A RANDOMISED COMPARATIVE STUDY OF SPLIT THICKNESS SKIN GRAFTING FIXATION AND UPTAKE WITH USE OF AUTOLOGOUS PLATELET RICH PLASMA VERSUS CONVENTIONAL METHOD

Submitted by: Dr Divyang G B

DISSERTATION SUBMITTED TO B. L. D. E. (DEEMED TO BE UNIVERSITY)'s SHRI B.M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA, KARNATAKA

In partial fulfilment of the requirements for the degree of

MASTER OF SURGERY

In

GENERAL SURGERY

Under the guidance of

DR. M.S KOTENNAVAR, M.S

PROFESSOR & HEAD OF DEPARTMENT OF GENERAL SURGERY

B. L. D. E. (Deemed to be University)

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

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation, "**A randomised comparative study of Split Thickness Skin Grafting fixation and uptake with use of autologous Platelet Rich Plasma versus conventional method"** is a bonafide and genuine research work carried out by me under the guidance of **DR. M.S KOTENNAVAR M.S.** Professor and Head of Department, Department of General Surgery at BLDE(Deemed to be university), Shri B. M. Patil Medical College Hospital and Research Centre, Vijayapura.

X

DR DIVYANG G B
JUNIOR RESIDENT

Date:

Place: Vijayapura

B. L. D. E. (Deemed to be university)

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

CERTIFICATE BY THE GUIDE

This is to certify that the dissertation entitled "**A randomised comparative study of Split Thickness Skin Grafting fixation and uptake with use of autologous Platelet Rich Plasma versus conventional method**" is a bonafide research work done by **Dr Divyang G B** in partial fulfillment of the requirement for the degree of M.S in General Surgery.

X

DR M S KOTENNAVAR
PROFESSOR AND HOD, DEP. OF GENERAL S...

Date:

Place: Vijayapura

B. L. D. E. (Deemed to be university)

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

ENDORSEMENT BY THE HOD AND PRINCIPAL

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Dr. M.S. KOTENNAVAR
Professor & Head,
Department Of General Surgery.
B. L. D. E. (Deemed to be university)
Shri B. M. Patil Medical College, Hospital and Research Centre, Vijayapura

Dr. ARAVIND V PATIL
Principal,
B. L. D. E. (Deemed to be university)
Shri B. M. Patil Medical College, Hospital and Research Centre, Vijayapura

B. L. D. E. (Deemed to be university)

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

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DECLARATION BY THE CANDIDATE

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DATE – **Dr Divyang G B**

PLACE – Vijayapura

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INTRODUCTION

Skin grafting represents one of the oldest and most fundamental techniques in reconstructive surgery, with its first documented use dating back to ancient Indian civilization. The procedure has evolved significantly over centuries, yet remains a cornerstone in managing various soft tissue defects, whether arising from trauma, burns, chronic wounds, or surgical resections.[1] Split-thickness skin grafts (STSGs), in particular, have emerged as a versatile and reliable option in reconstructive surgery, offering both functional and aesthetic restoration of skin defects.

The success of skin grafting procedures fundamentally depends on graft survival, which is influenced by multiple factors including the quality of the recipient bed, graft fixation techniques, and the complex biological processes that occur during graft take. Traditional methods of STSG fixation, including sutures, staples, and various dressing techniques, have shown varying degrees of success, with reported graft take rates ranging from 70% to 90% depending on the location and condition of the recipient site.[2] However, these conventional approaches often face challenges such as graft displacement, seroma formation, and incomplete graft-to-bed contact, which can compromise graft survival.

The biological process of graft take involves a precise sequence of events beginning with plasmatic imbibition, followed by revascularization and eventually complete incorporation of the graft. This process is heavily

dependent on the formation of a fibrin network between the graft and recipient bed, which not only provides initial adhesion but also serves as a scaffold for subsequent vascular ingrowth.[3] The quality and efficiency of this initial phase significantly influence the ultimate success of the grafting procedure.

In recent years, there has been growing interest in the application of autologous platelet-rich plasma (PRP) in various aspects of wound healing and tissue regeneration. PRP, defined as an autologous concentration of platelets in a small volume of plasma, contains numerous growth factors and bioactive proteins that are essential for tissue repair and regeneration.[4] These include platelet-derived growth factor (PDGF), transforming growth factor-β (TGF-β), vascular endothelial growth factor (VEGF), and epidermal growth factor (EGF), among others.

The theoretical basis for using PRP in skin grafting lies in its potential to enhance both the initial adhesion of the graft through its high fibrin content and the subsequent revascularization process through its rich array of growth factors.[5] Studies have shown that platelets play a crucial role in wound healing by releasing substances that promote tissue repair and influence the migration and proliferation of various cell types involved in the healing process.[6]

The use of PRP in medicine has expanded significantly over the past two decades, with applications ranging from orthopaedics to dental surgery. In the context of skin grafting, preliminary studies have suggested that PRP might

improve graft take rates, reduce healing time, and enhance the quality of healing.[7] However, despite these promising initial results, there remains a need for more comprehensive comparative studies to establish the true efficacy of PRP in skin graft fixation and survival.

The biological rationale for PRP use in skin grafting is particularly compelling when considering the mechanisms of graft take. The high concentration of platelets in PRP (typically 3-5 times above baseline) provides not only an enhanced fibrin network for graft adhesion but also a sustained release of growth factors that may promote faster revascularization.[8] Additionally, the autologous nature of PRP eliminates concerns about immune reactions or disease transmission, making it an attractive adjunct to traditional grafting techniques.

However, several factors need to be considered when evaluating the potential benefits of PRP in skin grafting. These include the optimal concentration of platelets, the method of PRP preparation, the timing and technique of application, and the cost-effectiveness of the procedure. Furthermore, the variability in PRP preparation methods and the lack of standardization in its application have made it difficult to draw definitive conclusions about its efficacy.[9]

AIMS & OBJECTIVES

Aim:

To compare split thickness skin graft fixation and uptake with use of autologous PRP versus conventional method.

Objective of the study:

1. To determine the fixation of split thickness skin graft by conventional method using staples versus fixation of graft by application of PRP to wound bed among patients undergoing split thickness skin grafting.
2. To evaluate the uptake of graft between the control and study group.

REVIEW OF LITERATURE

Lakshitha B et al (2024)[66] compared the efficacy of topical platelet-rich plasma in healing of split thickness skin grafting versus conventional split thickness skin grafting. This was a prospective randomized clinical trial conducted on 60 patients with chronic leg/foot ulcers due to Diabetes, trauma and varicosity of veins. Results showed that most of the patients were in 4th and 6th decade of life. All ulcer sizes in both groups varied equal to and above 4 cm2 and largest measuring 10 cm2 . Swab cultures were taken from all ulcers at the time of admission and after dressings. All patients were put on appropriate antibiotic therapy according to culture and sensitivity report before the STSG. Organisms encountered were Klebsiella, Escherichia coli, Pseudomonas Aeruginosa, Staphylococcus, Streptococcus and one case of MRSA. Post-operative complications (seroma and hematoma formation) were less in the PRP group compared to the Conventional group. 100% Graft uptake was achieved faster with STSG fixation using PRP in comparison to the conventional group (POD5 vs POD8, 50% of the patients had 100% graft uptake). Number of days of hospital stay and cost of treatment were significantly shorter in the PRP group when compared to the Conventional group. In this study, we have observed that post STSG, seroma and/or hematoma formation was more in the conventional group than in the PRP group. In the PRP group, out of the 30 patients, only 2 patients had hematoma formations and 18 patients had no seroma/ hematoma formation at the time of the first dressing and by the 5th

post-operative day 100% of the patients had no complications. Whereas, in the conventional group after 6 days post STSG, only 50% of the patients had no complications. Finally they concluded that PRP can be considered as a better option to the conventional method (suture/staple) in fixation of STSG and is a rapid and safe method of management of all patients with chronic leg/foot ulcers of diabetic, traumatic, and venous origin.

Gupta, Urbee et al (2024)[67] The aim of this study was to assess the immediate, subsequent adhesion and final take of STSG with application of PRP over recipient site. Results showed that irrespective of aetiology, and size, among a total of 80 wounds 87.5% grafts had adhered by 1st minute of application in the intervention group compared to nil in control group ($p< 0.0001$). Graft uptake was assessed on first three consecutive dressings. There was significantly better graft uptake in intervention group compared to control group [third dressing uptake (98.29%, 93%, $p< 0.0001$) respectively].Difference in seroma and haematoma formation were also compared between the two groups and found to be not significant. ($p>0.05$) they concluded that application of topical PRP facilitates STSG uptake. It decreases operative time by decreasing mobility of graft over the wound bed. Thus, use of PRP improves outcome of split thickness skin graft in wounds of various aetiologies and we recommend use of the same at recipient site of STSG.

Chigurupati, Veda Samhitha et al (2024)[68] assessed the effect of PRP on split-thickness skin graft uptake and donor site healing. It is a single-center-based prospective study done from August 2018 to June 2020, 60 patients with acute and chronic wounds were divided into two equal groups. Autologous PRP was applied on the recipient wound bed and donor site in PRP group, and conventional methods like staples/sutures were used to anchor the skin grafts and standard of care of the donor site in a control group. Results showed that instantaneous graft adhesion was observed in all patients of PRP group. The first graft inspection was delayed. Seroma, hematoma, total number of dressings, and duration of stay in hospital were significantly reduced in the PRP group. Donor site pain in the postoperative period was notably reduced in PRP group. PRP also remarkably hastened the donor site healing. They concluded that the application of PRP promotes graft take, minimizes complications, enhances donor site wound healing, mitigates donor site pain, and has immense economic benefits due to the reduced number of dressing changes and shorter hospital stay.

Sneha K R et al (2024)[69] conducted a randomized, prospective study to assess the efficacy of PRP in skin grafts compared to conventional methods such as sutures, staplers, or adhesive agents. Autologous PRP demonstrated accelerated and improved healing rates. Instant graft adherence was observed in all cases within the PRP study group. Incidences of hematoma, graft edema,

discharge from the graft site, frequency of dressings, and hospital stay duration were significantly lower in the PRP group. Furthermore, no adverse effects or reactions were noted with the use of autologous PRP among the study participants. They concluded that integration of PRP with Split Thickness Skin Graft (STSG) yielded significant enhancements in clinical outcomes and reduced the duration of wound healing. Consequently, this treatment amalgamation offers a promising avenue for expediting skin recovery following skin graft reconstruction, with minimal downtime. Our findings underscore its manifold benefits to both patients and surgeons, affirming its high utility and efficacy.

Raguram V et al (2022)[70] aimed to compare the efficacy of SSG fixation using autologous platelet-rich plasma with the conventional method like suturing. It is a randomized, controlled study with a sample size of 60. Thirty people were put in the autologous PRP group, and another 30 people were put in the suture group. Instant graft uptake of SSG to the ulcer was statistically significant in the PRP group. The seroma formation, the number of dressings and the period of hospital stay were comparatively increased in the suture group than in the PRP. The usage of PRP is secure and efficient in healing ulcer. It has been discovered to be very advantageous in many ways for both the patient and the surgeon. Based on their study results they recommend using autologous PRP on wounds before resurfacing to help them heal better and faster than suturing.

Chen J et al (2020)[71] The aim of this study was to evaluate the efficacy and safety of PRP for skin graft. The outcomes mainly included the rate of skin graft take, number of skin graft loss and haematoma formation, and complications. There were 11 studies involving a total of 910 cases of skin grafts. Compared with the control group, PRP group had a significantly higher rate of skin graft take (mean difference = 5.47%; 95% confidence interval [CI], 2.80%-8.14%; P < .0001), fewer number of skin graft loss (risk ratio [RR] = 0.26; 95% CI, 0.13-0.55; P = .0004) and fewer cases of haematoma formation (RR = 0.24; 95% CI, 0.11-0.54; P = .0006). There was no significant difference in the incidence of complications between two groups. This meta-analysis summarises current evidence and indicates that PRP is a safe and effective adjuvant for skin graft enrichment.

Thimmanahalli GU et al (2019)[72] The aim of this randomized, prospective study is to compare the effectiveness of PRP in skin graft with conventional method like sutures, staplers or glue. Results showed that Autologous PRP showed faster and better healing rates. With PRP study group instant graft adherence was seen in all cases. Hematoma, graft edema, discharge from graft site, frequency of dressings and duration of stay in hospital were significantly less in the PRP. There were no adverse effects or reactions seen with the use of autologous PRP among the study group. They concluded that the combination of PRP with Split Thickness Skin Graft (STSG) significantly

improved clinical outcomes and shortened the wound healing time. Therefore, this treatment combination could provide a way to heal skin after skin graft reconstruction with minimal recovery time. It is found to be highly beneficial in many aspects both to the patient and surgeon based on our results.

Dhua S et al (2019)[73] aimed at effective use of PRP in wound beds on graft take irrespective of etiology as compared to conventional methods of mechanical fixation using sutures and staples. Most significant result was the instant graft take to the wound bed irrespective of the etiology besides hemostasis and healing properties in the PRP treated group which resulted in considerable reduction of surgeon's time required for the removal of sutures and staples at the final stages. Also, only 10% with graft edema were noted in the PRP treated patients as compared to 68% in the control group. The inner dressings and skin graft were dry in the PRP group and the post-operative etching, weeping and pain at the graft site reduced. They concluded that the cosmetic appearance of this scar was better in the PRP group besides post-operative edema and graft loss. They recommend the use of PRP at the recipient site of split thickness skin graft.

Aggarwal A et al (2018)[74] aimed to affirm that autologous platelet rich plasma is a useful adjunct to early tangential excision and skin grafting to enhance wound epithelization rates and improve scar quality. There was 100% epithelization noted at the end of 2 weeks for all the 12 participants. Skin graft

take was faster with mean 85.4% take for all the 12 patients within 5 days. They concluded that platelet rich plasma is extremely safe and free of antigenic components. It is relatively simple to prepare, less time taking, cost effective and highly efficacious in improving wound healing and improving the efficacy of the traditional techniques like tangential excision and skin grafting in burn patients.

Waiker VP et al (2015)[65] The primary objective of this study was to use autologous platelet rich plasma (PRP) in wound beds for anchorage of skin grafts instead of conventional methods like sutures, staplers or glue. Results showed that Instant graft adherence to wound bed was statistically significant in the PRP group. Time of first post-graft inspection was delayed, and hematoma, graft edema, discharge from graft site, frequency of dressings and duration of stay in plastic surgery unit were significantly less in the PRP group. They concluded that autologous PRP ensured instant skin graft adherence to wound bed in comparison to conventional methods of anchorage. Hence, we recommend the use of autologous PRP routinely on wounds prior to resurfacing to ensure the benefits of early healing.

SKIN GRAFTING

Structure and function of Skin

The skin is the body's largest and primary protective organ, covering its entire external surface and serving as a first-order physical barrier against the environment.[11]

The skin is primarily made up of three layers. The upper layer is the epidermis, the layer below the epidermis is the dermis, and the third and deepest layer is the subcutaneous tissue

- The epidermis, the outermost layer of skin, provides a waterproof barrier and contributes to skin tone.
- The dermis, found beneath the epidermis, contains connective tissue, hair follicles, blood vessels, lymphatic vessels, and sweat glands.
- The deeper subcutaneous tissue (hypodermis) is made of fat and connective tissue.

