FROM SEIZURES TO WOUNDS: THE POTENTIAL OF PHENYTOIN IN TRAUMATIC WOUND MANAGEMENT

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ABSTRACT

Objective: Phenytoin is a medication primarily used to treat seizures, but it has been discovered to have the potential for wound healing due to its ability to increase collagen production, promote new blood vessel growth, reduce inflammation, fight infections, and encourage new skin growth. These effects are particularly useful for healing chronic wounds like pressure ulcers, diabetic ulcers, traumatic wounds, and venous ulcers.

Methods: This is a two-year prospective study conducted between January 2020 and December 2022 at the Government General Hospital in Kurnool. A study was conducted on 60 patients with traumatic wounds, dividing them into two groups. One group received topical phenytoin dressing, while the other received normal saline dressing. The study compared wound surface area, granulation tissue percentage, pain ratings on the visual analog scale, and healing time between the groups on day 14 and day 21.

Results: On day 0, cases and controls had similar wound surface areas (62.17±25.74 cm² and 62.14±21.57 cm², respectively) and VAS scores (8.8±1.22 and 8.88±1.52). By day 14, cases had significantly smaller wound surface areas (41±32.32 cm²), a higher percentage of granulation tissue (75.56±7.30%), and lower VAS scores (4.57±1.78) compared to controls (53.28±25.33 cm², 58.45±7.01%, and 6.32±1.02, respectively). By day 21, cases had even smaller wound surface areas (28.3±31.75 cm²), a higher percentage of granulation tissue (93±3.46%), and lower VAS scores (2.78±0.42) compared to controls (40.34±34.23 cm², 72.56±5.05%, and 4.82±1.27, respectively). The time for wound healing was significantly shorter for cases (22.76±7.28 d) compared to controls (32.6±9.31 d). On day 21, negative cultures were found in 80% of wounds in the study group and 50% of wounds in the control group, with a statistically significant difference (P-value<0.05).

Conclusion: Topical phenytoin dressing had positive effects on wound healing by increasing the rate of granulation tissue formation, providing better pain relief, and shortening the healing time. It was found to be safe, effective, and cost-effective option for wound healing due to its various mechanisms. The study highlights the significance of phenytoin in treating traumatic wounds, particularly in patients with limited access to expensive wound-healing medications.

Keywords: Phenytoin, Wound healing, Traumatic wound, Granulation tissue, Saline dressing

INTRODUCTION

Phenytoin, which is a type of medication that helps to control seizures, can lead to an increase in gum tissue growth in patients who take it orally observed by, Tn. Wigton Ha [1] and Shapiro [2]. However because it appears to have a positive effect on connective tissue, scientists have looked into whether it could be used for wound healing. Topical phenytoin has been tested on a range of wounds, including those caused by diabetes [3, 4], pressure [5], and leprosy [6], as well as traumatic wounds [7, 8]. DaCosta and colleagues observed that promoting angiogenesis at an early stage led to increased collagen deposition [8]. Kato and co-workers found impaired degradation of collagen in human gingival fibroblasts [9]. Shakeri et al. studied the role of membrane stabilization in wound healing [10]. Hasamnis and team investigated the effect of a substance on the epithelialization of wounds [11]. Swamy and colleagues investigated early transcriptional responses in human dermal fibroblasts [12]. Although some studies have looked into the impact of topical phenytoin on wounds caused by War [7] and Trauma [8], more research is required in this area. Our objective was to compare how effective topical phenytoin is compared to standard saline wound dressings in terms of reducing the size of traumatic wounds, promoting the formation of granulation tissue, reducing the number of days required for wound healing, and alleviating pain.

MATERIALS AND METHODS

A two-year prospective case-control study was conducted at Government General Hospital Kurnool, involving 60 participants. The study was approved by the institutional ethical review committee (IEC-KMC-GGH/27/1/2020), and written informed consent was obtained from all participants. The study focused on adult patients between 20 and 60 y of age, who had full-thickness traumatic wounds affecting the skin and subcutaneous tissue, and who were willing to participate. Patients with comorbid conditions that could affect wound healing, such as liver and kidney disease, uncontrolled diabetes, vascular issues, those on steroids, immunocompromised patients, those with a history of oral phenytoin use, and those who were allergic to phenytoin, were excluded from the study.

