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The effectiveness of hydrocolloid dressing in post-operative wound healing: a narrative review

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ABSTRACT

Hydrocolloid dressings, recognized as advanced wound care solutions, enhance the healing process through their impermeable characteristics. This narrative review aims to evaluate the efficacy of hydrocolloid dressings in managing post-operative wounds. This research scrutinized literature from databases and search engines such as PubMed, Cochrane Library, and Google Scholar, focusing on publications from 2013-2023. Analysis of five selected articles revealed that hydrocolloid dressings not only effectively support the healing of surgical wounds but also offer prolonged usage and cost-efficiency. These benefits underscore the value of hydrocolloid dressings as a recommended practice for post-operative wound care among nurses and healthcare professionals.

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1. Introduction

The wound-healing process unfolds in several phases, culminating in tissue remodelling. This intricate process encompasses hemostasis, inflammation, and proliferation and concludes with the formation of mature scar tissue, a stage known as maturation. Therefore, wound care is essential to enhance tissue strength (Grubbs & Manna, 2023). Current advancements in wound treatment include the application of moisture balance principles or modern dressings, which have been shown to be more effective than traditional methods. There exists a common misconception that wounds heal faster when allowed to dry. Contrarily, a moisture-balanced environment is conducive to cell growth and collagen proliferation in a healthy, noncellular matrix. In acute wounds, maintaining moisture balance is essential for the efficacy of growth factors, cytokines, and chemokines in promoting cell growth and stabilizing the wound tissue matrix. It's important to avoid overly humid conditions, which can cause maceration of the wound edges, as well as overly dry conditions, which can result in cell death and hinder the regeneration of the epithelium and tissue matrix (Kartika, 2015).

Modern wound care emphasizes three key stages: cleansing the wound, debriding necrotic tissue, and selecting an appropriate dressing. Unlike conventional wound care, which often requires frequent changes of gauze dressings, modern approaches focus on maintaining wound moisture through the use of hydrogels. These hydrogels facilitate a moist wound environment, gently dissolve necrotic tissue without harming healthy tissue, and are then absorbed into the gel structure to be removed with the dressing (natural autolytic debridement). Dressings can be applied for three to five days, reducing trauma and pain associated with dressing changes (Kartika, 2015).

Hydrocolloids, dressings composed of gelatin, pectin, and carboxymethyl cellulose, are available in various forms, including powder, paste, and sheets, and are sometimes combined with foam. Each form serves a distinct purpose: hydrocolloid powder is typically used for irritated skin wounds or as a filler for wound cavities, requiring thorough cleansing during wound washing; hydrocolloid paste is often used in stoma care to smooth the skin contour around the stoma for easier attachment and leakage prevention; and sheet hydrocolloids, preferred for both acute and chronic wounds due to their ease of application and ability to conform to the skin's contours (Wietlisbach, 2019).

Sheet hydrocolloids, in particular, support the wound healing process by creating a moist environment through their water and oxygen-impermeable nature. They prevent moisture loss and absorb water into their matrix or components to form a gel, thereby fostering a conducive environment for new tissue growth, dead tissue removal, and infection prevention. Their occlusive nature also shields wounds from external contaminants and pathogens. Furthermore, hydrocolloids are noted to lower wound pH, reduce bacterial presence, and prevent infection. They are best suited for wounds with low to moderate exudate, as their absorption capacity is limited. Hydrocolloid dressings can remain in place for 5-7 days on wounds with minimal fluid, indicated by a colour change to white when saturated and unable to absorb further fluid (Hartford, 2012). This characteristic significantly reduces the frequency of dressing changes, a vital aspect of postoperative wound care that require appropiate care. Therefore, this study aims to evaluate the efficacy of hydrocolloid dressings on postoperative wounds.

2. Methods

Study Design

This study was conducted as a narrative review, aiming to provide comprehensive descriptions and interpretations of the literature on the use of hydrocolloid dressings in post-operative wound care (Sukhera, 2022). The focus was on critically analyzing existing research to synthesize findings relevant to hydrocolloid dressings' efficacy and application in post-surgical settings.

