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Role of Autologous Platelet Rich Plasma in Application of Skin Grafts

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

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ABSTRACT

Aim: Skin grafting is a commonly done procedure in plastic surgery. One of the complications that the surgeon is worried about is skin graft failure. Various precautions have been described to prevent this complication. We would like to discuss the role of autologous platelet rich plasma in skin grafting.

Methods: Skin grafting was done for the raw area over the back post electrical burns. Intra-operatively, single injection of 2 ml APRP given to the Skin grafts.

Result: The Skin grafts were healthy, with well healed scars.

Conclusions: We proposed that APRP can be used in application of skin grafts. However, large randomized control trials are required for establishing its role.

Keywords: APRP; Skin grafts; Failure.

INTRODUCTION

ASkin graftis harvested when the surgeon needs to cover the raw area that needs to be covered, known as the recipient site in the local site. Skin grafts can be used to cover the raw area variety of body parts. The head, neck, chest, or breast areas, arms and legs, and the lower back, buttocks, or vagina are all examples. In this case report we will assess the use of autologous platelet rich plasma in the application of skin grafts.

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MATERIALS AND METHODS

In this case report, 32 year old male came to JIPMER Hospital with the chronic non healing ulcer over the lower back of size 5 X 5 cm for past 10 year post electrical burns. After wide local excision of the ulcer histopathology report came as Squamous cell carcinoma with all margins negative for tumor. After tumor removal size of the tumor ulcer size was around 8 x 8 cm. In view of scarred tissue all around the ulcer, local keystone flap based on the perforator on the right side of the ulcer and transposition flap on left side of the ulcer planned. The raw area created post local flaps from the donor site was covered with split skin grafting from the left thigh. During the application of skin grafts we prepared the skin grafts (Fig. 1) and wound bed by application of Autologous platelet rich plasma for decreasing the chance of graft failure. In this Patient, Graft uptake was good with the application of APRP.

Intra-operatively, APRP was prepared using 10 ml of patient's blood, which was mixed with 1000 U heparin and centrifuged at 3000 rpm for 10 min in a centrifugation machine. The supernatant buffy coat is taken into a conical test tube and centrifuged at 4000 rpm for 10 min. The bottom 2 ml of the clear fluid obtained is APRP. APRP was sprayed over the wound bed and over the dermal surface of the skin grafts.[1]

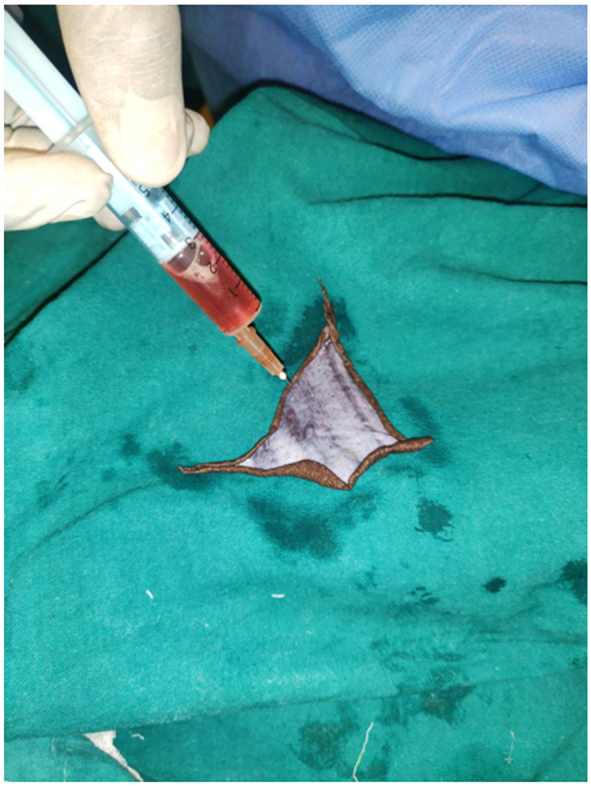

Fig. 1: Skin grafts

DISCUSSION

Our patient has scarred skin surrounding area due to electrical burns for which we planned excision of the ulcer with cover by transposition flap and post operative tip of transposition flap got necrosed and wound debridement done for which skin grafting was planned. As the scar tissue might cause unsatisfactory wound bed which increases the chance of graft failure and hence, we have decided to use APRP as an adjunctive procedure to help prevent skin graft failure. APRP contains several growth factors [(e.g., platelet-derived growth factor (PDGF)], vascular endothelial growth factor (EGF) 2 that are capable to stimulate angiogenesis and increase fibroblast cell differentiation, promote soft tissue healing. PDGF and EGF are the main growth factors involved in fibroblast migration, proliferation, and collagen synthesis.[3] Increased

RESULTS

In this case report, Graft uptake was good (Fig. 2). Skin grafts adhere well to surface of the wound bed and the healing was satisfactory. No complications noted with this procedure.

