"A RANDOMISED CONTROL STUDY ON EFFICACY OF TOPICAL LOSARTAN VERSUS TOPICAL CLOBETASOL FOR THE TREATMENT OF HYPERTROPHIC SCAR AND KELOID"

By

DR.GUNALAKSHMI.K,MBBS

Dissertation submitted to the

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In partial fulfillment of the requirements for the degree of

DOCTOR OF MEDICINE (M.D.)

IN

DERMATOLOGY, VENEREOLOGY AND LEPROSY

Under the guidance of

DR. RAJASHEKAR T.S., MBBS, MD

Professor & Head of Department

DEPARTMENT OF DERMATOLOGY, VENEREOLOGY AND LEPROSY,

SRI DEVARAJ URS MEDICAL COLLEGE, TAMAKA,

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Date:

Place: Kolar

Signature of candidate

DR. GUNALAKSHMI.K

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH TAMAKA, KOLAR,KARANATAKA

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Date:
Place: Kolar

Signature of Guide
DR. RAJASHEKAR.T. S MD.
Professor and Head,
Department Of Dermatology, Venereology and Leprosy,
Sri Devaraj Urs Medical College
Tamaka, Kolar

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Signature of HOD
DR. RAJASHEKAR. T.S
Professor & Head,
Department of Dermatology
Sri Devaraj Urs Medical College, Tamaka,
Kolar

Date:
Place: Kolar

Signature of principal
DR. PRABAKAR K
Sri Devaraj Urs Medical College,
Tamaka, Kolar

Date:
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The Institutional Ethics Committee of Sri Devaraj Urs Medical College, Tamaka, Kolar has examined and unanimously approved the synopsis entitled **" A Randomised Control Study On Efficacy Of Topical Losartan Versus Topical Clobetasol For The Treatment Of Hypertrophic Scar And Keloid"** being investigated by **Dr.Gunalakshmi K & Dr.Rajashekar.T.S** in the Department of Dermatology at Sri Devaraj Urs Medical College, Tamaka, Kolar. **Permission is granted by the Ethics Committee to start the study.**

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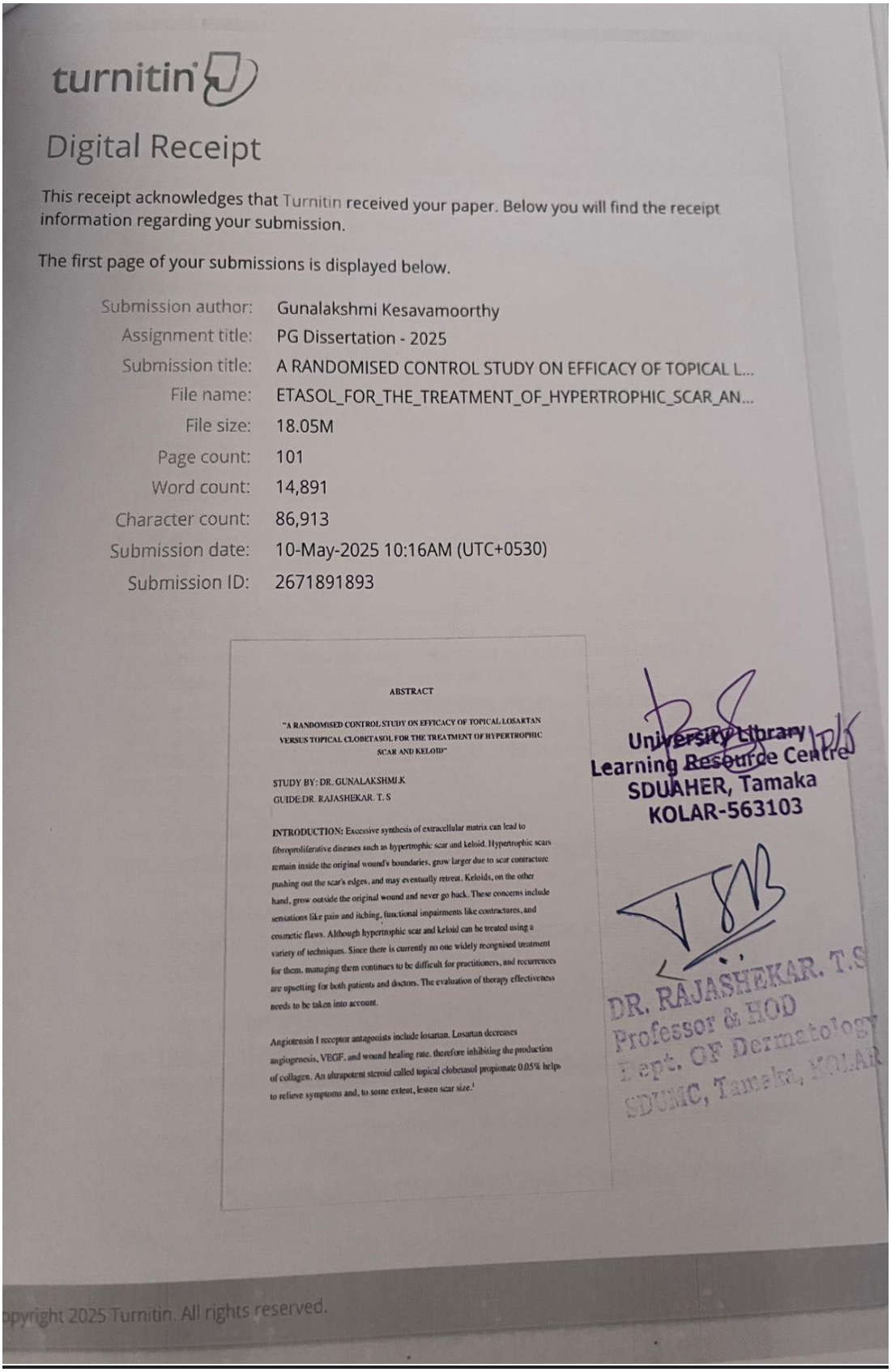

ABSTRACT

"A RANDOMISED CONTROL STUDY ON EFFICACY OF TOPICAL LOSARTAN VERSUS TOPICAL CLOBETASOL FOR THE TREATMENT OF HYPERTROPHIC SCAR AND KELOID"

STUDY BY: DR. GUNALAKSHMI.K
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INTRODUCTION: Excessive synthesis of extracellular matrix can lead to fibroproliferative diseases such as hypertrophic scar and keloid. Hypertrophic scars remain inside the original wound's boundaries, grow larger due to scar contracture pushing out the scar's edges, and may eventually retreat. Keloids, on the other hand, grow outside the original wound and never go back. These concerns include sensations like pain and itching, functional impairments like contractures, and cosmetic flaws. Although hypertrophic scar and keloid can be treated using a variety of techniques. Since there is currently no one widely recognised treatment for them, managing them continues to be difficult for practitioners, and recurrences are upsetting for both patients and doctors. The evaluation of therapy effectiveness needs to be taken into account.

Angiotensin I receptor antagonists include losartan. Losartan decreases angiogenesis, VEGF, and wound healing rate, therefore inhibiting the production of collagen. An ultrapotent steroid called topical clobetasol propionate 0.05% helps to relieve symptoms and, to some extent, lessen scar size.[1]

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Date: Signature of candidate

Place: **DR. GUNALAKSHMI.K**

LIST OF ABBREVIATIONS

ACE	Angiotensin converting enzyme
AT2	Angiotensin
BTX-A	Botulinum toxin type A
CO2	Carbon dioxide
ECM	Extracellular matrix
FGF	Fibroblast growth factor
G6PD	Glucose-6-phosphate deficiency
HGF	Hepatocyte growth factor
HLA	Human Leukocyte Antigen
IFN	Interferon
IGF	Insulin like growth factor
IL	Interleukin
ILS	Intralesional steroid
IPL	Intense pulsed light
IU	International unit
LED	Light Emitting diode
M6P	Mannose -6-phosphate
MMPs	Matrix metalloproteinases
MSH	Melanocyte stimulating hormone

MSS	Manchester Scar Scale
mTOR	Mammalian target of rapamycin
MTX	Methotrexate
Nd:YAG	Neodymium-doped: Yttrium Aluminium Garnet
PCNA	Proliferating cell nuclear antigen
PDGF	Platelet derived growth factor
PDL	Pulsed dye laser
POSAS	Patient observer scar assessment scale
RSTS	Rubinstein–Taybi syndrome
SGS	Silicone gel sheets
TGF	Transforming growth factor
TLR	Toll like receptor
TNF-α	Tumor necrosis factor alpha
VAS	Visual Analogue Scale
VEGF	Vascular endothelial growth factor
VSS	Vancouver scar scale
5-FU	5-fluorouracil
VDRL	Venereal Disease Research Laboratory

ABSTRACT

"A RANDOMISED CONTROL STUDY ON EFFICACY OF TOPICAL LOSARTAN VERSUS TOPICAL CLOBETASOL FOR THE TREATMENT OF HYPERTROPHIC SCAR AND KELOID"

INTRODUCTION: Excessive synthesis of extracellular matrix can lead to fibroproliferative diseases such as hypertrophic scar and keloid. Hypertrophic scars remain inside the original wound's boundaries, grow larger due to scar contracture pushing out the scar's edges, and may eventually retreat. Keloids, on the other hand, grow outside the original wound and never go back. These concerns include sensations like pain and itching, functional impairments like contractures, and cosmetic flaws. Although hypertrophic scar and keloid can be treated using a variety of techniques. Since there is currently no one widely recognised treatment for them, managing them continues to be difficult for practitioners, and recurrences are upsetting for both patients and doctors. The evaluation of therapy effectiveness needs to be taken into account.

Angiotensin I receptor antagonists include losartan. Losartan decreases angiogenesis, VEGF, and wound healing rate. therefore inhibiting the production of collagen. An ultrapotent steroid called topical clobetasol propionate 0.05% helps to relieve symptoms and, to some extent, lessen scar size.[1]

AIM:

- To assess and to evaluate the efficacy of topical losartan and topical clobetasol in the treatment of hypertrophic scar and keloid
- To document the adverse effects of topical losartan and topical clobetasol in the treatment of hypertrophic scar and keloid

MATERIALS AND METHODS

GROUP A- Emollient, 2-propanol, and powdered losartan potassium will be bought. In order to make the ointment for group A, 5 g of losartan potassium powder is dissolved in a solvent that contains 1 ml 2-propanol and 6 ml distilled water. The solution is then diluted with Eucerin to achieve a total weight of 100 g.The losartan ointment will be tested on the skin of the hands, and blood pressure readings will be taken every 15 minutes for two hours in order to assess the sensitivity, allergy, and potential hypotensive effect of topical losartan. For six months, the patients must apply the ointments twice daily, and we assess their effectiveness and side effects every month.

GROUP B Participants in will get commercially available Topical 0.05% clobetasol For four months, 0.05% clobetasol propionate cream is applied twice daily and advised for follow up. RESULTS - The treatment outcomes for the two groups were significantly different. Compared to group B patients, group A had significantly fewer unfavourable effects, including surrounding skin shrinkage, telangiectasia, and pigmentation abnormalities. Patients in group B showed comparable gains to those in group A, although they had a higher number of side effects. Patient satisfaction is higher in group A, which leads to better treatment compliance. The vast majority of patients (31.8%) were aged 31 to 40 years. Cosmetic concerns were the most common cause for treatment, as shown in 63.3% of patients.

CONCLUSION - Both regimens produced remarkable results, indicating that they are quite successful in the treatment of hypertrophic scars and keloids. Regimen B, on the other hand, was associated with more persistent and problematic side effects, implying that regimen A is a safer option for treating these exuberant wounds.

- **Keywords:** HYPERTROPHIC SCAR, KELOID, LOSARTAN, CLOBETASOL

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INTRODUCTION

An abnormal variant of normal wound recovery, keloid and hypertrophic scars (HTS) are distinguished by fibroblast hyperproliferation and excess collagen formation. Darker-skinned individuals are more susceptible to hypertrophic scarring, which can occur in all patients. In populations of African descent, the incidence ranges from 6 to 16%. Hypertrophic scars or keloids are occasionally the result of deep cutaneous injuries, including burns, physical trauma, surgical incisions, vaccinations, skin piercings, and insect bites. It diminishes the quality of life by causing cosmetic issues, functional disabilities such as contractures, and symptoms such as pruritus and discomfort.[2]

The five primary mechanisms by which these treatment approaches prevent further proliferation of scar tissue cells are as follows: compression therapies, which reduce inflammation, corticosteroids, chemotherapy, radiation, and direct destruction (cryotherapy), and surgery, which involves the removal of scar tissue cells. The majority of patients require a combination approach to obtain adequate disease control and mitigation, as monotherapy is frequently insufficient.

The present therapies include compression therapy, cryotherapy, laser therapy, electrical stimulation, photodynamic therapy, topical and intralesional steroids, surgical excision, and combination therapy. Also included are silicone gel sheeting. Nevertheless, none of the treatment options yields satisfactory outcomes and is susceptible to recurrence. 5. Corticosteroids increase collagenase activity and suppress the inflammatory response during the initial phase of the wound healing process. Topical clobetasol propionate 0.05%, an ultrapotent steroid, provides symptomatic relief and, to a lesser extent, reduces the size of keloid and HTS.[1]

Renin-angiotensin system (RAS) in organ fibrogenic processes. Angiotensin II, AT1, and AT2 receptors, as well as angiotensin converting enzyme, are located in dermal tissue and operate independently of systemic RAS activity.

AT1 receptors promote fibrogenesis and scar formation, while AT2 receptors reduce these effects. Through AT1 receptor stimulation, Angiotensin II promotes cutaneous scar development by upregulating proinflammatory mediators like IL-6, angiogenic factors like VEGF, and fibrogenic factors like TGF-b1 and connective tissue GF. Ang II downregulates antifibrotic drugs like tissue inhibitors of metalloproteinases. [3]

Both AT1 Angiotensin I and AT2 Angiotensin II induce collagen expression through the AT1 receptor via TGF-β. Keloid tissue in humans exhibits elevated levels of vascular endothelial growth factor (VEGF) relative to normal tissue. AT1 receptor antagonists, such as Losartan, diminish VEGF levels, angiogenesis, and the rate of wound healing. Consequently inhibiting collagen synthesis.[3]

The aforementioned impact of losartan on renal tissue can be generalised to skin tissue and HTS. Topical clobetasol has been demonstrated to diminish the size of scar tissue. The study aims to evaluate and compare the effectiveness of topical losartan and topical clobetasol in attaining a painless and aesthetically pleasing outcome. Despite various treatment modalities, keloids and hypertrophic scars are prone to recurrence. The lack of a universally accepted treatment protocol highlights the need for individualized treatment plans that consider the patient's specific scar characteristics and response to previous treatments

OBJECTIVES

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REVIEW OF

LITERATURE

REVIEW OF LITERATURE

HISTORICAL ASPECTS

Keloids were initially documented centuries ago in the Smith papyrus, subsequently by Retz in 1770, and by Alibert in 1802, who employed the term "cheloide" to distinguish these lesions from malignant neoplasms.[1]

The Yorubas of Western Nigeria, grounded in African folklore, represented keloids in sculpture as early as the 13th century.[4]

In 1806, Alibert provided the first precise description of a keloid. In 1816, he introduced the name "cheloide" to distinguish keloids from malignant tumours.
The term "keloid" is derived from the Greek word χηλη, meaning "claw." It pertains to the pseudopodial extensions of the extremities of specific keloids.[5]

In 1825, Alibert labelled a chapter on these lesions "Les Cancroides ou Keloides." The initial documented account of keloids was referred to as “dartres de graisse” in a publication by Noël Retz in 1790. [6]

In 1808, Jean-Louis Alibert at Saint-Louis Hospital in Paris began studying keloids. He called the phenomenon “cancroid” before coining “keloid” to distinguish it from malignancies.[5]

Yorubas recorded keloids ten centuries before Retz and Alibert. They discovered that keloids happen in particular families but affect everyone. They also know the trauma-to-lesion timeframe. Facial tattoos and carbolic perforation were common indigenous practices about 7 days following birth. If scarification is delayed in adolescence or adulthood, keloidal

development may result. Once a lesion formed, it expanded and had no cure unless "the divine Power is suitably appropriated to intervene in its resolution.[4]

Addison defined “true keloid” (arising spontaneously) in 1854 and classified Albert's “false keloids” (arising at trauma sites). Later, his true/false keloids nomenclature was abandoned because the lesions he described were possibly scleroderma or morphea.[7]

DEFINITION - Keloids are atypical scars that beyond the original wound boundaries and do not diminish over time, marked by excessive fibrous tissue development. Conversely, hypertrophic scars remain within the original incision margins and may diminish over time. Both disorders stem from atypical wound healing mechanisms; nevertheless, they diverge in clinical presentation, texture, and behaviour. Comprehending these disparities is essential for effective treatment and management techniques.[8]

INCIDENCE - Keloids appear in one in ten cases, however genetic keloids and darker phototypes increase their risk. Hypertrophic scars often emerge from acne, folliculitis, and surgical incisions, but this abstract does not offer numerical references. Keloids and hypertrophic scars are caused by the same skin damage, but their appearance rates vary due to genetic and environmental factors.[9]

ETIOLOGY - Tissue damage from burns, insect bites, surgery, tattoo receiving, stressful events, and vaccines can be repaired if the healing process works properly. In modulated healing settings, KDs and HTSs show increased scarring.[10]

TRAUMA - Trauma is the main cause in most individuals. This trauma can include scratches, bug bites, abrasions, post-vaccination, acne, chicken pox, surgery, or chemical or thermal burns. The development of spontaneous keloids in non-traumatized areas and the

lack of these lesions after cutaneous trauma, notably over the leg, has led to the idea that other predisposing variables exist.[6]

INFECTION - Despite the belief that tubercle bacilli caused keloids, a study of 168 keloid patients found no clinical indications of tuberculosis and positive tuberculin reactions were within the normal range. Keloids can follow varicella, small pox, herpes, or furuncles.[11]

GENITIC - Research has discovered two significant predisposing factors: HLA system alleles and DRB1*15, and E3 ubiquitin-protein ligase (NEDD4) and vitamin D receptor (VDR) polymorphisms. Associated with HLA-B14, -B21, -BW16, -BW 35, -DR5, -DQW3, blood group A. Autosomal dominant and recessive transmission.[12]

HYPRTENSION & KELOID - Patients with many big keloids (>10 cm2) were more likely to have hypertension.[13]

PREGNANCY & KELOID - Keloid scars are more likely during pregnancy, especially in dark-skinned people. Keloids can develop and worsen during pregnancy due to hormonal changes and skin strain.[14]

AGE - Keloid and hypertrophic scar patients were mostly 17-25 years old, accounting for 40% of cases. Keloids and hypertrophic scars had a male-to-female ratio of 1.07:1 and 1.09:1, respectively. Patients with both scars were mostly 36–45 years old.[15,16]

RACE - Keloids are more common in dark-skinned African, Hispanic, and Asian people than Caucasians. Keloids occur in 4.5% to 16% of predominantly black and Hispanic populations, including 16% of Africans. Polynesians and Chinese are affected more than Indians and Malaysians. Caucasians and albinos suffer least.[14]

HORMONES & HYPERTROPHIC SCARS – Non-keloidal scar tissue had modest androgen-binding levels (37–60 femtomoles per milligramme of cytosolic protein) and almost no oestrogen or progesterone binding. This shows that localised hyperandrogenism may cause or progress keloid development. Androgen blocker finasteride reduces pruritus and chest keloids. Keloid tissues show elevated androgen levels and receptor activity promote inflammation and fibroblast growth, complicating keloid therapy.[17]

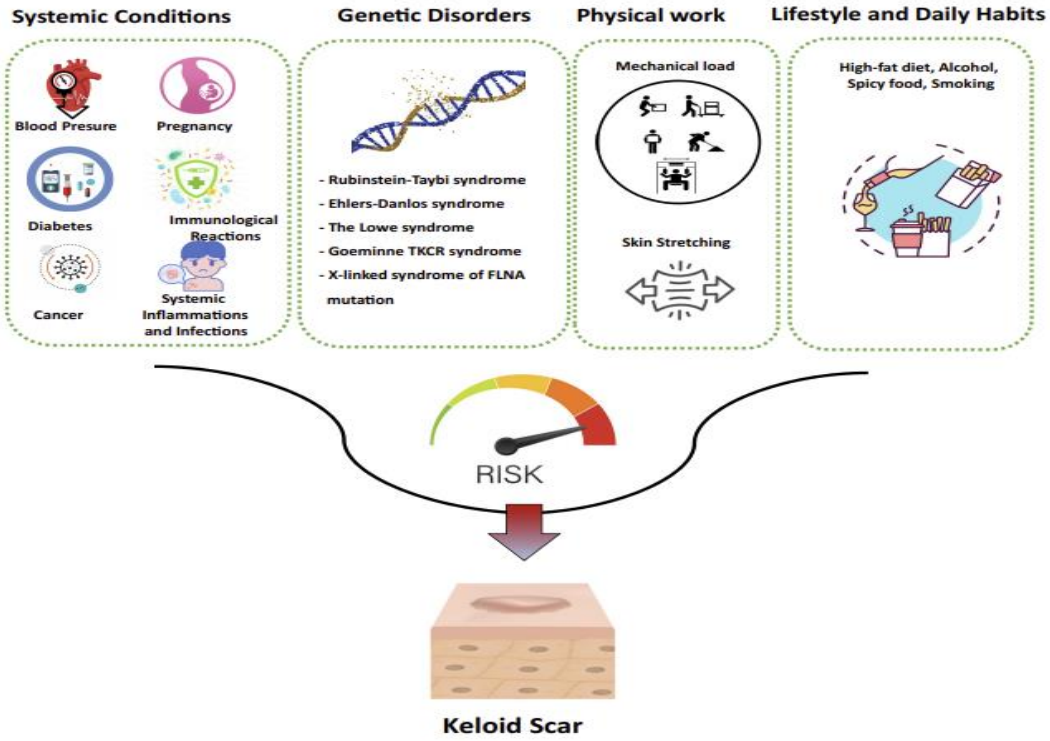

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Figure 1 ETIOLOGY OF KELOID SCAR

CLASSIFICATIONS

I. CLINICO-MORPHOLOGICAL CLASSIFICATION

a. Acute

b. Subacute

c. Chronic

II. ETIOLOGICAL CLASSIFICATION

Table 1 : Etiological classification

1. Due to injury
a. Mechanical
b. Burns
c. Electrocautery

2. Due to inflammation
a. Acne
b. Varicella
c. Vaccination especially intradermal
d. Furuncles

3. Miscellaneous
a. Incisions
b. Following surgeries such as thyroidectomy, thoracotomy, nephrectomy.
c. Skin grafting

DIFFERENT TYPES OF SCAR AND ITS DESCRIPTION:[18]

Table 2: DIFFERENT TYPES OF SCAR AND ITS DESCRIPTION:[18]

SCAR TYPE	DESCRIPTION
Immature scar	Pink slightly raised Sometimes itchy Firm but not hard Begins soon after injury, months to resolve Peaks at a few weeks after injury
Mature flat	Flat scar without crythema, stable No symptoms
Hypertrophic linear scar	Ropy (elevated) and pink or red Evolves from immature scar within several weeks Progressive enlargement for months before slow decrease in activity Often itchy or slightly sore to touch Resolution results in a persistently elevated scar that is no longer pink
Hypertrophic	Elevated, pink or red

wide scar	Arises from widespread injury such as a burn Frequently with severe pruritis and can be tender Very stiff with limitation of mobility across joint surface
Minor keloid	Round or elevated, extends beyond scar Most often at site of pierced scarring or surgical incision Strong genetic component which is different than hypertrophic scars Simple surgical excision with very high rate of recurrence
Major keloid	Elevated, large often irregular in shape (butterfly appearance) Frequently seen in multiple locations on person Initial injury can be very minor Often symptoms of pain and pruritis are debilitating Treatment options are limited

PATHOPHYSIOLOGY OF KELOID AND HYPERTROPHIC SCAR:

Fibroproliferation and ECM Production: Keloids have aberrant fibroblast activity and excessive ECM deposition, with higher fibronectin and proteoglycan levels and lower hyaluronic acid levels.[19] Keloids are fibrotic due to poor control. When proteoglycans like biglycan and decorin attach to collagen fibrils, they change collagen architecture. Scarring results from aberrant extracellular matrix and collagen architecture formation.[20]

Growth Factor Differences : Keloid fibroblasts are more TGF-sensitive. Studies show that keloid tissue with enhanced proliferation and collagen deposition has greater TGF levels. Keloids, like TGF, activate platelet-derived growth factor receptors four to fivefold and stimulate growth synergistically. Specific cytokine expression and growth factor activity affect hypertrophic scar development and regression.[21]

Collagen Synthesis and Accumulation

Increased Synthesis: Both keloid and hypertrophic scars show elevated rates of collagen synthesis compared to normal scars. In the early phases of scar formation, keloid fibroblasts produce more collagen than hypertrophic ones.

Keloids have more collagen bundles, which are thicker, wider, and unorganised, as shown under optical and electron microscopy. Ultrastructurally, "collagen nodules" are visible.[22,23]

Keloids may occur from an inherited aberrant immune response to skin damage due to HLA subtypes. Familial tendencies suggest polygenic inheritance. Over 152 keloid-specific genes, 10 of which were part of biological pathways critical to keloid development, have been discovered. Keloid patients with high serum immunoglobulin E levels have a higher risk of allergic diathesis. Multiple investigations have found similar blood complement,

immunoglobulin G, and immunoglobulin M levels in keloids patients, suggesting a genetically predisposed systemic immune system. [24]

Systemic inflammation can also control keloid growth. The complement system, cytokines, and chemokines comprise the inflammatory circuitry. ILs, IFNs, and TGF are crucial to keloid etiology. Keloid formation depends on proinflammatory cytokine IL-6. Blood IL-6 levels rise in sites of active inflammation, triggering transcription of downstream inflammatory components via IL-6RA. Keloids may have persistent inflammation due to an autocrine loop of IL-6 signalling that activates pathways like Jak/STAT3 or MAPK/extracellular signal regulated kinase, resulting in fibroblastic cell proliferation and matrix synthesis. [3]

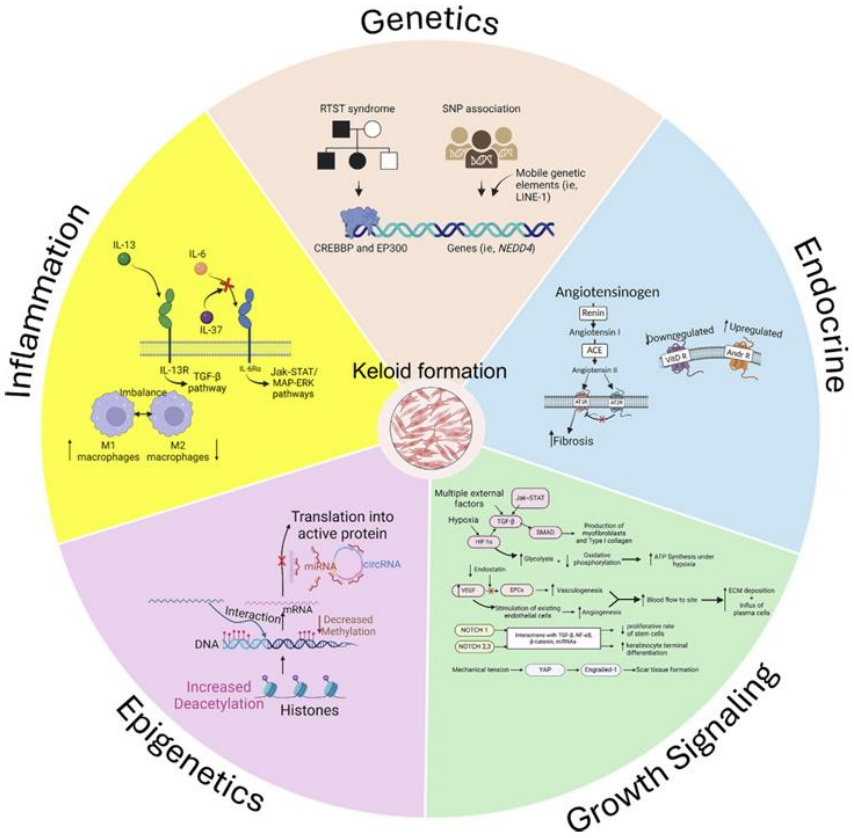

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Figure 2 Pathogenic factors

Pathogenic factors that contribute to keloid formation. The diagram is divided into 5 major sections:

- Genetics
- Endocrine system
- Growth factor signaling
- Epigenetics
- Inflammation.

