

What Is the Comparative Efficacy of Negative-Pressure Wound Therapy vs Alternate Temporary Abdominal Closure Techniques in Open Abdominal Wounds?

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The term *evidence-based medicine* was first coined by Sackett and colleagues¹ as “the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients.” The key to practicing evidence-based medicine is applying the best current knowledge to decisions in individual patients. Medical knowledge is continually and rapidly expanding and it is impossible for an individual clinician to read all the medical literature. For clinicians to practice evidence-based medicine, they must have the skills to read and interpret the medical literature so that they can determine the validity, reliability, credibility, and utility of individual articles. These skills are known as critical appraisal skills. Generally, critical appraisal requires that the clinician have some knowledge of biostatistics, clinical epidemiology, decision analysis, and economics as well as clinical knowledge.

The Canadian Association of General Surgeons (CAGS) and the American College of Surgeons (ACS) jointly sponsor a program entitled “Evidence-Based Reviews in Surgery” (EBRS). The primary objective of this initiative is to help practicing surgeons improve their critical appraisal skills. During the academic year, 8 clinical articles are chosen for review and discussion. They are selected not only for their clinical relevance to general surgeons, but also because they cover a spectrum of issues important to surgeons; for example, causation or risk factors for disease, natural history or prognosis of disease, how to quantify disease (measurement issues), diagnostic

tests and the diagnosis of disease, and the effectiveness of treatment. Both methodologic and clinical reviews of the article are performed by experts in the relevant areas and posted on the EBRS website. As well, a listserv discussion is held where participants can discuss the monthly article. Fellows and candidates of the College can access Evidence-Based Reviews in Surgery through the American College of Surgeons website (www.facs.org/education/ebrs.html). All journal articles and reviews are available electronically through the website. Currently we have a library of more than 100 articles and reviews, which can be accessed at any time.

Beginning in October, a new set of articles will be available each month until May. Surgeons who participate in the current (modules) packages can receive CME credits by completing a series of multiple choice questions. For further information about EBRS the reader is directed to the ACS website or should email the administrator, Marg McKenzie at mmckenzie@mtsinai.on.ca.

In addition to making the reviews available through the ACS and CAGS websites, 4 of the reviews are published in condensed versions in the *Canadian Journal of Surgery*, 4 in the *Journal of the American College of Surgeons*, and 4 in *Diseases of Colon and Rectum* each year.

REFERENCE

1. Evidence-Based Medicine Working Group. Evidence-based medicine. *JAMA* 1992;268:2420–2425.

SELECTED ARTICLE

Negative-pressure wound therapy for critically ill adults with open abdominal wounds: a systematic review

Roberts DJ, Zygun DA, Grendar J, et al. *J Trauma Acute Surg* 2012;73:629–639.

Objective: To determine the comparative efficacy and safety of negative-pressure wound therapy (NPWT) vs alternate temporary abdominal closure (TAC) techniques in critically ill adults with open abdominal wounds.

Data Sources: Medline, PubMed, Embase, Scopus, Web of Science, the Cochrane Database, the Center for

Reviews and Dissemination, clinical trials registries, and bibliographies of included studies.

Study Selection: Retrospective and prospective experimental and nonexperimental studies were included if there was a comparative group that included adult ICU patients and the intervention included NPWT compared with an alternate NPWT technique or TAC method. The reported outcomes included mortality or fascial closure rates.

Methods: Search terms and keywords for intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS), NPWT and alternate TAC techniques, trauma or sepsis, and critical care were screened by 2 reviewers, who also extracted the data. Risk of bias was assessed using Jadad score, Cochrane Collaboration criteria, or Newcastle-Ottawa scale depending on study design.

Outcomes: In hospital mortality, fascial closure rates, duration of hospital and ICU stay, effect on intra-hospital abdominal pressure, abdominal fistula formation, and intra-abdominal infection rate.

Results: Among 2,715 citations identified, 2 randomized controlled trials (RCT) and 9 cohort studies met the inclusion criteria. Methodologic quality of included prospective studies was moderate. One RCT observed an improved fascial closure rate (relative risk [RR] 2.4, 95% CI 1.0 to 5.3) and decreased length of hospital stay after addition of retention sutured sequential fascial closure to the Kinetic Concepts Inc (KCI) vacuum-assisted closure (VAC). Another reported a trend toward enhanced fascial closure using the KCI VAC vs Barker's vacuum pack (RR 2.6, 95% CI 0.95 to 7.1). A prospective cohort study observed improved mortality (RR 0.48, 95% CI 0.25 to 0.92) and fascial closure (RR 1.5, 95% CI 1.1 to 2.0) for patients who received the ABThera vs Barker's vacuum pack. Another reported reduced arterial lactate, intra-abdominal pressure, and hospital stay for those fitted with the KCI VAC vs Bogotá bag. Most retrospective studies were of low methodologic quality and reported no mortality or fascial closure benefit for NPWT.

