



Reducing Complications
Associated With Wound Exudate

Introduction

Wound exudate is a necessary component of acute wound healing, but it can be a complicating factor in chronic wounds. Purulent drainage may indicate underlying infection, and high volumes can lead to periwound maceration, increased risk of infection, and impaired healing, requiring more complex and expensive treatment. Excessive drainage may have psychosocial effects and cause a decreased quality of life, especially if the exudate is present for prolonged periods of time.

There are several important considerations for managing the highly exuding wound. Treatment can be accomplished in a variety of ways but typically includes application of an absorptive dressing or use of an advanced modality to remove exudate while maintaining an appropriate moisture balance. Negative pressure wound therapy (NPWT) is one of the most widely accepted advanced modalities and has been demonstrated to increase the supply of oxygen and nutrients, increase granulation tissue, promote wound contraction, and decrease infection risk. NPWT can accommodate large volumes of exudate without the need for frequent dressing changes, thus reducing in-person clinic visits.

When selecting an exudate management method, clinicians should take into consideration the decreased accessibility to outpatient care that many patients are experiencing as a result of the coronavirus disease 2019 (COVID-19) pandemic. The risk of exposure has resulted in the need to reduce clinic visits for the safety of both patients and clinicians. In order to facilitate this, clinicians will need to find strategies that accommodate longer durations between in-person visits.

Background

Definition and Etiology

Exudate is the fluid that seeps out of a vessel or organ in response to tissue damage. This fluid may contain water, electrolytes, and cells.¹ Wound exudate—sometimes referred to as wound drainage—is typically produced by damaged tissue within a wound or as part of the body’s natural healing process. During the acute phase of wound healing, exudate may be caused by vasodilation occurring as part of the inflammatory response.

Although a wound must maintain moisture to allow for moist wound healing, excessive drainage can cause complications. Certain types of wound exudate may also indicate underlying problems, such as infection, which can have negative health consequences.

Wound Exudate Types

There are several types of exudate, depending on the source and cause of the wound. The main types include:

- **Sanguineous Drainage** – Sanguineous drainage consists primarily of blood. It is common in the very early stages of an acute injury, such as a surgical wound, but may indicate continued bleeding.
- **Serous Drainage** – Serous drainage is clear but may have a yellow tint and consists primarily of serum or plasma. It is an indicator of wound healing and is often the last type of drainage seen. However, if present over a period of more than three or four days, or if volume increases, this may indicate that the wound is not progressing along the anticipated healing trajectory.



- **Serosanguineous Drainage** –

Serosanguineous drainage contains both sanguineous and serous drainage. It is normally seen as the wound advances from the early stages of healing into the more advanced stages. This drainage may be pink and resemble diluted blood.

- **Purulent Drainage** – Purulent drainage contains pus and consists of bacteria and immune cells. It may be tan, green, or brown and is usually cloudy. Purulent drainage often produces an unpleasant odor and indicates infection.

These main wound exudate types can help guide clinicians in understanding how the wound is healing. Purulent drainage can indicate infection, whereas a transition of sanguineous to serosanguineous to serous exudate with a consistently decreasing volume of exudate likely indicates the wound is healing appropriately.

Acute Wound Exudate Versus Chronic Wound Exudate

Acute wound exudate is a necessary component of wound healing. This initial drainage contains serum, immune cells, and nutrients needed for healing and remodeling. Chronic wound exudate can, conversely, inhibit healing and contains enzymes that degrade growth factors and affect the integrity of the periwound. Acute wound exudate has been shown to support cell proliferation and leave fibronectin (which plays a vital role in the adhesion, migration, growth, and differentiation of cells) intact while not damaging the periwound. Chronic wound exudate does not support cell proliferation and degrades fibronectin.² Chronic wound exudate leads to sustained inflammation and a feedback loop that prevents healing.

Complications of Wound Exudate

Periwound Maceration

Uncontrolled wound drainage resulting in constant moisture on the skin can leave the periwound saturated and vulnerable to maceration. Additionally, enzymes in the exudate may weaken skin integrity, potentially increasing the size of the wound.

Periwound maceration³ can occur much more easily in patients with advanced age or those who are already at risk for skin breakdown. Absorbent dressings placed over a wound may also absorb exudate and hold it against the skin, thus further exposing the skin to moisture and worsening skin damage.

Infection

The risk of infection increases with excessive exudate or exudate that is not well managed.⁴ High exudate levels allow for bacterial cells that are part of the normal skin flora to migrate more easily into the wound bed and provide an ideal growth medium for bacteria.⁵ Although high amounts of exudate may increase the risk of infection, the presence of infection can also cause an increase in wound drainage.

The highly exuding wound needs to be monitored closely for signs of an infection; however, the higher complexity of these wounds may also raise the risk of nosocomial infections. Extra precautions should be taken during the current COVID-19 pandemic to protect patients and providers alike from exposure to the virus.⁶

Impaired Healing

Moist wound healing provides the wound bed with nutrients, prevents dehydration, and assists with the growth of new blood vessels within the wound, which are needed for healing.⁷ Although maintaining an appropriate moisture balance is important for encouraging wound healing, excessive exudate can inhibit cells from correctly developing and growing within the wound.

High levels of drainage will also interfere with the application of topical treatments. Excessive drainage may necessitate more frequent dressing changes, thereby disturbing granulation tissue, as well as incurring greater expense and burden on the patient and clinician.

Higher-Complexity Treatment Plans

High-complexity treatment plans may be especially difficult during the COVID-19 pandemic because the frequent in-person visits necessary may be disrupted. Although many types of wound care can be performed in a home environment, highly exuding wounds are more likely to require the in-person care of a healthcare professional.