Genetics shows how genes and mobile genetic components interact in a genome. The endocrine system section discusses ARs and angiotensin. The growth signalling section covers the interplay between the Jak-STAT, TGFβ, and HIF-1α pathways. This section shows how VEGF produces vasculature and how NOTCH1, 2, and 3 are involved. The epigenetics section explains how histone modification, DNA methylation, miRNAs, lncRNAs, and circRNAs interact.

The inflammatory section discusses IL-6, IL-37, IL-13, and M1 and M2 macrophages. Image created with Biorender. ACE, angiotensin-converting enzyme; AR, androgen receptor; AT1R, AT2R, ECM, extracellular matrix; EPC, endothelial progenitor cell; lncRNA, long noncoding RNA; microRNA; RTST, Rubinstein–Taybi syndrome; STAT, signal transducer and activator of transcription; VitD R, vitamin D receptor.[3]

Noncoding RNAs (ncRNAs) also affect keloid epigenetics. Despite not being translated into protein, ncRNAs affect transcription and post-transcriptional gene expression. Approximately 98% of genomic DNA is transcribed as ncRNAs, including miRNA, lncRNA, and circRNA[4].

SYNDROMES ASSOCIATED WITH KELOID

Keloids can also occur as a clinical feature in a few congenital disorders, with Rubinstein–Taybi syndrome (RSTS) and Goeminne syndrome being the most prominent .[25]

- RSTS relies on germline mutations in CREBBP and EP300 genes. These genes produce histone acetyltransferases (HATs), which change chromatin structure and promote gene expression during transcriptional coactivation. Variations in these genes disrupt epigenetic gene expression regulation, affecting developmental pathways and contributing to RSTS phenotype.[25]
- Goeminne syndrome is rare and causes keloid development, congenital torticollis, nevi, and varicosities in early puberty.

Other rare syndromes associated with keloid development include

- Warburg-Cinotti syndrome (OMI 618175; DDR gene abnormality)
- Frontometaphyseal dysplasia 2 (OMIM 617137; MAP3K7 gene change)
- Lateral meningocele syndrome (OMIM 130720; NOTCH3 gene abnormality)
- Premature ageing syndrome
- Pantinen type (OMIM 601812; PDGFRB gene change) and cardiac valvular dysplasia
- X-linked (OMIM 314400; FLNA gene alteration)[25]

PATHOGENESIS

The wound healing process consists of four main stages:

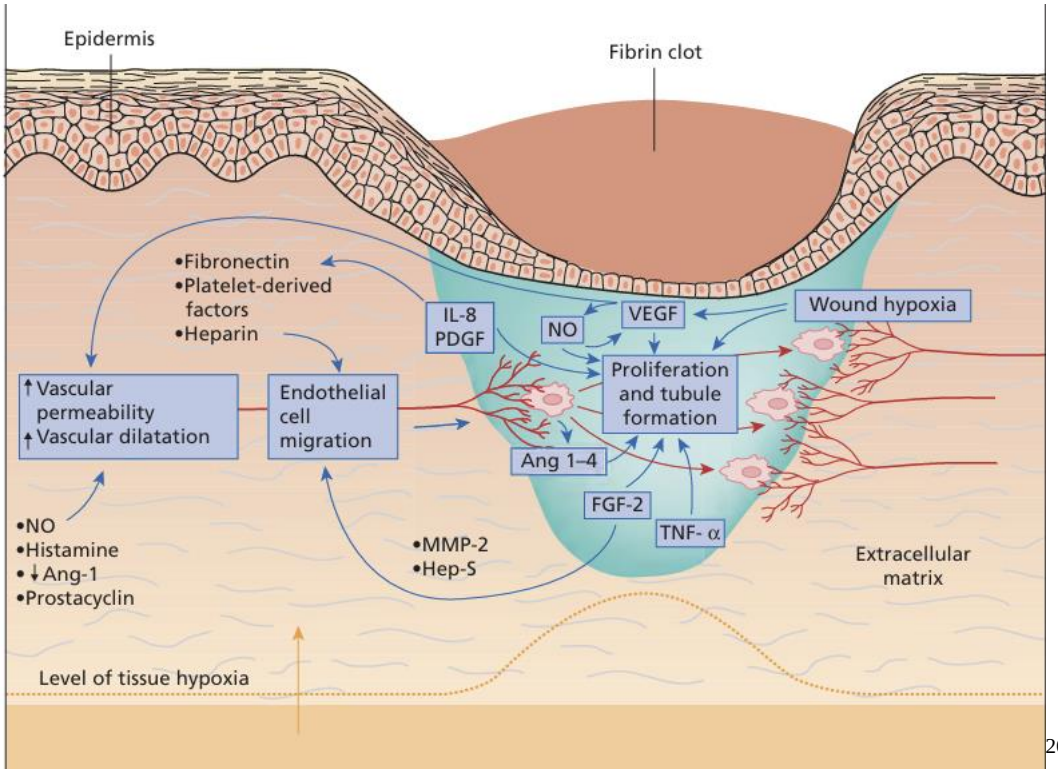
1. Hemostasis
2. Inflammation phase
3. Proliferative or granulation phase
4. Remodeling phase [26]

Hemostasis involves blood clotting to prevent blood loss.

Inflammation phase - where infections and detritus are removed before tissue development. The coagulation cascade releases cytokines that stimulate non-specific immune cells like macrophages and neutrophils to chemotactically enter the site for early wound debridement.[26]

Proliferative phase - After 48–72 hours, tissue development and repair begin for three to six weeks. Fibroblasts gather at the wound to form granulation tissue from procollagen, elastin, proteoglycans, and hyaluronic acid. This supports vascular ingrowth structural healing. Functional wound contraction is mediated by myofibroblasts with myofilaments.[27]

Remodeling phase restores skin integrity and function by maturing and reorganising newly generated tissue. After the lesion is closed, the juvenile scar may grow over several months.[28]



[26,29]

Figure 3 Angiogenesis

Angiogenesis requires molecular and cellular components that stimulate endothelial cell migration, proliferation, and tubule formation. After injury, angiogenesis restores and supplies nutrients to injured and rebuilding tissue. Inflammatory mediators such nitric oxide, histamine, angiopoietin 1, prostacyclin, and VEGF widen and permeabilize wound border capillaries. This aids endothelial cell migration into the perivascular area. Platelet-derived factors, extracellular matrix components (HEP-S and fibronectin), PDGF, IL-8, and FGF-2, which may be fibrin or fibrinogen bound, promote the process. Endothelial cells multiply and create capillary tubules in the wound bed, forming granulation tissue and restoring circulation. After 7 days, VEGF replaces FGF-2 as the primary stimulant, released by various cells such as macrophages, neutrophils, endothelial cells, keratinocytes, and fibroblasts. Tissue hypoxia, NO, TNF-α, and Ang-1–4 are also key proliferative factors.[27,30]

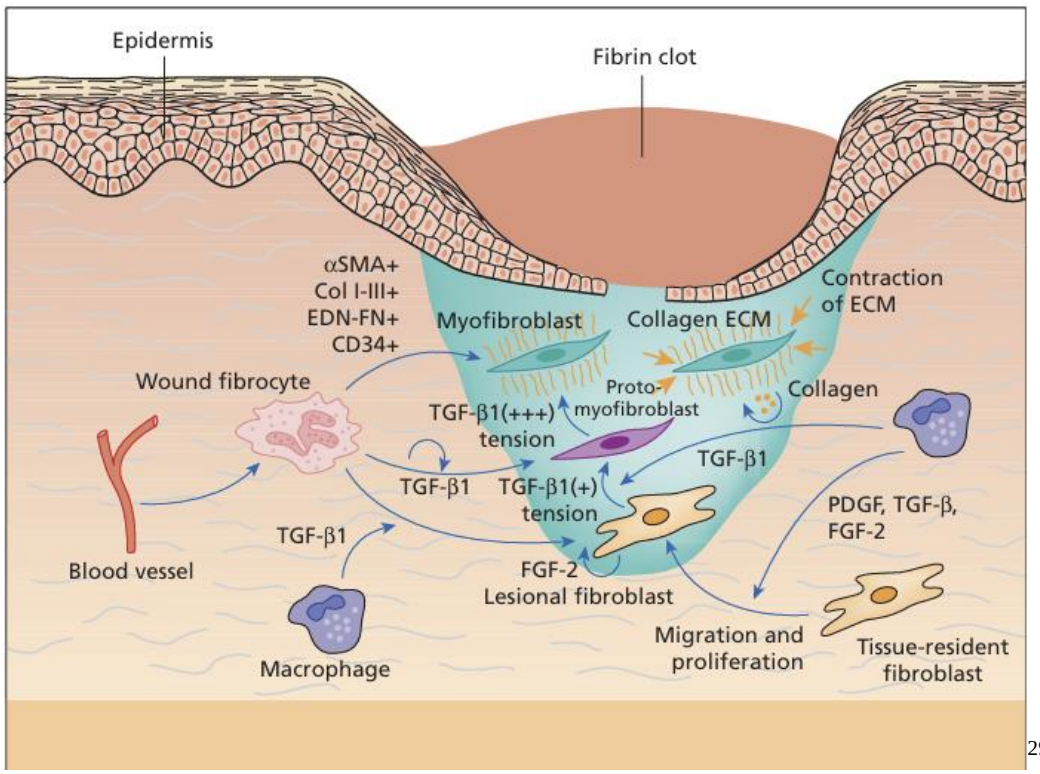


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Figure 4 SCAR FORMATION

Scarring from wound contraction. PDGF, TGF-β, and FGF-2 from macrophages cause fibroblast migration from healthy tissue to the wound site, initiating fibroplasia. TGF-β1 can differentiate bone marrow-derived cells into fibroblasts, proto-myofibroblasts, and myofibroblasts. 29 Later in the proliferative phase, fibroblasts become proto-myofibroblasts due to tissue stress and TGF-β. A positive feedback loop occurs when tension leads to TGF-β release and myofibroblast development, which generates most contractile forces in the wound. Myofibroblasts are identified by enhanced expression of α-smooth muscle actin (αSMA), collagen I and III, EDA-FN, and CD34+ cells. ECM, extracellular matrix

.[28,31]

CLINICAL FEATURES OF KELOID & HYPERTROPHIC SCAR:[6]

Table 3: clinical features between keloid and HTS

	KELOID	HYPERTROPHIC SCAR
ONSET	DELAYED	IMMEDIATE
PRESEDED BY INJURY	NOT ALWAYS	YES
ERYTHEMA	VARIES	PROMINENT
PROFILE	RAISED	RAISED
SYMPTOMATIC	YES	YES
CONFINED TO WOUND MARGIN	NO	YES
SPONTANEOUS RESOLUTION	RARE	POSSIBLE, GRADUAL
TREATMENT RESPONSE	POOR	GOOD [32]
LOCATION	Anywere especially deltoid region, pre sternal area, upper back regions, and earlobes, are more susceptible to them	Common in areas of tension .confined to the original wound boundary and may regress over time [21]

NUMBER	The majority of patients have one or two keloids, whereas a small percentage of patients, particularly those who acquire keloids spontaneously or as a result of acne or chicken pox, have many lesions.	Develop soon after surgery
SIZE OF THE LESION	The size of the tumor might range from a little papule to a big tumor. Lesions on the ear, neck, and belly are generally pedunculated, but those on the central chest are elevated with a flat surface, with the base often wider than the top.	Size commensurate with injury.Lesion can occur at any site followed by trauma
SHAPE	Most are round or oval with a regular margin, while others have a claw-like configuration with	Visible and elevated scars that do not spread into surrounding tissues and that often regress spontaneously

	irregular borders.	
CONSISTENCY	Range from soft and doughy to rubbery hard.	Hard with decreased pliability
COLOUR	Initially, keloids are erythematous, later turning brown and then pale as they age.	HTS is thick scar that are pink to red color
SURFACE	Keloids usually have a smooth surface devoid of hair follicles and other functioning adnexal glands.	HTS have smooth surface that remains within the boundaries [33]

HISTOPATHOLOGY:

Keloids and hypertrophic scars look identical under light microscopy, but scanning electron microscopy shows considerable morphological differences between normal human skin, keloids, and scars. Normal skin has collagen bundles, most of which run parallel to the epithelial skin. These collagen bundles appear to be randomly connected by fibrillar collagen strands.[34]

Hypertrophic scars have flatter, less defined collagen bundles that seem wavy. However, most bundles appear parallel to the epithelium. They often feature capsule-like bands around the periphery. Peripheral blood vessels. Although both keloids and hypertrophic scars have increased α1(I) procollagen gene transcription, hypertrophic scars' increased mRNA concentration is compensated post-transcriptionally, while keloids' is not.[6] Keloids reside beneath a normal epidermal layer without collagen bundles, and the fibres are loosely linked and arbitrarily orientated to the epithelial surface. More eosinophilic, thicker, and wavier collagen fibres than in hypertrophic scars. Keloids promote fibroblast proliferation. Keloids also have higher alanine transaminase and adenosine triphosphate levels. In keloid scars, proteoglycans are abundant. Reduced adnexal structure concentration[35]

Nodules with high cell and collagen density characterise hypertrophic scar. The cigar-shaped collagen fibres in the middle or deeper layer of the scar travel parallel to the skin and along the scar's tension lines. Nodules are absent in keloid scars. Hypertrophic scars have many fibroblasts but few glassy collagen bundles and little mucinous ground substance, and their collagen fibres are parallel to the scar's long axis, while keloid collagen is random.[11]

Histopathological Differences of HTS and keloid [6]

Table 4 - Histopathological Differences of HTS and keloid

	Hypertrophic scar	Keloid
Epidermis	Flattened	Not involved
Papillary dermis	Fibrotic	Not involved
Fibroblasts	Increased	Not increased

Collagen bundles	Fine, wavy, orientation is parallel to the epidermis	Large thick,closely packed, orientation is random relative to the epidermis
Elastic fibers	Diminished or absent	Increased within the deep dermis
Dermal mucin	Not increased	Increased
Dermal blood vessels	Increased, oriented vertically, perpendicular to the dermis	Not increased,if any,vertically oriented to vessels
Inflammatory infiltrate	Sparse perivascular	Sparse perivascular
Mast cells	Increased	Increased
Adnexal structure with in reticular dermis	Absent	Absent
Myofibroblast	+++	++
COX-1 expression	+	+++ [34]

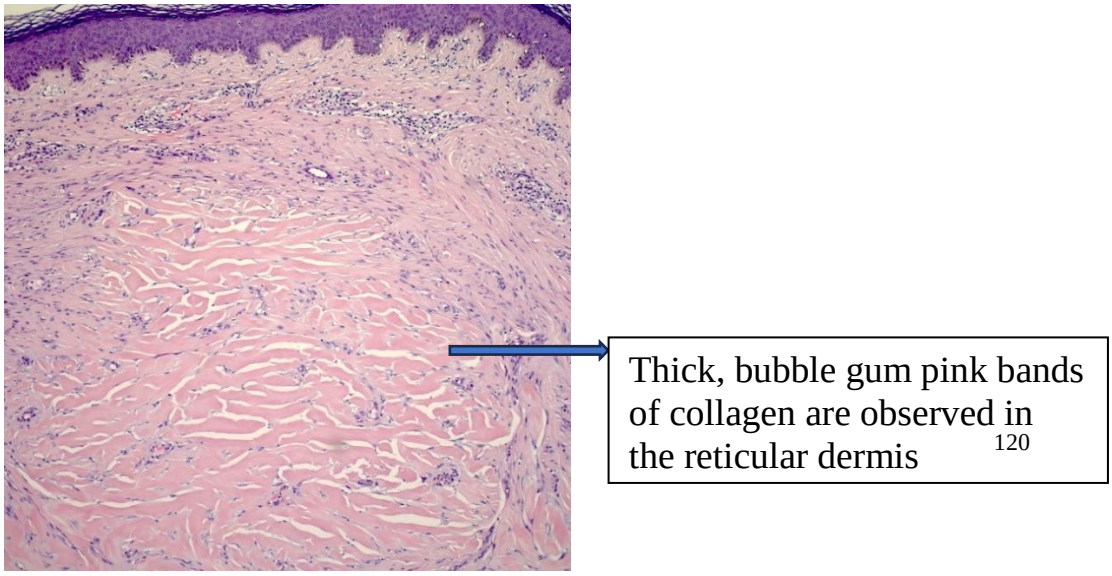


Figure 5: KELOID - Excision of a mass from skin of the right ear. (H&E, 10x).

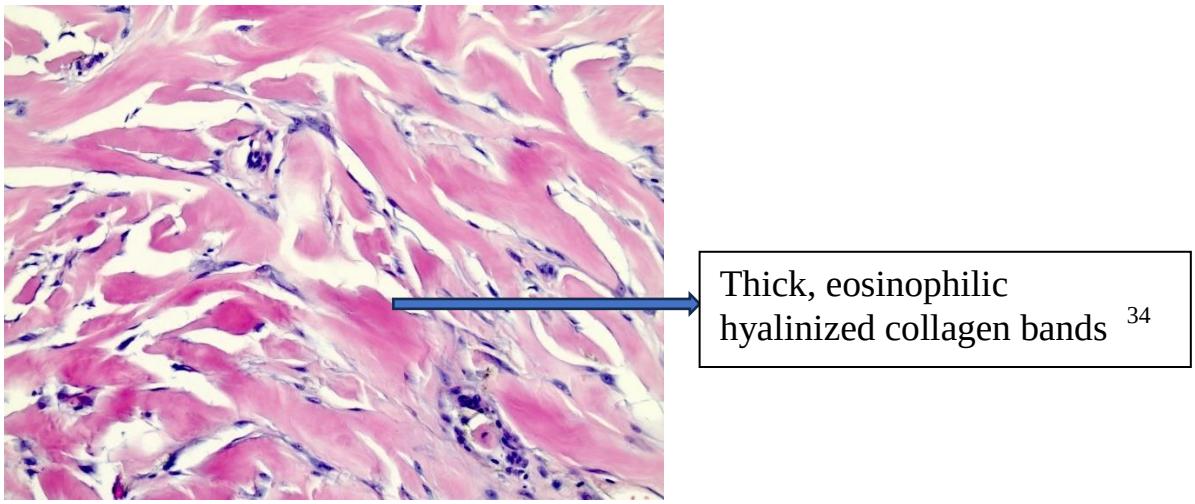


Figure 6 : KELOID - Excision of nodular lesion at the site of an ear piercing forming lesion of the left ear. (H&E, 40x).

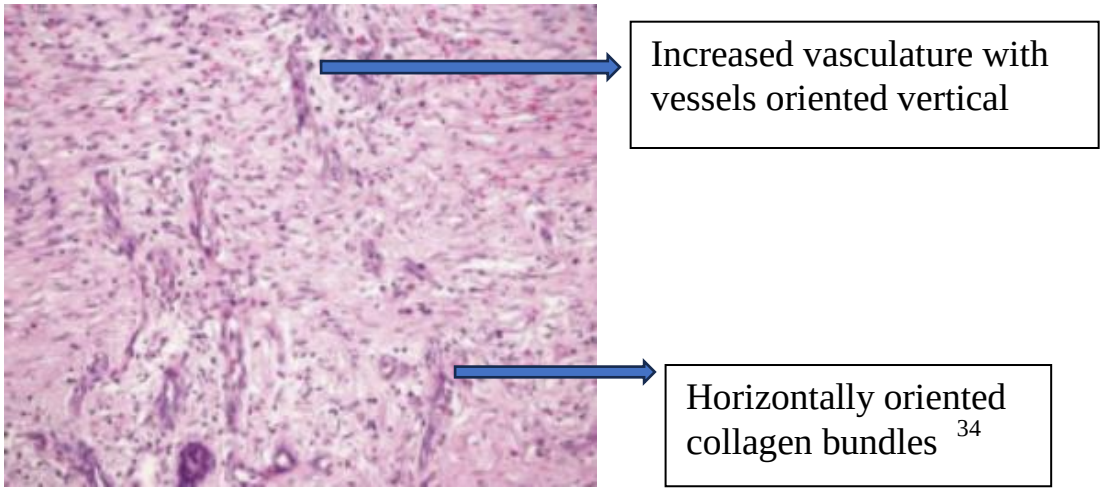


Figure 7 : HYPERTROPHIC SCAR - Excision of lesion at the site of Extensor aspect of arm. Higher power image of a newly forming scar

BIOCHEMICAL AND MOLECULAR DIFFERENCES BETWEEN KELOIDS AND HYPERTROPHIC SCARS[7]

Table 5- Biochemical and molecular differences between keloids and hypertrophic scars

Features	Hypertrophic scar	Keloid
Collagen bundles	Fine, well organised, wavy, parallel to epidermis	Large, thick, closely packed ,random to epidermis
Myofibroblasts	Present	Absent
Alpha-SMA expressing	Nodular formation	Around blood vessels wall
PCNA expressing	Low expression	High expression
Hyaluronic acid	localization Major component papillary dermis	Thickened, granular /spinous layer

Mucin deposition Negative	Negative	Focal expression in dermis
Amorphous substance on electron microscopy	Absent	Diffuse pattern
Apoptosis	Decreased	Increased
ATP level	Low expression	High expression
P53	Low	High [32]

Table 5- Biochemical and molecular differences between keloids and hypertrophic scars

DIFFERENTIAL DIAGNOSIS

1. Hypertrophic scars

2. Dermatofibrosarcoma protuberans

3. Trichilemmal carcinoma

4. Keloidal basal cell carcinoma

5. Apocrine cystadenoma

6. Adult-onset xanthogranuloma

7. Mixed tumour

8.Chronic folliculitis

9.Nodular scleroderma.[36]

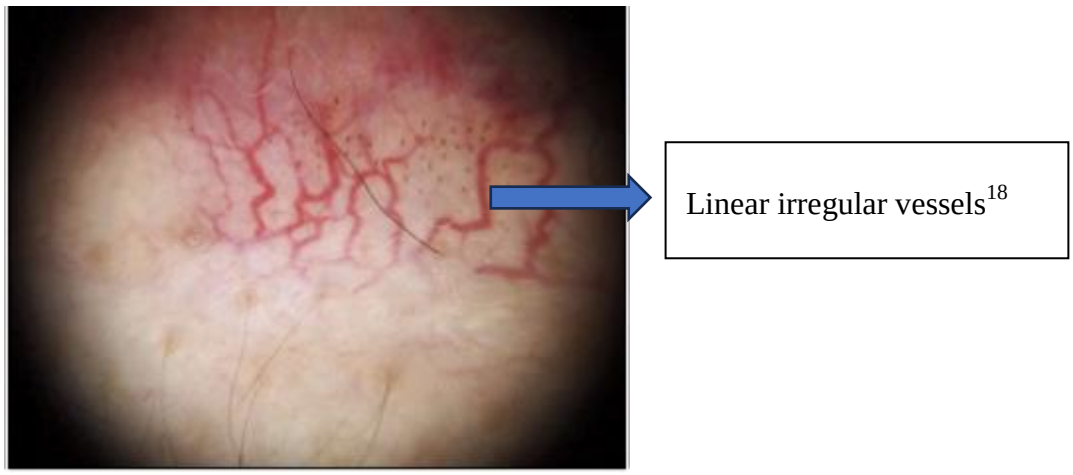


Figure 8 : Dermascopy of keloid

Arborizing vessels are visible

Comma-shaped vessels

Increased vascularization

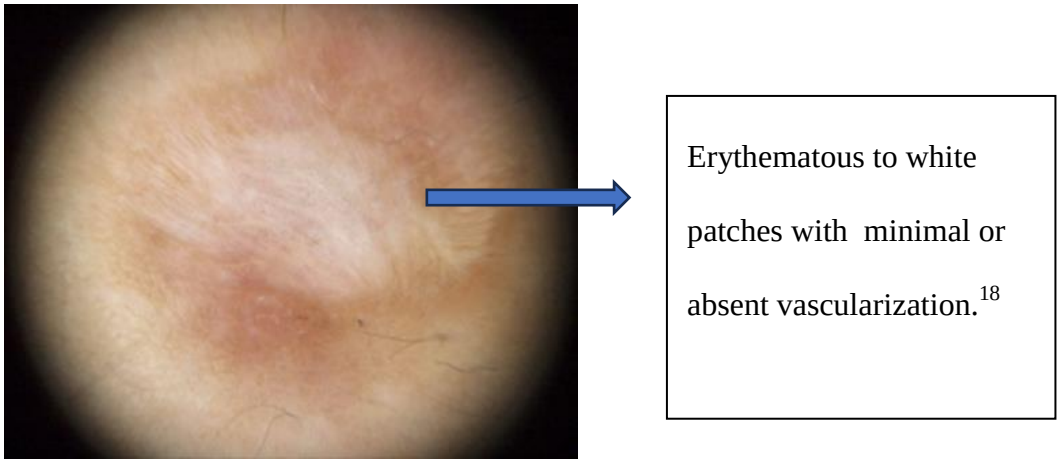


Figure 9 Dermascopy of hypertrophic scar

ASSESSMENT OF KELOIDS AND HYPERTROPHIC SCARS

Scar evaluation lacks standardisation and methodical approach. Improvements to these assessment systems may aid treatment and reduce scarring.

Factors to be considered include

1. Scar height or thickness

2. Pliability

3. Surface area

4. Texture

5. Pigmentation

6. Vascularity

The roughness of the keloid and normal skin were measured using Phase shift Rapid In vivo Measurement Of the Skin (PRIMOS),

Blood perfusion was measured using laser speckle contrast imaging (LSCI).

