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CASE REPORTS

Role of Tangential Exicision and Split thickness skin grafting in Management of Burns of Dorsum of Hand

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Keywords:
Burns, Dorsum of Hand, Skin Grafting, Tangential Exicision

Introduction: Hand is essential for execution of activities of daily living. Incidence of hand burn is as high as 70 to 80% in patient with severe burns. Involvement of dorsum of hand is more common as hands are used to protect the face against fire, acids, hot liquids and in turn get involved. Depth of involvement is more as the dorsal skin is thin, mobile with very thin subcutaneous tissue, thin fascia. Flat Extensor tendons & complex extensor expansion lie immediately below the thin dorsal skin and at risk of getting affected. Second and third degree burns of hand will cause severe deformity if not intervened early due to secondary healing and changes taking place in tendons, capsule, ligaments and joints. Hence Management of hand burns should start from day 1 with proper position and early excision of burn wound and Split thickness skin grafting (SSG) followed by post operative physiotherapy and pressure garments.

Aim: To study the effectiveness of early tangential excision & resurfacing with split thickness skin graft (SSG) of deep dermal burns of dorsum of hand in preserving the function and structure of hand.

Objectives: To study

1) Demographic features of hand burns
2) Wound healing & complications after Tangential excision of Dorsal hand burns
3) Functions and architecture maintenance of hand
4) Total Hospital stay

Patients and methods: This is a clinical study conducted at tertiary care center in Telangana between Jan 2021 to Jan 2023. 20 patients with TBSA < 40% with deep 2nd degree burns of <20% TBSA involving dorsum of hands and forearm between age group of 5–50 years were included in the study.

Patients with poor general condition or with comorbid conditions, involvement of more than 40% TBSA and deep dermal burns of more than 20% TBSA were excluded from the study.

Once the patients are hemodynamically stable, taken up for tangential excision and SSG of all 2nd degree deep dermal burns (involving dorsum of hand, forearm and other body parts) and followed by after care of graft, splint, physiotherapy and pressure garments. Functional and structural recovery in each patient were noted in subsequent follow-up of cases and results were analyzed.

Results: All cases except 2 showed good hand function like grip, grasp and key pinch and maintained good architecture first web space, MPJ flexion, cupping of hand.

Conclusion: This study concludes that setting standard protocol of treatment for hand burns from day 1 and Early tangential excision & SSG of deep dermal burns of dorsum of hand gives good structural outcomes like adequate first web space, MPJ flexion, cupping of hand and functional outcomes like power grip, tripod grasp and pinch. Early tangential excision and SSG is best treatment for burns of dorsum of hand.

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INTRODUCTION

Hand is essential for execution of activities of daily living. Hand burns is considered as serious injury. Incidence of hand burn is as high as 70 to 80% in patient with severe burns.[1] Hand burns alone do not increase mortality but are associated with significant increase in morbidity due to development of severe hand deformity due to secondary healing or injury to tendons or ligaments, joint capsule. Hence care for hand burns need to be given priority during acute phase along with burn shock resuscitation and management of inhalational burns.[2]

Involvement of dorsum of hand is more common as hands are used to protect the face against fire, acids, hot liquids and in turn get involved. Depth of involvement is more as the dorsal skin is thin, mobile with very thin subcutaneous tissue, thin fascia, flat, complex dorsal tendons and extensor expansion.

Management of hand burns should start from day of admission with dressing in glass holding position using POP splint to prevent position of ease and development of deformity. Proper planning of management of dorsal burns with tangential excision and SSG is essential which facilitates rapid healing of wounds, prevent joint deformities and contractures and provide good function and aesthetics.

AIM

To study the effectiveness of early tangential excision & resurfacing with split thickness skin graft of deep dermal dorsal hand burns in preserving the function and structure of hand.

OBJECTIVES

To study

1) Demographic features of hand burns
2) Wound healing & complications
3) Functions and architecture maintenance of hand
4) Hospital stay

PATIENTS AND METHODS

This is a clinical study conducted at tertiary care center in Telangana between Jan 2021 to Jan 2023. 20 patients with TBSA < 40% with deep 2nd degree burns of < 20% TBSA with involvement of dorsum of hands and forearm between age group of 5 to 50 years were included in the study.

