A Complication of Management of Closed Incision with Negative-Pressure Wound Therapy

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Negative-pressure wound therapy is routinely utilized in plastic surgery for the treatment of open wounds. However, a newer system, known as closed-incision management (CIM), may minimize the likelihood of open wounds. CIM is designed for use after primary surgical skin closure. Many studies of the effects of CIM in various surgical disciplines have been published. The main features of CIM are increased perfusion, maintenance of a closed-wound environment, reduced seroma/hematoma incidence, and reduced tension of skin edges. CIM appeals to some plastic surgeons because of these advantages. However, to date, no publication has addressed the complications of CIM.

We usually apply Steri-Strips (3 M, St. Paul, MN) after aesthetic surgery procedures, and their cost is nominal (approximately $4 per package). CIM is rarely utilized in our clinic because of its high cost (approximately $800). Moreover, we have observed superficial skin necrosis with CIM. In the present report, we emphasize the risk of this complication associated with CIM.

CASE PRESENTATION

A healthy 33-year-old woman was admitted to our hospital. She had excess skin and fat in her middle and lower abdomen (Figure 1A, C, E). Traditional abdominoplasty was planned. Preoperative laboratory findings were normal. The CIM negative-pressure device (Prevena 125, Kinetic Concepts, Inc, San Antonio, TX) was applied to the incision line after primary closure in the operating room (Figure 2A, B). The Prevena 125 therapy unit produces 125 mm Hg of negative pressure and contains a 45 mL canister for collecting wound fluids. Prevena is easy to use and immediately ready after removing the protecting film from the skin interface area and connecting pipes between the unit and the dressing pad.

The self-adhesive dressing was mounted on the patient’s incision line. No abdominal binder or other medical device was applied to the Prevena dressing. Drains were removed on postoperative day 3, and the patient was discharged from the hospital. The Prevena dressing was removed on postoperative day 7. No infection or dehiscence of the wound edges occurred, but an area of superficial skin necrosis, measuring 2 cm in diameter, was observed on the skin surface to which the Prevena disc had been applied (Figure 2C). Although direct causality could not be established, the necrosis appeared to be associated with CIM.

Gauze impregnated with chlorhexidine was used daily, for 10 days, as a wound dressing to treat the skin necrosis. The necrotic area recovered and exhibited a hyperpigmented scar after 10 days of treatment. The patient had weekly follow-ups for 12 weeks in the outpatient clinic. The incision lines healed as expected, but the scar from the superficial necrosis remained obvious (Figure 1B, D, F).

DISCUSSION

Before the advent of Prevena, negative-pressure wound therapy was utilized in some studies to treat open wounds after primary skin closure. Following the introduction of Prevena, many studies were conducted to assess its utility. Pachowsky et al recommended that CIM be performed in total hip arthroplasty to reduce seroma formation and postoperative complications. Colli used CIM in 10 patients who

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underwent cardiac surgery and had a high risk of poor wound healing. These authors also recommended performing CIM to reduce the incidence of sternal wound infection after cardiac surgery. Kilpadi and Cunnigham evaluated the effectiveness of CIM in reducing hematoma/seroma formation in a swine model. The rate of hematoma/seroma formation was 60% lower in the CIM group relative to the control group.

Wilkes et al investigated the biomechanics of CIM and demonstrated that this therapy normalized the distribution of stress around the closed incision. To our knowledge, only 1 study of the aesthetic effects of CIM has been performed. In that study, Bollero et al applied CIM after pathologic scar excision and achieved wound healing without infection or wound-edge detachment. However, their study included only 8 patients and lacked a comparison group.

Because a major goal of aesthetic surgery is to produce as few scars as possible, plastic surgeons continuously seek new techniques and equipment to minimize scarring. Therefore, Prevena has been recommended in aesthetic surgery. However, most of the aforementioned studies had very small sample sizes and therefore lacked sufficient data to determine the effect of Prevena on scar reduction. Furthermore, no complications associated with Prevena had been reported, and its cost-effectiveness is under discussion.

Although we believe that high pressure was the main reason for the skin necrosis in our patient, the precise

Figure 1. (A, C, E) Preoperative and (B, D, F) postoperative images of the 33-year-old woman described in this report. The postoperative photographs were obtained 12 weeks after the abdominoplasty.
source of the high pressure is unclear. A likely possibility is external pressure on the negative-pressure CIM disc. Even though an abdominal binder was not applied in our case, the patient was permitted to wear tight clothing after discharge. It is also possible that CIM-produced pressure was generated near the negative-pressure disc.

In light of the unfortunate outcome for this patient, we do not recommend CIM for routine aesthetic surgery, except in cases believed to have a very high risk of wound recovery. Moreover, when CIM is applied, patients should be advised not to wear tight clothing that could create pressure on the CIM-treated area. Further studies are needed to assess the safety and routine use of CIM in aesthetic surgery.

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