Fig. 2: Application of APRP treated Skin grafts.

concentrations of these growth factors are likely the reason for the accelerated soft tissue wound healing, which are suggested to be at least 2–3 times faster than that of normal.[4] These growth factors in APRP might have helped in angiogenesis and helped in the prevention of failure of skin grafts in our patients.

CONCLUSION

Loco regional flaps, free flaps, Skin grafts are commonly performed procedures in plastic surgery department. In this study we can able to appreciate the role ofAutologous platelet rich plasma in the application of skin grafts to decrease the failure rate. This was based on single case report, so validity of the splints should be tested by using it widely in many patients in future. These splints can be easily adaptable and can be used in any hospital.

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Role of Hybrid Reconstruction Ladder in Electric Burns of Scalp

Nikhil Bennur Nagabushan[1], Neljo Thomas[2], Ravi Kumar Chittoria[3]

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ABSTRACT

The role of hybrid reconstruction ladderin the treatment of burn wounds has been widely used owing to its role in improving the outcome in terms of wound bed preparation and post trauma scarring. Here, in our study, we are evaluating the efficacy of use ofhybrid reconstruction ladder in the electric burns of scalp.

Keyword: Hybrid Reconstruction Ladder; Electric Burns; Scalp.

INTRODUCTION

Burns are among the most devastating of all injuries, with the spectrum of outcomes spanning from physical impairments and disabilities to emotional and mental consequences.[1] Majority of burns are caused by thermal energy including scalding and fires, and minority being caused by exposure to chemicals, electricity, ultraviolet radiation, and ionising radiation. Globally, fire related burns are responsible for about 265,000 deaths annually.[1] Over 90% of fatal fire related burns occur in developing or low and middle income countries (LMICs) with South-East Asia alone accounting for over half of these fire related deaths.[1]

Involvement of scalp in electric burns is around 3-5%. There are challenges in managing the scalp burns in case of electrical burns with regard to need for split thickness skin graft or flap, choice of flap, reconstruction method to be adopted. It poses a special problem in the form of inelastic nature of scalp and also hairy nature of the scalp. Exposure of the calvarium necessitates the requirement of a vascularised flap. With proper choice of management, various complications can be prevented along with disfigurement.

Evidence for hybrid reconstruction ladder in electric burns of scalp in terms of its effectiveness and the process by which it helps in faster healing of the wound is inadequate. Aim of this study is to evaluate the effectiveness of hybrid reconstruction ladder in electric burns of scalp.

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MATERIALS AND METHODS

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. The subject was 13 years old female with history of thermal burns due to contact with the low voltage electric tower with sustained injury to the forehead, scalp (fig. 1), left big toe, right little toe. 5% burns on forehead with involvement of bilateral eyes and face and bilateral lower limbs. She was taken to near by hospital and treated with

analgesics and antibiotics. Then she was brought, and was treated here. Patient underwent regular dressing along with APRP (autologous platelet rich plasma) application (Fig. 2), with hydrojet debridement (Fig. 3), with serial dressings with vitamin D3 and Sucralfate therapy to scalp (Fig. 4) and serial NPWT (negative pressure wound therapy) was also applied (Fig. 5), later ER yag laser was given to scalp and other healed areas (Fig. 6). The wound site healed eventually (Fig. 7).

Fig. 1: Electric burns involving face and scalp

Fig. 2: APRP application

Fig. 3: Hydrojet debridement

Fig. 4: Vitamin D3 & Sucralfate application

Fig. 7: At the time of discharge

Fig. 5: Post NPWT application

Fig. 6: ERYAG laser to healed area

RESULTS

After application of serial dressings with serial application of vitamin D3 and sucralfate therapy to the scalp , in our study, we were able to reduce time taken for healing of burns area and good take of graft . Use of hybrid reconstruction ladderhelped in the wound bed preparation and aided early skin grafting and wound healing.

DISCUSSION

Burn injuries are very common and afflict approximately 1% of the population yearly. They are a source of heavy medical burden to medical systems worldwide. Morbidity and mortality are decided by factors like: total body surface area (TBSA) involved, the anatomical location, depth of burn,, the age of the subject, prior medical history involvement of other systems (especially airway injury).[2]

An electrical burn is a skin burn that happens when electricity comes in contact with your body. When electricity comes in contact with your body, it can travel through your body. When this happens, the electricity can damage tissues and organs. This damage can be mild or severe and it can even cause death. The organs that are commonly damaged are

heart, kidneys, bones, muscles and nervous system. The symptoms depend on how much electricity comes in contact with your body and how long the contact lasted. Electrical injuries can be caused by exposure to current from low voltage and high voltage sources as well as lightning strikes, and the circumstances of the exposure will dictate management strategies. Human tissues have varying resistance characteristics and susceptibility to damage, so injuries may be thermal, electrical, and or mechanical, potentially causing burns, thrombosis, tetany, falls and blast injury. Electricity can cause superficial burns, partial thickness and full thickness burns. Like many things in medicine, a team approach is best in complete management of a patient with an electrical burn.[3] There should be open and clear communication between providers regarding wound care from nursing or technicians involved in patient care, airway from respiratory therapy, sedation and analgesia, consultants such as a general surgeon or plastic surgeon, and the primary provider /team caring for the patient.