Eligibility Criteria

A structured literature search was conducted using the PICO framework (Population, Intervention, Comparison, Outcome) to develop relevant keywords: "post-operative patients," "hydrocolloid dressing," and "surgical wound care." These terms were further refined and combined with MeSH (Medical Subject Headings) terms to enhance the search strategy. Selection was based on title and abstract screening for relevance and the availability of full-text articles.

Study Selection

Articles were selected according to predefined criteria, focusing on research published within the last ten years (2013-2023) to ensure current relevance. Inclusion criteria were as follows: studies on the use of hydrocolloid dressings in post-operative wound care, written in English, consisting of randomized controlled trials (RCTs) or quasi-experimental designs, and available in full text. Exclusion criteria encompassed review articles, preliminary studies, or studies available only in abstract form.

Searches were conducted across PubMed, the Cochrane Library, and Google Scholar. The selected studies underwent manual data extraction and were organized in a table format detailing author(s), research objectives, population and sample size, research type, instruments used, interventions applied, and study results. The article search and selection process is depicted in Figure 1.

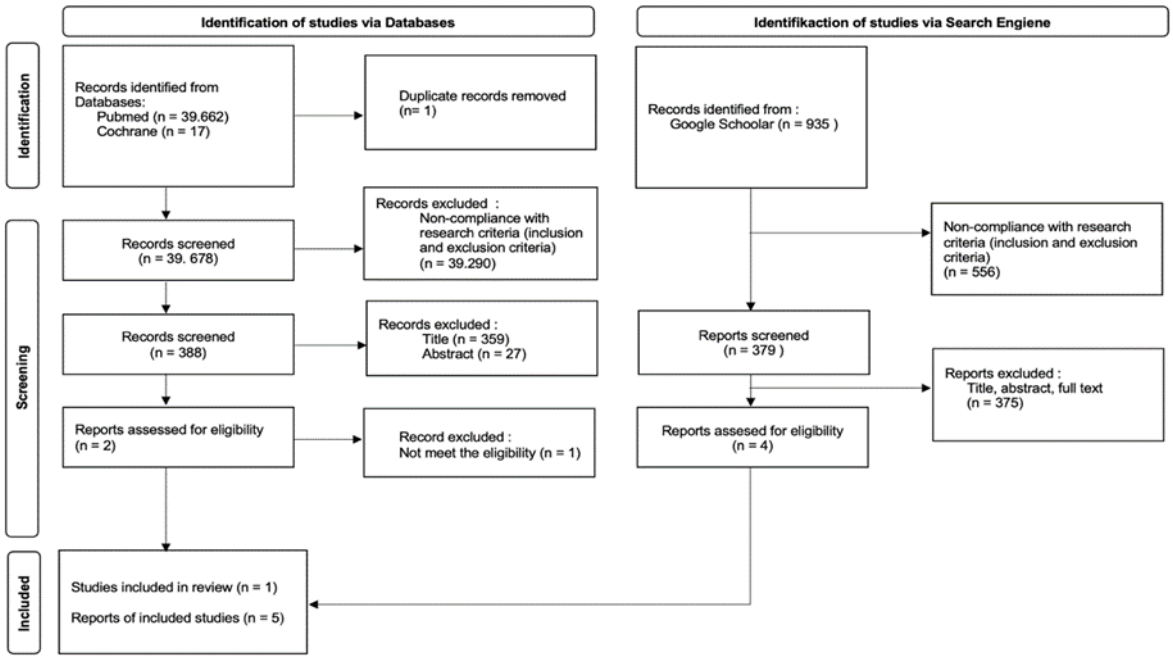

Figure 1. PRISMA Flow Diagram

Data extraction and analysis

This study was extracted using a manual tabulation. The items of this study include author, study design, population sample, instrument, intervention procedure, and outcome. This study was analysed using narrative analysis..

