

**NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE**

Interventional Procedures Programme

**Specialist Adviser questionnaire**

Before completing this questionnaire, please read [Conflicts of Interest for Specialist Advisers](#).

Please respond in the boxes provided.

Please complete and return to: [azad.hussain@nice.org.uk](mailto:azad.hussain@nice.org.uk) and [IPSA@nice.org.uk](mailto:IPSA@nice.org.uk)

**Procedure Name:** Coronary intravascular lithotripsy

Name of Specialist Advisor: Jonathan Hill

Job title: Consultant Interventional Cardiologist

Professional Regulatory Body: GMC  x  
Other (specify)

Registration number: 3685576

Specialist Society: British Cardiovascular Intervention Socie

Nominated by (if applicable): British Cardiovascular Intervention Society (BCIS)

**1 About you and your speciality’s involvement with the procedure**

**1.1 Do you have adequate knowledge of this procedure to provide advice?**

- Yes.
- No – please answer no more questions and return the form

**Comments:**

I was involved with Disrupt CAD I the pre-market study for coronary IVL and Disrupt CAD II, the post-market study. I am a PI for Disrupt CAD III, a global IDE Study. Additionally, I use coronary IVL outside of clinical trials and have done the most cases with coronary IVL in the world (approx. 10% of global volume)

**1.2 Is this procedure relevant to your specialty?**

- Yes.
- No - please answer no more questions. Please give any information you can about who is likely to be doing the procedure and return the form.

**Comments:**

As an Interventional Cardiologist that predominantly performs complex PCI procedures, coronary calcification is common.

**1.3 Is this procedure performed by clinicians in specialities other than your own?**

- Yes – please comment
- No

**Comments:**

Although widely used in peripheral intervention in other countries- IVL use in peripheral arterial disease has only just started in the UK. The device has been used to facilitate large bore access eg for percutaneous LV support and transcatheter valve procedures via the femoral artery.

**1.4 If you are in a specialty that does this procedure, please indicate your experience with it:**

- I have never done this procedure.
- I have done this procedure at least once.
- I do this procedure regularly.

**Comments:**

As soon as CE Mark was awarded we started using IVL for a wide variety of clinical scenarios outside the scope of the original DISRUPT CAD 1 and 2 trials.

**1.5 If your specialty is involved in patient selection or referral to another specialty for this procedure, please indicate your experience with it.**

- I have never taken part in the selection or referral of a patient for this procedure.
- I have taken part in patient selection or referred a patient for this procedure at least once.
- I take part in patient selection or refer patients for this procedure regularly.

**Comments:**

Coronary IVL for both de novo lesions as well as undeployed stents has become the default modality for calcium modification and has reduced the numbers of rotational atherectomy carried out in our cath lab.

**1.6 Please indicate your research experience relating to this procedure (please choose one or more if relevant):**

- I have done bibliographic research on this procedure.
- I have done research on this procedure in laboratory settings (e.g. device-related research).
- I have done clinical research on this procedure involving patients or healthy volunteers.
- I have had no involvement in research on this procedure.
- Other (please comment)

**Comments:**

I was a site PI for both Disrupt CAD I and Disrupt CAD II studies. Both studies have completed and I am the Study PI for Disrupt CAD III, the global IDE study. I am involved in several investigator initiated studies in the UK, Europe and US.

**1.7 Please estimate the proportion of doctors in your specialty who are doing this procedure (choose one):**

- More than 50% of specialists engaged in this area of work.
- 10% to 50% of specialists engaged in this area of work.
- Fewer than 10% of specialists engaged in this area of work.
- Cannot give an estimate.

**Comments:**

The technique is simple and does not require a significant learning curve and therefore has been taken up rapidly by multiple catheter labs throughout the UK.

## **2 About the procedure**

**2.1 Does the title used above describe the procedure adequately?**

- Yes

No - If no, please suggest alternative titles.

**Comments:**

**2.2 Which of the following best describes the procedure (choose one):**

- Established practice and no longer new.
- A minor variation on an existing procedure, which is unlikely to alter the procedure's safety and efficacy.
- Definitely novel and of uncertain safety and efficacy.
- The first in a new class of procedure.

**Comments:**

Coronary IVL was developed based on decades of safety and effectiveness data of lithotripsy used in treating kidney stones. The technology was miniaturized and modified to treat vascular calcium and was built on a familiar catheter-based platform. The procedural steps are nearly identical to all balloon-catheter PCI procedures.

