

Role of Topical Papaya Application in Debridement of Deep Burn Wounds

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¹ Conception of study

¹ Experimentation/Study conduction

¹ Analysis/Interpretation/Discussion

¹ Manuscript Writing

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Abstract

Objective: To study the role of topical papaya application in managing deep burn wounds in terms of proteolytic enzymatic debridement for wound bed preparation.

Material and Methods: This was a descriptive study carried out at Rawalian burn centre holy family hospital Pakistan from 12-10-2019 to 11-1-2020 over a period of 03 months. A total of 30 patients were included in the study (n=30). A convenient non-probability sampling technique was used for allocating patients to the study after getting written informed consent. For patients included in the study, papaya dressing was used for debridement and wound bed preparation of deep burn wounds.

Results: There were 19 (63.3%) female and 11 (36.7%) male patients. The age range of patients was 10y to 50y with a mean of 28 years and SD \pm 8.06 Patients included in the study had TBSA ranging from 10% to 35% with a mean of 19.8% and SD \pm 6.82%. On average 7 dressings (Range 5-7) were required to achieve pink healthy granulation tissue. Out of total 30 patients (n=30) included in the study, good healing with the production of pink granulation was seen in 27 patients (81%) while in the rest of the 03 patients minor surgical debridement was required to achieve the pink granulation tissue bed for skin graft.

Conclusion: Based on the results of this study it can be concluded that Papaya is an effective, safe, and rapid enzymatic proteolytic debriding agent of plant origin for deep burn wounds which promotes the growth of pink healthy granulation tissue with a minimal number of dressings. This granulation tissue readily accepts split-thickness skin graft.

Keywords: Burn, Papaya, Granulation Tissue, Rawalian Burn Center Pakistan.

Introduction

Burns are a common form of injury in our country especially in the winter season, when the incidence of burn injuries increases considerably. These patients mostly have deep burns and need skin grafting after the preparation of the wound bed. Commercially available dressings are very expensive and not always available in government hospitals. Major portion of our society comprises of poor people who cannot afford these dressings. Literature review shows that full-thickness burns need debridement either by surgical method, mechanical, proteolytic, or biological methods. Every method has its advantages and disadvantages.

Carica Papaya is commonly used for the debridement of wounds with slough in many countries of the world e.g. Regions of Africa, Nigeria, and India. It contains proteolytic enzymes Papain¹ and chymopapain which are heat resistant enzymes and are active even after autoclaving the pulp of papaya before application to the wound.² It is present in leaves, fruit (ripe/unripe), root, and seeds of the papaya tree. It can be used alone or in combination with other agents e.g. urea, collagenase, chlorophyllin, selenium, and copper.³ It works effectively at a wide range of P^H and Temperatures. Carica papaya extracts also have anti-inflammatory, anti-oxidant, and anti-bacterial activity against both gram-positive and negative bacteria e.g. staphylococcus aureus, eschericia coli, pseudomonas aeruginosa, and mycobacteria.^{4,5} It contains carpaine and aglycones responsible for antimicrobial activity. Extracellular glycoprotein proteinase inhibitor is also present in papaya whose role has yet to be determined.⁶

The current study was undertaken to determine the efficacy and safety of topical Papaya pulp application in managing deep burn wounds in terms of proteolytic wound debridement for preparation of wound bed as it is cheap, does not need any expertise, and blood transfusions. Wound beds are usually ready with healthy pink granulation tissue for split skin grafting in 7 days. Ultimately this technique of burn dressing will reduce hospital stay and cost of dressings per patient in economic terms.

Materials and Methods

Objective: To study the role of topical papaya application in managing deep burn wounds in terms

of proteolytic enzymatic debridement, for wound bed preparation.

Operational Definition of Wound Healing:

A wound with pink, healthy granulation tissue and no Slough/discharge was called a healthy wound.

Main outcome measures:

Wound debridement.

Study design:

Descriptive case series.

Setting:

Plastic Surgery Department, Holy Family Hospital Rawalpindi.

Duration:

This study was carried out from 12th October 2019 to 11th January 2020 over a period of 03 months.

Sample size:

A total of 30 patients (n=30) were included in this study.

Sampling technique:

Convenient (non-probability) sampling was used in this study.

Sample selection:

A sample selection criterion was:

Inclusion criteria:

- Patients with Deep/Full Thickness Burns.
- All age groups.
- Either gender.

Exclusion criteria:

- Burn patients with co-morbidities e.g Diabetes, IHD.
- Pregnant female patients.
- Allergy to Papaya.

Data Collection Procedure:

Patients of either gender with full-thickness burns of all age groups by simple random sampling were admitted and included in the study after taking written consent. Detailed history regarding any allergies was taken from the patient and recorded in pre-designed Performa. Baseline investigations were done.

Papaya paste prepared from fresh papaya pulp stored in the freezer was used for dressing. Papaya paste was spread on wet gauze which was applied to the wound. It was then covered with cling plastic film to preserve moisture and prevent papaya paste from drying. The dressing was changed the next day, so each dressing remained in place for 24 hrs. Dressings were continued till wound bed preparation with pink granulation tissue was achieved. Then skin grafting was done. Patients were discharged from the ward after the uptake of graft and followed for the next 2 months in

the outpatient department till the complete healing of the wound.

In our Rawalian burn center, Rawalpindi Pakistan patients with deep burn wounds are routinely managed by surgical debridement to prepare the wound bed till the development of healthy pink granulation tissue for skin grafting.

