NEONATAL SKIN AND WOUND CARE
Objectives

- Review the different categories of wounds seen in neonates and children.
- Understand the physiologic and structural differences between neonatal skin and adult skin.
- Review the risk factors associated with pressure ulcers in neonates.
- Review the different categories of pressure ulcers and how they present in neonates.
- Discuss wound care dressings that are safe and effective in neonates.
- Review the management of IV infiltrates in neonates.

Purpose

- To reduce swelling.
- To minimise pain and discomfort.
- To prevent further damage to vulnerable tissue.
- To reduce incidence and severity of scarring.
- To provide protection and allow fluid to escape from tissues.
- To ensure comprehensive assessment and documentation.
- To provide a record for infants notes.

Neonatal Wound Types

- Pressure Injuries
- Contact irritation
- Extravasation Wounds
- Surgical Wounds
- Trauma/Shear Injuries/Miscellaneous
- Infections
- Burns
Wound Healing Principles

- Adequate Debridement
- Proper moisture balance
- Control of infection and inflammation
- Appropriate choice of dressing

Unique features of Neonatal Skin

- Skin does not mature until 32 weeks gestation or about 10 – 14 days post birth for those born at less than 32 weeks.
- Skin integrity of premature infants is weak and far from complete.
- Stratum corneum is the outermost section of the epidermis. Composed of nonviable skin cells packed on top of each other to create a protective barrier.
- Key function of Stratum corneum is to control transepidermal water loss (TEWL) and to prevent absorption of toxic substances.

Stratum Corneum

- In full term infants and adults the Stratum corneum is 10-20 layers thick
- Premature neonates <30 weeks have less than 2-3 layers
- 23-24 week preterm infants have virtually no stratum corneum
**Basement Membrane**

- In premature infants, the connection at the dermal-epidermal junction is weak due to fewer hemidesmosomes and anchoring fibrils. They are also spaced further apart.
- Trauma to the epidermis can therefore arise when removing adhesive dressing in which the bond between adhesive dressing is stronger than the bond between dermis and epidermis.
- This factor, therefore, places the premature infant at greater risk for blistering or thermal insults.

**Dermis**

- The dermis of premature infants has less collagen and fewer elastin fibres.
- This increases the risk for oedema.
- Oedema can in turn raise the risk for pressure ulcers and other ischaemic injury due to reduced blood flow.
Epidermal stripping

Definition

Skin (Epidermal) stripping—Removal of one or more layers of the Stratum corneum occurring following removal of adhesive tape or dressing. Lesions are frequently shallow and irregular in shape and the skin may appear shiny. Open lesions may be accompanied by erythema and blister formation.

Action

- All staff must keep their fingernails short and ensure that all stoned rings are removed as, in some cases, handling alone may cause epidermal stripping.
- Minimal use of adhesive tape.
- Do not use tape on the skin when securing umbilical lines.
- A layer of hydrocolloid (Duoderm) should be used under tape as appropriate e.g. for nasogastric tube fixation.
- Careful removal of tapes and adhesive dressings following manufacturer’s instructions e.g. Remove film dressing by stretching the dressing parallel to the patient’s skin while stabilising the skin and IV catheter with the other hand.
- Use of adhesive removers if needed. (Appeel ® wipes)
Neonatal pressure injuries

Definition

A pressure ulcer is localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear. A number of contributing or confounding factors are also associated with pressure ulcers – moisture, nutrition, tissue perfusion, mobility and activity.

Stage I: Non-blanching erythema

- Intact skin with non-blanching redness of a localized area usually over a bony prominence.
- Darkly pigmented skin may not have visible blanching; its colour may differ from the surrounding area.
- The area may be painful, firm, soft, warmer or cooler as compared to adjacent tissue.
Stage II: Partial thickness skin loss

- Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough.
- May also present as an intact or open/ruptured and serum-filled.
- Presents as a shiny or dry shallow ulcer without slough or bruising. Bruising indicates deep tissue injury.
- This category should not be used to describe skin tears, tape burns, incontinence associated dermatitis, maceration or excoriation.

Stage III: Full thickness skin loss

- Full thickness tissue loss.
- Subcutaneous fat may be visible but bone, tendon or muscles are not exposed.
- Slough may be present but does not obscure the depth of tissue loss.
- May include undermining and tunnelling.
- Bone/tendon is not visible or directly affected.
Stage IV: Full thickness tissue loss

- Full thickness tissue loss with exposed bone, tendon or muscle.
- Slough or eschar may be present.
- Often includes undermining and tunnelling.
- Category/Stage IV ulcers can extend into muscle and/or supporting structures e.g., fascia, tendon or joint capsule making osteomyelitis likely to occur.