The epidermis is further divided into five layers on thick skin like the palms and soles (stratum basale, stratum spinosum, stratum granulosum, stratum lucidum, and stratum corneum, while in other places, the epidermis only has four layers, lacking the stratum lucidum).

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

The functions of the skin include:

- **Protection** against microorganisms, dehydration, ultraviolet light, and mechanical damage; the skin is the first physical barrier that the human body has against the external environment.
- **Sensation** of pain, temperature, touch, and deep pressure starts with the skin.
- **Mobility:** The skin allows smooth movement of the body.
- **Endocrine activity:** The skin initiates the biochemical processes involved in Vitamin D production, which is essential for calcium absorption and normal bone metabolism.
- **Exocrine** activity: This occurs by the release of water, urea, and ammonia. Skin secretes products like sebum, sweat, and pheromones and exerts important immunologic functions by secreting bioactive substances such as cytokines.
- **Immunity** development against pathogens.
- **Regulation of Temperature.** Skin participates in thermal regulation by conserving or releasing heat and helps maintain the body's water and homeostatic balance.[12]

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

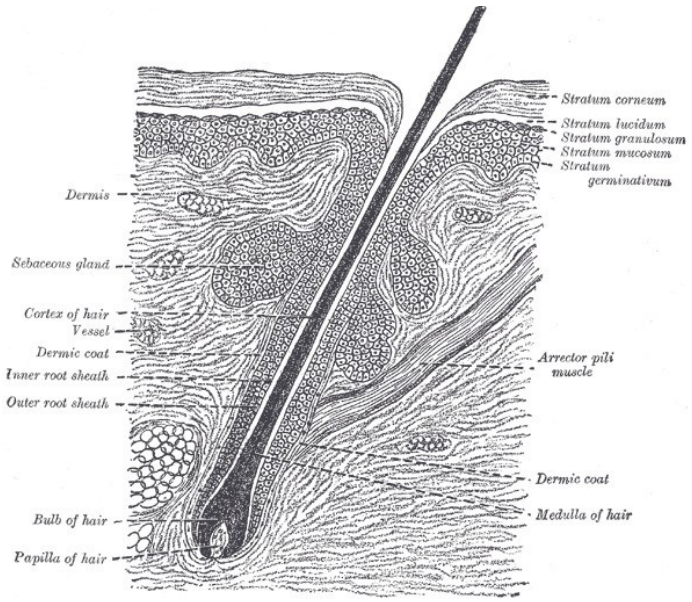


Figure 1: Layers of skin

BRIEF HISTORICAL INSIGHTS OF SKIN GRAFTING[13]

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

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

3. **19th Century Breakthroughs**

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

4. **Early 20th Century Developments**

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

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

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

6. **Modern Era**

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

FULL-THICKNESS SKIN GRAFTS

A skin graft is a cutaneous free tissue transfer that is separated from a donor site and transplanted to a recipient site.[14] Skin grafts are chosen when healing by second intention, primary closure, or flap repair
are deemed unsuitable. Full-thickness skin grafts (FTSGs) consist of complete epidermis and dermis, whereas partial-thickness skin grafts (PTSG) include the entire epidermis and only partial dermis. FTSGs are relatively simple to harvest and to secure within the recipient site, and they are particularly well suited to defects on the nasal tip, dorsum, ala, and sidewall as well as on the eyelids and the ears.[15] Optimal donor skin should closely match color, thickness, the degree of actinic damage, and texture of the skin surrounding the defect. Advantages of FTSGs are that they do not alter the architecture of the recipient site and are relatively easy for both the patient and the surgeon.

ANATOMY AND PHYSIOLOGY

Skin grafts can technically be harvested from virtually any area of skin on the body, although certain areas are preferable. Full-thickness skin grafts (FTSGs) consist of complete epidermis and dermis, whereas partial-thickness skin grafts (PTSG) include the entire epidermis and only partial dermis. One should try to match, as closely as possible, the skin at the recipient site. Among the variables to consider are skin thickness, number, and prominence of sebaceous glands, presence or absence of hair, skin color, and amount of actinic damage. Some areas that are particularly useful for skin harvest are the pre- and postauricular areas, clavicular skin, and inner arm among others. Sites in which grafts are most commonly useful include the nasal tip, dorsum, ala, and sidewall as well as the eyelids and the ears.

Graft survival depends on the ingrowth of capillaries from the recipient site for survival, so a viable base of tissue with some vascularity is needed. Provision of vascularity from peripheral to the wound, or "bridging," may supply up to about 5 mm of the periphery of the graft. A defect without adequate vascularity may be allowed to heal secondarily for a time to allow growth of granulation tissue, and then a delayed graft may be performed. Alternately, a muscle or soft tissue flap may be moved into the wound base, providing a vascular bed for the graft.[16] In the first 24 hours after placement, the graft absorbs transudate from the recipient bed and becomes edematous, a stage known as "plasmatic imbibition." Fibrin acts as a physiologic adhesive that

holds the graft in place during this time. The fibrin is eventually replaced by granulation tissue. Vascular anastomoses between the recipient bed and donor graft begin to develop at about 48 to 72 hours after grafting. This process is known as "inosculation." Full circulation is restored within 4 to 7 days, and a lymphatic circulation occurs within 7 days. Although re-innervation of the graft begins 2 to 4 weeks after grafting, full sensation may require several months or even years to return to normal.

Indications

Skin grafts are chosen in accordance with reconstructive ladder when healing by second intention, primary closure, or flap repair
are deemed unsuitable. They are particularly well-suited to defects on the nasal tip, dorsum, ala, and sidewall as well as the eyelids and the ears.

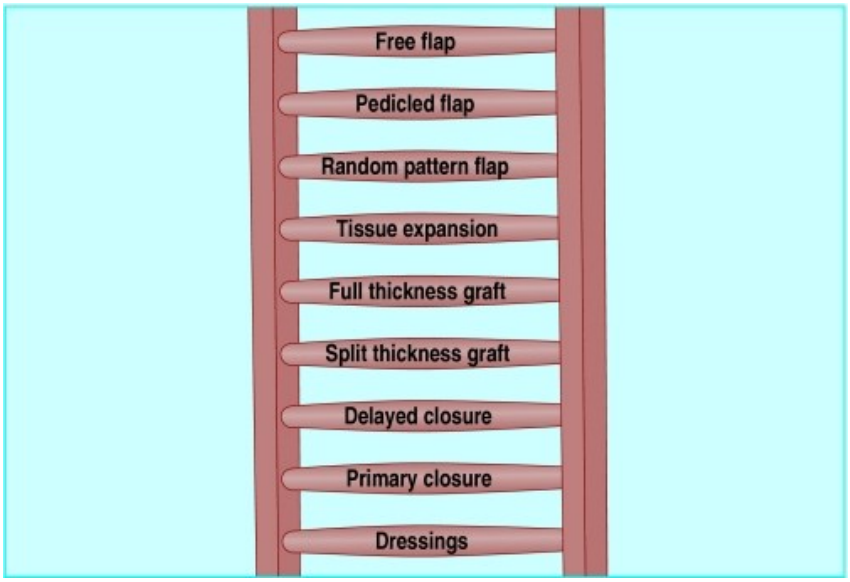


Figure 2 : Reconstructive ladder

Contraindications

Graft survival depends on the ingrowth of capillaries from the recipient site for survival, so a viable base of tissue with some vascularity is needed. Therefore, full-thickness skin grafts should not be placed in defects of any size without an underlying blood supply. For example, large (> 1 cm) areas of exposed bone or cartilage are not optimal for graft placement. Smoking significantly compromises oxygenation of tissue and should be stopped before graft placement if possible.[17]

SPLIT-THICKNESS SKIN GRAFTS

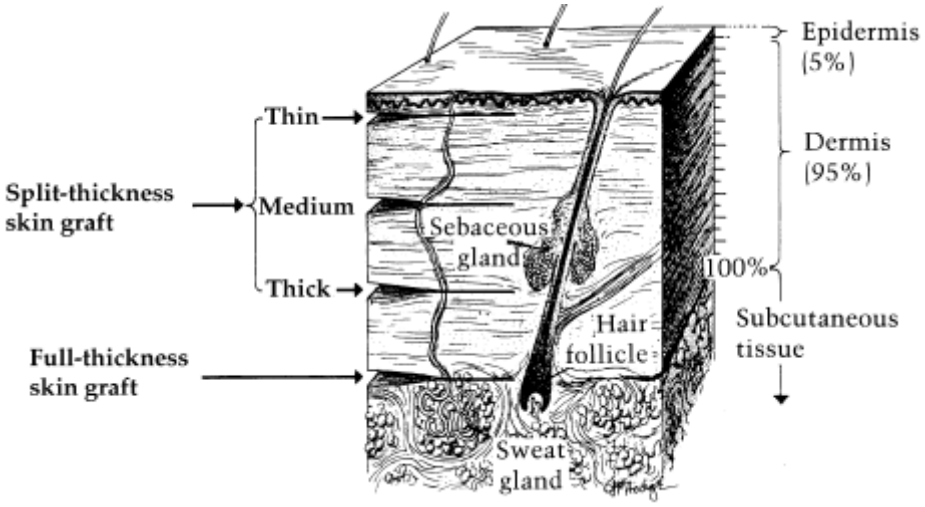


Figure 3: Depth of skin for grafting

A split-thickness skin graft (STSG), by definition, refers to a graft that contains the epidermis and a portion of the dermis, which is in contrast to a full-thickness skin graft (FTSG) which consists of the epidermis and entire dermis. Unlike flaps, skin grafts do not have their own blood supply, so they must rely on a well-vascularized wound bed for graft in-growth. Split-thickness skin

grafts are obtainable from multiple sources (autograft, homograft, allograft, or xenograft), multiple anatomical locations, and in various thicknesses. Most commonly, STSG autografts are taken from the lateral thigh, as well as trunk, as these sites are both aesthetically hidden, as well as easy to harvest from due to their broad surfaces. Split-thickness skin grafts classify according to their thickness into thin STSGs (0.15 to 0.3mm), intermediate STSGs (0.3 to 0.45mm), and thick STSGs (0.45 to 0.6mm).[18, 19] Because split-thickness skin graft donor sites retain portions of the dermis, including dermal appendages, the donor site can regrow new skin in 2 to 3 weeks. Thus, donor sites can be used more than once after appropriate healing has taken place, which makes STSGs versatile in burn surgery and large wounds where there are limited donor sites.

The advantages and disadvantages of STSGs are best highlighted by comparison with FTSGs. Considerations of proper skin graft selection should include graft take, contracture of skin graft, donor site morbidity, aesthetic match, and durability.

- **Graft Take**: The thicker a skin graft, the more metabolically active it is, and the worse is it's nutrient diffusion. FTSGs and thick STSG's require more robust recipient wound beds than thin STSGs. Thick grafts should be avoided in unhealthy wound beds such as chronic ulcers.
- **Contracture**: All skin grafts undergo primary and secondary contractures. Primary contracture is the immediate reduction in the size of

skin graft after it has been harvested, caused by passive recoil of elastin fibers in the dermis. As FTSGs have a greater amount of dermis, primary contracture is more significant in FTSG than STSG. Secondary contracture is the shrinkage of the skin graft in the wound bed over time, caused by myofibroblasts. Secondary contracture is greater for STSGs than FTSGs, as the additional dermis in FTSGs is resistant to the pull of myofibroblasts. Clinically, STSG placement should not be in aesthetically sensitive areas that could become deformed with contractures such as around the eyelids, face, and mouth.

- **Donor Site Morbidity**: The multipotent stem cells responsible for STSG donor site reepithelialization primarily reside in the hair follicles. By preserving portions of the dermis and thereby hair follicles, STSG donor sites regrow new skin and are reusable. Thin STSGs have the least donor site morbidity and regrow new skin the fastest. Full-thickness skin grafts involve excision of the entire thickness of skin, and thus adnexal structures, necessitating primary closure.
- **Aesthetic Match**: Skin grafts should ideally match the recipient bed in color, texture, and overall appearance. Full-thickness skin grafts commonly provide an appropriate color match, whereas STSGs are more likely to be hypo/hyperpigmented. Additionally, the meshing of STSGs significantly alters the aesthetics of STSGs.

- **Durability:** As the dermis provides strength and viscoelastic properties to the skin, the consideration of dermal thickness is essential for each specific wound. For example, thick STSGs or FTSG are common choices to cover mechanically demanding areas of the body, including the palms, soles, and joints, whereas thin STSGs do not withstand such forces as well.[20]

Disadvantages of STSGs compared to other reconstructive techniques include at times poor resemblance to surrounding recipient site skin (color match and texture if meshed), high susceptibility to trauma, poor sensation of the recipient site, need for anaesthesia/surgery (compared to secondary intention healing), and prolonged need for wound care of both the donor and recipient sites (compared to flap closure).

Anatomy and Physiology

Split-thickness skin grafts contain the **epidermis** and a portion of the **dermis**. The **epidermis** is the outermost layer of skin, comprised primarily of keratinocytes. The epidermis is a thin, semitransparent layer that provides a significant barrier function. The epidermis also includes melanocytes, Langerhans cells, Merkel cells, and nerve endings. Skin adnexal structures, including hair follicles, sweat glands, and sebaceous glands, are epidermal derivatives that invaginate into the dermis. Stem cells from the adnexal structures, specifically hair follicles, are responsible for the reepithelialization

of skin graft donor sites. The **dermis** is the fibrous layer below the epidermis composed of collagen, glycosaminoglycans, and elastin. The upper portion of the dermis, the papillary dermis, contains plexi of blood vessels and nerves. These plexi provide nutrients to the epidermis via diffusion. The undulating surface between the epidermis and papillary dermis portends stability between the two layers. The deeper portion of the dermis, the reticular dermis, contains robust collagen fibers. The dermis provides strength and stability to STSGs.

As mentioned above, STSGs do not have their own blood supply, so they must rely on the underlying wound bed for nutrients and blood supply. Presuming a stable, healthy, and well-vascularized wound bed, skin grafts take occurs in three commonly described steps:

1. Imbibition:
    - The skin graft passively absorbs oxygen and nutrients from the wound bed. During this phase, the skin graft is ischemic and survives on diffusion alone until reestablishing graft vasculature. The graft is pale/white during this time. Split-thickness skin grafts can tolerate up to 4 days of ischemia.[21-23]

2. Inosculation:

- A vascular network is established between the cut vessels on the underside of the skin graft and the capillary beds in the wound bed, establishing a vascular connection. The graft becomes pink at this point. Inosculation typically occurs at around 48 hours after graft placement.[24]

3. Revascularization

    - Several hypotheses exist regarding the exact mechanism of revascularization. The neovascularization theory is of new vessel ingrowth into the graft from the recipient wound bed. The endothelial cell ingrowth theory suggests that endothelial cells proliferate and slide from the recipient site by following pre-existing vascular basal lamina as structure, with graft endothelial cells eventually degrading. [25, 26]

Clinically, skin grafts are secured into place and often bolstered until postoperative day 5 to 7 to allow the skin graft to go through the above steps, ensuring the best skin graft take. Split-thickness skin grafts are typically adherent after 5 to 7 days upon completion of the stages of wound healing. Once the graft has integrated into the wound bed, it undergoes a maturation process that takes over one year to complete. Skin graft maturation can last up to several years in burn patients. The maturation process includes changes in

pigmentation, flattening, and softening. Even after maturation, meshed split-thickness skin grafts may maintain a cobblestone appearance.

