Pneumatic Anti-Shock Garment: Deflating and Removing

What Is a Pneumatic Anti-Shock Garment?

A pneumatic anti-shock garment (PASG; also known as a military anti-shock garment [MAST] or shock pants) is a device developed to initially stabilize patients with significant trauma of the pelvis or lower extremities by decreasing blood flow to the extremities. PASGs are intended to be used as a temporizing measure (i.e., short-term intervention) until definitive treatment is available. The PASG is distinguished from the nonpneumatic anti-shock garment, which does not use a pump for inflation (for more information, see Nursing Practice and Skill ... Postpartum Hemorrhage: Applying a Non-Pneumatic Anti-Shock Garment; and Nursing Practice and Skill ... Postpartum Hemorrhage: Removing Non-Pneumatic Anti-Shock Garment). The information contained in this Nursing Practice & Skill is intended to present a brief overview of the PASG and is not intended to replace facility protocols, clinician orders, or the coursework and clinical experience necessary to become proficient in applying, removing, or monitoring a patient with a PASG.

• **What**: A PASG is an inflatable garment with three compartments: abdominal, left leg, and right leg. A pump with a pressure gauge is used to inflate each compartment to the desired pressure in a manner similar to inflating a blood pressure cuff. Once the patient is stabilized or if a complication develops, the PASG is deflated as ordered. The patient is monitored continuously during deflation; rapid reinflation may be necessary, especially if the patient experiences sudden, severe hypotension. For information regarding application of a PASG, see Nursing Practice & Skill ... Anti-Shock Garment: Applying and Inflating; CINAHL Topic ID Number: T705457)

• **How**: PASGs should be applied per institutional or facility protocol. PASGs are never the sole treatment for a patient experiencing hemorrhage—other measures (e.g., I.V. fluid resuscitation, medications) are also initiated to help achieve hemodynamic stability. To remove the garment once the patient is stabilized and the treating clinician has issued an order, the nurse slowly deflates it while closely monitoring vital signs. If vital signs remain stable and the treating clinician has ordered garment removal, the PASG is removed; if hypotension develops, it might be necessary to administer I.V. fluids and medications, as prescribed, and to rapidly reinflate the garment to stabilize the patient.

• **Where**: PASGs are typically used in the prehospital (e.g., at the scene of an accident) or emergency department setting

• **Who**: In the prehospital setting, PASGs are applied by paramedics and emergency medical technicians (EMTs) according to institutional protocols. In the hospital setting, emergency department nurses apply PASGs per clinician orders and facility protocols. Depending on the situation and the patient’s preference, it may be appropriate to have family members present during placement and use of the PASG.
What Is the Desired Outcome of Removing a Pneumatic Anti-Shock Garment?
› The desired outcome of deflation and/or removal of the PASG is for the patient to remain physiologically stable and experience no adverse consequences or complications
› If the patient survives the initial stabilization period, he/she will receive definitive treatment for the condition that necessitated use of the PASG

Why Is Successful Removal of a Pneumatic Anti-Shock Garment Important?
› Successful removal of a PASG is an indication of physiologic stability and readiness of the patient to receive definitive treatment; the garment must be rapidly reinflated and applied if blood pressure drops or other vital sign abnormalities occur

Facts and Figures
› There are very few randomized controlled clinical trials of PASG use
› During the Vietnam War, the use of a PASG improved the survival of United States soldiers who had severe lower extremity trauma from 0% to 50%. The transport time from the field to the trauma center for these soldiers was approximately 45 minutes via helicopter (Cutler et al., 1971)
› Use of a PASG in a patient with a chest injury increases the risk for mortality (Cayten et al., 1993; Honigman, 1991)
› Most adverse effects of PASG use are caused by decreased distal perfusion (Hauswald, 2003)

