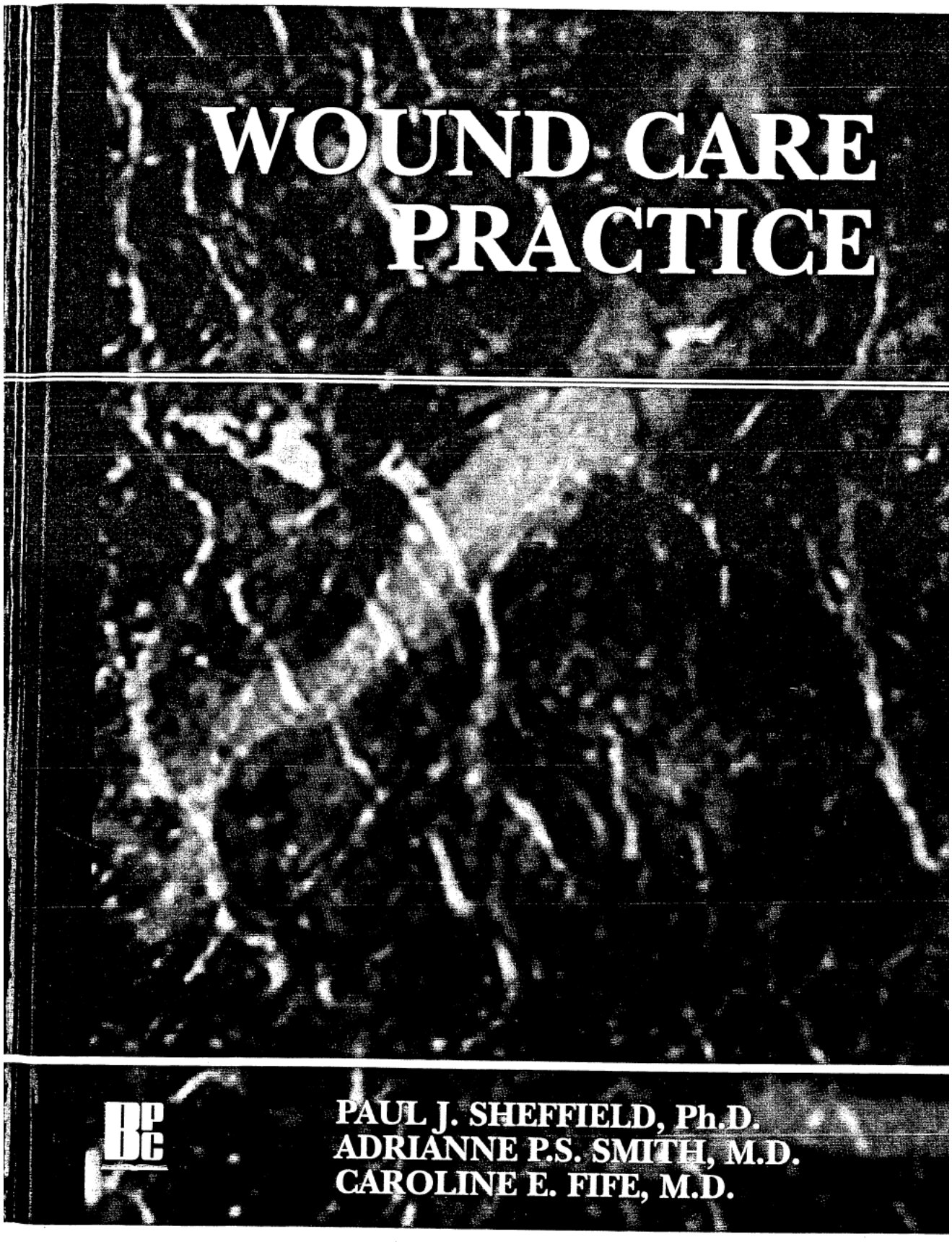

WOUND CARE PRACTICE

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CHAPTER 34

MODERN WOUND DRESSINGS

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HISTORICAL ROLE OF DRESSINGS

The use of dressings in wound management can be traced back to the Egyptians. In 1862, a papyrus dating back to 3000–2500 BC was discovered by American Egyptologist Edwin Smith. When the papyrus was finally translated in 1930 a variety of dressings were recorded. The dressings included grease, resin, honey, lint, and fresh meat. Wounds were closed by the use of linen strips to which sticky gum had been applied. Antiseptics were made from green copper pigment and chyrsoedla were used in open wounds.

