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[Intervention Review]

Patching for corneal abrasion

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ABSTRACT

Background

Published audits have demonstrated that corneal abrasions are a common presenting eye complaint. Eye patches are often recommended for treating corneal abrasions despite the lack of evidence for their use. This systematic review was conducted to determine the effects of the eye patch when used to treat corneal abrasions.

Objectives

The objective of this review was to assess the effects of patching for corneal abrasion on healing and pain relief.

Search methods

We searched CENTRAL (which contains the Cochrane Eyes and Vision Trials Register) (2016, Issue 4), Ovid MEDLINE, Ovid MEDLINE In-Process and Other Non-Indexed Citations, Ovid MEDLINE Daily, Ovid OLDMEDLINE (January 1946 to May 2016), EMBASE (January 1980 to May 2016), Latin American and Caribbean Health Sciences Literature Database (LILACS) (January 1982 to May 2016), System for Information on Grey Literature in Europe (OpenGrey) (January 1995 to May 2016), the ISRCTN registry (www.isrctn.com/editAdvancedSearch), ClinicalTrials.gov (www.clinicaltrials.gov) and the World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) (www.who.int/ictrp/search/en). We did not use any date or language restrictions in the electronic searches for trials. We last searched the electronic databases on 9 May 2016. We also searched the reference lists of included studies, unpublished 'grey' literature and conference proceedings and contacted pharmaceutical companies for details of unpublished trials.

Selection criteria

We included randomised and quasi-randomised controlled trials that compared patching the eye with no patching to treat simple corneal abrasions.

Data collection and analysis

Two authors independently assessed the risk of bias and extracted data. Investigators were contacted for further information regarding the quality of trials. The primary outcome was healing at 24, 48 and 72 hours while secondary outcomes included measures of pain, quality of life and adverse effects. We graded the certainty of the evidence using GRADE.

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Main results

We included 12 trials which randomised a total of 1080 participants in the review. Four trials were conducted in the United Kingdom, another four in the United States of America, two in Canada, one in Brazil and one in Switzerland. Seven trials were at high risk of bias in one or more domains and one trial was judged to be low risk of bias in all domains. The rest were a combination of low risk or unclear.

People receiving a patch may be less likely to have a healed corneal abrasion after 24 hours compared to those not receiving a patch (risk ratio (RR) 0.89, 95% confidence interval (CI) 0.79 to 1.00, 7 trials, 531 participants, low certainty evidence). Similar numbers of people in the patch and no-patch groups were healed by 48 hours (RR 0.97, 95% CI 0.91 to 1.02, 6 trials, 497 participants, moderate certainty evidence) and 72 hours (RR 1.01, 95% CI 0.97 to 1.05, 4 trials, 430 participants, moderate certainty evidence). Participants receiving a patch took slightly longer to heal but the difference was small and probably unimportant (mean difference (MD) 0.14 days longer, 95% CI 0 to 0.27 days longer, 6 trials, 642 participants, moderate certainty evidence).

Ten trials reported pain scores. Most studies reported pain on a visual analogue scale (VAS). It was not possible to pool the data because it was skewed. In general, similar pain ratings were seen between patch and no-patch groups. Data from two trials reporting presence or absence of pain at 24 hours was inconclusive. There was a higher risk of reported pain in the patch group but wide confidence intervals compatible with higher or lower risk of pain (RR 1.51, 95% CI 0.86 to 2.65, 2 trials, 193 participants, low certainty evidence). Five trials compared analgesic use between the patch and no-patch groups. Data from three of these trials could be combined and suggested similar analgesic use in the patch and no-patch groups but with some uncertainty (RR 0.95, 95% CI 0.69 to 1.32, 256 participants, low certainty evidence). Frequently reported symptoms included photophobia, lacrimation, foreign body sensation and blurred vision but there was little evidence to suggest any difference in these symptoms in people with or without a patch.

Activities of daily living (ADL) were assessed in one study involving children. There was little difference in ADL with the exception of walking which was reported to be more difficult with a patch on: VAS 1.7 cm (SD 2.1) versus 0.3 cm (SD 0.7).

Complication rates were low across studies and there is uncertainty about the relative effects of patching or not patching with respect to these (RR 3.24, 95% CI 0.87 to 12.05, 8 trials, 660 participants, low certainty evidence). Three trials reporting rates of compliance to treatment found that 22% of participants did not have their eye patches during follow-up. No-patch groups generally received more adjuvant treatment with antibiotics or cycloplegics, or both, than the patch group. There were limited data on the effect of patching on abrasions greater than $10mm^2$ in size.

Authors' conclusions

Trials included in this review suggest that treating simple corneal abrasions with a patch may not improve healing or reduce pain. It must be noted that, in these trials, participants who did not receive a patch were more likely to receive additional treatment, for example with antibiotics. Overall we judged the certainty of evidence to be moderate to low. Further research should focus on designing and implementing better quality trials and examining the effectiveness of patching for large abrasions.

PLAIN LANGUAGE SUMMARY

Eye patches for corneal abrasion

What is the aim of this review?

The aim of this Cochrane Review was to find out what effect using an eye patch for corneal abrasions has on healing and pain relief compared with not patching. Cochrane researchers collected and analysed all relevant studies to answer this question and found 12 studies.

Key messages

Patching probably does not speed up healing and may not have an important effect on pain relief. None of the studies provided information on the effect of patching on larger abrasions.

What was studied in the review?

The cornea is the transparent outer layer of the eye. Corneal abrasions can result from scratches or superficial damage to the cornea. These are common problems which can be very painful. A common treatment option is to place a patch over the eye. This may have an impact on how long it takes for the abrasion to heal. It may also provide pain relief.

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What are the main results of the review?

The review authors found 12 relevant studies. 6 were from North America, 5 from Europe, and 1 from South America (Brazil). These studies compared the use of eye patches with no patching.

People receiving a patch may be less likely to have a healed corneal abrasion after 24 hours compared with people not receiving a patch (low certainty evidence). Using eye patches probably makes little or no difference to the number of people whose abrasion heals after 48 and 72 hours (moderate certainty evidence).

Corneal abrasions in people receiving patches probably take slightly longer to heal than in people not receiving patches but the difference is small and probably unimportant (moderate certainty evidence).

Using eye patches may lead to more pain at 24 hours (low certainty evidence). However, the range where the actual effect may be shows that eye patches may lead to more pain, but may also lead to less pain.

People with corneal abrasions frequently experience sensitivity to light, watery eyes, a foreign body sensation and blurred vision. There was little evidence to suggest any difference in these symptoms in people with or without a patch.

There were limited data available on quality of life, visual acuity and adverse effects.

How up-to-date is this review?

The review authors searched for studies that had been published up to 9 May 2016.

