Making an informed decision: how to choose the correct wound dressing

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Introduction

Over the last few years, the wound care market has exploded. Numerous technologically advanced dressings have been introduced. In addition, dressings have been designed to treat specific wound aetiologies, e.g. skin substitutes for burns and nonhealing recalcitrant ulcers, and protease-modulating dressings to manage the chronic proinflammatory wound environment. However, within certain dressing categories there has been a proliferation and duplication of products.

Wound care is a multimillion rand business. For this reason, numerous competing brands exist. This can be confusing to a wound care novice. For instance, there is an abundance of information on silver dressings in the wound care market. Sometimes, rather than provide answers, this information raises more questions.

For example, what concentration of silver is required in order for it to be therapeutically effective? What type of silver is most beneficial from a clinical point of view? Which formulation of silver is most effective: gel, foam or nylon mesh?

Due to the nature of wounds, very few randomised control trials have taken place. As a result, many healthcare practitioners base their clinical decisions on anecdotal-type evidence that is provided by promotional material, wound care representatives or fellow healthcare practitioners.

Ideally, the decision-making process on the use of dressings should be based on the following:

- The condition of the wound (necrotic tissue, bacterial burden and moisture balance).
- A clearly defined treatment objective.
- The condition of the surrounding peri-wound.
- The aetiology of the wound. Most chronic wounds develop as a result of a chronic underlying pathology. Dressing selection needs to manage the unique characteristics of the various causes of the wounds.
- The location of the wound.

- The cost. It is not cost-effective to use a foam dressing on a wound that requires a daily dressing change.

According to Turner, the ideal dressing should meet the following criteria:

- Maintain high humidity.
- Remove excess exudate and toxic components.
- Allow gaseous exchange.
- Provide thermal insulation.
- Be impermeable to bacteria.
- Be free of particulate matter.
- Allow removal without causing trauma.

In this paper, conventionally used dressings will be evaluated to ensure that minimum requirements are being met.

Dressings can be classified as either inert or interactive. Inert dressings are passive and do not actively work with wound properties, e.g. exudate, to facilitate wound healing. An example of inert dressings are gauze and abdominal swabs.

Although gauze and abdominal swabs remove excess exudate and allow for gaseous exchange, they are made from fibrous material. The fibrous nature of these dressings increases the potential for lint and particulate matter to remain on the wound surface. This introduces foreign bodies into the wound environment, thereby increasing the risk of bacterial growth. Gauze and abdominal swabs do not function as a bacterial barrier. On the contrary, both are highly permeable to bacteria. When gauze and abdominal swabs become moist, they create an environment in which the growth of bacteria is facilitated. This increases the risk of bacterial contamination of the local wound environment.

Both of the aforementioned products sometimes adhere to the wound surface. The resulting wound trauma causes pain to the patient and delays wound healing because the fragile new neodermis is damaged.

Unlike inert dressings (gauze, abdominal swabs, telfa, tulle gras and melolin), modern interactive dressings actively work with local
wound properties, such as exudate and growth factors, to accelerate wound healing.

Modern interactive dressings are largely classified according to precise properties or characteristics. They are also classified according to specific ways in which the dressing interacts with the wound environment.

Generally, interactive dressings are classified accordingly:
- Film dressings
- Foam dressings
- Hydrogels
- Hydrocolloids
- Hydrofibre
- Alginate
- Topical antimicrobials
- Biological dressings
- Protease modulating
- Enzymatic
- Negative-pressure wound therapy (NPWT).

**Film dressings**

Polyurethane (PU) film dressings comprise a thin membrane that is coated with an acrylic adhesive. Film dressings are both vapour- and oxygen-permeable. These properties may vary from brand to brand.

The moisture vapour permeability (MVP) of a film dressing is important in wound management. A PU film dressing with a high MVP is important when selecting a dressing for an intravenous (IV) site. A high MVP is required on an IV site to prevent moisture accumulating underneath the dressing, thereby ensuring that the IV site remains dry. However, a film with a lower MVP is required to facilitate moist wound healing in chronic wounds.