3. Results and Discussion

Results of Study Selection

The literature search across PubMed, Cochrane Library, and Google Scholar yielded five articles that met the inclusion criteria for this study. Specifically, one article was identified through the Cochrane Library, and four articles were from Google Scholar. These selected studies are pivotal in discussing hydrocolloid dressings in post-operative wound care. The data extracted from these articles will be presented in tables and supplemented with figures for a comprehensive analysis. It is important to contextualize these findings within the broader literature, citing relevant studies to compare or support the results obtained.

Characteristics of Included Studies

Hydrocolloid dressings are distinguished by their occlusive, absorbent, and semi-permeable nature, allowing for steam passage. According to Jeffcoate et al. (2004) as cited in (Mir et al., 2018) these dressings comprise a hydrophilic adhesive layer filled with colloidal particles such as carboxymethyl cellulose (CMC), pectin, or gelatin. This composition lets them absorb wound exudate and transform into a gel-like substance that covers the wound, fostering a moist healing environment and providing thermal insulation. The dressings' outer polyurethane layer protects against bacteria, debris, and shear forces.

Hydrocolloid dressings are versatile and available in various shapes, sizes, and forms (paste, powder, or granular) to accommodate different wound types and care requirements. Their design prevents wound contamination, promotes autolytic debridement, and eliminates the need for a secondary dressing. Suitable for up to 7 days of use—or until the dressing shows signs of saturation—these dressings are recommended for partial and full-thickness wounds with low to moderate exudate.

They are also effective for granulating or necrotic wounds, minor burns, and pressure ulcers (Andrews et al., 2021). The details of included studies and outcomes can be seen in Table 1.

Table 1.
Details of the study

Author	Research objective	Population and sample size	Research type	Instrument	Interventions	Result
Khalique et al., 2014	To compare between hydrocolloid and conventional gauze dressing for preventing an infections after a clean surgical procedur	Population: Patients (15-55 years old) undergoing clean surgical prosedures in a Hospital at Rawalpindi Sample: 400 patients	RCT	-	• After the surgery, the wound is covered using polypropylene sutures and cleaned with methylated spirits. • Patients were divided into two groups. Group A (n=200) used a gauze dressing, and group B (n=200) used a hydrocolloid dressing • Inspection carried out for wound infection on the seventh postoperative day.	Out of a total of 400 patients, 24 patients (6%) experienced post-operative infections. The group using hydrocolloid dressing had fewer patients with infections (10 out of 200) than the group using gauze dressing (14 out of 200), but the difference was not significant (p = 0.709).
Kuo et al., 2017	To asses the efficacy of AQUACEL Ag Surgical for improving wound care, patients satisfaction and surgical site infection	Population : Patients undergoing primary Minimally Invasive Total Knee Arthroplasty (MIS-TKA) at a single institute Sample : 240 patients	RCT	Visual Analog Scale (VAS)	• AQUACEL is replaced if there is a leak in the hydrocolloid layer and the saturation of the inner layer is >50%. If not, replace the dressing on day 4/5 of POD. The dressing remains closed until the seventh day • SOFRA-Tule is replaced if there is drainage in the dressing wound • Wound complications and pain were measured when the dressing was changed at the visit	AQUACEL Ag Surgical dressing can provide wound care efficacy, reduce SSI superficial, and increase patient satisfaction. It also has a longer wear time and a lower number of dressing changes for patients with Minimally Invasive Total Knee Arthroplasty.
Halim et al., 2018	To evauate the efficacy of a chitosan derivative film dressing vs hydrocolloi	Population : Patients with superficial wounds or abrasions at Two Major Medical	RCT	-	• The first group used chitosan derivative film with a 1cm overlap (n = 86) • The second group used a hydrocolloid dressing, which had been cut to	During the removal of the dressing, patients with chitosan derivative film experienced more pain than the hydrocolloid group. Both can be used as dressings in wound care for superficial dressings. Regarding the

