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Rebuilding Human Ability to Regenerate Cells Inhibiting Anatomical Growth during Early Embryonic Stage

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Abstract:- Stimulating regeneration of complex tissue and organs after injury is one of curious topic that attract almost all young researchers and the possibility of revolutionise clinical medicine lies in these topics. The ability to regenerate during embryogenesis and early embryonic stage exist somewhere in the memory all organisms in the form of DNA encoding. Many earlier research conducted show us clear potential of re-growth occur by various Mesenchymal stem cells , progenitor cells and Morphogenic proteins that we easily found in bone marrow, some of the best example is of research conducted in regeneration of mice earlobes, human limb generation , lizard phylogeny etc . In this research proposed we will dig deep, try to explain and find answers of certain niche:

- **How to effectively modify human wound environment to induce regeneration and to establish a functional interface with a bioengineered artificial organ or structure.**
- **Mesenchymal growth zone / artificial Bio-reactive growth zones generation one of the most curious question about how to generate it.**
- **Using Nerve Signals for Specific Tissue Regeneration**
- **Problem arises while using stem cell for organ development and expected solution from this research method.**

We take our view point towards regeneration of human organs and create such type of artificial womb like growth zones which perform major role in inducing the process of organ regeneration together with it we use many bioengineered sensors to work and record the signals so arise.

I. INTRODUCTION

Regeneration one of the most important process of growth includes replacing and restoring damaged cells, tissues and organs. Every scientist working in growth and development of cell has curiosity to learn and know more about how the actual process of cell growth works.

Scientists are studying regeneration for its potential uses in medicine, such as treating a variety of injuries and diseases. Researchers also hope to learn more about the human aging process through studies of regeneration. This rapidly advancing field is called regenerative medicine. we know the methods of embryogenesis and organogenesis but now also wonders from where the signals of growth occurs from asexual reproduction in plants , algae to sexual reproduction in large mammals and animals the DNA encoded information is still not completely understood by humans however we have drawn some of the DNA patterns including the set of codons working for different tasks these codons include purine and pyramedine bases of proteins inducing signals and responsible for cell growth . The cells which take parts in growth usually termed as stem cells, these cells under right conditions divide to form different types of cells performing specific function and are categorized into five parts such as (1) Embryonic stem cells, (2) Adult stem cells, (3) Adult stem cells having similar properties of embryonic stem cells (4) Parental stem cells (5) Induced pluripotent stem cells.

II. PROCESS AND PATHWAYS OF HEALING

Normal wound healing is a dynamic series of events involving the coordinated interaction of blood cells, proteins, proteases, growth factors, and extracellular matrix components. The wound healing process can be divided into three phases: (1) inflammatory phase; (2) proliferative phase; and (3) maturational phase.

The inflammatory phase is the first phase of wound healing and is characterized by haemostasis and inflammation. Haemostasis is initiated during the exposure of collagen during wound formation that activates the intrinsic and extrinsic clotting cascade. A sudden injury to tissue causes a release of thromboxane A2 and prostaglandin 2-alpha to the wound bed causing a potent vasoconstrictor response.

After haemostasis is achieved, capillary vasodilatation and leakage result secondary to local histamine release by the activated complement cascade. The increased blood flow and altered vascular permeability allow for the migration of inflammatory cells to the wound bed. The presence of foreign organisms further stimulates the activation of the alternate complement pathway. Complement C3 activation results in a cascade of non enzymatic protein cleavage and interactions that eventually stimulate inflammatory cells and the lysis of bacteria.

The second response cell to migrate to the wound after complement activation and platelet recruitment is the neutrophiles. It is responsible for debris scavenging, complement-mediation and lysis of foreign organisms, and bacterial destruction via oxidative burst mechanisms (i.e., superoxide and hydrogen peroxide formation). Neutrophiles kill bacteria and decontaminate the wound from foreign debris. These wastes are later extruded with the escarp or phagocytosed by macrophages.

