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Smith F, Donaldson J, Brown T

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[Intervention Review]

Debridement for surgical wounds

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ABSTRACT

Background

Surgical wounds that become infected are often debrided because clinicians believe that removal of this necrotic or infected tissue may expedite wound healing. There are numerous methods of debridement available, but no consensus on which one is most effective for surgical wounds.

Objectives

To assess the effects of different methods of debridement on the rate of debridement and healing of surgical wounds.

Search methods

In October 2021, we searched the Cochrane Wounds Specialised Register, CENTRAL, MEDLINE, Embase, and CINAHL. To identify additional studies, we searched clinical trials registries for ongoing and unpublished studies, and scanned reference lists of relevant included studies, reviews, meta-analyses, and health technology reports. There were no restrictions on language, date of publication, or study setting.

Selection criteria

We included randomised controlled trials (RCTs) that enrolled people with a surgical wound that required debridement, and reported time to complete wound debridement or time to wound healing, or both.

Data collection and analysis

Two review authors independently performed study selection, risk of bias assessment using the RoB 1 tool, data extraction, and GRADE assessment of the certainty of evidence.

Main results

In this fourth update, we identified one additional study for inclusion. The review now includes six studies, with 265 participants, aged three to 91 years. Five studies were published between 1979 and 1990 and one published in 2014. The studies were carried out in hospital settings in China, Denmark, Belgium, and the UK.

Six studies provided six comparisons. Due to the heterogeneity of studies, it was not appropriate to conduct meta-analyses. Four studies evaluated the effectiveness of dextranomer beads/paste; however, each study used a different comparator (Eusol-soaked dressings, 10% aqueous polyvinylpyrrolidone, 0.1% chloramine-soaked packs, and silicone foam elastomer dressing). One study compared streptokinase/streptodornase with saline-soaked dressings, and one compared endoscopic surgical debridement with conventional 'open' surgical debridement.

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Five studies reported time to complete debridement (reported as time to a clean wound bed) and three reported time to complete healing. One study reported effect estimates (surgical debridement via endoscopy versus surgical debridement) for time to a clean wound bed and time to complete wound healing, and it was possible to calculate effect estimates for one other study (dextranomer paste versus silicone foam elastomer) for time to complete wound healing. For the other four studies that did not report effect estimates, it was not possible to calculate time to a clean wound bed or time to complete wound healing due to missing variance and participant exclusions.

None of the included studies reported outcomes pertaining to proportion of wounds completely healed, rate of reduction in wound size, rate of infection, or quality of life.

All studies had unclear or high risk of bias for at least one key domain.

Dextranomer paste/beads (autolytic debridement) compared with four different comparators

Four studies compared dextranomer paste or beads with Eusol-soaked gauze (20 participants), 10% aqueous polyvinylpyrrolidone (40 participants), 0.1% chloramine-soaked dressings (28 participants), or silicone foam elastomer (50 participants).

There is very low-certainty evidence that there may be no clear difference in time to a clean wound bed between dextranomer beads and Eusol gauze. The study did not report adverse events.

There is very low-certainty evidence that there may be no difference in time to a clean wound bed between dextranomer paste and 10% aqueous polyvinylpyrrolidone gauze. There was low-certainty evidence that there may be no difference in deaths and serious adverse events.

There may be a difference in time until the wounds were clinically clean and time to complete wound healing between dextranomer paste and 0.1% chloramine favouring 0.1% chloramine, but we are very uncertain. There is low-certainty evidence that there may be no difference in deaths and serious adverse events.

There is very low-certainty evidence that there may be no difference in time to complete healing between dextranomer beads and silicone foam elastomer. The study did not report adverse events.

Streptokinase/streptodornase solution (enzymatic) compared with saline-soaked dressings

One study (21 participants) compared enzymatic debridement with saline-soaked dressings. There is low-certainty evidence that there may be no difference in time to a clean wound bed or secondary suture between streptokinase/streptodornase and saline-soaked dressings. There is very low-certainty evidence that there may be no difference in deaths and serious adverse events.

Surgical debridement via endoscopic ('keyhole') surgery compared with surgical debridement by 'open' surgery (the wound is opened using a scalpel)

One study (106 participants) reported time to complete wound healing and time to a clean wound bed. There is low-certainty evidence that there may be a reduction in time to complete wound healing and very low-certainty evidence that there may be no difference in time to a clean wound bed with surgical debridement via endoscopy compared to 'open' surgical debridement. The study did not report adverse events.

Overall, the evidence was low to very low-certainty for all outcomes.

Five included studies were published before 1991 and investigated treatments that are no longer available. Worldwide production of dextranomer products has been discontinued, except for dextranomer paste, which is currently only available in South Africa. Furthermore, Eusol, used in one study as the comparator to dextranomer, is rarely used due to risk of harmful effects on healthy tissue and the enzymatic agent streptokinase/streptodornase is no longer available worldwide.

Authors' conclusions

Evidence for the effects of different methods of debridement on complete wound debridement and healing of surgical wounds remains unclear. Adequately powered, methodologically robust RCTs evaluating contemporary debridement interventions for surgical wounds are needed to guide clinical decision-making.

PLAIN LANGUAGE SUMMARY

Is there a best way to remove dead tissue from surgical wounds?

Key message

We cannot be certain whether removal of dead or infected tissue of surgical wounds or care that is usually provided makes any difference to how long it takes to remove all of the dead tissue from the wound and for the wound to heal.

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What did we want to find out?

Following surgery, most surgical wounds heal naturally with no complications. However, complications such as infection can occur, which may result in delayed healing. There are many different methods of removing dead or infected tissue (called debridement), such as surgical removal of the tissue, enzymes (naturally occurring proteins that dissolve the tissue), and mechanical methods (for example, a special dry gauze that is removed when the tissue has stuck to it). We wanted to look at the different ways to remove dead or infected tissue from wounds after surgical operations and find out how they affect the time it takes to remove all of the dead tissue from the wound and for the wound to heal.

What did we do?

We searched medical databases for well-designed studies including people of any age that compared one method of debridement versus a dummy treatment (placebo), no treatment, or another method of debridement after surgery.

What did we find?

We found six studies dating from 1979 to 2014 that compared different types of wound debridement with the way care was usually provided for wounds that had dead tissue within them after surgery. All six studies compared different types of debridement methods or different types of usual care, meaning we could not combine the results. The total number of participants within the studies was 265, and ages of participants ranged from three to 91 years. The studies were carried out in hospitals in China, Denmark, Belgium, and the UK.

Four studies compared a treatment method that promotes the body's natural wound healing process (called autolytic) with different types of usual care. Overall, we found that this method may make little or no difference to how long it takes to remove all of the dead tissue. One study compared an enzyme with usual care, and we found that this method may make little or no difference to how long it takes to remove all of the dead tissue. One study compared different methods of removing dead tissue using surgery (one via 'keyhole' surgery, the other 'normal' surgery). We found that using keyhole surgery to remove the dead tissue may have little or no effect on time for the wound to heal, but we are very uncertain about the results. Only three of the studies (two autolytic and one using an enzyme) reported serious harmful events that led to discontinuation of treatment or hospital admission. There may be no difference in deaths and serious harmful events between the treatment methods.

Overall, all the studies indicated that it is unclear whether any type of wound debridement is better than usual care at reducing time to remove all of the dead tissue, time to complete healing, serious harmful events that led to discontinuation of treatment, or hospital admission.

What are the limitations of the evidence?

Overall, we are very uncertain about the evidence, mainly because the studies had small numbers of people, and did not report the results well. Additionally, five studies used debridement products that are no longer used clinically.

How up to date is the evidence?

We searched for studies published up to October 2021.

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SUMMARY OF FINDINGS

Summary of findings 1. Dextranomer beads (autolytic) compared with Eusol gauze for debridement of surgical wounds

Dextranomer beads (autolytic) compared with Eusol gauze for debridement of surgical wounds

Patient or population: adults with surgical wounds

Settings: hospital (inpatient, outpatient, or both)

Intervention: dextranomer beads

Comparison: Eusol gauze

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Eusol gauze	Dextranomer beads				
Time to a clean wound bed (follow-up 28 days)	Mean time to a clean wound was **11.6 days**	Mean time to a clean wound was **3.5 days shorter**	Mean time to a clean wound was 8.1 days (range 5 to 28) in the dextranomer beads group and 11.6 days (range 6 to 22) in the Eusol gauze group. 1 wound in each group healed without secondary closure (healed by granulation) and these 2 participants were not included in mean time to a clean wound bed. 3 participants in Eusol gauze group had serious discharge for up to 5 days after wound closure compared to 0 participants in dextranomer beads group.	20 (1 study)	⊕⊖⊖⊖ **Very low**[a]	There may be no difference in time to a clean wound bed between dextranomer beads and Eusol gauze.
Proportion of wounds completely debrided	Not reported					
Rate of reduction in wound size	Not reported					
Proportion of wounds completely healed	Not reported					

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Time to complete healing (days)	Not reported
Serious adverse events: life-threatening/ hospitalisation	Not reported

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: confidence interval.

GRADE Working Group grades of evidence
High certainty: further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: we are very uncertain about the estimate.

[a]Downgraded three levels for imprecision as the sample size was small, and time to debridement reported as a mean and time to event data not reported as hazard ratios.

Summary of findings 2. Dextranomer paste (autolytic) compared with 10% aqueous polyvinylpyrrolidone for debridement of surgical wounds

Dextranomer paste (autolytic) compared with 10% aqueous polyvinylpyrrolidone for debridement of surgical wounds

Patient or population: adults with surgical wounds

Settings: hospital (inpatient, outpatient, or both)

Intervention: dextranomer paste

Comparison: 10% aqueous polyvinylpyrrolidone

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	10% aqueous polyvinylpyrrolidone	Dextranomer paste				
Time to a clean wound bed (follow-up 12 days)	Mean time to a clean wound was **5.2 days**	Mean time to a clean wound	Mean time to a clean wound was 6.5 days in the dextranomer paste group and 5.2 days in the 10% aqueous polyvinylpyrroli-	40 (1 study)	⊕⊖⊖⊖ **Very low**[a]	There may be no difference in time to a clean wound bed be-

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		was **1.3 days longer**	done group, no variance data provided. 2/20 wounds in the dextranomer paste group and 6/20 wounds in the 10% aqueous polyvinylpyrrolidone group did not become clean in the duration of the study (12 days).			tween dextranomer paste and 0.1% chloramine.
Proportion of wounds completely debrided	Not reported					
Rate of reduction in wound size	Not reported					
Proportion of wounds completely healed	Not reported					
Time to complete healing (days)	Not reported					
Serious adverse events: life-threatening/ hospitalisation	—	—	1 adverse event that led to discontinuation in the control group following an allergic reaction, oedema and erythema after 10 days	40 (1 study)	⊕⊕⊖⊖ **Low**[b]	There is probably no difference in deaths and serious adverse events between dextranomer paste and 0.1% chloramine.

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: confidence interval.

GRADE Working Group grades of evidence
High certainty: further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: we are very uncertain about the estimate.

[a]Downgraded three levels for imprecision as the sample size was small, no variance data were provided, and time to debridement reported as a mean time to event data not reported as hazard ratios.
[b]Downgraded two levels for imprecision as the sample size was small.

Summary of findings 3. Dextranomer paste (autolytic) compared with 0.1% chloramine-soaked dressings for debridement of surgical wounds

Dextranomer paste (autolytic) compared with 0.1% chloramine-soaked dressings for debridement of surgical wounds

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Patient or population: adults with surgical wounds

Settings: hospital (inpatient, outpatient, or both)

Intervention: dextranomer paste

Comparison: 0.1% chloramine-soaked dressing

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	0.1% chloramine-soaked dressing	Dextranomer paste				
Time to a clean wound bed (follow-up not stated but table 3 of publication showed range 13–157 days)	Median time until the wounds were clinically clean was **5 days**	Median time until the wounds were clinically clean was **1 day longer**	Median time until the wounds were clinically clean was 6 days for the dextranomer paste group and 5 days for the 0.1% chloramine group, no variance data provided. 4/14 participants in the dextranomer paste group and 2/14 participants in the chloramine-soaked dressings group were excluded from this analysis.	28 (1 study)	⊕⊖⊖⊖ **Very low**[a]	There may be a difference in time until the wounds were clinically clean between dextranomer paste and 0.1% chloramine favouring 0.1% chloramine, but we are very uncertain.
Proportion of wounds completely debrided	Not reported					
Rate of reduction in wound size	Not reported					
Proportion of wounds completely healed	Not reported					
Time to complete healing (days)	Median time to complete healing was **20 days**	Median time to complete healing was **7 days longer**	Median time to complete healing was 27 days for the dextranomer paste group and 20 days for the 0.1% chloramine group, no variance data provided. 4/14 participants in the dextranomer paste group and 2/14 participants in the chlo-	28 (1 study)	⊕⊖⊖⊖ **Very low**[b]	There may be a difference in time to complete healing between dextranomer paste and 0.1% chloramine favouring 0.1% chloramine, but we are very uncertain

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			ramine-soaked dressings group were excluded from this analysis.			
Serious adverse events: life-threatening/ hospitalisation	—	—	There were 2 deaths in the dextranomer paste group, 1 total wound rupture and 1 'peritoneal communication' in the 0.1% chloramine group requiring treatment discontinuation.	28 (1 study)	⊕⊕⊖⊖ **Low**[c]	There may be no difference in deaths and serious adverse events between dextranomer paste and 0.1% chloramine-soaked dressing.

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: confidence interval.

GRADE Working Group grades of evidence
High certainty: further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: we are very uncertain about the estimate.

[a]Downgraded one level for high risk of bias (attrition) and two levels for imprecision as the sample size was small, no variance data were reported, and time to event data not reported as hazard ratios.
[b]Downgraded one level for high risk of bias (attrition) and two levels for imprecision as the sample size was small, no variance data were reported, and time to event data not reported as hazard ratios.
[c]Downgraded one level for high risk of bias (attrition) and one level for imprecision as the sample size was small.

Summary of findings 4. Dextranomer beads (autolytic) compared with silicone foam elastomer (autolytic) for debridement of surgical wounds

Dextranomer beads (autolytic) compared with silicone foam elastomer (autolytic) for debridement of surgical wounds

Patient or population: adults with surgical wounds

Settings: hospital (inpatient, outpatient, or both)

Intervention: dextranomer beads

Comparison: silicone foam elastomer

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				

	Silicone foam elastomer	Dextranomer beads				
Time to a clean wound bed	Not reported					
Proportion of wounds completely debrided	Not reported					
Rate of reduction in wound size	Not reported					
Proportion of wounds completely healed	Not reported					
Time to complete healing (days)	Mean time to complete wound healing was **36.90 (SE 3.18) days**	**MD 4.02 days longer** (5.96 shorter to 14.00 longer). All participants were included in this analysis.	—	50 (1 study)	⊕⊖⊖⊖ **Very low**[a]	There may be no difference in time to complete healing between dextranomer beads and elastomer foam.
Serious adverse events: life-threatening/ hospitalisation	Not reported					

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: confidence interval; **MD:** mean difference; **SE:** standard error.

GRADE Working Group grades of evidence
High certainty: further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: we are very uncertain about the estimate.

[a]Downgraded three levels for imprecision as the sample size was small, time to debridement reported as a mean, and time to event data not reported as hazard ratios.

Summary of findings 5. Streptokinase/streptodornase (enzymatic) compared with saline-soaked dressing for debridement of surgical wounds

Streptokinase/streptodornase (enzymatic) compared with saline-soaked dressing for debridement of surgical wounds

Patient or population: adults with surgical wounds

Settings: hospital (inpatient, outpatient, or both)

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Intervention: streptokinase/streptodornase

Comparison: saline-soaked dressing

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Saline-soaked dressing	Streptokinase/streptodornase				
Time to a clean wound bed (follow-up not stated but figure 1 shows up to 25 days)	Mean time to a clean wound bed or secondary suture was **13.5 days**	Mean time to a clean wound bed or secondary suture was **8.5 days shorter**	Mean time to a clean wound bed or secondary suture was 5 days (SD 2.16) in the streptokinase/streptodornase group and 13.45 days (SD 6.77) in the saline-soaked dressings group. Secondary suture was performed in 3/7 wounds in the streptokinase/streptodornase group and 4/11 wounds in the saline-soaked dressing group. 3 participants were excluded from evaluation due to non-completion of treatment – see adverse events below.	21 (1 study)	⊕⊕⊖⊖ **Low**[a]	There may be no difference in time to a clean wound bed or secondary suture between streptokinase/streptodornase and saline-soaked dressings.
Proportion of wounds completely debrided	Not reported					
Rate of reduction in wound size	Not reported					
Proportion of wounds completely healed	Not reported					
Time to complete healing (days)	Not reported					
Serious adverse events: life-threatening/ hospitalisation	—	—	There was 1 reoperation for intra-abdominal sepsis requiring treatment discontinuation in the streptokinase/streptodornase group and 1 death from a pulmonary embolism and 1 burst abdomen requiring treatment discontinuation in the saline-soaked dressing group	21 (1 study)	⊕⊖⊖⊖ **Very low**[b]	There may be no difference in deaths and serious adverse events between streptokinase/streptodornase

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and saline-soaked dressings.

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
SD: standard deviation.

GRADE Working Group grades of evidence
High certainty: further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: we are very uncertain about the estimate.

[a]Downgraded two levels for imprecision as the sample size was small and time to event data not reported as hazard ratios.
[b]Downgraded one level for high risk of bias (attrition) and two levels for imprecision as the sample size was small and rarity of events reported within that small sample size.

Summary of findings 6. Surgical debridement via an endoscopic method versus conventional 'open' surgical debridement for debridement of surgical wounds

Surgical debridement via an endoscopic method versus conventional 'open' surgical debridement for debridement of surgical wounds

Patient or population: adults with surgical wounds

Settings: hospital (inpatient, outpatient, or both)

Intervention: surgical debridement via endoscopy

Comparison: 'open' surgical debridement

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Open surgical debridement	Surgical debridement via endoscopy				
Time to a clean wound bed (minutes)	Mean time to complete surgical debridement was **104 (SD 72) minutes**	**MD 24.00 minutes longer** (0.85 shorter to 48.85 longer). All participants were included in this analysis.	—	106 (1 study)	⊕⊖⊖⊖ **Very low**[a]	There may be no difference in time to a clean wound bed between surgical debridement via endoscopy and 'open' surgical debridement.

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Proportion of wounds completely debrided	Not reported					
Rate of reduction in wound size	Not reported					
Proportion of wounds completely healed	Not reported					
Time to complete healing (follow-up "at least 4 weeks")	Mean time to complete wound healing was **19.4 (SD 5.2) days**	**MD 9.40 days shorter** (10.99 to 7.81 shorter). All participants were included in this analysis.	—	106 (1 study)	⊕⊕⊝⊝ **Low**[b]	There may be a reduction in time to complete wound healing between surgical debridement via endoscopy and 'open' surgical debridement.
Serious adverse events: life-threatening/ hospitalisation	Not reported					

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: confidence interval; **MD:** mean difference; **SD:** standard deviation.

GRADE Working Group grades of evidence
High certainty: further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: we are very uncertain about the estimate.

[a]Downgraded two levels for imprecision as the sample size was small and the 95% CIs were wide, and time to event data not reported as hazard ratios, and one level for indirectness (surrogate endpoint).
[b]Downgraded two levels for imprecision as the sample size was small and time to event data not reported as hazard ratios.

