

Prevention and Treatment of Pressure Sores

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Even though easily prevented, pressure sores occur frequently. The consequences of allowing pressure sores to develop are great. Pressure sores are costly and disabling, both physically and psychologically.

This article presents 1) criteria for recognizing the stages of potential skin breakdown: hyperemia, ischemia, necrosis, and ulceration; 2) areas most vulnerable to skin lesions when the patient is in different positions; 3) responsibility for pressure sore prevention; 4) prevention of pressure sores by routine relief of pressure from susceptible areas; and 5) treatment of pressure sores.

Pressure sores can be prevented; therefore, they represent negligence in patient care. Their occurrence, nevertheless, is frequent. The authors estimate that the monetary cost of treating a patient with a single pressure sore is fifteen thousand dollars. The physical and emotional costs to the patient are inestimable.

Little can be done by the physical or occupational therapist in teaching a patient to perform functional activities while the patient is recumbent recovering from a pressure sore. Training must be postponed, sometimes for months, until the area is healed. The postponing of necessary training results in extended hospitalization for the patient. The purpose of this article is to discuss the prevention and treatment of pressure sores.

BACKGROUND

Definition

Confusion has existed regarding usage of the terms *pressure sore* and *decubitus ulcer*. The terms are synonymous. Dorland defines the

condition, however, as an "ulceration caused by prolonged pressure in a patient confined to bed for a long period of time."¹ This definition is misleading in that "prolonged" and "for a long period of time" are nebulous statements which may mean different things to different people. The definition also is inaccurate because it implies being confined to bed. The term *bed sore* probably was coined in association with this definition. *Pressure sore* is a more accurate term because it describes the cause of the condition, i.e., pressure without reference to body position.²

Incidence

Approximately 68 percent of patients with spinal cord injuries develop pressure sores.³ Bliss states that 35 percent of the geriatric patients in nursing homes have pressure sores.⁴

Etiology

The cause of a pressure sore is exactly what its name implies—pressure.² The patients most likely to develop pressure sores are patients who have loss of skin sensation. Comatose patients, emaciated patients with prominent bony prominences, and patients with metabolic protein disturbances also are likely candidates. It is erroneous to think, however, that only these persons are susceptible to pressure sores. Pressure sores can develop on anyone who is confined to one position without relief of pressure.

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A person with intact skin sensation experiences discomfort over bony prominences when he is confined to one position. If he has the ability to move, he will automatically relieve the pressure in response to his body demands. If he cannot move, he may develop a pressure sore even though he has intact skin sensation. For example, a person confined to one position because of a fractured hip or recent cerebral vascular accident may develop a pressure sore. The same could be true for a person who lies for hours in one position on an x-ray table or on a bedpan.

Symptomatology

The patient with skin sensation loss and the comatose patient will not complain as their skin develops a pressure sore. The alert patient with intact skin sensation confined to one position for long periods of time will complain bitterly of discomfort and pain.

When a pressure sore develops into its chronic stage of ulceration and infection, the patient suffers systemically from loss of protein, and from anemia and debilitation.^{3,5} Amyloidosis often occurs affecting the kidneys and liver and causing hypoproteinemia, nephrosis, hepatomegaly, and, sometimes, congestive heart failure.⁵⁻⁹ The pressure sore enlarges and begins to drain a pungently odored fluid. In addition, these chronically irritated tissues and

osteomyelitic sinuses are fertile ground for squamous cell carcinoma.¹⁰

As a consequence of these systemic conditions, the patient lacks the feelings and attitudes of well-being and complains of exhaustion. Psychologically, he may become discouraged. Frequently, he is unable to cope with the problem and develops suicidal tendencies.

Diagnosis

Diagnostic acumen is not measured by the ability to recognize a pressure sore once it has developed but by recognition of the early signs of potential skin breakdown and prevention of any further progression.

In the development of a pressure sore, external pressure causes diminished circulation between bony prominences and skin surfaces.^{3,11-13} With diminished circulation, the four stages of pressure sore development begin (Fig. 1).

Stage 1. Hyperemia. The first stage, hyperemia, can be observed within thirty minutes or less. Hyperemia is manifested by redness of the skin, and, if the pressure is removed, this redness will disappear within one hour.

Stage 2. Ischemia. Ischemia may develop if pressure is continuous for two to six hours. In contrast to hyperemia, the redness from ischemia takes at least thirty-six hours to disappear after pressure is relieved.

