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[Intervention Review]

Negative pressure wound therapy for open traumatic wounds

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ABSTRACT

Background

Traumatic wounds (wounds caused by injury) range from abrasions and minor skin incisions or tears, to wounds with extensive tissue damage or loss as well as damage to bone and internal organs. Two key types of traumatic wounds considered in this review are those that damage soft tissue only and those that involve a broken bone, that is, open fractures. In some cases these wounds are left open and negative pressure wound therapy (NPWT) is used as a treatment. This medical device involves the application of a wound dressing through which negative pressure is applied and tissue fluid drawn away from the area. The treatment aims to support wound management, to prepare wounds for further surgery, to reduce the risk of infection and potentially to reduce time to healing (with or without surgical intervention). There are no systematic reviews assessing the effectiveness of NPWT for traumatic wounds.

Objectives

To assess the effects of NPWT for treating open traumatic wounds in people managed in any care setting.

Search methods

In June 2018 we searched the Cochrane Wounds Specialised Register, the Cochrane Central Register of Controlled Trials (CENTRAL), Ovid MEDLINE (including In-Process & Other Non-Indexed Citations), Ovid Embase and EBSCO CINAHL Plus. We also searched clinical trials registries for ongoing and unpublished studies, and scanned reference lists of relevant included studies as well as reviews, meta-analyses and health technology reports to identify additional studies. There were no restrictions with respect to language, date of publication or study setting.

Selection criteria

Published and unpublished randomised controlled trials that used NPWT for open traumatic wounds involving either open fractures or soft tissue wounds. Wound healing, wound infection and adverse events were our primary outcomes.

Data collection and analysis

Two review authors independently selected eligible studies, extracted data, carried out a 'Risk of bias' assessment and rated the certainty of the evidence. Data were presented and analysed separately for open fracture wounds and other open traumatic wounds (not involving a broken bone).

Main results

Seven RCTs (1377 participants recruited) met the inclusion criteria of this review. Study sample sizes ranged from 40 to 586 participants. One study had three arms, which were all included in the review. Six studies compared NPWT at 125 mmHg with standard care: one of these studies did not report any relevant outcome data. One further study compared NPWT at 75 mmHg with standard care and NPWT 125mmHg with NPWT 75 mmHg.

Open fracture wounds (four studies all comparing NPWT 125 mmHg with standard care)

One study (460 participants) comparing NPWT 125 mmHg with standard care reported the proportions of wounds healed in each arm. At six weeks there was no clear difference between groups in the number of participants with a healed, open fracture wound: risk ratio (RR) 1.01 (95% confidence interval (CI) 0.81 to 1.27); moderate-certainty evidence, downgraded for imprecision.

We pooled data on wound infection from four studies (596 participants). Follow-up varied between studies but was approximately 30 days. On average, it is uncertain whether NPWT at 125 mmHg reduces the risk of wound infection compared with standard care (RR 0.48, 95% CI 0.20 to 1.13; $I^2 = 56%$); very low-certainty evidence downgraded for risk of bias, inconsistency and imprecision.

Data from one study shows that there is probably no clear difference in health-related quality of life between participants treated with NPWT 125 mmHg and those treated with standard wound care (EQ-5D utility scores mean difference (MD) -0.01, 95% CI -0.08 to 0.06; 364 participants, moderate-certainty evidence; physical component summary score of the short-form 12 instrument MD -0.50, 95% CI -4.08 to 3.08; 329 participants; low-certainty evidence downgraded for imprecision).

Moderate-certainty evidence from one trial (460 participants) suggests that NPWT is unlikely to be a cost-effective treatment for open fractures in the UK. On average, NPWT was more costly and conferred few additional quality-adjusted life years (QALYs) when compared with standard care. The incremental cost-effectiveness ratio was GBP 267,910 and NPWT was shown to be unlikely to be cost effective at a range of cost-per-QALYs thresholds. We downgraded the certainty of the evidence for imprecision.

