## "EXCEL" DrugElutingStent in Real World Experience

Mealunito-longternfollow-up

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## Background

- Drug-eluting stents represent a major advance in the in the field of of interventional cardiology \& the marked reduction in restenosis rate has led to overwhelming enthusiasm in the medical world

■ Two major issues of its wide application are:
■ Safety of polymer: potential for increased inflammatory \& thrombogenic responses \& life threatening consequences

- Cost
- "MEDISTRA" is a single center, open label, "first-in-man" (FIM) study of "EXCEL", a "less costly" sirolimus-eluting stent using biodegradable polymer in real world cases


## "EXCEL": <br> A NEW SIROLIMUS-ELUTING STENT



## The Platform: "S-Stent"


© Highly flexible corrugated ring stent (laser-cut from a stainless tube)

- Each corrugated ring has 6 serially connected S-shaped segments

■ 2 bend joints within each S-shaped segment
a Successive rings in the stent are connected by 2 short flexible links, with successive pairs of these links oriented in $90^{\circ}$ quadrature around the circumference of successive rings (Quadrature links)

## The Platform: "S-Stent"



■ Highly flexible

- Reduced expansion forces required to deploy the stent

■ High hoop strength

- High vessel wall support both in straight \& curved vessels
© Moderate radio-opacity, sufficient for correct placement by angiography


# Acute and Long-Term Clinical and Angiographic Outcome AfterS-Stentlmplantation: S-Stent Multicenter Satety and Efficacy Trial 

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#### Abstract

The purpose of this study is to demonstrate safety and effectiveness of the S-Stent in de novo coronary lesions treated with conventional percutaneous coronary balloon angioplasty. Between January 2000 and June 2001, 120 patients were prospectively enrolled at four study centers. Patients were treated with coronary stenting in a total of 137 lesions. Procedural success was achieved in $100 \%$ of 137 attempted lesions. Clinical success was $99.8 \%$. In-hospital mortality was $0.8 \%$; myocardial infarction occurred in $0.8 \%$ and stent thrombosis in $0.8 \%$. After stent implantation, the minimal lumen diameter increased from $0.92 \pm 0.43$ to $2.74 \pm 0.36 \mathrm{~mm}(P<0.0001)$ and the percent diameter stenosis decreased from $68.0 \pm 16.2$ to $4.5 \pm 12.0(P<0.0001)$. At 6 -month follow-up, the percent diameter stenosis was $33.5 \pm 21.3$ and the angiographic restenosis rate was $16.5 \%$. Target lesion revascularization was required in 12 patien s ( $10.1 \%$ ). We conclude that the use of S-Stent for coronary intervention resulted in a high procedural success rate and low angiographic restenosis at 6 months after implantation. Catheter Cardiovasc Interv 2004;62:439-444. 2004 Wiley-Liss, Inc.


Key words: Biosensors S-Stent; clinical outcome; restenosis

## "EXCEL" : A Sirolimus-Eluting Stent



- Very thin coating on the stent

■ Ideal coating-tissue interaction (asymmetrical polymer / drug coating: more drug is exposed to the vessel wall \& less to the artery)

## 28-day Preclinical Study Results

without Sirolimus

with Sirolimus



## Medistra Excel Drug-Elutİng Stent TRiAl

■ Single center, prospective, observational study (Medistra Hospital) (January 30, 2004 - February 28, 2006)
a Study NOT sponsored by the company
B Inclusions:
B All comers who are candidates for PCl ("real world cases")

- Exclusions:
- Contraindications to anti-platelets
- Patients with short life expectancy \& serious concomitant disease (advanced cancer, etc)
- Lack of patient's consent


## Medistra Excel Drug-ElutIng Stent TRiAl

■ Primary End-Point:
$\boxed{\square}$ TLR at 6 and 12 months
©Secondary End-Point:

- 6-month in-segment restenosis rate

■ In-segment late loss
■ Major Adverse Cardiac Events (MACE):
Death, QMI, NQMI, \& / or TLR
QCA analysis is done by an independent core laboratory (National Heart Heart Center - Singapore)
(Dr. A. Wong, Prof. Tian-Hai Koh)

## Medistra Excel Drug-ElutIng Stent TRiAl

$\triangle$ Predilatation is encouraged, even though direct stenting is allowed in simple lesion

■ Stent selection:
■ Try to always use Excel
■ If appropriate size / length not available, use other DES (Cypher or Taxus)

- If other DES is not available (logistic problem), use BMS
- Antiplatelet regimen:
- ASA 160 mg indefinitely (unless contraindicated)
- Clopidogrel 300 mg (loading), then 75 mg for 6 months


