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SHRI B. M. PATIL MEDICAL COLLEGE AND RESEARCH

CENTRE, VIJAYAPURA, KARNATAKA

"A COMPARISON OF CONVENTIONAL SKIN GRAFT DONOR SITE DRESSINGS AND COLLAGEN DRESSING"

Submitted by

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P.G. in Department of General Surgery

Dissertation Submitted to

BLDE (DEEMED TO BE UNIVERSITY)'S SHRI.B. M. PATIL MEDICAL COLLEGE HOSPITAL & RESEARCH CENTRE, VIJAYAPURA KARNATAKA

In partial fulfilment of the degree of

MASTER OF SURGERY IN

GENERAL SURGERY

Under the guidance of

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Date:

Place-Vijayapura

TABLE OF CONTENTS

INTRODUCTION

Skin grafting is a critical surgical procedure employed in reconstructive medicine to treat extensive burns, traumatic injuries, chronic wounds, and surgical defects.[1] The success of skin grafting not only depends on the graft's integration but also significantly relies on the management of donor site wounds, which are often overlooked yet crucial healing areas.[2] Donor site management represents a fundamental challenge in reconstructive surgery, directly impacting patient comfort, healing time, and overall clinical outcomes.

Conventional wound dressings have traditionally been the standard approach in managing donor site wounds, utilizing materials like petroleum-based gauze, semi-permeable films, and traditional hydrocolloid dressings.[3] However, these methods often present limitations such as increased pain, prolonged healing time, potential infection risks, and suboptimal aesthetic outcomes.[4] The emergence of advanced biomaterials, particularly collagen-based dressings, has introduced promising alternatives that potentially address these shortcomings.[5]

Collagen dressings represent a sophisticated approach to wound healing, leveraging the intrinsic properties of this essential extracellular matrix protein.[6] These innovative dressings offer multiple potential advantages, including enhanced wound healing mechanisms, improved moisture regulation, reduced inflammatory response, and potentially accelerated re-epithelialization.[7] The biomimetic nature of collagen dressings suggests they could revolutionize donor site wound management by providing a more physiologically compatible healing environment.[8]

Despite the growing interest in collagen-based wound management strategies, comprehensive comparative studies evaluating their performance against conventional dressings remain limited.[9] This research aims to systematically compare conventional skin graft donor site dressings with collagen dressings, examining critical parameters such as healing time, pain perception, infection rates, patient comfort, and long-term aesthetic outcomes.[10]

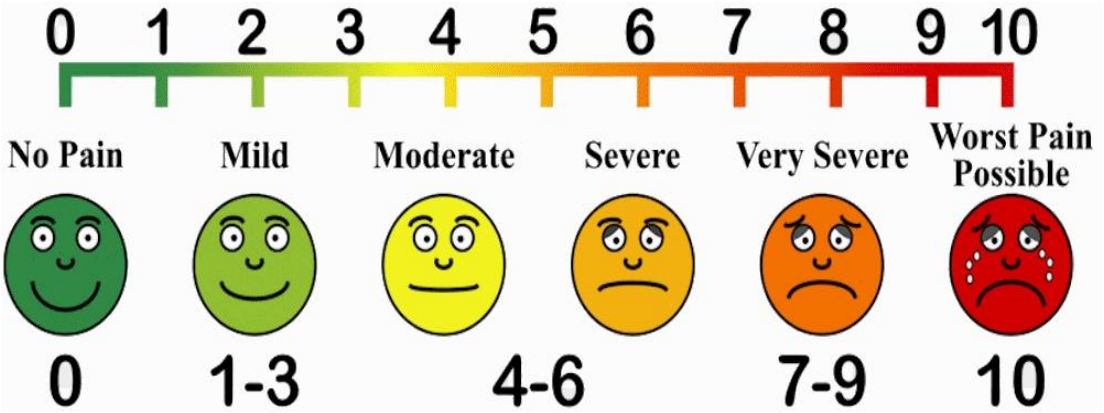
AIM & OBJECTIVES

Aim:

- The study aims to compare the efficacy of collagen dressings in treating Donor site of the split thickness skin grafts with that of conventional dressing [Paraffin gauze].

Objectives:

1. Pain
2. Epithelization
3. Scar



VISUAL PAIN ANALOGUE SCALE

vancouver scar scale

Scar characteristic	Score
Vascularity	
Normal	0
Pink	1
Red	2
Purple	3
Pigmentation	
Normal	0
Hypopigmentation	1
Hyperpigmentation	2
Pliability	
Normal	0
Supple	1
Yielding	2
Firm	3
Ropes	4
Contracture	5
Height (mm)	
Flat	0
<2	1
2~5	2
>5	3
Total score	13

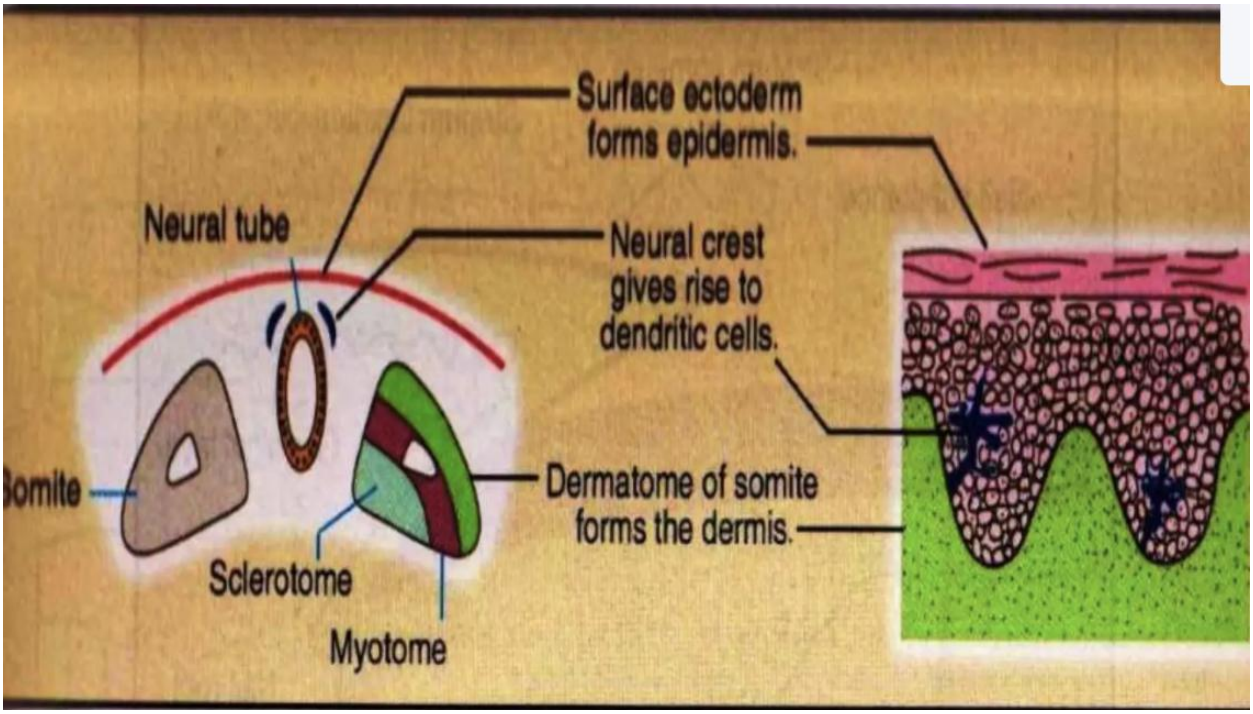
REVIEW OF LITERATURE

DEVELOPMENT OF SKIN

The development of skin, also known as cutaneous development, begins early in embryonic life and progresses through several stages to form the mature skin structure. The skin originates from the ectoderm, one of the three primary germ layers in early development. Here's an overview of how the skin develops:

Embryonic Development:

The skin development start at the week of 4 to 8 of gestational age.



Ectodermal Origin:

The skin develops from the ectoderm, the outermost layer of the embryo. During the fourth week of gestation, the ectoderm begins to differentiate into two main parts: the epidermis (the outer skin layer) and the neural tube.

Formation of the Epidermis:

Around week 4, the epidermal ridges form on the surface of the developing embryo. These ridges will later develop into the layers of the epidermis, including the stratum basale, stratum spinosum, stratum granulosum, and stratum corneum. Initially, the epidermis is a simple, undifferentiated layer of cells.

Dermal Development:

The deeper layer of skin, the dermis, arises from the mesoderm, the middle germ layer. The mesodermal cells differentiate into dermal papillae, which will eventually connect with the epidermis. Initially, the dermis is a thin layer, but it thickens over time as more connective tissue forms.

2. Development of the Epidermal Layers

Stratum Basale (Germinativum):

The stratum basale is the deepest layer of the epidermis and forms early in development. It consists of basal cells that continuously divide and differentiate, giving rise to new keratinocytes. This is the layer responsible for skin regeneration and growth.

Stratum Spinosum:

The stratum spinosum, or prickle cell layer, starts to form as the basal cells divide and move upward. Cells in this layer start to develop desmosomes (cell junctions) that

help hold the cells together. The spiny appearance of these cells comes from the way desmosomes attach adjacent cells.

Stratum Granulosum:

By the end of the first trimester, the stratum granulosum begins to form. Cells in this layer start to produce keratohyalin granules, which are important for the process of keratinization, where cells begin to harden and lose their nuclei.

Stratum Corneum:

As the epidermis matures, the stratum corneum forms. Initially, this layer consists of a thin, translucent layer of dead cells (the stratum lucidum forms later in thick skin areas), and over time, the epidermis becomes more robust and protective.

Development of cells in epidermis:

1) **Melanocytes:**

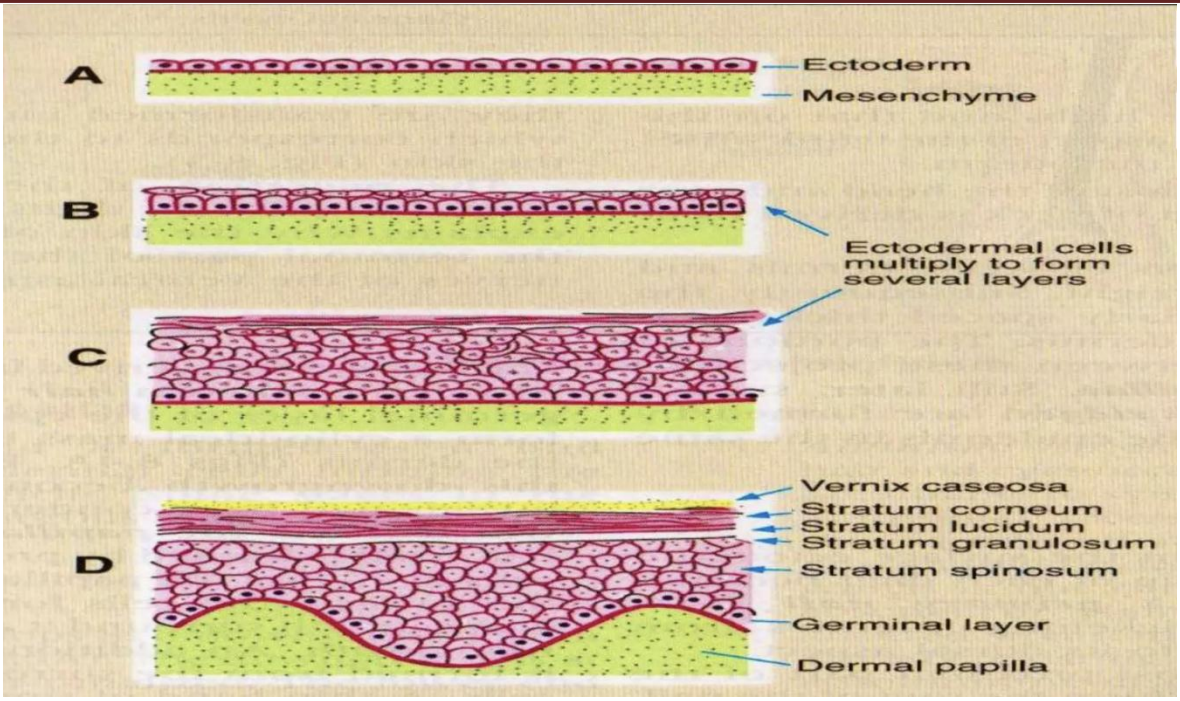
At 8 weeks of gestational age it reach to epidermis, at 4 to 6 months of age they become dendritic, synthesize and transfer melansomes.

2) **Langerhans cells:**

These are derived from the Bone marrow in faetal life arised from the yolk sac por liver. it appear in 6 to 7 weeks, and mature at 12 to 14 weeks.

3) **Merkel cells:**

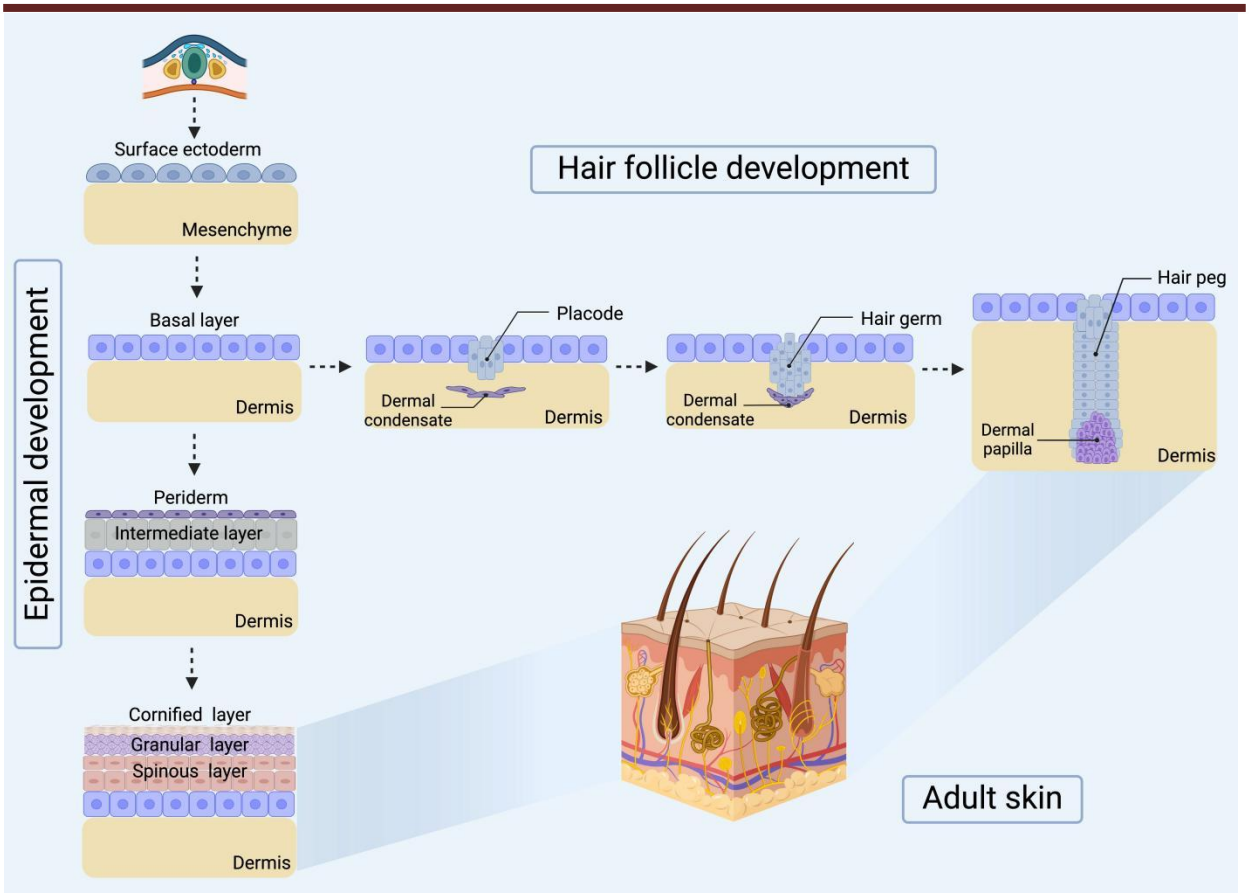
Dervied from the neural crest, at the 12 weeks of age.



3.**Hair Follicles and Glands**

Hair Follicles:

Around the 12th week of gestation, hair follicles begin to develop from the epidermis. The hair placodes form, which later develop into hair follicles that will produce hair throughout life.



Sebaceous Glands:

The sebaceous glands, which produce oil to lubricate the skin, begin to form at around 12 weeks. These glands develop as outgrowths of the hair follicles.

Sweat Glands:

The eccrine sweat glands (which produce watery sweat) and apocrine sweat glands (which are involved in scent production) begin developing between the 12th and 20th weeks of pregnancy. These glands arise from epidermal invaginations into the dermis.

4. Late Fetal Development and Birth

Stratum Corneum and Lanugo:

By the third trimester, the stratum corneum thickens, and the fetus is covered in a fine, soft hair called lanugo. Lanugo serves as a protective coating and helps anchor the vernix (a waxy substance) to the skin.

Vernix Caseosa:

The skin is coated with vernix caseosa, a white, greasy substance that helps protect the skin from amniotic fluid. The vernix is gradually absorbed into the skin.

5. Post-Birth Changes

Skin Adaptation:

After birth, the skin adapts to life outside the womb. The vernix is washed off, and the skin gradually loses its soft, smooth appearance as it begins to thicken and become more protective.

Melanin Production:

Melanocytes, which were present in the stratum basale from birth, begin producing melanin, the pigment responsible for skin color, in response to UV exposure over time.

Maturation:

Over the first few years of life, the skin's layers continue to develop and mature. The stratum corneum thickens, the dermis becomes more organized, and sweat glands become fully functional.

Conclusion:

The development of skin is a highly coordinated process that starts early in embryonic life and continues to mature after birth. The skin serves not only as a protective barrier but also as a vital organ for temperature regulation, sensation, and immune defense. The formation of the epidermis, dermis, hair follicles, sweat glands, and sebaceous glands ensures that the skin can perform its complex functions from birth onwards.

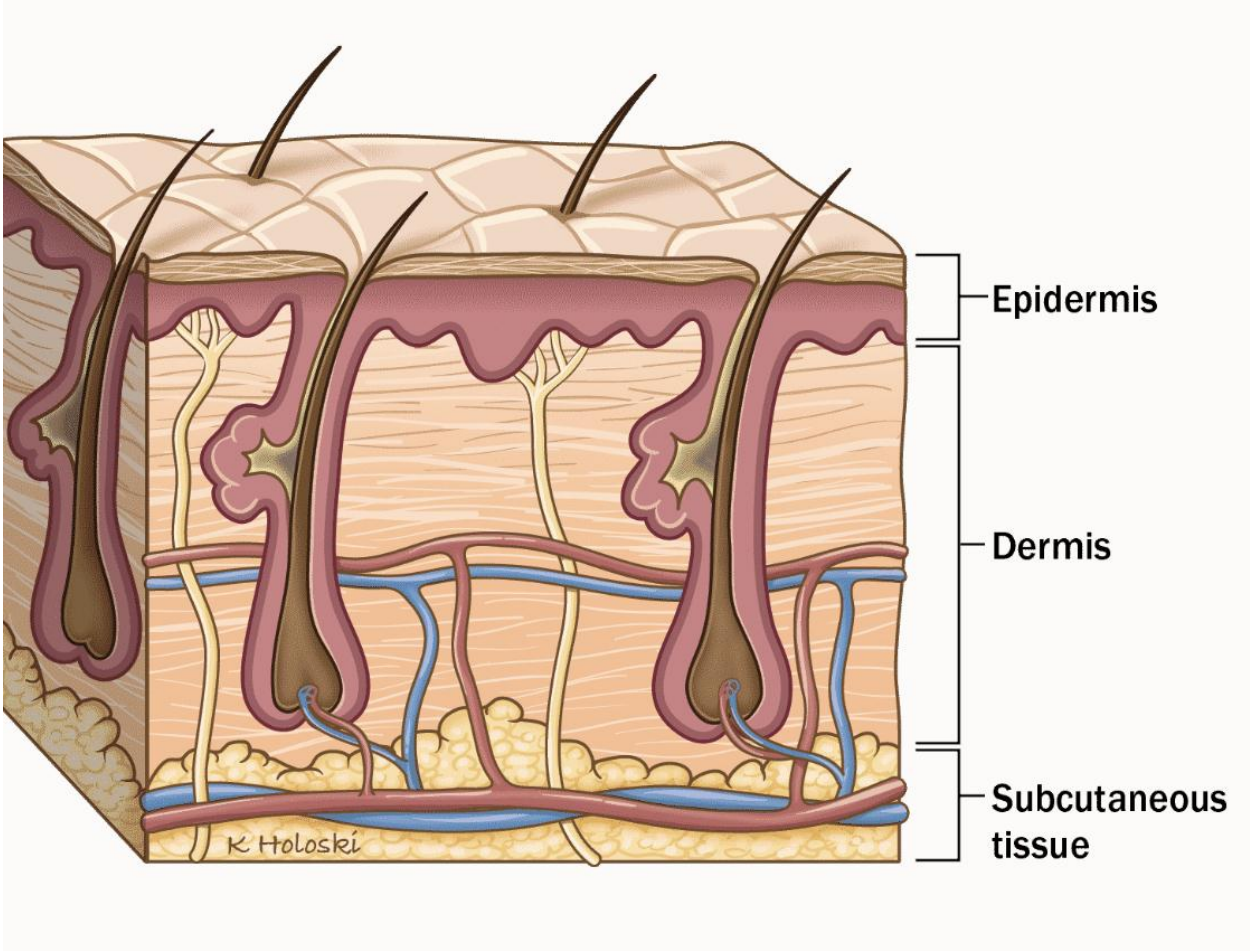
ANATOMY OF SKIN

It is the biggest organ of the integumentary system in humans and serves as the body's outermost layer.It provides sensory information, defends the body, and aids in maintaining a steady body temperature.

STRUCTURE OF SKIN:

The cutaneous membrane, or skin, is made up of two layers and covers the body's outside.

- Epidermis
- Dermis



EPIDERMIS:

It is made up of stratified squamous epithelium that has been keratinized and is the outermost layer of skin.It is made up of primary cell types.

a) Keratinocytes

b) Melanocytes

c) Langerhans cells

d) Markel cell

KERATINOCYTES:

Keratinocytes, a stiff, fibrous protein that helps shield skin and underlying tissues from heat, germs, and chemicals, make up about 90% of epidermal cells.

MELANOCYTES:

Melanocytes, which make up about 8% of epidermal cells, are responsible for producing the pigment known as melanin. The pigment known as melanin, which is yellow, red, or brown and black, gives skin its color and absorbs harmful UV rays.

LANGERHAN'S CELLS:

They originate in red bone marrow, go to the epidermis, and contribute a tiny percentage of epidermal cells. They also take part in immune responses that are aimed at destroying microorganisms.

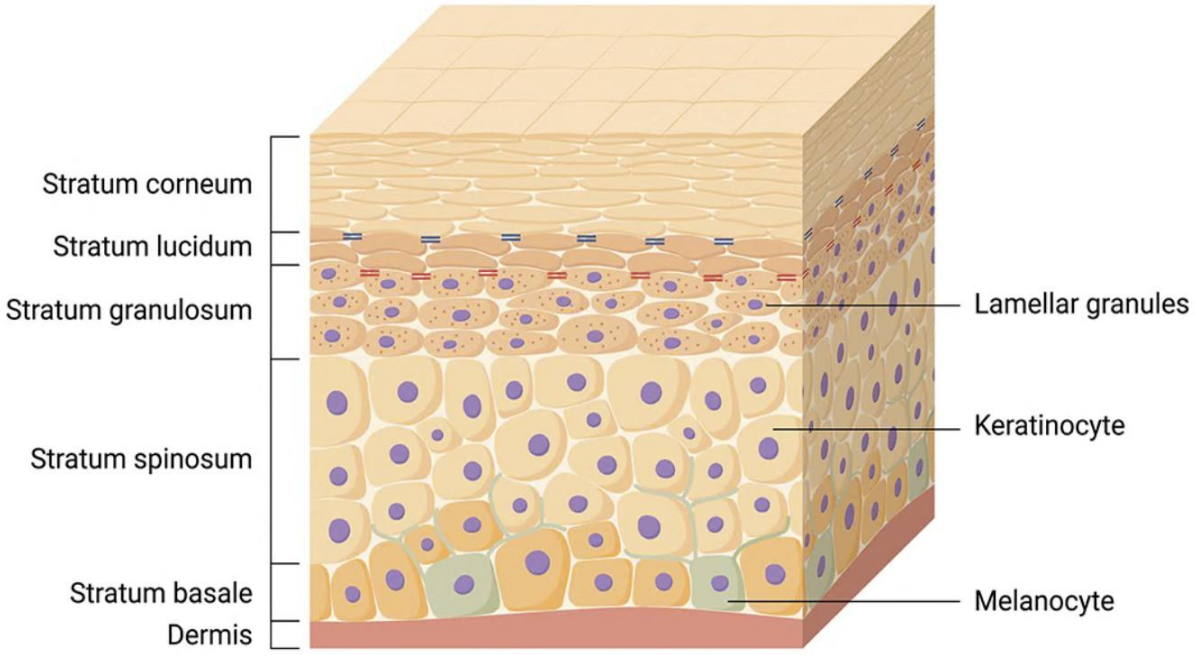
MARKEL CELLS:

These are the last numerous epidermal cells and are located in the deepest layer of epidermis.

Cells of Epidermis

Epidermis is composed of 5 layers:

1. Stratum corneum
2. Stratum lucidum
3. Stratum granulosum
4. Stratum spinosum
5. Stratum basale



STRATUM CORNEUM:

The outermost layer of the epidermis, or outermost portion of the skin, is called the stratum corneum. It is primarily made up of keratinocytes, which are dead, flattened skin cells that have filled with the stiff, protective protein keratin. This layer performs a number of crucial tasks:

1. Barrier Function: It acts as a barrier to protect the underlying tissues from environmental damage, such as UV radiation, chemicals, and pathogens.

2. Water Retention: It helps prevent the loss of moisture from the skin by acting as a waterproof barrier.

3. Protection: The cells in this layer are continuously sloughed off and replaced, which helps to remove dead skin cells and keep the skin smooth.

The stratum corneum is made up of multiple layers of dead cells, and it’s constantly replenished from the layers below as the cells migrate upwards. It's a key part of the skin's defense system and overall health.

STRATUM LUCIDUM:

Just beneath the stratum corneum and above the stratum granulosum is the stratum lucidum, a thin, translucent layer of the epidermis. Usually, it only appears in places with thick skin, like the palms of the hands and the soles of the feet. This layer performs a number of crucial tasks:

Protection: The stratum lucidum provides an additional layer of protection against mechanical stress and friction, especially in areas that experience a lot of wear, like the palms and soles.

Water Barrier: It helps in the formation of a barrier that retains moisture within the skin, preventing excessive water loss.

Cell Changes: The cells in the stratum lucidum are flattened, and their organelles (like the nucleus) start to break down. These cells are filled with a protein called **eleidin**, which is a precursor to keratin, and this contributes to the skin's overall strength and toughness.

In areas where the skin is thinner, like the face, the stratum lucidum is not present. It’s most visible in thick skin, where it provides an additional layer of resilience and helps with the skin's overall function.

STRATUM GRANULOSUM:

The stratum granulosum is a layer of the epidermis located just below the stratum lucidum(in thick skin) or beneath the stratum corneum (in thin skin). It is a crucial layer in the process of keratinization, where skin cells become hardened and lose their nuclei.Key features of the stratum granulosum:

1. Cell Characteristics:

The cells in this layer, called keratinocytes, are becoming flattened and start to accumulate keratohyalin granules, which contain proteins that contribute to the formation of keratin. These granules are crucial for the waterproofing properties of the skin.

2. Formation of the Waterproof Barrier:

The cells in the stratum granulosum begin to secrete lipid-rich substances that help create the skin's waterproof barrier. This barrier is vital for preventing dehydration and protecting against harmful microorganisms and chemicals.

3. Keratinization Process:

As cells move from the deeper layers to the stratum granulosum, they begin to undergo the process of keratinization. In this process, cells lose their nuclei and other organelles, and the remaining cellular structure is largely composed of keratin, making the skin tough and resistant to damage.

4. Transition Zone:

The stratum granulosum serves as a transition zone between the deeper layers (where cells are still alive and dividing) and the superficial layers (like the stratum corneum, where cells are dead and flattened).

In summary, the stratum granulosum plays a key role in the formation of the skin's protective barrier and the process of keratinization, helping the skin stay resilient, hydrated, and protected from external elements.

STRATUM SPINOSUM:

The stratum spinosum, also known as the spinous layer or prickle cell layer, is a crucial layer of the epidermis, the outermost layer of your skin. Here's a breakdown of its key characteristics:

Location:

- It is located between the stratum granulosum and the stratum basale, which is the deepest layer of the epidermis.
- Composition:
    - It primarily consists of keratinocytes, which are skin cells that produce keratin, a tough, protective protein.
    - These keratinocytes are connected by structures called desmosomes, which provide strength and flexibility to the skin.
    - It also contains Langerhans cells, which are immune cells that help protect the skin against pathogens.
- Characteristics:
    - The "spinosum" name comes from the spiny appearance of the cells when viewed under a microscope. This appearance is due to the desmosomes that connect the cells.
    - Keratinization, the process of keratin production, begins in this layer.
    - The cells are polyhedral in shape.
- Function:
    - Provides strength and flexibility to the skin.
    - Plays a role in the skin's immune response.

In essence, the stratum spinosum is a vital layer that contributes to the protective barrier function of your skin.

STRATUM BASALE:

The thickest layer of the epidermis, located immediately above the dermis, is called the stratum basale, or stratum germinativum. It is made up of a single row of keratinocytes, or basal cells, which divide continuously to create new skin cells.

