

Sessione: Lead Extraction

Estrazione di elettrocateri: nuove tecniche e nuovi dispositivi disponibili

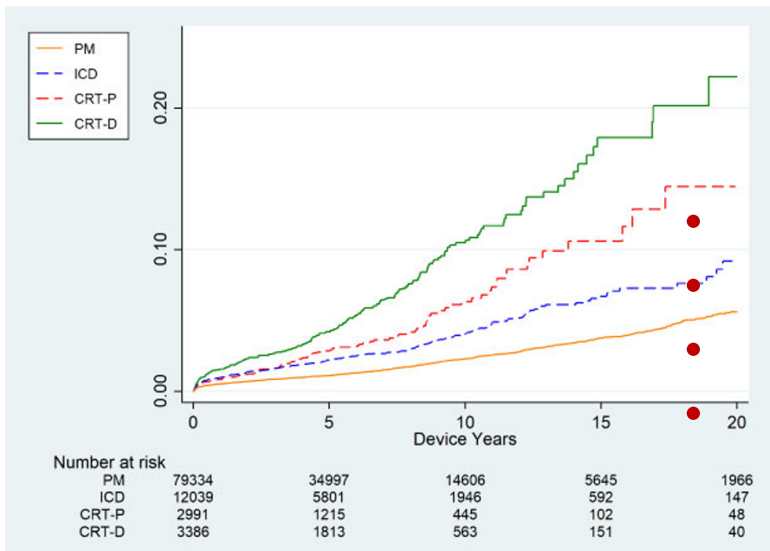


Dott. MAZZONE Patrizio

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Grande Ospedale Metropolitano Niguarda,
Milano

- Number of devices is continuously increasing and consequently number of CIED complications.
- **CIED infection** is one of the most serious complications and it is associated with significant mortality and morbidity



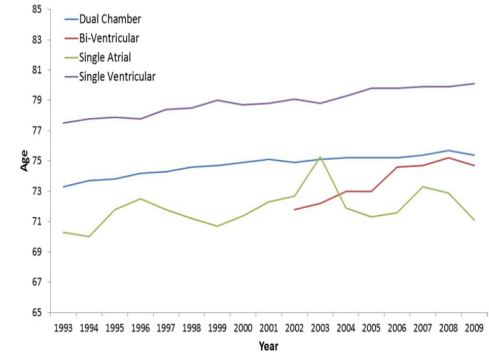
Incidence during lifetime

PM 1.19%
ICD 1,91%
CRT-P 2,18%
CRT-D 2,95%

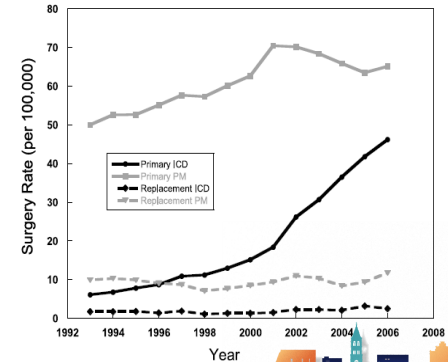


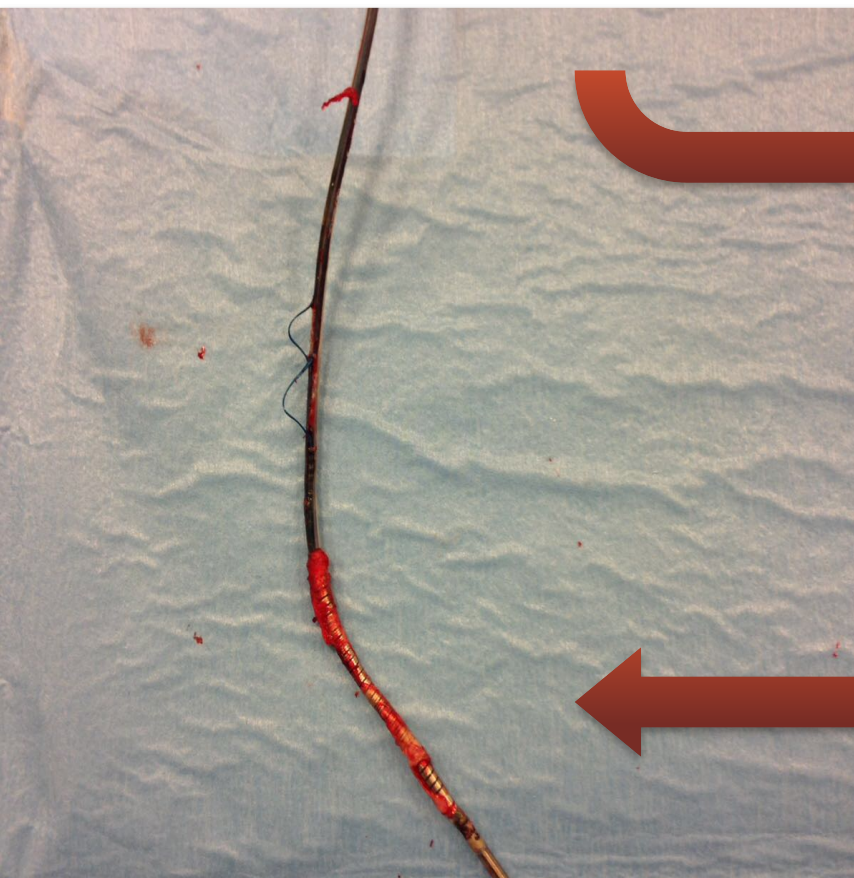
- Progressive older population
- Increasing number of ICDs and CRT-Ds:
 - Presence of a coil for shock therapy → more fibrosis
 - More leads per device
 - Complex Design → High rate of malfunction
- Patients with ICDs are younger and live longer
 - Greater number of upgrades and substitutions
 - Higher risk of infection

AGE AT IMPLANT



RATE OF IMPLANT






A DIAMOND IS FOREVER



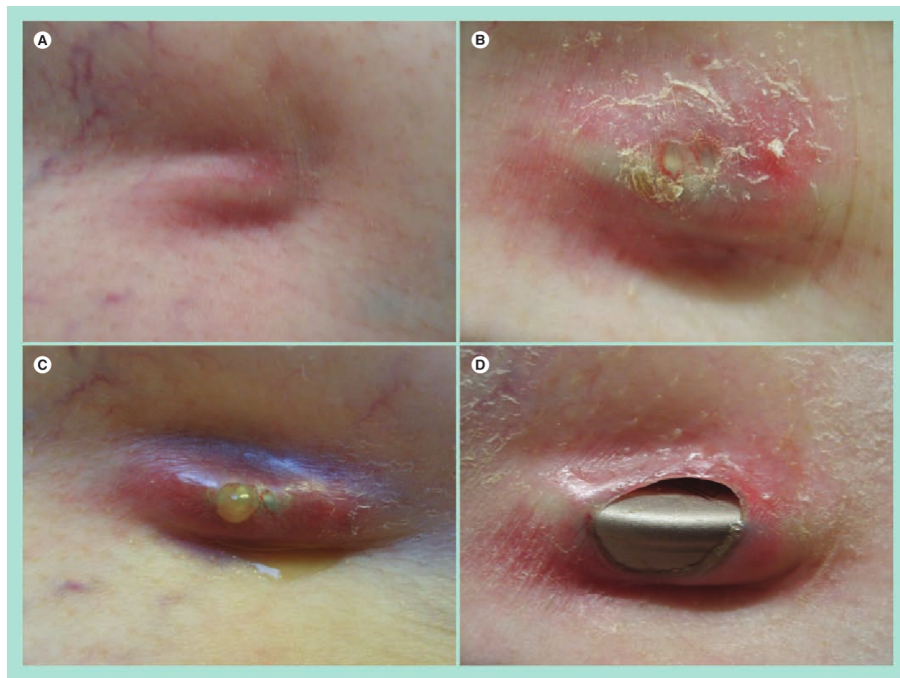
... BUT A CATHETER
IS NOT...





Love is eternal while it lasts





Edema of the pocket

**Skin retraction and
initial necrosis**

**Skin erosion with
system exposure**



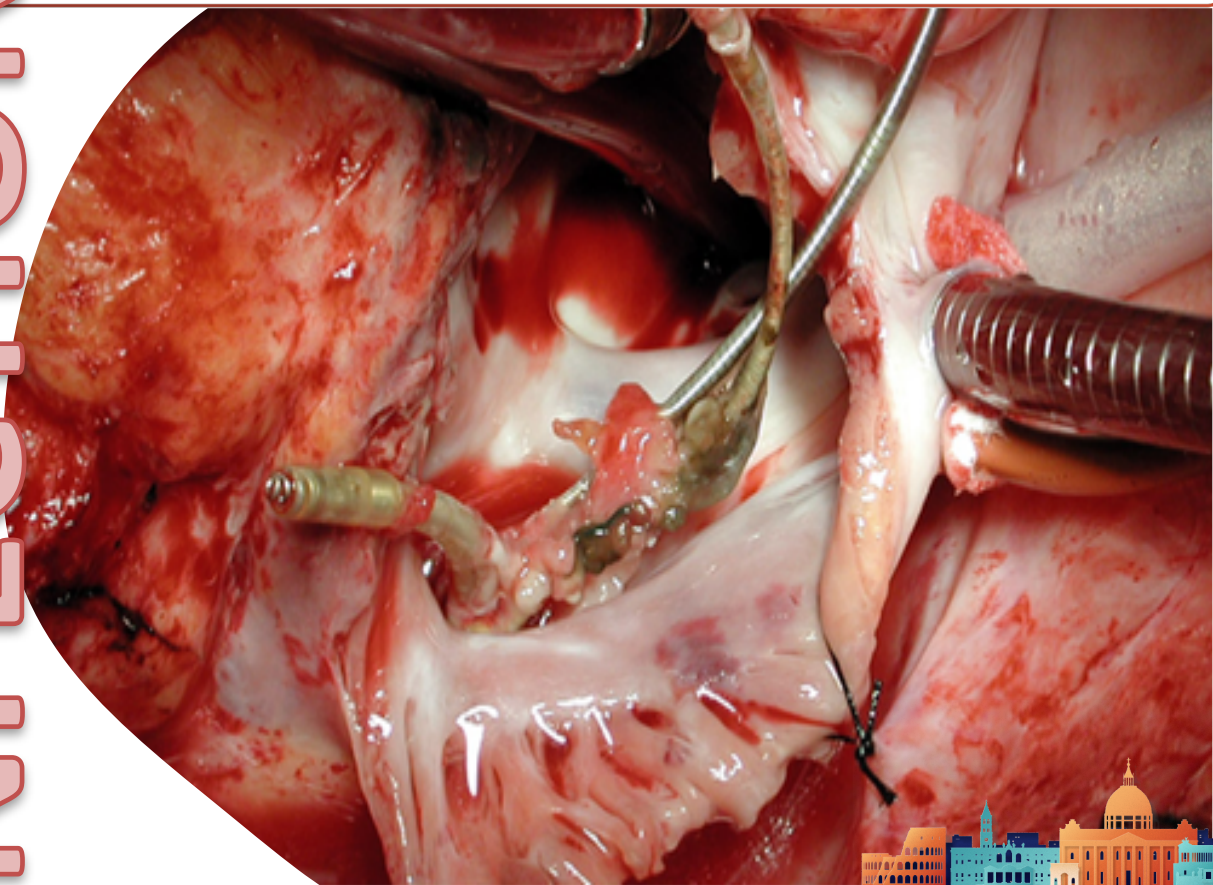
DIFFERENT STAGES OF DEVICE INFECTION



**Skin erosion with
system exposure**



INFECTION



Device-related

Leads & Generator

More leads	(5.4)
ICD	(1.8-8.5)
CRT	(2.7-28.5)

Additional interventions

Generator replacement	(2.0-3.8)
System upgrade	(3.1-39.6)
Reintervention	(3.1-8.0)

Operative approach

Epicardial	
Abdominal device	

Patient

Underlying

Younger age	(1.4-1.6)
Male	(1.5)
Renal dysfunction	(1.5-13.4)
Heart disease	(3.8)
COPD	(2.2-9.8)
AF	(3.1)
Immunocompromised	(2.3-13.9)

Transient

Recent fever	(5.8)
Temporary pacing	(2.5)
Anticoagulation	(2.8)

Procedural

Peri-operative

Absence of antibiotics	(2.0-11.5)
Operator inexperience	(2.5)
Procedure duration	(1.03)

Post-operative

Hematoma	(27.2)
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Europace (2021) **23**, iv3–iv10
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SUPPLEMENT PAPER

Epidemiology of cardiac implantable electronic device infections: incidence and risk factors

Hui-Chen Han¹, Nathaniel M. Hawkins¹, Charles M. Pearman^{1,2}, David H. Birnie³, and Andrew D. Krahn^{1*}

¹Heart Rhythm Services, Division of Cardiology, Department of Medicine, Center for Cardiovascular Innovation, University of British Columbia, Vancouver, British Columbia, Canada; ²Unit of Cardiac Physiology, Division of Cardiovascular Sciences, Manchester Academic Health Science Centre, Core Technology Facility, University of Manchester, Manchester M13 9XX, UK; and ³University of Ottawa Heart Institute, Ottawa, Ontario, Canada

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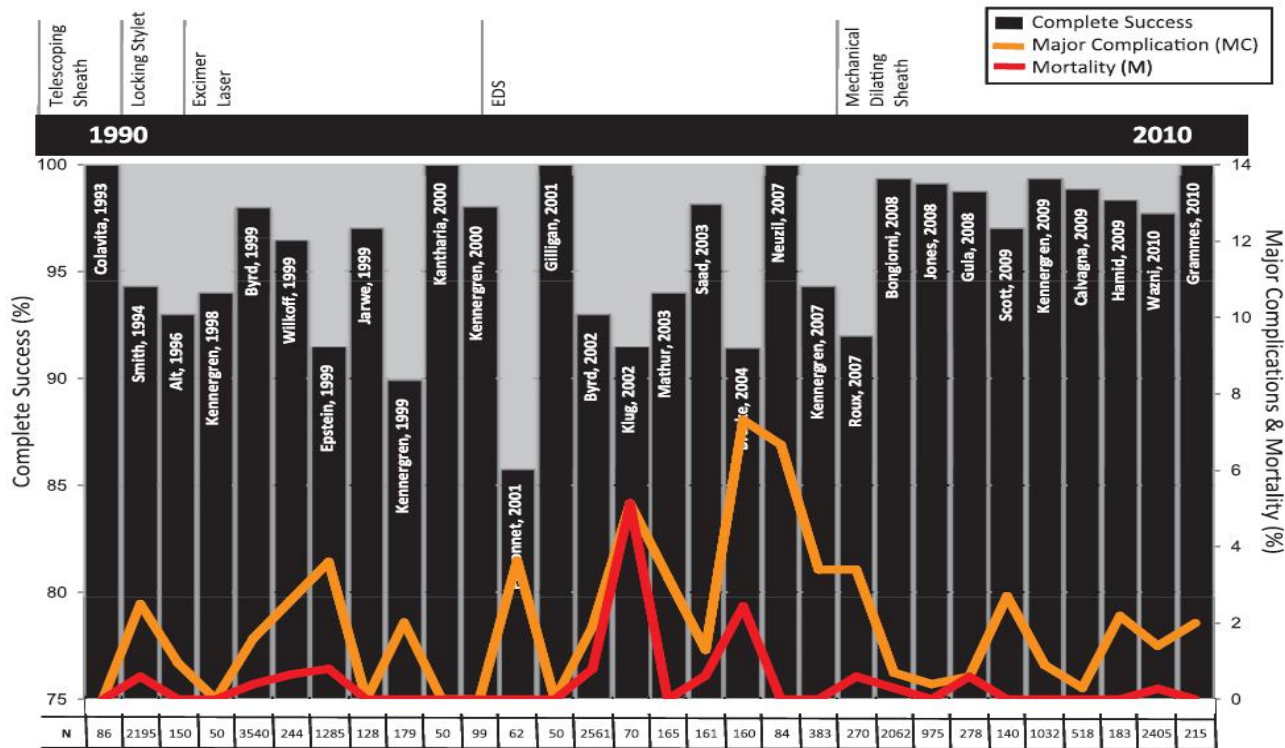


- **Local contamination in the pocket → Systemic infection**
 - During implantation or generator substitution
 - Skin erosion after traumatism
- **Bloodstream infection by distant infectious focus**
 - Septic thrombophlebitis
 - Osteomyelitis
 - Pneumonia
 - Contaminated vascular catheters
 - GI tract contamination



