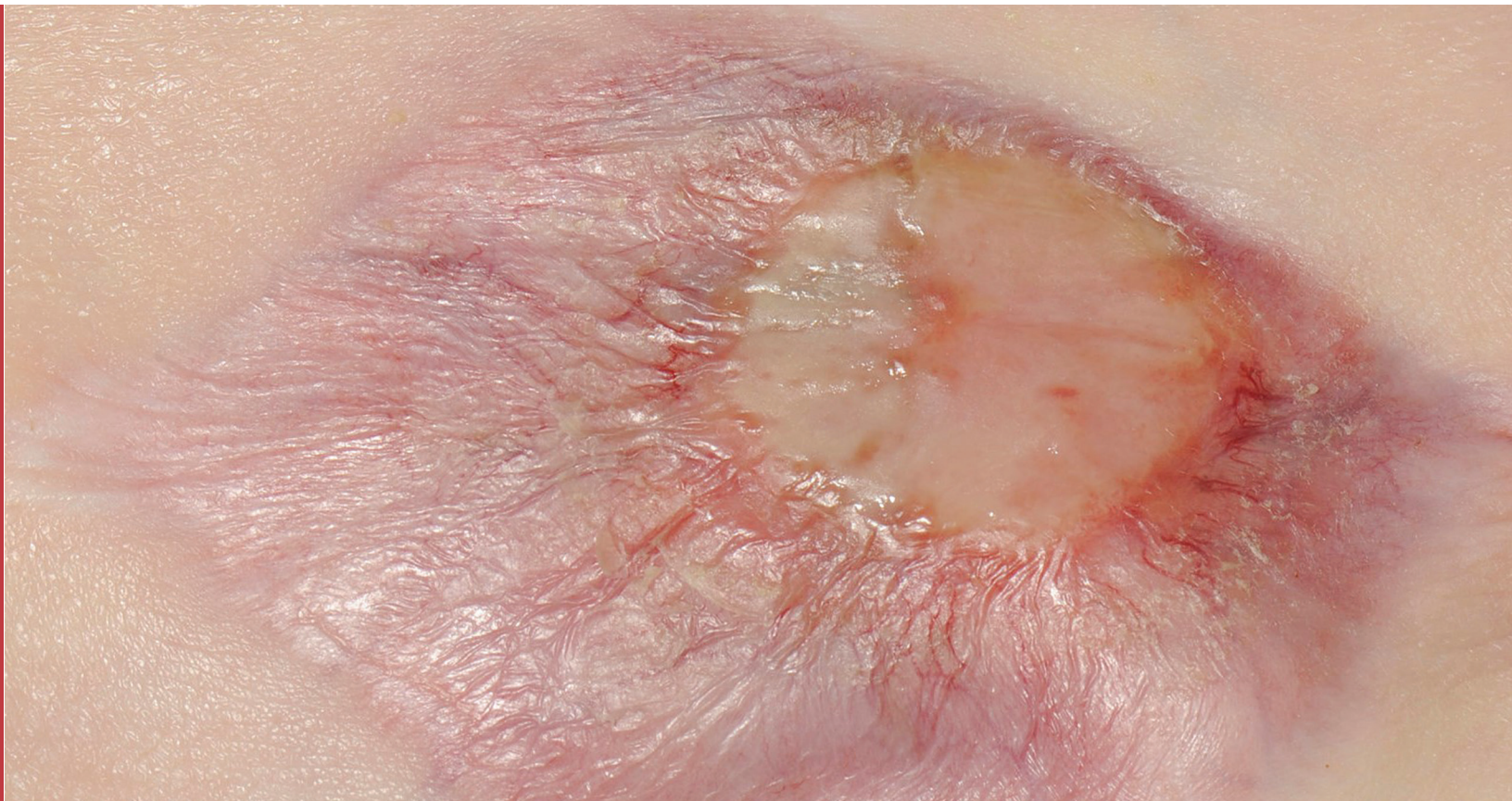


ABC of

Wound Healing

SECOND EDITION

Edited by Annie Price, Joseph E. Grey, Girish K. Patel,
and Keith G. Harding



WILEY Blackwell

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Foreword

The goal of treating wounds is to achieve healing and prevent secondary wound breakdown. Dressings have been used for thousands of years and several notable medical advances have contributed to better wound care. In the 1800s, Lister demonstrated the benefits of antiseptic surgery in reducing infection risk and throughout the 18th and 19th centuries, debridement techniques were developed and advanced by military surgeons. In the late 1800s, sterilised gauze was mass-produced as ready-to-use surgical dressings. George Winter's observations in 1962, that wounds kept moist healed faster than those kept dry, led to the development of many new materials and advanced wound dressings. Over the past 60 years, there has been an explosion of treatments and current practice involves the use of dressings, devices, drugs, surgical interventions and biologically based treatments to enhance wound healing.