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SUMMARY OF FINDINGS FOR THE MAIN COMPARISON [Explanation]

Patching compared to no patching for corneal abrasion

Patient or population: participants with corneal abrasion
Settings: Hospitals
Intervention: Patching

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Certainty of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	People with no patches	People with patches				
Complete healing after 24 hours	**620 per 1000** (273 to 1000)	**552 per 1000** (490 to 620)	**RR 0.89** (0.79 to 1)	531 (7 studies)	⊕⊕◯◯ **low**[2]	-
Complete healing after 48 hours	**856 per 1000** (813 to 1000)	**831 per 1000** (779 to 891)	**RR 0.97** (0.91 to 1.02)	497 (6 studies)	⊕⊕⊕◯ **moderate**[3]	-
Complete healing after 72 hours	**914 per 1000** (809 to 1000)	**923 per 1000** (797 to 1000)	**RR 1.01** (0.97 to 1.05)	430 (4 studies)	⊕⊕⊕◯ **moderate**[3]	-
Days to complete healing	The mean number of days in the no-patch group ranged from 1 to 2.3 days	The mean number of days to complete healing in the patch group was **0.14 longer** (0 to 0.27 days longer)	**MD 0.14** (0.00 to 0.27)	642 (6 studies)	⊕⊕⊕◯ **moderate**[3]	-
Pain at 24 hours	**157 per 1000**	**237 per 1000** (135 to 416)	**RR 1.51** (0.86 to 2.65)	193 (2 studies)	⊕⊕◯◯ **low**[4]	Most studies reported pain on a visual analogue scale (VAS). It was not possible to pool the data because they were skewed. In general, similar pain

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						ratings were seen between patch and no-patch groups
Quality of life	See comments	-	-	-	-	Activities of daily living (ADL) was assessed in one study of children. There was little difference in ADL with the exception of walking which was reported to be more difficult with a patch on. VAS 1.7cm (SD 2.1) versus 0.3cm (SD 0.7)
Adverse effects[1]	**9 per 1000** (0 to 50)	**26 per 1000** (8 to 86)	**RR 3.24** (0.87 to 12.05)	660 (8 studies)	⊕⊕◯◯ **low**[5]	-
Change in visual acuity one week from initial presentation	-	-	-	46 (1 study)	*Not graded as no estimate of effe*	Mean best-corrected Snellen acuity at baseline was 0.9 (SD 0.2) in the patch group and 1.1 (SD 0.3) in the no-patch group. At one week, mean acuity was 1.1 (SD 0.3) in the patch group and 1.1 (SD 0.2) in the no-patch group

*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; **RR:** Risk ratio; **SD:** standard deviation; **MD**: Mean 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.

[1]Adverse effects examined included persistent symptoms (such as photophobia, lacrimation, foreign body sensation, blurred vision), corneal ulceration with subsequent development of a hypopyon and repeat presentations for recurrent erosions.
[2]Downgraded one level for risk of bias as the studies were largely at high or unclear risk of bias and downgraded one level for imprecision as the confidence intervals were compatible with less healing in the patch group or no effect.
[3] Downgraded one level for risk of bias as the studies were largely at high or unclear risk of bias. Not downgraded for imprecision as confidence intervals reasonably narrow around 1 (no effect) and therefore we judged that important differences between the two groups are unlikely.
[4] Downgraded one level for risk of bias as the studies were largely at high or unclear risk of bias and downgraded one level for imprecision as the confidence intervals are wide and compatible with less pain or more pain in the patch group compared with the no-patch group.
[5] Downgraded one level for risk of bias as the studies were largely at high or unclear risk of bias and downgraded one level for imprecision as the confidence intervals are wide and compatible with fewer adverse events or more adverse events in the patch group compared with the no-patch group.

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BACKGROUND

Description of the condition

The cornea is the transparent outer layer of the eye. Besides its crucial role in refraction, the cornea also functions as a protective barrier against infection and trauma. It comprises five layers, with the corneal epithelium located most anteriorly. Corneal abrasions are superficial defects involving the corneal epithelium that mostly arise from mechanical injuries. In fact, corneal abrasions are among the most frequently encountered ocular conditions in eye emergency departments (Lubeck 1988; Vaughan 1995). A published audit ranked corneal abrasions as the eighth most common condition diagnosed in a series of 274 consecutive cases in the accident and emergency department of a regional eye hospital in Hong Kong (Lai 2003). In the same audit, external eye foreign bodies were the second most commonly treated condition. Corneal foreign bodies are often associated with corneal abrasions as an epithelial defect remains on removal. Eye injuries lead to significant morbidity and lost productivity. A major United States automotive corporation found an annual incidence of 15 eye injuries per 1000 employees, with a third of workers unable to resume normal duties for at least one day (Wong 1998).

Corneal abrasions are also a common presenting condition in general accident and emergency departments. An audit of US emergency departments (McGwin 2005) found that contusions or abrasions (44.4%) were the most common cause of ophthalmic-based presentations in this setting, with foreign bodies (30.8%) identified as the next most common presentation. If one were to extrapolate the findings of a British audit of general emergency departments (Edwards 1987) and consider 3% of new admissions to be eye-related trauma, then the total number of new cases of eye injuries would be approximately 420,000 per year in England alone (DOH 2004). This number is based on the total number of presentations to accident and emergency departments in one year. Two American audits of US emergency departments have estimated the incidence of eye-related presentations as between 315 per 100,000 (McGwin 2005) and 447.1 per 100,000 population (Nash 1998). In England, there are a number of emergency departments specifically for ophthalmology presentations where the proportion of corneal abrasions and foreign body injuries is much higher (Lai 2003). A recent audit of an eye emergency service in Ireland reported that corneal abrasions and corneal foreign bodies were the most common causes for traumatic eye presentations, making up 28.4% and 26.9% of traumatic ophthalmic presentations (Vartsakis 2014). In addition general practitioners and optometrists would likely deal with a significant proportion of corneal abrasions and therefore one can infer that this estimate of the total yearly number of corneal abrasions is conservative at best and underestimates the true incidence of this condition.

Description of the intervention

The management of a corneal abrasion with a patch (some form of occlusion of the affected eye) and topical antibiotics was the recommended therapy for corneal abrasion in many references (Catalano 1992; Cullom 1994; Khaw 2004; Parrish 1988; Pavan-Langston 1991; Webster 1987).

Why it is important to do this review

The practice of patching corneal abrasions has been questioned, with a number of trials suggesting no benefit (Hulbert 1991; Kirkpatrick 1993). Many of these trials had small numbers of participants and therefore lacked the statistical power to demonstrate any differences. A systematic review on the use of patching was completed in 1998 (Flynn 1998). This was reviewed by the Centre for Reviews and Dissemination which identified several areas for improvement: only a single author was involved in assessing the validity and quality of studies; the methods for selecting studies were not stated; and eligible studies were restricted to those published in English (CRD 2006). A second review, published in a Japanese journal, was restricted to trials published in the English language with searches restricted to only one database (Yamada 2001). Furthermore, new randomised controlled trials on the topic have been published since these reviews were prepared.

OBJECTIVES

The objective of this review was to assess the effects of patching for corneal abrasion on healing and pain relief.

METHODS

Criteria for considering studies for this review

Types of studies

This review included randomised and quasi-randomised controlled trials.

Types of participants

Participants in the trials were people of all ages with recent onset (less than 48 hours) of corneal abrasion due to mechanical injury, foreign body removal or contact lens use, as diagnosed by fluorescein or slit-lamp examination. We excluded trials of participants with corneal abrasions due to infection, peripheral corneal degeneration or chemical injury (these conditions can result in

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epithelial loss similar to primary abrasions due to mechanical injuries, but the pattern, progression, treatment and prognosis differs markedly).

Types of interventions

We examined the following comparisons:

- eye patching versus no eye patching;
- eye patching plus topical antibiotics versus topical antibiotics alone

Treatment may have included cycloplegics or analgesics, or both. Eye patching should have been for at least 24 hours of continuous intended use.

We considered the following methods of eye patching:

- cotton wool covered with a net held with tape over a closed eye;
- pressure patching with either double eye pad or bulk gauze (enough to exert pressure) on closed eye held with either bandage or plaster. Tape or plaster placed onto the skin of the eyelids to prevent eye opening;
- any other form of occlusion of the affected eye adopted by the trialists.

