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Undressing the choice of dressings

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Abstract

There is a vast number of wound dressings to choose from, which can make selecting the most suitable dressing for a wound a daunting prospect. This article highlights how the wound can guide the doctor's decision. Although all wound dressings are intended to achieve optimal wound healing and protection from contamination, they do so to varying degrees depending on the qualities of the dressing and the wound itself. This article looks at a range of dressings, from traditional to newer dressings, and evaluates their benefits and contraindications to help determine where they are best suited for use in wound management.

Key words: Dressings; Non-adhesive; Occlusive; Semi-permeable; Wounds

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Introduction

There is a wealth of dressings to choose from, each of which has individual indications and contraindications depending on the wound at hand. It is important to consider the nature of the wound itself when selecting a wound dressing. Important properties of the wound to consider are the level of exudate it produces, whether or not it is infected and whether it requires autolytic debridement. The impact the dressing has on the patient's lifestyle, and thus adherence to use of the dressing is vital for successful treatment.

Selecting a wound dressing

Choosing the most suitable wound dressing can cause confusion among healthcare professionals (Dabiri et al, 2016). The healing process is a dynamic cascade of events over four phases: coagulation and haemostasis immediately after injury, swelling in the inflammatory phase, development of new tissues and blood vessels (proliferative phase), and the remodelling of tissues (maturation phase) (Dhivya et al, 2015). A wound dressing must maintain a moist environment, absorb excess exudate, eliminate dead space, debride necrotic tissue, prevent bacterial growth and maintain gas exchange in a manageable way for the patient, with the goal of restoring normal function, appearance and architecture of the original tissue (Morin and Tomaselli, 2007; Abdelrahman and Newton, 2011).

There is a plethora of wound dressings to choose from, and each optimises normal wound healing in a different way. It is therefore essential to ensure the dressing, or combination of dressings, selected is best suited to provide the local microenvironment required by the individual wound (Sood et al, 2014) (Table 1). It is also important to consider financial implications as, provided the same results are achieved, it would seem counterintuitive to choose anything other than the dressing that carries the smallest cost (Al-Gharibi et al, 2019). This article summarises commonly available dressings and helps the reader understand which dressings may be used in different situations.

Wound assessment

To choose the appropriate dressing, the wound must first be assessed. The wound should be categorised by location, and the size of the wound quantified by its length, width and depth. The extent of tissue loss should be categorised as superficial (involving just the epidermis), partial (both dermis and epidermis) or full thickness (extending to subcutaneous tissue and possibly tendon and bone). The type of tissue occupying the wound bed should then be determined. Well vascularised, healthy, red, moist tissue indicates a granulating wound. If the tissue is pink or white, it is likely to be an epithelialising wound, where new epithelium is forming over healthy granulation tissue. The assessment should look

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Table 1. Ideal properties of a wound dressing
Maintain moist wound environment
Absorb excess exudate
Debride necrotic tissue
Prevent bacterial culture and growth
Allow gaseous exchange
Provide mechanical protection
Comfortable for the patient
Minimal demand for dressing change
Cost effective

for any evidence of slough, which is cream-yellow in colour, occurring as a result of accumulation of dead cells (not to be confused with pus). A hard, dry, black wound is characteristic of tissue death, indicating a necrotic wound. It is important to quantify the exudate levels and note any colour and odour in order to track the development of the wound. The margins of the wounds should be inspected for inflammation or oedema. Finally, the wound should be inspected for any signs of infection such as erythema, malodour, pain, heat and oedema.

Traditional dressings

The following dressings are low cost and widely available in most wards or emergency departments in the UK. They are often used in conjunction with other dressings.

Gauze

Traditionally, gauze has been used for generic wound care in a wet-to-dry manner, whereby a normal saline-soaked gauze is placed directly on the wound, covered by dry gauze (Foutsizoglou, 2018). This approach is now considered outdated because of the non-selective nature of the debridement, resulting in unintentional removal of healthy tissue and reinjury (Ovington, 2001). Adherence of gauze to the wound often makes removal painful for the patient and increases the risk of infection, which is amplified by the need for the frequent dressing changes (Morin and Tomaselli, 2007; Dhivya et al, 2015; Foutsizoglou, 2018). Gauze is frequently used as a temporising dressing (Figure 1) and is commonly used in conjunction with other dressings.

Non-adherent dressings (eg Atrauman, Jelonet, Mepitel)

Non-adherent dressings are designed so that they do not stick to a drying wound, to prevent damage to a granulating or epithelialising wound bed (Beldon, 2010). This is achieved through the incorporation of a silicone coating, lipido-colloid contact layer or petroleum emulsion (Beldon, 2010).