CONCLUSION

We have found that hybrid reconstruction ladder has been very useful in management of thermal wounds especially in electric burns of scalp, but requires large scale randomised trials for large scale application to explore the potential of the same in electric burns.

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Role of Hybrid Reconstructive ladder in Pressure Ulcer

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ABSTRACT

A twenty five years old male with post traumatic post-surgical lower motor neuron type recovering paraparesis sustained bilateral ischial Grade-IV pressure ulcer. Hybrid reconstruction ladder was applied for the management of pressure ulcer. Here, in our study, we are evaluating the efficacy of hybrid reconstruction ladder in the management of pressure ulcers. This type of reconstruction is being reported first time in the literature.

Keywords: Hybrid reconstruction ladder; Pressure ulcers.

INTRODUCTION

Pressure ulcer is common in hospitalised patients. In acute care setting, the incidence is around 11%, where as in chronic setting, it is 3.5-50%. The incidence below the level of umbilicus is 96%. Ischial pressure ulcers are most common in paraplegics while sacral pressure ulcers are common in acute care settings. Unrelieved pressure equal to twice the end capillary pressure, i.e., 70 mm for 1-2 hrs leads to ischemia of overlying skin.[1]

Various terms have been used to describe pressure ulcers. Bed sore is classical old terminology. Decubitus ulcer ('decumbre' – to lie down) doesn't explain ulcers in sitting position. Pressure ulcer is the most accurate term in practice.[2]

Currently, pressure is the single most important factor leading to ischemia, necrosis and ulceration. This sequence is accelerated in other infections, diabetes and altered neurological status. Pressure ulcer reconstruction is conventionally being done using classical reconstruction ladder whereas our highlights the application hybrid reconstruction ladder which is being reported first time in the literature (internet search).

MATERIALS AND METHODS

This study was conducted in tertiary care center in department of plastic surgery after getting the department ethical committee approval. Informed consent was obtained for examination and clinical photography. The subject was twenty five years old male with post traumatic post-surgical LMN type recovering paraparesis sustained bilateral ischial Grade-IV pressure ulcer. Initial management included hydro jet debridement with Hb spray therapy (Fig. 2 & 3). Later he underwent Insulin therapy followed by prolotherapy (Fig. 4 & 5). The wound was later exposed to LLLT and finally

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heterografted to improve the graft take. (Fig. 6 & 7). The wound was later subjected to negative pressure wound therapy (Fig. 8). Finally, we used keystone flap for closure of the wound without tension. (Fig. 9)

Fig. 1: Wound at presentation

Fig. 2: Wound being debrided with hydro jet

Fig. 3: Hemoglobin spray therapy

Fig. 4: Topical insulin being given (Insulin therapy)

Fig. 5: Prolotherapy of the wound

Fig. 6: Pressure ulcer undergoing Low level laser therapy

Fig. 7: Heterografting of pressure ulcer with collagen

Fig. 8: Negative pressure wound therapy being applied over the pressure ulcers

Fig. 9: Keystone flap done to give cover to the wound

RESULTS

The keystone flap covered the defect completely without tension and healed completely. (Fig. 10)

Fig. 10: Healed wound post hybrid reconstructive ladder day 41

DISCUSSION

Pressure ulcers (i.e., bed sores, pressure ulcers, pressure injuries, decubitus ulcers) are areas of localized damage to the skin and underlying tissue. They are common in the elderly and immobile, and costly in financial and human terms. Pressure-relieving support surfaces (i.e., beds, mattresses, seat cushions etc.) are used to help prevent ulcer development.[3]

Low-level lasers that affect biological systems without using heat include those made of Krypton, Argon, He, Ne, and ruby. When the tissue chromophores are influenced by laser energy, the cytochromes in the mitochondria absorb the laser radiation and convert them into energy by the cell (ATP), and created energy induces protein synthesis and acceleration or stimulation of cell proliferation. The interaction of light with biological tissues is influenced by various factors, including wave length, laser dose, and the tissue's optical characteristics. The structure, water content, thermal conductivity, heat capacity, density, and capacity to absorb, disperse, or reflect the released energy are examples of tissue qualities.[4-5]

Negative pressure wound therapy (NPWT), also called vacuum-assisted wound closure, refers to wound dressing systems that continuously or intermittently apply sub atmospheric pressure to the system, which provides a positive pressure to the surface of a wound. NPWT has become a popular treatment modality for the management of many acute and chronic wounds.

Keystone is a peg shaped, main stone which supports the arch in Greek architecture. Because of the shape the flap designed is called a keystone flap. Keystone flap was initially described for lower extremity defects. There have been reports of the used of this design for trochanteric pressure ulcers. Since our patient had partial recovery of paraplegia, he walks with support and can be in sitting position for long time leading to ischial pressure ulcer. A versatile flap was required in this patient as he had recurrent pressure sore. We have used the type 1 keystone flap for the pressure ulcer since we felt the fasciocutaneous flap would give an adequate cover.[6]

CONCLUSION

In our study hybrid reconstructive ladder of pressure ulcers with keystone flap has shown to have favorable results in our experience managing pressure ulcers. With the available methods, there

was a noticeable improvement in the flap take and wound healing. Multicentric tests with a bigger sample size are required to support the hypothesis. We have found that hybrid reconstruction has been very useful in management of pressure ulcers but requires large scale randomized trials for large scale application to explore the potential of the same in pressure ulcers.

