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RESEARCH ARTICLE

NON IMPLANTABLE MATERIALS IN MEDICAL TEXTILES

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ABSTRACT

Medical textiles constitute one of the most dynamic research fields characteristic of technical textiles and its range of applications. They represent structures designed and accomplished for a medical application (intrabody / extrabody, implantable/ non implantable), textiles used in biological systems to estimate, treat, increase or regenerate a tissue, organ or function of the body. Non implantable materials are used for external applications and may or may not contact with the skin. This includes wound care, bandages, plaster, pressure garments, orthopaedic belts etc. This paper discusses the role of bandages, types of bandages, wound care and wound care products.

Key words:

Bandages, Wound care,
Wound care products, Dressings.

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INTRODUCTION

Medical textiles constitute one of the most dynamic research fields characteristic of technical textiles and its range of applications. They represent structures designed and accomplished for a medical application (intra body / extra body, implantable and non- implantable) textiles used in biological systems to estimate, treat, increase or regenerate a tissue, organ or function of the body (plaster, dressings, bandages, pressure garments). Non-implantable materials are used in external applications, which may or may not be in contact with the skin. The materials used should be non-allergenic, anti-cancer, anti-bacterial, biocompatible, permeable to air, non-toxic, have a good ability to absorb liquids, high capillarity and wettability, enable moisture transport and have the ability to be sterilized. The main applications of these materials refer to wound care and bandages.

Bandages

A bandage is a piece of material used either to support a medical device such as a dressing or splint, or on its own to provide support to the body; they can also be used to restrict a part of the body. Bandages come in a variety of sizes, classifications and provide a number of functions from simple retention to graduated compression systems. The bandage should be:

- Flexible - to support the leg but still allow movement and maintain circulation
- Breathable - to allow proper air circulation and help prevent bacterial growth
- Stretchable - to allow easy placement on any area of your body or leg
- Non-Slip - to keep the bandage in position, regardless of how you move
- Non-Stick - to allow use on any area of your body without pulling skin or hair

Role of Bandages

Other than helping to hold a wound dressing in place, bandages provide support (for an injured limb or a wound) help to keep a dressing clean, help absorb exudates, protect the wound from self-mutilation, improve the environment of the wound site to improve healing, reduce swelling and haemorrhage, provide pain relief, restrict movement of the wound edges, keep intravenous cannulae in place.

Types of Bandages



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Fig. 1. Types of bandages-crepe, tubular, adhesive, wadding and gauze

Adhesive Bandage

Also called a sticking plaster (and also known by the trademarks Band-Aid or Elastoplasts) is a small dressing used for injuries not serious enough to require a full-size bandage. They are the most common used bandages in our daily lives because when we get small cut on our fingers or any part of our bodies, they come in handy. In other words, they are mostly used in minor injuries.

Elastic Adhesive Bandage

It is the most common type of bandage that will adhere to itself, but does not adhere well to other surfaces like hair and skin. However, one should not apply it too tightly because it will interfere with the blood circulation and makes suffer even more. This type of bandage is also used to secure and protect the dressings over wounds and to give more support in the treatment of fractures and swollen joints.

Compression Bandage

Regular bandages are mostly used for open gashes while compression bandages are used to apply the right amount of pressure to the wounded area. The term 'compression bandage' describes a wide variety of bandages with many different applications. Short stretch compression bandages are good for protecting wounds on one's hands, especially on one's fingers.

Triangular Bandage

It is known as a cravat bandage, which is nothing but a piece of cloth put into a right-angled triangle, and often provided with safety pins to secure it in place. It can be used fully unrolled as a sling, folded as a normal bandage, or for specialized applications, as on the head. One advantage of this type of bandage is that it can be makeshift and made from a fabric scrap or a piece of a t-shirt. The Boy Scouts popularized use of this bandage in many of their first aid lessons, as a part

of the uniform is a "neckerchief" that can easily be folded to form a cravat.

Tubular Bandage

Tubular bandages are used to hold dressings on fingers or toes or support injured joints. They are made of seamless fabric tube. Bandages made of tubular gauze can be placed over fingers or toes but they do not provide any pressure to stop bleeding. Before placing a tubular bandage over an injury, you may need to cut it to a smaller size. Some tubular come with a special device (an applicator) that is placed over the injured body part to help apply the bandage.

Crepe Bandage

A crepe bandage is a lightweight bandage that is generally applied to provide warmth, insulation and support in a variety of medical health situations. It can be used to treat sprains and strains, to help correct fractures and other bone problems in orthopedics, to serve as a compression bandage to support already bandaged varicose veins, and to support surgical gauze bandage dressings. This type of bandage is never directly applied to wounds.

Wadding and Gauze

Wadding and gauze are the general terms for materials used for surgical or wound dressings. These basic materials are often classified by their mesh (number of threads per inch), fiber length (for tensile strength), weight (in grams per square meter), or absorbency as required by a specific application. For example, some types of surgical dressings may require a closely woven gauze for extra strength or greater protection, while other wound dressings may require a more open weave for better absorbency or drainage.

