Inside the cathlab of GJNH

a day with Pr. Keith Oldroyd and Dr. Stuart Watkins

Overview of the Interventional Cardiology Department

The main procedure performed in the 4 interventional cathlabs of GJNH is the treatment of coronary artery disease (CAD). CAD is split into 3 different categories; 25% are STEMI patients, 45% non-STEMI, and the rest are elective interventions of patients with stable angina. As GJNH is an international center, there are also patients coming with congenital heart disease or advanced heart failure requiring, in some cases, cardiac transplant.

Management of Primary PCI at GJNH

Recipe to the fastest door to balloon time of the UK

The way GJNH manages patients coming for primary PCI is very efficient, reflecting why GJNH can claim the UK's fastest door to balloon time[1]. Indeed, GJNH serves a population of almost 2 million people for primary PCI. They perform around 750 PPCI cases per year.

Nobody will argue that time is of the essence with primary PCI. *"You want the artery open as quickly as possible,"* says Dr Watkins. The secret of GJNH's claim as first in the UK in terms of door to balloon time (21 minutes according to the National Cardiac Benchmarking Collaborative) relies on several aspects;

"When we started primary PCI in 2008, we had to design a completely new service. For patients who present in the community, Scottish ambulance service brings them directly here and they can transmit the ECG to confirm the diagnosis if necessary," says Pr. Oldroyd.

First, physicians in the cathlab are able to access the patient's ECG very quickly, before arriving at the hospital.

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The ECG is transferred digitally directly from the ambulance to the care unit. Therefore, they can decide remotely who needs to come for the procedure. There is no emergency department at the hospital to delay patients getting to the cathlab, so when patients arrive, they come straight to the cathlab. GJNH reports that time from the front door to the cathlab is 3-4 minutes.

Then, GJNH benefits from an on-call team who are able to stay onsite if they live a distance from the hospital. The Golden Jubilee Conference hotel is adjacent to the hospital allowing cathlab staff to be able to reach in the cathlab within a few minutes of leaving their rooms.

"Recently when we had bad weather, it became crucial and important that the staff was quickly available to deal with emergencies," says Pr. Oldroyd.

Dealing with complex PCI

Even though door to balloon is quick, some cases can take longer, especially for complex PCI. According to Dr. Watkins, complex PCIs happen more and more often as an ageing population is coming to the cathlab.

"The main challenge is that we've got an ageing population. With elderly patients you get more complex coronary disease which is often affecting multiple vessels or calcified coronary disease which is more difficult to fix," says Dr. Watkins.

Moreover, patients who were previously referred to surgery are now eligible for PCI as techniques are improving. As a result, more complex cases can be performed percutaneously instead of going for open heart surgery.

"The PCI that we are doing nowadays is more complex than in previous years. The West of Scotland has a high burden of coronary disease, so in terms of volume, we did just under 3000 PCIs in total last year. We are the second largest center in the UK in terms of PCI volume," comments Pr. Oldroyd.

Innovative tools to treat complex PCI

GJNH's PCI department is fortunate to have high-end imaging tools available in the cathlab to provide optimal treatment options for complex PCI. Indeed, although coronary angiograms are the gold standard to detect coronary lesions, other imaging modalities such as IVUS or OCT are used routinely to help procedural planning. *"These imaging modalities give us a lot of information about the calcifications, the circumferential nature of calcification, and help us decide what we need to do upfront before trying to implant stents, and to make sure stents are well expanded,"* says Dr. Watkins. Coronary pressure wire can be used as well if there remains a debate about the significance of a coronary lesion.

However, habits have changed since the arrival of PCI ASSIST in the lab. According to Pr. Oldroyd, IVUS and OCT

Golden Jubilee Live Case Conference

As the hospital is equipped to allow live case retransmission, GJNH is hosting an annual meeting focused on complex PCI. This year, the cases will be dedicated to high risk PCI (meaning for example, patients requiring circulatory support during the PCI, or patients needing ECMO...).
"At the opposite of other live cases in larger meetings, you can attend the whole case from beginning to end (4 entire cases should be done this year)" says Pr. Oldroyd.
It represents a major event for the cardiology department of GJNH.
"Live case courses put the operator under intense pressure. Last year, we did not have any visiting operators, all cases were done by our own interventional cardiologists, who felt very comfortable working in their own environment, and we succeeded to show every case from beginning to end" precises Pr. Oldroyd.

