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Innovative Preservation of Skin Graft on the Donor Site

Raghuveer Choudhury[1], Ravi Kumar Chittoria[2], Barath Kumar Singh. P[3]

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ABSTRACT

Skin grafting is a most common procedure done in plastic surgery department. The most common complication associated with skin grafting is graft loss. Graft loss is expected usually from day 7 - day 10. The excess skin graft harvested during the initial skin grafting will be preserved for the future graft loss. Various preservative methods are available for storage of excess skin grafts. In this article, we assess the preservation of skin grafts in the donor site of the same patient.

Keywords: Innovative; Donor Site; Preservation; Storage; Skin Graft.

INTRODUCTION

Most of the Skin grafts harvested from the patients has epidermal and upper dermal layer. Human Skin has five layers of epidermis and upper part of papillary dermis. The Skin has low immunogenic potential, anti-inflammatory nature, antioxidant properties, and also angiogenic properties.[1] Preserved skin grafts can either be used in staged reconstructive procedures as autografts. Although several nutrient media and techniques have been developed for storage, the conventional method of preservation is wrapping the graft in a normal saline soaked sterile gauze and refrigerating this material in a sterile container at +4°C. As normal saline contains only certain electrolytes and nothing more, it is far from physiological. For that reason, saline stored skin grafts lose some of their viability in a short period of time and become edematous. In our study, we assess the role of preservation of skin graft at donor site.

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Materials and Methods

This study was conducted in the department of Plastic Surgery at tertiary care center after getting the departmental ethical committee approval. Informed written consent was taken from the patient. This is the prospective observational study about a 73-year-old male came with non-healing post traumatic degloved wound with no known co morbidities. He met with RTA (road traffic accident) 5 months back with degloving injury of the left lower limb for which serial debridement was done by primary center before referring to our center. At admission patient presented to plastic surgery department with extensive raw area over the left lower limb extending from just below knee to dorsum of foot.

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After wound bed preparation (fig. 1), skin graft was harvested from right thigh and grafted in left lower limb raw area. (Fig. 2) The excess skin graft obtained during the procedure was preserved by applying the skin graft back to the donor site. (Fig. 3) The recipient skin graft site showed minimal graft loss after 14 days. (Fig. 4) The excess skin graft preserved at donor site was then peeled off used at areas of graft loss. (Fig. 5)

Fig. 1: Wound bed after preparation

Fig. 2: Wound bed after autologous skin grafting

Fig. 3: skin graft stored in the donor site

Fig. 4: Minimal graft loss after 14 days of primary skin grafting

Fig. 5: Peeling of excess skin graft preserved at donor site

Fig. 6: Final appearance after regrafting using preserved graft

Results

Skin grafting of the recipient site done with the graft taken from the right thigh. The extra skin graft which are available needs to be stored in physiological medium for the survival of the cells. The storage of skin grafts on donor site helps the cells by good nourishment from the wound bed and ensure the survival of the skin graft. In our case, after 14 days we used the stored skin graft from the right thigh for regrafting of the graft loss on the recipient area. Regrafted skin take was good on day 7 (fig. 6). No complication noted with this procedure.

Discussion

There are various methods to preserve the skin like direct storage, cryopreservation, glycerol, preservative medium, culture medium. The ideal way of preservation is one that is easy to carry out, safe to tissue, and does not cause any alteration in the biological properties of skin.[3] Cryopreservation is one of the commonly used methods for the preservation of skin. It is then stored in a storage medium at a very low temperature. Different cryomedia and storage temperatures ranges have been mentioned in the literature. The most common technique of cryopreservation involves the use of glycerol as a cryoprotectant medium along with antimicrobial agents and storage at a temperature of -80°C.[4] There is not an ideal or universally acknowledged medium for the preservation of skin grafts. In previous studies, Roswell Park Memorial Institute 1640 solution (RPMI) was reported superior to other media including Eagle's minimal essential medium, Euro-Collins preservation fluid, University of Wisconsin solution, Histidine tryptophan ketoglutarate solution, and saline.[5,6] Basaran et al. explained this superiority with the rich amino acid content of RPMI, which helps to improve cell preservation. It is suggested that Roswell Park Memorial Institute 1640 solution (RPMI) seemed to be the most efficient short term solution. On the other hand, storage at 4-8°C after wrapping the graft in physiological saline soaked gauze is still a widely used method by most clinicians because of practicality and inexpensiveness.[7] However, this solution is known to be inferior to others.

Storage of skin grafts with saline moistened gauze and using it later as a homograft or autograft is a widespread practice in plastic surgery. Recent studies have reported an increase in the quality and viability of skin grafts using different methods and, as saline lacks the nutrients necessary for cellular metabolism, this practice should be reviewed. Percentage graft take can be used to test the effects of different storage media on skin graft viability, but this may be affected by many factors other than viability such as infection, immobilization of the graft and hematoma, and so cannot be used as a primary measurement.[8] The use of autograft skin for the cover of burn wounds and other non-healing ulcers has since been the subject of numerous research that have been published. The autograft reduces the risk of wound infection and stops protein, fluid, and electrolyte loss from the wound, which saves the patient's energy. Additionally, it lessens discomfort while also enhancing the patient's overall wellbeing and psychological condition and preserving autografts. According to Snyder et al., autografts have been used to treat diabetic, venous, arterial, post-traumatic, post-scleroderma, and other ulcers.[8] He lists a number of advantages, such as a significant decline in wound infection, desiccation, and patient sensations like discomfort.

Autografts made of human skin effectively lower wound protein, water, and electrolyte losses while also lowering the body's energy needs.[10] We employed autograft in our case for the same reason. Compared to collagen dressing, autograft more successfully reduces pain and manages infection. The sick donor's torso, hips, thighs, and upper calves can be harvested for skin autograft. In the present study, we assess the skin graft preservation at donor site. We assess the viability of skin grafts preserved at donor sites. The results of this study showed that donor site maintained a better environment for skin grafts by increasing the quality and survival time of skin grafts. A complication of preserving the skin grafts at donor site may be bleeding during graft removal. Another disadvantage of the procedure is that the graft may be difficult to peeled off after 21 days as it will get taken up at the donor site.

Conclusion

In conclusion, donor site preservation can be a very good method for preservation of skin grafts in resource poor settings where there is no facility of refrigeration. This is an economical means of storage compared to other preservative media which require storage in cooler temperatures. But further studies with larger sample size and better histological markers

are needed.

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Role of Autologous Platelet Rich Plasma in Preventing Flap Necrosis

Jacob Antony Chakiath[1], Ravi Kumar Chittoria[2]

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ABSTRACT

Platelet rich plasma (PRP) is currently used in different medical fields. It is being used in several different applications as in tissue regeneration, wound healing, scar revision, skin rejuvenating effects, and alopecia. PRP is a biological product defined as a portion of the plasma fraction of autologous blood with a platelet concentration above the baseline. In this manuscript, we discuss the role of autologous platelet rich plasma in preventing the flap necrosis in an electrical burn patient.

Keywords: Autologous Platelet Rich Plasma; Electrical Burns; Flap; Flap Necrosis.

INTRODUCTION

Platelet-rich plasma (PRP) is currently used in different medical fields. The interest in the application of PRP in dermatology has recently increased. It is being used in several different applications as in tissue regeneration, wound healing, scar revision, skin rejuvenating effects, and alopecia. Platelet-rich plasma (PRP) is also known as platelet rich growth factors (GFs), platelet-rich fibrin (PRF) matrix, PRF, and platelet concentrate. The concept and description of PRP started in the field of hematology.[1] In this manuscript, we discuss the role of autologous platelet rich plasma in preventing the flap necrosis in an electrical burn patient.

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Materials and Methods

This study was conducted in the Department of Plastic Surgery in a tertiary care institute. Department scientific committee approval was obtained. In this case report a 45 year old male sustained electrical burn injuries while working at construction building. He sustained electrocution by contact with electric wire and initiated sparks and electrical wire fell on patient head. He was admittedto emergency department of Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER) with an electrical burn in the frontoparietal area (entry zone) and the left leg (exit zone). The scalp defect size was 20*15cm.(fig. 1) The scalp defect wound bed preparation was done and a rotation flap was performed. Adjuvant autologous platelet rich plasma was given to prevent flap necrosis. (fig. 2,3)

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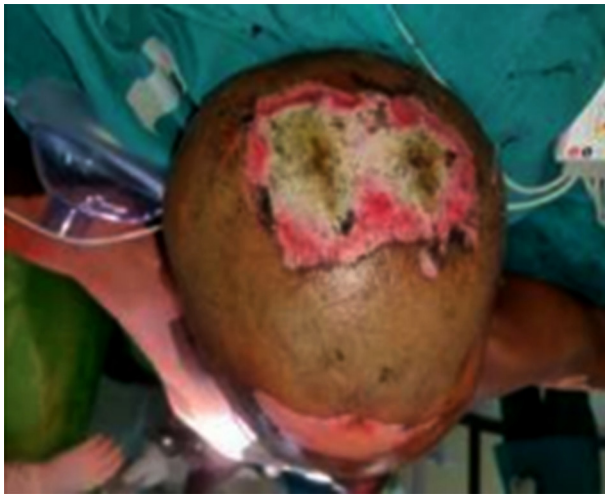