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Macrophages are important phagocytic cells that play a key role in wound healing. They are formed from monocytes stimulated by fragments of the extracellular matrix protein, transforming growth factor β, and monocyte chemo attractant protein 1. In addition to direct phagocytosis of bacteria and foreign materials, macrophages secrete numerous enzymes and cytokines; collagenases, which debride the wound; interleukins and tumour necrosis factor (TNF), which stimulate fibroblasts and promote angiogenesis; and transforming growth factor (TGF), which stimulates keratinocytes. Macrophages also secrete platelet-derived growth factor and vascular endothelial growth factor which initiate the formation of granulation tissue and thus initiate the transition into the proliferative phase and tissue regeneration.

A. Proliferative Phase

The proliferative phase is marked by epithelialization, angiogenesis, granulation tissue formation, and collagen deposition. Epithelialization occurs within hours after injury in wound repair. With an intact basement membrane, the epithelial cells migrate upwards in the normal pattern as occurs in a first-degree skin burn whereby the epithelial progenitor cells remain intact below the wound and the normal layers of epidermis are restored in 2-3 days. If the basement membrane has been damaged, similar to a deeper burn, then the normal epidermal cells from skin appendages (e.g., hair follicles, sweat glands) and the wound periphery reepithelialise the wound.

Neo vascularisation is necessary to deliver nutrients to the wound and help maintain the granulation tissue bed. Angiogenesis has been attributed to many molecules including fibroblast growth factor, vascular endothelial growth factor, transforming growth factor β, angiogenin, angiotropin, angiopoietin 1, tumour necrosis factor alpha, and thrombo spondin. In different clinical scenarios such as diabetes and vascular disease, this critical nutrient supply by capillaries is insufficient to sustain the tissue deposition in the granulation phase and thus results in a chronically unhealed wound.

The proliferative phase ends with granulation tissue formation. This new stroma begins to invade the wound space close to four days after injury. The new blood vessels at this time have provided a facilitated entry point into the wound to cells such as macrophages and fibroblasts. Macrophages continue to supply growth factors stimulating further angiogenesis and fibroplasias. The secreted platelet-derived growth factor and transforming growth factor β along with the extracellular matrix molecules stimulate fibroblasts differentiation to produce ground substance and then collagen. Fibroblasts are the key players in the synthesis, deposition, and remodelling of the extracellular matrix providing strength and substance to the wound.

B. Maturational Phase

The third and final phase of wound healing is the maturational phase. This is characterized by the transition from granulation tissue to scar formation. Close to two weeks after injury, the wound undergoes contraction, ultimately resulting in a smaller amount of apparent scar tissue. Collagen deposition by fibroblasts continues for a prolonged period with a net increase in collagen deposition reached after three weeks from tissue injury. The entire process is a dynamic continuum dictated by numerous growth factors and cells with an overlap of each of the three phases of wound healing to provide continued remodelling. The human wound is estimated to reach its maximal strength at one year, with a maximal tensile strength that is 70% of normal skin.

III. ADULT STEM CELLS

Adult stem cells are also called as somatic cell as they are non reproductive or immature cells present in our body, these cells are found living within specific differentiated tissues in our bodies that can renew themselves or generate new cell that replace dead and damaged tissues. Adult stem cells are divided into five parts: -

- Hematopoietic stem cells also called as blood cells find in haemostasis.
- Mesenchymal stem cells the cells which are found in bone marrow and connective tissues.
- Neural stem cell.
- Epithelial stem cells.
- Skin stem cells.

A. Regeneration ability of Mesenchymal stem cells:-

Mesenchymal stem cells (MSCs) are adult stem cells traditionally found in the bone marrow. However, Mesenchymal stem cells can also be isolated from other tissues including cord blood, peripheral blood, fallopian tube, and fetal liver and lung. Multipotent stem cells, MSCs differentiate to form adipocytes, cartilage, bone, tendons, muscle, and skin. Mesenchymal stem cells are a distinct entity to the mesenchyme, embryonic connective tissue which is derived from the mesoderm and differentiates to form hematopoietic stem cells.