Unstageable: Full thickness skin or tissue loss – depth unknown

- Full thickness tissue loss in which actual depth of the ulcer is completely obscured by slough (yellow, tan, green or brown) and/or eschar (tan, brown or black) in the wound bed.
- Until enough slough and/or eschar are removed to expose the base of the wound, the true depth cannot be determined but it will be either a Category/Stage III or IV.
Suspected Deep Tissue Injury – depth unknown

- Purple or maroon localized area of discoloured intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear.
- The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue.
- Deep tissue injury may be difficult to detect in individuals with dark skin tones.
- Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar.
- Evolution may be rapid exposing additional layers of tissue even with optimal treatment.

Risk factors for Neonatal Pressure Ulcers

- Identifying babies at risk for pressure ulcers is the key to their prevention
- Among neonates and children, 50% of pressure ulcers are equipment and device related (nasal prongs, CPAP masks, tubing, lines, tracheostomy devices, O2 monitors and bedding)
- Acutely ill and immobilised neonates are at high risk for pressure injuries. Such patients are often nutritionally challenged which directly affects skin integrity.
- Extremely premature infants less than 28 weeks are at greatest risk for pressure ulcers.
**Risk Factors**

- **Bedding**

- **Devices**

- **Oedema**
Action

- Timing of re-siting of probes will depend on the assessment of the individual infant’s skin condition and will be documented on the infant’s chart but saturation probes must be resited at least 4 hourly (as per MHRA advice).

- Change infant position as tolerated to alleviate pressure and reduce risk for pressure injuries.

- Use Duoderm under CPAP nasal prongs and mask on or apply to nasal septum and nasal bridge.

- Relieve pressure by alternating mask and prongs, as tolerated.

- Ensure that small plastic covers and caps from medical devices e.g. the ends of administration sets or IV cannulae, are discarded rather than left in the infant’s bed. These can cause pressure damage if the infant inadvertently lies on them for a period of time.
Extravasation Wound Care

Definition

Extravasation is the accidental leakage of certain medicines into the body from an IV drip in the vein.

Some medicines, such as TPN, blood products, calcium and sodium bicarbonate can be dangerous when they escape from the drip or the vein. The symptoms can vary from blisters to severe tissue injury or even cause the cells or tissue to die.

In severe cases, extravasation injuries can require surgical reconstruction or can lead to amputation.

What causes extravasation injuries?

Extravasation injuries are caused when certain medicines accidentally come into contact with tissue when being administered through an IV drip or needle. Some medicines will only cause slight damage and are called irritants. Medicines that cause more serious damage are called vesicants.

The medicine can come into contact with the surrounding tissue by leakage or direct exposure. The device that administers the medicine may not be secured properly, may be the incorrect size or may be placed on an area that moves a lot so can become loose or dislodged. A needle may puncture the vein and the medicine goes into the surrounding tissue, or the same vein may be used multiple times, which weakens it. Also, young patients have small veins can easily be damaged by the cannula itself.

What are the signs and symptoms of extravasation injuries?

Symptoms of an extravasation injury can include:

- Coolness or blanching at the medicine insertion site.
- Swelling - Infusion rates are often very low in neonates e.g. 0.1ml/hr so you may not observe any swelling prior to an extravasation injury.
- Tenderness/discomfort.
- Taut or stretched skin.
- Leakage of fluid at the insertion site.
- Inability to obtain blood return (not always present).
- Change in quality and flow of the infusion or injection.
- Numbness, tingling or a pins and needles feeling.
- Burning, stinging pain
- Redness may occur followed by blistering, tissue necrosis and ulceration.
- In severe cases of central line extravasation the infusate can enter the pleural or pericardial space and cause sudden unexpected collapse.
How extravasation injuries are normally diagnosed?

Sometimes, other conditions will need to be ruled out. Some symptoms can resemble other conditions, such as vessel irritation or hypersensitivity.

However, as extravasation injuries can be very serious, a nurse or doctor will always be extra cautious and treat the child as though it is an extravasation injury.

How are extravasation injuries treated?

Extravasation injuries are considered to be medical emergencies. Early detection of the condition is best to avoid complications.

Immediate treatment will be to stop the flow of medicine. The cannula (the flexible tube) may be left in place in case the doctor needs to administer any treatment or antidote.

The affected site will be elevated and monitored for any changes or gently washed out with Hyaluronidase/Saline and a dressing applied.

What happens next?

The injury will be observed and elevated until it regains a normal appearance. Sometimes, surgical reconstruction by a plastic surgeon is necessary.