## Methods



## 277 eligible pts



DES-tenting as default strategy ( $\mathrm{N}=771$ ), except if there is logistic problem (BMS will be used)


* 1 case when negotiating mildly stenotic, acutely angulated LCX to fix mid-LCX stenosis
1 case with diffuse, calcified mid_RCA stenosis, during attempted direct stenting


## Demography

- N

■ Age (yrs)

- Male / female
- Family history
- Hypertension

■ Dyslipidemia
■ Diabetes mellitus

- Smoking
- Prior MI
- Prior CABG
- Prior PCI

277
$58.5 \pm 9.4$
226/51
97 (35. 0\%)
152 (54.9\%)
160 (57.8\%)
110 (39.7\%)
119 (43.0\%)
123 (44.4\%)
14 (5.0\%)
77 (22.8\%)

## Clinical Presentation

- No

뜨․ No lesions
■ No stents

- Clinical presentation
- Stable angina

■ Unstable angina / ACS

- Acute MI
- Recent MI (<30 days)

■ Silent ischemia
■ LVEF (\%, mean $\pm$ SD)

277
631
771

133 (48.0\%)
32 (11.6\%)
11 (4.0\%)
15 (5.4\%)
86 (31.0\%)
$59 \pm 11 \%$

## Cumulative Patient Recruitment \& Excel stent utilization



## Extent of Disease



## Vessel location



## Indications for Stenting



## Types of Lesion



## Stent length



## Stent size



BMS ( $\mathrm{N}=46$ )


BIOMATRIX ( $\mathrm{N}=27$ ): $2.5 \mathrm{~mm}: 16 ; 3 \mathrm{~mm}: 5 ; 3.5 \mathrm{~mm}: 3 ; 4 \mathrm{~mm}: 3$ ENDEAVOUR (N=5): $2.5 \mathrm{~mm}: 2 ; 3 \mathrm{~mm}: 2 ; 3.5 \mathrm{~mm}: 2$

## Excel in Real World Cases



## Results In-hospital outcome

- No (pts)
- Cardiac deaths

277 (100\%)
0

- Noncardiac deaths 0

■ Nonfatal QMI 0
© Nonfatal NQMI 0
区 Any nonfatal MI 0

- CABG 0

⿶ Acute thrombosis
0

## Results 30-day clinical outcome

- No (pts)
- Cardiac deaths

232 (83.8\%)
■ Noncardiac deaths $2^{*+}$

- Nonfatal QMI

0

■ Nonfatal NQMI 0
区 Any nonfatal MI 0
■ CABG 0
$\boxed{\square}$ TVR 1* $^{*}$
■ Subac. thrombosis 2*

* Pt has very diffuse ultra-small LAD disease \& multiple overlapped Cypher \& Excel stents
+Pt had triple, small vessel disease \& died 1 week after PCI \& had 5 stents (Excel, Biomatrix \& Cypher stents)


## Results 6-month clinical outcome

| m No (pts) | 210 (75.8\%) |
| :---: | :---: |
| m Cardiac deaths | 2 |
| - Noncardiac deaths | 0 |
| - Nonfatal QMI | 0 |
| ® Nonfatal NQMI | 0 |
| x Any nonfatal MI | 0 |
| ¢ CABG | 0 |
| ■ TVR | 4 |
| ® Late thrombosis | 0 |

## Results

## 12-month clinical outcome

| ® No (pts) | 154 (50.5\%) |
| :---: | :---: |
| - Cardiac deaths | 2 |
| ■ Noncardiac deaths | 0 |
| ■ Nonfatal QMI | 0 |
| ® Nonfatal NQMI | 0 |
| ■ Any nonfatal MI | 0 |
| $\pm$ CABG | 0 |
| ■ TVR | 6 |
| ® Late thrombosis | 0 |

## QCA analysis at 6 months

QCA analysis: 94 pts with 217 lesions.
Vessels \& number of lesions treated:

- LAD/D = 97, LCX/OM = 63, RCA = 51; LM = 6

Types of Stents used (per lesion)

|  | Cypher <br> $(\mathbf{n}=34)$ | Taxus | Excel | BMS |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Lesion length $(\mathrm{mm})$ | 15.8 | 18.3 | $\mathbf{( n = 1 3 8 )}$ | $(\mathbf{n = 1 5 )}$ |
| Stent size $(\mathrm{mm})$ | 2.85 | 2.87 | 15.8 | 12.3 |
| Stent length $(\mathrm{mm})$ | 22.5 | 26.8 | 2.86 | 3.50 |
|  |  |  |  | 16.8 |