Mesenchymal stem/stromal cells (MSCs) are self-renewing cells that have the capacity to differentiate into adipocytes, chondrocytes, myocytes, and osteocytes. MSCs can be used clinically to replace or repair damaged tissues. However, the number of MSCs that can be obtained from a donor is significantly lower than the number needed for tissue regeneration. Therefore, MSCs are expanded *ex vivo* in media supplemented with growth factors. In addition to their proliferative and pro-survival effects, growth factors can induce differentiation of MSCs towards a specific lineage. For example, Transforming Growth Factor-beta 3 (TGF-beta 3) has been shown to increase proliferation of MSCs while inducing Chondrogenesis. Similarly, Bone Morphogenic Protein 3 (BMP-3) increases MSC proliferation while inducing Osteogenesis. In contrast, Epidermal Growth Factor (EGF) promotes MSC expansion without inducing differentiation.

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B. Induced Pluripotent stem cells (IPS):

The group of somatic cells which are genetically reprogrammed in lab and used to perform specific function in mammalian body is called as Induced pluripotent stem cells, these stem cells are embryonic type stem cells have highest ability to induce growth. In a human body many of such cells find easily in different tissues, cellular matrix, mitochondria, and platelets. These cells should be taken and actively multiply by many hosts to restructure it for particular function.

Induced pluripotent stem cells are a type of pluripotent stem cell derived from adult somatic cells that have been genetically reprogrammed to an embryonic stem (ES) cell-like state through the forced expression of genes and factors important for maintaining the defining properties of ES cells (Lei Ye, 2013).

C. Bio Reactive Growth zone: -

For inhibiting growth the cells require accurate controlled environment the problem of which is solved today by advance controlled reactors called Bioreactors or we can also called is as a Bio reactive growth zone , the zone which is full with all the necessary substances and molecules required for cell proliferation. By treating wounds in a controlled environment, delivery of antimicrobials, analgesics, other bioactive molecules such as growth factors, as well as cells and micro-grafts, the addition of growth factors or transplantation of cells yields the possibility of creating a regenerative wound microenvironment that favours healing, as opposed to excessive scar formation. The fabrication of materials which provide appropriate scaffolding conductive to cell adhesion and maintenance of cell function is of fundamental importance for successful regeneration.

D. Nerve Signals and Healing Response:

Serotonin chemical signal pathway is called as a switch to induce communication between cells, these signals guide them to start the process of growth or start generating a cell responsible for growth. This pathway define cells where to move, which proteins to be secreted also where the actual process of repair should be taken place, this daily occurring signals are act as a multiple factories running inside our body performing specific function. On the contrary wound healing response is an important part considered in the development of regeneration, the response of regeneration in mammals was first characterised in rabbit and latter shown to be characteristic non restricted to lagomorphs (William Boyce and Daniel 1986).However there are two defined cellular pathways that is intracellular and extracellular pathways which takes place in cellular matrix provide sufficient growth hormones and generating proteins required to initiate growth. It is seen that body secrete many Morphogenic proteins such as intraleukin I, intraleukin II responsible to form a hard base for tissue generation, the growth hormones secreted by the anterior pituitary stimulate growth in humans. It stimulates cell division, protein synthesis and growth in all the cells.

E. Wnt signals Pathway:

The Wnt signaling pathway is an ancient and evolutionarily conserved pathway that regulates crucial aspects of cell fate determination, cell migration, cell polarity, neural patterning and organogenesis during embryonic development. The Wnts are secreted glycoprotein's and comprise a large family of nineteen proteins in humans hinting to a daunting complexity of signalling regulation, function and biological output. To date major signalling branches downstream of the Fz receptor have been identified including a canonical or Wnt/β-catenin dependent pathway and the non-canonical or β-catenin-independent pathway which can be further divided into the Planar Cell Polarity and the Wnt/Ca2+ pathways, and these branches are being actively dissected at the molecular and biochemical Levels. (Yuko Komiya1 and Raymond Habas1, 2008).

