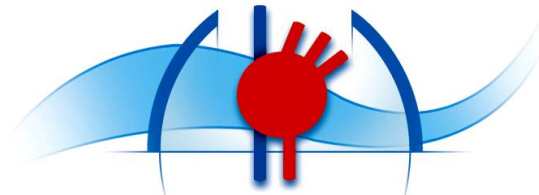


Qu'est ce que la thrombolyse pharmaco-mécanique ?

Y. Gouëffic, MD, PhD

Department of vascular surgery, University hospital of Nantes, France

l'institut du thorax



Disclosure of Interest

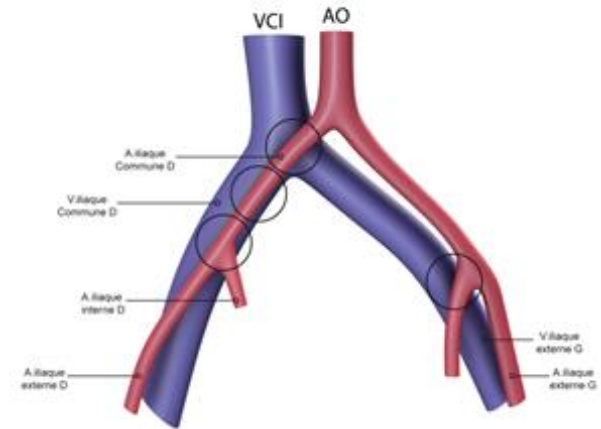
Research grants /Consulting/Honoraria for

- Abbott
- Bard
- Boston Sc
- Cook
- Hexacath
- Medtronic
- Spectranetics
- Terumo
- WL Gore

Lésions obstructives veineuses

- Primaires

- Syndrome de Cockett (May-Thurner)
- Variantes



- Secondaires

- **PostTVP**
- Iatrogène
- Compression extrinsèque
 - Fibrose rétropéritonéale
 - Tumeurs



Indications cliniques et anatomiques

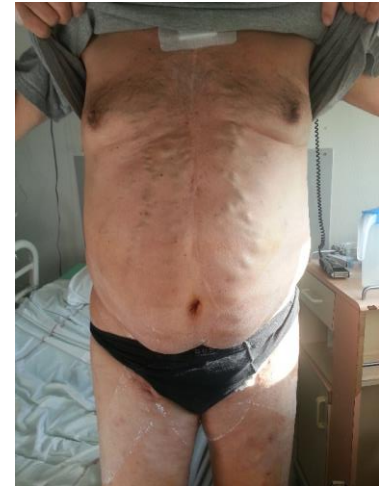
– Patients avec lésions C3 à C6, symptomatiques et invalidés malgré le traitement médical

- Claudication veineuse
- Dyspnée d'effort (occlusion VCI)
- Circulation collatérale
- Syndrome de congestion pelvienne
- Signes neurologiques

– Pas de néoplasie

– Atteinte ilio-cave (pas en dessous de la VFC)

– +/- reflux (superficiel et/ou profond)



Patient history

Female 32 years-old

Current smoking, alcohol

Symptomatology

- Painful, swelling, collateral circulation of the left upper limb for 7 days.

Medical history

- Car crash few days ago (seatbelt traumatism ?) 7 days ago.

Duplex scan

- Extensive thrombosis from the brachial vein to the subclavian vein (the brachial vein is free at its origin)

Patient history

Anticoagulation (Xarelto[®] 15-mg x2/day)

7 days later: symptomatology increase despite
anticoagulation

Post-thrombotic syndrome and pulmonary
embolism risk

Therapeutic options

Anticoagulation alone

Thrombolytic therapy and anticoagulation

- Surgery
 - Systemic thrombolysis
 - Loco-regional thrombolysis
- Catheter directed thrombolysis

Thrombolysis for acute deep vein thrombosis (Review)

Watson L, Broderick C, Armon MP

17 RCTs with 1103 participants were included

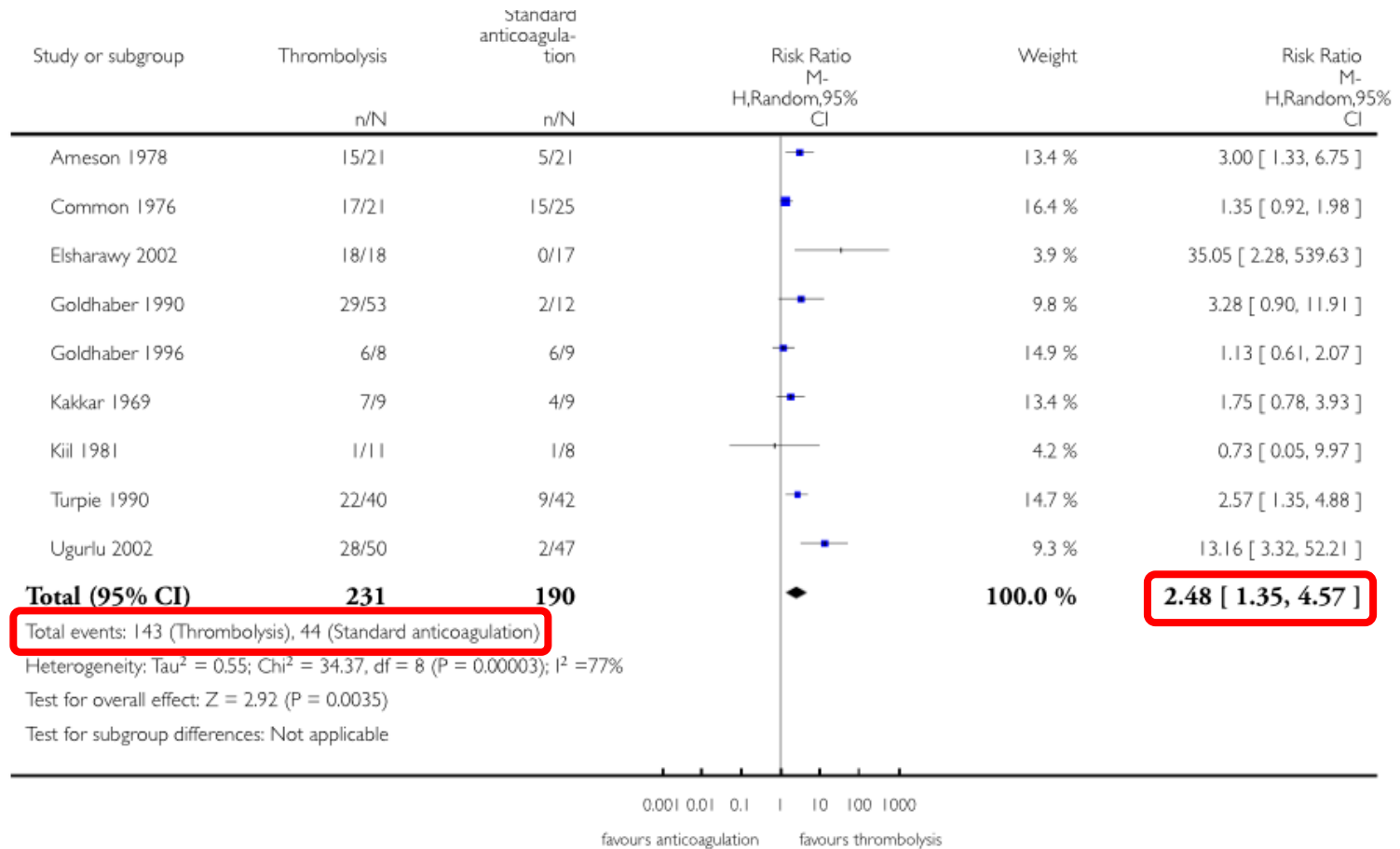
To assess the effects of **thrombolytic therapy and anticoagulation** compared to **anticoagulation alone** for the management of people with acute deep vein thrombosis (DVT) of the lower limb

Complete clot lysis, venous patency, post-thrombotic syndrome, recurrent venous thromboembolism, bleeding complications, mortality, pulmonary complications, recurrent DVT.

