CHAPTER 6

The Effects of Immobilization on the Skin

One of the major hazards to face immobilized patients is the breakdown of the skin and underlying tissues. Those areas that are exposed to prolonged and excessive pressures are vulnerable, especially wherever bony prominences are close to the surface. Under normal conditions the skin is protected by frequent movements which shift the body weight from one area to the other. The immobilized patient is incapable of performing these weight shifts, and the same skin area remains under pressure for long periods of time.

Tissue breakdown occurs if the external pressure exceeds the capillary pressure for an extended span of time. The intracapillary pressure is approximately 25 mm Hg. Kosiak et al. measured pressures of 300 mm Hg and more under the ischial tuberosity in the sitting position. Padding the seat with 2-inch foam rubber decreased the pressure to about one-half. Bush reported that the pressure under the tibial tuberosities was significantly greater when the feet were supported on the footrests of the wheelchair than when the legs were allowed to hang free. In that position the pressure was distributed over a wider surface area, i.e., the posterior thighs. Lindan was able to measure the pressure
over the skin surface of a recumbent man at more than 1000 points.\textsuperscript{3} From his data he constructed isobars which outlined the pressure distribution over the entire body surface. In the supine position, the greatest pressures are over the sacrum, ischial tuberosities, heels, scapulae, elbows, and occiput. In the prone position maximal pressures are exerted on the patellae and anterior chest wall. In the lateral position the trochanter is particularly vulnerable. A harder surface increases the maximal pressure, the area of higher pressure contact, and the steepness of the isobar gradients. It decreases the area of lower-pressure contact. In addition to the degree of pressure, the time during which the skin is exposed to pressure is also of critical importance. Kosiak, experimenting with dogs, plotted pressure versus time of exposure.\textsuperscript{4} The relationship followed a parabolic curve. A pressure of 500 mm Hg applied for 2 hr caused an ulceration, and a pressure of 150 mm Hg caused a skin breakdown when applied for 12 hr. All tissues under pressure points, epidermis, subcutaneous tissue, muscle, fascia, and bone were affected. There was a latent period of an average of 4\(\frac{1}{2}\) days from the time that pressure had been applied until ulcerations appeared. In one case the latent period was as long as 9 days.

Factors other than compressive pressure may play an important part in the development of decubitus ulcers. Reichel postulated that significant shearing forces act on the tissues overlying the sacrum.\textsuperscript{5} These forces are particularly destructive in paraplegic patients who are in bed in a halfway sitting position. In this position the body slides forward and downward against the sacral skin which remains in the same spot because of the friction between bed and skin. The shearing mechanism disrupts the deeper tissues and exerts its main effect on the superficial fascia. These forces place