Types of outcome measures

Primary outcomes

The primary outcomes for this review were:

- proportion with complete healing after 24, 48 and 72 hours;
- mean days to complete healing;
- rate (proportion/length/area of epithelial defect recovered per unit of time).

Healing should have been ascertained using fluorescein staining or slit-lamp examination.

Secondary outcomes

The secondary outcomes for this review were:

- pain assessment using 0 to 100 score, visual analogue scale (VAS) or any form of pain measurement adopted by the trialists;
- use of analgesia;
- quality-of-life measures;
- assessment of activities of daily living (ADL);
- insomnia assessments;
- duration of medical leave;
- other symptoms, for example photophobia, lacrimation, foreign body sensation and blurred vision;
- measure of compliance to treatment;
- use of topical cycloplegics;
- visual acuity measured using a logMAR acuity chart.

Adverse effects (severe, minor)

We examined the following adverse effects:

- infection or inflammation after commencement of trial as diagnosed by trialists;
- recurrent corneal abrasions as diagnosed by repeated episodes of corneal abrasion after complete healing had occurred;
- any other untoward events.

Follow-up

The minimum length of follow-up required was 24 hours after enrolment. Follow-up may have been repeated every 24 hours until complete healing of abrasion had been noted.

Search methods for identification of studies

Electronic searches

We searched CENTRAL (which contains the Cochrane Eyes and Vision Trials Register) (2016, Issue 4), Ovid MEDLINE, Ovid MEDLINE In-Process and Other Non-Indexed Citations, Ovid MEDLINE Daily, Ovid OLDMEDLINE (January 1946 to May 2016), EMBASE (January 1980 to May 2016), Latin American and Caribbean Health Sciences Literature Database (LILACS) (January 1982 to May 2016), System for Information on Grey Literature in Europe (OpenGrey) (January 1995 to May 2016), the ISRCTN registry (www.isrctn.com/editAdvancedSearch), ClinicalTrials.gov (www.clinicaltrials.gov) and the World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) (www.who.int/ictrp/search/en). We did not use any date or language restrictions in the electronic searches for trials. We last searched the electronic databases on 9 May 2016.

See appendices for details of search strategies for CENTRAL (Appendix 1), MEDLINE (Appendix 2), EMBASE (Appendix 3), LILACS (Appendix 4), OpenGrey (Appendix 5), ISRCTN (Appendix 6), ClinicalTrials.gov (Appendix 7) and the ICTRP (Appendix 8).

Searching other resources

Additional handsearching focused on reference lists and abstracts/proceedings of scientific meetings held on the subject. In particular, we searched the proceedings of the Association for Research in Vision and Ophthalmology (ARVO). For the abstracts from 2002, we performed electronic searches using the key words: corneal abrasion; patch*; occlusion; abrasion; trauma; foreign bod*. For abstracts from 1993 to 2001 the ARVO proceedings index was used searching through sections on 'Cornea' and checking subsections of 'Wound healing', 'Abrasion', 'Epitheli*'.

We contacted the authors of relevant published studies to help identify unpublished data. In March 2004 we contacted compa-

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nies and pharmaceutical firms that produce eye patches and topical antibiotics (including GlaxoSmithKline, Pfizer, Alcon, Troge, Sigma, Novartis, CibaVision) for unpublished data.

Data collection and analysis

Selection of studies

Two review authors (CHLL, BXL) independently screened the updated search results. When disagreements arose, the review authors assessed the studies separately once more and held a discussion to decide whether these studies should be included. Complete versions of all included studies were then independently reviewed. In instances where articles were not published in English, we obtained an accurate translation.

Data extraction and management

Two review authors (CHLL, BXL) independently extracted data from included studies onto a data collection template. We then compiled the individually extracted results and discussed any discrepancies in the data. We checked decisions we made against published study data. Data collected included study characteristics, interventions, follow-up and outcome data.

Assessment of risk of bias in included studies

Two review authors (CHLL, BXL) independently assessed the risk of bias of each included study in accordance with guidelines laid out in Chapter 8 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011).
We evaluated the following domains.

- Randomisation: how were participants allocated to either the intervention or control groups? How was the allocation sequence generation made unpredictable to study personnel?
- Selection bias (allocation concealment): was the allocation of participants to either the treatment or control arm of the study concealed from study personnel involved in the initial assessment of participants? If so, how were allocations performed?
- Performance bias: were study personnel masked to the interventions received by each participant to preclude any differences in the clinical management received?
- Detection bias: were personnel who were involved in the follow-up assessments of study participants adequately masked to the allocations of participants to the respective treatment arms?
- Attrition bias: how did the rates of follow-up compare between the treatment and control groups? Was the analysis based on an 'intention-to-treat' principle?
- Reporting bias: have all results with both demonstrable and non-demonstrable differences been reported in the manuscript?

Each of these domains was graded by each author as either 'high risk', 'low risk', or 'unclear risk' of bias. Thereafter, we compared the risk of bias tables and resolved any differences in assessments through discussion.

Measures of treatment effect

We used the risk ratio (RR) for dichotomous outcomes (proportion healed, with pain, adverse effects and analgesic use) and the mean difference (MD) for continuous outcomes (days to complete healing). We used the standardised mean difference (SMD) for analysing mean reduction in pain scores as these were measured on different scales. For continuous variables we checked the summary figures for skewness using the method described by Altman 1996.

Unit of analysis issues

All included studies were parallel group studies (i.e. people were randomly allocated to treatment). It was not clearly described how eyes were dealt with. In general corneal abrasions may be expected to occur predominantly in one eye and we have assumed that one eye per person only was included. Only one trial reported two bilateral cases (Arbour 1997). In these cases one eye was patched and the other not patched. It was difficult to distinguish this information from the complete dataset and was therefore ignored this in the analysis.

Dealing with missing data

Ideally we would have conducted an intention-to-treat (ITT) analysis using imputed data if computed by the trial investigators using an appropriate method.
ITT data were not available so an available case analysis was performed. This assumes that data are missing at random. We collected data from each included trial on the number of participants excluded or lost to follow-up and by treatment group, if reported.

Assessment of heterogeneity

We examined the overall characteristics of the studies, in particular the type of participants and types of interventions, to assess the extent to which the studies were similar enough to make pooling study results sensible. We examined the forest plots of study results to see how consistent the results of the studies were, in particular looking at the size and direction of effects. We calculated I^2 which is the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance) (Higgins 2002).

Assessment of reporting biases

We used the risk of bias assessment tool to look for selective or incomplete reporting. (See Assessment of risk of bias in included studies).
There were insufficient studies included in any meta-analysis to formally assess publication bias. In future updates of this review, if there are 10 trials or more included in a meta-analysis, we will

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construct funnel plots and consider tests for asymmetry for assessment of publication bias, according to Chapter 8 of *The Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011).

Data synthesis

Data analysis for this update was performed using Review Manager (RevMan) 5.3 (RevMan 2014). We pooled data using a random-effects model, unless there were three or fewer trials, in which case we used a fixed-effect model.

Subgroup analysis and investigation of heterogeneity

We considered two subgroup analyses.

Size of corneal abrasions

We planned to compare effects in people with large abrasions compared to people with small abrasions as we considered that the effects of patching may be different in these two groups. Large abrasions were defined as lesions measuring more than 10 mm^2. This subgroup was defined at the protocol stage.