Fig. 1*:* Post electrical burn scalp defect

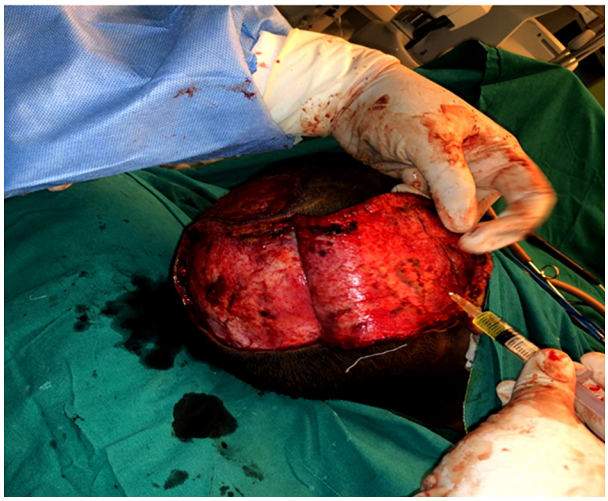

Fig. 2*:* Post electrical burn scalp defect

Fig. 3: Autologous platelet rich plasma on the flap after inset

Fig. 4: Healthy scalp flap

Results

In our patient, autologous platelet rich plasma helped as an adjuvant in preventing the flap necrosis.(fig. 4)

Discussion

Platelet-rich plasma (PRP) is also known as platelet rich growth factors (GFs), platelet-rich fibrin (PRF) matrix, PRF, and platelet concentrate. The concept and description of PRP started in the field of hematology. Hematologists created the term PRP in the 1970s in order to describe the plasma with a platelet count above that of peripheral blood, which was initially used as a transfusion product to treat patients with thrombocytopenia.[2] Ten years later, PRP started to be used in maxillofacial surgery as PRF. Fibrin had the potential for adherence and homeostatic properties, and PRP with its anti-inflammatory characteristics stimulated cell proliferation.[3] Subsequently, PRP has been used predominantly in the musculoskeletal field in sports injuries. With its use in professional sportspersons, it has attracted widespread attention in the media and has been extensively used in this field.[4] Other medical fields that also use PRP are cardiac surgery, pediatric surgery, gynecology, urology, plastic surgery, and ophthalmology.[5]

PRP is a biological product defined as a portion of the plasma fraction of autologous blood with a platelet concentration above the baseline (before centrifugation).[6] As such, PRP contains not only a high level of platelets but also the full complement of clotting factors, the latter typically

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remaining at their normal, physiologic levels.[7] It is enriched by a range of GFs, chemokines, cytokines, and other plasma proteins. The PRP is obtained from the blood of patients before centrifugation. After centrifugation and according to their different density gradients, the separation of blood components [red blood cells, PRP, and platelet poor plasma (PPP)] follows. In PRP, besides the higher concentration of platelets, other parameters need to be taken into account, such as the presence or absence of leucocytes and activation. This will define the type of PRP used in different pathologies.

Devices to Obtain PRP Currently, there is a great discussion and no consensus regarding PRP preparation. PRP is prepared through a process known as differential centrifugation, in which acceleration force is adjusted to sediment certain cellular constituents based on different specific gravity.[8]

Regarding the preparation of PRP, there are 2 techniques:

1. Open technique: the product is exposed to the environment of the working area and comes in contact with different materials that should be used for their production, such as pipettes or product-collection tubes. In the blood processing to obtain PRP with the open technique, it should be guaranteed that the product is not contaminated during microbiological handling.
2. Closed technique: it involves the use of commercial devices with CE marking (including centrifuge equipment and application) in which the product is not exposed to the environment (recommended). Several CE medical devices are available for the production of autologous PRP. Most of them are included in one of the following 3 types of devices:
    a. The blood is obtained with a tube that contains an anticoagulant, and this tube can be used for any type of centrifuge.
    b. Medical devices with which the blood is collected into a tube that already contains an anticoagulant; the centrifugation can then be made in any type of centrifuge.
    c. Medical devices with which the blood is collected into a syringe previously filled with an anticoagulant; usually, the blood is transferred into a secondary device whose shape imposes the use of the centrifuge supplied by the same manufacturer.[9]

After centrifugation, the tube shows 3 basic layers: at the bottom of the tube, there are red blood cells with leukocytes deposited immediately above; the middle layer corresponds to the PRP, and at the top, there is the PPP. The PPP is removed, and PRP is obtained. Platelets can be activated before application of the PRP, although there is no consensus on whether or not platelets must be previously activated before their application and with which agonist.[10] In our patient, autologous platelet rich plasma had a significant role in preventing flap necrosis.

Conclusion

Autologous platelet rich plasma had a significant role in preventing the flap necrosis in an electrical burn patient.

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New Preservative Medium for Storage of Skin Graft

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ABSTRACT

Preserved skin grafts can either be used in staged reconstructive procedures as autografts or for temporary coverage of wounds as allografts. Although several nutrient media and techniques have been developed for storage, the conventional method of preservation is wrapping the graft in a normal saline soaked sterile gauze and refrigerating this material in a sterile container at +4°C. As normal saline contains only certain electrolytes and nothing more, it is far from physiological. For that reason, saline stored skin grafts lose some of their viability in a short period of time and become edematous. In this study we have compared viability of skin grafts stored using autologous platelet rich plasma with that of grafts stored using normal saline alone.

Keywords: Preservative; Medium; Storage; Skin Graft.

INTRODUCTION

There is not an ideal or universally acknowledged medium for the preservation of skin grafts. In previous studies, Roswell Park Memorial Institute 1640 solution (RPMI) was reported superior to other media including Eagle's minimal essential medium, Euro-Collins preservation fluid, University of Wisconsin solution, Histidine-tryptophan-ketoglutarate solution, and saline.[1] Basaran et al. explained this superiority with the rich amino acid content of RPMI, which helps to improve cell preservation.[2] It is suggested that Roswell Park Memorial Institute-1640 solution (RPMI) seemed to be the most efficient short term solution. On the other hand, storage at 4-8°C after wrapping the graft in physiological saline soaked gauze is still a widely used method by most clinicians because of practicality and inexpensiveness.[3,4] However, this solution is known to be inferior to others.[2] In the present study, we aimed to compare histological changes of the human skin grafts stored in saline and autologous platelet rich plasma.

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Materials and Methods

This study was done in Department of Plastic Surgery, at tertiary care hospital. Split thickness skin grafts of 6 x 6 cm were harvested from 7 patients who had undergone grafting procedures for a variety of reasons. The grafts were harvested and split into two equal pieces (3x3 cm). Each piece was laid on a sterile gauze and moistened with sterile saline, this is labeled as specimen A. The other piece was stored in patient's own APRP, labeled as specimen B. Both specimens placed in a refrigerator at 40°C.

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Each 3x3 cm graft piece was further divided into three equal parts to examine the autolytic changes on days 0, 10 and 20. 1x1 cm skin graft stored in saline was sent as specimen A and the one stored in APRP was sent as specimen Beach time. All histological examination was performed by the same histologist. The stored graft was examined for autolytic changes.

Preparation of APRP

After getting consent from patient 15 ml of blood taken and centrifuged at 3000 rpm for 10 mins. The upper 2/3 rd fluid is taken and again centrifuged at 4000 rpm for 10 mins. The lower 1/3 rd fluid which is rich in platelet concentration is taken and used for storage of skin graft.

Results

On histological examination of the specimens of 7 patients there was no difference at day 0 between the two groups but the autolytic changes were more in the saline stored grafts substantially at day 10 compared to grafts stored in APRP. Autolytic changes in both the stored grafts were almost the same by day 20 but still the grafts stored in APRP showed better storage than that stored in saline.

Table 1: Demographic details of patients

Age	Gender	Indication For Grafting
21	Male	PBC of hand release
17	Male	PBC ankle release
8	Female	PBC on Rt foot
56	Female	PBC on Left forearm
13	Female	Donor area of Local flap
22	Male	PBC on Rt elbow
37	Female	PBC neck

(PBC – Post Burn Contracture)

Table 2: Day 10 – autolytic changes

Days	Graft in Saline -Autolytic changes	Graft in APRP – Autolytic changes
10	Yes	No
20	Yes	Yes, but changes are less compared to that in saline
10	Yes	No
20	Yes	Yes, but changes are less compared to that in saline
10	Yes	No
20	Yes	Yes, but changes are less compared to that in saline
10	Yes	No
20	Yes	Yes, but changes are less compared to that in saline
10	Yes	No
20	Yes	Yes, but changes are less compared to that in saline
10	Yes	No
20	Yes	Yes, but changes are less compared to that in saline

Discussion

Storage of skin grafts with saline moistened gauze and using it later as a homograft or autograft is a widespread practice in plastic surgery. Recent studies have reported an increase in the quality and viability of skin grafts using different storage media and, as saline lacks the nutrients necessary for cellular metabolism, this practice should be reviewed.[2-4] Percentage graft take can be used to test the effects of different storage media on skin graft viability, but this may be affected by many factors other than viability such as infection, immobilization of the graft and hematoma, and so cannot be used as a primary measurement. We compared the viability of saline stored and plasma stored skin grafts. Plasma is a physiological fluid which can supply physiological concentrations of electrolytes and nutrients to a basal level of cellular metabolism and can buffer acid metabolites. The results of this study showed that plasma maintained a better environment for skin grafts by increasing the quality and survival time of skin grafts based on The complication of storing the skin grafts may be infection.[5] as plasma is a good medium for bacterial growth, but we did not observe any bacteria in our skin grafts during microscopic examination.