Self-adhesive absorbent dressings (eg Cosmopor, Mepore)

Self-adhesive absorbent dressings are simple, sterile adhesive dressings with a semi-permeable pad in the centre used for mild to moderate exudative wounds. They are ideal for postoperative wound dressings and closed wounds, and are clinically cost-effective (National Institute for Health and Care Excellence, 2020).

Adjunctive dressings (eg Hypafix, Mefix, crepe bandages)

These dressings are not placed directly on the wound but are used as an adjunct to secure the wound. Examples include fixative adhesive dressings (eg Hypafix or Mefix) or cotton-based crepe bandages that can be wrapped around a wound and secured with tape. These usually act as secondary dressings and can be applied on top of other dressings.

Figure 1. Traumatic wound to the dorsum of the hand that required urgent exploration in theatre. Gauze is used to limit bleeding and dress the wound as the patient is prepared for theatre.

Modern dressings

Semi-permeable dressings

Films (eg C-View, Mepitel film, Opsite, Tegaderm)

Films provide a protective barrier to environmental contaminants, while allowing the outward passage of carbon dioxide and excess moisture (Foutsizoglou, 2018). By maintaining a moist local wound environment, films have autolytic debridement properties, allowing targeted removal of necrotic tissue while preserving the integrity of healthy tissue (Shi et al, 2020).

Film dressings can be used on superficial and shallow wounds with low levels of exudate. Their transparent nature is particularly useful for monitoring wounds without removing the dressing (**Figure 2**), which is ideal for minimising distress in children. These dressings should be avoided if a wound is contaminated or produces higher levels of exudate (Dhivya et al, 2015; Foutsizoglou, 2018).

Foams *(Allevyn, Kliniderm silicone with border, Mepilex Lite, Tegaderm foam adhesive, Urgotul Absorb Border)*

Foam dressings allow for increased absorption of exudate and provide a barrier to external moisture and infection, while allowing gaseous exchange (Dhivya et al, 2015) (**Figure 3**). These properties make foam dressings particularly useful for highly exudative, granulating wounds. Foam dressings, particularly those with a silicone base, can reduce friction and shear forces, so should be considered for the prevention of pressure injuries (Truong et al, 2016).

The healing properties of foam dressings are dependent on the exudate produced by the wound itself and should therefore not be used for dry or low exudate-producing wounds (Dhivya et al, 2015).

Figure 2. Tegaderm film dressing.

Figure 3. ALLEVYN non-adhesive foam dressing.

Occlusive dressings

Hydrocolloids (eg Comfeel Plus Transparent, Duoderm – extra thin, Granuflex)

Hydrocolloid dressings are two-layer, occlusive dressings. The inner layer interacts with exudate to form a soft, hydrated gel on the surface of the wound, facilitating autolytic debridement and re-epithelialisation (Cuschieri et al, 2013; Foutsizoglou, 2018). The outer layer (a film, foam or a combination of the two) forms a protective barrier against contaminants (Cuschieri et al, 2013; Foutsizoglou, 2018). This, alongside the acidic pH of the wound microenvironment generated by the occlusive dressing, results in lower infection rates with hydrocolloid dressings than traditional, dry dressings (Foutsizoglou, 2018).

Hydrocolloids should not be used to dress heavily colonised or highly exudative wounds. (Foutsizoglou, 2018). These dressings require frequent changing when initially applied, which may cause problems with regards to patient adherence and infection risk (Dhivya et al, 2015; Foutsizoglou, 2018).

Hydrocolloid dressings are suitable for granulating, moderate-to-low exudative wounds and small, non-draining ulcers (Dhivya et al, 2015). Hydrocolloids like Duoderm can be used for superficial wounds to appendages that can be dressed regularly. These were used often in the height of the COVID-19 pandemic to protect against pressure ulcers on the face caused by wearing filtering face piece (FFP3) masks (Payne, 2020).

Non-adhesive dressings

Hydrofibers (eg AQUACEL, AQUACEL Ag)

Hydrofiber dressings consist of a soft, non-woven sodium carboxymethycellulose fibre (Robinson, 2000) (Figure 4). They have a particularly high mass to fluid absorption capacity ratio, making them useful for dressing highly exudative wounds (Shi et al, 2020). Owing to this absorptive capacity, they are often used to pack wounds (Alimov et al, 2013). They do not require frequent changes and are easy to change, so they are favoured by clinicians and patients for chronic wounds such as diabetic foot and leg ulcers (Robinson, 2000; Shi et al, 2020). Additionally, silver can be incorporated into the hydrofiber complex to give additional antimicrobial properties. Hydrofibers are therefore indicated for use in chronic, at risk or infected wounds (Hurlow, 2012).