The MVP of dressings is tested under conditions specified in the British Pharmacopoeia 1980. During the test, the cup is either placed upright, so that that loss of fluid occurs through evaporation, or is inverted, so that loss of fluid occurs through evaporation, or is inverted, so that that loss of fluid occurs through evaporation, or is inverted, so that that loss of fluid occurs through evaporation, or is inverted, so that that loss of fluid occurs through evaporation, or is inverted, so that that loss of fluid occurs through evaporation, or is inverted, so that that loss of fluid occurs through evaporation. The differences in the foams, the density or structure of the foam, and macerating the peri-wound environment. The structure of the foam differs from brand to brand and this will have an influence on the function of the foam and its moisture-handling capacity.

**Absorbent dressings**

Absorbent dressings are classified according to their structure and their ability to absorb wound exudate, while simultaneously maintaining a moist wound healing environment. Absorbent dressings can be either adhesive or nonadhesive.

**Low to moderate exudate**

- Hydrocolloids: Hydrocolloids are dressings made of a polyurethane film or foam backing and a mass that contains sodium carboxymethylcellulose and other gel-forming agents.

The polymers absorb and swell when these dressings come into contact with wound exudate. This forms a gel on the wound surface that facilitates moist wound healing and promotes autolytic debridement.

- Hydrofibre: Hydrofibre dressings comprise a sheet of nonwoven fibres that consist of hydrocolloid fibres (carboxymethylcellulose). The fibres absorb exudate when they come into contact with wound exudate. On contact with the wound exudate, the fibres turn from a dry sheet into a soft gel sheet. This allows for atraumatic removal.

**Moderate to heavy exudate**

- Alginate: Alginate dressings are made of calcium or sodium salts obtained from alginic acid. In the presence of wound exudate, the fibres absorb liquid and take on a gel-like appearance. Calcium alginate has the ability to act as a haemostatic agent.

- Foam: The primary function of foam dressings is to wick extra fluid away from the wound bed. This prevents exudate pooling and macerating the peri-wound environment. The structure of the foam differs from brand to brand and this will have an influence on the function of the foam and its moisture-handling capacity.

**Heavy exudate**

Negative-pressure wound therapy: NPWT refers to the application of a negative pressure (vacuum) to a wound after an airtight seal has been achieved. In addition, NPWT facilitates the removal of excess wound exudate. NPWT systems can be either gauze- or foam-based. The gauze or foam acts as a wound interface to ensure uniform pressure distribution across the entire wound surface. In turn, the wound filler is covered with a transparent film that is connected to a pump or vacuum source.

Additional clinical benefits of NPWT include:
- Removal of excess wound exudate.
- Stimulation of granulating tissue formation.
- Increased perfusion.

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**Table I:** A comparison of the moisture vapour permeability of polyurethane film dressings

<table>
<thead>
<tr>
<th>Dressing brand</th>
<th>Upright cup: g/m²/24 hours</th>
<th>Inverted cup: g/m²/24 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>OpSite®</td>
<td>839</td>
<td>862</td>
</tr>
<tr>
<td>3M® Tegaderm®</td>
<td>794</td>
<td>846</td>
</tr>
<tr>
<td>Bioclusive®</td>
<td>547</td>
<td>605</td>
</tr>
</tbody>
</table>

PU film dressings act as a bacterial barrier. They are flexible and allow for application to anatomically difficult areas. PU film dressings are transparent. This allows for continuous wound inspection. Film dressings do not have the ability to absorb any exudate.
- Maintenance of a moist, wound-healing environment.
- Protection from exogenous contamination.
- A decrease in the frequency of dressing changes.

**Antimicrobial dressings**

**Chlorhexidine**

Chlorhexidine is a commonly used antiseptic solution and is available in several forms. In wound care, the most commonly used form is chlorhexidine gluconate. Chlorhexidine is bactericidal. It has activity against a wide range of microorganisms. Chlorhexidine is favoured for use in open wounds that are at risk of being infected.

