MagicTouch Sirolimus Coated Balloons for PAD: Experimental Data and Rationale

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Disclosure

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.
Employment in industry: No

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Owner of a healthcare company: No

Stockholder of a healthcare company: No
Elements of an Effective DCB Formulation

- Must deliver large quantities of the drug within seconds
- Distribute within the media in the first few days
- Therapeutic drug levels must be maintained for more than 4 weeks
- Must allow rapid healing as compared to DES
- Effective drug delivery to target tissue while avoiding non-target effect
Why We Need a Sirolimus DCB?

• Sirolimus is the standard for coronary artery disease treatment via DES and proven to be safe and effective

• Ptx modifications (crystalline form) means coating integrity and transfer are variable with substantial portion lost downstream into blood and tissues

• Loss of Ptx into body remains a significant safety concern which was further exacerbated by Katsanos analysis in published in JAHA

How about in Coronary Angioplasty?
Transient Slow-Flow Phenomenon After PCB Angioplasty: 2 case report

60-year-old man with BMS-ISR treatment with PCB. Slow-flow phenomenon was observed not after conventional balloon but after PCB dilatation.

PTCA With Drug-Coated Balloons Is Associated with Immediate Decrease of Coronary Flow Reserve (CFR)

32 stable CAD or ACS patients who were treated with conventional balloon and In Pct DCB for ISR or de novo lesion in coronary artery

Decreased CFR (dysfunction of microcirculation) suggests the potential adverse effect of DCB in terms of downstream microvascular endothelial function.
MAGIC TOUCH – Sirolimus Coated Balloon

- MAGICTOUCH® – SCB is Sirolimus Coated Balloon to treat coronary artery disease
- Delivers drug in 60 seconds
- Sub-micron phospholipid particles

Nothing Leaves Behind
Sirolimus Coated Balloons – Technical challenges

• **Enhance tissue absorption**
  - Difficult to get sirolimus to enter into arterial tissue within 30 to 180 seconds of balloon dilatation; hence some kind of “instant glue” is required to transfer the drug from the balloon to the tissue efficiently

• **Extend tissue retention**
  - Sirolimus must be continuously delivered over time, so some form of “time release mechanism” must be employed to maintain therapeutic levels
Raman imaging – free vs encapsulated sirolimus

Preliminary results
(1) Raman maps were evaluated by TCA with the reference components for sirolimus and the nanocarrier-encapsulated drug
(2) Mean GVI were determined for Raman images of free and encapsulated sirolimus

TCA: true component analysis
GVI: gray value intensity
Arterial Wall Sirolimus (ng/g tissue) after MagicTouch

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Pre-clinical study; swine coronary ISR lesion

Day 0:
- Vessel injury and BMS implantation in coronary arteries
- Yorkshire domestic Swine

Day 28:
- Angiogram and treatment of ISR with DCB or plain balloon
- Magic Touch 1x, POBA 1x,

Day 56:
- Collect
  - Coronary artery
  - Tissue and Organs
- Pharmacokinetics and Histopathology Analysis
- Euthanize
28 Day Histology

MagicTouch

POBA
28 Day ISR Histology

EEL Area

MT
POBA

IEL Area

MT
POBA

% Stenosis

Neointimal Area

MT
POBA

% Struts with Fibrin

MT
POBA
Downstream Findings

• Total of 84 sections of myocardium were examined
• No incidence of myocardial infarction in either group
• Microscopic scarring observed in 2 downstream myocardium sections from MagicTouch and 3 sections from POBA treated areas
  • although there was no direct visual evidence of downstream emboli
Conclusions

• Sirolimus is the preferred drug for intravascular interventions
• Ptx coated balloons are limited by high rate of distal embolization and loss of Ptx into the body--these concerns were only heightened by the analysis of Katsanos
• MagicTouch SCB demonstrated successful drug transfer for the arterial wall out to 60 days with evidence of drug effect and no toxicity
• Downstream emboli were minimal in the current coronary ISR study presented here
• This is a promising new technology for the treatment of PAD and CAD
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