Split-thickness skin grafts can be meshed to increase the overall size of the graft, which is useful in cases where the wound size is greater than the available donor site. In a meshed graft, the bridges of meshed skin follow the above phases of skin graft take — the spaces between the skin heal via epithelialization from the skin bridges. Meshing can occur in various ratios such as 3/8 to 1, 1 to 1, 2 to 1, 3 to 1, and even 6 to 1. The greater the ratio, the larger the spaces between the skin bridges, and the more epithelialization necessary to heal the space in-between. Meshing a skin graft effectively expands the skin graft to increase the area that can be covered by the skin graft. Additionally, the holes between skin bridges act as drainage holes to prevent fluid, blood, or seroma build-up between the recipient wound bed and skin graft, which would cause graft failure.

Indications[28]

Surgeons should assess each wound individually and utilize the reconstructive ladder to find a wound closure solution that is ideally the simplest, the fastest, and with the best aesthetic outcome.

Split-thickness skin grafts play an integral part of the reconstructive ladder. They are indicated when simpler methods of wound closure will not suffice, such as healing by secondary intention, primary closure, or negative

pressure wound therapy.[27] A prerequisite of skin grafting includes available donor sites and recipient sites that are well-vascularized and clean. Typically skin grafts are used to cover deep partial-thickness skin defects, full-thickness skin defects, or placement over muscle; however, they can survive on any wound bed with vascularity including tendon with intact paratenon (forearm, hand, fingers), cartilage with intact perichondrium (ears), bone with intact periosteum (skull), and even vascularized biologic dressings. If these thin vascular layers are not in place, STSGs will fail.

Split-thickness skin grafts are otherwise indicated in acute skin loss (burn wounds, traumatic wounds, infection), chronic skin loss (leg ulcers), and as adjuncts to other procedures (to cover a muscle flap).

Contraindications[28]

Absolute contraindications: wounds with an active infection, active bleeding, or known cancer. Wounds with exposed bone, tendon, nerve, or blood vessel without appropriate vascular layer.

Relative contraindications: wounds over joints or key anatomic landmarks in which contraction would reduce mobility and/or aesthetics (i.e., wrist, elbow, eyelid), and previously irradiated wounds.

Clinicians should consider patient factors such as tobacco use, anti-coagulant use, bleeding disorder, chronic steroid use, or malnutrition on a case-by-case basis.

Equipment

Skin Graft Harvest

Split-thickness skin grafts are harvestable in several ways, including with a surgical knife, oscillating Goulian knife, and most commonly with an air or electric powered dermatome. Manually harvesting a uniform depth skin graft is challenging and may result in irregularities in the donor site as well as a skin graft. Thus, powered dermatomes are a frequent choice as they offer harvest consistency, as well as adjustability in graft thickness (on the order of thousandths per inch) and width (1-inch, 2-inch, 3-inch, and 4-inch guards).

Skin Graft Meshing

Meshing methodologies vary from manual perforations in the skin graft with a surgical scalp to a hand-powered meshing device (mesher). Surgeons frequently utilize meshing devices as they apply multiple slits at regular intervals and in preset ratios. Commonly used ratios include 3/8 to 1, 1 to 1, 2 to 1, 3 to 1, and even 6 to 1. The split-thickness skin graft gets placed into the mesher and hand-cranked through the machine. Meshing a skin graft allows the graft to stretch, increasing the area that can be covered by the skin graft. The

higher the meshing ratio, the further a skin graft can stretch; however, the longer it will take for the skin graft to heal completely due to the increased area to epithelialize. The holes between skin bridges act as drainage holes to prevent fluid, blood, or seroma build-up between the recipient wound bed and skin graft, which would cause graft failure.

Other Equipment

Mineral oil is used to lubricate the donor site before skin graft harvest and allows for improved sliding of the dermatome. An epinephrine soaked sponge (1 vial of 1:1000 epinephrine in 500 milliliters of 0.9% normal saline) is placed on the donor site following harvest to minimize blood loss. Surgical pick-ups (Adson tissue forceps) are used to retrieve the skin graft from the dermatome.

Securing the Skin Graft

The STSG gets secured to the recipient site with skin staples or a running simple interrupted suture. The application of skin staples is must faster than suture; however, it does require eventual removal of staples once the skin graft has healed. Skin staples are applied at regular intervals around the extent of the skin graft. Typically dissolvable suture like chromic is utilized for securing the skin graft as it dissolves around the same time the skin graft becomes adherent and does not require removal. Securing split-thickness skin grafts with fast-clotting fibrin glue with high-concentration fibrin has also been reported.[29]

Dressings

A tie over bolster of petroleum-infused gauze, cotton balls, and non-dissolvable suture is frequently placed on smaller STSG recipient sites. A negative pressure wound vacuum is another viable option for areas that are difficult to bolster. In cases of large volume STSGs, petroleum-infused gauze and bulky gauze/kerlix are placed over the grafts. The grafts should not be left open to the air. The STSG donor site gets covered with petroleum-infused gauze and clear adhesive, followed by several layers of kerlix and an ACE wrap. Alternatively, the donor site can be covered with an anti-microbial foam dressing, kerlix, and ACE wrap.

Preparation

Consent

Part of the preparation process includes informed patient consent. The surgeon should discuss the postoperative course expected timeframe for donor and recipient site healing and the concept of skin grafting with the patient.

Wound Bed

Aside from preparing the equipment mentioned above, the most crucial aspect of preparation is creating a clean wound bed suitable to accept a split-thickness skin graft. Debridement of the wound bed is possible in multiple ways. The recipient bed should be debrided with a scalpel, Norsen debrider,

dermatome, or hydrosurgery device until the wound bed has healthy bleeding tissue at the base.[30] Freshen up the edges as necessary. The wound edges and base must be free of nonviable tissue, purulence, and exudate, such that all aspects of the wound should have pinpoint bleeding from the margins.

Without a clean wound base, the split-thickness skin graft cannot undergo the normal phases of skin graft healing.

Donor Site

The donor site should be chosen based on the amount of skin graft needed, surgical positioning of the patient, ease of donor site harvest, and aesthetics. Broad, flat regions like the anterolateral thighs, back, trunk, lateral arm/forearm, lateral lower leg serve as the easiest donor sites when using a mechanical dermatome because they are firm surfaces against which the dermatome operator can push. The thighs and back provide a large surface area from which to harvest a skin graft. Aesthetically, donor sites that will be routinely covered by clothing are typically chosen, such as the thighs. Skin from the back and the thighs is typically thicker than skin from other parts of the body; thus, skin graft harvest thickness requires adjustment for this (thicker graft used in the area of high stress, thinner graft used to match thin recipient skin). In large wounds or burns, donor sites are subject to limitation by the location of remaining healthy skin.

PREPARATION OF WOUND BED AND SPLIT-THICKNESS SKIN GRAFT HARVEST

- Debride the recipient bed with a scalpel, Norsen debrider, dermatome, or hydrosurgery device until the wound bed has healthy bleeding tissue at the base. Freshen up the edges as necessary.[30]
- Measure the recipient's wound bed. These measurements will equate to the size of the skin graft harvested.
- Apply lubricant to the donor site to optimize gliding.
- In conjunction with your assistant, use a towel or towel clamps to pull the donor site in opposite directions parallel to the path of the dermatome, making the donor site taught.
- Glide the Humbys knife over the skin od the donor site skin at a 15 - 30-degree angle. After making skin contact, flatten the dermatome to be nearly parallel with the skin.
- Apply firm downward pressure as the dermatome smoothly pushes forward.
- Upon achieving the desired length of the graft, use surgical scalpel or scissors to cut the skin graft from the donor site.
- Pull the skin graft from the dermatome using tissue forceps.
- Place the split-thickness skin graft in normal saline until it is to be used.

- Donor site is then dressed.

PREPARATION OF PRP

- When the patient is shifted on the table on the operating table venous blood is collected and transferred to C-PDA vacutainer (contain citric acid, monobasic sodium phosphate, dextrose and additionally adenine).
- Collected blood is centrifuged using double centrifugation technique.

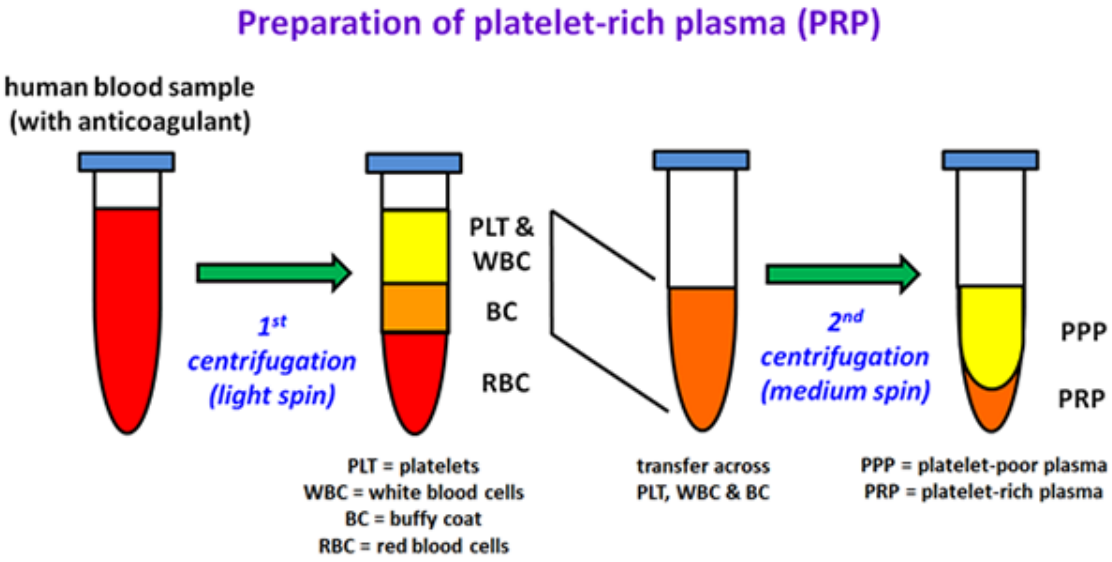


Figure 4 : Preparation of PRP

- PRP is then withdrawn into syringes with 16 gauge cannula and will be kept ready for use.

Meshing and Securing the Graft

- Mesh the split-thickness skin graft if desired. The surgeon can perform this process with a scalpel (fenestrating or "pie-crusting") or a skin graft mesher. If using a mesher, spread the skin graft out before entrance into

the mesher to ensure appropriately spaced slits. Gently guide the skin graft out of the mesher.

- In **control group,** after careful transfer of the skin graft to the donor site by placing the dermis side onto the recipient bed it is then secured to surrounding skin with staples or sutures.
- In **study group**, PRP is applied over the wound bed thoroughly, followed by which the dermis side of the graft is placed over the recepint wound. It is the pressed firmly against the recipient bed.
- Sterile Dressing is then placed.

Complications

Short term: Any buildup of fluid between the split-thickness skin graft and wound bed will jeopardize skin graft take, including seroma, hematoma, and infection. Shear or traction injury also disrupts skin graft healing. The graft can have incomplete (less than 100%) take or complete nontake.

Long term: Wound contracture and aesthetic issues, including pigmentary and texture differences between the skin-graft and donor site, are common.

Skin graft take: Split-thickness skin graft take is consistently reported at around 70 to 90%, even when accounting for a variety of recipient wound beds.[31-33] TBSA burned over 35%, age greater than 55 years old, and the presence of diabetes mellitus can adversely affect the success rate of STSGs.[32]

Clinical Significance

Split-thickness skin grafts typically become adherent to the recipient wound bed 5 to 7 days following skin graft placement. The dressings placed intraoperatively are kept in place until 5 to 7 days postoperatively to minimize shear and traction to the healing skin graft. At 5 to 7 days postoperatively, the dressings are taken down, and the skin graft inspected. The graft should be pink at this point, indicating successful inosculation and revascularisation. For the next 7 to 14 days, dressing changes should be performed every 24 to 72 hours. These dressing changes typically consist of petroleum-infused gauze, bulky gauze/kerlix, ACE wrap, or wound VAC, and can be performed by the patient, home nursing care, or wound clinic. At the 2 to 3 week postoperative mark, the skin grafts should be adherent and epithelialized so the patient may resume showering and bathing, and may stop frequent dressing changes. Lotion can be applied to the skin graft to promote continued healing.[28]

SKIN GRAFT FIXATION

History of skin graft fixation techniques

The history of free skin grafting dates back to as early as 600 BC in ancient India where the defects of the ears, nose and lips were treated using free gluteal grafts and skin grafts.[34]

Tile maker caste have been known for practicing free skin grafts, harvested from the gluteal region which was prepared by beating with wooden slippers until significant swelling had taken place they also used a secret cement for adhesion of the skin grafts which was called the "ancient Indian method".[35]

The suturing of the skin edges had been carried out by using giant ants, according to Sushrutha Samhitha. The ants were gently allowed to bite across the skin edges to be approximated. As soon as the ant bites well, the body is cut off leaving the head of the ants in place. There are evidences of using thorns to approximate the skin edges too. Similar technique for skin approximation using the ants had been in practice in ancient Egypt also.

It was the 'cisterian monks' in Worcesterschire who made a mark in the history for having used needles and sutures to approximate the wound edges. Evidently after this time scale, the modern day suturing started and securing the skin grafts by sutures come into practice.[36]

Bergel in 1909 discussed about the hemostatic nature of fibrin. In 1985, Rose, Dresdale et al.[37] described the combination of fresh frozen plasma and

bovine thrombin to form fibrin glue. During the 1990s, the fibrin sealant was widely put into use and became FDA approved. The fibrin also showed adhesive properties that were utilized in cases of fistula closure and seroma prevention. Later it was used as a skin graft fixation agent sometimes replacing sutures and staples.[38]

Present day scenario sees the use of sutures, staples and fibrin glues for fixation of the skin grafts.

Fixation of skin grafts

The recipient bed interface has a thin fibrin bed that holds the skin graft on to it. The fibrin acts as a barrier against infections that can cause graft failure.[39] Bleeding, shearing force, wound infection can all lead to graft loss, thus necessitating proper anchoring and protective dressing.

The skin graft goes through 2 distinct phases of adherence.

Phase 1: it lasts till 72 hours. The adherence is maintained by fibrin layer.