Arneson 1978	+	+	+	+	+	+	+
Common 1976	?	?	+	+	+	+	+
Elliot 1979	?	?	+	+	+	+	+
Elsarawy 2002	+	?	+	+	+	+	+
Enden 2011	+	+	+	+	+	+	+
Goldhaber 1990	+	?	+	+	+	+	+
Goldhaber 1996	?	?	+	+	+	+	+
Kakkar 1969	?	?	-	-	+	+	+
Kill 1981	?	?	+	+	+	+	+
Marder 1977	?	?	+	?	-	-	-
Schulman 1986	?	+	+	+	+	+	+
Schweizer 1998	+	?	+	+	+	+	+
Schweizer 2000	?	?	+	+	+	+	+
Tsapogas 1973	+	?	?	-	+	+	+
Turpie 1990	?	?	+	+	+	+	+
Ugurlu 2002	+	?	+	+	+	+	+
Verhaeghe 1989	?	?	+	+	+	+	+
	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias

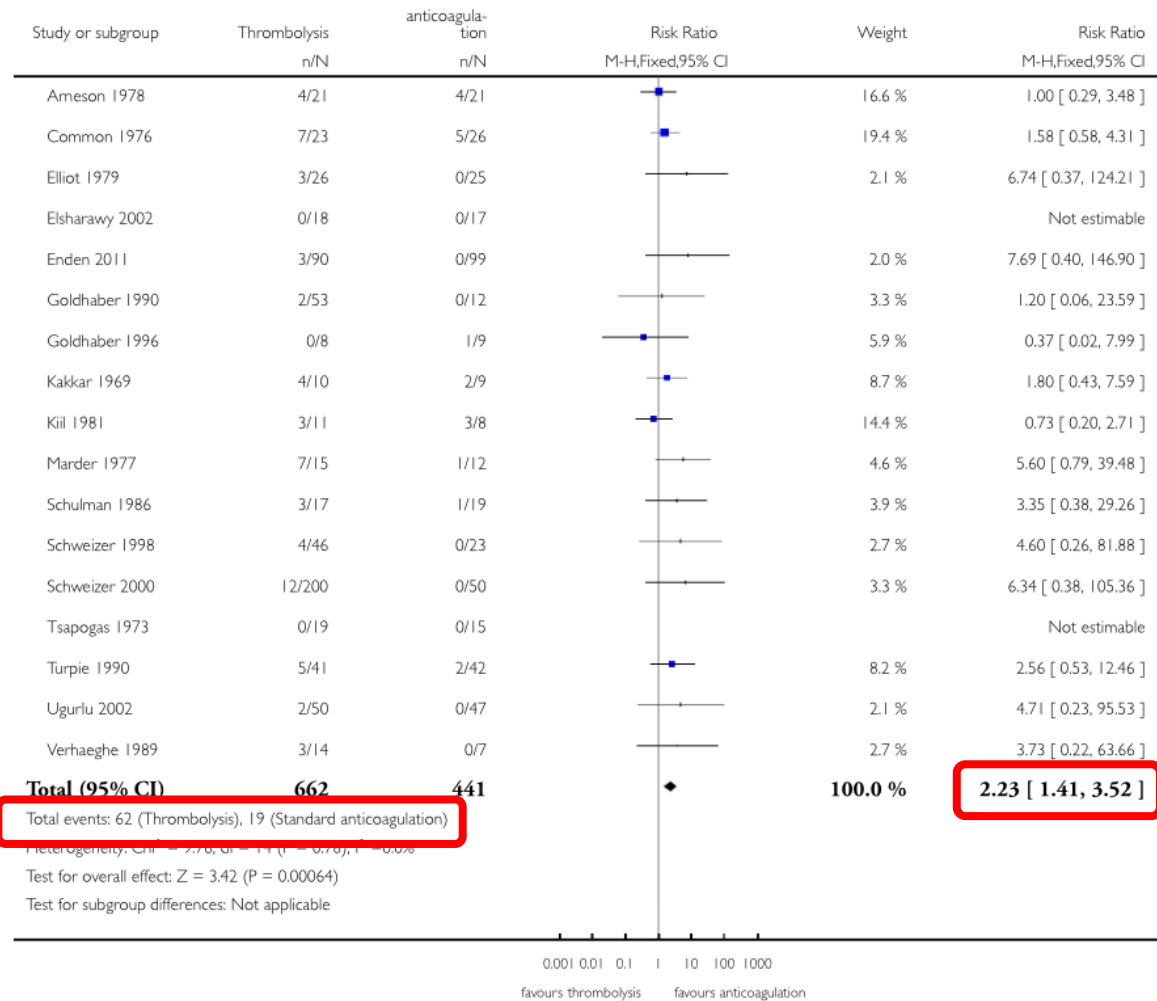
Early venous patency

Any thrombolysis versus anticoagulation alone



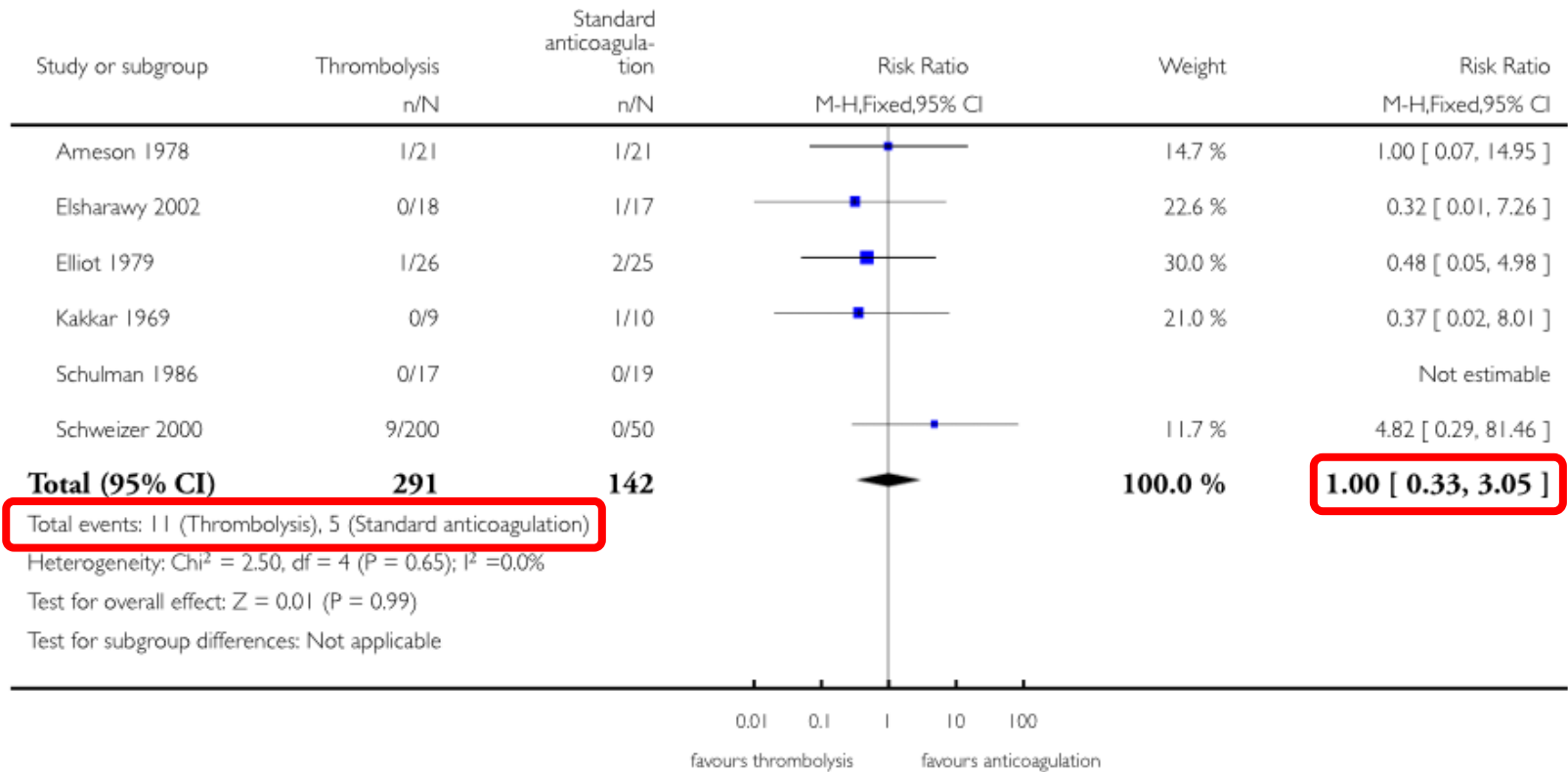
Early bleeding

Any thrombolysis versus anticoagulation alone



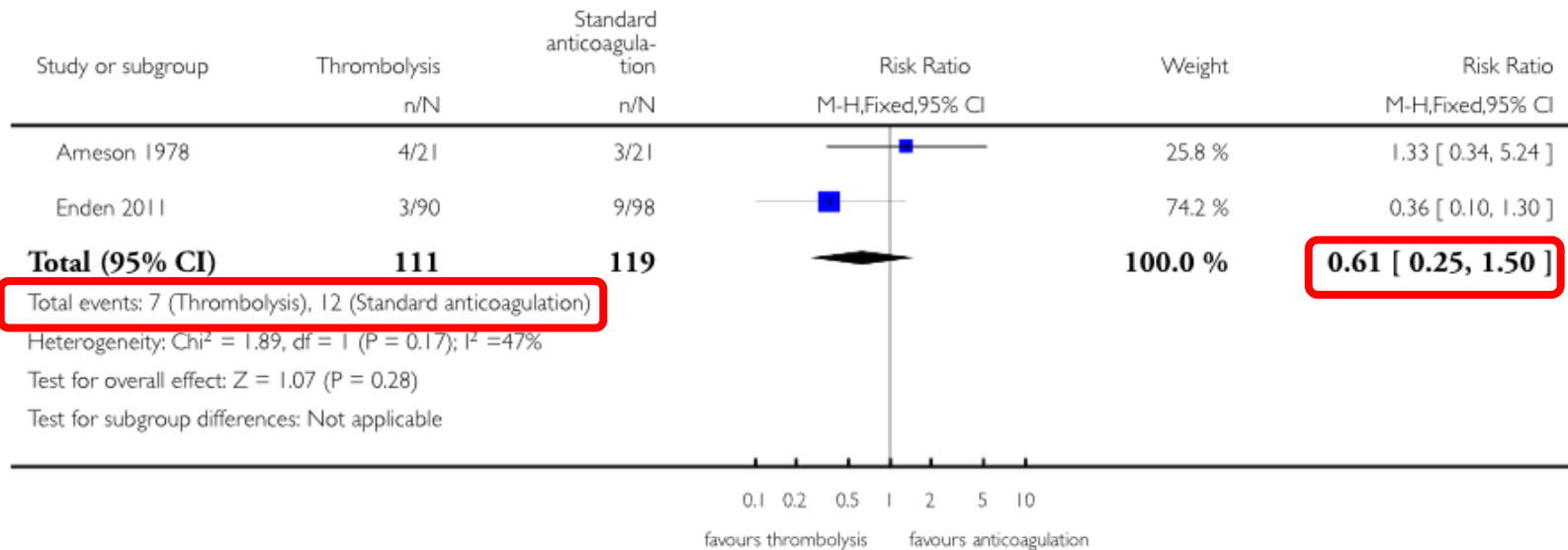
Pulmonary embolism

Any thrombolysis versus anticoagulation alone



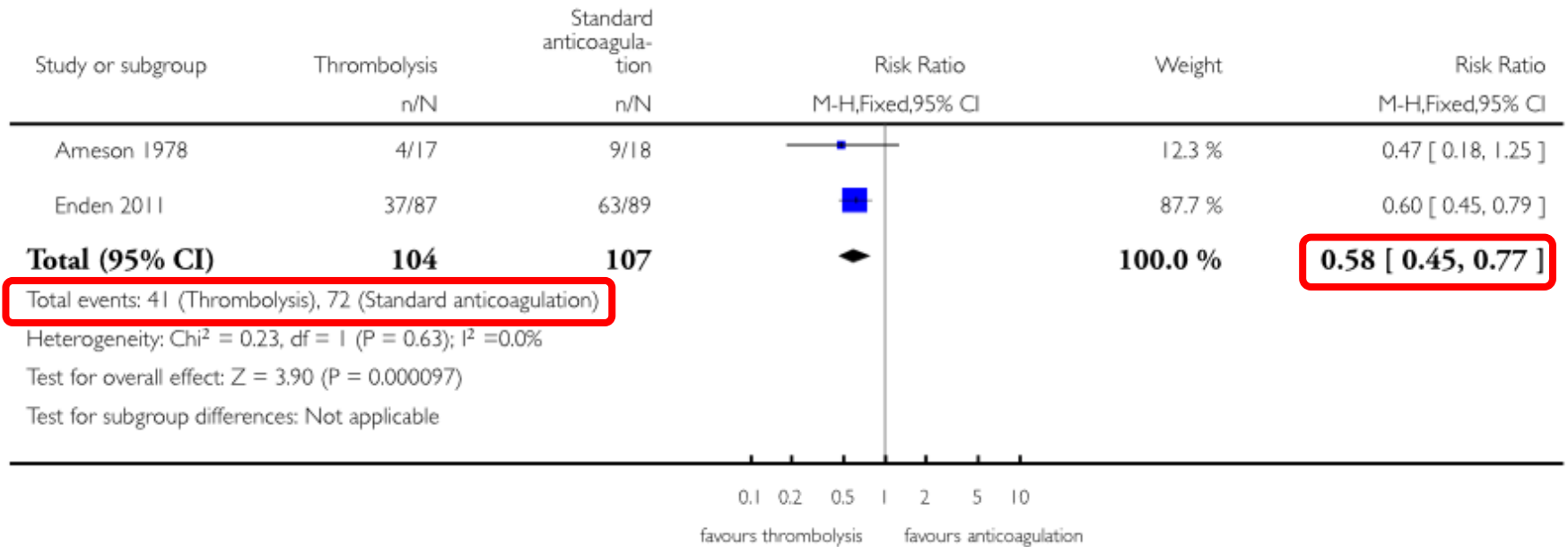
Late mortality

Any thrombolysis versus anticoagulation alone



Post-thrombotic syndrome

Any thrombolysis versus anticoagulation alone



Authors' conclusions

