DESIGN OF VEIN UNCLOGGING MICRO ROBOT PRODUCED WITH 3D (THREE DIMENSIONAL) PRINTER

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1. Introduction

Nowadays, the number of people suffering from cardiovascular disease is increasing day by day. In particular, due to the sudden blockage of the artery leading to heart, heart muscle cannot get enough oxygen, resulting in damage to the heart tissue, and consequently causing heart attacks in humans. There are many factors that cause occlusion of the mentioned arteries. The drugs used to eliminate occlusion cannot provide definitive treatment and only prevent instantaneous blockages. Apart from the drugs, some surgical interventions are also performed to eliminate occlusion (Taylor, 2017). With the development of medicine and technology, it is possible to perform such methods and for the patients to gain their health at least partially. However, the decrease in quality of life after surgery and the long recovery process are unwanted situations. From these problems, we hypothesised that we could create a micro-robot model that could move through the vein and break the blood clot with a propellant, which opens the vein pathway. In this project, we aimed to design a micro-robot model that can move in the vein that we created using 3-dimensional printer technology and can break up the blood clots formed in the vein with its propeller. We aimed to design an application by which we can control the movement of vein-unclogging micro-robot that we designed.

2. Method

Rhinoceros 5 software was used for the design of vein-unclogging micro-robot. In the design of the robot, the nest of the materials (motor, Bluetooth apparatus, propeller and battery) to be placed inside was initially designed (Figure 1).

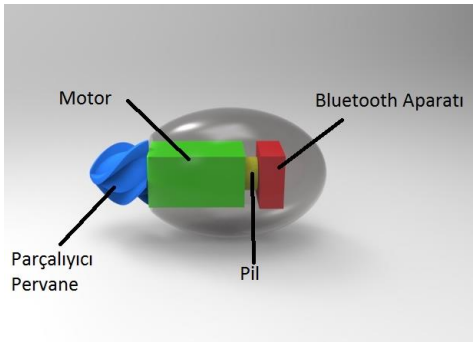

Figure 1. Design of micro-robot

Propeller which has 7 mm of inner diameter and 14 mm outer diameter was produced by SLA type 3D printer to eliminate the vascular occlusion. Also, protective layer that prevent vessel for damage is produced with 3D printer.

Figure 2. SLA type 3D printer

3. Results

In this project, we have been through all the steps to develop prototypes. The biggest challenge of our project was to find motor, battery and bluetooth module that are small enough to fit in such small area. Micro-robot had to work in a blood vessel with the diameter of 7 mm. For this purpose we used a motor with the diameter of 4 mm and completed our project. The vessel prototype is occurred within a plastic tube and after the installation of the robot is given in Figure 3.

Figure 3. Final state of micro-robot after assembly and representation of micro-robot in prototype

4. Conclusion

This micro robot that we have developed can be an alternative solution to vascular occlusion diseases because of its low cost and micro size.

5. References

1. Taylor , J.R., Harvin, J., Martin, C., Holcomb, J.B, Moore L. (2017) Vascular complications from resuscitative endovascular balloon occlusion of the aorta: Live over limb?, Journal of Trauma and Acute Care Surgery, 83, (1), 120-123.