GRADING AND SCORING SYSTEM

1. Vancouver Scar Scale (VSS)

2.Visual Analogue Scale (VAS)

3.Manchester Scar Scale (MSS)

4.Patient and Observer Scar Assessment Scale (POSAS)

1. Vancouver Scar Scale (VSS) - The VSS, first published by Sullivan in 199035,36, is a popular burn scar assessment tool. It assesses vascularity, height/thickness, pliability, colour, and more. Patient perception of scar is not factored towards the final result. This scale helps evaluate therapy and measure scar study outcomes.[33,37]Interpretation score: 1-4: good, 5-8: moderate, score 9-13: adverse, based on Perdanakusuma1 et al[38]

Table 6 - Vancouver Scar Scale (VSS)

Category	Scar characteristics	Score
Vascularity	Normal Pink Red Purple	0 1 2 3
Pigmentation	Normal Hypopigmentation Hyperpigmentation	0 1 2
Pliability	Normal Supple Yielding Firm Ropes Contracture	0 1 2 3 4 5
Height	Flat 2 mm 2-5 mm >5 mm	0 1 2 3
	Total	13

2.Visual Analogue Scale (VAS)

The multidimensional VAS evaluates standardised digital images in four dimensions: pigmentation, vascularity, acceptability and observer comfort, and shape. Overall scores range from “excellent” to “poor” based on individual scores. Compared to expert panel evaluation, it has excellent observer reliability and internal consistency. In lay panels, this scale is only moderately reliable.[39]

3.Manchester Scar Scale (MSS)

Beausang et al.'s 1998 scale adds POSAS and an overall VAS score to attribute scores. Scar colour, surface, proximity to surrounding skin, borders, size, quantity, and texture are assessed. A scar score is calculated from MSS and VAS assessments, with higher scores indicating clinically worse scars. The patient's race, ethnicity, medical history, keloid aetiology, symptoms, therapies, and reactions are examined. Unlike the VSS, the MSS classifies vascularity and pigmentation as colour mismatch to the surrounding skin, improving interpretation agreement. Thus, MSS can evaluate more scars, including post-operative scars.[40]

Table 7 - Manchester Scar Scale (MSS)

Category	Scar characteristics	Grade
Color	Perfect	1
	Slight mismatch	2
	Obvious mismatch	3
	Gross mismatch	4
Matte vs Shinny	Matte	1

	Shiny	2
Contour	Flush with surrounding skin Slightly indented Hypertrophic Keloid	1 2 3 4
Distortion	None Mild Moderate Severe	1 2 3 4
Texture	Normal Just palpable Firm Hard	1 2 3 4

4.Patient and Observer Scar Assessment Scale (POSAS)

In addition to objective VSS data, this scale allows subjective evaluation of symptoms like discomfort and itching. The system has two number scales: Patient Scar Assessment Scale and Observer Scar Assessment Scale. Vascularity, pigmentation, thickness, relief, pliability, and surface area are measured. Patient ratings of discomfort, itching, colour, rigidity,

thickness, and relief are included. Although it includes subjective pain and pruritus symptoms, it does not assess how these affect quality of life. The POSAS assesses postsurgical scars with internal consistency and inter-observer reliability, unlike the VSS.[41]

Table 8 - Patient and Observer Scar Assessment Scale (POSAS)

Observer component Normal skin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Want scar imaginable
Vascularization											
Pigmentation											Hypo
											Mix
											Hyper
Thickness											
Relief											
Pliability											
Patient component	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Yes, worst imaginable
No complaints											
Is the scar painful?											

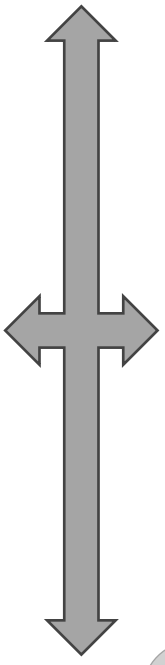
Is the scar itchy?											
No , as normal skin											Yes, very different
Is the color of scar different?											
Is the scar more stiff?											
Is the thickness of scar different?											
Is the scar irregular											

Table 9 - TREATMENT MODALITIES

TOPICALS

Silicone gel
Onion extract
Vitamin E gel
Heparin
5-flurouracil
Interferone
Bleomycin
Losartan
Verapamil
Imiquimod liposome gel
Calcineurin inhibitor
Basic fibroblast growth factor

Vascular endothelial growth factor
Hepatocyte growth factor
Transforming growth factor beta
GHRP-6
Pentoxphylline
Retinoids
Mitomycin C
Collagenase D
Tamoxifen citrate
Sirolimus



SURGERY
Excisional surgery
Excision with auto flap
Excision with Autografting
Autologous Fat Grafting

LASERS
Carbon dioxide laser
Pulsed dye laser
Nd:YAG laser
Laser-assisted drug delivery
Intense pulsed light therapy

COMBINATION THERAPY
Intralesional injection & Cryotherapy
Botulinum Toxin-PRP
Triple Therapy
Fractional CO2 Laser & TCA
Intralesional Steroids & 5-Fluorouracil
Cryotherapy & Intralesional steroid
Surgery with imiquimod

OTHERS
Radiation therapy
Cryotherapy with liquid nitrogen
Spray technique
Cryoroller technique
Pressure therapy
Extracorporeal shock wave therapy
I/L Steroid

LASER

1. Silicone sheeting - Silicone comes as creams, gels, sheets, silastic sheets, and orthosis garments. Soft, adherent, semi-occlusive silicone gel sheets (SGS) are made from cross-linked polydimethyl siloxane polymer and measure 3–5mm thick. Although its mechanism is unclear, silicone under occlusion may hydrate the skin by decreasing water vapour transmission, which decreases capillary permeability, hyperaemia, and collagen growth. [42]

   Silicone dressings are micropore-secured over keloids for 12 hours a day for 3-6 months. When filthy, they are cleansed with soap and water and replaced when they crack, crumble, or wear off. Various studies show a moderate improvement in 50% of cases. [43,44]

   Pressure therapy –Pressure therapy has been used for decades to cure and prevent elevated scars, especially earlobe keloids. Pressure should surpass 25mm of Hg natural capillary pressure, but not 40mm, which reduces peripheral blood circulation. Itching and pain will decrease with this pressure, making scarring faster. Earlobe earrings, tailored suits, and customised moulds with Velcro straps are retained in place for 12-23 hours for 6-12 months. Side effects include pressure loss of custom-made garments, heat and swelling discomfort, limb swelling, rashes, eczema, excessive friction, blistering, scar breakdown, and diminished patient compliance. [45]

2. Extracorporeal shock wave therapy (ESWT) - Pressure-induced hypoxia degenerates collagen and fibroblasts. It emphasises the efficacy of extracorporeal shock wave therapy (ESWT) over intralesional steroid therapy. Traditional treatments include compression therapy, however ESWT improves scar function and appearance, according to the review. Additionally, pressure-garment therapy (PGT) can minimise hypertrophic scarring after burn injuries.. [45]

4.Onion extract (topical) - Reduced inflammation and fibroblast growth. In combination with enoxaparin, onion extract inhibits fibroblast growth and reduces inflammation, which are crucial to scar formation. This combination also impacts β1 integrin expression, which is crucial for cell adhesion and migration during wound healing. 46 In a mouse model, a multicomponent healing formulation with onion extract reduced inflammatory cytokines and aberrant collagen deposition, suggesting it may prevent scar hypertrophy. [46]

5.Vitamin E (topical) - Antioxidant characteristics, Vitamin E may improve scar remodelling and decrease excess collagen synthesis, making it useful for treating and short-term prophylaxis of these disorders.[43]

6. Intralesional steroid injection –Intralesional steroid (ILS), mostly triamcinolone acetonide, is the first-line treatment for keloids. Fluoridated at the ninth carbon, triamcinolone acetonide is a strong anti-inflammatory corticosteroid. 46 Leukocyte and monocyte migration and phagocytosis are inhibited, vasoconstriction causes hypoxia, and antimitotic impact inhibits keratinocyte and fibroblast growth. 47,48 So collagenase can destroy collagen, it increases fibroblast degeneration and reduces plasma protease inhibitors. TGF-β1, endogenous vascular endothelial growth factor, and IGF-I synthesis decrease while basic FGF growth increases.[47]

It is injected intralesionally into the upper dermis at 0.05ml per linear centimetre of the keloid every 2-6 weeks at 10mg/ml to 40mg/ml until clinical resolution or negative effects prevent use. When liquid is driven into the hard mass of the keloid, fixed needle, lurelog-type, or dental syringes with needles not smaller than 27 gauge avoid needle-syringe separation. Injecting the lesion may induce irreversible skin atrophy. Lesions become softer and symptom-free after early injections, but they rarely shrink.[48,49]

7.Heparin – Heparin may treat keloid and hypertrophic scars by affecting fibroblast activity and collagen formation. Modulate growth factors: Heparin dramatically increases bFGF and TGF-b1 synthesis in normal, keloid, and foetal dermal fibroblasts. Scar formation requires fibroblast proliferation and collagen production, which this stimulation can disrupt. Heparin and ECGF down-regulate collagen gene expression in keloid fibroblasts, inhibiting collagen formation. This action is caused by suppressing type I collagen gene pro-alpha 1(I), a significant scar tissue component.[50]

8.Antihistamine

Anti-inflammatory and antiproliferative histamine H1 blockers diminish collagen deposition and synthesis in keloidal fibroblasts by reducing TGF-β1 release. Preventing mast cell degranulation and histamine release reduces keloids' burning, pain, and pruritus. Tranilast, at 3–300μM, suppresses fibroblast collagen production and TGF-β1 in keloid. Phenergan (promethazine hydrochloride), another strong antihistamine, reduces hypertrophic scar and keloids fibroblast cell proliferation, DNA synthesis, and collagen formation. This suggests it could reduce collagen accumulation in these scars.[52]

9.5-Fluorouracil –

Fluorinated pyrimidine antimetabolite 5-FU inhibits thymidylate synthase and RNA synthesis and function. It effectively treats keloids and hypertrophic scars since 1989. 52 In keloids, it inhibits collagen and fibroblast growth. It inhibits TFG-β-induced type I collagen gene expression in human fibroblasts. 53,54 The intralesional dose is 50mg/ml, 0.05ml every linear centimetre, or until blanching occurs, at one or two weeks. Each session contained 2-50mg and no more than 100mg. 55 About 5-10 injections are needed to flatten lesions completely. First, pain, pruritus, stretching or pulling sensation, and discomfort decrease, then lesion softens and flattens.[53,54]

10. Interferone:

IFN-α2b boosts collagenase activity via blocking metalloproteinases, which inhibit collagenase. Scar formation requires collagen and extracellular matrix synthesis, which decreases. 54 T-helper cells secrete anti-proliferative, anti-fibrotic, and antiviral interferons (IFN). They break down collagen, inhibit collagen I and III synthesis and cross linking, and boost collagenase. It boosts native p53 and fibroblast apoptosis. Systemic interferon therapy also inhibits TGF-β. While both interferon alpha and gamma were tested for keloids treatment, IFN α-2b had a more significant impact on collagen-modulating enzymes. Injecting 1.5 million IU of IFN α-2b into the wound base and margins twice daily for four days resulted in a 50% reduction in keloid size in nine days.[55,56]

11. Bleomycin:

Fungal bleomycin was isolated. Streptomyces verticillus. Antitumor, antibacterial, and antiviral efficacy comes from blocking cell cycle by inhibiting DNA, RNA, protein, and reactive oxygen species formation.[57,58]

It is given intradermally or by 22G needle punctures at 40 per cm2 or 0.1ml (1.5IU/ml) at a maximum dose of 6ml each session. You can give it monthly or every two weeks. Complete scar flattening may require two to six sessions..[59,60]

12. Angiotensin II receptor blocker:

Losartan's anti-scarring actions stem from its ability to suppress the TGF-β/Smad pathway, which is essential for scar formation. A losartan cream with chitosan and asiaticoside effectively reduced scarring by inhibiting TGF-β1, collagen, and Smad expression in both in vivo and in vitro experiments.[61] Scar formation requires myofibroblast activity and monocyte

trafficking, which losartan lowers. Losartan decreased scar cross-sectional area and elevation index, suggesting it could cure hypertrophic scars.[62]

13. VERAPAMIL:

Verapamil reduces fibrous tissue and extracellular matrix formation. Additionally, it suppresses interleukin-6, VEGF, and TGF-β1, while promoting fibroblast procollagenase production and death.[63,64]

Verapamil is an antiarrhythmic calcium channel blocker with phenylalkylamines. It increases collagenase, boosts procollagenase expression, inhibits extracellular matrix molecule synthesis/secretion (including collagen, glycosaminoglycans, and fibronectin), and transforms fibroblast shape from bipolar to spherical. It also decreases central keloid and fibroblast IL-6 and VEGF synthesis, decreasing cell proliferation, increasing apoptosis, and increasing decorin, a fibroblast proliferation and migration inhibitor. Administer 2.5mg/ml intralesionally at three weekly intervals until lesions flatten or side effects limit further use.[65]

14. Imiquimod 5% and Resiquimod cream –

TLR 7 and 8 agonist topical immunomodulators. They encourage the generation of cytokines, including as TNF, IFN-α, and IFN-γ, which have antifibrotic properties and limit collagen formation. They affect apoptotic gene expression, causing antikeloidal effects. Five nights a week, imiquimod is used for eight weeks. They are applied four to six weeks following surgery to avoid keloid recurrence. Resquimod is 10-100 times stronger than imiquimod. Itching, burning, pain, blister/ulceration, localised hyperpigmentation, fever, headache, nausea, exhaustion, muscular soreness, and bone pain are common adverse effects.66

15.Calcineurin inhibitors –

Tacrolimus (FK-506), an immunosuppressant via FKBP, is powerful. Calcineurin, a protein phosphatase that activates immunological T-cells, is inhibited. This inhibition lowers inflammation, which is essential for keloid and hypertrophic scar formation and persistence. A 12-week trial found that tacrolimus 0.1% ointment twice daily reduced induration, discomfort, erythema, and pruritus.68

16.Basic fibroblast growth factor –

To enhance wound healing, bFGF regulates ECM synthesis and breakdown, collagen distribution, and inhibits the TGFβ1/SMAD pathway. In scar tissues, this reduces fibronectin, TIMP-1, collagen I, and collagen III and increases MMP-1 and apoptosis. Patients can get low-dose (0.1µg/m) or high-dose (1µg/m) dermal injections or a rinse with high-dose bFGF (1µg/m wound). Scarring decreases 6-12 months after surgery. Adverse effects were absent. bFGF could help treat keloids and scarring in the future.40

17.Vascular endothelial growth factor (VEGF) –

Angiogenesis, which is more prominent in hypertrophic and keloid scars, requires VEGF. Increased angiogenesis can cause excessive scar tissue development in various circumstances. It induces endothelial cell mitogenesis, vascular hyperpermeability, and extravascular fibrin matrix formation. Keloids may be treated with siRNA sequences that suppress the VEGF gene.39

18. Hepatocyte growth factor(HGF) –

Regenerative, angiogenic, antiapoptotic, and antifibrotic cytokine hepatocyte growth factor. It alters cytokine levels, including VEGF and TGF-β1, potentially preventing scar formation.

By increasing collagen synthesis and MMP production. When coupled with TGF-β1, HGF boosted MMP-1 and MMP-3 mRNA expression in keloid fibroblasts and decreased collagen types I and III in human dermal fibroblasts. HGF may reverse pathological fibrosis, making it a prospective treatment for excessive collagen deposition in keloids and hypertrophic scars. Incisional wounds are treated intradermally to speed healing and reduce scarring.69

19.Transforming growth factor beta

Avotermin, human recombinant TGF-β3, has been shown to be safe and significantly improve scar appearance in Phase 2 double-blind, placebo-controlled, randomised, controlled trials (RCTs). Postsurgical injections of antisense TGF-β1 oligonucleotides, which reduce TGF-β1 gene expression, have shown long-lasting suppression of TGF-β-mediated scarring.70

TGF-β1 causes cell proliferation, migration, collagen synthesis, and extracellular matrix disruption in human hypertrophic scar fibroblasts.

20.Growth hormone-releasing peptide -6 –

The peptide modulates lipid metabolism, cytoskeleton configurations, and extracellular matrix dynamics, which generate hypertrophic scars and keloids.
The peptide regulates epidermal cell differentiation and ECM dynamics, which are necessary for scar formation. GHRP-6 cannot reverse adult hypertrophic scars, suggesting its job is preventative rather than therapeutic.71

21.Pentoxifylline – Inhibition of Fibroblast Activity: PTX inhibits fibroblast proliferation and collagen, glycosaminoglycans, and fibronectin synthesis, which cause keloids and hypertrophic scars. Reduced Inflammatory Markers: PTX lowers keloid fibroblasts' IL-6 and

PDGF expression, which are involved in scar formation's inflammatory and proliferative phases.72

22. Methotrexate (MTX) - MTX is a popular anti-proliferative and anti-inflammatory. Its low-dose anti-inflammatory action is mediated by adenosine A2 receptors and increased adenosine release at inflammation sites. When paired with excision, MTX has achieved complete remission and prevented keloid recurrences. From a week before excision to three months after surgery, oral MTX (15–20mg) was given once every four days to resolve keloid and prevent recurrence. Two patients had no recurrences after four years. Methotrexate 1ml (10mg with a maximum of 2ml per dosage), 0.5ml triamcinolone acetonide (20mg), and 1 ml 2% xylocaine can be given monthly for 6 sessions to infiltrate the keloid with good clinical improvement.73
23. Botulinum Toxin Type A (BTX – A)- Botox may treat keloid and hypertrophic scars. It works by reducing muscle tension on healing wounds, which is essential for tissue restoration. Botox also suppresses fibroblast activity, collagen synthesis, and inflammatory indicators. 74 With a 9G needle, it is injected intralesionally into the scar at 4U/0.1ml (100 U vacuum-dried powder in a single-use vial diluted in 2 mL of sterile, preservative-free 0.9% saline to form a solution). A monthly dose is given for three months. Many trials revealed improvements in size, erythema, itching, pliability, and no negative effects or recurrences. Minor side effects include itching, discomfort, and allodynia.75
24. Interleukin-10 (IL-10) - IL-4 and IL-13 are pro-fibrotic mediators involved in T helper 2 (Th2) immune dysregulation and keloids and hypertrophic scars. These scars can be treated with dupilumab, an IL-4 receptor alpha antagonist that blocks these interleukins. Systemic and intralesional dupilumab improves scar texture and appearance in numerous keloids and hypertrophic scars, according to studies.76

25. Retinoids - Vitamin A and its derivatives stimulate wound healing and scar tissue regression topically and intralessionally. Research suggests that retinoic acid regulates profibrotic factors including TGF-β, which are crucial for scar formation. It may reduce collagen deposition in keloids and hypertrophic scars by affecting collagen metabolism.77 They are powerful MMP inhibitors that upregulate MMP13 and downregulate MMP 1 and 8 in keloid-derived fibroblasts at both mRNA and protein levels. They also reduce TGF-β1-induced type 1 collagen gene expression in human fibroblasts. They suppress sebum production, which contributes to keloid development. Apply 0.05% tretinoin locally for 12 weeks. Some trials found considerable weight and size reductions, notably with intralesional steroid injections. Side effects include photosensitivity, skin irritation, and mild atrophy.77,78

26.Mitomycin C –Mitomycin C inhibits DNA synthesis and inhibits fibroblast proliferation. Fibroblast arrest can occur without affecting re-epithelialization. Mitomycin C (1mg/mL) was given to wound beds for three minutes following keloid resection and repeated after three weeks. Four out of 10 patients were satisfied, one was disappointed, and 80 percent were content. 79

Mitomycin C inhibits DNA synthesis and inhibits fibroblast proliferation. Fibroblast arrest can occur without affecting re-epithelialization. Mitomycin C (1mg/mL) was given to wound beds for three minutes following keloid resection and repeated after three weeks.80

27.Collagenase D - Collagenase D, derived from Dermestes frischii, was injected intralesionally to temporarily reduce scar volume, which normalised after 6 months.81

28.Tamoxifen citrate -Tamoxifen citrate, a selective oestrogen receptor modulator (SERM), can improve wound healing in keloids by reducing TGF-β1 expression. This cytokine is

essential for fibroblast proliferation and collagen synthesis, causing excessive scar tissue formation during treatment.82

29. Sirolimus - The mammalian target of rapamycin (mTOR) is a serine/threonine kinase, which plays an important role in the regulation of metabolic processes and translation rates. Sirolimus targets the mTOR pathway, which is crucial in regulating collagen expression and fibroblast proliferation. Inhibition of mTOR leads to decreased deposition of extracellular matrix components, including collagen, fibronectin, and alpha-smooth muscle actin, which are overexpressed in keloid and hypertrophic scars 83

Sirolimus creams, ointments, and gels with 0.1%–1% concentration. These are used once or twice daily with minimum skin discomfort. Children take 0.8mg/m2 twice a day and adults take 1 mg twice a day to get a trough level of 5-15 ng/mL. Tolerable side effects include mucositis and lipid problems. 84

30. Mannose 6 phosphate – M6P surface receptors play a role in activating TGF-β through proteolysis. Injections of M6P into wounds compete with latent M6P for receptors, limiting TGF-β1 and β2 activation and reducing fibrosis. M6P was safe, well-tolerated, and accelerated epithelialisation in a phase I dose-escalation experiment.

SURGERY

31. Excisional Surgery - Keloids with a narrow attachment to the skin, or those that are small and linear, can be completely removed with a little margin of skin around them. Sutures are placed parallel to the skin tension lines to close the incision. To lower the rate of recurrence, adjuvants such as radiotherapy, intralesional steroid, or 5-FU should be administered (55-80 percent). Recurrence rates may also be reduced with postoperative pressure therapy.85

32. Excision with auto flap (keloid fillet flap) - An autologous flap, a portion of skin from another part of the patient, covers the excision defect, improving healing and cosmetic benefits. (A semicircular incision near the keloid's base leaves one side connected. The epidermis and dermis are removed from the keloid mass and reflected back to display the keloid tissue as a flap (fillet flap). After thoroughly excising or debulking the keloidal mass, the reflected flap is sutured around to the base. This surgery is effective for big earlobe keloids.86

33. Excision with Autografting - Autografts, which transplant the patient's skin to the excised area, can improve cosmetic outcomes and reduce wound tension, lowering recurrence rates. This method's efficacy varies and often requires subsequent treatments. Remove small to medium-sized keloids, leaving a keloid tissue rim as a splint to limit central tensile contraction. Autografts are sutured along the base's periphery from the overlaying epidermis. No separate donor site is needed, which prevents another keloid from forming and relieves tension on the overlaying skin, which has already been stretched by the keloid.86

34. Autologous Fat Grafting: This technique involves the transplantation of fat from another part of the patient's body to the scar site. It has been shown to improve scar quality by decreasing fibrosis, enhancing skin pliability, and reducing pain and itching.87

35. Radio surgery - Radiowave-based electrosurgery is used to remove keloid. Minimal lateral heat damage. They are best for treating chest midline keloids with retained hair and sebum, which repeatedly infect. The keloid is cut open and debulked with loop probes. It is easier, less bleeding, and requires no donor site than cold steel excision. Prolonged healing time, cost, secondary intention healing, no atrophic scar, and long-term follow-up are drawbacks. Surgery and rapid postoperative radiation dramatically minimise keloid recurrence..88,89

36. Radiation therapy -Radiation can supplement surgical excision or be used alone. Keloids, which cause severe morbidity/limitation of joint movement/contracture and a recurrence incidence of 9–72%, are best treated with surgery followed by radiotherapy 24 hours later. Superficial X-rays, electron beam treatment, strontium-90 brachytherapy, and 32p-patch contact brachy radiation treat keloids. Recurrent keloids are best prevented by electron beam therapy.90

37.Cryotherapy

Cryotherapy with liquid nitrogen (LN2) is an effective treatment for keloids alone or in combination with intralesional steroid or 5-FU injections. It treats keloids 50–80% effectively. LN2 destroys keloid scars by causing direct cell anoxia in the lethal zone (220C) by forming intracellular crystals, which drain water from cells and reduce fibrous tissue density. The cold also destroys endothelial cell connections and induces blood stasis, which causes microthrombi, vascular injury, tissue necrosis, and sloughing.93

Various techniques of cryotherapy -

Intralesional cryosurgery: Massive keloids can be treated using it. After sterile measures and appropriate local anaesthesia with lidocaine 1% and epinephrine, an 18G hypodermic needle,

spinal needle, or cryoprobe is gradually twisted into the keloid scar until it reaches the other end. LN2 is then fed through the needle until the keloid is visibly frozen. After a few minutes of thawing, the needle is carefully withdrawn and the scar is treated with antibiotic ointment and sterile gauze. This method creates a 3600 deadly zone that kills diseased cells while sparing the surface epithelium.94

Spray technique: These work for small to medium keloids. Most experts recommend a 30-second freeze time 2-3 times every cycle. Lethal zone involves surface epithelium, causing more skin injury, while dermal diseased tissue may be avoided. The average keloids need 20 monthly sessions. Pain, hypopigmentation, especially in dark-skinned people, and a month-long recovery period are side effects.It is done using a -79 °C spray-type CryoPen 95

Cryoroller technique: They are used in flat surfaced, extensive keloids. It causes superficial epidermal peeling along with dermal remodeling, leading to complete flattening and faster resolution.96

LASERS

38.Carbon dioxide (CO2) laser - CO2 laser therapy has discovered unique gene expression profiles in well-treated scars. Scar reduction by regenerative mesenchymal fibroblasts was better in younger scars. Shave excision was utilised for small to medium-sized keloids. The radiation received by intracellular and extracellular water heats target tissue to 1000C, vaporising it. Due to a 90% recurrence rate, monotherapy is no longer recommended.97,98

39.Pulsed Dye Laser (PDL) –

The most successful treatment for scar texture, redness, itching, pain, and pliability was PDL. Common wavelengths are 585nm and 595nm, with pulse duration of 0.45ms and fluence of 6.5 7.25J/cm2. They occur every 6-8 weeks for 6 months. They perform better on early

keloids since haemoglobin is the target chromophore. They also decrease TGF-β1 induction and increase MMP expression in keloid tissue, causing regression. It wont work for large keloid.99

40.Neodymium-doped: Yttrium Aluminium Garnet (Nd:YAG) –

Continuous wave 1064nm laser .It produces keloid surface infarction, sloughing, selective collagen synthesis inhibition, and lesion softening and size decrease. Its cutaneous penetration and activity are limited by epidermal melanin pigment absorption. Recurrence was 53-100% Nd: YAG lasers reduce collagen layer thickness and swirl structure, improving scars. 100

41.Laser-assisted drug delivery (LADD)-

Laser-Assisted Drug Delivery (LADD) using fractional ablative lasers to produce skin microchannels appears promising for hypertrophic scars and keloids. LADD works better than topicals for hypertrophic scars and as well as intralesional injections for keloids.101

COMBINATION THERAPY

Due to the complexity of keloid and hypertrophic scars, combination therapy seems promising. Multiple combination medicines have been tested to improve therapy efficacy, recurrence rates, and patient satisfaction.42

Intralesional Injections with Cryotherapy: This combination significantly decreases scar thickness and improves appearance with few negative effects. Surgical excision or cryotherapy with intralesional corticosteroids and 5-fluorouracil followed by silicone gel sheeting has shown good efficacy and safety in treating keloids.102

43.Botulinum Toxin and Platelet-Rich Plasma (PRP): Botulinum toxin type A (BTX-A) and PRP outperform triamcinolone acetonide (TAC). These methods heal scars and are safe.103

44.Triple Therapy: A case series using triple therapy (resection, cryotherapy, and intralesional triamcinolone) showed a 66.7% non-recurrence rate, suggesting it may be helpful in treating keloid scars with few difficulties.

