Initial Experience With Ultrasound-Facilitated, Thrombolytic Enhanced Thrombectomy (SonoThrombectomy™), In Patients With Acute Proximal Deep Vein Thrombosis

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For the SonoThrombectomy™ Investigators

HOSPITAL DIPRECA HOSDIP
CLÍNICA LA SAGRADA FAMÍLIA

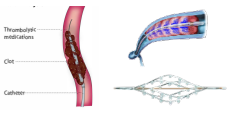
Disclosures

SonoVascular	Consultant
Intervene	Consultant and Research support

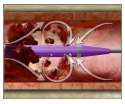
Evolution of Interventional Rx for VTE

Pharmacological | **Pharmaco-Mechanical** | **Mechanical**

Catheter-Directed Thrombolysis (CDT)
Catheter-directed delivery of thrombolytic drug with or without the assistance of ultrasound

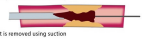


Combination Therapy
Blood clot removal with adjunct catheter-directed delivery of thrombolytic drug



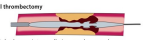
Thrombectomy
Removal of a thrombus utilizing catheters that aspirate, macerate and/or capture.

Catheter aspiration thrombectomy



Blood clot is removed using suction

Mechanical thrombectomy

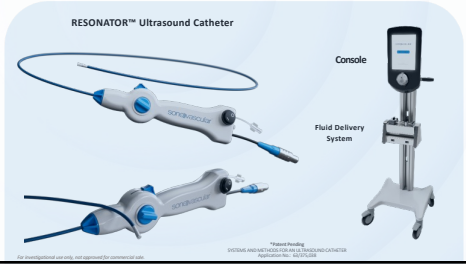


Blood clot is broken up into small pieces and removed

Objective: Single session therapy with high % of clot removal
Minimal damage to vein wall with preservation of valve function

SonoThrombectomy

ULTRASOUND SYSTEM FOR VENOUS THROMBOEMBOLISM (VTE)
SonoVascular, Inc



*Patent Pending
SYSTEMS AND METHODS FOR AN ULTRASOUND CATHETER
Application No.: 63/271,858

For investigational use only, not approved for commercial sale.

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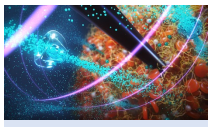
Intravascular Sonication – Mechanism of Action

- Ultrasound tipped steerable catheter applies energy to thrombus
- Microbubbles released through catheter tip excited by ultrasound energy
  - mediated cavitation mechanically debulks clot and increases clot surface area
- tPA infused via distal end of ultrasound catheter
  - Diffusion throughout clot optimized by excited microbubbles

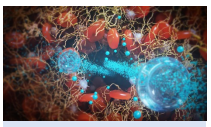
US = ultrasound; MB = microbubbles; tPA = thrombolytic drug

Stable Cavitation



Microbubbles oscillate upon US activation and induce localized **microstreaming** to loosen and thin clot fibrin

Inertial Cavitation



Microbubbles expand and collapse upon US activation to induce **microjets** that locally disrupt clot fibrin

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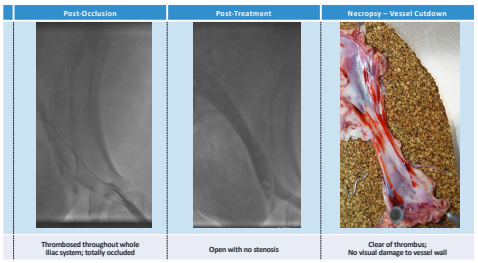
Porcine model result summary



FIRST-IN-HUMAN STUDY

Hospital DIPRECA – Santiago, Chile
Co-Principal Investigator:
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Clinica La Sagrada Familia – Buenos Aires, Argentina
Co-Principal Investigator:
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Principal Investigator:

Albrecht Krämer, MD
Vascular Surgery

Profesor Titular
Pontificia Universidad Católica de Chile
Santiago, Chile

HOSPITAL DIPRECA HOSDIP

CLÍNICA LA SAGRADA FAMILIA

Cleveland Clinic

Study Design

- Single-arm, prospective First-In-Human study to evaluate safety and feasibility of SonoThrombectomy System
- Up to 20 subjects
- Patients with Deep Vein Thrombosis (DVT) with unilateral iliofemoral venous thrombosis
- Symptoms for no more than 21 days prior to the index procedure

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FIRST-IN-HUMAN STUDY

TRIAL DESIGN

Procedural Details

- IVC filter placed for procedure in all patients, removed after procedure
- SonoThrombectomy procedure performed with measurement of thrombus reduction
- Venous Stenting performed for external compression

Safety Endpoints

- Major Adverse Events (MAE's) within 30 days
- Feasibility Endpoints
  - Reduction of venous thrombus (Marder score and SIR thrombolysis scoring)
  - Change in Villalta score, Revised Venous Clinical Severity Score (rVCSS), and leg pain (NPRS) at 30 days and 6 months
  - Patency of the target segment during follow-up

Follow-up

- 30 days and 6 months; including CT venogram or duplex ultrasound at 30 days, and duplex ultrasound at 6 months

