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CCAT Negative Pressure Wound Therapy Clinical Practice Guideline

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I. Background and Introductory Information
   A. Negative Pressure Wound Therapy (NPWT) is an alternative to wet to dry dressings and other temporary wound coverage methods.
   B. Negative pressure dressings can be left in place from 24 to 72 hours depending on wound characteristics.
   C. Negative pressure dressings have several advantages over traditional dressings:
      1. Provide wound coverage that aids in wound healing.
      2. Less labor intensive to manage.
      3. Allows for accurate measurement of fluid/blood loss from large wounds.
      4. Provides a simple temporary closure device for an open abdomen, allowing temporary sterile coverage of the peritoneal space.
   D. These benefits have led to extensive use in managing wounds and open abdomens throughout the deployed environment and make it the preferred wound coverage method during AE movement.
   E. There are multiple ways to create a negative pressure dressing
      1. The term "wound VAC" has become synonymous with the KCI negative pressure therapy system.
      2. Negative pressure dressings can be fashioned using other equipment.
      3. Non-US facilities often create negative pressure dressings using gauze and standard suction devices.
      4. All are permissible for use in-flight so long as the suction device is certified safe-to-fly or a waiver has been obtained.

II. Components of negative pressure dressing
   A. Porous material
      1. Cut to fit into wound and conform to its shape.
      2. Allows negative pressure to be distributed evenly throughout wound.
      3. Allows fluids to drain out of dressing into tubing.
      4. Examples:
         a. Reticulated Open Cell Foam (ROCF)
            (1) Most common
            (2) Used with KCI wound VAC
         b. Gauze
         c. Sterile OR towels
   B. Occlusive dressing
      1. Covers the entire wound and adheres to intact surrounding skin.
      2. Most often made from Ioban but other adhesive dressings may be used.
      3. Must form an airtight seal to allow the suction device to maintain negative pressure within dressing.
   C. Suction conduit
      1. Transmits the negative pressure from the suction device to the dressing.
      2. Consists of the tubing and whatever is attached to the end of it within the dressing.

a. With the KCI wound VAC there is a device called the TRAC pad that is attached to the end of the tubing and lies beneath the dressing..
b. Other dressings may employ a chest tube with or without a Heimlich valve for this purpose.

3. Y-connectors
   a. May be used within the tubing to allow a single suction device to be used for multiple wounds.
   b. This arrangement is less efficient and is limited by the combined size of the wounds.
   c. The most appropriate use is draining multiple small wounds using a single suction device.
   d. A leak in any one of the dressings will adversely impact the entire system and prevent appropriate drainage of all wounds.

D. Canister
   1. Collects fluid and blood removed from the wound.
   2. Canister on the KCI wound VAC contains a gel pack to solidify fluids collected from the wound.
   3. Fluid will be collected in standard suction canister with other types of negative pressure dressings.

E. Suction device
   1. Most often suction is generated by a dedicated KCI wound VAC (Freedom Pump is the specific model used in CCATT).
   2. Impact suction or wall section can also be used.

III. Operation of the KCI wound VAC pump

A. Continuous versus intermittent therapy
   1. Continuous therapy provides a constant level of negative pressure while intermittent therapy cycles between negative pressure and zero pressure applied to the wound.
   2. Most wounds are managed with continuous therapy.

B. Negative pressure setting
   1. The amount of negative pressure to be delivered is set in mm Mercury.
   2. This value will be determined by the surgeon that applied the dressing.
      a. The majority of wounds will be managed on 125 mm Mercury.
      b. Split thickness skin grafts may be managed with 75 mm Mercury.
   3. Suction intensity
      a. Determines intensity with which the pump reaches the set negative pressure.
      b. The value is set between 0 and 10.