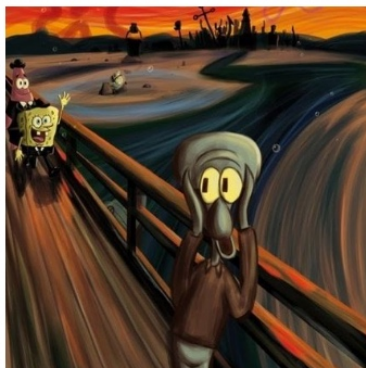
Infectious	Clinical Scenarios (Class I Indications)
Pocket infection with or without bacteraemia	Localised signs of inflammation such as erythema, swelling, pain, tenderness, warmth or drainage with positive or negative blood cultures
Left-sided endocarditis in a CIED carrier	Left heart vegetations with or without tricuspid valve or CIED involvement, and positive blood cultures
CIED-related endocarditis	Positive blood cultures and lead or valvular vegetation(s), without local signs of pocket infection
Occult bacteraemia with probable CIED infection	Bacteraemia without an alternative source, resolves after CIED extraction
Non-infectious	Clinical Scenarios (Class I, IIa, And IIb Indications)
Thrombosis/vascular Issues	Clinically significant thromboembolic events attributable to thrombus on a lead or a lead fragment that cannot be treated by other means (class I)
	Superior vena cava (SVC) stenosis or occlusion that prevents implantation of a necessary lead (class I)
	Planned stent deployment in a vein already containing a transvenous lead to avoid entrapment of the lead (class I)
	Maintaining patency of SVC stenosis or occlusion with limiting symptoms (class I) Ipsilateral venous occlusion preventing access to the venous circulation for required placement of an additional lead (class IIa)
Chronic pain	Severe chronic pain at the device or lead insertion site or believed to be secondary to the device, which causes significant patient discomfort, is not manageable by medical or surgical techniques, and for which there is no acceptable alternative ¹⁷ (Class IIa)
Other	Life-threatening arrhythmias secondary to retained leads (class I)
	Lead removal can be useful for patients with a CIED location that interferes with the treatment of a malignancy ¹⁸ (class IIa)
	CIED implantation requires more than four leads on one side or more than five leads through the SVC (class IIa)
	Abandoned lead(s) that interfere with the operation of a CIED system (class IIa)
	Leads that pose a potential future threat to the patient if left in place, because of their design or failure (class IIb)
	Lead removal may be considered to facilitate access to MRI ¹⁹ (class IIb) The setting of normally functioning, non-recalled pacing or defibrillation leads for selected patients after a shared decision-making process (class IIb)





Maytin, M., & Epstein, L. M. (2011). The challenges of transvenous lead extraction. *Heart (British Cardiac Society)*, 97(5), 425–434. <https://doi.org/10.1136/hrt.2009.189910>





Complications	Incidence (%)
Major	0.19–1.80
Death	0.19–1.20
Cardiac avulsion	0.19–0.96
Vascular laceration	0.19–0.96
Respiratory arrest	0.20
Pericardial effusion requiring intervention	0.23–0.59
Haemothorax requiring intervention	0.07–0.20
Massive pulmonary embolism	0.08
Minor	0.60–6.20
Haematoma requiring evacuation	0.90–1.60
Pneumothorax requiring chest tube	1.10
Bleeding requiring blood transfusion	0.08–1.00
Worsening tricuspid valve function	0.32–0.59
Pulmonary embolism	0.24–0.59
Venous thrombosis requiring medical intervention	0.10–0.21
Migrated lead fragment without sequelae	0.20
Pericardial effusion without intervention	0.07–0.16

Source: Kusumoto et al, 2017.¹ With permission from Elsevier





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journal homepage: www.jcvaonline.com



Original Article

Predictors of Intensive Care Unit Admission in Patients Undergoing Lead Extraction: A 10-Year Observational Study in a High-Volume Center



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Predictors of Intensive Care Unit Admission in Patients Undergoing Lead Extraction: A 10-Year Observational Study in a High-Volume Center

Objective: To identify reliable predictors of periprocedural intensive care unit (ICU) admission after transvenous lead extraction (LE) in a high-volume center.

Design: Retrospective observational study.

Setting: University tertiary-care hospital.

Participants: All patients undergoing LE at San Raffaele Scientific Institute, Milan, Italy, from 2005 to 2015.

Interventions: LE procedures were performed in the electrophysiology laboratories with a cardiac operating room on standby between the end of the morning surgical case and before the start of the afternoon surgical case. Most procedures were conducted with the patient under procedural sedation and analgesia. After LE, patients were admitted either to the ward or to the ICU. Medical history and intraprocedural data were recorded.

Measurements and Main Results: Of the 389 procedures performed during the study period, 50 patients (13%) were admitted to the ICU owing to persistent hemodynamic instability or intraoperative complications requiring endotracheal intubation. Complete procedural success was achieved in 370 patients (95%), and the clinical success rate was 98.4%. No deaths were recorded. Five complications requiring emergency surgery (1.3%) were reported. Preprocedural right ventricular dysfunction (odds ratio (OR) 7.41; confidence interval 1.85-29.7; $p < 0.01$) and the need for general anesthesia (OR 12; confidence interval 1.49-97.06; $p = 0.019$) were independent predictors of ICU admission.

Conclusions: Preoperative identification of patients who need ICU admission after LE is crucial to increase patient safety and decrease hospital costs. Severe right ventricular dysfunction and need for general anesthesia identify patients with low cardiac reserve who are at increased risk for ICU admission after the procedure.

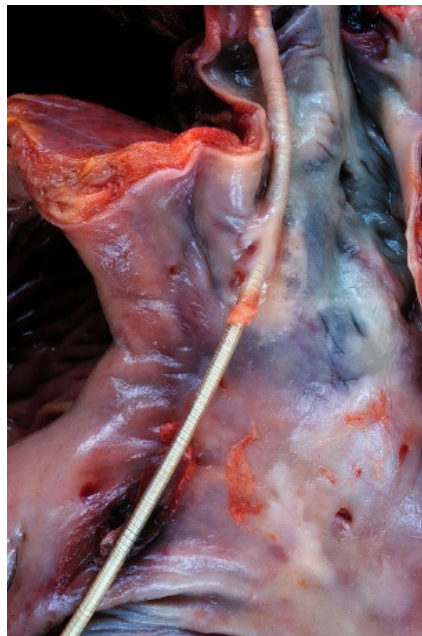
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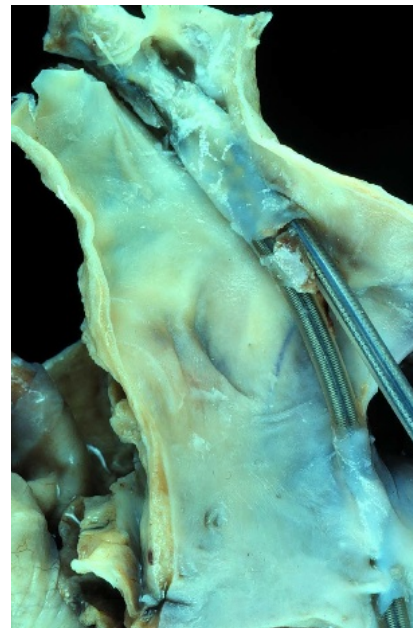
- **Patient procedural risk factors**

- Age
- Co-morbidities: LV function – IRC – DM - coagulopathy
- Venous status: occluded or stenosed
- Congenital heart disease
- Number of leads
- Fixation mechanism: passive → more fibrosis
- ICD lead: coil presence
- Implantation time: > 1 year
- Special/damaged leads: *Starfix* – *Accufix*

Fibrosis



Calcifications



- Subclavian vein tear/AV fistula
- Innominate tear/perforation
- High SVC tear/perforation
- SVC tear/perforation
- SVC/RA junction tear/perforation
- Atrial wall perforation
- Inferior vena Cava
- Valvular damage
- Ventricular wall perforation

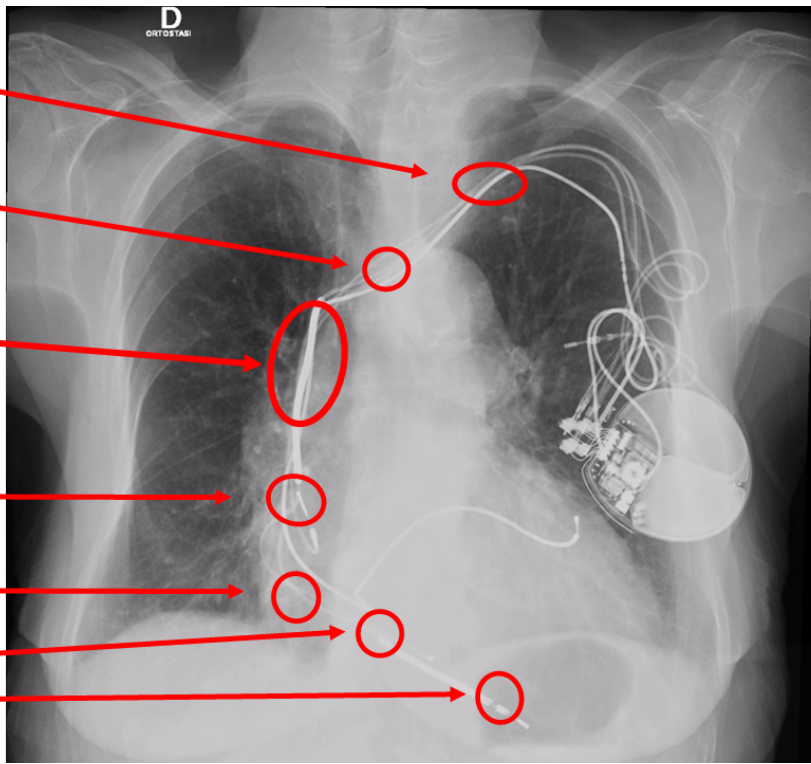
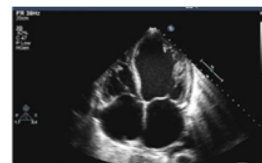
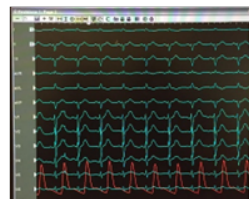
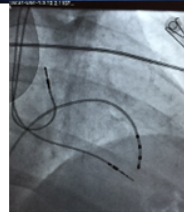
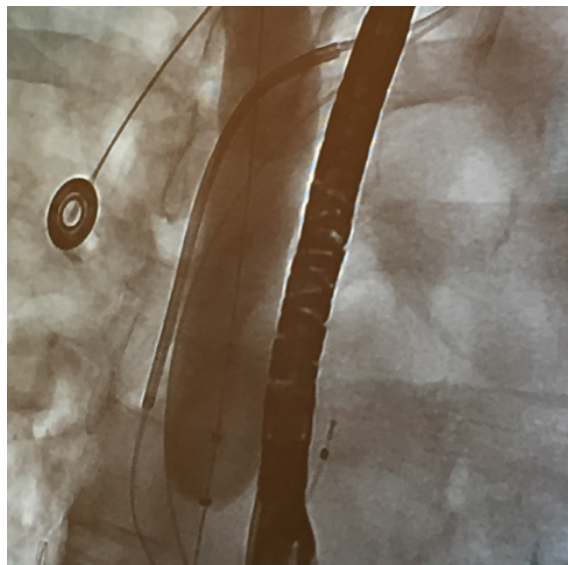
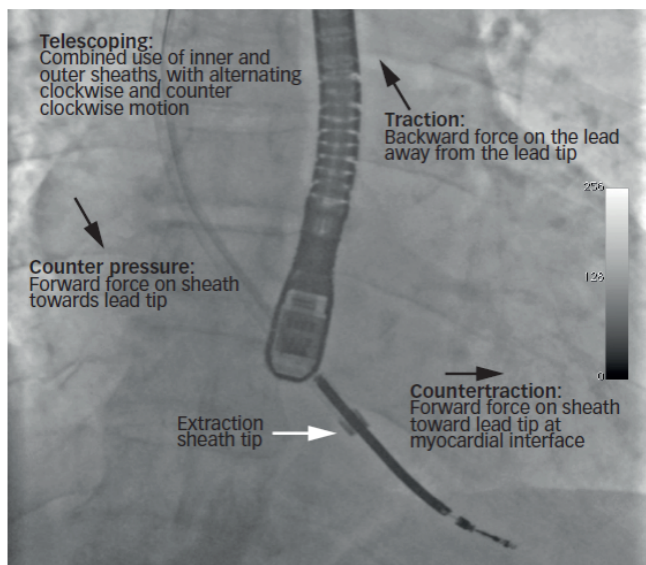


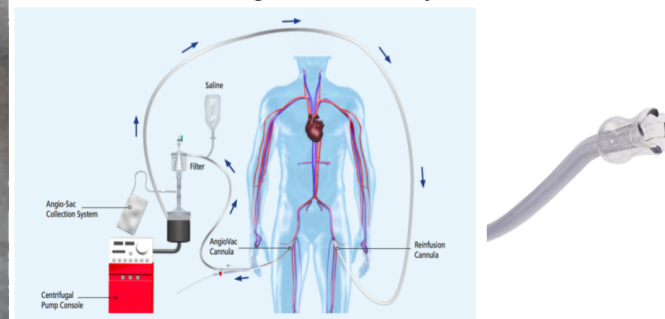
Table 5 Required facility and equipment for lead extraction procedures

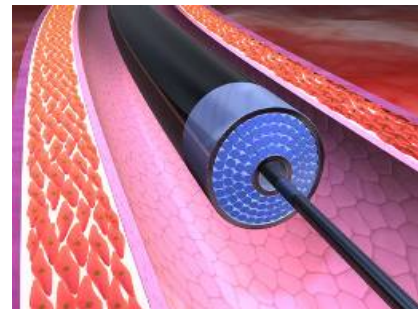
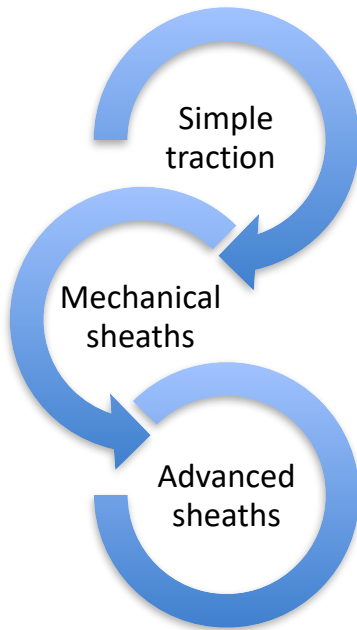
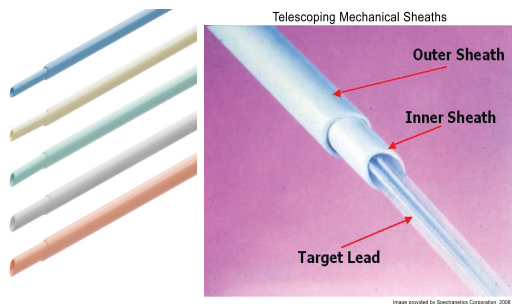
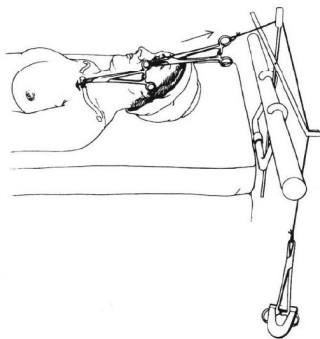
Facility/equipment	Description
Facility	Operating theatre or room or a cardiac catheter/EP lab
High-quality fluoroscopy	'Angiographic quality' equipment with image storage, either as an integral part of a lab or a mobile C-arm
Surgical instruments	Appropriate for transvenous lead extraction, device implantation, vascular repairs, thoracotomy, sternotomy, and cardio-pulmonary bypass—must be in good functional order and in the room or immediately available
Extraction tools	Depending on the operator(s) preferences, a selection of extraction stylets, sheaths, and femoral tools
CIED implantation tools	All standard implantation equipment as well as a variety of stylets, guidewires, wrenches, lead end caps
Echocardiography	'On-line' during the procedure for immediate use
Drainage sets	For emergency pericardiocentesis and for drainage of haemothorax
Temporary pacing	Venous sheath for temporary pacing electrode placement