Many formulations of chlorhexidine are available. However, it is important to note that the indication for use is largely dependent on the carrier, e.g. foam vs. tulle gras. It is for this reason that although both forms contain chlorhexidine, their indication for clinical use differs.

**Iodine**

In its various forms, iodine has been used as an antibacterial for centuries. Most modern forms of iodine are combined with polymers, e.g. povidone and cadexomer, which allow its slow release. The structure of the varying polymers determines the specific characteristics of the dressing.

- Povidone iodine mesh or sheet: Inadine is a knitted viscose fabric that is impregnated with a polyethylene glycol base that contains 10% povidone iodine.
- Cadexomer iodine: Cadexomer iodine is a combination of a polysaccharide polymer cadexomer and iodine at a low concentration (0.9%). When cadexomer iodine is applied to a wound, the exudate is absorbed into the polymer structure. This forms a gel and allows for the slow release of the 0.9% iodine beads over a period of 72 hours. The resultant gel that forms facilities autolytic debridement.

**Silver**

As an antimicrobial agent, silver has an impressive spectrum of use. The silver cation Ag+ is a potent antimicrobial. Ag+ binds to and damages the bacterial cell wall at multiple sites, thus killing the bacterial cell.

Most silver dressings contain Ag+. However, silver dressings will differ from brand to brand with regard to how the Ag+ is incorporated into the dressing, or how they create a reservoir from which the Ag+ is released over time. As a result, the indications for the clinical use of the dressing will differ.

- Ag+ hydrogel: Ag+ hydrogel is appropriate for low exuding wounds that require debridement, as well as an antimicrobial.
- Ag+ alginate: Ag+ alginate is appropriate for moderate to highly exuding wounds that require an antimicrobial.

**Medicinal honey**

Honey has an antibacterial activity. This is primarily due to hydrogen peroxide that is formed in a slow-release manner by the enzyme, glucose oxidase, that is present in honey. Active Manuka honey has been tested for its antibacterial activity. It contains an additional antibacterial component that is found only in honey that is produced from Leptospermum plants. This antibacterial compound has been called the Unique Manuka Factor® (UMF®). There is evidence that the abovementioned mechanism of action of honey and the UMF® component may have a synergistic action.

**Protease-modulating dressings**

**Promogran**

Protease-modulating dressings are indicated for use in wounds where there is an increase in proteolytic activity.

Protease-modulating dressings are made from a sterile, freeze-dried matrix consisting of collagen and oxidised regenerated cellulose. The matrix turns into a soft biodegradable gel when it comes into contact with wound exudate. This gel binds to and inactivates wound proteases (MMPs).

Table II lists some commercially available wound dressings and includes their indications, advantages and disadvantages.

Does the perfect dressing exist? Is there a turnkey dressing that is multifunctional and effective regardless of local barriers to healing?

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**Table II: Commerically available wound dressings**