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Role of Cyclic Negative Pressure wound Therapy on Skin Graft Donor Site

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ABSTRACT

Cyclic application of "negative pressure" results in a superior local enhancement of cutaneous microcirculation with regards to blood flow and consecutive tissue oxygenation. Beyond that, repeated alterations between different levels of "negative pressure" due to cyclic application represent a greater stimulus for remote conditioning effects, indicating a superior local interaction with the underlying tissue. Here we showed the beneficial effect of cyclic Negative Pressure wound Therapy (NPWT) on donor site after skin graft.

Keywords: Skin Graft Donor Site; Cyclic Negative Pressure Wound Therapy.

INTRODUCTION

Since the introduction of the cyclic negative pressure wound therapy (NPWT) system by Morykwas and Argenta, it has been applied to a number of wounds and has become an influential and effective technique for healing simple and complex wounds. The conventional cyclic NPWT system adopts either 'intermittent' or 'continuous' mode.

While the continuous mode constantly applies a sub-atmospheric pressure of −125 mmHg, the intermittent mode creates a sub-atmospheric pressure of −125 mmHg for 5 minutes and a 2-minute resting phase of 0 mmHg.

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In experiments performed on animal models, the intermittent mode showed increased perfusion level and formation of granulation tissue in the wound area compared with the continuous mode.[1,2] Despite the effectiveness of intermittent mode in wound healing, it has been avoided in clinical application because of the pain occurring every few minutes during the initiation phase of the system to reach −125 mmHg.[3–6]

The cyclic NPWT system is similar to the intermittent mode in terms of using the same maximal sub atmospheric pressure, but the pressure never reaches zero in the cyclic mode. So, it continuously creates certain pressure gradient that oscillates between −125 mmHg and the preset sub atmospheric pressure. The cycle runs based on the changes in sub atmospheric pressure, not time, and thus its frequency reflects the wound volume. In this article we present a case of a 54 years old male who presented with a chronic non healing ulcer on his back and the use of cyclic NPWT.

MATERIAL AND METHODS

This study was conducted in the department of plastic surgery in a tertiary care institute. Informed

consent was obtained from the patient under study. Department scientific committee approval was obtained. It is a single center, non-randomized, non-controlled study. The patient under study was a 54 years old, with no other known comorbidities. Patient was analyzed systematically and was found to have an 8cm by 6 cm non healing ulcer on the right side of his back close to the midline. Wound bed was prepared in accordance with Timers 11 concept mentioned in the guidelines, the ulcer was serially assessed and documented according to Bates – Jensen wound assessment tool. Non-viable necrotic tissue was managed with multiple sessions of surgical & hydro debridement. Infection was managed with local antimicrobials & antibiotics according to culture sensitivity. Eventually a split thickness skin graft was harvested from the posterior aspect of his upper left thigh for wound coverage. The donor site measured approximately 12 cm by 10 cm.) After application of collagen. (Fig. 1) Cyclic NPWT was commenced on the donor site. (Fig. 2)

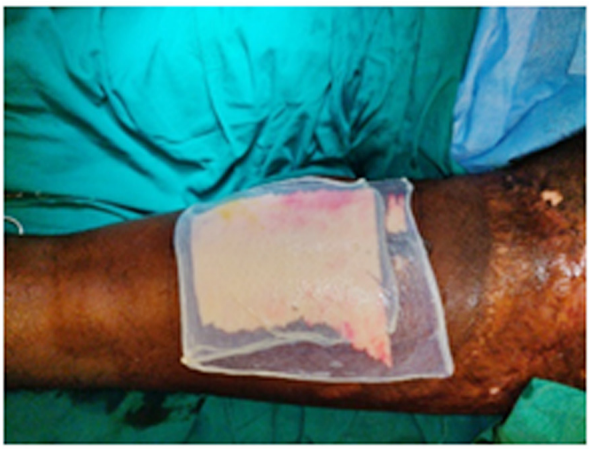

Fig. 1: Collagen application on donor site.

Fig. 2: Donor site on cyclic NPWT

RESULTS

Donor graft site improved well on cyclic NPWT. (Fig. 2).

Fig. 2: Donor site healed on cyclic NPWT

DISCUSSION

The cyclic mode operates its negative pressure in a manner similar to the sine wave by cycling through the designated negative pressures. Once it hits the upper target pressure of −125 mmHg, the pressure system shuts off and the pressure slowly drops till the lower target pressure is reached, regardless of time. As the change in the intralesional pressure is measured, the drop velocity of the pressure is closely associated with the defect volume in the cyclic mode. In other words, the larger the volume of defect, the shorter the time taken for completing one cycle of the system.

