Cochrane Wounds Group Reviews and Review Updates

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Chlorhexidine bathing of the critically ill for the prevention of hospital-acquired infection

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Citation example: Lewis SR, Schofield-Robinson OJ, Rhodes S, Smith AF. Chlorhexidine bathing of the critically ill for the prevention of hospital-acquired infection. Cochrane Database of Systematic Reviews 2019, Issue 8. Art. No.: CD012248. DOI: 10.1002/14651858.CD012248.pub2.

ABSTRACT

Background: Hospital-acquired infection is a frequent adverse event in patient care; it can lead to longer stays in the intensive care unit (ICU), additional medical complications, permanent disability or death. Whilst all hospital-based patients are susceptible to infections, prevalence is particularly high in the ICU, where people who are critically ill have suppressed immunity and are subject to increased invasive monitoring. People who are mechanically-ventilated are at infection risk due to tracheostomy and reintubation and use of multiple central venous catheters, where lines and tubes may act as vectors for the transmission of bacteria and may increase bloodstream infections and ventilator-associated pneumonia (VAP). Chlorhexidine is a low-cost product, widely used as a disinfectant and antiseptic, which may be used to bathe people who are critically ill with the aim of killing bacteria and reducing the spread of hospital-acquired infections.

Objectives: To assess the effects of chlorhexidine bathing on the number of hospital-acquired infections in people who are critically ill.

Search methods: In December 2018 we searched the Cochrane Wounds Specialised Register; the Cochrane Central Register of Controlled Trials (CENTRAL); Ovid MEDLINE; Ovid Embase and EBSCO CINAHL Plus. We also searched clinical trial registries for ongoing and unpublished studies, and checked reference lists of relevant included studies as well as reviews, meta-analyses and health technology reports to identify additional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: We included randomised controlled trials (RCTs) that compared chlorhexidine bathing with soap-and-water bathing of patients in the ICU.

Data collection and analysis: Two review authors independently assessed study eligibility, extracted data and undertook risk of bias and GRADE assessment of the certainty of the evidence .

Main results: We included eight studies in this review. Four RCTs included a total of 1537 individually randomised participants, and four cluster-randomised crossover studies included 23 randomised ICUs with 22,935 participants. We identified one study awaiting classification, for which we were unable to assess eligibility.

The studies compared bathing using 2% chlorhexidine-impregnated washcloths or dilute solutions of 4% chlorhexidine versus soap-and-water bathing or bathing with non-antimicrobial washcloths.

Eight studies reported data for participants who had a hospital-acquired infection during the ICU stay. We are uncertain whether using chlorhexidine for bathing of critically ill people reduces the rate of hospital-acquired infection, because the certainty of the evidence is very low (rate difference 1.70, 95% confidence interval (CI) 0.12 to 3.29; 21,924 participants). Six studies reported mortality (in hospital, in the ICU, and at 48 hours). We cannot be sure whether using chlorhexidine for bathing of critically-ill people reduces mortality, because the certainty of the evidence is very low (odds ratio 0.87, 95% CI 0.76 to 0.99; 15,798 participants). Six studies reported length of stay in the ICU. We noted that individual studies found no evidence of a difference in length of stay; we did not conduct meta-analysis because data were skewed. It is not clear whether using chlorhexidine for bathing of critically ill people reduced length of stay in the ICU, because the certainty of the evidence is very low. Seven studies reported skin reactions as an adverse event, and five of these reported skin reactions which were thought to be attributable to the bathing solution. Data in these studies were reported inconsistently and we were unable to conduct meta-analysis; we cannot tell whether using chlorhexidine for bathing of critically ill people reduced adverse events, because the certainty of the evidence is very low.

We used the GRADE approach to downgrade the certainty of the evidence of each outcome to very low. For all outcomes, we downgraded evidence because of study limitations (most studies had a high risk of performance bias, and we noted high risks of other bias in some stud-

ies). We downgraded evidence due to indirectness, because some participants in studies may have had hospital-acquired infections before recruitment. We noted that one small study had a large influence on the effect for hospital-acquired infections, and we assessed decisions made in analysis of some cluster-randomised crossover studies on the effect for hospital-acquired infections and for mortality; we downgraded the evidence for these outcomes due to inconsistency. We also downgraded the evidence on length of stay in the ICU, because of imprecision. Data for adverse events were limited by few events and so we downgraded for imprecision.

Authors' conclusions: Due to the very low-certainty evidence available, it is not clear whether bathing with chlorhexidine reduces hospital-acquired infections, mortality, or length of stay in the ICU, or whether the use of chlorhexidine results in more skin reactions.

Plain language summary

Bathing critically ill patients with chlorhexidine to prevent hospital-acquired infections

What is the aim of this review? The aim of this review was to find out whether people who are critically ill in hospital should be bathed with the antiseptic chlorhexidine, in order to prevent them from developing infections. Researchers from Cochrane collected and analysed all relevant studies to answer this question and found eight relevant randomised trials. Randomised trials are medical studies where people are chosen at random to receive different treatments. This study design provides the most reliable evidence on whether treatments have a relationship with desired or undesired health outcomes.

Key messages: This review assesses whether using chlorhexidine (instead of soap and water) to bathe patients in an intensive care unit (ICU), or a high-dependency or critical care unit reduces the number of hospital-acquired infections. The evidence available from the studies we analysed was very low quality, meaning that we cannot be certain whether bathing with chlorhexidine reduces the likelihood of critically-ill patients developing an infection, or dying. We are also uncertain whether bathing critically ill patients with chlorhexidine shortens the length of time people spend in hospital, or lowers their risk of developing skin reactions.

What was studied in the review? People who are critically ill (in an ICU, or a high-dependency or critical care unit) often catch infections during their time in hospital. These infections can lead to longer hospital stays, additional medical complications, permanent disability or even death. Patients in ICUs are particularly vulnerable to infections because the body's ability to fight infection is reduced by illness or trauma. Surgical tubes and lines (for example to help with feeding or breathing) may enable bacteria to enter the body. Chlorhexidine is a low-cost product which is used as an antiseptic and disinfectant in hospitals.

What are the main results of the review? In December 2018 we searched for studies looking at the use of chlorhexidine for bathing critically ill patients. We found eight studies dating from 2005 to 2018, involving a total of 24,472 people across more than 20 ICUs. Seven studies included people who were adults, and one study included only children. All studies included both males and females. All studies compared bathing with chlorhexidine versus bathing with soap and water or non-antimicrobial washcloths. Four studies received funding from independent funders (government organisations, or from hospital or university departments) or reported no external funding, and four studies received funding from companies that manufactured chlorhexidine products.

The evidence from all eight studies combined is not sufficient to allow us to be certain whether patients bathed in chlorhexidine are less likely to catch an infection during their stay in the ICU. We are also uncertain whether patients bathed in chlorhexidine are less likely to die, because the certainty of the evidence from the six studies that reported on this is very low. We did not pool the evidence from the six studies that reported how long patients had stayed in the ICU, because the results differed widely. We are also uncertain whether patients bathed in chlorhexidine are likely to be in the ICU for less time, because the certainty of the evidence is very low. Reports from five studies provided different evidence about whether chlorhexidine led to more or less skin reactions; we are uncertain whether patients bathed in chlorhexidine are likely to have more or less skin reactions, because the certainty of the evidence is very low.

Quality of evidence: Most studies did not use methods to conceal the type of bathing solution that staff were using, which increases the risk that staff may have treated patients differently depending on whether patients were in the chlorhexidine study group or the soap-and-water study group. Participants in some studies may have already caught an infection before the start of the study and we were concerned that this might have affected our results. We also noticed wide differences in some results, and some outcomes had few reported events. These were reasons to judge the quality of the evidence to be very low.

How up to date is this review? We searched for studies that had been published up to December 2018.

Publication in The Cochrane Library Issue 9, 2019

Prophylactic antibiotics to prevent surgical site infection after breast cancer surgery

Michael Gallagher, Daniel J Jones, Sophie V Bell-Syer

Citation example: Gallagher M, Jones DJ, Bell-Syer SV. Prophylactic antibiotics to prevent surgical site infection after breast cancer surgery. Cochrane Database of Systematic Reviews 2019, Issue 9. Art. No.: CD005360. DOI: 10.1002/14651858.CD005360.pub5.

ABSTRACT

Background: Surgery has been used as part of breast cancer treatment for centuries; however any surgical procedure has the potential risk of infection. Infection rates for surgical treatment of breast cancer are documented at between 3% and 15%, higher than average for a clean surgical procedure. Pre- and perioperative antibiotics have been found to be useful in lowering infection rates in other surgical groups, yet there is no consensus on the use of prophylactic antibiotics for breast cancer surgery. This is an update of a Cochrane Review first published in 2005 and last updated in 2014.

Objectives: To determine the effects of prophylactic (pre- or perioperative) antibiotics on the incidence of surgical site infection (SSI) after breast cancer surgery.

Search methods: For this fourth update, in August 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: We included randomised controlled trials of pre- and perioperative antibiotics for patients undergoing surgery for breast cancer. Primary outcomes were rates of surgical site infection (SSI) and adverse reactions.

Data collection and analysis: Three review authors independently examined the title and abstracts of all studies identified by the search strategy, then assessed study quality and extracted data from those that met the inclusion criteria. We contacted study authors to obtain missing information. We evaluated the certainty of evidence using the GRADE approach. We used standard methodological procedures expected by Cochrane.