Abrasions caused by the removal of foreign bodies

We planned to compare effects in people with abrasions caused by the removal of foreign bodies compared to people with abrasions caused by other means as we considered that the effects of patching may be different in these two groups. This subgroup was not considered in our original protocol but was included in the first published version of this review (Turner 2006).

Sensitivity analysis

We repeated the analyses excluding studies at higher risk of bias, that is, quasi-randomised studies and studies that were not masked.

Summary of findings table

We prepared a 'Summary of findings' table presenting relative and absolute risks. We graded the overall certainty of the evidence for each outcome using the GRADE classification(www.gradeworkinggroup.org). We included the following outcomes (see Summary of findings for the main comparison).

- Complete healing after 24 hours
- Complete healing after 48 hours
- Complete healing after 72 hours
- Days to complete healing
- Pain at 24 hours
- Quality of life
- Adverse effects
- Change in visual acuity one week from initial presentation

RESULTS

Description of studies

Results of the search

The initial search strategy resulted in a total of 74 reports of trials. We screened these reports and retrieved 39 full-text articles for further assessment. 12 papers described randomised controlled trials (RCTs). One further paper was a letter that contained enough information about a new trial to include its results in the review (Rao 1994). One study was subsequently excluded when translated since the two groups in the trial had different types of patches applied and there was no control group without patching (Gregersen 1991). Another randomised controlled trial was excluded as the characteristics of the participants did not fit our selection criteria (Kurt 2003). 11 papers were included in the review. The remaining 25 papers were either letters or comments made about trials that had been conducted.

There were no current or prospective trials listed on the UK and US online databases. The pharmaceutical firms were not helpful in providing any unpublished trial information. A number of authors were able to provide further information regarding their trials (Arbour 1997; Kaiser 1995; Kirkpatrick 2003; Le Sage 2001).

An updated search in December 2007 yielded a further 75 reports of studies. The Trials Search Co-ordinator (now known as the CIS) reviewed these results and removed any references which were not relevant to the scope of the review. This search did not identify any references which met the inclusion criteria for the review.

An update search run in January 2014 identified a further 274 references. The Trials Search Co-ordinator removed 12 duplicates and screened the remaining 262 references, of which 240 were not relevant to the scope of the review. We reviewed the remaining 22 references and discarded 21 reports as not relevant. We obtained one full-text report (Menghini 2013) and have included this study in the review.

Update searches ran in May 2016 yielded a further 259 records (Figure 1). After 68 duplicates were removed the Cochrane Information Specialist (CIS) screened the remaining 191 records and removed 165 references which were not relevant to the scope of the review. We screened the remaining 26 references but none met the inclusion criteria for the review.

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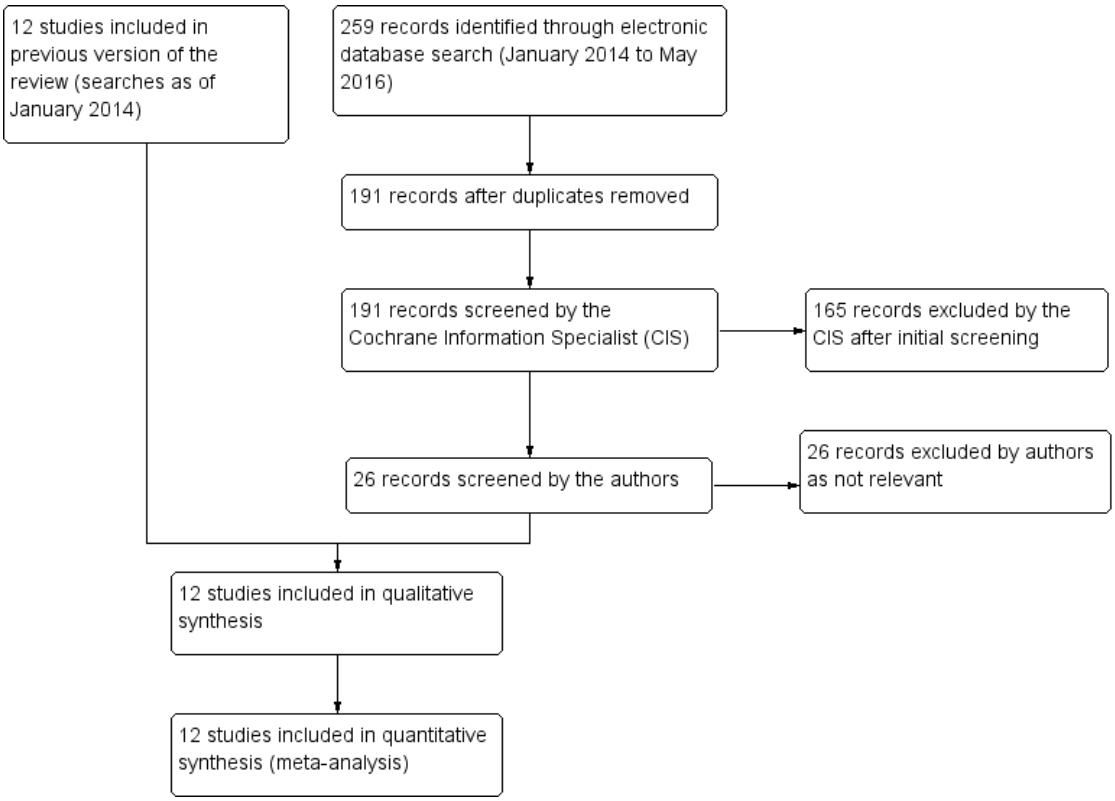
Figure 1. Study flow diagram.



Included studies

We have summarised the characteristics of the 12 included studies below. Details can be found in the 'Characteristics of included studies' tables.

Setting and participants

The four earliest trials were conducted in the United Kingdom (UK) (Hulbert 1991; Jackson 1960; Kirkpatrick 1993; Rao 1994). Four further trials were conducted in the United States of America (USA) (Campanile 1997; Kaiser 1995; Michael 2002; Patterson 1996), two in Canada (Arbour 1997; Le Sage 2001), one in Brazil (Agostini 2004) and one in Switzerland (Menghini 2013). All of the participants had a recent, simple corneal abrasion. Three trials excluded participants with a corneal abrasion secondary to a corneal foreign body (Arbour 1997; Jackson 1960; Kirkpatrick 1993). Five trials included data on participants with corneal abrasions specifically related to removal of corneal foreign bodies (Agostini 2004; Hulbert 1991; Kaiser 1995; Le Sage 2001; Menghini 2013). There were a total number of 1080 participants with total post-randomisation exclusions of 183. One trial enrolled children (Michael 2002).

Interventions

Most trials had two treatment groups with participants randomised to receive a patch (a form of occlusion of the affected eye) or no patch. One trial had three intervention arms (Menghini 2013) and in this review we only considered participants in the patch and no-patch groups. All the trials included a form of concurrent medication used in both treatment groups, for example antibiotic or cycloplegic eye drops. There were often differences in the formulation and administration of these additional drops between the two groups. For instance, participants in the patched group may have received one dose of an ointment-based formulation in 24 hours, while the no-patch group may have been instructed to administer three or four doses of a topical solution.