Key features of the stratum basale:

1. Cell Division:

The primary function of the stratum basale is to produce new keratinocytes through mitosis (cell division). These new cells gradually move upward through the layers of the epidermis as they mature and eventually become part of the more superficial layers, such as the stratum spinosum and beyond.

2 .Stem Cells:

The stratum basale contains stem cells, which are responsible for continuously generating new keratinocytes. These stem cells divide, and as the newly formed cells move upward, they undergo changes that result in the formation of the tougher, protective layers of the skin.

2. Melanocytes:

The stratum basale also contains melanocytes, cells that produce the pigment melanin. Melanin is responsible for giving the skin its color and protecting it from UV radiation. The melanin is transferred to nearby keratinocytes, where it helps protect DNA from sun damage

3. Merkel Cells:

In addition to keratinocytes and melanocytes, the stratum basale contains Merkel cells, which are involved in the sense of touch. These cells are connected to nerve endings and help the skin respond to mechanical stimuli.

4. Attachment to the Dermis:

The stratum basale is anchored to the underlying dermis by structures called hemidesmosomes, which help to stabilize the epidermis and prevent it from separating from the dermal layer.

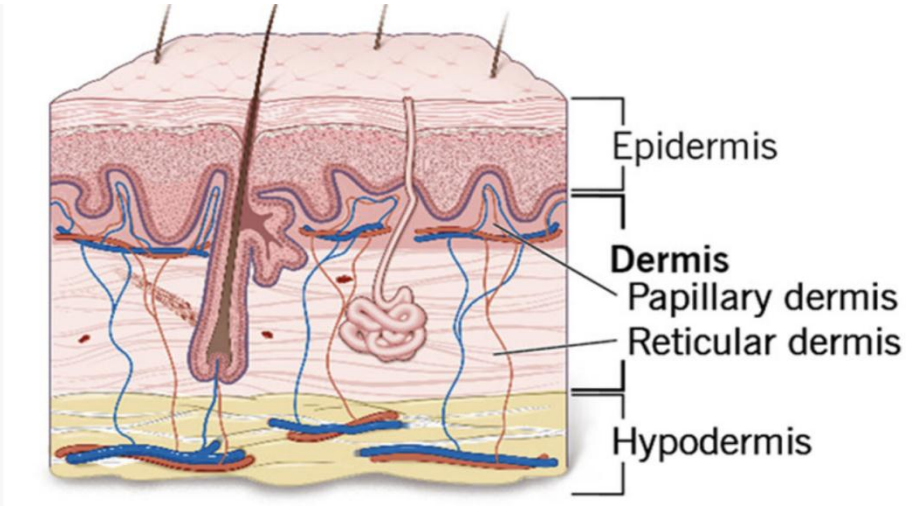
Overall, the stratum basale is crucial for skin regeneration and repair, as it contains the cells that generate new skin, produce pigment, and contribute to the skin's sensory functions.

DERMIS:

The dermis, which is the second deeper layer of the skin, is primarily made up of connective tissue, with blood arteries, nerves, glands, and hair follicles imbedded in it. The dermis is separated into

a) Papillary region

b) Reticular region



PAPILLARY REGION:

The papillary region is the upper part of the dermis, located just beneath the epidermis. It is named for the finger-like projections called dermal papillae, which extend upward into the epidermis. These papillae increase the surface area for the exchange of nutrients and waste products between the dermis and epidermis.

Key features of the papillary region:

1. Structure:

The papillary region consists of loose connective tissue, which is rich in collagen and elastin fibers. This structure allows for flexibility and a relatively loose arrangement of cells and fibers.

2. Dermal Papillae:

The dermal papillae extend into the epidermis and help bind the dermis to the epidermis. They create the boundary between the two layers and play a role in nourishing the epidermal cells. In areas like the fingertips, the papillae form friction ridges, which are responsible for fingerprints.

3. Blood Vessels:

The papillary region contains small blood vessels that supply nutrients to the epidermis, which doesn't have its own blood supply. These vessels also help regulate temperature by adjusting blood flow to the skin.

4. Sensory Receptors:

The papillary region contains sensory nerve endings, such as Meissner's corpuscles, which are responsible for detecting light touch. This makes the papillary region important for tactile sensations.

5. Immune Cells:

The papillary region also contains immune cells, like macrophages, which help in defending the skin against pathogens and other foreign invaders.

Overall, the papillary region plays a vital role in nourishing the epidermis, enhancing the skin's sensory functions, and contributing to the skin’s structural integrity.

RETICULAR REGION:

The reticular region is the deeper part of the dermis, located beneath the papillary region. It is much thicker and denser compared to the papillary layer and is primarily responsible for the skin’s strength and elasticity.

Key features of the reticular region:

1. Dense Connective Tissue:

The reticular region is made up of dense irregular connective tissue, which contains a large amount of collagen fibers and elastin fibers. These fibers provide strength, flexibility, and resilience to the skin, allowing it to resist stretching and tearing.

2. Collagen and Elastin Fibers:

The abundance of collagen fibers gives the skin its tensile strength, while elastin fibers allow the skin to stretch and return to its original shape. This combination contributes to the skin's durability and ability to withstand mechanical stress.

3. Hair Follicles and Glands:

The reticular region houses important structures such as hair follicles, sebaceous glands (oil-producing glands), and sweat glands. These structures extend from the epidermis into the dermis, with their associated nerve endings and blood vessels found in the reticular layer.

4. Blood Vessels:

Larger blood vessels are present in the reticular region, which provide nutrients and oxygen to the skin and help in regulating temperature by controlling blood flow.

5. Nerve Endings:

The reticular region contains nerve endings that are responsible for detecting pain, temperature, and pressure. These include Pacinian corpuscles, which are sensitive to deep pressure and vibration.

6. Fibers and Strength:

The arrangement of collagen fibers in the reticular layer is crucial for the skin's overall strength and resilience. The lines of cleavage (also known as Langer's lines) are patterns of collagen fibers in this region, and these lines are important in surgical procedures to reduce scarring.

Overall, the reticular region plays a major role in the skin's mechanical strength, elasticity, and structure, while also housing various structures that contribute to skin function.

PHYSIOLOGY OF WOUND HEALING

The wound-healing process consists of four highly integrated and overlapping phases: hemostasis, inflammation, proliferation, and tissue remodeling or resolution.[11] These phases and their biophysiological functions must occur in the proper sequence, at a specific time, and continue for a specific duration at an optimal intensity.[12]

FUNCTION

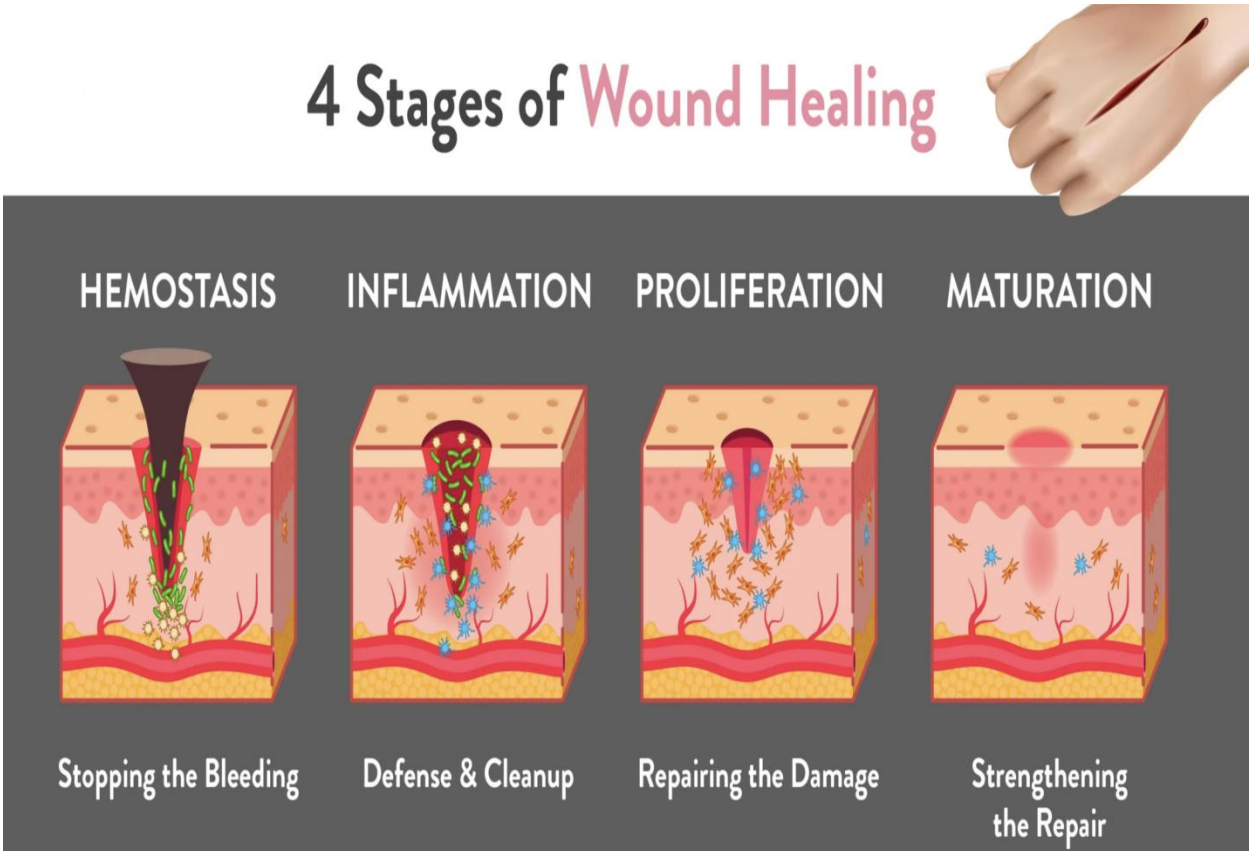
Restoring the barrier of protection is one of the main purposes of wound healing. Without it, we lose the first line of defense against infection, leaving us open to external infections and fluid loss. Regaining tissue strength and volume requires later phases of wound healing..[13]

THE WOUND-HEALING PROCESS

The dynamic process of wound healing is divided into four overlapping, continuously occurring, and well planned stages. Each phase's activities must be carried out precisely and under strict guidelines. Delays in wound healing or chronic wounds that do not heal might result from process disruptions, abnormalities, or extension.

MECHANISM

Tissue reconstitution is the outcome of wound healing, which moves via a planned series of overlapping stages. The development of mature scar tissue marks the conclusion of this process, which also includes hemostasis, inflammation, and proliferation.



Hemostasis

Immediately following the damage, hemostasis starts. In order to limit bleeding from the wound, vascular constriction, platelet thrombus development, coagulation cascade propagation, clotting termination, and fibrinolysis are used to remove the clot..[15]

Blood flows to the wound site when the vascular endothelium is damaged, exposing the basal lamina. Following their binding to the exposed collagen, activated platelets trigger the release of cytokines, inflammatory mediators, and other growth factors. A fibrin clot forms a seal to stop more blood loss, and the intrinsic and extrinsic coagulation pathways are triggered.[16]

The hemostasis phase releases cytokines that later contribute to angiogenesis, chemotaxis, extracellular matrix deposition, and epithelialization. These consist of fibroblast growth factor, platelet-derived growth factor, transforming growth factor-beta, epidermal growth factor, and vascular endothelial growth factor.[15]

Inflammation

During the initial days after injury, platelet activation causes inflammatory cells to move to the wound site. Vasoactive cytokines like prostaglandins and histamine are released by mast cells, and they help in migration by increasing capillary permeability and encouraging local dilatation.

The majority at first are neutrophils, which are drawn to the wound bed by bacterial products.After the first 48 to 72 hours, neutrophils absorb the bacteria and any dead tissue, resulting in the pus that is visible in wounds. Monocytes then develop into macrophages, which further debride the wound by removing fibrin, wasted neutrophils, and other cell debris from the matrix. The majority of inflammatory cytokines, including fibroblast growth factor, platelet-derived growth factor, epidermal growth factor, and transforming growth factor-beta, are also released by macrophages. Because of these functions, macrophages are necessary for effective wound healing; when their function is inhibited, wound healing is delayed.[15, 16]

The inflammatory phase establishes a clean wound bed through these mechanisms, which serve as the foundation for subsequent repair mechanisms..

Proliferation:

Three to twenty-one days following injury, the proliferative phase takes place, during which angiogenesis, granulation tissue development, collagen deposition, and epithelialization are all involved. This phase's main result is the wound defect being filled. When the wound bed is hypoxic, endothelial cells produce nitric oxide (NO), which triggers the release of vascular endothelial growth factor and encourages angiogenesis.[16]

Angiogenesis is also triggered by the production of fibroblast growth factor and platelet-derived growth factor, which provides oxygen, glucose, and other elements required for the new wound to heal properly. Here, preexisting arteries give rise to thin-walled endothelium, which then establishes itself on the freshly produced extracellular matrix. NO levels and vascular endothelial growth factor drop as blood flow returns to the location, causing oxygen saturation to restore to normal and slowing the angiogenesis process. Preventing excessive collagen synthesis and aberrant scar formation is one function of this autoregulatory system.

Elastin and collagen are produced by migrating fibroblasts to provide the new extracellular matrix required for granulation tissue and vascular support. The last phases of wound healing, maturation, and remodeling depend on granulation tissue, a highly vascular connective tissue.[15, 16]

Maturation

The maturation phase, which is the last stage of wound healing, involves remodeling, collagen cross-linking, and wound contraction. Fibroblasts first produce type 3 collagen, which is thinner than mature collagen. Healthy skin contains a lot of type 1 collagen. In the maturation phase, granulation tissue's type 3 collagen is replaced by type 1 collagen, resulting in the formation of a scar. The stronger wounds that appear four to five weeks after healing are correlated with this increase in type 1 collagen. After three months, a wound will return to 80% of its initial strength. Regretfully, it is difficult to restore the skin to its initial strength before to the injury.[15]

In open wounds, wound contraction reduces the quantity of connective tissue needed to fill the wound bed. According to one hypothesis, myofibroblasts' production of alpha-smooth muscle actin facilitates contraction.[17]How well the wound contracts depends on the position and mobility of the tissue around the wound bed. Contraction can be problematic in places with limited movement, although it can be prevented using a skin transplant or other flaps.

The creation of a new, protective epithelial layer is synthesized by epithelial cells migrating inward from the wound borders. In order to restore the proper thickness of the epithelium, different migration rates enable both stratification of the epithelial layer and increasing tissue depth.[18]

A scar remains after a wound has healed. Due to excessive collagen deposition and enhanced vascularity, the scar tissue will be red, hard, and somewhat elevated. For the first six to nine months, this would usually remain this way before starting to soften, flatten, and becoming whiter.[19]

FACTORS AFFECTING WOUND HEALING

Impaired wound healing can be caused by a variety of reasons. The elements that affect repair can be broadly divided into two categories: systemic and local. Systemic factors are those that affect an individual's ability to heal from their overall health or illness status, whereas local factors directly affect the characteristics of the wound itself (Table 1). The systemic factors influence wound healing through local effects, and many of these aspects are interrelated.

Table 1: Factors Affecting Wound Healing

Local Factors	**Systemic Factors**
Oxygenation Infection Foreign body Venous sufficiency	Age and gender Sex hormones Stress Ischemia Diseases: diabetes, keloids, fibrosis, hereditary healing disorders, jaundice, uremia

	Obesity Medications: glucocorticoid steroids, non-steroidal anti-inflammatory drugs, chemotherapy Alcoholism and smoking Immunocompromised conditions: cancer, radiation therapy, AIDS

SKIN GRAFTING

Structure and function of Skin

The skin is the body's largest and primary protective organ, covering its entire external surface and serving as a first-order physical barrier against the environment.[20]

Three layers make up the majority of the skin. The epidermis is the topmost layer, followed by the dermis, and the subcutaneous tissue is the third and deepest layer.

- The epidermis, the skin's outermost layer, influences skin tone and acts as a waterproof barrier.
- Beneath the epidermis is the dermis, which is home to sweat glands, blood vessels, lymphatic vessels, hair follicles, and connective tissue..
- The deeper subcutaneous tissue (hypodermis) is made of fat and connective tissue.

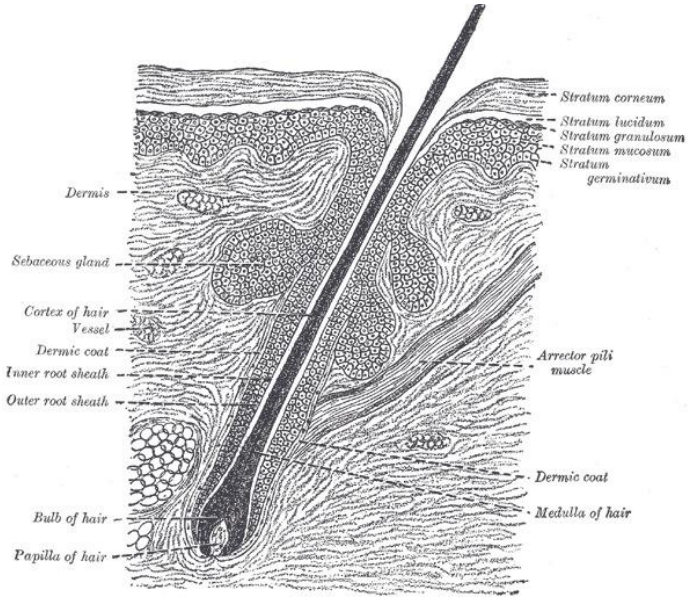
The stratum basale, stratum spinosum, stratum granulosum, stratum lucidum, and stratum corneum are the five layers of the epidermis that are further separated on thick skin areas like the palms and soles. In other areas, the stratum lucidum is absent, leaving the epidermis with only four layers.

The dermis is divided into two layers, the papillary dermis (the upper layer) and the reticular dermis (the lower layer).

The functions of the skin include:

- **Protection:**The skin serves as the body's primary physical defense against the outside world, protecting against microbes, dehydration, UV rays, and mechanical harm.
- **Sensation** :The skin is the first organ to sense pain, warmth, touch, and deep pressure.
- **Mobility:** The skin permits the body to move smoothly.
- **Endocrine activity:** Calcium absorption and healthy bone metabolism depend on vitamin D, which is produced by the skin through biochemical processes.
- **Exocrine activity**: Water, urea, and ammonia are released as a result. Products including perspiration, sebum, and pheromones are secreted by the skin, which also secretes bioactive chemicals like cytokines to perform vital immunologic tasks.
- **Immunity** development against pathogens.
- **Regulation of Temperature.** By retaining or releasing heat, the skin contributes to thermal regulation and supports the homeostatic and water balance of the body.[21]

Figure 1: A section of the skin showing the epidermis, dermis, hair shaft and follicle, arrector pili muscles, and sebaceous glands.



BRIEF HISTORICAL INSIGHTS[22]

1. **Ancient Origins** Skin grafting has roots dating back to ancient civilizations. The earliest known references appear in ancient Indian medical texts, specifically the Sushruta Samhita (around 600 BCE), where surgeons used skin from other body parts to reconstruct noses and ears.
2. **Medieval and Renaissance Period**

- During the 16th century, Italian surgeon Gaspare Tagliacozzi pioneered reconstruction techniques, particularly for nasal reconstruction using arm skin flaps.
- Early skin grafting attempts were crude and often unsuccessful due to limited understanding of wound healing and infection prevention.

3. **19th Century Breakthroughs**

- 1817: Karl Ferdinand von Graefe published significant work on reconstructive surgery techniques
- 1869: Jacques-Louis Reverdin introduced the concept of small skin grafts (punch grafts)
- 1870s: Swiss surgeon Jacques-Louis Reverdin demonstrated successful skin transplantation techniques

4. **Early 20th Century Developments**

- World War I dramatically accelerated skin grafting techniques
- Surgeons like Harold Gillies developed advanced reconstructive methods to treat soldiers with extensive war injuries
- Blood supply and wound healing mechanisms began to be better understood

5. **Mid-20th Century Advances**

- 1940s-1950s: Development of split-thickness and full-thickness skin grafting techniques
- Improved understanding of immunology and tissue compatibility
- Introduction of more sophisticated surgical techniques

6. **Modern Era**

- Advanced microsurgical techniques
- Development of synthetic and biological dressings
- Introduction of tissue engineering and cellular approaches to wound healing
- Emergence of specialized wound care technologies

Indications

Skin graft is one of the most indispensable techniques in plastic surgery and dermatology.

Surgeons should generally select the most straightforward closure that will yield the best cosmetic outcome. Grafts are usually taken into consideration when flap closure, primary closure, or secondary intent are unable to close the wound.[23]

TYPES OF GRAFT:

1) **Autogenous Graft:**

The Autogenous graft is type autograft, where the tissue is transplanted from one location to another within the same individuals body.

Advantages: There will be tissue biocompatibility and minimal risk of rejection or immune response, and in bone grafts increases osteogenesis, reduced risk of disease transmission.

Disadvantages: Requires a second surgical site for harvesting the graft, which canlead to additional pain, complications, and recovery time.

These grafts are used in various situations, such as:

- Dental implant placement

- Fracture repair
- Correcting bone defects
- Sinus lifts.
- Ridge augmentations.

ALLOGENIC GRAFT:

An allogeneic graft, or allograft, involves the transplantation of tissue or organs from one person (the donor) to another (the recipient) of the same species.

Applications:

- Commonly used in bone grafts, skin grafts, and organ transplants.
- Especially prevalent in procedures like:
    - Bone marrow transplants.
    - Ligament and tendon repairs.
    - Skin grafts for burn victims.

XENOGRAFT:

A xenograft, also known as a heterograft, is the transplantation of tissue or organs from one species to another. This means that the donor and the recipient are from different species

- **Source:**

- The graft material comes from an animal of a different species than the recipient.

- · **Challenges:**

- **Immune Rejection:**

- The risk of immune rejection is very high because the tissue is vastly different from the recipient's.

- **Disease Transmission:**
  - There's a significant risk of transmitting zoonotic diseases (diseases that can spread between animals and humans).

- Applications:

  - Research:
    - Xenografts are widely used in research, particularly in cancer research, to study tumor growth and test new treatments. For example, human cancer cells can be transplanted into immunodeficient mice.

Split-Thickness Skin Grafts

Large wounds are a good candidate for split-thickness skin grafts, which can thrive on comparatively avascular areas where FTSGs would normally fail. Usually, locations too big for a FTSG or flap are assigned to STSGs.[24]

Full-Thickness Skin Grafts

Because the metabolic needs of the additional adnexal structures of FTSG increase the chance of necrosis, full-thickness skin grafts are recommended for bigger areas with excellent blood supply or for small avascular portions smaller than 1 cm.Failure is common with large transplants over bone or cartilage that do not have any underlying tissue. FTSG placement can be facilitated by delayed grafting or by covering the exposed avascular tissue with hinge flaps.[25]

Composite Grafts

Composite grafts are recommended when the underlying bone or muscle at a donor site has been lost. Grafts that fortify the nose or ear with cartilage are the most popular composite grafts in dermatological surgery.[24]

Contraindications

Grafting is absolutely contraindicated in cases of uncontrolled bleeding, active infection, and inadequate cancer removal.

Chronic corticosteroids, bleeding disorders, smoking, anticoagulant medications, and malnourishment are examples of relative contraindications.[26]

Due to the higher risk of contracture, split-thickness skin grafts shouldn't be applied close to free margins.

Full-thickness skin grafts should not be used on an avascular site greater than 1 cm.[25]

Technique or Treatment

Split-Thickness Skin Grafts

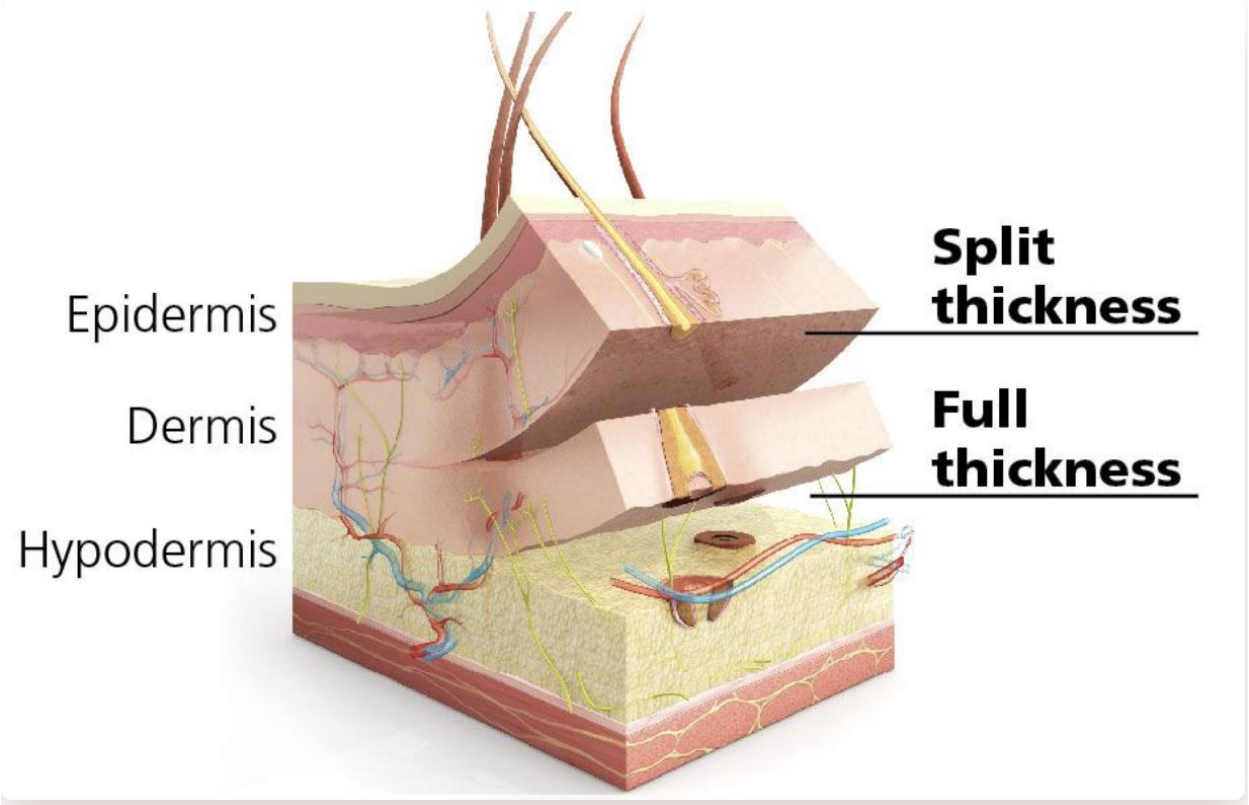
The dermatologic surgeon who does an STSG has access to a wide range of instruments and methods. To get rid of the antiseptic and stop the skin from drying up, it is usually sterilely prepared and then poperly cleaned with sterile saline. Next, anesthesia is applied to the area. Mineral oil or antibiotic ointment can be used on powered dermatomes to lubricate and moisturie the skin.Part of the dermis and the epidermis are included in an STSG.The surgeon can adjust the graft's thickness with certain instruments.The dermatome applied pressure both forward and downward, forcefully against the skin. To remove the antiseptic and avoid desiccation, the skin is usually extensively cleaned with sterile saline after being sterilely prepared. The dermatologic surgeon who does an STSG has access to a wide range of instruments and methods. To get rid of the antiseptic and stop the skin from drying up, it is usually sterilely prepared and then poperly cleaned with sterile saline. Next, applied to the area. Mineral oil or antibiotic ointment can be used on powered dermatomes to lubricate and moisturi ze the skin. Part of the dermis and the epidermis are included in an STSG. The surgeon can adjust the graft's thickness with certain instruments.

The dermatome applied pressure both forward and downward, forcefully against the skin. To keep the graft from folding in on itself, a helper might gently hold it with forceps and apply traction. The graft may then be meshed if desired; meshing is preferred for larger grafts. After that, the graft is put on the defect and shaped to fit it. Depending on the physician's option, the graft is next secured in place with either staples or sutures. Over the graft, a bolster is put. The donor site can be bandaged and coated with petrolatum, just like an abrasion.[30]

Full-Thickness Skin Graft

After selection of a donor site, both sites are sterilely prepped, draped, and anesthetized. A template of the defect can be made using a gauze, measurements or foil from the suture packaging. This template is then transposed onto the donor site. Classically, the donor site should be closed with a length to width ratio of 3:1, but Wang et al.[27] suggested that this ratio may not be necessary for donor sites, which could leave smaller donor defects. Some debate exists in the literature on the proper sizing of the graft. In general, grafts are oversized by 10% to 20% to allow for contraction and to allow contouring of the graft.[28] However, some others have suggested that grafts should be undersized by up to 10% to 20% to prevent puckering or pincushioning of the graft.[29] This suggests that there is leeway in terms of graft size, especially when grafts that are too small can be meshed to increase the size of the graft. FTSG can be harvested using a standard excision technique. After the graft is removed, it is placed in sterile saline while hemostasis is achieved at the donor site. The graft is subsequently defatted using a scalpel or scissors. An alternative method would be to take the deep margin of the graft just above the subcutaneous fat, which eliminates the defatting step. The graft should be contoured to the size of the defect and placed in the wound bed as quickly as possible. It is imperative that the graft is placed in apposition to the wound bed to reduce the risk of graft failure. Typically, grafts are sutured with a quickly absorbing suture, such as chromic gut or a non-absorbable suture such as nylon. For large grafts or at the preference of the surgeon, basting sutures can be placed. Basting suture should be placed first to allow for hemostasis of bleeding induced by suture placement. After hemostasis of the wound bed is achieved, the graft edges are sutured into place with an emphasis placed on

apposition of the wound bed and graft. After the graft is sutured in place, a bolster is placed over the graft to further assist in apposition. A variety of different products are available to use as bolsters, such as petroleum impregnated gauze. The bolster and overlying pressure dressing are used to secure the graft in place and to prevent desiccation of the graft. The bolster and pressure dressing can be removed in 1 week followed by removal of nonabsorbable sutures, if they are used, in approximately 2 weeks.