	d wound dressing material in the treatment of superficial wounds.	Centers in Malaysia Sample : 244 patients			the required size, and applied directly to the wound (n = 84). • The dressing is first checked and changed on the 5th and 7th, when the wound has completely epithelialized • The wound is evaluated on 5th, 7th, 9th and 13th day of treatment	percentage of epithelisation, adherence, ease of removal, wound drainage, erythema, itchiness, and tenderness, there were no significant differences between the two groups.
Sadati et al., 2019	To asses the effect of three different of dressing wounds (conventional, modern, and modified) on the pilonidal sinus wounds healing process.	Population : Patients who were candidates for pilonidal sinusectomy in Iran Sample : 60 patients	RCT	Numeric Rating Scale	• The respondent was divided into three groups : a. The first group used a hydrogel or alginate and hydrocolloid compounds as standard occlusive dressing methods. b. The second group used Vaseline gauze c. The third group cleaned and changed the dressing using sterile gauze • For one month, the depth and length of the wound are measured once a week • Pain scale is measured when changing the dressing	There was a significant reduction in wound length and depth after two weeks in the third group (P < 0.05). The first and second groups experienced lower pain than the third group. However, the lowest cost occured in the second group.
Hassan & Moham m ed., 2018	To asses the ffect of hydrocoloid dressing vs parrafin gauze dressing at the donor site for split-thickness skin grafts, for healing wounds and pain experience d.	Population: Patients at a hospital in Cairo, Egypt which performs skin grafting procedures Sample: 35 patients	Quasy experim ent	Numeri cal Rating Scale (NRS) and Bates Wound Asses ment Tool(B WAT)	• The donor area marked A (proximal) is covered with Duoderm hydrocolloid measuring 10x10 cm, and area B (distal) is covered with paraffin gauze measuring 10x10 cm • On the fourth postoperative day, the external dressing is checked, and the	The use of hydrocolloid dressing (Duoderm) has a lower BWAT score than paraffin gauze dressing. In addition, the use of hydrocolloid dressings had a shorter mean healing time for complete recapitalization (8.6 days ±1.08), fewer dressing changes, and lower pain intensity.

		Duoderm patch is replaced. • On the 7th, 10th, and 14th day, the condition of the wound was evaluated, and only the outer dressing was removed.

Benefits of Using Hydrocolloid Dressings

The findings from this literature review suggest that hydrocolloid dressings are beneficial for managing postoperative wounds. Hassan & Mohammed, (2018) revealed that wounds treated with Duoderm hydrocolloid dressings exhibited significantly lower wound assessment scores, enhanced re-epithelialization, and faster healing than those treated with paraffin gauze, without a corresponding increase in infection rates. Similarly, Hassan et al. (2021) found that hydrocolloid dressings acceleratesd healing times for caesarean section wounds and reduced the risk of infection compared to povidone-iodine dressings.

Furthermore, the application of hydrocolloid dressings has been associated with reduced pain levels in postoperative patients, in contrast to other dressing types such as povidone-iodine and paraffin gauze (Hassan & Mohammed, 2018; Hassan et al., 2018; Sadati et al., 2019). Halim et al. (2018), who conducted research on superficial and abrasion types of wound, noted less pain during dressing removal for patients using hydrocolloid dressings than those using chitosan derivative films. Kuo et al. (2017) also state that AQUACEL Ag Surgical dressing, which consists of a hydrofiber layer and hydrocolloid layer, had better scores for pain and freedom of movement so that it can provide patients satisfaction in patient undergoing MIS-TKA. One reason is that the hydrocolloid layer is skin-friendly and comfortable when the body moves (Hultén, 1994).

Hydrocolloid dressings, suitable for wounds with low to moderate exudation, are valued for their ease of use, availability in various sizes and shapes, and flexibility. They absorb wound fluid, forming a gel-like substance that maintains a moist healing environment and reduces local pH. Their semi-permeable nature enhances patient comfort and flexibility, offering immediate wound care benefits such as maintaining a moist, warm, and pathogen-free environment conducive to healing (Frykberg & Banks, 2015; Hassan & Mohammed, 2018; Mir et al., 2018). Meta-analyses and various studies have highlighted the superiority of hydrocolloid dressings over conventional gauze, particularly for chronic wounds, citing higher healing rates comparable to other moist healing dressings (Frykberg & Banks, 2015; Mir et al., 2018). These dressings also provide a protective barrier against pathogenic microorganisms and are waterproof, allowing patients to shower without compromising the wound. Notably, the extended wear time of hydrocolloid dressings reduces the need for frequent changes, offering significant cost savings in wound management (Khalique et al., 2014).