Improved tensile strength in in vivo research has previously showed increased collagen I production in wound healing. This rise could be owing to the pro-angiogenic effect of increased vascular endothelial growth factor and fibroblast growth factor levels. Both growth factors are involved in the wound healing process, namely in the stages of haemostasis, proliferation, and repair, and so influence wound healing. VEGF also controls cell proliferation, differentiation, and migration during angiogenesis. This encourages the creation of new capillaries, allowing for better circulation to the wound site and hence the delivery of critical nutrients and oxygen. The increased expression of certain mediators, such as IL-1 and monocyte Chemo attractant Protein-1, causes VEGF to be stimulated (MCP-1).[3]

Human and animal's studies have shown increased growth of granulation tissue, increased blood flow,

diminution of the wound area, and regulation of inflammatory response with VAC therapy.[7] VAC causes wound contraction, stabilization of the wound environment, decreased edema with removal of wound exudates, and micro deformation of cells. These effects allow VAC to accelerate wound healing by virtue of increase blood flow; reduced bacterial load; and improved wound bed preparation for subsequent coverage. The compression of tissue by negative pressure causes tissue hypoxia due to decreases perfusion beneath the foam which stimulates angio - neogenesis, and local vasodilatation due to release of nitric oxide[8,9,10]

Micro deformation/micro strain of cells due to VAC causes tissue expansion effect with release of growth factors. This tissue expansion effect is due to the differential pressure in the tissues after negative pressure application. The pressure within the cells is positive; while the pressure outside the cells and beneath the dressing is negative. This may lead to expansion of cells, growth of granulation tissue and pulling of wound edges closer to one another reducing wound size. The added beneficial effect of cyclic NPWT as compared to the conventional NPWT is the reduction of pain.

CONCLUSION

Cyclic application of "negative pressure" results in a superior local enhancement of cutaneous microcirculation with regards to blood flow and consecutive tissue oxygenation. Beyond that, repeated alterations between different levels of "negative pressure" due to cyclic application represent a greater stimulus for remote conditioning effects, indicating a superior local interaction with the underlying tissue. Hence we were able to manage superficial burns using cyclic NPWT successfully however it needs large scale randomized trials for application in clinical practice.

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Application of Hybrid Reconstruction Ladder in Post Burn Contracture

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ABSTRACT

Multidisciplinary team has effectively adapted advanced reconstructive techniques merged with regenerative medicine modalities to improve outcomes. These treatments combine traditional reconstruction measures with regenerative medicine applications and has been termed 'hybrid reconstructions'. The hybrid reconstruction model aids in maximizing the function while minimizing the disability and morbidity associated with traditional reconstruction.

Keywords: Hybrid reconstructive ladder; Burns; Contracture.

INTRODUCTION

The reconstructive ladder is a concept familiar to all plastic surgeons. Although it has undergone gradual evolution over time, the basic concept of methods of reconstruction ranked by complexity has been preserved and propagated in multiple forms. Most descriptions start with closure by secondary intention, followed by direct closure, local flaps, and distant flaps. Various authors have made finer distinctions among local, regional, and free flaps, and inserting tissue expansion somewhere in the spectrum.

The complex injury pattern has initiated efforts to create new and innovative techniques in tissue regeneration. Multidisciplinary team has effectively adapted advanced reconstructive techniques merged with regenerative medicine modalities to improve outcomes. These treatments combine traditional reconstruction measures with regenerative medicine applications and has been termed 'hybrid reconstructions'.[1]

The hybrid reconstruction model aids in maximizing the function while minimizing the disability and morbidity associated with traditional reconstruction. In aim of this study is to apply the hybrid reconstructive mole in our patient with a non-healing wound in the left knee.

MATERIALS AND METHODS

The study was carried out in a tertiary care hospital in South India after receiving approval from departmental ethical committee. The subject was a 28 yr old female patient with a history of self-immolation by kerosene oneyears back sustained burn over neck, right upper limb, face and back. It involved 30% of total body surface area which was second degree both superficial and deep burnfollowing which she developed a post burn contracture (Fig. 1). A hybrid reconstructive ladder

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approach was done which includes application of autologous platelet rich plasma (Fig. 2), low level laser therapy (Fig. 3), post burn contracture release and skin grafting (Fig. 4).

Fig. 1: Post burn contracture at the time of admission

Fig. 2: Autologous platelet rich plasma

Fig. 3: Low level laser therapy

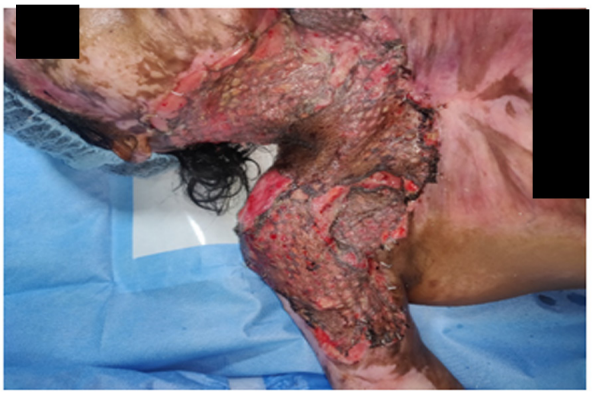

Fig. 4: Contracture release and skin grafting.

