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Review Article

A REVIEW ON: WOUND HEALING

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ABSTRACT

Wound healing is a biological process that begins with trauma and ends with scar formation. There are two types of tissue injury: full and partial thickness. Partial thickness injury is limited to the epidermis and superficial dermis, with no damage to the dermal blood vessels. Healing occurs by regeneration of other tissues. Full thickness injury involves loss of the dermis extends to deeper tissue layers, and disrupts dermal blood vessels. Wound healing involves the synthesis of several types of tissue and scar formation. The three phases of repair are lag, proliferative, and remodeling. Directly after injury, hemostasis is achieved with clot formation. The fibrin clot acts like a highway for the migration of cells into the wound site. Within the first four hours of injury, neutrophils begin to appear. These inflammatory cells kill microbes, and prevent the colonization of the wound. Next the monocyte, or macrophage, appears. Functions of these cells include the killing of microbes, the breakdown of wound debris, and the secretion of cytokines that initiate the proliferative phase of repair. Synthetic cells, or fibroblasts, proliferate and synthesize new connective tissue, replacing the transitional fibrin matrix. At this time, an efficient nutrient supply develops through the arborization (terminal branching) of adjacent blood vessels. This ingrowth of new blood vessels is called angiogenesis. This new and very vascular connective tissue is referred to as granulation tissue. The first phase of repair is called the lag or inflammatory phase. The inflammatory response is dependent on the depth and volume of tissue loss from the injury. Characteristics of the lag phase include acute inflammation and the initial appearance and infiltration of neutrophils. Neutrophils protect the host from microorganisms and infection. If inflammation is delayed or stopped, the wound becomes susceptible to infection and closure is delayed.Various plant species have served as a source of medicine for people all over the world, for year's plant is one of the most intense areas of natural product research yet the field is far from being exhausted. Plant & their extract have immense potential for the management & treatment of wound.

Key Words:- *Introduction, Process, Pathophysiology, Mechanism, Plants with wound healing properties*

INTRODUCTION [1],[2]

A wound is a disruption in the continuity of cells anything that causes cells that would normally be connected to become separated. Wound healing is the restoration of that continuity. Several effects may result with the occurrence of a wound: immediate loss of all or part of organ functioning sympathetic stress response, hemorrhage and blood clotting, bacterial contamination, and death of cells. The most important factor in minimizing these effects and promoting successful care is careful asepsis, which can be accomplished using aseptic techniques when treating a wound.

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A wound by true definition is a breakdown in the protective function of the skin; the loss of continuity of epithelium, with or without loss of underlying connective tissue (i.e. muscle, bone, nerves) following injury to the skin or underlying tissues/organs caused by surgery, a blow, a cut, chemicals, heat/cold, friction/shear force, pressure or as a result of disease, such as leg ulcers or carcinomas.

TYPE OF WOUND

As any adult knows all too well, wounds occur in countless ways and vary broadly in severity. A wound generically refers to a tissue injury caused by physical means. In everyday parlance, wounds typically refer to skin injuries. Medical professionals classify skin wounds in several ways, such as whether they are short- or long-term, and whether they are contaminated with bacteria. These

distinctions reflect differences in the nature, cause and likely course of wound, as well as treatment decisions. Short-term, open wounds are often described in 5 categories, based on the mechanism and appearance of a skin injury.

Incision

An incision wound refers to a clean cut in the skin caused by a sharp object. Accidentally cutting yourself with a kitchen knife, scissors or a piece of broken glass are everyday examples of incision wounds. A surgical incision is another common example. Incision wounds typically heal more quickly than other types of wounds because of the smooth skin edges. Scarring is also typically less extensive with deep incision wounds, compared to other types of deep skin wounds.

Laceration

A laceration refers to an injury caused by tissue tearing. Your skin is both tough and flexible, so it takes a lot of force to cause a laceration. Because of the high force involved, other deeper tissues - such as bones, muscles, tendons, ligaments, blood vessels, nerves and even internal organs - are frequently also damaged. Skin lacerations most frequently occur over bony prominences, like the elbows, knees and hips. Blunt trauma, such as occurs in a car accident or being hit with a hard object, is the most common mechanism of laceration injuries. Because the skin edges are jagged and torn, a laceration injury heals more slowly and with more scarring than an incision wound.

Abrasion

Abrasions occur when the skin is scraped off due to rubbing against a rough surface. A skinned knee or elbow is a common example of a minor, superficial abrasion wound. However, these skin wounds can be serious if the abrasions are deep or widespread, such as occurs after a fall from a motorcycle or a bicycle travelling at a relatively high speed. Commonly known as road rash or road burn, these injuries are often quite painful and sometimes require skin grafts to replace the lost skin. Scarring typically doesn't occur with superficial abrasions, but can be extensive with deep abrasions.

