

Enhanced Mechanical Strength Of Egg Shell Based Hydroxyapatite (Ha) In Polymer Matrix As Potential Tissue Scaffold Application

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Abstract

The hydroxyapatite are the Calcium Phosphate bio ceramic materials that are used to be integrated into the bone to recover from the fracture. Because of its nature they are used in the tissue culture as well. The only disadvantage that is seen in the HA is the brittle nature of the material. In order to avoid that, the scientists have used different type of polymers. In our innovation we are going to use the polymer which will overcome the disadvantages on the well recommended poly lactic acid. In our project we are using polyvinyl chloride which will increase the stability and the strength of the material. This material will also increase the rate at which the bone growth occurs. This diversity in the material will make it more convenient for the scaffolding. The Hydroxyapatite material that is extracted from the egg shell will be mixed with the polyvinyl chloride polymer which will increase the rate at which the bone grows.

Keywords : HA (Hydroxyapatite), scaffold(filling), ceramic material, calcium phosphate, bone fracture.

I. INTRODUCTION

The bone fracture is the crack or the braking of the bone in the body. The fracture in the olden days was treated with the help of the natural herbs and the other type of treatments. The latest technology has started to improve where the bone fractured can be treated with nano technology. In our innovation, the scaffold will be directly filled in the bone, which will act as a temporary support for the bone. This filling will slowly start to degrade as the bone growth starts to occur. The bone has the natural growing tendency which is actually fast for young children and will decrease as your age increases. The scaffold that we will use will increase the growth or the recovery rate of the bone. In that criteria even the old people do not have to worry about their bone, as we have found the solution for them. The scaffold that we will use will increase the growth rate and the stability of the bone. This will make the patient more convenient to move around.

This scaffold can be used for any people in any age, as the composition of the material is adaptable to all the ages. The mechanical nature of the scaffold is very flexible where it can also be used for the tissue generation as well. The tissue when gone under any damage takes time to recover. It will adsorb well on the tissue which will protect the tissue from the various radiations from the sun and the bacteria's around us.

II. OBJECTIVE

The main aim of our paper is to make hydroxyapatite material which is made from the polymer. This material is used for the scaffolding purpose. Where it will be like the white cement for filling. Once the fracture of the bone is found, it is easily integrated into the bone. After the filling it, it will get the shape of the bone. Once the bone starts to grow at a faster rate, the material that is filled will slowly start to degrade where it has the ability to mix with the blood and come out as waste.

III. EXISTINGSYSTEM

In the existing system, the Hydroxyapatite is mixed with the polymer Poly lactic acid, which actually increases the healing property of the Hydroxyapatite. Hence this mixture is used as the scaffold to heal the bones that are prone to fracture. They have used the Poly lactic acid as this material is the most preferred one for curing the bone fracture. This material can be used to increase the stability and the durability of hydroxyapatite.

The main component for this scaffold is the hydroxyapatite, which is easily extracted from egg shell. The procedure to extract such material will take time. There are researches going on to find right polymer to increase the efficiency of the scaffold material.

IV. PROPOSED SYSTEM

In our model, we are going to use a polymer named as Polyvinyl Chloride. This polymer is better than the poly lactic acid as this material has the

tendency to increase this strength of the fracture healing substance.

The procedure to extract the hydroxyapatite is as follows

Step 1: The first step is to boil the egg shell for 24 hours in the oven at a temperature of 60 centigrade.

Step 2: After that we have to filter the egg shell and remove the white interior layer of it.

Step 3: After doing this, we have to grind the egg shell to fine particles.

Step 4: The powdered egg shell are then boiled for about 24 hours

Step 5: Then they are treated with the chemical EDTA(ethylene diamine tetra acetic acid) and boiled for few hours.

Step 6: The NaOH is then used for the treated with the hydroxyapatite where the final reaction takes place.

Step 7: Then this is filtered with one of the most finest filters that allow only finite particles.

These are the steps involved in the process of creating the scaffold.

V. DESCRIPTION OF SCHEME

In this paper, we have used the Hydroxyapatite as the main material which is used for the main scaffolding purpose. Other than this we are using the polymer named as the polyvinyl chloride which will increase the strength and the stability of the scaffolding material. People have come up with different models, but we are going to use the polyvinyl chloride as its properties are immensely able to increase the properties of the bone.