F. Platelet Derived Growth Factors (PDGF):

Platelets are among the first response cells that play a key role in the formation of the haemostatic plug. They secrete several chemokines such as epidermal growth factor (EGF), fibronectin, fibrinogen, histamine, platelet-derived growth factor (PDGF), serotonin, and von Willebrand factor. These factors help stabilize the wound through clot formation and also attract and activate macrophages and fibroblasts. They also act to control bleeding and limit the extent of injury. Platelet degranulation activates the complement cascade, specifically C5, a potent neutrophiles chemo active protein. Vasoactive mediators and chemokines are released by the activated coagulation cascade, complement pathways, and parenchymal cells which play a key role in the recruitment of inflammatory leukocytes to injured skin.

G. Octamer Binding Transcription Factor:

Octamer-binding transcription factor 4 (Oct4) encodes a POU-domain transcription factor (Scholer et al., 1990). This genes is specifically expressed in embryonic stem (ES) cells but can also be detected in adult stem cells such as bone marrow-derived Mesenchymal stem cells (Pochampally et al., 2004). Expression of Oct4 is down regulated during stem cell differentiation. Oct4 plays a critical role in maintaining pluripotency and self-renewal of ES cells (Niwa et al., 2000; Pesce and Scholer, 2001).

H. How the Regeneration actual Works:

Once the part is amputed, brooked or start bleeding a signal received by our brain inducing a quick decision to act, the endocrine system and nerve signals of our body start actively and immediately working by inducing many proteins and passed in our blood cells, the anticoagulant hormones such as vitamin k, protein c, protein s and antithromobin flows with our blood and induce signals that generate tissues in damaged part covering the wound and for a structure called epidermis. These epidermis contains many somatic cells, undifferentiated cells that later can be programmed for growth. This epidermis grows cells from tissues forming a globe like structure called Blastema. The cells in Blastema have the ability to undergo division and induce pluripotency for specific growth functions. Moreover Mammalian models provide insight into how successful

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regeneration can be accomplished within the context of a warm blooded terrestrial animal with similarities to humans. Lessons learned from such examples are likely to provide important insight into how to effectively modify the human wound environment to elicit an enhanced regenerative response, or to establish a functional interface with a bioengineered or artificial organ or structure. Finger regeneration in humans is best example of regeneration of young age child when met in an accident if lost a part of finger.

The prospect of developing strategies for enhancing regenerative ability in humans is encouraged by clinical observations that the human fingertip is capable of a regenerative response (Fig. 1A, B).