Avulsion

Skin avulsion, also known as degloving, is a serious injury in which the skin is torn from the tissues beneath it. The mechanism of skin avulsion typically involves the skin catching on an object while the involved body part is in motion. Ring avulsion, such as occurred to comedian Jimmy Fallon, is an example. Depending on the circumstances of injury, avulsed skin can sometimes be surgically reattached. If reattachment is not possible, skin grafts are typically used to replace the lost tissue.

Puncture

A puncture wound is created when a sharp, slender object penetrates the skin and possibly the underlying tissues, depending on the length of the object. In contrast to an incision, a puncture wound is deeper than it is wide. Thus, the entrance site of a puncture wound is generally small and often doesn't cause much superficial bleeding. The surface wound tends to close quickly, but this can cause problems as it may lead to an enclosed pocket of infection. Tetanus is a particular concern with puncture injuries. Common mechanisms of puncture wounds include stepping on a nail, being bitten by an animal or sustaining a stab wound.

Other Type of Wound

- Some examples of other types of wounds:
- Contusion, commonly known as a bruise
- Thermal, chemical or electrical burn
- Penetrating wound, which extends into an internal organ or body cavity
- Skin ulcers, a type of chronic cavitary skin sore.

Pathophysiology of Wound:-[(4),(7)]

The word 'Pathology' is derived from two Greek word- pathos (meaning suffering) and logos (meaning study). Pathology is, thus, scientific study of changes in the structure and function of the body in disease.

Wound healing is a complex and highly regulated process that can be compromised by both endogenous factors

(pathophysiological) and exogenous factors (microorganisms). Microbial colonisation of both acute and chronic wounds is inevitable, and in most situations endogenous bacteria predominate, many of which are potentially pathogenic in the wound environment.The risk of wound infection increases as local conditions favour bacterial growth rather than host defence. Acute and chronic wounds affect millions of people around the world. In recent decades,clinicians have gained a better understanding of the mechanisms of normal wound repair process and causes of delays in healing. This progress has led to significant improvement in the quality of life of affected patients.

Skin Regeneration

In the epidermis, this process is called reepithelization. Cells at edge of wound flatten to cover more of the wound, releasing attachment to ECM to migrate across wound. Epithelial cells gradually cover the entire wound site. ECM attachments are reestablished, and cells recover original shape.

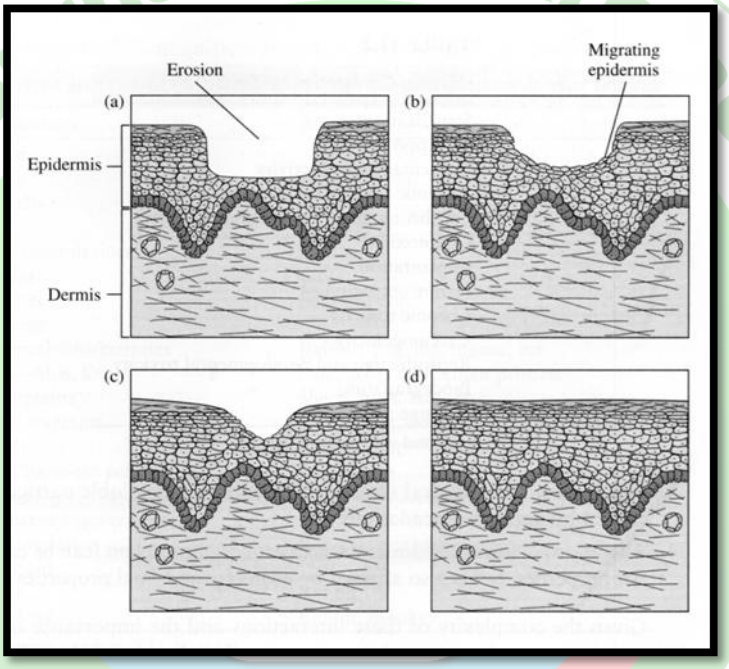

Figure:- 1 Structure of skin regeneration

Process Wound Healing[3]

As your body engages in wound healing, a wonderful process occurs throughout each of the systems that comprise your body. Generally six wound healing stages, each of which rely on one another in order to completely close a wound. Knowing what each step involves is crucial in developing a comprehensive healing plan.

Rapid Hemostasis

This refers to the mechanism that stops the actual bleeding. Most of the time, your body will accomplish this through a process called vasoconstriction, in which your blood vessels are closed tight. It's similar to how you might turn a level as to stop a leaky faucet.