Main results: A total of 11 randomised controlled trials (2867 participants) were included in the review. No new studies were identified in this update. All studies included breast cancer patients and were based in the hospital setting. Ten studies evaluated preoperative antibiotic compared with no antibiotic or placebo. One study evaluated perioperative antibiotic compared with placebo or no antibiotic. Pooling of the results demonstrated that prophylactic antibiotics administered preoperatively probably reduce the incidence of SSI for patients undergoing breast cancer surgery without reconstruction (pooled risk ratio (RR) 0.67, 95% confidence interval (CI) 0.53 to 0.85; moderate certainty evidence). Anticipated absolute effects were calculated for the outcome incidence of SSI; 105 per 1000 for the none or placebo group and 71 per 1000 (95% CI 56 to 89) for the preoperative antibiotic prophylaxis group. Analysis of the single study comparing perioperative antibiotic with no antibiotic was inconclusive for incidence of SSI (RR 0.11, 95% CI 0.01 to 1.95; very low certainty evidence). No studies presented separate data for patients who underwent reconstructive surgery at the time of removal of the breast tumour.

Secondary outcomes were not consistently included in the studies investigating preoperative antibiotic prophylaxis. It is very uncertain whether there is a difference in incidence of adverse events between the treatment and no treatment or placebo groups (10 studies, 2818 participants); very low certainty evidence downgraded one level for serious risk of bias, one level for serious inconsistency and one level for serious imprecision. It is unclear whether there is a difference in time to onset of infection between the treatment and no treatment or placebo groups (4 studies, 1450 participants); low certainty evidence downgraded one level for serious risk of bias and one level for serious inconsistency. It is unclear whether there is a difference in rates of readmission to hospital between the treatment and placebo groups (3 studies, 784 participants); low certainty evidence downgraded one level for serious inconsistency and one level for serious risk of bias. It is unclear whether there is a difference in cost of care between the treatment and no treatment or placebo groups (2 studies, 510 participants); low certainty evidence downgraded one level for serious risk of bias and one level for serious inconsistency. No analysable secondary outcome data were reported for the single study evaluating perioperative antibiotics.

Authors' conclusions: Prophylactic antibiotics administered preoperatively probably reduce the risk of SSI in patients undergoing surgery for breast cancer. However, it is very uncertain whether there is an effect on incidence of adverse events. Furthermore, the effects on time to onset of infection, readmission to hospital and cost of care remain unclear. Further studies are required to establish the best protocols for clinical practice.

Plain language summary

Do antibiotics prevent surgical site infection after breast cancer surgery?

What was the aim of this review? The aim of this review was to determine whether giving people antibiot-

ics before or during an operation is effective for preventing surgical site infection (SSI) following breast cancer surgery. Researchers from Cochrane collected and analysed all relevant studies (randomised controlled trials) to answer this question and found 11 relevant studies. Randomised controlled trials are medical studies where people are chosen at random to receive different treatments. This type of trial provides the most reliable health evidence.

Key messages: There is moderate certainty evidence that antibiotics given before an operation probably reduce the risk of SSI in patients having surgery for breast cancer. We cannot be certain whether antibiotics given during an operation reduce the risk of developing an SSI, as the available evidence is of very low certainty.

What was studied in this review? Breast cancer is the most common cancer affecting women and the leading cause of cancer death in women. Surgical removal of all or part of the breast is a common treatment for people diagnosed with breast cancer. However, an infection of the surgical wound is often a complication of the surgery, affecting up to 15% of patients. Having an SSI may require a longer stay in hospital or a repeat operation. Taking antibiotics prior to the operation or during the operation aims to reduce the risk of developing an infection in the surgical wound.

What are the main results of the review? In August 2018 we searched for randomised controlled trials that investigated whether antibiotics given to people before or during surgery for breast cancer prevent an infection of the surgical site (SSI). This is an update of an existing review and no new relevant studies were found in the most recent search. We analysed the results of 11 studies with 2867 participants. Ten studies looked at giving antibiotics to patients prior to the surgery compared with not giving antibiotics or giving placebo. One study compared giving antibiotics perioperatively (between induction of anaesthetic and the patient leaving the recovery room) to not giving antibiotics. The results showed us that giving antibiotics before surgery probably reduced the risk of developing surgical site infection in patients undergoing breast cancer surgery with moderate certainty. No conclusions can be made from the results of the single study comparing perioperative antibiotics to no antibiotics as the evidence is of very low certainty. It is very uncertain whether there is an effect on incidence of adverse events. Furthermore, the effects on time to onset of infection, readmission to hospital and cost of care remain unclear. The review is not able to establish which antibiotic is most appropriate.

How up to date is this review? We searched for studies that had been published up to August 2018.

Publication in The Cochrane Library Issue 12, 2019

Primary closure versus delayed or no closure for traumatic wounds due to mammalian bite

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Citation example: Bhaumik S, Kirubakaran R, Chaudhuri S. Primary closure versus delayed or no closure for traumatic wounds due to mammalian bite. Cochrane Database of Systematic Reviews 2019, Issue 12. Art. No.: CD011822. DOI: 10.1002/14651858.CD011822.pub2.

ABSTRACT

Background: Mammalian bites are a common presentation in emergency and primary healthcare facilities across the world. The World Health Organization recommends postponing the suturing of a bite wound but this has not been evaluated through a systematic review.

Objectives: To assess the effects of primary closure compared with delayed closure or no closure for mammalian bite wounds.

Search methods: In July 2019 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: We included randomised controlled trials which compared primary closure with delayed or no closure for traumatic wounds due to mammalian bite.

Data collection and analysis: Two review authors independently screened titles, abstracts and full-text publications, applied the inclusion criteria, and extracted data. We pooled data using a random-effects model, as appropriate. We used the Cochrane 'Risk of bias' tool and assessed the certainty of the evidence using the GRADE approach.

Main results: We found three trials (878 participants) that compared primary closure with no closure for dog bites and one trial (120 participants) that compared primary closure with delayed closure. No other mammalian bite studies were identified. The trials were from the UK (one trial), Greece (one trial) and China (two trials).

Overall, participants from both sexes and all age groups were represented.

We are uncertain whether primary closure improves the proportion of wounds which are infection-free compared with no closure, as the certainty of evidence for this outcome was judged to be very low (risk ratio (RR) 1.01, 95% confidence interval (CI) 0.97 to 1.05; 2 studies, 782 participants; I2 = 0%). We downgraded the evidence by one level for high risk of bias and two levels for imprecision. There is no clinically important difference in cosmesis (acceptable physical/cosmetic appearance) of dog bite wounds when primary closure is compared with no closure (mean difference (MD) -1.31, 95% CI -2.03 to -0.59; 1 study, 182 participants). The certainty of evidence for this outcome was judged to be moderate (we downgraded our assessment by one level for imprecision).

We are uncertain whether primary closure improves the proportion of dog bite wounds that are infection-free compared with delayed closure, as the evidence for this outcome was judged to be very low (RR 0.98, 95% CI 0.90 to 1.07; 1 study, 120 participants; I2 = 0%). We downgraded the evidence by one level for high risk of bias and two levels for imprecision.

None of the four trials reported any adverse outcomes such as death or rabies but they were, in any case, unlikely to have been large enough to have satisfactory power to provide precise estimates for these. Important outcomes like time to complete wound healing, proportion of wounds healed, and length of hospital stay were not evaluated.

Authors' conclusions: All the studies we identified concerned dog bites. There is no high-certainty evidence to support or refute existing recommendations concerning primary closure for dog bites. The potential benefits and harms of primary closure compared with delayed or no closure for mammalian bites remain uncertain and more robust trials are needed.

Plain language summary

Primary closure (immediate stitches) versus delayed closure (delayed stitches) or no closure (no stitches) for traumatic wounds due to mammalian bite

What is the aim of this review? The aim of this review was to find out whether animal bite wounds heal better when they are closed with stitches straight away (primary closure), or if the wounds are left open to heal for a short time before closure (delayed closure) or not stitched at all (no closure). We wanted to find out which wounds healed fastest, and if the method of closure affected the likelihood of wound infection, the appearance of the scar, the length of time patients were in hospital, and more serious side effects such as death. To answer this question, we collected and analysed all relevant studies (randomised controlled trials). Randomised controlled trials are medical studies where people are chosen at random to receive different treatments. This type of trial provides the most reliable health evidence. We found four relevant studies.

Key messages: All the studies we found concerned dog bites. In terms of wound infection, we cannot be certain whether it is better to close dog bite wounds straight away, or wait a while before stitching, or leave them with no stitches. There was little difference in the appearance of the bite scar. Most of the evidence we found was of low certainty due to the size of the studies and the methods used.

What was studied in the review? Mammalian bite wounds from animals such as dogs, cats and monkeys are a common problem throughout the world. In developed countries, many bite wounds are caused by domestic pets. In lower-income countries bites can also be caused by wild animals. Dogs are generally responsible for the majority of bites. Bite wounds are at high risk of infection as microbes are transmitted into the wound from the animal's mouth. In lower-income countries these wound infections can lead to serious complications and in some cases death.

The first priorities when treating an animal bite are to stop the flow of blood from the wound, provide pain relief, and prevent infection. This can include appropriate vaccination against tetanus and rabies. It is often recommended that bite wounds are not stitched straight away if infection is suspected, as closing an infected wound could delay healing and be potentially fatal.

