-3, MMP-8, or MMP-10. Visual analog scale score of INFL VLU was significantly higher than that in GRAN VLU (5.0 ± 0.24 vs 3.4 ± 0.29; $P = .0003$).

Conclusions: These data suggest the identification of different kinds of VLU microenvironments consisting of a harmful inflammatory phase with high expression of degrading MMPs and a reparative microenvironment dominated by a granulating phase with expression of proliferating and remodeling MMPs. Consistent with INFL VLU stage, higher pain levels were observed. These results suggest a potential use of MMP panels as useful biomarkers to determine VLU wound condition and to guide best medical treatment. Further research on MMPs in CVUWF is needed to determine how MMP profiles change in the microenvironment of healing vs nonhealing VLUs.

Table. Levels of different matrix metalloproteinases (*MMPs*) in inflammatory (*INFL*) and granulating (*GRAN*) venous leg ulcers (*VLUs*)

MMP types	*Inflammatory VLU*	*Granulating VLU*	P *value*	*MMP wound function*
MMP-2	943,900 ± 119,600	414,700 ± 65,300	.0026	Degrading
MMP-9	483,100 ± 68,190	173,900 ± 47,170	.0025	Degrading
MMP-12	67,550 ± 12,350	22,780 ± 7478	.037	Degrading
MMP-1	79,460 ± 26,370	142,800 ± 26,730	.0016	Reparative
MMP-7	1212 ± 609	3072 ± 1076	.0004	Reparative
MMP-13	3093 ± 930	10,290 ± 3775	.0016	Reparative

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Lower Limbs Venous Kinetics and Consequent Impact on Drainage Direction

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Objective: There is still a lack of literature concerning lower extremity venous hemodynamics. The interpretation of physiological order of venous emptying indicates the direction of drainage is from the most superficial to the deepest veins. Nevertheless, there is no evidence concerning the different venous systems kinetics: the deep venous network (N1), the saphenous system (N2), the tributaries network (N3). Aim of the present study is to assess these velocities and to find clues for a physical model identification.

Methods: Venous Doppler investigations were performed in 18 healthy subjects (mean age 25 + 5 yo, M/F 1/1) for a total of 36 lower limbs. Diameters, peak systolic velocity (PSV) and time average velocity (TAV) of the following were assessed: N1 external iliac vein (IL), common femoral vein (CFV) above the sapheno-femoral junction (SFJ), middle thigh femoral vein (MFV), popliteal vein (PV), posterior tibial vein (PTV). N2 great saphenous vein (GSV) at the SFJ, midthigh GSV (MTGSV), midleg GSV (MLGSV), small saphenous vein (SSV) at its confluence with the popliteal vein (SPJ), midleg (SSV). N3 (whatever flow detectable GSV and/or SSV tributary). The flow was elicited both by active foot dorsiflexion, (AFD) and passive manual compression/relaxation, (C/R) maneuvers.

Results: The detailed values have been reported in table 1. A TAV increase was demonstrated from the most superficial N3 to the progressively deeper N2 and N1 compartments ($P < .0001$). Inside the single compartments no statistical differences were reported among the different segments. TAV and PSV showed a direct correlation with TAV following C/R (r2 = 0.91; $P < .0001$) and AFD (r2=0.95; $P < .0001$). The comparison among TAV following C/R and AFD showed no statistically significant differences (P = NS), except in IL ($P < .0005$) and in N3 ($P < .0005$). A diameter decrease was reported from N1 to N3 ($P < .0001$). A direct correlation has been found among diameter and TAV both by C/R (r2 = 0,8; $P < .0005$) and AFD (r2 = 0.9; $P < .0001$).

Conclusions: The present investigation provides preliminary evidences of the velocity decrease from the deepest to the most superficial compartments. These data introduce the Venturi effect as potential factor in the flow aspiration from the tributary to the deeper veins. This work is to be considered preliminary. Nevertheless the reported data represent a first step toward an objective evaluation of the hemodynamics governing the lower limb drainage. Moreover, these values can constitute the basis for further investigations in pathological and post-procedural scenarios.

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Equivalent Outcomes Between Ultrasound-Assisted Thrombolysis and Standard Catheter-Directed Thrombolysis for the Treatment of Acute Pulmonary Embolism

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Objectives: The objective of this study is to compare the outcomes of patients undergoing ultrasound-assisted thrombolysis (USAT) and standard catheter-directed thrombolysis (CDT) for the treatment of acute pulmonary embolism (PE).

Methods: The records of all patients having undergone CDT or USAT for massive or submassive PE were retrospectively reviewed. CDT was performed by multiside hole catheter-directed tissue plasminogen activator infusion, and USAT was performed with the EkoSonic Endovascular System (EKOS Corporation, Bothell, Wash). Standard statistical methods

Table. Venous networks velocities and diameters

	N1					*N2*				*N3*
	IL	*CVF*	*MCFV*	*PV*	*PTV*	*SFJ*	*MTGSV*	*MLGSV*	*SSV*	*TRIBUTARY*
$PSV_{C/R}$ cm/sec	111.2 ± 46.2	111.2 ± 26.3	112.8 ± 36.9	85.5 ± 32.3	46.8 ± 24.5	36.9 ± 26.2	49.29 ± 32.5	39.7 ± 14.3	19.8 ± 7.7	11.0 ± 3.8
PSV_{AFD} cm/sec	111.5 ± 37.2	103.9 ± 35.5	83.3 ± 27.6	83.6 ± 28.9	48.1 ± 24.1	32.0 ± 15.8	35.1 ± 23.9	29.3 ± 12.2	25.5 ± 11.2	19.2 ± 13.0
$TAV_{C/R}$ cm/sec	39.6 ± 16.6	41.8 ± 11.2	43.2 ± 15.0	40.1 ± 21.6	29.4 ± 19.4	18.1 ± 12.3	21.6 ± 17.4	16.8 ± 5.0	10.8 ± 3.1	5.1 ± 2.12
TAV_{AFD} cm/sec	41.4 ± 20.8	38.9 ± 14.6	37.2 ± 21.0	30.4 ± 10.7	25.6 ± 16.7	15.2 ± 8.8	18.9 ± 8.5	14.5 ± 7.8	14.4 ± 7.2	10.7 ± 7.8
DIAM mm	13.9 ± 2.7	12.4 ± 2.8	9.7 ± 2.5	8.5 ± 2.3	4.2 ± 0.7	3.75 ± 0.8	2.78 ± 0.7	2.32 ± 0.3	2.7 ± 0.61	1.1 ± 0.3