DONOR SITE WOUND

EXPECTED HEALING TRAJECTORY FOR DONOR SITE WOUNDS

The donor sites for full-thickness skin grafts are directly closed and are managed in the same way as any other surgical wound healing by primary intention; partial-thickness skin graft donor sites heal by secondary intention (Holden, 2015).[31] Therefore, the more of the dermis that is removed, the longer the healing time.

The expected healing trajectory will range from 7 to 21 days, depending on the thickness of the graft taken (Mathes, 2006) and patient factors that impact on healing, together with how the wound is managed.[32] The group agreed that all donor site wounds should ideally heal within 2 weeks. However, in some patients – e.g. in patients with comorbidities such as diabetes – healing within 3 weeks may be a more realistic goal.

RISK FACTORS FOR HEALING PROBLEMS

A number of potential risk factors may delay or complicate healing in donor site wounds. These include:

■ Age

■ Comorbidities (e.g. diabetes, cardiovascular issues or renal insufficiency) and associated polypharmacy issues

■ Smoking

■ Nutritional status.

Sufficient vascularity is a key requirement, and transcutaneous oximetry (TcPO2) testing may be used to aid patient selection and ensure that both the recipient site is suitable and that the donor site will not be at increased risk of delayed healing. One issue that needs to be taken into account is mobilization in individuals with specific comorbidities. For instance, unloading is crucial when it comes to diabetic foot ulcers. It is crucial to prevent trauma in all donor site wounds. Every patient should have their potential risk factors for delayed or compromised healing taken into account, and if necessary, the proper actions should be implemented. To prevent delayed or hampered healing and related potential problems, at-risk individuals should be recognized as soon as feasible by a complete and comprehensive screening

MANAGEMENT OF DONOR SITE

Donor site management refers to the care, treatment, and protection of the area from which skin is harvested for grafting to another part of the body. It's crucial for ensuring proper healing, minimizing complications, and patient comfort.

TIPS IN PRACTICE FOR DONOR SITE SELECTION AND HARVESTING

■ Where possible, select a relatively flat surface for the donor site.

■ If possible, in patients where this is deemed necessary, encourage a moisturising/emollient routine for 1 week prior to harvesting.

■ Anecdotally, it was suggested that it can be helpful to warm the skin at the time of harvesting, to raise the epidermis, by applying a warm washcloth.

■ It can be helpful to use local anaesthetic mixed with vasoconstrictor to reduce bleeding immediately after skin harvesting.

■ Before harvesting, it is important to double-check the setting on the dermatome (if it is being used), to ensure no error is made.

IDEAL DRESSING SELECTION

When choosing a dressing for donor site wounds, the most important considerations are patient comfort and symptom management. Because sensory nerve endings are exposed, the donor site wound may cause the patient more discomfort than the original graft site wound. For this reason, patient comfort and quality of life should be given first priority.[33]

When choosing an appropriate dressing and using a product that promotes the best possible wound healing environment, it is crucial to take into account the process of re-epithelialization, which is how donor site wounds heal.

ADDRESSING IMMEDIATE PHYSIOLOGICAL FACTORS

One of the main and most pressing issues with donor site wounds is bleeding. Local pressure should be applied first, and topical adrenaline and local anesthetic may be helpful. Sometimes, if bleeding is a persistent problem, a calcium alginate dressing may be employed.

Depending on the size of the wound area, the donor site wound may produce moderate to high volumes of exudate in the first three to four days after surgery. As re-epithelialization advances, exudate levels will decrease after this time.33 One important dressing aspect during this initial phase is exudate management.

Dressings need to be firmly secured to avoid slippage and trauma to the wound in the early stages of healing.[31]

WEAR TIME AND SYMPTOM MANAGEMENT

When choosing a dressing for donor site wounds, wear time is a crucial factor to consider. Keeping the wound as undisturbed as possible during the initial stages of healing is crucial.

It is ideal for the patient if only one dressing is used and left in place until the wound heals.[33] Because of this, the optimum donor site dressing should last as long as possible. Additional advantages in terms of cost-effectiveness and clinician time might potentially result from this.

This indicates that the process of choosing a dressing for donor site wounds is intricate and necessitates taking into account a number of variables in real-world situations.

There are two primary stages to the healing of donor site wounds. Exudate production is higher during the first wet period. As healing advances, the exudate levels drastically drop and the wound bed dries out during the next dry phase.

Maintaining the best possible healing environment throughout each of these stages is crucial. A good dressing should promote regulated moisture levels. It should stop the wound from drying out too much and control the amount of exudate. The surrounding skin must also be taken into account in order to avoid maceration and maintain the integrity of the skin, reducing the possibility of additional issues and delayed healing. A skin protectant, such as polyacrylate skin barrier film, may be taken into consideration in wounds that are highly oozing.

Spreading infection in donor site wounds is not common. However, it is important to observe for signs and symptoms of elevated biofilm or local wound infection such as friable, dark red, hypergranulation and increased exudate (International Wound Infection Institute, 2016).[34] Failure to treat this promptly will potentially result in spreading infection and an extended inflammatory phase in a non-healing donor site.In order for dressings to stay in place as recommended, an antimicrobial dressing may be considered.[33]

However, the potential of cytotoxicity, which could result in extra complications or delayed healing, must be balanced with the requirement for long-lasting antibacterial action. Additionally, keep in mind that iodine or silver dressings may produce staining or discoloration, which the patient should be informed of and comforted about, even though it might seem like a small point. Even after healing, certain donor sites might not be completely healed and will need to be protected for a long time with an appropriate dressing.

OPTIMISING HEALING

It is crucial to promote re-epithelialization in donor site wounds without causing adhesion or stress that could hinder the wound's ability to heal. For healing to be successful, the wound bed must experience less trauma.

Some research points to the possibility that a dressing that uses micropore size technology (smaller pores) on the wound contact layer to stop new tissue from growing could help donor sites heal. A controlled, randomized study was conducted to compare various dressings for partial-thickness skin transplant donor sites using a micropore dressing. Compared to the patients wearing other dressings, the patients in the group that received micropore dressings accomplished full epithelialization far more quickly. Within 14 days of donor site harvesting, a much higher percentage of patients who used the micropore dressings experienced full reepithelialization.[35]

PATIENT COMFORT AND QUALITY OF LIFE

Patient comfort is crucial when choosing a dressing for donor site wounds because pain is a major contributing factor. The patient's quality of life is crucial, taking psychosocial elements into consideration.

Choosing a garment that doesn't exacerbate pain or trauma during application or removal is crucial. Micropore dressings (see the section above on "Optimising healing") have been shown to have the potential to lessen discomfort during dressing changes. The micropore size reduces the possibility of related pain by preventing tissue ingrowth. According to a number of studies, the discomfort is lessened than with other dressings, which could improve the patient's comfort and quality of life.[36]

It is advantageous for the patient to be informed and empowered in their continued treatment because the development of a donor site wound is complicated for them.

WOUND DRESSINGS

A wound is defined as a discontinuity of the epithelial lining of the skin or mucosa due to physical or thermal damage, which may lead to temporary or permanent dysfunction. All wounds have the potential to heal well.[37]

- It's crucial to check for the following variables before applying any wound dressing since they could affect the type of dressing selected. If any of these exist, they should all be addressed:
- Mechanism of injury
- Risk of contamination
- Potential injury to deeper structures
- Underlying nerve or tissue damage
- Presence of perfusion deficits
- Presence of tissue edema
- Amount of tissue loss
- Presence of infection

After the initial assessment of the wound, it should be thoroughly irrigated with a neutral solution, like sterile water or regular saline, to get rid of any debris that may have been present.

Hydrogen peroxide is one example of a hazardous or irritating solution that should not be used since it might cause discomfort and hinder the healing process.[38] To maximize bacterial clearance, current research recommends applying at least 50 to 100 mL of irrigant per centimeter of the wound.[39] However, depending on the wound, modifications should be made. Since necrotic tissue does not undergo re-epithelization, devitalized tissue can be removed with a sharp edge.[40] Persistent bacteria will form biofilm, however modest bacterial loads aid in wound healing by producing proteolytic enzymes. They ought to be eliminated since they may cause chronic inflammation, which would postpone healing.[41]

In the past, it was thought that dry wounds promoted faster healing. But according to recent studies, a moist wound environment promotes wound healing more effectively. There are numerous ways that a properly wet wound bed might improve healing. The secretion of relevant growth factors and signaling molecules facilitates cell communication, provides a pathway for epithelial cell migration to enable effective re-epithelization, and promotes collagen synthesis while simultaneously creating an environment conducive to necrotic tissue autolysis.However, a wound bed that is overflowing with exudate can impede the healing process. In order to prevent the surrounding tissue from macerating, it is crucial to choose a dressing that will regulate the exudate.[42]

The depth of the wound, the volume of exudate, the chronicity, and the presence of infection are some common considerations when selecting a dressing. Numerous essential qualities are present in the perfect wound dressing. In addition to minimizing pain, the dressing would shield the wound from the elements and not stick to it. Additionally, the dressing should control exudate, prevent maceration of the surrounding skin, and provide a moist wound bed to encourage autolytic debridement. Lastly, the dressing should be selected to maximize function, minimize cost, and maximize patient compliance in order to improve the patient's quality of life..[43]

CHARACTERISTICS OF IDEAL WOUND DRESSING

- Capable of maintaining a high humidity at the wound site while removing excess exudate
- Free of particles and toxic wound contaminants
- Non-toxic and non-allergenic

- Capable of protecting the wound from further trauma
- Can be removed without causing trauma to the wound
- Impermeable to bacteria
- Thermally insulating
- Will allow gaseous exchange
- Comfortable and conformable
- Require only infrequent changes
- Cost effective

Low adherent dressings

Low adherent dressings are inexpensive and accessible. Keeping the wound bed moist while allowing exudate to flow through into a secondary dressing is their principal purpose.

The majority are produced as textiles, multilayered or perforated plastic films, or tulles, which are open weave cloths soaked in soft paraffin or chlorhexidine.

They are especially helpful for patients with delicate or sensitive skin because they are made to lessen adhesion at the wound bed.[44]

Gauze: When removed, moistened gauze offers mechanical debridement.

- **Advantages**: Gauze is cost-effective and widely available.
- **Disadvantages**: Gauze doesn't hold onto moisture. With dressing changes, this dressing's non-selective debridement may result in the removal of newly formed granulation tissue. This dressing needs to be replaced with a secondary dressing since it is prone to bacterial infection.
- **Clinical Application**: This covers the initial phases of deeper wounds that need to be packed.
- **Frequency of Dressing Changes**: Change dressing multiple times a day if used for packing.[45]

Films: Films are thin and transparent dressings.

- **Advantages**: Films hold moisture and are pliable. They make it possible to visually monitor wounds. Because films are semi-permeable, gases can exchange while outside microorganisms cannot enter the wound. They stick to themselves.
- **Disadvantages**: Films can cause maceration because they are impermeable to fluids and non-absorbent.
- **Clinical Applications**: For shallow wounds, small wounds, intravenous access sites, split-thickness skin transplant donor sites, and secondary dressings, use films.
- **Contraindications**: These include moderate to heavy exudative or infected wounds.
- **Frequency of dressing changes**: This ranges from every few days a week to routine dressing changes every 7 days.[46]

Foams:

- **Bilayer dressing**: The exterior layer of this dressing is a porous, hydrophobic layer, whereas the interior layer is silicone or polyurethane.
- **Advantages**: Foams pick up exudate. They have semi-permeable and semi-occlusive properties. Their thickness provides additional defense against outside harm.
- **Disadvantages**: These include the inability to visualize wounds and drying out a wound.
- **Clinical Application**: For moderate to severe chronic wounds, pressure injuries, and exudative wounds, use foam.
- **Frequency of dressing changes**: Change daily or a few times a week.[46]

Hydrogels: Hydrophilic starch polymers, which are primarily made of water, are known as hydrogels. These come as gauze, amorphous gels, and sheets.

- **Advantages**: They can lessen discomfort by absorbing water and producing a cooling sensation. Hydrogels are often clear or translucent. They create a damp atmosphere that promotes autolytic debridement.

- **Disadvantages**: Hydrogels have a low absorptive capacity and require a secondary dressing.
- **Clinical Applications**: Hydrogels are used to treat surgical wounds and venous or arterial ulcers; they also keep tissue from drying out.
- **Contraindications**: These are not for heavy exudative wounds.
- **Frequency of dressing changes**: Every one to three days.[47]

Hydrocolloids: Hydrophilic cross-linked polymers including pectin, gelatin, or cellulose exist. Sheets, paste, and powder are all forms of hydrocolloids; hydrofiber dressings are one type of treatment that is accessible.

- **Advantages**: At first, they are impermeable to water, but as they absorb more water, they become more permeable and gel. Hydrocolloids limit the growth of germs by lowering the pH of wounds. These can fill up wound voids or be applied across joints.
- **Disadvantages**: It is not possible to visualize wounds.
- **Clinical Applications**: Apply these to mild to moderate exudative wounds and pressure wounds.
- **Contraindications**: These are not for necrotic or infected wounds.
- **Frequency of Dressing Changes**: Replace the dressings every two to four days..[46]

Alginate:In order to generate a gel, calcium ions are swapped out for sodium ions in this seaweed polysaccharide dressing.

- **Advantages**: Alginate is highly porous, and the calcium ions have hemostatic properties.
- **Disadvantages**: When this dressing dries, it may stick to the wound bed and turn yellow or brown, which could be confused with purulence. Alginate needs a secondary dressing to prevent drying and has an unpleasant smell.
- **Clinical Applications:** This dressing is for moderate to heavy exudative wounds.
- **Contraindications**: These are not for minimally exudative wounds.

- **Frequency of Dressing Changes**: Replace the dressing every one to three days..[45, 46]

Antimicrobial: In addition to deactivating bacterial enzymes, silver ions also interfere with DNA synthesis and bacterial cell walls. There are other dressings that are infused with iodine.

- **Advantages**: These have broad-spectrum antimicrobial properties.
- **Disadvantages**: Skin can get discolored by oxidized silver. Deep wounds cannot be penetrated by silver ions, and long-term use of iodine-based products raises the possibility of systemic side effects.
- **Clinical Applications**:Wounds with a high risk of infection or those that are only superficially infected can be treated with these.
- **Contraindications**: These are not for deep wounds.
- **Frequency of Dressing Changes**: Change daily or every few days, depending on dressing saturation.[46]

Another option for a treatment for wounds is honey. Because honey is hypertonic, it dehydrates the wound and produces an acidic environment, which inhibits the growth of bacteria.

For some wounds, the traditional treatments listed above will not promote proper healing. It is outside the purview of this activity to provide more specialized wound dressings for specific wounds, such as biological skin products, skin substitutes, and other sophisticated wound dressings.[48, 49]

An Alternative Perspective of Wound Types and Their Appropriate Treatment:

1. Infection: Local infections can be treated with topical antimicrobials and antimicrobial dressings. However, if there are indications of a systemic illness, antibiotics ought to be taken into account.
2. Dryness: The wound can be hydrated with hydrogel. Collagenase and other enzymatic debridement agents can also help dry eschars.

3. Exudate: Alginate dressings, foam, or hydrocolloid can be used to control high exudate. Film dressings, hydrogel, or hydrocolloid can be used to control low exudate.
4. Odor: Topical metronidazole or dressings with activated charcoal can be used to reduce excessive odor.
5. Deep wounds: For deep wounds, apply wound packing or negative pressure therapy.[50, 51]

CONVENTIONAL OR TRADITIONAL WOUND DRESSINGS[52]

Gauze, lint, plasters, natural or synthetic bandages, and cotton wool are examples of traditional wound dressings that are used as main or secondary dressings to keep the wound clean. A certain level of protection against bacterial infection is provided by gauze dressings comprised of cotton, rayon, and polyester woven and nonwoven fibers. Using the fibers in these dressings, certain sterile gauze pads are used to absorb liquids and exudates from an open wound. To prevent healthy tissues from macerating, these dressings need to be changed frequently. The cost of gauze dressings is lower. Too much wound drainage causes the dressings to get wet and stick to the wound, which makes taking them off uncomfortable.The purposes of synthetic bandages made of polyamide materials and natural bandages made of cotton wool and cellulose are different. For example, high compression bandages and short stretch compression bandages offer prolonged compression in the event of venous ulcers, whereas cotton bandages are utilized to retain mild dressings. Petrolatum gauze containing 3% bismuth tribromophenate is used as a non-occlusive dressing (XeroformTM) for wounds that do not exude or just slightly exude. Commercially available tulle dressings that are saturated with paraffin and appropriate for superficial clean wounds include Bactigras, Jelonet, and Paratulle. Conventional dressings are typically used as

secondary dressings or for clean, dry wounds with low exudate levels. Modern dressings with more sophisticated formulas have supplanted conventional dressings because the former are unable to offer a moist environment for the wound.

Definition Conventional dressings are traditional wound coverage materials used to protect, manage, and promote healing of wounds, including skin graft donor sites.

Types of Conventional Dressings

1. **Gauze Dressings**

- Most basic and widely used
- Made from cotton or synthetic fibers
- Types:
    - Dry gauze
    - Wet-to-dry gauze
    - Impregnated gauze
- Advantages:
    - Inexpensive
    - Readily available
    - Easy to apply
- Limitations:
    - Minimal moisture control
    - Can cause tissue trauma during removal
    - Limited barrier protection

2. **Paraffin-Based Dressings**

- Petroleum-based protective layer
- Provides moisture barrier
- Used for:
    - Superficial burns

- Donor sites
- Partial-thickness wounds

- Characteristics:
  - Prevents wound dehydration
  - Reduces pain
  - Minimizes scab formation

3. **Zinc Oxide Dressings**

- Contains zinc oxide as primary ingredient
- Provides:
  - Protective barrier
  - Mild antiseptic properties
  - Absorption of wound exudates
- Applications:
  - Superficial wounds
  - Donor sites
  - Minor skin injuries

4. **Adhesive Dressings**

- Include:
  - Transparent film dressings
  - Adhesive wound pads
- Features:
  - Waterproof
  - Allows visual wound monitoring
  - Provides bacterial barrier
- Best for:
  - Minor wounds
  - Low-exudate areas

5. **Cotton Wool Dressings**

- Soft, absorbent material
- Used for:
    - Initial wound coverage
    - Padding
    - Protecting sensitive areas
- Limitations:
    - High lint production
    - Limited moisture management

Characteristics of Ideal Conventional Dressings

- Protect wound from external contamination
- Allow gaseous exchange
- Absorb wound exudates
- Maintain appropriate moisture balance
- Minimize patient discomfort
- Cost-effective
- Easy to apply and remove

Application Techniques

1. **Direct Application**

- Placed directly on wound surface
- Requires careful technique
- Minimal manipulation

2. **Layered Approach**

- Primary dressing in direct contact with wound
- Secondary dressing for additional protection

- Provides comprehensive wound management

Advantages

- Low cost
- Widely available
- Simple application
- Familiar to healthcare providers
- Versatile

Limitations

- Limited advanced healing properties
- Potential for frequent dressing changes
- Risk of adherence to wound bed
- Minimal bacterial protection
- Can cause tissue trauma during removal

Considerations for Selection

- Wound characteristics
- Exudate level
- Patient comfort
- Healing stage
- Cost constraints
- Healthcare setting

Infection Control

- Regular dressing changes
- Aseptic technique
- Monitoring for signs of infection
- Proper hand hygiene

- Sterile technique during application

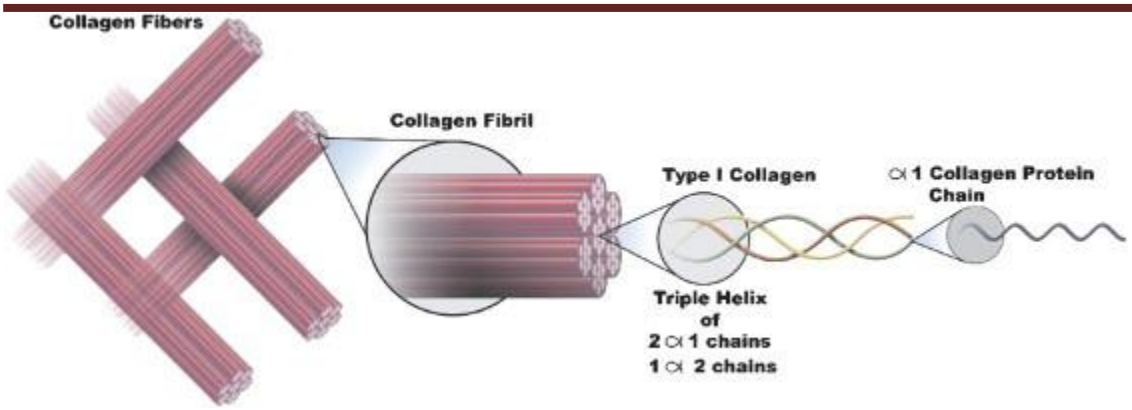
COLLAGEN WOUND DRESSING

Collagen, which is produced by fibroblasts, is the most abundant protein in the human body. A natural structural protein, collagen is involved in all 3 phases of the wound-healing cascade. It stimulates cellular migration and contributes to new tissue development.[53]

Collagen Formation in the Human Body

Mammals' bones, connective tissue, tendons, blood vessels, and skin all contain collagen, which makes up 25% of their total protein composition. Collagen and other proteins, including elastin, combine to produce the skin's fundamental, malleable, and flexible matrix, which includes blood vessels, sebaceous glands, live dermal cells, and other extracellular matrix components (glycosaminoglycans, glycoproteins).Three helical protein chains are synthesized inside a fibroblast cell to produce a super, triple-helical procollagen molecule, which is subsequently released into the extracellular space to form each collagen molecule in the dermal extracellular matrix. The chains go through proteolytic processing in the extracellular environment, which enables them to spontaneously form bigger, more intricate fibrils that are held together by covalent cross-links. The tensile strength of the skin, which supports all of the specialized structures in the skin, is provided by the enormous, cross-linked bundles of collagen. The inherent activities of the organs that use collagen as a structural protein are maintained by the body's maintenance of the different superstructures of collagen. Numerous scientific studies show that collagen's chemotactic qualities rely on maintaining its natural structure. For instance, fibroblasts have integrin receptors that can identify domains of native, intact collagen and fibronectin molecules.[54]

Figure 2: Organized Fiber Bundles Constituting Collagen.



Types of Collagens in the Skin and Wound

The most prevalent type of protein in the body is collagen. Cells like fibroblasts produce these collagens in the healing wound and alter them into intricate shapes.[55] The tensile strength of the healed skin is determined by changes in the type, quantity, and organization of collagen in the wound. Collagen I, the predominant skin collagen, takes the place of collagen III, which is the first to be generated during the early phases of wound healing. The covalent cross-linking caused by the lysyl oxidase enzyme further enhances the initial random deposition of collagen during the creation of granulation tissue. This process matures the collagen into complex structures that are reoriented for tensile strength restoration. Collagen remodeling continues for months after wound closure and the tensile strength of the repaired tissue increases to about 80–85% of normal tissue if all processes proceed without any perturbations.[56]

The most prevalent collagens in the skin are fibrillar collagens I, III, and V, which are followed by collagens XII, XIV, XVI, and VI that are related with fibrils. The skin's basement membrane contains the non-fibrillar collagens type IV and XVIII.[55]

Roles for Collagen in the Skin and Wound

Collagen serves as a natural foundation for cellular adhesion, proliferation, and differentiation and adds to the mechanical strength and suppleness of tissues.[57] A collagenolytic environment is produced in the wound by biofilm-mediated activation of MMP-2 via microRNAs, which significantly lowers the collagen I/collagen III ratio and jeopardizes the biomechanical characteristics of the repaired skin, potentially leaving it susceptible to wound recurrence.[58]

Role in Inflammation

The inflammatory phase of wound healing includes both inflammation and hemostasis. The clotting cascade, which creates a fibrin clot to stop the initial bleeding, is triggered by injury-induced collagen exposure. Collagen I and IV fragments can act as mediators of inflammation by acting as potent chemoattractants for neutrophils, increasing phagocytosis and immunological responses, and changing gene expression. Inflammation encourages the development of fibroblasts, which create collagen and extracellular matrix, and is an essential phase in the natural healing of wounds. Prompt inflammatory resolution is equally important in proper wound healing. The dynamic process of inflammation resolution is driven by balanced pro- and anti-inflammatory responses.[59]

Role in Angiogenesis

A vital part of both pathological (cancer) and physiological (development, wound healing) processes, angiogenesis is strictly controlled by the balanced action of stimulators and inhibitors. Collagen is a key component of ECM remodeling, which offers vital support for vascular growth. Collagen may act as an angiogenesis promoter or inhibitor, depending on its kind. By binding to particular integrin receptors, collagen I is known to strongly promote angiogenesis both in vitro and in vivo. In particular, endothelial cells are drawn to the collagen I C-propeptide fragment, which may initiate angiogenesis in the area that is healing.[60]

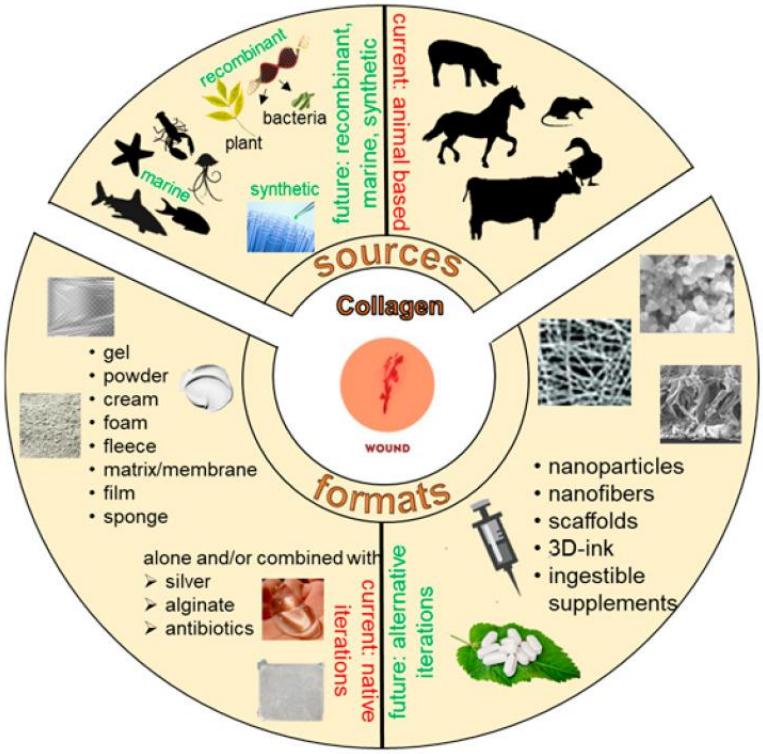
Role in ECM Remodeling

Collagens are a structural element of the extracellular matrix (ECM) that stabilize growth factors, control cell adhesion, and facilitate communication between cells and the ECM, all of which contribute to the flexibility of the skin. The adult wound heals with the production of a "normal" scar by the remodeling of the wound tissue over the course of years. Although it may not work as well, the scar tissue recovers between 50 and 80 percent of its initial tensile strength. The density, size, and direction of the collagen fibrils seem to be the primary distinction between scarred and unwounded skin.[61]

Collagen Formats and Applications in Wound Healing[62]

When the usual progression through the wound healing phases is disrupted, chronic wounds are created. These wounds require proper management in order to fully heal. Persistent inflammation, increased ECM component degradation from higher MMPs, and inappropriate activation of soluble mediators of the wound healing process are important components of the hostile environment of a chronic wound. Collagen has been used as an adjuvant wound therapy to aid healing since it is a key regulator of numerous of these processes. Collagen-based biomaterials have been utilized for wound dressings for a number of reasons, including biocompatibility, minimal immunogenicity, ease of application, and the capacity to attract cells that are responsive to wound healing (fibroblasts, macrophages, etc.). Conventional collagen sources are usually derived from pigs, horses, birds, or cows. The usage of collagen products derived from animals has several serious drawbacks, such as the potential for allergic reactions, the spread of prion illnesses (such bovine spongiform encephalopathy), and microbial contamination. Additionally, the use of tissue produced from cows and pigs is subject to religious restrictions in some societies. As a result, other natural (marine) or artificial (recombinant human collagen derived from plant or bacterial material) collagen sources have been explored.

Figure 3: Sources and formats of collagen for wound healing applications.



Applying collagen as an adjuvant therapy to wound healing may help the wound heal by: (i) serving as a substrate to facilitate the migration of important cellular components of wound healing; (ii) serving as a decoy or sink for the raging MMPs and other enzymes in the wound, reducing inflammation and restoring progression into the reparative stages; or (iii) promoting a proangiogenic, anti-inflammatory environment to heal the injury..

Collagen Wound Dressings

Numerous tests have been conducted on the use of collagen in wound healing. They have served as scaffolds or matrices for soft tissue repair, hemostatics, tissue engineering, and, more recently, drug delivery. Alginate, chitosan, elastin, silk fibroin, polyethylene oxide, hyaluronic acid, and other natural and synthetic polymers are mixed with collagen to create collagen wound dressings. These blended fabrications, which have been studied primarily in in vitro experiments or small animal models of wound healing, have included additional components like insulin, antibiotics, or gold nanoparticles. The market offers a wide range of collagen wound dressing formulations, including amorphous gels, sheets, or powders, when combined with other substances (such as silver for antimicrobial properties, or ethylenediaminetetraacetic acid (EDTA),

carboxymethyl cellulose (CMC), or alginate, also known as collagen enhancers). Collagen in the form of sponge or fleece has been tried as a cell-free matrix that stimulates the development of new tissue in a small research. Collagen particles or powders are active as signaling molecules when administered and have less covalent cross-linking.