After screening patients based on the inclusion and exclusion criteria, 60 individuals were selected for the study and randomly assigned to two equal groups using a lottery method. Both groups received a 1-gram intravenous ceftriaxone infusion twice daily for five days, and wound debridement was performed as required. On day 0, wound measurements were taken using tissue paper tracing, and the pain was evaluated using the Visual Analogue Scale (VAS).

The amount of phenytoin used in the study group(n=30) was determined based on the wound size [3], with 100 mg applied up to 5 cm, 150 mg for wounds between 5 and 10 cm, 200 mg for wounds between 11 and 15 cm, and 300 mg for wounds greater than 15 cm. The phenytoin tablets were crushed and mixed with 5 ml of normal saline for every 100 mg of the drug, and the resulting suspension was applied uniformly over the wound surface. The control group, on the other hand, received normal saline and moist dressings. Healing progress was evaluated on days 14 and 21 in terms of the
percentage of granulation tissue formation, pain alleviation measured by VAS, percentage reduction of wound size based on serial measurements, and the duration of time required for complete wound healing. Both groups were also evaluated for culture sensitivity on days 14 and 21 to assess the antibacterial effect.

RESULTS

This study involved 60 patients who had traumatic wounds, and they were equally distributed into two groups—cases (n=30) and controls (n=30). Of the total patients, 44 (74%) were male, while 16 (26%) were female. The patients had an average age of 34 y, with ages ranging from 20 to 60 y. The patients were classified into three age groups, including 15 patients (25.0%) aged between 20 and 35 y, 25 patients (42%) aged between 35 and 45 y, and 20 patients (33%) aged between 45 and 60 y.

The study assessed the percentage of granulation tissue present on the wound surface area on days 14 and 21. The results showed that on day 14, the mean percentage of granulation tissue in the cases (n=30) was 75.56% with a standard deviation of 7.30, while in the controls (n=30), it was 58.45% with a standard deviation of 7.01. This difference between the two groups was statistically significant, with a P-value of 0.01. Similarly, on day 21, the mean percentage of granulation tissue in the cases was 93% with a standard deviation of 3.46, whereas, in the controls, it was 72.56% with a standard deviation of 5.05. The difference between the two groups was statistically significant, with a P-value of 0.001.

The study measured pain alleviation using the Visual Analogue Scale on day 0, day 14, and day 21. On day 0, the Visual Analogue Score was 8.81±1.22 among cases (n=30) and 8.88±1.52 among controls (n=30). On day 14, the Visual Analogue Score for cases was 4.57±1.78, while that for controls was 6.32±1.02. On day 21, it was 2.78±0.42 for cases and 4.82±1.27 for controls. The difference between the groups was statistically significant, with a P-value of 0.02.

To determine the reduction in wound size, the surface area of the wound was measured at regular intervals. On day 0, the surface area of the wounds in both the cases (n=30) and control groups (n=30) was similar, with an average of 62.17±25.74 cm² and 62.14±21.57 cm², respectively. On day 14, the surface area of the wounds among cases decreased to 41±32.32 cm², while it decreased to 53.28±25.33 cm² among controls. On day 21, the surface area further reduced to 28.3±31.75 cm² among cases and 40.34±34.23 cm² among controls. Consequently, the percentage reduction in wound surface area on day 21 was found to be higher in cases (54.45%) compared to controls (35.08%).

On day 21, both groups of patients were examined to check for the antibacterial effect by testing the cultures of their wounds. In the study group (n=30), 24 out of 30 wounds (80%) had no detectable bacterial growth, whereas in the control group (n=30), only 15 out of 30 wounds (50%) showed no bacterial growth.

The study measured the time it took for the wound to heal or for the wound to be prepared for further medical treatment. Results showed that the average duration for the study group (n=30) was 22.76±7.28 d, while the average duration for the control group (n=30) was 32.64±9.31 d. The difference between the two groups was statistically significant, with a P-value of 0.01, indicating that the treatment had an impact on the healing time of wounds.

DISCUSSION

Over the years, wound dressings have evolved from simple dressings that only provide physical protection and prevent infections to more advanced agents such as hydrocolloids, honey, betadine, and aloe vera. Researchers now not only evaluate the effectiveness of these agents in wound healing but also their cost, accessibility, and practicality. The search for an efficient, affordable,
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AUTHORS CONTRIBUTIONS

All authors participated in every aspect of the study, including conceptualization, design, data collection, data analysis, interpretation, manuscript preparation, critical review, and approval of the final version to be published.

CONFLICTS OF INTERESTS

The authors confirm that they have no conflicts of interest related to this research, authorship, and publication of this article.

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