**2.3 What is/are the best comparator(s) (standard practice) for this procedure?**

Coronary IVL is a vessel preparation, specifically a calcium modification, tool. The mechanism of action is unique to IVL. The most common tool used, prior to the availability of IVL, was rotational atherectomy. Although, due to complexity of lesions and advanced skill set, rotational atherectomy isn't widely adopted.

**2.4 Are there any major trials or registries of this procedure currently in progress? If so, please list.**

The Disrupt CAD I and II Studies have now completed. The Disrupt CAD III Study is currently enrolling and is a global IDE study.

**2.5 Please list any abstracts or conference proceedings that you are aware of that have been *recently* presented / published on this procedure (this can include your own work). Please note that NICE will do a comprehensive literature search on this procedure and we are only asking you for any very recent or abstracts or conference proceedings which might not be found using standard literature searches. You do not need to supply a comprehensive reference list but it will help us if you list any that you think are particularly important.**

The clinical evidence continues to grow as IVL increases in utilization. The DISRUPT CAD 2 results have been presented at the recent TCT meeting and there is a simultaneous publication.

1. Yeoh, J and Hill, J. Intracoronary Lithotripsy for the Treatment of Calcified Plaque. *Interventional Cardiology Clinic*. 2019. 8; 411-424.
2. Brinton, T.J., Ali, Z., Hill, J., Meredith, I., Maehara, A., Lanksy, A., Gotberg, M., Van Mieghem, N., Whitbourn, R., Fajadet, J., Di Mario, C., Feasibility of Shockwave Coronary Intravascular Lithotripsy for the Treatment of Calcified Coronary Stenoses: First Description. *Circulation*, 2019. 139:834-836.
3. Ali ZA, Brinton TJ, Hill JM, Maehara A, Matsumura M, Karimi Galougahi K, Illindala U, Gotberg M, Whitbourn R, Van Mieghem N, Meredith IT, Di Mario C and Fajadet J. Optical Coherence Tomography Characterization of Coronary Lithoplasty for Treatment of Calcified Lesions: First Description. *JACC Cardiovasc Imaging*. 2017;10:897-906.
4. De Silva, K, et al. A Calcific, Undilatable Stenosis. Lithoplasty, a New Tool in the Box? *JACC: CI*. 2017: 10(3); 304-306.
5. Serruys, P. et al, Shaking and Breaking Calcified Plaque. Lithoplasty, a Breakthrough in Interventional Armamentarium? *JACC: CI*. 2017: 10(3); 907-911.
6. Wong, B. et al. Shockwave Intravascular Lithotripsy for Calcified coronary lesions: First real-world experience. *J Invasive Cardiol*. 2019. Epub ahead of print.
7. Wilson, S, Spratt, J, Hill J, Spence, M, Cosgrove, C, et al. Coronary Intravascular Lithotripsy is Associated with a High Incidence of “shocktopics” and Asynchronous Cardiac Pacing. *EuroIntervention*. 2019: DOI: 10.4244/EIJ-D-19-00484
8. Dini, CS, Tomberli, B, Mattesini, A, Ristalli, F, Valente, S, et al. Intravascular Lithotripsy for Calcific Coronary and Peripheral Artery Stenoses. *EuroIntervention*; 2019: DOI: 10.4244/EIJ-D-18-01056
9. Watkins, S, Good, R, Hill J, Brinton, TJ, Oldroyd, KG. Intravascular lithotripsy to treat a severely under-expanded coronary stent. *EuroIntervention*. 2018; Jaa-457 2018, DOI: 10.4244/EIJ-D-18-00780
10. Ali, Z, McEntegart, M, Hill, J and Spratt, J. Intravascular lithotripsy for the treatment of stent underexpansion secondary to severe coronary calcification. *European Heart Journal*. 2018: 10.1093/euroheartj/ehy747
11. Jurado-Roman, A, Gonzalvez, A, Galeote, G, Jimenez-Valero, S and Moreno, R. RotaTripsy: Combination of Rotational Atherectomy and Intravascular Lithotripsy for the Treatment of Severely Calcified Lesions. *JACC: Card Int*. 2019: <https://doi.org/10.1016/j.jcin.2019.03.036>
12. Luigi De Maria, G, Scarsini, R, and Banning, A. Management of Calcific Coronary Artery Lesions. Is it time to Change Our Interventional Therapeutic Approach?. *JACC: Cardiovascular Interventions*. 2019: 12(15); 1465-1478.
13. **Yeoh, J**, Pareek, N, Macaya-Ten, F, Arri, S, Webb, I, Dworakowski, R, Melikian, N, Byrne, J, MacCarthy, P, and Hill, J. Intravascular Lithotripsy for Calcified Coronary Lesions- Single Center Experience of a Novel Device. euroPCR Presentation, Paris, France, May 2019.
14. **Salazar, C**, Gonzalo, N, Aksoy, A, Sequieros, R, Forero, N, Blachutzik, F, Tirado, G, Matteo, M, Nef, H, Juanatey, C, Van Meigham, N, Latib, A, Sanchez, R, Werner, N and Escaned J. Feasibility and Safety of Intravascular Lithotripsy in Severely Calcified Left Main Coronary Stenosis. euroPCR Presentation, Paris France, May 2019.