Phase 2: it commences after 72 hours because of the fibrous ingrowth and vascular anastomoses.[40]

Securing the skin grafts

The skin graft edges are trimmed and the recipient wound edges are undermined to accommodate the skin graft. The edges of the skin graft are approximated and secured to the edges of the recipient wound with sutures or staples. The staples have the added advantage of consuming less time in securing the skin graft edges. There are several operators who wish to place absorbable sutures thereby negating the burden of suture removal after healing.[41]

Dressing over the skin graft

Appropriate dressing is placed over the skin graft for better adaptation and graft healing. This also avoids the seroma formation and hematoma formation that can subsequently lead to infection and graft failure.

Tie over dressing/bolster dressing

The tie over dressing is one of the earliest and effective methods for graft fixation. Once the graft is transferred to the recipient bed and secured with sutures, a bolster is placed on the skin graft and secured with silk sutures running over the bolster and offering some pressure that prevents dislodgement. The bolster generally would be a piled up gauze pieces.

Although supported only by some observational studies, the tie over dressing remains simple and effective means for skin graft fixation.

Tie over dressing involves downward pressure on the skin graft surface thereby adapting the skin graft well onto the recipient area thus eliminating the

hematoma and seroma formation leading to good take of the skin graft. The principle of tie over dressing remains as simple as that.

Such a simple technique also is accountable for flipside issues inviting criticism. The downward pressure when it exceeds the capillary pressure, can cause graft damage. Prolonged intraoperative time and graft healing time, technique sensitive procedure, may hinder inspection and wound care in the postoperative period are other disadvantages. Also, no Randomized Control trials exist to prove the superiority of tie over technique over non tie over techniques.[42]

Negative wound therapy

Negative wound therapy consists of application of gauze packs over the skin graft which is sealed by sticking an adhesive dressing. The dressing consists of a small fenestration that is connected to the vaccum regulator with the pressure maintained at 125 mm Hg.

Mohsin et al. concluded from their study that negative wound therapy has the following advantages.

- Decreases the need for secondary coverage procedures.
- Shortens the length of hospital stay.
- Early healing.43

Non pressure dressings

Netscher and associates advocate moist non adherent gauze applied over the grafted site and is secured with self-adhering foam. Application and removal of the dressings are technically easy and it offers an even pressure over the grafted area.[44]

Saltz and Bowles also advocate using Reston foam applied over Xenoform gauze as graft dressings.[45] Minami and colleagues acknowledge the usefulness of polyurethane dressings over the skin grafts as such dressings avoid the risks of pressure necrosis that is seen in tie over dressings.[46]

Balakrishnan advocates the use of Lyofoam, which is applied over the graft directly. It is an inert, bacteriostatic, semipermeable polyurethane foam that enhances reepithelialization. Its inner surface is smooth and hydrophilic and outer surface is hydrophobic. Lyofoam is directly applied over the skin grafts and secured with staples.[47]

Fibrin glue/octyl-2-cyanoacrylate ("super glue")

Fibrin sealant, two component material composed of fibrin and thrombin has been widely used as an adhesive for the skin graft ever since it got FDA approved. When applied at the skin edges it exhibits a remarkable adhesion property.[48]

It has been advocated for its property of improving graft survival, reducing blood loss, hastening healing over large surface and thereby produces

better results. A thin layer of fibrin glue significantly improves the graft take especially in mobile parts of the body.[49]

Quilting

Quilting involves placing basing sutures on the surface of the graft thereby adapting it well to the recipient bed. Such quilting sutures are generally placed using absorbable ones. They are aimed at reducing the dead space in the graft that can lead to seroma formation.

In a study conducted by Yuhui Wu, the quilting sutures have been documented to reduce grade 2 and 3 seroma thereby improving the healing.[50]

Tie over dressing vs. non tie over technique

Akhavani et al. and Dhillon et al. compared both these techniques to find out there is no statistically significant difference in graft take rate and infections. Even a study conducted by Yuki et al. in 266 patients also concluded the same.[51-53]

The application of pressure over the skin graft becomes an optional entity and is sometimes dictated only by the anatomical area to be grafted. Any anatomical area that displays frequent movement that self-endangers the viability of the skin graft needs a Tie over dressing. Also an anatomical area where dead space creates the risk of seroma or hematoma collection compromising the adaptation of skin graft requires a tie over dressing for better

adaptation. This again confirms the evidences that draw inconclusive evidences about the best type of skin graft fixation techniques.

In certain cases, absorbable sutures are preferred over the silk sutures as the silk gets buried while the bolster is removed when the healing is complete. Although our experience with cyanoacrylate glue is limited, the idea of applying any material other than autogenous entities had always raised concerns for the fear of it instilling hypersensitivity reactions.[54]

AUTOLOGOUS PLATELET-RICH PLASMA

History of autologous platelet-rich plasma

Normal platelet counts in blood range from approximately 1,50,000 to 4,50,000/cum3 , whereas platelet rich plasma (PRP) contains platelet concentration above baseline compared to same quantity of whole blood.

Platelet-rich plasma (PRP), whose therapeutic value is equal to that of stem cells, is currently one of the most promising therapy agents in regenerative medicine. It is increasingly being used in different areas of medicine including aesthetic dermatology, orthopedics, sports medicine and surgery.

In the early 1940s, clinicians used embryonic “extracts” composed of growth factors and cytokines to promote wound healing.[55] Rapid and effective wound healing is crucial for the success of surgical procedures. Therefore, Eugen Cronkite et al. introduced a combination of thrombin and fibrin in skin

grafting.[56] Firm and stable adhesion of flaps, guaranteed by the use of the above components, plays an important role in this type of surgery.

The term “platelet-rich plasma” was used for the first time in 1954 by Kingsley et al. to refer to the standard platelet concentrate for tranfusion.[57] During the 1960s, the first blood bank PRP preparations appeared and became popular in 1970s.[58]

At the end of the 1950s and 1960s, the “EDTA Platelet Pack” was used. The set contained a plastic bag with EDTA blood and allowed for platelets, which remained suspended in a small amount of plasma after the procedure, to be concentrated by centrifugation.[59]

The term “platelet-rich plasma” was used for the first time in 1954 by Kingsley et al. to refer to the standard platelet concentrate for tranfusion.[57] During the 1960s, the first blood bank PRP preparations appeared and became popular in 1970s.[58]

At the end of the 1950s and 1960s, the “EDTA Platelet Pack” was used. The set contained a plastic bag with EDTA blood and allowed for platelets, which remained suspended in a small amount of plasma after the procedure, to be concentrated by centrifugation.[59]

It was hypothesized that growth factors (GFs) were further compounds of PRP which were secreted from platelets and participated in its action. The hypothesis was confirmed in the 1980s. It was demonstrated that bioactive molecules (GFs) were released from platelets to repair damaged tissue, such as

skin ulcers.[59] A number of studies exploring this issue have been conducted to date. One of the most frequently investigated subjects in this field is a combination of PRP and hyaluronic acid.[60] Epidermal growth factor (EGF) was discovered by Cohen in 1962. Further GFs followed are platelet-derived growth factor (PDGF) in 1974 and vascular endothelial growth factor (VEGF) in 1989.[61]

In 1986, Knighton et al. were the first scientists who described platelet concentrate protocols and named them autologous platelet-derived wound healing factors (PDWHF).[62] Since formulating the protocols, this techniques has been increasing applied in aesthetic medicine.[63] Since the late 1980s, PRP has been used in regenerative medicine.[64]

Role of PRP in skin grafting

Growth factors4 that are released from platelets in the PRP promote angiogenesis, collagen synthesis and epithelization, reduce dermal scarring and facilitate remodelling. Autologous PRP helps achieve stable haemostasis as it mimics the last steps of coagulation cascade. It brings about instant adhesion of graft to bed preventing any collection under the graft or undue shear.[65]

MATERIAL AND METHODS

SOURCE OF DATA

All patients admitted in the Department of surgery at B.L.D.E.(D.U)'S Shri B.M.Patil Medical College Hospital and Research Centre, Vijayapura between April 2023 to March 2025 and undergoing split thickness skin grafting for ulcers of various aetiologies.

INCLUSION CRITERIA:

- Patients in the age range of 18 to 75 years.
- Ulcers over any part of the body
- Ulcer size less than 15cm x 15 cm
- Ulcers of various etiology.

EXCLUSION CRITERIA:

- Skin malignancy
- Critically ill patients
- Patients with platelet disorder

METHODOLOGY

Preparation of Wound Bed and Split-thickness Skin Graft Harvest[28]

- Debride the recipient bed until the wound bed has healthy bleeding tissue at the base. Freshen up the edges as necessary.[30]
- Measure the recipient's wound bed. These measurements will equate to the size of the skin graft harvested.
- Apply lubricant to the donor site to optimize gliding.
- In conjunction with your assistant, use a towel or towel clamps to pull the donor site in opposite directions parallel to the path of the dermatome, making the donor site taught.
- Glide the Humbys knife over the skin od the donor site skin at a 15 - 30-degree angle. After making skin contact, flatten the dermatome to be nearly parallel with the skin.
- Apply firm downward pressure as the dermatome smoothly pushes forward.
- Upon achieving the desired length of the graft, use surgical scalpel or scissors to cut the skin graft from the donor site.
- Pull the skin graft from the dermatome using tissue forceps.
- Place the split-thickness skin graft in normal saline until it is to be used.

- Donor site is then dressed.

Preparation of PRP

- When the patient is shifted on the table on the operating table venous blood is collected and transferred to C-PDA vacutainer (contain citric acid, monobasic sodium phosphate, dextrose and additionally adenine).
- Collected blood is centrifuged using double centrifugation technique.
- PRP is then withdrawn into syringes with 16 gauge cannula and will be kept ready for use.

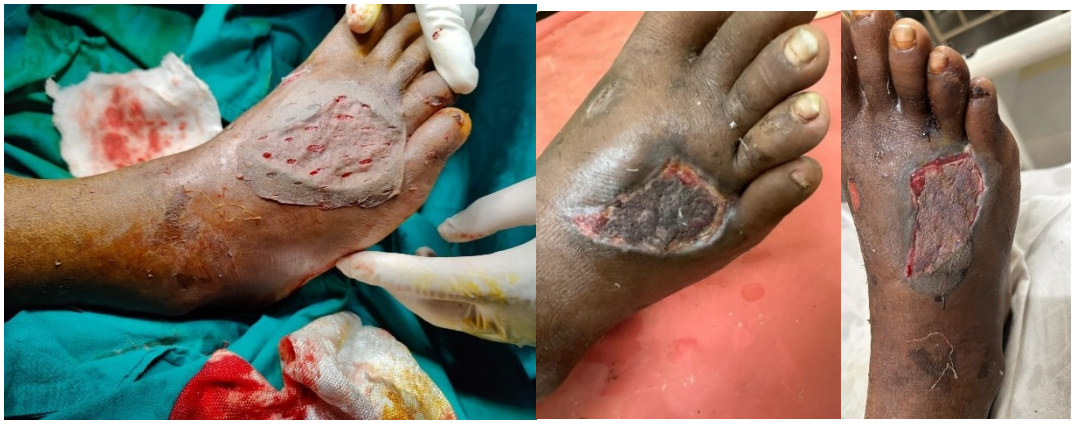
Meshing and Securing the Graft

- Mesh the split-thickness skin graft if desired. The surgeon can perform this process with a scalpel (fenestrating or "pie-crusting") or a skin graft mesher. If using a mesher, spread the skin graft out before entrance into the mesher to ensure appropriately spaced slits. Gently guide the skin graft out of the mesher.
- In **control group,** after careful transfer of the skin graft to the donor site by placing the dermis side onto the recipient bed it is then secured to surrounding skin with staples or sutures.

Figure 6 ACD Tube used for PRP Preparation

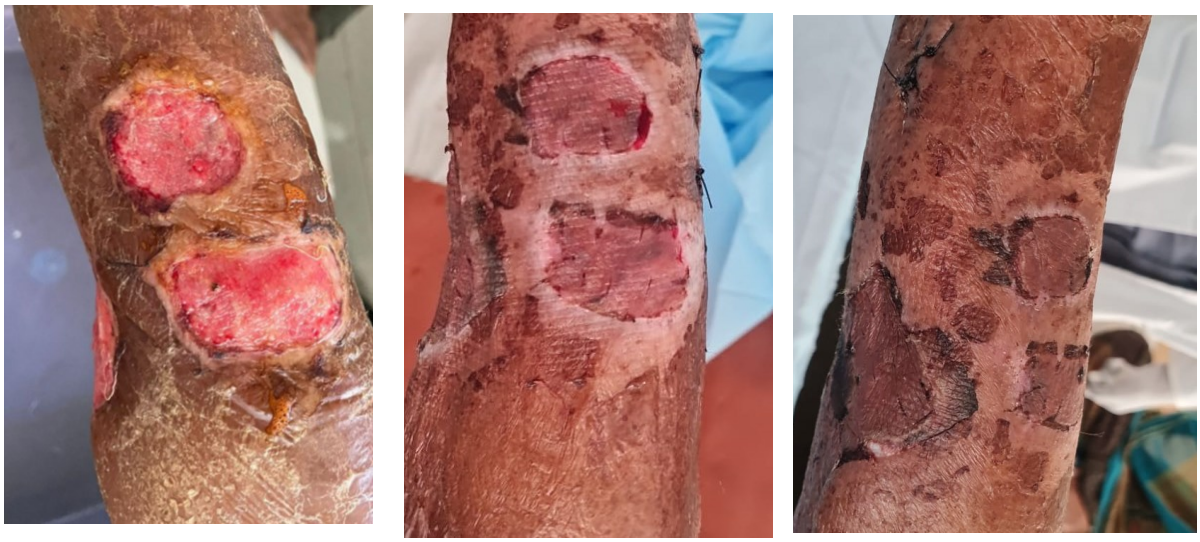
Figure 5 ACD tubes in centrifuge machine

Figure 7 Settings of centrifuge for soft and hard spin.



INTRA OP POD 3 POD 5

Figure 8 Different stage of graft using PRP fixation



PRE OP POD 3 POD 5

Figure 9 Graft uptake by PRP

POD 3 POD 7

Figure 10 Fixation with conventional methods

COLLECTIN OF DATA

PRO-FORMA: Pro-forma will be used to fill up general information about the study subjects with their details.

CONSENT: Informed consent will be taken from the research subjects through a consent form.

STUDY DESIGN

- Design - Randomised Comparative Study Design
- Proposed study period - March 2023 – March 2025
- Place of study - SHRI. B.M. Patil Medical College Hospital and Research Centre, B.L.D.E. (DEEMED TO BE UNIVERSITY), Vijayapura.

SAMPLE SIZE

As per study by Veena P Waiker et al [10], using G*Power ver 3.1.9.4 software for sample size calculation. The proportion of Graft edema for Control is 68% and PRP is 10%, this study requires a total sample size of 104(for each group 52 assuming equal group sizes).

To achieve a power of 97% for detecting a difference in Proportions Exact - Proportions: Inequality, two independent groups (unconditional) with 1% level of significance.

STATISTICAL ANALYSIS:

The data obtained is entered in a Microsoft Excel sheet, and statistical analyses are Performed using a statistical package for the social sciences (SPSS) (Version 20). Results are presented as Mean, SD, counts and percentages, and diagrams. For normally distributed continuous variables between the two groups will be compared using an independent sample t- test. For not normally distributed variables, the Mann-Whitney U test is used. Categorical variables between the two groups are compared using the Chi-square test/Fisher's exact test. If $p< 0.05$ will be considered statistically significant. All statistical are performed two-tailed.