Stage 3. Necrosis. Unless pressure is relieved within six hours, necrosis occurs. It may manifest itself as a blueness of the skin or as a hard lump similar to a boil. The necrosis does not disappear at a definite time interval after pressure is relieved but is individual with each case.

Stage 4. Ulceration. Within two weeks, a necrotic area may become ulcerated and infected. If the pressure sore progresses to this fourth stage, bony prominences may become incorporated and eventually destroyed.

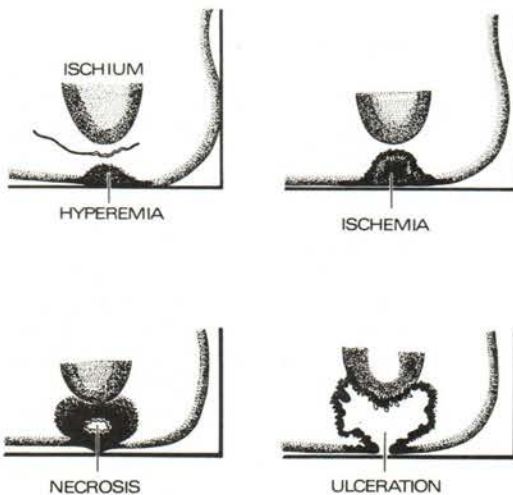


Fig. 1. The four phases of a pressure sore.

Prognosis

Prognosis depends upon action. Pressure sores are preventable and treatable. The earlier the signs of pressure sore development are recognized and action is taken to eliminate

pressure, the better. At best, recovery from pressure sores is time consuming and costly. At worst, pressure sores can lead to the debilitating systemic conditions mentioned above and even to death.

Common Pressure Sites

Likely areas of skin breakdown depend on the patient's position. The common pressure sites will be discussed, therefore, from the viewpoint of body position.

Supine. Patients in the supine position most frequently develop pressure sores over their scapulae, sacrum, and heels.

Prone. In the prone position, the susceptible areas are over the chest and patellae.^{1,2} Skin breakdown has also occurred over the anterior surface of the tibia.

Sidelying. The frequent areas of breakdown in the sidelying position are over the femoral trochanters, the malleoli, and even the femoral condyles.^{1,3}

Sitting. In the sitting position, the areas over the ischial tuberosities are the most vulnerable.^{1,1} The areas over the posterior aspects of the femoral trochanters also are susceptible if the hammock-style wheelchair seat panel sags, thereby, increasing the arc of the hammock. As the patient sinks into this hammock, the hard tubular seat rails place extreme pressure on the skin covering the trochanters.

Least susceptible areas. The areas least susceptible to breakdown are the areas which contain large amounts of soft tissue between the bone and skin, e.g., the abdomen, thighs, and posterior calf. The large amount of tissue in these areas allows a cushioning for the blood vessels between the skin and bone. If a patient is positioned on top of a small object which protrudes into one of these areas, however, the skin will break down and a pressure sore will result.

PREVENTION

Responsibility for Prevention

The key to prevention is the acceptance of responsibility by the entire team—the patient, his family, the physician, allied health professionals, and supportive staff.^{7,9,14} Once this responsibility is accepted and the team is

educated in prevention, pressure sores can be eliminated. The proportion of responsibility assumed by each member of the team will vary, of course, at various stages of the patient's recovery.

Of the utmost importance is having the patient and family assume total responsibility for prevention before the patient is discharged from the hospital. The reasons for daily preventative measures must be instilled in the patient at the outset. If the patient is physically capable of carrying out the prevention program, he should be so educated. If he is not physically able to complete the program, he must insist that others carry out the program for him.

Preventative Measures

All prophylactic measures focus on detection and elimination of prolonged pressure to any area of the body. Any reddened area must be considered as the beginning of a pressure sore, and immediate action must be taken to relieve pressure from such an area.

A basic concept implies that potential for pressure sores diminishes with time spent since onset of the illness. This conception, however, is not supported by data. The skin does not necessarily become tougher. Emphasis upon prevention, then, must begin immediately and cannot be slackened with time. The skin must be inspected *daily* for reddened areas by the patient, nurse, or family. A mirror can be used by the patient to inspect posterior body areas.