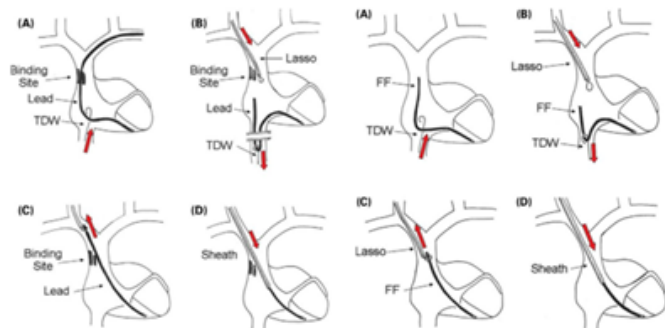




AngioVac System





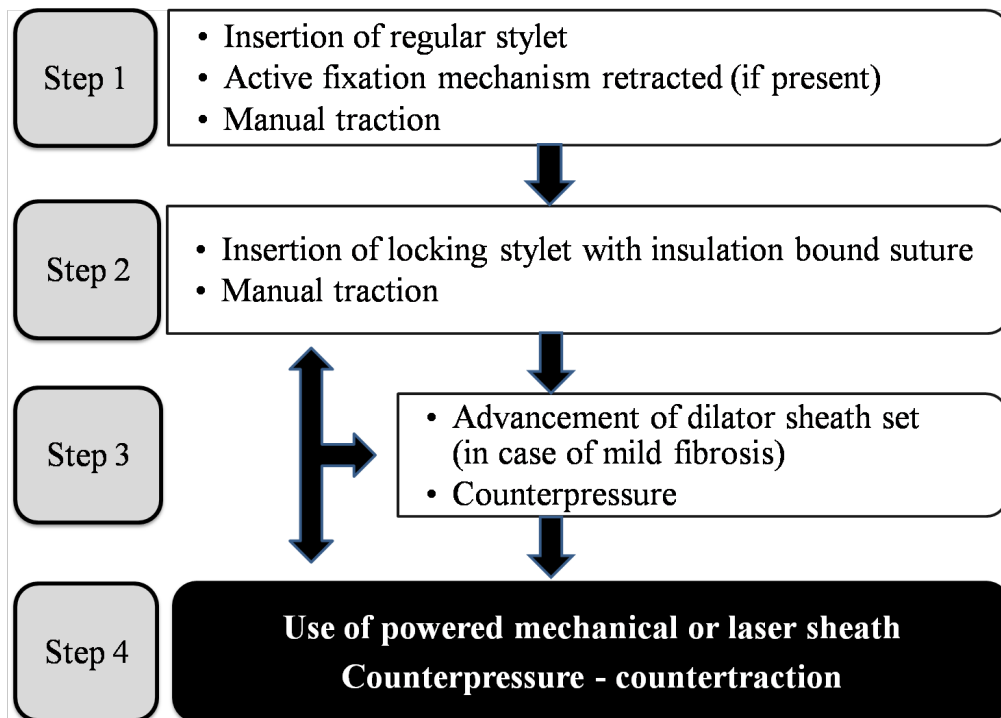


The European Lead Extraction ConTrolled (ELECTRa) study: a European Heart Rhythm Association (EHRA) Registry of Transvenous Lead Extraction Outcomes

Maria Grazia Bongiorno^{1*}, Charles Kennergren², Christian Butter³, Jean Claude Deharo⁴, Andrzej Kutarski⁵, Christopher A. Rinaldi⁶, Simone L. Romano¹, Aldo P. Maggioni^{7,8}, Maryna Andarala⁷, Angelo Auricchio⁹, Karl-Heinz Kuck¹⁰, and Carina Blomström-Lundqvist¹¹, on behalf of ELECTRa Investigators[†]

97.3%] and 95.7% [95% CI 95.2–96.2%], respectively. The all cause in-hospital major complications and deaths were significantly lower in HiV centres vs. LoV centres (2.4% [95% CI 1.9–3.0%] vs. 4.1% [95% CI 2.7–6.0%], $P = 0.0146$; and 1.2% [95% CI 0.8–1.6%] vs. 2.5% [95% CI 1.5–4.1%] $P = 0.0088$), although those related to the procedure did not reach statistical significance. Radiological and clinical successes were more frequent in HiV vs. LoV centres.





Mazzone, Patrizio et al. "Predictors of advanced lead extraction based on a systematic stepwise approach: results from a high volume center." Pacing and clinical electrophysiology : PACE vol. 36,7 (2013): 837-44. doi:10.1111/pace.12119



Step 1 or 2 was sufficient in **all** extractions if

Lead dwell time less than 12 months

Step 4 was required in only 5% of cases with one of the following features:

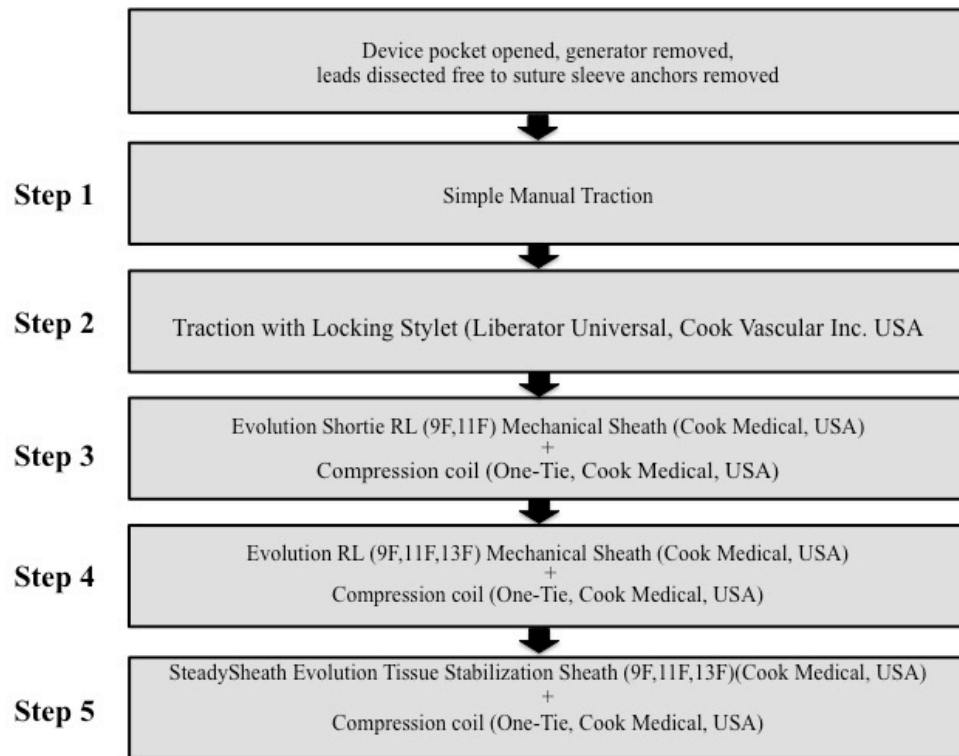
Lead dwell time less than 18 months

or

Single lead to remove

Short lead dwell time is a strong predictor for a simple extraction





DEVICES

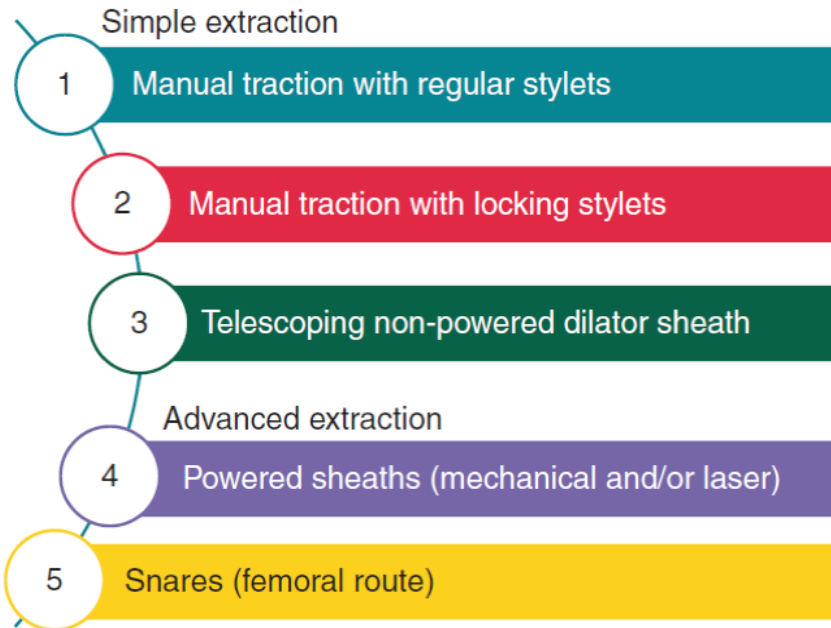
Multicenter experience with the Evolution RL mechanical sheath for lead extraction using a stepwise approach: Safety, effectiveness, and outcome

[Federico Migliore MD, PhD](#) ✉, [Martina Testolina MD](#), [Antonio Sagone MD](#), [Domenico Carretta MD](#), [Tullio Agricola MD](#), [Giovanni Rovaris MD](#), [Elena Piazzini MD](#), [Domenico Facchin MD](#), [Manuel De Lazzari MD, PhD](#), [Alessandro Zorzi MD, PhD](#), [Francesco Melillo MD](#), [Claudia Cataldi MD](#), [Alessandra Marzi MD](#), [Tomaso Bottio MD, PhD](#), [Vincenzo Tarzia MD, PhD](#), [Gino Gerosa MD](#), [Sabino Iliceto MD](#), [Emanuele Bertaglia MD, PhD](#), [Patrizio Mazzone MD](#) ... See fewer authors ^

First published: 17 April 2019 | <https://doi.org/10.1111/pace.13700> | [VIEW METRICS](#)

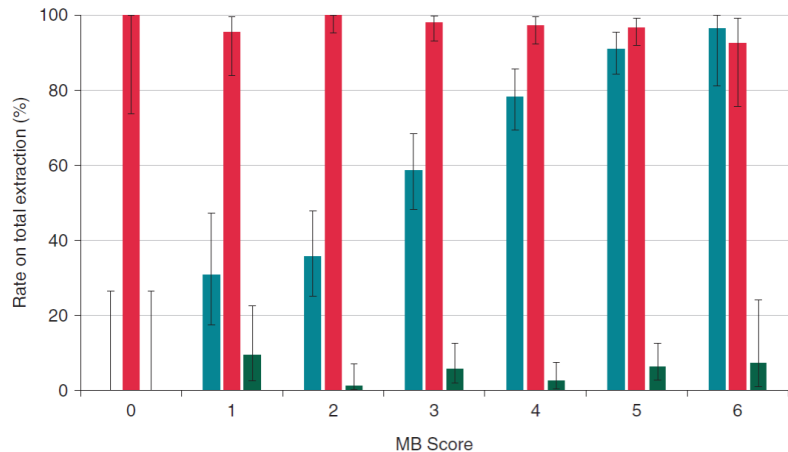
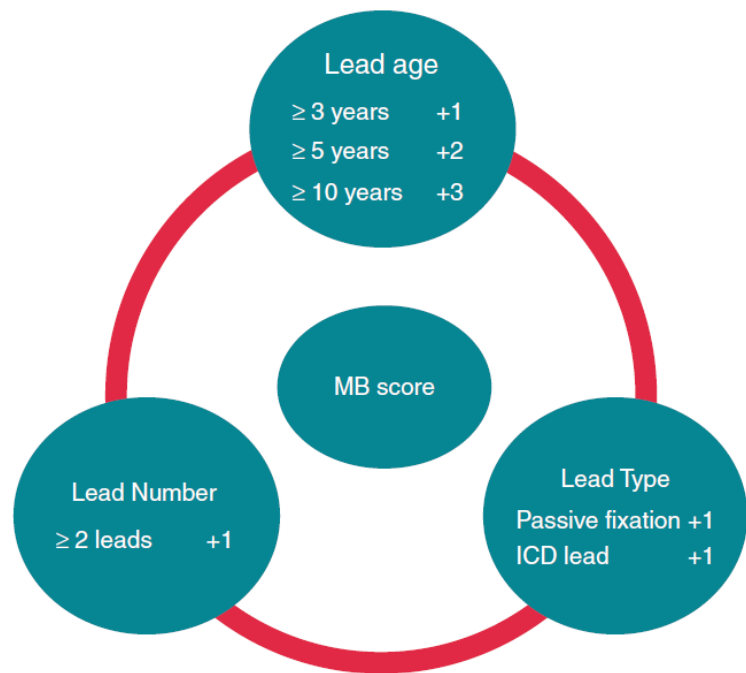


A new risk stratification index to predict the need for advanced tools in lead extraction procedures



Bontempi L, Curnis A, Della Bella P, Cerini M, Radinovic A, Inama L, Melillo F, Salghetti F, Marzi A, Gargaro A, Giacomelli D, Mazzone P. The MB score: a new risk stratification index to predict the need for advanced tools in lead extraction procedures. Europace. 2020 Apr 1;22(4):613-621. doi: 10.1093/europace/euaa027. PMID: 32087025





- Advanced extraction
- Complete success
- Complications

Bontempi L, Curnis A, Della Bella P, Cerini M, Radinovic A, Inama L, Melillo F, Salghetti F, Marzi A, Gargaro A, Giacomelli D, Mazzone P. The MB score: a new risk stratification index to predict the need for advanced tools in lead extraction procedures. *Europace*. 2020 Apr 1;22(4):613-621. doi: 10.1093/europace/euaa027. PMID: 32087025



Advanced techniques for chronic lead extraction: heading from the laser towards the evolution system

Patrizio Mazzone*, Dimitris Tsiachris, Alessandra Marzi, Giuseppe Ciconte, Gabriele Paglino, Nicoleta Sora, Simone Gulletta, Pasquale Vergara, and Paolo Della Bella

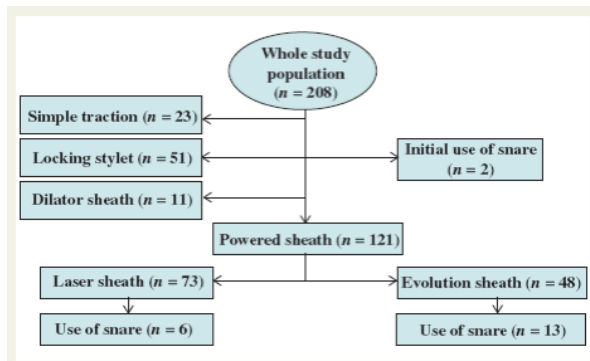


Europace (2013) **15**, 1771–1776
doi:10.1093/europace/eut126

We have demonstrated that use of the recently introduced evolution system for LE exhibits acceptably high levels of procedural and clinical success, although additional use of snare was required more frequently in the evolution compared with the laser group. Most importantly, both advanced techniques appear to be equally for LE in population with adverse clinical and technical characteristics.

Table 3 Procedural characteristics according to the use of laser or evolution system

	Laser system (n = 73)	Evolution system (n = 48)	P
Use of snare (%)	8.2	27.1	0.005
Procedural success (%)	97.3	91.7	0.16
Clinical success (%)	98.6	97.9	0.76
Major complication (%)	2.7	4.2	0.66
Minor complication (%)	5.5	4.2	0.76





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Europace (2018) 20, 829–834

doi:10.1093/europace/eux020

CLINICAL RESEARCH

Leads and lead extraction

Safety and efficacy of the new bidirectional rotational Evolution[®] mechanical lead extraction sheath: results from a multicentre Italian registry

Patrizio Mazzone^{1†}, Federico Migliore^{2*†}, Emanuele Bertaglia², Domenico Facchin³, Elisabetta Daleffe³, Vittorio Calzolari⁴, Martino Crosato⁴, Francesco Melillo¹, Francesco Peruzza², Alessandra Marzi¹, Nicoleta Sora¹, and Paolo Della Bella¹

Methods and results

Between September 2013 and June 2016, a total of 238 leads in 124 consecutive patients were removed by using the new Evolution RL rotational mechanical sheath. Indications for LE were cardiac device infection in 63 (50.8%) cases, lead malfunction in 41 (33.1%), upgrade in 1 (0.8%) case and for other reasons in the remaining 19 cases (15.3%). Ninety-one leads (38.2%) were implantable cardioverter defibrillator leads (81 dual coil vs. 10 single coil), 38 (16%) right ventricular leads, 86 (36.1%) right atrial leads, and 23 (9.7%) coronary sinus leads. The mean implant duration was 92.2 ± 52.9 months (range 12–336). 91.6% of the leads (218/238) were extracted completely with the Evolution RL alone, with the complete success rate rising to 98.7% (235/238 leads) with combined use of a snare. Overall clinical success rate was 100%. No Evolution sheath-related complications were noted. There were no deaths or major complications. Five minor complications (4%) were encountered. In cases of companion leads no wrapping or lead damage were observed.

Conclusion

On the basis of our prospective multicentre study, the new hand-powered bidirectional rotational mechanical LE sheath is an effective and safe tool for the extraction of chronically implanted leads without major complications and lead wrapping or lead damage.