What are the main results of the review? In July 2019 we searched for randomised controlled trials comparing primary closure versus delayed or no closure for mammalian bite wounds. We found four relevant studies on dog bites. They were carried out in the UK, Greece and China. No other mammalian bite studies were identified. Three of the studies we included compared primary closure with sutures (immediate stitches) with no closure for dog bite wounds. One study compared primary closure with delayed closure for dog bites. The people in the studies were followed, where stated, from 14 days to three months. Overall, participants from both sexes and all age groups were represented.

We are uncertain whether primary closure of dog bite wounds increases the proportion of wounds which are infection-free compared with no closure (very low-certainty evidence from two studies including a total of 782 people) and compared with delayed closure (very low-certainty evidence from one study with a total of 120 people). There is little difference in the appearance of dog bite wounds when primary closure is compared with no closure (moderate-certainty evidence from one study with a total of 182 participants). None of the included ▶

studies reported proportion of wounds healed, the time to complete wound healing, length of hospital stay or adverse events. The number of people in the included studies was small, and the people who assessed the outcomes were aware of which treatment had been given. Both of these are reasons why the results are uncertain.

How up to date is this review? We searched for studies that had been published up to July 2019.

Publication in The Cochrane Library Issue 1, 2020

Electrical stimulation for treating pressure ulcers

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Citation example: Arora M, Harvey LA, Glinsky JV, Nier L, Lavrencic L, Kifley A, Cameron ID. Electrical stimulation for treating pressure ulcers. Cochrane Database of Systematic Reviews 2020, Issue 1. Art. No.: CD012196. DOI: 10.1002/14651858.CD012196.pub2.

ABSTRACT

Background: Pressure ulcers (also known as pressure sores, decubitus ulcers or bedsores) are localised injuries to the skin or underlying tissue, or both. Pressure ulcers are a disabling consequence of immobility. Electrical stimulation (ES) is widely used for the treatment of pressure ulcers. However, it is not clear whether ES is effective.

Objectives: To determine the effects (benefits and harms) of electrical stimulation (ES) for treating pressure ulcers.

Search methods: In July 2019 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. We did not impose any restrictions with respect to language, date of publication or study setting.

Selection criteria: We included published and unpublished randomised controlled trials (RCTs) comparing ES (plus standard care) with sham/no ES (plus standard care) for treating pressure ulcers.

Data collection and analysis: Two review authors independently selected trials for inclusion, extracted data, and assessed risk of bias. We assessed the certainty of evidence using GRADE.

Main results: We included 20 studies with 913 participants. The mean age of participants ranged from 26 to 83 years; 50% were male. ES was administered for a median (interquartile range (IQR)) duration of five (4 to 8) hours per week. The chronicity of the pressure ulcers was variable, ranging from a mean of four days to more than 12 months. Most of the pressure ulcers were on the sacral and coccygeal region (30%), and most were stage III (45%). Half the studies were at risk of performance and detection bias, and 25% were at risk of attrition and selective reporting bias. Overall, the GRADE assessment of the certainty of evidence for outcomes was moderate to very low. Nineteen studies were conducted in four different settings, including rehabilitation and geriatric hospitals, medical centres, a residential care centre, and a community-based centre.

ES probably increases the proportion of pressure ulcers healed compared with no ES (risk ratio (RR) 1.99, 95% confidence interval (CI) 1.39 to 2.85; I2 = 0%; 11 studies, 501 participants (512 pressure ulcers)). We downgraded the evidence to moderate certainty due to risk of bias.

It is uncertain whether ES decreases pressure ulcer severity on a composite measure compared with no ES (mean difference (MD) -2.43, 95% CI -6.14 to 1.28; 1 study, 15 participants (15 pressure ulcers) and whether ES decreases the surface area of pressure ulcers when compared with no ES (12 studies; 494 participants (505 pressure ulcers)). Data for the surface area of pressure ulcers were not pooled because there was considerable statistical heterogeneity between studies (I2 = 96%) but the point estimates for the MD of each study ranged from -0.90 cm2 to 10.37 cm^2. We downgraded the evidence to very low certainty due to risk of bias, inconsistency and imprecision.

It is uncertain whether ES decreases the time to complete healing of pressure ulcers compared with no ES (hazard ratio (HR) 1.06, 95% CI 0.47 to 2.41; I2 = 0%; 2 studies, 55 participants (55 pressure ulcers)). We downgraded the evidence to very low certainty due to risk of bias, indirectness and imprecision.

ES may be associated with an excess of, or difference in, adverse events (13 studies; 586 participants (602 pressure ulcers)). Data for adverse events were not pooled but the types of reported adverse events included skin redness, itchy skin, dizziness and delusions, deterioration of the pressure ulcer, limb amputation, and occasionally death. We downgraded the evidence to low certainty due to risk of selection and attrition bias and imprecision.

ES probably increases the rate of pressure ulcer healing compared with no ES (MD 4.59% per week, 95% CI 3.49 to 5.69; I2 = 25%; 12 studies, 561 participants (613 pressure ulcers)). We downgraded the evidence to moderate certainty due to risk of bias. We did not find any studies that looked at quality of life, depression, or consumers' perception of treatment effectiveness.

Authors' conclusions: ES probably increases the proportion of pressure ulcers healed and the rate of pressure ulcer healing (moderate certainty evidence), but its effect on time to complete healing is uncertain compared with no ES (very low certainty evidence). It is also uncertain whether ES decreases the surface area of pressure ulcers. The evidence to date is insufficient to support the widespread use of ES for pressure ulcers outside of research. Future research needs to focus on large-scale trials to determine the effect of ES on all key outcomes.

Plain language summary

Is electrical stimulation effective for treating pressure ulcers?

What is the aim of this review? The aim of this review was to find out whether electrical stimulation (ES; an electrical current applied to the skin) can help heal pressure ulcers. We collected and analysed all relevant studies (randomised controlled trials) to answer this question and found 20 relevant studies.

Key messages: ES compared with no ES probably increases the proportion of pressure ulcers healed and the rate of pressure ulcer healing (moderate certainty evidence) but its effect on time to complete healing and the surface area of pressure ulcers is uncertain (very low certainty evidence). The most commonly reported side effects of ES were reddening of the skin and discomfort. There is a need for better quality research to determine whether ES is safe and effective.

What was studied in the review? Pressure ulcers (also known as pressure sores, bed sores or pressure injuries) are injuries to the skin and/or underlying tissue caused by sustained pressure over bony parts of the body such as the hips, heels or lower back. People with reduced mobility due to age, disability or illness are at risk of developing pressure ulcers.

ES is provided by an electrical current that can be applied to the skin in different ways. ES requires the placing of at least two small electrodes on the skin connected to a small battery-powered device which controls the intensity of the current. ES can be delivered either as a direct or pulsed current. It causes a tingling or vibratory sensation in most people except those who cannot feel due to conditions such as spinal cord injury. We reviewed the evidence about whether ES affects the number of pressure ulcers healed, the size and severity of the pressure ulcers, the time to complete healing, and quality of life. We also wanted to find out about any side effects associated with ES.

What are the main results of the review? This review includes the results of 20 randomised controlled trials dating from 1985 to 2018 and involving 913 participants. The average age of participants ranged from 26 to 83 years; 50% were male. Participants had their pressure ulcers for at least four days and in some cases for more than 12 months. The majority of pressure ulcers (60%) were serious and on or adjacent to the buttocks (62%). Studies were conducted in four different settings, including rehabilitation and geriatric hospitals, medical centres, a residential care centre, and a community-based centre. ES was administered for an average of five hours per week. Studies compared ES plus usual care (e.g. wound dressing, pressure relief, regular turning, nutritional advice and supplements) to no ES (but with usual care). Eight studies out of 20 were funded by a device manufacturer with a vested interest in the results of the studies.

Eleven studies that compared ES with no ES indicated that ES probably improves the proportion of pressure ulcers healed (moderate certainty evidence based on 501 participants (512 pressure ulcers)). It is uncertain whether ES decreases pressure ulcer severity on a composite measure (based on 1 study with 15 participants (15 pressure ulcers)). The effect of ES on pressure ulcer area was not estimable because different studies showed very different results. It is uncertain whether ES decreases the surface area of pressure ulcers (very low certainty evidence based on 494 participants (505 pressure ulcers)). We cannot be certain whether ES has an effect on time to complete healing (very low certainty evidence based on 55 participants (55 pressure ulcers)). The common complications related to ES were skin redness and discomfort (low certainty evidence based on 586 participants (602 pressure ulcers)). Twelve studies also indicated that ES probably increases the rate of pressure ulcer healing (moderate certainty evidence based on 561 participants (613 pressure ulcers)). No studies reported results for quality of life or depression.

How up-to-date is this review? We searched for studies that had been published up to July 2019.

Publication in The Cochrane Library Issue 4, 2020

Subcuticular sutures for skin closure in non-obstetric surgery

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Citation example: Goto S, Sakamoto T, Ganeko R, Hida K, Furukawa TA, Sakai Y. Subcuticular sutures for skin closure in non-obstetric surgery. Cochrane Database of Systematic Reviews 2020, Issue 4. Art. No.: CD012124. DOI: 10.1002/14651858.CD012124.pub2.

ABSTRACT

Background: Following surgery, surgical wounds can be closed using a variety of devices including sutures (subcuticular or transdermal), staples and tissue adhesives. Subcuticular sutures are intradermal stitches (placed immediately below the epidermal layer). The increased availability of synthetic absorbable filaments (stitches which are absorbed by the body and do not have to be removed) has led to an increased use of subcuticular sutures. However, in non-obstetric surgery, there is still controversy about whether subcuticular sutures increase the incidence of wound complications.

