

## The treatment of paediatric burns using topical papaya

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### Abstract

Due to the limited resources for the management of burns in most regions of Africa there is a significant role for many aspects of traditional African medicine. The active component of many traditional preparations is often of plant origin and more than 25 plants have been described as useful in relations to burns and wound healing. *Carica papaya* is currently used in The Gambia at the Royal Victoria Hospital, Banjul in the Paediatric Unit as the major component of burns dressings, where it is well tolerated by the children. Cheap and widely available, the pulp of the papaya fruit is mashed and applied daily to full thickness and infected burns. It appears to be effective in desloughing necrotic tissue, preventing burn wound infection, and providing a granulating wound suitable for the application of a split thickness skin graft. Possible mechanisms of action include the activity of proteolytic enzymes chymopapain and papain, as well as an antimicrobial activity, although further studies are required. © 1999 Published by Elsevier Science Ltd and ISBI. All rights reserved.

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### 1. Introduction

Burns are a major source of morbidity and mortality in the developing world. In Africa, burns commonly affect children and occur mainly in the home around the kitchen and fireplace [1,2]. The large number of paediatric burn patients in developing countries combined with limited resources make management of this group of patients difficult. Economic and logistics dictate that alternatives to the relatively expensive burns dressings available in the Developed World are required.

The Gambia, one of Africa's smallest and poorest countries is situated on the Atlantic coast of Africa, bordered by its larger neighbour Senegal. A former British colony much of its administration and health system was originally based on a British model, and continues along those lines.

The Gambia with a population estimated at 1.25 million, has a crude birth rate of 46 per 1000 population. The infant mortality rate and under five mortality are 85 and 137, respectively, and 44% of the population are aged less than 14 yr. The gross national product (GNP) is US\$ 360 per capita.

The Royal Victoria Hospital (RVH) in Banjul is the main government referral hospital for the Country. The Paediatric Unit at RVH has 120 beds, and admitted 6807 children during 1996. During 1996 there were 133 children less than 15 yr of age admitted for burn care. This comprised 19% of the total admissions to the children's surgery ward. Child health care is free, but additional expenses are met by the family, such as dressing which are available on the open market.

The paediatric unit comprises four wards, the largest (Fig. 1) being the main surgical ward. The three other wards are of similar size (Fig. 2), the burns unit being arbitrarily designated as such. There is no adequate ventilation, lighting or water supply for the paediatric

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Fig. 1. The main paediatric surgical ward at the Royal Victoria Hospital Banjul.

unit. Cold water is available from a central location in the unit.

Acute burns are managed on the burns ward if possible, allowing for bed availability. During the winter period, when there are increased numbers of burns admissions, they are located on the general ward. Conversely during the summer period general surgical cases including chronic osteomyelitis, soft tissue infections, and trauma are located in the burns unit. Bed occupancy can also be as high as three per bed. With no formal infection control policy for the unit and limited aseptic techniques for wound care management due to nursing constraints and limited facilities the situation is further compounded by the parents having to do some of the dressings unsupervised in less than ideal circumstances (Fig. 3).

Early debridement and grafting is being introduced but is limited by the availability of blood, resources such as dressings, and limited surgical experience. These issues are being addressed.

At the Royal Victoria Hospital in Banjul, The Gambia, we have incorporated a traditional medicine practice for treating burns into the care of paediatric



Fig. 2. A minor ward at the Royal Victoria Hospital Banjul.



Fig. 3. Parents removing dressings.

burn patients. This paper describes our method of using topical papaya to treat burn wounds and reviews the existing literature.

## 2. Method

All full thickness and infected burns admitted during 1996 were treated with papaya ( $n = 32$ ). No side effects were recorded. Initially, problems were encountered with burns which were only partial thickness and dressed with papaya. Some of these wounds were subsequently found to be full thickness. It is, however, not clear whether they were full thickness originally or were converted to full thickness wounds by the papaya. Superficial and partial thickness burns are now treated by the exposure method where possible, but not with papaya when a dressing was needed.