RESULTS

In our patient, the hybrid reconstructive ladder approach helped in a good wound bed preparation, helped in good graft take (Fig. 5) and also helped to decrease the duration of the hospital stay.

Fig. 5: Skin graft take after hybrid reconstruction ladder approach

DISCUSSION

The reconstructive ladder is an improper extension of a well-known and appropriate concept of a wound closure ladder. It has its own limitations. Although there is virtue in using the simplest solution to a given problem, at times more complex methods of reconstruction may be preferred, even when simpler methods can achieve wound closure. To address these concerns, several modifications to the reconstructive ladder have been proposed. Mathes and Nahai 2 suggested the "reconstructive triangle," which consisted of tissue expansion, local flaps, and microsurgery.

Gottlieb and Krieger[3] introduced the "reconstructive elevator" which, although still acknowledging the concept of increasing levels of complexity, suggests the freedom to ascend directly to the appropriate level if necessary.

Wong and Niranjan 4 recommended that the rungs be thought of as stages in the development of surgical skills, emphasizing that the difficulty of a reconstructive problem is related to the skill and training of the treating surgeon. Erbaet al.[5] integrated the concepts of surgical risk, technological complexity, and surgical complexity into a matrix to help organize the various reconstructive methods and provide a framework for further discussion.

The reconstructive grid 6 is a dynamic construct that takes into account the multiple reconstructive options available to the plastic surgeon. It also takes into consideration factors that help the reconstructive surgeon determine the best possible option to achieve the three reconstruction goals, namely, form, function, and aesthetics. The factors that aid the judgment of a reconstruction specialist, including wound complexity, surgeon skill, resources (and technology) available, and patient requests, form the boundaries of the reconstructive grid.

Surgeons' Skills

Resources available							Patient requests
	Bionegineered tissue	–	–	–	–	Superricrosurgery	–
	Oxygen therapy	–	–	–	–	Roboitic Microsurgery	–
	Extracellular matrix	–	–	Tissue expansion	–	Functional tissue transfer	–
	External tissues expansion	–	–	Pertorator flaps	Islanded flaps	Perforator free flaps	Abdominal wall transplant
	Cell therapy & Growth Factors	Gene therapy & Tissue Engineering	Composite graft	Keystone flaps	Composite flap	Composite free flap	Face transplant
	NPWT	In-utero reconstruction	Corrporent graft	Dermal flaps	Corrponent flaps	Comporent free flap	Hard transplant
	Secondary healing	Primary closure	Craft	Local flap	Distant flap	Free flap	Vascular Composite Allotransplant

Wound complexity

Source @ Viewpoints-Reconstruction 2.0: Restructuring the Reconstructive Ladder in Journal on Plastic and Reconstructive Surgery

The bottom row of the reconstructive grid houses the traditional modalities of reconstruction that are available in the ladder and elevator and the newer reconstruction modality, vascular composite allotransplant which, though absent in the reconstructive ladder, is mentioned in the modified reconstructive elevator.[7] The boxes above these primary reconstruction modalities show techniques available within each modality of reconstruction. The spatial nature of the reconstructive grid permits the specialist to select multiple options for a given defect. The reconstructive grid includes newer wound healing techniques such as bioengineered skin, cell therapies (e.g., adipocyte derived stem cells), and also still developing reconstruction techniques including tissue engineering[8] and gene therapies.[9] The blank boxes represent available space to accommodate newer techniques as they arise, under each modality, thus making the grid future ready.

The standard treatments for extremity injuries with massive composite tissue loss (bone, skin, soft tissue, nerves) require a spectrum of therapies. These therapies include extremity amputation, limb shortening to assist in residual limb soft tissue coverage, free tissue transfers, pedicle flaps, local

flaps, skin grafting, bone reconstruction, nerve repair or reconstruction and vascular repair. The traditional therapies may subtract from an already decreased functional capacity and may result in significant donor site morbidity. Revised amputations may have non-pliable and/or nondurable surface areas prone to erosive wear with prosthetic use. Furthermore, the multiple limb injuries and amputations seen in combat casualties typically involve expanded zones of injury that extend beyond the directly affected extremities that can complicate reconstructive efforts.[7] Furthermore, in the multiple extremity injured service member, the common accepted donor sites for autologous tissues become increasingly limited.