Objectives: To examine the efficacy and acceptability of subcuticular sutures for skin closure in non-obstetric surgery.

Search methods: In March 2019, 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: All randomised controlled trials which compared subcuticular sutures with any other methods for skin closure in non-obstetric surgery were included in the review.

Data collection and analysis: Two review authors independently identified the trials, extracted data and carried out risk of bias and GRADE assessment of the certainty of the evidence.

Main results: We included 66 studies (7487 participants); 11 included trials had more than two arms. Most trials had poorly-reported methodology, meaning that it is unclear whether they were at high risk of bias. Most trials compared subcuticular sutures with transdermal sutures, skin staples or tissue adhesives. Most outcomes prespecified in the review protocol were reported. The certainty of evidence varied from high to very low in the comparisons of subcuticular sutures with transdermal sutures or staples and tissue adhesives; the certainty of the evidence for the comparison with surgical tapes and zippers was low to very low. Most evidence was downgraded for imprecision or risk of bias.

Although the majority of studies enrolled people who underwent CDC class 1 (clean) surgeries, two-thirds of participants were enrolled in studies which included CDC class 2 to 4 surgeries, such as appendectomies and gastrointestinal surgeries. Most participants were adults in a hospital setting.

Subcuticular sutures versus transdermal sutures: There may be little difference in the incidence of SSI (risk ratio (RR) 1.10; 95% confidence interval (CI) 0.80 to 1.52; 3107 participants; low-certainty evidence).

It is uncertain whether subcuticular sutures reduce wound complications (RR 0.83; 95% CI 0.40 to 1.71; 1489 participants; very low-certainty evidence). Subcuticular sutures probably improve patient satisfaction (score from 1 to 10) (at 30 days; MD 1.60, 95% CI 1.32 to 1.88; 290 participants; moderate-certainty evidence). Wound closure time is probably longer when subcuticular sutures are used (MD 5.81 minutes; 95% CI 5.13 to 6.49 minutes; 585 participants; moderate-certainty evidence).

Subcuticular sutures versus skin staples: There is moderate-certainty evidence that, when compared with skin staples, subcuticular sutures probably have little effect on SSI (RR 0.81, 95% CI 0.64 to 1.01; 4163 participants); but probably decrease the incidence of wound complications (RR 0.79, 95% CI 0.64 to 0.98; 2973 participants). Subcuticular sutures are associated with slightly higher patient satisfaction (score from 1 to 5) (MD 0.20, 95% CI 0.10 to 0.30; 1232 participants; high-certainty evidence). Wound closure time may also be longer compared with staples (MD 0.30 to 5.50 minutes; 1384 participants; low-certainty evidence).

Subcuticular sutures versus tissue adhesives, surgical tapes and zippers: There is moderate-certainty evidence showing no clear difference in the incidence of SSI between participants treated with subcuticular sutures and those treated with tissue adhesives (RR 0.77, 95% CI 0.41 to 1.45; 869 participants). There is also no clear difference in the incidence of wound complications (RR 0.62, 95% CI 0.35 to 1.11; 1058 participants; low-certainty evidence). Subcuticular sutures may also achieve lower patient satisfaction ratings (score from 1 to 10) (MD -2.05, 95% CI -3.05 to -1.05; 131 participants) (low-certainty evidence). In terms of SSI incidence, the evidence is uncertain when subcuticular sutures are compared with surgical tapes (RR 1.31, 95% CI 0.40 to 4.27; 354 participants; very low-certainty evidence) or surgical zippers (RR 0.80, 95% CI 0.08 to 8.48; 424 participants; very low-certainty evidence). There may be little difference in the incidence of wound complications between participants treated with subcuticular sutures and those treated with surgical tapes (RR 0.90, 95% CI 0.61 to 1.34; 492 participants; low-certainty evidence). It is uncertain whether subcuticular sutures reduce the risk of wound complications compared with surgical zip-

pers (RR 0.55, 95% CI 0.15 to 2.04; 424 participants; very low-certainty evidence). It is also uncertain whether it takes longer to close a wound with subcuticular sutures compared with tissue adhesives (MD -0.34 to 10.39 minutes; 895 participants), surgical tapes (MD 0.74 to 6.36 minutes; 169 participants) or zippers (MD 4.38 to 8.25 minutes; 424 participants) (very low-certainty evidence). No study reported results for patient satisfaction compared with surgical tapes or zippers.

Authors' conclusions: There is no clear difference in the incidence of SSI for subcuticular sutures in comparison with any other skin closure methods. Subcuticular sutures probably reduce wound complications compared with staples, and probably improve patient satisfaction compared with transdermal sutures or staples. However, tissue adhesives may improve patient satisfaction compared with subcuticular sutures, and transdermal sutures and skin staples may be quicker to apply than subcuticular sutures. The quality of the evidence ranged from high to very low; evidence for almost all comparisons was subject to some limitations. There seems to be no need for additional new trials to explore the comparison with staples because there are high-quality studies with large sample sizes and some ongoing studies. However, there is a need for studies exploring the comparisons with transdermal sutures, tissue adhesives, tapes and zippers, with high-quality studies and large sample sizes, including long-term assessments.

Plain language summary

Stitches that go under the skin for closing wounds after surgery

What is the aim of this review? The aim of this review was to find out whether subcuticular sutures (stitches placed under the skin) are effective for closing wounds after surgery. We were interested in all types of surgery except obstetric surgery (operations related to childbirth, e.g. caesarean sections). Cochrane researchers collected and analysed all studies related to this question and found 66 relevant randomised controlled trials. Randomised controlled trials are medical studies where patients are chosen at random to receive different treatments. This type of trial provides the most reliable health evidence.

Key messages: In terms of wound infection following surgery, there is no clear difference between stitches that go under the skin and other methods of closing surgical wounds, such as standard stitches that go over the skin, surgical tape, staples, or glue. Stitches that go under the skin probably reduce wound complications compared with staples and improve patient satisfaction compared with stitches that go over the skin or staples. However, glue may improve patient satisfaction, and stitches that go over the skin and staples may be quicker for surgeons.

What was studied in the review? Surgeons have various options for closing surgical wounds at the end of an operation. Skin closure can be carried out with stitches (sutures) that go under the skin, stitches that go over the skin, staples (clips), tissue adhesives (glue), tapes or other devices. Sutures can be absorbable (the stitches dissolve into the body as part of the healing process and do not need removing) or non-absorbable (the stitches need removing once the wound has healed).

Surgical site infections are a common problem after surgery and can cause a range of problems for patients. Surgical wounds can also cause unsightly scars if they do not heal correctly. We wanted to find out how stitches that go under the skin compare with other methods of closing surgical wounds in terms of infection, scarring, patient satisfaction, cost, pain, length of hospital stay and quality of life.

What are the main results of the review? In March 2019, we searched medical databases and identified 66 studies that compared stitches that go under the skin with other methods of skin closure such as standard stitches, skin staples, tissue adhesive, tape, or surgical zippers. Sixty-four of these studies (involving 7487 participants) were used in our analysis. On average, each study involved 115 people. Most participants were adults (20 to 75 years) undergoing surgery in a hospital setting. Most studies did not state funding sources.

The majority of studies compared stitches that go under the skin with standard stitches, skin staples or tissue adhesives.

The main outcome of interest was whether wounds became infected. There was no clear difference between stitches that go under the skin and other closure methods in the number of people whose wounds became infected.

Compared with stitches that go over the skin, stitches that go under skin probably improve patient satisfaction. There is evidence that stitches that go under the skin probably prevent wound complications and improve patient satisfaction compared with skin staples. Stitches that go under the skin may prevent wound breakdown (skin separation) compared with staples or tissue adhesives, but tissue adhesives may improve patient satisfaction. However, alternative methods may be quicker for surgeons to use than stitches that go under the skin. There was no clear difference between stitches that go under the skin and the alternative closure methods for re-closure, pain, length of hospital stay and quality of life.

The studies we analysed often involved small numbers of participants and, in many cases, were not reported in a way that meant we could be sure they had been conducted robustly. We cannot, therefore, make conclusive

statements about the effectiveness of stitches that go under the skin, and for all comparisons except the comparison with staples, better quality research is needed to form stronger conclusions.

How up to date is this review? We searched for studies that had been published up to March 2019.

Publication in The Cochrane Library Issue 6, 2020

Repositioning for pressure injury prevention in adults

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Citation example: Gillespie BM, Walker RM, Latimer SL, Thalib L, Whitty JA, McInnes E, Chaboyer WP. Repositioning for pressure injury prevention in adults. Cochrane Database of Systematic Reviews 2020, Issue 6. Art. No.: CD009958. DOI: 10.1002/14651858.CD009958.pub3.

ABSTRACT

Background: A pressure injury (PI), also referred to as a 'pressure ulcer', or 'bedsore', is an area of localised tissue damage caused by unrelieved pressure, friction, or shearing on any part of the body. Immobility is a major risk factor and manual repositioning a common prevention strategy. This is an update of a review first published in 2014.

Objectives: To assess the clinical and cost effectiveness of repositioning regimens(i.e. repositioning schedules and patient positions) on the prevention of PI in adults regardless of risk in any setting.

Search methods: We searched the Cochrane Wounds Specialised Register, the Cochrane Central Register of Controlled Trials (CENTRAL), Ovid MEDLINE, Ovid Embase, and EBSCO CINAHL Plus on 12 February 2019. We also searched clinical trials registries for ongoing and unpublished studies, and scanned the reference lists of 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: Randomised controlled trials (RCTs), including cluster-randomised trials (c-RCTs), published or unpublished, that assessed the effects of any repositioning schedule or different patient positions and measured PI incidence in adults in any setting.