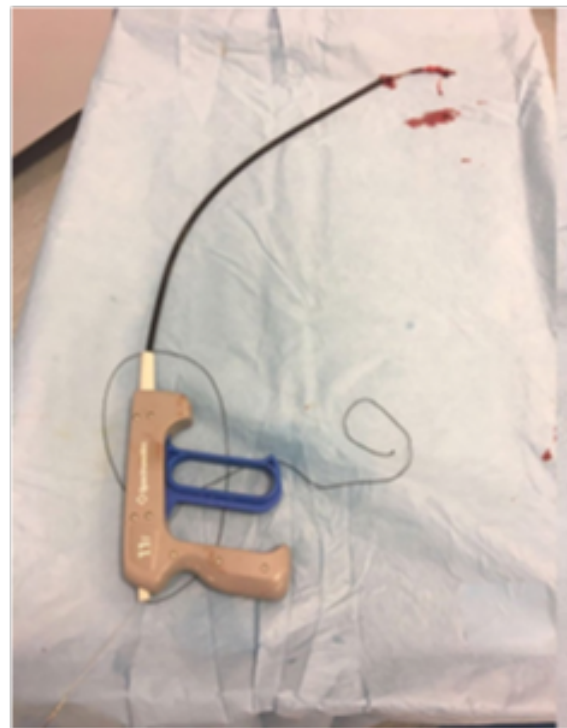


Use of the new rotating dilator sheath TightRail™ for lead extraction: A bicentric experience

Patrizio Mazzone MD^{1*}  | Francesco Melillo MD^{1*}  | Andrea Radinovic MD¹ |
Alessandra Marzi MD¹ | Gabriele Paglino MD¹ | Paolo Della Bella MD¹ | Giosuè Mascioli MD²

TABLE 1 Population and explanted leads characteristics

Patients, n	26
Clinical variables	
Age, y, median (IQR)	69 (60.7-79.5)
Female sex, n (%)	7 (26.9)
Chronic kidney disease, n (%)	7 (26.9)
Creatinine clearance, ml/min, median (IQR)	71.7 (55.5-92.0)
Indication for implantation, n (%)	
Bradyarrhythmias	11 (41.6)
Ventricular tachycardia	15 (58.4)
Indication for explantation, n (%)	
Malfunction	11 (42.3)
Endocarditis	8 (30.7)
Pocket infection	7 (26.9)



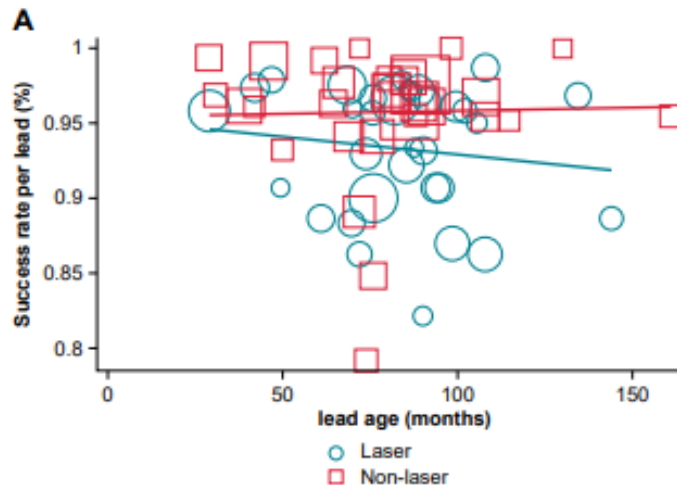
MECHANICAL VS LASER SHEATS: META-ANALYSIS

Comparison of non-laser and laser transvenous lead extraction: a systematic review and meta-analysis

Zaki Akhtar ^{1*}, Christos Kontogiannis ¹, Georgios Georgiopoulos^{2,3}, Christoph T. Starck ⁴, Lisa W.M. Leung ¹, Sun Y. Lee ⁵, Byron K. Lee ⁶, Sreenivasa R. K. Seshasai ¹, Manav Sohal¹, and Mark M. Gallagher ¹

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Received 12 June 2023; accepted after revision 24 September 2023; online publish-ahead-of-print 26 October 2023



Conclusion

Non-laser TLE is associated with a better safety and efficacy profile when compared with laser methods. There is a greater risk of SVC injury associated with laser sheath extraction.



Laser vs rotational transvenous lead extraction: A systematic review and meta-analysis of procedural safety and efficacy outcomes

Alphonsus C. Liew, MBBS,^{1,2} Nadeev Wijesuriya, MBBS,^{1,2} Felicity de Vere, BMBCh,^{1,2} Sandra Howell, MBBS,^{1,2} Vishal Mehta, PhD,^{1,2} Steven Niederer, PhD,^{3,4} Christopher Aldo Rinaldi, MD, FHRS^{1,2}

From the ¹School of Biomedical Engineering and Imaging Sciences, King's College London, ²Department of Cardiology, Guy's and St Thomas' NHS Foundation Trust, London, United Kingdom, ³National Heart and Lung Institute, Imperial College London, London, United Kingdom, and ⁴The Alan Turing Institute, London, United Kingdom.

Conclusion

Both laser and rotational TLEs are effective and safe. Our analysis suggests that there is no significant difference in safety profile between laser and rotational TLEs.



Associated factors and outcomes of crossover from a laser sheath to a bidirectional rotational mechanical sheath during transvenous lead extraction

Tsuyoshi Isawa MD¹ | Taku Honda MD¹ | Kazuhiro Yamaya MD² |
Shigeru Toyoda MD, PhD³ | Masataka Taguri PhD⁴

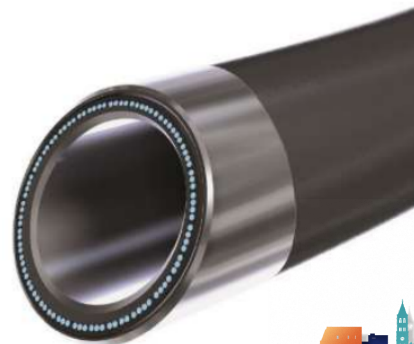
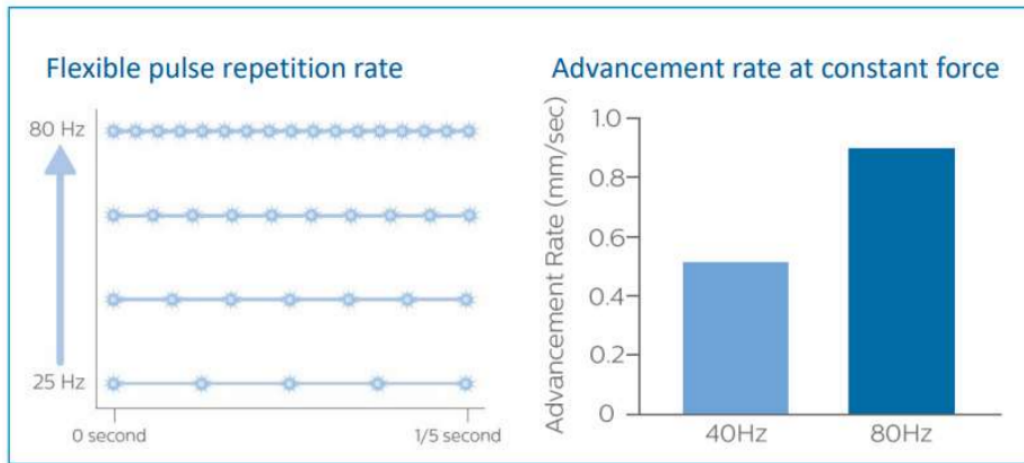
Variables	Overall n = 112	Crossover group n = 57	Noncrossover group n = 55	p ^a
Dwell time of all leads, median (IQR), years	8.6 (4.6–11.5)	9.8 (7.8–14.2)	5.6 (2.8–9.7)	<.001 ^b
Dwell time of the oldest extracted lead, median (IQR), years	8.9 (5.5–12.7)	10.8 (8.5–17.8)	5.8 (3.6–9.7)	<.001 ^b
No. of leads extracted per procedure, median (range: min–max)	2 (1–4)	2 (1–4)	2 (1–4)	.025 ^b
Failure of the locking stylet to advance to the lead tip in ≥1 pacemaker or ICD lead, n (%)	32 (28.6)	21 (36.8)	11 (20.0)	.061
Apparent calcification encapsulating the lead on fluoroscopy, n (%)	12 (10.7)	10 (17.5)	2 (3.6)	.029 ^b
Lead fixation of atrial or ventricular leads				
Active fixation atrial pacemaker lead, % (n)	37.2 (32/86) ^c	27.7 (13/47)	48.7 (19/39)	.072
Passive fixation atrial pacemaker lead, % (n)	64.0 (55/86) ^c	74.5 (35/47)	51.3 (20/39)	.043 ^b
Active fixation ventricular pacemaker lead, n (%)	42 (37.5)	18 (31.6)	24 (43.6)	.24
Passive fixation ventricular pacemaker lead, n (%)	37 (33.0)	25 (34.9)	12 (21.8)	.016 ^b
Active fixation ICD ventricular lead, n (%)	33 (29.5)	16 (28.1)	17 (30.9)	.84
Passive fixation ICD ventricular lead, n (%)	11 (9.8)	7 (12.3)	4 (7.3)	.53
Coronary sinus lead, n (%)	15 (13.4)	7 (12.3)	8 (14.6)	.79
Crossover to an Evolution RL sheath or an Evolution Shortie RL sheath, n (%)	57 (50.9)	57 (100)	0 (0)	N/A
Femoral approach (supportive or bailout use), n (%)	36 (32.1) ^d	29 (50.9)	7 (12.3)	<.001 ^b

Conclusions: Both groups showed a high rate of clinical success. Switching to the Evolution system may facilitate a safe and effective TLE when a laser sheath does not advance despite laser activation.



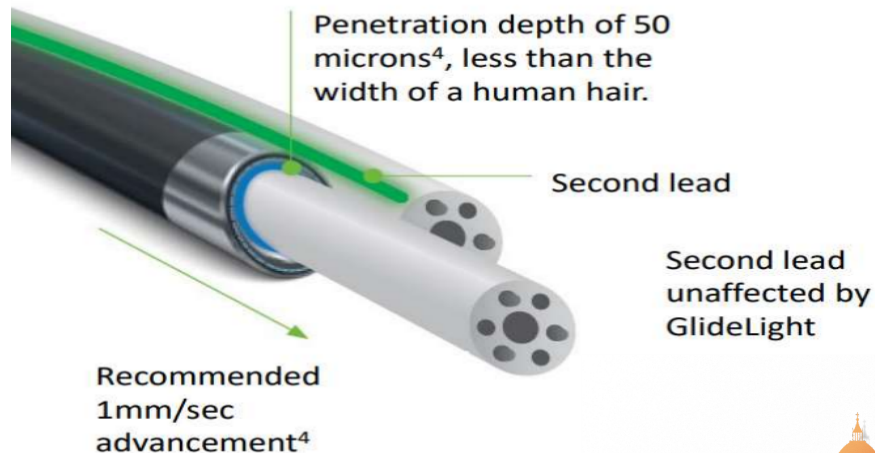
GlideLight

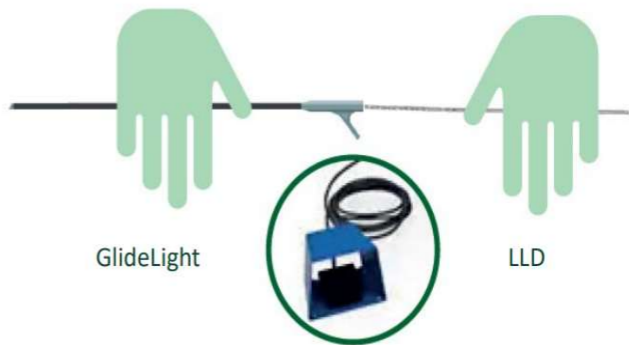
- Low-temperature excimer laser has a 50-micron penetration depth
- 15° bevel tip
- Flexible distal segment
- Lubricious coating along inner lumen
- Customizable repetition rate from 25Hz to 80Hz, based on anatomical and procedural considerations



Lead preservation

GlideLight uses UV light to ablate organic molecules, does not ablate to the side and **only ablates on contact**⁴



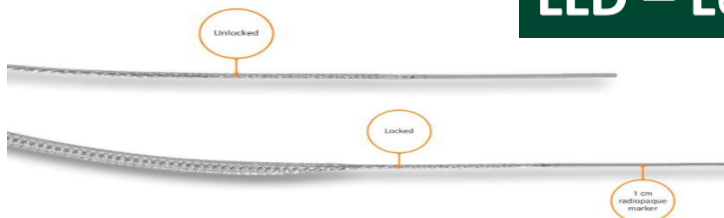


Hand fatigue & tactility

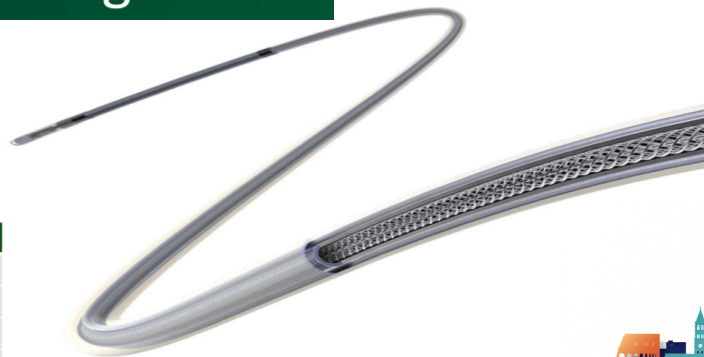
GlideLight can be used with only **two hands** – can be used by a **single operator**

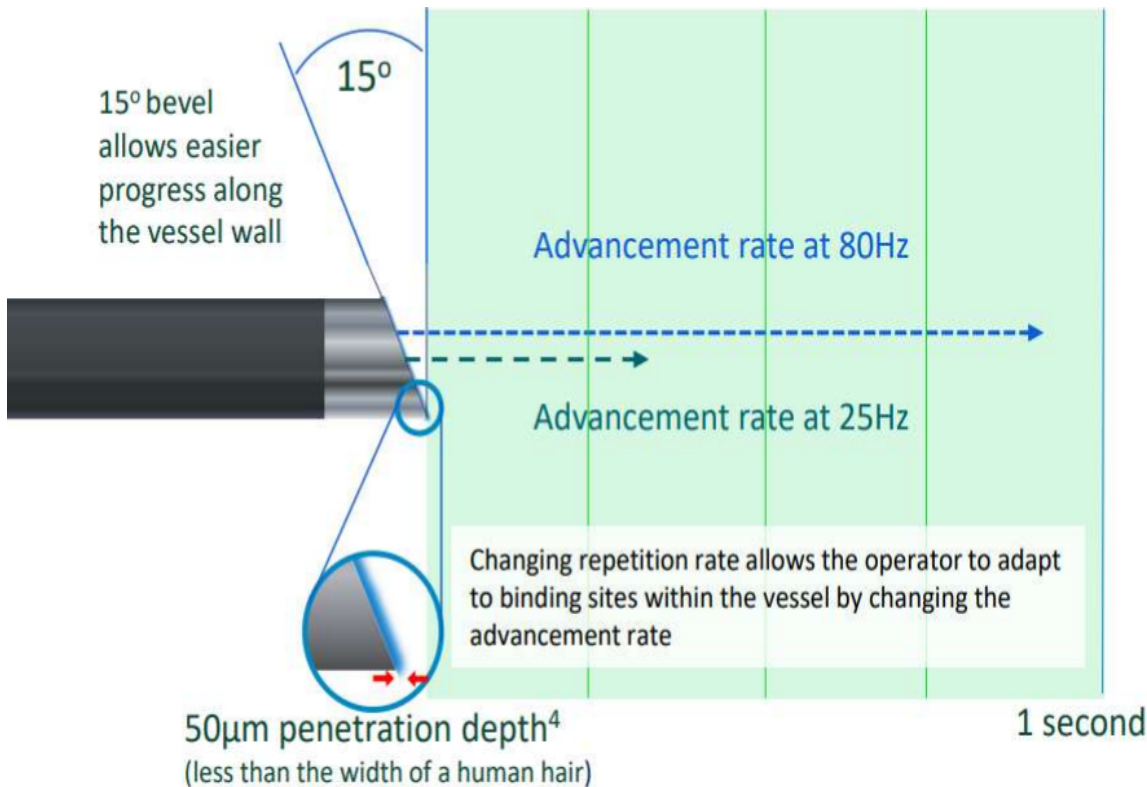
Footswitch activation leaves hands free for push/pull of the catheter/lead locking device

LLD – Lead Locking Device



Model	Size [mm]	Tensile Force [lb]
1	0.33 – 0.41	12
Ez / E	0.38 – 0.58	19
2	0.43 – 0.66	24
3	0.69 – 0.81	45





Binding sites

GlideLight laser sheath provides a **high degree of control** when progressing through **binding sites**^{2,3}

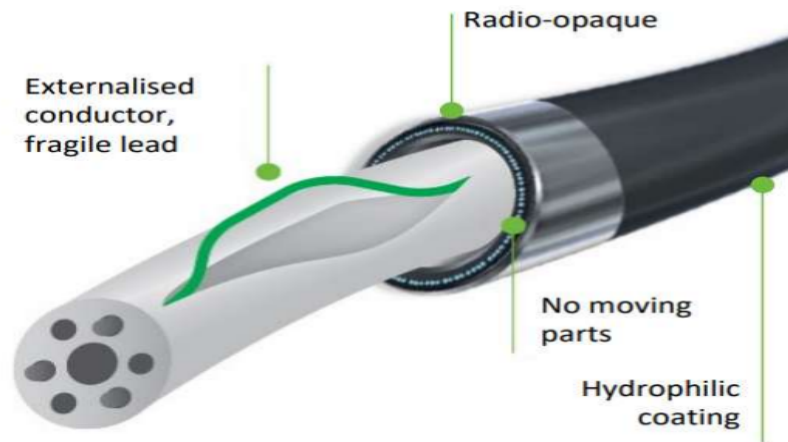
Greater control and less advancement force also means **less unintended forward motion**^{2,3}



Externalised conductors

GlideLight has a **lubricious inner coating** and is supplied with **two outer sheaths** which facilitate passing the target lead