The child's parent or guardian is asked to purchase a papaya from the local market. In The Gambia a large papaya weighs approximately 2 kg, and can be purchased for 10 Dalasis (1 US\$). Papaya is available the year around, and especially plentiful during the cool seasons when burns are the most common. One large papaya is usually sufficient to provide papaya paste for 10–15 children for several days time. The skin and seeds of the papaya are discarded and the flesh mashed into a paste. The papaya paste is stored cold until use.

Infected or full thickness burns are treated with topical papaya paste. We find the simplest method to apply the papaya to the burn is to spread the papaya paste on gauze and then apply the gauze to the wound (Fig. 4). Papaya applied by this method is sufficient for the dressing to stick to the wound and has the advantage of avoiding circumferential dressings, which are uncomfortable in a tropical environment. As the papaya dressing has usually dried by the following day it is usually necessary to soak the dressing off with water. Typically, the papaya paste is applied once a



Fig. 4. The preparation of papaya (papaya can be seen growing in the background).

day, but occasionally as twice daily dressings for infected wounds (Fig. 5) or wounds with thick eschars. There is little early grafting of burns, although with education, equipment and support this is expected to change. Limited experience has shown that wounds treated with papaya over a period of weeks do become



Fig. 5. Tropical papaya dressing applied to a child who presented with infected full thickness burns.



Fig. 6. Full thickness burn debrided with papaya then grafted.

clean enough for grafting (Fig. 6) and such wounds can accept a graft (Fig. 7).

### 3. Comment

Papaya seems to have several advantages over other



Fig. 7. Full thickness burns debrided with topical papaya dressing three weeks post injury.

topical antibiotic agents in the environment in which we are currently using it. Papaya is readily available and inexpensive. As it is applied only once a day in the majority of burn patients, nursing requirements are not high and dressing techniques are simple and easy. A major advantage is that topical papaya obviates the need to debride burn wounds surgically, with limited theatre time, blood and inherent risks to the patient. Since adopting the papaya method surgical debridement of full thickness burns has rarely been necessary.

Traditional medicine still plays a role in the management of a wide range of medical and surgical conditions [3]. In West Africa more than 25 plants have been described specifically for the treatment of burns. *Carica papaya* has long been recognised as having a role in a wide range of medical conditions. The juice has been used for treatment of warts, corns, and cancers, the roots for piles and yaws, the leaves for nervous pains and the fruit for infected wounds, malignant tumours and burns [4].

The desloughing effect of papaya may be related to proteolytic enzymes. Papaya contains papain, leukopapain, and chymopapain. The proteolytic activity of papain is well described in relation to its commercial use as a meat tenderizing agent. The dynamics of leukopapain in wound healing, using both animal models and clinical setting, have suggested that it is effective in facilitating wound cleaning primarily as a desloughing agent, promoting growth and improving the quality of the scar [5].

The role of an extracellular glycoprotein proteinase inhibitor found in *C. papaya* has yet to be determined in relation to its observed action [6]. The use of enzymes has been investigated as theoretically requiring no surgical skill to remove the eschar, not inciting bleeding, desloughing necrotic tissue and reducing hospitalisation [7,8]. Sepsis has proven to be a major limiting factor in large areas of enzymatic debridement unless combined with antibiotics. Papaya also contains carpaine and aglycones which have a broad spectrum antimicrobial activity.

Our experience suggests papaya is well tolerated in children, although anaphylactic reactions to papain

have been reported at approximately one per cent [9]. Similarly there is a theoretical risk of systemic absorption of the papaya, this is of some concern, as injection of papain intravenously to tenderise cattle before slaughter has been practised.

Papaya may therefore have a role in burn wound care. Topical papaya appears effective in desloughing wounds and limiting burn wound infection. Further studies are, however, required compare papaya to other accepted methods of burn wound treatment and to define the precise role of papaya in burn wound management.

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