Types of outcome measures

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Main outcomes

The primary outcome measure in all included trials was a measure of corneal healing. Five trials measured the number of participants who had completely healed (no further fluorescein staining) on each day of follow-up (Hulbert 1991; Jackson 1960; Kirkpatrick 1993; Le Sage 2001; Patterson 1996). Two trials measured mean time to healing (Agostini 2004; Kaiser 1995). Two trials measured percentage of healing on each day of follow-up (Campanile 1997; Michael 2002). Five trials measured corneal abrasion dimension sizes at baseline and at each day of follow-up (Arbour 1997; Kirkpatrick 1993; Le Sage 2001; Menghini 2013; Rao 1994).

Other outcomes

Ten trials measured pain scores (Agostini 2004; Arbour 1997; Hulbert 1991; Kaiser 1995; Kirkpatrick 1993; Le Sage 2001; Menghini 2013; Michael 2002; Patterson 1996; Rao 1994). Some trials measured analgesia use, impact on quality of life, duration of medical leave, other associated symptoms and compliance to treatment. One trial examined change in visual acuity.

Adverse events

Four trials specifically mentioned short-term adverse events (Jackson 1960; Kaiser 1995; Menghini 2013; Michael 2002). Three trials reported long-term complications and follow-up two to seven months after the corneal abrasion (Arbour 1997; Kaiser 1995; Kirkpatrick 1993).

Economic measures

Economic measures were not evaluated in any of the included trials.

Excluded studies

See: Characteristics of excluded studies tables for details.

Risk of bias in included studies

Only one trial (Menghini 2013) received a 'low' risk of bias rating across all assessed components, while another (Michael 2002) received a similar rating in most domains (See Figure 2; Figure 3).

Figure 2. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

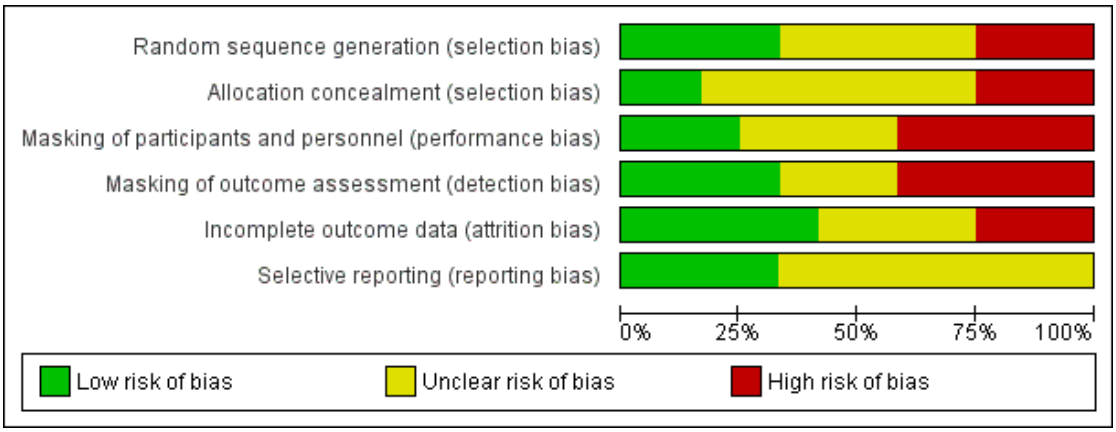

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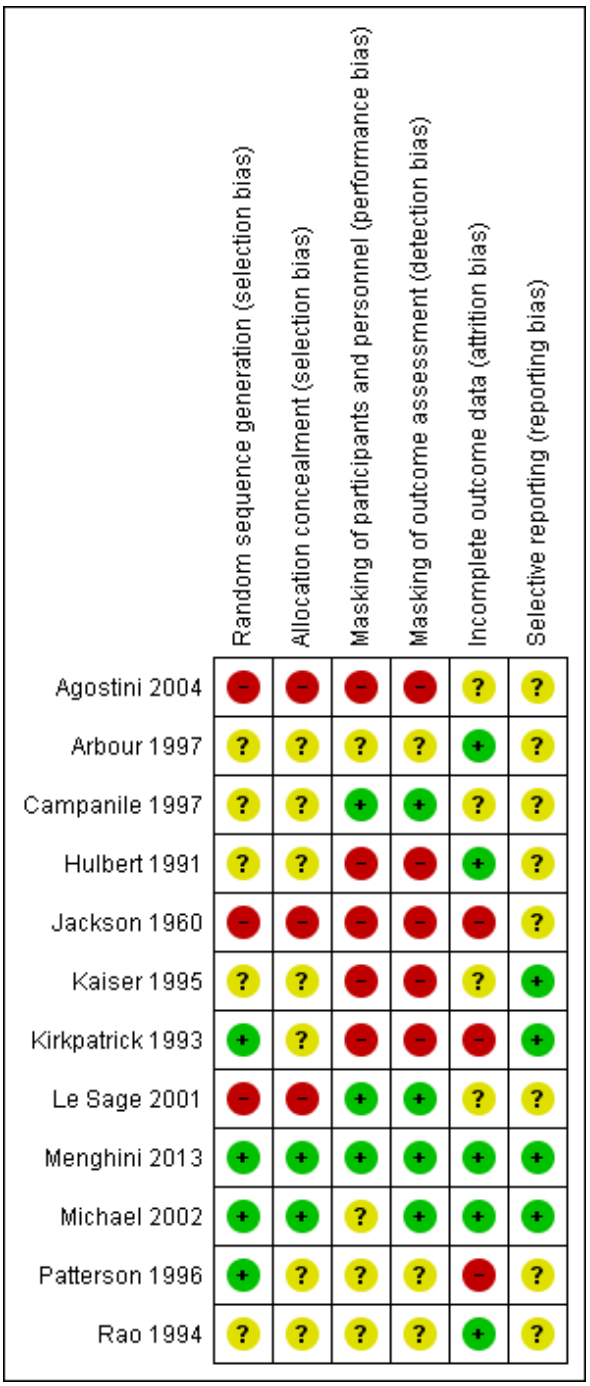
Figure 3. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.



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Allocation

All authors of included studies described elements of randomisation as part of their allocation process. However, we noted poor reporting of randomisation techniques across most studies. Only four studies were initially graded by both review authors who had judged risk of bias as having undergone 'low-risk' randomisation (Kirkpatrick 1993; Menghini 2013; Michael 2002; Patterson 1996). Kirkpatrick 1993, was assessed as having undergone an adequate randomisation process, following review of previous correspondence describing a coin-tossing randomisation technique. Menghini 2013 utilised a computer-based permuted-block randomisation technique to determine the allocation of participants across different treatment arms prior to the start of the study. This information was concealed from study personnel in numbered envelopes. Michael 2002 undertook a permuted-block randomisation process with allocations concealed within envelopes. These envelopes were pre-randomised within groups of four envelopes, which were numbered and subsequently handed out to participants in the designated sequence. Patterson 1996described a randomisation process involving the use of a computer-generated table.

Three studies described quasi-randomisation techniques (Agostini 2004; Jackson 1960; Le Sage 2001). In these, participants were allocated to treatment arms, either based on cases presenting to the department (Agostini 2004) or alternating days (Jackson 1960; Le Sage 2001), . We assessed these techniques as being at high risk of bias.

Although the remaining studies alluded to randomisation techniques in their participant allocation processes, there was insufficient information to allow us to assess the adequacy and comprehensiveness of these randomisation processes with confidence (Arbour 1997; Campanile 1997; Hulbert 1991; Kaiser 1995; Rao 1994).