<table>
<thead>
<tr>
<th>Dressing type</th>
<th>TIME</th>
<th>Indications</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hydrogels</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Askina® Gel</td>
<td>Tissue and moisture</td>
<td>Low exudate</td>
<td>Have high water content to promote rapid autolysis and granulation</td>
<td>Can macerate peri-wound area if used improperly</td>
</tr>
<tr>
<td>Curafil®</td>
<td></td>
<td>Sloughy and necrotic wounds</td>
<td>Maintain moist wound bed</td>
<td>May leak if the exudate is heavy</td>
</tr>
<tr>
<td>Cultimed® Gel</td>
<td></td>
<td>Malodorous wounds</td>
<td>Reduce wound discomfort</td>
<td></td>
</tr>
<tr>
<td>Granugel®</td>
<td></td>
<td>Cavity or flat wounds</td>
<td>Are easily removed</td>
<td></td>
</tr>
<tr>
<td>Intrasite® Gel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NuGel®</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Purilon® Gel</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ionic hydrogel</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ActiFormCool®</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Impregnated hydrogel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrasite®Conformable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nu-Gel® sheet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dressing type</td>
<td>TIME</td>
<td>Indications</td>
<td>Advantages</td>
<td>Disadvantages</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>--------------------</td>
<td>--------------------------------------------------------------</td>
<td>------------------------------------------------------</td>
<td>-------------------------------------------------------------------</td>
</tr>
<tr>
<td>Enzymatic debriding agent</td>
<td>Tissue</td>
<td>Hard, dry eschar, necrotic and sloughy wounds</td>
<td>• Promotes autolysis</td>
<td>• Is difficult to apply</td>
</tr>
<tr>
<td>• Truxol®</td>
<td></td>
<td></td>
<td>• Provides a viable wound bed</td>
<td>• Can macerate the peri-wound area</td>
</tr>
<tr>
<td>• Comfeel®</td>
<td></td>
<td></td>
<td>• Is easily removed</td>
<td>• May leak if the exudate is heavy</td>
</tr>
<tr>
<td>Hydrocolloids</td>
<td>Tissue and moisture balance</td>
<td>Low to medium exudate, sloughy wounds, cavity or flat wounds</td>
<td>• Promote debridement via autolysis</td>
<td>• Requires secondary dressing</td>
</tr>
<tr>
<td>• Askina® Hydro</td>
<td></td>
<td></td>
<td>• Are conformable</td>
<td>• May require frequent dressing changes</td>
</tr>
<tr>
<td>• Comfeel®</td>
<td></td>
<td></td>
<td>• Reduce wound discomfort</td>
<td></td>
</tr>
<tr>
<td>• Granuflex®</td>
<td></td>
<td></td>
<td>• Are easily removed</td>
<td></td>
</tr>
<tr>
<td>Hydrolact®</td>
<td>Moisture</td>
<td>Fibres of methylcellulose comprise a nonwoven cotton-like product</td>
<td>Creates a soft gel that maintains a moist wound environment</td>
<td>• Can macerate the peri-wound area</td>
</tr>
<tr>
<td>Silicon contact layers</td>
<td>Epidermal margin</td>
<td>Prevent wound bed trauma, wounds heal by secondary intention where protection of delicate granulating tissue is required</td>
<td>Have low adherence, are easily obtained, are easily applied</td>
<td>• Requires a secondary dressing</td>
</tr>
<tr>
<td>• Adaptic Touch®</td>
<td></td>
<td></td>
<td>• Are inexpensive</td>
<td>• Is not recommended for dry or minimally exuding wounds</td>
</tr>
<tr>
<td>• Siltex®</td>
<td></td>
<td></td>
<td>• Are easily obtained</td>
<td></td>
</tr>
<tr>
<td>• Episilk®</td>
<td></td>
<td></td>
<td>• Are easily applied</td>
<td></td>
</tr>
<tr>
<td>• NA-Ultra®</td>
<td></td>
<td></td>
<td>• Are inexpensive</td>
<td></td>
</tr>
<tr>
<td>• Mepitel®</td>
<td></td>
<td></td>
<td>• Are easily obtained</td>
<td></td>
</tr>
<tr>
<td>• Silfex®</td>
<td></td>
<td></td>
<td>• Are easily obtained</td>
<td></td>
</tr>
<tr>
<td>Alginates</td>
<td>Moisture</td>
<td>Medium to high exudate, cavity or flat wounds</td>
<td>• Are highly absorbent, some have haemostatic properties, maintain a moist wound bed, are easily removed</td>
<td>• May require secondary dressings for retention</td>
</tr>
<tr>
<td>• Sorbalgon®</td>
<td></td>
<td></td>
<td>• Are highly absorbent</td>
<td>• May require frequent dressing changes</td>
</tr>
<tr>
<td>• Seasoarb®</td>
<td></td>
<td></td>
<td>• Some have haemostatic properties</td>
<td></td>
</tr>
<tr>
<td>• Kaltostat®</td>
<td></td>
<td></td>
<td>• Maintain a moist wound bed</td>
<td></td>
</tr>
<tr>
<td>• Curasorb®</td>
<td></td>
<td></td>
<td>• Are easily removed</td>
<td></td>
</tr>
<tr>
<td>• Askina® Sorb</td>
<td></td>
<td></td>
<td>• May require secondary dressings</td>
<td></td>
</tr>
<tr>
<td>• Mepitel®</td>
<td></td>
<td></td>
<td>• May cause discomfort in dryer wounds</td>
<td></td>
</tr>
</tbody>
</table>
# Wound Care: Making an Informed Decision: How to Choose the Correct Wound Dressing