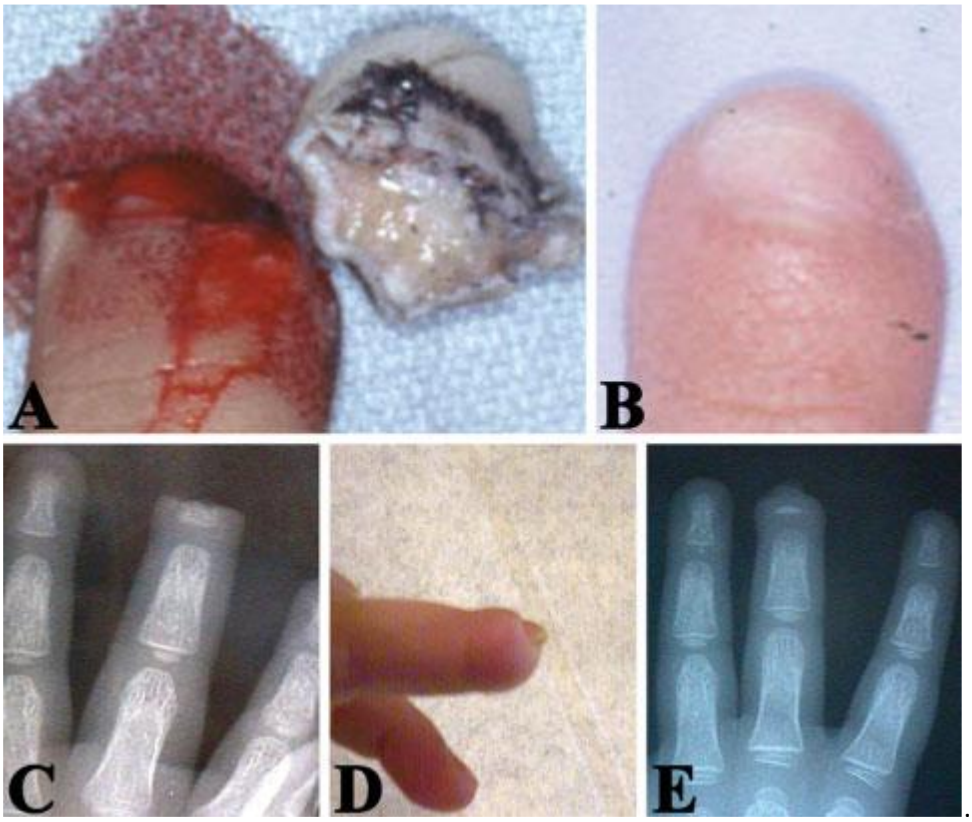

Fig. 1: Fingertip regeneration in humans. (A, B)

- Figure 1 A fingertip injury of a 7-year old girl resulted in an amputation at the base of the nail.
- Figure 2 The injury was treated conservatively with dressing changes and after 8 weeks the fingertip regenerated (From Stocum DL. Regen Biol Med 2006, 394, copyright 2006, Elsevier, reproduced by permission.). (C–E) A fingertip injury of a 2-year old child resulted in an amputation at a level proximal to the nail.
- Figure 3 (C) Radiograph at the time of injury indicated that the level of amputation was through the proximal region of the terminal phalangeal bone.
- Figure 4 (D) The amputation injury was treated conservatively with dressing changes and after 10 months the fingertip healed without significant scarring and a nail rudiment was present. The fingertip had a normal contour and sensibility had returned. (E) Radiographic evidence after healing showed that there was no re-growth of the terminal phalangeal bone and indicated that a regenerative response was not stimulated. (From Han M, Yang X, Lee J, et al. Dev Biol 2008, 315:125–135, Copyright 2008, Elsevier, reproduced by permission.)

While the initial descriptions of fingertip regeneration were made in children (Douglas, 1972; Illingworth,1974), they were followed by descriptions of fingertip regeneration in adults as well (Leet al., 1995). The key for human fingertip regeneration is to treat the amputation wound in a conservative manner, e.g., clean address the wound so as to allow it to heal by secondary intention(i.e., without assisted wound closure). It is thought that such conservative treatment in humans promotes the formation of a wound epidermis that is required for the initiation of a regenerative response. Appendage regeneration in amphibians and in embryonic limbs of birds has been shown to have a similar requirement of a specialized wound epidermis for a successful regenerative response (see Muller et al., 1999). Nevertheless, the actual closure of the amputation wound itself in humans is a very slow process, and much of the regenerative growth and remodelling associated with the regeneration response occurs before the completion of wound healing. Fingertip regeneration in humans is reported to be restricted to the most or terminal phalangeal element and associated with the nail organ (Illingworth, 1974). Whereas regenerative studies in animal models generally focus on the restoration of skeletal tissue in addition to soft tissue (Han et al., 2008).

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Using bone re growth as definitive evidence for a regenerative response, there is a subset of clinical reports that document fingertip regeneration after conservative management of amputation wounds in both children (Vidal and Dickson,1993) and adults (Lee et al., 1995). Thus, it is clear that human fingertips display a true regenerative response that establishes the foundation upon which we can begin to explore ways to enhance the regenerative response. As a first step, we provide evidence from a case report that begins to define the proximal extent of regenerative capabilities (Han et al., 2008). This case report involved an amputation injury in the proximal region of the terminal phalangeal bone that was conservatively treated, and because there was X-ray documentation at the time of injury and after the healing response was completed, there is clear indication that a regenerative response that included bone re growth did not occur (Fig. 1C, D,E). Thus, despite the fact that cosmetic healing and good sensibility of the fingertip was restored, this case report begins to identify the proximal boundary of regenerative ability in humans. Understanding the physical boundaries of regenerative potential in humans is an important first step toward developing a protocol that has predictive value for the treatment of amputation injuries. What is needed is a concerted effort to better document the limits of this amazing regenerative response in humans that would entail radiographic Analysis of amputation injuries before and after healing to establish a database that can be used both for predicting clinical outcome. (Ken Muneoka).