Conclusion

In conclusion, APRP maintained better histological outcomes for the preservation of human skin grafts. This is an economical

means of long-term storage compared to other preservative media. But further studies with larger sample size and better histological markers are needed.

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Role of Clip Lens as a Hair Assessment Tool

Barath Kumar Singh. P[1], Ravi Kumar Chittoria[2]

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ABSTRACT

Various hair assessment tools are available in the medical fields for assessment and follow up for treatment of alopecia. Most of the hair assessment tools are time consuming and not available at many centres. In this report, we describe the role of magnifying universal clip lens in the process of hair assessment

Keywords: Clip Lens; Hair Assessment; Tool; Alopecia.

INTRODUCTION

Alopecia is a common condition. The counting of hair to evaluate the severity of alopecia is essential. The three step approach to hair loss patient assessment includes a detailed history, clinical examination and investigations. Hair evaluation methods are grouped into Non-invasive methods, Semi-invasive methods and Invasive methods.[1,2] This article highlights the role of clip lens in taking photographs for the hair assessment.

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Materials and Methods

This study was done in the department of plastic surgery. Informed consent obtained from the patient. The patient coming to plastic surgery department with complains of alopecia are evaluated with history, clinical examination and investigation. In the process of evaluation, we have used photographic documentation for the scalp showing hair density, quality of hair and scalp quality. The video dermoscopy was usually done to assess the hair quality and taking in our hospital. The accessibility of the video dermoscopy and other technologies for hair assessments are not available in all centres. The hair assessment and photographs are taken in the outpatient department with the help of the magnifying clip lens attached to the camera of the mobile phone. This magnifying clip lens can be attached to any camera phone.(Fig. 1) The usage of this clip lens is very simple. The cost of the clip lens is 700 Indian rupees. The hair region where the photo to be taken is marked with the skin marker with 1*1 cm square box and followed by photos

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are taken and stored.(Fig. 2) The hair density in that region will be counted manually and can be used as a reference point for the hair assessment during the treatment period.

Results

The magnifying universal clip lens is very easy to use without any cumber some technology. The patient was very comfortable with the procedure. The magnifying clip lens usage is checked successfully as a hair assessment tool.

Discussion

The three main hair assessment methods in alopecia are Non-invasive (questionnaire, daily hair counts, standardized wash test, 60s hair count, global pictures, dermoscopy, hair weight, contrasting felt examination, phototrichogram, Tricho Scan), semi-invasive (trichogram and unit area trichogram), and intrusive procedures (e.g., scalp biopsy).[3-5] No method is ideal or realistic. These are useful for patient diagnosis and monitoring when interpreted carefully. Daily hair counts, wash tests, etc. are good ways to evaluate a patient's shedding. Hair clinics use procedures like global photography. Phototrichogram is exclusively used in clinical trials. The procedures like scalp biopsy require processing and interpretation expertise.[6]

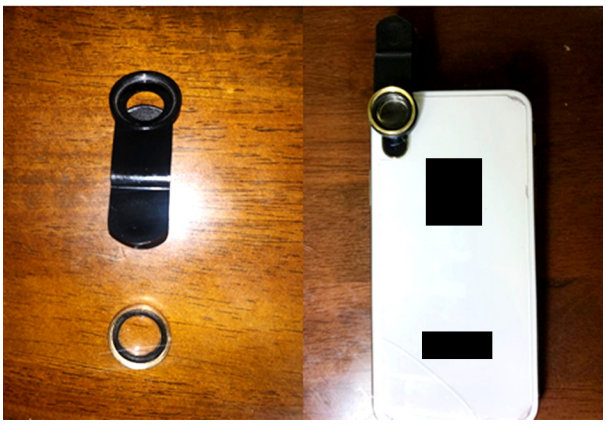

Fig. 1: Magnifying clip lens with mobile phone

The questionnaire consists of a set of questions for patient self-assessment, which have been shortlisted and psychometrically evaluated for validity. Daily scalp hair counts can be useful to the physician to help quantify how much the patient is losing and make sure that this is not more than the physiologic hair loss.[7] It is said that it is normal to loosen up to 100 hairs per day. Patients are instructed to collect hairs shed in one day, count them and place them in plastic bags. All shed hairs in the shower or sink or on the brush are collected. Daily hair counts for 7 days are maintained.[8] Unlike the conventional handheld dermoscope, videodermoscopy permits rapid, high-resolution viewing at several magnifications (up to×1000 with advanced models), together with the ability to capture the viewed images digitally and to store them for later use. Images can usually be obtained with this system at 20×–70×magnifications. Dermoscopy and videodermoscopy have a role in the diagnostic assessment of scalp and hair disorders.[9] Information may be used in conjunction with clinical and pathologic data to render a more accurate diagnosis. The global photography helps in getting the idea of overall hair pattern of the individual. TrichoScan can

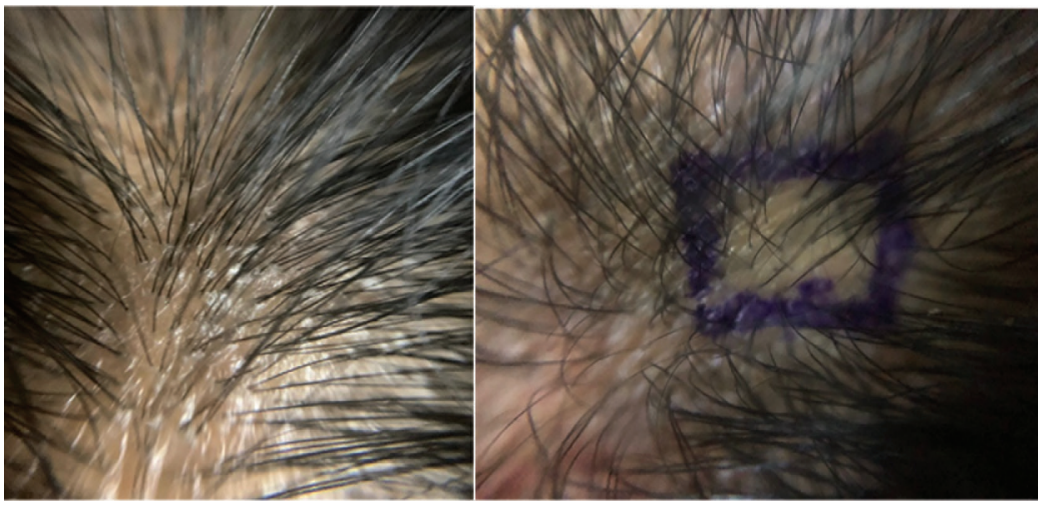

Fig. 2: Alopecia photography done with mobile camera with magnifying clip lens

be viewed as a modification of the classical trichogram. It combines standard epiluminescence microscopy with automatic digital image analysis for the measurement of human hair. The software quantifies the number of hairs and the anagen-telogen ratio within one operation. The use of TrichoScan initially involves shaving a scalp area (approx. 1.8 cm^2). After 3 days, hairs in the shaven area are dyed and a digital photograph is taken at 20-fold magnification and saved.[10,11] The TrichoScan software works on the basis that telogen hairs do not grow. The software uses this as a basis for calculation of the anagen-telogen ratio. Thus, the basic procedure is quite similar to that of the classical phototrichogram. The claimed advantage of this procedure lies in its simple and speedy photographic processing and the painlessness of the procedure with the reproducibility of results.[12]

In our study we used Magnifying clip lens attached to the mobile camera for taking pictures of scalp under magnification as a hair assessment tool in the outpatient department and in the treatment protocol.

Conclusion

The magnifying clip lens is easily adaptable method by any physician all over the world as a hair assessment tool in dermatology. This can be employed in other dermatology problems for taking photographs. Large Volume studies are required for assessing its wide usage in the various indications.

Conflicts of interest: None

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Role of Low-Level Laser Therapy in Wound Bed Preparation in Necrotizing Fasciitis

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ABSTRACT

Necrotizing fasciitis is an infection of subcutaneous tissue and fascia which may spread rapidly to deeper tissue and surrounding tissue which may cause damage to the tissue and present as a localized infection and fulminant septic shock with high mortality rate. Low-Level Laser therapy has been found to be effective in wound bed preparation. This study highlights our experience in wound bed preparation using Low Level Laser therapy as an adjuvant in a case of necrotizing fasciitis.

Keywords: Low level laser therapy; Wound bed preparation; Necrotizing fasciitis.

INTRODUCTION

Necrotizing soft tissue infections (NSTIs) include necrotizing forms of fasciitis, myositis, and cellulitis. These infections are characterized clinically by fulminant tissue destruction, systemic signs of toxicity, and high mortality.[1] Accurate diagnosis and appropriate treatment must include early surgical intervention and antibiotic therapy. Several different names have been used to describe the various forms of necrotizing infections; this is related in part to naming based on clinical features rather than surgical or pathologic findings. The degree of suspicion should be high since the clinical presentation is variable and prompt intervention is critical. The lay press has referred to organisms that cause NSTI as flesh eating bacteria.[2] There is sufficient evidence to conclude that healing of necrotizing fasciitis is accelerated by LLLT. Though it is well established therapy in the armamentarium of wound management, its role in wound bed preparation before cover by skin graft or flap has not been studied well. LLLT has been found to be effective in wound bed preparation but has not been reported in literature for necrotizing fasciitis. This study highlights our experience in wound bed preparation using Low level Laser therapy in a case of necrotizing fasciitis.