Consequently, this has led to increased use of regenerative medicine modalities to enhance tissue regeneration and improve reconstructive outcomes. Hence the term "Hybrid Reconstruction Ladder". (Fig. 5)

Source @ Article Plastic Surgery Challenges in War Wounded II: Regenerative Medicine

The reconstructive ladder was a term coined by plastic and reconstructive surgeons to describe levels of increasingly complex management of soft tissue wounds.[10] Theoretically, the surgeon would utilize the lowest rung of the ladder – that is, the simplest reconstruction technique – to address a clinical reconstructive problem.[11] The reconstructive surgeon would move up the ladder as a more complex or suitable method was required for a given reconstruction problem. A hybrid reconstructive ladder that augments the traditional reconstructive ladder with regenerative medicine modalities.[12] There were improved outcomes at each rung on the reconstruction ladder and these modalities may allow for the expansion of indications for each rung on the reconstruction ladder.

The study effectively employed dermal regenerates, soft tissue regeneration techniques, biologic scaffolds, fat grafting techniques and adipose-derived stem cells in a number of reconstructions.[13]

Indications

The utilization of high concentration allogeneic mesenchymal stem cell (MSCs) for segmental and severely comminuted osseous deficits.[14]

The dermal regeneration templates for preparation and to improve the durability of wound beds for skin grafting.

The biologic scaffolds such as urinary bladder matrix to provide for soft tissue regeneration, surgical wound bed preparation and muscle regeneration.[15]

The decelluarized allograft nerves to serve as nerve regeneration templates or conduits for segmental nerve defects in patients lacking adequate auto-graft nerve sources.

ADVANTAGES

The dermal regenerates have reduced skin erosion rates compared with those patients with skin grafting alone.

It has reduced wound healing issues surrounding the prosthetic wear sites by increasing durability.

Orthopedic union rates and nonunion rates have been reduced by adjunctive use of these measures when compared with traditional reconstructions without bony regenerates.[16]

These regenerative techniques have addressed bony healing and wound healing as well as salvage failed cases, which includes improving limb salvage rates, amputation preservation of length, and carefully selected cases.[17,18]

Even in patients with limb loss and multiple extremity amputations, using these modalities has allowed residual limbs to be preserved at a length suitable for prosthetic fitting.[19]

It may be extracted to treat lesser severe injuries from trauma, burn or oncologic cases using hybrid reconstructions.[20,21]

Disadvantages

High cost

Requirement of high infrastructure

Training to learn the skill.

CONCLUSION

Hybrid Reconstructive Ladder approach has a definitive role in post burn contracture. The hybrid reconstruction model aids in maximizing the function while minimizing the disability and morbidity associated with traditional reconstruction in post burn contracture.

Conflicts of interest: None

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A Study on Adverse Effects of Topical Steroids

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ABSTRACT

Background: Topical steroids are the most commonly prescribed topical medications for the treatment of psoriasis, eczema, lichen planus, vitiligo and dermatitis. Abuse of these topical steroids can lead to various adverse effects.

Aims: To study adverse effects of following topical corticosteroids: (a) Betamethasone valerate cream 0.05% (BV) (b) Betamethasone dipropionate cream 0.05% (BD) (c) Clobetasol propionate cream 0.05% (CP).

Methods and materials: Across sectional study of sixty five patients with side effects of topical steroids were studied in department of skin – VD, Tertiary care hospital from Jan 2010 to December 2010.

Statistics and Analysis: Mean, standard deviation

Results: Out of sixty five cases, eleven patients applied Betamethasone valerate 0.05%, three patients applied Betamethasone dipropionate 0.05% and fifty three patients applied Clobetasol propionate 0.05%. Maximum numbers of cases were in age group more than thirty years. Thirty five were male and nineteen were female. In our study the most common condition for which steroid was applied was chronic eczema. The most common side effect was change in skin color on application of Clobetasol propionate 0.05%. The maximum side effects appeared after three months of application of topical steroid.

Conclusion: The most frequently applied steroid was Clobetasol propionate cream 0.05%. The most common condition for which steroid was applied is chronic eczema and adverse effect is hypopigmentation and depigmentation. In most of the patients adverse effects appeared after three months of steroid application.

Keywords: Topical corticosteroids; Side effects; Abuse.

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INTRODUCTION

Topical steroids are the most commonly prescribed topical medications for the treatment of eczema, lichen planus, psoriasis and vitiligo. They are among twenty most important discoveries in the last century. In 1953, Sulzberger and Witten used topical hydrocortisone for the first time to treat dermatitis. Also known as panacea or wonder drug as they have anti allergic, antinflammatory,

anti proliferative, immunosuppressive and vasoconstrictive mechanism of action. They are classified based on their vasoconstriction abilities. Due to availability of over the counter topical steroids, its abuse is most commonly seen leading to its adverse effects.

METHODS

A total of sixty five patients with side effects of topical steroids were studied in department of skin – VD, Tertiary care hospital from Jan 2010 to December 2010.

Inclusion Criteria:

Any patient with side effects of three topical steroids namely Betamethasone valerate, Betamethasone dipropionate and Clobetasol propionate cream, which were applied for more than fifteen days were included.

Common skin conditions were included and side effects were studied.

Permission from ethical committee was taken.

RESULTS

Out of sixty five cases, eleven patients applied Betamethasone valerate, of which four were male and five were female. Three patients applied Betamethasone dipropionate, of which two were male and one was female. Fifty three patients applied Clobetasol propionate, of which thirty four were male and nineteen were female.