### 3 Safety and efficacy of the procedure

#### 3.1 What are the potential harms of the procedure?

Please list any adverse events and major risks (even if uncommon) and, if possible, estimate their incidence:

Adverse events reported in the literature (if possible please cite literature)

There is a consistency across studies and my experience as the most experienced Physician performing this procedure.

The rate of adverse events reported in The Disrupt CAD I Study, which was CEC and core lab adjudicated is below. The data from the recently completed Disrupt CAD II study is consistent and expected to be available to the public later in September.

Complication	N = 60
Dissections, Type D-F	0.0%
Perforations	0.0%
Abrupt Closure	0.0%
Slow Flow	0.0%
No Reflow	0.0%

In looking at our initial experience following CE Mark approval, we compared our real-world patients with the study cohort and found no differences in complications despite the real-world population being sicker and more complex. The data was presented by Dr Yeoh at EuroPCR, France 2019 and listed in the above references.

The rates of MACE are low in both in-hospital and 6 month time periods with the majority of events being Non Q Wave MI's. While there isn't a head-to-head study comparing IVL to rotational atherectomy, the rates are lower with IVL than reported in the rotational atherectomy studies.

Anecdotal adverse events (known from experience)

There have been reported cases, as well as my own experience, of IVL leading to PVCs or V-pacing during the brief time (10 sec) that the lithotripsy is activated. However, despite these reports, there have been no associated safety concerns as the phenomenon is very transient and only occurs in a subset of patients.

Additionally, there have been case reports in the literature of IVL balloon rupture creating dissections due to the "50 atm" pressure of IVL. Unfortunately, those publications were not vetted with experienced users prior to publication. Based on the images, what appears to be the issue is that contrast is seen on angiography, unlikely from a rupture, as no additional interventions were performed, but rather from extravasation from the pinhole in the balloon (which contains a contrast solution).

Theoretical adverse events

None that I am aware of beyond what is written above.

### **3.2 Please list the key efficacy outcomes for this procedure?**

Coronary IVL has a rate of effectiveness. In Disrupt CAD I, clinical success, defined as residual stenosis <50% post-PCI with no evidence of in-hospital MACE was 95%. Three patients experience Non-Q-Wave MI. In addition, the average final stenosis was 12%. The device was deliverable to the target lesion and facilitated stent delivery 100% of time. This data is also consistent with the Disrupt CAD II Study and my own experience.

### **3.3 Please list any uncertainties or concerns about the efficacy of this procedure?**

The Disrupt CAD I and CAD II Studies both included an OCT Sub-study to evaluate the mechanism of action. Given the results of that study, the mechanism of action is clear and therefore reproducible when IVL is used to modify calcified lesions prior to stenting.

Due to the unmet need and comorbidities associated with under expanded stents, there have been published reports of use of this technology in that set of patients. Anecdotally, it may be effective if the reason for the underexpansion was calcium, however, it is has not been systematically studied.

### **3.4 What clinician training is required to do this procedure safely?**

The coronary IVL system requires knowledge and expertise in performing PCI procedures. Additionally, understanding patient selection and procedural steps are important to understand prior to performing cases.

### **3.5 What clinical facilities are needed to do this procedure safely?**

This procedure can be done in a standard interventional suite.

### **3.6 Is there controversy, or important uncertainty, about any aspect of the way in which this procedure is currently being done or disseminated?**

Not that I am aware of

## **4 Audit Criteria**

Please suggest potential audit criteria for this procedure.

### **4.1 Beneficial outcome measures. This should include short and long term clinical outcomes, quality-of-life measures and patient related outcomes.**

**Please suggest the most appropriate method of measurement for each and the timescales over which these should be measured:**

Acute outcomes (end of procedure): residual stenosis, angiographic complications including dissection, perforation, slow flow or no reflow

**4.2 Adverse outcome measures. This should include early and late complications. Please state the post procedure timescales over which these should be measured.**

In-hospital MACE rates

## **5 Uptake of the procedure in the NHS**

**5.1 If it is safe and efficacious, in your opinion, how quickly do you think use of this procedure will be adopted by the NHS (choose one)?**

- Rapidly (within a year or two).
- Slowly (over decades)
- I do not think the NHS will adopt this procedure

**Comments:**

The device is already being used widely all over Europe.