<table>
<thead>
<tr>
<th>Grade 1</th>
<th>Grade 2</th>
<th>Grade 3</th>
<th>Grade 4</th>
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</thead>
<tbody>
<tr>
<td>Pain at infusion site</td>
<td>Pain at infusion site Swelling No skin blanching</td>
<td>Pain at infusion site Swelling Skin blanching Cool blanch ed area</td>
<td>Pain at infusion site Swelling Skin blanching Cool blanch ed area</td>
</tr>
<tr>
<td>Normal capillary refill and peripheral pulsation</td>
<td>Normal capillary refill and peripheral pulsation</td>
<td>Reduced capillary refill +/- Arterial occlusion +/- Blistering</td>
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</tbody>
</table>

To reduce the risk of extravasations

- Use splints if necessary to support cannula site to reduce the risk of extravasation injury

- Intravenous cannulae and peripheral longlines should be secured with a sterile clearfilm dressing to ensure cannulation site is clearly visible. A small piece of
gauze can be applied to support cannulae (UAC and UVC should be secured according to guidelines)

- A central line should ideally be sited for the administration of Total Parental Nutrition and infusions that contain glucose in concentrations greater than 12.5% and certain drugs
- Positioning of limb to aid visibility of site of infusion. This may involve nursing infant in an incubator if temperature cannot be maintained with the limb exposed.
- At least hourly assessment of the infusion site.
- Regular visual assessment of lines, ensuring the dressing is secure.
- Use infusion devices with continuous in line pressure monitoring
- Check the pressure limit alarm on the pump is set correctly when taking over infant’s care.

**Significant extravasation: (STAGE 3-4)**

When an extravasation injury has occurred treatment should be initiated without delay.

- Immediately stop the infusion/injection
- Elevate the limb
- Notify the neonatal doctor
- An extravasation of fluid into the pleural cavity or pericardial space is an emergency and requires immediate assessment and possibly intervention by a senior member of the medical team.
- If necessary, aspirate as much of the residual drug as possible to minimise the injury caused by the residue of the drug

- **DO NOT FLUSH THE CANNULA**
- Complete a DATIX form
- Take a photograph of the site. (Parental consent MUST be obtained before the pictures are attached to the patients’ records.
- If consent is refused, then pictures must be deleted.
- Use Hyaluronidase as soon as possible
Hyaluronidase for extravasation injuries

Equipment

- 1% Lignocaine (no adrenaline)
- 1 vial Hyaluronidase (1500 units). Dilute with 1 ml of water for injection (as per neonatal formulary) then add to 9 mls of 0.9% sodium chloride to give a solution of 150 IU/ml
- 0.9% Sodium Chloride ampoules
- 2 ml or 5 ml syringe
- 10 ml/20 ml syringes
- Pink blunt ended needles
- Absorbent sheets or towel to prevent large volumes of liquid from making the infant cold during the procedure

Method

- Use aseptic technique, Appendix 1
- Give sucrose, as appropriate
- Infiltrate 1% Lignocaine in and around the extravasation site (0.3 ml/kg maximum) Wait 3-5 minutes after infiltrating the anaesthetic agent
- Using a Pink blunt ended needle, infiltrate Hyaluronidase in 0.25 ml aliquots into the subcutaneous tissue (1 vial is diluted with 1 ml of water for injection, as stated above) in separate sites around the extravasation aiming toward the centre of the site. Wait 3 - 15 minutes after administering the Hyaluronidase.
- Flush 0.9% sodium chloride through the subcutaneous space in 5 ml aliquots.
- The saline is irrigated through 4-5 of the exit wound sites, exiting as a shower through the remainder - *The amount of fluid used depends on the size of the baby and extent of the wound
- Gentle massage of the limb can be performed to express fluid through the injection site
Apply the dressing and place the limb in a comfortable neutral position.

**Dressing Plan -**

**Hydrogel**

**Clear Film**

**Change after 24 hours**

- The site must be reviewed on a regular basis
- Post procedural photographs are recommended
- If necessary, the patient will be followed up by the plastic surgery service in conjunction with the neonatal service (community and outpatient follow up)
Glycerine Trinitrate (GTN) treatment

Rationale for use:

- For use in poor perfusion of extremities, for example dusky toes or fingers
- Can be used after extravasation with certain agents such as, Dopamine, Dobutamine and Adrenaline, following review and assessment by Consultant.