Maximum numbers of cases were in age group of more than thirty years, out of which thirty five were male and nineteen were female.

In our study the most common condition for which steroid was applied was chronic eczema.

Table 1: Indications of using steroids

Indication	BV (n=9)	BD (n=3)	CP (n=53)	Patients (n=65)
Chronic Eczema	3	2	40	45
Lichen Planus	0	1	5	6
Amyloidosis	0	0	5	5
Acne	0	0	1	1
Melasma	5	0	0	5
Tinea Cruris	1	0	1	2
Vitiligo	0	0	1	1

Abbreviations: BV-Betamethasone valerate, BD-Betamethasone Dipropionate, CP-Clobetasol propionate

The most common side effect was hypopigmentation on application of Clobetasol propionate.

Table 2: Adverse effects of steroids:

Adverse effects	BV	BD	CP	n=65
Hypopigmentation (Fig. 2)/ Depigmentation	3	3	48	54
Acneiform Eruption (Fig. 5)	5	0	0	5
Perioral dermatitis (Fig. 1)	0	0	1	1
Hypertrichosis	0	0	1	1
Tinea incognito (Fig. 3)	1	0	0	1
Atrophy	0	0	3	3
Total	9	3	53	65

Fig. 1: Perioral Dermatitis

Fig. 2: Hypopigmentation

Fig. 3: Tinea Incognito and Striae

Fig. 4: Striae

Fig. 5: Acenform Eruptions

Fig. 6: Milia and Telangiectasia

Abbreviations: BV - Betamethasone valerate, BD - Betamethasone Dipropionate, CP - Clobetasol propionate.

In maximum cases side effects appeared after three months of continuous application of topical steroid. Eight cases experienced adverse effects in the span of less than one month and seventeen cases experienced adverse effects between one and three months.

DISCUSSION

Topical corticosteroids are of significant importance in treating various dermatological diseases. They are misused both by the prescribing doctors and the patients themselves because it gives instant relief to most of the signs and symptoms. Its abuse has become a common problem faced by dermatologist in different parts of the world.[1,2]

Topical steroids or steroid containing antifungal creams are most commonly misused preparations for fungal infections, particularly in developing countries like India owing to their unregulated sales. Topical steroids may alleviate the symptoms such as itching but do not eliminate the fungus from the skin surface and also leads to antifungal drug resistance and relapse.

As reported by Nnoruka et al. in 2006, topical corticosteroids has been commonly used as depigmenting agents over the face in darkskinned individuals, and their availability over the counter in most Asian and African countries added to this misuse.[2] The first case series on topical steroids abuse in India was published in 2006, and since then various authors have published numerous case studies on its application. Hameed Bhat et al., and Saraswat et al. reported maximum number of patients in the age group of 21–30 years.[1,3,4] Sinha et al. reported that 80% of people had obtained steroids over the counter while only 4% had consulted dermatologists.[5]

Mahar et al also reported fungal infections to be the most common cause for the use of topical steroids followed by acne and for skin lightening.6In

the study by Mishra et al. patients prescribed potent steroids by nondermatologists suffered more adverse reactions than those prescribed by dermatologists. Nagesh et alreported that almost half the patients in their study were advised to use topical steroids by pharmacists, friends, and relatives.[7] The authors claimed that most of the time, general practitioners and doctors from alternative medicine had prescribed these medicines.

The most common fixed drug combination according to Verma et al. is clobetasol propionate, ornidazole, ofloxacin, and terbinafine.[8] The Drug Controller General of India (DCGI) and Ministry of Health and Family Welfare of the Government of Indiahad issued through a gazette notification in 2016, that certain fixed dose combinations (FDC) of topical steroids along with antibiotics drugs had no therapeutic justification and prohibited their manufacture with immediate effect.[9] As per the recent Central Drugs Standard Control Organization (CDSCO) notification of 2018, among 328FDCs which have been banned by the DCGI, there are 12 topical steroid FDCs along with antibiotics which havebeen banned.[10] The misuse of topical steroids in the community is increasing and steps need to be taken at every level to curb the problem. The precautions to be taken while using steroids and practices of using steroids were poor among externally prescribed patients as compared to institutional patients.There have been efforts at a national level by Indian Association of Dermatologists, Venereologists and Leprologists (IADVL). A Taskforce against Topical Steroid Abuse (ITATSA) by IADVL has submitted an online petition to the Ministry of Health and Family Welfare, Government of India, and CDSCO to look into the issues related to the indiscriminate over the counter sale of topical steroids in India.[10]

CONCLUSION

In our study the most frequently applied steroid was clobetasol propionate cream. The most common condition for which steroid was applied is chronic eczema and adverse effect was hypopigmentation and depigmentation. In most of the patients adverse effects appeared after 3 months of topical steroid application. The most common site of application and appearance of adverse effects are legs. Hence, judicious use of topical steroids is must and patients must be instructed about the correct use of steroids.

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