**5.2 If it is safe and efficacious, in your opinion, will this procedure be carried out in (choose one):**

- Most or all district general hospitals.
- A minority of hospitals, but at least 10 in the UK.
- Fewer than 10 specialist centres in the UK.
- Cannot predict at present.

**Comments:**

This device will be used preferentially as the first calcium modification device as a safer and easier to use alternative in comparison to rotational atherectomy.

**5.3 If it is safe and efficacious, in your opinion, the potential impact of this procedure on the NHS, in terms of numbers of patients eligible for treatment and use of resources:**

- Major.



Moderate.

Minor.

**Comments:**

The longer term benefits and effects on durability of percutaneous intervention have yet to be evaluated. There are no data to suggest that there may be an adverse effect. It is possible that achievement of greater stent expansion in the index procedure ie a greater minimum luminal area will translate into an improvement in long term outcome with reduction in major adverse cardiovascular events including target vessel failure and target lesion revascularisation.

## **6 Other information**

### **6.1 Is there any other information about this procedure that might assist NICE in assessing the possible need to investigate its use?**

**Comments:**

## 7 Data protection and conflicts of interest

### 7.1 Data Protection

The information you submit on this form will be retained and used by the NICE and its advisers for the purpose of developing its guidance and may be passed to other approved third parties. Your name and specialist society will be published in NICE publications and on the NICE website. The specialist advice questionnaire will be published in accordance with our guidance development processes and a copy will be sent to the nominating Specialist Society. Please avoid identifying any individual in your comments.

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I have read and understood this statement and accept that personal information sent to us will be retained and used for the purposes and in the manner specified above. For more information about how we process your personal data please see our [privacy notice](#)

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### 7.2 Declarations of interest by Specialist Advisers advising the NICE Interventional Procedures Advisory Committee

Nothing in your submission shall restrict any disclosure of information by NICE that is required by law (including in particular, but without limitation, the Freedom of Information Act 2000).

Please submit a conflicts of interest declaration form listing any potential conflicts of interest including any involvement you may have in disputes or complaints relating to this procedure.

Please use the “Conflicts of Interest for Specialist Advisers” policy as a guide when declaring any conflicts of interest. Specialist Advisers should seek advice if needed from the Associate Director – Interventional Procedures. [Conflicts of Interest for Specialist Advisers](#)

<b>Declarations of interest form</b>			
<b>Type of interest</b>	<b>Description of interest</b>	<b>Relevant dates</b>	
		<b>Interest arose</b>	<b>Interest ceased</b>
<i>Grant support</i>	<i>Investigator for clinical trials</i>	<i>2016</i>	<i>Ongoing</i>
<i>Speaker fees and honoraria</i>	<i>Educational and teaching activities</i>	<i>2016</i>	<i>Ongoing</i>

Equity	Shares in Shocswave Medical	March 2019	

\* Guidance notes for completion of the Declarations of interest form

<b>Name and role</b>	Insert your name and your position in relation to your role within NICE
<b>Description of interest</b>	<p>Provide a description of the interest that is being declared. This should contain enough information to be meaningful to enable a reasonable person with no prior knowledge to be able to read this and understand the nature of the interest.</p> <p>Types of interest:</p> <p><b>Direct interests</b></p> <p><b>Financial interests</b> - Where an individual gets direct financial benefits from the consequences of a decision they are involved in making. <i>For examples of financial interests please refer to the policy on declaring and managing interests.</i></p> <p><b>Non-financial professional and personal interests</b> - Where an individual obtains a non-financial professional or personal benefit, such as increasing or maintaining their professional reputation, from the consequences of a decision they are involved in making. <i>For examples of non-financial interests please refer to the policy on declaring and managing interests.</i></p> <p><b>Indirect interests</b> - Where there is, or could be perceived to be, an opportunity for a third party associated with the individual in question to benefit.</p> <p>A benefit may arise from both a gain or avoidance of a loss.</p>
<b>Relevant dates</b>	Detail here when the interest arose and, if applicable, when it ceased.
<b>Comments</b>	This field should be populated by the guidance developer and outline the action taken in response to the declared interest. It should include the rationale for this action, and the name and role of the person who reviewed the declaration.

Thank you very much for your help.

**Dr Tom Clutton-Brock, Interventional Procedures Advisory Committee Chair**      **Mirella Marlow Programme Director**

