THE HARTWELL FOUNDATION

2016 Individual Biomedical Research Award

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Partitioned Stent to Overcome Infections and Feeding Intolerance in Short Bowel Syndrome

Short bowel syndrome is diagnosed in approximately 2,000 infants in the United States each year. It is a life-threatening and often lethal condition in which children are unable to digest food due to the inadequate length of functioning intestine. The syndrome typically results when babies are born missing a portion of their intestine or who are born prematurely and subsequently acquire a severe infection that significantly damages their intestine. Older children may also develop short bowel syndrome following operations for trauma, cancer, inflammatory bowel disease, vascular disease, adhesions, and radiation damage. Therefore, with each passing year affected children increase the short bowel patient population, all of whom require supplemental or complete intravenous nutrition. In short bowel syndrome the intestine undergoes a process of adaptation over time in an attempt to make up for the lost intestine and reduce the need for intravenous nutrition. This adaptive process is stimulated by feeding and involves radial growth of the bowel; but when the bowel dilates too much, peristalsis (involuntary wavelike constriction and relaxation of the muscles of the intestine) becomes ineffective due to impairment of the bowel wall muscles. The lack of peristalsis promotes bacterial overgrowth and intestinal inflammation that weakens the intestinal wall, allowing leakage of gut bacteria that can cause a bloodstream infection; and the effectiveness of nutrient absorption plateaus or falls, which mandates more intravenous nutrition and a worsening prognosis. Unfortunately, current interventions are largely unsuccessful and often require another major surgery. Besides intestinal transplants, various alternatives have been suggested that include stretching the intestine, but such abdominal surgeries require extensive cutting, sewing and stapling of the bowel, together with risk of bleeding, leakage and failure that places the small amount of healthy bowel patients have in jeopardy. An option with better outcomes is clearly needed. To address this unmet need, Sam proposes a unique intestinal stent (tubular support) with a divider inside that creates multiple, small channels. His device can be implanted conveniently into the bowel without abdominal surgery via an endoscopic approach. The device will reduce the size of the lumen of the intestine and paradoxically, increase desirable flow of the intestinal contents. While his approach is counterintuitive, it will lead to a healthier intestinal wall; improve feeding tolerance by inhibiting the continued radial growth of the intestine; and in effect, reduce the potential for weakening of the bowel wall, bacterial overgrowth and inflammation. If Sam is successful, this new device will enable children affected with short bowel syndrome to graduate from intravenous nutrition and avoid risky abdominal surgery with its associated morbidity and mortality, providing them an opportunity to live a normal and productive life.