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Modern Approach for Fastest Cancer Treatment using Transient Electronic Device with Brachytheraphy

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Abstract: A healthy lifestyle isn't a guarantee against cancer, but it can help to stack the odds in your favour. This paper is all about using transient electronic devices for cancer patients that would get soluble in blood after its necessity of injection into the site of cancer. This method is never been in practice and this ideology remains as an concept . this method promises to cure cancer within 8 days of treatment in which conventional methods like chemotheraphy would take 60 to 90 days based on the type and the site of cancer .

We propose to use the transient electronic device which is soluble in blood as well as in water . it contains si and mg both of which is soluble . and which doesn't cause any harm to the man kind . the paper also deals about injecting the brachy seeds in the site of cancer . which is radioactive in nature . we propose to do this with Cesium -135 and Iodine -125 . which is available in most genral . so this method also prove to be cost effective in contrast to teletheraphy.

Keywords: TED(Transient Electronic Device), brachytheraphy,brachy seeds

I. INTRODUCTION

Cancer may be defined as a state of cells in which the cells disregards the normal rules of cell division. This might result in abnormal cell growth and proliferation . if this proliferation is allowed to continue and spread. It might prove to be fatal . recent statistics on cancer proves that the cancer related – deaths are due to tumour spreading . which is reffered as metastasis . The cancer starts with a particular part of the body and its outbreak may leads to various parts[1]. Cancer is a common condition and a serious health problem. More than one in three people will develop some form of cancer during their lifetime. Excluding non melanoma skin cancer, there are around 7,000 new cases diagnosed each year in India . hence cancer have proved to be life threatener in the recent past

II. STATISTICS

A. India Battles Cancer[1]

1) Estimated number of people living with the disease: around 2.5 million

2) Every year, new cancer patients registered: Over 7 lakh

3) Cancer-related deaths: 5,56,400

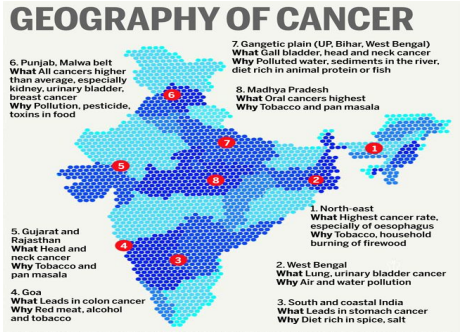
Deaths in the age group between 30-69 years

4) Total: 3,95,400 (71% of all cancer related deaths)

5) Men: 2,00,100

6) Women: 1,95,300

Cancers of oral cavity and lungs in males and cervix and breast in females account for over 50% of all cancer deaths in India. The top five cancers in men and women account for 47.2% of all cancers [1]; these cancers can be prevented, screened for and/or detected early and treated at an early stage . This could significantly reduce the death rate from these cancers



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B. Worldwide Cancer Pandemic

new cases of cancer totaled 13.2 million, costing $290 billion worldwide. These numbers are projected to rise to $21.6 million new cancer cases in 2030 [2]. That's comparable to every person in Australia getting cancer every year. Projected cancer-related health care costs skyrocket to $458 billion and costs to implement strategies to address common cancer risk factors in low- to middle-income countries will likely reach $2 billion per year by 2030. So a serious attention need to be paid throughout the world in the perspective of cancer .

III. TREATMENT OF CANCER

Cancer being at its earlier as well as tertiary states can be treated by radiotherphy . the techniques involved in radiotheraphy may internal or eternal . based on the radiation exposure to the tumour cells .the radiotheraphy is mainly classified into two types
They are

A. Teletheraphy

External beam radiotherapy (EBRT) or teletherapy is the most common form of radiotherapy (radiation therapy). The patient sits or lies on a couch and an external source of ionizing radiation is pointed at a particular part of the body.chemotheraphy is something that is based on teletheraphy [3]. Teletherapy is the most recognized type of radiation therapy, that which uses a source outside the body to treat cancer.These techniques are noninvasive procedures most often associated with daily radiation treatments using ionizing radiation (X-rays) created with electricity in a linear accelerator [3].There are a variety of techniques used for different types and extent of each disease

B. Brachytheraphy

It is the internal radiation treatment achieved by implanting radioactive material directly into the tumor or very close to it.
It is also reffered as *internal radiation therapy*. Prefix "brachy" – from Greek for "short range". Implanting radioactive sources directly into a tumor was a strategy first suggested by Alexander Graham Bell soon after the turn of the century[4].
There are two distinct forms of brachytherapy:

1) Intracavitary irradiation using radioactive sources are placed in body cavities in close proximity to the tumor and
2) Interstitia brachytherapy using radioactive seeds.implanteddirectly into the tumor volume[4].