What You Need to Know Before Deflating and Removing a Pneumatic Anti-Shock Garment
› Use of PASGs is controversial, and protocols outlining the appropriate circumstances for PASG use vary greatly by geographic area, facility, and institution
› PASGs have been found particularly useful as a means to stabilize patients in war zones
› The use of PASGs in the civilian setting (i.e., non-war zone environment) has been controversial, with many experts stating that their utility is limited
› Generally a PASG is ordered when a patient
  • is in decompensated shock
    – I.V. fluids and oxygen should always be administered in conjunction with PASG use to maximize hemodynamic stability
    – hemodynamic status must be monitored throughout the use of PASG and before removing the PASG
  • has a pelvic fracture and hypotension
  • has significant trauma and expected transport time is 20–40 minutes
› The nurse’s primary responsibilities in removing and deflating a PASG are to
  • complete a thorough patient assessment
  • assess and accurately record the patient’s vital signs and physiologic status, and monitor for any complications (for details, see Red Flags, below)
  • adjust the pressure in the PASG compartments according to clinician orders
  • assist in the removal of the PASG
› Nurses should be familiar with the contraindications to and risks associated with PASG use (for details, see Red Flags, below)
› Familiarity with all applicable equipment (e.g., PASG, tubing, airflow control valves) is essential
› Preliminary steps that should be performed before deflating and removing a PASG include the following:
  • Review the facility/unit-specific protocol for PASG deflation and removal, if one is available
  • Review the treating clinician’s order for the removal of the PASG
  • Review the patient’s medical record for any allergies (e.g., to latex or other substances); use alternative materials, as appropriate
  • Identify a colleague to assist; removal of a PASG may require more than one person, especially if rapid reinflation becomes necessary
  • Gather supplies and equipment necessary to deflate and remove the PASG, as follows:
    • Personal protective equipment (PPE; e.g., nonsterile gloves); use additional PPE (e.g., gown, mask, eye protection) if exposure to body fluids is anticipated
    • Vital signs monitoring equipment, including stethoscope, sphygmomanometer, and a blood pressure cuff of appropriate size for the patient
    • Long spine board or scoop stretcher
• Board straps
• Airflow control valves (e.g., stopcocks)
• Deflation valves
• Pressure gauge
• Emergency resuscitation equipment and supplies (e.g., crash cart, bag-valve-mask resuscitator, oxygen source and delivery system)

How to Remove and Deflate a Pneumatic Anti-Shock Garment

› Perform hand hygiene and don PPE as appropriate
› Identify the patient according to facility protocol
› Establish privacy by closing the door to the patient’s room and/or drawing the curtain surrounding the patient’s bed
› Introduce yourself to the patient and family member(s), if present; explain your clinical role in the deflation and removal of a PASG; assess the anxiety level of the patient/family and for knowledge deficits and anxiety regarding removal of the PASG
• Determine whether the patient/family requires special considerations regarding communication (e.g., due to illiteracy, language barriers, or deafness); make arrangements to meet these needs, if present
  – Use professional certified medical interpreters, either in person or via telephone, when language barriers exist
• Explain the procedure and its purpose; answer any questions and provide emotional support as needed
› Maintain in-line spinal immobilization at all times, if indicated
› Deflate the PASG as ordered when the patient has stabilized or if a complication develops. Perform the following steps to deflate the PASG:
  • Assess and document the patient’s vital signs, hemodynamic status, and level of consciousness before initiating deflation
  • Gradually deflate the abdominal compartment while monitoring and documenting the patient’s vital signs
    – If the SBP drops more than 5 mm Hg or the heart rate increases by 10 beats/min or more, deflation should be halted and I.V. fluids should be administered, as ordered. If the patient’s SBP is not restored, the abdominal compartment should be reinflated
  • Pause for 5 minutes or per facility/unit-specific protocol
  • Gradually deflate one of the leg compartments while monitoring and documenting the patient’s vital signs
    – If one of the legs is injured, the compartment containing the uninjured leg should be deflated first
    – If the SBP drops more than 5 mm Hg or the heart rate increases by 10 beats/min or more, deflation should be stopped and I.V. fluids should be administered, as ordered. If the SBP is not restored, the leg compartment should be reinflated
  • Pause for 5 minutes or per facility/unit-specific protocol
  • Gradually deflate the other leg compartment while monitoring and documenting the patient’s vital signs
    – If the SBP drops more than 5 mm Hg or the heart rate increases by 10 beats/min or more, deflation should be stopped and I.V. fluids should be administered, as ordered. If the SBP is not restored, the leg compartment should be reinflated
  • Monitor the patient’s vital signs closely. **Sudden and severe hypotension can occur**
› Do not remove the PASG until ordered. Rapid reinflation may be necessary if the patient becomes unstable
  • To remove the PASG, release the Velcro closures; **do not use scissors**
  • Leave the garment beneath the patient in case reinflation is necessary
› Discard used procedure materials appropriately; perform hand hygiene
› Update the patient’s plan of care, as appropriate, and document the following information in the patient’s medical record:
  • Date and time of PASG deflation and removal
  • Description of the procedure, including amount of supplemental oxygen administered, type and amount of I.V. fluids and blood products infused, and any medications administered
  • Patient assessment information (and the time each element was assessed) regarding
    – vital signs
    – level of pain/anxiety/consciousness
    – pulse oximetry readings
  • Patient’s response to use of the PASG
  • Any unexpected outcomes and the interventions performed
  • All patient/family teaching
Other Tests, Treatments, or Procedures That Might Be Necessary with Use of a Pneumatic Anti-Shock Garment