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Materials and Methods

This study was conducted in the department of plastic surgery in a tertiary care center after obtaining the departmental ethical committee approval. Informed written consent was taken from the patient. The study is a prospective observational type done on a 60-year-old male with known co-morbidities including hypertension & coronary artery disease with ejection fraction of 25%. Patient presented with raw area (fig. 1) over left lower limb & perineum of one month

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duration. He was apparently well one month back when he developed multiple blebs over left lower limb & perineum which ruptured leaving raw area with rapid progression of wound infection with foul smelling discharge. He was diagnosed with clinically as a case of necrotizing fasciitis. He underwent multiple debridement in referral surgery department after that he was referred to department of plastic surgery for further wound care. There are various modalities of regenerative wound care out of which here we used low level laser therapy (fig. 2) as a regenerative modality for wound care. We used gallium arsenide (gas) diode red laser of wave length 650nm, frequency 10khz and output power 100mw, which was a continuous beam laser with an energy density of 4 j/cm^2. Machine delivers laser in scanning mode (non-contact delivery) with 60 cm distance between laser source and raw area. Raw wound area was given laser therapy (fig. 3) for duration time for 15 minutes twice weekly for 3 consecutive cycles. Till wound bed got ready cadaveric human skin (allograft) was used as biological dressing. Wound bed was reassessed every weekly till wound bed got ready for cover by skin graft or flap.

Results

After 3 weeks, the wound bed got ready with appearance of healthy granulation tissue (fig. 4). The future plan is to cover the raw area with skin grafting once patient becomes fit for

Fig. 1: At admission with extensive necrotizing fasciitis of left lower limb & perineum

Fig. 2: Low-Level Laser machine

Fig. 3: Application of Low-Level Laser Therapy

Fig. 4: Wound bed with healthy granulation tissue with allograft in position

anesthesia.

Discussion

Necrotizing fasciitis is a life threatening condition, with a high mortality rate (median mortality 32.2%) that approaches 100% without treatment. Numerous conditions are associated with this pathology, such as diabetes mellitus, immunosuppression, chronic alcohol disease, chronic renal failure, and liver cirrhosis, which can be conductive to the rapid spread of necrosis, and increase in the mortality rate. The diagnosis of NF is difficult and the differential diagnosis between NF and other necrotizing soft tissue infections. The delay in diagnosis can be fatal, and septic shock is inevitable if the disease remains untreated. The characteristic of NF is the clinical status change over time. The early clinical picture includes erythema, swelling, tenderness to palpation, and local warmth; once the infection develops, the infection site presents skin ischemia with blisters and bullae. The diagnosis of NF can be secured faster with the use of laboratory based scoring systems, such as the LRINEC score or the FGSI score, especially in cases of Fournier's gangrene. However, the diagnosis is definitely established by performing explorative surgery at the infected site.[1]

Management of the infection begins with

antibiotic treatment. In the majority of cases with NF (70–90%) the reasonable pathogens are two or more, suggesting the use of broad spectrum antibiotics. The value of antibiotic treatment in NF is relatively low, and early and aggressive drainage and debridement is required. In NF of the extremities, the clinician should consider amputating the infected limb, although this will not reduce the risk of mortality. Finally, post-operative management of the surgical wound is important, along with proper nutrition of the patient.[2]

The use of LLLT therapy in wound management has greatly improved the results of post-operative management. LLLT helps in take up of FTSG and thus decreases morbidity related to necrotizing fasciitis. The acronym LASER abbreviated as "light amplification by stimulated emission of radiation", are defined by a power density at <l500 mW/cm^2.[3] Energy used in LLLT is much less than the one used for cutting, and ablation therapy. LLLT is a form of phototherapy that employs electromagnetic radiation, that is capable of generating enough energy for interacting with living tissues. It produces photochemical and photophysical effects without generation of heat, with consideration of re-establishing cell homeostasis. Essentially, light energy is delivered topically in controlled way which is absorbed by photo absorbers (chromophores) that transform it into chemical energy.[4]

Positive effects include increased formation of granulation tissue and acceleration of tissue repair, wound contraction, inflammation, modulation, and pain reduction. As per literature, low energy photo emissions given at a wave length range of 600nm to 900nm accelerate cell proliferation and promote wound healing.[5] Its action is thought to:

- Stimulate respiratory chain components promoting ATP synthesis,[6] and hence increase rate of mitoses and fibroblast numbers.[6]
- Stimulate collagen and elastin production.[7]
- Stimulate microcirculation with dilatation of the capillaries and neovascularisation.[8,9]
- Liberate mediator of inflammation histamine, serotonin and bradykinin and hence activate macrophages.
- Regenerate lymphatic vessels. In our study we found Low level Laser therapy (LLLT) as an effective adjuvant therapy in the wound bed preparation.

Conclusion

In our study we found that LLLT was useful in promoting granulation and Wound bed preparation. The limitation of the study includes that it is a case report with a single center study with no statistical analysis. Further randomized controlled studies are required to validate the efficacy of the LLLT in the Wound bed preparation of necrotizing fasciitis wound.

Conflicts of interest: None

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Role of Hybrid Reconstruction Ladder in Electric Burns

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ABSTRACT

Electrical injuries occur when high energy current travels through the body due to contact with an electrical source. Injuries can occur due to various methods; the flow of current through body, arc flash, clothing catches fire to name a few. In the former two, the body converts electricity into heat, which results in thermal burns. It is important to note that the external appearance of an electrical burn does not accurately predict the extent of the injury, as internal tissues and organs may be impacted severely than it appears from outside.[1]

Keywords: Hybrid Reconstruction; Electric Burns.

INTRODUCTION

Electricity is an indispensable part of modern life. However, use of multipurpose electricity in daily life increases the risks of accidents, injury or death. Electrical burns if severe and associated with high voltage (>1000 V) can cause significant morbidity and mortality. Of all the burns treated in a medical setting, 4% to 5% are electrical.[2] In the United States, accidental high voltage electrical injuries account for approximately 400 deaths per year and the total number of electrical deaths is approximately 1,000 per annum, thus making it a devastating, but preventable hazard. Electrical injuries in adults are most commonly occupational, with males more frequently affected than females. In children, household electrical injuries are more common. To minimize the functional effects, reconstruction with skin flaps or grafts should be performed as soon as possible.[3] Recent advances include reconstructive techniques merged with regenerative medicine modalities to improve outcomes in these cases. These treatments combine traditional reconstruction measures with regenerative medicine applications and has been termed 'hybrid reconstructions'.[4] The hybrid reconstruction model (fig. 1) aims at maximizing the function and to minimize the disability and morbidity associated with traditional reconstruction.

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Materials and Methods

This study was conducted in the department of plastic surgery in a tertiary care center after obtaining the departmental ethical committee approval. Informed written consent was taken from the patient. The study is a prospective observational type done on a 60-year-old male with known co-morbidities including hypertension & coronary artery disease with ejection fraction of 25%. Patient presented with raw area (fig. 1) over

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Fig. 1: Hybrid Reconstructive Ladder
Source Article: Plastic Surgery Challenges in War Wounded II: Regenerative Medicine[5]

left lower limb & perineum of one month

Methods and Materials

This study was conducted in tertiary care centre in department of plastic surgery after getting the department ethical committee approval. Informed consent was obtained for examination and clinical photography.

A 13 year old girl with 5% electric burns on forehead and bilateral lower limbs (Fig. 1) was admitted and underwent hybrid reconstruction ladder therapy. She underwent multiple sessions of hydrojet therapy, prolotherapy, activated platelet rich plasma, heterografting with collagen, collagen oinment local application, non adhesive dressing, negative pressure wound therapy, Vitamin D3, sucralfate local application, secondary dressing & splinting, and finally Er: YAG laser (Fig. 3-12) to healed areas to remove scars during her course in hospital.

Results

After the hybrid reconstruction ladder therapy, wound healing improved and there was good wound bed preparation for heterografting without any local adverse effects.