INVESTIGATIONS/INTERVENTIONS

Investigations or interventions required in this study are routine standardized procedures. There is no animal experiments involved in this study.

INTERVENTIONS:

GROUP 1 (Study): Application of PRP for fixation of graft in STSG.

GROUP 2 (Control): Fixation of the graft by staplers/sutures in STSG.

PROFORMA

SL NO

NAME PHONE NO

AGE IP NO

SEX UNIT

RELIGION DOA

OCCUPATION WARD

ADDRESS DOD

SOCIO-ECONOMIC STATUS

COMPLAINTS;

HISTORY OF PRESENT ILLNESS;

PAST HISTORY:

PERSONAL HISTORY:

GENERAL PHYSICAL EXAMINATION

BUILT: WELL/MODERATE/POOR

BODY MASS INDEX:

NOURISHMENT: WELL/MODERATE/POOR BMI=]

PALLOR

ICTERUS

CYANOSIS

CLUBBING

PEDAL EDEMA

GENERAL LYMPHADENOPATHY

VITAL DATA:

TEMPERATURE:

PULSE

RESPIRATORY RATE

BLOOD PRESSURE:

SYSTEMIC EXAMINATION

RESPIRATORY SYSTEM:

CARDIOVASCULAR SYSTEM:

PER ABDOMEN:

CENTRAL NERVOUS SYSTEM:

LOCAL EXAMINATION

CLINICAL DIAGNOSIS:

PLAN OF TREATMENT:

LABORATORY TESTS

HB%

TOTAL COUNT

DIFFERENTIAL COUNT

N/L/E/B/M

OPERATIVE PROCEDURE:

DATE:

METHOD OF GRAFT FIXATION: PRP / CONVENTIONAL

INSTANT ADHESION OF GRAFT: PRESENT/ ABSENT

POST OPERATIVE DRESSING AND LOCAL EXAMINATION RECORD

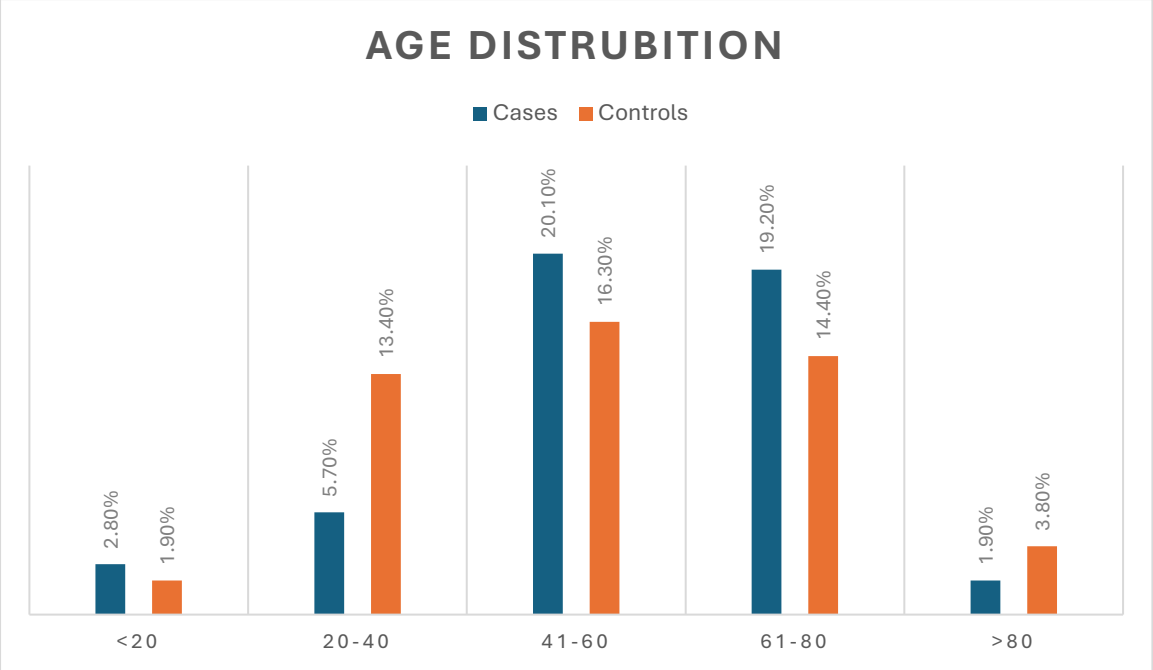
NUMBER OF DRESSING	DAY	PARAMETER		LOCAL EXAMINATION
1ST DRESSING		GRAFT UPTAKE %		
		HEMATOMA		
		GRAFT EDEMA		
2ND DRESSING		GRAFT UPTAKE %		
		HEMATOMA		
		GRAFT EDEMA		
3RD DRESSING		GRAFT UPTAKE %		
		HEMATOMA		
		GRAFT EDEMA		
4TH DRESSING		GRAFT UPTAKE %		
		HEMATOMA		
		GRAFT EDEMA		

TABLE 1.1: POST-OPERATIVE DRESSING ASSESSMENT CHART

RESULTS

Table 1: Comparison of groups according to age

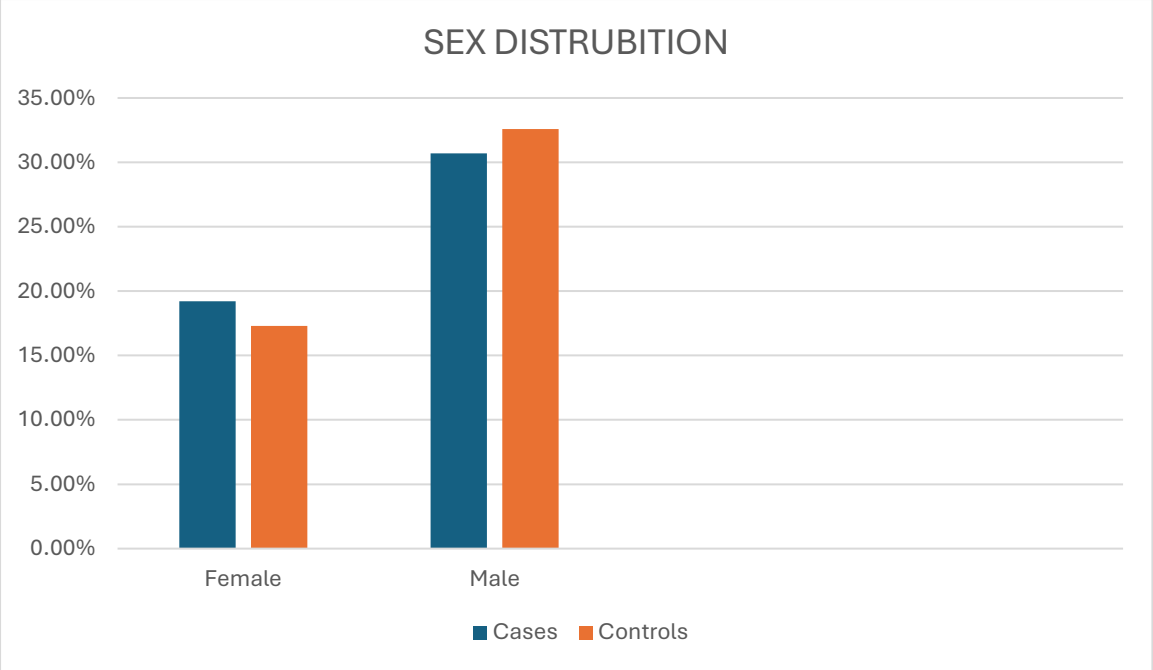
Age (in years)	Groups		p-value
	Cases	Controls	
<20	3 (2.8%)	2 (1.9%)	0.15
20-40	6 (5.7%)	14 (13.4%)	
41-60	21 (20.1%)	17 (16.3%)	
61-80	20 (19.2%)	15 (14.4%)	
>80	2(1.9%)	4 (3.8%)	
Total	**52 (50%)**	**52 (50%)**	**100%**



Graph 1: Comparison of groups according to age.

Table 2: Comparison of groups according to gender

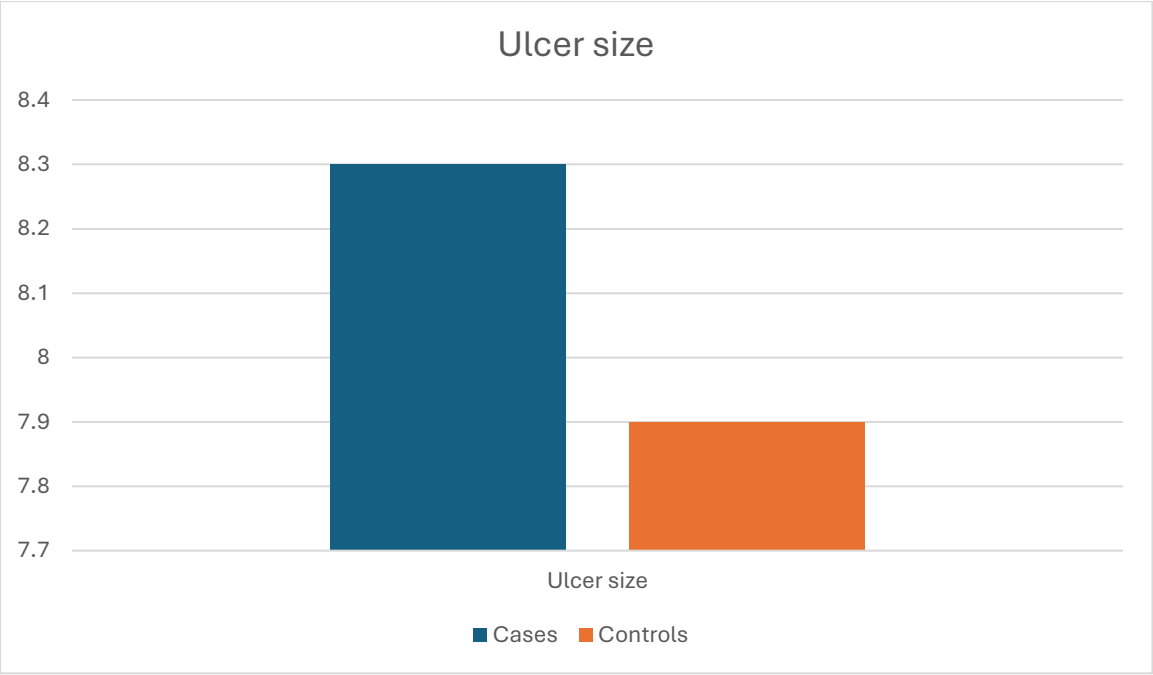
Gender	Groups		p-value
	Cases	Controls	
Female	20 (19.2%)	18 (17.3%)	1.0
Male	32 (30.7%)	34 (32.6%)	
Total	**52 (50%)**	**52 (100%)**	



Graph 2: Comparison of groups according to gender.

Table 3: Comparison of groups according to ulcer size

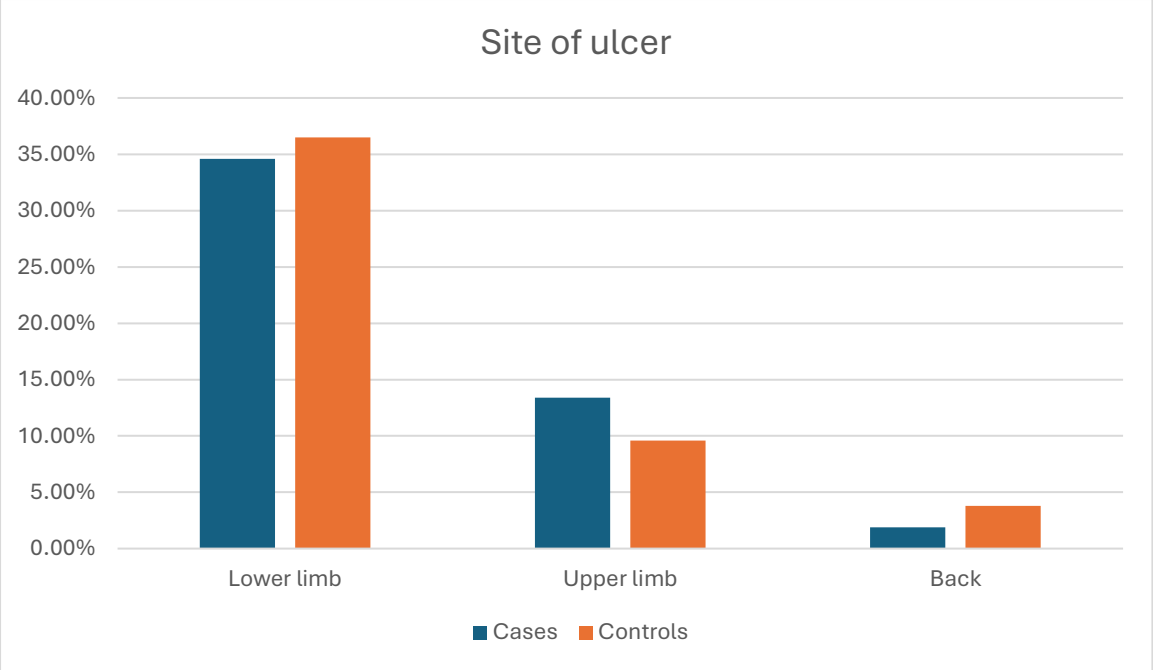
Ulcer size	Groups		p-value
	Cases	Controls	
Mean±SD	8.3±3.6	7.9±3.8	0.57



Graph 3: Comparison of ulcer size.

Table 4: Comparison of groups according to site of ulcer

Site	Groups		p-value
	Cases	Controls	
Lower limb	36 (34.6%)	38 (36.5%)	1.0
Upper limb	14 (13.4%)	10 (9.6%)	
Back	2 (1.9%)	4 (3.8%)	



Graph 4: Comparison of groups according to site of ulcer.