- « Thrombolysis increases the patency of veins and reduces the incidence of PTS following proximal DVT by a third. »
- « Strict eligibility criteria appears to improve safety in recent studies and may be necessary to reduce the risk of bleeding complications. This may limit the applicability of this treatment (thrombolysis). In those who are treated there is a small increased risk of bleeding. »
- « However, the results across studies were consistent and we have reasonable confidence in these results.»

	Anti-coagulation	Fibrinolyse par voie générale	Fibrinolyse dirigée par cathéter	Thrombolyse pharmacomécanique
Perméabilité court terme	27 – 47 %	63%	83%	80 - 100%
Mortalité	0.4 - 1.6%	1 – 1.2%	0 – 0.4%	0%
Hémorragie	0%	RR 1.73	8 – 9%	0% (10/16) 4-14% (6/16)
Perméabilité Long terme	18% (3ans)	RR 2.27	60% (6–12 mois)	68 – 90% (6-12 mois)
Syndrome post thrombotique	30 – 77%	RR 0.66	41%	3.4%
TVP	14.8%			2.3%

Laiho, Eur J Vasc Endovasc Surg, 2004; Comerota, J Vasc Surg, 2007; Vedantham, J Vasc Intervent Radiol, 2009; Enden, Lancet, 2011; Karthikesalingam, Eur J Vasc Endovasc Surg, 2011; Hilleman, JVIR, 2008.