Blinding

It was inherently impossible to conceal the implemented treatment modality from study participants because of obvious differences between patching and not patching. This may have influenced behaviours undertaken outside the study setting (e.g. those who belonged to the no-patch group may have gone home and applied other treatments to their eye). However, in terms of detection bias, masking of assessors (although achievable in all trials) was only reported in five studies (Arbour 1997; Campanile 1997; Le Sage 2001; Menghini 2013, Michael 2002). In three of these studies, participants in the patched group were requested to remove their eye patch prior to their scheduled consultations (Le Sage 2001; Menghini 2013;Campanile 1997). Although clinical assessors in Arbour 1997 and Michael 2002 did not appear to be masked to the treatment allocation of participants, the assessment and reporting of digitised corneal images or grid template diagrams was performed by a reviewer who had no knowledge of the treatment allocation. The remaining studies were either graded as high risk (Agostini 2004; Hulbert 1991, Jackson 1960, Kaiser 1995 Kirkpatrick 1993) or unclear risk (Patterson 1996; Rao 1994) of detection bias. Most of these studies provided insufficient detail about the measures adopted to mask assessors to the respective treatment arms to allow us to assess their effectiveness with any confidence.

Incomplete outcome data

The reported percentage of participants lost to follow-up ranged from 0% to 38%. High dropout rates may impact upon the validity of results obtained and their analysis. Furthermore, many included studies involved small numbers of enrolled participants. In these instances, even a small number of participants lost to follow-up could alter baseline characteristics of the different treatment arms. Moreover, in many of these trials, comparisons were not reported between dropout rates amongst patched and non-patched groups, nor were reasons provided for the losses.

Equal distribution of attrited participants across different treatment arms may not necessarily be acceptable, as participants may have dropped out for different or opposing reasons. The lack of such information across many studies made it difficult to assess the potential impact of this aspect on the validity of the results obtained. Although the highest percentage of participants lost to follow-up was reported by Menghini 2013, they have argued that this would most likely not have impacted upon the significance of their findings, since all included participants demonstrated complete resolution of corneal abrasions earlier in the trial.

Trials also often reported exclusions of participants following randomisation due to certain exclusion criteria. For example, participants found to have residual foreign bodies or stains from a prior visit on their first follow-up visit were excluded from the study (Hulbert 1991). This may be a subjective assessment and could have resulted in the introduction of bias as assessors were not masked to the treatment group. The assessor may have noted very poor healing in the no-patch group for instance, and also happened to note some residual staining in the same participant, thereby finding grounds for exclusion. With the small numbers in this study, one or two exclusions of this nature could bias the results.

Although efforts to contact participants lost to follow-up was described in several trials, intention-to-treat (ITT) analysis was not performed in many of these studies. Even in Michael 2002, where ITT was mentioned, participants lost to follow-up were not included in their analyses as outcome data were not available and

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there was a post-randomisation exclusion for ineligibility. Therefore, in this instance, ITT referred to participants who were assigned to the 'patch' group but removed their eye-patch during the follow-up period. They were still included in the data analysis despite deviating from protocol. Intention-to-treat is important since it seeks to minimise biases arising from differences in known and unknown prognostic factors between groups. As none of the studies adequately addressed ITT, results obtained should be interpreted with caution, especially given the apparent drop-out rates.

Selective reporting

We identified a range of issues across several studies. Many of these relate to the amount of information and level of detail provided by the study authors. Such issues include insufficient information regarding how the trialists performed certain aspects of the study and processes. Additionally, four studies did not discuss other important information, such as a comparison of baseline demographic characteristics of participants between treatment arms (Campanile 1997; Hulbert 1991; Jackson 1960; Patterson 1996). Such information may potentially skew the final analysis of results obtained and impact upon the validity of the results.

Effects of interventions

See: **Summary of findings for the main comparison** Patching versus no patching for corneal abrasion
See also Summary of findings for the main comparison.

Primary outcomes

Complete healing after 24 hours

Seven trials reported data for the number of participants in each group who had completely healed on the first day of follow-up. Participants receiving a patch may be less likely to have complete healing after 24 hours than participants receiving no patch (RR 0.89, 95% CI 0.79 to 1.00; participants = 531; studies = 7; I^2 = 0%) (see Analysis 1.1). However, upper limit of the 95% confidence intervals for this analysis included the point of no difference (RR = 1). We judged this to be low certainty evidence, downgrading for risk of bias and imprecision.

Complete healing after 48 hours

Six trials reported data on complete healing of corneal abrasions after 48 hours. A RR of 0.97 (95% CI 0.91 to 1.02; participants = 497; studies = 6; I^2 = 0%) suggested a negligible difference between the patch and no-patch groups (see Analysis 1.2). We judged this to be moderate certainty evidence, downgrading for risk of bias.

Complete healing after 72 hours

Four trials reported healing after 72 hours. Most corneal abrasions had healed regardless of which treatment option was used (RR 1.01, 95% CI 0.97 to 1.05; participants = 430; studies = 4; I^2 = 0%) (see Analysis 1.3). We judged this to be moderate certainty evidence, downgrading for risk of bias.

Days to complete healing

Six studies reported days to complete healing of corneal abrasions. Similar results were seen in the patch and no-patch groups (MD 0.14, 95% CI 0.00 to 0.27; participants = 642; studies = 6; I^2 = 37%) (see Analysis 1.4). It is likely that this variable was skewed to a certain extent. However, using the rule of thumb proposed in Altman 1996, in general most results were not too skewed as the mean was more than twice the size of the standard deviation. We judged this to be moderate certainty evidence, downgrading for risk of bias.

Changes in corneal abrasion dimension size

Corneal abrasion size at initial presentation and follow-up was measured in six trials. A variety of techniques and comparisons were utilised in the trials to evaluate changes in corneal abrasion size at follow-up. Agostini 2004 reported mean residual corneal abrasion sizes at follow-up. The patch group (total number in patch group 27) was found to have a mean abrasion size of 0.07 mm^2 (SD 0.19) on day one of follow-up compared to 0.10 mm^2 (SD 0.20) in the no-patch group (total number in no-patch group = 27) (P value = 0.620). On day two of follow-up, the patch group had completely healed, whereas the mean abrasion size was 0.01 mm^2 (SD 0.04) in the no-patch group (P value = 0.167). Arbour 1997 examined the linear and surface speed of re-epithelialisation. No marked differences were demonstrated in comparing the patch (total number in patch group = 17) and no-patch (total number in no-patch group = 16) groups. The authors also reported the percentage of erosions which closed at the first follow-up visit, which was 24% (6 participants) in the patch group compared to 27% (6 participants) in the no-patch group (P value = 0.80). Campanile 1997 calculated the percentage healed in 24 hours by comparing the measured defect on a grid sheet at presentation to that at follow-up. The authors reported the mean initial abrasion size of the patch group (total number in patch group = 31) as 6.1 mm^2 and 5.6 mm^2 for the no-patch group (total number in no-patch group = 35). This differed from a manual calculation of individual abrasion sizes provided. This revealed a mean of 6.0 mm^2 (SD 7.3) for the patch group and 5.6 mm^2 (SD 9.6) for the no-patch group, which contrasted with the reported mean abrasion size of the patch group of 6.1 mm^2 (P value = 0.8117). In this study, a larger percentage healing score was reported in the no-patch group (97.091%) compared to the patch group (84.130%) (P value = 0.0283). Michael 2002 also reported the percentage of

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healing achieved at follow-up. In this study, 94.23% (SD 15.6) of healing was achieved by participants in the patch group (total number in patch group = 17) compared to 96.33% (SD 10.3) in the no-patch group (total number in no-patch group = 18) (95% CI -11.00 to 7.00). Menghini 2013 analysed the reduction in corneal abrasion area achieved at follow-up. A reduction of 3.4 mm^2 (SD 3.3) was achieved in the patch group (total number in patch group = 17) and 3.5 mm^2 (SD 3.1) in the no-patch group (total number in patch group = 26). All participants in this study displayed complete reduction of the corneal abrasion area by the second day of follow-up. Rao 1994 measured the mean and medial values of the minor and major axes at baseline and at follow-up. Statistical analysis did not demonstrate a difference in the dimensions of the corneal abrasion at presentation (P value = 0.58 for the minor axis and P value = 0.43 for the major axis) or on days one and two (P value > 0.4).