Current indication for use:

Ischaemia secondary to arterial cannulation

Side effects

- Systemic vasodilatation and a rise in methaemoglobin level. If used for prolonged periods, measure MetHb levels
- Hypotension

Action to be taken:

- Inform doctors of the problem and refer to vascular emergency guideline
- Take photographs if necessary (Gain consent from parents)
- Follow prescription as stated by doctors
- Discuss need for analgesia in response to pain score
- Blood pressure should be monitored closely
- Close observation of affected limbs/ fingers/toes
- An online referral may need to be completed for plastic review
Dosage and duration

Transdermal patch
Apply a 1/8th of a patch (delivers 5mg/day) to the affected area for 24 hours or less
Review and reassess on a regular basis.

REMEMBER:

Document all findings and actions with timings very carefully in the notes.
Take photos (parental consent needed) where possible.
Wound beds and dressings

EPITHELIALISING WOUNDS

Characterised by
Wound bed pink in appearance tissue very fragile and needs to be kept moist.

Management aims
To protect new tissue growth.

<table>
<thead>
<tr>
<th>LEVEL OF EXUDATE</th>
<th>PRIMARY DRESSINGS</th>
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<tbody>
<tr>
<td>LOW</td>
<td>Silflex</td>
</tr>
<tr>
<td>MEDIUM</td>
<td>N/A</td>
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<tr>
<td>HIGH</td>
<td>N/A</td>
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</table>
GRANULATING WOUNDS

Characterised by
Wound has ‘granular’ appearance, looks red and bleeds easily.

Management aims
To maintain a warm moist environment to promote angiogenesis and therefore promote healing

<table>
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<th>LEVEL OF EXUDATE</th>
<th>PRIMARY DRESSINGS</th>
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<tbody>
<tr>
<td>LOW</td>
<td>Silflex Jelonet</td>
</tr>
<tr>
<td>MEDIUM</td>
<td>Silflex Jelonet</td>
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<tr>
<td>HIGH</td>
<td>Jelonet</td>
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</table>
SLOUGHY WOUNDS

Characterised by
Formation of viscous predominately yellow soft necrotic tissue.

Management aims
To debride wound bed of sloughy tissue.

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<th>LEVEL OF EXUDATE</th>
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<tbody>
<tr>
<td>LOW</td>
<td>Activon tulle Hydrogel</td>
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<tr>
<td></td>
<td>Duoderm</td>
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<tr>
<td>MEDIUM</td>
<td>Activon tulle Aquacel</td>
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<tr>
<td></td>
<td>Hydrogel</td>
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<td>HIGH</td>
<td>Activon tulle Aquacel</td>
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<td>Cutimed Sorbact</td>
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NECROTIC WOUNDS

Characterised by
Presence of dead devitalised tissues black / brown in colouration.

Management aims
To rehydrate eschar. This should only be done once a member of the wound care team had reviewed patient.

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<td></td>
<td>Duoderm</td>
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<tr>
<td>MEDIUM</td>
<td>Activon tulle</td>
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<tr>
<td>HIGH</td>
<td>Aquacel</td>
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</tbody>
</table>
INFECTED WOUNDS

Characterised by
Localised heat and increase in exudate, malodour and deterioration in wound bed, colouration yellow/green.

Management aims
To identify infection, reduce level of bacteria, control odour and exudate. Wound swab to be taken, Doctors to review and wound care team referral to be made.

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<td>Sorbsan</td>
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</table>
Silflex

**Type of dressing**
Non – adherent primary dressing.

**Suitable for**
- Use on lightly exudating wounds.
- Wounds with fragile surrounding edges.
- Ideal for traumatic surgical & chronic.

**Benefits**
- Minimise Trauma to wound and infant
- Minimise pain felt by infant
- Allows exudate to pass through the secondary dressing without the need to be changed, therefore reducing trauma to the wound bed

**Change frequency**
Can remain in place for up to 14 days - Secondary dressing will need to be changed regularly.
# Activon tulle

![Activon Tulle product image](image)

<table>
<thead>
<tr>
<th>Type of dressing</th>
<th>Honey dressing</th>
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</thead>
<tbody>
<tr>
<td><strong>Suitable for</strong></td>
<td>Use on low to moderate exuding wounds.</td>
</tr>
<tr>
<td><strong>Benefits</strong></td>
<td>Draws exudate out into secondary dressing.</td>
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<tr>
<td></td>
<td>Antibacterial properties</td>
</tr>
<tr>
<td><strong>Change frequency</strong></td>
<td>Can be left on for 72 hours.</td>
</tr>
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</table>
# Cavilon Barrier Stick

## Type of dressing
Barrier film preparation

## Suitable for
- Protects peri-wound skin
- Protection from body fluids/ adhesives

## Benefits
- Transparent
- Non-sting
- Acts as a barrier to protect healthy skin

## Change frequency
Protects for up to 72 hours (therefore no need to re-apply with each change)
Duoderm

Type of dressing
Hydrocolloid dressing

Suitable for
- For use on non-lightly exudating wounds
- Can be used as a skin protector