Fig. 2: Facial burns at the time of admission

Fig. 3: Burn wounds in the foot at the time of admission

Fig. 5: Application of hydrojet debridement

Fig. 6: Application of prolotherapy

Fig. 7: Application of Vitamin D3, sucralfate therapy

Fig. 8: Application of non adhesive dressing

Fig. 9: Application of heterografting (collagen)

Fig. 10: Application of negative pressure wound therapy

Fig. 11: Application of secondary dressing on the face

Fig. 12: Application of Er:YAG laser on healed areas

Fig. 13: Wound at discharge

Patient was discharged after wound healing and scar reduction. (Fig. 13)

Discussion

In recent years, surgical teams have incorporated a "hybrid reconstructive ladder/elevator" paradigm, in which regenerative medicine therapies are used in conjunction with traditional approaches of reconstruction. This novel treatment paradigm is originally a modification of the conventional reconstructive ladder and has led to improvement in definitive closure of wounds with extensive soft tissue loss.[6] Literature on the topic suggests that technique escalation in accordance with the ladder should be undertaken based on wound etiology, presentation, extent and nature of tissue loss, available resources, and surgeon expertise.[7] It involves starting at the bottom of the ladder and escalating up if one therapy fails to improve the wound. A study conducted in Turkey in 2015 involved 117 patients with HVEI (high voltage electrical injury) who were treated with a flap cover and HVEI defects should include urgent first aid followed by serial debridement and reconstruction with a reliable flap.[3] Hydrojet therapy, prolotherapy, activated platelet rich plasma, heterografting with collagen, collagen oinment local application, non adhesive dressing, negative pressure wound therapy, Vitamin D3, sucralfate local application, secondary dressing & splinting, and Er: YAG laser were the components of hybrid reconstruction ladder used in our patient. Except for the high cost and requirement of extensive infrastructure, hybrid reconstruction ladder is a promising advancement in the field of reconstruction.

Conclusion

Hybrid reconstruction ladder is an important alternative in the treatment of electrical burns patients. At each step of the reconstruction ladder, results were better,

and these modalities may allow for the expansion of indications for each step. The performance of simultaneous hybrid procedures is associated with potential advantages such as reduction in the length of hospital stay and associated morbidity, hospital acquired infections. It also helps in better wound healing, early and definitive recovery. In our study the hybrid reconstruction ladder approach to treatment of electric burns was found to improve wound healing and reduce overall morbidity, hospital stay and better scar outcome.

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Role of Hybrid Reconstruction Ladder in Scald Burn

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ABSTRACT

Burns and other related ailments frequently result in fatalities and disabilities. Children and adults suffer burn cases at a higher rate than other age groups. Contact with hot surfaces and scald burns are the most typical hospital presentations in toddlers under the age of two. Some of the factors include the custom of cooking on the ground or sleeping next to a burning candle. Better outcomes are seen when this sort of burns are treated quickly. In this instance, we discuss the use of a hybrid reconstruction ladder in the treatment of pediatric scald burns.

Keywords: Management; Scald Burn; Hybrid Reconstruction Ladder.

INTRODUCTION

One of the most common causes of illness and mortality in children is burns. Basic understanding of thermal injury is crucial for managing burns in children who present with them. According to a Davis study from 1990, there are 2 million burn cases across the Indian Subcontinent every year. Burn victims make up 40% of those under 15 years old. 90% of kid burn injuries are caused by scalding and hot liquids. At home, open fire areas and the kitchen are typical locations. Plastic and reconstructive surgeons developed the phrase "reconstructive ladder" to characterize stages of progressively sophisticated care of soft tissue wounds.[1] The simplest reconstruction strategy would be used by the surgeon to solve a clinical reconstructive problem, which is the lowest step on the ladder. Regenerative medicine techniques can be added to the conventional reconstructive ladder using the hybrid reconstructive ladder (fig. 1). We evaluate the function of the hybrid reconstruction ladder in the treatment of pediatric heat burns in this case report.

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Materials and Methods

This research was carried out in a tertiary care facility's plastic surgery department. The patient who was the subject of the study provided informed consent. The approval of the departmental scientific committee was gained. It is a non-randomized, non-controlled trial that only has one centre. The patient, a female 2-year-old with no other known comorbidities, had right chest, arm, and forearm second degree deep scald burns that made about 15% of the total burn surface area (fig. 2). A non-cultured keratinocyte graft was applied after the burn lesion was debrided with regenerative therapies such Autologous platelet rich plasma (APRP) (fig.s 3 and 4). For four weeks, APRP was applied once each week. scaffold

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dressing made of collagen was used (fig. 5). On the wound, negative pressure wound treatment was used (fig. 6). Once a week, low level laser therapy was used for 10 minutes (fig. 7).

Results

The superficial second degree burn wounds recovered quickly. Patient was successfully discharged, and all burn injuries had entirely healed (fig. 8). Both the surgical procedure and the recovery period went smoothly.

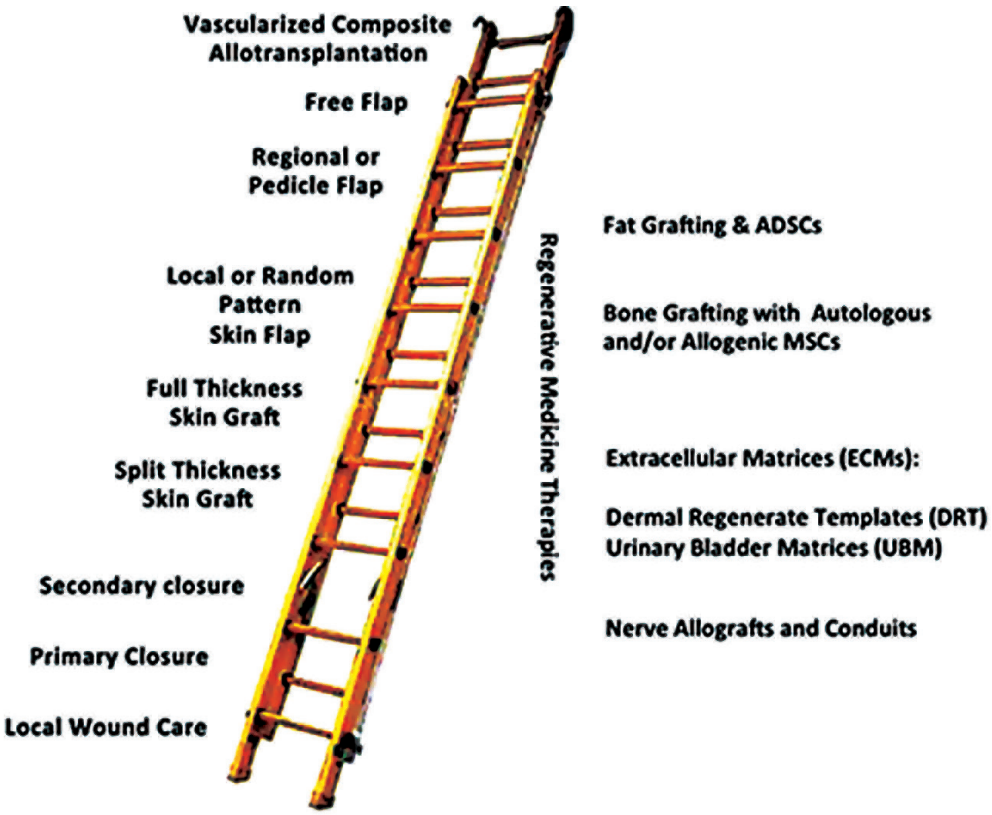

Fig. 1: Hybrid reconstruction ladder

Discussion

Based on the method of injury, burn wounds can be divided into six different categories: scalds, contact burns, fire, chemical, electrical, and radiation. In this article, the first three forms of burns are discussed. Steam, grease, or liquids can all produce scald burn injuries. Spill and immersion scalds are further categories for liquid burns. Flash burns and flame burns are two types of fire burn injuries. A predictor of outcome can be found in the mechanism of burn injury. For instance, people who suffer from flame burns and electrical burn injuries frequently need to be hospitalized. In contrast, the majority of patients with burns brought on by sun exposure or contact with hot surfaces are treated as outpatients.

Burn injuries are a terrible concern for critical care. Burns in children continue to be an important global health issue that cause severe morbidity and mortality. It appears that there are considerable physiological and psychological differences between treating these burn injuries in children and adults, despite the similarities in treatment. In comparison to adults, the dermal layer of skin is often thinner in newborns, infants, and children. The danger of hypothermia in children is increased by increased evaporative loss and the requirement for isotonic fluids.

The care of difficult injuries has been altered by hybrid reconstructions, which also provided an expansion of the procedures that can be used to treat composite tissue loss. There is still a need for more study and the creation of tactics to deal with complex tissue loss. Utilizing biologic scaffolds could speed up the healing of wounds.[1] In addition to helping in tissue moulding, APRP is known to encourage the production of collagen, blood vessels, and adipose tissue.[2,3] This not only aids in the absorption of skin grafts placed but also ensures scarring that is more

Fig. 2: At the time of presentation

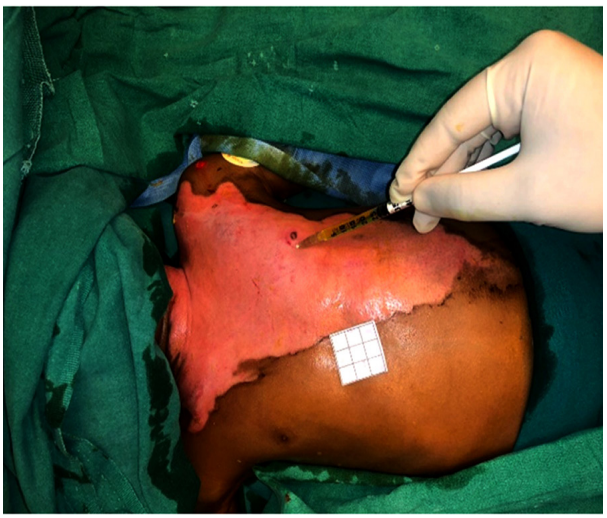

Fig. 3: Autologous platelet rich plasma applied to the burn wound.