Table 5: Comparison of groups according to etiology of ulcer

Etiology	Groups		p-value
	Cases	Controls	
Necrotising fasciitis	24 (23%)	20 (19.2%)	1.0
Diabetic foot ulcer	20 (19.2%)	26 (25%)	
Burns	2 (1.9%)	4 (3.8%)	
Trauma	6(5.7%)	2(1.9%)	

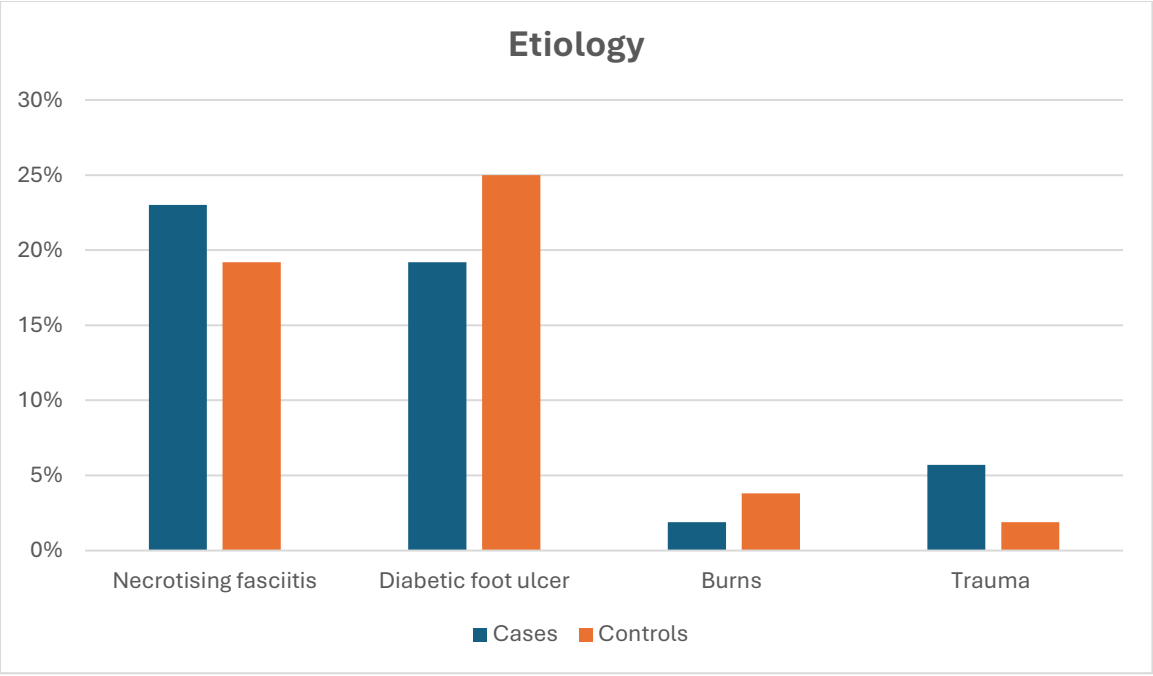
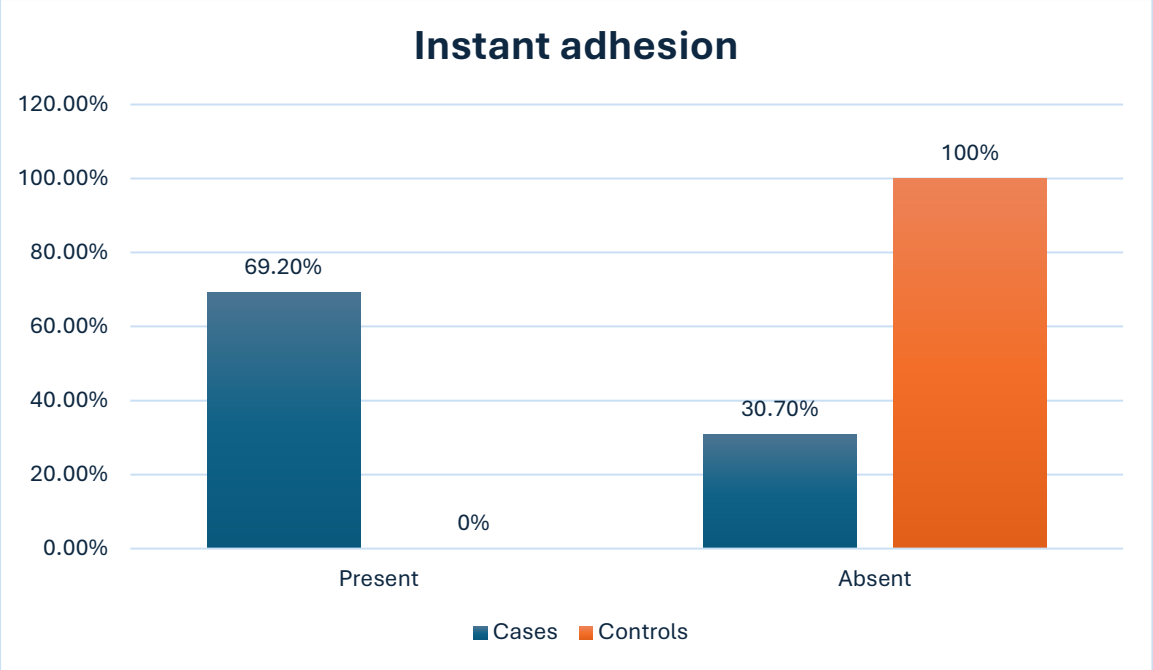


Chart 5: Comparison of groups according to etiology of ulcer

Table 6: Comparison of groups according to instant adhesion post operatively.

Immediate post operative Outcome		Groups		p-value
		Cases	Controls	
Instant adhesion	Absent	16 (30.7%)	52 (100%)	<0.001
	Present	36 (69.2%)	0	



Graph 6: Comparison of groups according to instant adhesion post operatively.

Table 7: Comparison of groups according to outcome at post operative day 3

Outcome at post operative day 3		Groups		p-value
		Cases	Controls	
Graft uptake (%)	Mean±SD	96.07±5.7	86.33±6.06	**<0.001**
Graft oedema	Minimal	32 (61.5%)	13 (25%)	**<0.001**
	Moderate	17 (32.6%)	29 (55.7%)	
	Gross	3 (5.7%)	10 (19.3%)	
Hematoma	Minimal	46 (88.4%)	17 (32.6%)	**<0.001**
	Moderate	6(11.5%)	35 (67.3%)	

Table 8: Comparison of groups according to outcome at post operative day 5

Outcome at post operative day 5		Groups		p-value
		Cases	Controls	
Graft uptake (%)	Mean±SD	92.7±8.4	79.9±9.1	**<0.001**
Graft oedema	Minimal	42 (80.7%)	23 (44.2%)	**<0.001**
	Moderate	10 (19.2%)	29 (55.7%)	
Hematoma	Minimal	50 (96.1%)	31 (59.6%)	**0.05**
	Moderate	2 (3.8%)	21 (40.3%)	

Table 9: Comparison of groups according to outcome at post operative day 7

Outcome at post operative day 7		Groups		p-value
		Cases	Controls	
Graft uptake (%)	Mean±SD	90.8±10.5	75.62±11.2	0.07
Graft oedema	Minimal	47 (90.3%)	35 (67.3%)	**<0.001**
	Moderate	5 (9.6%)	17 (32.6%)	
Hematoma	Minimal	50 (96.1%)	38 (73%)	**<0.001**
	Moderate	2 (3.8%)	14 (26.9%)	

DISCUSSION

The management of skin defects, especially those resulting from diabetic foot ulcers, necrotizing fasciitis, burns, and trauma, remains a significant challenge in reconstructive surgery. Split-thickness skin grafting (STSG) stands as a cornerstone technique in addressing these defects, and its success critically depends on adequate graft take. This study aimed to evaluate the effectiveness of autologous platelet-rich plasma (PRP) in enhancing split-thickness skin graft fixation and uptake compared to conventional methods.

Platelets, beyond their hemostatic role, are recognized as reservoirs of numerous growth factors, including platelet-derived growth factor (PDGF), transforming growth factor-β (TGF-β), vascular endothelial growth factor (VEGF), and epidermal growth factor (EGF), among others. These growth factors play pivotal roles in various stages of wound healing, including angiogenesis, epithelialization, and extracellular matrix formation.76 PRP, being a concentrated source of these growth factors, has gained significant attention for its potential applications in tissue regeneration and wound healing.77

The present study was designed as a prospective randomized controlled trial comparing STSG with PRP application (case group) versus traditional methods (control group). A total of 104 patients participated, divided equally between the two groups. The demographic

characteristics, ulcer size, site, and etiology were comparable between the groups, ensuring minimal confounding factors. The outcomes were assessed based on immediate post-operative adhesion, graft uptake percentage, and complications such as graft edema and hematoma formation at days 3, 5, and 7 post-operatively.

Demographic Characteristics

In our study, the age distribution across both groups showed no statistically significant difference (p=0.15), with the majority of patients falling within the 41-60 and 61-80 year age brackets. Similarly, the gender distribution was balanced, with males constituting 30.7% in the case group and 32.6% in the control group (p=1.0). This demographic pattern aligns with findings from Sonker et al.78, who reported a predominance of middle-aged to elderly patients in their study on chronic non-healing ulcers treated with PRP.

The mean ulcer size was comparable between the case (8.3±3.6 cm) and control (7.9±3.8 cm) groups (p=0.57), indicating homogeneity in the wound characteristics. This is crucial as ulcer size can significantly influence graft take. Wider ulcers typically have poorer vascularity at their center, which can compromise graft survival79.

Regarding the site of ulcers, the upper limb was the predominant location in both groups (34.6% in cases vs. 36.5% in controls), followed by the lower limb (13.4% in cases vs. 9.6% in controls), with no statistical

difference between the groups (p=1.0). Saleh et al.80 similarly noted in their study that upper and lower extremity wounds were common sites for STSG application, with comparable outcomes when augmented with PRP. The etiology of ulcers in our study population included necrotizing fasciitis (23% in cases vs. 19.2% in controls), diabetic foot ulcers (19.2% in cases vs. 25% in controls), burns (1.9% in cases vs. 3.8% in controls), and trauma (5.7% in cases vs. 1.9% in controls). The proportions were not significantly different between the groups (p=1.0), ensuring comparable baselines for evaluation. This spectrum of etiologies reflects the diverse applications of STSG in reconstructive surgery, as also highlighted by Driver et al.81 in their comprehensive review of PRP applications in wound management.

Immediate Post-operative Outcomes

One of the most striking findings of our study was the immediate post-operative adhesion observed in 69.2% of patients in the PRP group, whereas none of the patients in the conventional group exhibited this phenomenon ($p<0.001$). This instantaneous adhesion can be attributed to the fibrin-rich nature of PRP, which provides an immediate biological adhesive effect. Kakudo et al.82 demonstrated similar findings, reporting enhanced adherence of skin grafts when PRP was applied to the wound bed before graft placement. They proposed that the fibrin in PRP helps in

securing the graft to the wound bed, minimizing micro-motion, which is detrimental to graft take.

This immediate adhesion is particularly beneficial in anatomically challenging regions where conventional dressings might not provide optimal graft-recipient contact. The fibrin network formed from PRP not only secures the graft but also facilitates the diffusion of nutrients and waste products during the early critical period before revascularization.83

Post-operative Day 3 Outcomes

By the third post-operative day, the PRP group demonstrated significantly higher graft uptake (96.07±5.7%) compared to the conventional group (86.33±6.06%, $p<0.001$). This substantial difference highlights the early beneficial effects of PRP on graft survival. Akhundov et al.(83) reported similar findings, with enhanced graft take rates in wounds treated with PRP by the third post-operative day.

The accelerated graft take in the PRP group can be attributed to the growth factors present in platelets. PDGF, for instance, is known to stimulate fibroblast proliferation and extracellular matrix production, while VEGF promotes angiogenesis.85 The earlier onset of these processes in the PRP-treated wounds facilitates faster integration of the graft with the recipient bed.

Moreover, the PRP group exhibited less graft edema, with 61.5% of patients showing minimal edema compared to 25% in the conventional

group ($p<0.001$). Hematoma formation was also significantly reduced in the PRP group, with 88.4% of patients showing minimal hematoma compared to 32.6% in the conventional group ($p<0.001$). Graft edema and hematoma are two significant complications that can compromise graft survival. Edema can impair the diffusion of nutrients, while hematoma can mechanically separate the graft from the wound bed, leading to inadequate nutrition and eventual graft failure.86 The reduced incidence of these complications in the PRP group can be attributed to the hemostatic and anti-inflammatory properties of PRP. The concentrated platelets in PRP release thromboxane A2, which promotes vasoconstriction and platelet aggregation, thus minimizing bleeding and subsequent hematoma formation.87

Post-operative Day 5 Outcomes

By the fifth post-operative day, the superior graft uptake in the PRP group persisted, with a mean uptake of 92.7±8.4% compared to 79.9±9.1% in the conventional group ($p<0.001$). This trend indicates that the early advantages of PRP are sustained through the critical first week of graft healing.

The incidence of graft edema continued to be lower in the PRP group, with 80.7% of patients showing minimal edema compared to 44.2% in the conventional group ($p<0.001$). Similarly, hematoma formation remained less frequent in the PRP group, with 96.1% of patients

exhibiting minimal hematoma versus 59.6% in the conventional group ($p=0.05$).

These sustained benefits can be ascribed to the temporal release of growth factors from platelets. While some growth factors are released immediately upon platelet activation, others are released more gradually over several days.88 This phased release ensures a continuous supply of growth factors, promoting sustained healing and graft integration.

Post-operative Day 7 Outcomes

By the seventh post-operative day, although the difference in graft uptake between the PRP (90.8±10.5%) and conventional (75.62±11.2%) groups did not reach statistical significance ($p=0.07$), the clinical difference remained substantial. The narrowing of statistical significance might be attributed to the body's natural healing mechanisms beginning to compensate in the conventional group. Nevertheless, the absolute difference of approximately 15% in graft uptake is clinically significant and can translate to reduced need for regrafting or other interventions.

Graft edema and hematoma continued to be less pronounced in the PRP group, with 90.3% of patients showing minimal edema compared to 67.3% in the conventional group ($p<0.001$), and 96.1% exhibiting minimal hematoma versus 73% in the conventional group ($p<0.001$). This persistent reduction in complications underscores the sustained protective effect of PRP against factors that compromise graft survival.

Pallua et al.[89] similarly reported reduced complications and enhanced graft take rates with PRP application, even at the end of the first week post-surgery. They attributed these benefits to the matrix metalloproteinase inhibitors present in platelets, which mitigate excessive tissue remodelling and potential graft damage.

Mechanisms Underlying PRP Benefits in STSG

The beneficial effects of PRP in enhancing STSG outcomes can be attributed to multiple mechanisms:

1. Enhanced Graft Adhesion: The fibrin-rich nature of PRP provides an immediate biological adhesive effect, securing the graft to the wound bed and minimizing micro-motion.[82]

2. Accelerated Revascularization: Growth factors like VEGF and FGF in PRP promote angiogenesis, facilitating earlier revascularization of the graft.[90] This ensures adequate nutrition and oxygenation, critical for graft survival.

3. Reduced Inflammation: PRP contains anti-inflammatory cytokines that modulate the inflammatory response in the wound bed.91 Excessive inflammation can damage the graft, and its modulation contributes to improved graft survival.

4. Enhanced Cellular Proliferation and Migration: Growth factors such as PDGF and EGF stimulate the proliferation and migration of

fibroblasts, keratinocytes, and endothelial cells, accelerating wound healing and graft integration.[92]

5. Antibacterial Properties: PRP has been shown to possess antibacterial properties against certain pathogens, reducing the risk of infection, a significant cause of graft failure.[93]

6. Reduced Scar Formation: TGF-β3 in PRP has been associated with reduced scar formation, potentially leading to better aesthetic outcomes.[94]

These multifaceted mechanisms work synergistically to enhance graft take and minimize complications. The temporal release of these growth factors ensures sustained effects throughout the critical phases of graft healing.