In scaffolds and matrices, collagen is frequently applied as a surface coating to improve moisture retention and encourage cell adherence. In order to maintain the moistness of the wound bed, water retention is crucial. In in vitro experiments, the arginine-glycine-aspartic acid (RGD) sites on collagen bind cell integrins and encourage fibroblast and keratinocyte motility and cell adhesion. In comparison to a standard of care dressing, a collagen-coated scaffold implanted in a rat burn wound model demonstrated quicker wound re-epithelialization and healing.

A recent review examined the technological processing of collagen tissues to hydrolyzesates and then rebuild them into forms for clinical usage.

Collagen nanostructures have gained a lot of attention in recent years. Made of collagen that has been shrunk to the size of nanoparticles, nanocollagen is a relatively novel substance. The surface area-to-volume ratio is larger at this nanoscale. The main method for creating biocompatible nanocollagen fibers is electrospinning. The potential of collagen nanoparticles as therapeutic drug delivery vehicles has been investigated. For instance, in vitro testing revealed that a gold-loaded hydroxyapatite collagen nanostructure enhanced cell adhesion, growth, and proliferation. One major benefit of nano collagens is their ability to provide therapeutic elements locally utilizing a substance that is stable and compatible with the wound's tissue milieu. One limiting element is the lack of understanding and research on these nanoparticles, which calls for more thorough investigation.

Recombinant Human Collagen

Using collagen derived from other sources helps mitigate the dangers associated with using collagen derived from animals. The scaffold characteristics of plant-derived human collagen (PDHC), which is usually recombinant human collagen produced in plants like tobacco, are comparable to those of wild-type human collagen. Numerous PDHC formulations, including gel, matrix, electrospun scaffolds, and lyophilized sponges, have been developed and evaluated through experimentation.

The need for post-translational proline hydroxylation in recombinant human collagens derived from non-animal sources may be an issue that restricts their large-scale manufacturing. In an attempt to develop large-scale production techniques, constructs were created in a recombinant E. coli system following the identification of collagen-like proteins, Scl1 and Scl2, from Streptococcus pyogenes. Collagens made from bacteria are a biosynthetic starting point that allows for the manipulation of non-animal collagen that lacks particular bioactivity to achieve desired interactions. This system's chondrogenic capacity was demonstrated in a test using human mesenchymal stem cells.

Marine Collagen

Numerous marine sources, including squid, sponges, jellyfish, and fish skin, have been used to extract collagen I. Collagen I generated from marine sources has been demonstrated to accelerate wound healing in both clinical and experimental (rodent models) settings. The abundance of material that would normally be regarded as "waste products" in the fish processing industry can be recycled into collagen-based wound dressings and derivatized into dietary supplements for sugar and weight control, making the marine source of collagen advantageous.

Percutaneous Collagen Induction

Subcision, a minimally invasive technique for treating scars, was first shown in 1995. It involves using incredibly thin needles to break down dermal collagen, which causes dermal remodeling and skin resurfacing. Today, this technique is referred to as percutaneous collagen induction (PCI) or microneedling. In order to start the release of growth factors that cause the production of collagen I and elastin, the microneedles pierce the skin's outer layers into the papillary dermis. In small cohort clinical studies, this technique has been used to treat alopecia, scars, acne, face rejuvenation, pigmentation problems, etc.

Hydrolyzed Collagen

In contrast to the native form, low molecular weight (3–6 KDa) peptides with distinct physicochemical and biological characteristics can be produced by denatured and hydrolyzed native collagen using acids, alkali, or heat treatment (with enzymatic digestion). The benefits of hydrolyzed collagen (HC) are its high solubility, ease of absorption and distribution within the body, affordability, ease of emulsification, and stability for use. One drawback, though, is that in order to create scaffolds or films, HC must be mixed with other biopolymers, such as cellulose or

chitosan, unlike the natural form. It's interesting that HC possesses antibacterial and antioxidant properties. It has been demonstrated that HC hydrogel formulations exhibit antibacterial action against Staphylococcus aureus and Escherichia coli.It has also been demonstrated that these preparations aid in the migration and proliferation of cells as well as the healing of burn wounds. It was demonstrated that HC exhibited both biomechanical and antibacterial qualities in electrospun nanofibrous scaffolds.

Collagen Bioink

The development of wound treatments that can address the problems associated with conventional wound dressings—such as the need for frequent dressing changes and adherence to wound tissue that makes dressing changes uncomfortable—is made possible by three-dimensional (3D) bioprinting, an evolving adaptive manufacturing technique. Cell-laden hydrogels, also known as bioinks, are combined with motorized devices in the bioprinting process to produce intricate structures that can be precisely tailored to the patient or circumstance. The first successful attempt to create a skin implant was a 3D-printed human skin construct in 2009 that included collagen I along with fibroblasts and keratinocytes.

Because of its low immunogenicity, biocompatibility, and history of usage in clinical practice, collagen bioinks are currently the most widely used material for 3D engineering. With limited in vitro and in vivo (small animal models) testing, collagen I—the most prevalent type used to make bioinks—has been employed in laboratory-based bioprinting of skin, bone and cartilage, cardiovascular tissues, liver, nerve regeneration, and cornea.

REVIEW OF RELATED ARTICLES

Dr,. Narayanathu Chellappantilla, in 2015[68] "Comparative study of collagen and paraffin gauze dressing on skin graft site" published in India journal of Burns in that he concluded that the reduction of pain is highest for first 3 days and then gradually diminishes, and found minimal effect on epithelization.

Ramesh BA et al (2017)[70] in their study they compared collagen dressing with petroleum gauze dressing in control of post-operative pain on skin graft donor area. They concluded that the collagen sheet dressing on skin graft donor area reduces pain in post-operative period.

Njraj kumar et al., in 2018[67] "Comparing collagen dressing with the Vaseline gauze dressing over split skin graft donor site" with 40 samples , has been concluded that collagen is easy to apply, reduces pain, less soakage, and fast healing.

Pancy Sonia Moses, Shrad Gova in 2019[66] "comparative study between collagen and simple Paraffin dressing applied on skin graft with special emphasis on Vancouver scar scale and patient and observer scar assessment scale" with the samples of 60 had been concluded that collagen application to donor site wound is better than simple paraffin dressing in relation to early wound healing with better scar results and patient comfort.

Tushar J. Dave et al., in 2021[65] "A retrospective study of comparison of collagen dressing. Versus conventional dressing for skin graft donor site" with 30 samples he concluded that the collagen dressings as low pain and less scar.

Dr. Narinder Singh, et al (2022)[63] "Comparative study between collagen dressing and conventional dressing in skin donor site healing" with 30 samples, included the collagen significantly reduces the reduces the pain and promotes fast healing.

Jain, A et al (2022)[64] In their prospective interventional study, they examined the effects of biological dressings with collagen sheets and conventional dressings with petroleum jelly-impregnated gauze on skin graft site discomfort, infection, and healing. They came to the conclusion that collagen sheet dressings are simple to use and offer the benefits of reduced donor site pain and infection risk. Additionally, it takes less time to recover than vaseline gauze dressings. Overall, collagen sheet dressing is more clinically effective.

Dr. Mahendra Bendre et al., in 2022[69] "Role of collagen dressing over Donor Site in case of split skin Grafting" published in European Journal of Molecular and clinical Medicine has been concluded that collagen dressing show better result than betadine dressing.

RESULTS

MATERIAL AND METHODS

- **Study design:** Prospective intervention study
- **Study area:** Department of General Surgery, BLDE (DU) Medical College Hospital and Research Center.
- **Study period:** Research study was conducted from March 2023 to March 2025. Below is the work plan.

Table 1: Work plan of the study with percentage of allocation of study time and duration in months

Work plan	**% of allocation of study time**	**Duration in months**
Understanding the problem, preparation of questionnaire.	5-10%	March 2023 to July 2023
Pilot study, Validation of questionnaire, data collection and manipulation	Upto 80%	August 2023 to September 2024
Analysis and interpretation	5-10%	October 2024 to December 2024
Dissertation write-up and submission	5-10%	January 2025 to March 2025

- **Sample size**: 100

Dr. Mahendra Bendre et al., Role of collagen dressing over Donor Site in case of split skin Grafting. European Journal of Molecular and clinical medicine, 2022; 9(8): 2908-2914. The anticipated Mean±SD of post-operative pain score in collagen dressing 0.03±1.83 and in betadine dressing 0.43±0.568 resp. (ref) the required minimum sample size is 50 per group (i.e. a total sample size of 100, assuming equal group sizes) to achieve a power of 80% and a level of significance of 5% (two sided), for detecting a true difference in means between two groups.

$$N = 2\left[\frac{(Z_{\propto} + z_{\beta}) * S}{d}\right]^2$$

$Z_{\propto}$ Level of significance=95%

Z_{β}--power of the study=80%

d=clinically significant difference between two parameters

SD= Common standard deviation

- **Inclusion criteria:**

1. All patients who are undergoing for Grafting related surgeries included Healing ulcers in BLDE (DU) medical college and research centre, Vijayapura at Department of General Surgery.

- **Exclusion criteria:**

1. Patient is not fit for surgery.
2. Patient having skin Diseases and Malignancy.

METHODOLOGY

The study was designed as a intervention, prospective clinical investigation comparing conventional skin graft donor site dressings with collagen-based dressings. The research protocol was approved by the Institutional Ethics Committee and conducted in full compliance with the Declaration of Helsinki and Universal Safety Precautions.

Patient Selection and Recruitment

Patients requiring skin grafting procedures were consecutively screened and enrolled after providing informed written consent. The inclusion criteria comprised patients requiring skin grafts for burn reconstruction, traumatic wound management, or surgical reconstruction. Exclusion criteria included patients with immunocompromised conditions, active systemic infections, and those with known allergies to collagen-based products.

Study Design

Participants were randomly allocated into two equal groups using computer-generated randomization:

- Group A: Conventional wound dressing group
- Group B: Collagen dressing group

Standardized Procedures

All skin graft donor site procedures were performed by the same surgical team under standardized operational protocols. The donor sites were carefully prepared, cleaned, and prepared using identical antiseptic techniques. The harvesting method and graft procurement remained consistent across all participants to minimize procedural variations.

Investigations

The following standardized investigations were conducted for all participants:

1. Complete Blood Picture A comprehensive hematological assessment was performed at baseline, immediately post-procedure, and during follow-up visits. The complete blood count (CBC) included:
    - Hemoglobin levels
    - Total and differential leukocyte count
    - Platelet count
    - Erythrocyte sedimentation rate (ESR)
2. Infectious Disease Screening Mandatory serological tests were conducted to ensure patient and healthcare worker safety:
    - HIV screening
    - Hepatitis B virus (HBV) screening
    - Hepatitis C virus (HCV) screening (as an additional precautionary measure)
3. Renal function test and Random blood sugar and the Chest xray, ECG, 2D echo where ever it needed.

These tests were performed in accordance with Universal Safety Precautions, using standardized serological testing methods.

Wound Assessment and Monitoring

Wound healing was systematically evaluated using:

- Photographic documentation
- Wound surface area measurements
- Healing time assessment
- Pain scoring using standardized visual analog scales
- Infection detection protocols

Culture Testing

Wound swabs were systematically collected at predefined intervals to:

- Detect potential bacterial contamination
- Identify specific pathogens
- Guide appropriate antimicrobial interventions if required

Standard microbiological culture techniques were employed, including:

- Aerobic bacterial culture
- Fungal culture (if clinically indicated)
- Sensitivity testing for identified microorganisms

Follow-up Protocol

Participants underwent structured follow-up assessments at:

- POD-7
- POD-14
- 3 MONTHS

During each follow-up, comprehensive wound assessments, clinical examinations, and necessary investigations were conducted to track healing progression and detect any potential complications.

Data Collection and Analysis

All clinical data were prospectively collected, digitally recorded, and subsequently analyzed using appropriate statistical methods. Patient confidentiality was maintained throughout the research process.

Ethical Considerations

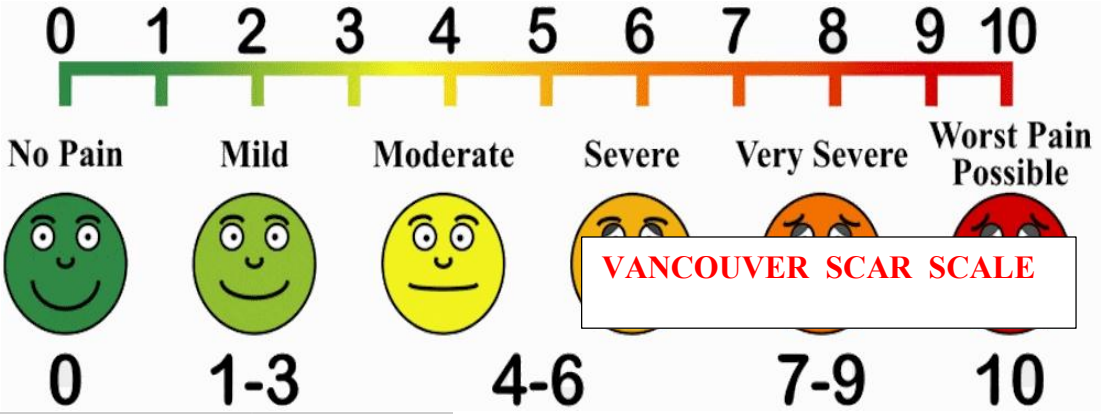
- No animal testing was conducted
- Universal Safety Precautions were strictly adhered to
- Patient anonymity and data protection were prioritized
- Informed consent was obtained from all participants

STATISTICAL ANALYSIS

Data was entered in excel sheet and analyzed using SPSS version 21. Results were presented in tabular and graphical forms Mean, median, standard deviation and ranges were calculated for quantitative data. Qualitative data were expressed in terms of frequency and percentages. Student t test (Two Tailed) was used to test the significance of mean and P value <0.05 was considered significant.

- Pain will be considere through VISUAL PAIN ANALOGUE SCALE and scar assesment will be done by VANCOOUVER SCAR SCALE.

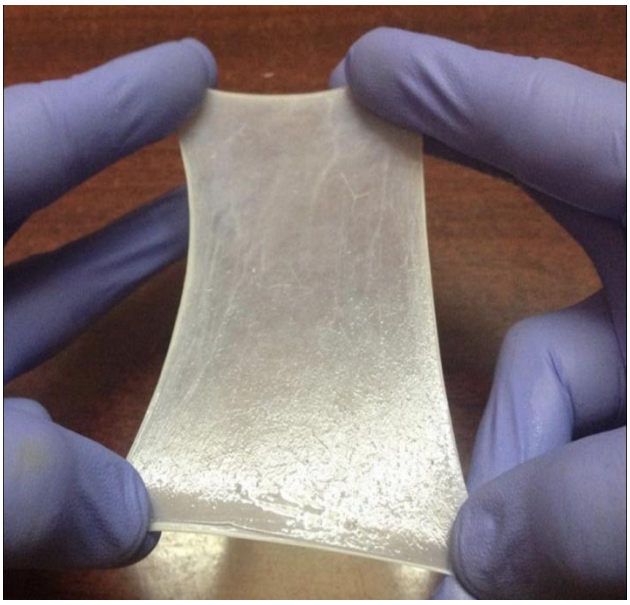
VISUAL PAIN ANALOGUE SCALE



VANCOUVER SCAR SCALE

Scar characteristic	Score
Vascularity	
Normal	0
Pink	1
Red	2
Purple	3
Pigmentation	
Normal	0
Hypopigmentation	1
Hyperpigmentation	2
Pliability	
Normal	0
Supple	1
Yielding	2
Firm	3
Ropes	4
Contracture	5
Height (mm)	
Flat	0
＜2	1
2～5	2
＞5	3
Total score	13

The images of collagen and paraffin gauze :



- **Collagen**:•

  The main component of the dressing is **collagen**, often derived from **bovine** (cow) or **porcine** (pig) sources, though synthetic versions are also available. Collagen promotes wound healing by stimulating the body's own cells to repair tissue and by supporting new tissue formation.

Hydrocolloids or Hydrogels:•

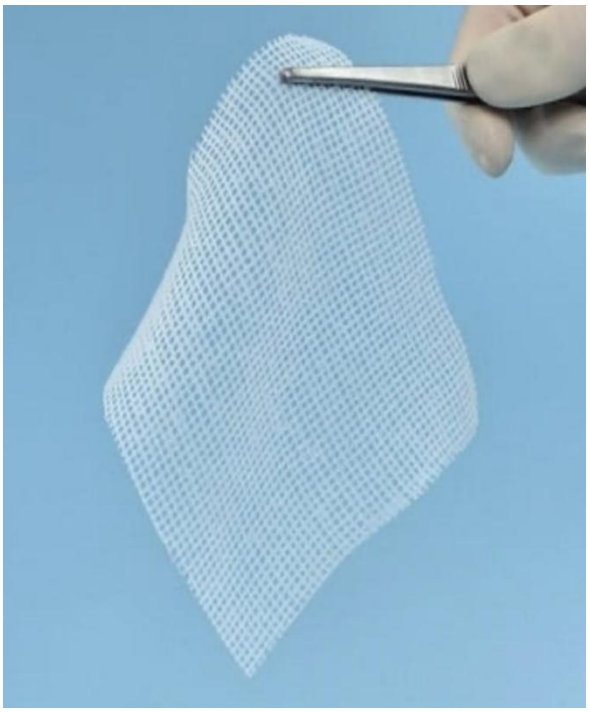
Many collagen dressings include a **hydrocolloid** or **hydrogel** layer to help maintain moisture in the wound bed. This is crucial for promoting faster healing and preventing the wound from drying out.

- **Glycerin**:•

  Some collagen dressings contain **glycerin**, a humectant that helps to keep the wound moist and promotes a healing environment.

- **Water**:•

PARAFFIN GAUZE **:**



Gauze or Fabric:

The base layer of the dressing is made from **woven or non-woven gauze**. This is typically made from materials like cotton or polyester.

Paraffin Wax:

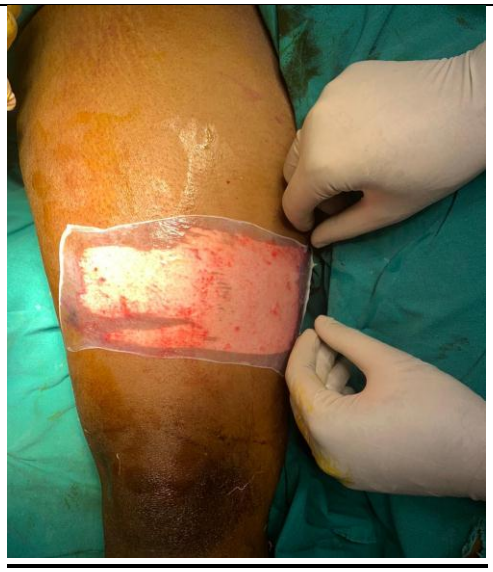
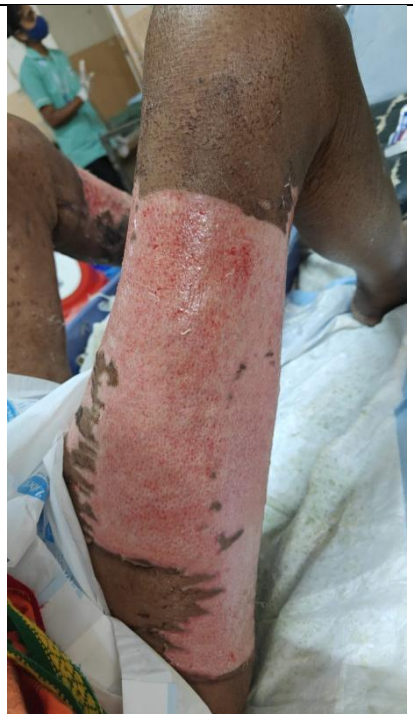
The gauze is coated with **paraffin wax**, which helps to keep the wound moist and creates a barrier between the wound and the external environment. This moisture-preventing the dressing from sticking to the wound, making it less painful when it is removed.

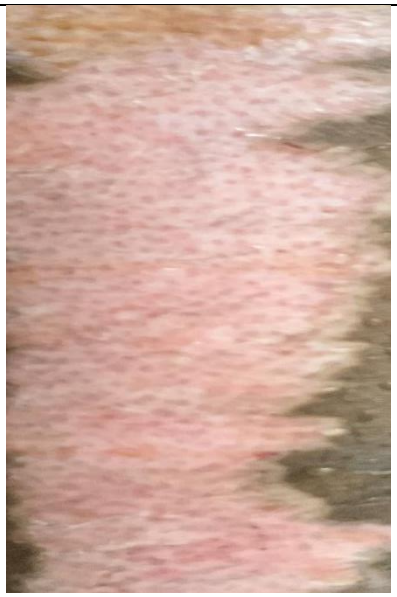
Petrolatum (Mineral Oil)

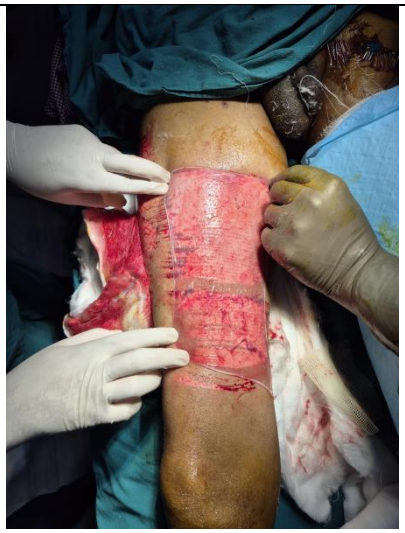
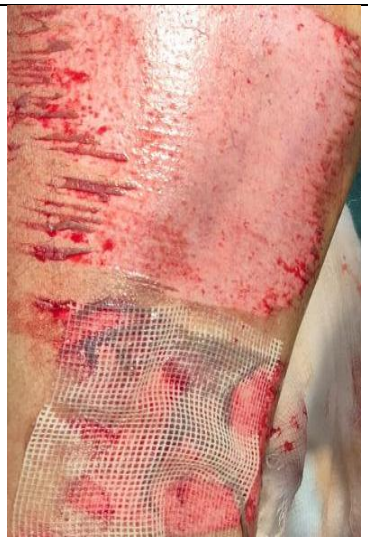
Sometimes **petrolatum** (a type of mineral oil) is included with the paraffin to provide additional moisture retention and a smooth, non-stick surface.

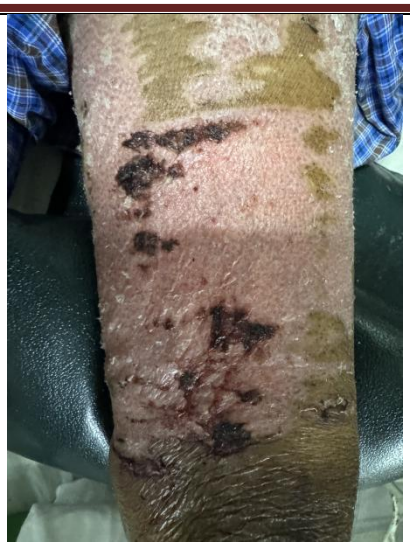
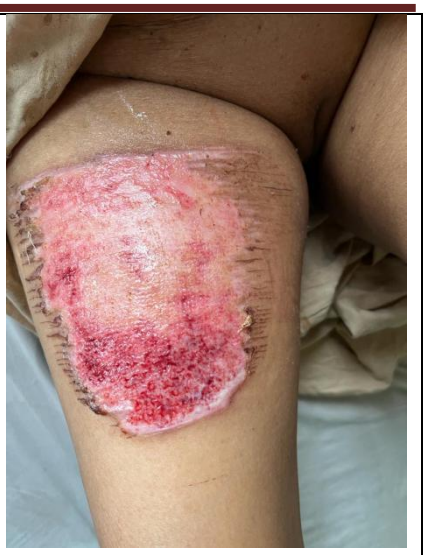
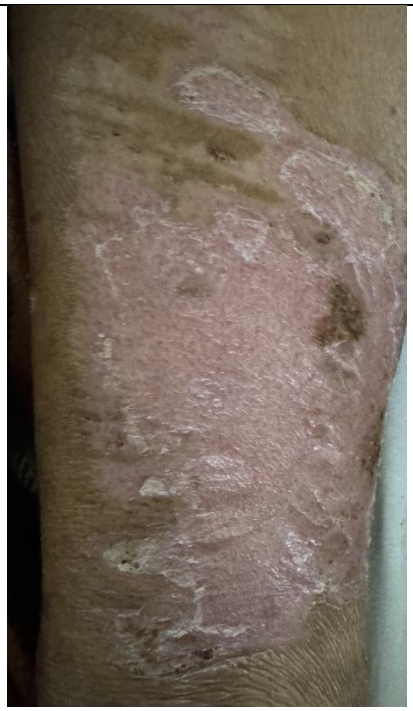
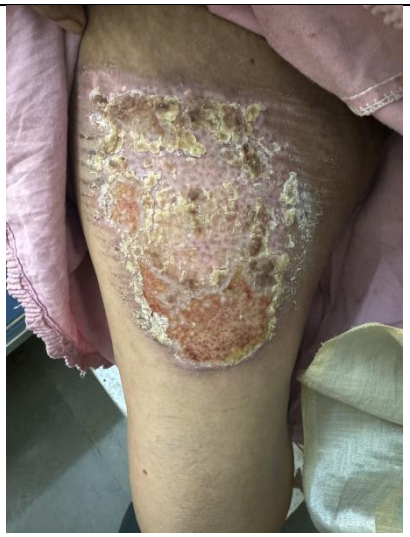
Sterile Components:

Paraffin gauze dressings are often **sterilized** to ensure they do not introduce infection into the wound.