Secondary outcomes

Pain and discomfort

Pain and discomfort was recorded utilising a wide variety of methods (see Table 1). The means were not normally distributed for this outcome measure. Of the 10 trials that measured pain outcomes, only two reported results demonstrating evidence suggesting less pain in the no-patch group (Hulbert 1991; Kaiser 1995). Three other trials showed less pain in the no-patch groups (Kirkpatrick 1993; Le Sage 2001; Michael 2002) while five trials demonstrated less pain in the patch groups (Agostini 2004; Arbour 1997; Menghini 2013 Patterson 1996; Rao 1994). However, no demonstrable differences were identified. .

Six trials included information on the mean reduction in VAS between baseline and 24 hours' follow-up (Kaiser 1995; Kirkpatrick 1993, Le Sage 2001; Menghini 2013; Patterson 1996; Rao 1994).

Agostini 2004 reported the mean scores on a pain scale on days one and two post follow-up. The patch group (total number in patch group = 27) was found to have a mean pain score of 0.44 (SD 1.05) on day one of follow-up compared to 0.96 (SD 2.24) in the no-patch group (n = 27) (P value = 0.283). On day two of follow-up, the patch group had a mean pain score of 0.11 (SD 0.57), whereas the mean pain score was 0.14 (SD 0.45) in the no-patch group (P value = 0.794).

Arbour 1997 presented the mean VAS scores with a mean of 15.4 (SD 15.9) in the patch group (total number in patch group = 25) compared with the no-patch group (total number in no-patch group = 22) where mean VAS was 23.0 (SD 18.9) (P value = 0.15). Interestingly, a mean maximal VAS score was also examined in this study. The patch group was found to have a score of 23.7 (SD 22.8) compared to 33.9 (SD 27.3) (P value = 0.18) in the no-patch group. Despite the results appearing to favour the patch group, 48% identified the patch as their principal source of discomfort.

Hulbert 1991 reported that 75% of patients in the patch group (total number in patch group = 16) compared to 29% of patients in the no-patch group (total number in no-patch group = 14) experienced discomfort (RR 7.5 95% CI 1.17 to 55.6).

Kaiser 1995 found a greater reduction in mean pain scores in the patch group (total number in patch group = 39) compared to the no-patch group (total number in no-patch group = 42) of participants with corneal abrasions secondary to the removal of foreign bodies (MD 0.80, 95% CI 0.35 to 1.26). Similarly, there was also a greater reduction in the patch group (total number in patch group = 62) compared to the no-patch group (total number in no-patch group =58) in participants with traumatic corneal abrasions (MD 1.10 95% CI 0.71 to 1.48).

Kirkpatrick 2003 reported the mean decrease in pain scores of 20.8 (SD 20.3) in the patch group and 27.6 (SD 24.2) in the no-patch group (P value = 0.37) on a 100 point VAS.

Le Sage 2001 measured the level of discomfort on a VAS and reported a mean reduction of 4.8 (interquartile range (IQR) 2.2 to 7.0) in the patch group (total number in patch group = 82) and 3.3 (IQR 1.5 to 5.8) in the no-patch group (total number in patch group = 81) on day one of follow-up. The authors also analysed the number of participants who reported experiencing pain at presentation and follow-up. 54% of participants reported experiencing pain at presentation, while 15% reported pain as a symptom at 24 hours' follow-up and none reported experiencing pain at 48 hours' follow-up. In the no-patch group, 47% of participants experienced pain at presentation, while 14% and 2% experienced pain at 24 hours' and 48 hours' follow-up respectively.

Menghini 2013 demonstrated a difference in mean pain relief achieved by the patched group, with a mean score reduction of 4.1 (SD 2.0 95% CI 3.0 to 5.1; 19 participants), and the non-patched groups, with a mean score reduction of 2.2 (SD 3.0, 95% CI 0.9 to 3.4; 28 participants), 24 hours following therapy (P value = 0.04). However, this analysis included another intervention group involving the use of a soft therapeutic contact lens. No statistical differences between the different treatment arms were identified on further post-hoc analysis.

Michael 2002 used pain scores with a picture scale of faces depicting different levels of pain for children aged between 3 to 10 years, while a VAS was used for those aged between 11 to 17 years. Children in the patch group had a mean VAS score of 1.7 (SD 2.1) and 0.3 (SD 0.7) in the no-patch group, with a mean difference of 1.4 (95% CI 0.3 to 2.5; unclear number of participants).

Patterson 1996 presented 24-hour mean pain scores without including individual data or standard deviations. The patch group (total number in patch group = 17) had a mean pain score of 1.11 versus 2.47 in the no-patch group (total number in no-patch group = 16). The mean change in pain score was 3.09 in the patch group and 2.77 in the no-patch group (P value = 0.50).

Rao 1994 reported mean and median VAS at presentation and at follow-up on days one and two. The reduction in mean VAS from baseline for pain in the patch group (total number in patch group = 20) were 3.18 on day one and 2.43 on day two, while in the no-

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patch group (total number in no-patch group = 20), the reduction in mean VAS from baseline for pain was 0.44 on day one and 1.65 for day two in the no-patch group. A comparison between pain scores on days one (P value = 0.44) or two (P value = 0.89) did not demonstrate any statistical differences.

Two trials (Hulbert 1991, Le Sage 2001) reported presence or absence of pain at 24 hours (RR 1.51, 95% CI 0.86 to 2.65, 2 trials, 193 participants). (Analysis 1.5) We judged this to be low certainty evidence, downgrading for risk of bias and imprecision.

Use of analgesia

The use of analgesia was reported in several included trials. However, comparison of analgesic use between the patch and no-patch groups was only performed in five trials (Arbour 1997; Le Sage 2001; Menghini 2013; Michael 2002; Rao 1994). Arbour 1997 examined analgesia use based on the categories 'mild', 'strong' and 'the use of any form of analgesia'. 36% of participants in the patch group (total number in patch group = 25) used analgesia compared to 41% in the non-patch group (total number in no-patch group= 22) (P value = 0.73). Comparable rates of strong analgesia use (52% and 54%; P value = 0.86) was reported. Similar proportions of participants were also found to have used any form of analgesia (84% in the patch group compared to 82% in the non-patch group, P value = 0.84). This was in contrast with reported rates of analgesia use by Le Sage 2001 which was approximately 5% in the patch and non-patch groups. Menghini 2013 reported rates of analgesia use in the patch (total number in patch group = 18) and non-patch groups (total number in no-patch group = 28) as 14% and 25% respectively (RR 0.95, 95% CI 0.69 to 1.32, 156 participants). Michael 2002 explored the doses of pain medications taken, with similar mean scores of 1.4 between the patch (SD 1.2) and non-patch groups (SD 1.5) (95% CI -1.0 to 0.95). Rao 1994 found no differences between the number of participants taking paracetamol (P value > 0.2) and the number of tablets taken in both groups (P value > 0.8) (total number in patch group = 20 , total number in no-patch group = 20).