Although a wide range of materials exists, the major benefits of dressings are in managing exudate, minimising leakage and controlling odour and pain. More recently, there has been a rapid increase in the use of devices, from beds and mattresses that aim to prevent and treat pressure injuries, to therapeutic footwear used in diabetic foot disease and negative-pressure devices for a range of wound types. Drugs are often needed to assist in wound healing. The most obvious example is the use of antibiotics for treating wound infection. However, at a time when antimicrobial resistance is seen as a global health challenge, greater understanding and appropriate selection of agents to treat wound infection are urgently needed. Surgery is an essential component for some wound healing problems. This can range from simple draining of an abscess or debridement of unhealthy tissue on the wound surface, through to specialist vascular, orthopaedic or reconstructive procedures. Advances in the understanding of wound healing biology have led to an interest in biological therapies, from platelet concentrate to stem cells.

While treatment advances are rapidly expanding the options for wound care, recent studies have revealed that there are ongoing

problems with wound assessment and diagnosis. Without understanding the cause of the wound and appreciating factors that contribute to delayed or non-healing, successful treatment is less likely. An emphasis on clinical assessment coupled with developments in wound diagnostics may help, but there is also a need for greater engagement of medical specialties and their integration with other members of a multidisciplinary team.

Complete healing of a wound is an obvious measure that should be the goal of care when relevant. However, reduction in wound size, pain, leakage and infection, or improvement in quality of life could also be seen as measures of success in patients who do not have the potential to heal their wounds. Similarly, prevention of recurrence, avoidance of complications and provision of care in dedicated settings should be seen as alternative measures of success. There is a need to capture these factors when evaluating both treatments and services.

Though scientific advances and enhancing the evidence base for existing treatments are important, innovations in service provision and education of healthcare professionals in the management of wounds should not be underestimated. The future for individuals with wound problems requires the ability to access a relevant and capable multidisciplinary team that is appropriate for their needs. Comprehensive, appropriate and patient-centred wound care utilising evidence-based treatments has the potential to benefit many. It is only in recent years that the complexity of the wound healing process and the wide range of factors that can influence healing have been recognised. Greater funding and focus on this subject are essential if the current situation is to be improved.

This new edition of the *ABC of Wound Healing* aims to take the reader through these issues and provide a ready guide to the recognition, investigation and management of a variety of wound types. It is aimed at ensuring that individuals with wounds receive the standard of care appropriate for modern-day clinical practice.

Professor Keith G. Harding CBE

CHAPTER 1

Wound Assessment

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OVERVIEW

- Most wounds heal without difficulty, but all wounds have the potential to become chronic.
- The key to successful wound management is diagnosis and treatment of the underlying cause, which requires a detailed history and assessment.
- Certain wound characteristics point to a specific diagnosis and indicate the status of the wound, e.g. infected or clean, healing or non-healing.
- Many local and systemic factors may impede healing; these should be identified and corrected where possible.
- Despite best practice, a small minority of wounds will never heal; improving quality of life and preventing complications are the treatment goals in these cases.

The majority of wounds, of whatever aetiology, heal without difficulties (see Chapters 2–4). Some wounds, however, are subject to factors that impede but do not prevent healing if managed appropriately. In contrast, most common chronic wounds do not heal until the underlying disease is adequately treated (see Chapters 5–8). A minority of wounds do not heal despite best practice, where control of symptoms and prevention of complications, rather than healing, become the goals of treatment.

Complications of chronic wounds

- Sinus formation
- Fistula
- Unrecognised malignancy
- Malignant transformation in the ulcer bed (Marjolin ulcer)
- Osteomyelitis
- Contractures and deformity in surrounding joints
- Systemic amyloidosis
- Heterotopic calcification
- Colonisation by multiple drug-resistant pathogens leading to antibiotic resistance
- Anaemia
- Septicaemia

Approach to patients with wounds

In patients with wounds, it is important that the normal processes of developing a diagnostic hypothesis are followed before attempting to treat the wound. A detailed clinical history should be taken, along with an examination of the wound, surrounding skin and (where relevant) the limb, and any appropriate investigations should be performed. Seek to define the cause of the wound and factors that might impede healing. In order to aid management, regular wound assessments are used to monitor progress.

A systematic approach to wound assessment is helpful. The following factors should be considered as part of every wound assessment.