Conclusions: Although there are limited prospective comparative studies, there is some evidence that in critically ill adults with open abdominal wounds, NPWT vs selected alternate TAC methods may be associated with improved outcomes.

Commentary: Managing patients with an open abdomen is an important part of trauma care, acute

care surgery, and critical care. There are many different methods of managing the open abdomen, from mesh closure and the Bogotá Bag to negative pressure systems, both "homemade" and commercial. Negative pressure wound therapy (NPWT) has become a frequently used option, likely because of its ease of application and the simplification of wound care in the ICU. Because there are many different approaches to temporary abdominal closure (TAC), it makes sense to survey the literature and clarify which system is best, or at least see if evidence supports the use of this costly treatment.

Systematic reviews and meta-analysis are well-established techniques for combining the results of randomized controlled trials and are felt to provide one of the highest levels of evidence in support of an intervention. Combining the results of observational studies is less well established but being used more frequently. The STROBE statement is meant to guide authors in presenting the results of systematic reviews and meta-analyses of observational studies, leading to a higher quality of review.

Roberts and colleagues performed a systematic review to determine if NPWT is superior to other methods of TAC with respect to in-hospital mortality, length of stay, and rates of fascial closure. The authors' primary research question was, "What is the comparative efficacy of NPWT vs alternative methods?" Efficacy is defined as the capacity to benefit under ideal conditions (ie, RCTs). Because this systematic review includes more observational studies than RCTs, it is more accurate to say they are actually comparing effectiveness (the results of therapy in clinical practice).

The authors performed an exhaustive search of the literature and were able to find 2 RCTs, 3 prospective, and 6 retrospective cohort studies among 2,715 citations and 57 full text articles. The NPWT included the AbThera NPT (Kinetic Concepts Inc [KCI]) system, the KCI VAC system (KCI), and several other less well defined systems. The comparison group included Bogotá bag closure, mesh closure, and open packing of the abdomen. Interestingly, some form of vacuum therapy (Barker bag or NPWT with retention sutures) was the control therapy in several studies, weakening the results somewhat.

The outcomes assessed were in-hospital mortality, fascial closure rates, duration of stay, fistula formation, infectious complications, measures of intra-abdominal pressure (IAP), and surrogate measures such as arterial lactate levels. Incisional hernia rate, which would have required long-term follow-up, was not reported in any of the studies.

Because of the clinical and methodologic heterogeneity, the authors did not perform pooled analyses. Instead

they reported important outcomes in summary form. Based on the Jadad scores, the Cochrane criteria, and the “Newcastle-Ottawa” score, the authors concluded that there was a moderate risk of bias.

The overall results of the review are quite variable. There did not appear to be any difference in in-hospital mortality. Fascial closure rates appeared to be better in the NPWT group, but there was a trend toward longer length of stay and possibly an increased rate of fistula formation with NPWT. However, placement of operative feeding tubes in one of the randomized controlled trials may have contributed to the increased complications in the treatment group. Intra-abdominal pressure and arterial lactate levels were lower in 1 study in the NPWT group. Because of this, the authors concluded that “limited prospective comparative data suggest that NPWT may be associated with improved surrogate and clinical outcomes.” There is not strong evidence of harm from the therapy, which allows us at least to be comfortable carrying on using NPWT.

This review provides a good overview of what has been published on this topic and therefore is better than a traditional nonsystematic review. Although there is inadequate evidence that NPWT is better than other options, there is also no strong evidence of harm from the therapy, which provides some comfort that NPWT is safe to use. However, more research is necessary. Current investigation is focusing on refining techniques that already incorporate NPWT to minimize patient morbidity and reduce the cost of care. These include using sutures to prevent fascial retraction, the role of early enteral nutrition in the open abdomen, use of pharmacologic paralysis or hypertonic saline infusion to facilitate fascial closure, and direct peritoneal resuscitation to reduce visceral edema

and promote early fascial approximation. However, quite rightly, the authors suggest that more fundamental research is required, including “adequately powered and internally valid RCTs comparing the AbThera or KCI VAC (KCI) with other TAC methods...before NPWT can be advocated as a superior surgical intervention.”

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