## QCA analysis at 6 months

CYPHER TAXUS EXCEL

BMS

| Pre procedural |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| RVD, mm | 2.60 | 2.57 | 2.53 | 3.20 |
| MLD, mm | 0.93 | 0.95 | 0.97 | 1.09 |
| DS, \% | 57.3 | 62.2 | 60.0 | 66.0 |
| Post procedural |  |  |  |  |
| RVD, mm | 2.61 | 2.61 | 2.53 | 3.17 |
| MLD, mm | 2.13 | 2.11 | 2.08 | 2.73 |
| DS, \% | 17.7 | 18.8 | 17.7 | 12.8 |
| Stent MLD, mm | 2.28 | 2.29 | 2.33 | 2.76 |
| In-stent DS, \% | 12.1 | 11.5 | 7.23 | 12.2 |
| Follow-up (6 months) |  |  |  |  |
| RVD, mm | 2.67 | 2.60 | 2.64 | 3.22 |
| MLD, mm | 1.89 | 1.78 | 2.07 | 2.06 |
| DS, \% | 29.2 | 31.7 | 21.6 | 35.9 |
| Stent MLD, mm | 2.03 | 1.92 | 2.26 | 2.06 |
| In-stent DS, \% | 24.0 | 26.3 | 14.2 | 35.9 |

## QCA analysis at 6 months

CYPHER TAXUS EXCEL BMS

Follow-up (6 months)(cont'd)
Late loss, mm In-segment

$$
0.24
$$

0.31

$$
(p=0.12)
$$

( $p=0.03$ )
In-stent

$$
\begin{aligned}
& 0.25 \\
& (p=0.055)
\end{aligned}
$$



0.55
( $p=0.003$ )
0.59
$(p<0.001)$

Restenosis (>50\%), n
In-segment

In-stent

$$
\begin{array}{ll}
\begin{array}{l}
6 / 33(18.2 \%) \\
(p=0.012)
\end{array} & \begin{array}{l}
3 / 30(10 \%) \\
(p=N S)
\end{array} \\
5 / 33(15.2 \%) & 2 / 30(10 \%) \\
(p=0.013) & (p=N S)
\end{array}
$$

| $7 / 135(5.2 \%)$ | $2 / 12(16.7 \%)$ <br> $(p=N S)$ |
| :--- | :--- |
| $5 / 135(3.7 \%)$ | $2 / 12(16.7 \%)$ <br> $(p=N S)$ |

## Cumulative Distribution Curves for EXCEL Stent



Minimal Luminal Diameter (mm)

## Cumulative Distribution Curves for All Stents



Minimal Luminal Diameter (mm)



Minimal Luminal Diameter (mm)


## Instent Restenosis of RCA

SariPD, 50, SAP


Baseline:
Focal instent restenosis of a Bard stent


6 month f/up: No restenosis

## Acute Myocardial Infarction

TedAD, M, 45, AMI

Baseline




No restenosis at 6 months angiogr. f/up



## Triple CTO (LAD/LCX/RCA)

IskS, M, 63, Stable angina

## LAD



## Triple CTO (LAD/LCX/RCA)

IskS, M, 63, Stable angina

## RCA

Baseline:
CTO in RCA

After placement of 3 overlapping Excel stents
(3/14; 3/18; 3/14 mm)


No restenosis at 6 months angiogr. f/up


## Triple CTO (LAD/LCX/RCA)

IskS, M, 63, Stable angina

After placement of Excel stent ( $2.5 / 18 \mathrm{~mm}$ )

No restenosis at 6 months angiogr. f/up



6 month f/up:
Prox. peristent restenosis


## Diffuse, small vessel disease with CTO in LAD (1)

HW, M, 45, OMI



Baseline:Diffuse, small vessel disease (dotted line) with CTO (arrow).


After placement of very long overlapping Excel ( $2.5 / 28 \mathrm{~mm}$ ) \& Cypher (2.5/23; 3/33; 3/13 mm) stents

## Diffuse, small vessel disease with CTO in LAD (2)

Cypher ( $3.0 / 13 \mathrm{~mm}$ )
Cypher ( $3.0 / 33 \mathrm{~mm}$ )

Cypher (2.5/23 mm)

Excel ( $2.5 / 28 \mathrm{~mm}$ )

After placement of very long overlapping Excel (2.5/28 mm) \& cypher (2.5/23; 3/33; 3/13 mm) stents

HW, M, 45, OMI


Occlusion of Cypher (\& Excel) stent. TLR not performed as distal LAD was filled by collaterals from RCA

## Conclusion

Despite the inclusion of chalenging
"real world cases" (DM, MVD, small vessel, complex lesions, long - diffuse disease, calcified stenosis, ostial stenosis, LM, AMI, CTO, instent restenosis, etc)
the preliminary results are encouraging,
with very low MACE rate \&
"clean" angiographic appearance of the stent on angiography