Patients with poor general condition or with comorbid conditions, involvement of more than 40% TBSA and deep dermal burns of more than 20% TBSA were excluded from the study.

Patient who was included in the study were treated in for burn shock and other associated problems as per the standard protocols. Clinical examination of burn wound and mapping of depth of burn wound in burn chart done at the time of admission and reassessed after 48hrs. Hands are maintained in functional position in POP splint (Figure 1). Once the patients are hemodynamically stable, taken up

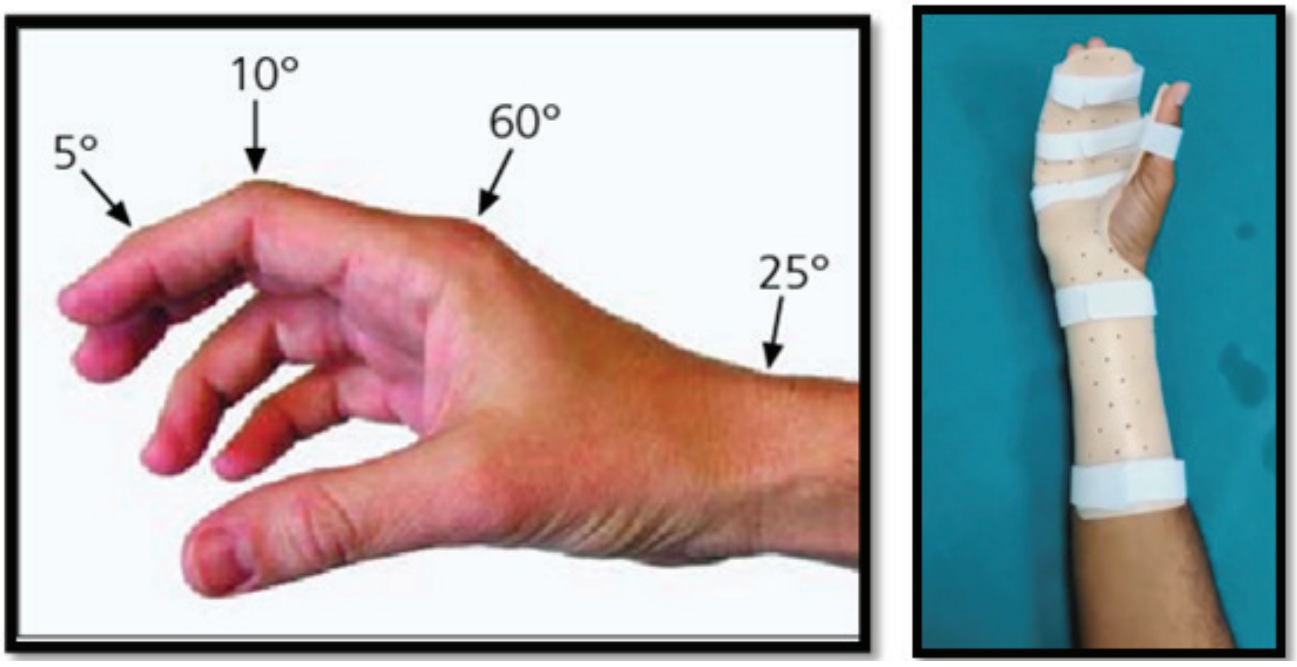

Figure 1: Functional position and maintenance of position with thermoplastic splint

for tangential excision and SSG of all 2nd degree deep dermal burns (involving dorsum of hand, forearm and other body parts) and superficial burns were treated conservatively with Vaseline or collagen dressing. Per operatively mapping of deep dermal burns done by clinically observing non blanching and white appearing of areas (Figure 2A). Tangential excision of hands and forearm was done under GA under tourniquet control. Watson's modification of humby's knife was used to excise the burn wound sequentially layer by layer until pearly white dermal matrix with pale yellow fat protruding through dermis was visible (Figure 2B). To prevent blood loss Injection tranexamic acid given half an hour before surgery and done under tourniquet application and Botraclot and adrenaline saline soaked mops applied after excision. Once haemostasias achieved, wound bed is resurfaced with strip or stamp or 1:1.5 meshed auto graft harvested from thigh or leg (Figure 2B). Primary dressing is done after 48 hours. and later as per requirement for 14 days and patient were discharged once superficial burns healed and graft uptake is good and followed in OPD (Figure 2C). Once the graft is stable advised regarding after care of graft with emollient, moisturizing cream or coconut oil, graft massages, pressure garments, physiotherapy and splintage for hands. Patient reviewed in OPD for 6 to 12 months noting down wound status, nature of scar and movement of joints and functional recovery of the hands.

