Original Article

Enzymatic Wound Debridement; Role of Papaya in the Management of Post Cesarean Gaped Wounds

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Abstract

Background: Enzymatic wound debridement is an emerging concept in facilitating the wound healing process. Papaya has de-sloughing, antibacterial and wound healing properties. It has been used in African countries since centuries for different medicinal purposes. Apart from anecdotal reports and few studies on chronic ulcers and burns, no planned studies are available to support its action in postoperative wound infection.

Objectives: To compare efficacy and safety of papaya dressing with conventional wound dressing with povidone iodine in post cesarean section gaped wounds.

Setting: Gynecology Unit 3, Sir Ganga Ram Hospital Lahore – Pakistan, over a period of six months(June 2012 to Nov 2012).

Study Design: Randomized, qausi experimental study.

Materials and Methods: The study sample included 60 patients with post cesarean section gaped wounds. The sample was divided into two groups; thirty patients as Group A or the study group received Papaya dressing andrest of thirty patients as Group B or the control group received Povidone iodine dressing. Wounds were thoroughly washed with saline and then mashed unripe papaya was spread over the whole area of wound in the study group and povidone iodine in the control group. Wounds were covered with sterile bandage for at least 48 hours in study group and 24 hours in the control group. The process was repeated till a clean base of wound with healthy granulation tissue was achieved suitable for secondary suture. The efficacy parameters studied were the duration of time needed to develop healthy granulation tissue and total duration of hospital stay which were compared between the two groups. Safety factors studied were the adverse effects of medications used in the study.

Results: Out of 1200 cesarean sections done during study period, sixty (5%) were gaped in the post-operative period. Out of 60, 55 (90%) were emergency and only 5 (10%) were elective cesarean sections. All the sixty patients with postoperative gaped wounds were included in the study, of which 30 patients received Papaya and 30 received Povidone iodine dressing. Time required to induce healthy granulation tissue was significantly shorter in the papaya group as compared to povidone iodine group (3.4 ± 0.4 days versus 7.2 ± 0.2 days).Similarly the duration of hospital stay was also short in the study as compared to control group i.e. 11.6 ± 1.2 days and 16.8 ± 1.4 days respectively. The side effects of medications used in study (papaya and povidone iodine) like local irritation and hypersensitivity reactions were minor & not significally

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different in both groups.

Conclusion: Papaya dressing is effective, safe, widely available and cost effective for wound healing in post-operative infected gaped wounds.

Key words: Papaya, enzymatic wound debridement, povidone iodine, post cesarean.

Introduction

Cesarean section is the most common operation[1] done in obstetrics and post-operative wound infection is still a big challenge in the developing world with an incidence of 0.5 to 20%.[2]

Gaped wounds add significant morbidity in terms of prolonged hospital stay leading to immobilization and hence risk of deep venous thrombosis, the need for wound debridement, re-suturing, increased cost and psychological morbidity[3].

Infection is the most important and commonest contributory factor for gaped wound with anemia, uncontrolled diabetes and immunosuppression as the background risk factors. Wound infection results in formation of necrotic tissue and poor blood supply. This is clinically evident as slough on the wound base and edges. This slough prevents angiogenesis and epitheliazation of the wound leading to gaped wound[4].

The presence of devitalized tissue in the wound enhances bacterial growth and inhibits formation of granulation tissue. Debridement of necrotic tissue is therefore, an essential step in wound management.[5] Dedridement is the medical removal of dead, damaged or infected tissue to improve the healing potential of the remaining healthy tissue. Debridement[6-10] may be by surgical, mechanical, enzymatic, autolytic and by maggot therapy.

Enzymatic wound debridement[11] is an emerging concept in wound healing process. Many enzymatic debriding agents like collagenase, pure papain and papain – urea have been used for preparation of wound bed. Papaya is known to have rapid de-sloughing and wound healing properties since ancient times due to the presences of protease enzymes.[12]

From the fruit of Carica papaya, enzyme papain has been derived and used since decades in the food and pharmaceutical industries. It has also been used for many years for wound healing by natives in tropical countries. Papain is the best studied and most applied protease from thiol protease family.[11,12] The most frequently used products that contain papain are Accuzyme, Ethezyme, Kovia, Ziox and panafil.[13] Due to hypersensitivity reactions mentioned in some reports,[13] these products are not widely used in clinical practice.