Pharmacomechanical Catheter-Directed Thrombolysis for Deep-Vein Thrombosis

Suresh Vedantham, M.D., Samuel Z. Goldhaber, M.D., Jim A. Julian, M.Math., Susan R. Kahn, M.D., Michael R. Jaff, D.O., David J. Cohen, M.D., Elizabeth Magnuson, Sc.D., Mahmood K. Razavi, M.D., Anthony J. Comerota, M.D., Heather L. Gornik, M.D., Timothy P. Murphy, M.D., Lawrence Lewis, M.D., [et al.](#), for the ATTRACT Trial Investigators*

Pharmacomechanical catheter-directed thrombolysis (hereafter “pharmacomechanical thrombolysis”) rapidly removes thrombus and is hypothesized to reduce the risk of the post-thrombotic syndrome.

Anticoagulation alone (control group)

VS

Anticoagulation plus pharmacomechanical thrombolysis

The primary outcome was development of the post-thrombotic syndrome between 6 and 24 months of follow-up.

In./Ex. criteria

IN.

Symptomatic proximal DVT involving the iliac, common femoral, and/or femoral vein.

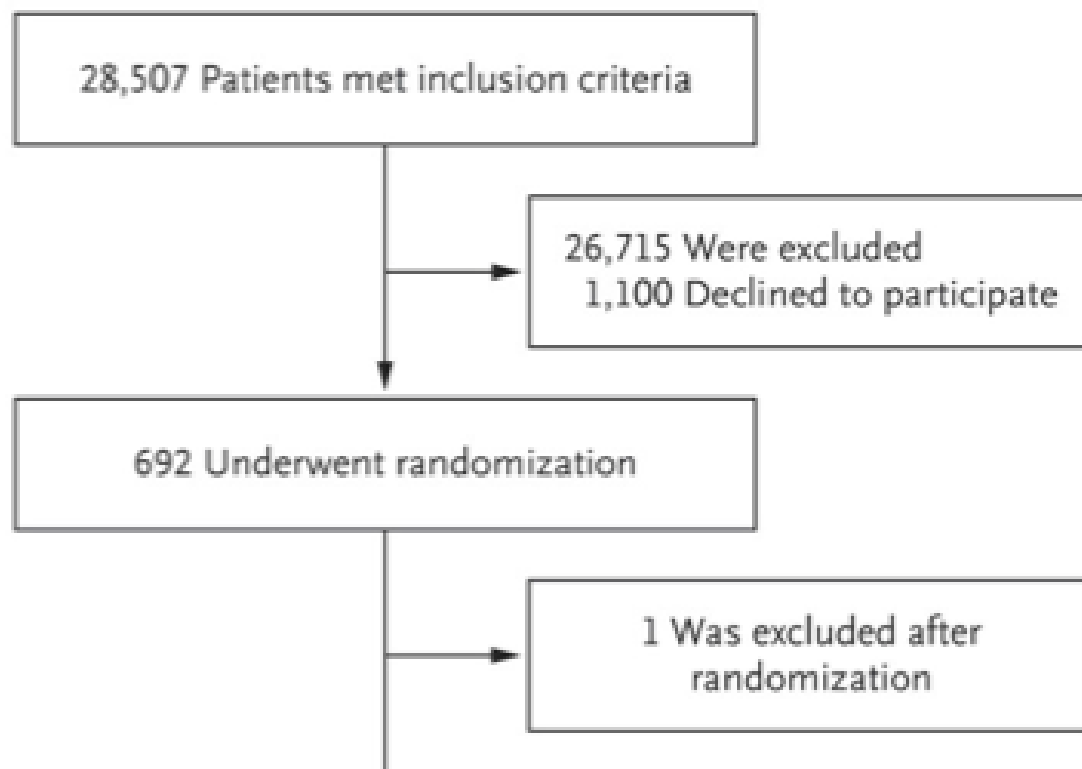
EX.

Symptom duration > 14 days for the DVT episode in the index leg (i.e. non-acute DVT).

In the index leg: established PTS, or previous symptomatic DVT within the last 2 years.

In the contralateral (non-index) leg: symptomatic acute DVT a) involving the iliac and/or common femoral vein; or b) for which thrombolysis is planned as part of initial therapy.

From December 2009 through December 2014, a total of 692 patients underwent randomization (337 to the pharmacomechanical-thrombolysis group and 355 to the control group)



Key ATTRACT Data

- 692 patients (337 PCDT; 355 no-PCDT)
- 56 clinics
- 62% men; 38% women
- Median age: 53 years
- Mean thrombus removal: 74%

SHORT-TERM OUTCOMES

PCDT vs no-PCDT, within 10 days:

- Major bleeding: 1.7% vs 0.3%; $P = .049$
- Any bleeding: 4.5% vs 1.7%; $P = .034$
- Leg pain: -1.62 vs -1.29; $P = .019$
 - At 30 days: -2.17 vs -1.83; $P = .026$
- Leg swelling: -0.26 vs +0.27; $P = .024$
 - At 30 days: -0.74 vs -0.28; $P = 0.51$

0 fatal or intracranial bleeds in either arm

LONG-TERM OUTCOMES

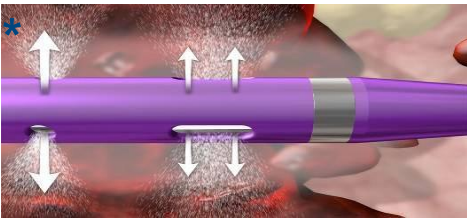
PCDT vs no-PCDT

- Postthrombotic syndrome: 46.7% vs 48.2%; $P = .56$
- Recurrent venous thromboembolism: 12.5% vs 8.5%; $P = .09$

In conclusion, among patients with acute proximal deep-vein thrombosis, the addition of pharmacomechanical catheter-directed thrombolysis to anticoagulation did not result in a lower risk of the post thrombotic syndrome but did result in a higher risk of major bleeding.

Angiojet®

(Boston Scientific)



Sonde (1 par procédure):

Générateur

± stents (Wallstent)

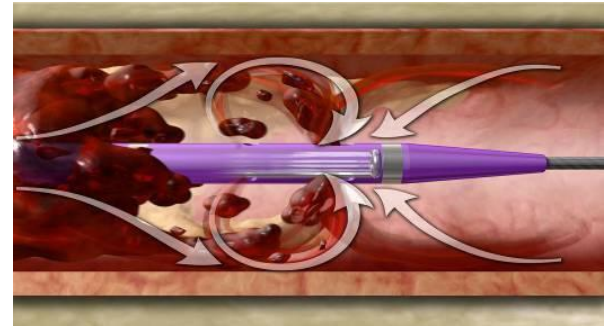
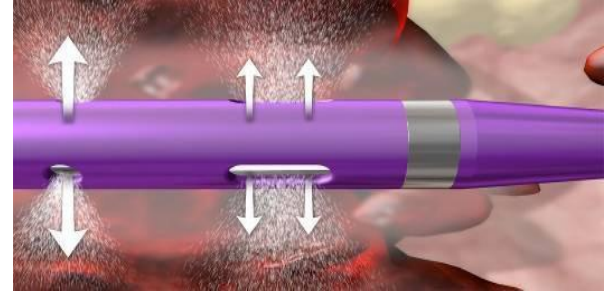
± filtre cave

PEARL Registry *(Garcia et al, J Vasc Interv Radiol 2015)*

- **Objective:** To report procedural and patient outcomes of endovascular treatment for lower-extremity deep vein thrombosis (DVT) with rheolytic thrombectomy (RT)

- **Angiojet® (Boston Scientific)**

- 32 sites et 329 patients
- 67% traités avant 14 jours



- Réduction immédiate et significative de la masse cruorique et des symptômes dans 95% des cas.
- Amélioration significative des scores QOL à 3,6 et 12 mois sous anticoagulant seul
 - A 3,6, 12 mois, 94%, 87% et 83% des patients sans thrombose itérative