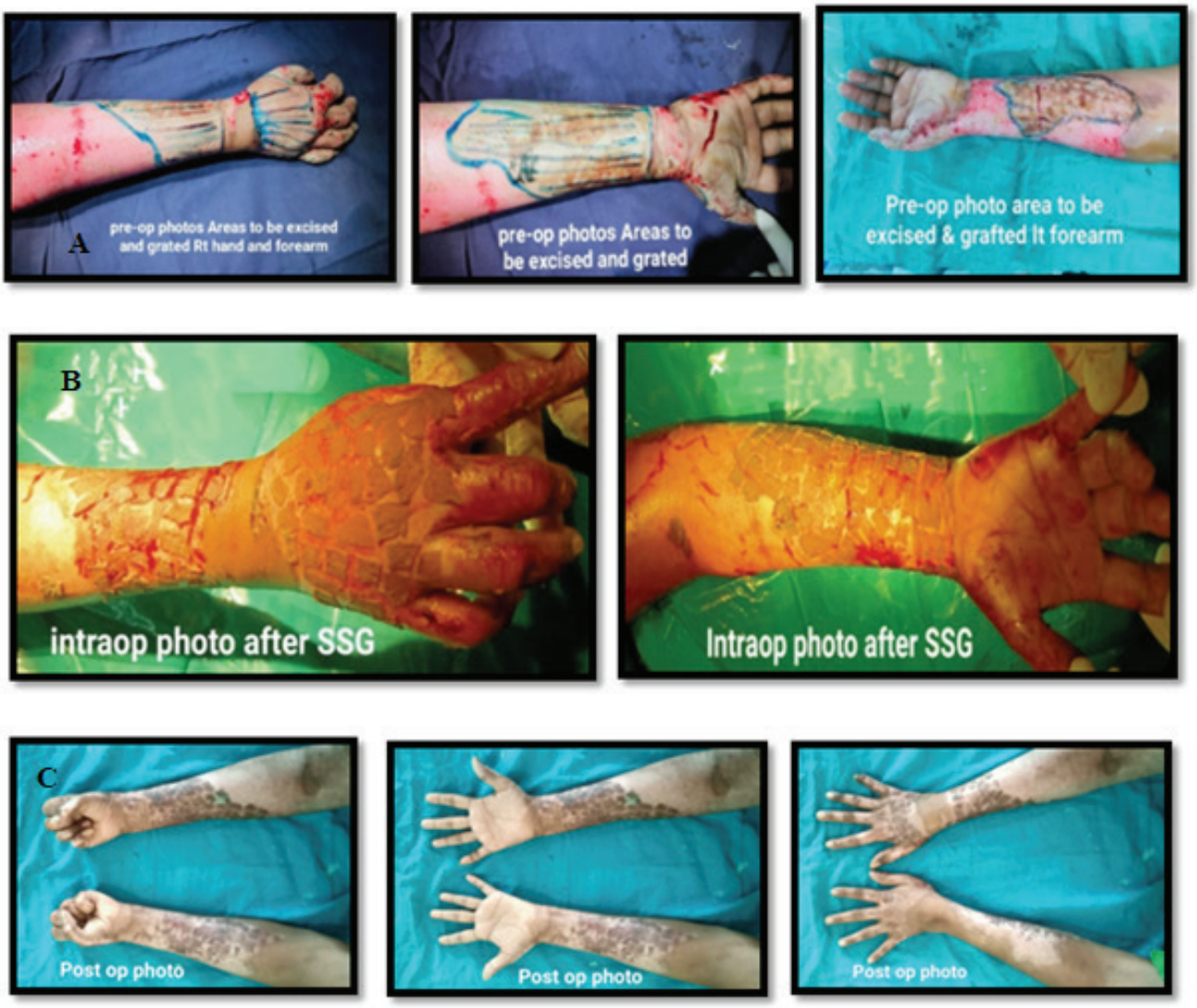

Figure 2: (A) Preoperative image showing markings of deep 2nd degree burns to be tangentially excised and grafted. (B) Intraoperative image of area excised and grafted with SSG. (C)Postoperative follow up image of hands with active flexion & and extension of all fingers at MPJ, IP joints, 1st web space, cupping of hand.

