Wound management of surgical site infection post myelomeningocele repair

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This case report outlines the author's experience of treating a 35-week gestational age infant girl diagnosed with myelomeningocele (MMC) and delivered 3 weeks later. MMC repair was performed; however, the surgical repair was complicated by wound dehiscence. Wound management played a role in this case, not only to achieve healing, but also to preserve central nervous system function.

A 24-year-old Chinese woman residing in Malaysia was healthy during her first pregnancy until she noticed a sudden increase in her weight in the third trimester. She had an antenatal scan in the 35th week of her pregnancy, which found severe hydrocephalus with a hypoplastic cerebellum and lumbosacral kyphoscoliosis with open spina bifida at the level of lumbosacral region in the unborn infant. She underwent an elective emergency lower-segment Caesarean section for this foetal anomaly at 38th week gestational age after advice from an obstetrician. A baby girl was delivered on February 21, 2019, in Sarawak General Hospital, Malaysia, with a birth weight of 3.56 kg. Her Apgar score was good — 7 at the first minute and then 9 at the fifth minute. As expected, the infant presented with thoracolumbar myelomeningocele (MMC) and macrocephaly at birth. The infant also had a neurogenic bladder and right congenital talipes equinovarus.

Prior to surgery, a cranial ultrasound recorded the following: gross hydrocephalus, bilateral lateral ventricles grossly dilated, thin cerebral parenchymal and third ventricle dilated small cerebellum. MRI was conducted and concluded Chiari II malformation with gross hydrocephalus and thoracic MMC with the presence of diastematomyelia. The findings of these imaging studies were consistent with the common findings of MMC and its accompanying abnormalities.

MMC repair was conducted on the infant's second day of life by the neurosurgical team. Intraoperatively, placode and cauda equina were noted within the cerebral spinal fluid-filled sac, measuring 3 x 2 cm. Placode is an area of thickening of the epithelium in the embryonic head ectoderm layer that gives rise to neurons and other structures of the sensory nervous system. They are normally not present at birth. Cauda equina, meanwhile, is a bundle of spinal nerve roots at the end of the spinal cord filling to lower part of the spinal canal. The skin edge was thinning throughout. A separate bony protuberance was also noted under the middle portion of sac, measuring 3 x 2 x 2 cm.

The operative wound was covered with an occlusive dressing. However, by the third postoperative week, the wound developed mild erythema and serous discharge. Antibiotics were administered and daily wound care was carried out to monitor the progression of the wound and change the normal saline dressings. Two days later, the baby developed low-grade fever and the wound was gaping at the thoracic MMC repair. Subsequently, the wound dehisced. The wound breakdown had been managed by a paediatrician. However, the wound care service was consulted on March 20, 2019.

Initial wound assessment by the wound team on March 20, 2019 *[Figure 1]* indicated that the wound was 8 x 0.5 x <1cm; the wound bed was sloughy with necrotic tissue and minimal purulent discharge. The wound edge was rolled in and there was mild erythema in the periwound. A swab culture, which was taken at the initial presentation of surgical site infection

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Conflict of interest
Silver polyurethane membrane dressing and polyurethane membrane dressing were provided free of charge by PolyMem, Ferris Mfg. Corp. U.S.A.

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Figure 1 (above left). March 20, 2019. Wound size was 8 x 0.5 x <1 cm, wound bed was sloughy with necrotic tissue and minimal pus discharge. Wound edge was rolled in and mild erythema at the periwound.
Figure 2 (above right). March 22, 2019. Wound size increased due to the dehiscence and loosening of the slough. The wound bed was sloughy but improving. Minimal granulation noted at the wound bed. Exudate level was high, but pus discharge was absent. Wound edge was rolled in. Erythema at periwound was reduced.

Figure 3 (above left). April 9, 2019. Full granulation noted at proximal wound bed. Distal wound bed was still sloughy but started to show budding of granulation tissue. Exudate level was moderate. Wound edge was more regular. Periwound was not inflamed nor macerated.
Figure 4 (above right). April 15, 2019. Proximal wound bed started to close. Distal wound bed almost fully granulated with minimal sloughy zone. Scab was noted on wound bed. Wound edges started to contract. Periwound was not inflamed nor macerated.

Figure 5 (above left). April 26, 2019. Full closure of wound with scab presented at distal wound bed.
Figure 6 (above right). May 22, 2019. Wound healed and remodelling well.

(SSI), showed no pathogen growth. Two days later, the wound size increased due to the dehiscence and loosening of the slough *[Figure 2]*. Although the wound bed was still sloughy, it was improving, with granulation tissue noted at the wound bed. Exudate level was high, but without pus discharge. Erythema at periwound was reduced.

After 2 weeks of treating the patient with silver dressings, full granulation was noted at proximal wound bed *[Figure 3]*. Distal wound bed was still sloughy but budding of granulation tissue had started. Exudate reduced to a moderate level. Wound edge was more regular and epithelialisation was observed. Periwound was not inflamed or macerated. At this time, the silver dressing had been replaced by a non-silver dressing (polyurethane membrane dressing).

Proximal wound bed achieved closure at third week of wound management *[Figure 4]*. In the meantime, distal wound bed almost fully granulated despite minimal sloughy zone. A scab was noted on the wound bed. The wound edges started to contract and periwound maintaining well.

