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Study Design for Spinal Cord Stimulation (SCS) for Angina

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Purpose

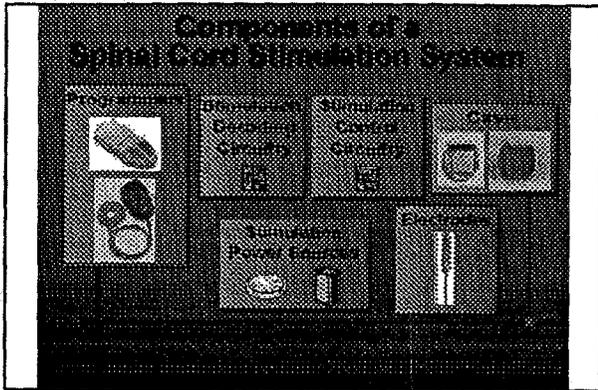
- No medical devices are currently commercially available for Spinal Cord Stimulation for the treatment of angina

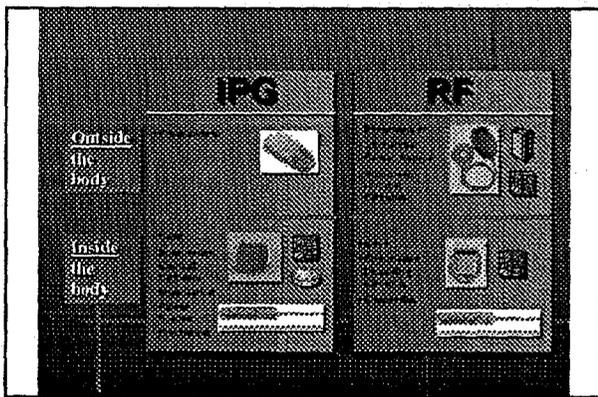
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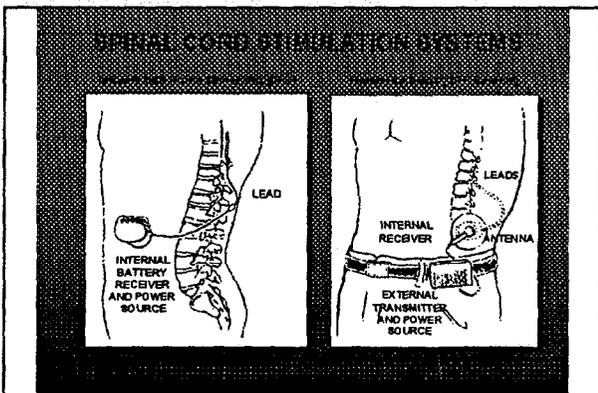
Outline

- What is Spinal Cord Stimulation?
- Components of the Stimulation Systems
- Background - Indications for Use
- Study Design Issues
- Questions to Panel

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Potential Mechanisms

- Gate Theory
- Chemical Neuronal Interactions
- Gamma-Aminobutyric Acid (GABA)

Indications for Use

Cleared:

- Chronic Intractable Pain of the trunk and/or limbs
- RF coupled SCS systems have been cleared under the 510(k) process
- totally implanted SCS systems have been cleared under the PMA process

Investigational:

- relief of anginal pain is a new indication and requires a clinical study

Clinical Study Design Issues for the Treatment of Angina

- control group
- masking
- duration of the study
- effectiveness endpoints
- safety endpoints

Control Groups and Alternative Studies

- published information uses the patient as his/her own control
- Other possibilities for studies include:
 - Randomized Controlled Study
 - Crossover Study
 - Single-Arm Historical Control Study
 - Dose Response Study
 - Other

Masking

- patients feel "tingling" sensation, to guide physician
- patients know whether stimulation is on or off
- stimulation of pain area provides some relief from anginal pain

Study Duration

- ranges from a few weeks to one year
 - duration of *placebo effect*
 - duration of *treatment effect*
 - *safety*
 - *others*

Effectiveness Endpoints Include:

- Physiological Measures such as pulse rate and ST segment depression
- One or Two Class Reduction on CCS angina scale or the NYHA angina scale
- Treadmill Exercise Testing
- Reduced Consumption of Pain Medications related to Angina
- Hospital Admissions related to angina
- Quality of Life (QoL) measures

Safety Endpoints

- current literature provides minimal information on device safety
- stimulation masking symptomology
- safety endpoints for a specific angina claim

Questions for the Panel



- Clinical Study Design Issues in Using SCS for angina:
 - control group
 - masking
 - duration of the study
 - effectiveness endpoints
 - safety endpoints

Q1: Based on the literature information and other known clinical information, please discuss the advantages and disadvantages of the following study designs for SCS for angina. Also, please discuss any clinical issues that would be specific for these studies.

- Single-Arm with Baseline Period
- Randomized Controlled Study
- Crossover Study
- Single-Arm Historical Control Study
- Dose-Response Study

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Q2: Please discuss the advantages and disadvantages of the following effectiveness endpoints (e.g., physiological measures, treadmill exercise testing, and QoL).

- What primary and secondary endpoints would be important to collect to fully characterize the effect of SCS for angina?
- What would be a clinically meaningful response to each of these endpoints?
- For each endpoint, what follow-up duration is necessary to capture a clinically meaningful benefit taking into consideration the duration of the placebo effect.

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Q3: Endpoints such as lead migration, infection, electrode breakage, and battery failure have been reported in the literature for active implantable medical devices.

- Please discuss any safety endpoints that would be important to consider during a clinical investigation.
- Please discuss the follow-up duration necessary to capture the safety endpoints.

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