

Healing and Recovery: Is there a difference?

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Abstract

Healing and recovery are terms often used synonymously. Is there a difference between healing and recovery? This article aims to define the two terms and debates whether they are the same. Using examples from wound and fracture healing the question of whether healing and recovery are identical will be answered.

The Oxford English Dictionary defines the word “heal” in the following way; “Restore person or injured part of body to health; cure person of disease...” The word “recover” is defined as; “Regain possession, use or control of...come back to consciousness, health or normal state or position...”¹ The two words are synonyms of each other. They therefore have the same or very similar meanings. At first glance the definitions appear to have the same meaning. Is there a difference?

A search of the online dictionary “Wictionary” yields the following definitions:

Healing – “The process where the cells in the body regenerate and repair themselves”

Recovery – “The act or process of regaining or repossession of something lost. Return to normal health. A return to former status.”² These definitions make more of a distinction between the two words. Healing more specifically implies physical healing of cells and tissues. Recovery is more focused on a return to normal function or former state. There are many steps involved in returning a patient to their former state and wound healing is the first of these steps.

There are four broad stages of wound healing; inflammation, proliferation, maturation and remodelling. These stages are applicable to any type of wound. When the skin is wounded there is initially bleeding followed by arteriolar constriction, fibrogen, platelet, coagulation cascade and complement activation to promote haemostasis. Inflammation occurs to produce an exudate rich in neutrophils which begin to remove debris. After a few days the neutrophils are replaced by macrophages. The macrophages secrete cytokines which help to promote re-epithelialisation, angiogenesis,

fibroplasias and extracellular matrix synthesis. Initially epidermal cells migrate to cover the skin defect after a few hours. The basal layers of skin at the wound edges also start to produce new epidermal cells which grow underneath the fibrin clot produced as a result of haemostasis. Cytokines and other factors such as Tumour Necrosis Factor- (TNF-) promote angiogenesis. In order for the new blood vessels to develop the existing vessels start to degrade. The new vessels form a mass of fragile vascular tissue called granulation tissue. Collagen is deposited as hydroxyapatite within the first few hours from injury.

It is later converted to collagen, and remodelled. The scar that is formed is never as strong as the original tissue.³

A skin wound heals by primary or secondary intention. Primary intention refers to a clean surgical type of wound where the edges are nearly opposed. It heals as described. Healing by secondary intention occurs if there is loss of epithelial and subepithelial tissue. It follows the same processes as primary healing but also shows wound contraction. Contraction is produced by the action of myofibroblasts at the wound edges.³

Chronic wound healing occurs when the healing process is impaired by continued tissue damage. This is seen in leg ulcers. The features are a longer inflammatory phase with impaired proliferation and epithelialisation.³

Bone healing after a fracture follows the same four stages. In the inflammatory phase the fracture haematoma forms. There is a fibrin mesh which traps red blood cells and acts as a scaffold for neutrophils and macrophages to clear the tissue debris. During the proliferative phase granulation tissue starts to form. This vascular tissue also consists of pluripotent stem cells, chondroblasts and osteoblasts.

During this stage soft callus is formed. In the maturation phase the soft callus is converted to woven bone. The callus spreads until there is no more movement at the fracture site. Over time the woven bone is remodelled into lamellar bone and regains most of its stiffness. The main difference between bone and other tissues is that bone does not heal by scar formation but over time will reform lamellar bone.⁴

There is direct and indirect fracture healing. If there is no movement at the fracture site and good blood supply the bone will heal “directly”. Remodelling osteons are led across the fracture site by the cutting cones of osteoclasts and thus new channels form. These channels are filled with osteoid which over time forms new bone with Haversian canals. This is achieved by fixing a fracture with absolute stability to abolish movement at the fracture site. Achieving absolute stability is particularly important when reducing and fixing articular fractures. “Indirect” fracture healing refers to the process of healing by callus formation as outlined previously.⁵

