Management of complex infected postoperative Caesarean section wound with negative pressure wound therapy with instillation (NPWTi): a multidisciplinary team approach

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Caesarean sections represent 76.9% of births in the population covered by medical aids in South Africa, which is one of the highest in the world. The authors present a case of a patient with a complex, infected Caesarean section wound, which was successfully treated by a multidisciplinary team using surgical debridement, various types of negative pressure wound therapy (NPWT) and definitive closure. This combined treatment allowed the patient to be managed as an outpatient, able to care for her newborn twins, with a positive impact on her emotional, psychological and social well-being.

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Case presentation

A 37-year-old female underwent a Caesarean section for a twin pregnancy. She had no comorbidities and her previous pregnancy, which was also via Caesarean section, was uncomplicated.

One week after the Caesarian section the patient developed what she described as a "pimple", surrounded by skin erythema. The skin lesion subsequently ruptured and started producing a sero-purulent exudate. The wound was treated with local irrigations and conventional dressings which included the use of feeding tube irrigations and silver-based dressings with an absorbent dressing as a secondary dressing. Systemic antibiotics were prescribed by the treating doctor. The exudate was expressed manually at the local wound clinic during every dressing change, which the patient found very painful.

Figure 1: Partially dehisced incision on the left side of the initial surgical site showing erythema extending beyond the surgical cut (Courtesy Dr N Kairinos)

Figure 2A: Wound after excision of edges (Courtesy Dr N Kairinos)

After two weeks of poor progress the patient asked to be seen by a plastic surgeon and was referred to the third author. Having examined the wound, it was decided that a debridement was indicated to remove necrotic fat which appeared infected (Figure 1).

This procedure and all subsequent procedures were done as day cases to allow the patient to return home to care for her newborns. The edges of the wound on the affected left side were excised and a moderate amount of fat necrosis and purulent secretions was found (Figure 2A). A sample of the tissue was sent for microbial analysis. The necrotic tissue was removed and the cavity was debrided with a hydro jet system (Versajet®, Smith & Nephew). The wound was irrigated with 1 000 ml of saline solution prior to dressing (Figure 2B).

A polyvinyl alcohol (PVA) foam was placed into the cavity and connected to a negative pressure wound therapy (NPWT) unit (3M + KCI™, St Paul, Minnesota, USA). The patient was discharged and scheduled for follow-up NPWT changes with the first author.

Figure 2B: Wound after hydrodebridement and washout prior to applying the PVA-NPWT

Figure 3: Purulent exudate present in the old suture line exuding into the debrided cavity (Courtesy the Cape Advanced Wound Care Centre/CAWCC)

On the first follow-up visit three days after the surgery, there was purulent fluid exuding from the wound edges into the debrided site (Figure 3). The referring plastic surgeon was contacted for advice. Blood tests for inflammatory markers were requested, as well as an abdominal and pelvic ultrasound to exclude deeper pathology. PVA NPWT was continued.

The blood results indicated a raised white cell count and C-reactive protein. The ultrasound did not find any intraperitoneal or pelvic collection, demonstrating only a liquefied haematoma anterior to the lower uterine segment. Advice was sought from her gynaecologist, who did not feel this was a cause for concern.

The tissue specimen collected in surgery grew Gram-positive cocci. The infectious diseases specialist on the dedicated multidisciplinary wound team was consulted regarding the most appropriate antibiotics and the patient was treated with a five day oral course.

The patient's wound started to show signs of improvement with the on-going NPWT changes and two weeks later the wound appeared ready for closure (Figure 4).

On the day of the planned closure, multiple pockets of pus were found in the adjacent fat (Figure 5). The pockets extended to the underlying fascial sheath and to the midline but on probing the sheath suture line it did not appear to extend intra-abdominally. The surgeon expressed that this was an unusual finding given her good progress and considered that the initial painful manual expression of exudate prior to her referral, may have contributed to the extension of the pus into the healthy fat tissues.

A "woundectomy" (aggressive debridement of any abnormal tissue), as described by Kairinos, was performed (Figure 6).[1] The wound was then irrigated and NPWT with instillation (NPWTi) was commenced using the V.A.C. Ulta device (3M + KCI™, St Paul, Minnesota, USA).

The NPWTi was set to deliver 40 ml of normal saline solution with a six-minute soak phase, alternating with a 3.5 hours negative pressure interval. The medium Cleanse Veraflo™ kit (3M + KCI, St Paul, Minnesota, USA) was used (Figure 7). After four days with this system, the granulation tissue improved but there were patches of purulent granulation and there was an odour present (Figure 8). A decision to use the Fill Assist function on the V.A.C. Ulta machine was taken, increasing the volume of irrigation of saline solution to 90 ml every three hours.

The patient continued her treatment as an outpatient as she was managing well with the device at home. After four sessions with the last settings of NPWTi, and with good granulation in the bed and no foul smell, it was felt that the wound was ready again for definitive closure. This was five weeks after initial referral.