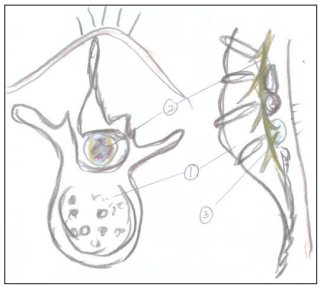

Figure 7. Spina bifida occulta.

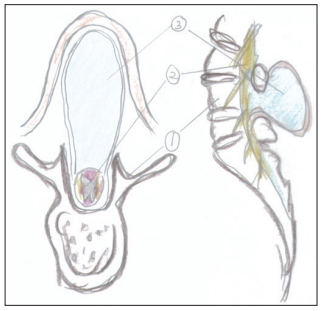

Figure 8. Meningocele.

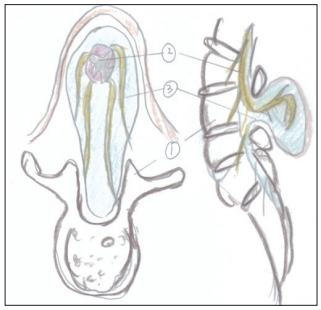

Figure 9. Myelomeningocele.

Full length closure of the wound was achieved at fifth week on April 26, 2019 *[Figure 5]*. Follow-up of the patient on May 22, 2019 noted a well healed and remodelled wound *[Figure 6]*.

Follow-up wound care treatment plan

Preference for autolytic debridement

In view of the infant's age, location of wound and skin fragility, it was daunting to perform sharp debridement for this patient. Therefore, the team decided that autolytic debridement was the preferred approach. In addition, the dressing should have high absorptive capacity, be pain-free, require fewer dressing changes and be latex-free (latex allergy is a common long-term sequala of spina bifida).

A silver polyurethane membrane dressing was chosen as it fulfilled the aforementioned requirements. The cleanser in this dressing product facilitates autolytic debridement without painful cleansing or debridement. Meanwhile, the moisturiser in the product prevented adhesion to the wound bed and the silver served as a local antiseptic. The latex-free dressing could reduce the risk of developing latex allergy in this patient.

Procedure

Using sterile technique, the wound was cleansed with normal saline then rinsed off with sterile water before the application of a silver polyurethane membrane dressing. Dry gauze served as secondary dressing and was changed every day. The silver polyurethane membrane dressing was changed every 2 to 3 days depending on the exudate level. Silver dressings were no longer used once the slough had cleared. The dressing was then changed to a polyurethane membrane dressing (without silver). Aggressive wound debridement was not adopted with the dressing changes owing to the patient's tender age. A scab formed and was allowed to detach by itself instead of being mechanically removed, in order to prevent injury to the epithelial layer. A plastics barrier was applied between the wound and anus to prevent contamination of the wound by faecal matter.

Outcome and follow-up

The wound was found to be closed during inspection on April 26, 2019. Follow up on May 22, 2019 noted that the patient had undergone a ventriculoperitoneal shunt. The wound was remodelling well. The patient was discharged home on May 29, 2019.

Discussion

Spina bifida is a form of neural tube defect, which is subdivided into spina bifida occulta, meningocele and MMC *[Figures 7–9]* (Martin and Kessler, 2015). MMC requires surgical intervention to protect the exposed spinal cord and control CSF leakage, in order to preserve CNS function (Nejat et al, 2011). Although multiple methods of closure were suggested to reduce wound dehiscence, a study evaluating 91 neonates following MMC closure reported the SSI incidence as 11% (n=12) (Demir et al, 2015)

There are few basic principles while handling affected neonates (Jensen, 2012):

- Firstly, the use of sterile technique when caring for the defect
- Secondly, to maintain the appropriate body temperature of the neonate and prevent heat loss
- Thirdly, to nurse the neonate in prone position to avoid shearing and pressure on the incision
- Lastly, to avoid the possibility of latex allergy.

In this case, the SSI occurred after the MMC repair and wound dehiscence. In order to avoid mechanical damage and desiccation of the underlying potentially functioning tissue, wound care management was a crucial issue. The dressing in this case was chosen according to the specific needs of the neonate.

Most studies in the field of SSI have focused on prevention strategies, risk factors, incidence, economic burden, microbiology data and outcomes. The amount of studies that provided details of wound management in terms of SSI was relatively scarce.

The ongoing growth of the dressing product industry provides more choices for end-users; however, it also becomes a major concern whether healthcare providers are practising evidence-based, industry-based or experience-based medicine. Industry-based practice utilises all kinds of product provided by companies with little consideration of the appropriateness of usage in individual cases, while experience-based practice involves managing cases according to the clinician's previous experience. Every single patient should be treated on an individual basis. On the contrary, evidence-based medicine emphasises that decision-making regarding the care of individual patient should be based on the best available evidence.

Wound care practitioners should always bear in mind that a wound dressing provides an ideal environment to facilitate the body's natural healing process (Bennett-Marsden, 2010). Poor knowledge of wound healing and wound care

products might lead to the wrong prescription and application, and subsequently, cause a detrimental outcome to the patient's health (Young, 1997).

Conclusion

Evidence-based practice and the use of educated decision-making in choosing the relevant dressing determined the successful treatment of SSI in this case.

Consent

The patient consent for medical photography form was adopted from that of the American College of Medical Genetics Committee (2000). The medical photography consent was signed by the patient's mother. The parents of the infant discussed in this article, have seen and read this manuscript and agreed to its publication.

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