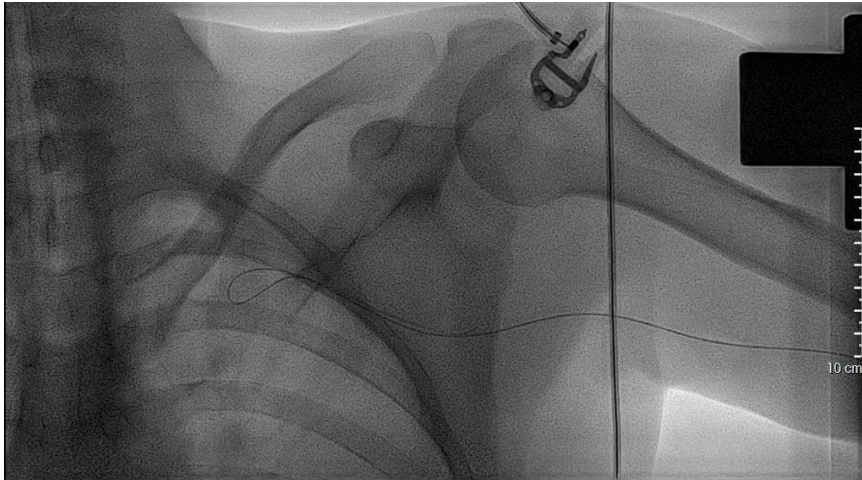
Approach

Brachial vein guided puncture

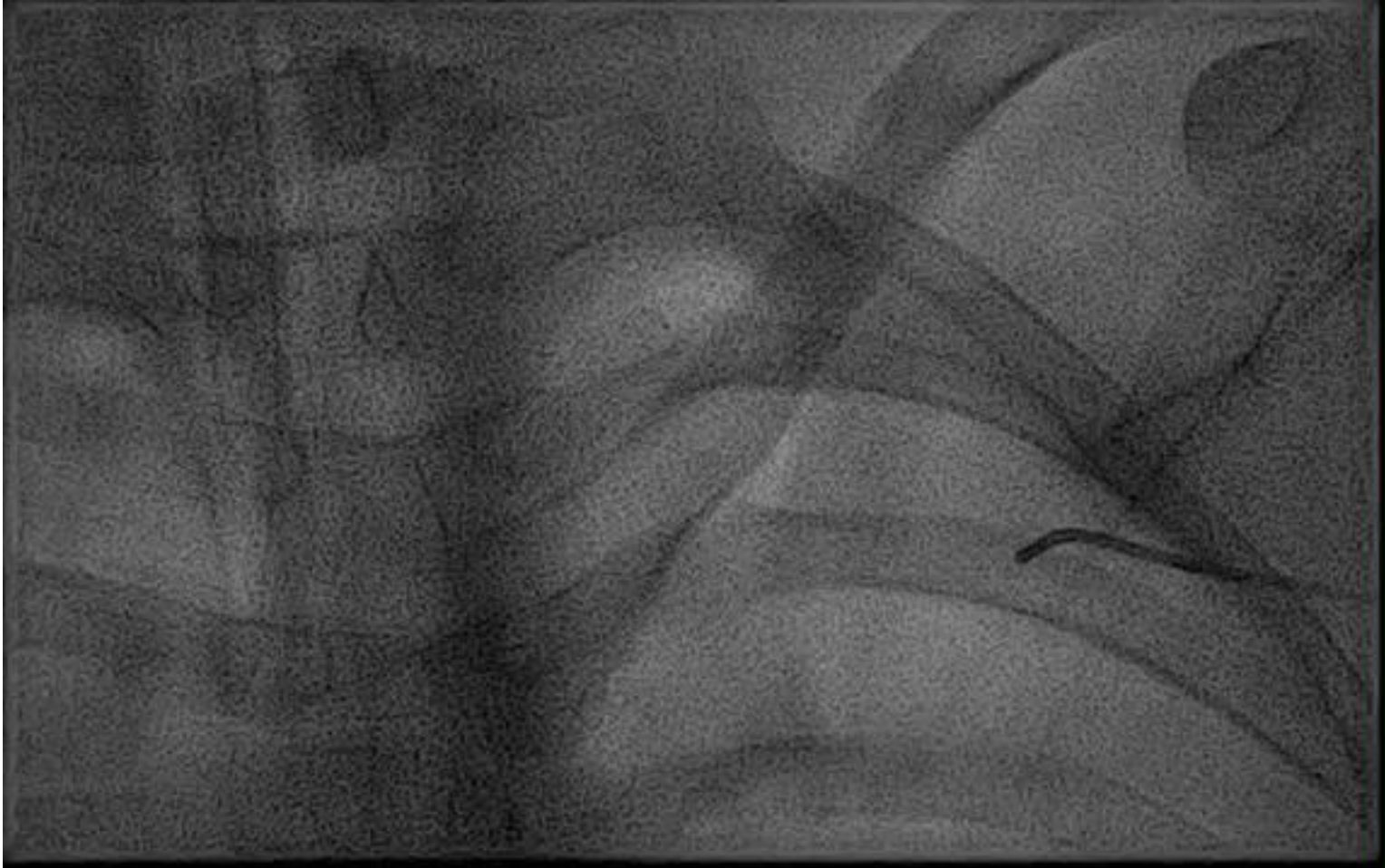
8F sheath

0.035 guidewire

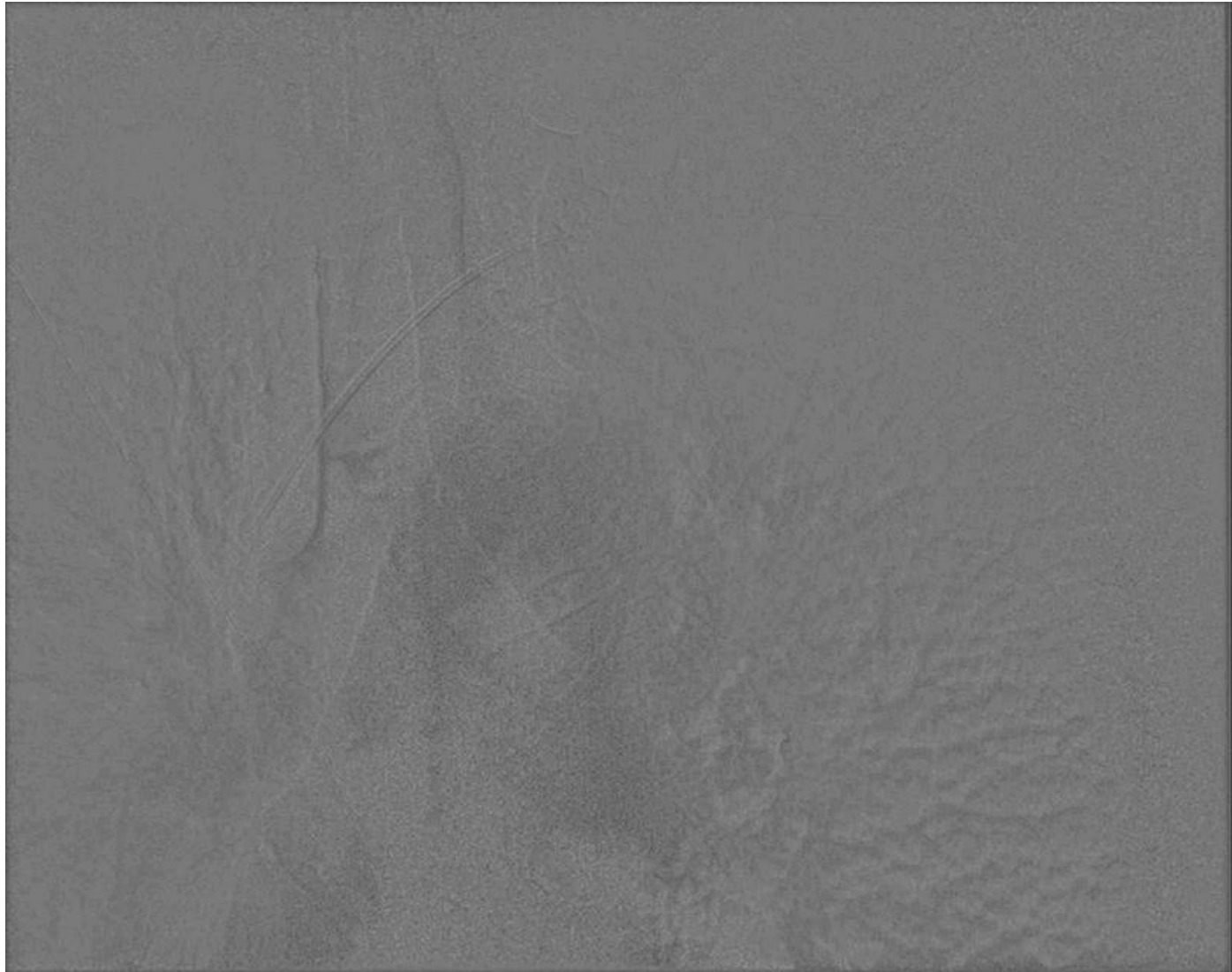