Inflammation

Inflammation is your body's way of alerting you of an injury. Beyond that, it helps dictate where the next barrage of healthy cells should be headed. As such, inflammation is vital in the wound care process, but if it goes on for too long, it can actually prevent regeneration.

Proliferation and Migration

When inflammation occurs, the body releases several kinds of cells, including those that are responsible for migration and proliferation. The former function actually refers to the

movement of the cells, a carefully coordinated process that involves cells moving in a specific order. Meanwhile, proliferation is similar to hemostatis, as cells work to further constrict your blood vessels.

Evaluation of Wound Healing Drugs Models [8],[9]

Excision Wound Model

The back of each rat was shaved under Pentobarbitone (4mg/kg) anesthesia and prepared for operation. Thereafter open circular wound of 500mm^2 area was produced in each rat by excising the skin. For this purpose a marker was used to mark the area to be excised. The wounded animals were kept separately. Rats wound were left underessed to the open environment, this model was used to monitor wound contraction and epithelisation time. The standard drug (0.2% w/w nitrofurazone ointment), simple ointment; methanolic extract ointment 10%w/w and 15%w/w of leaves of Salivasplendenswere applied everyday till the wound was completely healed.

Measurment of wound area:-

The progressive changes in wound area were measured planimetrically by tracing the woung margin on a graph paper every alternate day.

% Wound Contraction = Healed Area/Total Area*100

PLANTS WITH WOUND HEALINNG PROPERTY[11]

Santalum Album

Synonyms - Indian sandal wood
Family - Santaceae
Plant part - Heart wood, oil

Figure 2:- Santalum Album

Swertia Chiraita

Synonyms - Bunch Ham, Chirayaita
Family - Gentnanaceae
Plant part - Whole Plant

Figure 3:- SwertiaChiraita

Gloriosa Superba

Synonyms - Agni Shikha
Family - Colchicaceae
Plant part - Seeds & tuber

Figure 4:- Gloriosa Superba

Embelia Ribes

Synonyms - Vidanga
Family - Myrsinceae
Plant part - Root, fruit & leaves

Figure 5:- Embelia Ribes

Lawsenniaiermis

Synonyms - Henna
Family - Lythraceae
Plant part - Leaf, flower & seed

Figure 6:- Lawsenniaiermis

Aloe Verra

Synonyms - Grathkumari
Family - Aloaceae / Asphodelaceae
Plant part - Leaves

Figure 7:- Aloe Verra

Strychinosnuxvomica

Synonyms - Nux vomica
Family - Loganiaceae
Plant part - Seed

Figure 8:- Strychinosnuxvomica

Table. 1: Marketed Preparation For Wound Healing [3],[6]

S.NO.	Brand Name	Salt Name
1.	Accuzyme	Papain/Urea
2.	Granulex	Balsam Peru/Castor Oil/Trypsin
3.	Xenaderm	Balsam Peru/Castor Oil/Trypsin
4.	Panafil	Chlorophyllin Copper Complex/Papain/Urea
5.	Collagenase Santyl	Collagenase
6.	Accuzyme SE	Papain/Urea
7.	AllanEnzyme	Papain/Urea
8.	Granulderm	Balsam Peru/Castor Oil/Trypsin
9.	Ethezyme	Papain/Urea
10.	Papfyll	Chlorophyllin Copper Complex/Papain/Urea
11.	Optase	Balsam Peru/Castor Oil/Trypsin
12.	Vasolex	Balsam Peru/Castor Oil/Trypsin
13.	Revina NLT	Balsam Peru/Castor Oil/Trypsin
14.	TBC	Balsam Peru/Castor Oil/Trypsin
15.	Paptase	Papain/Urea

CONCLUSION OR SUMMARY[4]

There are a number of plants which are used traditionally used the tribal people of India are not been validated or such plants not been evaluated keeping the traditional and conventional claim in mind. Generally pharmacologist should study traditional systems of medicine in scientific way and validate by screening Plant extracts for pharmacological activity. This review focused on the pharmacological reports of plant extractsscreens the soluble extracts in the development of an acceptable wound healing preparation, which if validated properly and proven scientifically can act as substitute or may even replace the modern wound healing agents. Considering the principle drawbacks, associated with synthetic compounds, plants which are the gift from nature having traditional knowledge, provides excellent raw material for the treatment of various diseases and disorders. As in the allopathic system of medicine, wound healers are available but

traditional knowledge in the form of literature provides number of traditional and household preparations for those purposes. Preliminary scientific investigations on plants indicate that natural products could be exploited to discover some novel wound healers.

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