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Film-forming wound gel for preterm infant skin injuries - a case series

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Short title: Film-forming wound gel for preterm infants

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Abstract

Introduction: Preterm infants are at unique risk of skin injury due to their immature skin structure. This risk increases with exposure to essential nursing and medical interventions during neonatal intensive care. Wound care for this population is challenging due to the unique properties of the preterm infant's skin and limited evidence base. **Case Presentation:** This small, uncontrolled case series demonstrates the use of film-forming wound dressings (Stratamed, Stratpharma AG, Switzerland) for the treatment of a variety of preterm skin injuries. **Conclusion:** This case series suggests that film-forming dressings facilitate wound healing for preterm infant's skin.

Introduction

Neonatal skin is structurally and functionally distinct from both paediatric and adult skin [1, 2]. Skin consists of three principal structures – the epidermis, the dermis and the hypodermis [3]. The total skin thickness ranges from 0.9 mm for a preterm infant to 1.2 mm for a term infant, compared to 2.1 mm in adults. Skin thickness, especially of the epidermis and dermis, as well as susceptibility to skin injury are inversely related to gestational age [4, 5]. This is due to the premature infant's poor skin barrier with few cornified layers and limited dermal proteins [6]. The application of any medical device or intervention to preterm infant skin may result in injury [7]. Such forces include mechanical (pressure, shearing, friction, and stripping (medical adhesive related skin injuries, MARSI) as well as chemical (e.g. skin disinfectants) and thermal (e.g. monitoring probes) forces [4, 8]. Neonatal nurses typically undertake skin assessment including identification and mitigation of risk factors for skin injuries. Evidence-based measures to prevent skin injury include using appropriately sized devices for respiratory therapy, regular repositioning, and routine evaluation of skin integrity [5]. Nevertheless, neonates remain at high risk for skin injury and therefore, optimising available treatment options is critical. Dressing products have not been extensively appraised in the neonatal population and thus guidance has been derived from paediatric and adult evidence [5]. Assessment of wound healing can be compromised by non-transparent dressings and removal may lead to new or worsening injuries. Transparent dressings might therefore be beneficial. Silicone-based film-forming wound dressings (e.g. Stratamed, Stratpharma AG, Switzerland) create a thin protective layer that is waterproof and gas permeable. Wound exudate, which contains essential growth factors, is kept protected by this dressing. Water loss is prevented reducing secondary tissue damage from dehydration. As silicone gel is hydrophobic, it does not bond to granulation tissue. This facilitates epidermal migration and re-epithelisation of the skin [9]. Film-forming gel can be applied easily to wounds and dries to form a bacteriostatic film [10]. This film may decrease exposure to bacteria, antigens and irritation which reduces possible infectious complications [9]. Silicone gel has been noted to reduce the risk of developing keloid or hypertrophic scars [9]. The following cases describe the use of film-forming wound gel for the treatment of skin injuries in preterm infants cared for in the Neonatal Intensive Care Unit of a tertiary referral centre. Parents of all infants provided

written consent for the publication of clinical images. The CARE checklist has been completed by the authors for this case series and attached as online supplementary material.

Case reports

Case 1

A baby boy was born by non-elective caesarean section at 23+5 weeks' gestation and birth weight of 633g following preterm labour and chorioamnionitis. Apgar scores were 2, 3 and 4 at 1, 5 and 10 minutes. Skin injuries were first noted on postnatal day 10 with the putative mechanisms being an identification wrist band for the chest injury and the presence of umbilical catheters for the abdominal injury. Chemical injury from the cleansing solution and friction when cleaning the skin prior to umbilical catheter insertion likely caused the abdominal injury. Neonatal skin condition score of 6 was recorded. The Neonatal skin condition score (NSCS) is a visual skin assessment which ranges from a score of 3 (best condition) to a score of 9 (worst condition). The score is based on skin dryness, erythema and evidence of breakdown (11). NSCS was recorded once per shift as per policy in our NICU. The injuries were treated with topical film-forming gel twice daily until healed. A thin layer of gel was applied to the wounds on the chest and abdomen until the skin was healed. No skin preparation or secondary dressing was required. Figure 1A demonstrates the skin injuries that were noted Postnatal day 10. Figure 1B depicts the skin injuries following 7 days of treatment with NSCS 4. No further injuries were noted. There was full adherence to the prescribed film-forming gel as referenced from the medication chart.