45.Fractional CO2 Laser and TCA: Fractional CO2 laser and trichloroacetic acid (TCA) have been used to treat keloid, offering a wide range of treatments including corticosteroids, cryotherapy, and laser.104

46.Intralesional Steroids and 5-Fluorouracil: Combining TCA with 5-fluorouracil (5-FU) is more effective than TCA alone. The combined therapy group improved scar appearance and pruritus by 75.07% on the Vancouver Scar Scale (VSS) compared to 65.80% for TCA alone. 105

47.Cryotherapy and Intralesional Steroids: It reduce scar thickness better than triamcinolone alone. This combination improved scar appearance more often in good and moderate patients. The combo therapy reduced scar height more in the treated group, according to ultrasounds.94

48. Laser Therapy and Other Modalities: Keloid scars can be treated effectively with fractional CO2 laser and triamcinolone, improving aesthetics and patient satisfaction. 104

49.Intense pulsed light (IPL) therapy: Compared to intralesional triamcinolone, improved vascularity and pigmentary results, suggesting combination therapy potential.101

50. Surgery with silicone gel sheeting: Over 80% of keloid excisions with SGS for 24 hours a day for 4-6 months are recurrence-free. Side effects include minor skin irritation and maceration.46

51. Surgery plus 5-FU Injection of 5-FU into wound beds following surgical excision of the keloid has shown to yield better results with fewer recurrence rate than surgery alone. Adverse effects like skin irritation is also minimal.106

52. Imiquimod surgery Recurrences were absent after 24 weeks of applying 5% imiquimod lotion to the suture line and surrounding skin every night for 8 weeks after surgical excision. Side effects included itching, burning, pain, and blisters.66

EMERGING TECHNOLOGIES

1.Keloids may use new technologies including microneedle (MN) therapy and photodynamic therapy , as well as photosensitisers and exosomes. Innovative materials can increase histocompatibility and reduce immunological rejection making them promising for safer and more effective pathological scar care.107

2.New treatment for hypertrophic scars and keloids: intralesional dupilumab, an IL-4 receptor alpha antagonist. IL-4 and IL-13 are targeted in this method to treat scar formation-related immune dysregulation. The findings imply dermatologists may use systemic dupilumab for large keloids and intralesional for more resistant locations.76

3.SODERMIX, with high superoxide dismutase concentration, is antioxidant, anti-inflammatory, anti-fibrotic, and anti-pruritic.108

4.Hyperbaric Oxygen: Hypoxia activates fibroblasts, but excessive oxygen tension may inhibit them. The response of fibroblasts to high and low oxygen tension is compared in studies109

5.Glucocorticoids and 5-FU pneumokinetic treatment for hypertrophic scars is beneficial. Drug administration is improved via "needle-free" delivery. Positive scar morphology was shown by a 25.4% epidermis thickness increase and a 48.0% dermis thickness decrease. Pneumokinetic therapy and sequential neodymium laser treatment (1064 nm) were highly effective, suggesting it could be a new hypertrophic scar treatment.105

METHODOLOGY

METHODOLOGY

Source of data:

This study will be conducted in outpatient clinic of Dermatology, Venereology and Leprosy in R L Jalappa Hospital and Research Centre attached to Sri Devaraj Urs Medical College, Tamaka, Kolar from APRIL 2023 to NOVEMBER 2024.

Study Design:

Randomized Controlled Trial [RCT]

Sample size calculation:

Sample Size is calculated based on the VSS score improvement at the end of 6month in a recent original study Losartan ointment relieves hypertrophic scars and keloid: A pilot study by Hedayatyanfard K et al and A Comparison of the effectiveness of topical silicone gel and corticosteroid cream on the pfannenstiel scar prevention - A randomized controlled trial by Meseci E etal which is 25% and 60% respectively. So with 95% confidence interval Alpha error 5% and power value of 80% -The estimated total sample size for the study is 60 and the sample size per group is 30 the sample size has been calculated by using OPEN EPI data version 3.01

Inclusion criteria:

Patients aged 18-59 years with clinical features suggestive of hypertrophic scar and keloid over any part of the body.

Patients with HTS and keloid Scars of any size, who has not taken medical treatment for HTS and keloid in any form for the past 3months.

Exclusion criteria:

Patients with facial lesions, pregnant or lactating women, patients with history of diabetes, cancer

patients on immunosuppressive drugs

Elderly patients with severe hypertension associated with other cardiovascular problems.

Patients with keloids that experienced infection or ulceration.

Patients with other skin conditions

Patient not willing for study

Patient allergic to drug (Topical losartan and clobetasol).

Method of Data Collection:

Randomization: block randomisation.

A Randomization Plan

from

http://www.randomization.com

1. a
2. b
3. a
4. b
5. a
6. b
7. b
8. a
9. a
10. a
11. a
12. b
13. b
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45. a
46. a
47. b
48. b
49. a
50. b
51. a
52. b
53. a
54. a
55. b
56. b
57. b
58. b
59. b
60. a

60 subjects randomized into 2 blocks
To reproduce this plan, use the seed 13462
Randomization plan created on 3/23/2023, 11:45:13 AM

The study will include individuals of either gender over 18 with single or more keloids or hypertrophic scars under 10 cm in diameter and two groups of patients received different treatment regimens using computer-generated block randomisation.

Before starting therapy, a full physical and systemic examination and patient clinical history were taken, including age, sex, address, occupation, site of lesion, number of lesions, duration of lesions, family history of keloids, previous treatment, and associated symptoms like pain, pruritus, cosmetic disfigurement, skin discolouration, and restriction of movement.

Keloids were serially photographed before and during treatment. Clinical examination, scar appraisal at each stage, and serial photographic records and Vancouver Scar Scale follow-up will be done at the end of each month.

Pigmentation and vascularity are quantified with clinical examination after blanching with glass slide: comparing to surrounding skin and blood refilling, respectively.

Scar pliability is evaluated by palpation. The clinical improvement defined as decreasing values of the scores and complete recovery consider if scoresreach to zero. Scar flattening is considered<1mm scar height over 90% of subject.

At the 6-month follow-up, patients will score their satisfaction on a 4-point scale. Patients gave informed consent after being told about the disease, course, and prognosis. The institutional ethics committee approved the study.

All patients satisfying the inclusion criteria will be divided into two groups as follows:

GROUP-A

1. Formulation of Base Cream- The base cream is made with Emollient as the Ointment's carrier. Emulsifying ointments like emollients, petrolatum gel give topicals solidity and durability. Next, measure Emollient - Weigh 94 g to prepare the final ointment formulation with the active component solution.

2. Incorporation of Active Ingredients- Losartan potassium powder weigh 5 g accurately must be properly added to base cream. In another container, measure 1 ml 2-propanol and 6 ml distilled water. Losartan potassium dissolves well in 2-propanol and distilled water. Losartan potassium powder is added to the solvent mixture. Make sure all losartan is dissolved by gently stirring the liquid.

3. Mixing and Homogenization- To mix the active ingredient with the base cream, slowly add the dissolved losartan potassium solution to the pre-measured Emollient (94 g). Keep the mixture homogenous by spatula-combining the two components. Mix ointment until smooth and lump-free.

4. Cooling and Stabilization- Let the combined ointment cool to room temperature. This process affects ointment viscosity and stability. Stabilisation, After chilling, we checked for separation and uniformity.

5.Final Product- After correctly incorporating each ingredient, the ointment will weigh 100 g. To stay stable and effective, store it in a clean, labelled, light- and moisture-free container.

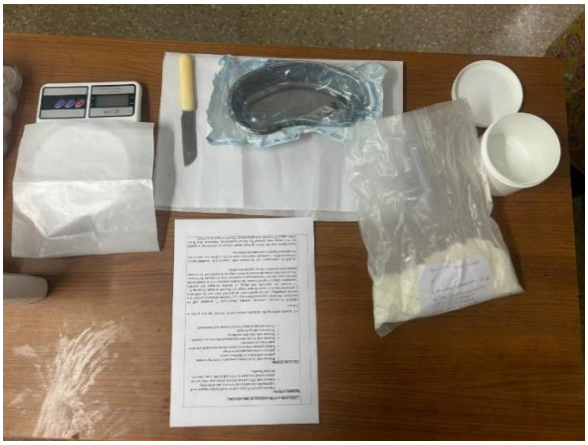


Figure 10 Losartan cream preparation

Group A: Participants will get ready-made Losartan ointment. Losartan ointment is used twice a day for six months with 4-week follow-ups. Losartan ointment will be tried on the hand skin and blood pressure measured every 15 minutes for 2 hours to determine its sensitivity, allergy, and hypotensive effect. Patients wear the ointments twice a day for 6 months and are evaluated monthly for efficacy and side effects.

Group B will get commercial Topical clobetasol 0.05%. Clobetasol propionate cream 0.05% is given twice a day for 6 months with follow-up.

•All patients were evaluated for improvement and side effects at each visit.
•Treatment ceased if the required therapeutic response was attained before four sessions.
•Patients reported treatment effects and side effects throughout the research.
In all patients, regression in size, lesion flattening, and symptom reduction were considered improved.

Statistical Analysis:

Data will be entered into a Microsoft Excel Data Sheet and will be analysed using SPSS 22 version software. Categorical data will be represented in the form of Frequencies and proportions. Chi-square will be used as test of significance. Continuous data will be represented as mean and standard deviation. p value <0.05 will be considered as statistically significant.

Study Design:

Randomized Controlled Trial [RCT]

Sample size calculation:

Sample Size is calculated based on the VSS score improvement at the end of 6month in a recent original study Losartan ointment relieves hypertrophic scars and keloid: A pilot study by Hedayatyanfard K et al and A Comparison of the effectiveness of topical silicone gel and corticosteroid cream on the pfannenstiel scar prevention - A randomized controlled trial by Meseci E etal which is 25% and 60% respectively. So with 95% confidence interval Alpha error 5% and power value of 80% -The estimated total sample size for the study is 60 and the sample size per group is 30 the sample size has been calculated by using OPEN EPI data version 3.01

Proportion in group 1 = 25%

Proportion of group 2 =1%

Risk difference =24%

Power (chance of detecting)= 80%

Ratio of two groups= 1:1

Sample size of group 1= 30

Sample size of group 2= 30

Total sample size = 60

$$N_1 = \left\{ z_{1-\alpha/2} * \sqrt{\bar{p} * \bar{q} * (1 + \frac{1}{k})} + z_{1-\beta} * \sqrt{p_1 * q_1 + (\frac{p_2 * q_2}{k})} \right\}^2 / \Delta^2$$

$$q_1 = 1 - p_1$$

$$q_2 = 1 - p_2$$

$$\bar{p} = \frac{p_1 + kp_2}{1 + K}$$

$$\bar{q} = 1 - \bar{p}$$

$$N_1 = \left\{ 1.96 * \sqrt{0.425 * 0.575 * (1 + \frac{1}{1})} + 0.84 * \sqrt{0.25 * 0.75 + (\frac{0.6 * 0.4}{1})} \right\}^2 / 0.35^2$$

$$N_1 = 30$$

$$N_2 = K * N_1 = 30$$

p_1, p_2 = proportion (incidence) of groups #1 and #2
$\Delta = |p_2 - p_1|$ = absolute difference between two proportions
n_1 = sample size for group #1
n_2 = sample size for group #2
α = probability of type I error (usually 0.05)
β = probability of type II error (usually 0.2)
z = critical Z value for a given α or β
K = ratio of sample size for group #2 to group #1

RESULTS

RESULTS

1. DISTRIBUTION OF SUBJECTS ACCORDING TO GENDER BETWEEN GROUPS

Sex	Group		Total
	Group (a) losartan	Group (b) clobetasol	
Male	15(50%)	15(50%)	30(100%)
Female	15(50%)	15(50%)	30(100%)
total	30	30	60

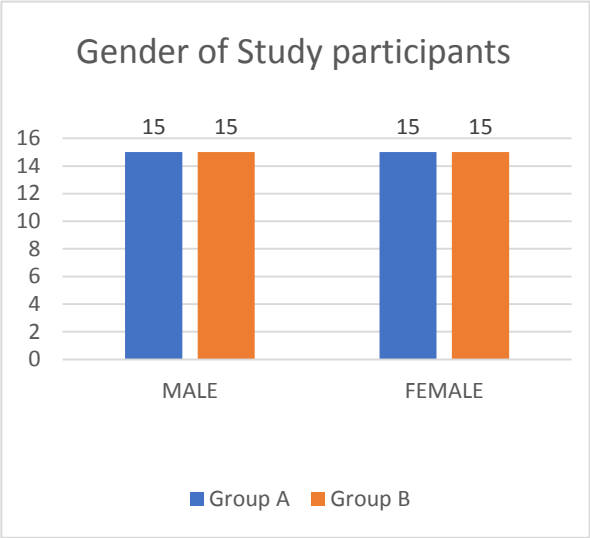


Table Figure 11. Gender distribution

Among subjects in Group 1, 50% of the subjects were female and 50% of the subjects were male. Among subjects in Group 2, 50% of the subjects were female and 50% of the subjects were male.

2.DISTRIBUTION OF SUBJECTS ACCORDING TO FAMILY HISTORY BETWEEN GROUPS

FAMILY HISTORY	GROUP (A)	GROUP (B)	Total
NO	24(80%)	23(76.7%)	47(78.3%)
YES	6(20%)	7(23.3%)	13(21.7%)
Total	30	30	60

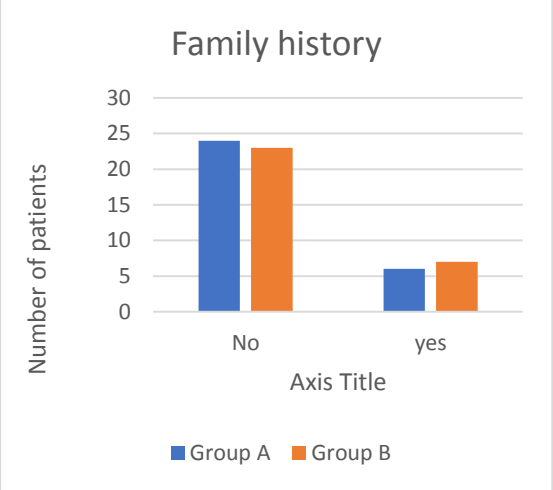


Table Figure 12 Family history

Majority (78.3%) of the patients had no family history of keloids and only 21.7% of the cases gave a positive family history. Of those with a positive family history, 20% in group A and 23.3% in group B patient developed multiple keloids

3.DISTRIBUTION OF SUBJECTS ACCORDING TO OCCUPATION BETWEEN GROUPS

Occupation	GROUP (A)	GROUP (B)	Total
SKILLED	3(10%)	6(20%)	9(15%)
SEMISKILLED	12(40%)	12(40%)	24(40%)
UNSKILLED	15(50%)	12(40%)	27(45%)
TOTAL	30	30	60

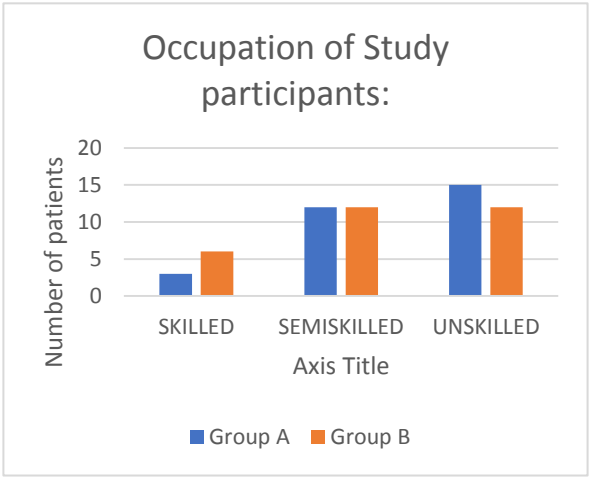


Table Figure 13 Occupation between two groups

Among the occupational groups, unskilled workers especially housewives, farmers and factory workers constituted majority (45%) of treatment seekers, followed by semi-skilled workers constituting 40% of patients and 15% were skilled workers.

4.DISTRIBUTION OF SUBJECTS ACCORDING TO REASON FOR TREATMENT BETWEEN GROUPS

Reason for treatment	GROUP (A)	GROUP (B)	Total
SYMPTOMATIC RELIEF	8(26.7%)	10(33.3%)	18(30%)
COSMETIC	21(70%)	17(56%)	38(63.3%)
PROFESSIONAL ASPECT	1(3.3%)	3(10.0%)	4(6.7%)
Total	30	30	60

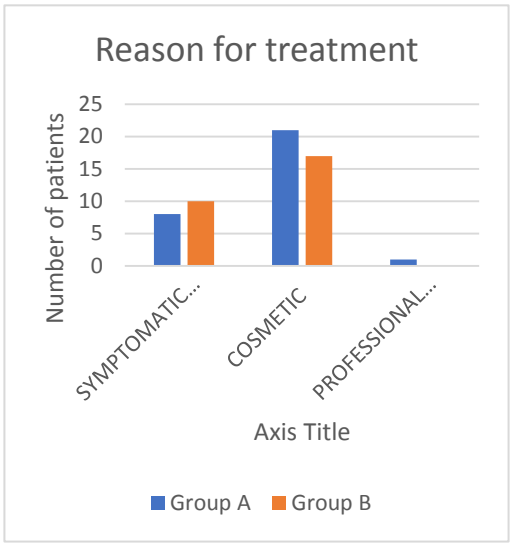


Table . Figure . 14 Reason for treatment between groups

Majority (63.3%) of the patients sought medical intervention for cosmetic reasons, followed by 30% of patients who came for treatment for symptomatic relief. Treatment for job purposes comprised of 6.7 % of treatment seekers.

5.DISTRIBUTION OF SUBJECTS ACCORDING TO DIAGNOSIS BETWEEN GROUPS

Diagnosis	GROUP (A)	GROUP (B)	Total
KELOID	19(63.3%)	20(66.7%)	39(65%)
HYPERTROPHIC SCAR	11(36.67%)	10(33.33%)	21(35%)
TOTAL	30	30	60

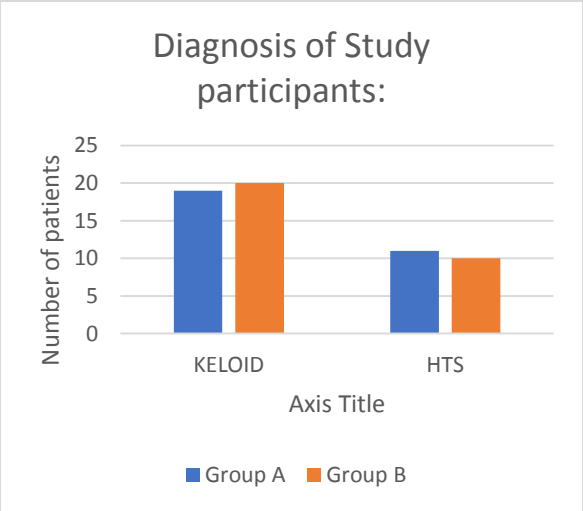


Table . Figure . 15 Diagnosis between groups

Majority (65%) of the patients diagnosed with Keloid, followed by 35% of patients diagnosed with Hypertrophic scar.

6.DISTRIBUTION OF SUBJECTS ACCORDING TO NUMBER OF KELOID/HTS BETWEEN GROUPS

No of keloids/HTS	GROUP (A)	GROUP (B)	Total
1	23(76.7%)	25(83%)	48(80%)
2	6(20%)	2(6.7%)	8(13.3%)
3	1(3.3%)	3(10%)	4(8.7%)
Total	30	30	60

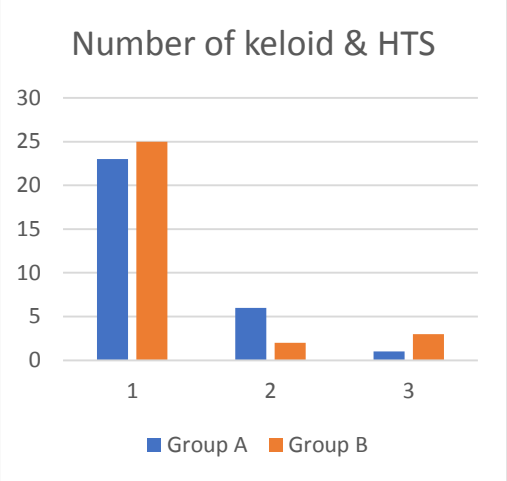


Table . Figure . 16 Number of keloid/hts

In our study, majority (80%) of patients presented with only one keloid or HTS and 13.3% of patients presented with only two keloid or HTS and 8.7% of patients presented with both keloid & HTS as 3 lesions

7.DISTRIBUTION OF SUBJECTS ACCORDING TO SITE OF KELOIDS/HTS BETWEEN GROUPS

SITE	GROUP (A)	GROUP (B)	TOTAL
CHEST	6(20%)	9(30%)	15(25%)
BACK	3(10%)	3(10%)	6(10%)
SHOULDER	2(6.7%)	1(3.3%)	3(5%)
FACE & EARS	5(16.7%)	8(26.7%)	13(21.7%)
ABDOMEN	4(13.3%)	0(0%)	4(6.7%)
KNEES & ELBOWS	7(23.3%)	6(20%)	13(21.7%)
OTHERS	3(10%)	3(10%)	6(10%)
TOTAL	30	30	60

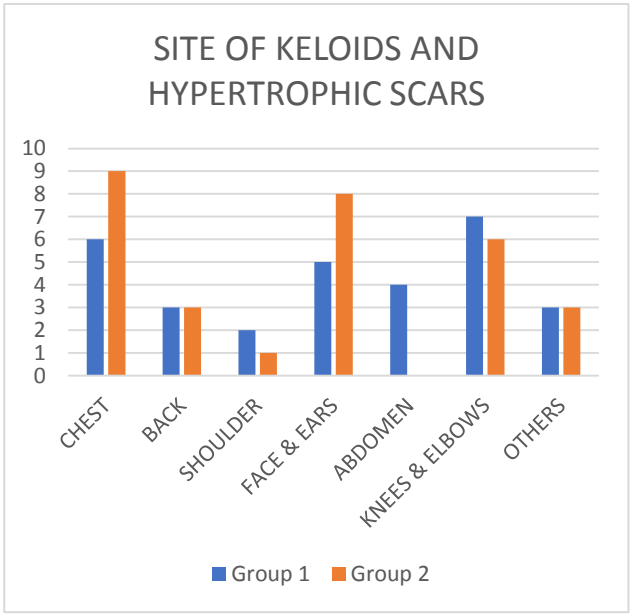


Table . Figure . 17 Site of keloids/HTS

In this study, keloids and HTS were most commonly found on the Chest (25%), followed Face & ears (21.7%), Knees & Elbows (21.7%), Back (10%), Others (10%), Shoulder (5%), Abdomen (6.7%). patients had keloids or HTS on other parts of the body. While keloids may be found anywhere on the body, they have a predilection for certain sites such as chest, shoulders, back, upper limbs and ears.5 According to a study by Berman et al1, the most frequently involved sites were chest, shoulders, head and neck areas (mainly the earlobes), arms and upper back. The results of the present study are in agreement with those of the above-mentioned studies.

8.DISTRIBUTION OF SUBJECTS ACCORDING TO SIZE OF KELOIDS/HTS BETWEEN GROUPS

SIZE	GROUP (A)	GROUP (B)	TOTAL
<2CM	8 (26.7%)	13(43.3%)	21(%)
2-5CM	18(60%)	16(53.3%)	34(%)
>5CM	4(13.3%)	1(3.3%)	5(%)
Total	30	30	60

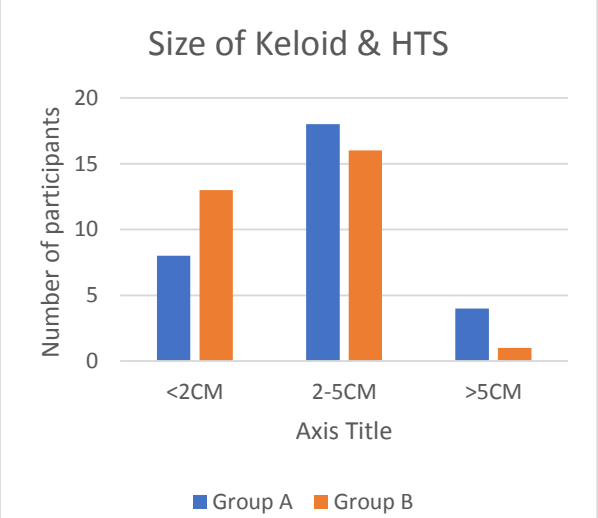


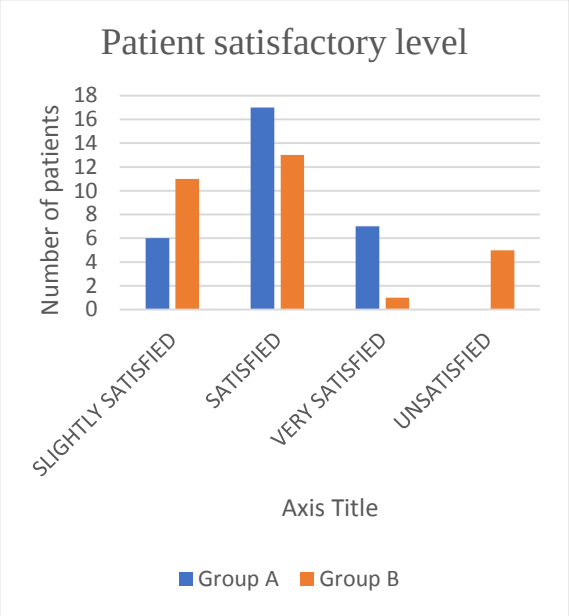
Table . Figure . 18 - Size of keloids/HTS

Majority (34%) of patients had keloids/HTS measuring 2 to 5cm followed by 21% of patients with lesions of size <2cm and 5% of patients with lesions of size >5cms

9.DISTRIBUTION OF SUBJECTS ACCORDING TO PATIENTS SATISFACTORY LEVEL BETWEEN GROUPS

PSL	GROUP (A)	GROUP (B)	TOTAL
UNSATISFIED	0	5(16.67%)	5(8.33%)
SLIGHTLY SATISFIED	6(20%)	11(36.67%)	17(28.33%)
SATISFIED	17(56.67%)	13(43.33%)	30(50%)
VERY SATISFIED	7(23.33%)	1(3.3%)	8(13.33%)
Total	30	30	60

Table . Figure . 18 – PSL of keloids/HTS



In our study 56.6% from group A and 43% from group B are satisfied with the treatment , followed by 20% from group A and 37% from group B are slightly satisfied and 23% in group A and 3% in group B are very much satisfied . p value <0.007 b which is statistically significant

10.DISTRIBUTION OF SUBJECTS RECEIVED LOSARTAN AND CLOBETASOL ACCORDING TO PATIENTS SATISFACTORY LEVEL BETWEEN HYPERTROPHIC SCAR AND KELOID

	LOSARTAN		CLOBETASOL	
PSL	HTS	Keloid	HTS	Keloid
Unsatisfied	0	0	2(20%)	3 (15%)
Slightly satisfied	3 (27.27%)	3 (15.78%)	2 (20%)	9 (45%)
Satisfied	6 (54.54%)	11 (57.89%)	5 (50%)	8 (40%)
Very satisfied	2 (18.18%)	5 (26.31%)	1 (10%)	0
Total	11	19	10	20