From 25 BC to 37 AD, Celsus wrote extensively on medicine. He was the first to describe rubor, tumor, calor, and dolor (redness, swelling, heat, and pain) as cardinal symptoms of infection. Celsus advocated the removal of foreign bodies before closure and expected the wound to become purulent.

Galen (129–200 AD) was a surgeon who tended gladiators in Pergamun. He is famous for his "laudable pus" theory. Galen advocated that wounds needed to become infected and form pus before healing would ensue. As a result, clean uninfected wounds were inoculated with a variety of substances to induce infection. This theory persisted for more than a thousand years.

Renaissance physician, Dr. Ambrose Paré followed the theory of his times and used boiling oils as cautery for amputation of limbs and wounds. During a great battle he ran out of boiling oils used to treat the soldiers. Dr. Pare began applying egg yolks, oil of roses, and turpentine. At the conclusion of the battle, he found the soldiers to whom the egg yolk mixture had been applied were making better progress than those soldiers that had boiling oil applied to their wounds. Dr. Pare began to question the theory of "laudable pus" and changed his practice.

During World War I, the use of topical antiseptics such as Dakins, iodine, carbolic acid and mercury was used to prevent infection in battlefield wounds. British soldiers were advised to carry iodine and immediately apply it to gunshot wounds. Unfortunately, many developed dermatitis as a result of indiscriminate use. It was also in this era a dressing called tulle gras was developed by Lumiere. This was gauze that had been impregnated with paraffin.

Through World War I, the task of changing dressings was in the realm of physicians and medical students. In the 1930s, the changing of dressings was given over to experienced nurses and became recognized as a nursing task. For the next 40–50 years the mainstay of wound coverings were gauze, cotton wool pads, impregnated gauze, absorbent cotton, and adhesive pads. The 1960s were the start of a change in dressings and the philosophy of their use.

CHANGING PHILOSOPHY

Early work in the 1960s started to define the idea of moist wound care and the benefit in optimizing wound healing. The concept of moist wound care began to receive serious consideration in the late 1970s and 1980s. Prior to this time, drying of the wound was accomplished by several mechanisms. The use of betadine as a drying agent, heat lamps, wet-to-dry dressings, and leaving the open wound exposed to air. Transparent film dressings and hydrocolloids were the first widely used dressings that addressed moisture retention. Throughout the 1980s and early 1990s there was an explosion in the realm of dressing products. Alginates, hydrogels, and foams appeared on the market in a wide variety of products. The concept of passive dressings began to change. Dressings were becoming active in their role to change the wound milieu in the healing process. The advent of growth factors and other biosynthetics such as collagen began the movement to an interactive dressing.

Today, research and development is being focused at the cellular level. Interactions of the cellular components within the chronic wound environment and how interactive dressings can alter the wound milieu is putting dressing technology on the cutting edge. What is next may be limited only by our understanding of how the body changes from a normal healing environment to a chronic wound environment, our technological ability to create products and our imagination on how to get there.

DRESSING CATEGORIES

For two decades we have taught practitioners to learn categories of dressings in order to understand how they work and when to use them (Table 1). The classic categories are gauze, films, alginates, foam, hydrogels, hydrocolloid, and composite dressings. Today, there is such an expanse of dressing products that the seven classic categories no longer are adequate. In order to embrace the new dressings, an eighth category was created called interactive dressings.