Relief of Pressure in Bed

When a patient is confined to bedrest, our staff and others have found that he must be repositioned at least every two hours to prevent pressure sores.^{2,7,14} All four sides of his body should be utilized so that after eight hours he has been positioned prone, supine, and on each side.

Routine bed positioning procedures should be followed with special emphasis upon bridging any area which becomes reddened. For example, if, while supine, a person develops a reddened sacrum, then the sacrum should be bridged by the use of pillows so that it is free from bed pressure.^{15,16} The patient's sacrum should not be positioned directly on a special pad or pillow since this merely increases the



Fig. 2. Use of side rails helps patient to turn independently to relieve pressure.

pressure over the area. The use of doughnut-like foam rings to diminish pressure should be avoided. While the ring may decrease the pressure over the bony prominence, it creates a narrow bank of pressure completely surrounding the bony prominence. This circumscribing pressure decreases circulation to the area within the center of the ring. Necrosis may ensue.

Use of equipment specifically designed to prevent pressure sores, e.g., circo-electric beds, stryker frames, and gel cushions, will not prevent pressure sores alone. Watchfulness cannot be relaxed with use of this equipment. Indeed, persons often develop pressure sores after being positioned on special frames. These special frames allow the use of only supine and prone body positions; therefore, the patient is off of one body surface for only two hours at a time. If sidelying positions were utilized, he would be off of each body surface for six hours at a time. The only solution for prevention at present is routine pressure relief by frequent change of position.

The responsibility for bed positioning initially is that of the nursing staff.¹⁷ All members of the team, however, must be knowledgeable of the positioning principles in order to assist in adjusting the patient's position as necessary. As soon as the patient is allowed to move by himself, the nurse should teach him how to position himself and then delegate the responsibility for pressure relief to him.



Fig. 3. A loop attached to a trapeze bar assists the patient in turning.

Special apparatus may be attached to the bed to assist the patient in turning. A patient with paraplegia can use a trapeze bar and bed rails (Fig. 2), while a patient with quadriplegia can assist in turning himself by using a loop suspended from a trapeze bar (Fig. 3), or several loops suspended from a Balkan frame.

Relief of Ischial Pressure in Wheelchairs

While sitting in a wheelchair, the patient must have pressure relieved from his ischia.^{9,14} He can be taught to elevate his trunk every ten to fifteen minutes. If he cannot raise himself, he can lean forward to rest his trunk in his lap for relief of pressure. Also, he can lean sideways until the pressure is relieved from one ischial tuberosity. Then he must lean in the opposite direction to relieve the other side. Special loops may be added to the chair to assist the patient with quadriplegia in relieving ischial pressure (Fig. 4).

If the patient is unable to relieve the pressure himself, someone must help him lean forward or toward the sides. If one armrest is removed from the wheelchair, the patient can lean sideways onto pillows on his bed. Although one ischium is relieved of pressure by this position, excessive pressure is placed on the other ischium; therefore, this position should not be maintained for more than five minutes. Other ways of relieving ischial pressure are tilting the wheelchair backward until the patient's trunk is horizontal or by manually lifting him off his tuberosities.



Fig. 4. Relief of pressure when sitting may be aided by attaching loops to the wheelchair just below the push handles.

A properly fitted and equipped wheelchair aids in pressure sore prevention. The wheelchair must meet certain specifications.

Seat Depth. Seat depth should be such that one can place four fingers between the edge of the seat and the patient's popliteal fossa.

Seat Width. The seat should be wide enough so that the patient's femoral trochanters do not rest upon the seat rails or the skirt guard.

Seat Height. The height should allow maximum support for the patient's thighs. This thigh pressure decreases ischial pressure dramatically. Lindan has shown that if the patient's feet are permitted to hang without support, the ischial pressure is decreased to almost half of that when his feet are supported, and no distal thigh pressure is present.¹² This demonstrated decrease in ischial pressure has refuted Chase and White's statement of indications for bilateral high thigh amputations in paraplegic patients.¹⁸ To obtain maximum thigh pressure while still maintaining functional wheelchair use, the footpedals should be lowered until the patient's heels are free. The pedals then are raised one centimeter. The seat must be high enough for the footpedals to clear the ground by six centimeters after they are adjusted; otherwise, the footpedals will scrape the ground when ascending a small incline. If a

standard wheelchair cannot be adjusted to fit in this manner, a custom wheelchair can be ordered from a manufacturer.