are more often used for procedure planning instead of insuring the adequate deployment of a stent; *"As PCI ASSIST works very well for stent deployment control, we mostly use IVUS/OCT for pre-procedure planning. For controversial cases, we start the case with IVUS/OCT to assess the degree of calcification, the vessel size, and to resolve some diagnostic ambiguities, then, the catheters are already open; it's quite natural to use it for post procedural assessment. For the remaining cases, PCI ASSIST is very useful."*

Dr. Watkins finds PCI ASSIST very helpful in many ways. It helps him see how well a stent is expanded to assist with good procedural outcomes as under expanded stents carry risks of restenosis and stent thrombosis. *"It is helpful when you are deploying stents, to make sure the stents are properly expanded, without any fractures, and when you are post dilating stents, making sure that your non-compliant balloons are accurately within the stent margins and not outwith in order to avoid edge dissections."*

It's even more useful for his complex calcified cases where visualization of the stent within calcified arteries is sometimes challenging. *"A lot of our patients have heavily calcified coronary disease and often it gets quite hard to see stents when they are implanted. Even implanting platinum chromium stents in heavily calcified vessels can be very hard to see and obviously when we post dilate the stent we want to make sure that our non-compliant balloons are within the stent margins and certainly StentViz is excellent for that. We also use StentVesselViz as well, which is helpful to check that our non-compliant balloons are accurately placed. It's also really good for checking how well expanded the stents are, and making sure you don't have any stent fractures or other problems. We use it a lot here,"* says Dr. Watkins.

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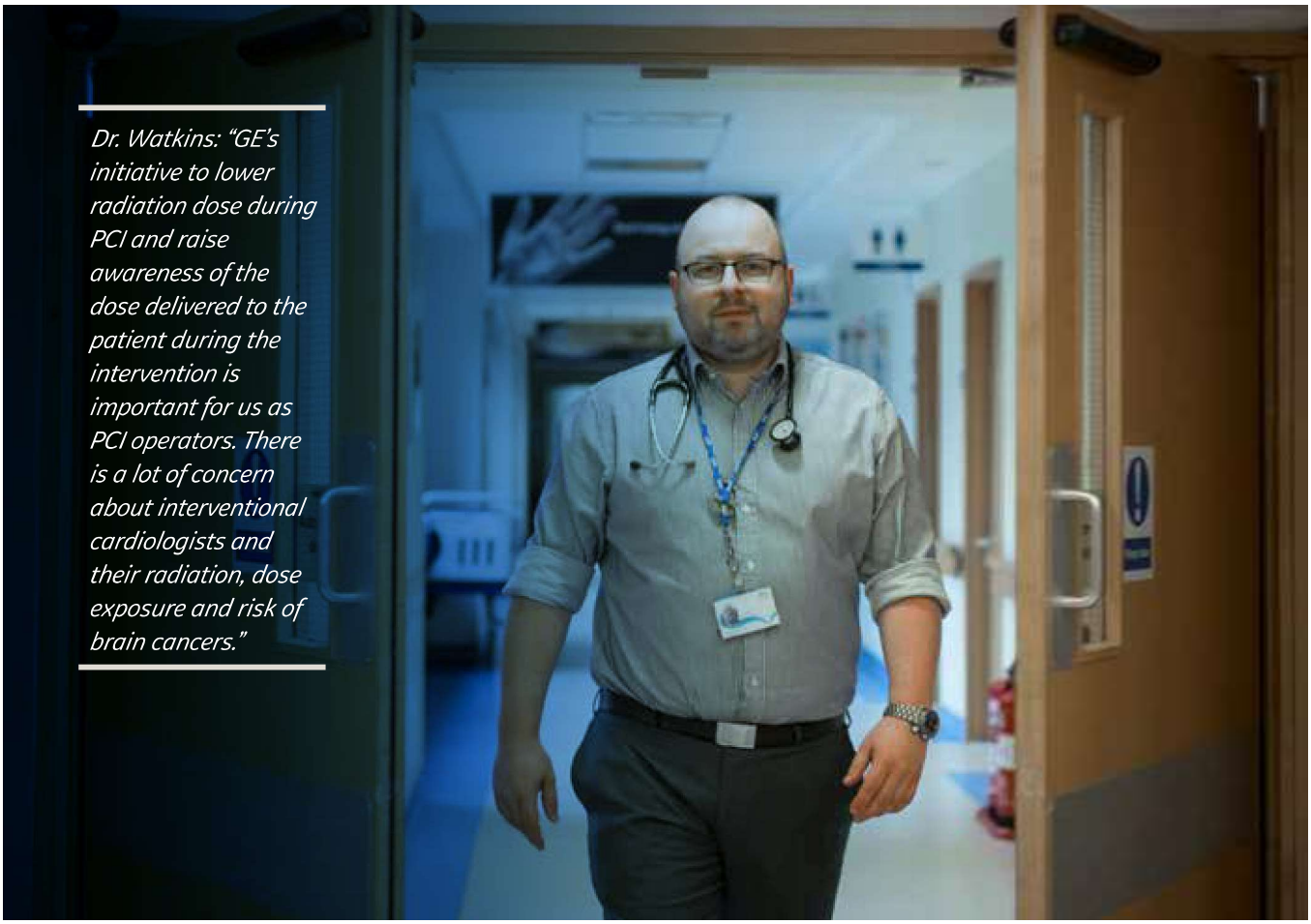