	COLLAGEN	PARAFFIN GAUZE
Intra op pics		
POD-7		

	COLLAGN	PARAFFIN
3MONTHS		

	COLLAGEN	PARAFFIN GAUZE
Intra op pics		
POD-7		

POD-14		
3MONTHS		

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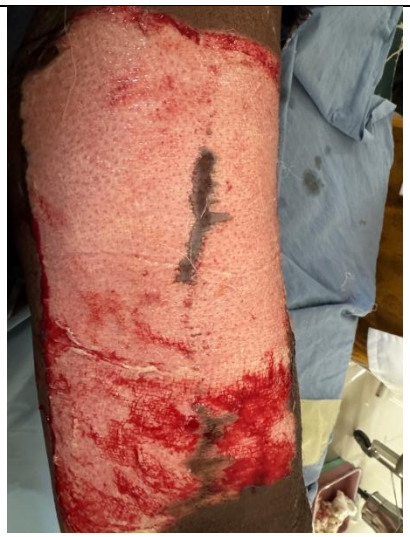
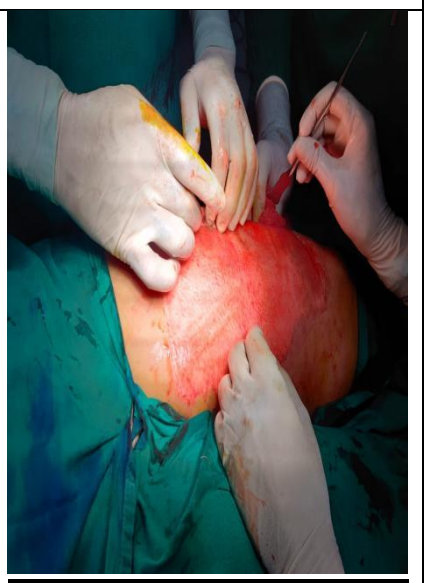
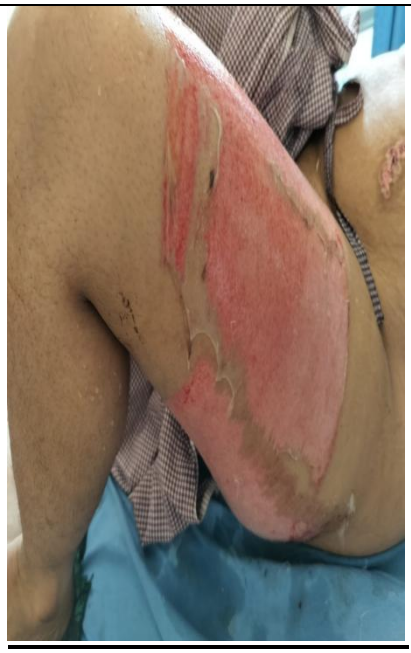
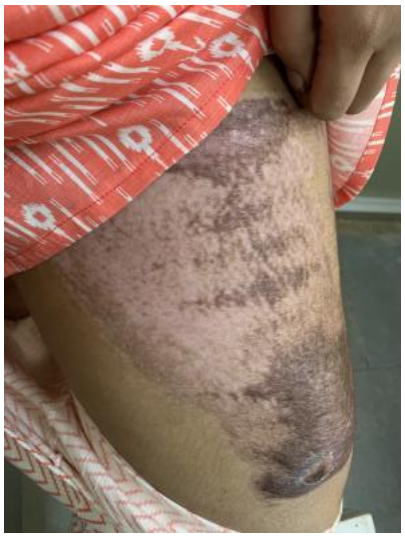
intra op		
pod-7		

	pod-14 	**3months** 

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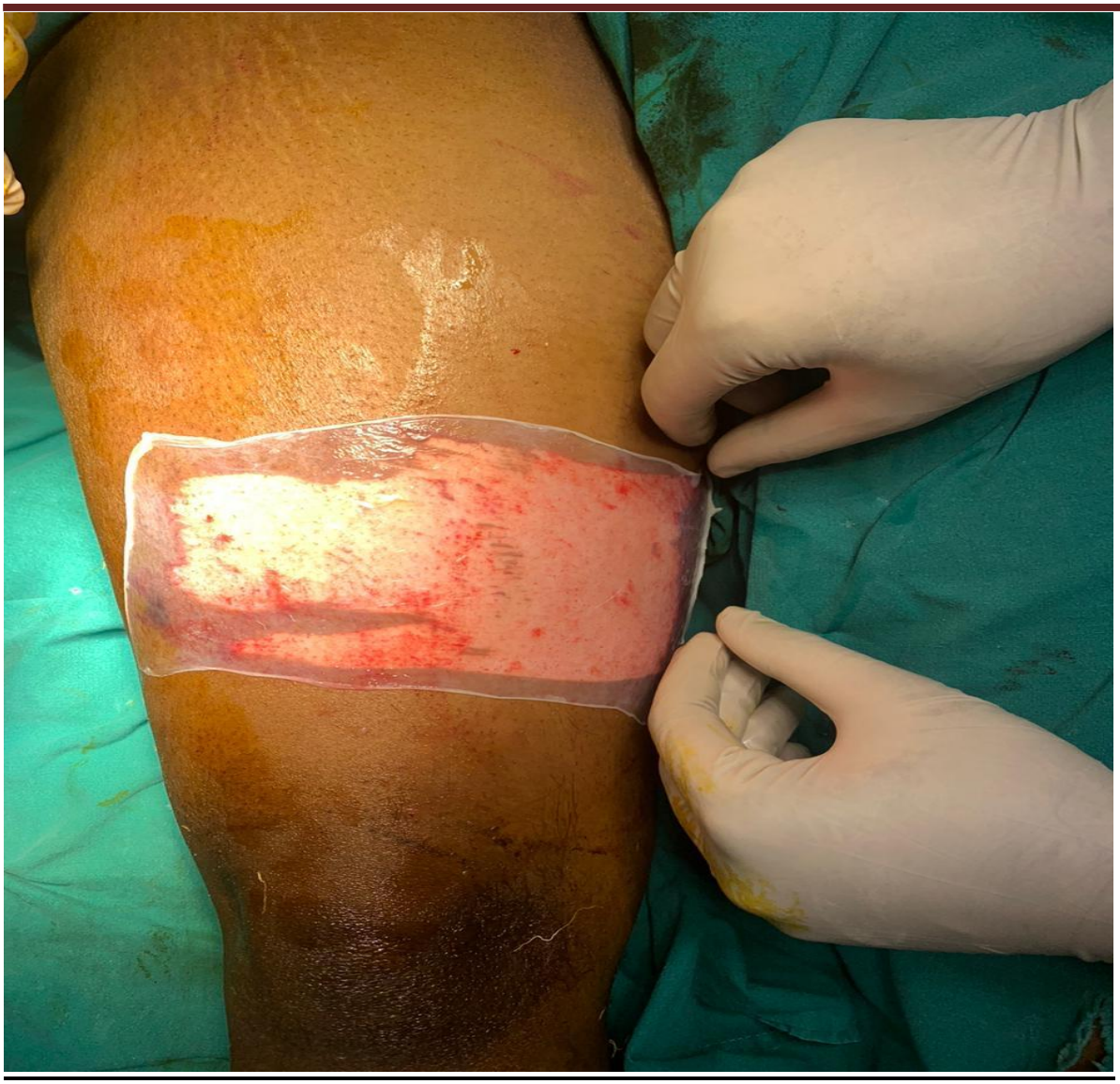
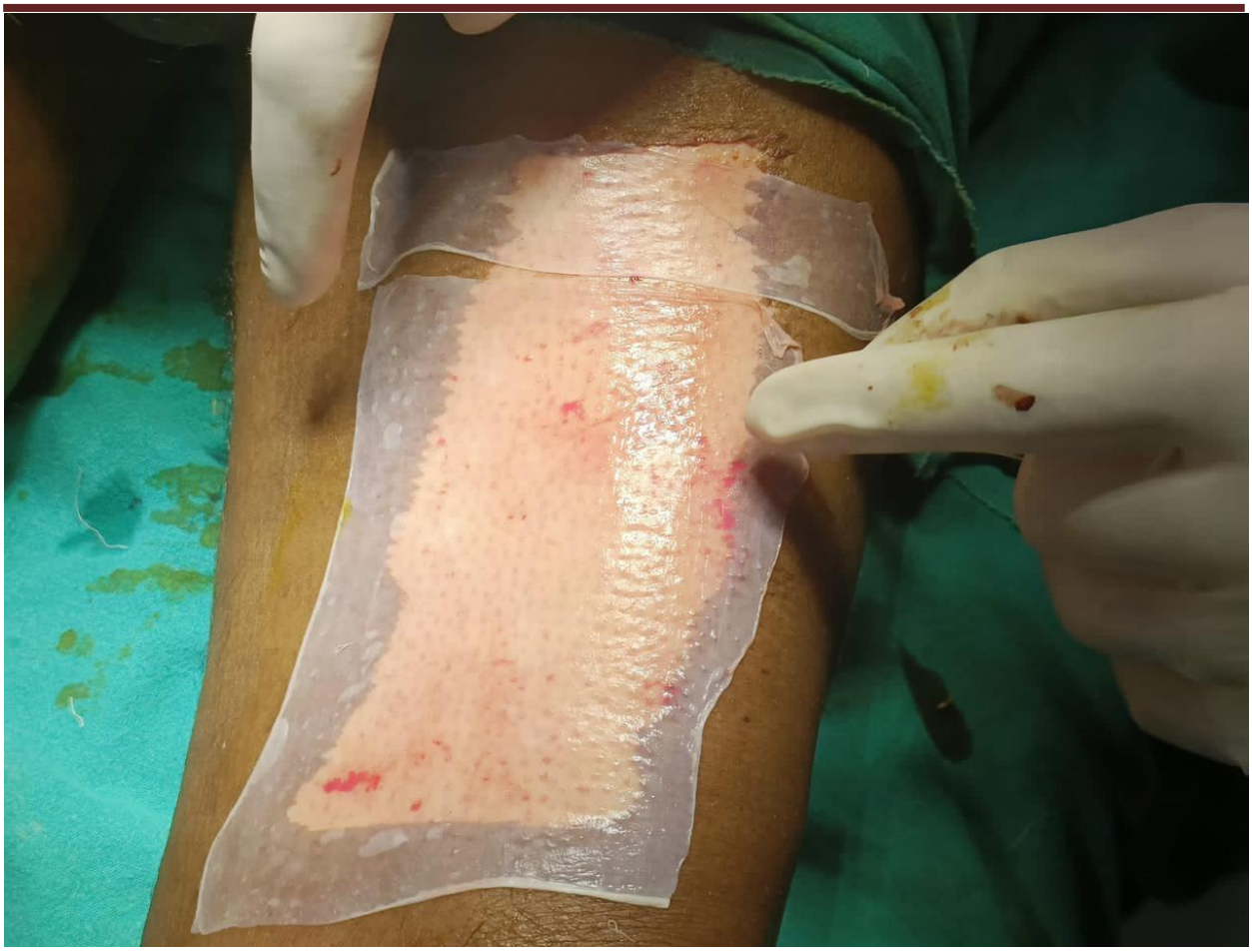
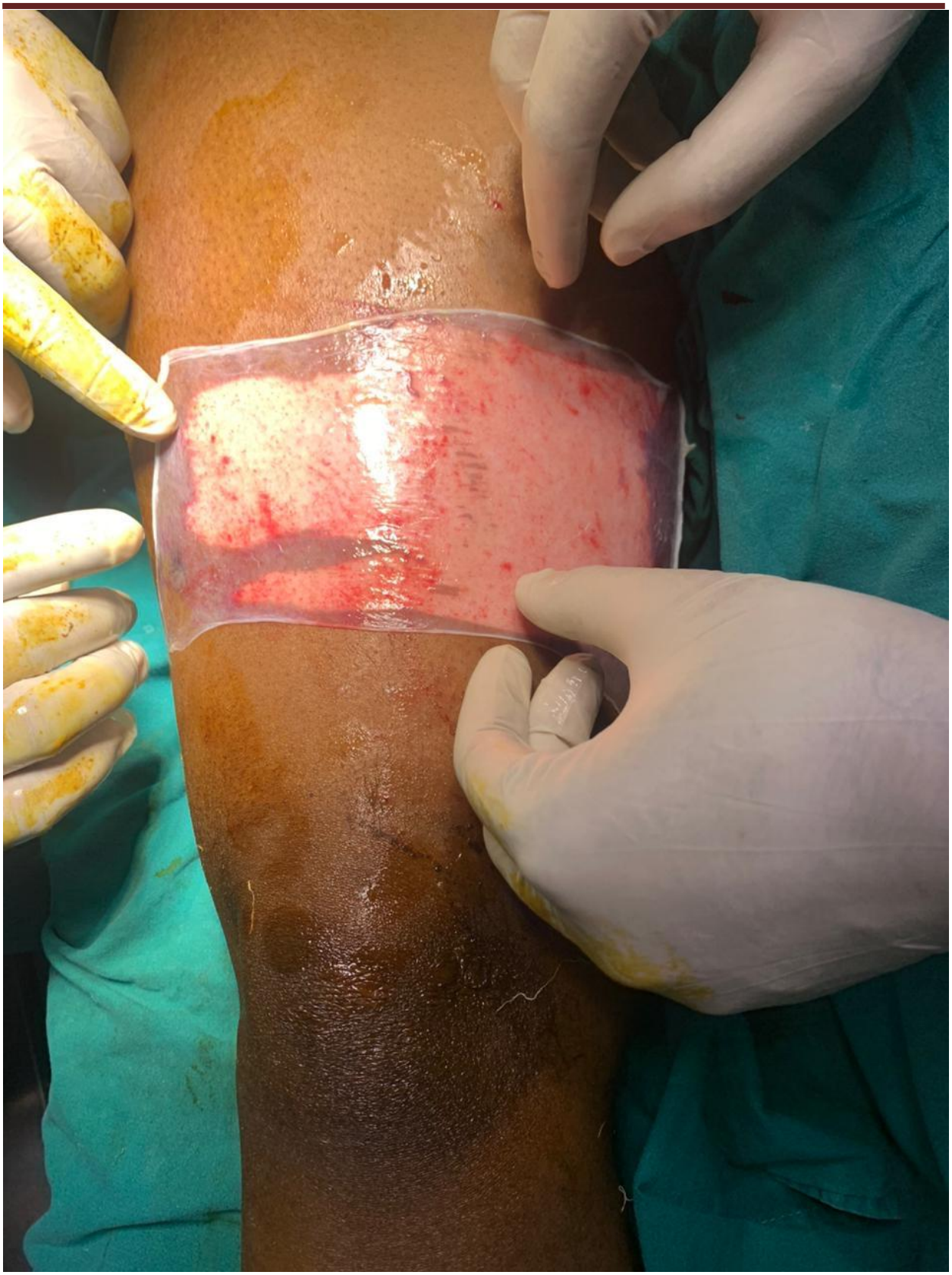
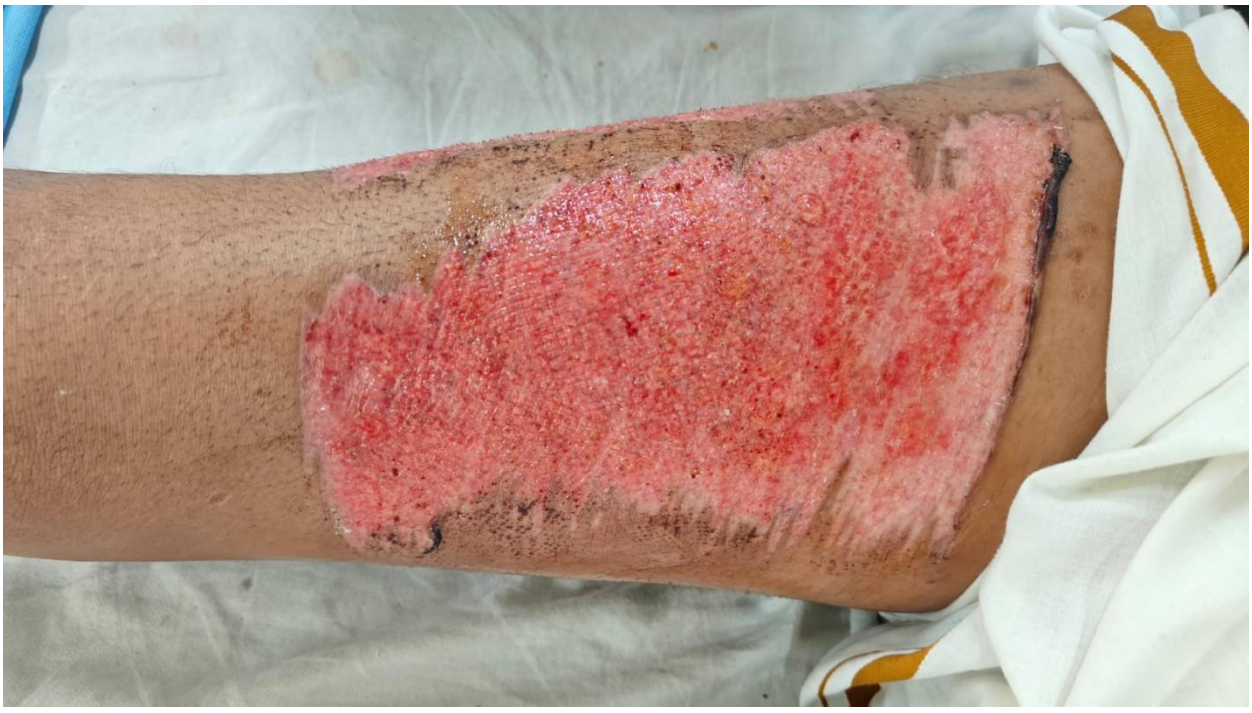
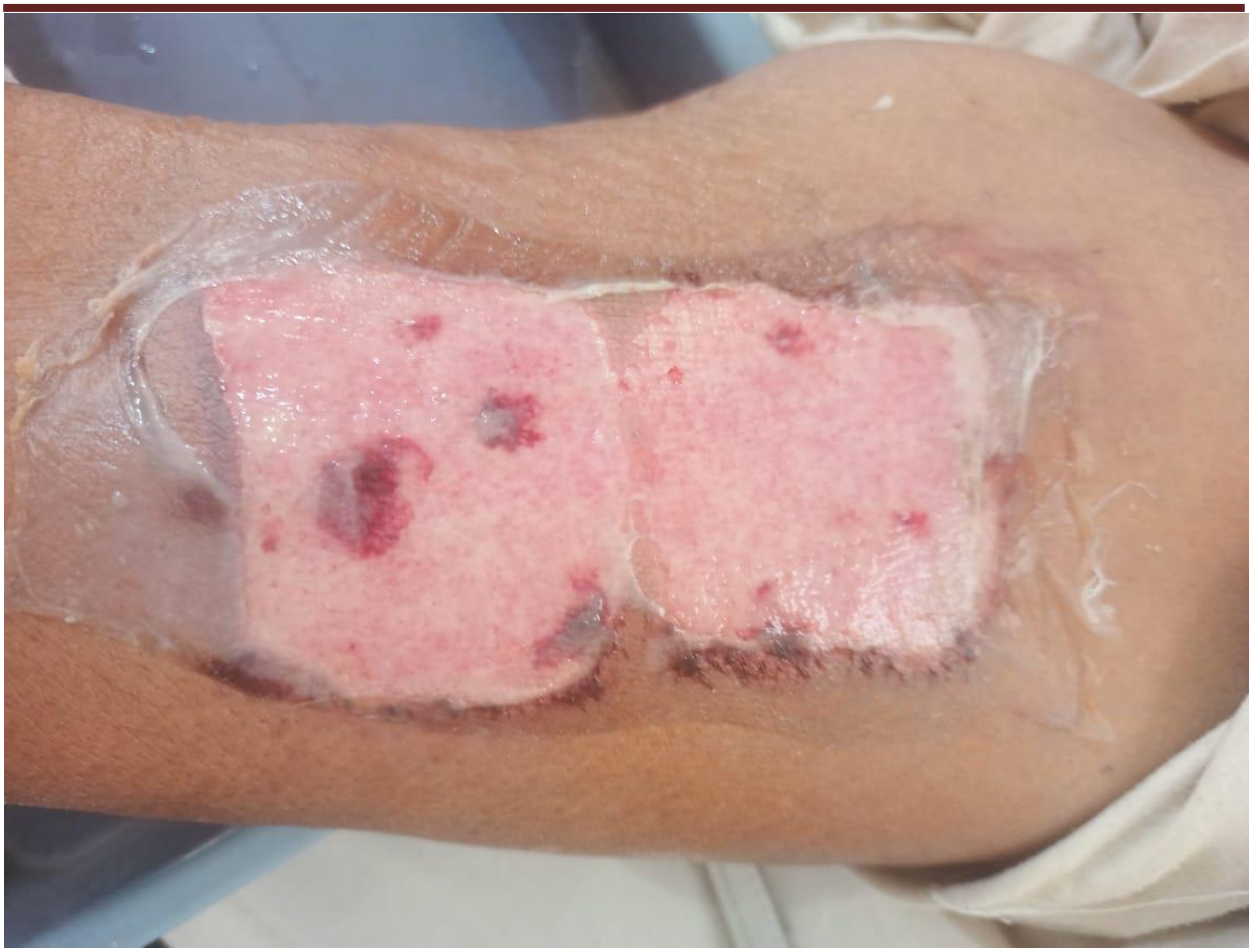




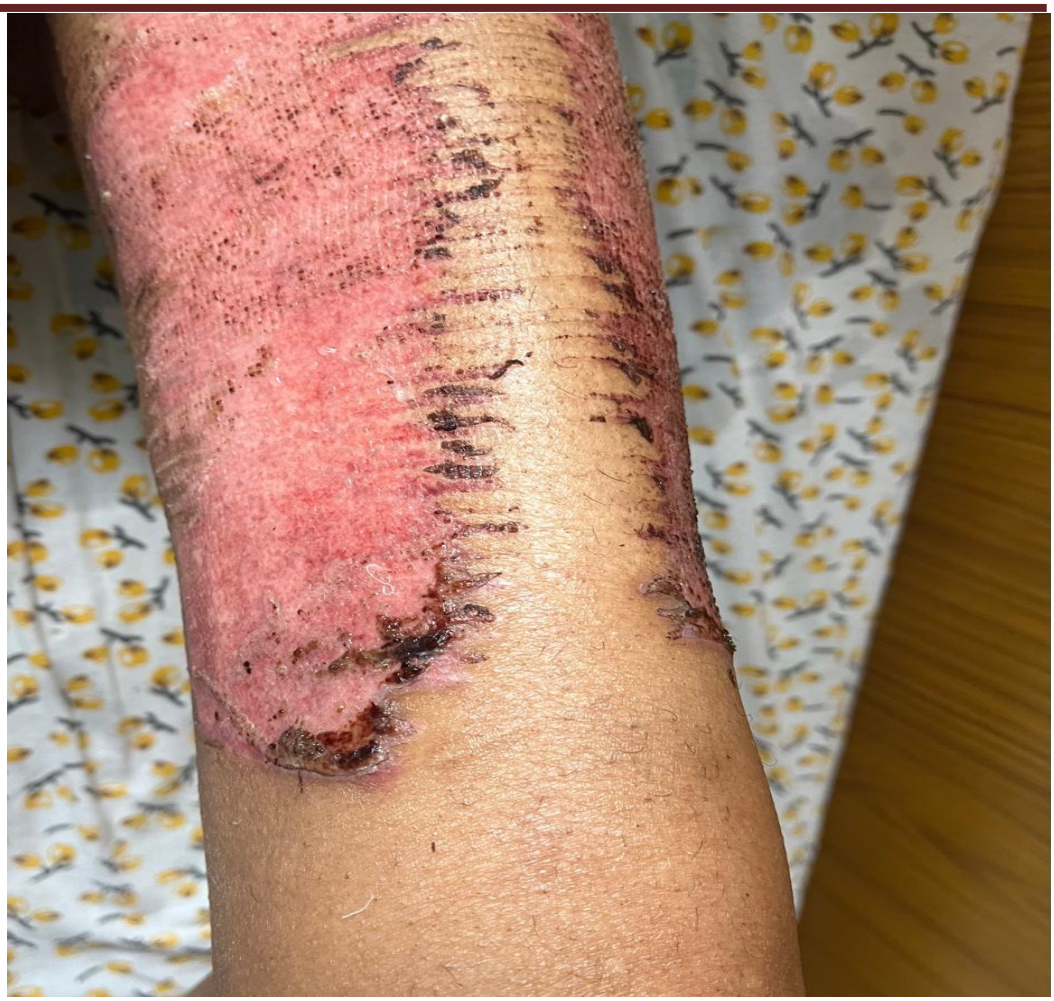




COLLAGEN DRESSINGS ON POD-7

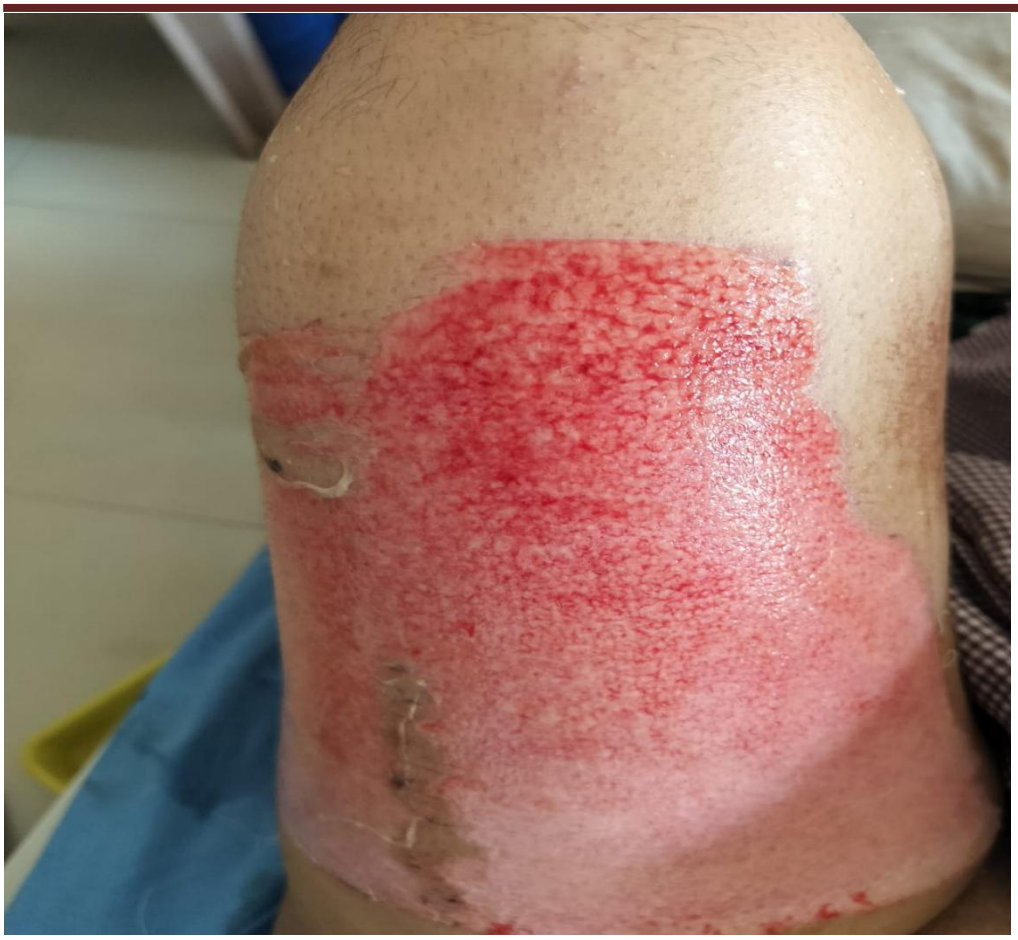


COLLAGEN DRESSINGS ON POD-7



CONVENTIONAL DRESSINGS

ON POD-7

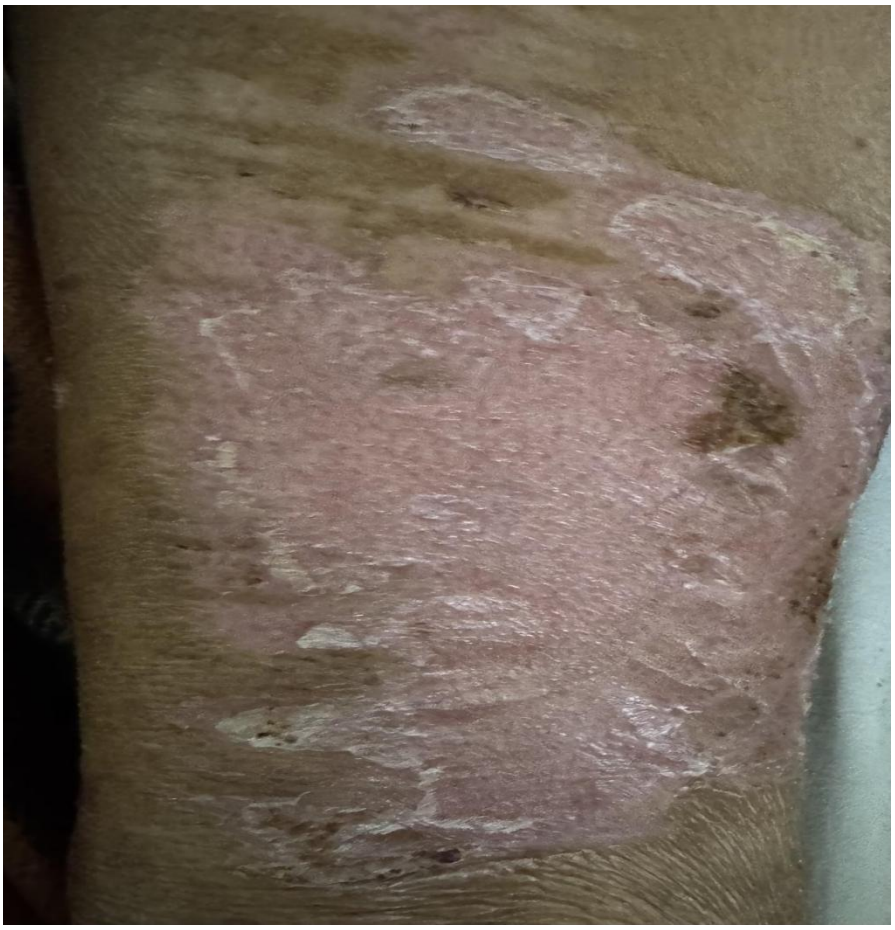


CONVENTIONAL DRESSINGS

ON POD-7

CONVENTIONAL DRESSINGS

ON POD-7



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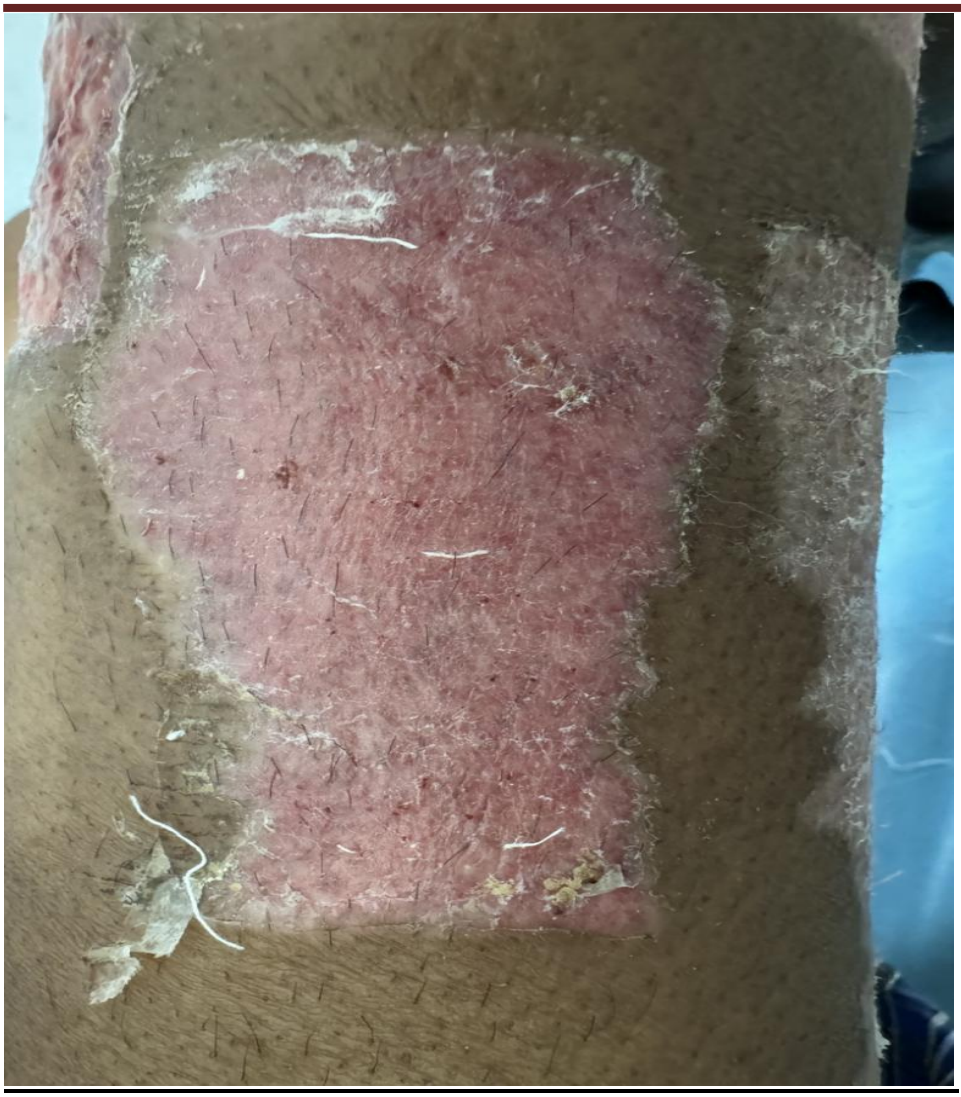