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BACKGROUND

Description of the condition

Surgical wounds, by definition, are initially acute and most heal naturally without delay or complications (Brown 2015). However, surgical wound complications, such as wound dehiscence (opening) and surgical site infection (SSI) may occur, and may result in either delayed wound healing or wound breakdown, or both (IWII 2016; WUWHS 2018). SSIs have been defined as occurring within 30 days following the operative procedure and are categorised as superficial (incisional), deep (incisional), and organ/space SSI, and it is acknowledged that the presence of an SSI within a wound can lead to prolonged hospital stay or readmission and delayed recovery (Berríos-Torres 2017; Seidelman 2023). The European Centre for Disease Prevention and Control report occurrence rates of SSI vary by type of surgery from 0.6% in knee surgery to 9.5% in open colon surgery (ECDC 2023). Surgical wounds with SSIs may contain devitalised (dead) tissue. The appearance, colour, and texture of this tissue may vary from hard, black tissue (necrotic or eschar) to a soft fibrous yellow or green tissue (slough) (Anderson 2006; EWMA 2013). This may be accompanied by increased production of fluid (exudate) and the presence of an odour (IWII 2016; WUWHS 2019).

There is a widely held belief that wound healing is impeded by the presence of devitalised, necrotic tissue and wounds containing such material do not heal successfully (EWMA 2013; NICE 2020; Spear 2010). Non-viable tissue not only inhibits the growth of epithelial tissue, but also increases the production of exudate, impairs assessment of the wound bed, and makes it more difficult to achieve wound closure, thus having an adverse effect on quality of life (Fletcher 2020; IWII 2016; Wounds UK 2013; WUWHS 2008). Although Atkin 2020 details a number of reasons for debriding a wound, such as optimisation of the wound bed, reduction in the risk of infection, and addressing the cause of inflammation, these reasons do not appear to be supported by robust scientific evidence.

Description of the intervention

Debridement is the process whereby foreign material, dead tissue, damaged tissue, and debris are removed from a wound (Atkin 2020; EWMA 2013; Vowden 2011; WUWHS 2019). Debridement of wounds includes any method that removes infected or contaminated tissue, cell debris or dead, devitalised, fibrous material (frequently classified as eschar or slough) to create a clean wound bed (EWMA 2013; Ousey 2021; Vowden 2011). Debridement is thought to provide a foundation for the subsequent healing of wounds (Lantis 2017; Spruce 2016).

Debridement may be achieved by a variety of methods including surgery, biosurgical (larvae) debridement, autolytic debridement, mechanical debridement, and enzymatic debridement.

Surgical or sharp debridement

Surgical debridement may be achieved by the aggressive excision of all devitalised tissue using surgical techniques (Moore 2012; Schultz 2003). Disadvantages associated with this method are the requirement for hospital admission, the administration of an anaesthetic with associated complications, and time in the operating theatre. It is also associated with pain, bleeding, and excision of healthy tissue and, as such, is not suitable or desirable for all patients (Gray 2009; Leak 2012). Sharp debridement involves the excision of small quantities of dead tissue by a clinician using scissors or a scalpel (Moore 2012). This procedure may be performed in a community or hospital setting. However, for both surgical and sharp procedures, issues of patient consent, and training and skill of the clinician must be considered (Moore 2012; WUWHS 2019).

Biosurgical/biological debridement

In biosurgical or biological debridement, sterile larvae (maggots) of the *Lucilia sericata* species of greenbottle fly are applied to a sloughy wound. There, the larvae are capable of producing powerful proteolytic enzymes that destroy the dead tissue by liquefying and ingesting it (McFarland 2014). Healthy tissue in the wound bed is not damaged and, although there are aesthetic considerations (Leak 2012), larvae are increasingly being used for wound debridement (Atkin 2020).

Autolytic debridement

Over time, naturally occurring enzymes generated from within the wound itself will eventually break down and dissolve dead or sloughy tissue in wounds (Gray 2011). This natural process is promoted by the maintenance of a moist environment through judicious use of dressings and topical agents (e.g. hydrogels, semi-occlusive and occlusive wound dressings) (Callaghan 2014; Spruce 2016). Many of these dressings hydrate and remove black, necrotic tissue and slough (Fletcher 2020).

Mechanical debridement

Mechanical methods of debridement are non-selective and may result in damage to healthy tissue (EWMA 2013). These methods include wet-to-dry debridement, hydrosurgical/wound cleansing debridement, whirlpool debridement, monofilament debridement pads, and ultrasonic methods (EWMA 2013; Haemmerle 2011; Vowden 2011).

Wet-to-dry debridement

The wet-to-dry method of debridement involves the application of a saline-soaked gauze dressing to a wound. The moist dressing induces separation of the devitalised tissue and, once dry, the dressing is removed, together with the slough and necrotic tissue (Moore 2012). This is reported to be a painful procedure and may damage healthy tissue; fibres may be left in the wound and the dressing does not provide a barrier to bacterial contamination (EWMA 2013; Vowden 2011).

Hydrosurgical/wound cleansing debridement

Wound cleansing debridement involves irrigating a wound with a continuous or intermittent flow of fluid delivered under high pressure. This method is reported to be suitable for debridement of smaller areas such as the hands and feet (Janis 2014). There is the potential for aerosol generation of bacteria from the wound, which must be considered prior to and during use. Evidence on the cost-effectiveness of hydrosurgery for wound debridement is inconclusive (Sainsbury 2009).

Whirlpool debridement

Whirlpool debridement is used for large wounds on the trunk or extremities. The affected person is immersed in a whirlpool bath, where the vigorous action of the water and its hydrating effect

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loosen the surface bacteria and devitalised tissue, and allow them to be washed away. Pressures generated are difficult to control or predict with whirlpool debridement and the potential for cross-infection, in particular with *Pseudomonas aeruginosa* (a gram-negative bacteria) requires strict infection control procedures (Tao 2012).

Monofilament debridement pad

The monofilament debridement pad contains chemically inert polyester fibres of a specific texture and density that, when wet and wiped gently over a wound, loosen and then bind the debris without disintegrating (Bahr 2011; Haemmerle 2011). Although it is acknowledged that there is limited evidence to support its use, the National Institute for Health and Care Excellence has produced guidelines for the use of Debrisoft (Activa Healthcare) monofilament debridement pads for both acute and chronic wounds (NICE 2019).

Ultrasonic

Low-frequency ultrasonic methods can be administered either via contact or non-contact devices (Vowden 2011). This relatively painless method is effective in removing dead tissue and reducing bacterial content of wounds, but is relatively expensive (Madhok 2013), and there is limited evidence to support routine adoption (NICE 2011).

Enzymatic debridement

Topical enzymatic preparations are applied to moist (or moistened) devitalised tissue. Such preparations include: streptokinase/streptodornase, collagenase, papain/urea, and a combination of fibrinolysin and deoxyribonuclease (Lantis 2017). This method has a number of disadvantages, including a requirement for frequent dressing changes and a slow rate of debridement. Worldwide production of the enzymatic preparation of streptokinase/streptodornase has now been discontinued.

It should be noted that a range of chemical agents, including hypochlorites such as EUSOL (Edinburgh University Solution of Lime) and Dakin's Solution (sodium hypochlorite), hydrogen peroxide, and iodine, have been used to promote cleansing of wounds through their antimicrobial properties (Cornwell 2010; Ovens 2018; Norman 2016), but not as primary methods of wound debridement.

How the intervention might work

Debridement using any of the methods described under How the intervention might work to remove the presence of dead, devitalised tissue is thought to expedite wound healing (EWMA 2013; Fletcher 2020; IWII 2016; Lantis 2017). The presence of dead tissue within the wound prevents progression through the normal phases of wound healing (EWMA 2013; Schultz 2003), and accurate assessment of the wound itself making staging or grading severity difficult (Prince 2013). Dead tissue also prevents wound contraction and epithelial cell growth and migration at the wound edge (Spear 2010; WUWHS 2019), and the bioburden within the wound increases (Cornell 2010; WUWHS 2019).

Why it is important to do this review

There is considerable debate about the appropriateness and efficacy of debridement methods. Consensus guidelines indicate that debridement is an integral part of wound management (EWMA 2013), as devitalised, infected, or damaged tissue can interfere with the healing process (Fletcher 2020; Lantis 2017; Spruce 2016; Vowden 2011). The choice of debriding agent and method is usually made on the basis of the clinician's expertise and knowledge, the available resources, and cost (EWMA 2013; Fletcher 2020). Since wound management choices, however, continue to increase, as do the cost of products, the choice of debridement method or agent should be guided by good evidence (EWMA 2013). An up-to-date review of debridement for surgical wounds is therefore necessary, to enable evidence-based clinical decision-making.

This is an update of a Cochrane review first published in 2008 (Dryburgh 2008), and previously updated in 2011 (Smith 2011) and 2013 (Smith 2013). Two previous updates found no new additional studies for inclusion; therefore, the conclusion of the first publication remained: that there was insufficient robust evidence to support any one particular method of debridement. It is important to update this review to ascertain if there is any new robust evidence to guide clinical decision-making pertaining to debridement method for surgical wounds.

OBJECTIVES

To assess the effects of different methods of debridement on the rate of debridement and healing of surgical wounds.

METHODS

Criteria for considering studies for this review

Types of studies

We included all RCTs evaluating debridement in the management of surgical wounds.

Types of participants

We included studies that recruited people of any age, in any care setting, with a surgical wound that required debridement. We excluded studies of wounds that were not caused by surgery (i.e. trauma wounds, burns, abscesses or sinuses, pressure ulcers, leg ulcers, diabetic foot ulcers, fungating tumours, and wounds caused by the removal of foreign bodies).

Types of interventions

We considered any method of debridement compared with a control regimen (a placebo, an alternative method of debridement, any other therapy or no treatment) including:

- surgical, such as the excision of all devitalised tissue, or sharp, such as the excision of small quantities of non-viable tissue using a scalpel or scissors;
- biosurgical, such as the use of sterile larvae;
- autolytic, such as the use of hydrogels/hydrocolloids to promote a moist environment;
- mechanical, such as wet-to-dry debridement, high-pressure irrigation, or whirlpool debridement; and
- enzymatic debridement, such as topical enzymatic preparations (e.g. collagenase).

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Types of outcome measures

We reported outcome measures at the latest time point available for a study.

Primary outcomes

- **Complete wound debridement** defined as a clean wound bed
- **Wound healing**

As the debridement of wounds includes any method that removes infected or contaminated tissue, cell debris or devitalised material to create a clean wound bed, we planned to include studies that reported on any of these methods of debridement and measured in any way and at any time point. This included:

- **time to complete debridement** (e.g. *mean time to a clean wound bed in minutes/days* or *mean time until secondary suture/ wound closure* assessed by measurements, bacteriological swabs, visual examination, or combinations of these, during the trial period);
- **proportion of wounds completely debrided** during the trial period (e.g. number of wounds that did/did not become completely clean assessed by measurements, bacteriological swabs, visual examination, or combinations of these, during the trial period);
- **rate of reduction in wound size** expressed in either absolute or relative terms (e.g. area, length, breadth, depth, volume of wounds, assessed by measurements, bacteriological swabs, visual examination, or combinations of these, during the trial period);
- **proportion of wounds completely healed** during the trial period (e.g. number of wounds that did/did not become completely healed assessed by measurements, bacteriological swabs, visual examination, or combinations of these, during the trial period);
- **time to complete healing** (e.g. time taken for the disappearance of pus and debris, necrosis, erythema, oedema, or slough assessed by measurements, bacteriological swabs, visual examination, or combinations of these, during the trial period);
- **serious adverse events** (life-threatening or those leading to hospitalisation) measured as number or proportion of events, or as number or proportion of participants with adverse events (or both), during the trial period;
- **other adverse events** (those leading to discontinuation of treatment) measured as number or proportion of events, or as number or proportion of participants with adverse events (or both), during the trial period.

As two outcomes included mean time to healing or debridement, we planned to report time-to-event data (e.g. time to complete wound healing), as hazard ratios (HR) with 95% confidence intervals (CI), where possible, in accordance with the methods described by Deeks 2021 in the *Cochrane Handbook for Systematic Reviews of Interventions*. Where studies analysed time to wound healing as a continuous measure, but it was not clear if all wounds had healed, we planned not to calculate effect estimates or use the data in any meta-analysis but would have reported if all wounds reached the outcome or noted if they did not.

Secondary outcomes

- **Participant satisfaction** (e.g. pain associated with treatment as recorded using a recognised pain scale)
- **Rate of infection** measured as number or proportion of events or as number or proportion of participants with adverse events (or both), during the trial period
- **Cost-effectiveness** (e.g. as presented in a cost-effectiveness analysis, which may have included: nursing time; time taken to change dressing; number of dressing changes required; cost of dressing materials)
- **Quality of life** (mean or median health-related quality of life such as EQ-5D or 36-item Short Form Health Survey (SF-36), measured using any validated tool, during the trial period)
- **Length of hospital stay** expressed as mean or median days

Search methods for identification of studies

Electronic searches

We searched the following electronic databases to identify reports of relevant RCTs.

- Cochrane Wounds Specialised Register (searched 13 October 2021)
- Cochrane Central Register of Controlled Trials (CENTRAL; 2021, Issue 9) in the Cochrane Library (searched 13 October 2021)
- MEDLINE Ovid including In-Process & Other Non-Indexed Citations (1946 to 13 October 2021)
- Embase Ovid (1974 to 13 October 2021)
- CINAHL Plus EBSCO (Cumulative Index to Nursing and Allied Health Literature; 1937 to 13 October 2021)

The search strategies for the Cochrane Wounds Specialised Register, CENTRAL, MEDLINE Ovid, Embase Ovid, and CINAHL Plus EBSCO can be found in Appendix 1. In MEDLINE Ovid, we combined the subject-specific strategy with the sensitivity- and precision-maximising version of the Cochrane Highly Sensitive Search Strategy for identifying RCTs (2008 revision) (Lefebvre 2021). We combined the Embase Ovid search with the Ovid Embase filter developed by Cochrane UK (Lefebvre 2021). We combined the CINAHL Plus EBSCO search with the trial filter developed by Glanville 2019. There were no restrictions with respect to language, date of publication, or study setting.

Searching other resources

We searched the following clinical trials registries.

- ClinicalTrials.gov (www.clinicaltrials.gov; searched 13 October 2021)
- World Health Organization International Clinical Trials Registry Platform (www.who.int/clinical-trials-registry-platform; searched 13 October 2021)

Three ongoing studies identified from the above searches in October 2021 were reviewed in March 2024. Two remained ongoing and one was complete and excluded as per the rationale detailed in Shoham 2021.

Search strategies for clinical trial registries can be found in Appendix 1.

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Details of the search strategies used for the previous version of the review are given in Smith 2013.

We aimed to identify other potentially eligible trials or ancillary publications by searching the reference lists of retrieved included trials, as well as relevant systematic reviews, meta-analyses, and health technology assessment reports.

Data collection and analysis

We carried out data collection and analysis according to the methods stated in the published protocol (Dryburgh 2006).

Selection of studies

Two review authors (FS and JD) independently assessed the titles and abstracts identified for relevance and design. We obtained the full-text of all potentially relevant records. Two review authors (FS and JD) independently assessed the full-text reports of studies against a list of eligibility criteria and resolved any disagreements through discussion. We recorded all reasons for exclusion of studies for which we had obtained full-text copies in the Characteristics of excluded studies table. We completed a PRISMA flowchart to summarise this process (Liberati 2009).

Data extraction and management

Two review authors (FS and TB) independently performed data extraction using a standardised data extraction sheet to record and summarise details of the studies. We resolved discrepancies by discussion and entered data into Review Manager 5 software (Review Manager 2020).

We extracted the following data:

- general information: author(s), title, source, contact address, year of study, country of study, language of publication, year of publication;
- trial characteristics: design (RCT), randomisation method, manner of recruitment, sampling method, duration of intervention period, length of follow-up, reason for and number of dropouts and withdrawals, adverse events;
- participants: baseline characteristics such as sex, age, type of wound, wound size, duration of wound, method of debridement, prevalence of comorbidities (e.g. diabetes), study inclusion and exclusion criteria, all by treatment group;
- intervention: detailed description of the comparison intervention, mode, intensity, duration;
- outcome measures including time of measurement, assessment tool used and scoring range where appropriate;
- primary outcomes: time to complete debridement, proportion of wounds completely debrided, reduction in wound size, proportion of wound completely healed, time to complete healing;
- secondary outcomes: patient satisfaction with intervention method (e.g. pain associated with treatment using a recognised pain assessment tool), rate of infection, quality of life, length of hospital stay, cost-effectiveness, serious/other adverse events;
- co-interventions (e.g. antibiotic administration);
- funding source (referred to as trials sponsored by the dressing manufacturer in previous iterations of this review).

Assessment of risk of bias in included studies

Two review authors (FS and TB) independently assessed the risk of bias for each included study, without blinding to journal or authorship, using the Cochrane RoB 1 tool and the criteria specified in Chapter 8 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2017). This tool addresses six specific domains, namely sequence generation, allocation concealment, blinding, incomplete outcome data, selective outcome reporting, and other potential sources of bias. See Appendix 2 for details of the criteria on which the judgements were based. We classed studies as being at high risk of bias overall if any one of the criteria was judged at high risk of bias. We judged studies at unclear risk of bias if they did not report sufficient information to make a judgement with respect to each domain and unclear risk of bias if dropout was 20% or higher for the 'incomplete outcome data' domain. We used discussion and consensus to resolve any disagreements.

Measures of treatment effect

For dichotomous outcomes (e.g. proportion of participants with serious adverse events), we planned to present the risk ratio (RR) with 95% CI. For continuous outcomes (e.g. quality of life), if all studies used the same assessment scale, we planned to use the mean difference (MD) with 95% CIs. If studies used different assessment scales, we planned to use the standardised mean difference (SMD) with 95% CI. We planned to report time-to-event data (e.g. time to complete wound healing), as HR with 95% CI, where possible, in accordance with the methods described in the *Cochrane Handbook for Systematic Reviews of Interventions* (Deeks 2021). Where studies analysed time to wound healing as a continuous measure, but it was not clear if all wounds had healed, we planned not to summarise or use the data in any meta-analysis but would have reported if all wounds reached the outcome or noted if they did not.

Unit of analysis issues

We intended to take into account the level at which randomisation occurred (cluster, participant, or wound). We acknowledge that centre effects may exist but, based on previous reviews including only single-centre experiences, we believed we were unlikely to include studies to address analytical considerations of regional or centre clustering effects. We planned to assess whether a cluster trial had correctly accounted for unit of analysis issues as part of the risk of bias assessment and, if this was the case, then we planned to incorporate such study designs in meta-analyses where appropriate to do so.

If included studies were randomised at the participant level and measured outcomes at the wound level, we planned to treat the participant as the unit of analysis. In cases where studies randomised wounds or body parts as opposed to individuals and there were multiple wounds per participant, we did not analyse further or include them in the meta-analysis but instead presented narrative summaries of the results.

Studies with split-body designs enroll participants and randomise one wound to one treatment and the other to the alternative treatment. These studies should be analysed separately from parallel-group trials, using paired data, which reflects the reduced variation in evaluating different treatments on the same person.