Fig. 4: Application of non-cultured keratinocyte graft (NCKG) over the non-healed areas on day 8

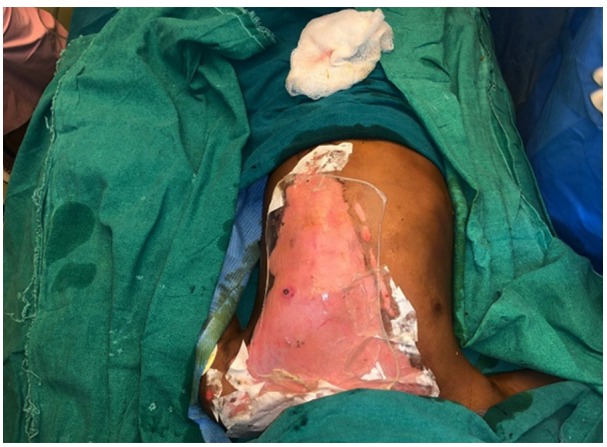

Fig. 5: Application of collagen scaffold dressing

Fig. 6: Negative pressure wound therapy

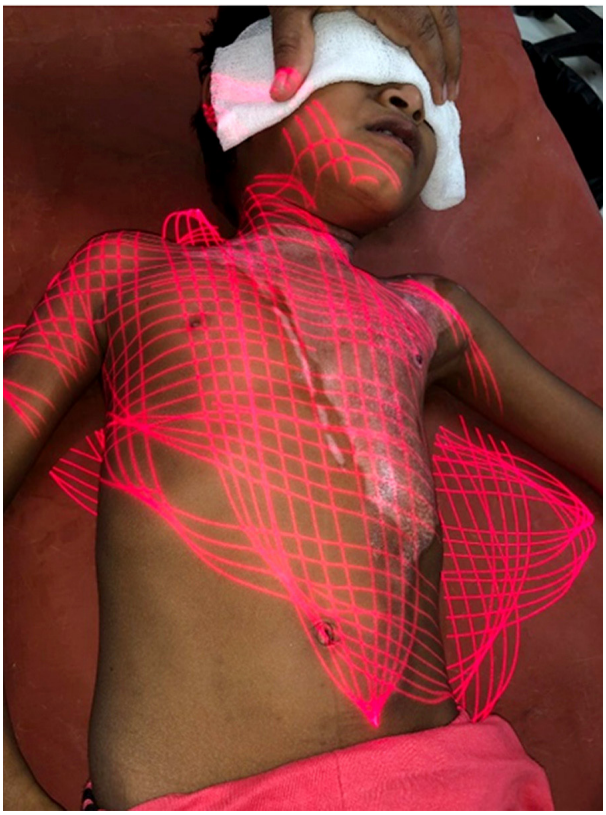

Fig. 7: Low level laser therapy.

Fig. 8: Healed burn wounds at the time of discharge.

aesthetically pleasing.[4,5]

Topical sucralfate therapy has been shown to be beneficial in treating wounds in studies and rare case reports. In vitro, sucralfate stimulates the development of dermal fibroblasts and keratinocytes while inhibiting the release of interleukin-2 and interferon-gamma from injured skin cells.[6,7] Sucralfate decreases inflammatory response and encourages mucosal repair through the creation of a physical barrier. Sucralfate also encourages angiogenesis, which hastens the healing of wounds. Basic fibroblast growth factor (bFGF) and epidermal growth factor levels are increased in the wound by sucralfate.[8] In addition, sucralfate encouraged skin cells to generate IL-6 and PGE2, which benefited in the healing process.[9]

LLLT stimulates tissue regeneration, wound healing, and repair in addition to having analgesic and anti-inflammatory properties.[10] At the cellular level, LLLT promotes cell regeneration, increases collagen production, reduces the development of fibrous tissue, decreases oedema, increases growth factor synthesis, reduces the number of inflammatory cells, reduces the synthesis of inflammatory mediators like substance P, bradykinin, histamine, and acetylcholine, and stimulates the production of nitric oxide. The photobiological effects are influenced by the LLLT treatment's intensity, wavelength, and duration. LLLT lasers are frequently made of gallium arsenide (Ga-As), gallium aluminium arsenide (Ga-Al), krypton, helium neon (Hé-Ne), ruby, and argon. It has been used to treat burn wounds, acute and chronic pain, wrinkles, scars, hair loss, and photo rejuvenation of photodamaged skin in addition to wrinkles, scars, and hair loss. As a result of its biostimulatory properties, LLLT has proven to be useful as an adjuvant therapy in the treatment of wounds. Low-level laser therapy (LLLT) can improve and speed up the healing process for burn wounds and also help with scar modulation.[11]

The literature suggests that the four primary processes by which negative pressure wound therapy works are contraction of the wound, stabilisation of the environment around the wound, drainage of extracellular fluids, and micro deformation at the foam wound interface.[12] It has helped with scar modification and burn wound healing.

Application of cultivated keratinocytes seems to encourage the development of wholesome granulation tissue within the wound bed. When used as a sheet, the graft functions as an occlusive dressing to keep the surrounding area moist and avoid wound dehydration. The overwhelming body of research points to the fact that cultured epidermal allografts do

not last after transplantation indefinitely.[13] However, it appears that their brief contact with the wound is enough to promote epithelialization, especially when dermal tissue is present in the wound bed. This could be as a result of keratinocytes releasing growth factors that may help with wound healing. In addition, keratinocytes secrete a number of growth factors that aid in the healing of wounds. It is well known that cultured keratinocytes secrete a variety of substances that promote the in vitro development of keratinocytes, fibroblasts, and melanocytes. The factors interleukin-1, additional interleukins, and transforming growth factor alpha have been identified. The origin of these keratinocytes can be either autologous or allogenic.[14] Trypsin or other techniques are used to separate these cells from the skin graft. These are cultivated in the proper conditions after separation to create a sheet. These sheets are applied to the wound as a graft. To aid in the healing process in our situation, we employed autologous keratinocyte cells that were not grown or trypsinized. We saw positive results in the quick epithelialization of the wound from the margins and the healing of scald burn wounds.

Conclusion

Pediatric scald burn patients can be successfully treated using the hybrid reconstruction ladder with regenerative therapies.

Conflicts of interest: None.

Authors' contributions: All authors made contributions to the article.

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Role of Non-Cultured Keratinocyte Cell Grafting in Management of Full Thickness Skin Graft Loss our Experience: Case Report

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ABSTRACT

All deeper burns i.e. second degree deep dermal and full thickness heals by scarring that causes restrictions in the movements and aesthetics issues for patients. Burn reconstructive surgery requires that the defects after release should be replaced with donor tissues which have matching texture and colour like autologous skin grafting or flap surgeries. Here we are using this method to look for role in management of failure of take of FTSG in a case of post burn contracture. Full thickness skin grafts include full thickness of the epidermis and dermis whereas split thickness skin grafts (STSG) include the entire epidermis and only partial dermis. The main complication of this procedure is risk of graft failure. Keratinocyte cells suspension is claimed to hasten the wound healing. In this article, we share our experience of using non-cultured keratinocyte grafting (NCKG) in improving the take of pixel grafting following full thickness skin graft (FTSG).

Keywords: NCKG; FTSG; Pixel Grafting; Post Burn Contracture.

INTRODUCTION

Burn trauma constitutes the second most common cause of trauma related deaths after vehicular accidents, in both developing and developed country. An extensive burn is the most devastating injury that human being had to suffer. After immediate concern for survival in victim, restoration to pre-injury status, and return to daily activities becomes important for victim and treating team.[1] A healed burn patient may be left with contractures and scars with varying degrees of functional issues and cause social stigma among victims. The healed contractures need to be revised and raw areas covered with FTSG or STSG which may be associated with delayed wound healing of the skin grafts due to aberrant vascularity of the graft bed.

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Materials and Methods

This study was conducted in Plastic surgery department in a tertiary care center in the month of November-December 2021. The patient is male child a case of Post burns recurrent band like constriction of Right index and middle fingers with restriction of daily activities with USS:12/13 (fig. 1). Release of post

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burns contracture with FTSG with K-wire fixation was done. (Fig. 2) post operative period patient there was epidermal loss of FTSG which was managed with pixel grafting and the patient was discharged, patient returned to us with epidermal loss following frictional trauma to the finger. We used non cultured keratinocyte epidermal graft (NCKEG) to manage the pixel graft loss. Under all aseptic precautions, a 3cm x 1cm area of groin region was marked (Fig. 4) Local anaesthesia (2% xylocaine) was given. The donor area was derma braded (Fig. 4) after the application of mupirocin ointment. The paste, containing dermabraded cells, was collected, homogenized, and was applied on the wound. A non-adherent dressing was placed on it followed by gauze dressing. The wound was inspected on the 7th day and there after weekly. Remnant raw area was calculated on each dressing.