Data analysis procedure:

Data were analyzed by SPSS-22 software.

Results

There were 19 (63.3%) female and 11 (36.7%) male patients. The age range of patients was 10 to 50 years with a mean of 25.36 years and SD ± 8.06 years. Patients included in the study had TBSA ranging from 10% to 35% with a mean of 19.2% and SD ± 6.82% (Table 1). On average 7 dressings (Range 5-7) were required to achieve pink healthy granulation tissue (Table 2). Out of a total of 30 patients (n=30) included in the study, good healing with the production of pink granulation was seen in 27 patients (81%) while in the rest of the 03 (19%) patients minor surgical debridement was done to achieve the pink granulation tissue bed for skin graft (Table 3).

A split-thickness skin graft was very well accepted (>90% area) in 28 (93.3%) patients whereas in 2 (6.7%) patients take up of skin graft was relatively less (50% and 70% area).

Table 1: Distribution of Total Burn Surface Area (TBSA)

No. of Patients (N=30)	TBSA %
9	10-15
3	15-20
12	20-25
4	25-30
2	30-35

(Mean TBSA was 19.2% ± 6.82%)

Table 2: Distribution of Patients on Basis of No. of Papaya Dressings done

No. of Patients	No. of Papaya Dressings done to Achieve Healthy Granulation Tissue.
2	6
10	8
15	7

Average no. of papaya dressings done to achieve healthy granulation tissue=7

Table 3: Wound Debridement by Topical Papaya Application

N=30	Debridement achieved by Topical Papaya Application	Debridement not achieved by Topical Papaya Application
No. of Patients	27 (81%)	3 (19%)

In 3 patients healthy granulation tissue could not be achieved and needed minor Surgical debridement.

Discussion

Many other plants are used for the treatment of different medical conditions for example treatment of piles and tumours. Papaya has also been used for improving the quality of scars and promoting the growth of healthy granulation tissue in wounds. This is because of the presence of vitamin C in papaya that converts proline into hydroxyproline, a hallmark of good granulation tissue. More than twenty-five plants are used for the treatment of burn wounds in different countries of the world for example Bromelain (commercially available as Debrase) a proteolytic enzyme from the pineapple plant, a collagenase collostridio-peptidase⁷, Actinidia deliciosa from Kiwi fruit.⁸ Proteases from bacteria for example Proteus Bacillus, have been also tried but left due to the occurrence of bacteremia.

In the current study, we found that debridement of deep burn wounds with eschars by topical application of papaya is a simple method that requires no expertise. There is no blood loss as occurs in surgical debridement. Papaya dressing remains in place for twenty-four hours and is then changed. A total of 5 to 7 dressings depending upon the thickness of eschar are usually required to separate the eschar and promote good healthy granulation tissue which will accept the skin graft. Jayarajan RC et al in his study supports our views and states that in conventional clinical practice surface area of the burn is either over or underestimated. If over-estimated, treatment by early surgical debridement will lead to the sacrifice of a considerable burn area that otherwise will heal by itself, and underestimation will lead to healing with deformities. In his study, he concludes that papaya can be used for early and complete debridement of deep burn wounds leading to the production of healthy granulation tissue.⁹

We applied the dressing once daily for 24 hours. Ian F. Starley in his study on papaya also states that topical papaya is a better topical antibiotic and debriding

agent than others because it is usually applied once a day with minimal nursing needs and simple application technique. So results of his study support our study.¹⁰

According to the results of this study, Papaya was found to be an efficient debriding agent. Some studies have compared the efficacy of *Carica papaya* in preparing wound beds with other agents being used for the same purpose and confirmed our result. Mangla B. Murthy in his study has established the superiority of papaya over hydrogen peroxide in the preparation of wound beds.¹¹ Adam J. Singer et al. in his work using another plant origin protease Debrase derived from Bromelain, reported rapid debridement of deep burn wounds and rapid re-epithelialization in swine model.¹² Koller J. et al also studied plant origin enzyme debridase for debridement of deep burn wounds and found it to be safe, effective, rapid and innovative.¹³ Hewitt H. in his work used papaya for the treatment of chronic ulcers. According to his study papaya promoted desloughing, granulation, wound healing and odour reduction. He declared papaya as a more effective topical application for the treatment of chronic ulcers.¹⁴ Septicaemia and bacteraemia observed with the use of proteases of bacterial origin¹⁵ is not seen with the use of proteolytic enzymes of plant origin especially papaya which also has anti-septic properties.¹⁶

Although topical papaya is well tolerated as is the case in our study but the risk of 1% anaphylactic reaction has been reported by one study.¹⁷ M. Awais in his thesis "10 medicinal plants of Pakistan" has also described the proteolytic and anti-bacterial properties of papaya in detail highlighting its importance in medical practice¹⁸ and confirming easy availability of papaya in Pakistan throughout the year more so in the winter season.

As this is a descriptive study and lacks comparison and control, the limitations of the study were a small sample size and a single-center study. More multicenter studies with a larger sample size are required to confirm the results of this study.

Conclusion

Based on the results of this study it can be concluded that Papaya is an effective, safe, and rapid enzymatic proteolytic debriding agent of plant origin for deep burn wounds which promotes the growth of pink healthy granulation tissue with a minimal number of dressings. This granulation tissue readily accepts split-thickness skin graft. The current study also

confirms that debridement by this proteolytic method prevents excessive blood loss associated with surgical method, multiple transfusions, prolonged hospital stay, long theatre time and hence local and national health budget loss.

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