

DVX, Inc

Princeton, NJ

MEMS* to Measure Blood Flow A “Disruptive” Technology

**** Micro-Electro-Mechanical System***



Why Add Blood *Flow* to Pressure?

- Majority of deaths caused by bad blood *flow* – heart attacks, strokes, kidney disease, peripheral arterial disease...so must treat *flow*
- Pressure – often measured – only shows potential for the blood *flow* that keeps tissue alive
- DVX's devices measures *flow* as well as pressure – to improve surgery, both invasive & non-invasive, and make possible long-term monitoring
- ***This will change cardio-vascular medicine –future devices will have to incorporate this new technology***



DVX's Technology

Unique Diffraction-Grating Transducer ('DGT'), mm-sized flexible film, can be wrapped inside or outside a blood vessel to measure flow

- Automatic measurement: operator independent
- Accurate: $\pm 5\%$ error
- Low-power: Pacemaker battery can supply flow-monitor for > 5 years



Presently Under Development

SmartGraft™ -- graft wall contains a DGT & pressure sensor to automatically measure flow and pressure every night, radioed to bedside monitor

- Data sent by internet to monitoring service
- Implanted in more than a dozen dogs; testing continuing (CaseWestern, NIH-funded)

Presently Under Development, cont'd

- **SmartStent™** -- Flow/pressure-measuring device held in place by stent (University of Penn, NIH-funded)
- **SmartCath™**-- Integrates flow/pressure-measuring in with therapy in one catheter to optimize interventions (CaseWestern, NIH-funded)

A SmartGraft Flow Measurement



SmartGraft Wireless V1.3

Utilities

Machine State	Samp Time	Sample Rate	New Subject's Name	Implant ID
Chart	3	34000		

Date	File Name	Select Subject Name	Next Subject
01-17-08		Oscar	NEXT

Ave Vel	Ave Pk Vel	Beats	V-Dev	Flow	Power	BPM	Data Status	Show Data
45.21	99.	7	.014	767.	198	65	OK	Hide data

Notes

Immediate Mode

Take Data

MathCad Port

MathCad File Name
C:\McaKSG 1-4-08 a

Input New Subject
Add Subject

Velocity Graft

Velocity Graft

Link Status	Start Link	RSSI	Time Out	Antenna Cal
Idle		7		23

Implant ID	End Link	Miss	Vsup
CAE902		0	3.234

Clear Channel	Total Link Time	Block Cnt
2	18	18000

Delay Timer

Minutes: 00

Seconds Remaining: 00

Start Delay

Cancel

Set Video Mode

Clear Video Mode

Play Back Last Video

Play File

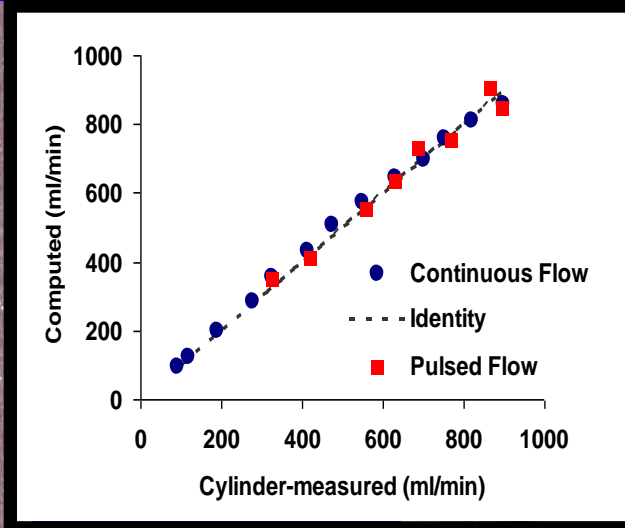
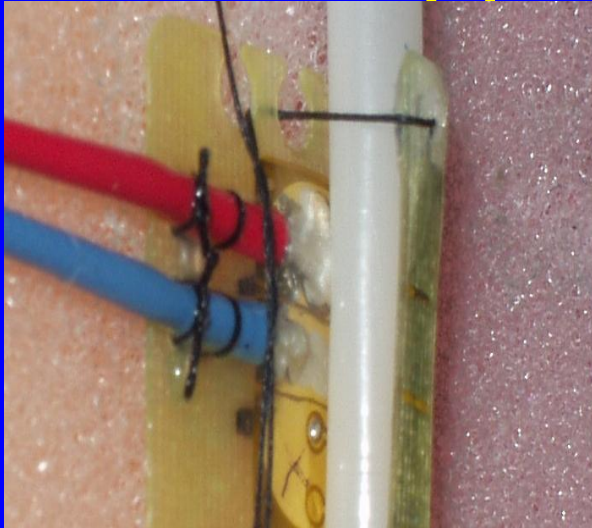
Stop Play Back

Start Project1 - Microsoft Visu... SmartGraft Wireless ...