The Hydroxyapatite are have the properties to improve the bone strength. Using this we have come up with the polymer that have the exclusive property to have increase the strength of the bone and to increase the rate at which the bone tends to grow.

We have used a several components for the manufacturing of the scaffold, the components are as follows.

Polyvinylchloride

The Polyvinylchloride components is the main element for the manufacturing of the scaffold. This polymer increases the strength of the material and also gives the mechanical characteristics to the scaffold. This is the reason for this polmer to be used for the scaffolding technique. This polymer is used in order to increase the strength of the material that is used in the bones. In the olden days, this material was not known. Which made hard for the scientists to

find the right fixture for the bones. Now that the this polmer is know, it has become easier for us to fix the bone issues and also the issues with the tissues

Sodium Hypochloride

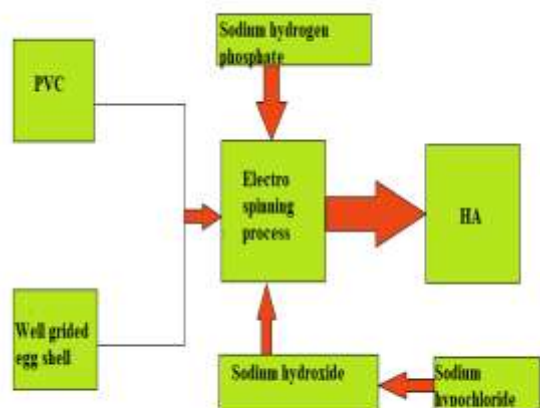
The solution of this kind is used for the softening of the scaffold material, this can also be used to increase the stability of the scaffold material. This solution is mixed well with the polymer so that the composition is correctly formed, due to the addition of this material, now days, the method for the manufacturing of the scaffold has become easier. The ability of this material to create the extra strength to the polymer makes the functions of the polymer more active.

EDTA

The EDTA known as the Ethylene Diamine Tetra Acidic Acid, this is used to find the structure of the material, so that we have the right scaffold to construct the materials well. The EDTA was naturally used in all the chemical reactions to find the structure and the nature of the various elements, even in today's world of chemistry, the usage of this solution has improved more. This solution can also be used for the detection of the various types of the bacteria which may degrade the growth of the cells in the place where the scaffold is used. Various methods have evolved to increase the strength of the hydroxyapatite material, but the detection methods have still been holding with the EDTA solution, this is why in this experiment the usage of the EDTA plays a vital role in the detection of the scaffold material and to know its nature with the other chemicals.

Sodium Hydrogen Phosphate

The Sodium hydrogen phosphate is used for the fluidity of the material and to increase the mechanical strength of the material. This solution can also be used for the detection of the various types of the bacteria which may degrade the growth of the cells in the place where the scaffold is used. This material can also be used for the preparation of the repairing the tissues. There are multiple uses for the Sodium Hydrogen Phosphate material in the scaffolding process, but the well efficient way to increase the strength of the material stays with the type of the sodium material that we use, the better we improve the quality of the sodium material, the better it gets to get the right efficient output.



Other than these types of the invention will increase the medical facility to improve the way at which we look at the medication for bones. These are the starting for the bone therapies. These are the ways in which we have to improve the way of facing the problem.

VI. CONCLUSION

The final output of the experiment gives the scaffold for the implementation. This is the method in which we obtain the output of the hydroxyapatite. The well grinded material is then gone through many steps to reach the right time. The HA that is extracted from the egg shell is then mixed with the polymers that increase the strength of the material. The stability and the function of the elements depends on the type of the material that we use, the more the purity of the substance increases the stronger the HA gets. This is why we have kept the atmosphere as clean and neat as possible.



The resultant out put is pure in nature and also can be used for the future purposes dealing with the HA, The material does not have a specified expired date, if this material is kept at the 60 degree Celsius, then it can be used and reserved for a long period of time, We are also planning to improve the material by using an even better polymer that increases the strength of the scaffold material.

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