Benefits
- Provides bacterial and viral barrier
- Atraumatic on removal
- Reduces risk of skin breakdown

Change frequency
Change as dictated by the amount of exudate. Maximum ‘wear time’ is 7 days.
Sorbsan

**Type of dressing**
Calcium Alginate dressing.

**Suitable for**
- Absorbs moderate high amounts of exudate
- Suitable for flat shallow or cavity wounds

**Benefits**
- Encourages bacteria into the secondary dressing
- Conforms to shape of the wound

**Change frequency**
Can be left in place for 72 hours
Type of dressing
Hydrogel

Suitable for
- For use of dry – light exuding wounds

Benefits
- Rehydrates necrosis and slough

Change frequency
Can be left in place for 72 hours
Aquacel Extra

Type of dressing

Hydrocolloid Fibrous Dressing (Hydrofibre)

Suitable for

- Absorbs moderate - heavy amounts of exudate
- Will require secondary dressing

Benefits

- Re-hydrates & debrides necrotic tissue or dry slough
- Reduces maceration to surrounding skin
- Provides a bacterial barrier
- Use with 0.9% sodium chloride when applied to necrotic areas to hydrate and debride necrosis

Change frequency

Change as dictated by the amount of exudate. Maximum ‘wear time’ is 7 days.

Removal

Aquacel maintains its integrity when gelled, allowing one-piece removal. If adherence occurs, assist removal by gently irrigating with warmed sodium chloride 0.9% solution.
Appeel

Type of dressing
Silicone Adhesive remover

Suitable for
- Use to remove adhesive wound dressings

Benefits
- Non – Sting
- Completely removes adhesive
- Leaves no residue on skin
- Reduces trauma to fragile skin

Change frequency
Can be used as often as required
Kaltostat

Type of dressing
Sterile non-woven calcium-sodium alginate fibre

Suitable for
- Moderate to heavily exuding wounds and the local management of bleeding minor wounds.

Benefits
- On contact with a bleeding wound, promotes haemostasis

Change frequency
Change as dictated by the amount of exudate. Maximum ‘wear time’ is 7 days.

Removal
Kaltostat maintains its integrity when gelled, allowing one-piece removal. If adherence occurs, assist removal by gently irrigating with warmed 0.9% sodium chloride solution.
Cutimed Sorbact

Type of dressing
Sorbact Technology-coated antimicrobial dressings

Unlike dressings which depend on antimicrobials or antiseptics to remove bacteria from contaminated and infected wounds, Cutimed Sorbact is the first range of wound dressings to work without a chemically active agent.

By the physical principle of hydrophobic interaction, within 30 seconds, bacteria and fungi become physically and irreversibly bound to the dressings' specially coated surface of Sorbact Technology. Therefore with every dressing change, the bound bacteria and fungi are simply removed from the wound bed.

Suitable for
Cutimed Sorbact can be used safely on all types of colonised or infected wounds regardless of their aetiology:

- Chronic wounds such as venous, pressure or diabetic foot ulcers
- Post-operative or dehisced surgical wounds
- Traumatic wounds
- Wounds after excision of abscesses

Benefits
The use of Cutimed Sorbact dressings are also not linked to contraindications and side effects that are associated with the use of other antimicrobial dressings
• Reducing the bacterial bioburden in a wound improves the conditions for wound healing to take place. By removing bacteria with each dressing change, Cutimed Sorbact reduces not only their number but also the level of harmful toxins, improving conditions for wound healing to take place.

• None of the drawbacks of conventional antimicrobial dressings. There is no cytotoxicity, no disturbance in wound inspection and no contra-indications - the dressing can be used safely during pregnancy, breastfeeding and on children.

• Safe to use for pro-longed periods of time as no chemicals are donated into the wound

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**Change frequency**

Cutimed Sorbact is to be applied as a single layer only.

Change as dictated by the amount of exudate. Maximum ‘wear time’ is 7 days - Secondary dressing will need to be changed regularly.
Jelonet consists of a leno-weave fabric, of cotton or cotton and viscose, which has been impregnated with white soft paraffin.

**Suitable for**

- Minor Burns and scalds
- Donor sites
- Graft sites
- Trauma

**Benefits**

- Allows the wound to drain freely
- Soothes
- Protects
- Easy removal

**Change frequency**

- Change dressing daily or more often according to the condition of the wound.
- A double layer of Jelonet will prevent the dressing from sticking to the wound bed.