Hydrogels (eg ActiFormCool, Aquaform Hydrogel, Intrasite gel)

Hydrogels are composed predominantly of water suspended in a gel base (Foutsizoglou, 2018) (Figure 5). Their porous and hydrated molecular structure strongly resembles the normal skin microenvironment (Tavakoli and Klar, 2020).

There are three main configurations of hydrogel dressings; they can be suspended in a thin mesh (sheet hydrogel), added to a dry dressing such as gauze (impregnate hydrogel) or can be free-flowing and viscous coverings of a wound (amorphous hydrogel) (Foutsizoglou, 2018).

Hydrogels are able to absorb high levels of exudate and maintain a moist wound bed (Tavakoli and Klar, 2020). Owing to their ability to quickly hydrate a wound and their lack of dependence on wound exudate for moisture, hydrogels can be used to dress a whole spectrum of wounds; from dry to moderately exudative, as well as those that require autolytic debridement (Foutsizoglou, 2018; Shi et al, 2020). They are often the most comfortable option for the patient and are typically transparent, so it is possible to monitor the development of wound healing while avoiding unnecessary dressing changes (Shi et al, 2020).

Figure 4. AQUACEL Extra hydrofiber dressing.

Figure 5. INTRASITE hydrogel dressing.

Alginate (eg Kaltostat, Sorbsan Flat, Urgosorb)

Alginate dressings are absorbent, biodegradable dressings derived from brown seaweed, which form a strong, protective, hydrophilic gel through ion exchange with the blood when in contact with exudate (Dhivya et al, 2015; Foutsizoglou, 2018; Shi et al, 2020).

Alginate is often used in the preparation of other wound dressings such as foams and hydrogels. The properties of alginate enable the absorption of excess exudate and minimise bacterial infection to the site (Aderibigbe and Buyana, 2018). Alginate dressing is particularly useful for highly exudative and sloughy wounds and can be applied to both infected and non-infected sites, such as pressure ulcers and infected surgical wounds (Thomas, 2000; Shi et al, 2020). They also provide haemostatic properties (Aderibigbe and Buyana, 2018), and can be used in bleeding wounds (Figure 6).

The absorptive properties of alginate dressings, accompanied by their inability to autonomously hydrate the wound bed, mean that they should not be used when dressing dry wounds (Shi et al, 2020).

Figure 6. This patient had a traumatic wound to the scalp that was closed with a local flap. There was some epidermal skin loss and the patient was taking clopidogrel and at high risk of bleeding from the wound. The wound was dressed with Kaltostat.

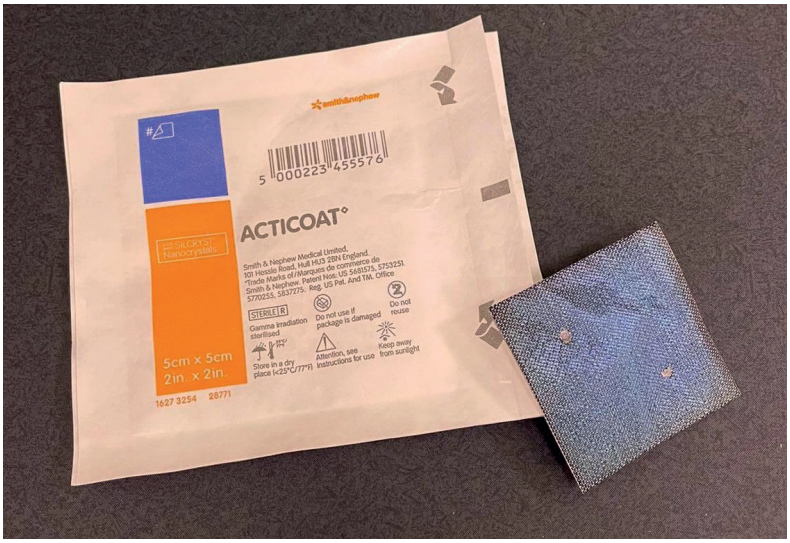

Figure 7. ActiCoat SILCRYST (silver nanoparticle-containing) dressing.