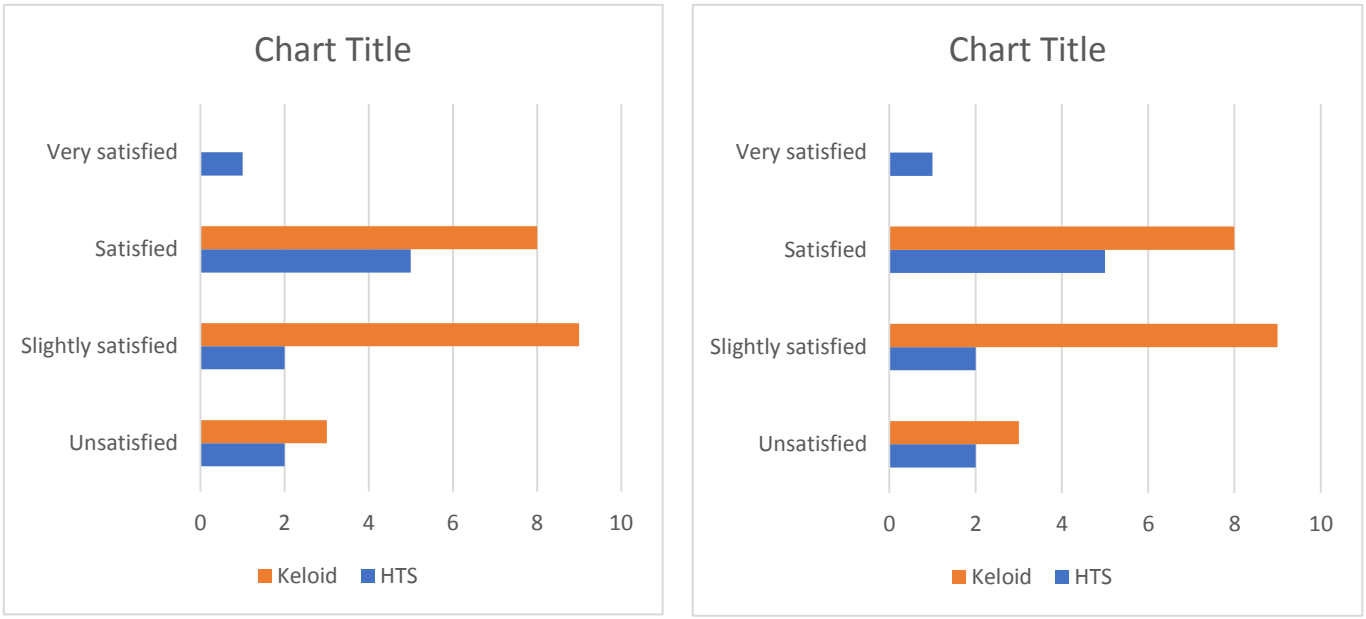
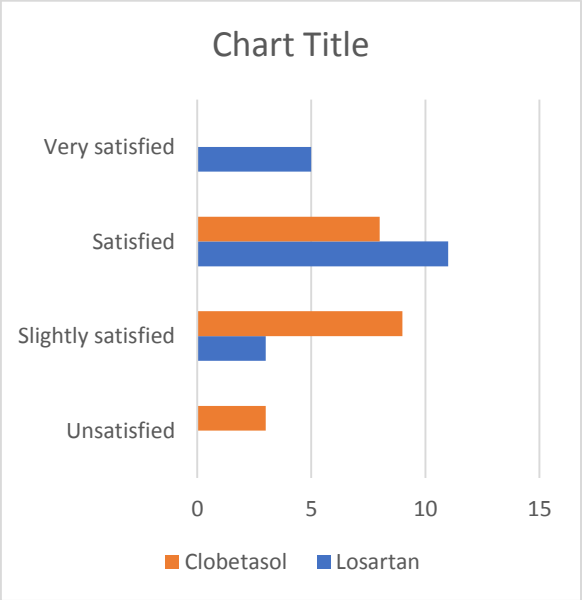


Table . Figure . 19 - PSL of keloids/HTS between losartan and clobetasol

In our study 27.27% with hypertrophic scar and 15.78% with keloid are slightly satisfied with losartan, 54.54% with hypertrophic scar and 57.89% with keloid are satisfied and 18.18% with hypertrophic scar and 26.31% with keloid are very much satisfied. p value 0.44 which is statistically insignificant. In our study 20% with hypertrophic scar and 45% with keloid are slightly satisfied with clobetasol, 50% with hypertrophied scar and 40% with keloid are satisfied and 10% with hypertrophic scar are very much satisfied. p value 0.43 which is statistically insignificant.

11.DISTRIBUTION OF SUBJECTS WITH HYPERTROPHIC SCAR AND KELOID ACCORDING TO PATIENT SATISFACTORY LEVEL BETWEEN LOSARTAN AND CLOBETASOL

	HTS		KELOID	
PSL	Losartan	Clobetasol	Losartan	Clobetasol
Unsatisfied	0	2(20%)	0	3 (15%)
Slightly satisfied	3 (27.27%)	2 (20%)	3 (15.78%)	9 (45%)
Satisfied	6 (54.54%)	5 (50%)	11 (57.89%)	8 (40%)
Very satisfied	2 (18.18%)	1 (10%)	5 (26.31%)	0
Total	11	10	19	20



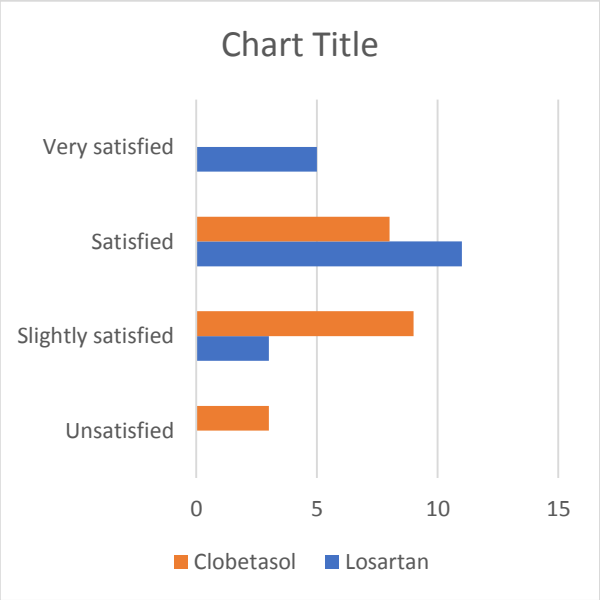


Table . Figure . 20- PSL of keloids/HTS between losartan and clobetasol

In our study 27.27% and 20% are slightly satisfied with losartan and clobetasol respectively, 54.54% and 50% are satisfied with losartan and clobetasol respectively and 18.18% and10% are very much satisfied with losartan and clobetasol. p value 0.004 which is statistically significant. In our study 15.78% and 45% are slightly satisfied with losartan and clobetasol respectively, 57.89% and 40% are satisfied with losartan and clobetasol respectively and 26.31% are very much satisfied with losartan. p value 0.27 which is statistically insignificant.

13.DISTRIBUTION OF SUBJECTS ACCORDING TO VANCOUVER SCAR SCALE BETWEEN GROUPS

Estimated Marginal Means	VSS	Mean	Std. Error	P Value
GROUP (A)	Baseline	8.033	.225	p<0.001
	24th week	3.633	.239	
GROUP (B)	Baseline	7.800	.225	
	24th week	4.167	.239	

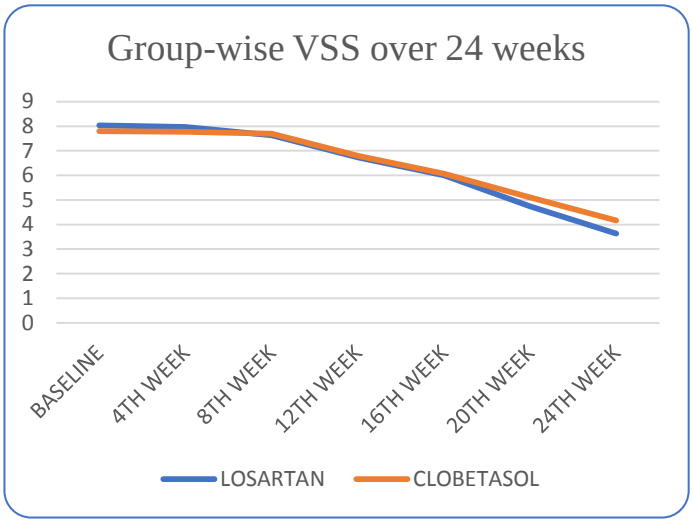
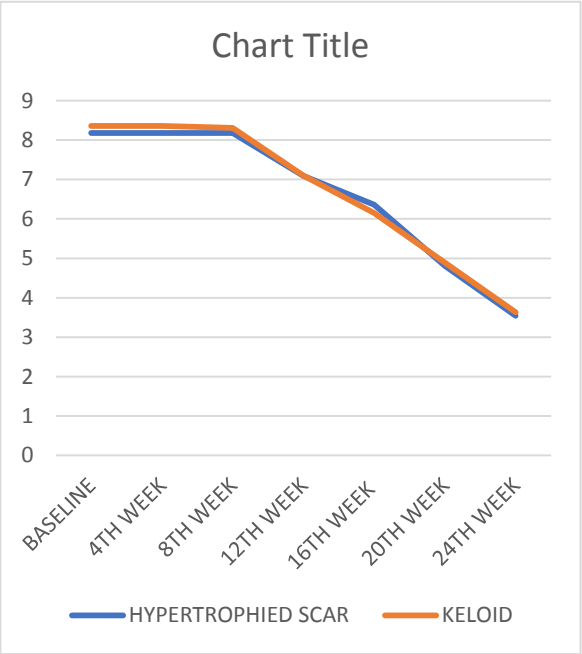


Table . Figure . 21- vancouver scar scale between groups

On doing repeated measures ANOVA with multivariate test for VSS over both the groups, confirmed significant time effects throughout treatment course (Wilk's Lambda: $F = 154.89$, $p < 0.001$ $\eta^2 = 0.95$). There was a statistically significant difference within the subjects ($F = 3.701$; $p = 0.012$); however there was no overall group difference observed ($F = 0.11$ zero, $p = 0.741$).

14.DISTRIBUTION OF SUBJECTS RECEIVED LOSARTAN AND CLOBETASOL ACCORDING TO VANCOUVER SCAR SCALE BETWEEN HYPERTROPHIC SCAR AND KELOID

	LOSARTAN			CLOBETASOL		
	VSS	Mean	Std error	VSS	Mean	Std error
HTS	Baseline	8.18	0.42	Baseline	8	0.33
	24 weeks	3.55	0.31	24 weeks	3.3	0.15
Keloid	Baseline	8.36	0.31	Baseline	7.55	0.32
	24 weeks	3.63	0.27	24 weeks	3.4	0.24



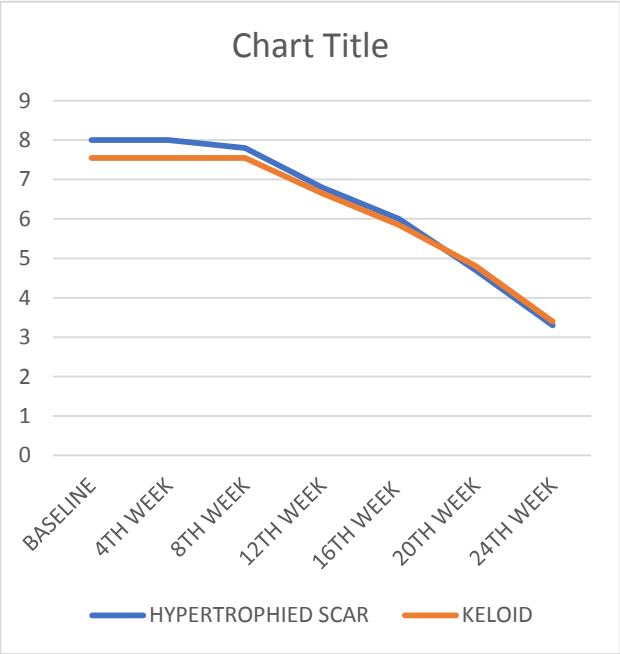
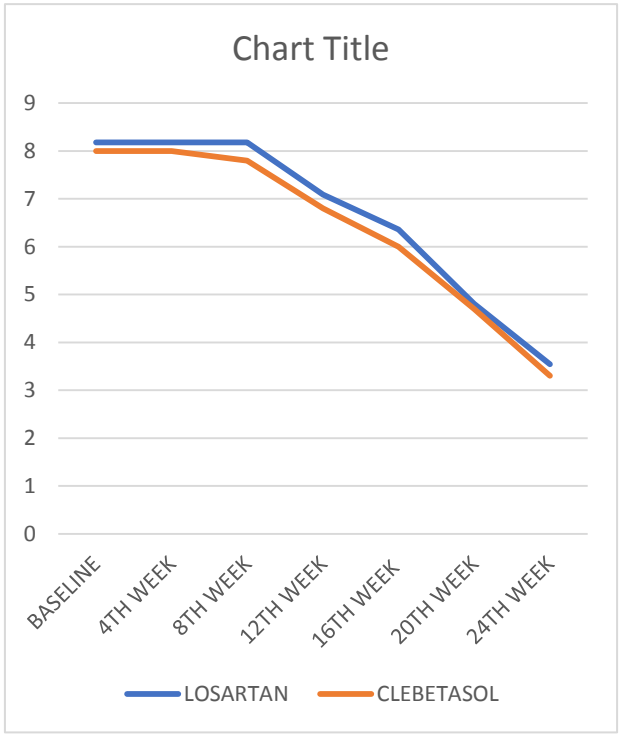


Table . Figure . 21- VSS between groups in keloid & HTS

On doing repeated measures ANOVA for VSS over hypertrophic scar and keloid who received losartan, confirmed significant time effects throughout treatment course ($p = <0.001$). There was a statistically significant difference within the subjects. On doing repeated measures ANOVA for VSS over hypertrophic scar and keloid who received clobetasol, confirmed significant time effects throughout treatment course ($p = <0.001$). There was a statistically significant difference within the subjects.

15.DISTRIBUTION OF SUBJECTS WITH HTS AND KELOID ACCORDING TO VANCOUVER SCAR SCALE BETWEEN LOSARTAN AND CLOBETASOL

	HTS			Keloid		
	VSS	Mean	Std error	VSS	Mean	Std error
Losartan	Baseline	8.18	0.42	Baseline	8.36	0.31
	24 weeks	3.55	0.31	24 weeks	3.63	0.27
Clobetasol	Baseline	8	0.33	Baseline	7.55	0.32
	24 weeks	3.3	0.15	24 weeks	3.4	0.24



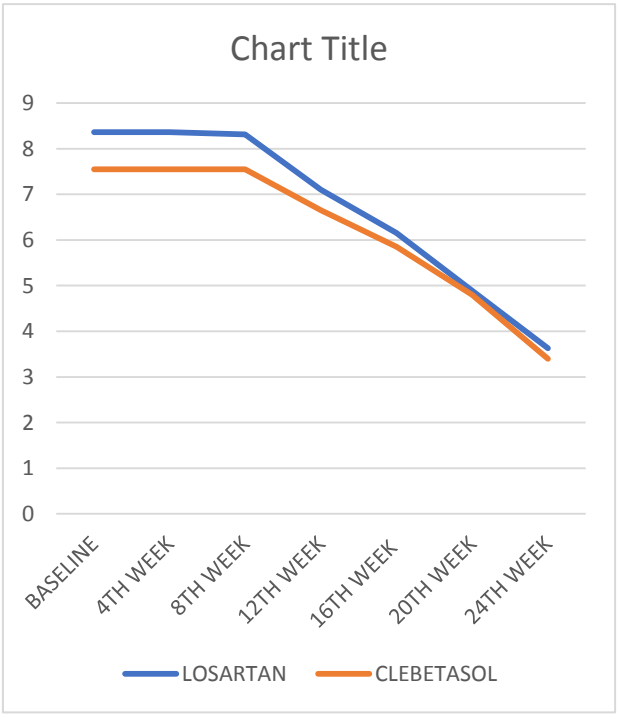


Table . Figure . 22- VSS between groups in keloid & HTS

On doing repeated measures ANOVA for VSS over losartan and clobetasol for hypertrophic scar, confirmed significant time effects throughout treatment course ($p = <0.001$). There was a statistically significant difference within the subjects. On doing repeated measures ANOVA for VSS over losartan and clobetasol for keloid, confirmed significant time effects throughout treatment course ($p = <0.001$). There was a statistically significant difference within the subjects.

16.DISTRIBUTION OF SUBJECTS ACCORDING TO GLOBAL PHOTOGRAPHIC ASSESMENT BETWEEN GROUPS

Estimated Marginal Means	GPA	Mean	Std. Error	P Value
GROUP (A)	Baseline	.000	.000	p<0.001
	24th week	2.067	.092	
GROUP (B)	Baseline	.000	.000	
	24th week	1.800	.092	

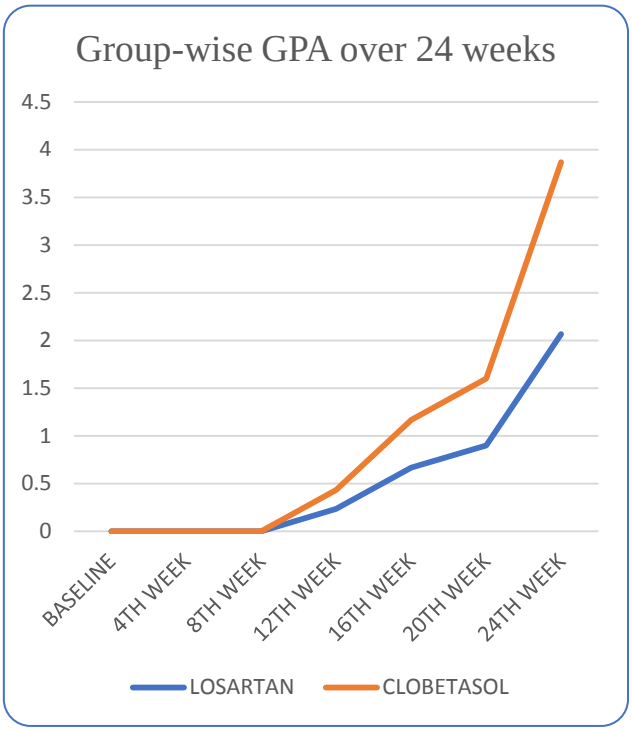
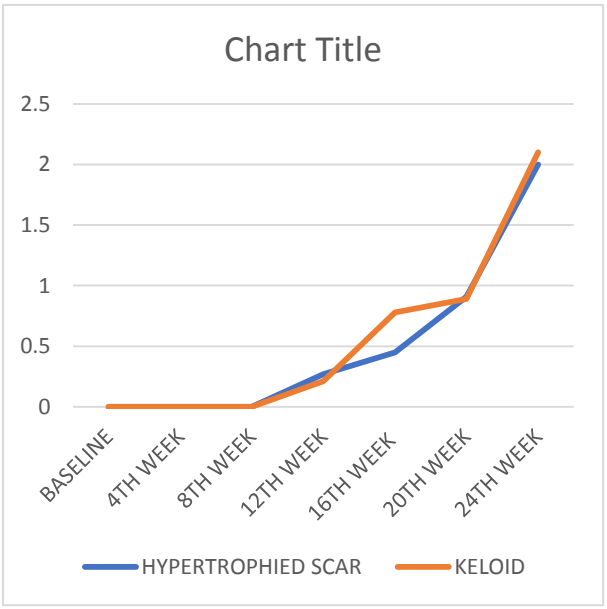


Table . Figure . 23 GPA between groups

On doing repeated measures ANOVA with multivariate test for GPA over both the groups, confirmed a highly significant effect on time of time on keloid improvement (Wilk's Lamda: $F = 220.91$, $p < 0.001$, $\eta^2 = 0.94$). There was a statistically significant difference within the subjects ($F = 670.13$; $p<0.001$) and with lower final GPA scores (1.80 vs. 2.07, $p = 0.050$) near significance.

17.DISTRIBUTION OF SUBJECTS RECEIVED LOSARTAN AND CLOBETASOL ACCORDING TO GLOBAL PHOTOGRAPHIC ASSESMENT BETWEEN HYPERTROPHIC SCAR AND KELOID

		Losartan		Clobetasol	
	GPA	Mean	Std error	Mean	Std error
HTS	Baseline	0	0	0	0
	24 weeks	2	0.13	1.9	0.1
Keloid	Baseline	0	0	0	0
	24 weeks	2.11	0.10	2	0.1



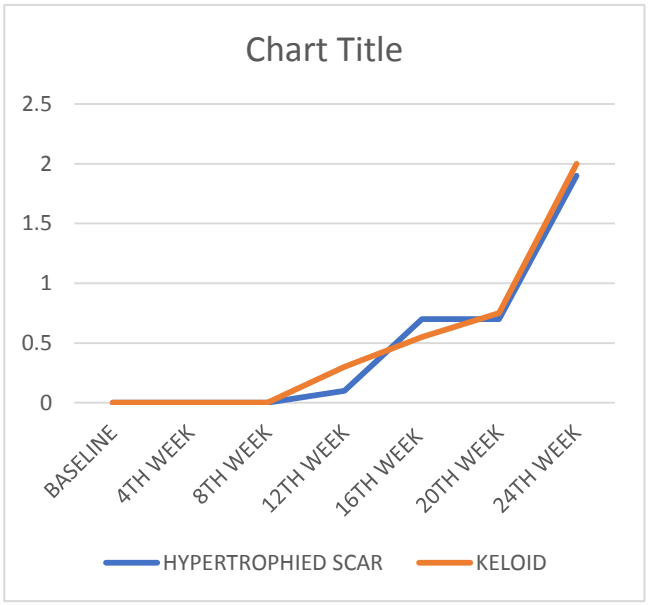


Table . Figure . 23 GPA in keloid/HTS between groups

On doing repeated measures ANOVA for VSS over hypertrophic scar and keloid with losartan, confirmed significant time effects throughout treatment course (p = <0.001). On doing repeated measures ANOVA for VSS over hypertrophic scar and keloid with clobetasol, confirmed significant time effects throughout treatment course (p = <0.001).

18.DISTRIBUTION OF SUBJECTS ACCORDING TO PIGMENTARY CHANGES BETWEEN GROUPS

Pigmentary changes	GROUP		Total
	GROUP (A)	GROUP (B)	
NO	30(100%)	23(76.7%)	53(88.3%)
YES	0(%)	7(23.3%)	7(11.7%)
Total	30	30	60

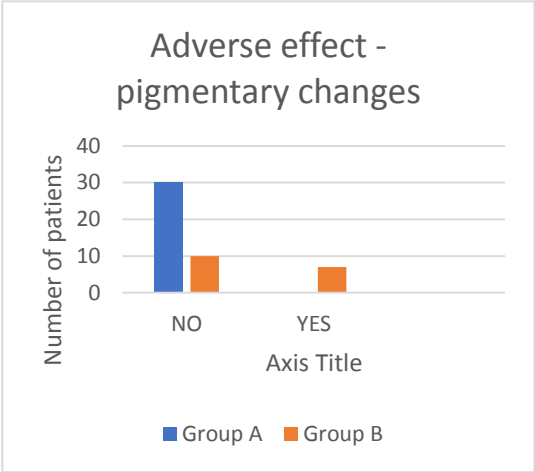


Table . Figure . 24 - Pigmentary changes between groups

In our study pigmentary changes were present in 7 patient which is 23.3% of group B group and there is no visible pigmentary changes noticed in group A patients. p value <0.011 b which is statistically significant difference found between groups with respect to Pigmentary changes

19.DISTRIBUTION OF SUBJECTS RECEIVED LOSARTAN AND CLOBETASOL ACCORDING TO PIGMENTARY CHANGES BETWEEN HYPERTROPHIC SCAR AND KELOID

	Losartan		Clobetasol	
Pigmentary changes	HTS	Keloid	HTS	Keloid
NO	11 (100%)	19 (100%)	7 (70%)	16 (80%)
YES	0	0	3 (30%)	4 (20%)
Total	11 (100%)	19 (100%)	10	20

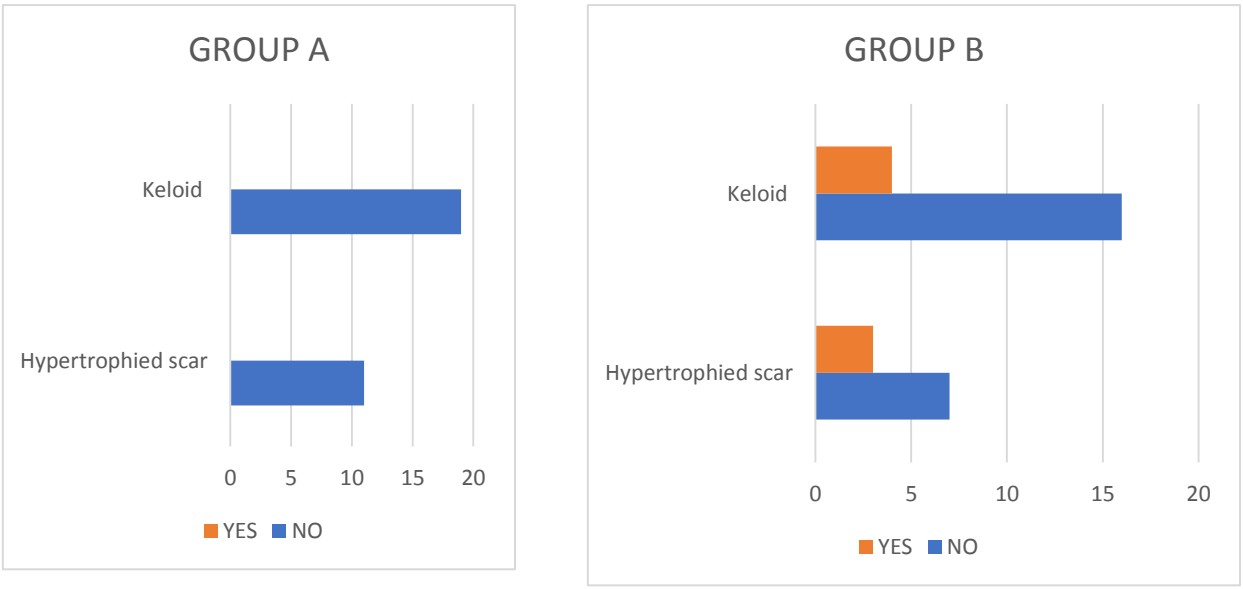


Table . Figure . 25 - Pigmentary changes between groups

In our study, there is no visible pigmentary changes seen with losartan in both hypertrophic scar and keloid. p value is 1 which is statistically insignificant difference found between hypertrophic scar and keloid with respect to Pigmentary changes. In our study, 30% of the hypertrophic scar who received clobetasol showed pigmentary changes while in keloid it was 20%. p value is 0.65 which is statistically insignificant.