C. Classification Of Brachytheraphy Based On Dosage

1) Low dosage rate brachy
2) Permanent implant brachy
3) High dosage rate brachy

D. Low dosage rate (LDR)

It invlovesthe placement of temporary or permanent radioactive sources in the tumour area.this often recquires anaesthesia and surgical procedures It invloves placement of temporary Low dose intracavitary brachytherapy (dose rate of about 50cGy/hr, or 50 rad/h) is temporary and usually takes long time in comparison to HDR. It is most commonly used for the uterine cervix.

E. Permanent Implant

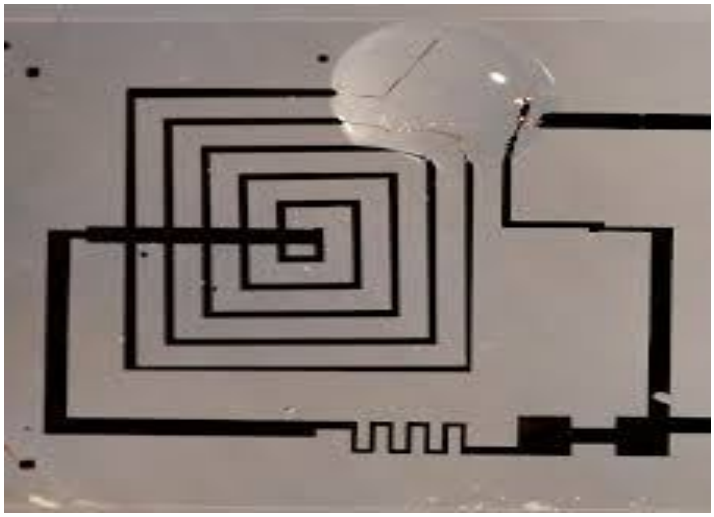
These are quite similar to low dosage rate brachy but the radioactive sources are permanently embedded with the tumour tissues . in this type of brachy the patient needs to follow a set of instructions that is tedious .

F. High dosage rate (HDR) :

To an increasing extent, low-dose-rate intracavitary brachytherapy is being replaced by high-dose-rate intracavitary therapy, delivered in 3 to 12 dose fractions. This therapy gives up much of the radiobiological advantage and the sparing of late-responding normal tissues For high-dose-rate treatments lasting a few minutes, it is possible to sue retractors that result in even lower doses to the critical normal tissues that are possible with an insertion that lasts 24 hours or more. Frequent Implant And Extraction Of Brachy Seeds Is Recquired On A Daily Basis For Hdr .Which Is Tedious Though HDR is the fastest its not convenient to use HDR in brachytheraphy .

IV. TRANSIENT ELECTRONIC DEVICES (TED)

Researchers at the University of Illinois at Urbana-Champaign and Tufts University have developed biocompatible devices able to serve as conventional electronics but unlike them, they can harmlessly dissolve into fluids. This characteristics opens up a complete array of possible applications like bioresorbable (can be broken down by body, but doesn't require removal) medical implants, degradable environmental
monitors and compostable consumer devices. Incorporating silicon from conventional circuits, magnesium as conductor and silk protein for encapsulation of circuit, researchers created these thin electronic devices which can be dissolved into fluids in a programmed manner, called Transient Electronics.



A. What is Ted ?

It is a technology that involves components that physically disappears in whole at prescribed rates and programmed times The key features of TED are

1) Completely Soluble
2) Programmable
3) Flexible to design (similar to IC's)

B. What is TED Made of ?

TED mainly consists of silicon and magnesium. where magnesium acts as a conductor and silicon forms the substrate layer. The thickness of this TED is extremely small where it ranges between 2mm to 3mm . and the complexity of the circuit varies based on the specific application. TED consists of many internal circuitry that are designed based on users perspective.

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C. What Happens When it Gets Resorbed ?