RESULTS

20 patients of age group 6–50 years were included in this study. Most common age group is 21-30 years (n=12, 60%) (Table 1). Incidence is more in females than males with ratio of 1:1.5(Table 2). Thermal burns were the most common etiology (n=16, 80%) followed by Chemical and scalds (n=1,5%) (Table 3). Maximum TBSA involvement of 21 to 30% in 8 patients (40%) (Table 4) & bilateral involvement of hands is seen in 12 patients (60%) (Table 6). Maximum % of burn wound treated by Tangential Excision & SSG for dorsal hand & forearm burns was 6-10% in 13 patients (65%) with a range of 5-20% (Table 5). All patients of hand burns were taken up for Tangential Excision & SSG between day 3 and day 6 (Table 7). Total hospital stay was < 3 weeks in 15 cases (75%) and more than 3 weeks in 5 cases (25%) (Table 8). Complete wound healing was seen in < 2 weeks in 7 patients (35%), < 3 weeks in 8 patients (40%), >3 weeks in 5 patients (25%) (Table 9). Hand and forearm burns healed within 2 weeks in all patients.

Graft take-up was > 80% in 18 patients (90%). Less than 80% in 2 cases which developed contracture due 20% graft loss and healing by secondary intension and loss of follow up, poor physiotherapy & splintage (Table 10). Hypertrophy was seen in 5 patients & mild burn contracture is seen in 2 patients due to graft loss, infection & loss of follow up (Table 11). Functions of the hand like good grip, grasp, pinch, span were analyzed and found Excellent -Good in 18 cases (90%) of cases and poor in 2 cases (10%) (Figure 2C, 3C, 4B) (Table 12).

Architecture of the hand like span of 1st web space, MP joint flexion, cupping of hand was excellent - good and maintained in 18 cases (90%) Not maintained and developed mild contracture in 2 cases (10%) (Table 13).

Table 1: Age distribution

AGE	NUMBER	PERCENTAGE
11-20	1	5%
21-30	12	60%
31-40	05	25%
41-50	2	10%
TOTAL	20	100%

Table 2: Sex proportion

SEX	NUMBER	PERCENTAGE
MALE	08	40%
FEMALE	12	60%
TOTAL	**20**	**100%**

Table 3: Type of burns

MODE	NUMBER	PERCENTAGE
SCALDS	01	5%
THERMAL	16	80%
ELECTRICAL FLASH BURNS	02	10%
CHEMICAL	01	05%

Table 4: Percentage of Burns

Percentage of Burn	Number	Percentage
11-20%	05	25%
21-30%	08	40%
31-40%	07	35%

Table 5: Percentage of Area Excised and Resurfaced

TE+Coverage	Number	Percentage
1-5%	2	10%
6-10%	13	65%
11-15%	05	25%

Table 6: Hand Involvement

Limb	Right	Left	Bilateral
Number	05	03	12
Percentage	25%	15%	60%

Table 7: Time of Intervention

Time of Intervention	Number	Percentage
DAY 3	08	40%
DAY 4	06	30%
DAY 5	03	15%
DAY 6	03	15%

Table 8: Duration of Hospital Stay

Hospital Days	Number	Percentage
< 3 Weeks	15	75%
>3 Weeks	05	25%

Table 9: Total time of Healing

Wound Healing Time	Number	Percentage
<2 weeks	07	35%
<3 weeks	08	40%
>3 weeks	05	25%

Table 10: Graft Uptake

% of Uptake	Number	Percentage
50 -60%	01	05%
60-70%	01	05%
>80%	18	90%

Table 11: Complications

Complication	Number	Percentage
Hypertropic Scarring	05	25%
Post Burn Contracture	02	10%