The other tissue type to consider is peripheral nervous tissue. When a nerve axon is damaged it undergoes Wallerian degeneration. The axon and myelin sheath degenerate and are removed by macrophages and Schwann cells. There is then proliferation of Schwann cells around the damaged axon. As the axon begins to regenerate the Schwann cells act to guide its growth. The axon grows at a rate of two or three millimetres per day. Once the axons re-innervate the tissue they are re-myelinated. The myelin sheaths are in smaller segments than previously with less distance between nodes of Ranvier.³

Recovery is a return to health or pre-injury status. Even if all the right factors are in place to enable good bone and soft tissue healing there may be a poor recovery for the patient. Healing is an early, vital part of a longer process of recovery.

Recovery is influenced by many factors. Initially rapid assessment of the patient combined with a good surgical strategy and precise planning are important. This should take into account the aim of the treatment. At first this is usually to save the life of the patient and then to restore normal function. Achieving these first steps relies on team communication, surgical tactic and good surgical technique. Knowledge of how to reduce a specific fracture and how to hold the reduction is vital. Delay to surgical treatment can affect healing, examples of this are best seen in relation to open fractures and long bone fractures. Open fractures

require thorough debridement within six hours. This is the time taken for a single bacterium to multiply into a colony of one million which is the amount needed to cause clinical infection. A delay to surgical treatment in this case can result in deep infection with resultant detrimental effects on the recovery of the patient. Long bone fractures in polytrauma patients should be stabilized as part of the initial life-saving treatment and also to decrease later complications such as Adult Respiratory Distress Syndrome (ARDS) which would in turn increase the hospital stay and slow recovery.^{5, 6} Different surgical treatment methods will also have different outcomes in terms of wound healing.⁷

The initial phase of recovery also relies upon knowledge of wound and fracture healing along with factors that will promote or impede healing. Different techniques of bone stabilization rely on different methods of healing so it is essential to understand how bone and soft tissue heal and how an intervention will affect this. There are many things that can impair healing and therefore have an adverse effect on recovery. These include patient and wound factors. Patient factors shown to have an adverse effect on healing include increased age, smoking, alcohol consumption, and co-morbidities such as obesity and diabetes.^{7, 8} Wound factors such as fracture pattern, location, mechanism of injury, severity of soft-tissue injury, vascular damage, infection, presence of foreign bodies in the wound or local tissue damage such as ischaemia can also effect the healing of tissues.⁷

Delayed union of a fracture is when it takes longer than expected to heal. Non-union occurs when there is no further evidence of healing. Non-union is evidenced by persistent fracture lines, sclerosis at bone ends, fracture gap and hypertrophic or absent callus. The reasons for non-union include: infection, disturbed vascularity, instability, neuropathies and patient non-compliance.⁹ If a fracture fails to heal the disability that the patient suffers is prolonged. This can have a greater negative impact on the patient's life than other diseases such as ischaemic heart disease or undergoing renal dialysis.⁵ This highlights the importance of healing in the recovery of the patient. Studies of patients with severe tibial fractures have shown that there is a better health outcome for the patient if there is primary bone union.^{9, 10} One study used Psychological Adjustment to Illness Scores (PALS) to determine quality of life in transtibial amputees from the Vietnam War. The results showed significantly worse scores for those who had suffered chronic osteomyelitis and non-union.⁹ Post-

operative complications do have an adverse effect on patient outcome.