GlideLight has **no moving parts** and lead insulation is not ablated⁴

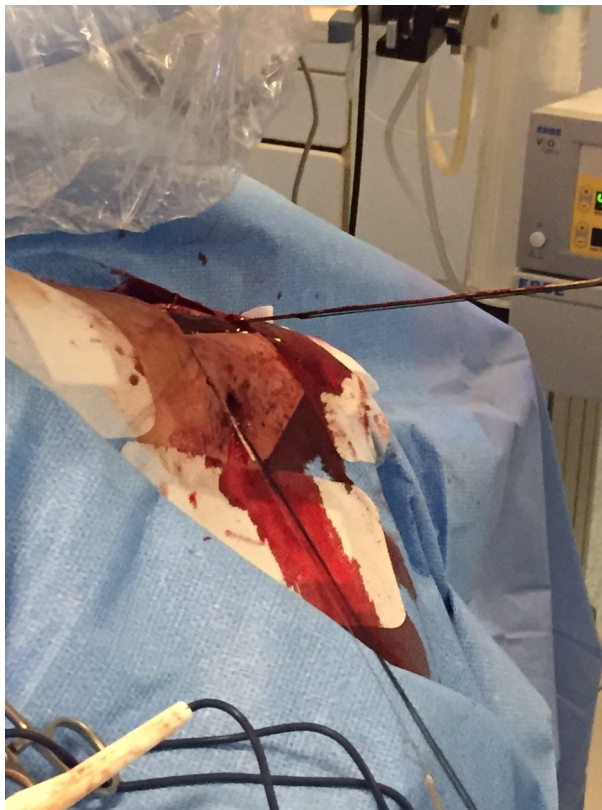
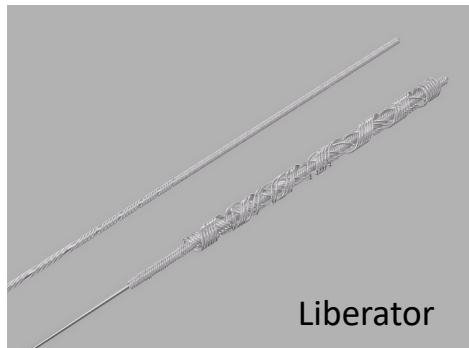


Using a high degree of mechanical force when removing leads can compromise lead integrity⁵⁻⁷



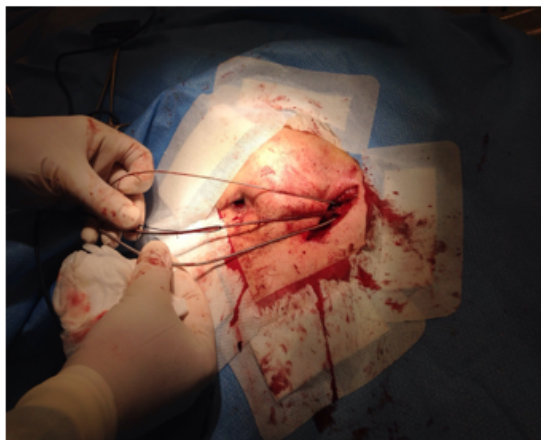
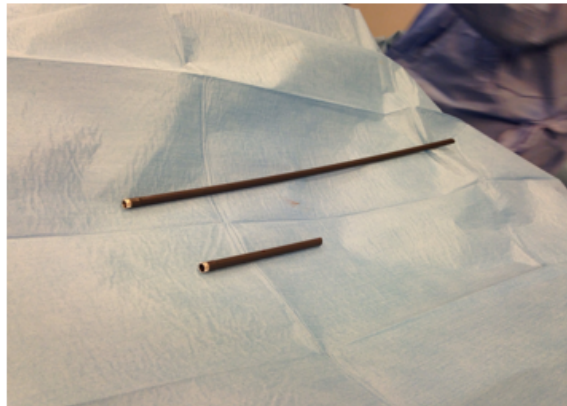
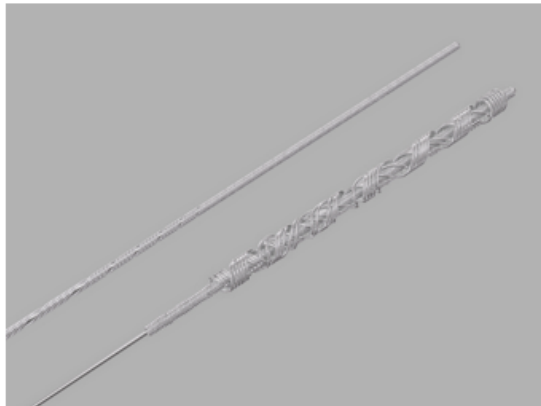
Model Number	500-301	500-302	500-303
Sheath size	12F	14F	16F
Maximum target lead diameter (F/inches/mm)	7.5/0.098/2.50	9.5/0.124/3.17	11.5/0.150/3.83
Minimum tip inner diameter (F/inches/mm)	8.3/0.109/2.77	10.2/0.134/3.40	12.5/0.164/4.17
Maximum tip outer diameter (F/inches/mm)	12.5/0.164/4.17	14.7/0.192/4.88	17.2/0.225/5.72
Working length (cm)	50	50	50
Repetition rate (Hz)	25-80	25-80	25-80
Clinical energy setting (mJ/mm)	30-60	30-60	30-60



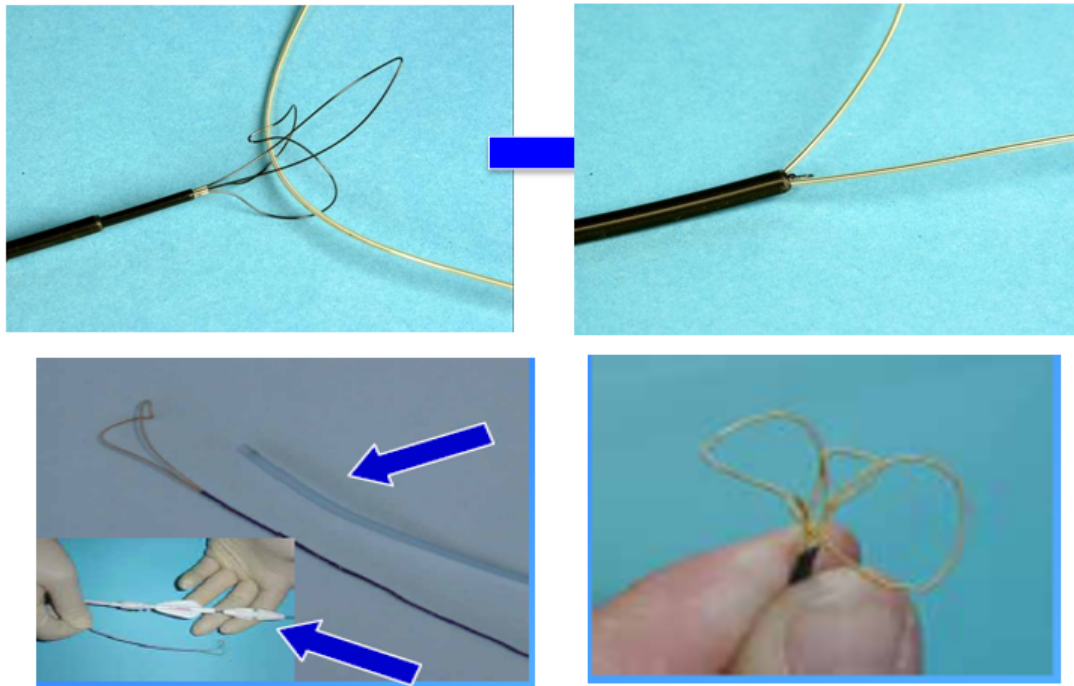


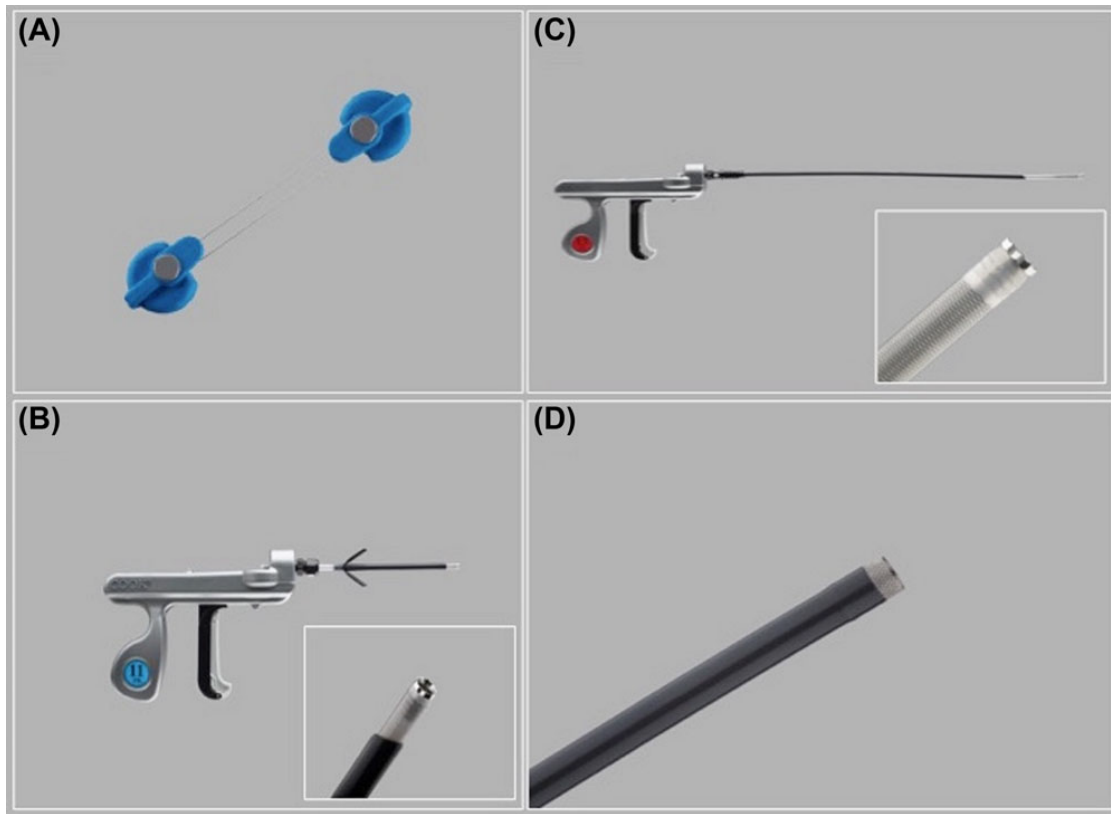
**Control of the entire lead body
before manual traction**

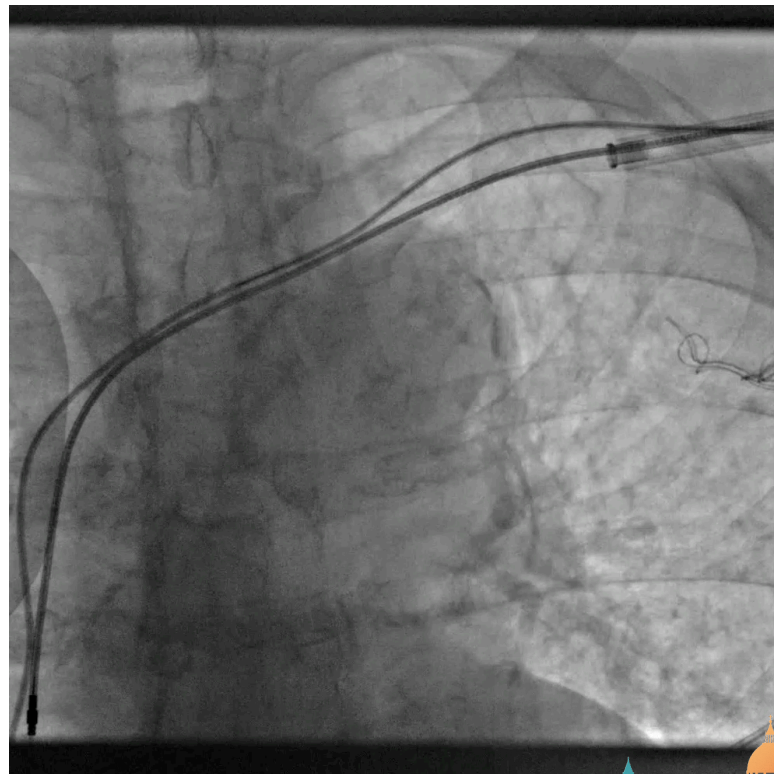
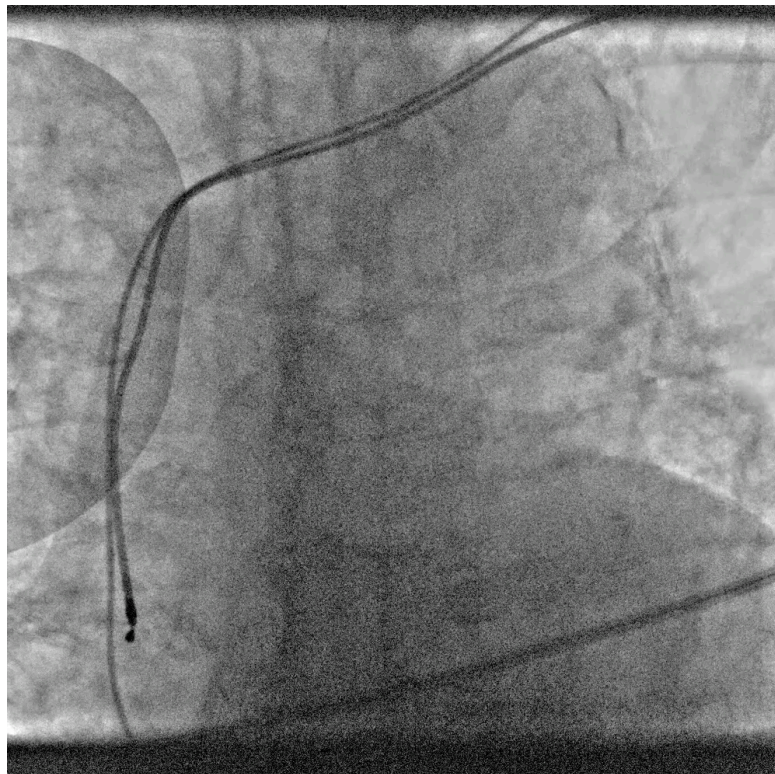


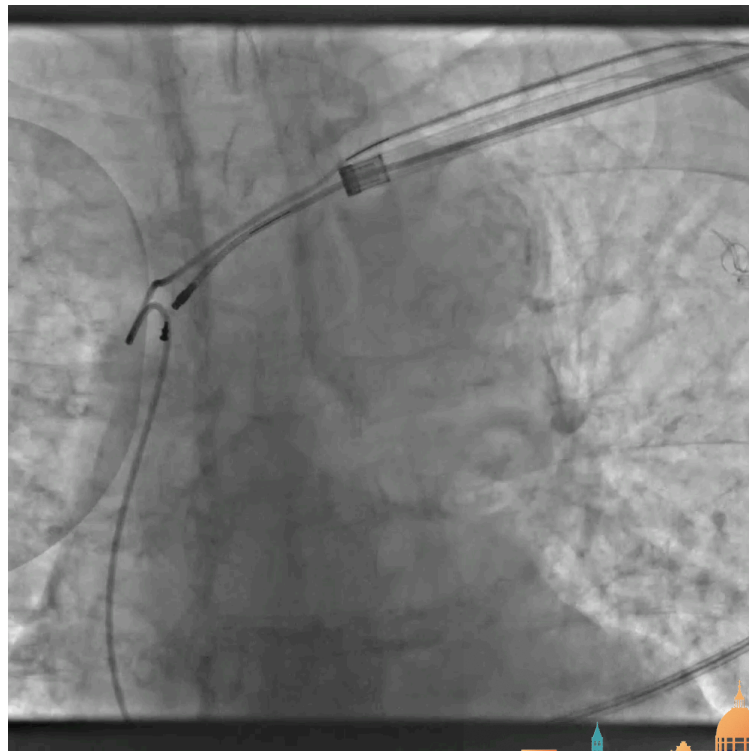
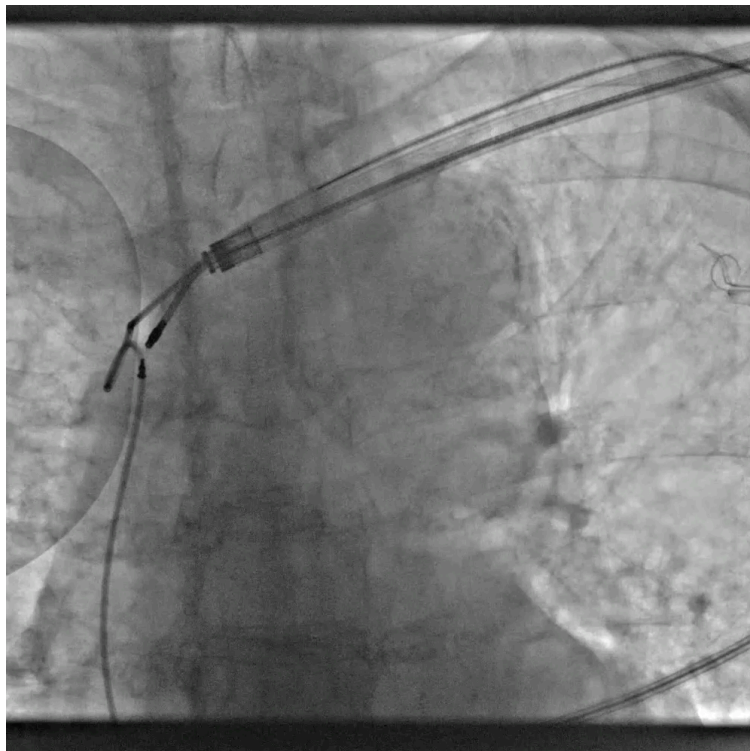