Data collection and analysis: Three review authors independently performed study selection, 'Risk of bias' assessment, and data extraction. We assessed the certainty of the evidence using GRADE.

Main results: We identified five additional trials and one economic substudy in this update, resulting in the inclusion of a total of eight trials involving 3941 participants from acute and long-term care settings and two economic substudies in the review. Six studies reported the proportion of participants developing PI of any stage. Two of the eight trials reported within-trial cost evaluations. Follow-up periods were short (24 hours to 21 days). All studies were at high risk of bias. Funding sources were reported in five trials.

Primary outcomes: proportion of new PI of any stage

Repositioning frequencies: three trials compared different repositioning frequencies

We pooled data from three trials (1074 participants) comparing 2-hourly with 4-hourly repositioning frequencies (fixed-effect; I^2 = 45%; pooled risk ratio (RR) 1.06, 95% confidence interval (CI) 0.80 to 1.41). It is uncertain whether 2-hourly repositioning compared with 4-hourly repositioning used in conjunction with any support surface increases or decreases the incidence of PI. The certainty of the evidence is very low due to high risk of bias, downgraded twice for risk of bias, and once for imprecision.

One of these trials had three arms (967 participants) comparing 2-hourly, 3-hourly, and 4-hourly repositioning regimens on high-density mattresses; data for one comparison was included in the pooled analysis. Another comparison was based on 2-hourly versus 3-hourly repositioning. The RR for PI incidence was 4.06 (95% CI 0.87 to 18.98). The third study comparison was based on 3-hourly versus 4-hourly repositioning (RR 0.20, 95% CI 0.04 to 0.92). The certainty of the evidence is low due to risk of bias and imprecision.

In one c-RCT, 262 participants in 32 ward clusters were randomised between 2-hourly and 3-hourly repositioning on standard mattresses and 4-hourly and 6-hourly repositioning on viscoelastic mattresses. The RR for PI with 2-hourly repositioning compared with 3-hourly repositioning on standard mattress is imprecise (RR 0.90, 95% CI 0.69 to 1.16; very low-certainty evidence). The CI for PI include both a large reduction and no difference for the comparison of 4-hourly and 6-hourly repositioning on viscoelastic foam (RR 0.73, 95% CI 0.53 to 1.02). The certainty of the evidence is very low, downgraded twice due to high risk of bias, and once for imprecision.

Positioning regimens: four trials compared different tilt p ositions

We pooled data from two trials (252 participants) that compared a 30° tilt with a 90° tilt (random-effects; I^2 = 69%). There was no clear difference in the incidence of stage 1 or 2 PI. The effect of tilt is uncertain because the certainty of evidence is very low (pooled RR 0.62, 95% CI 0.10 to 3.97), downgraded due to serious design limitations and very serious imprecision.

One trial involving 120 participants compared 30° tilt and 45° tilt with 'usual care' and reported no occurrence of PI events (low certainty evidence). Another trial involving 116 ICU patients compared prone with the usual supine positioning for PI. Reporting was incomplete and this is low certainty evidence.

Secondary outcomes: No studies reported health-related quality of life utility scores, procedural pain, or patient satisfaction.

Cost analysis: Two included trials also performed economic analyses.

A cost-minimisation analysis compared the costs of 3-hourly and 4-hourly repositioning with 2-hourly repositioning schedule amongst nursing home residents. The cost of repositioning was estimated at CAD 11.05 and CAD 16.74 less per resident per day for the 3-hourly or 4-hourly regimen, respectively, compared with the 2-hourly regimen. The estimates of economic benefit were driven mostly by the value of freed nursing time. The analysis assumed that 2-, 3-, or 4-hourly repositioning is associated with a similar incidence of PI, as no difference in incidence was observed.

A second study compared the nursing time cost of 3-hourly repositioning using a 30° tilt with standard care (6-hourly repositioning with a 90° lateral rotation) amongst nursing home residents. The intervention was reported to be cost-saving compared with standard care (nursing time cost per patient EUR 206.60 versus EUR 253.10, incremental difference EUR –46.50, 95% CI EUR –1.25 to EUR –74.60).

Authors' conclusions: Despite the addition of five trials, the results of this update are consistent with our earlier review, with the evidence judged to be of low or very low certainty. There remains a lack of robust evaluations of repositioning frequency and positioning for PI prevention and uncertainty about their effectiveness. Since all comparisons were underpowered, there is a high level of uncertainty in the evidence base.

Given the limited data from economic evaluations, it remains unclear whether repositioning every three hours using the 30° tilt versus "usual care" (90° tilt) or repositioning 3-to-4-hourly versus 2-hourly is less costly relative to nursing time.

Plain language summary

Repositioning to prevent pressure injuries

What was the aim of this review? The aim of this review was to compare different positions and repositioning frequencies to find out which were the most effective in preventing pressure injuries in adults regardless of risk or healthcare setting. We collected and analysed all relevant studies (i.e. randomised controlled trials, a type of study in which participants are assigned to one of two or more treatment groups using a random method, and which provides the most reliable health evidence) to answer this question and found eight relevant trials and two economic evaluations.

We found the effectiveness of repositioning frequencies to be unclear in the 2014 version of this review. This update includes the results of new trials conducted since that time.

Key messages: There is no clear evidence regarding which particular positions and repositioning frequencies are the most effective for preventing pressure injuries in adults. This is partly due to the low quality of the studies, most of which had small numbers of participants and were lacking in details about study methods. There is also limited evidence to support the cost-effectiveness of different repositioning frequencies and positions. There is a need for further research to measure the effects of repositioning on pressure injury development and to find the best repositioning regimen relative to frequency and position.

What was studied in this review? Pressure injuries, also called pressure ulcers, pressure sores, decubitus ulcers, and bedsores, are caused by pressure and rubbing on the bony weight-bearing points of the body. A pressure injury is indicated by an area of localised damage to the skin or underlying tissue over a bony prominence. Pressure injuries occur most commonly in the elderly, or those who are immobile.

Repositioning is one strategy used alongside other strategies to prevent the development of pressure injuries. Repositioning involves moving the person into a different position to redistribute pressure from a particular part of the body. We wanted to know which repositioning regimen was most effective in preventing pressure injuries in adults. We looked at the effect of different repositioning on peoples' perceived satisfaction, pain, and quality of life. We were also interested in comparing the cost-effectiveness of different repositioning approaches.

What were the main results of this review? We identified eight clinical trials and two economic analyses published between 2004 and 2018 involving 3941 participants. Participant age ranged from 55 to 90 years. Three clinical trials compared repositioning frequencies using

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2-, 3-, 4-, or 6-hourly repositioning. Three other trials compared different tilt positions.

Two included trials also included cost-effectiveness analyses. No studies reported health-related quality of life, procedural pain, or patient satisfaction.

The evidence to support the use of one particular repositioning frequency and position over another to prevent pressure injuries is low in quality and limited in amount, therefore which position or frequency of repositioning is the most effective in reducing pressure injury development is unclear. None of the included trials reported on participant pain, satisfaction, or quality of life. Results were inconclusive, and the certainty of the evidence in the included trials is low to very low.

How up-to-date is this review? We searched for studies published up to February 2019.

Publication in The Cochrane Library Issue 6, 2020

Negative pressure wound therapy for surgical wounds healing by primary closure

Gill Norman, En Lin Goh, Jo C Dumville, Chunhu Shi, Zhenmi Liu, Laura Chiverton, Monica Stankiewicz, Adam Reid

Citation example: Norman G, Goh EL, Dumville JC, Shi C, Liu Z, Chiverton L, Stankiewicz M, Reid A. Negative pressure wound therapy for surgical wounds healing by primary closure. Cochrane Database of Systematic Reviews 2020, Issue 6. Art. No.: CD009261. DOI: 10.1002/14651858.CD009261.pub6.

ABSTRACT

Background: Indications for the use of negative pressure wound therapy (NPWT) are broad and include prophylaxis for surgical site infections (SSIs). Existing evidence for the effectiveness of NPWT on postoperative wounds healing by primary closure remains uncertain.

Objectives: To assess the effects of NPWT for preventing SSI in wounds healing through primary closure, and to assess the cost-effectiveness of NPWT in wounds healing through primary closure.

Search methods: In June 2019, 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 and references of included studies, systematic reviews and health technology reports. There were no restrictions on language, publication date or study setting.

Selection criteria: We included trials if they allocated participants to treatment randomly and compared NPWT with any other type of wound dressing, or compared one type of NPWT with another type of NPWT.

Data collection and analysis: At least two review authors independently assessed trials using predetermined inclusion criteria. We carried out data extraction, assessment using the Cochrane 'Risk of bias' tool, and quality assessment according to Grading of Recommendations, Assessment, Development and Evaluations methodology.

Main results: In this third update, we added 15 new randomised controlled trials (RCTs) and three new economic studies, resulting in a total of 44 RCTs (7447 included participants) and five economic studies. Studies evaluated NPWT in the context of a wide range of surgeries including orthopaedic, obstetric, vascular and general procedures. Economic studies assessed NPWT in orthopaedic, obstetric and general surgical settings. All studies compared NPWT with standard dressings. Most studies had unclear or high risk of bias for at least one key domain.