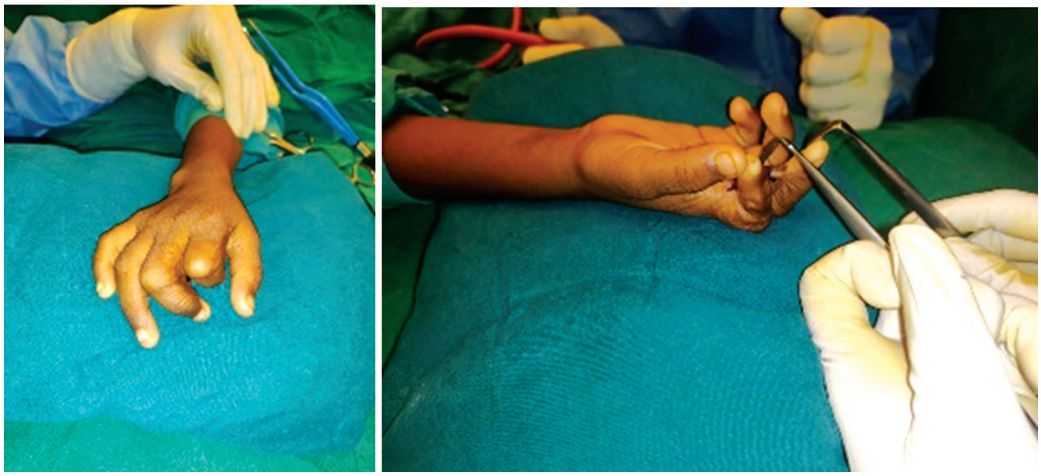

Fig. 1: post burns contracture in right index and middle finger

Fig. 2: PBC release with FTSG and K WIRE fixation done

Fig. 3: FTSG raw area

Results

NCKG treated wound showed accelerated wound healing (fig. 5). Though the grafted cells did not survive but rapid epithelialization started from the periphery of the wound.

Fig. 4: NCKG harvested

Fig. 5: Healed FTSG

Discussion

Wound healing is a complex process. It involves three phases inflammation proliferation and maturation.[1] The chronic wounds are characterized by a prolonged and persistent proliferative phase due to altered local and systemic factors. The spectrum of modalities available to manage these types of wounds is very wide. Conveniently it can be grouped into four categories conventional therapy, novel therapy, reconstructive therapy, and cell based therapy. Conventional therapies include conventional dressings with or without topical application of antimicrobial agents, growth factors; various biological dressings such as silver and alginate; hyperbaric oxygen, etc. Novel therapies include the use of platelet rich plasma, negative pressure wound therapy, and skin substitutes. These are minimally invasive with much better healing efficacy than conventional therapies. Reconstructive therapy, such as skin and flap grafting, are invasive and damage the normal tissue also. Cell based therapy is also emerging as a part of wound management.[2,3]

Application of cultured keratinocytes appears to promote healthy granulation tissue formation within the wound bed. The graft, when applied as a sheet, act as an occlusive dressing, preventing wound dehydration and maintaining a moist environment. The majority of evidence suggests that cultured epidermal allografts do not survive indefinitely after transplantation.[4] Their brief contact with the wound, however, seems sufficient to stimulate reepithelialisation, particularly when dermal tissue is present in the wound bed. This may be due to the release of growth factors by keratinocytes which may favourably influence wound healing. In addition

to this, there is a release of several growth factors by keratinocytes that promote wound healing. It is known that cultured keratinocytes release various factors that enhance the growth of other cells in vitro including keratinocytes, fibroblasts, and melanocytes. Identified factors include interleukin-1, other interleukins, and transforming growth factor-alpha.

These keratinocytes may be autologous or allogenic in origin. These cells are separated from skin graft by using trypsin or other methods. After separation, these are cultured in appropriate media to form a sheet. These sheets are used as graft to cover the wound. In our case, we have used autologous non-cultured, non trypsinised keratinocytes cells to promote the healing. We observed favourable result in terms of formation of healthy granulation tissue and rapid epithelialization of the wound from the margins.

Conclusion

In this study we found that non-cultured keratinocyte grafting has role in healing of the wound and the wound heals at faster rate. But since it is a single case study, definite conclusion cannot be made. Large randomized control trials are required to confirm the efficacy of NCKG in wound healing.

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Availability of data and materials: Not applicable.

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Role of Golden Ion Technology in Skin Rejuvenation: Case Report

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ABSTRACT

Skin rejuveneation with facial massage is an important method that has been used for a bvery long time. It breaks the collagen fibrils, realingn them and aid in formation of extracellular matrix. Recently we have come across the use of massager with golden ion and have used in our patient and have found useful

Keywords: Skin Rejuvenation; Golden Ion Technology; Face Massage.

INTRODUCTION

Skin aging is process that is affected by genetic and environmental factors. Chronic exposure of UV radiation is an important cause of aging and can cause solar elastosis, degradation of the extracellular matrix (ECM), as well as wrinkle formation. Skin aging is influenced by both intrinsic and extrinsic factors. Intrinsic or chronological skin aging results from the passage of time and is influenced by genetic factors. Extrinsic skin aging mainly results from UV irradiation, which is called photoaging. These two types of aging processes are superimposed in sun exposed skin, and they have common clinical features caused by dermal matrix alterations that mainly contribute to wrinkle formation, laxity, and fragility of aged skin.[1]

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Materials and Methods

This study was conducted in the department of Plastic Surgery at tertiary care center after getting the departmental ethical committee approval. Informed written consent was taken from the patient. The details of the patient in study are as follows: 56 yrs gentle man with c/o feeling of being aged more than his age came to the OPD for skin rejuvenation (fig. 1). The patient was advised to use golden ion massage bar for skin rejuvenation. The golden ion massage bar (fig. 2) consist of T shaped instrument with gold plating over the shot limb. The massage bar weighs about 120 grams, dimension of 15.24*2.54*2.54 cm in size and has a handle for strong grip with a vibration frequency of 6000

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times per minute. It works on one AA battery. The patient used the massage bar for 6 weeks daily for 10 minutes over his face. (fig. 2).

Results

The patient reported that his skin felt more young and that his face rejuvenated (fig. 3). Patient was satisfied with the treatment and felt the massager easy to use

Discussion

The dermal matrix contains ECM proteins such as collagen, elastin, and proteoglycans which is responsible for conferring strength and resiliency of the skin. Skin aging associated with dermal matrix alterations and atrophy can be caused by senescence of dermal cells such as fibroblasts, and decreased synthesis and accelerated

Fig. 1: Patient face before treatment

Fig. 2: golden ion massage bar applied to the patient

Fig. 1: Patient face before treatment

Fig. 2: golden ion massage bar applied to the patient

breakdown of dermal collagen fibers.[2]

Vibration therapy was a method known back in ancient times. Today, many devices that apply vibrations are accessible, most often with fixed parameters describing the generated vibrations. The impact of vibration on the human body is multidirectional. Among others, vasodilatation is observed, resulting in an improvement in blood and lymph circulation[3], as well as a change in muscle tension through reflex activation.[4] It is also confirmed that vibration therapy exerts an antalgic effect and leads to an increase in muscle mass and bone density.[5-7]

The sue of golden ion has been associated with various benefits. Gold can activate the basal cells of the skin which reduces the elasticity of the skin. It thus reduces wrinkles, fine lines, blemishes and marks on the skin, and will make look younger. The ions present in gold help in stimulating the cells, nerves and veins in your body which leads to improved blood circulation. This will increase the metabolism of skin cells and secretion of the waste. Gold can help to stimulate the cells and have a healthy skin. Dryness of skin can lead to its premature aging. Use of gold can reduce the dryness of skin and helps in increasing the metabolic rate. This would prevent the skin from premature aging. Collagen is naturally produced in our body which keeps the body flexible. It is responsible for giving smooth skin and shining hair. The collagen level in the body starts depleting from the age of 20-30yrs. Skin care with gold can slow down the depletion of collagen level in your skin cells. Production of melanin or black pigment in the skin is responsible for tanning of the skin, when exposed to sunlight. The production of melanin in the body can be reduced with the use of gold.

Skin tends to sag when its elasticity decreases or is completely lost. Use of gold can breakdown the elastin gradually and restore the elasticity of the tissues. This would further prevent the skin from sagging. Gold increases the elasticity of the skin, thus makes it firm and toned.

Conclusion

The patient noticed that after using the golden ion massage bar his skin felt more rejuvenated. However it needs large scale multicentric randomized controlled trial to be brought into practice

DECLARATIONS

Acknowledgment: Authors' contributions

All authors made contributions to the article: Availability of data and materials

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Conflicts of interest: None.

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Role of Platelet Rich Fibrin Matrix in Keystone Perforator Flap

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ABSTRACT

Flaps are important part of reconstruction ladder for wounds and defects following trauma, burns, surgery and infection. Keystone flap is a fasciocutaneous perforator flap on the local level. The robust vascularity of perforator flaps, relative ease of technique, quick operative time, good reproducibility, convenience of usage, and local tissue aesthetic similarities are all advantages of the keystone island flap. Platelet rich fibrin matrix (PRFM) is a fibrin matrix gel comprising platelets, leucocytes, cytokines, and circulating stem cells polymerized in a tetra molecular structure. In this article we employed platelet rich fibrin matrix in the wound bed to prompt the adherence of a type 4 keystone flap in a patient with scalp defect post electrical burn.

Keywords: Platelet Rich Fibrin Matrix; Keystone; Flap; Plasma.