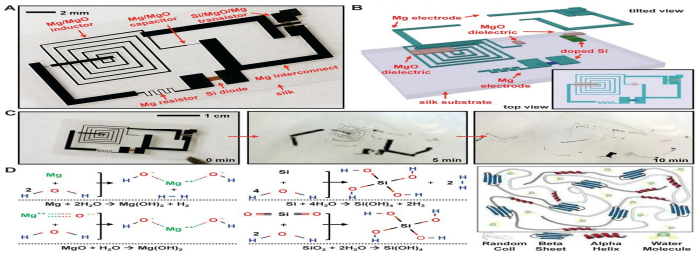
Silicon and magnesium have the capability of being soluble in blood as well as water . their resulting constituents wont affect human kind of any possible ways . The chemical reaction that takes place in the transient electronic device is as follows :

Reaction with silicon

$$Si + 4H_2O \rightarrow Si(OH)_4 + 2H_2$$

Reaction with magnesium

$$Mg + 2H_2O \rightarrow Mg(OH)_2 + H_2$$



So as an conclusion when resorbed by blood TED doesn't cause any health effects to man kind

V. PROPOSED TECHNOLOGY

Considering the difficulties in todays brachytheraphy field. We propose to integrate the brachy seeds on to the transient electronic devices . so that we can overcome few disadvantages of the brachytheraphy. We are intended especially about HDR Brachy . where the protocols and procedures of treatment involve daily or frequent implant and extaction of brachy seeds. This proves to be tedious.by using TED , high dosage rate brachy can be implemented with the advantage of having total control over the radioactive radiations from Cesium -131 or iodine -125 . important thing to be noted is that the TED is manufactured in a way so that it needs to perform 3 different roles having separate circuitry for each . The roles of TED with Brachy include

1) *Control Unit:* Using Anti ionizing radiations **.**
2) *Monitoring Unit:* To monitor tumor tissues
3) *Transreciever Unit:* To interpret radigraphers regarding the actual stage of treatment.

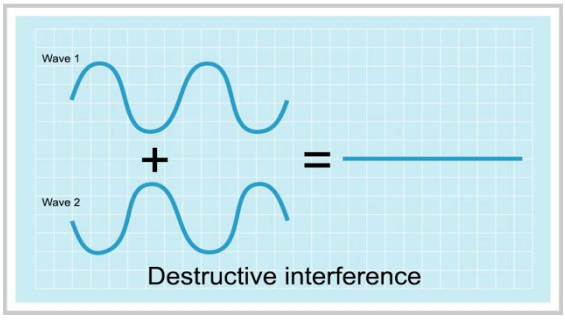
It need to be noted that the HDR cant be used for prolong interval of time . since high dosage may lead to various health disciplinary issues . so there exists a time interval for which the HDR brachy need to be done .

This is where the role of TED comes into play . the TED's control unit has an anti ionizing radiator that can create anti ionizing radiations in the range of radioactive substance. Moreover the radioactive radiations exists only in a very small range (i.e) less than few cms . under such criterion the interference of the radioactive rays have a negative or destructive interefence with the anti ionizing radiations [5]. hence the control of brachy seeds could be obtained by the radiographers using remote servers.so the ted can control Brachy seeds with two modes of operation

A. Active high (HDR Mode)

B. Active low (Permanent Implant Mode)

With active high mode brachy seeds act as HDR mode . when interference acknowledgement signal is sent by the radiographers to the TED , it will start to emit the anti ionizing radiations , so that the brachy seeds go into the active low mode . which is similar to permanent implant brachy . so using our proposed technology it is easy to implement HDR as well as the cancer Treatment have to be the fastest using this methodology which would be less than 7 days .



VI. COST OF BRACHY WITH TED [6]

S.NO	MATERIALS REQUIRED	COSTS
1.	TED(transient electronic device)	$3,650
2.	Brachy seeds (cesium-131 or iodine-125	$15,301 (2+3)
3.	Treatment procedures	
4.	TOTAL :	$18,951

VII. ADVANTAGES AND DISADVANTAGES

A. *Advantages Of Proposed Tech*

1) Frequent implant and extraction of seeds is neglected
2) This method proves to be fastest ideology for curing cancer .(i.e) less than a week
3) Cost of ted with brachy is a 3 times lesser than conventional chemotheraphy and teletheraphy methods .[6]
4) Easy monitoring of tumour is made possible
5) Special care is not recquired as the TED intimates the changes in the states