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FIRST-IN-HUMAN STUDY

CLINICAL STUDY SUMMARY – AS OF NOVEMBER 3, 2024

	Study Population			
	Background		DVT Diagnosis [1]	
Subject	Gender / Age	Days Symptomatic	Clot Location and Length (cm)	
Patient #1	Female / 37	≥ 24 days	Common, external iliac	15
Patient #2	Male / 39	≥ 16 days	IVC, Common, external iliac	16.5
Patient #3	Female / 21	≥ 12 days	IVC, Common, external iliac and CFV	29
Patient #4	Female / 22	≥ 15 days	Common iliac	9
Patient #5	Female / 52	≥ 8 days	Common, external iliac, CFV and femoral	40

FIRST-IN-HUMAN STUDY

CLINICAL STUDY SUMMARY – AS OF NOVEMBER 3, 2024

	Procedural and Treatment Characteristics			
	DVT Diagnosis [1]		Treatment	
Subject	Clot Location and Length (cm)		Time (min)	tPA Dose (mg)
Patient #1	Common, external iliac	15	39	6.50
Patient #2	IVC, Common, external iliac	16.5	60	13.39
Patient #3	IVC, Common, external iliac and CFV	29	52	11.44
Patient #4	Common iliac	9	19	3.60
Patient #5	Common, external iliac, CFV and femoral	40	57	5.12

[1] All patients diagnosed with May-Thurner Syndrome

FIRST-IN-HUMAN STUDY

CLINICAL STUDY SUMMARY – AS OF NOVEMBER 3, 2024

	Clinical Outcomes					
	Safety	Feasibility (Efficacy)				
		Core Lab		30 Day Follow-Up		
Subject	Device-Related Adverse Events	Post-Sono SIR Score	Post-Procedure SIR Score	Pain Score	Villalta Score	rVCSS Score
Patient #1	No	Grade II	Grade III	3 → 0	10 → 3	12 → 3
Patient #2	No	Grade II	Grade III	6 → 0	10 → 0	6 → 0
Patient #3	No	Grade III	Grade III	0 → 0	4 → 0	5 → 0
Patient #4	No	Grade II	Grade III	0 → 0	0 → 0	0 → 0
Patient #5	No	Grade III	Grade III	4 → 2	11 → 5	6 → 1

FIRST-IN-HUMAN STUDY

CLINICAL SUMMARY

Procedure Performed By:
Manuel Espindola, MD
Albrecht Krämer, MD
Hospital DIPRECA
Santiago, Chile

Medical History

- 52-year-old female with 8 days of DVT symptoms and hysterectomy 16 days prior to symptom onset

Diagnosis

- DVT involving the iliac and femoral veins;
- Severe external compression of left common iliac vein

Treatment

- Vena cava filter deployed via jugular vein (per protocol)
- Prone position with popliteal access
- 57 minutes of intravascular sonication
- 5.1 mg of tPA
- Single stent was deployed to address compression

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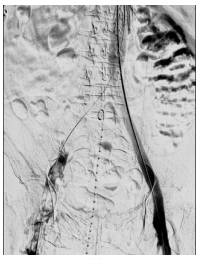
FIRST-IN-HUMAN STUDY

PRE-TREATMENT VENOGRAM

Complete occlusion of iliac and femoral veins, visible collateral vein flow

Femoral Vein



CFV and Iliac Veins

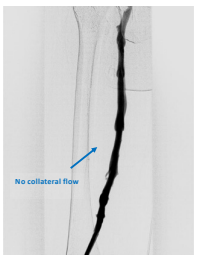
Occlusion Length
40 cm

FIRST-IN-HUMAN STUDY

POST-PROCEDURE VENOGRAM – FEMORAL SEGMENT

Restoration of flow through femoral segment, and significant reduction of collateral flow

Pre-Treatment



Post-Treatment

13 Minutes of intravascular sonication

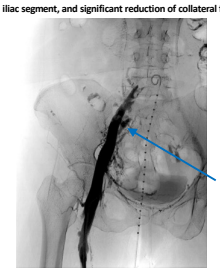
1.2 mg of tPA delivered

FIRST-IN-HUMAN STUDY

POST-SONOTHROMBECTOMY VENOGRAM – ILIAC SEGMENT

Restoration of flow through common femoral and iliac segment, and significant reduction of collateral flow

Pre-Treatment



Post-Treatment

44 Minutes of intravascular sonication

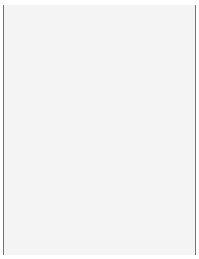
3.9 mg of tPA delivered

Restoration of flow distal to MTS Compression

FIRST-IN-HUMAN STUDY

POST-PROCEDURE VENOGRAM

Equivalent flow through left and right iliofemoral segments, and complete elimination of collateral flow



Pre-Treatment

Post-Treatment

Venous stent deployed to treat MTS compression

Stent:

Optimed sinus-Obliquus (14mm x 10cm)

SonoThrombectomy: conclusions

- Novel treatment modality combining ultrasound, microbubble energy diffusion, tPA
- Initial cases suggest consistent thrombus elimination
- Minimal blood loss
- No evidence of adverse affects on vein wall

- Additional cases and longer follow-up required
- Plan to complete initial study by end of Q1 2025