There are some studies on chronic ulcers[14] & burn patients,[15] no controlled studies have been done to support the use of papaya in patients with postoperative wound dehiscence. So a study was planned to study efficacy and safety of papaya dressing in postoperative wound infection.

Materials and Methods

This was a randomized, semiexperimental study carried out over a period of 6 months in the inpatient department of Obstetrics and Gynecology Unit – 3, Sir Ganga Ram Hospital, Lahore – Pakistan. Out of 60 patients, 30 were allocated to Group A (Enzymatic debridement) as the study group and another 30 to Group B (surgical debridement) as the control group.

Inclusion Criteria

Post cesarean section patients with gaped wound, defined as absence of continuity between edges of the surgical wound after removal of sutures on the seventh post-operative day were included in the study after taking informed consent.

Exclusion Criteria

Patients with the following complications were excluded from the study.

1. Systemic disease (diabetes, hypothyroidism, HIV).
2. Severe anemia (Hb < 6 gm %).
3. Complete burst abdomen.
4. Body mass index > 30.
5. Patient allergic to papaya.

Detailed history of enrolled patients including age, parity, gravidity, history of allergy and any other medical disorder was taken. General physical examination including body mass index, vital signs and systemic examination was carried out. Local examination of the wound was done to observe the type of discharge, presence of slough and nature of granulation tissue at the base of the wound. A wound swab was taken for culture and sensitivity test and empirical broad spectrum antibiotic therapy was started to cover the common infecting microorganisms which was then modified according to the culture and sensitivity report.

Patients were randomized to two groups; Group A or the control group received papaya dressing. This

consisted of placing sterile gauze dressing after placing 200 Gms of well cleaned, peeled and mashed unripe papaya between edges of gaped wound which remained insitu for 48 hours. The dressing was removed on 3rd day to observe the condition of the wound and re-dressing was done if required. The group B or the control group received daily povidone iodine.

The outcome measure in both groups was the presence of healthy granulation tissue, defined as pink tissue with beaded or granular appearance; serous non foul smelling discharge and complete absence of slough at the center of the wound. Dressing in both groups was continued till the end point i.e. healthy granulation tissue was achieved after which re-suturing was done. Number of days for which dressing was required before achieving the end point was noted. The patients were followed until surgical wound healing was achieved and total duration of hospitalization was noted. The number of patients requiring surgical debridement and repeat resuturing was also noted in both groups. Patients were closely monitored for any hypersensitivity reaction and safety of study medications.

Statistical Analysis

Was done using computer programme SPSS Version 14 for windows. A p-value of < 0.05 was considered statistically significant.

Results

Out of 1200 cesarean sections done during study period, sixty (5%) were gaped in the post-operative period. Out of 60, 55 (90%) were emergency and only 5 (10%) were elective cesarean sections. Out of 60 patients enrolled in the study, 30 patients received papaya dressing(study group) and the rest 30 received povidone iodine dressing(control group). Both groups were comparable with respect to parameters like age, weight, parity and condition of wound as shown in Table 1.

Table 2 shows that the duration of time to induce development of healthy granulation tissue was significantly short in the study as compared to the control group i.e. 3.4 ± 0.4 days versus 7.2 ± 0.2 days which was statistically significant with a p-value of 0.01. The mean duration of hospital stay was also short in papaya group i.e. 11.6 ± 1.2 days as compared to povidone iodine group i.e.16.8 ± 1.4 days.

As shown in Table 3, the surgical debridement and repeat re-suturing was needed in two (6.6%) patients in papaya group and 8 (20.6%) patients in the control group.

There was no statistically significant difference in the adverse effects e.g. local irritation and itching of the medications between the two groups. Hypersensitivity reactions were noted in 2 patients in papaya group as shown in Table 4.

Table 1: Demographic factors and condition of wound at admission in study and control group.

S. No.	Parameters	Study Group	Control Group
1.	Age (years)	25 ± 3	26 ± 2
2.	BMI (body mass index)	24 ± 2	23 ± 4
3.	Parity	4	3
4.	Condition of wound	Infected with slough at the base	Infected with slough at the base

Table 2: Outcome measures or end-point in both groups.

S. No.	Parameters	Study Group	Control Group	P-value
1.	Time to develop healthy granulation tissue (days)	3.4 ± 0.4	7.2 ± 0.2	0.01
2.	Mean duration of hospital stay	11.6 ± 1.2	16.8 ± 1.4	0.02

Table 3: Need for repeat debridement and re-suturing in both groups.

