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Slicing Of Blood Clot In Human Brain By Advanced Nano Robot System

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Abstract

Nanorobotics is the field in which various nanomachines, nanodots, nanobots and other nanomolecules are being simulated. Nanorobots or nanobots are constructed with the molecular components by the process called nanomanipulation. Nanomachines are mostly used in the research where the molecular machines are being tested. An example is a sensor with a switch around 1.5 nanometers, which can count specific molecules in a chemical sample. The eternity starts with nanomachines in the field of medical technology, which is used to diagnose cancer cells, to detect toxic chemicals and its concentration in environment. Nanotechnology has a good scope in future applications such as micro robots that assembles machines or swim inside the body to deliver drugs or do microsurgery. This paper investigates on advanced nanorobots which is used to slice the blood clot in human brain where it is not necessary to open the skull that prevents the death and coma stage of the patients.

Keywords: Nanorobots, Nanoblades, Guiding mechanism, Stimulators, Stent, Enzyme.

Introduction

Nanotechnology is the fastest growing field that brings in its need in every field of day to day's life. Nanomaterials are of the size that is lesser than the width of the hair strands. Initially these nanomaterials were made of the nanocarbon tubes. Nowadays researches are going in cutting down the size of various materials to its nanosize. Nanomaterials have already making its mark in various fields, whereas its necessity in medical field is demanding much. Many theories and research paper has been done in various nanobots that could help in tumor removal with radio dye guiding mechanism.

These nanorobots in medical field find its application due to its lightweight and incredible surface area per unit mass. These nanobots moves along with red blood cells as shown in Fig 1 which is another factors for its medical application [11].

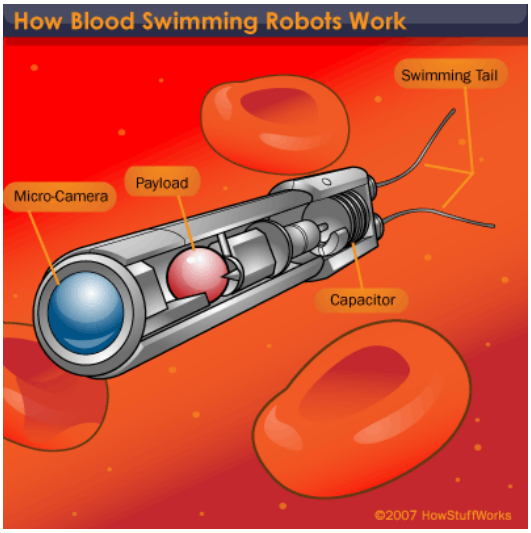

Figure 1: Nanorobot in blood stream [14]

This paper elaborates the use of nanorobot in detecting brain blood clot and helps in slicing the blood clot with the advance guiding mechanism.

Brain and Its Nervous System

Brain is the complex system of the human body. It controls the activity of the human being. It is the centre of the nervous system. The functions of the brain depend on the ability of neurons to transmit electrochemical signals to other cells, and their ability to respond appropriately to electrochemical signals received from other cells. Brain functions in many areas such as information processing, motor controls, perception, arousal, hemostasis, memory, thinking and learning. It controls in functioning of all parts of the body. When clot is formed in such a system, the working of all other parts of the body gets affected. The clot is usually formed when an injury is acquired, in order to reduce the loss of blood due to bleeding [12]. But in some abnormal this clotting system is formed in random process and it blocks the flow of blood to brain. The supply of blood to brain is initiated in the spine, where the nerves get divided to supply blood to various sections of the brain as shown in Fig 2.