Case 2

A baby boy was born by vaginally at 28+6 weeks' gestation and birthweight of 1220g following preterm labour and chorioamnionitis. Apgar scores were 8, 9 and 9 at 1, 5 and 10 minutes. The infant required nasal continuous positive airway pressure from birth (nCPAP). On day 9, the infant developed erythema and broken skin on his nasal septum from the respiratory support prongs. This resulted in a device-related pressure injury. The injury had a width of 4mm, length of 3mm and depth of 1mm. NSCS 4. The injury healed after 5 days of twice daily topical film-forming gel application with NSCS 3. Full adherence to the treatment plan. Routine daily assessment of skin continued for the course of NICU stay with no further injuries noted. Skin imaging for this infant is detailed in Figure 2.

Case 3

A baby girl was born by non-elective caesarean section at 24+6 weeks' gestation due to severe pre-eclampsia and oligohydramnios. The baby was small for gestational age with a birthweight of 496g. Apgar scores were 6, 6 and 6 at 1, 5 and 10 minutes. The baby was intubated at delivery and supported with nCPAP since day 2. On day 13, a device related pressure injury was noted on the occiput. The injury measured 4cm width, 3cm length and 2mm depth. NSCS 7.

Initial treatment was with an absorbent thin foam dressing and a highly absorbent thick cotton dressing. The site was cleansed aseptically prior to dressing application. However, 2 days later there was no improvement. NSCS remained 7. The management plan was reassessed, and twice daily topical film-forming gel application commenced, with complete healing within 7 days. No additional dressings were required. Foam material was positioned to keep CPAP hat from resting on the infants broken skin. Daily assessment of skin condition was completed with no further skin deterioration. Figure 3 depicts healing of the infants skin with NSCS 4. There was complete adherence to the skin management plan.

Discussion

The immature structure of extremely preterm infant skin results in unique vulnerability to skin injuries, most commonly but not exclusively mediated by mechanical forces. Between 20-60% of pressure injuries for preterm infants are related to medical devices [12]. Apart from pressure injuries, medical adhesive related mechanical skin injuries are common among the preterm population [13, 14]. For wound care, a typical adhesive dressing could

cause further skin injury if inappropriately removed. This highlights the need for safe and effective treatment methods that are tailored to the vulnerabilities of preterm skin.

Absorbent thin foam and non-adhesive dressings have been used successfully within the NICU [15]. Incubator humidity and emollient application can hinder these dressings remaining secure on a skin injury. Film-forming silicone gels do not require secondary dressings. Dressings that obscure visibility of the skin can impact close monitoring of the injury. The clear gel facilitated close observation of the wound healing.

This small, uncontrolled case series demonstrated the use of film-forming silicone dressings for treatment of a variety of mechanical skin injuries in extremely preterm infants. There are numerous advantages of using a film-forming wound dressing. These advantages include ease of application and ability to monitor healing without the need to remove dressings. Healing in line with the concept of protecting the wound while keeping the beneficial secretions in the wound was noted. We did not observe any wound infections. These findings align with existing evidence from the adult population supporting the use of film forming silicone dressings to successfully shorten wound healing time.

In conclusion, this case series demonstrates that the dressing facilitated wound healing within a time frame of five to eight days. No adverse effects were identified during this case series. Further research is necessary to assess if other silicone film-forming products can be used prophylactically to protect the fragile skin of these infants.

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Statement of Ethics

Ethical approval for publication of the case series was granted by the Child and Adolescent Health Service Human Research Ethics Committee on the 19th of August 2025. Parental written informed consent was obtained for publication of the images.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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Author Contributions

RF and TS equally contributed to the data collection and writing of the manuscript, reviewing, and editing of the final manuscript.

Data Availability Statement

All de-identified data generated or analysed during this study is included in this article. Further enquiries can be directed to the corresponding author.

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