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If a future update identifies cluster-RCTs, we will note whether studies presented outcomes at the level of the cluster or at the level of participants. Unit of analysis issues can occur if studies randomise at the cluster level, but the outcome data are analysed at the level of the participant. We would have noted whether data from participants in a cluster were (incorrectly) treated as independent. In this case, we would have recorded this as part of the risk of bias assessment (using the 'other potential sources of bias' domain). Where possible, we would then have adjusted for clustering ourselves using appropriate methods (Higgins 2021). If no such adjustments were possible, we would have recorded the results but would not have included them in a meta-analysis.

Dealing with missing data

We planned to present the data available from the study reports and not impute missing data. We did assess risk of bias due to missing outcome data; for example, we assessed how each trial dealt with missing data and attrition rates, including dropouts, loss to follow-up, and withdrawals.

Assessment of heterogeneity

We planned to assess any statistical heterogeneity using the I^2 statistic, where values of I^2 over 75% indicate a high level of heterogeneity (Higgins 2003). The I^2 statistic examines the percentage of total variation across RCTs that is due to heterogeneity rather than chance (Higgins 2003). The accuracy of the I^2 statistic is limited when the number of studies is small as is the case in our review. We planned to further explore any indication of high statistical heterogeneity when we pooled the data. We considered clinical and methodological heterogeneity, including the degree to which the included studies varied in terms of participant, intervention, outcome, and characteristics such as length of follow-up. This informed our decision not to conduct any meta-analyses but to present the results as a series of unique comparisons.

Assessment of reporting biases

We considered the various types of reporting biases and related issues using guidelines in the *Cochrane Handbook for Systematic Reviews of Interventions* (Page 2021). For example, we undertook a comprehensive search of the literature using multiple databases and trial registries; we also searched for duplicate publications, companion papers, and protocols, in order to try and reduce reporting biases. Selective reporting (outcome reporting bias) was assessed as a domain within our risk of bias assessments. We planned to assess reporting bias using visual assessment of funnel plots, whilst acknowledging the limitations of this, if more than 10 studies were included in a meta-analysis (Page 2021); however, this was not possible as no meta-analysis was undertaken.

Data synthesis

We planned to pool the data if appropriate to do so after considering clinical and methodological heterogeneity regarding the type of intervention, comparator, population, and outcomes. Where studies were clinically similar and outcome measurements comparable, we planned to pool results using a random-effects model and report the pooled estimate together with its 95% CI. We planned to use a random-effects approach because we were unable to prespecify the amount of clinical, methodological, and statistical heterogeneity in the included studies. We planned to present data using forest plots, where possible. For dichotomous outcomes, we planned to present the summary estimate as an RR with 95% CI. Where studies measured continuous outcomes, we planned to present an MD with 95% CI; we planned to pool SMD estimates where studies measured the same outcome using different methods. For time-to-event data (such as time to wound healing), we planned to plot (and, if appropriate, pool), estimates of HRs and 95% CIs as presented in the study reports using the generic inverse variance method in Review Manager 5 (Review Manager 2020). Where statistical synthesis of data from more than one study was not possible or considered inappropriate, we conducted a narrative review of eligible studies.

Subgroup analysis and investigation of heterogeneity

If heterogeneity was high for the primary outcomes, we planned to investigate heterogeneity, considering population, intervention, or comparator subgroup analyses. Consideration of clinical and methodological heterogeneity informed our decision not to conduct any meta-analyses but to present the results as a series of unique comparisons. Therefore, subgroup analyses were not required.

Sensitivity analysis

We did not plan to conduct sensitivity analyses.

Summary of findings and assessment of the certainty of the evidence

We presented the main results of the review in summary of findings tables. These tables summarise information concerning the certainty of the evidence, the magnitude of the effects of the interventions examined, and the sum of available data for the main outcomes (Schünemann 2021a). The tables include an overall grading of the evidence related to each of the main outcomes using the GRADE approach, which defines the certainty of a body of evidence as the extent to which one can be confident that an estimate of effect or association is close to the true quantity of specific interest. The certainty of a body of evidence involves consideration of five factors: within-study risk of bias (methodological quality), directness of evidence, heterogeneity, precision of effect estimates, and risk of publication bias (Schünemann 2021b).

When undertaking GRADE assessment, we downgraded the certainty when studies were at high risk of bias for one or more domains. In assessing the precision of effect estimates, we also followed GRADE guidance (GRADE 2013); we assessed the size of any CIs, downgrading two levels for imprecision where there were few events, wide CIs, or if clustering effects were not considered during analysis. We downgraded one level per issue per GRADE consideration, so, for example, if a study had a small sample size and also failed to report variance data for an outcome, then that study was downgraded two levels for imprecision; if a study was rated at high risk of attrition bias and had a small sample size, it was downgraded one level for bias and one level for imprecision.

We presented the following outcomes in the summary of findings tables.

- Time to complete debridement
- Proportion of wounds completely debrided
- Rate of reduction in wound size

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- Proportion of wounds completely healed
- Time to complete healing
- Serious adverse events that were life-threatening, led to hospitalisation, or both

We did not pool data, so we conducted the GRADE assessment for each comparison and presented this narratively within the Effects of interventions section with associated summary of findings tables.

RESULTS

Description of studies

See Characteristics of included studies; Characteristics of excluded studies; and Characteristics of ongoing studies tables.

Results of the search

Over the lifetime of this review, we have assessed 4919 titles and abstracts (43 as full-text articles).

Electronic searching for this fourth update resulted in 2237 titles and abstracts of potentially relevant studies after removal of duplicates (Figure 1). There were no other potentially relevant studies identified via reference lists of included and excluded studies, and searching other sources. We excluded 2224 records that were irrelevant and obtained 13 full-text articles. We excluded 10 full-text articles with reasons (Acosta 2013; Cassino 2013; Kim 2013; Ma 2014; NCT01237392; NCT02482948; Oosthuizen 2014; Shoham 2021; Tewarie 2013; Yang 2012). One trial met the inclusion criteria (Wang 2014), and two trials are ongoing (NCT03798041; NCT03880331).

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Figure 1. Study flow diagram (2021 update).

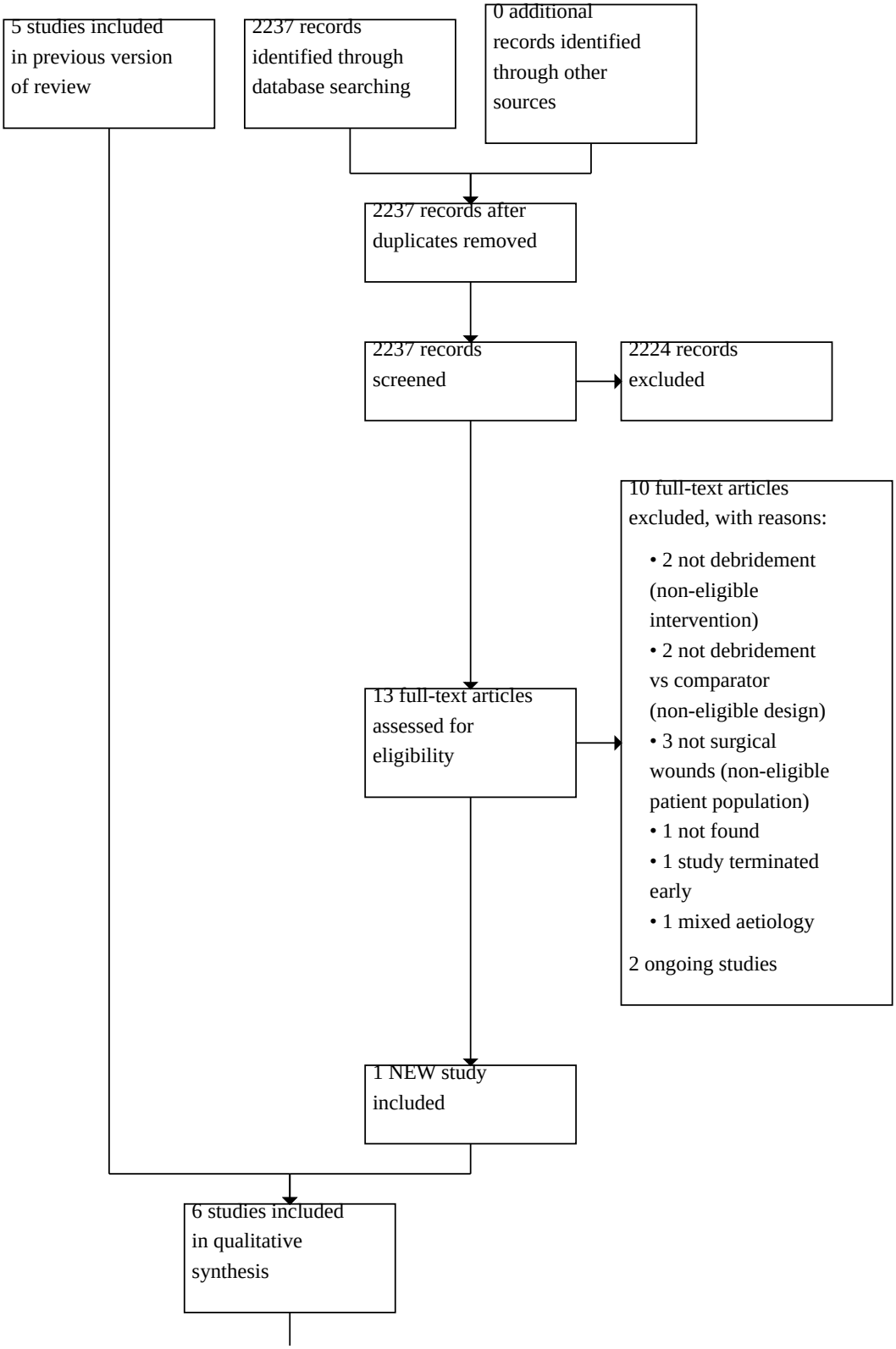

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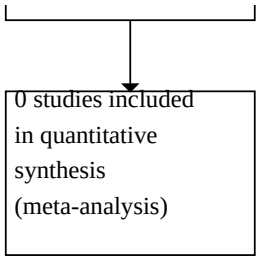
Figure 1. (Continued)



Therefore, in this fourth update, there are a total of six included studies; five from previous iterations of this review (Goode 1979; Sondergaard 1982; Young 1982; Poulson 1983; Michiels 1990), and one new included study (Wang 2014).

Included studies

Descriptions of included studies can be found in the Characteristics of included studies table.

Design

We included six RCTs with a total of 265 participants (Goode 1979; Michiels 1990; Poulson 1983; Sondergaard 1982; Wang 2014; Young 1982). All six RCTs had a parallel-group design with two arms. The RCTs were published between 1979 and 2014 (although there were no trials reported between 1990 and 2014).

Setting

All trials took place in a single setting. Five trials had an inpatient setting (Goode 1979; Michiels 1990; Poulson 1983; Wang 2014; Young 1982), and one trial had both an inpatient and community setting (Sondergaard 1982). The RCTs were carried out in China (Wang 2014), Europe (Michiels 1990; Poulson 1983; Sondergaard 1982), and the UK (Goode 1979; Young 1982).

Participants

Trial sample size was mostly small and varied from 18 participants (Poulson 1983) to 106 participants (Wang 2014). Trials included males and females with four trials reporting numbers of males and females (Goode 1979; Michiels 1990; Poulson 1983; Wang 2014). Where reported, there were 105 (55%) males and 79 (41%) females within the studies and the age of participants, where reported, ranged from three years to 91 years.

All participants had postsurgical wounds described as infected, or at risk of infection, and reported that the wounds were either left open or required opening and drainage for infection.

Interventions

Each of the six studies had different interventions. In Goode 1979, the intervention group had twice-daily dressings of dextranomer granules covered with a light pack and the control group had twice-daily dressings of Eusol and paraffin-soaked ribbon gauze. In Michiels 1990, the intervention group had the dressing changed daily, the wound was cleansed (no details of the technique given) and a saline-soaked compress applied and covered by a 3-mm layer of dextranomer paste, covered with a compress and bandaged. The control group had the dressing changed daily with the wound cleansed then a gauze dressing soaked in 10% aqueous polyvinylpyrrolidone applied, covered with a dry dressing and bandaged. Further changes of the dressings for intervention and control groups were dictated by the degree of soakage of the dressings. In Poulson 1983, the intervention group had twice-daily dressings, necrotic tissue removed, and dressing soaked in 20 mL solution (streptokinase/streptodornase) applied. The control group had twice-daily dressings, necrotic tissue removed, and dressing soaked in 20 mL saline solution applied. In Sondergaard 1982, the intervention group had wound irrigation with saline, dextranomer beads made into a paste applied to the wound, covered with a sterile compress, and the dressing was changed at least daily and before it became fully saturated. The control group had a dressing soaked in 0.1% chloramine solution, covered with a sterile compress, and the dressing was changed once daily and two or three times if saturated. In Young 1982, all wounds were initially treated with gauze packing for the first 48 hours. The intervention group had dextranomer beads applied twice daily, then reduced to once daily when the discharge reduced. The control group had a silicone foam elastomer dressing applied, which was removed and cleaned twice daily, then reduced to once daily with reduction in the discharge. In Wang 2014, the intervention was either endoscopic debridement (where the wound area draped and sterilised conventionally, 6 mm opening of the original wound to allow entry of choledochoscope, wound washed and cleansed with sterile saline, necrotic tissue and infected sutures removed under direct visualisation, a saline gauze used to drain the wound for no longer than 24 hours) or open surgical debridement (where the wound area was draped and sterilised conventionally, wound opened via original incision, wound washed and cleansed with sterile saline).

Only one trial reported follow-up duration (Wang 2014).

Excluded studies

For this update, we excluded 10 full-text articles (Acosta 2013 (no debridement); Cassino 2013 (unable to obtain full text); Kim 2013 (not surgical wounds); Ma 2014 (no debridement in trial); NCT01237392 (not surgical wounds); NCT02482948 (trial terminated due to poor recruitment); Oosthuizen 2014 (not surgical wounds); Shoham 2021 (mixed wound aetiology); Tewarie 2013 (no comparator method); Yang 2012 (no debridement); see Characteristics of excluded studies table for more details).

Over the lifetime of this review, we excluded 34 studies (25 exclusions prior to this update).

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Studies awaiting classification

No studies are awaiting classification.

Ongoing studies

We identified two ongoing studies (NCT03798041; NCT03880331; see Characteristics of ongoing studies table).

Risk of bias in included studies

The Characteristics of included studies reports the risk of bias results for the six included studies. We present a risk of bias summary with review authors' judgements about each risk of bias item for each included study (Figure 2), and a risk of bias graph with review authors' judgements about each risk of bias item presented as percentages across all included studies (Figure 3). When a study included insufficient information to allow us to make a judgement for a particular domain, we classified it as unclear. We classified studies at high risk of bias overall if any one of the domains was at high risk of bias.

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Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.

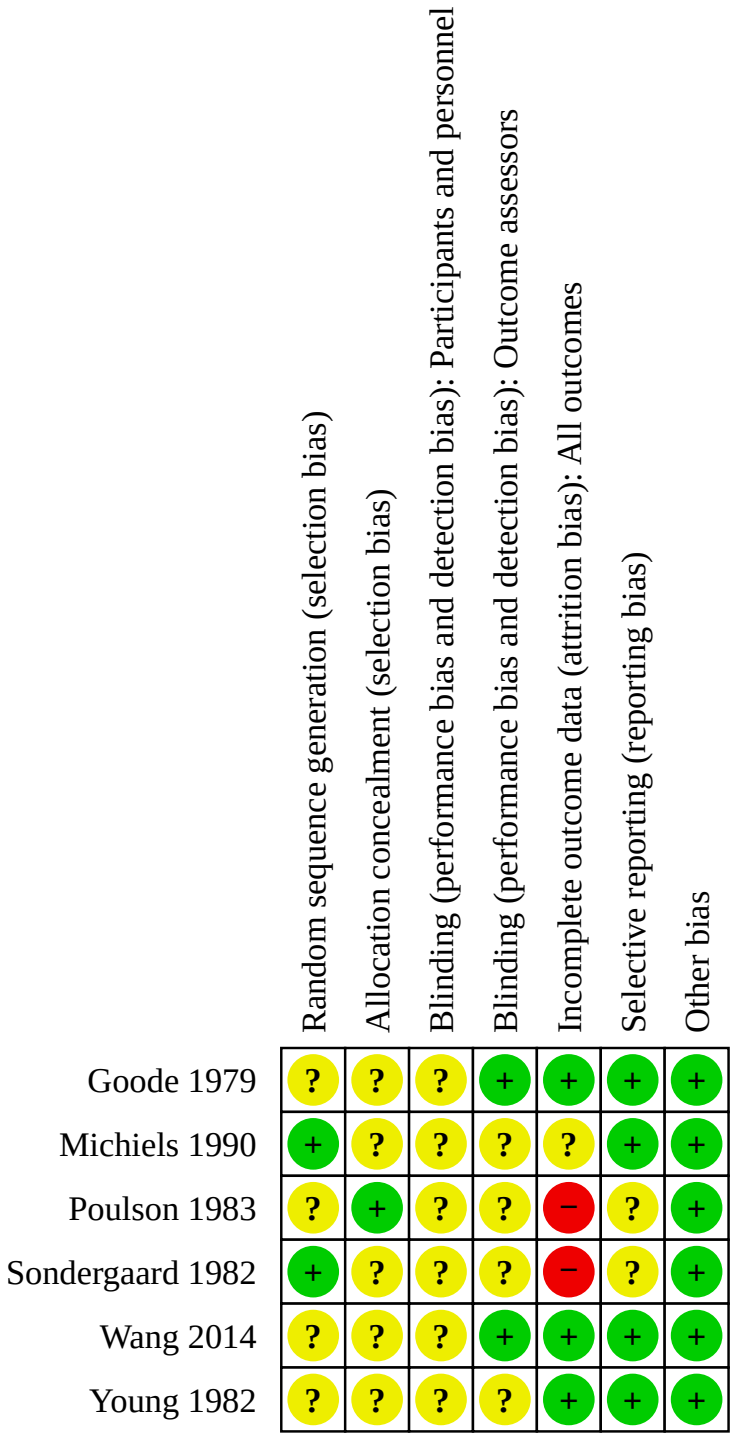

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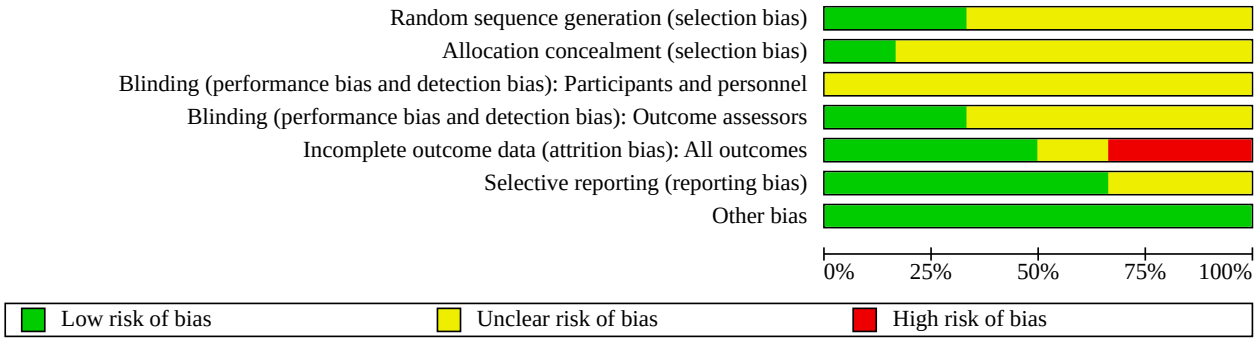
Figure 3. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.