Figure 1. Guaze Dressings

Figure 2. Transparent Films

Gauze Dressings (Figure 1)

Dry woven or non-woven sponges and wraps with varying degrees of absorbency, based on design. Fabric composition may include cotton, polyester or rayon. They are available as sterile or nonsterile, in bulk, and with or without adhesive border. The gauze may be impregnated with other products.

Transparent Films (Figure 2)

Transparent films are adhesive, semi-permeable films that are waterproof, yet permit oxygen and water vapor to exchange. The films are impermeable to bacteria and other contaminants. Transparent films maintain a moist environment to promote

TABLE 1. WOUND DRESSING CATEGORIES

Advantages	Disadantages	Examples
Gauze Mechanically debride Permeable to gases Fills dead space Economical Readily available Absorptive	Can damage granulation tissue on removal May dehydrate the wound Permeable to fluid and bacteria May require more frequent dressing changes	Kerlix Kling Nu-Gauze Sof-wick Tendersorb Mirasorb
Impregnated Gauze Less adherent to wound bed May keep wound moist	Requires secondary dressing Less absorptive than plain gauze	Xeroform Vaseline gauze Adaptic DermAssist
Films Semipermeable Retain moisture Waterproof Allow wound visualization	Cannot be used on infected wounds May tear fragile skin May dislodge in high friction areas	Bioclusive Flexfilm Tegaderm Opsite Polyskin II Cutifilm
Hydrocolloids Impermeable to bacteria Facilitates autolytic debridement Conformable Water resistant Self adhesive Reduces pain Can be used under compression dressings	Cannot be used in moderate to heavy exudate Cannot be used on infected wounds Softens and loses shape with heat and friction Caution if there is fragile skin surrounding the wound	Duoderm Replicare Restore Tegasorb Cutinova
Hydrogels Soothing and reduces pain Rehydrates wound Extends period of time between dressing changes Can fill dead space Comes in amorphous gels, sheets, freeze dry forms	Requires secondary dressing Sheets may be difficult to secure Can cause periwound maceration Minimal absorption	NU-GEL Curasol Safe-gel Carrasyn Hypergel Gentell Vigilon Cearsite
Foams Highly absorptive Non-adherent Conformable Protects wound and periwound against trauma Thermal insulation Can be used under compression dressing	May require secondary dressing May macerate wound edge if dressing becomes saturated Not effective for wounds with dry eschar	Allevyn Flexan Lyofoam PolyMem
Alginates Form moist gel in wound Highly absorptive Fills dead space Controls heavy exudate	Cannot be used in dry wounds or wounds with minimal exudate Can dehydrate wound bed Reports of burning sensation on application with certain products Requires secondary dressing	Sorbsan Kaltostat Curasorb Algisite Tegagen HG AlgiDERM Seasorb Melgisorb
Composite Combines 2 or more physically distinct products for better outcomes	Can be expensive Provider must have good understanding of properties of dressing Generally requires intact skin border for anchoring dressing	Fibrocol (collagen & alginate) Versiva (foam & hydrofiber) Tielle (foam & polyurethane covering) Safe-Gel (hydrogel & alginate)