› Imaging studies may be performed to assess the extent of the patient’s injuries
  • Use of a PASG can mask a pelvic fracture. The abdominal compartment should be deflated prior to obtaining pelvic X-rays in order to assess for pelvic fractures
› An electrolyte panel may be ordered before, after, and while the patient is wearing a PASG to identify any electrolyte shifts caused by the PASG that require treatment
› Vasopressors (e.g., DOPamine), I.V. fluids, oxygen administration, and other measures are often necessary to stabilize the patient
› Patients often require surgical intervention to definitively treat the underlying condition (e.g., uncontrolled bleeding, pelvic fracture)

What to Expect After Deflating and/or Removing a Pneumatic Anti-Shock Garment

› Following deflation and/or removal of the PASG, the patient will remain physiologically stable and will experience no adverse consequences or complications (see Red Flags, below)
› If the patient survives the initial stabilization period, he/she will receive definitive treatment for the condition that necessitated use of the PASG

Red Flags

› PASG pressure changes can occur with changes in altitude (e.g., during air transport or ground transport over mountain passes). PASG pressure should be monitored carefully during transport that involves changes in altitude
› PASG use is absolutely contraindicated in patients with
  • pulmonary edema
  • congestive heart failure
  • penetrating thoracic wounds
› PASG use is relatively contraindicated in patients
  • impaled by a foreign body
  • with abdominal evisceration
  • who are pregnant. If a PASG is used to treat a pregnant woman, it is suggested that only the leg compartments be inflated. In the event of complications following emptying of the uterus (e.g., abortion complications, ectopic pregnancies, hypocoagulation states, hydatidiform mole bleeding), the entire garment can be utilized to tamponade hemorrhage
  • who have isolated lower-extremity fractures; splinting is preferred for isolated lower-extremity fractures
› PASGs should be used cautiously in patients with expected transport times > 40 minutes
› Potential complications of PASG use include
  • skin breakdown
  • compartment syndrome (i.e., compression of muscle, blood vessels, and nerves within a compartment of the body, which leads to tissue necrosis) in the lower extremities
  • metabolic acidosis with prolonged PASG use because lactic acid is released from peripheral tissues
  • decreases in renal perfusion, urine output, and glomerular filtration rate as a result of decreased renal blood flow
  • impaired respiration if the PASG abdominal compartment is incorrectly positioned over the rib cage
  • aggravation of lumbar instability if the abdominal compartment is inflated on a patient who has lumbar instability
  • masking of pelvic fractures
  • increased bleeding as blood pressure increases

What Do I Need to Tell the Patient/Patient’s Family?

› Educate about the function of the PASG, that it is a temporary intervention, and that definitive treatment will be performed as soon as possible
› On discharge from acute care, instruct the patient to seek immediate medical attention for new or worsening signs and symptoms (e.g., pain, swelling, bleeding)
Note

› Recent review of the literature has found no updated research evidence on this topic since previous publication on August 7, 2015

References


