

## **BIOGRAPHICAL SKETCH**

Allena Diane Ward was born in Knoxville, Tennessee, on September 7, 1994. She attended elementary and middle school in Roane County and graduated from Harriman High School with honors in May of 2012. During her time at Harriman High School she also attended Roane State Community College. The following August she entered Tennessee Technological University and in May of 2016 she received the degree of Bachelor of Science in Mechanical Engineering. She continued at Tennessee Technological University and received her Master of Science in Mechanical Engineering in August of 2018.

## **EDUCATION**

M.S. Mechanical Engineering  
Tennessee Technological University  
Cookeville, TN  
expected August 2018

B.S. Mechanical Engineering  
Tennessee Technological University  
Cookeville, TN  
May 2016



## **College of Engineering**

**TENNESSEE TECH**

The Department of  
Mechanical Engineering  
Announces the Thesis Defense  
of

**Allena Diane Ward**

In Partial Fulfillment of the Requirements

For the degree of  
**Master of Science**

July 2, 2018 at 2:30 p.m.

Held in

Brown Hall Room 241

Tennessee Technological University

## **FIELD OF STUDY**

Bio-Mechanical Engineering

## **THESIS TOPIC**

A STUDY OF THE EFFECT OF  
NEGATIVE PRESSURE  
ON HERNIA MESH

## **EXAMINING COMMITTEE**

Dr. Dale Wilson (Advisor)

Professor of Mechanical Engineering

Dr. Kristine Craven

Interim Chair Basic Engineering

Dr. Sally Pardue

Director Millard Oakley STEM Center,

Associate Professor of Mechanical Engineering

## **ABSTRACT**

As many as 10% of Americans will develop a hernia during their lifetime. Over 500,000 of those hernias are surgically repaired each year [1], and around 90% of those repairs in the groin area use surgical mesh [2]. Hernias can be treated in two main ways surgery or wait and see if the problem resolves itself. If surgery is chosen, the use of hernia mesh can decrease recurrence by up to 6.5 percent [30]. Although using mesh can be beneficial, complications from its use, including excess fluid, do arise. The creation of fluid around the surgical site is not necessarily an issue, but if too much fluid accumulates, severe complications can occur. Some of these complications can include, but are not limited to, rupture in the sutures, infection, and pain. Using a wound vacuum to remove the excess fluid can help reduce these complications and decrease the need for further surgeries to remove or replace hernia mesh. Although wound vacuums do help the healing process, no device is perfect. Some of the major issues that plague wound vacuums are infection, skin irritation, and pain [16]. Issues of lines clogging to the point that the device needs to be removed and reinserted have also occurred. Even with these issues, for many physicians and patients the benefits outweigh the risk for both hernia mesh and wound vacuums.

The issues addressed in this research are mesh migration and mesh shrinkage in inguinal hernias when negative pressure is applied. With the lasting effects that these complications cause and the lack of research in this area, discovering what happens inside the body could help to create better solutions in the future.