Other open traumatic wounds (two studies, one comparing NPWT 125 mmHg with standard care and a three-arm study comparing NPWT 125 mmHg, NPWT 75 mmHg and standard care)

Pooled data from two studies (509 participants) suggests no clear difference in risk of wound infection between open traumatic wounds treated with NPWT at 125 mmHg or standard care (RR 0.61, 95% CI 0.31 to 1.18); low-certainty evidence downgraded for risk of bias and imprecision.

One trial with 463 participants compared NPWT at 75 mmHg with standard care and with NPWT at 125 mmHg. Data on wound infection were reported for each comparison. It is uncertain if there is a difference in risk of wound infection between NPWT 75 mmHg and standard care (RR 0.44, 95% CI 0.17 to 1.10; 463 participants) and uncertain if there is a difference in risk of wound infection between NPWT 75 mmHg and 125 mmHg (RR 1.04, 95% CI 0.31 to 3.51; 251 participants). We downgraded the certainty of the evidence for risk of bias and imprecision.

Authors' conclusions

There is moderate-certainty evidence for no clear difference between NPWT and standard care on the proportion of wounds healed at six weeks for open fracture wounds. There is moderate-certainty evidence that NPWT is not a cost-effective treatment for open fracture wounds. Moderate-certainty evidence means that the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different. It is uncertain whether there is a difference in risk of wound infection, adverse events, time to closure or coverage surgery, pain or health-related quality of life between NPWT and standard care for any type of open traumatic wound.

PLAIN LANGUAGE SUMMARY

Negative pressure wound therapy for open traumatic wounds

What is the aim of this review?

The aim of this review was to find out whether negative pressure wound therapy (NPWT) (a sealed wound dressing connected to a vacuum pump that sucks up fluid from the wound) is effective for treating open traumatic wounds (injuries such as animal bites, bullet wounds or fractures that result in bone piercing the skin to form open wounds). Researchers from Cochrane collected and analysed all relevant studies (randomised controlled trials) to answer this question and found seven relevant studies.

Key messages

We cannot be certain whether NPWT is effective for treating traumatic wounds. We are moderately confident that there is no clear difference in healing rates in open fracture wounds treated with NPWT compared with standard care. We are very uncertain whether people treated with NPWT experience fewer wound infections compared with those treated with standard care. There is moderate-certainty evidence that NPWT is not a cost-effective treatment for open fracture wounds.

What was studied in the review?

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Traumatic wounds are open cuts, scrapes or puncture wounds, where both the skin and underlying tissues are damaged. These wounds may have jagged edges and contain items such as gravel or glass. Injuries caused by road traffic accidents, stab and gunshot wounds, and animal bites are common types of traumatic wound.

NPWT is a treatment that is used widely on different types of wounds. In NPWT, a machine that exerts carefully controlled vacuum suction (negative pressure) is attached to a wound dressing that covers the wound. Wound and tissue fluid is sucked away from the treated area into a canister. This is thought to increase blood flow and improve wound healing.

We wanted to find out if NPWT could help open traumatic wounds to heal more quickly and effectively. We wanted to know if people treated with NPWT experienced any side effects or other complications, such as wound infections and pain. We were also interested in the impact of NPWT on people's quality of life.

What are the main results of the review?

We found seven relevant studies, dating from 2008-2017, which compared the effect of different strengths of NPWT with standard wound care. The studies involved a total of 1381 participants aged 12 years and over. The participants' sex was not recorded. Not all the studies stated how they were funded. One was funded by an NPWT manufacturer.

There is no clear difference in healing rates in participants with open fracture wounds treated with NPWT compared with those receiving standard care. There is moderate-certainty evidence that NPWT is not a cost-effective treatment for open fracture wounds. We are very uncertain as to whether NPWT may reduce the likelihood of wound infection compared with standard care. There is no clear evidence that NPWT impacts on people's experience of pain, adverse events or their experience of receiving therapy.

How up to date is this review?

We searched for studies that had been published up to June 2018.