Antimicrobial dressings

Silver-containing dressings (eg Acticoat, AQUACEL Ag, Flamazine, Meliplex Ag)

Silver-containing dressings (Figure 7) can reduce pain and infection rates in burn injuries and, although not clinically first line, have been effective at improving wound healing and exudate management in patients with chronic venous leg ulcers (Shi et al, 2020). Silver nanoparticles have been of particular interest as a result of their activity against a vast number of microbes as well as antibiotic-resistant bacteria (Negut et al, 2018). Use of silver nanoparticles promote healing in chronic wounds because of their ability to counteract oxygen depletion and their anti-inflammatory properties (Wilkinson et al, 2011).

Honey (Activon, Medihoney)

Honey has been exploited for its antibacterial properties since ancient times. As well as its action against infection, honey also reduces wound healing time, facilitates autolytic debridement, reduces inflammation and exhibits antioxidant properties (Yaghoobi et al, 2013).

The beneficial impact of honey in chronic wounds is relatively unknown and therefore it is not recommended for treatment of chronic venous leg ulcers. However, there is sufficient evidence to recommend its use in the management of acute wounds and moderate superficial and partial thickness wounds (Yaghoobi et al, 2013).

Enzyme alginogels (Flaminal Forte, Flaminal Hydro)

Enzyme alginogels combine the qualities of hydrogels, alginates and antimicrobial wound dressings (White, 2014). They maintain a moist wound environment and promote continuous debridement.

Enzyme alginogel dressings promote accelerated wound healing in severe hand burns and venous leg ulcers, as well as reducing perceived pain in leg ulcers. They can also be used as adjuncts to other modern and traditional dressings for prevention of infection and improved wound healing (Strohal et al, 2017).

Negative pressure wound therapy (vacuum-assisted closure, single use negative pressure wound therapy devices (PICO))

Negative pressure wound therapy is a relatively new concept. The basic premise is that wound healing is improved by a consistent negative pressure applied through special gauze or foam overlying a wound. It has three key advantages that encourage better and faster healing:

1. It removes fluid and exudate, which helps achieve a clean environment
2. The wound bed becomes reorganised into healthy granulation tissue (microdeformation)

3. Wound edges are brought closer together, often enough to allow delayed primary closure (macrodeformation).

The negative pressure of these dressings means that the wound should never be placed on exposed blood vessels, nerves or viscera (Deutsch et al, 2017).

Table 2 outlines the properties and uses of different dressings and Table 3 gives recommendations of which dressings should be used for which types of wounds.

Conclusions

The pool of wound dressings currently in use is incredibly diverse. Although all dressings have the same goal of promoting wound healing, they do so in different manners and to different extents. It is therefore important to treat each wound as individually as possible and dress it with the best dressing, or combination of dressings, according to its unique needs, in a way that is both cost effective and manageable for the patient, while promoting optimal wound healing and minimal scar formation.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Table 2. Dressings, their properties and indications for use

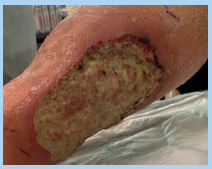
Type of dressing	Examples	Uses	Advantages	Disadvantages
Gauze	Gauze	Simple wounds, eg skin incisions Immediate, interim absorption of blood and exudate from the wound site	Low cost Readily available Can be trimmed to fit the wound	Complications of adhesion of dressing to the wound Potential for injury to healthy tissue
Film	C-View Mepitel Film	Low-exudative wounds Superficial wounds Simple, closed wounds	Protective against environmental contaminants Minimises scar formation Facilitates selective autolytic debridement	Cannot tolerate high levels of exudate
Foam	Kliniderm Silicone with Border Mepilex Lite Tegaderm Foam Adhesive Urgotul Absorb Border	Highly exudative, granulating wounds Pressure ulcers Superficial ulcers	Highly absorptive Barrier to external moisture and infection	Some require a second dressing to secure foam dressing in place Require frequent changing Cannot be used for dressing dry wounds
Hydrocolloid	Comfeel Plus Transparent Duoderm – extra thin Granuflex	Granulating wounds Low or moderately exudative wounds Small, non-draining ulcers	Creates moist wound environment, promoting autolytic debridement and re-epithelialisation Outer layer provides protection from external contaminants	Cannot be used in infected wounds Relatively low absorbance capacity

Table 2. Dressings, their properties and indications for use (continued)