Allocation

Adequacy of the randomisation process

Two studies were at low risk and four studies were at unclear risk.

All studies reported that allocation was randomised but the method of generating the randomisation sequence was not always clear. We judged sequence generation to be adequate in two studies: Michiels 1990 reported the use of a randomisation list and Sondergaard 1982 randomised participants in blocks of four. Hence, we judged these two studies at low risk of bias for this domain. We judged the remaining four studies at unclear risk of bias as they did not report sufficient information to make a judgement with respect to the method of sequence generation: Goode 1979 and Young 1982 used a randomised card system, whilst Poulson 1983 arranged for the hospital pharmacy to control the randomisation but none of them stated how the sequence was generated. For Wang 2014, the only detail given was that this was done using the "sealed envelope method".

Adequacy of allocation concealment

One study was at low risk and five studies were at unclear risk.

One study reported adequate allocation concealment and was at low risk of bias for this domain. Poulson 1983 reported that the hospital pharmacy prepared and provided the ampoules of the treatment and control solutions (treatment and control solutions were both 20 mL vials of clear fluid). Sondergaard 1982 reported the use of numbered sealed envelopes which were not described as opaque; therefore, we judged it at unclear risk of allocation concealment. The extent of the allocation concealment in the remaining trials was unclear either because there was insufficient information or studies did not state that allocation was concealed.

Blinding

Blinding of participants and personnel

All six studies were at unclear risk of performance and detection bias. None of the included studies reported blinding of participants or personnel involved in the care of the participants. It would be difficult to blind the personnel involved in applying the wound dressings where the control and treatment dressings had very different properties; the same would apply to the participants; however, the judgement remained at unclear risk of bias as this was not directly reported within any of the studies. It would be impossible to blind the personnel involved in the surgical intervention (Wang 2014), or the personnel involved in the care following surgery due to the appearance of the wound; however, the judgement remains at unclear risk of bias as this was not directed reported in Wang 2014.

Blinding of outcome assessors

Two studies were at low risk and four studies were at unclear risk for blinding of outcome assessors. Two trials reported that the outcome assessors were blinded to treatment. Goode 1979 reported that the outcome assessor was blinded to treatment and the assessment was carried out using photographs rather than a visual inspection. Wang 2014 documented that the outcome assessors who undertook the follow-up of the postoperative wounds were blinded and that information on group allocation was not recorded in the clinical or surgical notes. Therefore, both Goode 1979 and Wang 2014 were at low risk of bias for this domain. The remaining trials did not report if the outcome assessors were blinded and were at unclear risk of bias for this domain (Michiels 1990; Poulson 1983; Sondergaard 1982; Young 1982).

Incomplete outcome data

Two studies were at high risk, three studies at low risk, and one study at unclear risk of attrition bias. Poulson 1983 and Sondergaard 1982 were at high risk of bias for this domain. Poulson 1983 reported three withdrawals which were excluded from the final analysis and Sondergaard 1982 reported six withdrawals and in the tables of results indicated that these participants were excluded. It is not clear if these were also excluded from the final analysis. In addition, the dropout rate in Sondergaard 1982 was 21% (we originally prespecified greater than 20% dropout would be assessed as at high risk for attrition bias) and hence was judged to be high risk. Goode 1979 and Young 1982 did not record any withdrawals or dropouts and the number of participants included at the start of each trial was reflected in the results. Therefore, we judged them at low risk of bias for this domain. Wang 2014 stated that there were no withdrawals during the trial period and no participants were "lost during the follow-up period"; therefore, Wang 2014 was at low risk of bias for this domain. The remaining trial reported limited information and was judged at unclear risk of bias in this domain (Michiels 1990).

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Selective reporting

Four studies were at low risk and two were at unclear risk of reporting bias. We found no study protocols. However, we judged Goode 1979, Michiels 1990, Wang 2014, and Young 1982 at low risk of bias for this domain because they adequately reported the expected study outcomes. We judged Poulson 1983 and Sondergaard 1982 at unclear risk of bias due to poor reporting. In Sondergaard 1982, the intention was also to examine the number of daily wound dressing changes required, but this was abandoned due to insufficient recording. In Poulson 1983, the size of the wound and the type of bacterial growth was recorded at the start of the trial but was not reported on again within the results.

Other potential sources of bias

We identified no other sources of bias.

Effects of interventions

See: **Summary of findings 1** Dextranomer beads (autolytic) compared with Eusol gauze for debridement of surgical wounds; **Summary of findings 2** Dextranomer paste (autolytic) compared with 10% aqueous polyvinylpyrrolidone for debridement of surgical wounds; **Summary of findings 3** Dextranomer paste (autolytic) compared with 0.1% chloramine-soaked dressings for debridement of surgical wounds; **Summary of findings 4** Dextranomer beads (autolytic) compared with silicone foam elastomer (autolytic) for debridement of surgical wounds; **Summary of findings 5** Streptokinase/streptodornase (enzymatic) compared with saline-soaked dressing for debridement of surgical wounds; **Summary of findings 6** Surgical debridement via an endoscopic method versus conventional 'open' surgical debridement for debridement of surgical wounds

See Summary of findings 1; Summary of findings 2; Summary of findings 3; Summary of findings 4; Summary of findings 5; and Summary of findings 6 for each comparison. Table 1 provides a summary of effects for all outcomes reported within the six studies.

Five trials reported time to a clean wound bed and was the primary outcome prior to wound closure or discharge from hospital (Goode 1979; Michiels 1990; Poulson 1983; Sondergaard 1982; Wang 2014). Three trials reported time to complete healing (Sondergaard 1982; Wang 2014; Young 1982).

Comparison 1: dextranomer beads (autolytic) compared with Eusol gauze

One study (20 participants) compared dextranomer beads (an autolytic debridement agent) with Eusol-soaked ribbon gauze in participants with infected surgical wounds, following appendectomy or bowel surgery (Goode 1979). Summary of findings 1 provides a summary of the results for this comparison.

Primary outcomes

Time to a clean wound bed

Resolution of erythema and oedema, absence of pus or slough at the base, and the formation of granulation tissue were the criteria to determine a clean wound bed. There is very low-certainty evidence that there may be no clear difference in time to a clean wound bed between dextranomer beads and Eusol gauze (downgraded three levels for imprecision). The study authors stated that mean time to a clean wound bed was shorter with dextranomer (8.1 (range 5 to 28) days with dextranomer versus 11.6 (range 6 to 22) days with Eusol). The study authors also reported that one wound in each group healed without secondary closure.

The study did not specify the follow-up duration.

No other primary outcomes were reported.

Secondary outcomes

Cost-effectiveness

The study did not conduct a cost-effectiveness analysis but commented on the higher cost of dextranomer (Great British pound (GBP) 3.40 per twice-daily dressing), but that the shorter hospital stay in the treatment group compensated for this. This claim was not supported by any data.

Length of hospital stay

Participants in the dextranomer group were described as having a shorter hospital stay by a median of 2.2 days compared with the Eusol group; however, no data for the control group were reported.

The trial did not report any other secondary outcomes.

Comparison 2: dextranomer paste (autolytic) compared with 10% aqueous polyvinylpyrrolidone

One study (40 participants) compared dextranomer paste with gauze dressings soaked in 10% aqueous polyvinylpyrrolidone (an iodine-based solution) in participants with infected surgical wounds following osteosynthesis, microsurgery, and reconstructive procedures (Michiels 1990). Summary of findings 2 provides a summary of the results for this comparison.

Primary outcomes

Time to a clean wound bed

The disappearance or resolution of pus and debris were the criteria to determine a clean wound bed, although the study authors also reported on the presence of granulation tissue, erythema, oedema, and necrotic tissue. The duration of the trial was 12 days and treatment was discontinued when the wound was clean and had new granulation tissue. There is very low-certainty evidence that there may be no difference in time to a clean wound bed between dextranomer paste and 10% aqueous polyvinylpyrrolidone gauze (downgraded three levels for imprecision). The study authors stated that mean time to a clean wound bed was longer with dextranomer paste (6.5 days with dextranomer versus 5.2 days with 10% aqueous polyvinylpyrrolidone; no variance data were provided). The study authors also reported that two wounds in the dextranomer paste group and six wounds in the 10% aqueous polyvinylpyrrolidone did not become clean in the duration of the study.

The study did not specify the follow-up duration.

Other adverse events (those leading to discontinuation of treatment)

There is low-certainty evidence that there is probably no difference in serious adverse events leading to discontinuation of treatment between dextranomer paste and gauze dressing (downgraded two levels for imprecision). The study authors report one adverse event that led to discontinuation in the control group following an allergic reaction, oedema, and erythema after 10 days.

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No other primary outcomes were reported.

Secondary outcomes

The study did not report any secondary outcomes.

Comparison 3: dextranomer paste (autolytic) compared with 0.1% chloramine-soaked dressings

One study (28 participants) compared dextranomer paste with 0.1% chloramine-soaked dressings in participants with infected open surgical wounds (Sondergaard 1982). Summary of findings 3 provides a summary of the results for this comparison.

Primary outcomes

Time to a clean wound bed

The study did not report the criteria used to determine when the wound was clinically clean. There may be a difference in time until the wounds were clinically clean between dextranomer paste and 0.1% chloramine favouring 0.1% chloramine, but we are very uncertain (evidence downgraded one level for attrition and two levels for imprecision). The number of days until the wounds were clinically clean was a median of six days with dextranomer paste and five days with chloramine-soaked dressings (no variance data provided). The study authors also reported mean time from the start of the treatment until the participant was assessed as ready for outpatient treatment (median: 9 days with dextranomer paste versus 7 days for chloramine-soaked dressings; no variance data provided).

Time to complete healing

There may be a difference in time to complete healing between dextranomer paste and 0.1% chloramine favouring 0.1% chloramine, but we are very uncertain (evidence downgraded one level for attrition and two levels for imprecision). Time to complete healing was a median of 27 days with dextranomer paste and 20 days with chloramine-soaked dressings (no variance data provided). There were some participants excluded from this analysis; 4/14 participants in the dextranomer paste group and 2/14 participants in the chloramine-soaked dressings group were excluded.

The study did not specify the follow-up duration.

Serious adverse events (life-threatening or those leading to hospitalisation)

There is low-certainty evidence that there may be no difference in deaths and serious adverse events between dextranomer paste and 0.1% chloramine-soaked dressing (evidence downgraded one level for attrition and one level for imprecision). There were two deaths in the dextranomer paste group, one total wound rupture, and one 'peritoneal communication' in the 0.1% chloramine-soaked dressings group that required treatment discontinuation.

No other primary outcomes were reported.

Secondary outcomes

Participant satisfaction

The study did not use a pain scale but reported that the dextranomer dressing was less painful as it was easier to remove. However, there were no data.

Cost-effectiveness

The study did not conduct a cost-effectiveness analysis; the mean cost per change of dressing for the dextranomer paste group was 123 Danish Kroner compared with approximately 1.50 Danish Kroner for the chloramine-soaked dressings group; however, no further cost analysis was reported.

No other secondary outcomes were reported.

Comparison 4: dextranomer beads (autolytic) compared with silicone foam elastomer (autolytic)

One study (50 participants) compared dextranomer beads with silicone foam elastomer in participants with open, infected surgical wounds (Young 1982). Summary of findings 4 provides a summary of the results for this comparison.

Primary outcomes

Time to complete healing

There is very low-certainty evidence that there may be no difference in time to complete healing between dextranomer beads and silicone foam elastomer (evidence downgraded three levels for imprecision). Mean time to complete wound healing was 40.92 days (SE 3.98) with dextranomer beads and 36.90 days (SE 3.18) with silicone foam elastomer (MD 4.02 days, 95% CI −5.96 to 14.00; Analysis 1.1). All participants were included in this analysis.

The study did not specify the follow-up duration.

No other primary outcomes were reported.

Secondary outcomes

Participant satisfaction

The trialists reported that comfort of the dressing was assessed by questioning the participant. Pain of the wound was graded using a scale of 0 to 3 (with 0 being no pain and 3 severe pain). The mean time to a pain-free wound was 5.32 (SD 0.55) days in the dextranomer beads group compared with 5.64 (SD 0.45) days in the silicone foam elastomer group (MD −0.32 days, 95% CI −0.60 to −0.04).

Cost-effectiveness

The study did not conduct a cost-effectiveness analysis. The trialists reported that dextranomer was markedly less cost-effective than silicone foam elastomer. However, only approximate costings from another dextranomer trial by Goode 1979 were quoted.

No other secondary outcomes were reported.

Comparison 5: streptokinase/streptodornase (enzymatic) compared with saline-soaked dressing

One study (21 participants) compared enzymatic debridement with streptokinase/streptodornase to saline-soaked dressings in participants with infected abdominal surgical wounds following a range of operations (Poulson 1983). Summary of findings 5 provides a summary of the results for this comparison.

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Primary outcomes

Time to a clean wound bed

There is low-certainty evidence that there may be no difference in time to a clean wound bed or secondary suture between streptokinase/streptodornase and saline-soaked dressings (downgraded two levels for imprecision). The study authors stated that mean time until the wound was clean or could be closed by secondary suture was shorter with streptokinase/streptodornase (5 (SD 2.16) days with streptokinase/streptodornase versus 13.45 (SD 6.77) days with saline-soaked dressing). Secondary suture was performed in 3/7 wounds in the streptokinase/streptodornase group and 4/11 wounds in the saline-soaked dressing group. The MD was not calculated as these data do not represent a valid measure because not all participants achieved the outcome. Three participants were excluded from evaluation due to non-completion of treatment — see adverse events below.

The study did not specify the follow-up duration.

Serious adverse events (life-threatening or those leading to hospitalisation)

There is very low-certainty evidence that there may be no difference in deaths and serious adverse events between streptokinase/streptodornase and saline-soaked dressings (downgraded one level for attrition and two levels for imprecision). There was one reoperation for intra-abdominal sepsis requiring treatment discontinuation in the streptokinase/streptodornase group and one death from a pulmonary embolism and one burst abdomen requiring treatment discontinuation of two participants in the saline-soaked dressing group.

No other primary outcomes were reported.

Secondary outcomes

Length of hospital stay

There may be no difference in length of hospital stay between streptokinase/streptodornase and saline-soaked dressings, as the certainty of the evidence is low (downgraded two levels for imprecision). Participants in the streptokinase/streptodornase group were described as having a had a shorter stay of 8.5 days than the saline-soaked dressings group; however, no further data were included in the trial report.

No other secondary outcomes were reported.

Comparison 6: surgical debridement via an endoscopic method versus conventional 'open' surgical debridement

One study (106 participants) compared surgical debridement via endoscopic ('keyhole') surgery and surgical debridement by 'open' surgery (the wound is opened using a scalpel) in participants with infected surgical wounds (Wang 2014). Summary of findings 6 provides a summary of the results for this comparison.

Primary outcomes

Time to a clean wound bed

There is very low-certainty evidence that there may be no difference in time to a clean wound bed between surgical debridement via endoscopy and 'open' surgical debridement (evidence downgraded two levels for imprecision and one level for indirectness). The study authors stated that mean time to complete surgical debridement was 128 (SD 56) minutes in the endoscopic group and 104 (SD 72) minutes in the 'open' surgery group (MD 24.00 minutes, 95% CI −0.85 to 48.85).

Time to complete healing

There is low-certainty evidence that there may be a reduction in time to complete wound healing with surgical debridement via endoscopy compared with 'open' surgical debridement (evidence downgraded two levels for imprecision). The study authors stated that mean time to complete wound healing was 10.0 (SD 2.5) days for the endoscopic group and 19.4 (SD 5.2) days for the 'open' surgery group (MD −9.40 days, 95% CI −10.99 to −7.81). All participants were included in this analysis.

Follow-up duration stated to be "at least four weeks following intervention" by study authors.

No other primary outcomes were reported.

Secondary outcomes

Participant satisfaction

The trial reported pain scoring using a visual analogue score seven days postsurgery. The mean pain score for the endoscopic group was 3.2 (SD 1.5) compared with 5.5 (SD 1.1) for the open surgery group (MD −2.30, 95% CI −2.80 to −1.80).

Length of hospital stay

The trial reported mean length of hospital stay for the endoscopic group of 15 (SD 4.1) days compared with 22.5 (SD 2.3) days for the open surgery group (MD −7.50 days, 95% CI −8.74 to −6.26).

No other secondary outcomes were reported.

DISCUSSION

Summary of main results

This review update provides very low- to low-certainty evidence of debridement for surgical wounds. Despite the availability of a range of debridement methods and an increasing number of modern dressings, we identified only six studies, with a total of 265 participants. Five studies were conducted prior to 1991 and one in 2014. The six trials enrolled people with postsurgical wounds described as infected or at risk of infection, and reported that the wounds were either left open, or required opening and drainage for infection. Reporting of the type and site of the surgery and extent of the wound was variable.

The included studies provided six comparisons employing three methods of debridement; autolytic debridement using dextranomer (paste or beads), enzymatic debridement using streptokinase/streptodornase, and surgical debridement comparing endoscopic and 'open' surgery.

Due to the heterogeneity of studies, it was not appropriate to conduct meta-analyses and the six separate comparisons presented are dependent upon a single, small study with low- to very low-certainty evidence. Additionally, meta-analysis was not appropriate due to a number of factors such as heterogeneity of wound type, lack of definition and type of infection in studies, poor reporting of data and cointerventions, and all studies had unclear or high risk of bias for at least one key domain.

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Effect estimates are only reported in one study (surgical debridement via endoscopy versus surgical debridement) (Wang 2014) and were calculated for dextranomer beads versus silicone foam elastomer (Young 1982). For the other four studies where effect estimates were not reported, it was not possible to calculate time to a clean wound bed, time to complete debridement, and time to complete wound healing due to missing variance and participant exclusions as noted in the summary of findings tables.

Dextranomer paste/beads (autolytic debridement) compared with four different comparators

Four studies compared dextranomer paste or beads with Eusol-soaked gauze (20 participants), 10% aqueous polyvinylpyrrolidone (40 participants), 0.1% chloramine-soaked dressings (28 participants), or silicone foam elastomer (50 participants).

There is very low-certainty evidence that there may be no clear difference in time to a clean wound bed between dextranomer beads and Eusol gauze (Goode 1979). Adverse events were not reported.

There is very low-certainty evidence that there may be no difference in time to a clean wound bed between dextranomer paste and 10% aqueous polyvinylpyrrolidone gauze (Michiels 1990). For this trial, there is low-certainty evidence that there may be no difference in deaths and serious adverse events.

There is very low-certainty evidence on the effects of dextranomer paste and 0.1% chloramine-soaked dressings treatment on both time to complete healing and time to a clean wound bed (Sondergaard 1982). For this trial, there is low-certainty evidence that there may be no difference in deaths and serious adverse events.

There is very low-certainty evidence that there may be no difference in time to complete healing between dextranomer beads and silicone foam elastomer. (Young 1982). Adverse events were not reported.