Angiogram



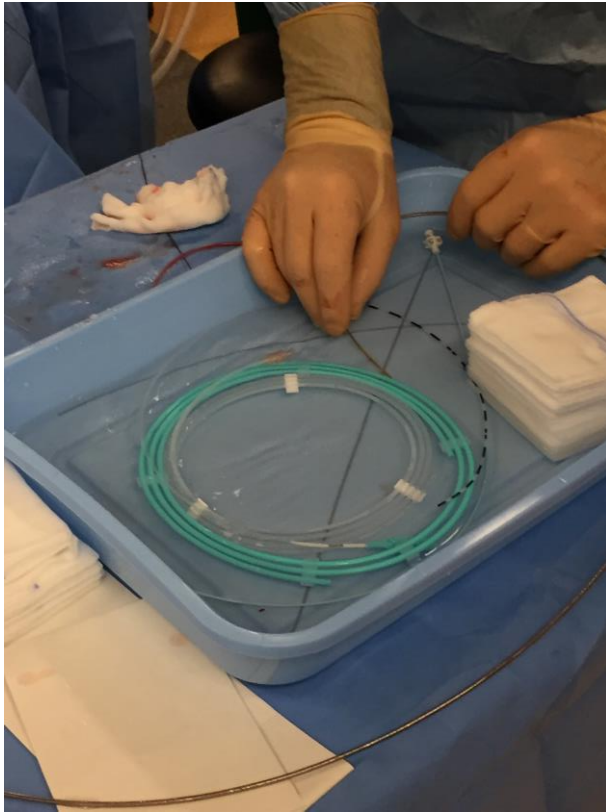
Angiogram



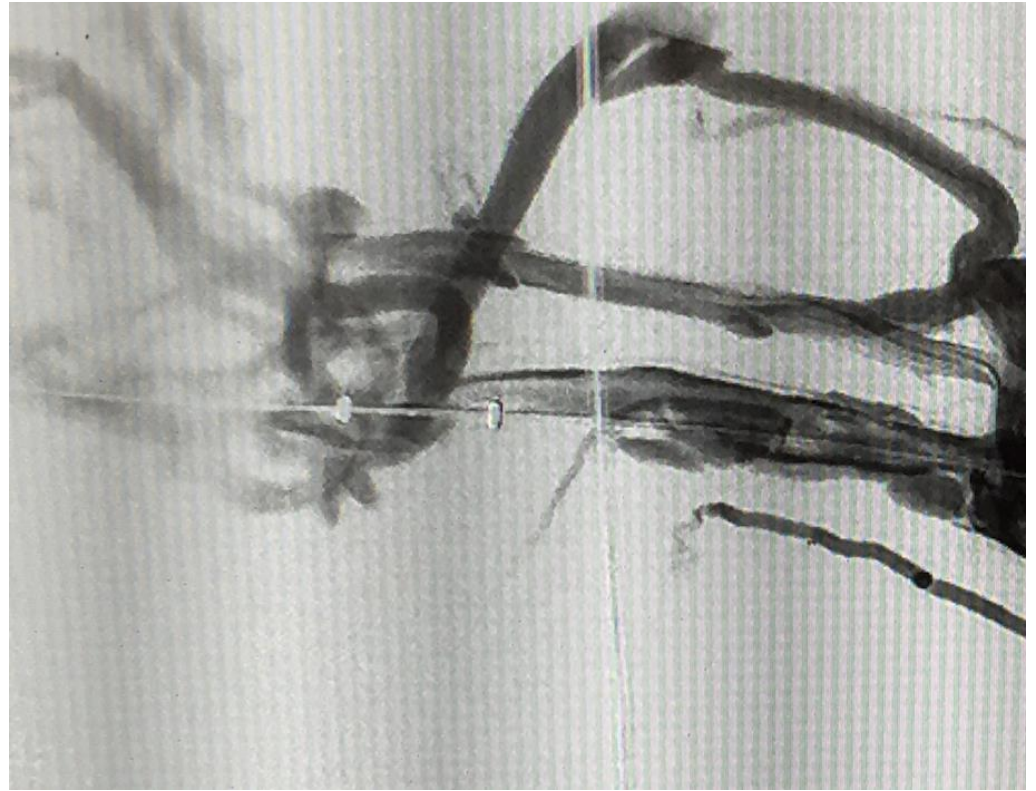
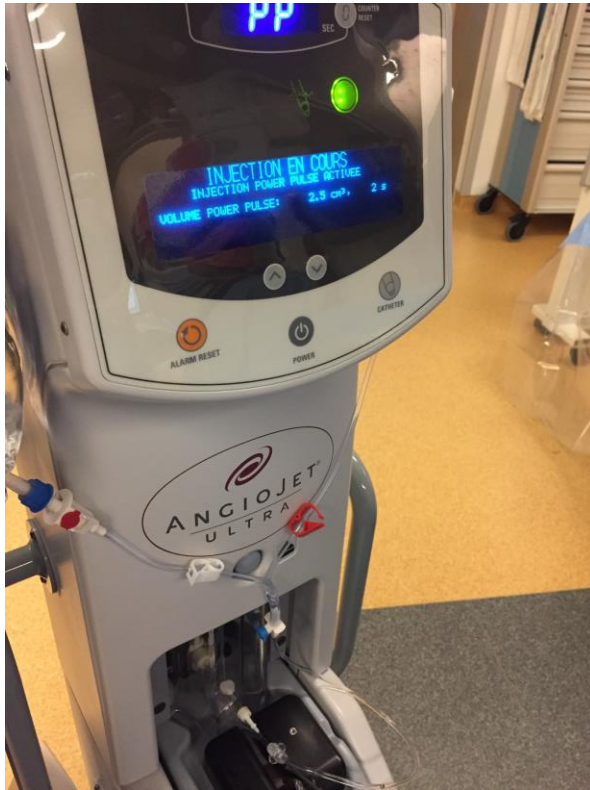
Recanalization



