Case Report

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Role of Topical Feracrylum in Wound Management

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Abstract

Uncontrolled haemorrhage remains the leading cause of prehospitaltrauma deaths which are potentially preventable. Several haemostaticproducts are currently available. One of the chemical haemostaticagents is Feracrylum which is a water-soluble mixture of incomplete ferrous salt (II and III) of polyacrylic acid. It has a molecular weight of500,000-800,000 Daltons because of which it is not absorbedsystemically and has no adverse effects on the liver, kidney, adrenals,cardiovascular and haemostatic systems. Feracrylum also exhibits antimicrobial activity thus reduces risk of wound infection

Keywords: Topical, Feracrylum, Wound management.

INTRODUCTION

Haemorrhage is a rapid and uncontrollable loss or outflow of blood from the circulatory system and is responsible for majority of pre-hospital trauma deaths in both the combat and civilian settings which are potentially preventable[1]. Rapid haemostasis is essential for decreasing mortality and also for optimal recovery. There are a variety of wounds that may cause traumatic bleeding such as incisions, lacerations, abrasions, hematoma, puncture wounds, contusions, crushing injuries, etc.

Wounds may be contaminated with microorganisms which delays wound healing due to the release of toxins and exhibits active signs and symptoms of infections[2]. Therefore, prevention and treatment of such infectious complications is also essential. Today many haemostatic agents have been proposed for haemostasis in severe bleeding with their merits and demerits. One of the chemical haemostatic agents is feracrylum which is biocompatible, biodegradable, non-toxic and non-allergenic in nature. It is not only haemostatic but also anti-infective against a nu mber of Gram-positive and Gram-negative pathogenic bacterial and fungal strains thus decreasing risk of wound infection. It has no local or systemic adverse effects. It is safe, economical with good haemostatic property.

MATERIALS AND METHODS

As pilot research, the investigation was carried out in a higher education facility in July 2023. The research was entirely descriptive; no statistical

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analysis was carried out. After gaining informed consent, the patient with the persistent wound (*Fig. 1*) was included. The patient was 57 years old. Patients were examined after a Doppler investigation to make sure they had no vascular insufficiency of the extremity. Feracrylum in solution form was used for both hemostasis at time of debridement and as antimicrobial solution (*Fig. 2*). Regular debridement of wound was done every 3rd day.

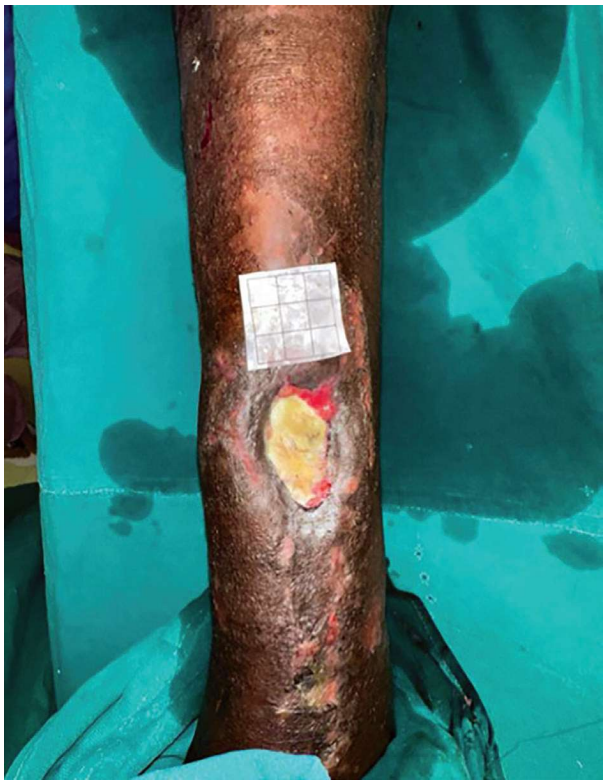

Fig. 1: Wound at Presentation

Fig. 2: Feracrylum application during dressing

RESULTS

In this study, we had one diabetic male patient with bare bone and raw area in the anteromedial distal 1/3 of the right lower extremity after more than 12 weeks of road traffic accident (RTA). The wound at the end of 4 weeks (*Fig. 3*) showed a significant reduction in untreated area measured by digital planimetry with an intact granulation tissue layer. After treatment, the size of the wound surface decreased (*Fig. 3*). Due to the application of feracrylum no pain, soaking was observed and good hemostasis was observed on application of feracrylum before closure ofdressing.patient was discharged at request and future plan is to cover with flap cover in subsequent admission.