Streptokinase/streptodornase solution (enzymatic) compared with saline-soaked dressings

One study (21 participants) compared enzymatic debridement with saline-soaked dressings. There is low-certainty evidence that there may be no difference in time to a clean wound bed or secondary suture between streptokinase/streptodornase and saline-soaked dressings (Poulson 1983). For this trial, there is very low-certainty evidence that there may be no difference in deaths and serious adverse events.

Surgical debridement via endoscopic surgery compared with surgical debridement by 'open' surgery

One study (106 participants) reported time to complete wound healing and time to a clean wound bed. There is low-certainty evidence that there may be a reduction in time to complete wound healing and very low-certainty evidence that there may be no difference in time to a clean wound bed with surgical debridement via endoscopy compared to 'open' surgical debridement (Wang 2014). Adverse events were not reported.

Overall completeness and applicability of evidence

This update identified one additional RCT (Wang 2014), which has increased the evidence base for wound debridement to six RCTs. This additional study is of surgical debridement via endoscopy and is the only identified trial from this review that might have some relevance to modern clinical practice in surgically addressing infected wounds. We identified two ongoing trials that appear to meet our inclusion criteria and will contribute to the findings of future updates (Characteristics of ongoing studies table). There is currently insufficient evidence regarding the most effective method of debridement for surgical wounds. There is a clear need for more research into which method is most effective in removing dead or infected tissue (or both) from surgical wounds.

Five trials included in this review were published before 1991 and investigate treatments that are no longer available. Worldwide production of dextranomer products has been discontinued, except for dextranomer paste (which is currently only available in South Africa), the impact on clinical practice of these findings is extremely limited. Furthermore, Eusol, which one study used as the comparator to dextranomer, is rarely used due to risk of harmful effects on healthy tissues. The enzymatic agent streptokinase/streptodornase is no longer available worldwide.

For people with infected surgical wounds, we found no evidence comparing any form of wound debridement versus no debridement. This is reflective of earlier findings by Bradley 2001 who identified no trials that compared debridement with no debridement for surgical wounds. We have only very low-certainty evidence that endpoints related to infection eradication and healing capacity were improved with more highly biologically active agents with enhanced autolytic debridement capabilities.

Although only six RCTs met the inclusion criteria for this review, a range of more-recent research papers were identified but following closer scrutiny were all excluded (see Characteristics of excluded studies table). It is apparent from these excluded studies that a range of debridement methods are being used in clinical practice, including surgical debridement (Zeitani 2004) and mechanical debridement (Allie 2004; Granick 2006). However, these studies are not RCTs and, therefore, are highly susceptible to selection bias. It is disappointing that recently published studies are not employing more rigorous research methods that aim to minimise bias and, therefore, increase the confidence with which we can view the findings. The cost of conducting an RCT may be one consideration. Manufacturers of existing and new wound debridement products appear to use controlled trials, retrospective analysis of patient case notes, and case studies as evidence of effectiveness. This lack of RCTs has continued to be demonstrated since the first publication of this review in 2008 with this update yielding only one new RCT that met the inclusion criteria (Wang 2014). There is a complete absence of adequately powered, methodologically robust RCTs evaluating contemporary debridement interventions for surgical wounds. Trials reflecting the wider range of surgical, biosurgical, mechanical, and autolytic debridement methods, and other agents available for debridement of surgical wounds were not identified.

Quality of the evidence

The certainty of the evidence was low or very low in all six studies.

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Methodological considerations

The methodological quality of the trials was variable, with method of randomisation not always being clear, and inadequate allocation concealment. None of the six RCTs were at high risk of selection bias, performance and detection bias, or reporting bias. Blinding was unclear across all studies with only two studies reporting that they attempted to blind outcome assessors. Two studies were at high risk of bias for incomplete outcome data (attrition bias) and outcome data were downgraded accordingly.

Indirectness

There was no indirectness in relation to the review question as the participants, interventions, and outcomes in the included studies were within the scope of the published review protocol. In one study, the evidence was downgraded due to indirectness (surrogate endpoint reporting). However, five of the six included studies used dextranomer paste or beads or streptokinase/streptodornase solution that are no longer available.

Imprecision

We downgraded the evidence in all six studies due to imprecision, which included small sample size, lack of variance data, wide CIs, and inadequate reporting of time to event data (reporting of mean and none of the studies reported time to event data as HRs). Due to the absence of sufficient data, we were unable to carry out a meta-analysis.

Inconsistency

We did not downgrade the certainty of the evidence for inconsistency as there was only one trial for each comparison. The direction and magnitude of effect was broadly consistent across the trials. Overall, the results showed either small reductions or no effect for the two primary outcomes (debridement and healing) between intervention and comparator. We judged the evidence to have no inconsistency.

Publication bias

We did not downgrade the evidence for publication bias. We are confident that our comprehensive electronic searches identified all existing, published RCTs addressing the review question and ongoing trials through searching the trial registries. It is theoretically possible, though unlikely, that we did not manage to locate some potentially eligible studies that have been published. There is always the risk that there are unpublished studies available that we have not been able to locate. In line with Cochrane policy, we may update this review again, and will include any further studies identified that meet the inclusion criteria at that stage.

Potential biases in the review process

We followed clearly described procedures in order to prevent potential bias in the review process, including a careful and thorough search of the literature using transparent and reproducible methods. It is possible that studies published in journals that were outside our search strategy may have been missed, but we are confident that all relevant studies have been identified and included or identified as ongoing. For this fourth update, we did not write to the manufacturers and distributors of wound products for details of trials or contact relevant experts, search conference proceedings, or handsearch recent journal publications; however, we did search trial registries. Although not made explicit in the protocol, all versions of this review only included studies that reported at least one of the primary outcomes (as well as meeting all other eligibility criteria).

Agreements and disagreements with other studies or reviews

We are not aware of any other reviews relating to debridement for surgical wounds. Therefore, we cannot say if the outcomes of this review agree or disagree with other studies or reviews.

AUTHORS' CONCLUSIONS

Implications for practice

The overall certainty of the evidence is very low to low, as the findings of the studies included in this review were based mainly on imprecise data, meaning that additional research is required to confirm these results. Therefore, there is insufficient evidence from independently funded clinical studies to support or refute the use of different types of debridement method or agent for surgical wounds. Existing randomised controlled trials (RCTs) of methods of debridement for surgical wounds are small, evaluate outdated products, and are of poor methodological quality. In the absence of sufficient and high-certainty evidence, clinicians should be guided by existing local wound formularies and policy when selecting a method of debridement for surgical wounds.

Implications for research

Adequately powered, methodologically robust RCTs evaluating contemporary debridement interventions for surgical wounds are needed to guide clinical decision-making. Future trials should compare current debridement methods, for example, surgical debridement compared with high-powered saline jet (at high pressure up to 15,000 pounds per square inch) or honey compared with low-cost established alternatives such as hydrogel dressings. The following would also be beneficial: analysing time to healing as well as time to a clean wound bed using appropriate statistical methods that do not exclude data from participants whose wounds fail to heal during follow-up; using valid measures of wound healing; clearly defining wound type; identifying the type of infection present and stratifying according to type of infection (as per surgical site infection definition); clearly identifying and defining study endpoint(s); including publication of study protocol; assessing quality of life and cost-effectiveness; and reporting in accordance with CONSORT requirements (www.consort-spirit.org).

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The following people conducted the editorial process for this article.

- Sign-off Editor (final editorial decision): Toby Lasserson, Deputy Editor in Chief, Cochrane

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- Managing Editor (selected peer reviewers, provided comments and editorial guidance to authors, edited the article): Lara Kahale, Cochrane Central Editorial Service
- Editorial Assistant (conducted editorial policy checks, collated peer-reviewer comments and supported editorial team): Leticia Rodrigues, Cochrane Central Editorial Service
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CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Goode 1979

Study characteristics	
Methods	RCT
	Setting: single hospital and outpatient, UK
	Follow-up period: 28 days

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Goode 1979 *(Continued)*

	Funding: not stated
Participants	20 started the trial, 20 completed the trial Group A: 10 Group B: 10 13 men/7 women Age: 24–91 years Postsurgical wounds, infected wounds left open for delayed closure, or closed wounds requiring opening and drainage following infection. Consent: not stated Inclusion criteria: people at risk from wound infection, following abdominal surgery for appendicitis or bowel surgery; wounds heavily contaminated at surgery and left open for delayed primary closure; wounds closed at surgery but developed an abscess and required removal of sutures and wound drainage. Exclusion criteria: none listed.
Interventions	All participants were given antibiotic cover prior to surgery for 48–72 hours postoperatively. Each wound was photographed at the start, during, and end of trial. Group A: twice-daily dressings of dextranomer granules covered with a light pack. Group B: twice-daily dressings of Eusol and paraffin-soaked ribbon gauze. All other wound procedures were identical for both groups. Independent assessor decided when the wound was clean and could be closed by secondary suture (achieved within 5–28 days).

Outcomes	**Primary outcomes**
	
	• **Mean time to wound closure** (SD not reported):
	  ◦ Group A: 8.1 days
	  ◦ Group B: 11.6 days
	  ◦ $P < 0.05$ (Mann-Whitney U-test)
	• **Time to complete healing**: not reported
	
	Secondary outcomes
	
	• **Participant satisfaction**: not reported
	• **Rate of infection**: not reported
	• **Quality of life**: not reported
	• **Length of hospital stay** (median):
	  ◦ Group A: 2.2 days less than group B
	  ◦ Group B: not reported
	• **Cost-effectiveness**:
	  ◦ Group A: approximately GBP 3.40 per day
	  ◦ Group B: not reported
	• **Adverse events**: not reported

Notes	Trial did report that 1 participant in each group was left to heal by granulation but the time to healing was not reported.

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Goode 1979 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "… each patient was allocated to treatment with either Debrisan or Eusol by means of cards drawn from a sealed envelope" (p.325). However, the method used for generating the randomisation sequence for the cards was not reported. Hence, it was judged to be unclear.
Allocation concealment (selection bias)	Unclear risk	Although "sealed envelopes" are documented, no further details are given.
Blinding (performance bias and detection bias) Participants and personnel	Unclear risk	Participants: blinding not stated but lack of blinding unlikely to influence results. Personnel: blinding not stated but unlikely to be achievable due to different properties (beads versus ribbon gauze). Lack of blinding unlikely to influence results.
Blinding (performance bias and detection bias) Outcome assessors	Low risk	Outcome assessor: blinded to treatment (quote) "an independent assessor decided when the wound was clean" using photographs of the wound (p.325).
Incomplete outcome data (attrition bias) All outcomes	Low risk	20 participants studied, 20 participants "mean time to secondary wound closure reported" reported within table 1 (p.325). 1 participant in each treatment group did not achieve secondary wound closure.
Selective reporting (reporting bias)	Low risk	No study protocol available but expected outcomes reported. Quote: "Efficacy of treatment assessed by time taken to allow secondary skin closure, by the condition of the wound after closure and the number of days in hospital" (p.328). All reported on although limited details given for the later 2.
Other bias	Low risk	None identified.

Michiels 1990

Study characteristics	
Methods	RCT Setting: single hospital, Belgium Follow-up period: 12 days Funding: not stated
Participants	40 started the trial, 39 completed the trial Group A: 20 (10 men, 10 women) Group B: 20 (10 men, 10 women) Age: 3–89 years Infected postsurgical wounds, oozing, covered in pus and debris.

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Michiels 1990 *(Continued)*

	Participants all gave informed consent. Inclusion criteria: people hospitalised in the surgical unit presenting with infected postoperative wounds, covered in pus and debris. Surgery: ranged from osteosynthesis, microsurgery, reconstructive procedures; surgical site not reported. Exclusion criteria: people with diabetes, vascular insufficiency, severe anaemia, and serum albumin < 30 g/L.
Interventions	Duration of the trial was 12 days. Group A: dressing changed daily: wound cleansed – no details of the technique given; a saline-soaked compress was applied and this was covered by a 3 mm layer of dextranomer paste, covered with a compress and bandaged. Group B: dressing changed daily; wound cleansed; then a gauze dressing soaked in 10% aqueous polyvinylpyrrolidone was applied, covered with a dry dressing and bandaged. Further changes of the dressings for groups A and B were dictated by the degree of soakage of the dressings.
Outcomes	**Primary outcomes** • **Time to a clean wound bed** – changes evaluated using specific variables; degree of erythema; degree of pus and debris; oedema; necrosis; granulation tissue. The results for each variable were assessed subjectively and presented individually. *Degree of erythema* (reported using a 0–3 degree table): no difference reported (2 wounds in group A and 2 in group B did not have any erythema and were excluded from the evaluation of this variable). *Oedema* (reported using a 0–3 degree table): no difference (2 wounds in group A and 2 in group B did not have any oedema and were excluded from the evaluation). *Necrosis* (reported as a percentage of the total area of the wound): no difference (4 wounds in group A and 10 in group B did not exhibit any necrotic material and were excluded from the evaluation). *Pus and debris* (reported as a percentage of the total area of the wound): (1 wound in group B did not have any pus or debris and was excluded from the evaluation). No difference between the days of treatment or cleaning of the wounds. However, the trial also reported a further division of group A and B for evaluation of this variable, but it was unclear as to when this division was made and the handling and reporting of the data was unclear, subjective, and the groups were not comparable at baseline. So while the subgroup of group A showed a higher degree of improvement in the removal of pus and debris and this was reported as significant ($P < 0.05$, Student's t-test) the poor handling and subjective nature of the data makes this outcome unreliable. The subgroup of group B did not demonstrate a difference. *Granulation tissue*: mean time to a clean wound bed (SD not reported): group A: mean 6.5 days, group B: mean 5.2 days. No difference (1 wound in group A and 2 in group B did not have any granulation tissue by the end of the trial and were excluded from the evaluation). • **Time to complete healing**: not reported **Secondary outcomes** • **Participant satisfaction**: not reported • **Rate of infection**: not reported • **Quality of life**: not reported • **Length of hospital stay**: not reported

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Michiels 1990 *(Continued)*

- **Cost-effectiveness**: not reported
- **Adverse events**: 1 participant in group B had an allergic reaction with oedema and erythema after 10 days and the treatment was discontinued.

Notes	The development and testing of the comparison tables was not reported; therefore, it was not possible to determine the reliability and validity of these tables. While the mean days for granulation tissue was reported, no other data or statistics were presented.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The patients were allotted to one or other of the preparations according to a randomisation list" (p.284).
Allocation concealment (selection bias)	Unclear risk	No details given about allocation concealment.
Blinding (performance bias and detection bias) Participants and personnel	Unclear risk	Participants: blinding not stated but blinding unlikely to influence outcome. Personnel: blinding not stated but unlikely to be achievable due to different properties (application of paste vs soaked dressings). Lack of blinding unlikely to influence results.
Blinding (performance bias and detection bias) Outcome assessors	Unclear risk	Outcome assessor: blinding not stated, p.284 states that the "status of the wound was recorded each day by the same doctor when the dressing was changed", but no further details given.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Of the 5 criteria to be reported on (granulation, pus and debris, erythema, oedema, and necrosis), data were included within report on all 5 with missing data accounted for (e.g. within 'necrosis', 4 participants in 1 arm had no necrosis at the start or during so not reported). 1 participant in the control group exhibited an allergic reaction to treatment; therefore, treatment was discontinued (p.288); it is not clear how this withdrawal was dealt with in the data presented.
Selective reporting (reporting bias)	Low risk	No study protocol available but expected outcomes reported. Quote: "aim of study was to assess and compare the clinical effects of dextranomer paste and a control treatment with polyvinylpyrrolidone (PVP) in a trial of patients with infected post-operative wounds. All variables dealing with cleansing, inflammation reducing effect, and different signs of ongoing healing were studied" (p.284). Reporting of granulation, pus and debris, erythema, oedema, and necrosis was given within the report.
Other bias	Low risk	None identified.

Poulson 1983

Study characteristics

Methods	RCT Setting: single hospital, Denmark

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Poulson 1983 *(Continued)*

	Follow-up period: not stated Funding: not stated
Participants	21 started the trial; 18 completed the trial Group A: 7 Group B: 11 5 men/13 women Age: 26–86 years People with infected laparotomy wounds, a minimum of 7 cm, requiring opening and drainage. Consent: not stated Inclusion criteria: wound infection following laparotomy surgery; operations included appendicectomy, bowel surgery, cholecystectomy, hysterectomy, and repair of ventral hernia; wound infection which necessitated opening and drainage of the wound. Minimum length of wound 7 cm Maximum depth of wound 7 cm Exclusion criteria: people with burst abdomen, stoma or fistula in the vicinity of the wounds, because this increased the risk of continuous wound contamination.
Interventions	A and B: initial drainage and removal of necrotic tissue method of removal not stated. All wounds dressed with saline dressings to secure haemostasis. Group A: twice-daily dressings, necrotic tissue removed; dressing soaked in 20 mL solution (streptokinase/streptodornase) applied; solution provided by hospital pharmacy. Group B: twice-daily dressings, necrotic tissue removed; dressing soaked in 20 mL solution applied; solution provided by hospital pharmacy (saline).

Outcomes	**Primary outcome**
	
	• **Mean time to a clean wound bed and closure by secondary suture**
	
	Group A: 5.00 (SD 2.16) days
	
	Group B: 13.45 (SD 6.77) days
	
	P < 0.05, both Student's t-test and Mann-Whitney U-test
	
	Secondary outcomes
	
	• **Participant satisfaction**: neither group complained of significant wound discomfort; no data or statistics presented.
	• **Rate of infection**: not reported
	• **Quality of life**: not reported
	• **Length of hospital stay** (median):
	  ◦ Group A: 2.2 days less than group B
	  ◦ Group B: not reported
	• **Cost-effectiveness**: not reported
	• **Adverse events**: 3 participants were excluded from the evaluation for non-completion of the treatment; in group A, 1 participant died of a pulmonary embolism and the other required further surgery for intra-abdominal sepsis; 1 participant in group B was withdrawn as a result of abdominal dehiscence.

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Poulson 1983 *(Continued)*

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Pharmacy undertook the randomization" (p.245). However, no details are given regarding how this randomisation was done.
Allocation concealment (selection bias)	Low risk	Pharmacy prepared the solutions (20 mL of Varidase or 20 mL of saline).
Blinding (performance bias and detection bias) Participants and personnel	Unclear risk	Not explicitly stated and therefore judged as unclear. However, it would be highly unlikely that participants and personnel would have been able to determine which solution was being applied as both ampoules contained 20 mL of clear solution, so unlikely to influence results. On p.246, the authors stated, "only when the code was broken 11 patients were found to have saline and 7 had Varidase".
Blinding (performance bias and detection bias) Outcome assessors	Unclear risk	Not explicitly stated and therefore judged as unclear. However, it would be highly unlikely that outcome assessors would have been able to determine which solution was being applied as both ampoules contained 20 mL of clear solution, so unlikely to influence results. On p.246, the authors stated, "only when the code was broken 11 patients were found to have saline and 7 had Varidase".
Incomplete outcome data (attrition bias) All outcomes	High risk	From the 21 originally recruited, 3 were withdrawn: 2 from the placebo group and 1 from the Varidase group. These 3 were excluded from the results presented and, therefore, no intention-to-treat analysis was undertaken. Rationales were given for the withdrawal.
Selective reporting (reporting bias)	Unclear risk	No study protocol available. The stated aim of the trial was "to show, by means of a prospective clinical trial with randomised double blind procedure if Varidase is superior to conventional management of infected laparotomy wounds" (p.245). However, they did not state what constitutes 'superior' and how this would be measured. The study reported number of days required for wound dressing and number of days in hospital (within discussion section). Size of wound and type of bacterial growth recorded at the start of the trial; this is not reported on within the results.
Other bias	Low risk	None identified.