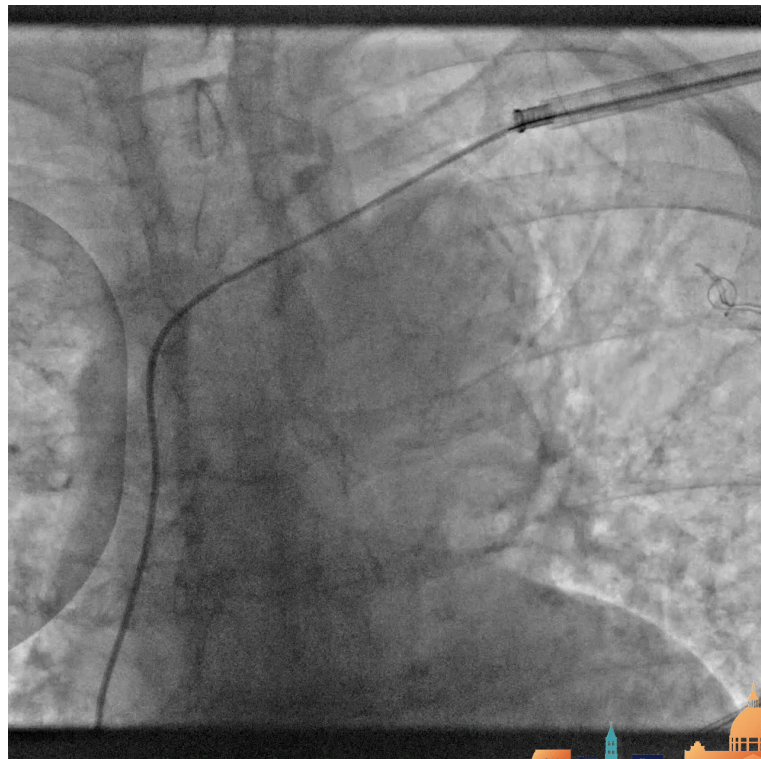
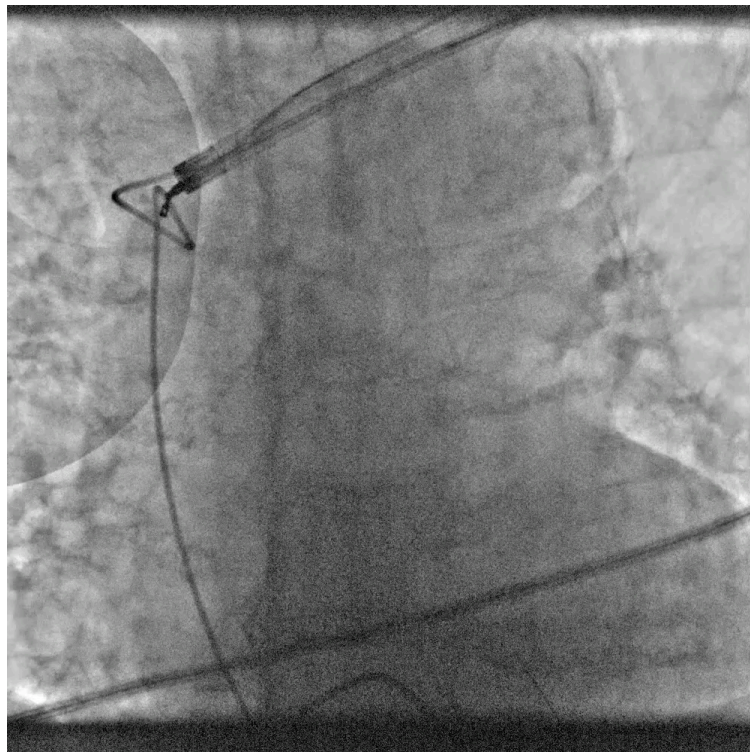
The SNARE



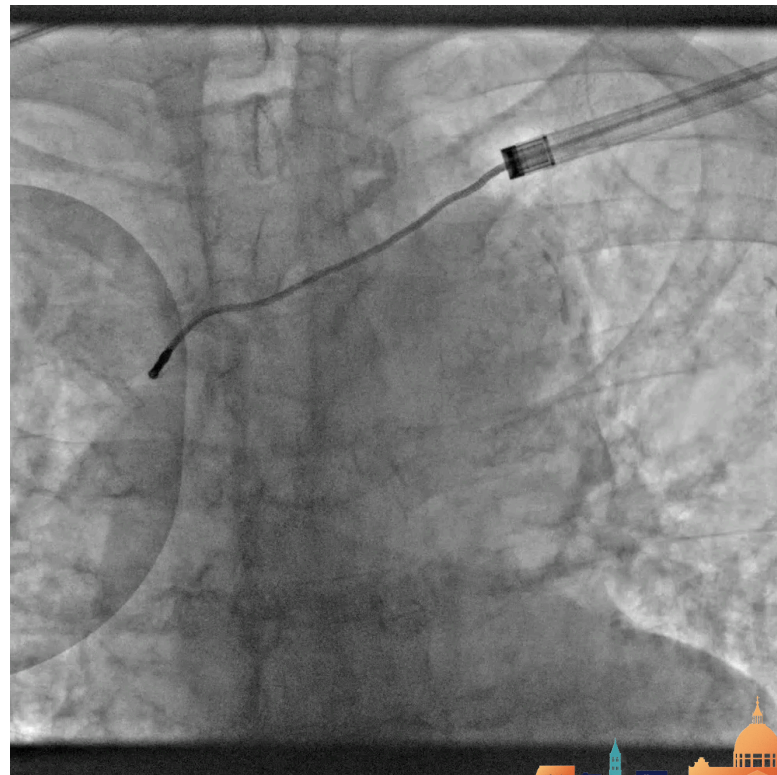
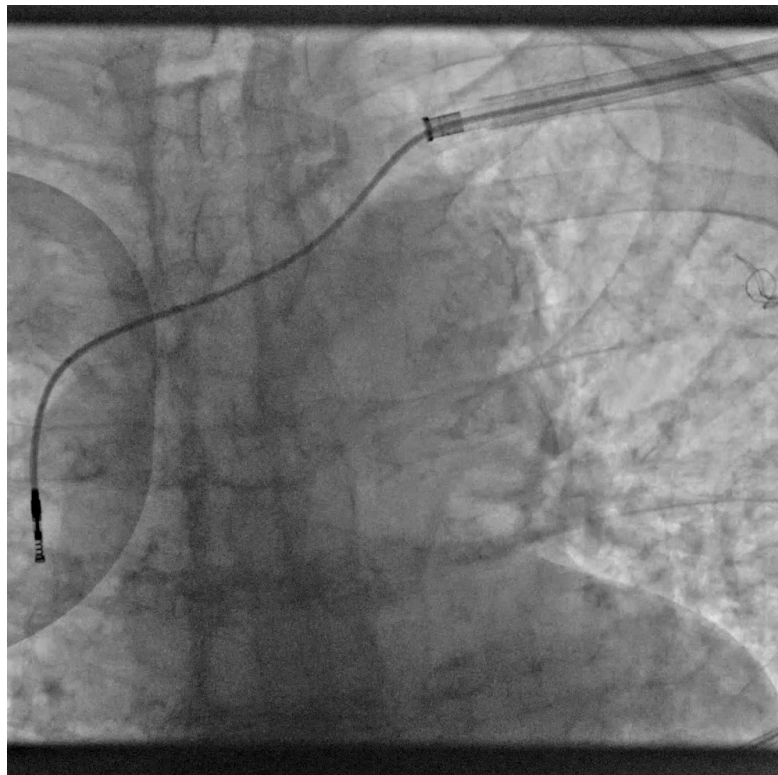


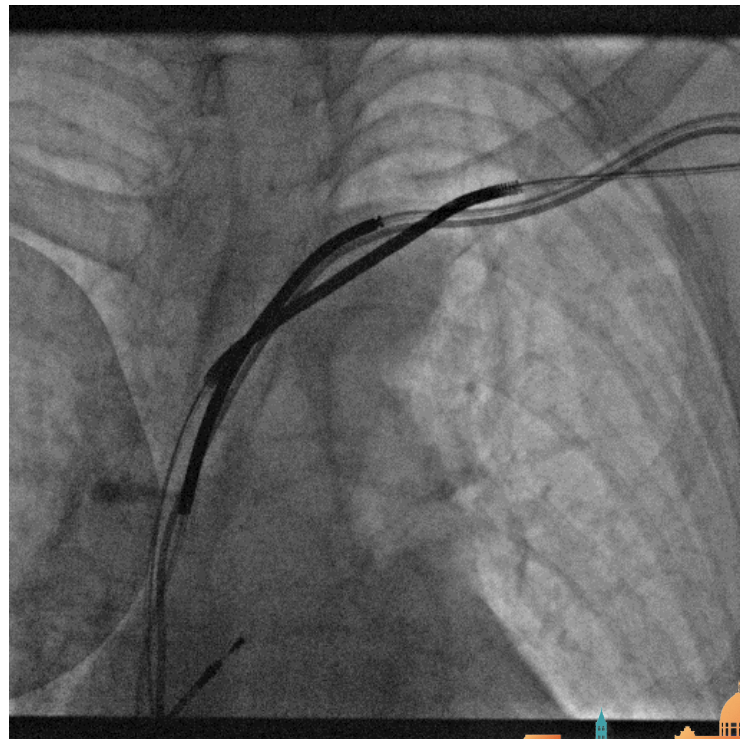
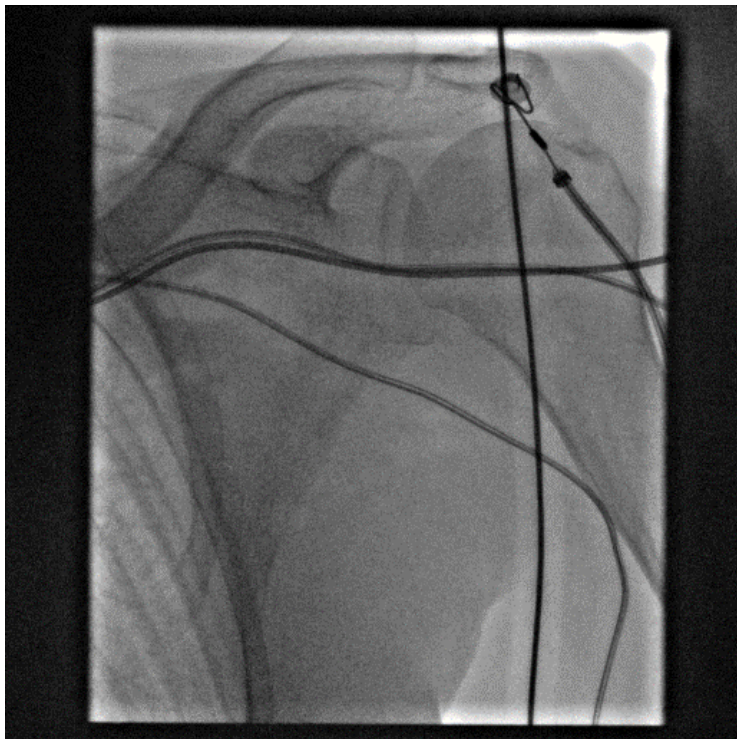


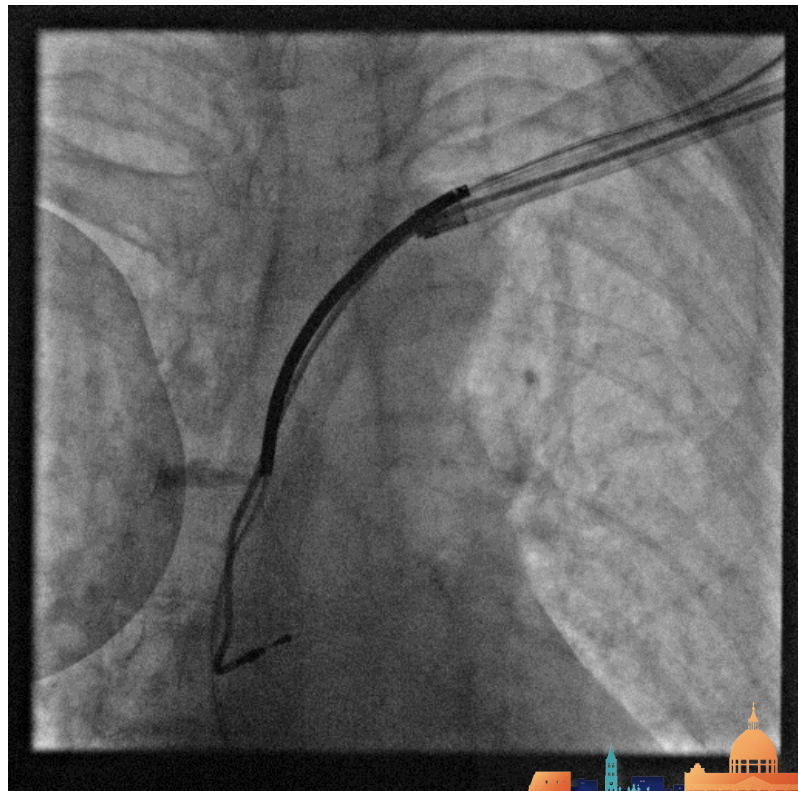
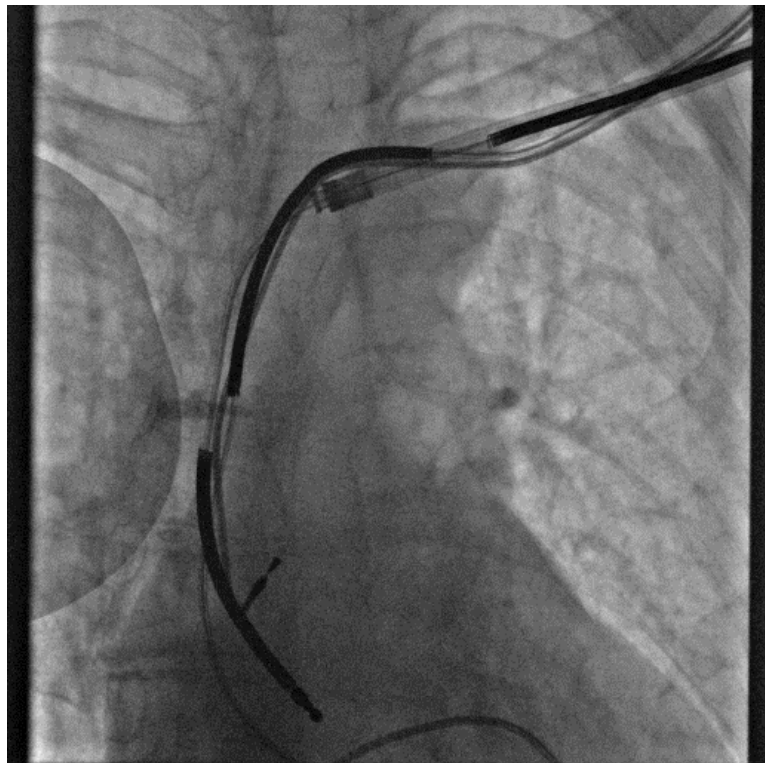


