Implantable Telemetric Pressure Sensor System for Long-Term Monitoring of Therapeutic Implants

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WP12 Objective

- Pressure Sensor System for Continuous Monitoring of Therapeutic Implants
  - Electrically and mechanically long term stable
  - Highly biocompatible
  - Miniaturized and flexible for minimal invasive delivery
  - Wireless communication
  - No battery or internal power source
  - Easy measurement at home
- Monitoring pressure within the head under common conditions

- Types of patient that potentially suffer from high intra cranial pressure:
  - Hydrocephalus
  - Head injury
  - Cerebral Oedema
  - Benign intracranial hypertension
- Hydrocephalus describes state of excessive accumulation of CSF within the fluid system of the head causing high intracranial pressure
- Therapy: draining CSF from the CNS by shunts
  - Shunt failure
- Approx 40 per 100,000 Individuals have shunts in place
  - 125,000 p.a. in USA
  - 3,400 p.a. in UK
- There is currently no practical way to measure shunt performance in vivo!

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- Abdominal aortic aneurysm
- Swelling of the main artery in the body due to weakening of the artery wall making it vulnerable to life-threatening ruptures
- Endovascular repair replaces conventional surgery
- Endoluminal stent-graft excluding aneurysm from normal circulation
- Approx 190,000 AAAs diagnosed each year in the USA; up to 50% of all elective AAAs are now being with endovascular aneurysm repair
Endoleak development can lead to pressurization and increased risk of rupture
  - Continuous surveillance required

Standards of clinical surveillance
  - Contrast media enhanced CT scanning
  - MRI
  - Pressure measurement via percutaneous puncture

Success of therapy depends on pressure remaining inside the aneurysm

Currently there is no diagnostic approach being better alternative to CT scanning!

L. A. Sanchez et al. in J Vasc Surg, 26,2; 1997
Telemetric Pressure Sensor System

Diagram showing the components of the telemetric pressure sensor system, including external telemetry unit, implanted telemetry unit, power, demodulator, modulation, interface, body area network, pressure sensing unit, and wireless power and data transmission.
ITPS Prototype

Telemetry unit

Conducting lead

External reader/writer device

Measuring head
Telemetry Unit

- Transponder chip
- Antenna coil
- Microcontroller
Existing Devices

- Working prototypes of implantable, passive transponder telemetry based pressure sensor system incorporated into an intraocular lens
- Project leader
- Clinical trials
- Mounting & assembly
- RF communication & BAN
Implantable telemetric sensor systems will be of significant value for cost-effective continuous monitoring of therapeutic procedures even under everyday life conditions.

Close collaboration with clinical end-users guarantees development closely along the market needs and medical requirements.

High integration of technology partners during development enables the introduction of new and reliable products.

Functional ICP prototypes demonstrate the measuring chain and will be used for technical and clinical evaluation.
Thank You for Your Attention

Your Sensor System Integrator

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