IV. Preflight Considerations

A. Inspect the wound and dressing
   1. What is the nature of the wound? (open abdomen, soft tissue wound, coverage of fasciotomy site, etc.)
   2. Ensure that the adhesive dressing provides an airtight seal around the wound edges. With suction applied, the dressing should be firm and obviously under negative pressure.
   3. Examine the edges of the dressing closely and determine if there are areas At risk for leakage that may require additional reinforcement.
   4. Not any fluid leaking under the dressing.
      a. Fluid leaking out from under the dressing will progressively separate the adhesive from the skin.

b. If there is fluid leaking, there is error leaking. If the leak a small the suction device may compensate for initially but the dressing will eventually fail in flight.
c. Summon the surgeon to the bedside of there is fluid leaking and troubleshoot the dressing before departure.

B. Contingency planning for failure of negative pressure dressing.
1. Inability to maintain negative pressure
a. Usually results from leaks around the edges of the adhesive.
b. If the problem cannot be overcome by reinforcing the dressing an alternative strategy is needed.
(1) Leave the dressing in place without negative pressure for the remainder of the transport.
(2) Remove the dressing and replace with a traditional wet to dry dressing.
c. The appropriate management strategy will be dictated by transport time remaining, size/location of the wound and wound output.
d. Management should be discussed with MTF surgeon prior to departure.
2. Equipment failure
a. If the KCI wound VAC fails in flight it is usually appropriate to attach the dressing to a standard Impact suction device.
b. In small wounds with minimal output it may be a more appropriate to switch to wet to dry dressings.
c. Planning for this contingency should be discussed with the surgeon prior to departure.

C. Supplies
1. Canisters
a. KCI wound VAC canisters are small. They cannot be emptied and reused due to their design and the gel material that solidifies drainage within the canister. The pump will not function with a full canister. **It is imperative that enough canisters are on hand to last for the duration of the flight.**
b. Suction canisters on the Impact device are less problematic as they are larger and can be emptied and reused if absolutely necessary.
2. Obtain additional Ioban and/or Tegaderm to allow reinforcement of the adhesive dressing in the event of suction loss.
3. Extra suction tubing, Y-connectors and "football" connectors will facilitate troubleshooting negative pressure dressings.

V. Management and troubleshooting
A. Monitoring
1. Quantity and quality of drainage should be monitored frequently to detect malfunctions or excessive bleeding.
2. Additional vigilance is required when using a standard suction unit for NPWT as there are no alarms to alert the team to malfunctions or changes in output.

B. Negative pressure should be applied continuously to the dressing.
1. Prolonged periods without negative pressure allow fluid to accumulate in the wound, which will lead to failure of the airtight dressing.
2. If the VAC is without negative pressure for greater than two hours it is recommended that the dressing be changed.

C. Inability to maintain negative pressure
1. Detecting loss of negative pressure

a. The dressing will no longer be firm and collapsed.
b. The KCI wound VAC alarm will alert the team to loss of negative pressure.
c. There is no such alarm on the impact suction device so additional vigilance is required.

2. Thorough inspection of the pump, canister and all tubing connections will quickly eliminate these as a source of suction loss.
3. Leaks around the edges of the adhesive dressing are the most common source of loss of negative pressure.
   a. The site of the leak can often be identified by inspection of the dressing.
   b. Large leaks may make a hissing sound that can be detected by listening closely.
4. If the source of the leak can be definitively identified it can usually be remedied by reinforcing the dressing with additional adhesive material.
5. If not obvious sources identified an attempt be made to cover the entire existing adhesive dressing with a larger sheet of Ioban. Depending on the size and location of the wound this may or may not be possible.
6. In complex dressings with multiple wounds attached to a single suction source, it may be possible to preserve suction on the dressing by excluding a single wound that is responsible for loss of pressure on the entire dressing.
7. If efforts to resolve the loss of suction unsuccessful the teams resort to the contingency plan established before departure.

D. KCI wound VAC alarms
   1. Leak detected alarm should be addressed using the strategy outlined above under "Inability to maintain negative pressure."
   2. Tube obstructed alarm sounds if the tubing is obstructed but may also be triggered by four canister.
      a. First check the canister and replaces it is full.
      b. Check the tubing to ensure that there are no clamps occluding it.
      c. Ensure the canister is properly seated on the VAC pump.
      d. Check the tubing to be certain it is not occluded by blood.
      e. Replaced the canister at this point if no other culprits have been found.
      f. Increasing the level suction may assist with maintaining to patency.