Primary outcomes: Four studies (2107 participants) reported mortality. There is low-certainty evidence (downgraded twice for imprecision) showing no clear difference in the risk of death after surgery for people treated with NPWT (2.3%) compared with standard dressings (2.7%) (risk ratio (RR) 0.86; 95% confidence interval (CI) 0.50 to 1.47; I2 = 0%). Thirty-nine studies reported SSI; 31 of these (6204 participants), were included in meta-analysis. There is moderate-certainty evidence (downgraded once for risk of bias) that NPWT probably results in fewer SSI (8.8% of participants) than treatment with standard dressings (13.0% of participants) after surgery; RR 0.66 (95% CI 0.55 to 0.80 ; I2 = 23%). Eighteen studies reported dehiscence; 14 of these (3809 participants) were included in meta-analysis. There is low-certainty evidence (downgraded once for risk of bias and once for imprecision) showing no clear difference in the risk of dehiscence after surgery for NPWT (5.3% of participants) compared with standard dressings (6.2% of participants) (RR 0.88, 95% CI 0.69 to 1.13; I2 = 0%).

Secondary outcomes: There is low-certainty evidence showing no clear difference between NPWT and standard treatment for the outcomes of reoperation and incidence of seroma. For reoperation, the RR was 1.04 (95% CI 0.78 to 1.41; I2 = 13%; 12 trials; 3523 participants); for seroma, the RR was 0.72 (95% CI 0.50 to 1.05; I2 = 0%; seven trials; 729 participants). The effect of NPWT on occurrence of haematoma or skin blisters is uncertain (very low-certainty evidence); for haematoma, the RR

was 0.67 (95% CI 0.28 to 1.59; I2 = 0%; nine trials; 1202 participants) and for blisters the RR was 2.64 (95% CI 0.65 to 10.68; I2 = 69%; seven trials; 796 participants). The overall effect of NPWT on pain is uncertain (very low-certainty evidence from seven trials (2218 participants) which reported disparate measures of pain); but moderate-certainty evidence suggests there is probably little difference between the groups in pain after three or six months following surgery for lower limb fracture (one trial, 1549 participants). There is also moderate-certainty evidence for women undergoing caesarean sections (one trial, 876 participants) and people having surgery for lower limb fractures (one trial, 1549 participants) that there is probably little difference in quality of life scores at 30 days or 3 or 6 months, respectively.

Cost-effectiveness: Five economic studies, based wholly or partially on trials included in our review, assessed the cost-effectiveness of NPWT compared with standard care. They considered NPWT in four indications: caesarean sections in obese women; surgery for lower limb fracture; knee/hip arthroplasty and coronary artery bypass graft surgery. They calculated quality-adjusted life-years for treatment groups and produced estimates of the treatments' relative cost-effectiveness. The reporting quality was good but the grade of the evidence varied from moderate to very low. There is moderate-certainty evidence that NPWT in surgery for lower limb fracture was not cost-effective at any threshold of willingness-to-pay and that NPWT is probably cost-effective in obese women undergoing caesarean section. Other studies found low or very low-certainty evidence indicating that NPWT may be cost-effective for the indications assessed.

Authors' conclusions: People experiencing primary wound closure of their surgical wound and treated prophylactically with NPWT following surgery probably experience fewer SSI than people treated with standard dressings (moderate-certainty evidence). There is no clear difference in number of deaths or wound dehiscence between people treated with NPWT and standard dressings (low-certainty evidence). There are also no clear differences in secondary outcomes where all evidence was low or very low-certainty. In caesarean section in obese women and surgery for lower limb fracture, there is probably little difference in quality of life scores (moderate-certainty evidence). Most evidence on pain is very low-certainty, but there is probably no difference in pain between NPWT and standard dressings after surgery for lower limb fracture (moderate-certainty evidence). Assessments of cost-effectiveness of NPWT produced differing results in different indications. There is a large number of ongoing studies, the results of which may change the findings of this review. Decisions about use of NPWT should take into account surgical indication and setting and consider evidence for all outcomes.

Plain language summary

Negative pressure wound therapy for surgical wounds healing by primary closure

What is the aim of this review? The aim of this Cochrane Review was to find out if negative pressure wound therapy (NPWT) has an effect on complications including infections in surgical wounds which are healing by primary closure (where the edges have been brought together, usually by using stitches or staples) and to assess its cost-effectiveness. We collected and analysed all relevant studies to answer this question and found 44 studies analysing NPWT and surgical site complications, and five studies analysing cost-effectiveness. This is a new update of a Cochrane review which was last updated in March 2019.

Key messages: NPWT probably reduces the incidence of surgical site infection (SSI) in surgical wounds healing by primary closure – this is moderate-certainty evidence and new studies could change this finding. It is not clear what effect NPWT has on reopening of the wound ("dehiscence") and risk of death - this is low-certainty evidence. Results for other complications also show no clear difference with NPWT treatment. NPWT is probably cost-effective for caesarean section wounds in obese women and probably not cost-effective for fracture surgery wounds. Evidence for the cost-effectiveness of NPWT in other surgical wounds is less certain.

What was studied in the review? A potential complication of surgery is the development of SSI which can occur at the site of a surgical incision. The incidence of SSI can be as high as 40%, with an increased infection risk linked with age, diet, weight, diabetes, heart disease and cancer. An SSI can cause pain and discomfort, as well as increasing a person's length of hospital stay and cost of treatment. Dehiscing (separation of wound edges) may occur if a wound fails to heal. Wound infection and weight can increase the risk of dehiscence.

NPWT is a sealed wound dressing attached to a vacuum pump which sucks fluid away from the wound. This may assist with wound healing and reduce risk of infection.

There has been a large number of new studies over the last decade as NPWT is increasingly being assessed for different surgical wound types. We assessed the effect of NPWT on risk of death, SSI and dehiscence.

What are the main results of the review? We found 44 studies analysing NPWT and surgical site complications and five studies analysing cost-effectiveness of NPWT. A total of 7447 participants have been included in the review. A wide variety of surgeries are included such as knee and hip operations, caesarean sections, operations for broken bones and abdominal surgeries. Most partici-

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pants were enrolled in North America, Europe or Australasia.

NPWT was compared with a standard dressing (e.g. gauze) in all 44 studies. A variety of NPWT systems was used. Only four studies reported risk of death; little difference was shown between NPWT and standard dressing and the evidence is low certainty. We pooled the SSI results of 31 studies; NPWT probably reduces the risk of SSI compared with standard dressings (moderate-certainty evidence). Fourteen studies which reported on dehiscence were combined; the low-certainty evidence suggests no clear difference between NPWT and standard care.

In the cost-effectiveness analysis, two studies looked at women with caesarean sections, one looked at people with lower limb fractures, one at knee and hip surgeries, and one at heart surgery. All these studies used clinical information from studies included in this review. There is moderate-certainty evidence that NPWT is probably cost-effective for caesarean section wounds in obese women and probably not cost-effective for fracture surgery wounds. Evidence for the cost-effectiveness of NPWT in other surgical wounds is low or very low-certainty.

How up to date is this review? We searched for studies that had been published up to June 2019.

Publication in The Cochrane Library Issue 7, 2020

Nutritional interventions for treating foot ulcers in people with diabetes

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Citation example: Moore ZEH, Corcoran MA, Patton D. Nutritional interventions for treating foot ulcers in people with diabetes. Cochrane Database of Systematic Reviews 2020, Issue 7. Art. No.: CD011378. DOI: 10.1002/14651858.CD011378.pub2.

ABSTRACT

Background: Foot ulcers in people with diabetes are non-healing, or poorly healing, partial, or full-thickness wounds below the ankle. These ulcers are common, expensive to manage and cause significant morbidity and mortality. The presence of a wound has an impact on nutritional status because of the metabolic cost of repairing tissue damage, in addition to the nutrient losses via wound fluid. Nutritional interventions may improve wound healing of foot ulcers in people with diabetes.

Objectives: To evaluate the effects of nutritional interventions on the healing of foot ulcers in people with diabetes.

Search methods: In March 2020 we searched the Cochrane Wounds Specialised Register; the Cochrane Central Register of Controlled Trials (CENTRAL); Ovid MEDLINE; 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: We included randomised controlled trials (RCTs) that evaluated the effect of nutritional interventions on the healing of foot ulcers in people with diabetes.

Data collection and analysis: Two review authors, working independently, assessed included RCTs for their risk of bias and rated the certainty of evidence using GRADE methodology, using pre-determined inclusion and quality criteria.

Main results: We identified nine RCTs (629 participants). Studies explored oral nutritional interventions as follows: a protein (20 g protein per 200 mL bottle), 1 kcal/mL ready-to-drink, nutritional supplement with added vitamins, minerals and trace elements; arginine, glutamine and β-hydroxy-β-methylbutyrate supplement; 220 mg zinc sulphate supplements; 250 mg magnesium oxide supplements; 1000 mg/day omega-3 fatty acid from flaxseed oil; 150,000 IU of vitamin D, versus 300,000 IU of vitamin D; 250 mg magnesium oxide plus 400 IU vitamin E and 50,000 IU vitamin D supplements. The comparator in eight studies was placebo, and in one study a different dose of vitamin D.

Eight studies reported the primary outcome measure of ulcer healing; only two studies reported a measure of complete healing. Six further studies reported measures of change in ulcer dimension, these studies reported only individual parameters of ulcer dimensions (i.e. length, width and depth) and not change in ulcer volume.

All of the evidence identified was very low certainty. We downgraded it for risks of bias, indirectness and imprecision.