Future of PCI

Both Pr. Oldroyd & Dr. Watkins expect substantial improvements for PCI, whether it be from the device side or the imaging side. According to Pr. Oldroyd, the future of PCI relies on the development of multimodality imaging in the cathlab. He currently has access to IVUS catheters that can do near infrared spectroscopy, and sees great value in catheters ready for multimodality imaging as it helps him to understand the type of coronary disease patients have.

More than the imaging, the dose needed to perform PCI cases is also of great interest to Dr. Watkins, *"I think that GE initative to lower radiation dose during PCI and raise awareness of the dose delivered to the patient during the intervention is important for us as PCI operators. There is a lot of concern regarding interventional cardiologists and lifetime radiation dose exposure."*

Even though the site has recently been equipped with HD IVUS and OCT co-registration, Dr. Watkins also sees great development from the treatment side, especially for complex and very calcified cases; *"In terms of treating calcified coronary disease I think intravascular lithotripsy (IVL) is going to be a big addition to the ornament of dealing with calcified disease. We've already got scoring balloons, cutting balloons, open balloons, and rotational atherectomy, but I think the next device intravascular lithotripsy in the future may be the first line treatment of severe calcified coronary disease."*

When it comes to stents, both physicians agree that a lot of improvements have been made since the introduction of BMS. Despite the results provided by the recent ABSORB III Trial, they are convinced that BVS is not dead.

"As far as PCI is concerned, there has

been a major disappointment in the past few years with bio resorbable scaffolds. They have proven to be no better than conventional metallic stents and possibly harmful in the long term. I personally don't believe that it's the end of the story. I think we will see a new wave of re-engineered bio resorbable vascular scaffold, improved versus the first-generation stents, and we will move towards using devices that in the long term don't leave a permanent metal cage in the artery," says Pr. Oldroyd.

Opening a structural activity

Finally, GJNH has recently opened a TAVI programme. It has been a long road since 2012, when TAVI activity started in Scotland. The main reasons were cost restrictions and government decision to allow no more than one TAVI center for the country,

Demand has increased dramatically since 2012, and the single center in Edinburgh that was providing TAVI for Scotland had to do more than 200 cases a year, which is a lot for one site to deliver.

However, according to Pr. Oldroyd, being amongst the last to start TAVI can also be an advantage.

"First TAVI done in 2002, the first one in the UK was 2007 so we are entering in the TAVI arena at a very late stage. The advantage of that is the technology has become quite mature, and the clinical results are excellent, the length of stay is much shorter, most cases are done transfemorally under local anesthesia."

The closest medical center performing TAVI is in Edinburgh, with a volume exceeding 200 implants per year. GJNH aims to perform 150 cases in the first year, and expand the activity in the following years".

Linking MRI and invasive coronary physiological parameters

Pr. Oldroyd is proud to lead research activities in the cardiology department. Most of his work relates to finding a link between invasive coronary physiological parameters and cardiac MRI imaging.

"During STEMI, we measure (if possible) myocardial blood flow, then we use the MRI (after stenting) to determine the final size of the myocardial fracture. If we can tie these two things together, we can use the blood flow measurement in the cathlab to target new treatments."

And part of the results they published may have changed practice.

"If you have a patient after primary PCI who has very low IMR (index of microcirculatory resistance), we know, from our MRI study, that this patient is going to have a large infarction and a high probability of developing heart failure. Those are the patients on which new therapies can be targeted to try and reduce infarct size. It's a means of trying to select the very high-risk population who potentially will benefit from new treatments."

The Statements by GE's customers described here are based on results that were achieved in the customer's unique setting. Since there is no " typical" hospital and many variables exist i.e. hospital size, case mix, there can be no guarantee that other customers will achieve the same results.

1. https://www.nhsgoldenjubilee.co.uk/news/press-releases-2014/uks-fastest-heart-attack-treatment/)
data source : National Cardiac Benchmarking Collaborative
JB57196FR