20.DISTRIBUTION OF SUBJECTS ACCORDING TO ADVERSE EFFECT(ITCHING) BETWEEN GROUPS

Itching	GROUP		Total
	GROUP (A)	GROUP (B)	
NO	24(80%)	30(100%)	54(90%)
YES	6(20%)	0(0%)	6(10%)
Total	30	30	60

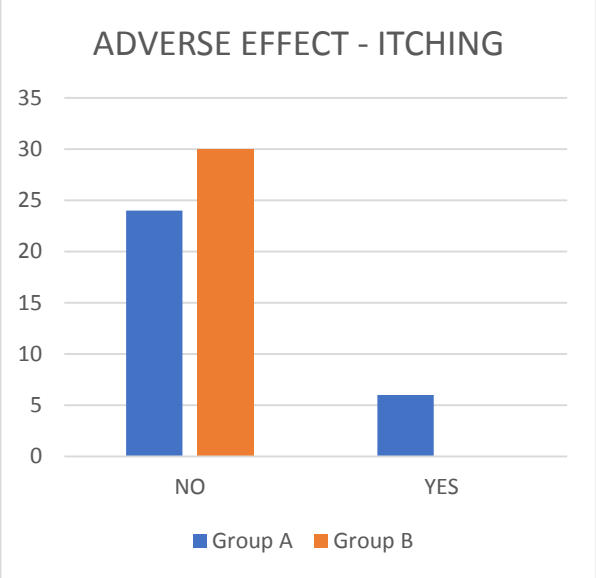


Table . Figure . 26 – Itching between groups

In our study Itching were present in 6 patient which is 20% of group A and there is no Pruritis noticed in group B patients. p value <0.112 b which is not statistically significant difference found between groups with respect to Itching.

21.DISTRIBUTION OF SUBJECTS RECEIVED LOSARTAN AND CLOBETASOL ACCORDING TO ITCHING BETWEEN HYPERTROPHIC SCAR AND KELOID

	Losartan		Clobetasol	
Itching	HTS	Keloid	HTS	Keloid
NO	9 (81.81%)	15 (78.94%)	10(100%)	20(100%)
YES	2 (18.18%)	4 (21.05%)	0	0
Total	11	19	10	20

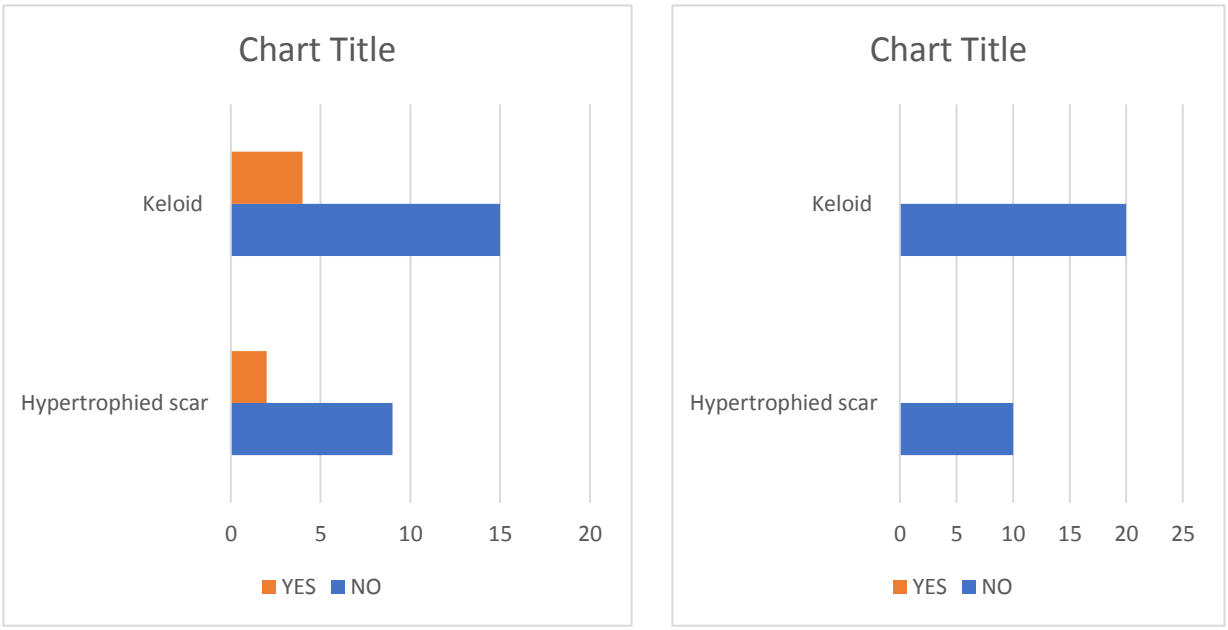


Table . Figure . 26 – Itching between groups

In our study, patients with hypertrophic scar who received losartan, itching were present in 2 patient which is 18.18% and in keloid it was 4 patients which is 21.05%. p value is 0.89 which is not statistically significant difference found between hypertrophic scar and keloid. In our study, patients with hypertrophic scar and keloid who received clobetasol none of them presented with itching. p value is 1 which is not statistically significant difference found between hypertrophic scar and keloid.

22.DISTRIBUTION OF SUBJECTS WITH HYPERTROPHIC SCAR AND KELOID ACCORDING TO ITCHING BETWEEN LOSARTAN AND CLOBETASOL

	HTS		Keloid	
Itching	Losartan	Clobetasol	Losartan	Clobetasol
NO	9 (81.81%)	10 (100%)	15 (78.94%)	20 (100%)
YES	2 (18.18%)	0	4 (21.05%)	0
Total	11	10	19	20

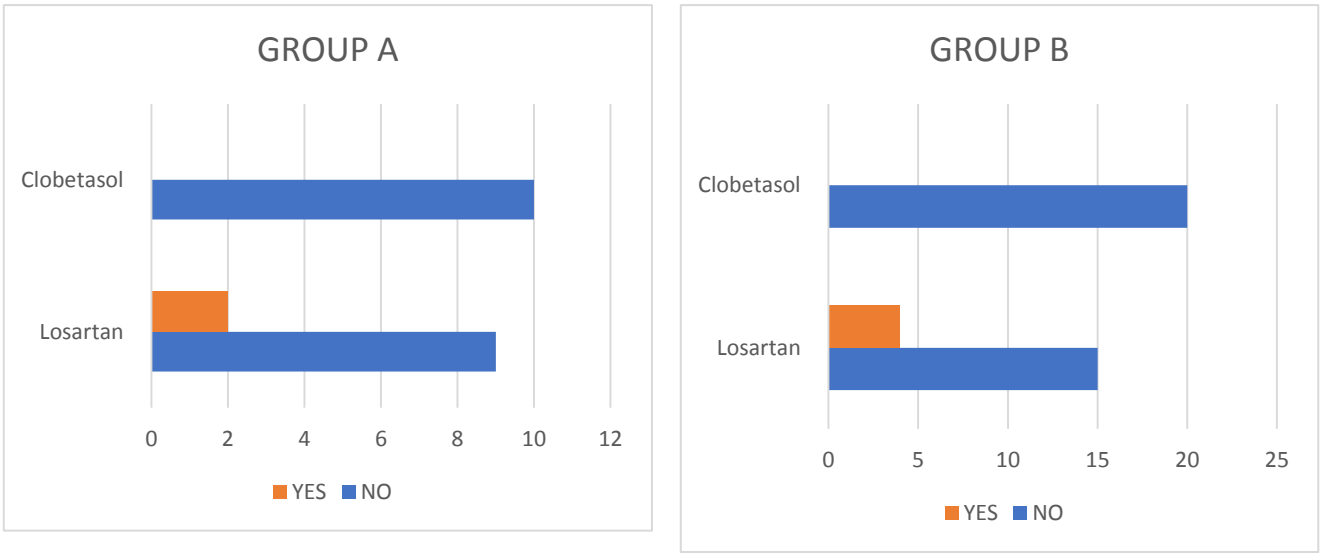


Table . Figure . 27 – Itching between groups

In our study, patients with hypertrophic scar who received losartan, itching were present in 2 patient which is 18.18% and with clobetasol none of them presented with itching. p value is 0.47 which is not statistically significant difference found between losartan and clobetasol In our study, patients with keloid who received losartan, itching were present in 4 patient which is 21.05% and with clobetasol none of them presented with itching. p value is 0.04 which is statistically significant difference found between losartan and clobetasol.

23.DISTRIBUTION OF SUBJECTS ACCORDING TO ADVERSE EFFECT (TELANGIECTASIA) BETWEEN GROUPS

Telangiectasia	GROUP (A)	GROUP (B)	Total
NO	30	26(86.67%)	56(93%)
YES	0	4(13.33%)	4(6.6%)
Total	30	30	60

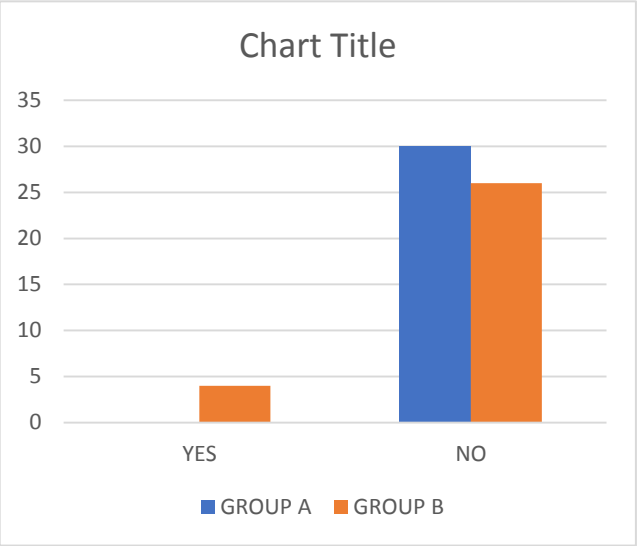


Table . Figure . 28 – Adverse effect (telangiectasia) between groups

In our study Telangiectasia was seen in 4 patient which is 13.3% of group B group and there is no patient with Telangiectasia in group A . p value 0.35 which is statistically insignificant difference found between groups with respect to Telangiectasia

24.DISTRIBUTION OF SUBJECTS RECEIVED LOSARTAN AND CLOBETASOL ACCORDING TO TELEGIECTASIA BETWEEN HYPERTROPHIC SCAR AND KELOID

	Losartan		Clobetasol	
Telangiectasia	Hypertrophied scar	Keloid	Hypertrophied scar	Keloid
NO	11 (100%)	19	8 (80%)	18 (90%)
YES	0	0	2 (20%)	2 (10%)
Total	11	19	10	20
P value	1		0.58	

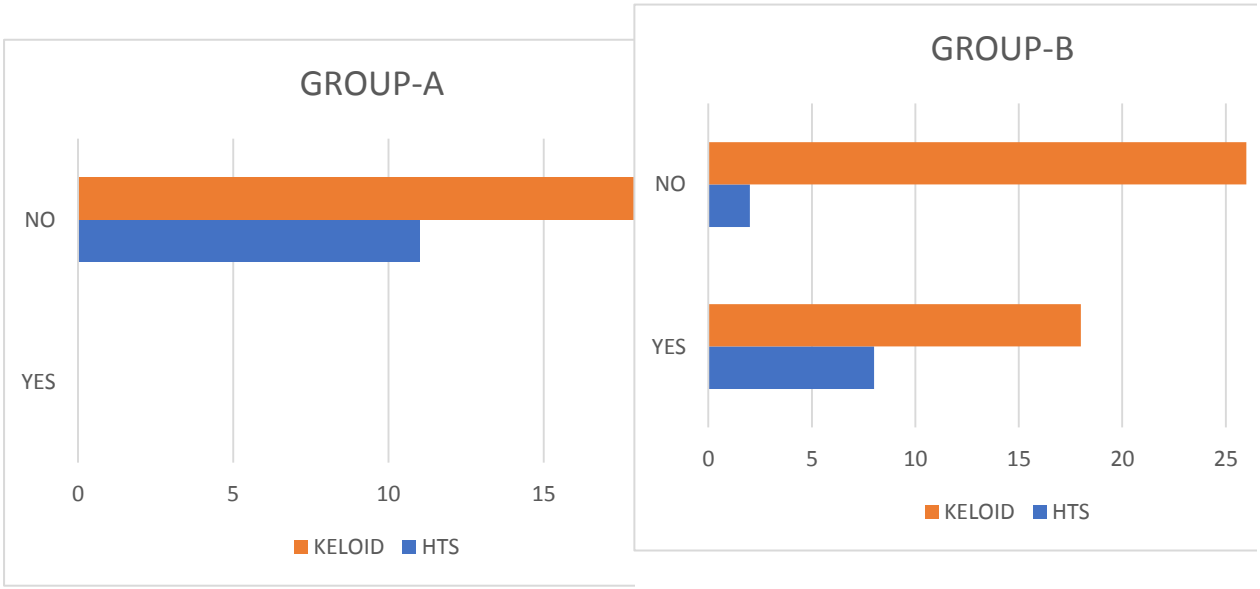


Table . Figure . 29 – Adverse effect (telangiectasia) between groups

In our study, Telangiectasia was seen in 2 patient with HTS who received clobetasol which is 20% and 2 patient with keloid who received clobetasol which is 20%. p value is 0.58 which is statistically insignificant difference found between hypertrophied scar and keloid with respect to Telangiectasia . However there is no Telangiectasia noticed in group A both in keloid and HTS. p value is 1 which is statistically insignificant difference found between hypertrophic scar and keloid with respect to Telangiectasia.

25.DISTRIBUTION OF SUBJECTS WITH HYPERTROPHIC SCAR AND KWLOID ACCORDING TO TELENGIECTASIA BETWEEN LOSARTAN AND CLOBETASOL

	HTS		Keloid	
Telangiectasia	Losartan	Clobetasol	Losartan	Clobetasol
NO	11 (100%)	8 (80%)	19	18 (90%)
YES	0	2 (20%)	0	2 (10%)
Total	11	10	19	20
P value	0.21		0.48	

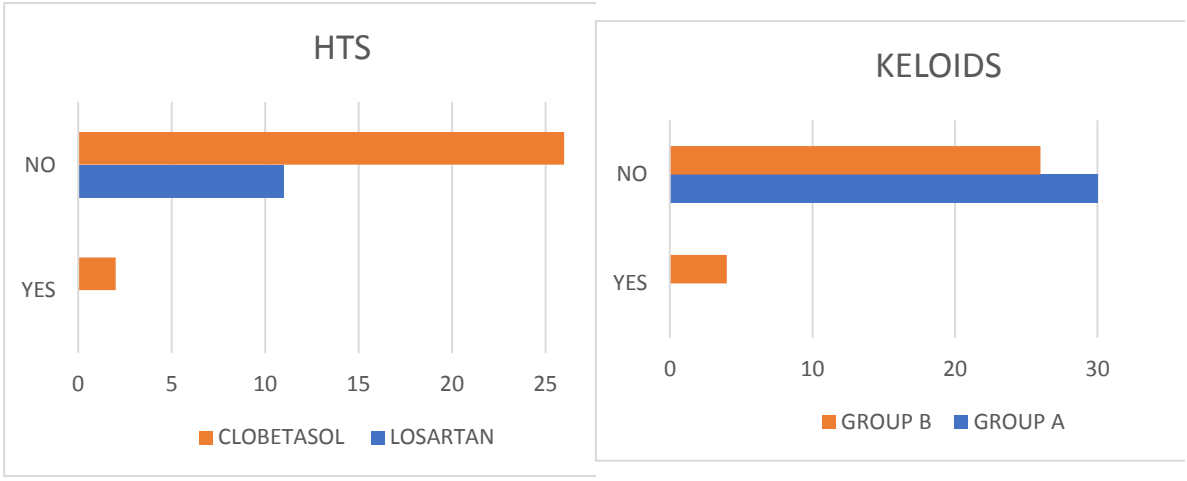


Table . Figure . 29 – Adverse effect (telangiectasia) between groups

In our study, Telangiectasia was seen in 2 patient with hypertrophic scar who received clobetasol which is 10%. p value is 0.21 which is statistically insignificant difference found between losartan and clobetasol with respect to Telangiectasia. 2 patient with keloid who received clobetasol which is 10%. p value is 1 which is statistically insignificant difference found between losartan and clobetasol with respect to Telangiectasia

26.DISTRIBUTION OF SUBJECTS ACCORDING TO ADVERSE EFFECT (SURROUNDING SKIN ATROPHY) BETWEEN GROUPS

Surrounding skin atrophy	GROUP (A)	GROUP (B)	Total
No	30(100 %)	25(83.3 %)	55(91.6 %)
YES	0	5(16.7%)	5(8.4%)
Total	30	30	60

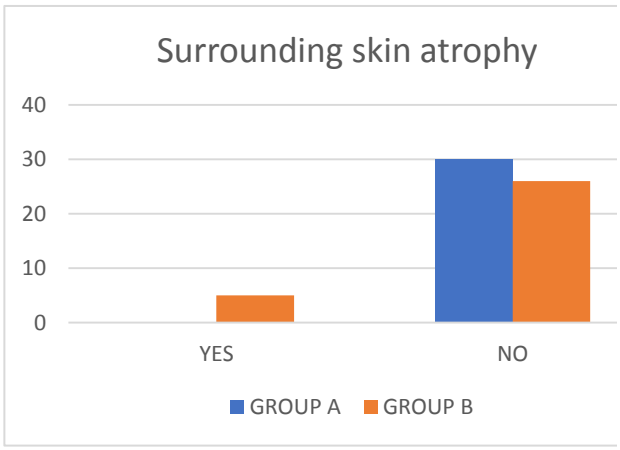


Table . Figure . 29 – Adverse effect (telangiectasia) between groups

In our study surrounding skin atrophy was seen in 5 patient which is 16.7% of group B and there is no surrounding skin atrophy in group A patients and the p value is 0.42

27.DISTRIBUTION OF SUBJECTS RECEIVED LOSARTAN AND CLOBETASOL ACCORDING TO SURROUNDONG SKIN ATROPHY BETWEEN HYPERTROPHIC SCAR AND KELOID

	Losartan		Clobetasol	
Surrounding skin atrophy	Hypertrophied scar	Keloid	Hypertrophied scar	Keloid
NO	11	19	8 (80%)	17 (85%)
YES	0	0	2 (20%)	3 (15%)
Total	11	19	10	20
P value	1		1	

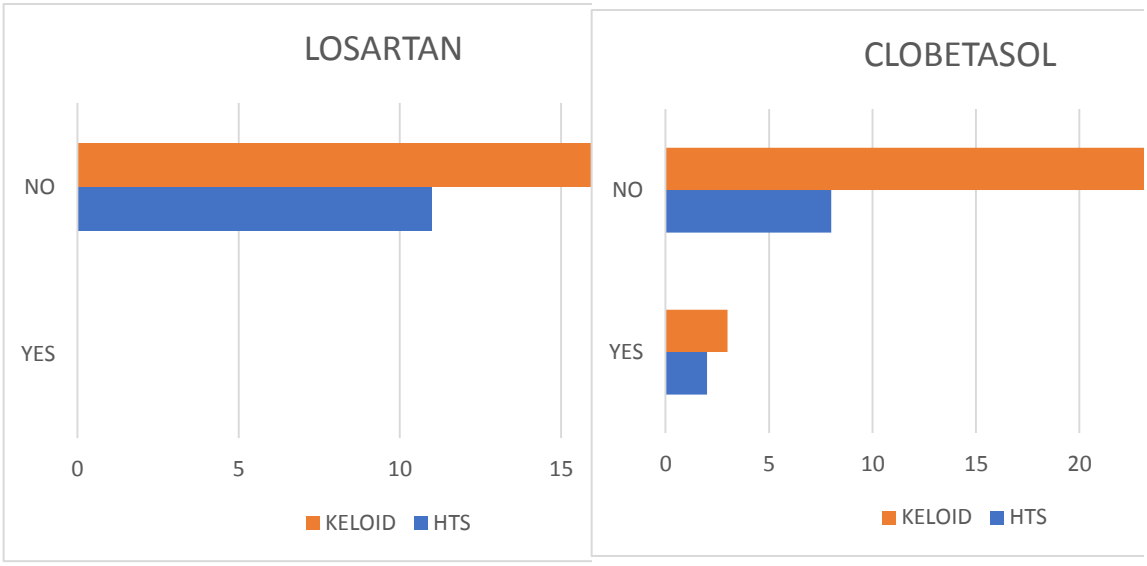


Table . Figure . 30 – Adverse effect (telangiectasia) between groups

In our study, surrounding skin atrophy was seen in 1 patient with hypertrophic scar and keloid who received losartan which is 5.26%. p value is 1 which is statistically insignificant. In our study, surrounding skin atrophy was seen in 3 patients with keloid who received clobetasol which is 15% and 2 patients with hypertrophic scar who received clobetasol which is 20%. p value is 1 which is statistically insignificant.

28.DISTRIBUTION OF SUBJECTS WITH HYPERTROPHIC SCAR AND KELOID ACCORDING TO SURROUDNING SKIN ATROPHY BETWEEN LOSARTAN AND CLOBETASOL

	HTS		Keloid	
Surrounding skin atrophy	Losartan	Clobetasol	Losartan	Clobetasol
NO	11	8 (80%)	19	17 (85%)
YES	0	2 (20%)	0	3 (15%)
Total	11	10	19	20
P value	0.21		0.23	

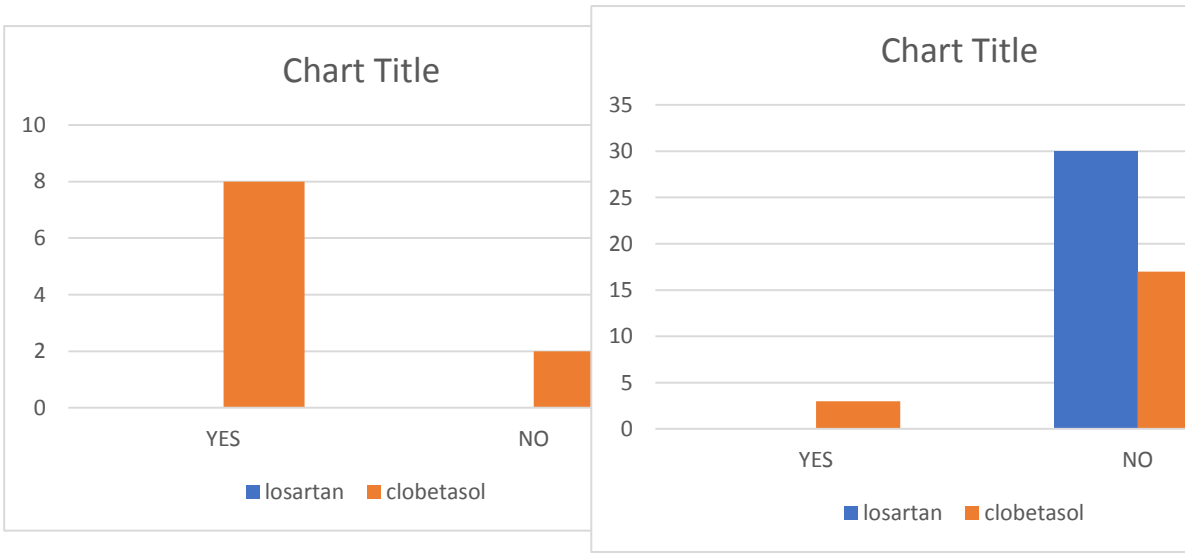


Table . Figure . 31 – Surrounding skin atrophy between losartan and clobetasol

In our study, surrounding skin atrophy was seen in 2 patient with hypertrophic scar who received clobetasol which is 20%. p value is 0.58 which is statistically. There is no surrounding skin atrophy seen in losartan group which is 5.26% and 3 patient with keloid who received clobetasol which is 15%. p value is 0.60 which is statistically insignificant.