Sondergaard 1982

Study characteristics

Methods	RCT Setting: single hospital inpatient and outpatient, Denmark Follow-up period: not stated Funding: not stated

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Sondergaard 1982 *(Continued)*

Participants	28 started the trial and 22 completed the trial Group A: 10 Group B: 12 Numbers of men and women not reported. Participants ages not reported. Consent was not reported but participants were provided with oral and written objectives of the study. Study was in accordance with the Helsinki declaration, 1975. Inclusion criteria: people with suppurating infected surgical wounds involving subcutaneous tissue. Exclusion criteria: people prescribed systemic steroid therapy, receiving another local wound intervention, with substantial wound revision, and if there was peritoneal communication.
Interventions	A microbiological swab was taken from the bottom of each wound at the start of the trial and on every 7th day until the wound was clean; this was to document the bacterial flora to register any favourable influences of the dressings. Group A: wound irrigated with saline; dextranomer beads made into a paste and applied to the wound; covered with a sterile compress; dressing changed at least daily and before it became fully saturated. Group B: dressing soaked in 0.1% chloramine solution; covered with a sterile compress; changed once daily and 2 or 3 times if saturated; dressings changed by senior registrars; trial authors undertook assessment of the wounds.

Outcomes	**Primary outcomes**
	
	• **Time to a clean wound bed** (reported as the median: mean, SD, or SEM not reported for any of the results):
	  ◦ Group A: 6 days
	  ◦ Group B: 5 days
	• **Time until the wound was clinically assessed as ready for outpatient treatment** (median):
	  ◦ Group A: 9 days
	  ◦ Group B: 7 days
	• **Time to wound healing** (median):
	  ◦ Group A: 27 days
	  ◦ Group B: 20 days
	
	Observed results were compared and assessed using the Mann-Whitney U-test; no difference reported; detailed data and statistics not included.
	
	Secondary outcomes
	
	• **Participant satisfaction**: dressing changes were less painful in group A; no data or statistics presented.
	• **Rate of infection**: not reported; results of microbiological wound swabs not reported.
	• **Quality of life**: not reported
	• **Length of hospital stay**: not reported
	• **Cost-effectiveness**:
	  ◦ Group A: approximately DKK 123 per dressing change
	  ◦ Group B: approximately DKK 1.50 per dressing change
	  ◦ Cost analysis not presented
	• **Adverse events**: 4 participants excluded from group A: 2 participants died, cause of death not reported; 1 had peritoneal communication; in 1 the wound was too undermined for application of the paste;

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Sondergaard 1982 *(Continued)*

	2 excluded from group B: 1 had heavy growth of bacteria and the dressing was changed to acetic alumina; 1 had a total wound rupture.
Notes	The trial authors observed more granulation tissue, less irritation, and less pain on dressing changes with the dextranomer dressing. Blinding of assessors (trial authors) was not reported. The original paper was in German and the data were extracted after being translated into English.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Although the trial reported that the participants were allocated by a "random sequence generated in blocks of 4" (p.1523), no further information was given regarding the blocks of 4. However, this was judged to be adequate sequence generation.
Allocation concealment (selection bias)	Unclear risk	Study reported "… sealed, numbered envelopes" (p.1523) to conceal allocation; however, it was not stated if these envelopes were opaque. Therefore, this was at unclear risk of allocation concealment.
Blinding (performance bias and detection bias) Participants and personnel	Unclear risk	It was not stated if the participants were blinded; however, this would be unlikely to influence findings. It was not stated if the personnel involved in redressing the wounds (senior registrars) were blinded or not.
Blinding (performance bias and detection bias) Outcome assessors	Unclear risk	It was unclear from the trial if the assessors (the study authors) were blinded.
Incomplete outcome data (attrition bias) All outcomes	High risk	6 participants were excluded from the study (2 from the chloramine and 4 from the Debrisan), a rationale for the exclusions was given and exclusions were mentioned in the presented in results tables. It was not clear if these were also excluded from the final analysis. The dropout rate was 21% and hence judged to be unacceptable.
Selective reporting (reporting bias)	Unclear risk	No study protocol was available. No study aims or outcomes were stated in the paper. Results reported included number of days from start of treatment to a clean wound; number of days until wound assessed as ready for outpatient treatment; and number of days until wound healed. It was apparent that the intention was also to examine the number of daily wound dressing changes required but this was abandoned due to insufficient recording (p.1524).
Other bias	Low risk	None identified.

Wang 2014

Study characteristics

Methods	RCT Setting: single hospital inpatient, China Follow-up period: "at least 4 weeks following intervention" Funding: not stated
Participants	106 (with no loss during follow-up period)

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Wang 2014 *(Continued)*

	Group A: 35.5 (± 5.5) years[a] Group B: 34.8 (± 7.2) years[a] Group A: 37 males, 20 females Group B: 30 males, 19 females All participants provided written informed consent. Inclusion criteria: people with surgical site infection who had undergone surgery > 30 days ago, and people in which non-surgical treatment was ineffective after surgical site infection. Surgery: not reported but surgical site reported: • 8 chest • 60 abdomen • 14 limb • 14 lumbar • 10 other Wound size: ranged from < 5 cm to > 15 cm Duration of wound: > 30 days since surgery Presence of comorbidities: none documented apart from BMI. Group A: BMI 30.4 (± 3.2)[a] Group B: BMI 28 (± 4.4)[a] Exclusion criteria: aged < 18 years; immune system disorder; prosthetic implant in the surgical site.
Interventions	Group A: endoscopic debridement. Wound area draped and sterilised conventionally. 6 mm opening of original wound to allow entry of choledochoscope. Wound washed and cleansed with sterile saline. Necrotic tissue and infected sutures removed under direct visualisation. A saline gauze was used to drain the wound for ≤ 24 hours. Group B: open surgical debridement. Wound area draped and sterilised conventionally. Wound opened via original incision, wound washed and cleansed with sterile saline then drained using negative pressure. A suture was performed 2 days later. Both groups received intravenous antibiotic prophylaxis 30 mins before surgical incision.
Outcomes	**Primary outcomes** • **Time to complete debridement**: length of surgery detailed Group A: 128 (± 56) minutes[a] Group B: 104 (± 72) minutes[a] • **Proportion of wounds completely debrided in the trial period**: all wounds (endoscopic and open) debrided completely during surgery. • **Proportion of wounds completely healed during trial period**: all wounds healed during trial period. • **Reduction in wound size**: all wounds surgically closed during trial period. • **Time to complete healing**: Group A: 10.0 (± 2.5)[a] Group B: 19.4 (± 5.2)[a] Mean difference −9.40, 95% confidence interval −10.99 to −7.81; P < 0.001

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Wang 2014 *(Continued)*

Secondary outcomes

- **Length of stay**

Group A: 15 (± 4.1) days[a]

Group B: 22.5 (± 2.3) days[a]

Mean difference −7.50 days, 95% confidence interval −8.74 to −6.26; P < 0.001

- **Visual Analogue Score (pain) 7 days postdebridement**

Group A: 3.2 (± 1.5)[a]

Group B: 5.5 (± 1.1)[a]

Mean difference −2.30, 95% confidence interval −2.80 to −1.80; P < 0.001

Student's t-test and Chi^2 performed

No adverse events reported during trial period (all participants followed up for ≥ 4 weeks following intervention).

Notes	[a]±: measure of variance not otherwise specified.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient detail is provided to make a judgement: (quote) "By using the sealed envelope manner" (p.1728). Quote: "to match the two groups, randomisation was stratified according to body regions of the primary surgery" (p.1728) (abdomen, chest, limb, lumbar, other).
Allocation concealment (selection bias)	Unclear risk	Insufficient detail is provided to make a judgement: "By using the sealed envelope manner" (p.1728). No indication if the envelopes were opaque, sequentially numbered. Quote: "to match the two groups, randomisation was stratified according to body regions of the primary surgery" (p.1728) (abdomen, chest, limb, lumbar, other).
Blinding (performance bias and detection bias) Participants and personnel	Unclear risk	It was not reported if participants were blinded to treatment; however, blinding would be unlikely to affect results. It stated that, "the surgical team in theatre were aware of group allocation but only following induction of anaesthesia" (p.1728). Blinding or not of personnel involved following surgery to treatment was not reported; however, due to the different appearance of the wound following surgery, this would be unachievable.
Blinding (performance bias and detection bias) Outcome assessors	Low risk	Outcome assessors were blinded to intervention. Quote: "Information on group allocation was not recorded in clinical or surgical notes and clinicians' undertaking the follow-up of post operative wounds were fully blinded to the group assignments" (p.1728).
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data. Quote: "all patients enrolled were followed up for at least 4 weeks following surgery" (p.1729) and "no patients were lost during the follow-up period" (p.1728).
Selective reporting (reporting bias)	Low risk	No study protocol is available but appropriate study outcomes reported "the primary outcome of interest was the wound healing time. The secondary out-

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Wang 2014 *(Continued)*

		comes of interest were duration of surgery, blood loss, pain level 7 days after surgery, volume of irrigation saline, rate of skin transplantation and length of hospital stay" (p.1728).
Other bias	Low risk	None identified.

Young 1982

Study characteristics	
Methods	RCT Setting: hospital and outpatient clinic, UK Follow-up period: not stated Funding: not stated
Participants	50 Group A: 25 Group B: 25 Numbers of men and women not reported. Mean age (years): Group A: 44.48 (SD 5.17) Group B: 49.64 (SD 4.57) People with surgical wound breakdown. Consent not reported. Inclusion criteria: people undergoing surgery for perforated or gangrenous appendix, where the wound was left open from the muscle layer outwards; people with surgical wound breakdown postoperatively. No exclusion criteria listed.
Interventions	Each wound was measured at the start of the trial. Mean length (cm): Group A: 5.53 (SD 0.55) Group B: 6.57 (SD 0.89) Mean breadth (cm): Group A: 2.25 (SD 0.33) Group B: 2.48 (SD 0.32) Mean depth (cm): Group A: 1.80 (SD 0.20) Group B: 2.24 (SD 0.29) Mean volume (mL):

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Young 1982 *(Continued)*

	Group A: 4.92 (SD 1.15) Group B: 6.37 (SD 1.30) Individual wounds were photographed. All wounds were initially treated with gauze packing for the first 48 hours. Group A: dextranomer beads applied twice daily: reduced to once daily when the discharge reduced. Group B: silastic foam dressing applied, and this was removed and cleaned twice daily; reduced to once daily with reduction in the discharge. All wounds were reviewed on 1st, 3rd and 7th days, and then weekly. Patients discharged home had their wounds reviewed weekly. The review included: photograph, measurement of the wound, review of erythema, oedema, rash, odour and slough. Comfort of the dressing was assessed by questioning the patient. Pain was graded using an ordinal scale (0 = no pain to 3 = severe pain).
Outcomes	**Primary outcomes** • **Mean time to complete healing** (days) Group A: 40.92 (SD 3.98) Group B: 36.96 (SD 3.18) Results subjected to analysis using the Student's t-test. Time to disappearance of erythema, oedema and slough: similar in group A and group B; data and statistics not reported. **Secondary outcomes** • **Participant satisfaction**: mean days until pain-free dressings. Group A: 5.32 (SD 0.55) days Group B: 5.64 (SD 0.45) days Results subjected to analysis using the Student's t-test. Wound pain reported as similar for both groups. • **Rate of infection**: not reported • **Quality of life**: not reported • **Length of hospital stay**: not reported • **Cost-effectiveness**: authors quoted the costs as calculated in a previous study (Goode 1979): Group A: approximately GBP 3.40 per day Group B: approximately GBP 0.75 per week; no data or statistical evidence reported. • **Adverse events**: not reported
Notes	Used an ordinal scale to assess the pain at dressing changes. This may have resulted in skewed data, so a non-parametric Mann-Whitney U-test may have been more appropriate than the Student's t-test. Also, there was a methodological flaw in the analysis of the data and time to complete healing and time to a pain-free wound, which should have been expressed as a hazard ratio and not as continuous data.

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Young 1982 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Patients were allocated to receive either Debrisan or Silastic foam elastomer by means of a random card system" (p.33). Not clear if the cards were randomised. However, the method used for generating the randomisation sequence for the cards was not reported. Hence, it was judged to be unclear.
Allocation concealment (selection bias)	Unclear risk	Allocation concealment not stated.
Blinding (performance bias and detection bias) Participants and personnel	Unclear risk	It was not reported if participants were blinded to treatment; however, blinding would be unlikely to affect results. Blinding or not of personnel to treatment was not reported; however, due to the different properties of the dressings this would be unachievable.
Blinding (performance bias and detection bias) Outcome assessors	Unclear risk	Limited information given within the paper: (quote) "wounds were reviewed" (p.33), but it was not stated by whom and if they were blinded to the intervention.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No loss to follow-up reported, 50 participants completed the trial (25 in each arm).
Selective reporting (reporting bias)	Low risk	No study protocol was available but appropriate study outcomes reported. The aim of the trial was to (quote) "compare the efficacy of these two dressings in surgical wounds that have either broken down or have been left open postoperatively" (p.33). It was not stated how "efficacy" was to be measured at the outset. Time to heal and time to pain-free were reported within the trial; presence of erythema, odour, slough, and rash were also reported.
Other bias	Low risk	None identified.

A: intervention group; B: control group; BMI: body mass index; CI: confidence interval; DKK: Danish kroner; GBP: Great British pounds; MD: mean difference; RCT: randomised controlled trial; SD: standard deviation; SE: standard error.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Acosta 2013	Prior to randomisation all wounds were surgically debrided; therefore, no tissue present in the wounds that required debridement. 2 methods used compared time to heal and microvascular circulation following a single method of debridement not a comparison of 1 method against another/control/placebo.
Allie 2004	Non-randomised retrospective method
Bethell 2003	Literature review, not a research study
Cannavo 1998	RCT comparing alginate with gauze dressings for healing of surgical wounds, not of debridement
Capasso 2003	Non-experimental retrospective chart review

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Study	Reason for exclusion
Cassino 2013	Paper not available via University Library Services or via The British Library. Wounds group contacted and paper not available via their resources either. Contact author emailed with no response. Paper excluded as it was considered highly unlikely that it would meet the inclusion criteria for the following reasons: the abstract detailed participants being "divided" into 2 groups rather than randomised, wounds were of "mixed aetiologies" and described as "any kind of chronic skin wound". In addition, the journal where the study was published focuses on chronic wounds; therefore, with all of the above factors, the paper was excluded.
Cohn 2004	Comparison of hydrofibre to wet-to-dry dressings for healing rates of surgical wounds, not of debridement
De Feo 2001	Retrospective chart review of wound infections over 20 years
De Feo 2003	Retrospective non-randomised study
Doughty 2005	Management of surgical wound dehiscence and not a research paper
Douville 2004	Retrospective review of managing sternal wound complications
Edwards 1967	Clean surgical wound healing by primary intention – no debridement required
Foster 2000	Abscess wounds
Gliantsev 1996	In vitro study
Gottrup 2005	A review, not RCT
Granick 2006	Retrospective study of people's records: debridement of a range of wounds, including pressure ulcers, trauma wounds, and surgical wound complications
Guest 2005	Not an RCT: models used to estimate the cost of 2 dressings
Kim 2013	Wounds were defined as acute trauma wounds and dressings were applied to lacerations, abrasions, and minor operation incisions. Data of results did not differentiate between wound types and tissue type at baseline, as determined by trialists, included wounds with granulation tissue that would not require debridement.
Kuleshov 1992	Not an RCT: chronic wounds
Ma 2014	Study participants had an infected surgical wound that was treated using different methods of wound closure (butterfly bandage, needle-free incision suture closure, and secondary suturing). Upon diagnosis of wound infection, any sutures or foreign bodies were removed and 1 of the 3 methods of wound closure were used. Therefore, no method of debridement used for any of the wounds within the trial.
Moore 2000	Included abscesses; did not measure debridement
Moore 2001	Systematic review
Moues 2004	Wounds treated prior to surgical closure
Mulder 1995	Non-randomised study; debridement of chronic wounds
NCT01237392	Chronic wounds
NCT02482948	Study terminated due to poor recruitment

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Study	Reason for exclusion
Oosthuizen 2014	Study participants had open tibia fracture wounds not surgical wounds
Rand 1998	Compared methods of wound closure for dehiscence, rather than debridement methods
Shoham 2021	Mixed wound aetiology
Soul 1978	Not an RCT: study included a range of wounds including pressure ulcers
Tewarie 2013	All participants received ultrasound therapy as a method of debridement, therefore, trial did not meet the inclusion criteria
Tolstykh 1987	Not an RCT: no randomisation method identified
Williams 1995	Abscess wounds
Yang 2012	Participants were recruited and randomised to either receive Hydrofibre with silver or Vaseline gauze immediately postoperatively. Therefore, dressing not applied to debride but to compare wound healing rates postoperatively.
Zeitani 2004	Not an RCT: controlled study

RCT: randomised controlled trial.

Characteristics of ongoing studies *[ordered by study ID]*

NCT03798041

Study name	Early debridement within 24 hours after surgery for wound healing of abdominal incision
Methods	RCT
Participants	Adults with major abdominal incision
Interventions	Study is designed to compare the impact of early debridement of the wound vs regular dressing (24 hours later) on the wound healing.
Outcomes	Healing of the wound, stitch removal time, incidence of incision complications.
Starting date	February 2019
Contact information	Contact: Xu-Feng Zhang, MD, PhD 86 29 85323900 xfzhang125@126.com
Notes	Noted as study completed in 2021, but there are no published results (checked March 2024).

NCT03880331

Study name	Prospective randomized clinical trial comparing outcomes of secondary intention wound care methods
Methods	RCT

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NCT03880331 *(Continued)*

Participants	Adult dermatology participants, acute post-surgical wound.
Interventions	Aggressive vs minimal debridement
Outcomes	Time to healing
Starting date	November 2019
Contact information	Jeffrey B Tiger, MD jeffrey.b.tiger@lahey.org
Notes	Noted as study completed in March 2021, but there are no published results (checked March 2024). Appears that the trial is using debridement 'prophylactically', i.e. there is no necrotic tissue to remove.

RCT: randomised controlled trial.