The closure of the wound by the plastic surgeon involved excision of wound edges and undermining of the abdominal flap as one would do for a mini-abdominoplasty (Figure 9). After advancing the flap downward the cavity under the flap was quilted back down in its new position to the underlying fascia with multiple reabsorbable sutures to minimise seroma formation, eliminate the need for a drain and promote rapid flap adhesion. A layered repair of the wound was then done (Figure 10).

Figure 4: NPWT dressing change prior to planned closure (Courtesy CAWCC)

Figure 5: Pus pockets found at time of planned closure (Courtesy Dr N Kairinos)

Figure 6: Woundectomy performed and NPWTi inserted (Courtesy Dr N Kairinos)

Figure 7: Veraflo placement (Courtesy Dr N Kairinos)

Figure 8: Removal of the Veraflo Kit (Courtesy Dr N Kairinos)

Figure 9: Skin flaps undermined after healthy granulation tissue achieved

A Prevena incisional NPWT system (3M + KCI, St Paul, Minnesota, USA) was applied to the skin over the closed incision and was removed four days later. Figure 11 depicts the final appearance of the incision two months after the operation when micropore (3M, St Paul, Minnesota, USA) was applied to the scar.

Discussion

Of all births in South Africa, 76.9% are via Caesarian section.[2] While there is a paucity of South African data on wound complications following these surgeries, a New Zealand study, which included 2 231 women, demonstrated that 116 (5.2%) developed surgical site infections.[3]

Management of Caesarean section complications is costly, with complications including wound infection, dehiscence, haemorrhage and injury to other structures or organs.[4] This usually results in extended hospital stay, prolonged recovery time, risk of additional surgeries and emotional issues related to the complication.[2]

NPWT is a modality which has been used extensively for a diversity of wounds, in preparation for definitive closure. Although the mechanism of action remains unclear, it is postulated that it reduces oedema, increases granulation tissue formation (and in so doing perfusion) and possibly reduces bacterial bioburden.[5]

NPWT with instillation (NPWTi) is an advancement on the above, which allows for irrigation of the wound while it still has the NPWT foam in place. This allows for a reduction in bacterial bioburden, as demonstrated by Gabriel et al.,[6] who reported that NPWTi showed a significant decrease in the period of time for bioburden reduction, wound closure and hospital discharge compared with traditional wet-to-moist wound care. The use of NPWTi in this case allowed the wound to be cleared of exudate as well as reducing bioburden until definitive closure was achieved.

Closed incision NPWT (iNPWT) has been demonstrated to reduce complications such as surgical site infections in high risk wounds.[7] The surgeon felt it was an important adjunct in this patient's wound closure because of the previous complications and also because the closure was under some tension.

All of the above variations of NPWT were used at different time intervals and for different indications during the care of this patient. Appropriate antibiotic administration was also necessary to eliminate on-going infection and the assistance of the infectious disease specialist in advising on antibiotic type and dosage was invaluable.

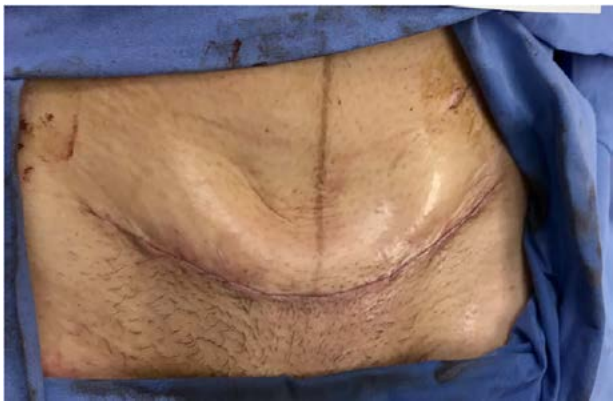

Figure 10: Incision line following inferior advancement and layered closure of upper abdominal flap

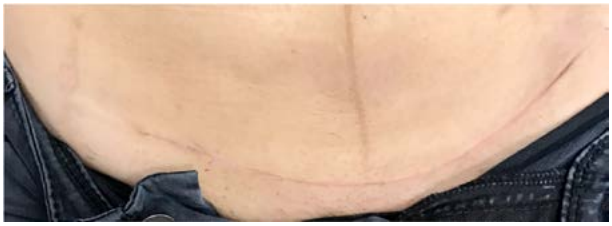

Figure 11: Suture line inspection two months after closure (Courtesy Dr N Kairinos)

The multidisciplinary approach in this case therefore involved the gynaecologist performing the Caesarean section, the plastic surgeon, an infectious disease specialist and the private nurse practitioners who were responsible for the wound care. This case demonstrates the importance of early referral because it is unlikely that this wound would have healed if conservative treatment with conventional dressings were to be continued.

Conflict of interest

The authors declare no conflict of interest

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