<table>
<thead>
<tr>
<th>Dressing type</th>
<th>TIME</th>
<th>Indications</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| **Foams**                     | Moisture                    | • Medium to high exudate  
• Cavity or flat wounds  
• Over-granulating wounds |
|                               |                             | • Are highly absorbent  
• Maintain a moist wound bed  
• Can control over-granulation  
• Can be used as a secondary dressing with a debriding agent on the wound bed  
• Are easily removed  
• Adhesive dressings are washproof and can act as a bacterial barrier  
• Are conformable around bony prominences |
|                               |                             | • May require secondary dressings or fixation  
• Do not debride dry necrotic wounds |
| **Antibacterial dressings**   |                             | • Medium to high exudate  
• Malodorous wounds  
• Colonised wounds  
• Locally infected wounds |
| **Silver**                    |                             | • Are effective against localised colonisation and infection  
• Have broad-spectrum antimicrobial activity  
• Have 1-day or 7-day antimicrobial activity  
• May act as a desloughing agent (Iodosorb® only) |
|                               |                             | • Antimicrobial agent may be used up more rapidly by excessive moisture  
• Are contraindicated for certain patient groups, i.e. silver and iodine (see manufacturer’s instructions)  
• May form pseudoeschar |
| **Nanocrystalline**           |                             | • Acticoat® |
| **Chlorhexidine**             |                             | • Bactigras® |
| **Iodine**                    |                             | • Inadine®  
• Iodosorb® (cadexomer iodine) |
| **Honey**                     |                             | • Activon®  
• Meltaderm®  
• L-Mesitran®  
• Mellanate® |
| **Protease modulating**       |                             | • Promogran® |
| **Biological**                |                             | • Odacutan®  
• Keragenin® |
| **Temporary skin substitutes** |                             | • Biobrane®  
• Keragenin® |
| **Permanent skin substitutes** |                             | • Integra®  
• Pelnac®  
• Apligraf® |
| **Negative-pressure wound therapy** |                             | • V.A.C.™  
• Remasys Ez®  
• Genadyne XLR®  
• RICO™  
• Prevena® |

**TIME:** tissue viability, inflammation or infection, moisture balance and epidermal margins
**Choice of wound dressing**

The choice of wound dressing should be based on sound clinical assessment which includes, but is not limited to, assessment of the wound, definition of the general treatment initiative, prioritisation of the specific treatment parameters, selection of the most suitable dressing to meet the objectives and a review of its effectiveness.

**Assessment of the wound**

A thorough systemic, as well as local wound assessment, needs to be performed so as to identify potential barriers to wound healing [tissue viability, inflammation or infection, moisture balance and epidermal margins (TIME) principle]:

- **T** (tissue viability): Right leg: viable wound bed; left leg: yellow fibrinous slough centre wound (approximately 10-15%).
- **I** (inflammation or infection): Right leg: increased purulent exudate, subcutaneous haemorrhaging, significant pain (where previously no pain was reported) and abnormal granulating tissue; left leg: increased purulent exudate, significant pain (where previously no pain was reported), an increase in white mucinous slough and a friable wound bed with abnormal granulating tissue.
- **M** (moisture balance): Right leg: copious seropurulent exudate; left leg: copious seropurulent exudate.
- **E** (epidermal margins): Right leg: nonadvancing wound margin; left leg: copious seropurulent exudate.

**Definition of the general treatment objective**

Once a thorough wound assessment has been completed, it is important to define the objective of the wound therapy. It is important to remember that the aim of dressing a wound is not always to achieve wound closure. In certain instances, the treatment objective is to manage symptoms so as to improve quality of life.