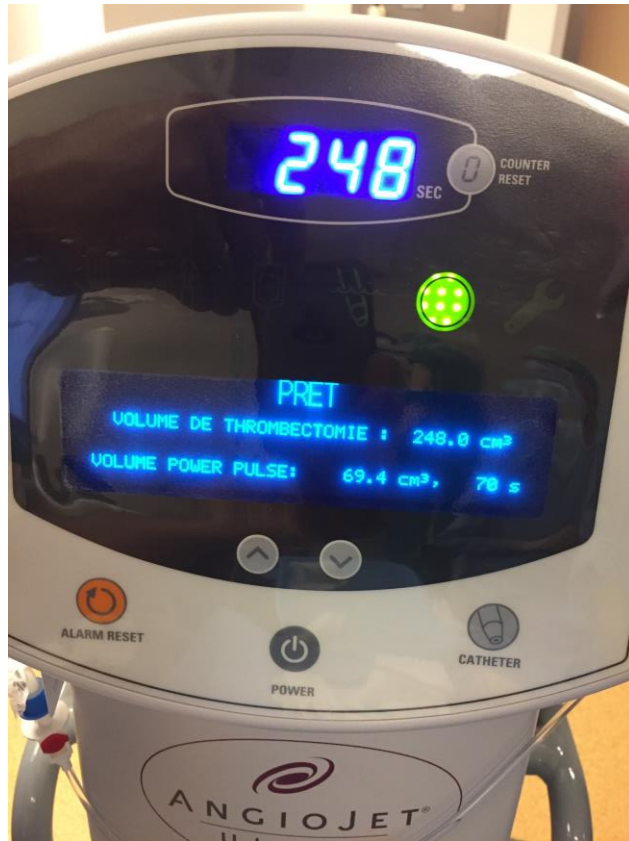
Local fibrinolysis



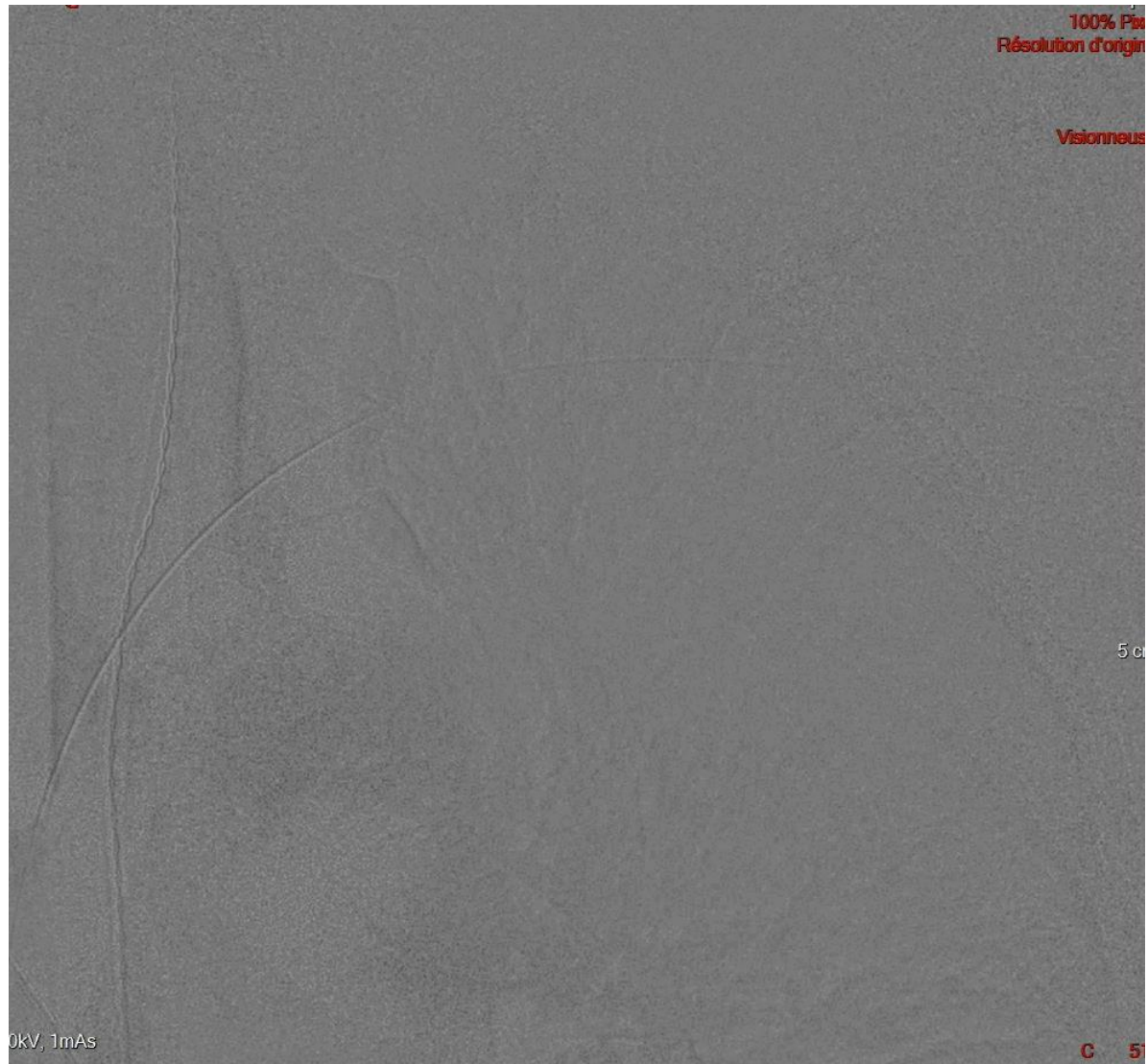
Local fibrinolysis



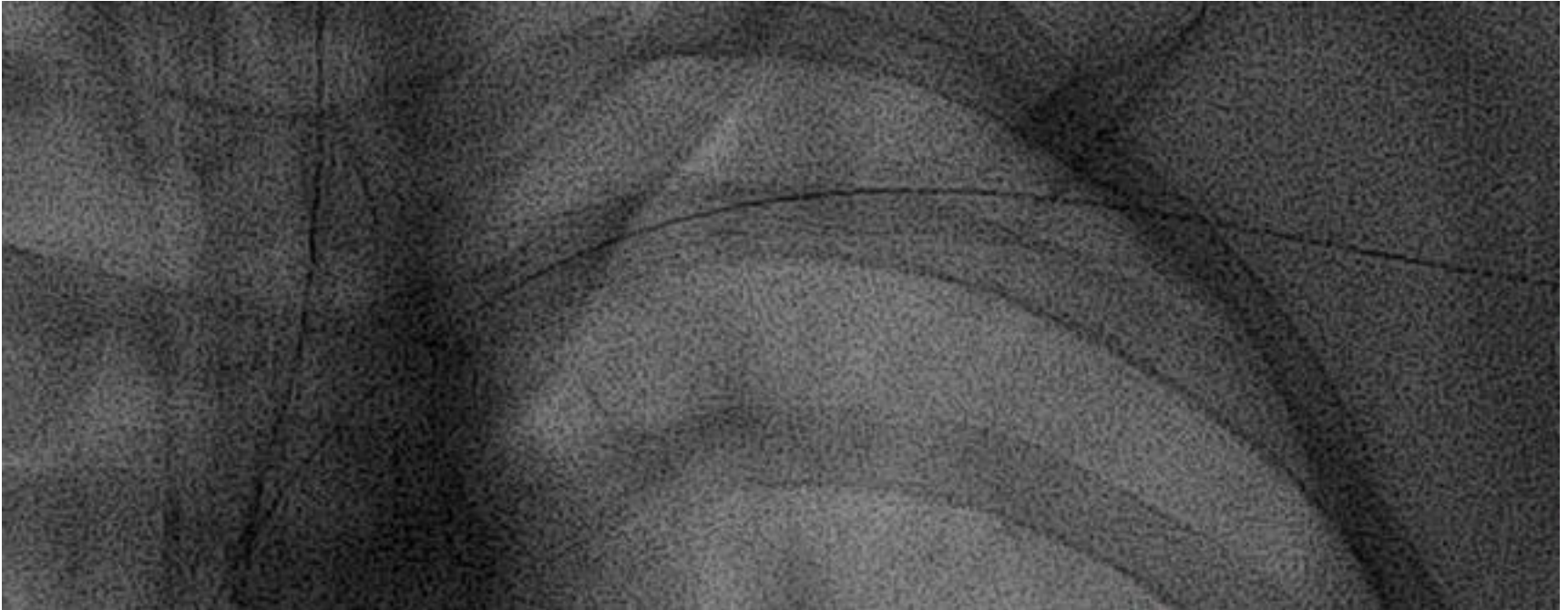
Endovascular thrombectomy



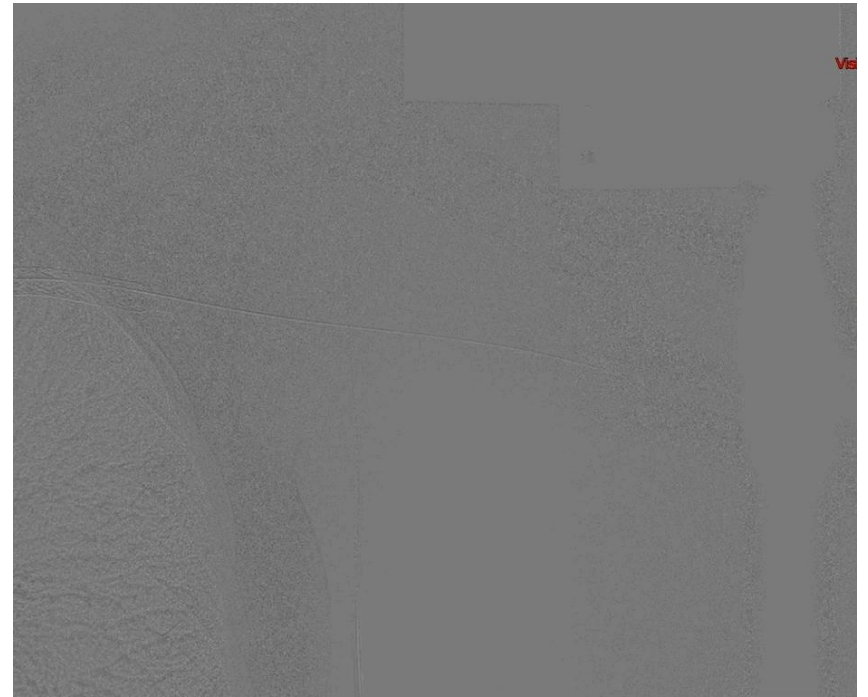
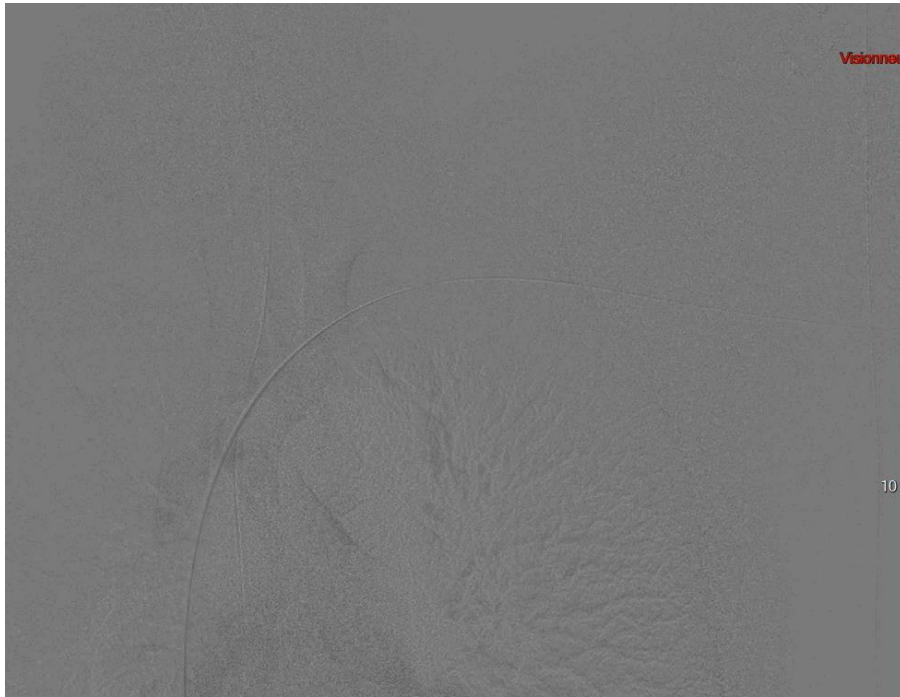
Control angiogram



Venous stenting



Final angiogram



Registre monocentrique

Tom Le Corvec, Olivier Espitia, Philippe Chaillou, Jerome Connault, Marc Antoine Pistorius,
Yann Gouëffic, Blandine Maurel

Department of vascular medicine and surgery - University hospital of Nantes, France



- **Objective:** évaluer l'efficacité du traitement pharmaco-mécanique des TVP symptomatiques
- **Critère primaire:** perméabilité primaire à 24 heures
- **Prise en charge médico-chirurgicale**

Critères d'éligibilité

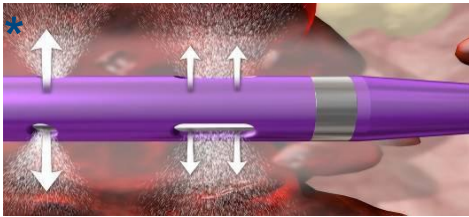
Critères d'inclusion

- Une TVP proximale ilio-fémorale aiguë < 21 jours
- Symptomatologie intense
- Syndrome occlusif majeur (œdème)
- Espérance de vie de plus d'un an
- Absence d'antécédent hémorragique significatif dans les trois mois

Critères d'exclusion

- Femmes enceintes
- Patients ayant une espérance de vie limitée
- Patients à haut risque hémorragique (antécédents hémorragiques significatifs de moins de 3 mois)
- Patient ayant une néoplasie évolutive associée

Angiojet[®] (Boston Scientific)



Sonde (1 par procédure):

Générateur

+ filtre cave

± stents (Wallstent)

Prise en charge post-interventionnelle

- Marche +++++
- Compression pneumatique intermittente en post procédure
- Anticoagulation curative (Min. 6 mois - durée en fonction du contexte)
- Antiagrégant plaquettaire (au moins 1 mois si stent)
- Contention veineuse
- Contrôle écho doppler à H24, M1, M3, M6 et M12