B. *Disadvantages of Proposed Tech*

1) This method haven't been experimentally done
2) So the actual disadvantages of this will be interpreted once it is done in RLAPP .
3) Wherever nuclear radiations are involved a minimal amount of radiations escapes inspite of destructive interference[3]
4) The amount of radiations expelled after destructive interference is not known

VIII. ACKNOWLEDGMENT

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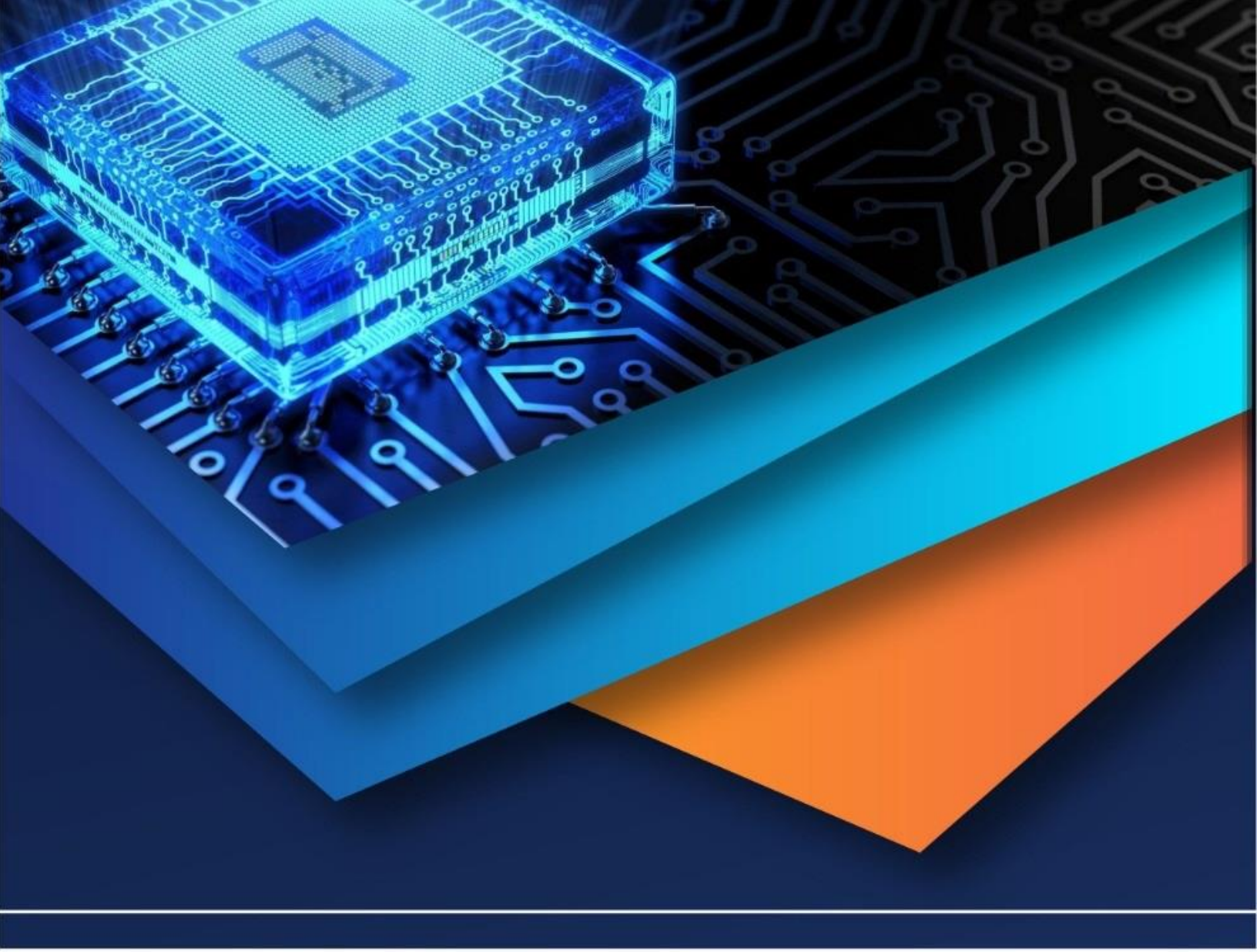

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