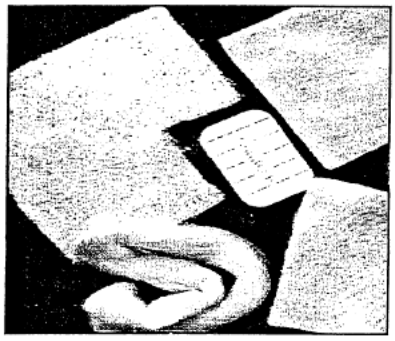

Figure 3. Alginates

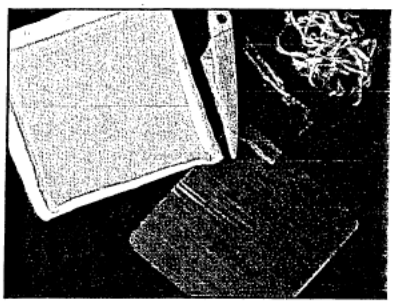

Figure 4. Hydrogels

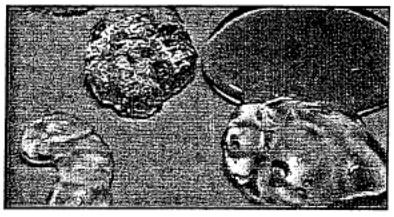

Figure 5. Hydrogels

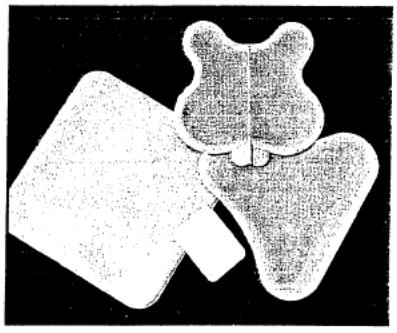

Figure 6. Hydrocolloids

granulation and can initiate autolytic debridement of necrotic tissue.

Alginates (Figure 3)

Calcium-alginate, calcium-sodium-alginate, and collagen alginate dressings are natural fiber dressings derived from processed seaweed. These dressings are highly absorbent and conform readily to wounds of various shapes and sizes. The chemical reaction between the dressings and the wound exudate creates a gel-like substance. The gel in turn assists in maintaining a moist wound-healing environment. An alginate can absorb up to 20 times its weight. Most alginates come in both sheet and rope form. Because alginate dressings are very porous and have no adhesive properties, secondary dressings must be used to secure them.

Hydrogels (Figures 4 and 5)

Hydrogels are three dimensional water polymer gels that are made from gelatin, polysaccharides water, glycosaminoglycan or polyelectrolyte complexes. The high moisture content of hydrogels maintains a moist interface with the wound that facilitates cell migration. Hydrogels come in amorphous gels, impregnated gauze, freeze dried or sheet dressings. Hydrogels provide a moist environment, re-hydrate a dry wound bed, and can soothe and reduce pain at the wound site. Hydrogels provide only minimal absorption.

Hydrocolloids (Figure 6)

Hydrocolloids are occlusive, adhesive wafers that provide a moist environment that allows clean wounds to granulate and necrotic wounds to debride autolytically. Hydrocolloids are also available in pastes and granules that are absorptive; yet leave a gel-like residue in the wound to promote healing.

Foams (Figure 7)

Foams are semi-permeable dressings that allow for fluid absorption while repelling contaminants. Foams are non-adherent so they provide non-traumatic removal and will not injure surrounding skin. Foams create moist wound environment and thermal insulation. Foams are available in pads or packing "bullets."

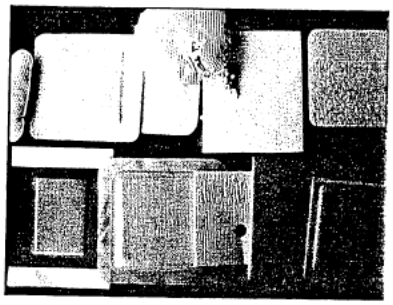

Figure 7. Foams

Composite (Figure 8)

Composite dressings combine several properties to create a single product that has both moisture retentive abilities along with an absorptive capacity. Composite dressings allow the exchange of air to the wound, but prevent bacteria and fluid contamination.

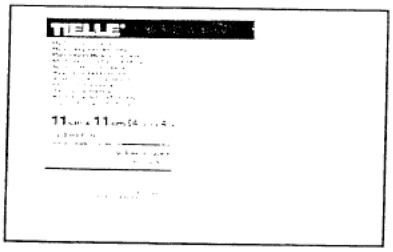

Figure 8. Composite

Interactive

Dressings that interact with the wound bed components to assist in producing an improved wound healing mileau. They can accomplished this via reducing colonization count, reducing the level of exudates, improving wound bed moisture retention, improving wound collagen matrix or providing protection for the epithlializing bed. Interactive dressings come in various forms.

