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A Survey of Stainless Steel in Medical and Surgical Application

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A SURVEY OF STAINLESS STEELS IN MEDICAL AND SURGICAL APPLICATIONS

NOAH SLACK AND CLINT BALCH

1

This project acts as a survey of stainless steel alloys and their use in medical implants such as surgical fixation in orthopedic injuries. Various alloys will be compared and evaluated for biocompatibility, mechanical properties, and behavior in cyclic load bearing conditions.



Figure 1

2

A literature review was performed to identify the different types of stainless steel surgical implants and how well they perform in the field. The list includes hip joint replacement fixation, coronary stents, and bone pins used in bone fracture fixation.

3

The literature review led to the identification of 316L Stainless Steel as the premiere material for surgical implants. The mechanical properties of 316L Stainless Steel were then compared to other 300 series and 17-

Stainless Steel

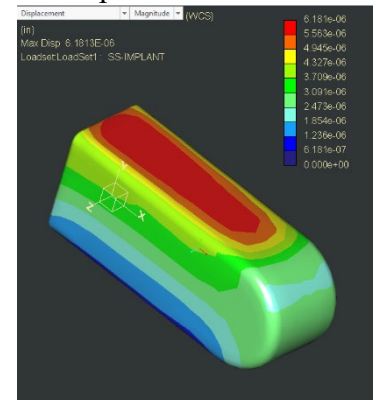


Figure 2

4

Finite Elemental Analysis of a simple model was performed for 3 alloys: 316L, 304, and 17- 4 Stainless Steel to evaluate how each sample compared under uniform loading conditions.

5

A literature review of materials used in medical implants was performed in order to identify the ideal properties for various types of implants. Biocompatibility, magnetism, structural properties, hardness, and surface finish were among the most important.

6

A review of the processing of 316L and how it determines the microstructure of the material was used to identify what treatments and processing techniques could be useful for medical implants. Finally, a PSPP map was constructed in order to construct a structure-property relationship for 316L stainless steel