I. Nuclear Cloning:

Nuclear cloning (the transfer of nuclei from mature cells of the individual to be treated into primitive enucleated cells, allowing the reprogramming of DNA) could be used to generate embryonic stem cells. To avoid the ethical problems of nuclear cloning and the potential immunogenicity of proteins encoded by foreign mitochondrial DNA, one might envision treating mature cells with "cloning factors" obtained from xenogenic sources that would partially reprogram nuclei without transfer[16]. IPS cells are created by taking a mature cell (such as a skin cell) from a living or dead person and applying treatment that drive it back to a more immature state. If the cell could be driven back to an embryonic stem cell, it may one day be possible to use IPS cells to make viable embryos. That embryo would be a clone of the cell donor. The public and scientists have huge concerns about human cloning. But it has been possible to clone a human being using a different process, called nuclear transfer, for 25 years. Nuclear transfer created Dolly the Sheep in 1997 and a monkey in 2018. In the late '90s and early 2000s, a flurry of laws introduced around the world successfully banned human cloning. We should not let our fears about cloning stand in the way of crucial research. The benefits could make organ donor waiting lists a thing of the past, save premature babies, and give women an option to have children in a different way. Cloning, or any other unethical use of the technology, can be prevented by regulation. Nuclear reprogramming describes a switch in gene expression of one kind of cell to that of another unrelated cell type. Early studies in frog cloning provided some of the first experimental evidence for reprogramming. Subsequent procedures included mammalian somatic cell nuclear transfer, cell fusion, induction of pluripotency by ectopic gene expression, and direct reprogramming. Through these methods it becomes possible to derive one kind of specialized cell (such as a brain cell) from another, more accessible, tissue (such as skin) in the same individual. This has potential applications for cell replacement without the immune suppression treatments that are required when cells are transferred between genetically different individuals. (J. B. Gurdon, 2008).

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J. Recent Studies and Key Facts:-

- Don Fox, assistant professor of pharmacology and cancer biology, maintains over 1,000 varieties of flies in his lab for tests related to regenerative medicine. His research focuses on organ repair and remodelling as well as aspects of cancer. In all, there may be more than 500,000 total flies in the lab at a time. One adult female fly has 200 to 500 babies in her short lifetime of one to two months.
- Debra Silver, an assistant professor of molecular genetics and microbiology, has performed research on a rare disorder that stunts brain development in utero. The work could help scientists better understand the Zika virus and its effect.

Chinese scientists study of the axolotl's ability to regenerate cells after injury was published in Science journal say their findings have the potential to help improve the regenerative capability of mammalian and human brains in the future.

- A team of scientists in China has discovered a new subtype of neural stem cell that is a key to brain regeneration in the axolotl, an animal capable of re-growing lost body parts.
- The scientists said their research on the amphibian could potentially improve the regenerative capability of the brains of humans and other mammals in future.
- Scientists in the Netherlands say they are within 10 years of developing an artificial womb that could save the lives of premature babies.

K. Moving towards asexual reproduction in humans? Embryos developed without fertilisation

The development of an artificial mouse embryo outside a mother's womb without the need for sperm or eggs is a major step forward in synthetic biology. The tiny embryo was constructed purely from stem cells, opening up intriguing but ethically problematic prospects for the future possibility of growing a live animal, including humans, solely from cultivated stem cells in a laboratory.

- In a recent research work published in the journal Cell, a team led by researchers from the Weizmann Institute of Science in Israel have grown mouse embryo models using only stem cells outside the uterus in a special incubator. The embryo was developed without fertilising gametes, sperm and egg, and without any assistance from the

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parents. The embryo shows evidence of a brain and a beating heart.