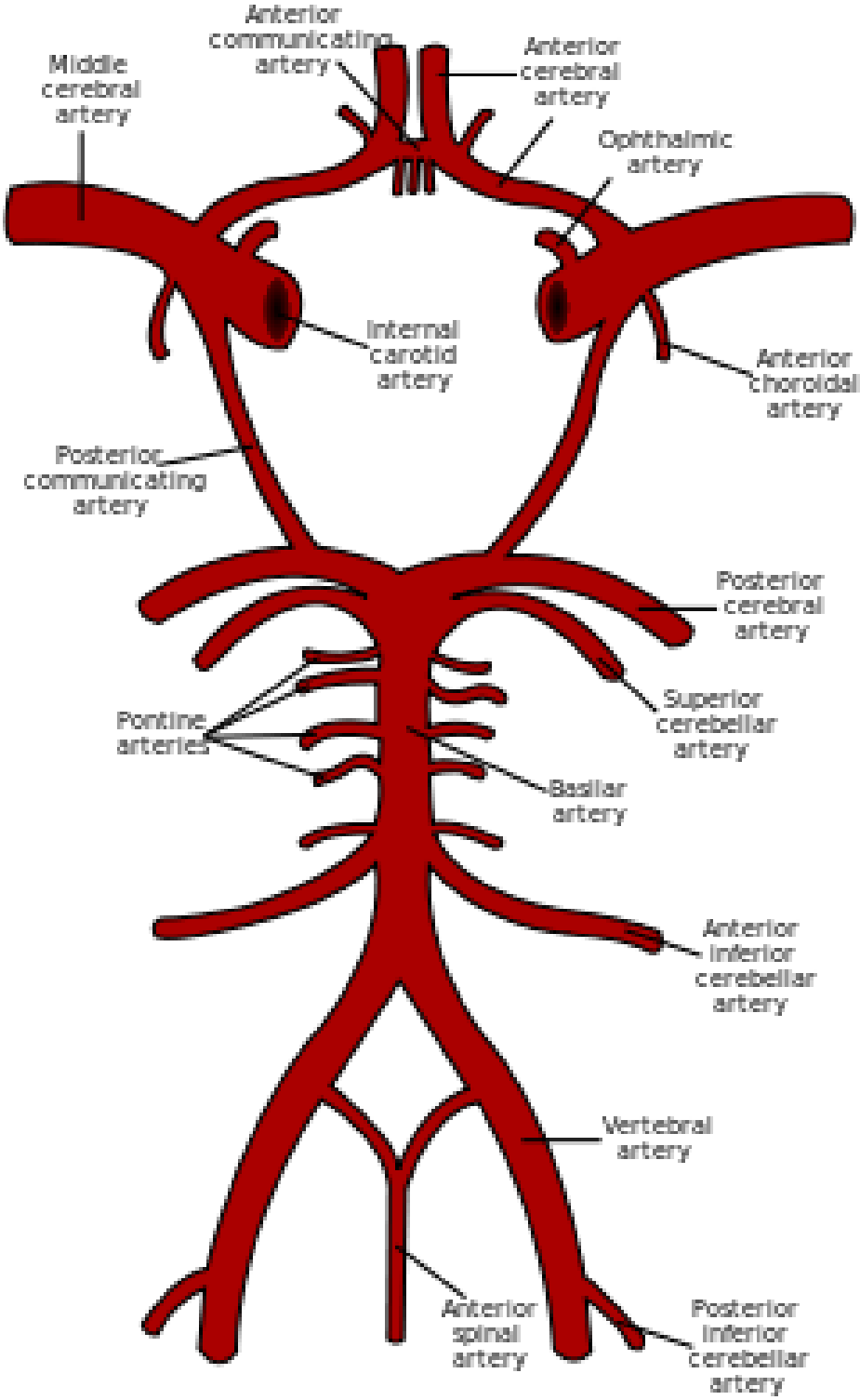

Figure 2: Blood distribution from spine to brain [15]

When clot is formed in the brain due to any head injury these clotting factors are activated in brain nerve. There are other chances also, where the blood clot formed in other region moves through the circulatory system to the brain gets clogged. These blood clots could be removed by the use of nano devices that are passed into the brain nerve, since the size of the brain nerve is 4-100microns and the nano device is of 0.1-10microns [5]. The blood stream helps in movement of nano device in both upstream and downstream movement during injection and removal of the device.

Nanorobot

Nanorobots are small microscopic devices measured on the scale of nanometers size. They are designed so as to function like bacteria or any normal virus. Nanorobots are small minute particles that are of small solar cell or some kind of battery. They can also power by the use of body heat using Seebeck effect or we could directly mount the electric motor, that is of $1/64^{th}$ of an inch, its designing [11]. Nanorobots that is to be explained in this paper contains its powering system in such a way that it makes use of the blood flow current. These nanobots contains transducer that could use the electrolyte found in the blood to power its device. The nanorobots are made of tiny silicon pieces called as transducers that takes up energy and converts into mechanical energy. Nanorobots fabrication is done using various methods in which bottom up method is the best method in the designing of this slicing nanobot. This nanobot is going to contain nanoblade which is of nanometer size and works with high frequency. The powering can of this nanoblade could also be done with the blood stream current. The patient who is to be treated with this nanobot should be monitored to maintain normal blood pressure level of 120/80 so that the movement of the nanobot could be monitored easily.

Design Methodologies

Clot slicing nanobot is designed using bottom up method and, the sizing and arrangements analysing could be done with Atomic Force Microscopy. The nanobot is to be designed with the base of the molecular material that is to be biocompatible. Silicon is the cheapest and best-engineered biocompatible material in human blood. The powering and the movement of nanobot in blood is done with the help of the transducer that is to be mounted. The introduction of this nanobot into the human body is done with the best choice of vertebral artery in the spinal cord as shown in Fig 3.