It is uncertain whether oral nutritional supplement with 20 g protein per 200 mL bottle, 1 kcal/mL, nutritional supplement with added vitamins, minerals and trace elements, increases the proportion of ulcers healed at six months more than placebo (risk ratio (RR) 0.80, 95% confidence interval (CI) 0.42 to 1.53). It is also uncertain whether arginine, glutamine and β-hydroxy-β-methylbutyrate supplement increases the proportion of

ulcers healed at 16 weeks compared with placebo (RR 1.09, 95% CI 0.85 to 1.40).

It is uncertain whether the following interventions change parameters of ulcer dimensions over time when compared with placebo; 220 mg zinc sulphate supplement containing 50 mg elemental zinc, 250 mg magnesium oxide supplement, 1000 mg/day omega-3 fatty acid from flaxseed oil supplement, magnesium and vitamin E co-supplementation and vitamin D supplementation. It is also uncertain whether 150,000 IU of vitamin D, impacts ulcer dimensions when compared with 300,000 IU of vitamin D.

Two studies explored some of the secondary outcomes of interest for this review. It is uncertain whether oral nutritional supplement with 20 g protein per 200 mL bottle, 1 kcal/mL, nutritional supplement with added vitamins, minerals and trace elements, reduces the number of deaths (RR 0.96, 95% CI 0.06 to 14.60) or amputations (RR 4.82, 95% CI 0.24 to 95.88) more than placebo. It is uncertain whether arginine, glutamine and β-hydroxy-β-methylbutyrate supplement increases health-related quality of life at 16 weeks more than placebo (MD −0.03, 95% CI −0.09 to 0.03). It is also uncertain whether arginine, glutamine and β-hydroxy-β-methylbutyrate supplement reduces the numbers of new ulcers (RR 1.04, 95% CI 0.71 to 1.51), or amputations (RR 0.66, 95% CI 0.16 to 2.69) more than placebo.

None of the included studies reported the secondary outcomes cost of intervention, acceptability of the intervention (or satisfaction) with respect to patient comfort, length of patient hospital stay, surgical interventions, or osteomyelitis incidence.

One study exploring the impact of arginine, glutamine and β-hydroxy-β-methylbutyrate supplement versus placebo did not report on any relevant outcomes.

Authors' conclusions: Evidence for the impact of nutritional interventions on the healing of foot ulcers in people with diabetes compared with no nutritional supplementation, or compared with a different dose of nutritional supplementation, remains uncertain, with eight studies showing no clear benefit or harm. It is also uncertain whether there is a difference in rates of adverse events, amputation rate, development of new foot ulcers, or quality of life, between nutritional interventions and placebo. More research is needed to clarify the impact of nutritional interventions on the healing of foot ulcers in people with diabetes.

Plain language summary

Dietary supplements for treating foot ulcers in people with diabetes

What is the aim of this review? We wanted to find out whether nutritional supplements or special diets are effective in treating foot ulcers in people with diabetes. Researchers from Cochrane collected and analysed all relevant studies (randomised controlled trials (RCTs)) to answer this question and found nine studies for inclusion. RCTs are medical studies where the treatment or care people receive is are chosen at random. This type of trial provides the most reliable health evidence about whether different approaches to treatment or care make a difference.

Key messages: Of the nine studies that we identified, eight reported the outcomes we were interested in, primarily impact on ulcer healing. Findings from five studies showed very low-certainty evidence regarding the effect of oral nutritional supplements in tablet form on the healing of foot ulcers in people with diabetes. These five studies did not measure healing in such a way that we could be certain of the results, and they did not have enough participants for us to be certain of the effects. The results of three other studies also showed very low-certainty evidence as to whether nutritional supplements in other forms have any impact on ulcer healing. Two of these studies showed very low-certainty evidence as to whether nutritional supplement drinks have any impact on other outcomes such as death, likelihood of amputation, reduction in numbers of new ulcers, or people's quality of life. These studies were not well conducted and did not have enough participants involved for us to be certain of the effects.

What was studied in the review? People with diabetes can develop foot ulcers. These are often due to reduced blood supply, reduced sensation, foot deformity, the presence of trauma, or a combination of all or some of these causes. Foot ulcers are a serious complication of diabetes and can result in serious consequences such as amputation.

It is thought that foot ulcers, like other wounds, heal better, and more quickly, if people are well-nourished. Food supplements containing certain vitamins and protein can be given to people with foot ulcers and diabetes to help to treat their wounds.

What are the main results of the review? We found nine relevant studies dating from 2004 to 2019, involving 629 participants, 72% were men, aged, on average, 59.2 years. Most studies took place in hospital outpatient clinics. Three studies explored a different nutritional supplement drink and compared this with a drink that looked the same but did not have any added nutritional supplement. Five studies explored the effects of different types of nutritional tablets and compared these with tablets that did not contain any active ingredient, or nutritional supplement. One study compared two different doses of a vitamin D injection. One study did not report any of the outcomes of interest for this review.

Two of the studies were sponsored by the manufacturers of the nutritional supplement, five studies were sponsored by Iranian university research funding.

Findings from eight studies are unclear as to whether nutritional interventions improve the healing of foot ulcers in people with diabetes compared with no nutritional supplementation, or compared with a different dose of nutritional supplementation. One study reported adverse events and two studies reported numbers of amputations. Results are unclear as to whether there is a difference in the numbers of amputations or deaths between nutritional supplementation and no nutritional supplementation. It is also unclear if there is a difference in health-related quality of life or number of ulcers that recur between nutritional supplementation and no nutritional supplementation.

Overall, we judged the certainty of the evidence to be very low. None of the studies had enough participants, five did not measure outcomes in such a way that we could be certain of the results and the studies were not well conducted, so we are not very confident in the results. Additional studies at low risk of bias and of high-certainty evidence are needed to clarify the role of nutritional interventions for the treatment of foot ulcers in people with diabetes.

How up to date is this review? We searched for studies that had been published up to March 2020.

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Topical treatment for facial burns

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ABSTRACT

Background: Burn injuries are an important health problem. They occur frequently in the head and neck region. The face is the area central to a person's identity that provides our most expressive means of communication. Topical interventions are currently the cornerstone of treatment of burns to the face.

Objectives: To assess the effects of topical interventions on wound healing in people with facial burns of any depth.

Search methods: In December 2019 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: Randomised controlled trials (RCTs) that evaluated the effects of topical treatment for facial burns were eligible for inclusion in this review.

Data collection and analysis: Two review authors independently performed study selection, data extraction, risk of bias assessment and GRADE assessment of the certainty of the evidence.

Main results: In this first update, we included 12 RCTs, comprising 507 participants.

Most trials included adults admitted to specialised burn centres after recent burn injuries.

Topical agents included antimicrobial agents (silver sulphadiazine (SSD), Aquacel-Ag, cerium-sulphadiazine, gentamicin cream, mafenide acetate cream, bacitracin), non-antimicrobial agents (Moist Exposed Burn Ointment (MEBO), saline-soaked dressings, skin substitutes (including bioengineered skin substitute (TransCyte), allograft, and xenograft (porcine Xenoderm), and miscellaneous treatments (growth hormone therapy, recombinant human granulocyte-macrophage colony-stimulating factor hydrogel (rhGMCS)), enzymatic debridement, and cream with Helix Aspersa extract).

Almost all the evidence included in this review was assessed as low or very low-certainty, often because of high risk of bias due to unclear randomisation procedures (i.e. sequence generation and allocation concealment); lack of blinding of participants, providers and sometimes outcome assessors; and imprecision resulting from few participants, low event rates or both, often in single studies.

Topical antimicrobial agents versus topical non-antimicrobial agents: There is moderate-certainty evidence that there is probably little or no difference between antimicrobial agents and non-antimicrobial agents (SSD and MEBO) in time to complete wound healing (hazard ratio (HR) 0.84 (95% confidence interval (CI) 0.78 to 1.85, 1 study, 39 participants). Topical antimicrobial agents may make little or no difference to the proportion of wounds completely healed compared with topical non-antimicrobial agents (comparison SSD and MEBO, risk ratio (RR) 0.94, 95% CI 0.68 to 1.29; 1 study, 39

participants; low-certainty evidence). We are uncertain whether there is a difference in wound infection (comparison topical antimicrobial agent (Aquacel-Ag) and MEBO; RR 0.38, 95% CI 0.12 to 1.21; 1 study, 40 participants; very low-certainty evidence). No trials reported change in wound surface area over time or partial wound healing. There is low-certainty evidence for the secondary outcomes scar quality and patient satisfaction. Two studies assessed pain but it was incompletely reported.

Topical antimicrobial agents versus other topical antimicrobial agents: It is uncertain whether topical antimicrobial agents make any difference in effects as the evidence is low to very low-certainty. For primary outcomes, there is low-certainty evidence for time to partial (i.e. greater than 90%) wound healing (comparison SSD versus cerium SSD: mean difference (MD) –7.10 days, 95% CI –16.43 to 2.23; 1 study, 142 participants). There is very low-certainty evidence regarding whether topical antimicrobial agents make a difference to wound infection (RR 0.73, 95% CI 0.46 to 1.17; 1 study, 15 participants). There is low to very low-certainty evidence for the proportion of facial burns requiring surgery, pain, scar quality, adverse effects and length of hospital stay.

Skin substitutes versus topical antimicrobial agents: There is low-certainty evidence that a skin substitute may slightly reduce time to partial (i.e. greater than 90%) wound healing, compared with a non-specified antibacterial agent (MD –6.00 days, 95% CI –8.69 to –3.31; 1 study, 34 participants).