Table 12: Functonal Outcome

Outcome	PINCH, GRIP, GRASP	PERCENTAGE
Excellent	13	67.5
Good	05	22.5
Poor	02	10%

Table 13: Structural Outcome

Outcome	MCP FLEXION, 1ST Web Space, Cupping of Hand	Percentage
Excellent	16	80 %
Good	02	10 %
Poor	02	10 %

DISCUSSION

Cope et al gave concept of early tangential excision and grafting of burn wounds in 1942.[3] Zora Janzekovic had a great impact on the concept of tangential excision of burn wounds and coverage with SSG.[4] Tangential Excision and grafting is now considered as routine treatment of deep dermal burns. Goal is to tangentially excise all burnt skin in layers until viable tissue appear.[5] Early tangential excision of the deep dermal burns remove the nidus of infection and causes reduced inflammatory response and colonization of wound.

Hand is essential to perform the activities of daily living. It is the most common part to get involved with burns while protecting face from sustaining thermal or acid or chemical burns.

If hand burns are not noticed early & intervened in preference to save the life of the patient tend to develop severe edema of dorsum of hand and develop various hand deformities.

Following burns there is increased vascular permeability leading to edema of hand (Figure 5). In dorsal hand burns, edema is more severe and remains for longer period of time causing hands to go in position of ease i.e., hyperextension of MCP joint and flexion of PIP joint which provide more space in the respective joints allowing collection of the fluid in the joints leading lax collateral ligaments & later contract leading to progressive shortening, contracture of volar plate resulting in various deformities of hand and fingers like Claw hand deformity. If tendons attenuate or injured due to burn's they develop Boutonniere deformity, Mallet and swan-neck deformities making hand nonfunctional (Figure 6).

Deformity can be prevented by taking care of hand burns from day -1 of burns by maintaining hand in functional position i.e., wrist -20-30^0 extension, MCP -60-70^0 flexion, IP joints -5-10^0 flexion and identification, planning tangential excision & skin grafting of deep dermal burns of dorsum of hands from day 2 to 5 once the haemodynamic stability is achieved. Post op, after care of the graft with emollients, massages, physiotherapy and thermoplastic splintage & dynamic split will maintain the results obtained with surgery.

The clinical study is conducted at our centre including 20 cases of < 40%TBSA & <20% deep dermal burns involving hands & treated them by Tangential Excision of the deep dermal burns of hands. Results analysed and compared with various studies.

The commonest age group in our study was 21 to 30 years (n=12,60%) (Table 1). Female (60%) were affected more than males (Table 2). Thermal injury is most common mode encountered in our study. (n=16, 80%) (Table 3). Similar finding was observed in the other study.[7,10] Timing of intervention is an important prognostic indicator. Patient underwent surgical intervention within 3 to 7 days of injury in this study. Mean duration of intervention after injury was 4.05 days (Table 7). Similar finding was observed in the other study[7]

Figure 3: (A) Pre-operative image (B) Intra-operative image (c) Post-operative follow up images

where maximum patient was operated between 2 to 7 days following injury.

In our study, the upper limb was involved bilaterally in 15 patients (75%) involving dorsum of hand (Table 6). Overall graft uptake was 83.95%. (Table 10). Total healing time was overall reduced in patients with early excision and grafting. Mean healing time was 20.74 (Table 9). Patient with higher graft uptake had early healing of wound and better functional outcome in post-operative period.

Average hospital stay is 15 days in this study (Table 8). Whereas it is 19 & 22 days in other studies.[6,7] There is significant decrease in hospital stay for 7 days in our study. Scar hypertrophy of dorsum of hand was seen in 5 (25%) patients out of which 2 patients developed contracture (Table 11) and 3 were advised pressure garments and regular massage which gave good results in due course.[6]

Two patients who developed post burn contracture due to 20% loss of skin graft, did not come for