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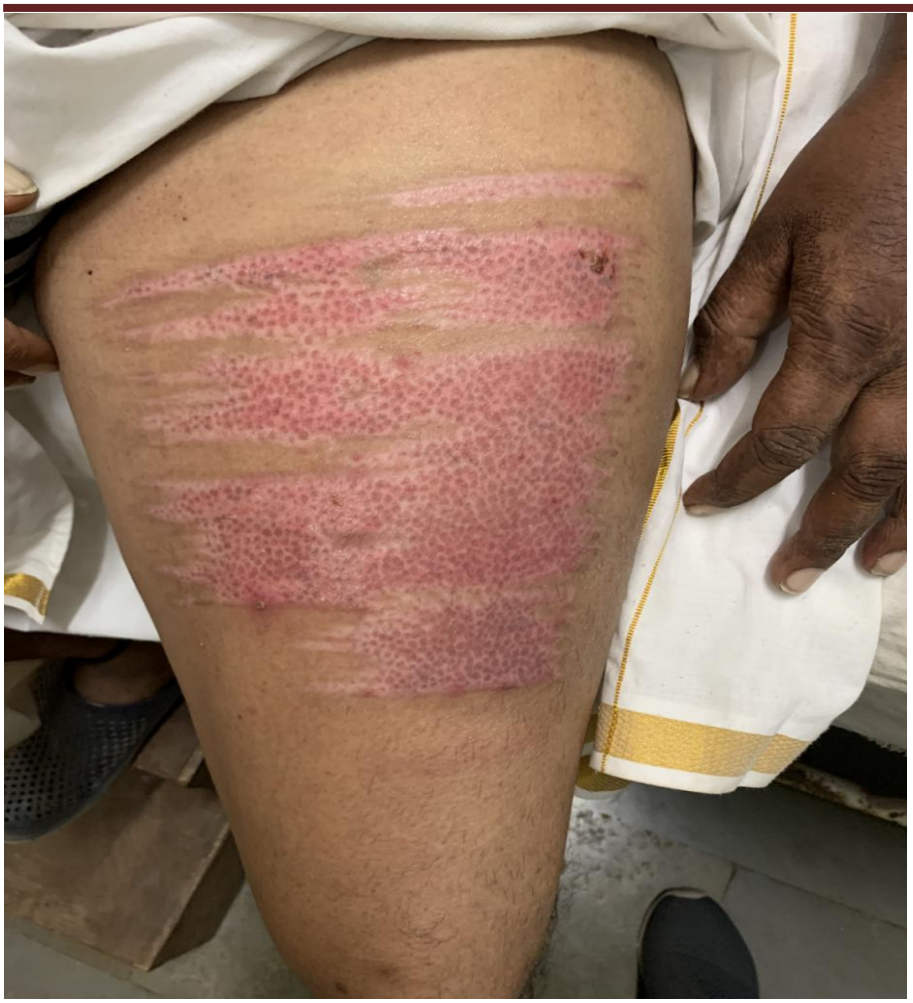

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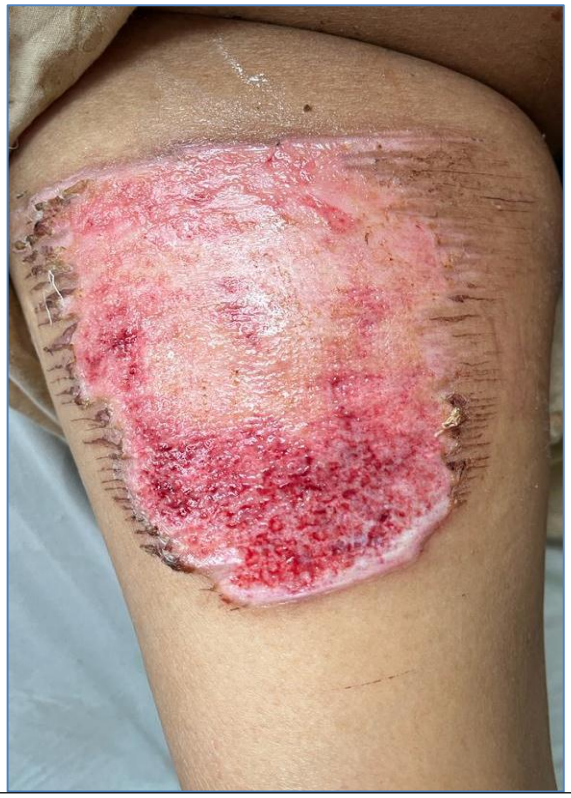

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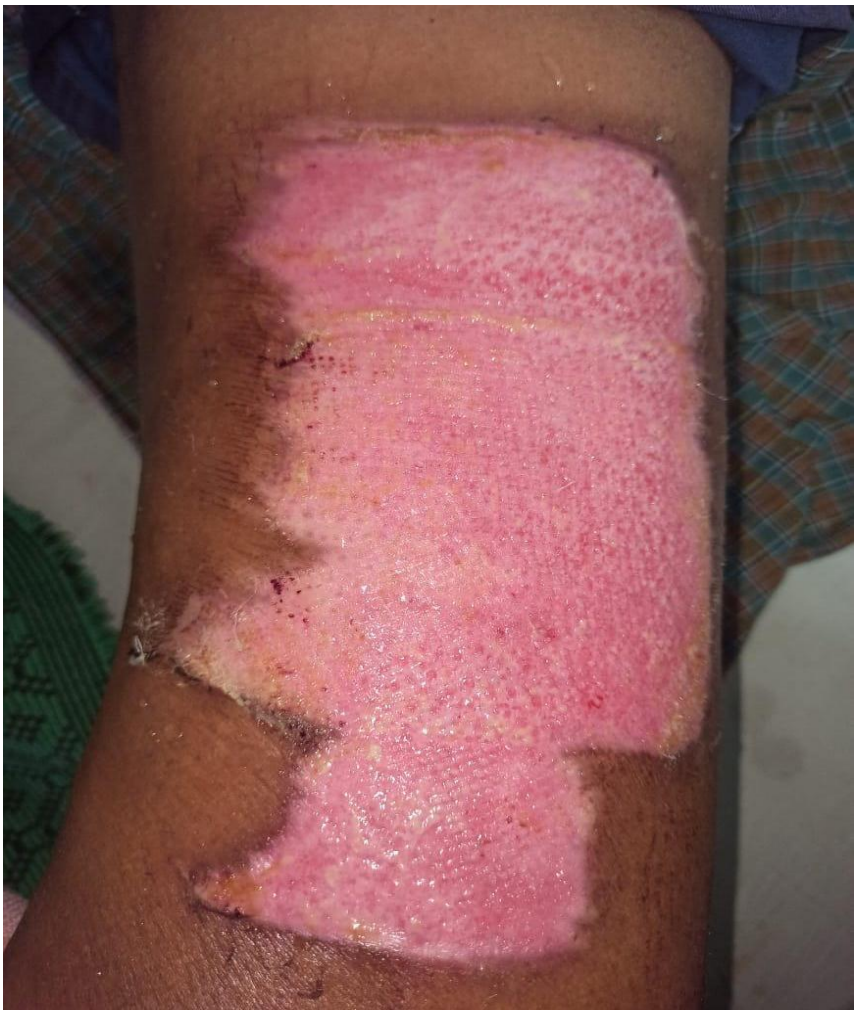
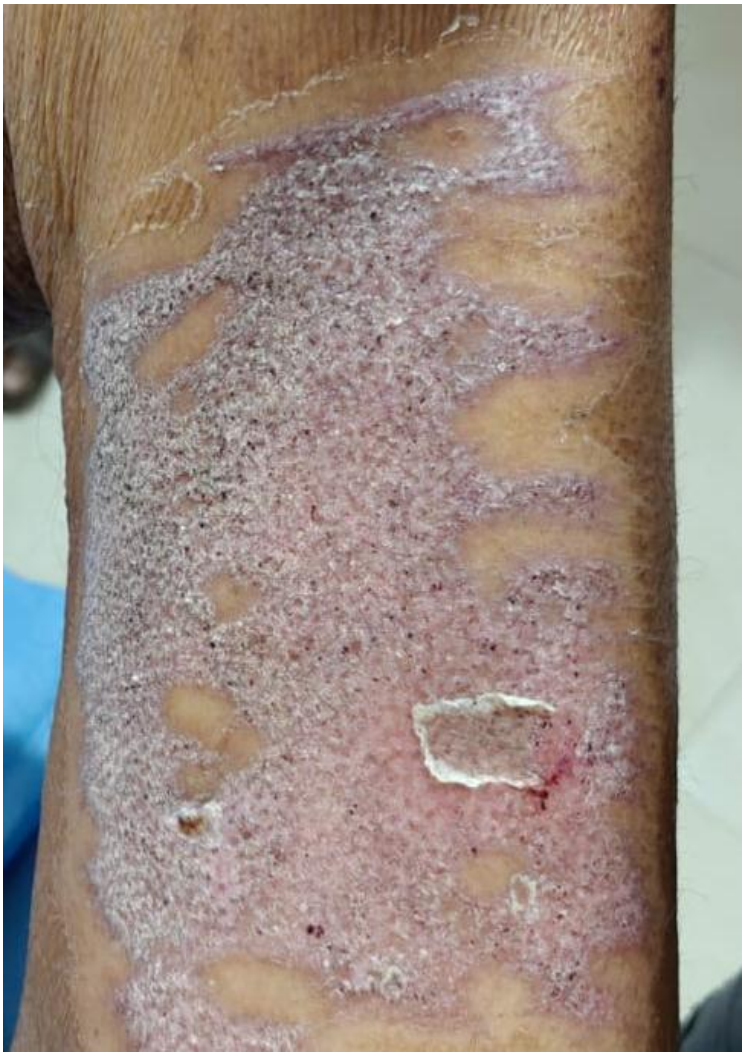
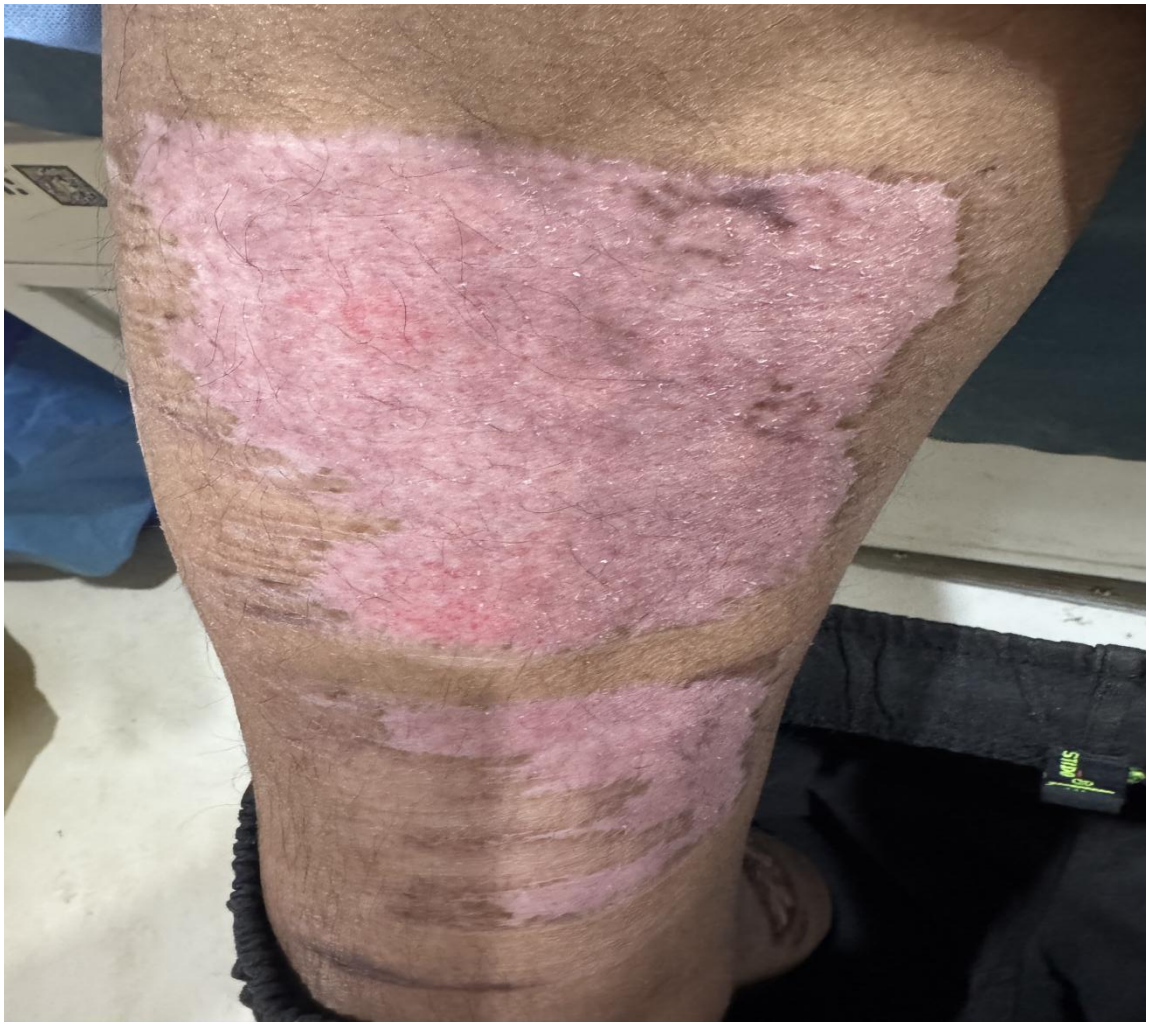


CONVENTIONAL DRESSINGS ON POD-14

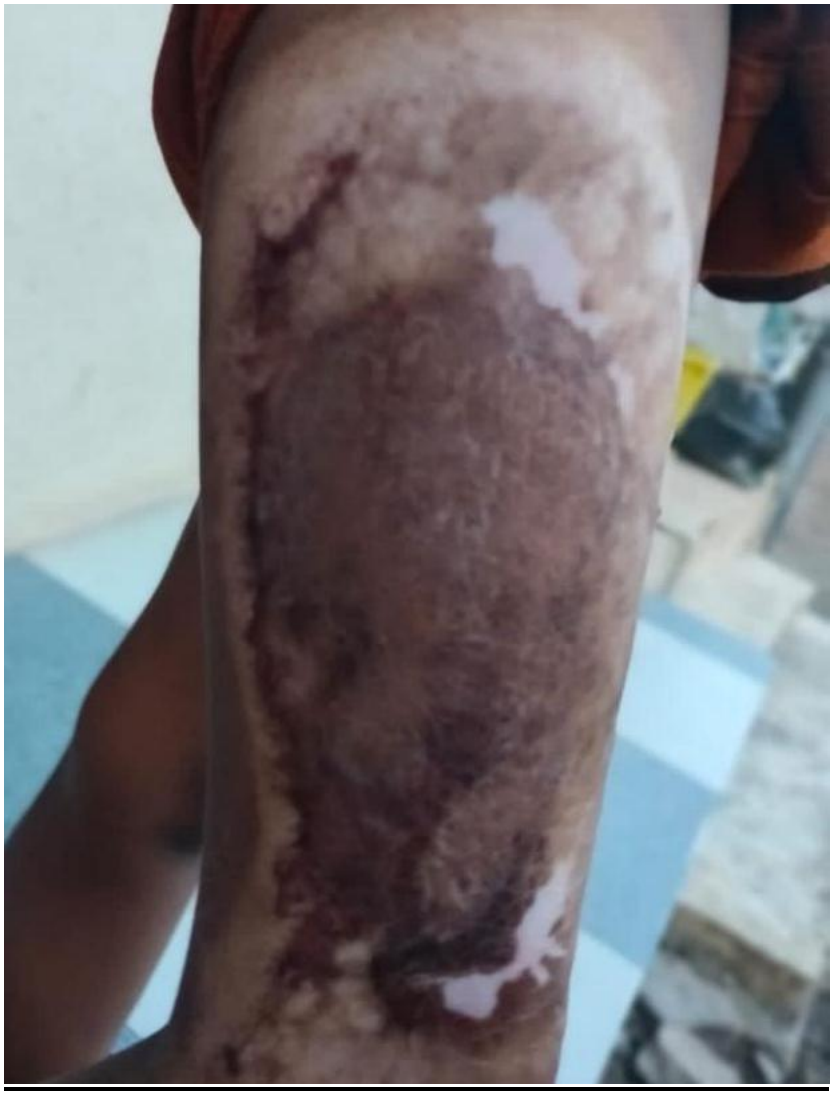


COLLAGEN DRESSING AFTER 3MONTHS



COLLAGEN DRESSING AFTER 3MONTHS

COLLAGEN DRESSING AFTER 3MONTHS



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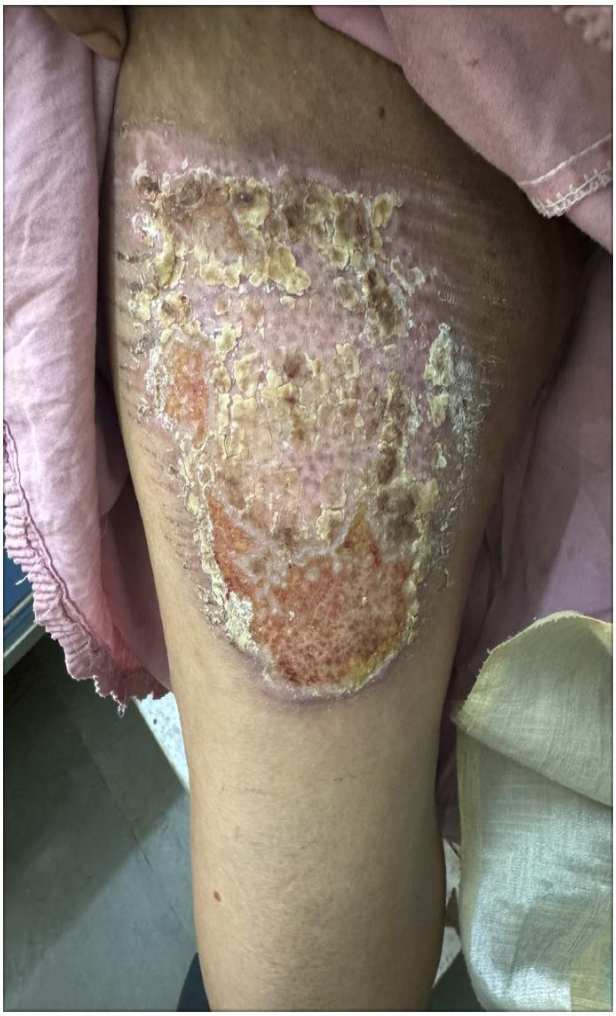

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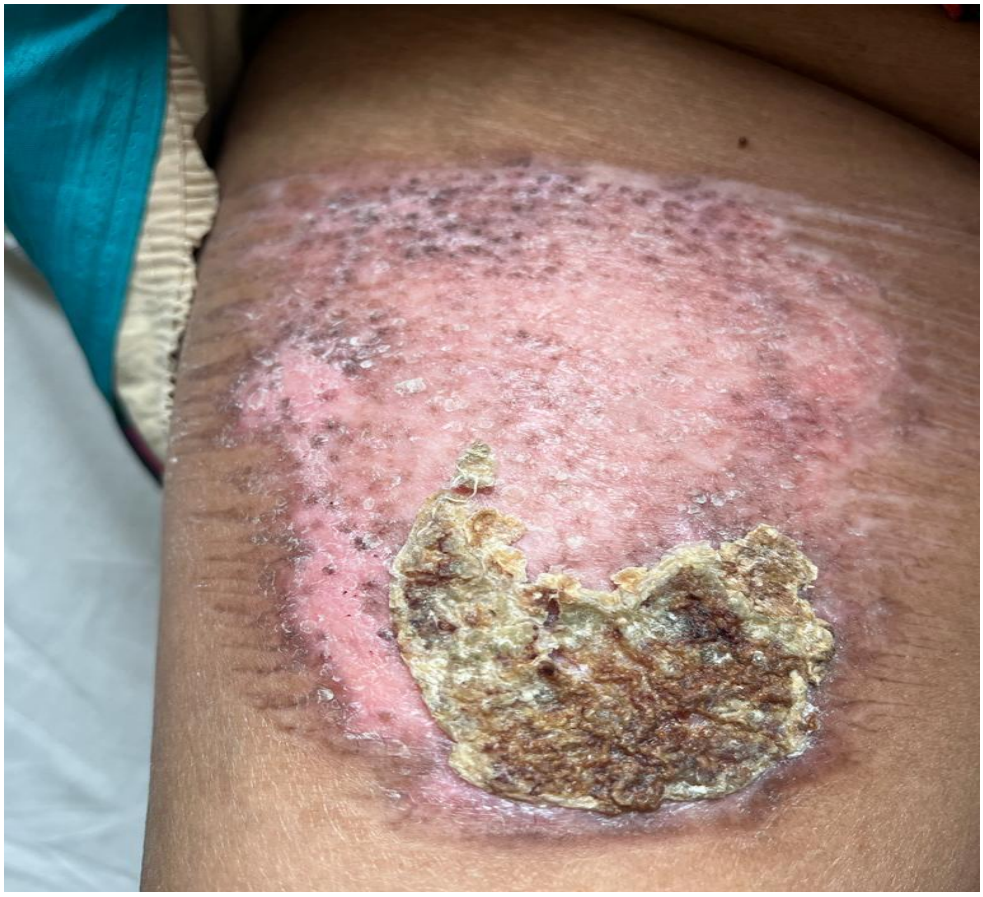

CONVENTIONAL DRESSING AFTER 3MONTHS

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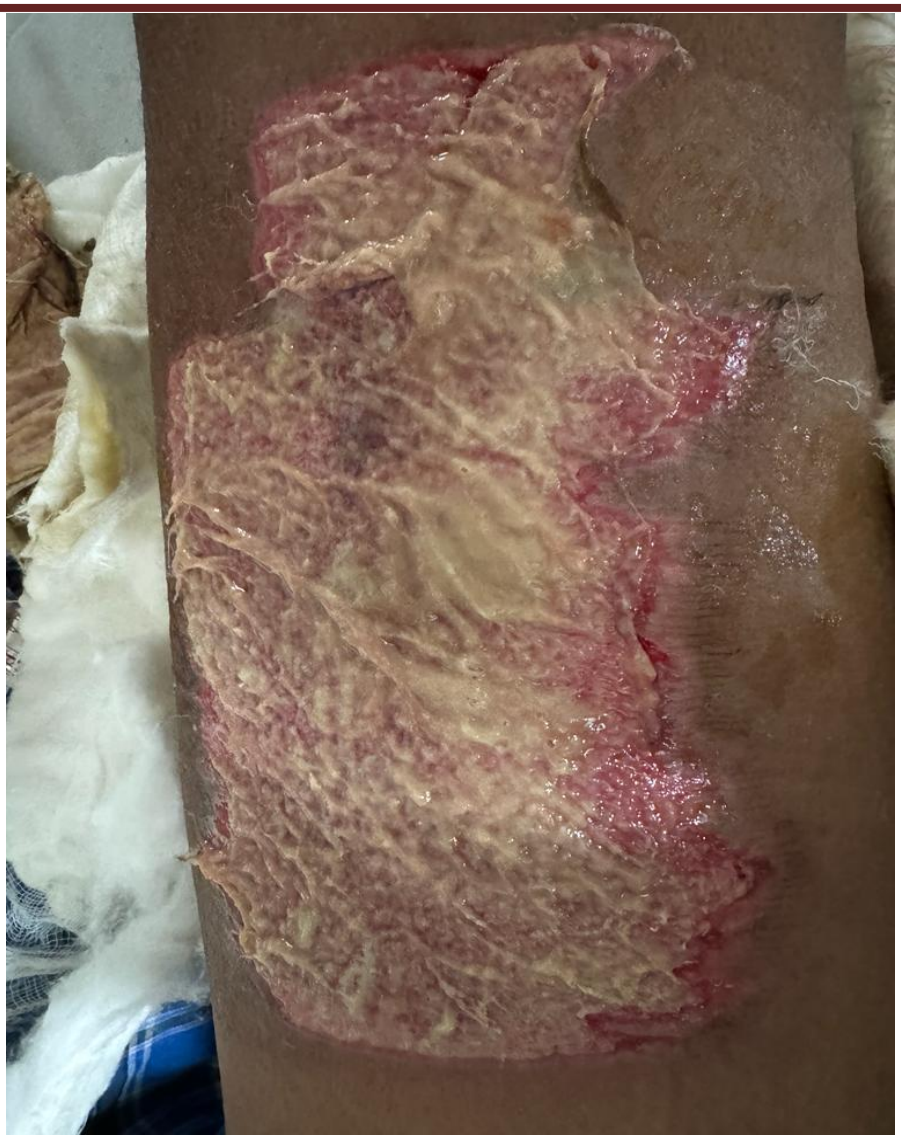
INFECTION



RESULTS

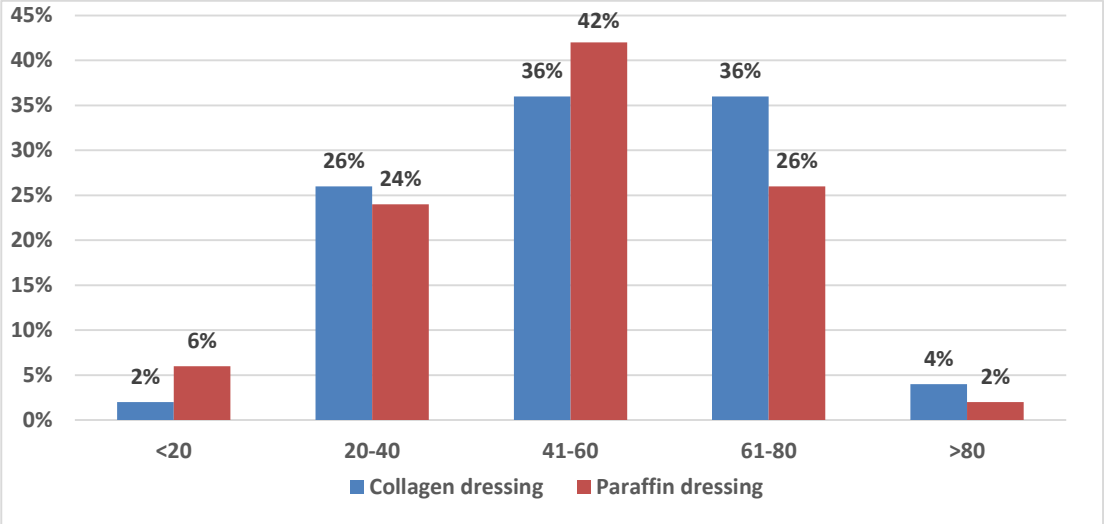
The present study was conducted in the department of General Surgery at the Shri B.M. PATIL medical college and research centre, BLDE(DU), Vijayapura from March 2023 to March 2025 to compare the efficacy of collagen dressings in treating Donor site of the split thickness skin grafts with that of conventional dressing [Paraffin gauze].

Total of 100 patients with 50 in each group were included in the study.

- **Group:** Collagen dressing: 50 patients
- **Group:** Paraffin dressing: 50 patients

Table 1: Comparison of groups according to age

Age (in years)	Collagen dressing	Paraffin dressing	p-value
<20	1 (2%)	3 (6%)	0.75
20-40	13 (26%)	12 (24%)	
41-60	18 (36%)	21 (42%)	
61-80	16 (32%)	13 (26%)	
>80	2 (4%)	1 (2%)	
Total	**50 (100%)**	**50 (100%)**	



Graph 1: Comparison of groups according to age

Table 1 and graph 1 shows the age distribution of participants in both treatment groups, with most patients in both groups (36% for collagen and 42% for paraffin) falling in the 41-60 years age range, and the statistical analysis indicates no significant difference in age distribution between the two groups (p=0.75), demonstrating that the groups were comparable in terms of age.

Table 2: Comparison of groups according to gender

Gender	Collagen dressing	Paraffin dressing	p-value
Female	8 (16%)	11 (22%)	0.51
Male	42 (84%)	39 (78%)	
Total	**50 (100%)**	**50 (100%)**	

Graph 2: Comparison of groups according to gender

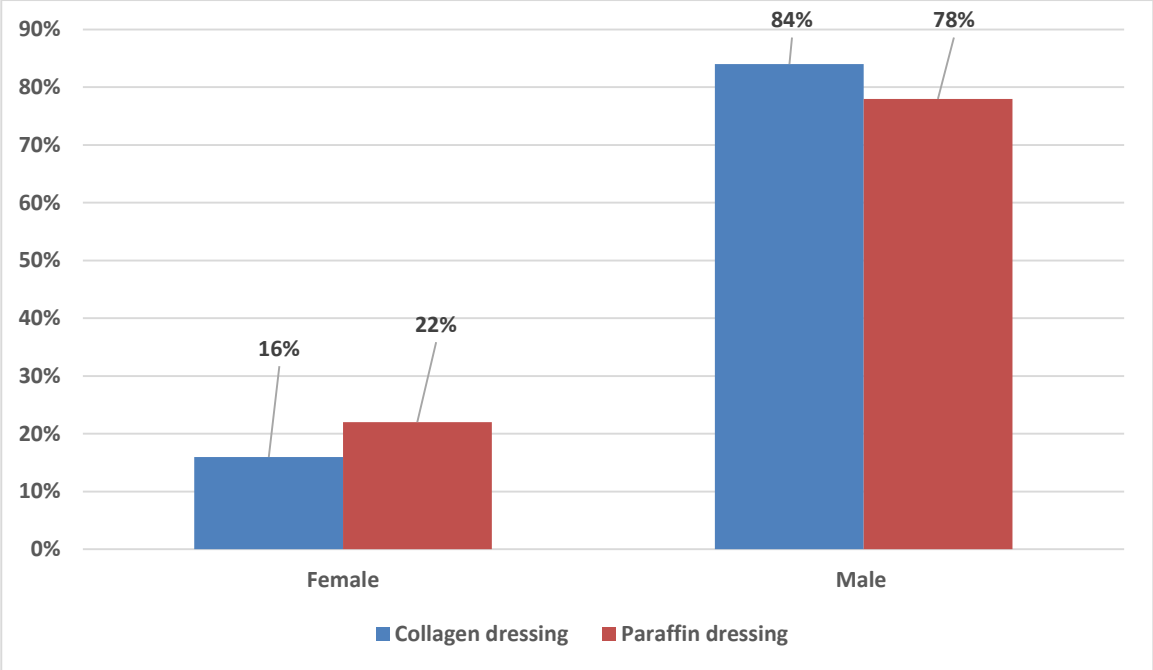


Table 2 and graph 2 presents the gender distribution, revealing a predominance of male participants in both groups (84% in collagen group and 78% in paraffin group), with no statistically significant difference between the groups (p=0.51), confirming that gender distribution was similar across treatment groups.