DATA AND ANALYSES

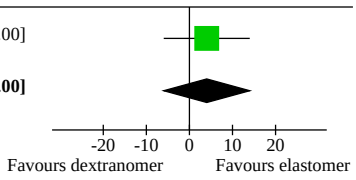
Comparison 1. Dextranomer beads versus elastomer foam

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 Mean time to complete healing (days)	1	50	Mean Difference (IV, Fixed, 95% CI)	4.02 [-5.96, 14.00]

Analysis 1.1. Comparison 1: Dextranomer beads versus elastomer foam, Outcome 1: Mean time to complete healing (days)

Study or Subgroup	Dextranomer Mean	SD	Total	Elastomer Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI
Young 1982	40.92	19.9	25	36.9	15.9	25	100.0%	4.02 [-5.96 , 14.00]
Total (95% CI)			**25**			**25**	**100.0%**	**4.02 [-5.96 , 14.00]**

Heterogeneity: Not applicable
Test for overall effect: Z = 0.79 (P = 0.43)
Test for subgroup differences: Not applicable



ADDITIONAL TABLES

Table 1. Evidence of effect

Outcome	Intervention/comparison	Evidence
Time to complete debridement	Surgical debridement via an endoscopic method vs convention-	Wang 2014 reported that debridement was completed during surgery (endoscopic surgery 128 (SD 56) minutes vs 'open' surgery

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Table 1. Evidence of effect *(Continued)*

	al 'open' surgical debridement (1 RCT, 106 participants)	104 (SD 72) minutes; mean difference 24.00 minutes, 95% confidence interval −0.85 to 48.85).
	Dextranomer beads compared with elastomer foam (1 RCT, 50 participants)	Sondergaard 1982 reported the number of days until the wounds were clinically clean were a median of 6 days with dextranomer and 5 days with chloramine-soaked dressings (P > 0.05).
	Streptokinase/streptodornase compared with saline-soaked dressing (1 RCT, 21 participants)	Poulson 1983 reported time to a clean wound bed or secondary suture was significantly shorter for the streptokinase/streptodornase group (mean 5 (SD 2.16) days) compared with the saline-soaked dressings group (mean 13.45 (SD 6.77) days) (P < 0.05).
	Dextranomer paste compared with 10% aqueous polyvinylpyrrolid1 (1 RCT, 40 participants)	Michiels 1990 reported that a clean wound was obtained a mean of 6.5 days in the dextranomer paste group compared with 5.2 days in the control group and the difference between the groups was not significant.
	Dextranomer beads compared with Eusol gauze (1 RCT, 20 participants)	Goode 1979 reported mean time to a clean wound bed was significantly shorter with dextranomer; 8.1 days (range 5–28) compared with 11.6 days (range 6–22) for Eusol (P < 0.05).
Proportion of wounds completely debrided	Not reported	
Rate of reduction in wound size	Not reported	
Proportion of wounds completely healed	Not reported	
Time to complete healing	Surgical debridement via an endoscopic method vs conventional 'open' surgical debridement (1 RCT, 106 participants)	Wang 2014 reported mean time to complete wound healing for the endoscopic group was 10.0 (SD 2.5) days, compared with the 'open' surgery group which was 19.4 (SD 5.2) days; mean difference −9.40 days, 95% CI −10.99 to −7.81; P < 0.001.
	Dextranomer beads compared with silastic foam elastomer (1 RCT, 50 participants)	Young 1982 reported mean time to healing with dextranomer (40.92 (SE 3.98) days) compared with elastomer foam (36.96 (SE 3.18) days) (P > 0.05).
	Dextranomer beads compared with 0.1% chloramine-soaked dressings (1 RCT, 28 participants)	Sondergaard 1982 reported median time to complete healing for the dextranomer group (27 days) compared with the chloramine group (20 days); no variance data provided (P > 0.05).
Serious adverse events (life-threatening or those leading to hospitalisation)	Dextranomer beads compared with 0.1% chloramine-soaked dressings (1 RCT, 28 participants)	Sondergaard 1982 reported 6 exclusions from the study (discontinuation), 4 in the treatment group (dextranomer beads) and 2 in the control group (0.1% chloramine-soaked dressings). This included 2 deaths in the treatment group and 1 total wound rupture in the control group.
	Streptokinase/streptodornase compared with saline-soaked dressing (1 RCT, 21 participants)	Poulson 1983 reported that 1 participant in the control group (saline-soaked dressings) died of a pulmonary embolism and control treatment had to be discontinued in another participant due to a burst abdomen. Streptokinase/streptodornase treatment was discontinued in 1 participant due to reoperation for intra-abdominal sepsis.
Other adverse events (those leading to dis-	Surgical debridement via an endoscopic method vs convention-	Wang 2014 reported there were no clinical complications in either the endoscopic method or the conventional 'open' surgical debridement group at 4 weeks postsurgery.

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Table 1. Evidence of effect *(Continued)*

continuation of treatment)	al 'open' surgical debridement (1 RCT, 106 participants)	
	Dextranomer paste compared with 10% aqueous polyvinylpyrrolid1 (1 RCT, 40 participants)	Michiels 1990 reported that 1 participant in the control group (10% aqueous polyvinylpyrrolid1) was withdrawn from the study due to oedema and erythema.
Participant satisfaction: pain	Surgical debridement via an endoscopic method vs conventional 'open' surgical debridement (1 RCT, 106 participants)	Wang 2014 reported pain level 7 days postsurgery measured by the Visual Analogue Scale, for the endoscopic group was 3.2 (SD 1.5), compared with 'open' surgery group 5.5 (SD 1.1); mean difference −2.30, 95% confidence interval −2.80 to −1.80; P < 0.001.
	Dextranomer beads compared with silastic foam elastomer (1 RCT, 50 participants)	Young 1982 reported mean time to a pain-free wound with dextranomer was 5.32 (SD 0.55) days compared with 5.64 (SD 0.45) days for silastic foam elastomer; this was reported as similar between groups.
	Dextranomer beads compared with 0.1% chloramine-soaked dressings (1 RCT, 28 participants)	Sondergaard 1982 reported that changes of dressing in the treatment group was less painful as the dressings were easily removed during rinsing.
Rate of infection	Not reported	
Cost-effectiveness	Surgical debridement via an endoscopic method vs conventional 'open' surgical debridement (1 RCT, 106 participants)	Wang 2014 reported that the costs of treatment for the endoscopy group were significantly lower due to decreased wound healing time, rate of skin transplantation, blood loss and hospital stay compared to the 'open' surgery group.
	Dextranomer beads compared with silastic foam elastomer (1 RCT, 50 participants)	Young 1982 reported costs from Goode 1979 of GBP 3.40 per twice-daily dressing for a wound of 10 cm and cost of silicone foam elastomer of GBP 0.75 per week.
	Dextranomer beads compared with 0.1% chloramine-soaked dressings (1 RCT, 28 participants)	Sondergaard 1982 reported an average cost per change of dressing for the dextranomer group of DKK 123 compared with DKK 1.50 for the chloramine group.
	Dextranomer beads compared with Eusol gauze (1 RCT, 20 participants)	Goode 1979 commented on the higher cost of dextranomer (GBP 3.40 per twice-daily dressing for a wound of 10 cm).
Quality of life	Not reported	
Length of hospital stay	Surgical debridement via an endoscopic method vs conventional 'open' surgical debridement (1 RCT, 106 participants)	Wang 2014 reported length of hospital stay for the endoscopic group was 15 (SD 4.1) days, compared with the 'open' surgery group which was 22.5 (SD 2.3) days; mean difference −7.50 days, 95% confidence interval −8.74 to −6.26; P < 0.001.
	Streptokinase/streptodornase compared with saline-soaked dressing (1 RCT, 21 participants)	Poulson 1983 reported that participants in the streptokinase/streptodornase group had a shorter stay by 8.5 days compared with the saline-soaked dressings group.
	Dextranomer beads compared with Eusol gauze (1 RCT, 20 participants)	Goode 1979 reported that participants treated with dextranomer beads had a shorter hospital stay by a median of 2.2 days compared with Eusol gauze.

DKK: Danish krone; GBP: Great British pounds; RCT: randomised controlled trial; SD: standard deviation.

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APPENDICES

Appendix 1. Search strategies

Cochrane Wounds Specialised Register

1 MESH DESCRIPTOR Debridement EXPLODE ALL AND INREGISTER

2 debrid* or slough* or deslough* AND INREGISTER

3 MESH DESCRIPTOR Larva EXPLODE ALL AND INREGISTER

4 larva* or maggot* or biosurg* or bio-surg* AND INREGISTER

5 (wound* next irrigat*) AND INREGISTER

6 (wound* next cleans*) AND INREGISTER

7 (whirlpool) AND INREGISTER

8 MESH DESCRIPTOR Collagenases EXPLODE ALL AND INREGISTER

9 MESH DESCRIPTOR Papain EXPLODE ALL AND INREGISTER

10 MESH DESCRIPTOR Fibrinolysin EXPLODE ALL AND INREGISTER

11 MESH DESCRIPTOR Streptokinase EXPLODE ALL AND INREGISTER

12 (enzymatic or collagenase* or fibrinolytic* or fibrinolysin or proteolytic* or protease* or trypsin or streptokinase or streptodornase or varidase or papain) AND INREGISTER

13 MESH DESCRIPTOR sodium hydrochlorite EXPLODE ALL AND INREGISTER

14 MESH DESCRIPTOR Hydrogen Peroxide EXPLODE ALL AND INREGISTER

15 (hypochlorite or (hydrogen next peroxide)) AND INREGISTER

16 ((malic next acid) or (benzoic next acid) or (salicylic next acid) or (propylene next glycol)) AND INREGISTER

17 (dakin* next solution*) AND INREGISTER

18 (autolytic or autolysis or dextranomer* or cadexomer or xerogel or eusol or debrisan) AND INREGISTER

19 ((polysaccharide next bead*) or (polysaccharide next paste*)) AND INREGISTER

20 (iodoflex or iodosorb) AND INREGISTER

21 ((intrasite next gel) or intrasitegel or sterigel or granugel or nugel or (purilon next gel) or purilon or vigilon) AND INREGISTER

22 ((gauze next dressing*) or (adherent next dressing*) or (absorbent next dressing*) or (tulle next dressing*) or (polysaccharide next dressing*) or (hydrofibre next dressing*) or (hydrofiber next dressing*) or "wet to dry dressing" or "wet to dry dressings") AND INREGISTER

23 MESH DESCRIPTOR Bandages, Hydrocolloid EXPLODE ALL AND INREGISTER

24 (hydrocolloid* or granuflex or tegasorb or aquacel or hydrocoll or combiderm or duoderm) AND INREGISTER

25 ((alginate next dressing*) or (foam next dressing*) or hydrogel* or (saline next gauze)) AND INREGISTER

26 MESH DESCRIPTOR Honey EXPLODE ALL AND INREGISTER

27 honey* AND INREGISTER

28 #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 AND INREGISTER

29 MESH DESCRIPTOR Surgical Wound Infection EXPLODE ALL AND INREGISTER

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30 MESH DESCRIPTOR Surgical Wound Dehiscence EXPLODE ALL AND INREGISTER

31 (surg* near5 infection*) AND INREGISTER

32 (surg* near5 wound*) AND INREGISTER

33 (surg* near5 necrot*) AND INREGISTER

34 ((postoperative or post-operative) near5 infection*) AND INREGISTER

35 (exudat* near5 wound*) AND INREGISTER

36 (exudat* near5 cavit*) AND INREGISTER

37 (necrot* near5 wound*) AND INREGISTER

38 (necrot* near5 cavit*) AND INREGISTER

39 #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 AND INREGISTER

40 #28 AND #39 AND INREGISTER

The Cochrane Central Register of Controlled Clinical Trials (CENTRAL)

#1 MeSH descriptor: [Debridement] explode all trees

#2 (debrid* or slough* or deslough*):ti,ab,kw

#3 MeSH descriptor: [Larva] explode all trees

#4 (larva* or maggot* or biosurg* or bio-surg*):ti,ab,kw

#5 (wound* next irrigat*):ti,ab,kw

#6 (wound* next cleans*):ti,ab,kw

#7 whirlpool:ti,ab,kw

#8 MeSH descriptor: [Collagenases] explode all trees

#9 MeSH descriptor: [Papain] explode all trees

#10 MeSH descriptor: [Fibrinolysin] explode all trees

#11 MeSH descriptor: [Streptokinase] explode all trees

#12 (enzymatic or collagenase* or fibrinolytic* or proteolytic* or protease* or trypsin or streptokinase or streptodornase or varidase or papain):ti,ab,kw

#13 MeSH descriptor: [Hydrogen Peroxide] explode all trees

#14 (hypochlorite or (hydrogen next peroxide)):ti,ab,kw

#15 ((malic next acid) or (benzoid next acid) or (salicylic next acid) or (propylene next glycol)):ti,ab,kw

#16 (dakin next solution*):ti,ab,kw

#17 (autolytic or autolysis or dextranomer* or cadexomer or xerogel or eusol or debrisan):ti,ab,kw

#18 ((polysaccharide next bead*) or (polysaccharide next paste*)):ti,ab,kw

#19 (iodoflex or iodosorb):ti,ab,kw

#20 ((intrasite next gel) or intrasitgel or sterigel or granugel or nugel or purilon next gel or purilon or vigilon):ti,ab,kw

#21 ((gauze next dressing*) or (adherent next dressing*) or (absorbent next dressing*) or (tulle next dressing*) or (polysaccharide next dressing*) or (hydrofibre next dressing*) or "wet to dry dressing" or "wet to dry dressings"):ti,ab,kw

#22 MeSH descriptor: [Bandages, Hydrocolloid] explode all trees

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#23 (hydrocolloid* or granuflex or tegasorb or aquacel or hydrocoll or combiderm or duoderm):ti,ab,kw

#24 ((alginate next dressing*) or (foam next dressing*) or hydrogel* or (saline next gauze)):ti,ab,kw

#25 MeSH descriptor: [Honey] explode all trees

#26 honey*:ti,ab,kw

#27 {or #1-#26}

#28 MeSH descriptor: [Surgical Wound Infection] explode all trees

#29 MeSH descriptor: [Surgical Wound Dehiscence] explode all trees

#30 (surg* near/5 infection*):ti,ab,kw

#31 (surg* near/5 wound*):ti,ab,kw

#32 ((postoperative or post-operative) near/5 infection*):ti,ab,kw

#33 (exudat* near/5 wound*):ti,ab,kw

#34 (exudat* near/5 cavit*):ti,ab,kw

#35 (necrot* near/5 wound):ti,ab,kw

#36 (necrot* near/5 cavit*):ti,ab,kw

#37 {or #28-#36}

#38 {and #27, #37} in Trials

The Cochrane Central Register of Controlled Clinical Trials (CENTRAL) trial registry specific search

1 MESH DESCRIPTOR Debridement EXPLODE ALL AND CENTRAL:TARGET

2 debrid* or slough* or deslough* AND CENTRAL:TARGET

3 MESH DESCRIPTOR Larva EXPLODE ALL AND CENTRAL:TARGET

4 larva* or maggot* or biosurg* or bio-surg* AND CENTRAL:TARGET

5 (wound* next irrigat*) AND CENTRAL:TARGET

6 (wound* next cleans*) AND CENTRAL:TARGET

7 (whirlpool) AND CENTRAL:TARGET

8 MESH DESCRIPTOR Collagenases EXPLODE ALL AND CENTRAL:TARGET

9 MESH DESCRIPTOR Papain EXPLODE ALL AND CENTRAL:TARGET

10 MESH DESCRIPTOR Fibrinolysin EXPLODE ALL AND CENTRAL:TARGET

11 MESH DESCRIPTOR Streptokinase EXPLODE ALL AND CENTRAL:TARGET

12 (enzymatic or collagenase* or fibrinolytic* or fibrinolysin or proteolytic* or protease* or trypsin or streptokinase or streptodornase or varidase or papain) AND CENTRAL:TARGET

13 MESH DESCRIPTOR sodium hydrochlorite EXPLODE ALL AND CENTRAL:TARGET

14 MESH DESCRIPTOR Hydrogen Peroxide EXPLODE ALL AND CENTRAL:TARGET

15 (hypochlorite or (hydrogen next peroxide)) AND CENTRAL:TARGET

16 ((malic next acid) or (benzoic next acid) or (salicylic next acid) or (propylene next glycol)) AND CENTRAL:TARGET

17 (dakin* next solution*) AND CENTRAL:TARGET

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18 (autolytic or autolysis or dextranomer* or cadexomer or xerogel or eusol or debrisan) AND CENTRAL:TARGET

19 ((polysaccharide next bead*) or (polysaccharide next paste*)) AND CENTRAL:TARGET

20 (iodoflex or iodosorb) AND CENTRAL:TARGET

21 ((intrasite next gel) or intrasitegel or sterigel or granugel or nugel or (purilon next gel) or purilon or vigilon) AND CENTRAL:TARGET

22 ((gauze next dressing*) or (adherent next dressing*) or (absorbent next dressing*) or (tulle next dressing*) or (polysaccharide next dressing*) or (hydrofibre next dressing*) or (hydrofiber next dressing*) or "wet to dry dressing" or "wet to dry dressings") AND CENTRAL:TARGET

23 MESH DESCRIPTOR Bandages, Hydrocolloid EXPLODE ALL AND CENTRAL:TARGET

24 (hydrocolloid* or granuflex or tegasorb or aquacel or hydrocoll or combiderm or duoderm) AND CENTRAL:TARGET

25 ((alginate next dressing*) or (foam next dressing*) or hydrogel* or (saline next gauze)) AND CENTRAL:TARGET

26 MESH DESCRIPTOR Honey EXPLODE ALL AND CENTRAL:TARGET

27 honey* AND CENTRAL:TARGET

28 #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 AND CENTRAL:TARGET

29 MESH DESCRIPTOR Surgical Wound Infection EXPLODE ALL AND CENTRAL:TARGET

30 MESH DESCRIPTOR Surgical Wound Dehiscence EXPLODE ALL AND CENTRAL:TARGET

31 (surg* near5 infection*) AND CENTRAL:TARGET

32 (surg* near5 wound*) AND CENTRAL:TARGET

33 (surg* near5 necrot*) AND CENTRAL:TARGET

34 ((postoperative or post-operative) near5 infection*) AND CENTRAL:TARGET

35 (exudat* near5 wound*) AND CENTRAL:TARGET

36 (exudat* near5 cavit*) AND CENTRAL:TARGET

37 (necrot* near5 wound*) AND CENTRAL:TARGET

38 (necrot* near5 cavit*) AND CENTRAL:TARGET

39 #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 AND CENTRAL:TARGET

40 #28 AND #39 AND CENTRAL:TARGET

41 (NCT0* or ACTRN* or ChiCTR* or DRKS* or EUCTR* or eudract* or IRCT* or ISRCTN* or JapicCTI* or JPRN* or NTR0* or NTR1* or NTR2* or NTR3* or NTR4* or NTR5* or NTR6* or NTR7* or NTR8* or NTR9* or SRCTN* or UMIN0*):AU AND CENTRAL:TARGET

42 http*:SO AND CENTRAL:TARGET

43 #41 OR #42 AND CENTRAL:TARGET

44 #40 AND #43

Ovid MEDLINE

1 exp Debridement/

2 (debrid* or slough* or deslough*).ti,ab.

3 exp Larva/

4 (larva* or maggot* or biosurg* or bio-surg*).ti,ab.

5 (wound* adj irrigat*).ti,ab.

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6 (wound* adj cleans*).ti,ab.

7 whirlpool.ti,ab.

8 exp Collagenases/

9 exp Papain/

10 Fibrinolysin/

11 exp Streptokinase/

12 (enzymatic or collagenase* or fibrinolytic* or fibrinolysin or proteolytic* or protease* or trypsin or streptokinase or streptodornase or varidase or papain).ti,ab.

13 exp Hydrogen Peroxide/

14 (hypochlorite or (hydrogen adj peroxide)).ti,ab.

15 ((malic adj acid) or (benzoic adj acid) or (salicylic adj acid) or (propylene adj glycol)).ti,ab.

16 (dakin* adj solution*).ti,ab.

17 (autolytic or autolysis or dextranomer* or cadexomer or xerogel or eusol or debrisan).ti,ab.

18 ((polysaccharide adj bead*) or (polysaccharide adj paste*)).ti,ab.

