WOUND MANAGEMENT: DRESSINGS AND DRAINS

Marc R. Bernbach, D.P.M.

Dressings and drains should accomplish a specific function as they relate to wound management. Each dressing and drain should be utilized with a purpose in mind. The actual materials and their utilization will vary according to the wound one is managing, i.e. clean, primarily closed versus open, contaminated wounds.

Dressings

The manner in which a dressing functions is determined by its physical as well as chemical composition. For example, cotton absorbent gauze is graded into eight subtypes defined by the number of threads per square inch. The degree of dressing adherence is directly related to the size of dressing interstices. The greater the interstice size the more likely the dressing will be penetrated by granulation tissue. If debridement is the goal, a dressing with large interstices should be selected.

Dressings function to absorb wound exudate. The beneficial effects of absorbency are 1) bacteria contained within the absorbed fluid are removed, 2) the exudate itself is removed, depleting the wound of bacterial nutrients, and 3) tissue maceration is prevented. Absorption results from capillary forces of attraction exerted by the capillary spaces between the dressing fibers. Highly absorbent dressings are usually adhesive since exudates form a glue-like substance within the dressing. Dressings with high absorbency will remove fibrous debris and granulation tissue contained within the dressing making them useful for debridement of open wounds.

The surgical dressing acts as a barrier to exogenous bacteria. Dressings soaked with serum easily allow passage of bacteria through the dressing. When both inner and outer surfaces become saturated strike-through contamination results. However, as long as the outer surface remains dry, a dressing will remain an effective barrier to contamination.

This concept, as well as the absorbency principle, is employed at Doctors Hospital with the use of saline moistened sponges applied directly to the wound surface. A routine dressing follows the application of the saline soaked gauze. Care must be taken to carefully wring the gauze so as to remove excess moisture. Bacteria as well as wound exudates are carried from the wound through the moist dressing sponge into the surrounding dry sponges. The result is a clean, non-macerated wound surface.

The compressive force of a dressing exerts pressure on underlining tissues. A pressure dressing limits the accumulation of intercellular fluids, reduces dead space, limits post-operative edema and assists coaptation of wound edges enhancing fine scar formation. Maximal pressure should be applied to the wound site as well as distal to it. Pressure applied proximal to the wound should be decreased so as to assist lymphatic and venous drainage. Gentle compressive force may be obtained from a dressing by using concentric layers of gauze pads within kling bandage as the wound is dressed. Concentric sponges remove the potentially irritating kling from the skin's surface as well as concentrating compressive force at the wound site. A layering of gauze pads also allows the dressing to accommodate to postoperative edema and prevent constriction.

Compressive forces by their nature are immobilizing. Immobilization of a wound is a desired function of a dressing since lymphatic flow is reduced limiting microflora spread, and an immobilized wound demonstrates the best resistance to the growth of bacteria. Furthermore, anatomic correction may be obtained or maintained by splintage properties of dressing material, i.e., postoperative maintenance of hallux abducto valgus surgery.

The length of time a dressing should cover the wound is based upon the period during which a wound is susceptible to bacterial penetration. Experimental studies document increasing resistance to infection as surgical wounds heal. Numerous studies indicate 48 hours of wound coverage is necessary to prevent gross wound infection. Thereafter, removal of the dressing may be performed as necessary to permit inspection and palpation of the wound area.

The potential dangers of a wound dressing should be appreciated as well. Constriction resulting in ischemia, skin irritation, and pressure ulceration are all complications of improperly applied dressings. Regions

susceptible to skin irritation include the anterior tibial tendon, the anterior and posterior ankle, the medial and lateral malleoli, the first and fifth metatarsal heads, as well as the heel. Proper padding of these areas should be considered when applying a dressing in addition to the avoidance of dressing wrinkles or creases at these sites.

Drains

The use of surgical drains is a delicate balance between benefits and harmful effects. The advantages of wound drainage include the removal of potentially harmful collections of blood and serous exudates. These fluids if not removed may result in hematoma formation. Potential dangers of hematoma formation include increased postoperative pain, necrosis of superficial tissues secondary to ischemia, as well as an excellent culture medium for bacterial growth. Numerous studies have determined hematoma formation to be the greatest etiological agent of postoperative infection.

Impaired wound healing and postoperative infections are the greatest risks of drain usage. Retrograde passage of bacteria through drain tubes or drain exit sites may result in an increased rate of wound infection. Due to these risks drain utilization should not be indiscriminate. Placement should be performed with a definite purpose in mind so that the benefits will outweigh the risks. Procedures involving large amounts of medullary bone, extensive tissue dissection, traumatic wounds, or dead space are all excellent candidates for drain placement.

Drains may be classified as either active or passive systems. The common penrose drain, a passive system, is dependent upon exudate flow out the drain exit site via gravity or capillary action. Whereas the closed suction drain, an active system, functions by draining wound exudate through a silastic tube into a sterile collecting device. The closed suction system is the drain of choice since it will function in dependent as well as elevated extremity positions. Furthermore, it functions in a near sterile environment permitting the fluid to be cultured if necessary. Additionally, the potential for wound contamination is greater with penrose drains since the risk of retrograde contamination is increased in contrast to a closed suction system.

Procedures which will benefit from drain placement include heel spur resection, neuroma removal, delayed primary closure, split peroneus brevis lateral ankle stabilization, excision of plantar fibromatosis, calcaneal osteotomies, triple arthrodesis, medial arch tendosuspension, and Haglunds resection.

Proper selection and utilization of dressing and drain materials will optimize the results of the operative procedure. Patience and attention to dressing technique will enhance patient comfort and help prevent dressing induced complications.

Bibliography

Chinn S, Burns A: Closed suction drainage. *J Foot Surg* 24:76, 1985.

Colebrook L, Hood AM: Infection through soaked dressings. *Lancet* 2:682, 1948.

Crissey J, Parish L: Wound healing: development of the basic concepts. *Clinics Dermatology* 2:1, 1984.

Greenburg A, Saik R, Peskin G: Wound dehisence. *Arch Surg* 114:143, 1979.

Miller S: Surgical wound drainage system using silicone tubing. *J Am Podiatry Assoc* 71:287, 1981.

Moss J: Historical and current perspectives on surgical drainage. *Surg Gynecol Obstet* 152:517, 1981.

Schilling J: Wound healing. *Surg Clin North Am* 56:859, 1976.