Type of dressing	Examples	Uses	Advantages	Disadvantages
Hydrofibre	AQUACEL	Highly exudative wounds Chronic and acute wounds	Highly absorptive Minimal changing required Can be combined with silver for antimicrobial activity Facilitates autolytic debridement High patient adherence Vertical wicking	Cannot be used in dry wounds May need soaking before removal in moderately exudative wounds Requires secondary dressing
Hydrogel	ActiFormCool Aquaform Hydrogel Intrasite gel	Dry to moderately exudative wounds Painful or necrotic wounds	Resembles normal skin microenvironment High absorbance capacity Facilitate autolytic debridement Few dressing changes required	Can require a second dressing because of a lack of structural integrity
Alginate	Kaltostat Sorbsan Flat Urgosorb	Highly exudative, sloughy wounds	Protects against infection Absorption of excess exudate Can be used for infected wounds Haemostatic properties	Cannot be used to dress dry wounds
Antibiotic dressings		Infected wounds	Prevent infection with commonly problematic bacteria Improve wound closure	Can promote formation of antibiotic-resistant bacteria
Silver	AQUACEL Ag Flamazine	At risk or infected wounds Highly exudative wounds Burn injuries Chronic venous leg ulcers	Widespread antimicrobial activity Reduce inflammatory processes	Potential toxicity complications with silver nanoparticles Expensive
Honey	Activon Medihoney	Acute wounds Moderate superficial and partial thickness burns	Antimicrobial Anti-inflammatory Antioxidant properties Deodorising Promotes autolytic debridement	Unknown effect on chronic wounds
Enzyme alginogels	Flaminal Forte Flaminal Hydro	Severe hand burns Venous leg ulcers	Maintain moist wound environment Autolytic debridement Antimicrobial properties	May require use of secondary dressing
Negative pressure wound therapy	Vacuum assisted closure Single use negative pressure wound therapy devices (PICO)	Diabetic ulcers Pressure injuries Dehisced wounds	Removal of excess exudate Removal of infected material	Must avoid exposed blood vessels, nerves and viscera Expensive

From Bennett-Marsden (2010); Foutsizoglou (2018); Guy's and St Thomas' NHS Foundation Trust (2019); Headlam and Illsley (2020)

Table 3. Wounds and their recommended choice of dressing

Type of wound	Aim of dressing	Recommended dressing or treatment	
Necrotic 	Removal dead tissue (autolytic debridement) Hydrate wound Manage exudate	Low exudate	Semi-permeable film Hydrocolloids Hydrogels Honey (Consider external debridement)
		High exudate	Alginate with secondary absorbent dressing Hydrofibre
Infected 	Reduce infection Prevent colonisation Manage exudate	Superficial	Topical antibacterial, eg honey, antibiotics Impregnated antimicrobial dressing, eg silver Alginate
		Deep	Consider systemic antibiotics Negative pressure wound therapy
Dry 	Hydration Maintenance of moist wound microenvironment	Superficial	Hydrocolloids
		Deep	Hydrogels
Epithelialising 	Protection Maintain moist wound environment Encourage wound healing	Low exudate	Hydrocolloid Film
		High exudate	Foam Alginate with secondary absorbent dressing
Granulating 	Protection Maintain moist wound environment Promote granulation Manage exudate	Low exudate	Hydrocolloid Foam
		High exudate	Foam Alginate with secondary absorbent dressing
Sloughy 	Autolytic debridement to remove sloughy tissue	Hydrocolloid Hydrofibre Hydrogel Honey Enzyme alginogels Negative pressure wound therapy	
Fungating 	Low adherent Absorptive Deodorising Manage infection if present	Hydrocolloid Hydrofibre Honey Antibiotic agents (metronidazole) Bleeding: Alginate	

From Bennett-Marsden (2010); Foutsizoglou (2018); Guy's and St Thomas' NHS Foundation Trust (2019); Headlam and Illsley (2020)

Key points

- Choosing a dressing with which to dress a wound can be a challenging process.
- There is a wealth of dressings to choose from, each of which has individual indications and contraindications depending on the wound being treated.
- It is important to consider the nature of the wound itself when selecting a wound dressing, including the level of exudate it produces, whether or not it is infected and whether it requires autolytic debridement.
- Consideration of the impact the dressing has on the patient's lifestyle and thus adherence to use of the dressing is vital for the success of the dressing.

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Curriculum checklist

This article addresses the following requirements of the general internal medicine curriculum:

- Able to successfully function within NHS organisational and management systems.
- Is focused on patient safety and delivers effective quality improvement in patient care.
- Managing patients in an outpatient clinic, ambulatory or community setting, including management of long-term conditions.

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