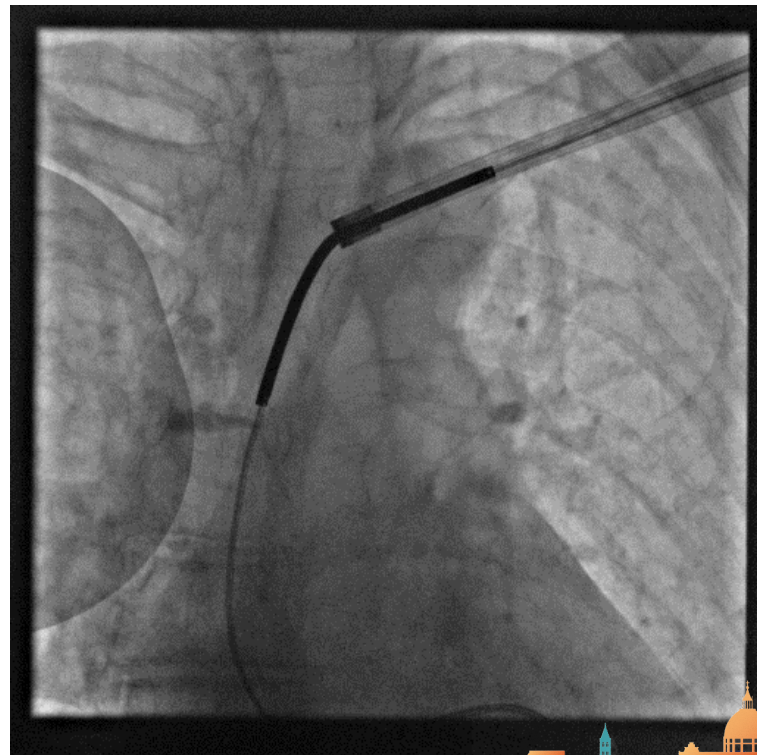
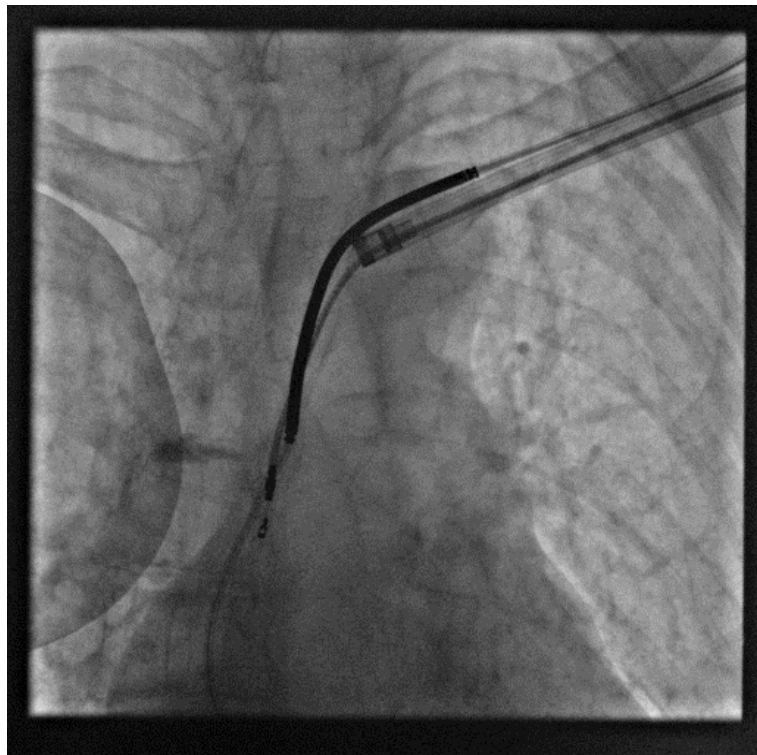


LEAD EXTRACTION TECHNIQUES





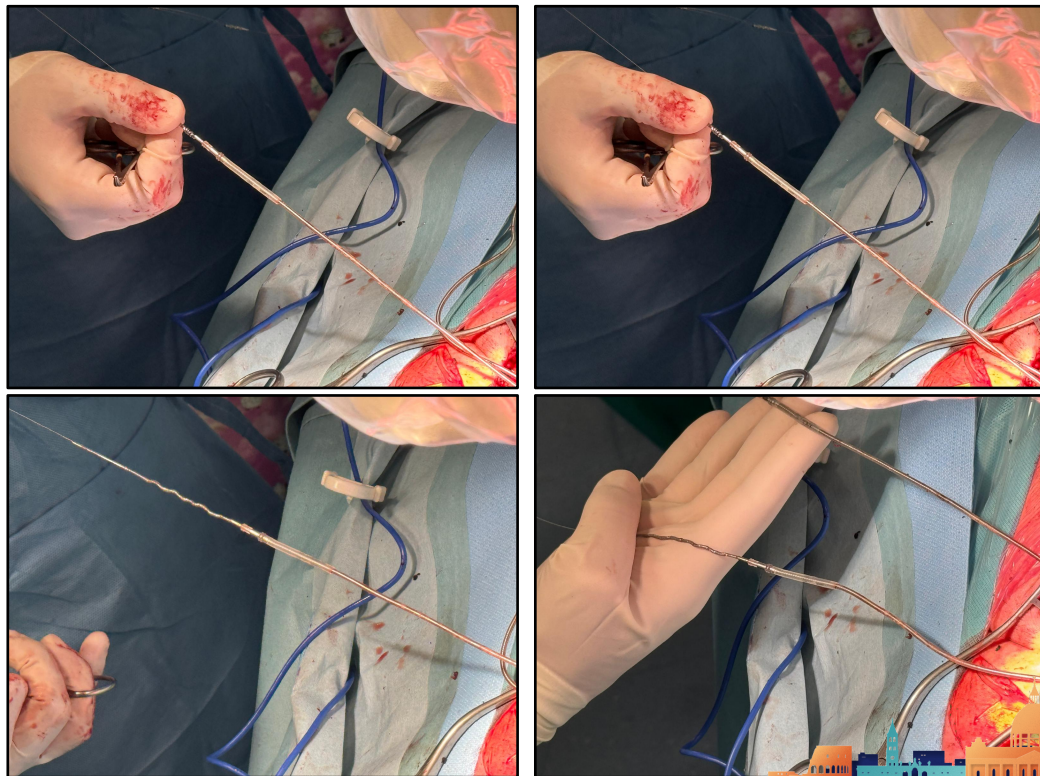


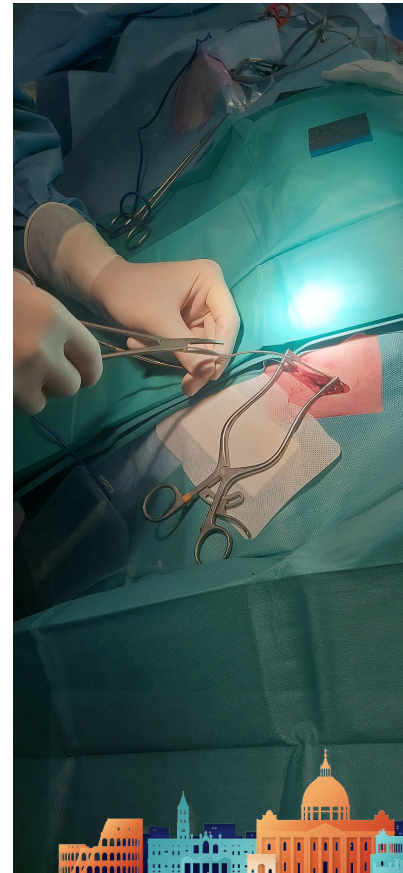
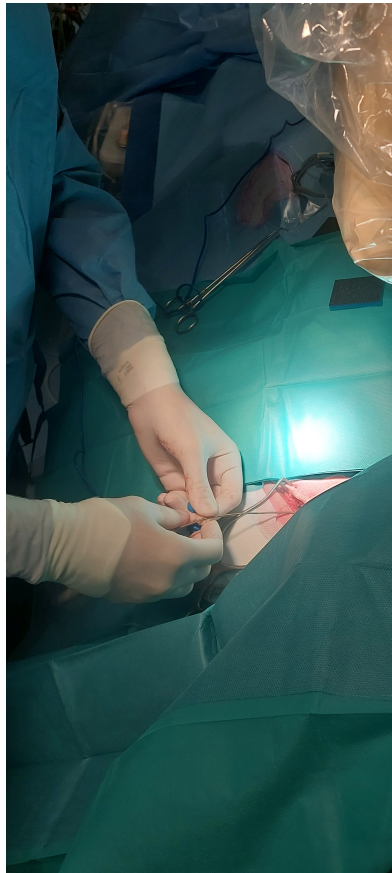


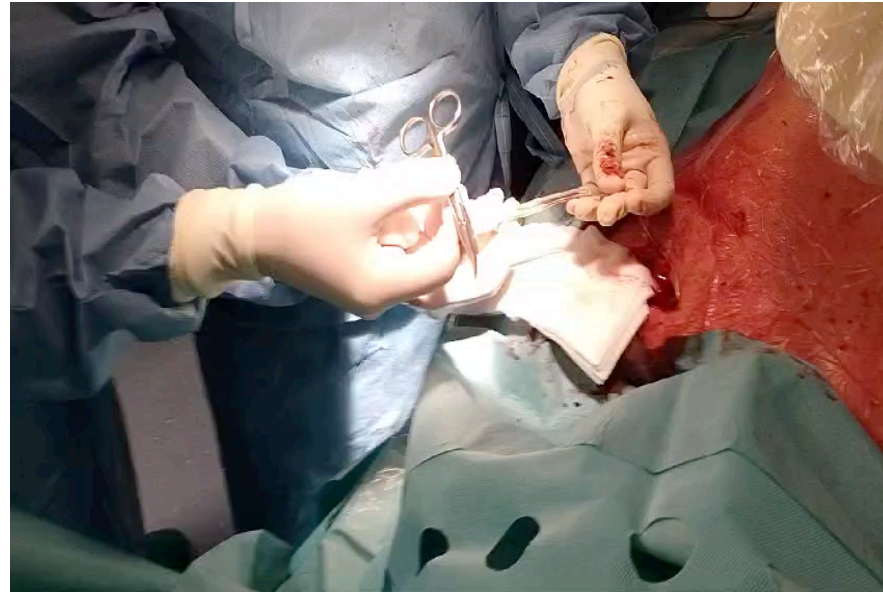
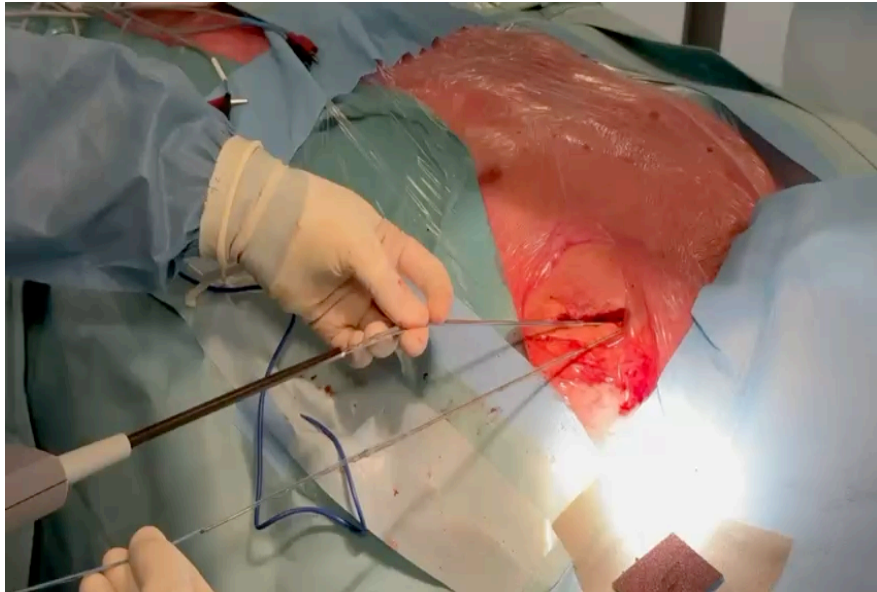
**We don't cut
electrocatheters
for TLE**

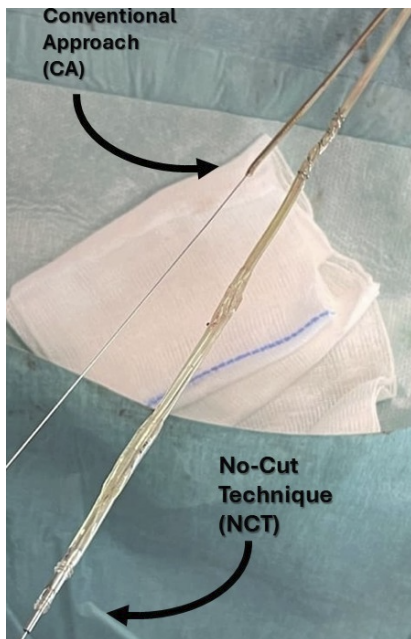
THE “NO-CUT TECHNIQUE”

**Do you
remember
Fineline?**



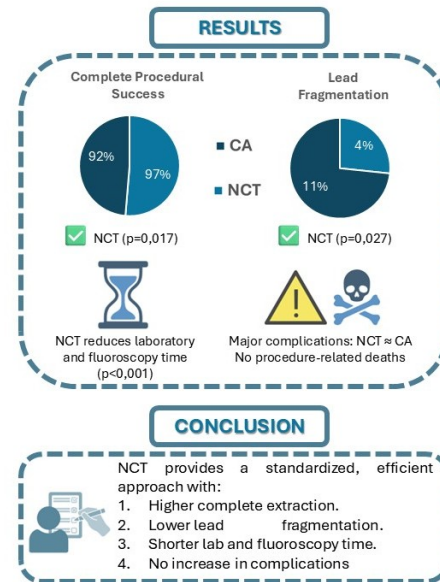
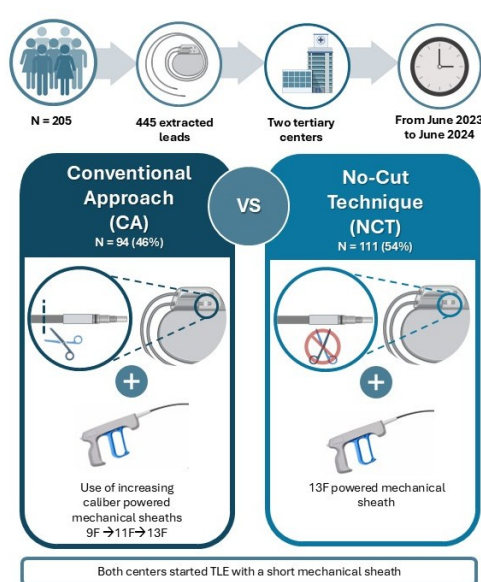






The "No-cut technique" for lead preparation in transvenous lead extraction

Matteo Baroni, MD,¹ Alberto Preda, MD,¹ Leandro Fabrizio Milillo, MD,¹ Alessandro Oliva, MD,² Lorenzo Rampa, MD,² Raffaele Falco, MD,¹ Marco Carbonaro, MD,¹ Sara Vargiu, MD,¹ Marisa Varrenti, MD,¹ Giulia Colombo, MD,¹ Fabrizio Guarracini, MD, PhD,¹ Lorenzo Gigli, MD,¹ Antonio Frontera, MD, PhD,¹ Gabriele Paglino, MD,² Alessandra Marzi, MD,² Paolo Della Bella, MD,² Patrizio Mazzone, MD¹



PLACEMENT OF EXTERNAL PM FROM LEFT SUBCLAVIAN VEIN (PM DEPENDENT)

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ORIGINAL ARTICLE

Journal of Arrhythmia WILEY

Working on the dirty side—the ipsilateral subclavian access for temporary pacing after lead extraction

David Zweiker MD, PhD^{1,2,3} | Francesco Melillo MD⁴ | Giuseppe D'Angelo MD¹ |
Andrea Radinovic MD¹ | Alessandra Marzi MD¹ | Lorenzo Cianfanelli MD⁵ |
Savino Altizio MD⁶ | Luca R. Limite MD¹ | Gabriele Paglino MD¹ |
Antonio Frontera MD, PhD¹ | Kenzaburo Nakajima MD¹ | Luigia Brugliera MD⁵ |
Lorenzo Malatino MD⁷ | Paolo Della Bella MD¹ | Patrizio Mazzone MD¹





ESC

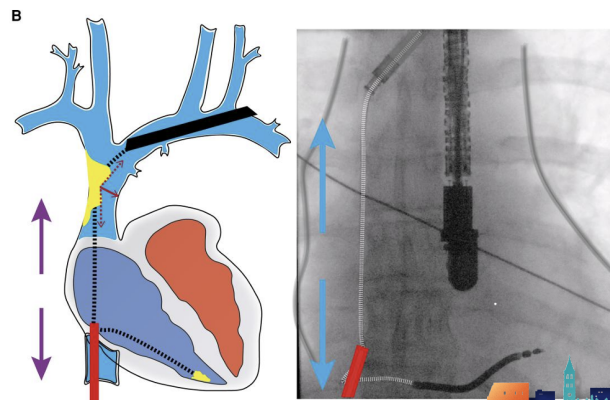
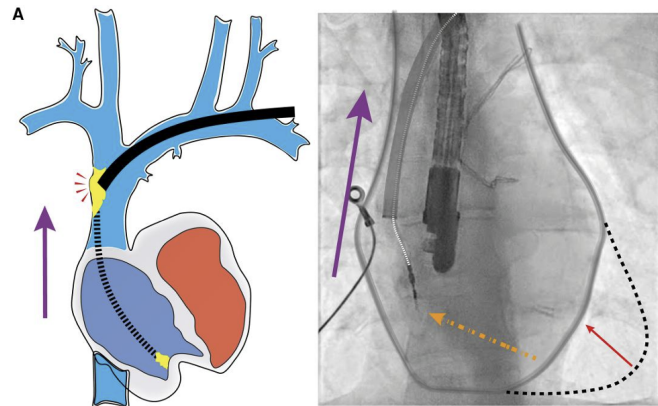
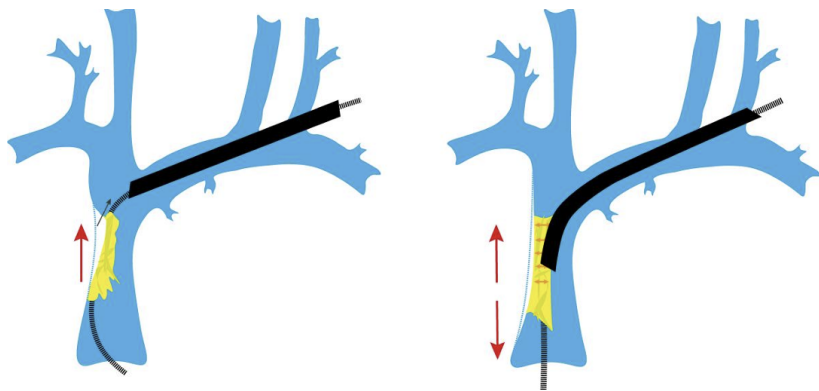
European Society
of Cardiology