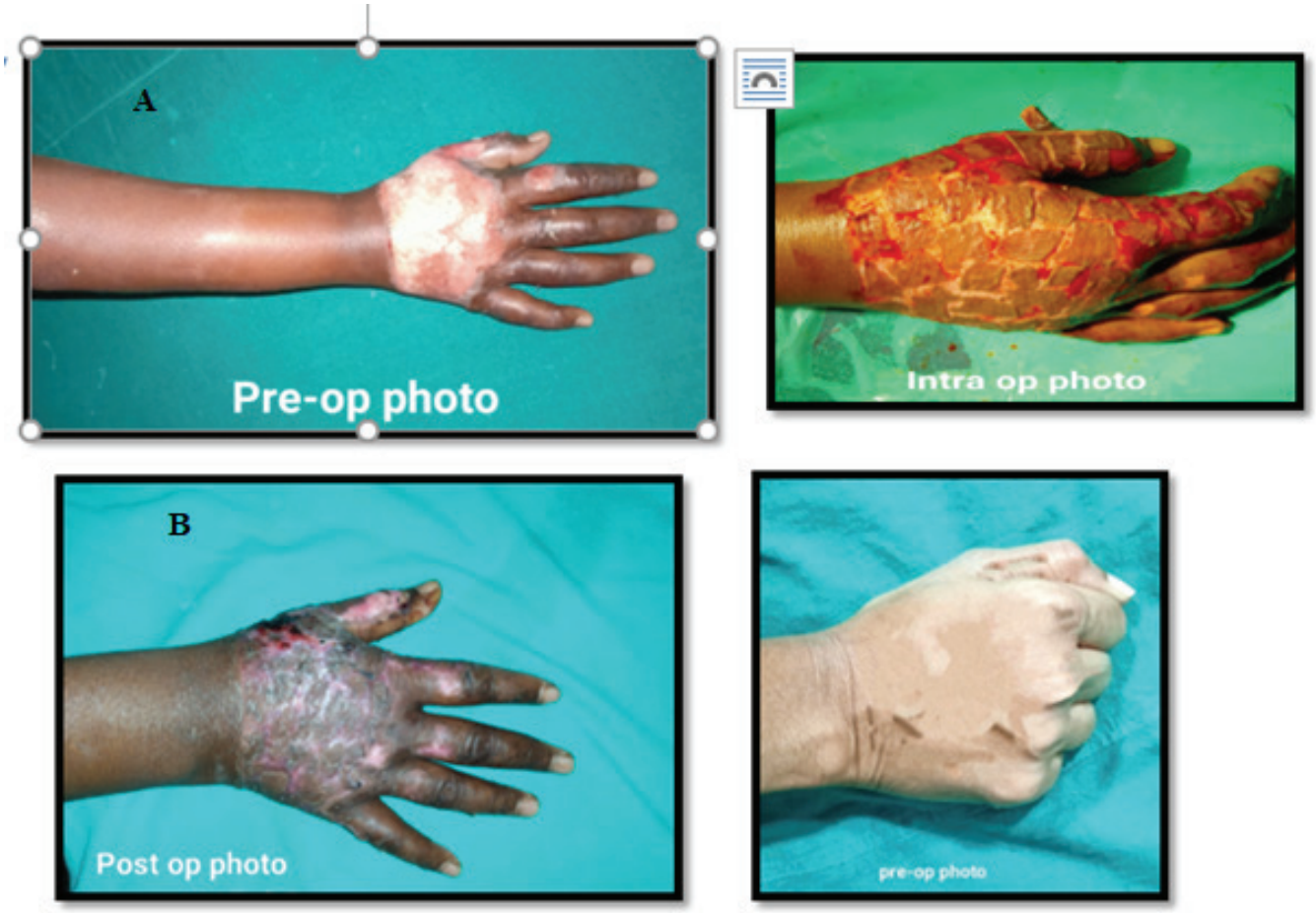

Figure 4: (A) Pre-op and intra-operative image (B) post-operative follow up images.

Figure 5: Deep dermal burns dorsum of hand with edema & position of ease

Figure 6: Burn claw hand deformity

post operative follow up & not used splintage, physiotherapy. They were treated by contracture release and SSG after 6 months. Functional outcome was analyzed and classified into excellent, good and poor based on range of movement of hand like flexion, extension, fist formation. 18 patients (90%) had excellent outcome. (Table 12).[8,9]

CONCLUSION

This study concludes that setting standard protocol of treatment for hand burns from day 1 and Early tangential excision and SSG of deep dermal burns of hand gives good structural outcomes like adequate first web space, MPJ flexion, cupping of hand and functional outcomes like power grip, tripod grasp

and pinch. Early tangential excision and SSG is best treatment for dorsal hand burns.

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