

Vacuum Assisted Wound Closure Therapy

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Summary and conclusions

SBU's appraisal of the evidence

Vacuum assisted closure (VAC) therapy is a method intended to accelerate the healing of surgical wounds and wounds that fail to heal on their own (primary healing), e.g. after suturing. In recent years, Swedish hospitals have started to use this method to a greater extent.

Many controlled trials have been published that address the method's effects on wound healing, length of hospital stay, and complications involving different types of wounds. Further, a smaller number of studies have been published regarding the effects on mortality. None are of high scientific quality, and only a few are of moderate scientific quality.

- The scientific documentation on vacuum assisted closure therapy offers some evidence that the method:
 - yields faster healing and a higher percentage of healed wounds in patients with split-thickness skin grafts* for wounds that are not "surgically clean", in patients with inflammation in the thoracic cavity (mediastinitis) following surgery where the sternum is divided (sternotomy), and in patients with diabetes where gangrene necessitates forefoot amputation.
 - leads to fewer infections and fewer wound complications in patients with orthopaedic trauma and open fractures.
 - leads to a shorter length of hospital stay for patients with split-thickness skin grafts* for wounds that are not "surgically clean".
 - reduces mortality in post-sternotomy patients with mediastinitis.

- The utility of the method is uncertain in many clinical situations. The review of the scientific documentation reveals a lack of well-executed studies involving patients with split-thickness skin grafts* in otherwise "healthy" wounds, with open abdominal wounds, with a necrotising fasciitis, with severe deep infection in the tissues between the urethra and the rectum (Fournier gangrene), with an open wound after fasciotomy, or with a tissue defect following musculoskeletal tumour surgery.
- Randomised, controlled trials of different well-defined wound types are urgently needed. There continues to be a lack of good-quality health economic assessments.

Technology and target group

Vacuum assisted closure therapy is used for many different types of wounds that require secondary healing (i.e. from the wound floor and edges). Reasons could be that the wound is infected, that the tissue near the wound is damaged or swollen, or that a healing wound has opened. Generally, patients with such wounds are severely ill and often require a long period of hospital care. Also, mortality is high in some categories of patients.

Vacuum assisted closure therapy requires a sealed and moist wound environment. The intent is that negative pressure in the wound will cause swelling to subside more quickly, that the wound will be cleansed more effectively, and that blood circulation in the wound region will increase. Hence, the wound healing processes (granulation) will accelerate, along with reformation of the outer (epithelial) layer of skin, so the wound will heal faster.

An advantage of vacuum assisted closure therapy is that usually the wound only needs to be dressed every second or third day instead of daily, as is the case with conventional treatment.

* Plastic surgery procedure where a section of the epidermis is removed and transplanted to another site on the body.

The method was first used in Sweden in the early years after 2000. Knowledge about its mechanism of action is based mainly on animal studies. In recent years, further controlled trials and case series have been published.

The patient groups that we analysed in this report are adult patients with surgical wounds after some type of intervention where primary wound healing cannot take place. However, we did not include patients with pressure sores or diabetes patients with wounds that have only been debrided surgically.

Primary questions

- Does VAC therapy after surgical intervention lead to faster and more effective wound healing (healing time, reduction of wound surface, skin graft healing time) compared to conventional wound treatment?
- Does VAC therapy after surgical intervention lead to shorter length of stay in hospital compared to conventional wound treatment?
- Does VAC therapy after surgical intervention lead to lower mortality compared to conventional wound treatment?
- What side effects or complications are associated with VAC therapy?
- What does VAC therapy cost? What is its cost-effectiveness?

Patient benefit

- There is some evidence that VAC therapy yields better healing of transplanted skin and a shorter length of stay than conventional wound treatment in patients that receive split-thickness skin grafts because the skin in direct contact with the wound provides insufficient coverage due to trauma, burns, infection, or pressure (low quality evidence, GRADE ⊕⊕○○).
- There is some evidence that VAC therapy yields fewer infections and wound complications than conventional wound treatment in patients with wounds following orthopaedic trauma and open fractures (low quality evidence, GRADE ⊕⊕○○).
- There is some evidence that VAC therapy yields better wound healing, a shorter length of stay, and lower hospital mortality than conventional wound treatment in patients with mediastinitis and unsuccessful wound healing following sternotomy (low quality evidence, GRADE ⊕⊕○○).

- There is some evidence that VAC therapy improves wound healing in comparison to conventional wound treatment in patients with diabetes mellitus and gangrene that necessitates amputation (low quality evidence, GRADE ⊕⊕○○).

- Scientific documentation is lacking or insufficient (very low quality evidence, GRADE ⊕○○○) regarding the effects of VAC therapy in the following categories:

1. Patients with split-thickness skin grafts in an otherwise "healthy" wound
2. Patients with open abdominal wounds
3. Patients with necrotising fasciitis
4. Patients with Fournier gangrene
5. Patients with open wounds after fasciotomy
6. Patients with tissue defects following musculoskeletal tumour surgery

Ethical aspects

An ethical dilemma could arise if a health care provider does not offer VAC therapy, and the clinician asserts that the patient is being denied a beneficial, non-dangerous therapy that involves fewer dressing changes and less-offensive odour. On the other hand, one must question whether it is defensible to generally use a treatment method that is not shown to be superior to conventional wound therapy for several different types of wounds.

Economic aspects

The cost of treating wounds with vacuum assisted closure therapy is comparable to the cost of conventional wound treatment. Hence, the method is cost-effective in treating categories of wounds for which the evidence indicates a shortened length of stay and reduced mortality. Regarding other wound categories, further clinical studies are required to show whether or not vacuum assisted wound closure therapy is cost-effective.

Four levels are used in grading the strength of the scientific evidence on which conclusions are based:

High quality evidence (⊕⊕⊕⊕). Based on high or moderate quality studies with no factors that weaken the overall assessment.

Moderate quality evidence (⊕⊕⊕○). Based on high or moderate quality studies with isolated factors that weaken the overall assessment.

Low quality evidence (⊕⊕○○). Based on high or moderate quality studies having factors that weaken the overall assessment.

Very low quality evidence (⊕○○○). Scientific evidence is deemed insufficient when scientific findings are absent, the quality of available studies is low, or studies of similar quality present conflicting findings.

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The Regional HTA Centre of Region Västra Götaland

Health technology assessment (HTA) involves evaluating the evidence behind a healthcare method, device, or process – including its economic, organizational, and ethical aspects.

Assessments are conducted by critically reviewing the published scientific literature in accordance with the principles applied by the Swedish Council on Health Technology Assessment (SBU).

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SBU evaluates healthcare technology

The Swedish Council on Health Technology Assessment (SBU) is a national governmental agency that assesses healthcare technologies. SBU analyses the benefits, risks, and costs of different methods and compares the scientific facts to prevailing practices in Sweden. SBU's goal is to provide stronger evidence for everyone engaged in shaping the delivery of health services.

The SBU Alert reports are produced in collaboration with experts from the respective subject areas, the National Board of Health and Welfare, the Medical Products Agency, the Swedish Association of Local Authorities and Regions, and a special advisory panel (the Alert Advisory Board).

This assessment was published in 2011. Findings based on high quality evidence usually continue to apply well into the future. However, findings based on very low or low quality evidence might have already been replaced by more recent findings.

The complete report is available in Swedish.

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