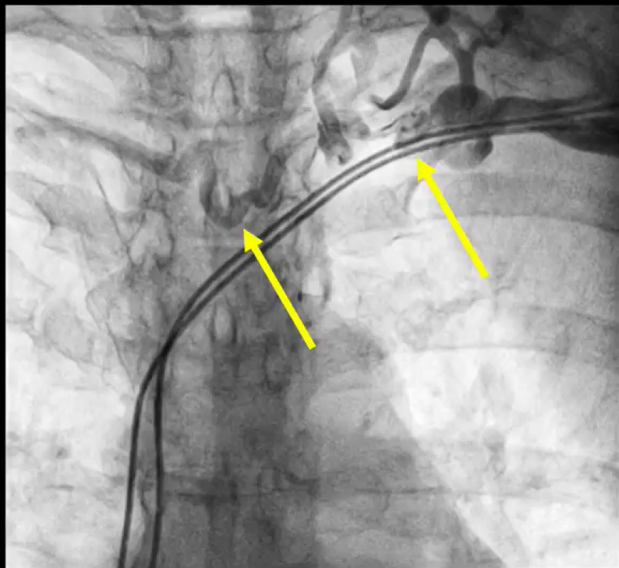
Europace (2023) 25, 1–9
<https://doi.org/10.1093/europace/euad331>

PRACTICAL EP

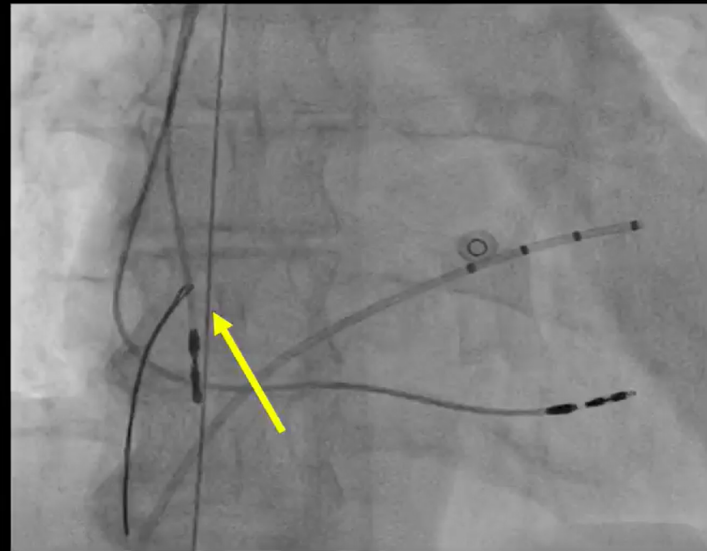
Transvenous lead extraction: Experience of the Tandem approach

Zaki Akhtar ^{1*}, Christos Kontogiannis ¹, Ahmed I. Elbatran ^{1,2},
Lisa W.M. Leung ¹, Christoph T. Starck ³, Zia Zuberi¹, Manav Sohal¹,
and Mark M. Gallagher ¹



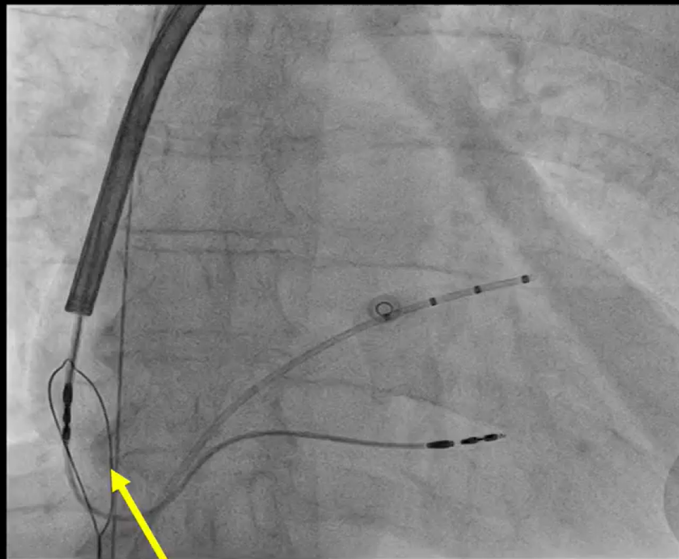


Long subclavian occlusion with collateral veins

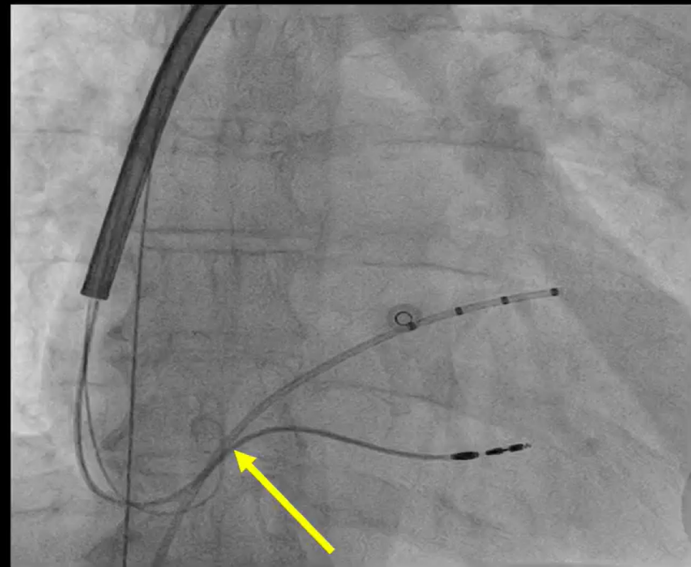


Unscrewed the (expendable) atrial lead
Grabbed with a 35mm snare from femoral vein



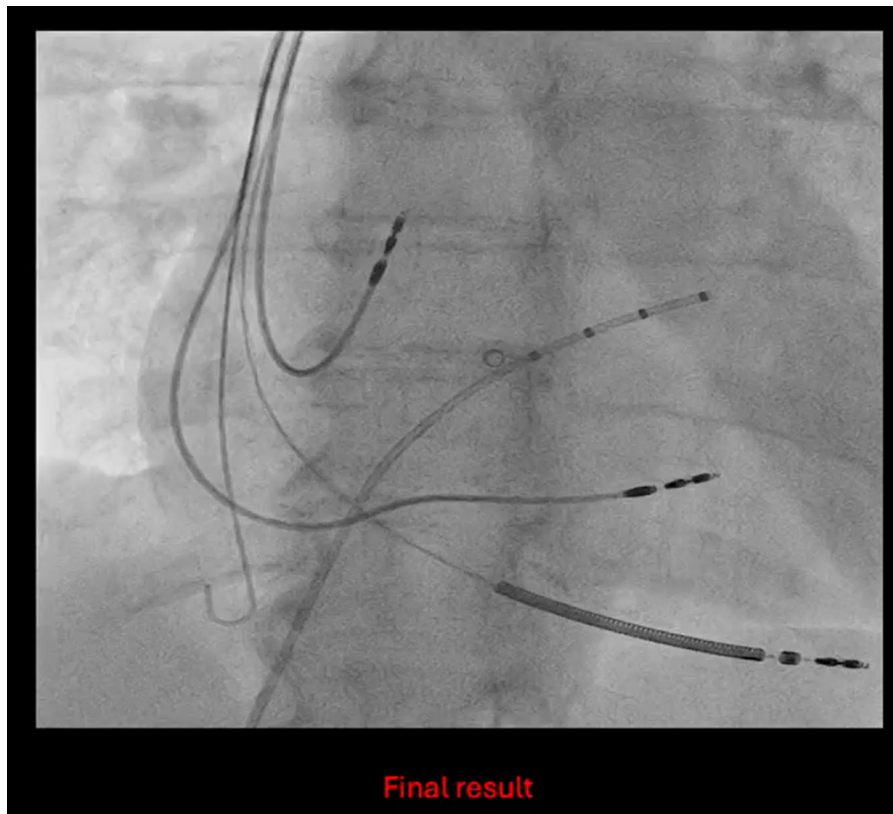


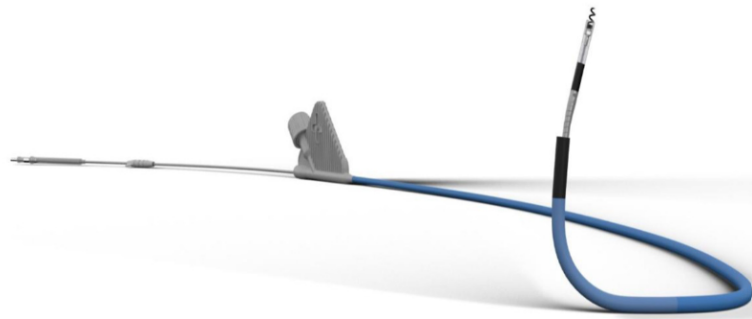
After gaining a secure access to RA
the lead is released from the snare and finally extracted from by sheath



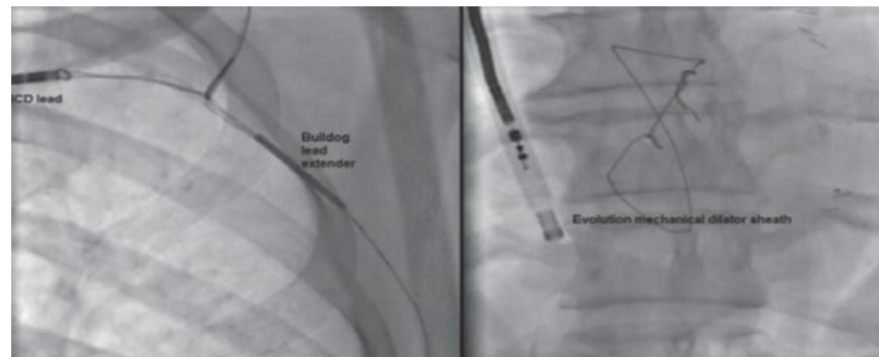
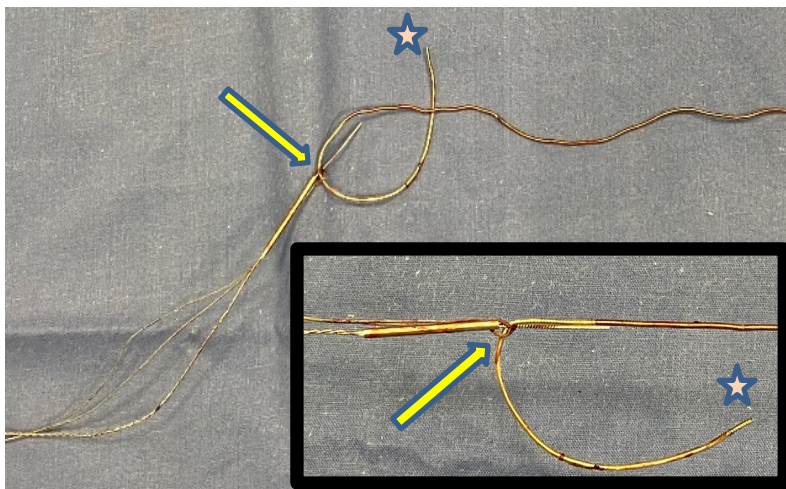
Angiographic guidewire through the sheath
and exchange with long peel away introducer





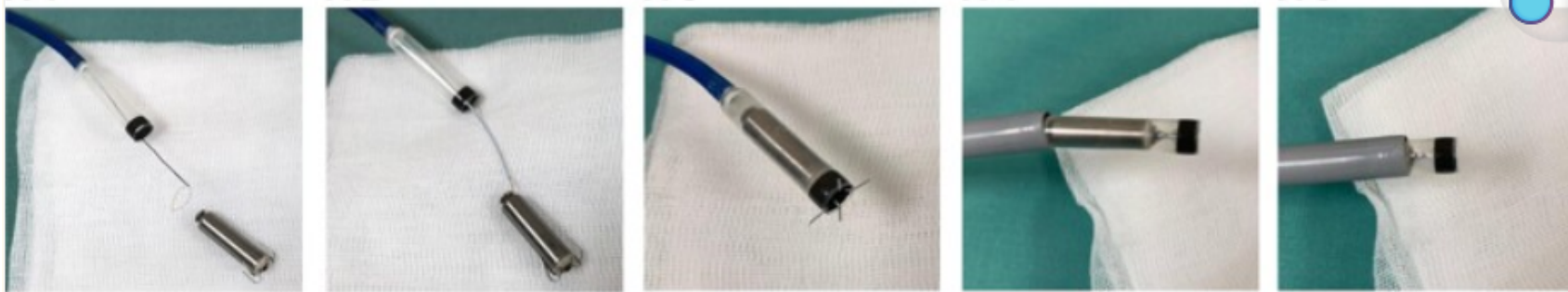


Bulldog lead extender



HOW TO EXTRACT A LEADLESS PM MICRA?

Official Micra delivery catheter + SNARE



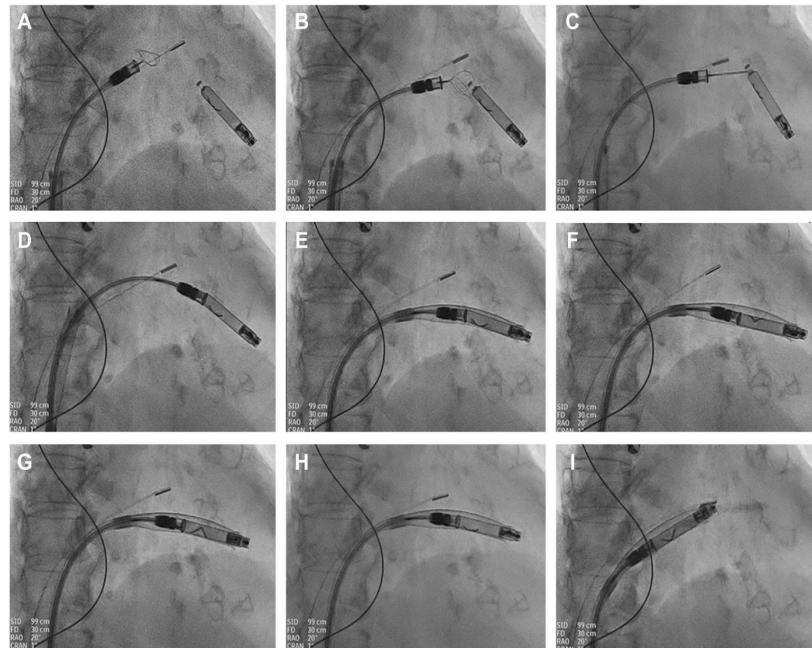
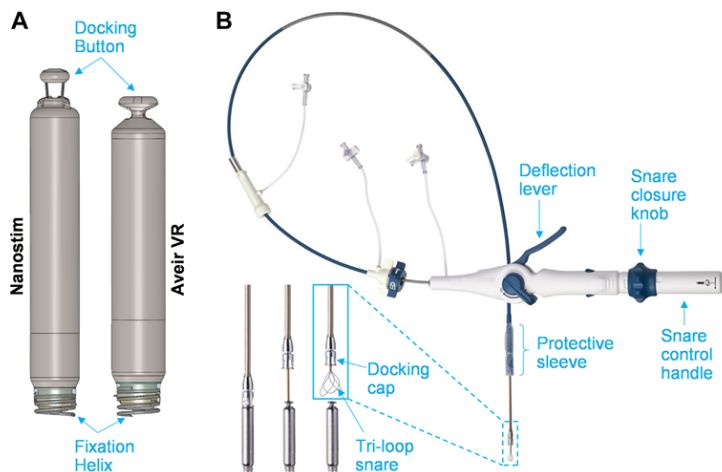
Steerable Introducer + SNARE



Retrieval and replacement of a helix-fixation leadless pacemaker at 9 years post-implant

Petr Neužil, MD, PhD,* Jan Petruš, MD,* Milan Chovanec, MD, PhD,*
Pavel Hála, MD, PhD,* Lucie Šedivá, MD, PhD,* Vivek Y. Reddy, MD*†

From the *Na Homolce Hospital, Prague, Czech Republic, and †Icahn School of Medicine at Mount Sinai Hospital New York New York



- Lead extraction is a complex procedure that must be executed in centre with adequate expertise
- An Hub and Spoke model is fundamental for an optimal organization in high volume centre
- Every lead extraction procedure is different from others and requires different techniques
- A combined and a stepwise approach is necessary
- In the future, new TLE tools will help us for more successful TLE precedure



Patrizio Mazzone

MD, FESC, FANMCO, FAIAC

Director of Electrophysiology, Arrhythmology and Cardiac Pacing Unit (Cardiologia 3),
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