Fig. 3: Wound at the time of discharge

DISCUSSION

Haemostasis Mechanism

Haemostasis is a complex physiological process which involves three major steps that occur in a

rapid sequence i.e. (1) Vasoconstriction, (2) Platelet plug formation and (3) Blood coagulation or clotting.[1]

After the injury occurs, there is an immediate vasoconstriction of damaged blood vessels caused due to several chemicals called endothelins that are released by vessel lining cells and by the pain receptors in response to vessel injury. This results in a temporary reduction of the blood flow and thus the blood loss.

In the second step platelets which normally float free in the plasma, encounter the area of vessel rupture with the exposed underlying connective tissue and collagenous fibers[2]. The platelets begin to stick to the exposed collagen and endothelial lining (platelet adhesion) and become activated. This process is assisted by a glycoprotein in the blood plasma called Von Willebrand factor, which helps stabilize the growing platelet plug.

Activated platelets release chemical messengers such as:

- Adenosine diphosphate and thromboxane, which cause aggregation of more platelets at the site of injury reinforcing (Platelet aggregation) and expanding the platelet plug and enhance vascular contraction, respectively.
- Serotonin, which maintains vasoconstriction.
- Prostaglandins and phospholipids, which also maintain vasoconstriction and help to activate further clotting chemicals, as discussed next.

As a result, a platelet plug is formed that physically prevents the blood from escaping the Vessel[3]. Meanwhile the third step initiates, a series of reactions known as the coagulation cascade that ends in the formation of fibrin polymer. In the coagulation cascade, chemicals called clotting factors (or coagulation factors) prompt reactions that activate still more coagulation factors. The coagulation factors exist in the blood in an inactive state and following the damage of a blood vessel, are activated according to two pathways: the intrinsic pathway and extrinsic pathway. Both of these pathway's merge into a third pathway, referred to as the common pathway[4]. All three pathways are dependent upon the twelve known clottingfactors, including calcium ions and vitamin K. Clotting factors are secreted primarily by theliver and the platelets. The twelve clotting factors are numbered I to XII according to theorder of their discovery[5].

In the current study, we used 1% Feracrylum citrate, a novel hemostatic agent. It is an effective, safe, reliable topical agent which is used in various surgeries for control of diffuse oozing from the surgical site.

Feracrylum is a water-soluble mixture of incompleteferrous salt II and III of polyacrylic acid containing 0.05–0.5% of iron. It is biodegradable and hygroscopic[6]. The molecular weight is about 5,00,000–8,00,000 Daltons,due to which there is no systemic absorption. No noted sideeffects on major organs like liver, kidney, adrenal gland,cardiovascular system and hemopoietic system. It hasantimicrobial and wound healing properties [7]

Feracrylum has three ways Action for wound care

Haemostatic action**:** It causes activation of thrombin (factor IIa) which is a serine protease that converts soluble fibrinogen into insoluble strands of fibrin thus forming clot as well as catalyzing many other coagulation related reactions in blood coagulation.[8]

Also, feracrylum on coming in contact with blood proteins especially albumin, it forms a biodegradable water insoluble synthetic complex creating a large rubbery clot which forms a physical barrier on wound surface and stops capillary bleeding and oozing in 2-3 minutes. It is non allergic with no systemic absorption.[9]

Antimicrobial action: Feracrylum is not only haemostatic but also anti-infective against a number of Gram-positive and Gram-negative pathogenic, bacterial and fungal strains like Staphylococcus aureus, Streptococcus pyogenes, Corynebacterium diptheriae, Salmonella typhi, Shigella dysentriae, Pseudomonas aeruginosa, Proteus vulgaris, Escherichia coli, Trichoderma viridae and Candida albicans.[10]

It ruptures microbial cell wall causing cell lysis. Feracrylum is superior to povidone iodine for its antimicrobial properties and its efficacy is comparable to that of povidone iodine.[11]

Feracrylum decreases risk of wound infection which delays wound healing.

Hygroscopic action: Feracrylum is hygroscopic in nature and maintains a moist environment at wound site resulting in faster healing and easy dressing removal. It promotes growth of healthy granulation tissue. Feracrylum is available in the form of a solution (1% w/v feracrylum), gel and tubes (1% feracrylum) and tulle (3% feracrylum).

CONCLUSION

The present study, results may conclude that lesser intraoperative time and also less blood loss when Feracrylumwas used.Topical feracrylum can be used to manage bleeding wounds with satisfactory results.The time taken by thepatients to recover from pain, resume their normal activityand also with regard to normal food intake was rapid.

Its good topical agent for wound bed preparation (WBP) before cover by skin graft or flap. Furtherstudies are recommended with large sample size to confirm these findings.

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