

NON-PNEUMATIC ANTI-SHOCK GARMENT



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INTRODUCTION: Every year, an estimated 342,900 women die from complications of pregnancy and childbirth, 99% of these deaths occur in developing countries. Worldwide, for every 100,000 live births, about 251 women die. The leading cause of maternal mortality (deaths from pregnancy and childbirth related complications) is obstetric hemorrhage in which a woman bleeds heavily, most often immediately after giving birth. A woman dies every 4 minutes from this kind of complication. A woman can bleed to death in two hours or less, and in rural areas, where hospitals may be away, this leaves little hope for women suffering from hemorrhage.

DEFINITION: The non-pneumatic anti-shock garment (NASG) is a low-technology firstaid device used to treat hypovolemic shock.

PURPOSE: Its efficacy for reducing maternal deaths due to obstetrical hemorrhage is being researched. Obstetrical hemorrhage is heavy bleeding of a woman

during or shortly after a pregnancy. Current estimates suggest that over 3,00,000 women die every year, of which 99% occurs in developing countries, most of which are preventable. Many women in resource-poor settings deliver far from health-care facilities. Once hemorrhage has been identified, many women die before reaching or receiving adequate treatment. The NASG can be used to keep women alive until they can get the treatment they need.

HISTORY:

- ❖ In the 1900s an inflatable pressure suit was developed by George Crile. It was used to maintain blood pressure during surgery.
- ❖ In the 1940s and after undergoing numerous modifications, the suit was refined for use as an anti-gravity suit (G-suit).
- ❖ Further modification led to its use in the Vietnam War for resuscitating and stabilizing soldiers with traumatic injuries before and during transportation.
- ❖ In the 1970s the G-suit was modified into a half-suit which became known as MAST (Military anti-shock trousers) or PASG (Pneumatic Anti-Shock Garment).
- ❖ During the 1980s the PASG garment became used more and more by emergency rescue services to stabilize patients with shock due to lower body hemorrhage.
- ❖ During the 1990s the PASG was added to the American College of Obstetrics and Gynecology, making it part of the recommended treatment for use by obstetricians and gynecologists in the USA. However, it was removed from the guidelines later and is no longer on the ACOG guidelines.
- ❖ From the 1970s, NASA/Ames was involved in developing a non-pneumatic version of the anti-shock garment. This was originally used for hemophiliac children, but has since been developed into the



garment known as the Nonpneumatic Anti-Shock Garment (NASG).

USAGE: The non-pneumatic anti-shock garment is a simple neoprene and Velcro device that looks like the bottom half of a wetsuit cut into segments.

1. Place NASG under woman.
2. Close segment 1 tightly around the ankles.
3. Close segment 2 tightly around each calf.
4. Close segments 3 tightly around each thigh, leave knees free.
5. Close segment 4 around pelvis.
6. Close segment 5 with pressure ball over the umbilicus.
7. Finish closing the NASG using segment 6.

Segments 1, 2, 3 can be applied by two persons simultaneously, segments 4, 5, 6 should only be applied by one.

BENEFITS:

1. It protects hemophiliac children from bleeding into elbow and knee joints by straightening and compressing the joint until medical attention was available.
2. Within minutes of being placed in the NASG, a patient’s vital signs are restored and, if confused or unconscious, their sensorium generally clears.
3. The design of the garment permits complete perineal access so that genital lacerations can be repaired, speculum or bimanual examinations can be performed, and manual removal of placenta or emptying of the uterus with manual vacuum aspiration or curettage can all be accomplished with the NASG in place.
4. It significantly reduces further blood loss. When the NASG is applied, the external circumferential counter pressure is distributed evenly through out the abdominal cavity and to the outside of the circulatory vessels – tamponading venous bleeding. NASG compresses all the intra-abdominal vessels including the internal iliac and uterine arteries. This

compression reduces the radius of the arteries and reduces the transmural pressure (the difference between the pressure inside the artery and the pressure outside the artery) which, in turn, reduces the tension in the arterial wall, closing the defect and reducing blood loss.

5. The use of the NASG for obstetric hemorrhage in low- resource settings is that persons with no medical background can learn to apply the garment safely with minimal training.

MECHANISM: It can be used to treat shock, resuscitate, stabilize and prevent further bleeding in women with obstetric hemorrhage.

When in shock, the brain, heart and lungs are deprived of oxygen because blood accumulates in the lower abdomen and legs. The NASG reverses shock by returning blood to the heart, lungs and brain. This restores the woman’s consciousness, pulse and blood pressure. Additionally, the NASG decreases bleeding from the parts of the body compressed under it.

Mechanisms of action are based upon laws of physics. Recent research has identified that the pressure applied by the NASG serves to significantly increase the resistive index of the internal iliac artery (which is responsible for supplying the majority of blood flow to the uterus via the uterine arteries). Another recent study has shown the NASG to decrease blood flow in the distal aorta.

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