We are uncertain whether skin substitutes in general make any other difference in effects as the evidence is very low certainty. Outcomes included wound infection, pain, scar quality, adverse effects of treatment and length of hospital stay.

Single studies showed contrasting low-certainty evidence. A bioengineered skin substitute may slightly reduce procedural pain (MD –4.00, 95% CI –5.05 to –2.95; 34 participants) and background pain (MD –2.00, 95% CI –3.05 to –0.95; 34 participants) compared with an unspecified antimicrobial agent. In contrast, a biological dressing (porcine Xenoderm) might slightly increase pain in superficial burns (MD 1.20, 95% CI 0.65 to 1.75; 15 participants (30 wounds)) as well as deep partial thickness burns (MD 3.00, 95% CI 2.34 to 3.66; 10 participants (20 wounds)), compared with antimicrobial agents (Physiotulle Ag (Coloplast)).

Miscellaneous treatments versus miscellaneous treatments: Single studies show low to very low-certainty effects of interventions. Low-certainty evidence shows that MEBO may slightly reduce time to complete wound healing compared with saline soaked dressing (MD –1.7 days, 95% CI –3.32 to –0.08; 40 participants). In addition, a cream containing Helix Aspersa may slightly increase the proportion of wounds completely healed at 14 days compared with MEBO (RR 4.77, 95% CI 1.87 to 12.15; 43 participants). We are uncertain whether any miscellaneous treatment in the included studies makes a difference in effects for the outcomes wound infection, scar quality, pain and patient satisfaction as the evidence is low to very low-certainty.

Authors' conclusions: There is mainly low to very low-certainty evidence on the effects of any topical intervention on wound healing in people with facial burns. The number of RCTs in burn care is growing, but the body of evidence is still hampered due to an insufficient number of studies that follow appropriate evidence-based standards of conducting and reporting RCTs.

Plain language summary

Topical treatment for facial burns

Review question: We reviewed the evidence about the effects of topical (applied to the surface of the skin) treatments for healing burn wounds on the face or neck. We wanted to find out which treatments were most effective at healing these wounds and improving the appearance of scars, which is a particularly important issue in relation to facial burn injuries. We also wanted to find out how topical treatments affected the risk of complications such as infection and pain, and how they impacted on peoples' quality of life.

Background: Burn injuries are an important health problem, and a major global cause of disability and disfigurement in both adults and children. Women and children in low-income countries are at particular risk. Burns pose particular problems when they occur on the head or neck. The face is central to a person's identity and plays a vital role in communication. Other basic functions such as hearing, smell and breathing may become affected as a direct result of a facial burn. Topical treatments such as (non) antimicrobial creams and skin substitutes, are most commonly used to treat facial burns. We wanted to compare the effectiveness of these treatments to evaluate their benefits and harms.

Study characteristics: In December 2019, we searched for randomised controlled trials (RCTs) investigating topical treatments for facial burns. RCTs are medical studies where the treatment or care people receive is chosen at random. This type of study design provides the most reliable health evidence about whether different approaches to treatment or care can make a difference. We found 12 studies that were suitable for inclusion in this review update, with 507 participants with mean ages ranging from 5.3 to 41.9 years. Three studies compared antimicrobials with non-antimicrobials agents, two studies compared different antimicrobials, four studies compared skin substitutes with antimicrobials, while four studies compared a variety of topical treatments. One study contributed to two comparisons. Eight studies

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were small (fewer than 40 participants) and almost all studies were at high risk of bias due to lack of blinding (where participants and evaluators may have known which group the participants were allocated to and interpreted effects differently).

Key results: Overall, there is mainly low to very low-certainty evidence on the effects of any topical intervention on wound healing or infection in people with facial burns. In addition, there is low to very low-certainty evidence on the effects of the included interventions on need for surgery, pain, scar quality, patient satisfaction, length of hospital stay and side effects.

All results were at high risk of bias and varied, which may have exaggerated the effects.

Certainty of the evidence: Overall, the certainty of the evidence about the effectiveness of topical treatments for facial burns is low to very low. There is insufficient reliable evidence as to whether topical treatments improve outcomes for people with facial burns including improving wound healing, or rates of infection. Better trial design and reporting of these studies is required to contribute to evidence-based burn care.

How up to date is this review? We searched for studies that had been published up to December 2019.

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Hydrosurgical debridement versus conventional surgical debridement for acute partial-thickness burns

Justin CR Wormald, Ryckie G Wade, Jonathan A Dunne, Declan P Collins, Abhilash Jain

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ABSTRACT

Background: Burn injuries are the fourth most common traumatic injury, causing an estimated 180,000 deaths annually worldwide. Superficial burns can be managed with dressings alone, but deeper burns or those that fail to heal promptly are usually treated surgically. Acute burns surgery aims to debride burnt skin until healthy tissue is reached, at which point skin grafts or temporising dressings are applied. Conventional debridement is performed with an angled blade, tangentially shaving burned tissue until healthy tissue is encountered. Hydrosurgery, an alternative to conventional blade debridement, simultaneously debrides, irrigates, and removes tissue with the aim of minimising damage to uninjured tissue. Despite the increasing use of hydrosurgery, its efficacy and the risk of adverse events following surgery for burns is unclear.

Objectives: To assess the effects of hydrosurgical debridement and skin grafting versus conventional surgical debridement and skin grafting for the treatment of acute partial-thickness burns.

Search methods: In December 2019 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: We included randomised controlled trials (RCTs) that enrolled people of any age with acute partial-thickness burn injury and assessed the use of hydrosurgery.

Data collection and analysis: Two review authors independently performed study selection, data extraction, 'Risk of bias' assessment, and GRADE assessment of the certainty of the evidence.

Main results: One RCT met the inclusion criteria of this review. The study sample size was 61 paediatric participants with acute partial-thickness burns of 3% to 4% total burn surface area. Participants were randomised to hydrosurgery or conventional debridement. There may be little or no difference in mean time to complete healing (mean difference (MD) 0.00 days, 95% confidence interval (CI) −6.25 to 6.25) or postoperative infection risk (risk ratio 1.33, 95% CI 0.57 to 3.11). These results are based on very low-certainty evidence, which was downgraded twice for risk of bias, once for indirectness, and once for imprecision.

There may be little or no difference in operative time between hydrosurgery and conventional debridement (MD 0.2 minutes, 95% CI −12.2 to 12.6); again, the certainty of the evidence is very low, downgraded once for risk of bias, once for indirectness, and once for imprecision. There may be little or no difference in scar outcomes at six months. Health-related quality of life, resource use, and other adverse outcomes were not reported.

Authors' conclusions: This review contains one randomised trial of hydrosurgery versus conventional

debridement in a paediatric population with low percentage of total body surface area burn injuries. Based on the available trial data, there may be little or no difference between hydrosurgery and conventional debridement in terms of time to complete healing, postoperative infection, operative time, and scar outcomes at six months. These results are based on very low-certainty evidence. Further research evaluating these outcomes as well as health-related quality of life, resource use, and other adverse event outcomes is required.

Plain language summary

Is surgery with a high-pressure water jet (hydrosurgery) better than conventional surgery for early treatment of mid-depth burns?

Background: Burns are common injuries worldwide and can cause illness, lifelong disability and even death. Deep burns often require surgery because the skin is too damaged to heal on its own. The damaged, burnt skin must therefore be cut away (debridement) and replaced with healthy skin, which is typically a very thin layer of healthy skin (graft) taken from another part of the body. Debridement is normally done with a specific surgical knife.

Recently, a high-pressure, water-based jet system has been developed, known as hydrosurgery. This tool removes burnt skin only, leaving behind the unburned, healthy skin. Hydrosurgery may be more accurate than a knife in terms of removing burned skin, which may lead to better healing.

All open wounds, including burns, are at risk of infection so adequate debridement is important to reduce the risk of infection. If the wound is closed quickly, it will heal better, with less scarring and less risk of infection.

What did we want to find out? In this Cochrane Review, we wanted to know whether burns treated with hydrosurgery heal more quickly and with fewer infections than burns treated with a knife. We also wanted to see whether there were any differences in overall quality of life, how well the wound healed in terms of scarring and the amount of medical resources used (using measures like the number of dressing changes and burn clinic appointments, length of hospital stay, and whether further surgery was needed).

Our methods: We searched medical databases for randomised controlled trials that compared burn treatment using hydrosurgery with conventional debridement. Randomised controlled trials are medical studies where the treatment people receive is chosen at random. This type of study provides the most reliable evidence about whether different approaches to health care make a difference. Participants in the studies could be any age. The studies could have taken place anywhere and be reported in any language.

What are the main results of the review? We found only one Australian study that included 61 children with small burns. The children were randomly allocated to treatment with either hydrosurgery or conventional debridement. Hydrosurgery made little or no difference in the time burns took to heal completely, infection after the operation, or scarring compared to conventional debridement. There was little or no difference in the length of time debridement took using hydrosurgery compared with conventional surgery. The study did not give any information about quality of life or resource use.

Certainty of the evidence: Our certainty (confidence) in the evidence was very limited because we found only one study. It only included children, so the results may not apply to adults or people with more severe burns. It was a randomised study, but did not report the outcomes we expected it to, so we are not sure how reliable its results are.

Conclusions: We do not know if hydrosurgery is better than conventional surgery for early treatment of mid-depth burns. We need more studies to investigate this question.

Search date: This review includes evidence published up to December 2019.

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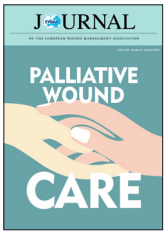
Conflicts of Interest: None



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