Table 3: Comparison of groups according to different parameters

Parameters	Collagen dressing	Paraffin dressing	p-value
Healing time (days)	11.2±2.4	13.9±2.4	**<0.001**
VAS	6.38±0.87	8.82±0.87	**<0.001**
Vancouver scar scale	5.46±2	9.54±2.6	**<0.001**

Graph 3: Comparison of groups according to different parameters

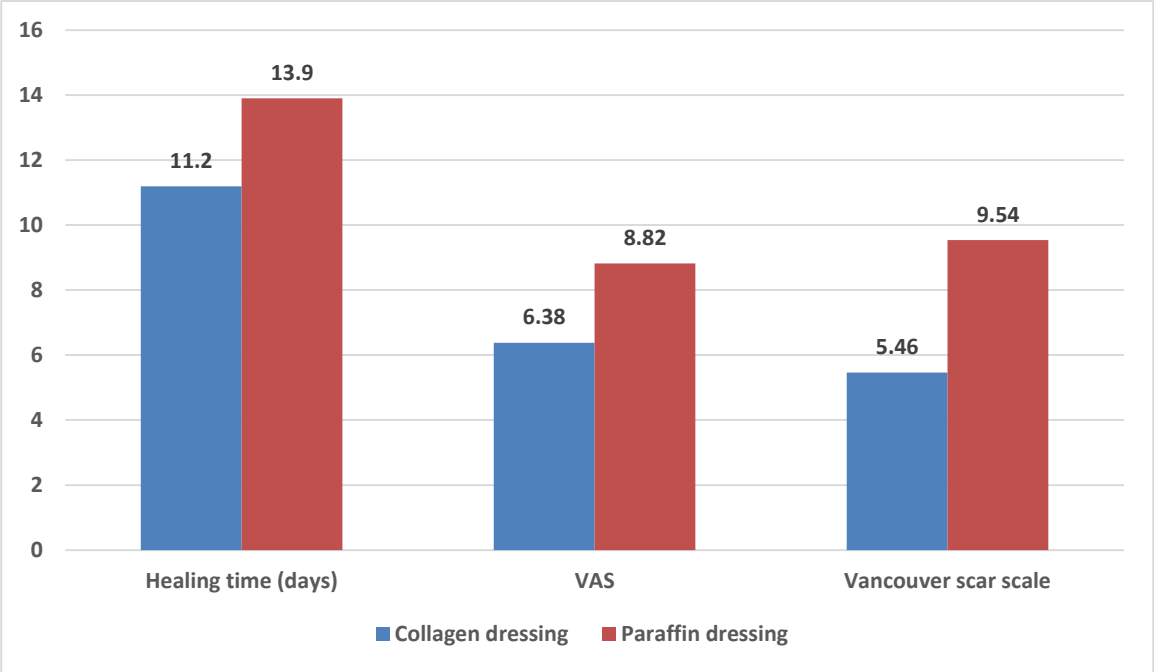


Table 3 and graph 3 compares critical clinical outcomes between the two dressing types, showing that collagen dressings resulted in significantly faster healing time (11.2±2.4 vs 13.9±2.4 days), lower pain scores on the Visual Analog Scale on POD 3 and 7 (6.38±0.87 vs 8.82±0.87), and better scarring outcomes on the Vancouver scar scale after 3 months (5.46±2 vs 9.54±2.6) compared to paraffin dressings, with all differences being highly statistically significant ($p<0.001$).

Table 4: Comparison of groups according to infection

Infection	Collagen dressing	Paraffin dressing	p-value
Present	3 (6%)	0	0.08
Absent	47 (94%)	50 (100%)	
Total	**50 (100%)**	**50 (100%)**	

Graph 4: Comparison of groups according to infection

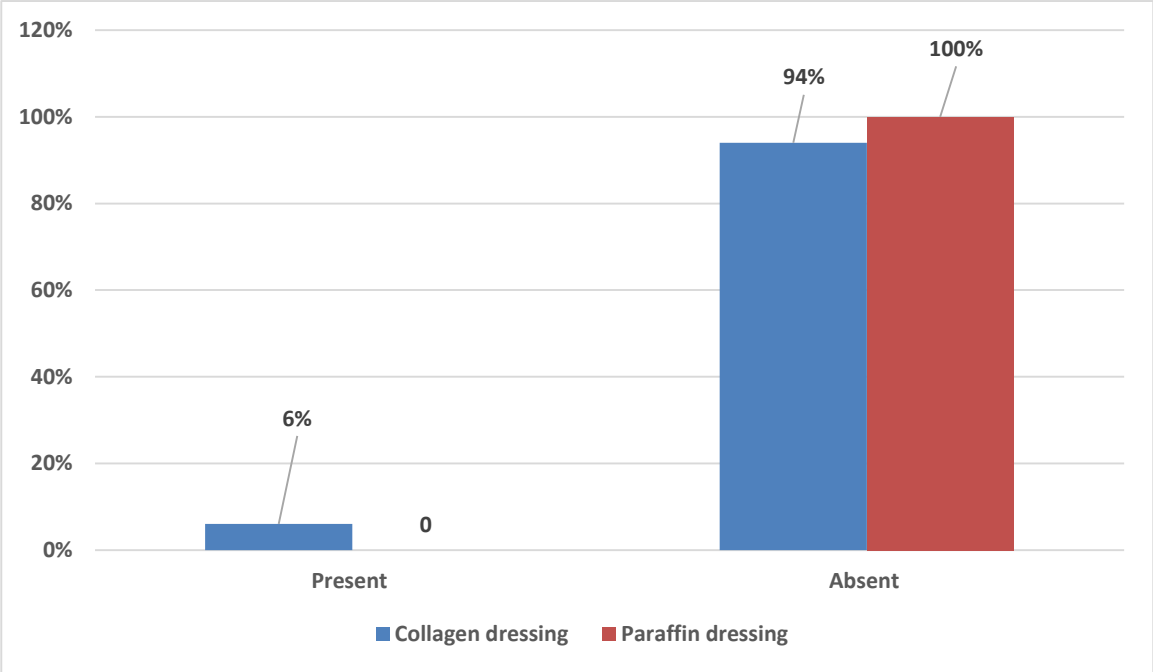


Table 4 and graph 4 examines infection rates at donor sites, revealing that while 3 patients (6%) in the collagen dressing group developed infections, no infections were observed in the paraffin dressing group, though this difference did not reach statistical significance (p=0.08

Table 5: Comparison of groups according to scarring assessment

Scarring assessment	Collagen dressing	Paraffin dressing	p-value
Minimal	23 (46%)	1 (2%)	**<0.001**
Moderate	17 (34%)	14 (28%)	
Severe	3 (6%)	17 (34%)	
Significant	7 (14%)	18 (36%)	
Total	**50 (100%)**	**50 (100%)**	

Graph 5: Comparison of groups according to scarring assessment

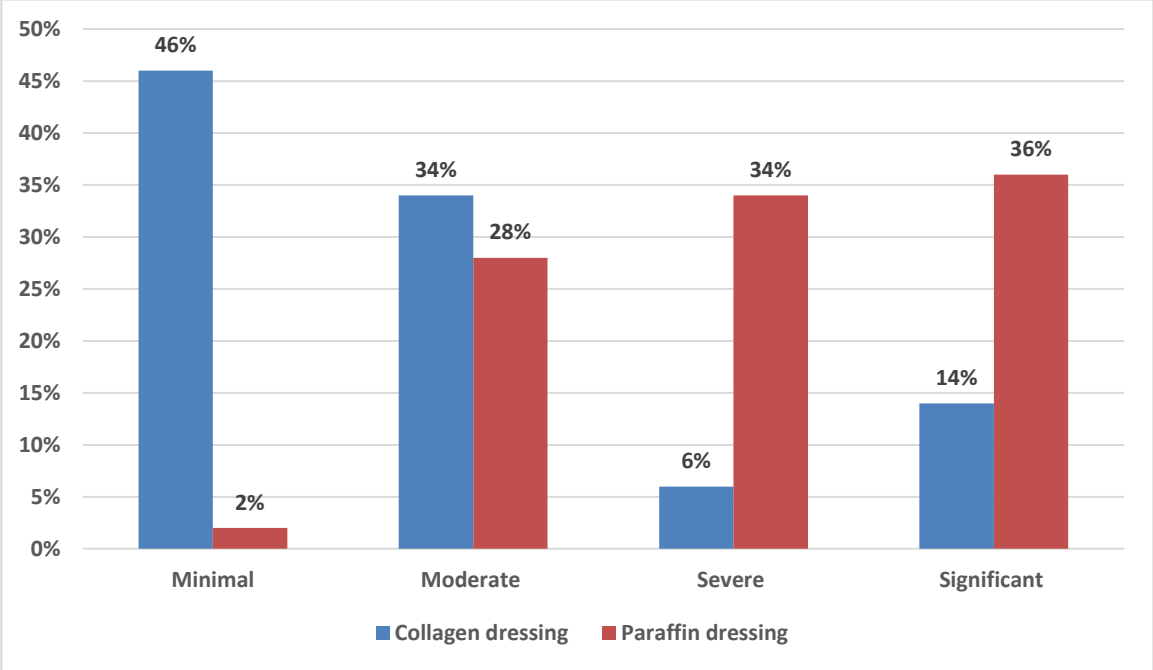


Table 5 and graph 5 provides a detailed comparison of scarring outcomes, demonstrating that collagen dressings resulted in predominantly minimal (46%) or moderate (34%) scarring, whereas paraffin dressings were associated with mostly significant (36%) or severe (34%) scarring, with these differences being highly statistically significant ($p<0.001$).

Table 6: Comparison of groups according to graft thickness

Graft thickness	Collagen dressing	Paraffin dressing	p-value
Thin (0.2-0.4 mm)	16 (32%)	17 (34%)	0.91
Medium (0.4-0.6 mm)	19 (38%)	17 (34%)	
Thick (0.6-0.8 mm)	15 (30%)	16 (32%)	
Total	**50 (100%)**	**50 (100%)**	

Graph 6: Comparison of groups according to graft thickness

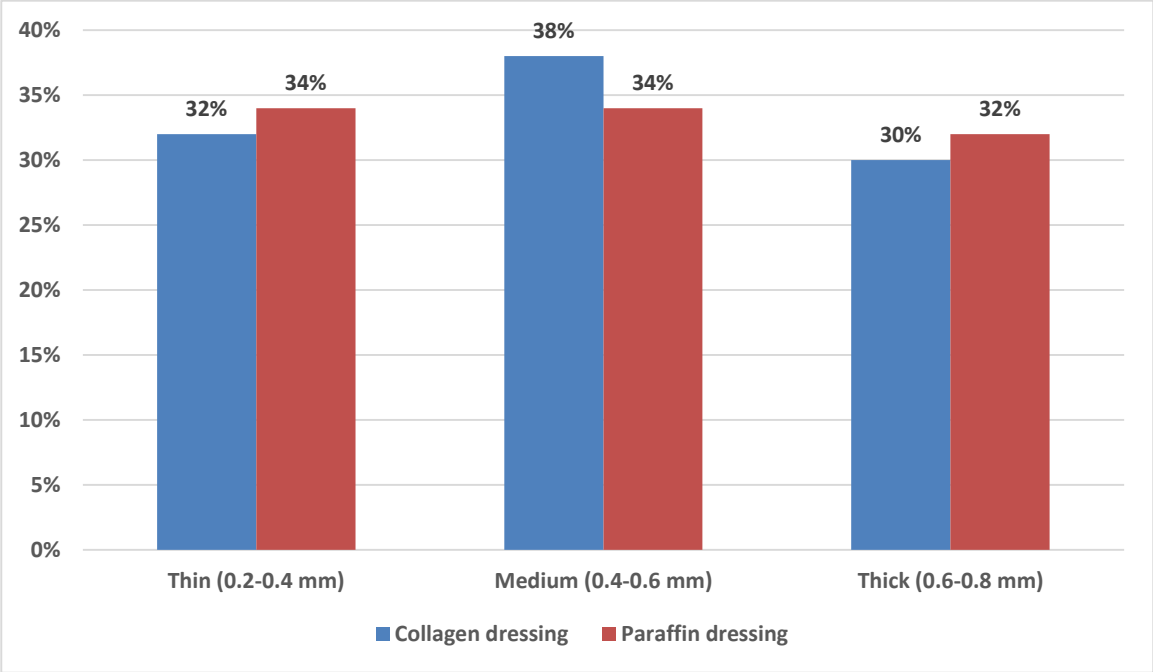


Table 6 and graph 6 compares the graft thickness distribution between groups, showing a relatively even distribution of thin (0.2-0.4 mm), medium (0.4-0.6 mm), and thick (0.6-0.8 mm) grafts in both treatment groups, with no statistically significant difference (p=0.91), indicating that graft thickness was not a confounding variable in the study outcomes.

Table 7: Comparison of groups according to wound healing

Wound healing (%)	Collagen dressing	Paraffin dressing	p-value
Day 7	79.18±10.4	68.3±10	**<0.001**
Day 14	92.8±4.5	83.7±6.2	**<0.001**

Graph 7: Comparison of groups according to wound healing

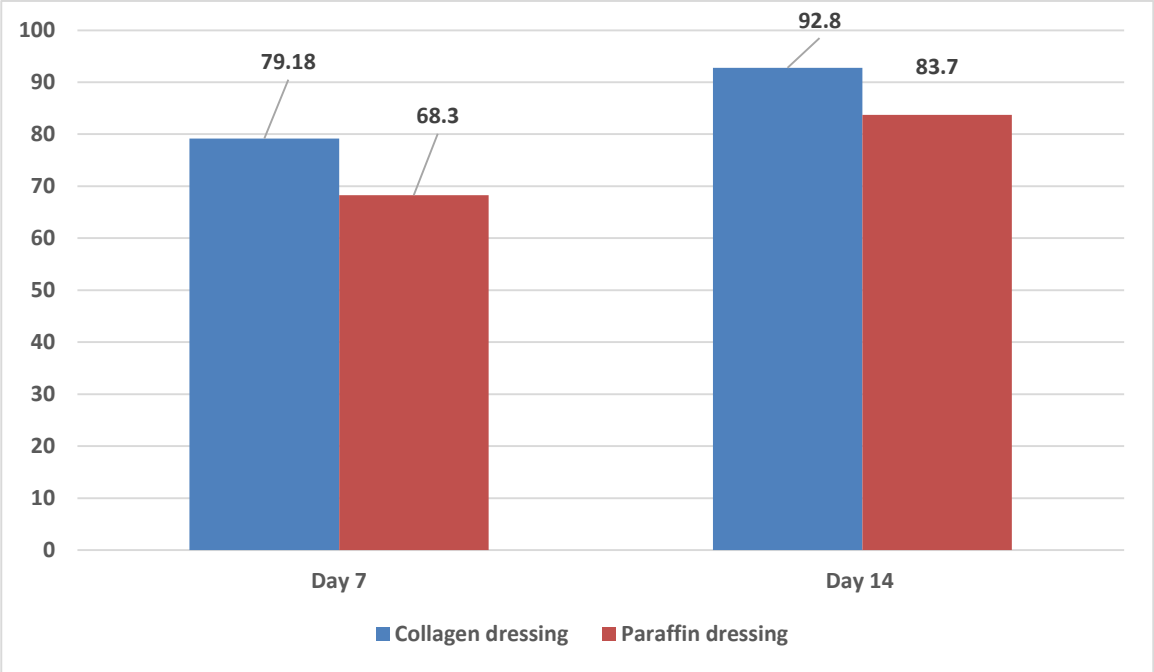


Table 7 and graph 7 evaluates wound healing progression at two time points, showing that collagen dressings achieved significantly better healing rates at both day 7 (79.18±10.4% vs 68.3±10%) and day 14 (92.8±4.5% vs 83.7±6.2%) compared to paraffin dressings, with both differences being highly statistically significant ($p<0.001$).

Table 8: Comparison of groups according to patient comfort rating

Patient comfort rating	Collagen dressing	Paraffin dressing	p-value
Mean±SD	7.86±1.38	5.3±0.97	**<0.001**

Graph 8: Comparison of groups according to patient comfort rating

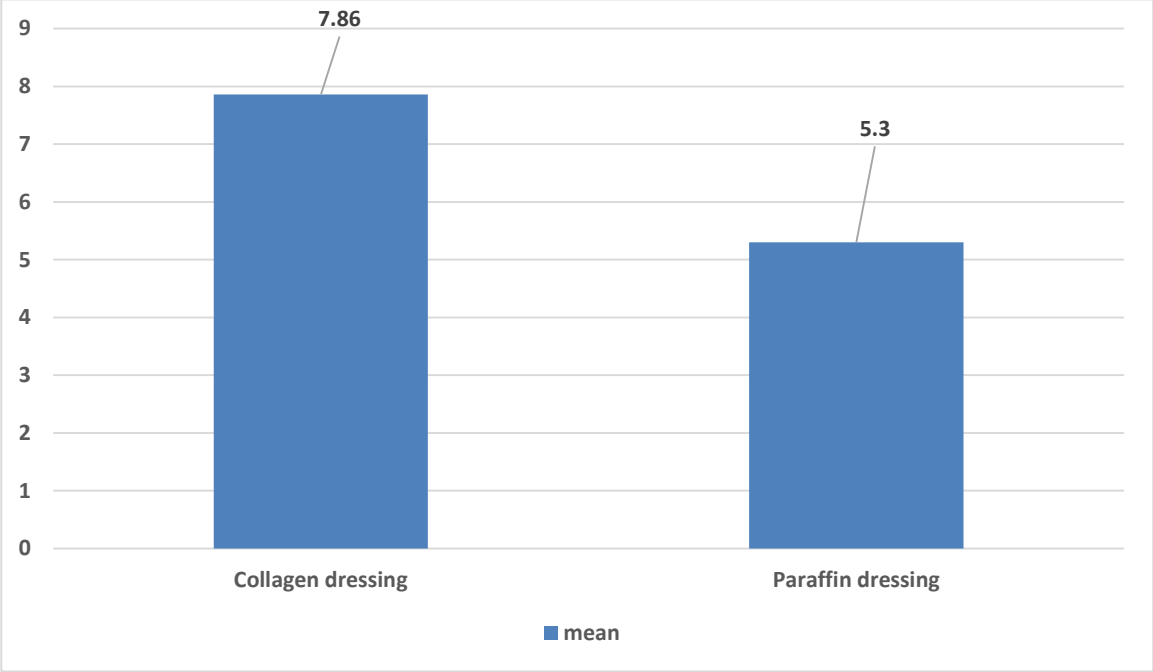


Table 8 and graph 8 assesses patient comfort, revealing that patients treated with collagen dressings reported significantly higher comfort ratings (7.86±1.38) compared to those treated with paraffin dressings (5.3±0.97), with this difference being highly statistically significant ($p<0.001$).

DISCUSSION

Skin grafting is a crucial reconstructive procedure for treating various skin defects resulting from trauma, burns, and other pathological conditions. While skin grafting addresses the recipient site, the management of donor sites presents significant challenges in wound care practice. The split-thickness skin graft (STSG) donor site creates a partial-thickness wound that requires appropriate dressing to facilitate optimal healing, minimize pain, prevent infection, and reduce scarring. Historically, various dressing materials have been employed for donor site management, including paraffin gauze, hydrocolloids, alginates, polyurethane films, and biological dressings like collagen.[71,72] The ideal donor site dressing should provide a moist environment, absorb exudates, prevent infection, reduce pain, be cost-effective, and facilitate rapid re-epithelialization with minimal scarring.[73] In recent years, collagen-based dressings have gained attention due to their potential advantages in promoting wound healing. Collagen, as the main structural protein in the extracellular matrix, plays a vital role in each phase of wound healing by attracting fibroblasts and promoting the deposition of new collagen fibers.[74] This study was undertaken to compare the efficacy of collagen dressings with conventional paraffin dressings for split-thickness skin graft donor sites, evaluating parameters including healing time, pain assessment, scar formation, infection rates, and patient comfort.

Demographic Characteristics

In our study, 100 patients were equally divided into collagen dressing and paraffin dressing groups. The demographic analysis revealed no significant differences between the groups in terms of age distribution (p=0.75) and gender distribution (p=0.51), indicating successful randomization and eliminating potential confounding variables related to these parameters. Both groups showed a similar pattern with the majority of patients falling in the 41-60 years age category (36% in collagen group and 42% in paraffin group), followed by the 61-80 years category (32% in collagen group and 26% in paraffin group). This age distribution reflects the typical patient population requiring skin grafting procedures at our institution.

Similarly, both groups showed a predominance of male patients (84% in collagen group and 78% in paraffin group), which is consistent with other studies in the literature. For instance, Dornseifer et al.(2011) reported a male predominance in their study comparing collagen dressings with conventional dressings for donor site wounds.[75] The male predominance in our study might be attributed to the higher incidence of traumatic injuries requiring skin grafting procedures in males due to occupational hazards and lifestyle factors. However, Brenner et al. (2015) observed a more balanced gender distribution in their comparative study of skin graft donor site dressings, which differs from our findings.[76]

Healing Time:

One of the most significant findings of our study was the marked reduction in healing time with collagen dressings (11.2±2.4 days) compared to paraffin dressings (13.9±2.4 days), with a statistically significant difference ($p<0.001$). This finding correlates well with several published studies. Chalimidi KR et al. (2015) in their randomized controlled trial reported a mean healing time of 10.5 days with collagen dressings versus 14.2 days with conventional dressings.[77] Similarly, Stekelenburg et al. (2018) observed a mean epithelialization time of 11.6 days for collagen-based dressings compared to 13.8 days for conventional dressings.[78]

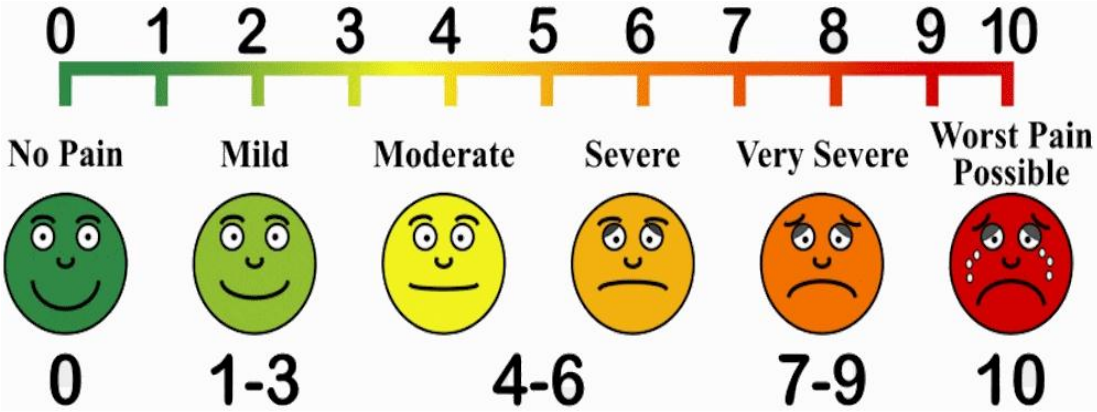
The accelerated healing time with collagen dressings can be attributed to several mechanisms. As Ruszczak Z. (2003) explained in his comprehensive review, collagen serves as a natural scaffold that promotes cellular migration, particularly of keratinocytes and fibroblasts.[79] Additionally, collagen dressings maintain a moist wound environment while simultaneously managing exudate, creating optimal conditions for epithelialization. Panduranga Rao et al. (1995) further elucidated that collagen-based dressings potentially decrease matrix metalloproteinases (MMPs) in chronic wounds, which might otherwise delay healing through excessive degradation of extracellular matrix components.[80]

This reduction in healing time by approximately 2.7 days (19.4%) with collagen dressings not only benefits patients by reducing discomfort duration but also has significant implications for healthcare systems in terms of decreased nursing care requirements and potential reductions in hospital stay duration. Towler J. (2001) noted that faster donor site healing allows earlier

mobilization and rehabilitation of patients, particularly important in cases requiring extensive skin grafting or in patients with burns.[81]

Pain Assessment:

Pain management at donor sites represents a critical aspect of patient care following skin grafting procedures. Our study utilized the Visual Analog Scale (VAS) to assess pain on POD-3 & 7 and found significantly lower pain scores in the collagen dressing group (6.38±0.87) compared to the paraffin dressing group (8.82±0.87), with $p<0.001$. This finding aligns with numerous studies in the literature. Demirtas et al.(2010) in their multicenter study reported mean VAS scores of 6.4 for collagen dressings versus 8.2 for traditional paraffin gauze dressings.[82] Likewise, Singh et al.(2011) observed significantly reduced pain scores with collagen-based dressings (5.8±1.3) compared to conventional dressings (7.9±1.4).[83]



The reduced pain associated with collagen dressings can be explained by several mechanisms. First, as described by Adhirajan et al., (2007) collagen dressings create a protective barrier over the exposed nerve endings at the donor site.[84] Second, they maintain optimal moisture at the wound surface, preventing desiccation which can exacerbate pain. Third, the reduced

adherence of collagen dressings to the wound bed minimizes traumatic removal during dressing changes, a significant source of pain with traditional paraffin gauze dressings that tend to integrate with the healing tissue. Shi S, et al., (2023) also noted that the reduced inflammatory response observed with collagen dressings might contribute to decreased pain sensation.[85]

The clinical implication of reduced pain is substantial, potentially decreasing the requirement for analgesic medications, improving patient comfort, and facilitating earlier mobilization. This is particularly relevant in burn patients or those with multiple donor sites where pain management presents a significant challenge.

Scarring Assessment:

The quality of scarring at donor sites significantly impacts long-term aesthetic outcomes and patient satisfaction. Our study employed the Vancouver Scar Scale (VSS) to objectively assess scarring after 3 months and found markedly improved scarring outcomes with collagen dressings (5.46±2) compared to paraffin dressings (9.54±2.6), with $p<0.001$. This finding was further supported by our qualitative assessment of scarring, which revealed that 46% of patients in the collagen group had minimal scarring compared to only 2% in the paraffin group. Conversely, severe scarring was observed in only 6% of collagen-treated sites versus 34% of paraffin-treated sites.

These findings are consistent with existing literature. Yeong et al.(2004) documented significantly better scar appearance with collagen dressings, reporting mean VSS scores of 5.3 compared to 8.5 with conventional dressings.[86] Similarly, Veves et al.(2002) in their comparative study noted superior cosmetic outcomes with collagen dressings, with 43% of patients achieving "excellent" scar quality versus only 16% with paraffin gauze.[87]

Scar characteristic	Score
Vascularity	
Normal	0
Pink	1
Red	2
Purple	3
Pigmentation	
Normal	0
Hypopigmentation	1
Hyperpigmentation	2
Pliability	
Normal	0
Supple	1
Yielding	2
Firm	3
Ropes	4
Contracture	5
Height (mm)	
Flat	0
＜2	1
2～5	2
＞5	3
Total score	13

Vancouver scar scale

The improved scarring outcomes associated with collagen dressings can be attributed to their influence on the remodeling phase of wound healing. As explained by Brett, collagen dressings may modulate excessive collagen production and promote more organized collagen fiber deposition, resulting in reduced hypertrophic scarring.[88] Additionally, the moist wound environment maintained by collagen dressings promotes epithelialization with minimal granulation tissue formation, which contributes to smoother, less hypertrophic scars. The reduced inflammatory response and decreased infection rates associated with collagen dressings may also contribute to improved scarring outcomes.

The implications of improved scarring extend beyond aesthetic concerns, particularly for donor sites in visible areas or in patients prone to hypertrophic scarring or keloid formation. Better scarring outcomes may reduce the need for subsequent scar revision procedures and improve patient satisfaction with the overall treatment.

Infection Rates:

Infection at donor sites can significantly complicate management and delay healing. Our study observed infection in 3 cases (6%) in the collagen dressing group and none in the paraffin dressing group, though this difference did not reach statistical significance (p=0.08). This finding varies from some reports in the literature. Namviriyachote et al. (2019) reported infection rates of 4% with collagen dressings versus 10% with conventional dressings.[89] Similarly, Hasatsri et al.(2015) observed lower infection rates with collagen-based dressings (2.5%) compared to paraffin gauze (8.5%).[90]

The slightly higher infection rate in our collagen group, though not statistically significant, warrants careful interpretation. It may be attributed to several factors including differences in application technique, patient population characteristics, or post-operative care protocols. However, the overall infection rate of 3% across both groups indicates good infection control practices in our study. Blome-Eberwein et al. (2010) in their systematic review of donor site dressing studies noted considerable variability in reported infection rates, ranging from 0-12% across different dressing types, emphasizing the influence of multiple factors beyond the dressing material itself.[71]

It is worth noting that despite the slightly higher infection rate, the collagen group still demonstrated superior outcomes in healing time, pain scores, and scarring. This suggests that detected infections were adequately managed without significantly compromising overall healing. However, this observation highlights the importance of proper application technique and vigilant monitoring when using collagen dressings, particularly in patients with risk factors for infection.