Further, the comorbidities that often contribute to wound complexity—such as diabetes, hypertension, chronic obstructive pulmonary disease, etc.—also result in an increased risk of contracting COVID-19. At-risk patients should be encouraged to social distance and stay home as much as possible.⁸





Psychosocial Effects

The presence of bodily fluids produced by a wound and unpleasant odor can make social interactions significantly more difficult for patients with a draining wound. The psychosocial effects, especially when the wound is chronic, can be difficult for patients to handle and lead to isolation and decreased psychological well-being.

Decreased Quality of Life

The negative consequences and potential complications of managing a constantly draining wound may decrease the quality of life for some patients. The psychological and physical impacts can cause patients to be unable to participate in activities that they previously could or to enjoy activities at the same level as earlier.

Considerations for Managing Wound Exudate

There are multiple factors that must be taken into consideration when developing a comprehensive wound treatment plan and are beyond the scope of this article. It must be mentioned, however, that while managing wound exudate is a vital component of any treatment plan, it also is imperative to identify the underlying condition(s) and/or contributing factors. Failure to address these factors may further hinder wound progress.

The primary aims of exudate management should be to promote moist wound healing, prevent periwound maceration by removing excess exudate, and decrease bacterial load through the removal of infectious organisms.

Exudate Management Methods

Physical management of exudate may be accomplished in a variety of ways but typically includes application of an absorptive dressing or use of an advanced modality to remove exudate while maintaining an optimal moisture balance. Furthermore, each patient's unique situation should be considered when selecting the appropriate treatment method.

Absorptive dressings are applied to the wound surface or filled into the wound cavity and manage exudate by drawing it into the dressing and/or allowing it to evaporate, depending on the dressing properties. Absorptive dressings adequately handle low to

moderate or non-viscous drainage but may be insufficient to tackle the challenges associated with excessive or viscous drainage. In these situations, more frequent dressing changes are required to avoid periwound maceration and further impairing healing,⁹ incurring additional costs and nursing time as well.

NPWT is an ideal method to accommodate the demands of clinically complex wounds, including those producing large volumes of exudate and/or viscous drainage. NPWT not only removes drainage but also promotes healing through multiple mechanisms of action using subatmospheric pressure applied to the wound bed.

Removal of Infectious Organisms

When managing wound exudate, it is important to reduce the bacterial load of the wound. One of the primary contributing factors to the development of chronic wounds is the presence of a biofilm.¹⁰ Preventing a biofilm from developing and removing bacterial organisms within the wound bed are always priorities in wound management. Exudate management should take into consideration methods that have an antimicrobial component. Excessive exudate may affect the efficacy of antimicrobial agents or topical agents that are applied to the wound bed, thereby further promoting the proliferation of infectious organisms.

Decreased Accessibility of Outpatient Care

During the COVID-19 pandemic, accessibility to outpatient care has been a significant barrier to the treatment of complex wounds with high volumes of exudate. This decreased access to non-COVID-19-related care has often shifted outpatient care into the home setting, with self-treatment becoming more necessary. This change may be less disruptive for treatment of low-complexity wounds; however, wounds with high volumes of exudate typically require increased in-person attention and care by clinicians. Although decreased accessibility to outpatient care has resulted from the COVID-19 pandemic, it could also occur in the future with a “second wave” of COVID-19 infections or in another pandemic situation. Clinicians should consider management strategies for highly exuding wounds that are more conducive to continued care in an environment where outpatient care accessibility is limited.



Negative Pressure Wound Therapy

Principles

NPWT is an effective and widely accepted modality to treat clinically complex wounds through the use of subatmospheric pressure applied to the wound bed.¹¹

The application of NPWT involves placing foam or gauze into the wound (depending on the clinician's preference), covering with a transparent dressing to prevent external contamination, and connecting to a NPWT pump. Once activated, the system provides localized subatmospheric pressure to the wound bed and removes excess drainage and debris into a collection canister.

Previous studies have established that NPWT promotes wound healing through six mechanisms of action:

1. Promotes increased perfusion
2. Creates a mechanical force that draws the wound edges together and facilitates closure¹²
3. Promotes granulation tissue
4. Facilitates the removal of excess interstitial fluid and reduces edema, processes that are vital for allowing adequate blood flow to the wound
5. Removes potentially infectious materials
6. Creates and maintains a moist wound environment

In fact, studies have shown that the use of NPWT in wounds can lead to increased perfusion and that wounds treated with NPWT experience an average increase in granulation tissue formation of 60%.^{13,14}

Benefits of Negative Pressure Wound Therapy in the Management of Wound Exudate

NPWT provides the ideal solution to managing excessive exudate. NPWT dressings can be left in place for significantly longer than traditional dressings, which may have to be changed multiple times a day. The reduced frequency of dressing changes decreases disruption to the wound bed and promotes healing and remodeling. Many times, NPWT foam dressings have antimicrobial characteristics that further reduce the risk of infection.

Some NPWT devices are portable and allow for more discreet and hygienic management of wounds with high exudate volumes in all care settings. The need for better at-home management has become especially prevalent during the COVID-19 pandemic. NPWT provides an excellent strategy for overcoming the barrier of decreased availability of outpatient services while simultaneously reducing the potential exposure to persons with COVID-19 by decreasing the need for in-person outpatient treatment. The ability to effectively handle excessive drainage while promoting a moist healing environment makes NPWT an ideal treatment strategy for avoiding the complications associated with the highly exuding wound.



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