- The development of an artificial mouse embryo outside a mother's womb without the need for sperm or eggs is a major step forward in synthetic biology. The tiny embryo was constructed purely from stem cells, opening up intriguing but ethically problematic prospects for the future possibility of growing a live animal, including humans, solely from cultivated stem cells in a laboratory.
- This is an excellent example of biotechnology that will aid researchers in understanding how stem cells function and whether or not they hold the key to curing a wide range of illnesses. According to the convention, Life began when an egg met a sperm. One of the biggest mysteries in biology is how a little clump of cells can develop into a sophisticated biological system with many different types of specialised tissues and organs. Biologists have been dissecting embryos almost cell by cell for the past few decades to learn every part of their development.

IV. HYPOTHESIS AND EXPERIMENTAL METHOD

The clinical procedure is developed to start growth of an organ in a person who recently met with an accidental injury leads to loss of his arm, limbs or other body parts. Let's just suppose a volunteer patient who met with an accident lead to loss his arm and want to go through with this clinical procedure. The basic idea is to use his/her self brain ability to induce growth by developing a bio reactive system connected to its lost body parts. The process begins by analysing the Blastema/scar or scaffold that covered the injured part we take some samples to analyse and find weather there is somatic cells, germ cell, stem cells or genes available in it that undergo cell differentiation and multiplication when induce it with pluripotent cells. Then we take stem cells from the patient body and culture them in laboratory for multiple uses in complete procedure, we build a close loop bioreactor contain amniotic fluid and all necessary mixture of lipids, proteins, growth hormones, mitochondrial cell and enzymes which initiate growth connected it with a brain and artificial hippocampus like structure to record, develop and analyse signals and changes that occur in brain during these processes. In beginning we give a slight cut in wounded part and attach all the equipments of bioreactors with these wound and dip the portion into amniotic fluid all the time till complete process of regeneration is finished. In the injured part we inject the especially cultured induced pluripotent Mesenchymal stem cells and many growth hormones such as interleukin-I, interleukin-II, and Bone Morphogenic proteins etc which start the process of repair in initial level. We insert two computerised chips in injured portion these chip one can induce a slight current and act like an artificial nerve cell this chip record the signal and pass it to the brain which we will analyse and study deeply other chip work is to detect new cells that starts developing there and provide us with a detailed study of the processes going on all time inside the damaged part. Then we wait for few days to allow body to initially start the process of repair and growth, in these days we leave the portion dipped and attached with that artificial womb like bioreactors and study the changes occurs in it measuring, checking many time what's the position of stem cell and growth regulators in it and inject many other cell required regularly. Now coming to the therapy section in which the person has to involve 2 to 4 hours daily in which we develop and build many films, videos and animations together with the actual kind of sound that a child listen when he is in mother's womb, by using current AI technologies we show the patient all that procedures that a child undergo when he is in embryonic stage including the procedures of mitosis, meiosis, cell division, differentiation and multiplication of new cells, ligament and bone healing and developing procedures etc and record which types of signal arising in brain , how and what morphological growth, proteins and cell secretion occurring due to the induced signals , we use these signals to study the pattern of growth and connections a nerve cells start building in the brain which control the signals/power of growth. We go through and apply these clinical procedure in patient for 9 months to year to start building the potential or pattern of programming the growth in his/her brain which we have to deeply study and analyse to find a key of power that actually a human brain had in it which we loss after birth the new era of modern regenerative science and medicine shows and come up with possibilities of cell and developmental biology that the human and other mammals actually have it, One of great and successful example of which is the successful clinical procedure applied by the professor of university of Pittsburgh.

The tantalizing prospect of regrowing tissue using Badylak's technique first made headlines in 2007, when he announced the successful re-growth of a small portion of fingertip using a concoction based on cells derived from a pig's bladder. His approach with muscle tissue is similar: Surgeons start by implanting what's called an extracellular matrix, a sort of "cellular glue," whose key components are growth factor proteins from pig bladders. Those proteins trigger the body's own stem cells to flock to the area and initiate the process of tissue growth and wound repair -- which adult muscles normally wouldn't do. Combined with an intensive rehab program to essentially "exercise" the nascent muscle, the body is able to restore not only basic muscle tissue, but the tendons and nerves that are necessary for function.