A 35-year-old man sustained approximately 5% total body surface area superficial- to partial-thickness cold burns to the back of his thighs. He presented to the practice approximately one week post-burn. The patient was a healthy and fit individual with no co-morbidities.

The depth of his injuries was superficial to partial thickness. Dermal appendages remained so re-epithelialisation could occur. The general treatment objective for this patient was to create an ideal wound environment in order to facilitate wound closure. Figure 1 demonstrates progress after one week of management with advanced wound care dressings. Management included sharp debridement of all necrotic epidermal tissue.

**Prioritisation of specific treatment parameters**

Once the general treatment objective has been defined, it is important to identify potential barriers to wound healing. These specific treatment parameters will then need to be prioritised according to which will be the most likely to result in treatment failure. The parameter that is most likely to cause immediate treatment failure or result in deterioration of the condition of the wound should become the treatment priority. Dressing selection should focus on managing the identified treatment priority. As the wound evolves, so should specific treatment priorities.

Specific treatment objectives for the above patient would be:

- To decrease the bacterial burden.
- To directly manage the wound exudate.
- To debride the nonviable tissue.

The priority of wound management is to decrease the bacterial burden. This will indirectly facilitate the management of the wound exudate. Once the bacterial burden has been effectively managed (evidenced by a reduction in clinical signs of a critical colonisation), the priority would be to debride the wound and create a moist environment. Once the wound has been debrided and adequate moisture remains at the wound interface, epithelial migration across the wound surface can occur.

**Selection of the most suitable dressing to meet the objectives**

The next step, once specific treatment objectives have been identified and prioritised, is to choose dressings that will most effectively manage the specific treatment objectives.

In the above case, the patient was treated with a silicone wound contact layer, using a hydrofibre and silver-impregnated foam. This dressing selection was continued until no clinical signs of a critical colonisation were evident. The silicone dressing protected the fragile wound bed and minimised repeated wound trauma. Repeated wound trauma can delay wound healing and has the potential to convert the wound to a deeper depth of injury.

The wound exuded copious seropurulent wound exudate. To manage the high volume of exudate, a combination of a hydrofibre- and a silver-impregnated foam dressing was used. The silver in the foam dressing offered antimicrobial cover to reduce the bacterial burden.

Once both wound beds were clean and viable, with no clinical signs of infection present, the specific treatment objectives changed. At this point, the priority was to facilitate epithelial migration. To encourage this, the patient’s dressing was changed to a hydrogel (1 mm-thick layer), enzymatic debrider and a PU film. The
A combination of the hydrogel and the enzymatic debrider kept the wound bed free of nonviable tissue while the moisture facilitated epithelial migration.

Generally, as a wound begins to re-epithelialise, the amount of wound exudate begins to decrease. For this reason, the patient’s foam dressing was changed to a PU film dressing. The film dressing provided a bacterial barrier to prevent wound contamination and wound desiccation.

A review of the effectiveness of the dressing

The wound should be reassessed at every dressing change. Its progress should be monitored and recorded. This includes measurement of the wound, as well as photographs. This enables the healthcare practitioner to monitor the progress and response of the wound to the chosen dressings. Should the chosen dressing be ineffective in managing the specific treatment objectives, the dressings should be adjusted and changed accordingly.

The ideal dressing does not exist. There is no single dressing that will manage the myriad of nuances within the wound environment. Although two dressings may fall into the same category, e.g. silver, the performance characteristics and clinical indications may vary between each dressing.

Adequate wound assessment is vital. This forms the cornerstone for dressing selection. A wound assessment should be performed at each dressing change to review the condition of the wound. This will allow the healthcare practitioner to monitor the effectiveness of the previous dressings.

A wound is an evolving entity. Therefore, the same dressing cannot be used from the beginning of treatment to the end. Dressings are selected according to the wound characteristics. As the wound characteristics change, so should the dressings. This accommodates the evolving wound environment.

Bibliography