Duration of Use of Hydrocolloid Dressings

Research indicates that hydrocolloid dressings can be utilized for extended periods than some other types of other dressing, offering both flexibility and effectiveness in wound management. Studies by Halim et al., (2018) and Khalique et al., (2014) demonstrate that hydrocolloid dressings were effectively changed at intervals up to the seventh day post-operation, with subsequent assessments for wound infection indicating positive outcomes. Hassan et al. (2021) extended the replacement interval of hydrocolloid dressings to the seventh day, continuing this practice for two weeks. This extended use is particularly beneficial for managing clean ulcers, enhancing patient mobility and reducing outpatient visits due to the dressings' ability to stay in place for 7-10 days. The semi-permeable nature of these dressings also allows for regular bathing and personal hygiene without necessitating dressing changes (Frykberg & Banks, 2015; Mir et al., 2018). Sadati et al. (2019) explored a progressive change schedule, gradually

extending the interval between dressing changes over four weeks, further demonstrating the versatility and durability of hydrocolloid dressings.

Cost-Effectiveness of Using Hydrocolloid Dressings

Cost-effectiveness is interrelated with the choice of dressing, the average time for wound healing, the cost of health care services and patient transportation for wound care (Hassan & Mohammed, 2018). Hydrocolloid dressing and AQUACEL Ag Surgical are cost-effective for patients who use them (Khalique et al., 2014). Shinohara et al. (2008) in Japan also state that occlusive hydrocolloid dressing was cheaper than conventional gauze dressing. This condition occurs; apart from speeding up wound healing and reducing the risk of wound infection, hydrocolloid occlusive dressings do not require frequent replacement, which can help reduce wound care costs (Halim et al., 2018; Khalique et al., 2014).

Occurrence of Infection with Hydrocolloid Dressing Use

Hydrocolloid dressings have been shown to prevent wound infections effectively. Halim et al., (2018) noted their efficacy in treating shallow wounds or abrasions by maintaining a moist environment conducive to healing without impeding the process. Garrido-Martín et al., (2022) corroborated these findings, indicating that hydrocolloid dressings foster ideal healing conditions through moisture retention, gas exchange, and protection against secondary infections. The gel-forming capability of fibrous hydrocolloid dressings, due to sodium carboxymethylcellulose, additionally prevents fluid spread and has been proven to reduce surgical site infections (SSI), especially in cardiac surgery, offering a cost-effective and preventive solution. Comparatively, Khalique et al., (2014) reported a lower incidence of SSI in patients using hydrocolloid dressings after clean surgeries than those using traditional gauze, further affirming the effectiveness of hydrocolloid dressings in infection prevention and overall wound care management.

Study Limitation

This research shows that hydrocolloid dressing is still recommended for wound care, including postoperative wounds. However, the findings of this study are still limited and could not be explained in detail, especially regarding on what postoperative day the hydrocolloid dressing is most effective to start using. Further studies that identify the potential of modern wound care are needed, such as PRP, where this method is rich in plasma and contains good proteins that help improve the wound healing process. (Platini et al., 2024).

4. Conclusion

The literature reviewed demonstrates the manifold benefits of hydrocolloid dressings in managing postoperative wounds, including accelerated healing, reduced pain levels, ease of use, and cost-effectiveness. These dressings create an optimal healing environment, fostering re-epithelialization while minimizing infection risk. The extended wear time of hydrocolloid dressings offers both practical and economic advantages, reducing the need for frequent changes and outpatient visits. However, while the evidence overwhelmingly supports their efficacy, the specific optimal timing for initiating hydrocolloid dressing use remains unclear, presenting a notable limitation in current research. Future studies could delve deeper into this aspect and explore emerging wound care techniques, such as platelet-rich plasma (PRP), to enhance our understanding and refine postoperative wound management protocols. Continued research efforts in this field hold the potential to further optimize patient outcomes and advance wound care practices.

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