"The patient needs to do their part, and that involves a lot of work -- we aren't just putting a cast on the leg and waiting," Badylak said. "But these soldiers coming in with 60, 70 percent muscle loss, they'll do anything to get their lives back."

Now, only four years after Badylak's fingertip achievement suggested his technique could restore lost tissue, his team is celebrating a notable milestone: The first patient enrolled in their trial, a veteran who lost the majority of the anterior tibial muscle in his lower leg during an IED attack, has today graduated from the requisite six-month rehabilitation program that follows surgery. "He's doing great," Badylak says of the unnamed patient, who has yet to be identified. "What would have been an amputation is now somebody with a limb that works much, much better than it did after the injury."

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And if this patient's results are anything like those of Marine Corporal Isaias Hernandez, a U.S. soldier who served as Badylak's veritable guinea in 2008, after he returned from deployment missing 70 percent of his right quadriceps, the procedure applied has returned his lost strength in his hands.

The goal was to improve their ability to perform day-to-day tasks such as walking up stairs, getting out of a chair and raising a leg to a sitting position.

One of the patients, Nick Clark, lost massive amounts of muscle and nerve tissue from his left leg in a 2005 skiing accident. He had terrible balance in his left leg, he said, and sometimes relied on canes or ankle braces to stabilize his stride.

Clark underwent the experimental surgery in 2012. "The second day I was in the hospital, they had me walking up and down the halls of the hospital," he said in the news briefing. "It was pretty tough. It was painful. But it was worth it."

He now can balance on his left leg for several minutes at a time, and has more strength pushing off with his left foot.

"My balance is still not 100 percent, but it's improved quite a bit," said Clark, 34, of Youngwood, Penn. "Now I can almost keep pace with a normal person walking, maybe 90 percent. Before the surgery, I had about half the pace of a normal walk."

The procedure represents an important medical advance, according to a trauma expert who was not involved in the study.

"I think it will set a new treatment paradigm in people with significant muscle injury, which we in the trauma world see quite frequently," said Dr. David Lowenberg, an orthopaedic surgeon at Stanford School of Medicine. "They took something that's a huge problem and found a way to fix it relatively inexpensively, and it's not technically difficult to do."

V. PROBLEM ARISES WHILE USING STEM CELL FOR ORGAN DEVELOPMENT

Stem cells have the capacity to proliferate and to differentiate into relatively mature cells of various types. Embryonic stem cells can become any organ in the body and do so when implanted into a Blastocyst. In principle, then embryonic stem cells could be used to replace any organ in the body. However, at least two factors limit this possibility. First, embryonic stem cells and embryonic stem cell lines are in enviably different genetically from the person to be treated and their use, and use of tissues or organs derived from these cells may require immune suppression. This problem can potentially be solved by cloning, as discussed above. The greater limitation to using embryonic stem cells (or stem cells generated by nuclear cloning) is that while those cells can be grown into differentiated cells and tissues, no means are known by which those cells can be coaxed to form organs outside of the embryo. The limit of stem cell technology, thus, appears to be the fetal microenvironment.

VI. EXPECTED RESULT

The above examples mentioned clearly state that there is very much potential in a field of regenerative therapies and medicine which provide a healthy impact on Humans life, we clearly demonstrated by defining in different section how the process of regeneration works in mammals and humans that is transforming life and may be some day make a super human. The experimental method which we are going to apply enhance human tendency to produce different cells and genes required to grow and develop organs as supported with many applied clinical procedures that is already in use shows the actual successful result that we get from this therapies, all these procedures helps us to someday intensify human ability to regenerate and anatomically mature lost organs and parts of the body.

VII. CONCLUSION

To start regeneration in humans' body we have to study and work in the stem cells, germ cells and somatic cells which can easily undergo many divisions and finally rebuilt or reprogrammed to perform a specific growth function. This study establish clearly shows that the human tendency to regenerate organ lies inside our body only and are present in the period of embryogenesis and after many years of birth, also different research and clinical procedures already taken into considerable use demonstrate a large impact of the stem cells which in nearby future revolutionise regenerative medicines.

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