Comparison with Other Studies

Study	Age Predominance	Sex Predominance	Prevalent site	Mean Ulcer size	Instant adhesion	Mean Uptake
Dhillon M et al.	30-50	Male	NA	10	NA	80
Hurjui I et al.	35 – 40	Male	Lower Limb	NA	NA	90
Chigurupati et al.	30 – 40	Male	NA	16	NA	85
Raguram V et al.	30 - 40	NA	Lower Limb	NA	Present	90

Clinical Implications

The findings of our study have several clinical implications:

1. Reduced Need for Regrafting: The enhanced graft take rates with PRP can reduce the need for regrafting, minimizing patient discomfort and healthcare costs.

2. Application in Challenging Anatomical Regions: The immediate adhesive effect of PRP makes it particularly valuable for STSGs in anatomically challenging regions where conventional dressings might not provide optimal graft-recipient contact.

3. Potential for Outpatient Procedures: The reduced complications and enhanced graft security with PRP might facilitate outpatient STSG procedures in selected cases, reducing hospital stay and associated costs.

4. Reduced Dependence on Compression Dressings: The immediate adhesion provided by PRP might reduce the reliance on compression dressings, which can sometimes compromise blood flow, especially in vascular-compromised regions.

5. Potential for Earlier Rehabilitation: With enhanced graft take and reduced complications, patients might be able to start rehabilitation earlier, improving functional outcomes.

These clinical benefits are not just confined to improved surgical outcomes but extend to enhanced patient experience, reduced healthcare costs, and potentially better long-term results.

Limitations and Future Directions

While our study provides compelling evidence for the benefits of PRP in enhancing STSG outcomes, it's not without limitations:

1. Sample Size: Although our sample size was adequate for statistical analysis, a larger cohort would further strengthen the findings.
2. Duration of Follow-up: Our study assessed outcomes up to the 7th post-operative day. Longer follow-up would provide insights into the long-term outcomes and potential differences in scar quality and functional results.
3. Standardization of PRP Preparation: While we followed a standardized protocol for PRP preparation, there's still variability in PRP concentration and composition, which could influence outcomes.
4. Cost Analysis: We did not conduct a comprehensive cost-benefit analysis, which would be valuable given the additional expense of PRP preparation.

Future research should address these limitations and also explore:

1. Optimal PRP Concentration: Determining the optimal platelet concentration and growth factor profiles for different wound types.
2. Combination Therapies: Investigating the synergistic effects of PRP with other wound-healing adjuncts like negative pressure wound therapy or growth factor supplements.

3. Molecular Mechanisms: Deeper exploration of the molecular mechanisms underlying the benefits of PRP in STSG.

4. Patient-Specific Factors: Identifying patient-specific factors that predict optimal response to PRP, enabling personalized treatment approaches.

5. Alternative Applications: Exploring other potential applications of PRP in reconstructive surgery, such as in composite grafts or flap survival enhancement.

SUMMARY

This prospective randomized controlled study demonstrated that autologous platelet-rich plasma significantly enhances split thickness skin graft fixation and uptake compared to conventional methods. The immediate adhesion observed in 69.2% of the PRP group patients represents a distinct advantage, providing enhanced graft stability without additional mechanical fixation methods. This immediate adhesion effect can be particularly valuable in anatomically challenging areas where conventional dressings may not provide optimal graft-recipient contact.

The superior graft uptake percentages observed in the PRP group throughout the follow-up period (96.07% vs 86.33% on day 3, 92.7% vs 79.9% on day 5, and 90.8% vs 75.62% on day 7) highlight the sustained beneficial effects of PRP on graft survival. This approximately 15% improvement in graft take rate is clinically significant and can translate into reduced need for regrafting procedures, shorter hospital stays, and improved patient outcomes.

Furthermore, the significantly reduced incidence of complications, including graft edema and hematoma formation, in the PRP group underscores the protective effects of PRP against factors that typically compromise graft survival. The anti-inflammatory, pro-angiogenic, and hemostatic properties of PRP create an optimal environment for graft integration with the recipient bed.

The findings of this study support the incorporation of autologous PRP as a valuable adjunct in split thickness skin grafting procedures. Being autologous in nature, PRP offers these benefits without the risks associated with allogenic or synthetic products. The technique is relatively simple, cost-effective, and can be easily integrated into existing surgical protocols without significant additional resources.

In conclusion, autologous platelet-rich plasma significantly enhances split thickness skin graft fixation and uptake, improves overall graft take rates, and reduces post-operative complications. Its routine use in split thickness skin grafting procedures has the potential to elevate surgical outcomes, enhance patient experience, and optimize resource utilization in reconstructive surgery.

CONCLUSION

In conclusion, our study provides robust evidence supporting the use of autologous PRP as an effective adjunct for enhancing STSG outcomes. The immediate post-operative adhesion, superior graft uptake, and reduced complications observed in the PRP group highlight its multifaceted benefits. As reconstructive surgeons continue to seek methods to optimize graft survival and minimize complications, PRP emerges as a promising, accessible, and autologous option. Its incorporation into routine STSG protocols has the potential to elevate surgical outcomes, enhance patient experience, and optimize resource utilization.

SAMPLE CONSENT FORM

SHRI B.M. PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTER, BIJAPUR-586103

INFORMED CONSENT FOR PARTICIPATION IN DISSERTATION/RESEARCH

I, the undersigned, _____ , S/O D/O _____, aged ____ years, ordinarily resident of _____ do hereby state/declare that Dr. Sake P. Shetty of Shri. B. M. Patil Medical College Hospital and Research Centre have examined me thoroughly on _____at _____ (place) and it has been explained to me in my own about the study. Further, Dr. Divyang G B informed me that he/she is conducting a dissertation/research titled " **A randomised comparative study of split thickness skin grafting fixation and uptake with use of autologous platelet rich plasma versus conventional method.**" under the guidance of Dr. M S Kotennavar sir requesting my participation in the study. The Doctor has also informed me that during the conduct of this procedure, adverse results may be encountered. Among the above complications, most of them are treatable but are not anticipated; hence there is a chance of aggravation of my condition, and in rare circumstances, it may prove fatal despite the anticipated diagnosis and best treatment made available. Further, the Doctor has informed me that my participation in this study would help in the evaluation of the results of the study, which is a useful reference to the treatment of other similar cases shortly,

and also, I may benefit from getting relieved of suffering or cure of the disease I am suffering.

The Doctor has also informed me that information given by me, observations made, photographs video graphs taken upon me by the investigator will be kept secret and not assessed by a person other than my legal hirer or me except for academic purposes. The Doctor did inform me that though my participation is purely voluntary, based on the information given by me, I can ask for any clarification during the course of treatment/study related to diagnosis, the procedure of treatment, result of treatment, or prognosis. At the same time, I have been informed that I can withdraw from my participation in this study at any time if I want, or the investigator can terminate me from the study at any time study but not the procedure of treatment and follow-up unless I request to be discharged. After understanding the nature of dissertation or research, diagnosis made, mode of treatment, I the undersigned _____ under my full conscious state of mind agree to participate in the said research/dissertation.

Date: Signature of the patient:

Place: Signature of Doctor:

CONFIDENTIALITY

I understand that medical information produced by this study will become a part of this hospital record and will be subjected to the confidentiality and privacy regulation of this hospital. Information of a sensitive, personal nature will not be a part of the medical records but will be stored in the investigator‘s research file and identified only by a code number. The code key connecting name to the numbers will be kept in a separate secure location.

If the data are used for publication in the medical literature or teaching purposes, no names will be used and other identifiers such as photographs and audio or videotapes will be used only with my special written permission. I understand that I may see the photograph and videotapes and hear audiotapes before giving this permission

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study at any time. **Dr. DIVYANG G B** is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during this study, which might influence my continued participation. If during this study, or later, I wish to discuss my participation in or concerns regarding this study with a person not directly involved, I am aware that the social worker of the hospital is available to talk with me. And that a copy of this consent form will be given to me for careful reading.

REFUSAL OR WITHDRAWAL OF PARTICIPATION

I understand that my participation is voluntary and I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital.

I also understand that **Dr. DIVYANG G B** will terminate my participation in this study at any time after he has explained the reasons for doing so and has helped arrange for my continued care by my physician or therapist if this is appropriate.

INJURY STATEMENT:

I understand that in the unlikely event of injury to me/my ward, resulting directly to my participation in this study, if such injury were reported promptly, then medical treatment would be available to me, but no further compensation will be provided.

I understand that by my agreement to participate in this study, I am not waiving any of my legal rights.

I have explained the purpose of this research, the procedures required, and the possible risks and benefits, to the best of my ability and the patient‘s language.

DATE: -

DR. M S KOTENNAVAR **DR. DIVYANG G B**

(GUIDE) (INVESTIGATOR)

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Ethical clearance certificate

BLDE
(DEEMED TO BE UNIVERSITY)
Declared as Deemed to be University u/s 3 of UGC Act, 1956
Accredited with 'A' Grade by NAAC (Cycle-2)
The Constituent College
SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

BLDE (DU)/IEC/ 921/2023-24 10/4/2023

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

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

TITLE: "A RANDOMIZED COMPARATIVE STUDY OF SPLIT THICKNESS SKIN GRAFTING FIXATION AND UPTAKE WITH USE OF AUTOLOGOUS PLATELET RICH PLASMA VERSUS CONVENTIONAL METHOD".

NAME OF THE STUDENT/PRINCIPAL INVESTIGATOR: DR.DIVYANG G.B.

NAME OF THE GUIDE: DR.M.S.KOTENNAVAR, PROFESSOR, DEPT. OF GENERAL SURGERY.

Dr. Santoshkumar Jeevangi
Chairperson
IEC, BLDE (DU),
VIJAYAPURA
Chairman,
Institutional Ethical Committee,
BLDE (Deemed to be University)
Vijayapura

Dr.Akram A. Naikwadi
Member Secretary
IEC, BLDE (DU),
VIJAYAPURA
MEMBER SECRETARY
Institutional Ethics Committee
BLDE (Deemed to be University)
Vijayapura-586103. Karnataka

Following documents were placed before Ethical Committee for Scrutinization.

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

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.
BLDE (DU): Phone: +918352-262770, Fax: +918352-263303, Website: www.bldedu.ac.in, E-mail:office@bldedu.ac.in
College: Phone: +918352-262770, Fax: +918352-263019, E-mail: bmpmc.principal@bldedu.ac.in

MASTER CHART

SL No	IPNO	NAME	AGE	SEX	ULCER SIZE	SITE	CASE/ CONTROL	INSTANT FIXATION	1ST DRESSING			2ND DRESSING			3RD DRESSING		
									EDEMA	HEMATOMA	UPTAKE	EDEMA	HEMATOMA	UPTAKE	EDEMA	HEMATOMA	UPTAKE
1	BLDE-2024-00249826	Mr. Sahebagouda Mahadevappagouda Biradar	63	M	10 X 5	UL	CASE	PRESEN	MOD	MIN	90	MIN	MIN	90	MIN	MIN	90
2	BLDE-2024-00270711	Mr. Shivappa N Sonnad	72	M	4 x 3	LL	CASE	PRESENT	MOD	MIN	90	MIN	MIN	90	MIN	MIN	90
3	BLDE-2024-00280609	Mr. Balu Basappa Jiragal	67	M	15 x 5	LL	CASE	PRESENT	MOD	MIN	90	MIN	MIN	80	MIN	MIN	80
4	BLDE-2024-00260441	Mr. Channappagouda R Patil	60	M	7 X 5	LL	CASE	PRESENT	MIN	MIN	90	MIN	MIN	90	MIN	MIN	90
5	BLDE-2024-00244044	Mrs. Vittabai Keruti	70	F	10 X 5	LL	CASE	PRESENT	MOD	MIN	90	MIN	MIN	80	MIN	MIN	80
6	BLDE-2024-0027110	Mr. Gurupadappa Naganur	63	M	15 x 5	LL	CASE	PRESENT	MOD	MIN	95	MIN	MIN	90	MIN	MIN	90

	2																
7	BLDE-2024-00269733	Mr. Rajendar Bhimarao Naik	59	M	4 x 3	UL	CASE	PRESENT	MIN	MIN	98	MIN	MIN	98	MIN	MIN	98
8	BLDE-2024-00233174	Mr. Babasab Havaldar	54	M	7 X 5	UL	CASE	PRESENT	MIN	MIN	98	MIN	MIN	90	MIN	MIN	90
9	BLDE-2024-00107688	Mr. Jeevalu Gangappa Lamani	65	M	15 X 10	LL	CASE	PRESENT	MOD	MOD	95	MIN	MIN	90	MIN	MIN	85
10	BLDE-2024-00147557	Mr. Basavaraj Sharanappa Shabadi	59	M	7 X 5	LL	CASE	PRESENT	MIN	MIN	90	MIN	MIN	90	MIN	MIN	90
11	BLDE-2024-00086118	Mr. Hanamanthgouda Biradar	63	M	5 x 5	LL	CASE	PRESENT	MOD	MIN	90	MIN	MIN	80	MIN	MIN	80
12	BLDE-2024-00249913	Master Siddarth Iranna Akalawadi	18	M	5 x 4	UL	CASE	PRESENT	MIN	MIN	95	MIN	MIN	95	MIN	MIN	95
13	BLDE-2024-00239948	Mr. Shivappa Siddappa Jamadar	60	M	8 X 8	LL	CASE	PRESENT	MIN	MIN	90	MIN	MIN	90	MIN	MIN	90
14	BLDE-	Mrs. Sumitra	65	F	9 X 5	LL	CASE	PRESEN	MOD	MOD	80	MIN	MIN	75	MIN	MIN	70

	2024-0019651 4	Namadev Ingale						T									
15	BLDE-2024-0023252 5	Gururav Hanamanthraya Kulakarani	56	M	10 X 5	LL	CASE	PRESENT	MOD	MOD	90	MIN	MIN	80	MIN	MIN	80
16	BLDE-2024-0020154 1	Mr. Siddappa Yamanappa Kamble	60	M	10 x 8	UL	CASE	PRESENT	MIN	MIN	80	MIN	MIN	80	MIN	MIN	80
17	BLDE-2024-0013996 3	Mrs. Gouramma Kambar	58	F	3 x 2	LL	CASE	ABSENT	MIN	MIN	90	MIN	MIN	90	MIN	MIN	90
18	BLDE-2024-0016698 9	Mr. Sachin Ramesh Hebbal	23	M	10 X 5	LL	CASE	PRESENT	MOD	MOD	90	MIN	MOD	70	MIN	MIN	70
19	BLDE-2024-0011227 5	Mrs. Siddamma Ramchandra Biradar	60	F	6 X 4	UL	CASE	PRESENT	MOD	MIN	90	MIN	MIN	90	MIN	MIN	90
20	BLDE-2024-0013605 7	Mr. Shankaragouda Somaninga Biradar	29	M	7 X 5	UL	CASE	ABSENT	MOD	MOD	80	MIN	MOD	80	MIN	MIN	70
21	BLDE-2024-0013108	Mr. Madivalappagouda Shantagouda	26	M	7 X 5	LL	CASE	PRESENT	MIN	MIN	90	MIN	MIN	90	MIN	MIN	90

