A NOVEL NANO APPROACH OF CANCER DETECTION USING CAMERA PILL– A MINI REVIEW

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ABSTRACT

The aim of technology is to make products in a large scale for cheaper prices and increased quality. Pill camera is a new technique to diagnose the whole part of our intestine which is better than the earlier study of endoscopy. The pill looks like a vitamin capsule and it can be swallowed up by a sip of water. The biomaterial which is bio-compactable helps to resist the digestive enzyme actions. The detailed report of small intestine can be received, within just eight hours mechanism. It is otherwise known as wireless Endoscopy. It also helps to overcome the drawbacks of Enteroscopy and Endoscopy.

KEYWORDS: Pill camera, cancer, Nanotechnology.
INTRODUCTION

The pill is a concept of Nanotechnology which is developed by University of Washington [1]. The pill cam contains a battery operated camera. Once it is swallowed, it travels throughout the intestines of human body within eight hours, taking pictures of intestine and sends them to display device.

The capsule is useful for cancer patients. Anyhow, this pill has no side effects and surely it is an enlightening thunder in medical history.

“It is non-invasive diagnostic alternative that is relatively quick easy, office based test that will encourage people to see their doctors to get checked for disease” said by Dr. Micheal Brown. The first medical application of implantable nanotechnology was tried in diabetic rats. This implant, developed by Tejal Desai of University of Illinois, consists of a silicon box a tenth of a millimetre across – too large to qualify as a Nano device, containing a sponge of fibrous collagen tissue seeded with pancreatic cells from pig, dog or mouse.

BACKGROUND OF THE STUDY

In camera pill, it is to be visualized that the entire gut-all 30 feet. The earlier studies in Enteroscopy describes that a direct view of small intestine is remained difficult. Only certain portion of the small intestine could be identified because the size of instruments are elusive to control and manipulate. Thus, the accuracy is limited so, it has only limited success.

An Israeli physician Dr. GavidIddon[2] began the development of video camera which fits inside the pill. The scientific world seeks 20 years for technology to catch up and atlast it is being approved by FDA system. The size of the pill is 11mm x 26mm and capsule weighs 4 grams. It consists of a video camera, four LED lights, a battery and a radio frequency transmitter. The biomaterial of the cam is bio-compatible, smooth and disposable. The second study in Gastroscopy and Colonoscopy indicates that the first four feet of the upper digestive tract is being checked by means of gastroscopy and colonoscopy is being used to diagnose colon and rectum. In these two studies, identification of diseases like unexplained anaemia and chronic ulcer cancer is very much difficult.
The camera pills overcome these drawbacks and it is very much useful to avoid stomach acids, powerful digestive enzymes etc. The pill is very compactable to swallow because its size is as same as a vitamin capsule. Seibel said [3] that ‘In the tested model, the fibre swings 5000 times per second, creating 15 pictures. So, the procedure is so easy “I could imagine it is being done in shopping mall”. A wireless endoscope is used to detect the whole parts of our body. The main advantage of pill cam is lack of friction. Within eight hours of process from pill intake, the image is transmitted to special antenna pads placed on the body and we could record video by using recorder. The video recorder looks like a portable Walkman. In case of gastrointestinal tract, a silver trace comes out from the pill while it passes through the body. However the silver trace left in the body is less than that of silver absorbed by an average person who drinks tap water.

The patients with gastrointestinal structures or narrowing are not fit for this procedure due to risk of obstruction. By using nanotechnology product like signal motor, we can overcome this problem. In case of pill get stucked, it would be a partial obstruction in the small intestine and another one is impossible to control the camera behavior. By using bidirectional telemetry process we can overcome these two drawbacks. Siebel [4] acted as the human volunteer in the test of UW device. He reports that it felts like swallowing a rectangular pill and the tether, which is 1.4mm wide doesn’t bother him. Because it is totally disposable and it makes no harmful effects to our body.

**PROPOSED METHOD**

**Pill Sized Camera**

Camera pill is a recent development of nanotechnology. Imagine a camera pill whose size is as same as a vitamin capsule travels throughout digestive system and helps to diagnose disease. In earlier periods, these can be found only through surgeries. This technology is a lightning thunder of nanotechnology’s history.

![Figure 1 Pill camera](image-url)
Conventional Method

At present situation, doctors examine the small intestine by using endoscopes. We can identify the abnormalities of our body but, these scopes are unable to reach out the whole internal parts of our body. It provides only a partial view of bowel.

