# Rib Fixation Device for Treatment of Early Onset Scoliosis and Spinal Deformities (2016-007)

Provides improved treatment of upper thoracic region of the spine

## Market Overview

This rib fixation device attaches expanded titanium hooks on two or four ribs, improving stability of fixation for safer management of upper thoracic instabilities. With early onset scoliosis (EOS) having an incidence of approximately 1-2 per 1000 births, and with frequent complications of originally untreated individuals, care for severe thoracic deformations exceeds an annual $17 billion in costs. Current treatments involve the use of pedicle screws, of which are fixed to the spine itself. However, the pedicle screws fixations are subjected to pull-out failure in the presence of kyphosis forces and pose the risk of intraoperative spinal cord damage. Researchers with the joint Clemson-MUSC program therefore have developed methods to overcome these complications, specifically with a device that attaches to the ribs rather than the spine. By moving fixation to the ribs, a more secure upper thoracic fixation is achieved through increased contact area and construct flexibility while providing less risk for device migration and post-operative complications.

## Technical Summary

This rib-fixation device for use in treatment of severe spinal deformities allows for rib fixation through utilization of spinal rods and rib hooks acting as fasteners. The spinal rods are secured to the upper thoracic region of the spine and are attached to bilaterally placed rib hook in order to stabilize fixation to the ribs. More specifically, these rib hooks are arranged in a block formation on two or four ribs depending on the needs for the patient. This construct achieves the greatest fixation strength and stability compared to pedicle screws or other approaches, allowing for safer and more stable treatment of severe spinal deformities including early onset scoliosis.

### Application

Upper-thoracic repair

### Development Stage

Validated Prototype; *in vitro* studies completed; *in vivo* large animal studies ongoing

### Advantages

- Reduces risk of implant migration and spinal cord injury, allowing for safer treatment
- Improves availability of treatment for severe spinal deformities including kyphosis, osteoporosis, and vertebral fractures
- Achieves fixation via attachment to ribs, providing more effective management of thoracic instability

| App Type | Country | Serial No. | Patent No. | CURF Ref. No. | Inventors |
|---|---|---|---|---|---|
| Utility | United States | 15/374,615 | NA | 2016-007 | Hai Yao |

## About the Inventors

### Dr. Hai Yao

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Dr. Hai Yao serves as an Associate Chair for the Clemson-Medical University of South Carolina (MUSC) Bioengineering Program and holds a dual appointment in the Departments of Orthopaedics and Oral Health Sciences at MUSC. He earned his first Ph. D. in Mechanical Engineering from Xian Jiaotong University in China and his second in Biomedical Engineering from the University of Miami in Florida. His current research focuses on the musculoskeletal biomechanics and tissue engineering, including recent work in successfully demonstrating a fully functional synovial joint regeneration procedure.

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