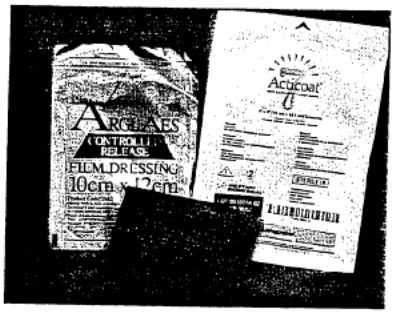

Figure 9. Antimicrobials

Antimicrobials (Figure 9)

Wound covers that deliver the effects of agents, such as silver and Polyhexamethylene Biguanide (PHMB) to maintain the efficacy against common infectious bacteria. Frequently used to decrease the bioburden of a wound.

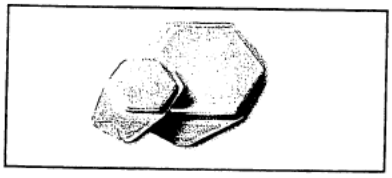

Figure 10. Matrix

Matrix (Figure 10)

Matrix dressings are used to instill a product into the wound bed to normalize the cellular activity and assist in wound matrix formation.

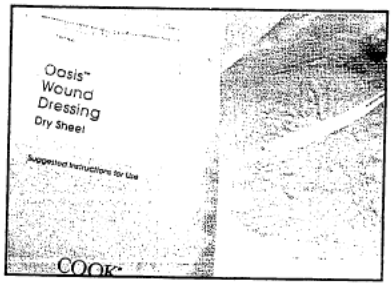

Figure 11. Collagen

Collagen (Figure 11)

Dressings derived from bovine, porcine or avian sources. Requires a secondary dressing. Collagen dressings can be used to promote epithlialization of the wound.

DRESSING SELECTION

Today, we have over 6000 wound care products and over 2000 wound dressings that challenge the health care provider to select the correct product. Traditionally, dressing selection has been made by category. A shift is needed in how we select dressings. First selection of dressings should be based on the established goals of wound care along with the form and function of dressings (Table 2). The first goal is to maintain a moist healing environment. Moist wound healing promotes epithlialization, enhances autolytic debridement, prevents wound desiccation and decreases pain. The second goal is to remove eschar and debris from the wound bed. This will decrease bioburden, improve epithlialization and decrease inflammation. The third goal is to control exudate. Increased exudate can cause periwound maceration and contributes to an increased bioburden in the wound. The fourth goal is to prevent further wounding. Patients may unknowingly traumatize their wounds due to neuropathy or a dressing or product may be chosen which actually traumatizes the wound or surrounding skin.

Goals, form, and function must be combined with a nursing assessment of the wound and the patient prior to dressing selection. The dressing must match the patient, the wound, and the setting. In Ovington's article[11], she gave an all-purpose performance-based approach to using wound dressings by asking six basic assessment questions when deciding on a wound dressing:

- **What does the wound need?** Determined by a complete assessment of the wound and surrounding tissues. Assessment is performed at each dressing change, including the initial. Apply the goals. Anticipate that the needs of the wound will change as the tissue envelope normalizes and the healing process progresses.
- **What does the product do?** This is the function. Read the product literature and clinical data available.
- **How well does it do it?** Examine clinical studies and laboratory comparisons to other products in the same category. Talk with other clinicians. Evaluate it on your patients. Does the dressing perform how it is stated?
- **What does the patient need?** Comprehensive assessment of the patient, including psychosocial. Do they need a dressing that doesn't require daily changes, do they need protection from trauma, or is there a large amount of exudate?
- **What is available?** Health insurance coverage, facility formulary and reimbursement?
- **What is practical?** Examine the goals of wound management. Does the dressing choice satisfy the goals? Is the dressing easy to apply (patient/family), easy to obtain and cost effective?

TABLE 2. GOALS OF WOUND MANAGEMENT

Goal #1: Maintain moist healing environment
Goal #2: Remove eschar and debris from wound bed
Goal #3: Control exudate
Goal #4: Prevent further wounding