19 (iodoflex or iodosorb).ti,ab.

20 ((intrasite adj gel) or intrasitegel or sterigel or granugel or nugel or (purilon adj gel) or purilon or vigilon).ti,ab.

21 ((gauze adj dressing*) or (adherent adj dressing*) or (absorbent adj dressing*) or (tulle adj dressing*) or (polysaccharide adj dressing*) or (hydrofibre adj dressing*) or (hydrofiber adj dressing*) or "wet to dry dressing" or "wet to dry dressings").ti,ab.

22 exp Bandages, Hydrocolloid/

23 (hydrocolloid* or granuflex or tegasorb or aquacel or hydrocoll or combiderm or duoderm).ti,ab.

24 ((alginate adj dressing*) or (foam adj dressing*) or hydrogel* or (saline adj gauze)).ti,ab.

25 exp Honey/

26 honey*.ti,ab.

27 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26

28 exp Surgical Wound Infection/

29 exp Surgical Wound Dehiscence/

30 (surg* adj5 infection*).ti,ab.

31 (surg* adj5 wound*).ab,ti.

32 (surg* adj5 necrot*).ti,ab.

33 ((postoperative or post-operative) adj5 infection*).ti,ab.

34 (exudat* adj5 wound*).ab,ti.

35 (exudat* adj5 cavit*).ab,ti.

36 (necrot* adj5 wound*).ab,ti.

37 (necrot* adj5 cavit*).ab,ti.

38 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37

39 27 and 38

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40 randomized controlled trial.pt.

41 controlled clinical trial.pt.

42 randomi?ed.ab.

43 placebo.ab.

44 clinical trials as topic.sh.

45 randomly.ab.

46 trial.ti.

47 or/40-46

48 exp animals/ not humans.sh.

49 47 not 48

50 39 and 49

Ovid Embase

1 exp debridement/

2 (debrid* or slough* or deslough*).ti,ab.

3 exp maggot therapy/

4 exp larva/

5 (larva* or maggot* or biosurg* or bio-surg*).ti,ab.

6 (wound* adj irrigat*).ti,ab.

7 (wound* adj cleans*).ti,ab.

8 whirlpool.mp.

9 exp collagenase/

10 exp papain/

11 exp plasmin/

12 exp streptokinase/

13 (enzymatic or collagenase* or fibrinolytic* or fibrinolysin or proteolytic* or protease* or trypsin or streptokinase or streptodornase or varidase or papain).ti,ab.

14 exp hypochlorite sodium/

15 exp hydrogen peroxide/

16 (hypochlorite or hydrogen peroxide).ti,ab.

17 (malic acid or benzoid acid or salicylic acid or propylene glycol).ti,ab.

18 (dakin* adj solution*).mp.

19 (autolytic or autolysis or dextranomer* or cadexomer or xerogel or eusol or debrisan).ti,ab.

20 ((polysaccharide adj bead*) or (polysaccharide adj paste*)).ti,ab.

21 (iodoflex or iodosorb).ti,ab.

22 (intrasite gel or intrasitegel or sterigel or granugel or nugel or purilon gel or purilon or vigilon).ti,ab.

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23 ((gauze adj dressing*) or (adherent adj dressing*) or (absorbent adj dressing*) or (tulle adj dressing*) or (polysaccharide adj dressing*) or (hydrofibre adj dressing*) or (hydrofiber adj dressing*) or "wet to dry dressing" or "wet to dry dressings").ti,ab.

24 exp hydrocolloid dressing/

25 (hydrocolloid* or granuflex or tegasorb or aquacel or hydrocoll or combiderm or duoderm).ti,ab.

26 ((alginate adj dressing*) or (foam adj dressing*) or hydrogel* or (saline adj gauze)).ti,ab.

27 exp Honey/

28 honey.mp.

29 or/1-28

30 exp Surgical Wound Infection/

31 exp Surgical Wound Dehiscence/

32 (surg* adj5 infection*).mp.

33 (surg* adj5 wound*).ti,ab.

34 (surg* adj5 necrot*).ti,ab.

35 ((postoperative or post-operative) adj5 infection*).ti,ab.

36 (exudat* adj5 wound*).ti,ab.

37 (exudat$ adj5 cavit$).ti,ab.

38 (necrot$ adj5 wound$).ti,ab.

39 (necrot$ adj5 cavit$).ti,ab.

40 or/30-38

41 29 and 40

42 Randomized controlled trials/

43 Single-Blind Method/

44 Double-Blind Method/

45 Crossover Procedure/

46 (random* or factorial* or crossover* or cross over* or cross-over* or placebo* or assign* or allocat* or volunteer*).ti,ab.

47 (doubl* adj blind*).ti,ab.

48 (singl* adj blind*).ti,ab.

49 or/42-48

50 exp animals/ or exp invertebrate/ or animal experiment/ or animal model/ or animal tissue/ or animal cell/ or nonhuman/

51 human/ or human cell/

52 and/50-51

53 50 not 52

54 49 not 53

55 41 and 54

CINAHL Plus

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S63 S39 AND S62

S62 S61 NOT S60

S61 S40 OR S41 OR S42 OR S43 OR S44 OR S45 OR S46 OR S47 OR S48 OR S49 OR S50 OR S51 OR S52 OR S53 OR S54

S60 S58 NOT S59

S59 MH (human)

S58 S55 OR S56 OR S57

S57 TI (animal model*)

S56 MH (animal studies)

S55 MH animals+

S54 AB (CLUSTER W3 RCT)

S53 MH (crossover design) OR MH (comparative studies)

S52 AB (control W5 group)

S51 PT (randomized controlled trial)

S50 MH (placebos)

S49 MH (sample size) AND AB (assigned OR allocated OR control)

S48 TI (trial)

S47 AB (random*)

S46 TI (randomised OR randomized)

S45 MH cluster sample

S44 MH pretest-posttest design

S43 MH random assignment

S42 MH single-blind studies

S41 MH double-blind studies

S40 MH randomized controlled trials

S39 S27 AND S38

S38 S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37

S37 TI (necrot* n5 cavit*) OR AB (necrot* n5 cavit*)

S36 TI (necrot* n5 wound*) OR AB (necrot* n5 wound*)

S35 TI (exudat* n5 cavit*) OR AB (exudat* n5 cavit*)

S34 TI (exudat* n5 wound*) OR AB (exudat* n5 wound*)

S33 TI (((postoperative or post-operative) n5 infection*)) OR AB (((postoperative or post-operative) n5 infection*))

S32 TI (surg* n5 necrot*) OR AB (surg* n5 necrot*)

S31 TI (surg* n5 wound*) OR AB (surg* n5 wound*)

S30 TI (surg* n5 infection*) OR AB (surg* n5 infection*)

S29 (MH "Surgical Wound Dehiscence")

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S28 (MH "Surgical Wound Infection")

S27 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26

S26 TI honey* OR AB honey*

S25 (MH "Honey")

S24 TI (((alginate dressing*) or (foam dressing*) or hydrogel* or (saline gauze))) OR AB (((alginate dressing*) or (foam dressing*) or hydrogel* or (saline gauze)))

S23 TI ((hydrocolloid* or granuflex or tegasorb or aquacel or hydrocoll or combiderm or duoderm)) OR AB ((hydrocolloid* or granuflex or tegasorb or aquacel or hydrocoll or combiderm or duoderm))

S22 (MH "Hydrofiber Dressings")

S21 (MH "Hydrocolloid Dressings")

S20 TI (((gauze dressing*) or (adherent dressing*) or (absorbent dressing*) or (tulle dressing*) or (polysaccharide dressing*) or (hydrofibre dressing*) or (hydrofiber dressing*) or "wet to dry dressing" or "wet to dry dressings")) OR AB (((gauze dressing*) or (adherent dressing*) or (absorbent dressing*) or (tulle dressing*) or (polysaccharide dressing*) or (hydrofibre dressing*) or (hydrofiber dressing*) or "wet to dry dressing" or "wet to dry dressings"))

S19 TI (((intrasite gel) or intrasitegel or sterigel or granugel or nugel or (purilon gel) or purilon or vigilon)) OR AB (((intrasite gel) or intrasitegel or sterigel or granugel or nugel or (purilon gel) or purilon or vigilon))

S18 TI ((iodoflex or iodosorb)) OR AB ((iodoflex or iodosorb))

S17 TI (((polysaccharide bead*) or (polysaccharide paste*))) OR AB (((polysaccharide bead*) or (polysaccharide paste*)))

S16 TI ((autolytic or autolysis or dextranomer* or cadexomer or xerogel or eusol or debrisan)) OR AB ((autolytic or autolysis or dextranomer* or cadexomer or xerogel or eusol or debrisan))

S15 TI (dakin* N1 solution*) OR AB (dakin* N1 solution*)

S14 TI (((malic acid) or (benzoic acid) or (salicylic acid) or (propylene glycol))) OR AB (((malic acid) or (benzoic acid) or (salicylic acid) or (propylene glycol)))

S13 TI ((hypochlorite or (hydrogen peroxide))) OR AB ((hypochlorite or (hydrogen peroxide)))

S12 (MH "Hydrogen Peroxide")

S11 (MH "Sodium Hypochlorite")

S10 TI ((enzymatic or collagenase* or fibrinolytic* or fibrinolysin or proteolytic* or protease* or trypsin or streptokinase or streptodornase or varidase or papain)) OR AB ((enzymatic or collagenase* or fibrinolytic* or fibrinolysin or proteolytic* or protease* or trypsin or streptokinase or streptodornase or varidase or papain))

S9 (MH "Streptokinase+")

S8 (MH "Fibrinolytic Agents+")

S7 TI (whirlpool) OR AB (whirlpool)

S6 TI (wound* n1 cleans*) OR AB (wound* n1 cleans*)

S5 TI (wound* n1 irrigat*) OR AB (wound* n1 irrigat*)

S4 TI ((larva* or maggot* or biosurg* or bio-surg*)) OR AB ((larva* or maggot* or biosurg* or bio-surg*))

S3 (MH "Larva")

S2 TI ((debrid* or slough* or deslough*)) OR AB ((debrid* or slough* or deslough*))

S1 (MH "Debridement+")

US National Institutes of Health Ongoing Trials Register (ClinicalTrials.gov)

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(debride OR debridement OR slough OR deslough) | Surgical Wound

(debride OR debridement OR slough OR deslough) | surgical wound infection

(debride OR debridement OR slough OR deslough) | surgical wound dehiscence

(debride OR debridement OR slough OR deslough) | surgical site infection

World Health Organization International Clinical Trials Registry Platform

(debride OR debridement OR slough OR deslough) Surgical wound

(debride OR debridement OR slough OR deslough) Surgical wound infection

(debride OR debridement OR slough OR deslough) surgical wound dehiscence

(debride OR debridement OR slough OR deslough) surgical site infection

Appendix 2. Criteria for judgements for the sources of bias

1. Was the allocation sequence randomly generated?

Low risk of bias

The investigators described a random component in the sequence generation process such as: referring to a random number table; using a computer random number generator; coin tossing; shuffling cards or envelopes; throwing dice; drawing of lots.

High risk of bias

The investigators described a non-random component in the sequence generation process. Usually, the description would involve some systematic, non-random approach, for example, sequence generated by odd or even date of birth; sequence generated by some rule based on date (or day) of admission; sequence generated by some rule based on hospital or clinic record number.

Unclear risk of bias

Insufficient information about the sequence generation process to permit judgement of low or high risk of bias.

2. Was the treatment allocation adequately concealed?

Low risk of bias

Participants and investigators enrolling participants could not have foreseen assignment because one of the following, or an equivalent method, was used to conceal allocation: central allocation (including telephone, web-based and pharmacy-controlled randomisation); sequentially numbered drug containers of identical appearance; sequentially numbered, opaque, sealed envelopes.

High risk of bias

Participants or investigators enrolling participants could possibly have foreseen assignments and thus introduced selection bias, such as allocation based on: using an open random allocation schedule (e.g. a list of random numbers); assignment envelopes were used without appropriate safeguards (e.g. if envelopes were unsealed or non--opaque or not sequentially numbered); alternation or rotation; date of birth; case record number; any other explicitly unconcealed procedure.

Unclear risk of bias

Insufficient information to permit judgement of low or high risk of bias. This is usually the case if the method of concealment is not described or not described in sufficient detail to allow a definite judgement, for example if the use of assignment envelopes was described, but remained unclear whether envelopes were sequentially numbered, opaque and sealed.

3. Blinding – was knowledge of the allocated interventions adequately prevented during the study?

Low risk of bias

Any one of the following.

- No blinding, but the review authors judged that the outcome and the outcome measurement were not likely to be influenced by lack of blinding.
- Blinding of participants and key study personnel ensured, and unlikely that the blinding could have been broken.
- Either participants or some key study personnel were not blinded, but outcome assessment was blinded and the non-blinding of others unlikely to introduce bias.

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High risk of bias

Any one of the following.

- No blinding or incomplete blinding, and the outcome or outcome measurement was likely to be influenced by lack of blinding.
- Blinding of key study participants and personnel attempted, but likely that the blinding could have been broken.
- Either participants or some key study personnel were not blinded, and the non-blinding of others likely to introduce bias.

Unclear risk of bias

Any one of the following.

- Insufficient information to permit judgement of low or high risk of bias.
- The study did not address this outcome.

4. Were incomplete outcome data adequately addressed?

Low risk of bias

Any one of the following.

- No missing outcome data.
- Reasons for missing outcome data unlikely to be related to true outcome (for survival data, censoring unlikely to be introducing bias).
- Missing outcome data balanced in numbers across intervention groups, with similar reasons for missing data across groups.
- For dichotomous outcome data, the proportion of missing outcomes compared with observed event risk not enough to have a clinically relevant impact on the intervention effect estimate.
- For continuous outcome data, plausible effect size (difference in means or standardised difference in means) among missing outcomes not enough to have a clinically relevant impact on observed effect size.
- Missing data were imputed using appropriate methods.

High risk of bias

Any one of the following.

- Reason for missing outcome data likely to be related to true outcome, with either imbalance in numbers or reasons for missing data across intervention groups.
- For dichotomous outcome data, the proportion of missing outcomes compared with observed event risk enough to induce clinically relevant bias in intervention effect estimate.
- For continuous outcome data, plausible effect size (difference in means or standardised difference in means) among missing outcomes enough to induce clinically relevant bias in observed effect size.
- 'As-treated' analysis done with substantial departure of the intervention received from that assigned at randomisation.
- Potentially inappropriate application of simple imputation.

Unclear risk of bias

Any one of the following.

- Insufficient reporting of attrition/exclusions to permit judgement of low or high risk of bias (e.g. number randomised not stated, no reasons for missing data provided).
- The study did not address this outcome.

5. Were reports of the study free of suggestion of selective outcome reporting?

Low risk of bias

Any of the following.

- The study protocol was available and all of the study's prespecified (primary and secondary) outcomes that were of interest in the review were reported in the prespecified way.
- The study protocol was not available but it was clear that the published reports included all expected outcomes, including those that were prespecified (convincing text of this nature may be uncommon).

High risk of bias

Any one of the following.

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- Not all of the study's prespecified primary outcomes were reported.
- One or more primary outcomes was reported using measurements, analysis methods, or subsets of the data (e.g. subscales) that were not prespecified.
- One or more reported primary outcomes were not prespecified (unless clear justification for their reporting was provided, such as an unexpected adverse effect).
- One or more outcomes of interest in the review were reported incompletely so that they could not be entered in a meta-analysis.
- The study report failed to include results for a key outcome that would be expected to have been reported for such a study.

Unclear risk of bias

Insufficient information to permit judgement of low or high risk of bias. It is likely that most studies will fall into this category.

6. Other sources of potential bias:

Low risk of bias

The study appeared free of other sources of bias.

High risk of bias

There is at least one important risk of bias. For example, the study:

- had a potential source of bias related to the specific study design used; or
- had extreme baseline imbalance; or
- had been claimed to have been fraudulent; or
- had some other problem.

Unclear risk of bias

There may be a risk of bias, but there is either:

- insufficient information to assess whether an important risk of bias exists; or
- insufficient rationale or evidence that an identified problem will introduce bias.

WHAT'S NEW

Date	Event	Description
7 May 2024	New search has been performed	Fourth update, GRADE assessment included. One new study identified for inclusion. Conclusions remain the same.
7 May 2024	New citation required but conclusions have not changed	Updated. Conclusions unchanged

HISTORY

Protocol first published: Issue 4, 2006
Review first published: Issue 3, 2008

Date	Event	Description
13 June 2013	New citation required but conclusions have not changed	No new studies identified for inclusion. The conclusions remain the same.
13 June 2013	New search has been performed	Third update, new search.

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Date	Event	Description
13 April 2011	New search has been performed	Second update, new search, no new studies included. Risk of bias assessment completed on all included studies. The conclusions remain unchanged.
13 April 2011	New citation required but conclusions have not changed	New lead author and contact person
12 January 2011	New search has been performed	First update, new searches, no new studies identified, conclusions remain unchanged.
17 February 2010	Amended	Contact details updated.
24 April 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

FS: conceived the review; designed the review update; co-ordinated the review update; extracted data; checked quality of data extraction; undertook quality assessment; checked quality of statistical analysis; produced the first draft of the review update; contributed to writing or editing the review update; performed previous work that was the foundation of the current review update; approved final review update prior to submission; is guarantor of the review update.

JD: conceived the review; extracted data; checked quality of data extraction; checked quality assessment; checked quality of statistical analysis; contributed to writing or editing the review update; advised on the review update; performed previous work that was the foundation of the current review update; approved final review update prior to submission.

TB: co-ordinated the review update; extracted data; analysed or interpreted data; undertook quality assessment; performed statistical analysis; produced the first draft of the review update; contributed to writing or editing the review update; approved final review update prior to submission.

Contributions of editorial base

Gill Rizzello (Managing Editor): co-ordinated the editorial process; advised on content; edited this review update.

Sophie Bishop (Information Specialist): ran the search and edited the search methods sections.

Tom Patterson (Editorial Assistant): edited reference sections of the review.

DECLARATIONS OF INTEREST

FS: none.

JD: none.

TB: none.

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Internal sources

- School of Nursing, Midwifery and Social Care, Edinburgh Napier University, UK

  Ongoing support from the School to publish and update the review
- Faculty of Health Sciences and Sport, University of Stirling, UK

  Ongoing support from the Faculty to update the review

External sources

- National Institute for Health Research (NIHR), UK

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DIFFERENCES BETWEEN PROTOCOL AND REVIEW

For this fourth update, we made the following changes.

We updated our search strategies by adding new search terms and relevant database indexing terms.

We restructured the outcomes slightly to improve clarity.

We included summary of findings tables and used GRADE.

We did not write to the manufacturers and distributors of wound products for details of trials or contact relevant experts, search conference proceedings or handsearch recent journal publications; however, we did search trial registries.

Although not made explicit in the protocol (Dryburgh 2006), all versions of this review only included studies that reported at least one of the primary outcomes (as well as meeting all other eligibility criteria).

INDEX TERMS

Medical Subject Headings (MeSH)

Bandages; Bias; *Debridement [methods]; *Randomized Controlled Trials as Topic; Surgical Wound [therapy]; *Surgical Wound Infection; Time Factors; *Wound Healing

MeSH check words

Adolescent; Adult; Aged; Aged, 80 and over; Child; Child, Preschool; Humans; Middle Aged; Young Adult

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