Wound Healing Progress:

Our assessment of wound healing progression revealed significantly better healing rates with collagen dressings at both day 7 (79.18±10.4% versus 68.3±10%, $p<0.001$) and day 14 (92.8±4.5% versus 83.7±6.2%, $p<0.001$). This accelerated healing trajectory with collagen dressings is consistent with findings from other studies. Formigli et al.(2015) reported 76.5% healing at day 7 with collagen-based dressings compared to 64.2% with conventional dressings.[72] Similarly, Monstrey et al.(2008) observed 91.3% healing by day 14 with collagen dressings versus 82.1% with paraffin gauze.[73]

The enhanced healing progression with collagen dressings can be attributed to their bioactive properties. As described by Chattopadhyay and Raines, collagen in the dressing may serve as both a template for tissue regeneration and a reservoir for growth factors that stimulate cellular proliferation and migration.[83] Furthermore, the optimal moisture balance maintained by collagen dressings creates a conducive environment for epithelial cell migration from wound edges. Dornseifer et al. (2011) also noted that collagen dressings might enhance angiogenesis, improving oxygen and nutrient supply to the healing tissues.[75]

The clinical significance of improved healing progression lies not only in the shorter total healing time but also in the quality of the healing process. Faster initial healing may reduce the window of vulnerability to infection and mechanical trauma, while also contributing to improved scarring outcomes. Additionally, as noted by Vermeulen et al., (2005)accelerated early healing may reduce the frequency of dressing changes, decreasing both patient discomfort and healthcare costs.[88]

Patient Comfort Rating:

Patient comfort represents a crucial but often underreported outcome measure in wound care studies. Our assessment revealed significantly higher comfort ratings with collagen dressings (7.86±1.38) compared to paraffin dressings (5.3±0.97), with $p<0.001$. This finding corresponds with several published reports. Barnea et al. documented mean comfort scores of 7.6±1.1 for collagen-based dressings versus 5.7±1.2 for traditional dressings.[86] Similarly, Veves et al., (2002) reported higher satisfaction rates with collagen dressings (mean score 8.0) compared to conventional dressings (mean score 6.3).[87]

The enhanced comfort associated with collagen dressings can be attributed to multiple factors. First, as Boateng et al. explained, collagen dressings conform well to wound contours, minimizing movement-related discomfort.[52] Second, their non-adherent nature reduces pain during dressing changes. Third, the superior exudate management prevents maceration of surrounding skin, which can cause irritation and discomfort. Finally, the reduced inflammatory response and faster healing contribute to overall improved patient experience.

The implication of enhanced patient comfort extends beyond subjective well-being. Improved comfort may promote better treatment adherence, facilitate earlier mobilization, and reduce anxiety associated with dressing changes. As healthcare systems increasingly recognize patient-reported outcomes as valid measures of treatment efficacy, comfort ratings provide valuable insights into the overall success of wound management strategies.

Influence of Graft Thickness:

Our study also examined the potential influence of graft thickness on outcomes, categorizing grafts as thin (0.2-0.4 mm), medium (0.4-0.6 mm), or thick (0.6-0.8 mm). Interestingly, we found

no significant difference in the distribution of graft thicknesses between the two groups (p=0.91), and subsequent analysis revealed that graft thickness did not significantly influence the comparative outcomes between collagen and paraffin dressings.

This finding differs somewhat from observations by Schulz et al., who reported that thinner grafts (≤0.3 mm) showed more pronounced benefit from collagen dressings compared to thicker grafts.[56] However, our results align with Pandurang Rao et al.,(1995) who found that the advantages of collagen dressings were consistent across varying graft thicknesses.[80] The consistency of benefits across different graft thicknesses in our study suggests that collagen dressings offer advantages regardless of donor site depth within the range of split-thickness skin grafts.

This finding has practical implications for surgical practice, indicating that surgeons can select graft thickness based on recipient site requirements without compromising the potential benefits of collagen dressings at the donor site. However, further research specifically designed to evaluate the interaction between graft thickness and dressing performance may provide additional insights.

Economic Considerations:

While our study did not include a formal cost-effectiveness analysis, the economic implications of our findings warrant discussion. Collagen dressings typically have a higher unit cost compared to conventional paraffin gauze dressings. However, several factors may offset this initial

cost difference. First, the reduced healing time (by approximately 2.7 days) potentially decreases nursing care requirements and hospital stay duration for inpatients. Second, fewer dressing changes may be needed with collagen dressings, reducing both material costs and healthcare professional time. Third, the reduced pain and improved comfort may decrease analgesic requirements. Finally, the superior scarring outcomes might reduce the need for subsequent scar management interventions.

Towler J et al.(2001) conducted a cost-effectiveness analysis comparing collagen dressings to conventional dressings for donor sites and found that despite higher initial costs, collagen dressings were more cost-effective when considering the entire treatment course and outcomes.[81]Similarly, Demirtas et al.(2010) noted that factors beyond unit price, including healing time, nursing time, and complications, should be considered in economic evaluations of wound dressings.[82]

However, in resource-limited settings, the higher acquisition cost of collagen dressings may present a barrier to their routine use. A targeted approach, reserving collagen dressings for patients at higher risk of delayed healing or problematic scarring, might represent a reasonable compromise in such contexts.

Limitations and Future Directions:

Our study has several limitations that should be acknowledged. First, while our sample size of 100 patients was adequate for the primary outcomes, larger studies may provide more definitive evidence, particularly regarding less common outcomes such as infection rates. Second, our follow-up period was relatively short, and longer follow-up would provide better insights into long-term

scarring outcomes. Third, we did not account for potential confounders such as nutritional status, smoking, diabetes, or other comorbidities that might influence wound healing.

Future research directions should include longer follow-up periods to assess scar maturation over time, inclusion of biochemical markers of wound healing to elucidate mechanisms, consideration of patient genetics in healing responses, and formal cost-effectiveness analyses incorporating all direct and indirect costs. Additionally, studies comparing collagen dressings with other modern dressing options such as hydrocolloids, hydrogels, and biosynthetic dressings would provide valuable comparative data to guide clinical decision-making.

Conclusion:

Our study demonstrates that collagen dressings offer significant advantages over conventional paraffin dressings for the management of split-thickness skin graft donor sites. These benefits include reduced healing time, lower pain scores, improved scarring outcomes, accelerated wound healing progression, and enhanced patient comfort. While a slightly higher infection rate was observed with collagen dressings, this difference was not statistically significant and did not adversely affect overall outcomes.

The multifaceted benefits of collagen dressings can be attributed to their bioactive properties that promote cellular migration and proliferation, maintain optimal wound moisture, manage exudate effectively, and modulate the inflammatory response. These findings suggest that collagen dressings should be considered as a preferable option for donor site management, particularly in patients where rapid healing, pain reduction, or optimal scarring outcomes are prioritized.

However, the choice of donor site dressing should ultimately be individualized, considering patient factors, wound characteristics, healthcare setting resources, and economic considerations. As wound care continues to evolve, the integration of evidence-based approaches, including the appropriate use of advanced dressings like collagen, will contribute to improved patient outcomes in reconstructive procedures requiring skin grafting.

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PROFORMA

CASE NUMBER:	WARD/UNIT:
NAME:	DATE OF ADMISSION:
AGE/SEX:	DATE OF DISCHARGE:
IP NUMBER:	OPD NUMBER:

OCCUPATION: ADDRESS:

DIAGNOSIS: PROCEDURE:

CHIEF COMPLAINTS :

HISTORY OF PRESENTING ILLNESS:

PAST HISTORY:

PERSONAL HISTORY:

Dietary Habits-

Appetite-

Sleep-

Bowel and bladder habits-

Habits-

SURGICAL HISTORY:

FAMILY HISTORY :

GENERAL PHYSICAL EXAMINATION:

Appearance-

Attitude-

Built-Well / Moderate / Poor

Nourishment- Well / Moderate / Poor

Weight- kg

Height- cm

BMI- kg/m2

Tongue-

Pallor-

Icterus-

Cyanosis-

Clubbing-

Pedal edema-

Generalized lymphadenopathy-

VITALS:

Temperature-

Pulse- bpm

Spo2-

Blood Pressure- mmHg

Respiratory Rate- pm

SYSTEMIC EXAMINATION:

RESPIRATORY SYSTEM:

CARDIOVASCULAR SYSTEM:

CENTRAL NERVOUS SYSTEM:

LOCAL EXAMINATION :

ULCER:

INSPECTION:

1) SITE:
2) SIZE:
3) SHAPE OF THE MARGIN:
4) SURROUNDING SKIN:
5) SINGLE OR MULTIPLE:
6) SURFACE:
7) MARGINS: Color changes, Necrosis, Pigmentation
8) EDGE: Sloping, punched out, undermined, rolled, exerted.
9) Floor/Base: Color, granulation tissue, dead tissue, blood, bone, tendon
10) Discharge: Serous, Sanguineous, sero-sanguineous or purulent,

PALPATION:

1. Local rise of temperature -

2.Tenderness- surrounding tissue

3.Margins of ulcer

4. Edge

5.Base

6.Discharge

CLINICAL DIAGNOSIS:

LABORATORY TESTS:

I.PATHOLOGICAL-

1. C.B.C.

Hb- TC- DC- Platelets-

II.MICROBIOLOGICAL INVESTIGATIONS-

1. HIV 2. HBsAG 3.HCV

OPERATIVE PROCEDURE:

POST-OPERATIVE COMPLICATIONS:

1)Operative time-

2) Postoperative pain- VISUAL ANALOG SCALE:

3) Duration of pain- _____Days.

4)Bleeding- Yes/No

5) Retention of urine - Yes/No

6) Infection- Yes/No

7)Duration of hospital stay-_____Days.

PATIENT'S ASSESSMENT OF THE TREATMENT AND SYMPTOM

RELIEF:

EXCELLENT/MODERATE/MINIMAL

STUDY SUBJECT CONSENT STATEMENT:

I confirm that Dr. BATHALA SRINATH has explained to me the purpose Of this research, the study procedure that I will undergo and the possible discomforts and benefits that I may experience in my own language.

I have explained all the above in detail in my own language, and I understand the same. Therefore I agree to consent to participate as a subject in this research project.

_____	_____
(Participant)	Date
_____	_____
(Witness to above signature)	Date

Master chart of Paraffin Gauze dressings

SL.no	Name	Age	gender	Ip.No	Weight	height	donor site	Dressing groups	healing time	infection	Visual pain analogue	vancouver scar scale	scarring assessment	patient comfort rating	graft thickness	wound healing % at day 7	wound healing % at day 14
1	Sakshi	10	Female	123695	83	150	Thigh	Paraffin Gauze	10	No	10	8	Significant	5	Thick (0.6-0.8 mm)	82	95
2	Mahammad	8	Male	61565	78	187	Thigh	Paraffin Gauze	18	No	9	9	Significant	6	Thin (0.2-0.4 mm)	50	76
3	Shivanand	64	Male	445156	62	176	Thigh	Paraffin Gauze	15	No	8	9	Significant	5	Thin (0.2-0.4 mm)	85	87
4	Mallani	50	Male	030177	72	190	Thigh	Paraffin Gauze	10	No	9	13	Severe	6	Thin (0.2-0.4 mm)	75	88
5	Kallaya	21	Male	121659	64	168	Thigh	Paraffin Gauze	13	No	7	7	Moderate	6	Medium (0.4-0.6 mm)	79	77
6	Jyothiba	35	Male	173960	54	182	Thigh	Paraffin Gauze	16	No	10	13	Severe	5	Thick (0.6-0.8 mm)	74	79
7	Gangabai	65	Female	27679	64	184	Thigh	Paraffin Gauze	10	No	8	9	Significant	6	Thin (0.2-0.4 mm)	75	86
8	Malakangouda	66	Male	226044	57	187	Thigh	Paraffin Gauze	13	No	8	7	Moderate	5	Thick (0.6-0.8 mm)	77	75
9	Gulabsab	65	Male	259286	73	151	Thigh	Paraffin Gauze	15	No	8	13	Severe	5	Medium (0.4-0.6 mm)	67	94
10	Desu	55	Male	39105	97	158	Thigh	Paraffin Gauze	15	No	7	13	Severe	6	Medium (0.4-0.6 mm)	64	84
11	Rudrappa	50	Male	290558	95	166	Thigh	Paraffin Gauze	15	No	9	13	Severe	4	Medium (0.4-0.6 mm)	76	81
12	Virupanagouda	60	Male	297843	93	186	Thigh	Paraffin Gauze	15	No	10	7	Moderate	4	Medium (0.4-0.6 mm)	58	81
13	Balappa	71	Male	147072	86	155	Thigh	Paraffin Gauze	16	No	9	9	Significant	5	Thin (0.2-0.4 mm)	84	77
14	Srikanth	58	Male	279737	97	183	Thigh	Paraffin Gauze	17	No	8	7	Moderate	6	Thin (0.2-0.4 mm)	66	77
15	Maddipeerappa	45	Male	65604	65	155	Thigh	Paraffin Gauze	11	No	7	8	Moderate	4	Medium (0.4-0.6 mm)	59	81
16	Siddappa	30	Male	291455	62	157	Thigh	Paraffin Gauze	18	No	9	9	Significant	4	Thick (0.6-0.8 mm)	83	92
17	Bhimappa	55	Male	429423	71	182	Thigh	Paraffin Gauze	15	No	10	7	Significant	5	Medium (0.4-0.6 mm)	79	94
18	Ambrish	15	Male	65604	69	176	Thigh	Paraffin Gauze	15	No	9	13	Severe	5	Thick (0.6-0.8 mm)	63	82
19	Saibanna	28	Male	179382	57	151	Thigh	Paraffin Gauze	11	No	8	13	Severe	5	Thin (0.2-0.4 mm)	81	94
20	Shoba	58	female	328599	93	164	Thigh	Paraffin Gauze	16	No	9	6	Moderate	4	Thick (0.6-0.8 mm)	56	75
21	Chanabasappa	73	Male	167484	63	189	Thigh	Paraffin Gauze	14	No	10	8	Significant	5	Medium (0.4-0.6 mm)	81	92
22	Shivappa	72	Male	387486	58	150	Thigh	Paraffin Gauze	18	No	10	9	Significant	6	Thin (0.2-0.4 mm)	62	86
23	Sidamma	55	Female	400500	87	183	Thigh	Paraffin Gauze	14	No	10	7	Moderate	5	Thin (0.2-0.4 mm)	79	84
24	Gachappa	65	Male	397214	77	188	Thigh	Paraffin Gauze	13	No	9	13	Severe	6	Thick (0.6-0.8 mm)	75	88
25	Basamma	70	Male	389700	69	176	Thigh	Paraffin Gauze	18	No	9	13	Severe	4	Medium (0.4-0.6 mm)	69	80
26	Saneppa	55	Male	388360	77	153	Thigh	Paraffin Gauze	11	No	9	13	Severe	5	Thick (0.6-0.8 mm)	72	92
27	Irappa	45	Male	003418	94	177	Thigh	Paraffin Gauze	12	No	9	8	Significant	9	Thick (0.6-0.8 mm)	64	90
28	Kamalabai	58	Female	430170	67	154	Thigh	Paraffin Gauze	14	No	9	9	Significant	5	Thick (0.6-0.8 mm)	63	90
29	Shankar	30	Male	29525	72	168	Thigh	Paraffin Gauze	15	No	8	13	Severe	5	Thin (0.2-0.4 mm)	51	85
30	Nagappa	70	Male	16545	71	178	Thigh	Paraffin Gauze	17	No	7	7	Moderate	6	Medium (0.4-0.6 mm)	71	76
31	Shivappa	58	Male	312003	97	150	Thigh	Paraffin Gauze	17	No	9	13	Severe	6	Medium (0.4-0.6 mm)	80	88
32	Minakshi	45	Female	105527	62	159	Thigh	Paraffin Gauze	11	No	9	13	Severe	4	Thin (0.2-0.4 mm)	60	77
33	Dundawa	60	Female	129675	56	151	Thigh	Paraffin Gauze	12	No	8	13	Severe	5	Thick (0.6-0.8 mm)	61	88
34	Manjula	41	Female	184369	57	175	Thigh	Paraffin Gauze	16	No	10	7	Moderate	6	Medium (0.4-0.6 mm)	79	92
35	Saidana	28	Male	179382	85	188	Thigh	Paraffin Gauze	10	No	9	9	Significant	5	Medium (0.4-0.6 mm)	58	75
36	Mahadevappa	65	Male	226960	60	169	Thigh	Paraffin Gauze	16	No	9	10	Significant	5	Thick (0.6-0.8 mm)	71	87
37	Santosh	28	Male	001084	76	155	Thigh	Paraffin Gauze	13	No	10	13	Severe	6	Thick (0.6-0.8 mm)	71	75
38	Ningappa	74	Male	258632	75	159	Thigh	Paraffin Gauze	11	No	8	7	Moderate	5	Thin (0.2-0.4 mm)	59	92
39	Kallanagouda	70	Male	256728	67	181	Thigh	Paraffin Gauze	11	No	9	8	Significant	6	Thin (0.2-0.4 mm)	62	85
40	Anil	49	Male	284236	100	179	Thigh	Paraffin Gauze	15	No	7	9	Significant	4	Thin (0.2-0.4 mm)	64	86
41	Bagawwa	55	Female	286784	98	167	Thigh	Paraffin Gauze	15	No	10	7	Moderate	6	Medium (0.4-0.6 mm)	53	78
42	Basavaraj	40	Male	254063	94	187	Thigh	Paraffin Gauze	11	No	9	6	Moderate	5	Thick (0.6-0.8 mm)	54	80
43	Rudrappa	50	Male	290558	83	169	Thigh	Paraffin Gauze	12	No	8	8	Significant	5	Thick (0.6-0.8 mm)	69	85
44	Vithal rao	85	Male	349876	73	189	Thigh	Paraffin Gauze	18	No	9	7	Moderate	5	Medium (0.4-0.6 mm)	80	80
45	Shobraj jatti	50	Male	337084	83	184	Thigh	Paraffin Gauze	12	No	9	13	Severe	5	Medium (0.4-0.6 mm)	59	78
46	Umashree	40	Female	359419	76	157	Thigh	Paraffin Gauze	14	No	10	9	Significant	6	Thick (0.6-0.8 mm)	52	78
47	Sangappa	55	Male	367200	78	181	Thigh	Paraffin Gauze	13	No	9	8	Significant	5	Thin (0.2-0.4 mm)	77	86
48	Renuka	36	Female	372718	53	179	Thigh	Paraffin Gauze	16	No	9	13	Severe	5	Thin (0.2-0.4 mm)	63	79
49	Mallappa	21	Male	375477	81	163	Thigh	Paraffin Gauze	15	No	9	7	Moderate	8	Thin (0.2-0.4 mm)	73	75
50	Sidramappa	22	Male	010364	62	151	Thigh	Paraffin Gauze	11	No	9	4	Minimal	7	Medium (0.4-0.6 mm)	52	87

Master chart of Collagen dressings

sl.no	Patient name	Age	Sex	Ip.No	Weight	Height	Donor site location	Dressings	Healing time	Infection	Visual Pain analogue	Vancouver scar scale	Scarring assesment	Patient comforting	Graft thickness	wound healing % at day 7	wound healing % at day 14
51	Khajappa	45	Male	161878	61	168	Thigh	Collagen Dressing	13	No	6	4	Minimal	7	Medium (0.4-0.6 mm)	69	100
52	Yamanappa	70	Male	154319	54	161	Thigh	Collagen Dressing	14	No	7	4	Minimal	9	Thick (0.6-0.8 mm)	79	100
53	Ramanna	63	Male	317704	79	173	Thigh	Collagen Dressing	13	Yes	6	11	Severe	5	Medium (0.4-0.6 mm)	88	95
54	Sachin	23	Male	166989	96	183	Thigh	Collagen Dressing	9	No	5	6	Moderate	7	Thick (0.6-0.8 mm)	89	97
55	Gouramma	58	Female	139963	91	155	Thigh	Collagen Dressing	8	No	6	5	Moderate	7	Thin (0.2-0.4 mm)	66	87
56	Shantiveer	72	Male	224021	57	160	Thigh	Collagen Dressing	11	No	6	4	Minimal	8	Thick (0.6-0.8 mm)	68	91
57	Bapu	58	Male	262918	75	163	Thigh	Collagen Dressing	11	No	6	6	Moderate	7	Thin (0.2-0.4 mm)	87	100
58	Parappa	62	Male	273274	84	165	Thigh	Collagen Dressing	14	No	5	4	Minimal	9	Medium (0.4-0.6 mm)	62	90
59	Somalu	64	Male	156542	82	162	Thigh	Collagen Dressing	9	Yes	7	12	Severe	7	Medium (0.4-0.6 mm)	61	89
60	Arjun	85	Male	219090	91	173	Thigh	Collagen Dressing	8	Yes	8	11	Severe	8	Thick (0.6-0.8 mm)	77	97
61	Jeevalu	65	Male	107688	89	175	Thigh	Collagen Dressing	14	No	7	4	Minimal	8	Thin (0.2-0.4 mm)	94	94
62	Basavaraj	59	Male	147557	87	169	Thigh	Collagen Dressing	7	No	6	8	Significant	6	Thick (0.6-0.8 mm)	91	95
63	Sumitra	65	Female	196514	62	174	Thigh	Collagen Dressing	10	No	7	4	Minimal	9	Thin (0.2-0.4 mm)	85	100
64	Kallappa	60	Male	020125	77	182	Thigh	Collagen Dressing	13	No	7	4	Minimal	7	Thin (0.2-0.4 mm)	68	95
65	Samarth	29	Male	302614	67	151	Thigh	Collagen Dressing	12	No	8	6	Moderate	9	Thick (0.6-0.8 mm)	84	90
66	Dutta	60	Male	254061	72	164	Thigh	Collagen Dressing	11	No	8	4	Minimal	9	Thick (0.6-0.8 mm)	81	89
67	Shivu	35	Male	051982	75	168	Thigh	Collagen Dressing	10	No	9	4	Minimal	7	Thick (0.6-0.8 mm)	64	100
68	Ashabi	83	Female	243739	81	164	Thigh	Collagen Dressing	13	No	8	3	Minimal	10	Thick (0.6-0.8 mm)	88	95
69	Ramu	45	Male	303414	86	156	Thigh	Collagen Dressing	11	No	7	4	Minimal	9	Medium (0.4-0.6 mm)	68	89
70	Basanna	62	Male	009405	53	168	Thigh	Collagen Dressing	10	No	6	6	Moderate	8	Thick (0.6-0.8 mm)	87	94
71	Jayamala	37	Female	480340	60	188	Thigh	Collagen Dressing	13	No	6	8	Significant	10	Medium (0.4-0.6 mm)	87	98
72	Lakkawa	70	Female	229397	80	189	Thigh	Collagen Dressing	7	No	6	5	Moderate	7	Thin (0.2-0.4 mm)	80	98
73	Shettu	65	Male	008588	90	161	Thigh	Collagen Dressing	10	No	5	5	Moderate	10	Thick (0.6-0.8 mm)	94	99
74	Sanjiv	40	Male	009020	81	152	Thigh	Collagen Dressing	12	No	6	4	Minimal	10	Thin (0.2-0.4 mm)	73	93
75	Sunanda	22	Female	175618	86	166	Thigh	Collagen Dressing	13	No	6	8	Significant	7	Thin (0.2-0.4 mm)	91	85
76	Appashya	52	Female	198764	64	178	Thigh	Collagen Dressing	8	No	6	4	Minimal	10	Thick (0.6-0.8 mm)	91	91
77	Shrishail	40	Male	437	70	174	Thigh	Collagen Dressing	14	No	7	4	Minimal	10	Medium (0.4-0.6 mm)	66	91
78	Praveen	25	Male	441	65	151	Thigh	Collagen Dressing	7	No	5	8	Significant	9	Thin (0.2-0.4 mm)	65	97
79	Shankargouc	36	Male	299094	76	153	Thigh	Collagen Dressing	14	No	6	4	Minimal	7	Thin (0.2-0.4 mm)	79	88
80	Danappa	74	Male	13881	93	186	Thigh	Collagen Dressing	14	No	6	4	Minimal	7	Thick (0.6-0.8 mm)	70	92
81	Kamlakar	45	Male	14797	81	177	Thigh	Collagen Dressing	14	No	7	5	Moderate	9	Medium (0.4-0.6 mm)	87	86
82	Preetam	10	Male	63910	72	160	Thigh	Collagen Dressing	13	No	5	4	Minimal	7	Medium (0.4-0.6 mm)	65	85
83	Sarojini	29	Female	122042	50	176	Thigh	Collagen Dressing	10	No	7	6	Moderate	9	Thin (0.2-0.4 mm)	74	87
84	Sanju	56	Male	147790	84	174	Thigh	Collagen Dressing	13	No	6	6	Moderate	8	Thick (0.6-0.8 mm)	69	91
85	Shivanand	50	Male	214447	65	163	Thigh	Collagen Dressing	7	No	6	5	Moderate	5	Thin (0.2-0.4 mm)	67	97
86	Naveen	39	Male	147797	62	165	Thigh	Collagen Dressing	14	No	7	5	Moderate	8	Thin (0.2-0.4 mm)	95	92
87	Chanappa	61	Male	43032	65	171	Thigh	Collagen Dressing	8	No	5	5	Moderate	8	Medium (0.4-0.6 mm)	82	87
88	Nagappa	70	Male	165545	90	150	Thigh	Collagen Dressing	14	No	6	4	Minimal	8	Medium (0.4-0.6 mm)	92	94
89	Irappa	45	Male	003418	82	164	Thigh	Collagen Dressing	13	No	6	5	Moderate	5	Medium (0.4-0.6 mm)	70	93
90	Shantosh	58	Male	159167	59	176	Thigh	Collagen Dressing	8	No	6	6	Moderate	9	Medium (0.4-0.6 mm)	86	91
91	Mallikarjuna	65	Male	35045	55	182	Thigh	Collagen Dressing	10	No	7	5	Moderate	7	Medium (0.4-0.6 mm)	85	85
92	Karthik	45	Male	35045	87	188	Thigh	Collagen Dressing	14	No	6	7	Significant	7	Medium (0.4-0.6 mm)	91	97
93	Shivanand	50	Male	23628	92	189	Thigh	Collagen Dressing	7	No	6	4	Minimal	7	Medium (0.4-0.6 mm)	78	88
94	Rakesh	23	Male	234270	92	172	Thigh	Collagen Dressing	14	No	6	8	Significant	6	Medium (0.4-0.6 mm)	84	96
95	Vikas	45	Male	283735	78	154	Thigh	Collagen Dressing	14	No	6	4	Minimal	10	Medium (0.4-0.6 mm)	95	95
96	Shankargouc	30	Male	299056	96	157	Thigh	Collagen Dressing	10	No	7	8	Significant	8	Medium (0.4-0.6 mm)	88	99
97	Ninganagouc	44	Male	5230	79	181	Thigh	Collagen Dressing	14	No	7	4	Minimal	6	Thin (0.2-0.4 mm)	66	87
98	Sayawwa	68	Male	16765	67	161	Thigh	Collagen Dressing	14	No	6	4	Minimal	9	Thick (0.6-0.8 mm)	68	90
99	Jagadeesh	46	Male	177072	73	179	Thigh	Collagen Dressing	9	No	6	6	Moderate	7	Thin (0.2-0.4 mm)	81	92
100	Sharanappa	65	Male	176917	84	187	Thigh	Collagen Dressing	10	No	7	4	Minimal	7	Thin (0.2-0.4 mm)	84	93

Azadi Ka Amrit Mahotsav

BLDE

(DEEMED TO BE UNIVERSITY)

Declared as Deemed to be University u/s 3 of UGC Act, 1956

Accredited with 'A' Grade by NAAC (Cycle-2)

The Constituent College

SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

BLDE (DU)/IEC/ 920/2023-24 10/4/2023

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this University met on **Saturday, 18th March, 2023 at 11.30 a.m. in the CAL Laboratory, Dept. of Pharmacology,** scrutinizes the Synopsis/ Research Projects of Post Graduate Student / Under Graduate Student /Faculty members of this University /Ph.D. Student College from ethical clearance point of view. After scrutiny, the following original/ corrected and revised version synopsis of the thesis/ research projects has been accorded ethical clearance.

TITLE: "A COMPARISON OF CONVENTIONAL SKIN GRAFT DONOR SITE DRESSINGS AND COLLAGEN DRESSING".

NAME OF THE STUDENT/PRINCIPAL INVESTIGATOR: DR.BATHALA SRINATH

NAME OF THE GUIDE: DR.M.B.PATIL, PROFESSOR AND HEAD, DEPT. OF GENERAL SURGERY.

Dr. Santoshkumar Jeevangi
Chairperson
IEC, BLDE (DU),
VIJAYAPURA

Chairman,
Institutional Ethical Committee,
BLDE (Deemed to be University)
Vijayapura

Dr.Akram A. Naikwadi
Member Secretary
IEC, BLDE (DU),
VIJAYAPURA

MEMBER SECRETARY
Institutional Ethics Committee
BLDE (Deemed to be University)
Vijayapura-586103. Karnataka

Following documents were placed before Ethical Committee for Scrutinization.

- Copy of Synopsis/Research Projects
- Copy of inform consent form
- Any other relevant document