It can easily identify and recognize all diseases that affect our intestines. The camera pill is the emerging invention in science history with the help of nanotechnology.

Internal Imaging System

The device otherwise called as diagnostic imaging system. It looks like a capsule with a size of 11x26 mm and weighs 4 grams. It is capable to transmit 50,000 colour imaging during its activity. It captures 2 images per second and it consists of a video chip and a lamp. Video chip is used to take images of intestine and lamp gives illumination to capture images.

Figure 2 examination of the small intestine

Components of Capsule Camera

- Optical dome
- Lens holder
- Lens
- Illuminating LED's
- CMOS Image Sensor
- Battery
- ASIC transmitter
- Antenna

COMPONENTS OF PILL CAM

1. Optical dome
   - It is the front part of the capsule and it is bullet in shape.
   - It contains the light receiving window and doesn’t have non
conducting material to prevent the infiltration of the digestive fluids inside the capsule.

2. **Lens holder.**
   - To hold the lens and tightly fixed to avoid dislocation.

3. **Lens**
   - This is the main part of the camera pill. It is situated behind the light receiving window.

4. **Illuminating LED's.**
   - It contains lens, CMOS image sensor & light emitting diodes.
   - Arranged in a donut shape for illuminating object.

5. **CMOS Image Sensor.**
   - It is highly sensitive and sense quality images.
   - It has 140 degree field of view to detect objects even as small as 0.1mm.

6. **Battery.**
   - It looks like a button and it is two in number.
   - Silver oxide primary batteries are used which is harmless and disposable.

7. **ASIC transmitter.**

8. **Antenna.**
   - It is enclosed in a dome shaped chamber, which is made of Paylene coated polyethylene or polypropelene is used.
   - The main function of antenna is to receive signals from transmitter and sends to receiver.

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**Fig.4: Circuit block diagram for transmitter & receiver**

The above shows the block diagram of transmitter Using 3 biasing resistor and 1 inductor, a tiny SAW resonator which can oscillate at 315 MHz for modulation of the video signals. These signals radiated from
inside the body to outside the body and it contains a heterodyne receiver with 8 pin SMD, local oscillator and LED’s. CMOS image used for creating high quality pictures without using wires.

**External Control Unit**

![External control circuit](image)

Figure 5 External Control Units

It contains ON/OFF switches and the switches are controlled by using channel 1. The main unit is encoded into 4 channel’s control signal. These signals are converted to a synthesizer and modulated into radio frequency by using transmitter called OOK. It contains a carrier frequency of 433 MHz. Channel 2 & 4 is used to control the LED lightning. For power saving, the camera would be turned off for a dead time.

**Conceptual diagram of bidirectional wireless endoscopy**

Multichannel wireless capsule includes an antenna, transmitter & receiver units. The CMOS image sensor is a single chip 1/3 inch format video camera. The image sensor supports an NTSC type analog colour video signal and it can directly interface with the device. It has lower energy consumption as it requires very low power.

**Capsule Working:**

The patient swallows the pill along with a sip of water. It travels throughout the digestive system intestines and capture pictures twice a second as it glides through digestive tract. Capsule transmits the captured images to the data recorder for further treatment and it has no side effects. The Sayaka doesn’t need motor move throughout but, it requires 50 mill watts to run its camera, light and computer.

![Figure 6 Internal organs](image)
It consists of a coil which transmits the power continuously. As soon as the pill reaches the intestine, LED’s illuminates the tissue wall and Sayaka cam begins to capture images. It captures clearer picture by mounting the camera around 360 degree and visualize the whole parts. The magnet turns the inner capsule and the image sensor by 60 degrees in every two seconds.

Antenna is used to receive the transmitted data and the images would be of 1.175 Megapixel size. Camera pill is removed through excretory waste.

FUTURE PROSPECTUS

By future, the capsule with advanced features such as laser form, zooming, autofocus would be established for restorative surgery, pharmacological invention and of reduced size. It would be provided in cheaper prizes, with long lasting battery service and attain telemetric capacities by future.

CONCLUSION

Camera pill is bioengineering concept and plays a vital role in medical science. It makes biggest impact on surgeries. It is very much helpful for the physicians all over the world. In future nanotechnology makes the conventional manufacturing process cheaper. Science and research studies predicts that by using nanotechnology, lungs, liver, heart etc. could be developed by providing coal, water and some impurities. The ageing effect can be prevented; it also detects the ESO and SB effects.

REFERENCES

IntestEndosce, 2007; 65:521,522, discussion