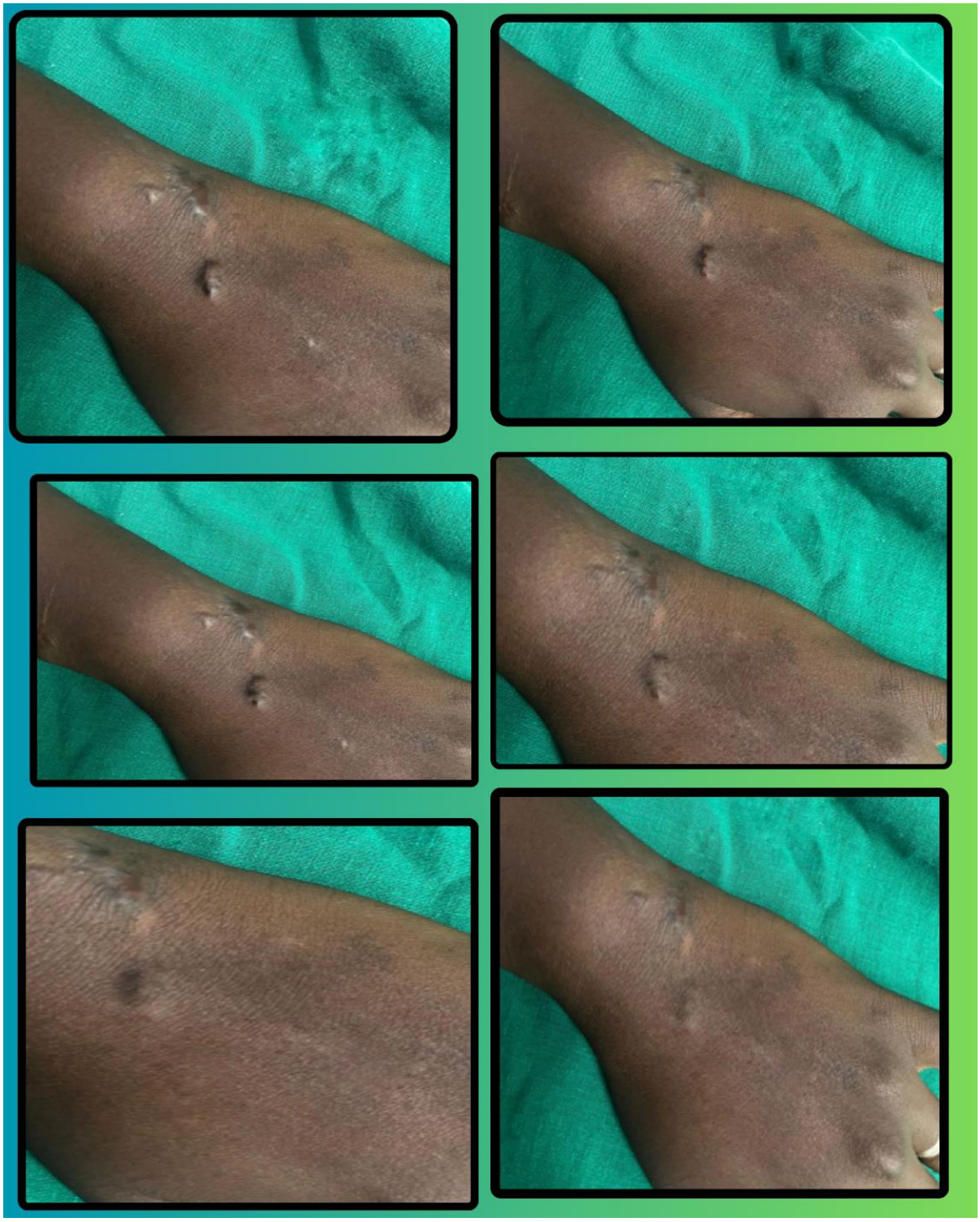


Figure . 32 Group A –Topical losartan group HTS (4^{th},8^{th},12^{th},16^{th},20^{th},24^{th} week)

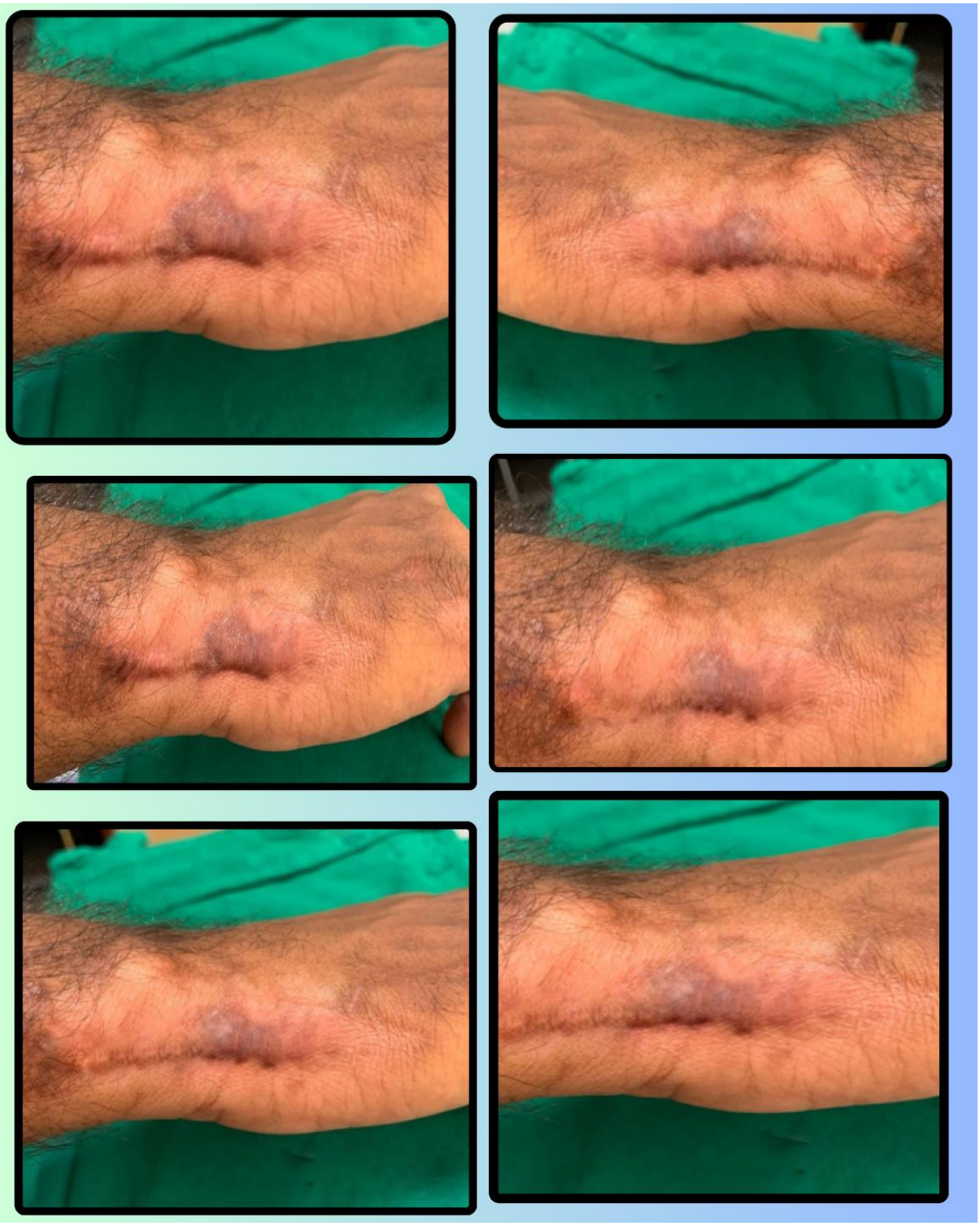


Figure . 33 Group B – Topical clobetasol 0.05%group HTS (4th,8th,12th,16th,20th,24th week)

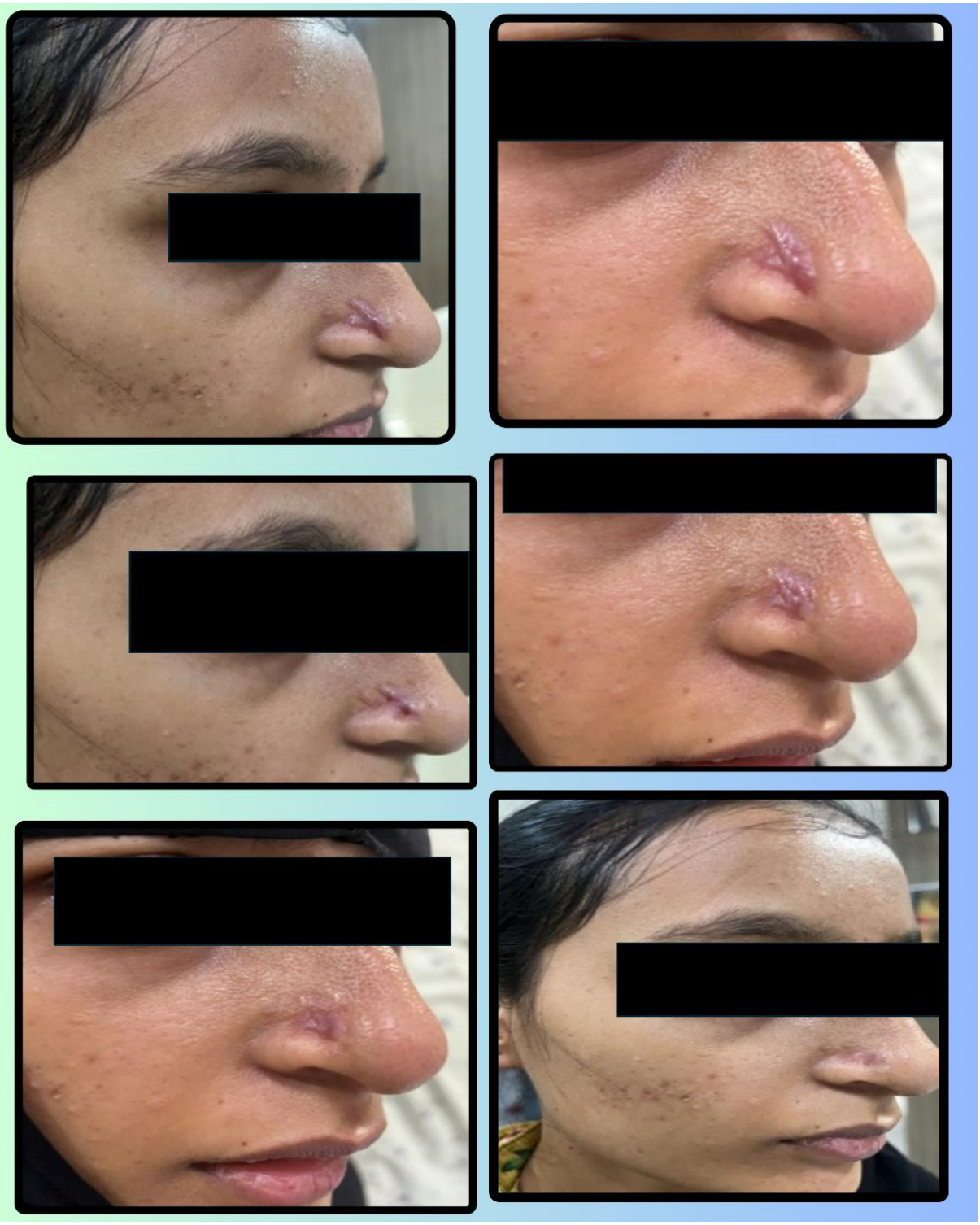


Figure . 34 Group A –Topical losartan group Keloid (4^{th},8^{th},12^{th},16^{th},20^{th},24^{th} week)

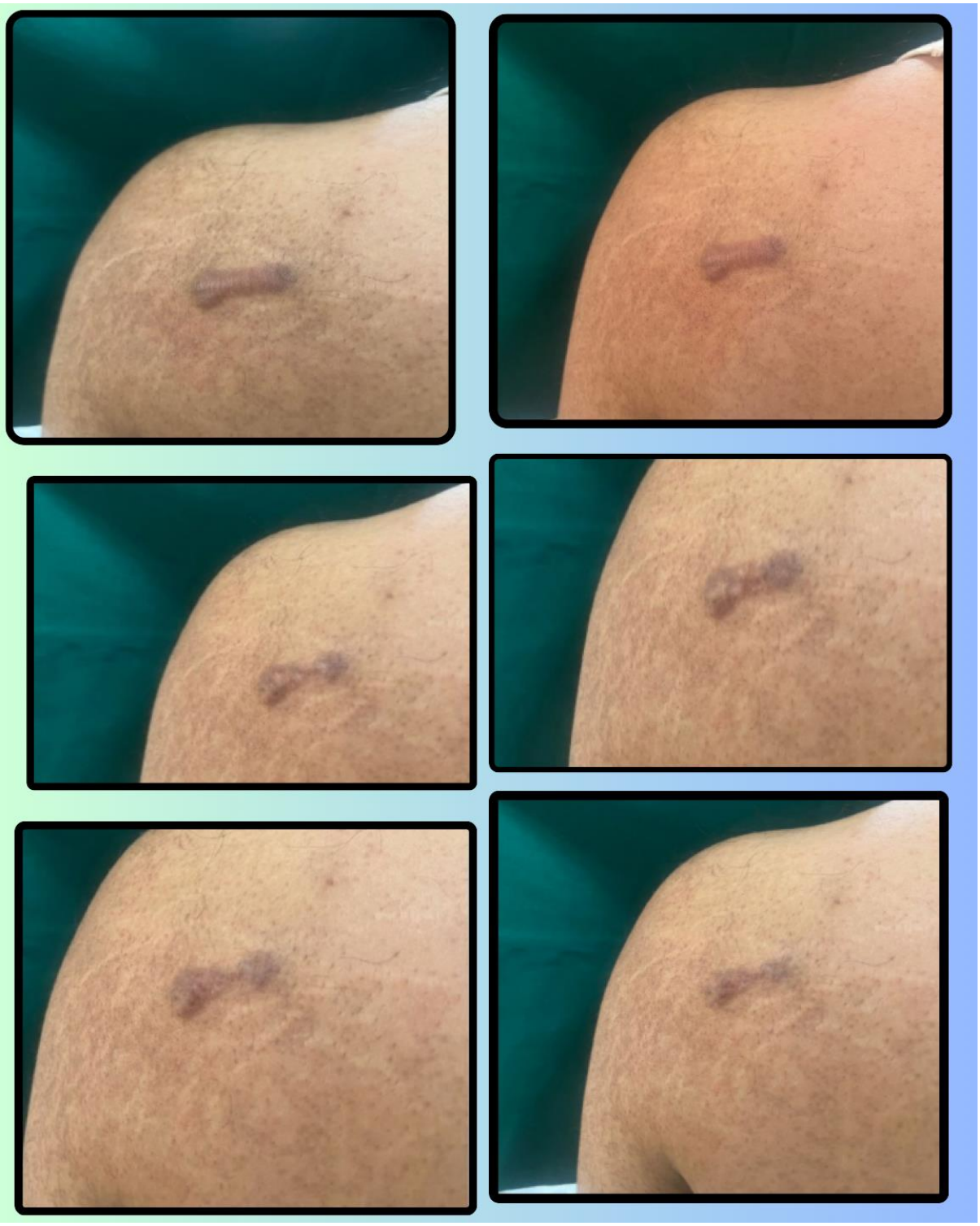


Figure . 35 Group B – Topical clobetasol 0.05%group HTS (4th,8th,12th,16th,20th,24th week)

DISCUSSION

DISCUSSION

Gender-based distribution of 60 patients, 50% were male and 50% female, a 1:1 ratio. This is consistent with Ketchman et al, who found approximately equal prevalence in both sexes. [110]

Only 21.7% of the cases had a positive family history, while the majority of patients (78.3%) had no family history of keloids. Twenty percent of patients in group A and twenty-three percent of patients in group B who had a favourable family history had numerous keloids. The majority of Kiprono participants (93.2%) in a study by Samson K. et al. did not have a family history of keloids, according to responses (6.8%).

In a Study done by Samson k Kiprono et al states that respondents (6.8%), indicating that the majority of participants (93.2%) did not have a family history of keloids. [111]Familial inheritance is uncertain, but autosomal recessive and autosomal dominant patterns have been described.

Fifteen percent of the study participants were skilled, forty percent were semi-skilled, and forty-five percent were unskilled. Similar to the earlier study by Labadie et al.,108 our investigation found that the majority of patients (63.3%) sought medical intervention for cosmetic reasons, followed by symptomatic treatment. In this study, 20 patients in group B had keloid and 10 had HTS, while 19 patients in group A had keloid and 11 had HTS. Numerous lesions developed on their own or as a result of chicken pox, folliculitis, or acne. Compared to a study by Kombaté K et al. on the prevalence and features of keloids in dermatology outpatients in West Africa, which included 78 keloid cases in total, this is less. The study highlights the link between keloids and inflammatory and traumatic lesions, including acne keloidalis nuchae.[112]

Keloids can appear any where in the body among which keloid and HTS were most common on the mid-sternum (25%), followed by face & ears (21.7%), knees & elbows (21.7%), back (10%), shoulder (5%), and others (10%). 11.1% had additional body keloids. Keloids can appear anywhere on the body, but they prefer the chest, shoulders, back, upper limbs, and ears. The study by Anbumalar Manoharan et al.[112] found that the majority of keloids (51.67%) were located on the chest, followed by the shoulder (20%), and other sites such as the back (8.33%), arms, ear lobes, and forearms (5% each). This aligns with findings from Fernández-Crehuet et al stated that most common areas for keloid formation include the upper trunk, back, shoulders, head, neck region, particularly earlobes, and the helix of the auricle. The results of the present study are in agreement with those of the above mentioned studies.

Majority (34%) of patients had keloids/HTS measuring 2 to 5cm followed by 21% of patients with lesions of size <2cm and 5% of patients with lesions of size >5cms showing symptoms and signs.

Patient satisfaction measured by patient satisfactory level score at the end of our trial 44 % reported very much satisfied and 0 % unsatisfied on using losartan where majority of the patients belong to keloid subgroup in group A. 10 % reported very much satisfied and 35%unsatisfied on using clobetasol which might be due to the adverse effect created by the drug. This is contradicting a study done by Nor et al., 2017 et al., where patients treated with clobetasol reported fewer adverse effects compared to those receiving triamcinolone, contributing to higher satisfaction levels.

VANCOUVER SCAR SCALE

According to our study, VSS for both groups verified significant temporal effects over the length of treatment. Although there was no discernible significant group difference overall,

there was a statistically significant difference among the subjects. Both keloid and hypertrophic scar groups experienced a significant drop in Vancouver Scar Scale (VSS) ratings following laser treatment, according to Elrefaie A et al., suggesting that there were significant temporal effects during the course of treatment. Nevertheless, the two groups' VSS ratings did not differ statistically significantly ($p = 0.773$), indicating that although both groups improved with time, the degree of progress was comparable and no overall group difference was seen.[113]

In a study by Hedayatyanfard Keshvad et al A total of 30 subjects were examined ($n = 20$ who received losartan ointment and 10 who received a placebo; seven placebo volunteers dropped out of the research because they felt the medication was ineffective). VSS scores decreased considerably ($p<0.05$) in the losartan group.[114]

GLOBAL PHOTOGRAPHIC ASSESMENT

Our study reported that GPA over both the groups confirmed significant time effects throughout treatment course. However there was a statistically significant difference within the subjects and also near significance group difference observed.

ADVERSE EFFECTS – Our study reported NO pigmentary changes among those who had losartan and 7 patients (23%) had pigmentary changes in clobetasol group during the course of treatment. Among the study participants in clobetasol group 3 participants developed pigmentary changes for HTS and 4 participants developed pigmentary changes for keloid Losartan. Norazirah Md Nor et al., reported that in the clobetasol propionate 0.05% cream group, 35.3% of patients experienced hypopigmentation, while 41.2% reported telangiectasia. [115]

In our research Six patients (20%) in group A had itching, while group B patients showed no symptoms. According to a study by Yuni Eka Anggraini et al., skin irritation brought on by the active ingredient or the ethosomal gel's composition may cause itching. Itching sensations may also be influenced by the inflammatory response in keloid tissue. The precise processes underlying this adverse effect in the context of losartan use would require more investigation. .[115]

According to our study, there was no telangiectasia in the losartan group, but four patients (13.3%) in the clobetasol group experienced telangiectasia while on treatment. In the clobetasol group, two study participants acquired telangiectasia while receiving treatment for HTS, and two patients developed telangiectasia for keloid.

According to Norazirah Md. Nor et al., the intra-lesional (IL) triamcinolone group saw a greater rate of telangiectasia (41.2%) than the clobetasol propionate 0.05% cream group under occlusion with silicone dressing (17.6%).

Our study found that 5 patients (35%) in the clobetasol group experienced surrounding skin atrophy following treatment, but no surrounding skin atrophy was observed in those receiving losartan. Three study participants experienced surrounding skin shrinkage for keloid, and two persons experienced surrounding skin atrophy for HTS in the clobetasol group.

According to D Lubach et al., a typical side effect of long-term topical corticosteroid therapy is skin atrophy, which is linked to clobetasol propionate (CP). During the first continuous treatment phase, skin thickness dropped by about 15% in one research. Skin thinning continued even during intermittent maintenance therapy, especially when applications were made every fifth or seventh day. The results show that clobetasol can, in fact, result in atrophic surrounding skin.[116]

Both groups responded well out of the two. Although there was no overall significant difference between the two groups (Losartan and Clobetasol), there was a statistically significant difference in the VSS score between the participants in the same group over the course of treatment. Furthermore, according to the study by Ang et al., the significance levels ($p < 0.05$) show that the observed reductions in keloid symptoms with losartan are unlikely to be the result of chance, bolstering its potential as a treatment option.[117,118]

Both groups responded well. However, there was a statistically significant difference in GPA score between the two groups (Losartan and Clobetasol) across the treatment duration, but no overall significant difference was identified. Murakami et al. and Aggarwal et al. have conducted studies in which losartan and clobetasol were compared to other medications such as triamcinolone acetonide and combination therapy. While losartan shows potential, corticosteroids remain a standard due to their proven efficacy.[109,119]

SUMMARY

SUMMARY

Over half the patients were under 40. This may be because this age group is more trauma-prone. Males were more cosmetically concerned and less compliant with monotherapy, therefore the gender distribution was practically equal. About half of the cases involved unskilled workers, such as homemakers, farmers, and manual labourers, or students. Patients prioritise cosmetic blemishes, while farmers prioritise symptoms like itching and pain. Most cases occurred in the chest/mid-sternum, the keloid-prone area. Most patients developed one keloid due to infection or trauma at one place. Rarely did patients have keloids in their families. Both regimens worked, proving topical treatment for keloids & HTS . However, group A outpaced group B in responses. Most patients responded well regardless of lesion length or placement, proving that both treatments can treat all lesions at any site. Side effects were much higher in group B than A. The majority of these side effects were permanent and cosmetically unattractive.

LIMITATIONS

LIMITATIONS

The study's limitations include a restricted sample size, which may limit the generalization of the results to broader populations. Furthermore, patient satisfaction metrics are intrinsically subjective and may fluctuate according to individual expectations and perceptions. The results of the research may not accurately represent the outcomes of diverse populations or various settings, as it was conducted at a single center. The outcomes could also be influenced by potential confounding variables, such as the severity of keloids or hypertrophic scars, prior treatments, and skin types, which could introduce bias or variability. Additionally, the study's validity may be compromised by the potential for bias in evaluations due to the absence of blinding for participants and assessors.

CONCLUSION

CONCLUSION

Based on the preceding data Topical treatments can effectively treat keloid and HTS. patients those who have procedural anxiety and time constraints. It offers greater cost-effectiveness relative to procedural therapies. Despite the fact that both the regimens were equally effective, group A(Losartan) had the highest patient satisfaction, moreover, In group B(Clobetasol) there were excessive side effects in the form of Pigmentary changes, surrounding skin atrophy, Telangiectasia were noticed. Hence we would like to conclude that topical preparation of Losartan is preferred due to its better results and greater safety profile relative to the clobetasol

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ANNEXURE

ANNEXURE I

PROFORMA

Name: Age: Sex: M/F OP No.:

Address: Occupation: Ph No.:

C/C:-

HOPI:- History of Presenting Illness:

1. Age of Onset:
2. Site of onset:
3. Duration:
4. Any Associated Symptoms: itching/ burning/ pain
5. Mode of spread: static/ growing/ receding
6. Use of any drugs before onset of illness
7. Aggravating factors: Occupational/ hobbies/ trauma/ drug/ work/ sunlight/ emotional factors/ menstruation/ pregnancy/ food/ cosmetics/ chemicals/ any other:
8. Recovery: Some/ good/ poor/ no response

Past history:

- Associated systemic diseases: DM/ HTN/ Thyroid disease.

- Associated cutaneous diseases:

Family history:

A. Similar complaints:

B. Other skin problems:

Personal history:

C. Diet: veg/ nonveg/ mixed

D. Bowel/ Bladder habits: regular/ altered.

E. Sleep- adequate/ disturbed

F. Appetite-

G. Habits: smoking/ tobacco chewing/ alcoholism

Menstrual/Obstetric history:-

Surgical history:-

Occupational history:-

General physical examination:-

- Built and nourishment
- Pallor/Icterus/Cyanosis/Clubbing/Generalised Lymphadenopathy/Edema

VITALS :

- Pulse :

- BP :
- Temperature :
- Respiratory Rate :

SYSTEMIC EXAMINATION :

1. CVS
2. RS
3. PER ABDOMEN
4. CNS

LOCAL EXAMINATION for keloid and HTS

INSPECTION :

- SITE
- SIZE
- NUMBER
- SYMMETRY
- BORDER

PALPATION :

- LOCAL RISE OF TEMPERATURE
- TENDERNESS

- NUMBER
- SIZE
- SURFACE
- BORDER

Others- Hair – Oral mucosa – Nails –

Investigations:-

Diagnosis:-

Treatment:-

ANNEXURE II

INFORMED CONSENT FORM

I Mr./Mrs. _____ have been explained in my own understandable language, that I will be included in a study which **A RANDOMISED CONTROL STUDY ON EFFICACY OF TOPICAL LOSARTAN VERSUS TOPICAL CLOBETASOL FOR THE TREATMENT OF HYPERTROPHIC SCAR AND KELOID**

Hence as per the computer generated randomization of the study – I am allotted to

Group - ____ for whom _____ will be given as a treatment modality for my illness.

I have been explained about the randomization of the treatment modality I receive and that my clinical findings, investigations, will be assessed and documented for study purpose.

I have been explained my participation in this study is entirely voluntary, and I can withdraw from the study any time and this will not affect my relation with my doctor or the treatment for my ailment.

I have been explained about the necessity of the intervention, possible benefits and adverse effects due to interventions, in my own understandable language.

I have understood that all my details found during the study are kept confidential and while publishing or sharing of the findings, my details will be masked.

The principal investigator will bear the cost of the study.

I have principal investigator mobile number for enquiries.

I in my sound mind give full consent to be added in the part of this study.

No monetary benefits will be given to me during the study.

Signature of the patient

- Name:

Date:

- Place:

Signature of the witness

Name:

Relation to patient:

ಮಾಹಿತಿ ನೀಡಿದ ಒಪ್ಪಿಗೆ ನಮೂನೆ

ನಾನು ಶ್ರೀ/ಶ್ರೀಮತಿ. _____ ಅನ್ನು ನನ್ನ ಸ್ವಂತ ಅರ್ಥವಾಗುವ ಭಾಷೆಯಲ್ಲಿ ವಿವರಿಸಲಾಗಿದೆ, ಅದರ ಪರಿಣಾಮಕಾರಿತ್ವದ ಮೇಲೆ ಯಾದೃಚ್ಛಿಕ ನಿಯಂತ್ರಣ ಅಧ್ಯಯನದ ಅಧ್ಯಯನದಲ್ಲಿ ನನ್ನನ್ನು ಸೇರಿಸಲಾಗುವುದು

ಹೈಪರ್ಟ್ರೋಫಿಕ್ ಸ್ಕಾರ್ ಮತ್ತು ಕೆಲಾಯ್ಡ್ ಚಿಕಿತ್ಸೆಗಾಗಿ ಟಾಪಿಕಲ್ ಲೊಸಾರ್ಟನ್ ವರ್ಸಸ್ ಟಾಪಿಕಲ್ ಕ್ಲೋಬೆಟಾಸೊಲ್

ಆದ್ದರಿಂದ ಕಂಪ್ಯೂಟರ್ ರಚಿತವಾದ ಅಧ್ಯಯನದ ಯಾದೃಚ್ಛಿಕತೆಯ ಪ್ರಕಾರ - ನನಗೆ ನಿಯೋಜಿಸಲಾಗಿದೆ ಗುಂಪು - ____ ಯಾರಿಗೆ _____ ನನ್ನ ಅನಾರೋಗ್ಯಕ್ಕೆ ಚಿಕಿತ್ಸಾ ವಿಧಾನವಾಗಿ ನೀಡಲಾಗುವುದು.

ನಾನು ಸ್ವೀಕರಿಸುವ ಚಿಕಿತ್ಸಾ ವಿಧಾನದ ಯಾದೃಚ್ಛಿಕತೆಯ ಬಗ್ಗೆ ನನಗೆ ವಿವರಿಸಲಾಗಿದೆ ಮತ್ತು ನನ್ನ ಕ್ಲಿನಿಕಲ್ ಸಂಶೋಧನೆಗಳು, ತನಿಖೆಗಳನ್ನು ಮೌಲ್ಯಮಾಪನ ಮಾಡಲಾಗುತ್ತದೆ ಮತ್ತು ಅಧ್ಯಯನ ಉದ್ದೇಶಕ್ಕಾಗಿ ದಾಖಲಿಸಲಾಗುತ್ತದೆ.

ಈ ಅಧ್ಯಯನದಲ್ಲಿ ನನ್ನ ಭಾಗವಹಿಸುವಿಕೆಯು ಸಂಪೂರ್ಣವಾಗಿ ಸ್ವಯಂಪ್ರೇರಿತವಾಗಿದೆ ಎಂದು ನನಗೆ ವಿವರಿಸಲಾಗಿದೆ ಮತ್ತು ನಾನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಅಧ್ಯಯನದಿಂದ ಹಿಂದೆ ಸರಿಯಬಹುದು ಮತ್ತು ಇದು ನನ್ನ ವೈದ್ಯರೊಂದಿಗಿನ ನನ್ನ ಸಂಬಂಧ ಅಥವಾ ನನ್ನ ಕಾಯಿಲೆಯ ಚಿಕಿತ್ಸೆಯ ಮೇಲೆ ಪರಿಣಾಮ ಬೀರುವುದಿಲ್ಲ. ಹಸ್ತಕ್ಷೇಪದ ಅಗತ್ಯತೆ, ಸಂಭವನೀಯ ಪ್ರಯೋಜನಗಳು ಮತ್ತು ಮಧ್ಯಸ್ಥಿಕೆಗಳಿಂದಾಗುವ ಪ್ರತಿಕೂಲ ಪರಿಣಾಮಗಳ ಬಗ್ಗೆ ನನಗೆ ಅರ್ಥವಾಗುವ ಭಾಷೆಯಲ್ಲಿ ವಿವರಿಸಲಾಗಿದೆ.

ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ಪತ್ತೆಯಾದ ನನ್ನ ಎಲ್ಲಾ ವಿವರಗಳನ್ನು ಗೌಪ್ಯವಾಗಿ ಇರಿಸಲಾಗಿದೆ ಮತ್ತು ಸಂಶೋಧನೆಗಳನ್ನು ಪ್ರಕಟಿಸುವಾಗ ಅಥವಾ ಹಂಚಿಕೊಳ್ಳುವಾಗ, ನನ್ನ ವಿವರಗಳನ್ನು ಮರೆಮಾಚಲಾಗುತ್ತದೆ ಎಂದು ನಾನು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ.

ಮುಖ್ಯ ತನಿಖಾಧಿಕಾರಿಗಳು ಅಧ್ಯಯನದ ವೆಚ್ಚವನ್ನು ಭರಿಸುತ್ತಾರೆ. ವಿಚಾರಣೆಗಾಗಿ ನಾನು ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿಯ ಮೊಬೈಲ್ ಸಂಖ್ಯೆಯನ್ನು ಹೊಂದಿದ್ದೇನೆ. ಈ ಅಧ್ಯಯನದ ಭಾಗದಲ್ಲಿ ಸೇರಿಸಲು ನನ್ನ ಉತ್ತಮ

ಮನಸ್ಸಿನಲ್ಲಿ ನಾನು ಸಂಪೂರ್ಣ ಒಪ್ಪಿಗೆಯನ್ನು ನೀಡುತ್ತೇನೆ. ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ನನಗೆ ಯಾವುದೇ ಹಣಕಾಸಿನ ಪ್ರಯೋಜನಗಳನ್ನು ನೀಡಲಾಗುವುದಿಲ್ಲ.

• ರೋಗಿಯ ಸಹಿ

ಸಾಕ್ಷಿಯ ಸಹಿ

• ಹೆಸರು: ಹೆಸರು:

• ದಿನಾಂಕ:

ರೋಗಿಗೆ ಸಂಬಂಧ: • ಸ್ಥಳ:

ANNEXURE III

PATIENT INFORMATION SHEET

STUDY TITLE:A RANDOMISED CONTROL STUDY ON EFFICACY OF

TOPICAL LOSARTAN VERSUS TOPICAL CLOBETASOL FOR THE TREATMENT OF HYPERTROPHIC SCAR AND KELOID

PLACE OF STUDY: R.L Jalappa Hospital and Research Centre, Tamaka, Kolar.

OBJECTIVES:

1. To assess and to evaluate the efficacy of topical losartan and topical clobetasol in the treatment of hypertrophic scar and keloid
2. To document the adverse effects of topical losartan and topical clobetasol for the treatment of hypertrophic scar and keloid

In this study, GROUP A- Losartan potassium powder, Eucerin , and 2- propanol will be purchased. Ointment is prepared dissolving 5 g of losartan potassium powder in a solvent containing 1 ml 2-propanol and 6 ml distilled water and the solution is dispersed in Eucerin to reach the total weight of 100 g will be made for group A.

To evaluate the sensitivity and allergy of losartan ointment and possible hypotensive effect of topical losartan, the losartan ointment will be tested on the hand skin and patients' blood pressure is measured every 15 minutes for 2 hours. The patients have to use the ointments twice a day for 6 months and we evaluate patients each month for efficacy and adverse effects

GROUP B- participants will be treated with Topical clobetasol 0.05% it can be purchased in pharmacy . Clobetasol propionate cream 0.05% is given two times a day for a period of 6 months and comes for follow up.

Please read the following information and discuss with your family members. You can ask any question regarding the study. If you agree to participate in this study we will collect information (as per proforma) from you. Relevant blood investigations will be carried out if required. This information collected will be used for dissertation and publication only. NO MONETARY BENEFITS WILL BE MADE AVAILABLE FOR PARTICIPANTS OF THE STUDY. Even If you are not willing to participate in this study the care, treatment & relationship with doctor will not affect .All information collected from you will be kept confidential and will not be disclosed to any outsider. Your identity will not be revealed. The expenses required for the above study will be taken care by the principal investigator. This study has been reviewed by the Institutional Ethics Committee and you are free to contact the member of the Institutional Ethics Committee. There is no compulsion to agree to this study. The care you will get will not change if you don't wish to participate. You are required to sign/ provide thumb impression only if you voluntarily agree to participate in this study.

- Left Thumb Impression/Signature of the Patient Left Thumb Impression/Signature of the Witness

- **For any further clarification you can contact the study investigator:**

- Dr.GUNALAKSHMI.K

- Mobile no: 9790886764

- E-mail : gunalakshmi1118@gmail.com

ರೋಗಿಯ ಮಾಹಿತಿ ಹಾಳೆ

ಅಧ್ಯಯನದ ಶೀರ್ಷಿಕೆ: ಪರಿಣಾಮಕಾರಿತ್ವದ ಮೇಲೆ ಯಾದೃಚ್ಛಿಕ ನಿಯಂತ್ರಣ ಅಧ್ಯಯನ ಹೈಪರ್ಪೋಫಿಕ್ ಸ್ಕಾರ್ ಮತ್ತು ಕೆಲೋಯ್ಡ್ ಚಿಕಿತ್ಸೆಗಾಗಿ ಟಾಪಿಕಲ್ ಲೊಸಾರ್ಟನ್ ವರ್ಸಸ್ ಟಾಪಿಕಲ್ ಕ್ಲೋಬೆಟಾಸೊಲ್

ಅಧ್ಯಯನದ ಸ್ಥಳ: ಆರ್.ಎಲ್ ಜಾಲಪ್ಪ ಆಸ್ಪತ್ರೆ ಮತ್ತು ಸಂಶೋಧನಾ ಕೇಂದ್ರ,

ಟಮಕ, ಕೋಲಾರ.

ಉದ್ದೇಶಗಳು: 1. ಹೈಪರ್ಪೋಫಿಕ್ ಸ್ಕಾರ್ ಮತ್ತು ಕೆಲಾಯ್ಡ್ ಚಿಕಿತ್ಸೆಯಲ್ಲಿ ಸಾಮಯಿಕ ಲೋಸಾರ್ಟನ್ ಮತ್ತು ಸಾಮಯಿಕ ಕ್ಲೋಬೆಟಾಸೋಲ್‌ನ ಪರಿಣಾಮಕಾರಿತ್ವವನ್ನು ನಿರ್ಣಯಿಸಲು ಮತ್ತು ಮೌಲ್ಯಮಾಪನ ಮಾಡಲು

2. ಹೈಪರ್ಪೋಫಿಕ್ ಸ್ಕಾರ್ ಮತ್ತು ಕೆಲಾಯ್ಡ್ ಚಿಕಿತ್ಸೆಗಾಗಿ ಸಾಮಯಿಕ ಲೊಸಾರ್ಟನ್ ಮತ್ತು ಸಾಮಯಿಕ ಕ್ಲೋಬೆಟಾಸೋಲ್ನ ಪ್ರತಿಕೂಲ ಪರಿಣಾಮಗಳನ್ನು ದಾಖಲಿಸಲು

ಈ ಅಧ್ಯಯನದಲ್ಲಿ, ಗ್ರೂಪ್ ಎ-ಲೊಸಾರ್ಟನ್ ಪೊಟ್ಯಾಸಿಯಮ್ ಪೌಡರ್, ಯುಸೆರಿನ್ ಮತ್ತು 2-ಪ್ರೊಪನಾಲ್ ಅನ್ನು ಖರೀದಿಸಲಾಗುತ್ತದೆ. 1 ಮಿಲಿ 2-ಪ್ರೊಪನಾಲ್ ಮತ್ತು 6 ಮಿಲಿ ಡಿಸ್ಟಿಲ್ಡ್ ವಾಟರ್ ಹೊಂದಿರುವ ದ್ರಾವಕದಲ್ಲಿ 5 ಗ್ರಾಂ ಲೋಸಾರ್ಟನ್ ಪೊಟ್ಯಾಸಿಯಮ್ ಪುಡಿಯನ್ನು ಕರಗಿಸಿ ಮುಲಾಮುವನ್ನು ತಯಾರಿಸಲಾಗುತ್ತದೆ ಮತ್ತು 100 ಗ್ರಾಂ ಒಟ್ಟು ತೂಕವನ್ನು ತಲುಪಲು ಯೂಸೆರಿನ್‌ನಲ್ಲಿ ದ್ರಾವಣವನ್ನು ವಿತರಿಸಲಾಗುತ್ತದೆ ಗುಂಪು A ಗಾಗಿ ತಯಾರಿಸಲಾಗುತ್ತದೆ. ಲೊಸಾರ್ಟನ್ ಮುಲಾಮುಗಳ ಸೂಕ್ಷ್ಮತೆ ಮತ್ತು ಅಲರ್ಜಿ ಮತ್ತು ಸಾಮಯಿಕ ಲೋಸಾರ್ಟನ್‌ನ ಸಂಭವನೀಯ ಹೈಪೋಟೆನ್ಸಿವ್ ಪರಿಣಾಮವನ್ನು ಮೌಲ್ಯಮಾಪನ ಮಾಡಲು, ಲೊಸಾರ್ಟನ್ ಮುಲಾಮುವನ್ನು ಕೈಯ ಚರ್ಮದ ಮೇಲೆ ಪರೀಕ್ಷಿಸಲಾಗುತ್ತದೆ ಮತ್ತು ರೋಗಿಗಳ ರಕ್ತದೊತ್ತಡವನ್ನು ಪ್ರತಿ 15 ನಿಮಿಷಗಳಿಗೊಮ್ಮೆ 2 ಗಂಟೆಗಳ ಕಾಲ ಅಳೆಯಲಾಗುತ್ತದೆ. ರೋಗಿಗಳು 4 ತಿಂಗಳವರೆಗೆ ದಿನಕ್ಕೆ ಎರಡು ಬಾರಿ ಮುಲಾಮುಗಳನ್ನು ಬಳಸಬೇಕಾಗುತ್ತದೆ ಮತ್ತು ಪರಿಣಾಮಕಾರಿತ್ವ ಮತ್ತು ಪ್ರತಿಕೂಲ ಪರಿಣಾಮಗಳಿಗಾಗಿ ನಾವು ಪ್ರತಿ ತಿಂಗಳು ರೋಗಿಗಳನ್ನು ಮೌಲ್ಯಮಾಪನ ಮಾಡುತ್ತೇವೆ.

GROUP B- ಭಾಗವಹಿಸುವವರಿಗೆ ಟಾಪಿಕಲ್ ಕ್ಲೋಬೆಟಾಸೋಲ್ 0.05% ನೊಂದಿಗೆ ಚಿಕಿತ್ಸೆ ನೀಡಲಾಗುತ್ತದೆ, ಇದನ್ನು ಔಷಧಾಲಯದಲ್ಲಿ ಖರೀದಿಸಬಹುದು. ಕ್ಲೋಬೆಟಾಸೋಲ್ ಪ್ರೊಪಿಯೊನೇಟ್ ಕ್ರೀಮ್ 0.05% ಅನ್ನು ದಿನಕ್ಕೆ ಎರಡು ಬಾರಿ 4 ತಿಂಗಳ ಅವಧಿಗೆ ನೀಡಲಾಗುತ್ತದೆ ಮತ್ತು ಅದನ್ನು ಅನುಸರಿಸಲು ಬರುತ್ತದೆ.

ದಯವಿಟ್ಟು ಕೆಳಗಿನ ಮಾಹಿತಿಯನ್ನು ಓದಿ ಮತ್ತು ನಿಮ್ಮ ಕುಟುಂಬದ ಸದಸ್ಯರೊಂದಿಗೆ ಚರ್ಚಿಸಿ. ಅಧ್ಯಯನಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ನೀವು ಯಾವುದೇ ಪ್ರಶ್ನೆಯನ್ನು ಕೇಳಬಹುದು. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನೀವು ಒಪ್ಪಿದರೆ ನಾವು ನಿಮ್ಮಿಂದ ಮಾಹಿತಿಯನ್ನು (ಪ್ರೊಫಾರ್ಮಾ ಪ್ರಕಾರ) ಸಂಗ್ರಹಿಸುತ್ತೇವೆ. ಅಗತ್ಯವಿದ್ದರೆ ಸಂಬಂಧಿತ ರಕ್ತ ಪರೀಕ್ಷೆಗಳನ್ನು ಕೈಗೊಳ್ಳಲಾಗುತ್ತದೆ. ಸಂಗ್ರಹಿಸಿದ ಈ ಮಾಹಿತಿಯನ್ನು ಪ್ರಬಂಧ ಮತ್ತು ಪ್ರಕಟಣೆಗೆ ಮಾತ್ರ ಬಳಸಲಾಗುತ್ತದೆ. ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸುವವರಿಗೆ ಯಾವುದೇ ವಿತ್ತೀಯ ಪ್ರಯೋಜನಗಳು ಲಭ್ಯವಾಗುವುದಿಲ್ಲ. ನೀವು ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ಸಿದ್ಧರಿಲ್ಲದಿದ್ದರೂ ಸಹ ವೈದ್ಯರೊಂದಿಗಿನ ಆರೈಕೆ, ಚಿಕಿತ್ಸೆ ಮತ್ತು ಸಂಬಂಧವು ಪರಿಣಾಮ ಬೀರುವುದಿಲ್ಲ ನಿಮ್ಮಿಂದ ಸಂಗ್ರಹಿಸಿದ ಎಲ್ಲಾ ಮಾಹಿತಿಯನ್ನು ಗೌಪ್ಯವಾಗಿ ಇರಿಸಲಾಗುತ್ತದೆ ಮತ್ತು ಯಾವುದೇ ಹೊರಗಿನವರಿಗೆ ಬಹಿರಂಗಪಡಿಸಲಾಗುವುದಿಲ್ಲ. ನಿಮ್ಮ ಗುರುತನ್ನು ಬಹಿರಂಗಪಡಿಸಲಾಗುವುದಿಲ್ಲ. ಮೇಲಿನ ಅಧ್ಯಯನಕ್ಕೆ ಅಗತ್ಯವಿರುವ ವೆಚ್ಚಗಳನ್ನು ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿಗಳು ನೋಡಿಕೊಳ್ಳುತ್ತಾರೆ. ಈ ಅಧ್ಯಯನವನ್ನು ಸಾಂಸ್ಥಿಕ ನೀತಿಶಾಸ್ತ್ರ ಸಮಿತಿಯು ಪರಿಶೀಲಿಸಿದೆ ಮತ್ತು ನೀವು ಸಾಂಸ್ಥಿಕ ನೀತಿಶಾಸ್ತ್ರ ಸಮಿತಿಯ ಸದಸ್ಯರನ್ನು ಸಂಪರ್ಕಿಸಲು ಮುಕ್ತರಾಗಿದ್ದೀರಿ. ಈ ಅಧ್ಯಯನವನ್ನು ಒಪ್ಪಿಕೊಳ್ಳಲು ಯಾವುದೇ ಒತ್ತಾಯವಿಲ್ಲ. ನೀವು ಭಾಗವಹಿಸಲು ಬಯಸದಿದ್ದರೆ ನೀವು ಪಡೆಯುವ ಕಾಳಜಿಯು ಬದಲಾಗುವುದಿಲ್ಲ. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನೀವು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಸಮ್ಮತಿಸಿದರೆ ಮಾತ್ರ ನೀವು ಸಹಿ/ಹೆಬ್ಬೆರಳಿನ ಗುರುತನ್ನು ಒದಗಿಸಬೇಕಾಗುತ್ತದೆ.

• ಎಡ ಹೆಬ್ಬೆರಳಿನ ಅನಿಸಿಕೆ/ರೋಗಿಯ ಸಹಿ

ಎಡ ಹೆಬ್ಬೆರಳಿನ ಅನಿಸಿಕೆ/ಸಾಕ್ಷಿಯ ಸಹಿ

• ಯಾವುದೇ ಹೆಚ್ಚಿನ ಸ್ಪಷ್ಟೀಕರಣಕ್ಕಾಗಿ ನೀವು

ಅಧ್ಯಯನ ತನಿಖಾಧಿಕಾರಿಯನ್ನು ಸಂಪರ್ಕಿಸಬಹುದು:

• ಡಾ.ಗುಣಲಕ್ಷ್ಮಿ.ಕೆ

• ಮೊಬೈಲ್ ಸಂಖ್ಯೆ: 9790886764

• ಇ-ಮೇಲ್ : gunalakshmi1118@gmail.com

MASTER CHART

AGE	SEX	GROUP	REASON FOR TREATMENT	FAMILY HISTORY	DIAGNOSIS	GROUP WITH DIAGNOSIS	OCCUPATION	SITE	NUMBER OF KELOID &HTS	SIZE	VSS_B	VSS_4	VSS_8	VSS_12	VSS_16	VSS_20	VSS_24	GPA_B	GPA_4	GPA_8	GPA_12	GPA_16	GPA_20	GPA_24	PSL	PIGMENTARY CHANGES	ITCHING	TELANGIECTASIA	Surrounding skin atrophy
19	2	1	1	0	1	1	2	6	1	2	8	8	8	7	6	5	4	0	0	0	0	0	0	2	3	0	1	0	0
21	1	2	1	1	1	3	3	2	1	1	7	7	7	6	5	5	4	0	0	0	0	1	1	2	3	0	0	0	0
41	1	1	2	0	2	2	3	3	1	1	8	8	7	6	6	5	4	0	0	0	1	1	1	2	3	0	0	0	0
33	2	2	2	0	1	3	2	4	1	1	9	8	8	7	6	6	5	0	0	0	1	1	1	2	3	0	0	1	1
43	2	2	1	0	2	4	2	5	1	2	8	8	8	8	7	6	5	0	0	0	0	0	0	1	2	0	0	0	0
35	2	1	2	1	1	1	3	7	2	2	9	9	9	8	9	7	4	0	0	0	1	1	1	2	3	0	0	0	0
27	2	1	2	0	1	1	3	2	1	1	10	10	9	9	8	8	7	0	0	0	0	1	1	2	1	0	0	0	0
52	2	1	1	0	2	2	3	4	1	2	7	7	7	6	6	4	3	0	0	0	0	0	1	1	4	0	0	0	0
19	1	1	2	0	1	1	2	3	2	1	8	8	8	7	6	4	3	0	0	0	0	1	1	2	3	0	0	0	0
31	1	2	1	0	1	3	2	1	2	1	6	6	6	6	5	4	4	0	0	0	0	1	1	2	3	1	0	0	0
33	1	2	3	1	2	4	1	6	1	2	7	7	7	7	6	5	3	0	0	0	0	1	1	2	3	0	0	0	0
21	2	2	2	0	1	3	2	2	1	2	6	6	6	5	5	4	4	0	0	0	0	1	1	2	3	0	0	0	0
38	2	1	2	0	1	1	3	4	1	2	10	10	9	9	8	6	5	0	0	0	0	1	2	3	3	0	0	0	0
27	2	1	2	0	1	1	1	5	1	2	9	9	9	8	6	6	5	0	0	0	0	1	1	2	3	0	0	0	0
25	1	2	3	0	2	4	3	2	3	2	8	8	8	7	6	4	3	0	0	0	0	0	1	2	2	1	0	1	1
46	2	1	1	1	2	2	2	6	1	2	8	8	7	7	6	4	3	0	0	0	0	0	1	2	3	0	0	0	0
29	1	1	1	0	1	1	2	5	2	2	7	7	6	6	5	4	3	0	0	0	1	0	0	1	3	0	0	0	0
32	1	1	2	0	2	2	3	4	1	1	8	8	8	6	7	4	3	0	0	0	0	0	1	2	4	0	0	0	0
36	1	2	1	1	1	3	3	6	1	1	6	6	6	5	5	4	4	0	0	0	0	0	2	2	3	1	0	0	0
28	1	1	2	0	1	1	3	2	1	2	9	8	8	7	5	4	4	0	0	0	0	0	1	2	3	0	0	0	0

AGE	SEX	GROUP	REASON FOR TREATMENT	FAMILY HISTORY	DIAGNOSIS	GROUP WITH DIAGNOSIS	OCCUPATION	SITE	NUMBER OF KELOID &HTS	SIZE	VSS_B	VSS_4	VSS_8	VSS_12	VSS_16	VSS_20	VSS_24	GPA_B	GPA_4	GPA_8	GPA_12	GPA_16	GPA_20	GPA_24	PSL	PIGMENTARY CHANGES	ITCHING	TELANGIECTASIA	Surrounding skin atrophy
49	1	1	2	0	1	1	3	1	2	2	8	8	8	7	6	4	3	0	0	0	0	0	1	2	4	0	0	0	0
35	1	2	2	0	2	4	3	5	1	2	9	9	9	8	7	5	4	0	0	0	0	1	0	2	4	0	0	0	0
27	1	2	2	0	2	4	2	4	2	2	7	7	7	6	5	4	3	0	0	0	0	1	0	2	2	0	0	0	0
23	1	1	2	1	1	1	3	6	1	2	6	6	6	5	5	4	2	0	0	0	0	1	1	3	3	0	1	0	0
48	1	2	1	0	2	4	1	1	1	1	9	9	9	6	5	5	4	0	0	0	0	1	1	2	2	0	0	0	0
31	2	2	2	0	1	3	2	4	1	2	7	7	7	6	6	6	3	0	0	0	1	1	1	2	2	0	0	0	0
34	1	2	3	0	2	4	2	6	1	2	9	9	9	8	7	6	4	0	0	0	0	0	1	2	3	1	0	0	0
53	1	2	2	0	1	3	2	7	1	2	8	8	8	7	6	6	4	0	0	0	0	0	0	2	3	0	0	0	0
38	2	1	2	0	1	1	1	5	1	3	9	9	8	8	7	6	6	0	0	0	0	1	1	2	2	0	0	0	0
23	2	2	2	1	2	4	3	4	3	2	9	9	9	8	7	6	5	0	0	0	0	1	1	2	2	0	0	0	0
41	1	2	1	0	1	3	3	6	1	2	6	6	6	5	4	3	2	0	0	0	0	0	1	3	3	0	0	0	0
21	1	1	2	0	1	1	1	1	1	1	8	8	8	7	4	4	3	0	0	0	0	1	1	2	3	0	0	0	0
29	1	1	1	0	1	1	2	6	1	2	6	6	6	5	5	4	2	0	0	0	0	1	1	3	4	0	0	0	0
35	1	1	2	0	2	2	3	6	1	3	9	9	8	8	6	6	5	0	0	0	0	0	1	2	1	0	0	0	0
44	1	2	2	0	1	3	3	4	1	1	8	8	8	7	7	5	5	0	0	0	0	0	0	2	2	0	0	0	0
51	2	1	2	1	2	2	3	6	1	2	9	9	9	8	7	6	4	0	0	0	0	1	1	2	2	0	1	0	0
26	1	1	2	0	1	1	2	5	2	2	8	8	7	7	6	4	3	0	0	0	0	1	1	2	3	0	0	0	0
42	1	1	1	0	1	1	2	6	1	1	6	6	6	5	4	3	2	0	0	0	0	1	1	2	3	0	0	0	0
29	1	2	2	0	1	3	1	5	1	2	9	9	9	8	7	5	4	0	0	0	0	0	0	2	2	0	0	0	0
31	1	1	2	0	2	2	2	4	1	2	7	7	7	6	6	4	3	0	0	0	0	0	1	2	3	0	0	0	0
27	2	2	1	1	1	3	1	7	1	1	6	6	6	5	4	4	3	0	0	0	1	1	1	2	2	0	0	0	0
36	1	1	1	1	1	1	3	6	1	2	8	8	8	7	6	5	3	0	0	0	0	1	0	2	3	0	0	0	0

AGE	SEX	GROUP	REASON FOR TREATMENT	FAMILY HISTORY	DIAGNOSIS	GROUP WITH DIAGNOSIS	OCCUPATION	SITE	NUMBER OF KELOID &HTS	SIZE	VSS_B	VSS_4	VSS_8	VSS_12	VSS_16	VSS_20	VSS_24	GPA_B	GPA_4	GPA_8	GPA_12	GPA_16	GPA_20	GPA_24	PSL	PIGMENTARY CHANGES	ITCHING	TELANGIECTASIA	Surrounding skin atrophy
43	1	2	1	0	1	3	3	4	1	2	9	9	9	8	7	4	3	0	0	0	0	0	0	1	2	0	0	0	1
35	2	2	2	0	1	3	3	1	1	3	10	10	10	9	9	8	8	0	0	0	0	0	0	1	2	1	0	1	1
31	1	1	2	0	2	2	2	7	1	1	8	8	8	7	6	5	3	0	0	0	0	1	0	2	3	0	0	0	0
29	2	1	2	1	1	1	3	4	1	1	8	8	7	5	4	3	3	0	0	0	0	1	0	2	3	0	0	0	0
34	2	2	2	0	1	3	3	6	1	1	7	7	7	6	5	5	3	0	0	0	1	1	1	2	2	0	0	0	0
44	2	2	2	0	1	3	1	3	1	2	8	8	8	7	7	6	5	0	0	0	1	1	1	2	2	0	0	1	0
33	2	1	3	0	2	2	3	6	3	2	6	6	6	5	5	4	3	0	0	0	0	1	1	3	3	0	0	0	0
21	2	2	2	0	1	3	2	4	1	1	9	9	9	8	7	6	5	0	0	0	0	0	1	2	2	0	0	0	0
26	2	1	2	0	2	2	2	5	1	3	8	8	7	6	6	5	4	0	0	0	1	0	1	2	2	0	0	0	0
22	2	2	2	1	1	3	2	1	1	2	10	10	10	10	9	9	9	0	0	0	0	0	0	0	1	1	0	1	1
32	2	1	2	0	1	1	2	4	1	2	9	9	9	6	7	5	5	0	0	0	1	1	1	2	4	0	1	0	0
23	2	1	2	0	2	2	3	5	2	2	7	7	7	6	5	4	3	0	0	0	1	1	1	2	4	0	0	0	0
45	2	2	1	0	1	3	3	6	1	1	8	8	8	7	6	5	5	0	0	0	0	0	1	2	2	0	0	0	0
21	2	2	2	0	2	4	2	7	1	2	6	6	6	5	5	4	3	0	0	0	0	1	1	2	2	0	0	0	0
49	1	2	1	1	1	3	3	4	1	1	9	9	9	8	7	5	4	0	0	0	0	0	0	1	2	0	0	1	1
25	2	2	2	0	1	3	2	6	1	1	6	6	6	6	5	4	4	0	0	0	0	0	1	1	2	0	0	0	0
32	2	2	2	0	2	4	1	6	3	1	8	8	6	5	5	4	3	0	0	0	1	1	1	2	2	1	0	0	1
51	2	1	1	0	1	1	2	1	1	3	10	9	9	8	7	5	4	0	0	0	1	1	2	2	3	0	0	0	0