Case-Western HL071359
Dr. John Blebea, MD



Wrappable Film Flowsensor

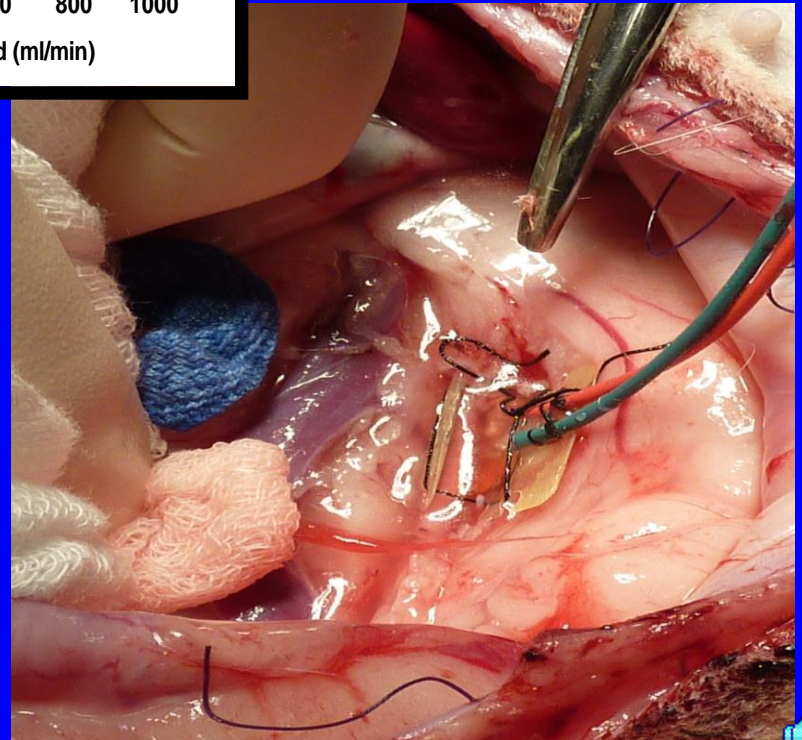


On rabbit aorta –
5 hour closed chest

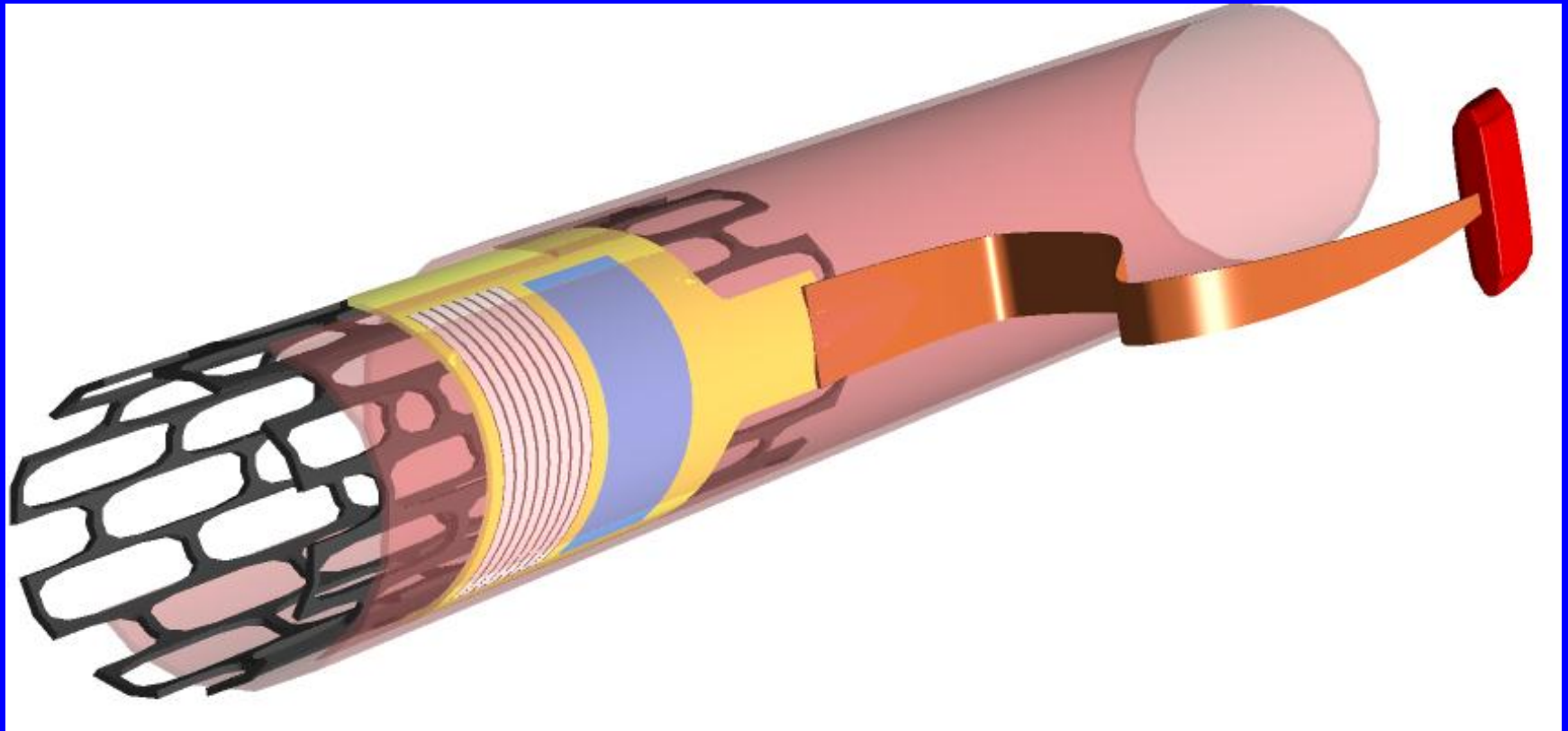
On flow phantom results

Biocompatible, implantable,
< 1 gram weight, requires less than
15 mW power.

Thom Jeff U HL087467
Dr. Barry Goldberg, MD



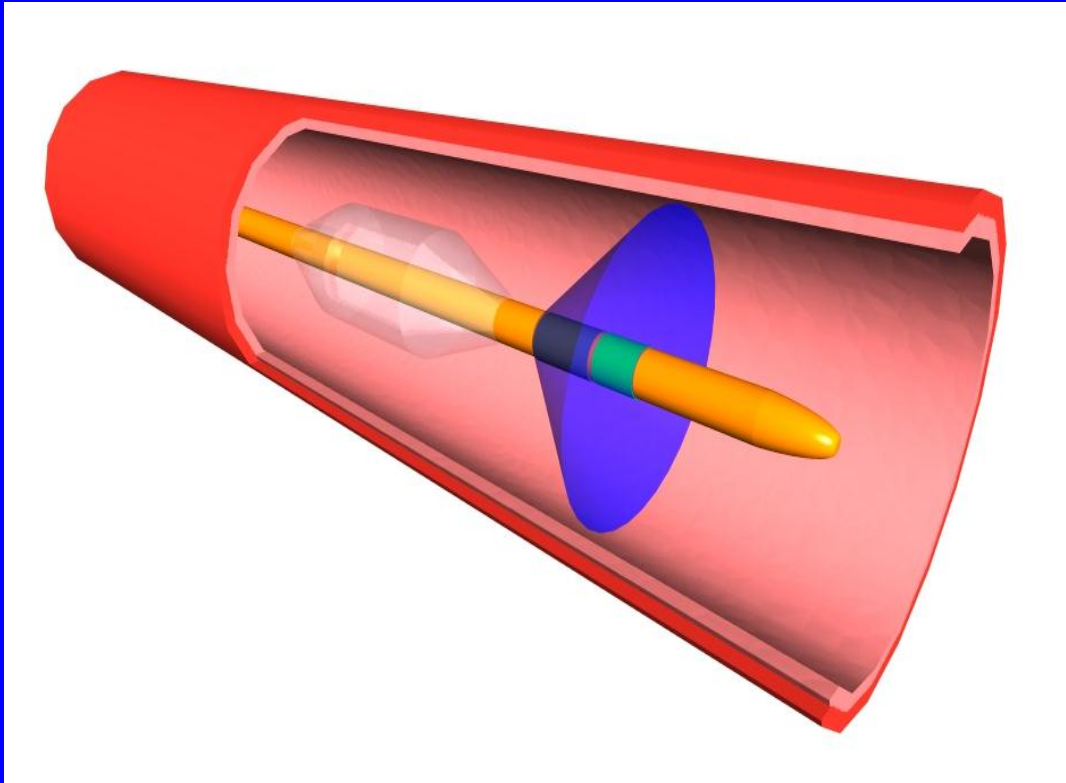
Stent-Sensor



U of Penn HL104812
Dr. Joseph Gorman, MD



Catheter-mounted Flowsensing



- Functional measurement improves outcomes (FAME study*)
- Integrated measurement to reduce cost and improve results

*N Engl J Med 2009; 360:213-224

Case-Western HL095195
Dr. John Blebea, MD



Pending NIH-Grants:

Dialysis-Access flow monitoring to extend access life (Harvard – Dr. Greg Clement, MD)

Monitoring hemodynamics of kidney transplants for early detection of rejection (Thomas Jefferson University -- Dr. Barry Goldberg, MD)

Other Applications:

- Post-operative monitoring for vascular reconstructions
- Flow measurement on coronaries and cardiac bypass grafts to trigger injection of fibrolytic to stop MI's



Partnering Opportunities

- **Joint-ventures** to commercialize DVX's present devices (FDA, manufacturing, etc)
- **Joint-ventures** to develop new devices
- **License** DGT technology to incorporate in proprietary devices
- **Purchase** custom-made DGT's to incorporate in proprietary products



Summary

- DVX's patent-protected technology measures a crucial cardiovascular parameter: blood flow
- NIH-funded developments have validated both acute and chronic utilization of this technology platform
- DVX is seeking partners to commercialize -- by joint venture, license, or purchase as a component -- this technology

Thank You!

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