An aggressive initial surgical approach with early stabilization of fractures and reconstruction of soft-tissues ensures that early joint movement can be commenced by the patient. The physiotherapist therefore has a pivotal role in the patient's recovery. The aim of rehabilitation is to return the patient to normal function once the life and limb threatening injuries have been dealt with. The AO concept of "life is movement, movement is life" is very relevant here as without the early surgical treatment and subsequent prompt physiotherapy to ensure mobilization there would be resultant stiffness of joints and reduced function which could in turn have a detrimental effect on the patients independence and quality of life.⁵ Other factors in the rehabilitation of a patient can have an effect on their recovery. Delaying weight bearing has been shown to have an increased risk of delayed bone healing or non-union in tibial shaft fractures.⁷ A Multi-Disciplinary Team approach with adequate follow-up is also very important to encourage a good recovery. Ideally this should be carried out in a centre that specifically deals with patients who have sustained injuries. Amputees from the Vietnam War who were treated in a centre specifically dealing with amputees had a better outcome and more consistent care than other amputees treated in non-specific centres.⁹ Often meeting people with the same injury can aid a patient's progress. In some hospitals this is facilitated by group physiotherapy sessions and specific outpatient clinics.

Along with clinicians and physiotherapists other services are required to help with the return to normal function post-injury. Occupational Therapy and Social Services are important to help with the provision of equipment and home adaptation to enable the patient to live as near to normal as possible. Helping the patient return to driving or work are also large milestones along the road to recovery.

Patient compliance and motivation are important things which impact on recovery. As mentioned previously, poor compliance can adversely affect fracture healing. It can also hinder return to function. The patient needs support in order to make realistic goals and to develop plans for the future.

Gopal et al. noted that "saving life and limb takes the highest priority followed by rehabilitation. The psychological impact of trauma is often neglected".¹⁰ MacKenzie et al. interviewed three-hundred and ninety-seven patients post-amputation or lower limb reconstruction. Each participant completed a

Sickness Impact Profile (SIP) to determine their perceived health-status. The SIP contains questions in twelve categories including mobility, social interaction, work and emotional behaviour. Worse outcomes were found in older age groups, females, non-white races, lower education levels, low income families, those with low health-status pre-injury, current or ex-smokers and those involved in legal proceedings.¹¹ Many of these things are unalterable, but could help to determine which patient groups would benefit from psychological support post-injury.

Doherty et al. found that patients with trans-tibial amputations and one other major injury were more likely to use psychological support services compared with patients with isolated trans-tibial amputations.⁹ The SF-36 is a standardized questionnaire divided into eight sections; physical function, role physically, bodily pain, general health, vitality, social function, role emotional and mental health. It assesses the patients' perception of their health and quality of life. When using the Short Form-36 (SF-36) health survey patients with more than one injury showed worse outcomes than those with isolated injuries.^{9, 10} Military personnel were also found to have better SF-36 outcomes.¹⁰ This could be due to a variety of factors including better social support, personality type, improved coping strategies and having survived in a war situation. It is also well documented that patients with good social support and a spouse report better quality of life post-injury and have improved recovery.

A final factor in recovery after injury is the patients' self-esteem, body image and ability to adapt. There are several definitions of body image. Most recently it has been described by Price as "the totality of how one feels and thinks about one's own body and its own appearance".¹² Body image can be altered by injury and this can lead to poor self-esteem. Patients with low self-esteem are unlikely to contribute towards their own care and rehabilitation so tend to have worse outcomes. This is often due to beliefs that they are unable to perform tasks such as physiotherapy exercises, and they are not worth the effort put in by everyone involved. Elderly patients for example often feel guilty about using resources on them. Patients' individual coping mechanisms have a great impact on their ability to adapt post-injury. In a study by Fisher et al., there was no increased evidence of depression in patients following amputation.¹³ Certain patients and personality types are more vulnerable to depression. These independent patient factors cannot be controlled. Another important part of helping

someone reach full recovery is recognizing all of these issues and giving adequate support to overcome them.

Although at first glance healing and recovery are synonymous a closer look reveals some differences. In fact, they are closely linked. Healing is an integral part of recovery. In order for the patient to return to their former status full bone and soft tissue healing is necessary. Recovery takes into account many other important factors. Use of the injured part and returning to pre-injury function is crucial. Adapting to an altered body image using individual coping strategies, social and family support is also important. Healing is therefore only one thing that can affect the recovery of a patient. Full recovery depends on good clinical care and rehabilitation along with psychological and social support.

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