	3	Nadagouda															
22	BLDE-2024-00118965	Mr. Gurushantappan Uppin	75	M	10 X 5	UL	CASE	PRESENT	MIN	MIN	98	MIN	MIN	98	MIN	MIN	98
23	BLDE-2023-00388079	Mr. Shankar Dharmanna Naikodi	50	M	5 x 4	LL	CASE	PRESENT	MIN	MIN	90	MIN	MIN	90	MIN	MIN	90
24	BLDE-2024-00042688	Mr. Ravath Gurapad Doddaganger	60	M	10 X 5	LL	CASE	PRESENT	MIN	MIN	90	MIN	MIN	80	MIN	MIN	80
25	BLDE-2024-00062123	Mr. Ashok Mallappa Ranagatti	45	M	10 x 15	LL	CASE	PRESENT	MIN	MOD	90	MIN	MIN	85	MIN	MIN	70
26	BLDE-2024-00078404	Mrs. Dyamavva Dharamappa Naikodi	75	F	5 x 4	BACK	CASE	PRESENT	MOD	MIN	100	MIN	MIN	100	MIN	MIN	100
27	BLDE-2024-00048190	Mr. Hanumanta Madivalappa Kolkar	68	M	15 X 10	LL	CONTROL	ABSENT	MOD	MOD	80	MIN	MOD	70	MIN	MIN	70
28	BLDE-2024-00089246	Mrs. Lalubai Bhaggu Chavan	65	F	5 x 4	LL	CASE	PRESENT	MIN	MIN	100	MIN	MIN	100	MIN	MIN	100
29	BLDE-	Mr. Nagappa	65	M	6 X 4	UL	CASE	ABSENT	GROSS	MOD	90	MIN	MOD	70	MIN	MOD	50

	2024-0009037 7	Shivanna Kannure															
30	BLDE-2024-0005198 2	Mr. Shivu Basappa Matur	35	M	6 X 4	BACK	CASE	ABSENT	MOD	MIN	90	MIN	MOD	80	MIN	MOD	75
31	BLDE-2024-0004056 7	Mr. Laxman Basavaraj Katakar	22	M	5 x 5	LL	CASE	ABSENT	MOD	MOD	80	MOD	MOD	75	MIN	MOD	70
32	BLDE-2022-0036267 7	Mr. Shankareppa Siddaram Biradar	60	M	12 X 6	UL	CASE	ABSENT	GROSS	MOD	80	MOD	MOD	70	MOD	MOD	70
33	BLDE-0001213 8 Age &	Master Nabilal Kamal Nagathan	19	M	15 X 10	LL	CASE	ABSENT	GROSS	MOD	80	MOD	MOD	75	MIN	MOD	75
34	BLDE-2023-0040418 4	Mrs. Gouramma S Mural	72	F	5 x 5	UL	CONTROL	ABSENT		MOD	80	MIN	MOD	75	MOD	MOD	75
35	BLDE-2023-0037062 2	Mr. Gangadhar Patil	74	M	10 X 5	UL	CASE	ABSENT	MOD	MOD	100	MIN	MIN	100	MIN	MIN	100
36	BLDE-2023-0029145 5	Mr. Siddappa Wagh	30	M	15 X 10	UL	CONTROL	ABSENT	MOD	MOD	70	MOD	MOD	60	MIN	MIN	55

37	BLDE-2023-00282629	Mr. Desu P Chavan	55	M	5 X 2.5	LL	CONTROL	ABSENT	MOD	MOD	95	MOD	MOD	90	MIN	MIN	90
38	BLDE-2022-00147072	Mr. Balappa Basappa Jiragal	71	M	10 X 10	UL	CONTROL	ABSENT	MOD	MOD	80	MOD	MOD	75	MIN	MIN	90
39	BLDE-2023-00031044	Mr. Malakappa B Lachan	82	M	7 X 5	LL	CONTROL	ABSENT	MOD	MOD	90	MIN	MIN	88	MIN	MIN	90
40	BLDE-2023-00065604	Mr. Maddipeerappa Ningappa Miragi	45	M	10 X 5	LL	CONTROL	ABSENT	MOD	MOD	90	MOD	MOD	70	MOD	MOD	80
41	BLDE-2023-00085239	Mr. Subhash Lalu Angadi	39	M	5 x 5	LL	CONTROL	ABSENT	MOD	MOD	90	MIN	MIN	90	MIN	MIN	90
42	BLDE-2023-00088612	Mr. Kareppa Walikar	35	M	5 x 4	UL	CONTROL	ABSENT	MOD	MOD	80	MOD	MOD	70	MIN	MIN	80
43	BLDE-2023-00317704	Mr. Ramanna Gulappa Poojari	63	M	10 X 5	LL	CASE	ABSENT	MIN	MOD	95	MOD	MIN	90	MIN	MIN	90
44	BLDE-2023-	Mr. Samarth Shivakumar	26	M	5 x 5	LL	CASE	ABSENT	MOD	MOD	85	MIN	MIN	80	MIN	MIN	98

	00362614	Sindagi															
45	BLDE-2023-00261494	Mr. Vithalrao Krishna Rao Deshapande	85	M	3 x 2	LL	CONTROL	ABSENT	MOD	MOD	90	MIN	MIN	90	MIN	MIN	90
46	BLDE-2023-00348004	Mrs. Ambakka Hadapad	45	F	6 X 5	LL	CASE	ABSENT	MIN	MIN	98	MIN	MIN	98	MIN	MIN	85
47	BLDE-2023-00115277	Mrs. Sunanda Shreeshail Chawan	34	F	10X5	LL	CONTROL	ABSENT	MOD	MOD	80	MOD	MOD	75	MIN	MIN	90
48	BLDE-2023-00179382	Mr. Saibanna Bhimaray Naikodi	28	F	6X7	BACK	CONTROL	ABSENT	MIN	MOD	90	MIN	MIN	90	MIN	MIN	80
49	BLDE-2023-00216327	Mr. Iranna M Biradar	46	M	4X5	UL	CONTROL	ABSENT	MOD	MOD	90	MOD	MIN	90	MIN	MIN	95
50	BLDE-2023-00167246	Mr. Kallappa S Kulekumatagi	72	M	10X5	UL	CONTROL	ABSENT	MOD	MOD	80	MOD	MOD	75	MIN	MIN	90
51	BLDE-2023-00234243	Mr. Prabhu Meti	42	M	15X15	LL	CONTROL	ABSENT	MOD	MOD	90	MIN	MIN	85	MIN	MIN	70

52	133953	BHIMASHANKAR BASANNA	22	M		LL	CONTROL	ABSENT									
53	109720	JYOTHI	21	M	10 X 5	LL	CASE	PRESENT	MOD	MIN	90	MIN	MIN	90	MIN	MIN	90
54	133595	JAYKANTH	25	F	4 x 3	LL	CONTROL	ABSENT	MOD	MIN	90	MIN	MIN	90	MIN	MIN	90
55	136399	CHETAN BASAVRAJ	19	M	15 x 5	LL	CONTROL	ABSENT	MOD	MIN	90	MIN	MIN	80	MIN	MIN	80
56	142465	HANMANT	35	M	7 X 5	BACK	CONTROL	ABSENT	MIN	MIN	90	MIN	MIN	90	MIN	MIN	90
57	151811	SIDDARAY	21	M	10 X 5	LL	CONTROL	ABSENT	MOD	MIN	90	MIN	MIN	80	MIN	MIN	80
58	179968	THOUSHIF HANSIGI	30	M	15 x 5	LL	CONTROL	ABSENT	MOD	MIN	95	MIN	MIN	90	MIN	MIN	90
59	200547	NIRMALA GURBASAPPA	61	F	4 x 3	LL	CONTROL	ABSENT	MIN	MIN	98	MIN	MIN	98	MIN	MIN	98
60	232332	SHASHIKUMAR HARYAGI	27	M	7 X 5	LL	CASE	PRESENT	MIN	MIN	98	MIN	MIN	90	MIN	MIN	90
61	32657	SAIKUMAR BABU DODAMANI	24	M	15 X 10	LL	CONTROL	ABSENT	MOD	MOD	95	MIN	MIN	90	MIN	MIN	85
62	251891	MAMTASHREE CHALAWADI	19	F	7 X 5	LL	CONTROL	ABSENT	MIN	MIN	90	MIN	MIN	90	MIN	MIN	90
63	260489	SACHIN WADDAAR	29	F	5 x 5	LL	CASE		MOD	MIN	90	MIN	MIN	80	MIN	MIN	80
64	355873	PARSHURAM VITTHAL	32	M	5 x 4	LL	CONTROL	ABSENT	MIN	MIN	95	MIN	MIN	95	MIN	MIN	95
65	378521	GANESH KALLAPPA KAMBHAR	35	M	8 X 8	LL	CASE	PRESENT	MIN	MIN	90	MIN	MIN	90	MIN	MIN	90
66	40635	MALINATH RUGI	18	F	9 X 5	LL	CONTROL	ABSENT	MOD	MOD	80	MIN	MIN	75	MIN	MIN	70

67	398980	SABBUDDIN MULLA	28	F	10 X 5	LL	CONTROL	ABSENT	MOD	MOD	90	MIN	MIN	80	MIN	MIN	80
68	391910	SOMARAY DODDAMANI	22	M	10 x 8	LL	CONTROL	ABSENT	MIN	MIN	80	MIN	MIN	80	MIN	MIN	80
69	391696	SHENU HANAMANTH	21	M	3 x 2	LL	CASE	PRESENT	MIN	MIN	90	MIN	MIN	90	MIN	MIN	90
70	330141	RESHMA HASAN HUCHYAL	39	M	10 X 5	LL	CONTROL	ABSENT	MOD	MOD	90	MIN	MOD	70	MIN	MIN	70
71	388269	BASAVRAJ	30	M	6 X 4	LL	CONTROL	ABSENT	MOD	MIN	90	MIN	MIN	90	MIN	MIN	90
72	388605	SUVARNA MANE	40	M	7 X 5	LL	CONTROL	ABSENT	MOD	MOD	80	MIN	MOD	80	MIN	MIN	70
73	107688	Jeevalu	65	M	7 X 5	LL	CASE`		MIN	MIN	90	MIN	MIN	90	MIN	MIN	90
74	147557	Basavaraj	59	F	10 X 5	LL	CONTROL	ABSENT	MIN	MIN	98	MIN	MIN	98	MIN	MIN	98
75	196514	Sumitra	65	M	5 x 4	LL	CASE		MIN	MIN	90	MIN	MIN	90	MIN	MIN	90
76	020125	Kallappa	60	M	10 X 5	LL	CONTROL	ABSENT	MIN	MIN	90	MIN	MIN	80	MIN	MIN	80
77	302614	Samarth	29	M	10 x 15	LL	CONTROL	ABSENT	MIN	MOD	90	MIN	MIN	85	MIN	MIN	70
78	254061	Dutta	60	M	5 x 4	LL	CASE	PRESENT	MOD	MIN	100	MIN	MIN	100	MIN	MIN	100
79	051982	Shivu	35	M	15 X 10	LL	CASE	ABSENT	MOD	MOD	80	MIN	MOD	70	MIN	MIN	70
80	243739	Ashabi	83	M	5 x 4	LL	CONTROL	ABSENT	MIN	MIN	100	MIN	MIN	100	MIN	MIN	100
81	303414	Ramu	45	M	6 X 4	UL	CONTROL	ABSENT	GROSS	MOD	90	MIN	MOD	70	MIN	MOD	50
82	009405	Basanna	62	M	6 X 4	UL	CASE		MOD	MIN	90	MIN	MOD	80	MIN	MOD	75
83	480340	Jayamala	37	M	5 x 5	LL	CONTRO	ABSENT	MOD	MOD	80	MOD	MOD	75	MIN	MOD	70

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84	229397	Lakkawa	70	M	12 X 6	BACK	CONTROL	ABSENT	GROSS	MOD	80	MOD	MOD	70	MOD	MOD	70
85	008588	Shettu	65	M	15 X 10	LL	CASE	ANSENT	GROSS	MOD	80	MOD	MOD	75	MIN	MOD	75
86	009020	Sanjiv	40	M	5 x 5	UL	CONTROL	ABSENT		MOD	80	MIN	MOD	75	MOD	MOD	75
87	175618	Sunanda	22	M	10 X 5	LL	CASE	PRESENT	MOD	MOD	100	MIN	MIN	100	MIN	MIN	100
88	198764	Appashya	52	M	15 X 10	LL	CONTROL	ABSENT	MOD	MOD	70	MOD	MOD	60	MIN	MIN	55
89	437	Shrishail	40	M	5 X 2.5	LL	CASE	PRESENT	MOD	MOD	95	MOD	MOD	90	MIN	MIN	90
90	441	Praveen	25	M	10 X 10	LL	CONTROL	ABSENT	MOD	MOD	80	MOD	MOD	75	MIN	MIN	90
91	299094	Shankargouda	36	M	7 X 5	LL	CONTROL	ABSENT	MOD	MOD	90	MIN	MIN	88	MIN	MIN	90
92	13881	Danappa	74	M	10 X 5	LL	CONTROL	ABSENT	MOD	MOD	90	MOD	MOD	70	MOD	MOD	80
93	14797	Kamlakar	45	M	5 x 5	LL	CONTROL	ABSENT	MOD	MOD	90	MIN	MIN	90	MIN	MIN	90
94	63910	Preetam	10	F	5 x 4	LL	CASE		MOD	MOD	80	MOD	MOD	70	MIN	MIN	80
95	122042	Sarojini	29	M	10 X 5	LL	CONTROL	ABSENT	MIN	MOD	95	MOD	MIN	90	MIN	MIN	90
96	147790	Sanju	56	M	5 x 5	BACK	CONTROL	ABSENT	MOD	MOD	85	MIN	MIN	80	MIN	MIN	98
97	214447	Shivanand	50	M	3 x 2	LL	CONTROL	ABSENT	MOD	MOD	90	MIN	MIN	90	MIN	MIN	90
98	147797	Naveen	39	M	6 X 5	LL	CONTROL	ABSENT	MIN	MIN	98	MIN	MIN	98	MIN	MIN	85

99	43032	Chanappa	61	F	10X5	LL	CONTROL	ABSENT	MOD	MOD	80	MOD	MOD	75	MIN	MIN	90
100	165545	Nagappa	70	M	6X7	LL	CONTROL	ABSENT	MIN	MOD	90	MIN	MIN	90	MIN	MIN	80
101	003418	Irappa	45	M	4X5	LL	CASE	PRESENT	MOD	MOD	90	MOD	MIN	90	MIN	MIN	95
102	159167	Shantosh	58	F	10X5	LL	CONTROL	ABSENT	MOD	MOD	80	MOD	MOD	75	MIN	MIN	90
103	35045	Mallikarjuna	65	F	15X15	LL	CASE	PRESENT	MOD	MOD	90	MIN	MIN	85	MIN	MIN	70
104	35045	Karthik	45	M	10 X 5	UL	CONTROL	ABSENT	MOD	MIN	90	MIN	MIN	90	MIN	MIN	90

Divyang

Skin grafting represents one of the oldest and most fundamental techniques

ELDE University

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