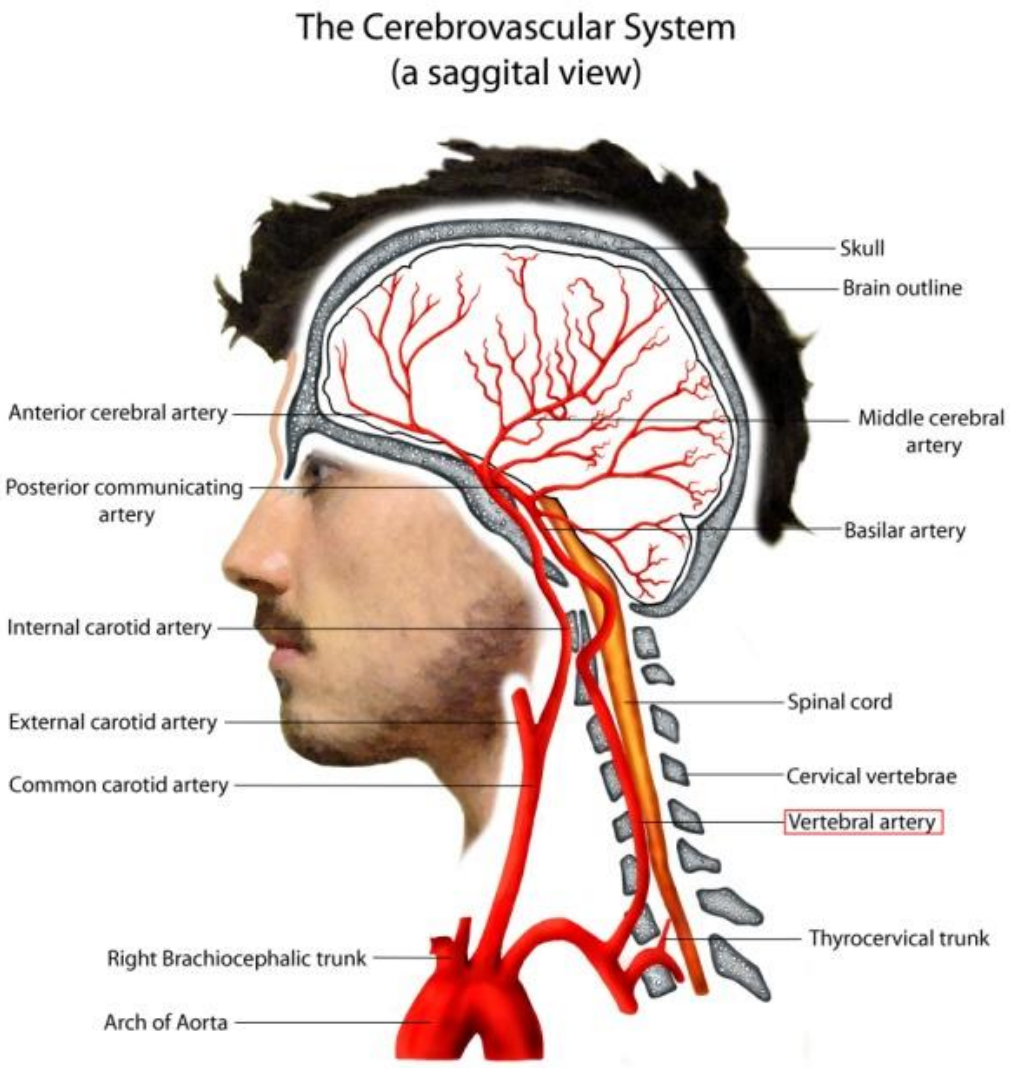

Figure 3: Vertebral artery for nanobot path

Since the size of the nerve in human brain is larger than the size of the nanobot to be introduced, the movement of this nanobot without any damage to the blood walls is done. The movement of this device to the exact location could be viewed and controlled with the help of the radioactive dye. The detection of the working site can be localized at a much specified range using sensors. Hence long range sensors such as chemical sensors to detect the accumulation of the fibrin could be used. The advantage of using this radioactive dye is that it could trace the path of the device and helps in 3D mapping of the working of the device [7].The control of the device could be done with the help of the spectroscopic technique so that it could be viewed on the screen, and any movement to wrong passage could be avoided. The core of the device

is the nanoblade that helps in the slicing process of the blood clot formed. These nanoblades are mounted on the device using sol gels on its base surface. The frequency in this nanoblades that it could slice the nanosize materials in fraction of seconds. The slicing work can be checked with the help of the viewing system that is being integrated. Once the work of the nanodevice is done, the removal of the device plays another important factor to be considered. Nanodevices that are made to float in the blood are removed by deactivating the device, and it is removed by the natural excretory unit of the body. But this nanodevice is removed using the stent that helped in upstream of the device. Therefore the reusability of the device could be done, which further reduces the cost of treatment. The major advantage of using this technique is that

- It reduces the risk factor of opening up of the human skull
- It reduces the loss of bleeding
- The procedure takes less duration
- Stroke patients whose blood circulation in brain should be restored within 8 hours are benefitted.

Conclusion

Nanorobotics is the fast growing field and it finds its best application in medical field. The usage of Nanorobot in tumor detection is the ongoing research. The other applications in medical field are kidney stone, wound debriding, parasite removal, breakdown of tar in lungs etc. Since blood clot stops the active functioning of the brain, the removal of the clot using nanodevice is depicted. The device is also attached with visual system which in later could be developed such that the patients could watch the clot removal. The nano robotics functionalities such as self-replication, healing, adaptability and intelligence, helps in finding its application in medical field. Manufacturing and real time use of these nanorobots helps in reducing the medical expenses in large amount, and also it saves much of healing duration. This paper helps in the further research in the area of brain surgeries and could help in the reduction cost of surgery, if the nano materials are easily available in the market.

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