S. No.	Parameter	Study Group	Control Group	P-value
1.	Repeat debridement and re-suturing	2 (6.6%)	8 (20.6%)	0.09

Table 4: Side effects of medications used in both groups.

S. No.	Parameter	Study Group	Control Group	P-value
1.	Local irritation	4	3	0.6
2.	Hypersensitivity	2	1	0.9

Discussion

Papaya has been used since centuries in African countries for different medicinal purposes.[16] Enzymes like papain and chymopapain in papaya assist in the removal of necrotic debris and induces development of healthy granulation tissue. Till to date many enzymatic wound debridement agents like collagenase, pure papain and papain urea have been tried for preparation of the wound bed. Literature review shows few research articles[14,15] on the role of papaya as the wound debridement agent.

The results of our study are comparable to other such studies done at national and international level. The rate of post-operative gaped wound was 5% in our study which is within the quoted range of 0.5 to 20% mentioned in different studies.[1,2] The mean duration of wound bed ready for suturing was significantly reduced in papaya group (3.4 ± 0.4 days) as compared to povidone iodine group (7.2 ± 0.2 days). Results of a study conducted in Jamica[14] for chronic skin ulcers show that the use of Papaya fruit by nurses promoted desloughing, granulation and wound healing along with reduced odour in ulcers.

Results of our study show that the use of papaya leads to faster removal of dead tissues, shorter hospital stay (11.6 ± 1.2 in study group as compared to 16.8 ± 1.4 days in control group) and overall low cost. Results of another study conducted in the pediatric unit of the Royal Victoria Hospital Gambia[15] shows that the use of papaya dressing in burn wounds is cost effective, widely available and effective in desloughing necrotic tissue. The mechanism of action is not only the proteolytic enzymes chymopapain and papain but also its antimicrobial activity.[16,17] Papaya fruit has been found to be active against some organism involved in wound infection like staphylococcus aurous and pseudomonas.[18]

Animal studies[19] have shown efficacy of papaya extract in induction of healthy granulation tissue on excised wounds in diabetic rats. Results of a study conducted on diabetic rats show that papaya extract also increased the hydroxyproline content of the wound. Increased amount of vitamin C present in papaya fruit helps in the conversion of proline to hydroxyl proline which is an indicator of collagen content of granulation tissue laid down during healing.

Results of our study show that a major advantage of papaya dressing is that it obviates the need to debride wound surgically, with limited theatre time, no blood loss, risks of anesthesia and pain to the patients. It can be used in patients with bleeding disorders and in rural areas where theatre facilities for surgical debridement are not available. Results our study show that only 2 (6.6%) patients needed surgical debridement and repeat suturing in the study group as compared to 8 (20.6%) patients in the control group. Studies[15] in burn patients show that adopting papaya method, surgical debridement of full thickness burns has rarely been necessary.

Safety and tolerability of papaya remained excellent in our study except few cases where some local irritation was reported. Previous studies[14,15] have also proved safety of papaya fruit although an increase in hypersensitivity reactions with purified papain preparations was observed. Despite concern of hypersensitivity, no such reactions were noted in our study. However, papaya fruit should be used under closed supervision. Additional advantages of papaya fruit include its availability in plenty in all seasons and low cost. Papaya fruit dressing as used in the present study can be easily prepared even by unskilled persons provided aseptic precautions are taken.

We used unripe papaya fruit in our study. Studies show that there are presently no guidelines regarding selection of the fruit (Some studies have used ripe[21] while others used unripe[22] or partially ripe papaya), preparation of dressing (either mashed[21] fruit or extract[8]) and method of application. The enzymatic content of papaya is said to decrease as the fruit ripens[20] suggesting better efficacy of raw papaya. However, most studies have used mashed ripe papaya for dressing due to ease of preparation and have obtained induction of granulation tissue inspite of difference in their enzyme content. Studies[21,22] confirm there is no difference between efficacy of ripe and unripe papaya in terms of their antibacterial activity.

Limitations of Study

Our study has certain limitations e.g. there is lack of standard methods of fruit selection, papaya dressing preparation and application. Also there are concerns regarding aseptic measures used. Thus, there is a need for development of standardized methods of papaya dressing which could be used in clinical practice. It is necessary to have controlled studies regarding use of papaya as a wound debriding agent and guidelines should be developed regarding its use.

Conclusion

Papaya dressing is effective and safe for wound debridement with additional benefits of no need of anesthesia, no pain and bleeding. Moreover it is cost effective and widely available.

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