Site of the wound

The site of the wound may aid diagnosis; diabetic foot ulcers often arise in areas of abnormal pressure distribution caused by disordered foot architecture. Venous ulcers mostly occur in the gaiter area of the leg. Non-healing ulcers, sometimes in unusual sites, should prompt consideration of malignancy.

Size of the wound

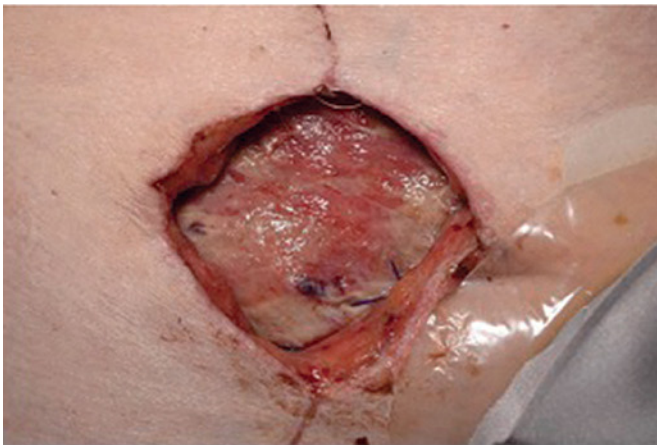
This should be assessed at first presentation and regularly thereafter to monitor response to treatment and provide an indication of healing. The simplest method is using a ruler to measure wound dimensions (longest length and perpendicular width). Wound surface area can be measured using an acetate tracing; the outline of the wound margin is traced onto transparent acetate sheets marked with 1 cm squares and the longest diameter in one plane is multiplied by the longest diameter in the perpendicular plane (for approximately circular wounds) or the number of squares contained within the wound outline are added together (for irregularly shaped wounds). These methods are relatively subjective and can be unreliable; accuracy is also affected by patient positioning, body curvature or tapering of the limbs. More sophisticated methods include using digitised area measurement software or laser techniques, but these require training and specialist equipment. Clinical photography should be carried out whenever possible.



(a)



(b)



(c)



(d)

Common types of chronic wounds. (a) Venous leg ulcer. (b) Pressure injury. (c) Post-operative wound dehiscence. (d) Diabetic foot ulcer.

Causes of ulceration.

- Vascular (venous, arterial, lymphatic, vasculitis)
- Neuropathic (e.g. diabetes, spina bifida, leprosy)
- Metabolic (e.g. diabetes, gout)
- Connective tissue disease (e.g. rheumatoid arthritis, scleroderma, systemic lupus erythematosus)
- Pyoderma gangrenosum (often a reflection of systemic disorder)
- Haematological disease (red blood cell disorders, e.g. sickle cell disease; white blood cell disorders, e.g. leukaemia; platelet disorders, e.g. thrombocytosis)
- Dysproteinaemias (e.g. cryoglobulinaemia, amyloidosis)
- Immunodeficiency (e.g. HIV, immunosuppressive therapy)
- Neoplastic (e.g. basal cell carcinoma, squamous cell carcinoma, metastatic disease)
- Infectious (bacterial, fungal, viral)
- Panniculitis (e.g. necrobiosis lipoidica)
- Traumatic (e.g. pressure injury, radiation damage)
- Iatrogenic (e.g. drugs)
- Dermatitis artefacta – self-inflicted wounds
- Others (e.g. sarcoidosis)

Depth of the wound

Accurate methods for measuring wound depth are not practical or available in routine clinical practice. However, approximate measurements of greatest depth should be taken to assess the extent of

Factors that impede wound healing.

Local factors

- Inadequate blood supply
- Increased skin tension
- Limited tissue mobility, e.g. wound tethered by scarring
- Poor surgical apposition
- Wound dehiscence
- Poor venous drainage
- Presence of foreign body and foreign body reactions
- Continued presence of micro-organisms and infection
- Excess local mobility, e.g. over a joint
- Previous radiotherapy

Systemic factors

- Advancing age and general immobility
- Obesity
- Smoking
- Malnutrition
- Deficiency of vitamins and trace elements, e.g. scurvy
- Systemic malignancy and terminal illness
- Shock of any cause
- Chemotherapy
- Immunosuppressant medications, e.g. corticosteroids
- Inherited neutrophil disorders such as leucocyte adhesion deficiency
- Impaired macrophage activity (malacoplakia)

the wound. Undermining of the edge of the wound must be identified by digital examination or use of a probe. The depth and extent of sinuses and fistulae should be identified. Undermining areas and sinuses should be packed with an appropriate dressing to facilitate healing. Undermining wounds and sinuses with narrow necks that are difficult to dress can sometimes be laid open at the