INTRODUCTION

Flaps are important part of reconstruction ladder for wounds and defects following trauma, surgery and infection. Behan first characterised the keystone island flap in 2003. It's a fasciocutaneous perforator flap on the local level.[1] The robust vascularity of perforator flaps, relative ease of technique, quick operative time, good reproducibility, convenience of usage, and local tissue aesthetic similarities are all advantages of the keystone island flap. This approach eliminates the need for microsurgery, extra skin grafts, and lengthy operative time. The keystone flap gets its name from its resemblance to the architectural keystone that marks the arch's middle section. It uses nearby skin and soft tissue to produce a good colour match while also recreating the defect's contour, resulting in a considerably improved cosmetic result.

Platelet rich fibrin matrix, which is rich in growth factors, has been demonstrated to be beneficial for the adherence of the flap to the bed in recent research.

We employed platelet rich fibrin matrix (PRFM) to prompt the adherence of a type 4 keystone flap to the bed in a patient with scalp defect.

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Materials and Methods

This study was conducted in a tertiary care hospital after obtaining approval from department scientific and ethical committee. This is a prospective, descriptive, observational case study. Informed consent was obtained from

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the patient. This case report is about a 45 year old male who sustained electrical burn injury by 220 volts alternating current to the vertex region of the scalp (entry zone) and the left leg (exit zone). The patient was disoriented and unconscious at the time of admission with a Glasgow score of 12 and was intubated. Multiple second degree superficial burns were present over the face, neck, chest and anterior aspect of abdomen, bilateral arms, bilateral thighs and second-degree deep burns involving frontoparietal region of scalp at the vertex (fig. 1). CT skull showed small ill defined hypodense area with loss of grey white differentiation noted in the left frontal region suggestive of left frontal infarct. He was resuscitated with the standard WHO burn protocol. Serum electrolytes, urea and creatinine, urine analysis, and electrocardiogram were normal, urine myoglobin negative. Patient was asymptomatic with no seizures, syncope, focal neurological deficits. He was managed conservatively with prophylactic antiepileptic Phenytoin. The patient was extubated after three days of intensive care. According to the manual muscle test, both upper and lower extremities were normal. Sensory function was intact, muscle stretch reflexes were normoactive, no pathological reflexes were identified, and all the other cranial nerve and cerebellar functions were normal. Debridement of scalp wound was done after demarcation of necrotic patch. Once the wound bed showed healthy granulation, perforator based type 4 keystone flap was done. To enhance to adhesion of flap to the wound bed and for the nutriment of the flap Platelet Rich Fibrin Matrix was made. Ten millilitres of venous blood were taken under rigorous aseptic conditions and placed in a sterile centrifugation tube devoid of anticoagulant. For 10 minutes, centrifugation was performed at 3000 rpm (about 400 g). Upper straw-colored platelet deficient plasma (PPP), lower red-colored fraction containing red blood cells (RBCs), and intermediate fraction containing PRFM were obtained. The upper layer of straw colour (PPP) was discarded. Using sterile forceps and scissors, PRFM was removed from red corpuscles at the base, leaving a thin RBC layer measuring roughly one millimetre in length that was deposited onto sterile gauze (fig. 2). The PRFM was applied to the wound bed before the inset of the flap.(fig. 3) study was conducted in the department of Plastic Surgery at tertiary care center after getting the departmental ethical committee approval. Informed written consent was taken from the patient. The details of the patient in study are as follows: 56 yrs gentle man with c/o feeling of being aged more than his age came to the OPD for skin rejuvenation (fig. 1). The patient was advised to use golden ion massage bar for skin rejuvenation. The golden ion massage bar (fig. 2) consist of T shaped instrument with gold plating over the shot limb. The massage bar weighs about 120 grams, dimension of 15.24*2.54*2.54 cm in size and has a handle for strong grip with a vibration frequency of 6000.

Results

There was good adherence of the flap to the bed and good take of type 4 keystone perforatorflap. (fig. 4)

Fig. 1: Scalp electrical burn wound at presentation

Fig. 2: Platelet rich fibrin matrix made

Fig. 3: applied platelet rich fibrin matrix in the wound bed before flap inset

Fig. 4: Flap adherent to the wound bed and good flap take

Discussion

The keystone flap is made up of two V-Y advancement flaps that face each other. The migration of these advancement flaps results in the availability of additional tissue adjacent to the defect, allowing for main skin edge approximation. Younger surgeons can simply replicate this method because it is straightforward. In order to follow the chosen nourishing vessels for a short tract into the muscle belly or into the septa, microsurgical expertise is frequently required during the vasculature dissection phase of loco regional flaps, which should be performed under loupe magnification. There is also aesthetic morbidity in the donor area of loco regional flaps due to skin grafts. In loco regional flaps, pre-operative Doppler flow is frequently used to locate perforator arteries in the anatomical area. The location of the perforating vessels is operator dependent, time demanding, and not always exact. Donor site morbidity is low with the keystone flap. Only one of our instances required a little skin graft. The donor locations were mostly closed in the remaining cases.[2,3]

Types of Keystone Island Flaps

Type I: Standard flap design with no deep fascia segmentation.

Type II: The convex side of the flap's deep fascia is separated to improve mobilisation. The secondary defect is closed predominantly in Type II a, and the secondary defect is closed with a splint skin graft in Type II b.

Type III: Two keystone flaps, one on each side of the defect, are designed to aid closure.

Type IV: The flap is undermined up to two-thirds of the way. The mobilisation of the flaps is maximised.

In regions where skin expansibility is limited, such as around the knee, ankle, elbow, plantar aspect of foot, and palmar aspect of hand, the keystone flap should be used with caution. We had to raise the distal end of the flap to cover a defect below the knee in our patients since there was less skin laxity.[4] We incised the flap's edges through deep fascia on a regular basis. This will make it easier for the flap to move around and fill the defect. The flap's mobility is equivalent to that of a tree top, and it's only achievable after cutting the deep fascia all the way around the flap's convex border. In situations where the deep fascia was not incised, we saw shearing of the flap and increased strain in the suture line. We did not incise the skin over the central part of the convex surface of the flap to retain more vascularity in the flap when closing smaller defects and in the presence of sufficient laxity, but we did incise the deep fascia underneath the skin to retain more vascularity in the flap when closing smaller defects and in the presence of sufficient laxity. Splints were worn for 3-4 days to aid soft tissue healing in the upper and

lower limbs. In cases when skin grafting has been performed, physiotherapy will be required.[5] In none of the patients was long term splinting used. As a result, bilateral limb surgeries can be completed in one session. Traditional skin grafts, whether with or without a local flap, result in substantial scarring, post-operative immobility, prolonged physiotherapy, graft pressure therapy, and other complications. We operated on an instance of a raw region over the knee joint on the right side of the knee. Four days following surgery, the patient was advised to move his lower limb. Within 9 days, the wound was completely healed. However, unlike a free flap, key stone flaps have minor limitations such as lengthy scars beyond the defect's bounds and a limited arc of rotation. It's critical to make sure the keystone flap's blood supply hasn't been harmed by either cancer ablation surgery or radiation therapy.[6] Despite these drawbacks, keystone flaps provide primary wound healing for a wide range of abnormalities with minimum pain, a sensitive cover, and great cosmetic results. It's been utilised to treat malformations in the head and neck, as well as parotid and trunk deformities. This method can eliminate the requirement for microsurgical flaps. When compared to perforator flaps and microvascular free flaps, the keystone flap has a shorter learning curve. This flap could be a valuable tool in the hands of a plastic surgeon.

Platelets have a vital part in wound healing as well as haemostasis. Platelets emit cytokines and growth factors, which help keratinocytes, fibroblasts, and endothelial cells migrate, proliferate, and function better.[7] Fibrin is a type of fibrinogen that is active. Thrombin converts fibrinogen to insoluble fibrin, which aids platelet aggregation. Platelet concentrates are frequently devoid of coagulation components, hence platelet-rich fibrin matrix (PRFM) was created to address the expected features in tissue regeneration and wound healing. Fibrinogen is concentrated in the upper section of the tube during centrifugation and combines with thrombin to create a fibrin clot. The release of these factors begins 5-10 minutes after clotting and lasts at least 60-300 minutes, resulting in a slow and steady release.[8]

PRFM is a fibrin matrix gel comprising platelets, leucocytes, cytokines, and circulating stem cells polymerized in a tetra molecular structure. PRFM preparation is simpler, requires less handling, and does not require the use of an anticoagulant or thrombin activator.[9] In a hospital; all of the necessary items are readily available. When opposed to the liquid formulation of APRP, the gel form of PRFM is easier to apply to the raw region. After fibrin formation, the action of autologous growth factors and the biomechanical rigidity of plasmatic proteins provide a unique architecture that aids in the healing process. Growth factors from activated platelet alpha-granules, as well as others like fibrin, fibronectin, and vitronectin, play a crucial part in this process. Vessel endothelial growth factor (VEGF), fibroblast growth factor-b (FGFb), Platelet Derived Growth Factor (PDGF), hepatocyte growth factor (HGF), Epidermal Growth Factor (EGF), and angiopoietin-I are examples of these growth factors.[10]

Conclusion

This is a preliminary study to evaluate the role of platelet rich fibrin matrix (PRFM) in adhesion of keystone flap to the wound bed and good take of the flap and it has been demonstrated to be helpful. To confirm the findings, a large multicentric, double blinded control research with statistical analysis is needed.

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