13 patients

Mai 2017 → Février 2018

43,5 ans H/F : 4/9

Membre inférieur : 11 patients (1 bilatérale)

Membre supérieur : 2 patients

-Extension thrombus veine cave : 3 patients

Succès technique 92.3%

- Stenting complémentaire systématique 2 [2,2] stents
- Perméabilité post opératoire (doppler)
 - J1 : 75%
 - J30 : 81.8%
- Amélioration clinique: 100%

Complications

- Complications : 4 patients
 - 1 faux anévrisme AFS
 - 1 EP
 - 1 fistule artério-veineuse
 - 1 IRA avec hémodialyse temporaire
- 2 réinterventions :
 - fermeture FA
 - thrombolyse pour thrombose précoce
- Pas de complication hémorragique

Conclusions

- Résultats reproductibles avec données de la littérature
 - Taux de perméabilité à 30 jours 81.8%
 - Amélioration clinique chez les patients reperméabilisés
- Intérêt de réaliser une étude comparative plus large pour observer les bénéfices à moyen et long terme
- Résultats communiqués à la SCVE juin 2018

Use of Rheolytic Thrombectomy



- AngioJet Solent Proxi (MEDRAD, Minneapolis, MN; Bayer)
- PowerPulse delivery – may use IVCF for selected patients
 - 5-10 mg in 50-100 ml
 - 30-minute dwell time
- Aspiration – guiding catheter
- Bradycardia – pt selection, pauses
- Met-hemoglobinuria - awareness

Use of Isolated Thrombolysis

Trellis-8 Peripheral Infusion System
(Covidien, Mansfield, MA)

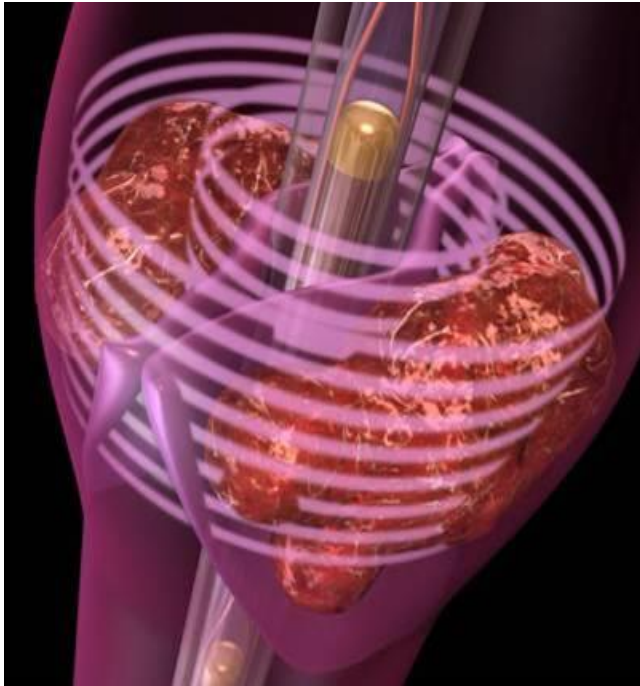
4-8 mg per spin, 2 spins

Dwell time, balloon maceration, no
need to aspirate clot-TPA

Single session most likely with good
popliteal inflow



Use of Ultrasound-Lysis



Concentrate TPA solution

Does it add value for subacute clot?

If value is added, some may prefer return to quick-procedure CDT model

EKOS Corporation, Bothell, WA