Wound Care

A wound is a type of injury in which skin is torn, cut, or punctured (an *open* wound), or where blunt force trauma causes a contusion (a *closed* wound). A wound means damage to the surface of the skin resulting in loss of its protective function. Acute wounds include surgical incisions and traumatic injuries such as lacerations, abrasions, avulsions, penetrations or bites, and burn injuries. Chronic wound is an open wound extending into at least the second layer of the skin called the dermis that needs to be filled with new tissue, e.g. an ulcer or pressure sore. The basic function of the wound care materials is providing protection against an infection, blood and exudates absorption, to promote healing and possibly apply a medication to the wound. The today available materials range from simple cotton gauzes and lint to sophisticated multifunctional systems made from natural or synthetic materials.

Wound Care Products





Fig. 2. Wound care products - Hydrosorb, hydrosorb gel, Hydrocoll, Dressings - Foam, Silver, Calcium alginate, Zetuvit plus, Grassolind Film dressings - Hydrofilm

Hydrosorb

Hydrosorb is a transparent, solid hydrogel sheet with a semi-permeable outer layer. The dressing provides a moist wound environment for optimal healing. The dressing's 60% water content makes it particularly effective for stimulating tissue growth by keeping the young epithelium and granulation tissue moist. The soft elastic property of Hydrosorb creates a cushioning effect, which provides protection to the wound. It has a soothing and cooling effect on superficial burns and minor skin irritations. Hydrosorb does not adhere to the wound and can be removed without pain or disturbance to the wound bed. Hydrosorb Gel is a clear, viscous, sterile gel, which is used for the treatment of dry chronic wounds. It contains Ringers solution, glycerol, hydroxy-ethyl cellulose and carboxy-methyl cellulose.

Hydrocolloid Dressings

Hydrocoll is a sterile, self adhesive absorbent hydrocolloid wound dressing consisting of a wound contact layer of carboxymethyl cellulose particles contained within an adhesive polymer matrix. The outer layer is a semi permeable, bacteria and waterproof polyurethane film. On contact with the wound, Hydrocoll takes up wound exudate creating a gel. This gel provides an environment suitable for autolytic debridement,

protection of granulation tissue and management of wounds of various a etiologies

Foam Dressings

Perma Foam is a highly absorbent foam dressing that manages exudate whilst facilitating a moist wound environment. This allows for autolysis debridement and supports the development of granulating tissue. The dressing is a combination of two differently structured foams, an absorbent layer and an outer layer. Perma Foam's absorbent layer consists of hydrophilic polyurethane foam and the outer layer consists of soft, flexible, semi-permeable polyurethane foam, which is bacteria and waterproof.

Silver Dressings

Atrauman Ag

Atrauman Ag is a polyamide fabric coated with metallic silver and impregnated with a non medicated neutral lipid. Its soft, thin support fabric drapes easily over the wound to ensure close contact. The silver provides an antimicrobial barrier, which is useful for the management of contaminated wounds, helping reduce the risk of bacterial colonization. Bacteria on the dressing surface are killed by silver ions, which are activated by the moist wound environment. Atrauman Ag is effective against Gram-negative and Gram-positive organisms and suitable for use in chronic wounds of various etiologies.

Calcium Alginate Dressings

Sorbalgon

Sorbalgon is a soft gelling alginate dressing composed of textile fibers of calcium alginate. Sorbalgon is a highly conformable dressing ideal for managing cavity wounds. When Sorbalgon comes into contact with wound exudate or blood, a gel is formed by the exchange of calcium ions in the dressing for the sodium ions in the wound fluid. This gel provides a supportive, protective environment for the development of granulating tissue while managing excess exudate. The dressing should be changed once it has completely turned to gel. Sorbalgon should not be left on the wound for more than 7 consecutive days and needs to be covered with a secondary dressing and secured with retention tape.

Honey Dressings

Honey has been employed in wound care since Egyptian times and over the last few years there has been resurgence in its use. Honey has been shown to be effective against bacteria, aerobes, anaerobes, gram positives, gram negatives and resistant strains of *Staphylococcus pyogenes* and *staphylococcus aureus*. It works by producing low concentrations of slow release hydrogen peroxide found naturally in honey. Honey dressings should not be used on patients with diabetes because of the glucose and fructose can be absorbed from the open wound. Honey dressing are available in sheet or gel format and should be covered with a secondary dressing depending on the exudate level.

Non-Adherent Absorbent Dressings

Zetuvit

Zetuvit is a multi-layered exudate management dressing pad. It is soft, comfortable, cost effective and can be used under compression bandages. Zetuvit is covered in a soft non-woven, hydrophobic polyamide fibre. The inner surface of the cover has a high capillary activity, providing wicking of wound exudate into the central core of cellulose fluff. Zetuvit can be used to manage all heavily exuding wounds and as a primary dressing on surgical wounds.

Grassolind

Grassolind is an open-weave cotton dressing, impregnated with a non-medicated paraffin with no sensitising effects. Grassolind is sufficiently porous to allow an easy passage of exudate from the wound surface, preventing maceration of surrounding tissue. The dressing is ideal for treatment of large surface wounds where low adherence is essential.

Film Dressing

Hydrofilm is an adhesive, transparent, semi-permeable polyurethane film dressing, which is waterproof. The elasticity of the film means that the dressing conforms to body contours. Hydrofilm is used as a primary dressing to cover post operative and trauma wounds or as a secondary dressing for retention purposes.

Conclusion

Medical textiles are a major growth area within the technical textiles sector and the range of applications for such products continue to grow and increase in diversity with every new development. In these circumstances, textiles are playing major role through its diversified applications and undoubtedly the future of such textiles appears to be bright.

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