

## A Case Study of Physician Interaction in the Medical Device Development Process

**Lauren Aquino Shluzas**  
*Stanford University*

John H. Linehan  
*Northwestern University*

Larry J. Leifer  
*Stanford University*

A multiphase empirical field study is being conducted at Stanford University to examine the process of physician interaction during medical device development. The initial component of this study involved creating an analytic framework for case-based research that provided a conceptual guide for the pilot case study documented in this paper. The pilot case study examined the process of engaging physicians in medical device development within the context of an entrepreneurial device company. The methods used in this study included a combination of interviews with

cross-functional team members, a quantitative survey, and the collection of archival data. Data analysis first involved documenting physician-developer interaction practices that had been used within the company, from needs finding to post-market surveillance, across multiple product generations. Leading development factors involving physicians that had influenced the company's clinical and financial outcomes were next identified. The case study illustrated the importance of working with and understanding the user experiences of a wide range of physicians when developing new products. The case also captured how physician interaction influences risk perceptions toward medical device performance for both surgeons and developers. The case likewise highlighted the benefits of a systems-based design approach, as opposed to designing products for a single technical end point. From a methodological perspective, the case study revealed the importance of examining user interaction within a contextual framework, as opposed to an isolated examination of input and output variables. The study presented in this paper has provided a foundation for future case-based analyses regarding the process of physician interaction in medical device development.

## Rotary Ultrasonic Machining of Dental Ceramics: A Preliminary Study on Subsurface Cracks

**Zhichao Li**  
*North Carolina Agricultural and Technical State University*

Weilong Cong  
*Kansas State University*

Matthew Stanco and Zhigang Xu  
*North Carolina Agricultural and Technical State University*

Zhijian Pei  
*Kansas State University*

Clyde Treadwell  
*Sonic-Mill Company*

Commercially available dental computer aided design/computer aided manufacture (CAD/CAM) systems usually use abrasive machining processes such as diamond grinding and milling. One of the major disadvantages of abrasive machining processes is subsurface cracks. In the present paper, rotary ultrasonic machining (RUM) technology is introduced into machining of alumina dental ceramics. The subsurface cracks are observed under scanning electron microscope. Effects of ultrasonic vibration on the subsurface cracks are also investigated. Results show that RUM is a very promising process to significantly reduce subsurface cracks in CAD/CAM of dental ceramics.