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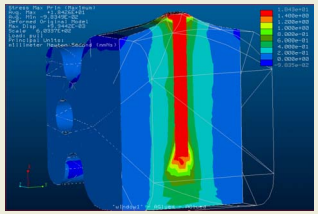
Computational Modeling

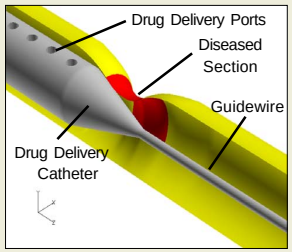
MDI has the facilities and expertise to perform complex computational modeling and uses these results to guide medical device design. Incorporating the insight gained through device-focused analyses improves the design and deepens the "technical foundation" of a new idea.

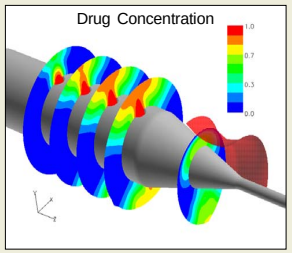
Structural Finite Element Analysis (FEA) is a powerful computational tool for designing implants or surgical instruments. The FEA model shown here predicts the pullout resistance of a bone screw embedded in a vertebral body section.

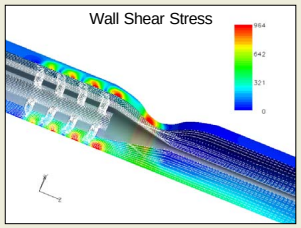


Maximum Principal Stress Distribution

Computational Fluid Dynamics (CFD) modeling is invaluable when establishing the flow patterns within or around new devices. Shown here is a drug delivery catheter. CFD was used to maximize the drug delivery within a diseased artery and limit the wall shear stress, and thereby potential damage, to adjacent healthy tissue.



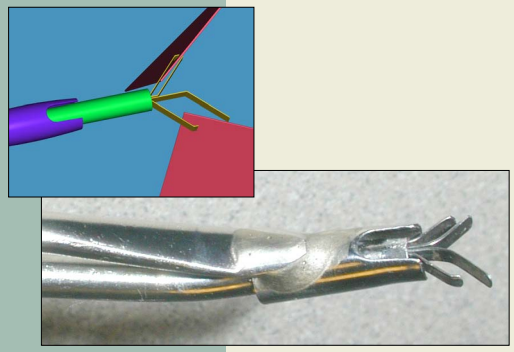




THE CLEVELAND CLINIC FOUNDATION

MDI MEDICAL DEVICE INNOVATIONS

Advancing patient care through the development of innovative medical devices



"Every good idea deserves a chance"

LERNER RESEARCH INSTITUTE

DEPARTMENT OF BIOMEDICAL ENGINEERING

Services

Medical Device Design

- Design assistance at all levels, from concept generation to detailed engineering drawings
- 3D solid modeling to visualize new designs

Analysis to Guide Design

- Structural finite element analysis
- Computational fluid flow modeling

Prototype Fabrication

- Stereolithography - rapid plastic prototyping
- Prototype Lab - mechanical prototype design and construction
- Electronics Lab - electronic device design and construction
- Polymer Lab - plastic prototyping & injection molding

Program Management

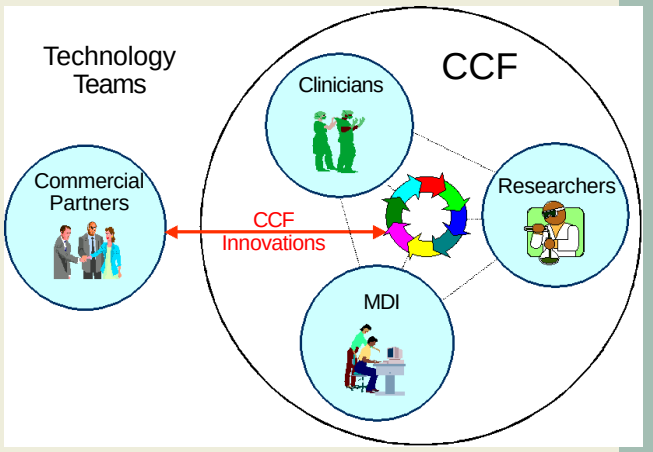
- Guide development effort
- Interface with corporate R&D groups
- Comply with FDA design requirements

CT data and stereolithographic reconstruction of knee

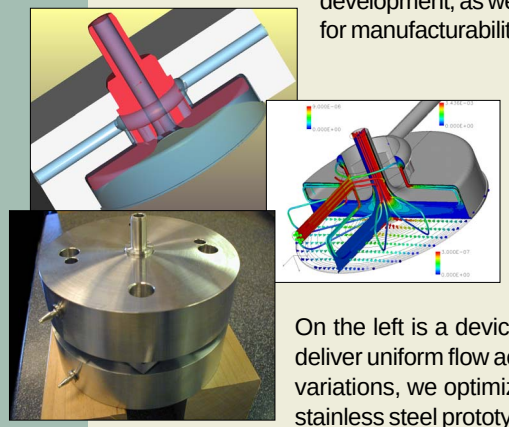
Every good idea deserves a chance

MDI can give you that chance

Our experience in medical device development can quickly and efficiently transform your promising new device ideas into functional prototypes. Such functional prototypes are needed to demonstrate the technical feasibility and clinical utility of a new concept. These are both key points when establishing a new product's commercial viability. We use our engineering expertise and our in-house rapid prototyping capabilities to help you create the next generation of medical devices.



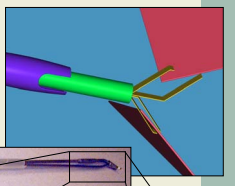
The purpose of MDI is to enhance and create innovative medical devices from ideas originating at CCF. MDI is staffed with a multidisciplinary team of professionals who have extensive experience in medical device design, prototyping, and product development, as well as commercial experience, including project management and design for manufacturability.



MDI strives to develop strong collaborations throughout CCF, forming technology teams to advance new technologies. We work closely with CCF Innovations, LRI/BME Prototype, Electronics, and Polymer Laboratories, and outside medical device companies.

Our work is kept strictly confidential. Example projects that have reached a sufficient level of maturity to be disclosed to the public are shown here.

On the left is a device designed using computational fluid dynamics to deliver uniform flow across cartilage test specimens. By modeling design variations, we optimized the internal flow path prior to fabrication of the stainless steel prototype.



Our patented laparoscopic anastomosis device, shown to the right as a 3D model and a fully functional prototype, is used to approximate two tissue edges allowing a tension-free suture or staple application.