Seat Cushion. A wheelchair must have a seat cushion. A five-centimeter foam rubber cushion is adequate for most patients having normal sensation. The patient who has a spinal cord injury with sensory loss needs an eight-centimeter cushion. If his skin still becomes reddened over the ischial tuberosities, a cut-out seat board can be made to relieve more pressure. The cut-out seat board must be made large enough to allow the ischia to clear the board by approximately four centimeters around all sides.

No cushion yet manufactured can alone guarantee the prevention of pressure sores. The pressure of the trunk weight upon the ischial tuberosities is too great to be sufficiently relieved by any cushion.¹² The only present solution for prevention of ischial pressure sores is the routine pressure relief stated earlier.

Relief of Pressure from Appliances

The disabled person often needs assistive equipment. If he wears braces, they must fit properly. If an area of skin becomes reddened as a result of improper fit, the brace must be adjusted. This redness may result from cuff pressure, and, often, by increasing the width of the cuff, the amount of surface area in contact with the skin is sufficiently increased to prevent



Fig. 5. Custom shoes for individual patients can be fabricated from a soft plastic material built on a polyurethane sole.

further reddening. Redness may also be caused by uprights of the brace which contact bony prominences.

If the patient's feet become reddened because of ill-fitting shoes, the shoes can be refitted with fleece innerlining. Shoes made of soft plastic material* may be necessary for some patients (Fig. 5). These shoes are readily fabricated by a local orthotist.

Body jackets, other rigid trunk supports, and corsets must be scrutinized carefully and regularly to be sure that they are not causing excessive pressure to the underlying skin. Not only can a tight appliance cause pressure, but a jacket which is too loose can rub sores over the iliac crests.

TREATMENT

The treatment of recently developed pressure sores is simple. Relieve the pressure! Adequate care does not involve special diets or the use of time-consuming modalities, such as whirlpool, ultraviolet, or massage. The ischemic stage of a pressure sore has developed if a reddened area does not blanch within one-half hour. Unless pressure is removed from the area, an ulcerated pressure sore soon will appear.

When ulceration occurs, the pressure must be relieved and the area exposed to air until it has healed. A cradle to keep the bedding off the sore is useful. Cleanliness of the area is extremely important. Two successful methods of cleansing are the use of hydrogen peroxide or an organic iodine solution. Ointment with an oily base, such as zinc oxide, never should be used because it shuts out air which aids healing.¹⁹

When the physician determines that a surgical dressing is necessary, i.e., if the patient must wear clothes over the area or if there is a large amount of drainage from the area, a simple dry gauze dressing is effective. Should the gauze stick to the sore, it is no cause for alarm, since its removal aids in the debriding of necrotic tissue.

Sometimes surgical debridement and closure are indicated when the lesion is massive and involves bone. Surgery is effective if the sore is free from infection and the skin is pliable and

free from adhesions to bone and other connective tissue. Following surgery, the patient must be even more careful of his skin, especially if underlying bone has not been removed. Scar tissue is thinner, less elastic, and more fragile than normal skin and tends to become injured more easily.^{8,11}

SUMMARY

1. Since pressure sores are preventable, their presence is evidence of improper or inadequate care.
2. Pressure sores are costly not only monetarily but in the physical and emotional trauma to the patient. The healed pressure sore results in body surfaces less tolerant to pressure, that is, scar tissue.
3. The term *pressure sore* is preferable to *decubitus ulcer* because it accurately describes the cause—pressure. Pressure sores can occur in any position and from numerous mechanical sources.
4. Recognition of early signs of potential skin breakdown, hyperemia, ischemia, necrosis, and ulceration along with frequent changes of body position are the keys to prevention of pressure sores.
5. Pressure sores are preventable but require the concerted effort of the entire team which includes the patient, his family, the physician, allied health professionals, and the supportive staff.
6. As soon as he is alert enough, the patient should be largely responsible for prevention of pressure sores.
7. A properly fitted wheelchair is essential in prevention of ischial pressure and should include a seat cushion and cut-out seat board for ischial tuberosities if necessary. In addition, ischial pressure must be relieved every ten to fifteen minutes.
8. Adaptive or assistive equipment must fit properly and accommodate the stressful areas over bony prominences.
9. Treatment of a pressure sore includes keeping pressure off the area, keeping it clean, exposing it to air, and sometimes surgical debridement and closure if the area is massive.

* Plastizote®

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