Impact on quality of life

The impact of the intervention (eye patching) upon quality of life was examined and reported in two studies. Arbour 1997 found comparable rates of reported insomnia between the patch and no-patch groups (P value = 0.98, 47 participants). Michael 2002 (participants were children) measured 10 aspects of daily living on a VAS. These included: dressing, feeding, walking, running, going to the bathroom, play, impact on resting and sleeping duration, any trips or falls, bumping into things and excessive crying. The only statistical difference between the patch (total number in patch group = 17) and no-patch groups (total number in no-patch group =18) was found with walking (95% CI for difference in means 0.3 to 2.5).

Duration of medical leave

Menghini 2013 measured the duration of medical leave taken in the patch (total number in patch group = 18) and non-patch groups (total number in no-patch group = 28). The patch group took 2.0 days (SD 1.6) of medical leave compared to 1.9 days (SD 2.2) in the non-patch group. A comparison of these groups and another intervention arm involving the application of a therapeutic contact lens found no statistical differences between these three groups (P value = 0.553). Michael 2002 examined the number of participants missing at least a day of school. 47%of participants in the patch group (total number in patch group = 17) were found to have taken at least one day off school compared to 33% in the no-patch group (total number in no-patch group =18) (95% CI -0.18 to 0.46).

Reported symptoms

Frequently reported symptoms across trials include photophobia, lacrimation, foreign body sensation, blurred vision, irritation and eye redness (Table 2). The latest reported time point was included for each of the trials to reflect the persistence of symptoms despite therapy. Pain and discomfort were reported as a separate outcome measure.

Agostini 2004 found that 25% of participants in the patch group (total number in patch group = 27) reported experiencing photophobia compared to 45% in the no-patch group (total number in no-patch group = 27) (P value = 0.091). 37% of participants in the patch group experienced lacrimation compared to 29% in the no-patch group (P value = 0.563). 25% of participants in the patch group and 48% of participants in the no-patch group reported experiencing foreign body sensations (P value = 0.761). Blurring of vision was reported by 25% of participants in the patch group and 29% in the no-patch group (P value = 0.761).

Arbour 1997 did not examine the presence of these symptoms during the initial follow-up, but noted that 28% of participants (total number in patch group = 25) in the patch group compared to 4.5% (total number in no-patch group = 22) in the no-patch group reported experiencing residual symptoms at a six-month follow-up requiring further consultation.Kaiser 1995 examined these symptoms in two specific cohorts of participants, those that had experienced a "traumatic corneal abrasion" and others that had had corneal foreign bodies removed. Although the study authors provided values at various time points, we chose to include reported rates at day one of follow-up as this was the most commonly available time point across the different studies. In the 'traumatic corneal abrasions' cohort of participants, 24% of participants in the patch group (total number in patch group = 62) compared to 19% of participants in the no-patch group (total number in no-patch group = 58) reported experiencing photophobia on day one (P value = 0.515). 61% of participants in the patch group experienced lacrimation compared to 57% of participants in the no-patch group (P value = 0.711). 45% of participants in the patch

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group reported experiencing a foreign body sensation compared to 36% of participants in the no-patch group (P value = 0.356). 40% of participants in the patch group experienced blurred vision compared to 17% in the no-patch group (P value = 0.009). In the cohort of participants who had had corneal foreign bodies removed, 15% of participants in the patch group (total number in patch group = 39) compared to 12% of participants in the no-patch group (total number in no-patch group = 42) reported experiencing photophobia on day one (P value = 0.751). 43% of participants in the patch group experienced lacrimation compared to 59% of participants in the no-patch group (P value = 0.184). 36% of participants in the patch group reported experiencing a foreign body sensation compared to 31% of participants in the no-patch group (P value = 0.647). 23% of participants in the patch group experienced blurred vision compared to 14% in the no-patch group (P value = 0.395).

Le Sage 2001 also examined symptoms at various time points. In this study, 15% of participants in the patch group (total number in patch group = 82) compared to 17% in the non patch group (total number in no-patch group = 81) reported photophobia, while 21% of participants in the patch group experienced foreign body sensation compared to 19% in the non-patch group at 24 hours following initial evaluation. This was distinguished from "local irritation", which 39% of participants in the patch group reported experiencing at 24 hours compared to 49% of participants in the non-patch group. Interestingly, Le Sage 2001 also examined "eye redness" as a symptom. Following discussions between authors of this review, we concluded that this was more appropriately identified as a sign and was excluded from this compilation.

Pooling the results of these studies did not suggest any difference between patch and no-patch groups although there was uncertainty with wide confidence intervals.

Photophobia: RR 0.99, 95% CI 0.48 to 2.07; participants = 255; studies = 3; I^2 = 0% (Analysis 1.7)

Lacrimation: RR 1.04, 95% CI 0.64 to 1.68; participants = 255; studies = 3; I^2 = 0% (Analysis 1.8)

Foreign body sensation: RR 0.98, 95% CI 0.63 to 1.55; participants = 418; studies = 4; I^2 = 49% (Analysis 1.9)

Blurred vision: RR 0.99, 95% CI 0.48 to 2.07; participants = 255; studies = 3; I^2 = 0% (Analysis 1.10)

Patient compliance

Compliance to treatment was examined in three of the included studies (Kaiser 1995; Kirkpatrick 2003; Michael 2002). Thirty-three out of a total of 153 participants (22%) in the patch groups of these three trials were found not to have their eye patches during follow-up. Of these, 15 participants reported that the eye pads fell off, 17 participants described discomfort associated with the eye patches and one participant removed the patch "to sleep".

Use of mydriatic drops

Mydriatic agents were used routinely in eight trials (Agostini 2004; Arbour 1997; Campanile 1997;Kaiser 1995; Kirkpatrick 1993 Le Sage 2001; Michael 2002; Rao 1994), while their use by Jackson 1960 and Le Sage 2001 was left up to the discretion of the treating physician. Agents used included: cyclopentolate hydrochloride, homatropine, atropine and phenylephrine. No comparisons were performed between participants in any of the included trials.

Visual outcomes

Visual outcomes were measured in two trials (Menghini 2013; Michael 2002), but only reported in one included trial. Menghini 2013 measured the best-corrected Snellen visual acuity (BCVA) at baseline and at one-week follow-up. The authors reported that the BCVA Snellen at baseline was 0.9 (SD 0.2) in the patch group and 1.1 (SD 0.3) in the no-patch group. Follow-up assessment found an average of 1.1 (SD 0.3) in the patch group compared to 1.1 (SD 0.2) in the no-patch group.

Adverse effects

Several trials examined participants longitudinally for adverse effects, with follow-up periods ranging from one week to 12 months. Adverse effects reported include persistent symptoms, recurrent corneal erosions, corneal ulceration with the development of hypopyon and conjunctivitis.

Arbour 1997 attempted to perform a six-month follow-up on all included participants. They were able to contact 17 participants in the patch group (total number in patch group= 25) and 11 participants in the non-patch group (total number in no-patch group = 22). Out of these participants, 7 participants in the patch group and 1 in the no-patch group complained of persistent symptoms, which included pain, foreign body sensation, photophobia and lacrimation. 4 participants in the patch group and 1 in the no-patch group required consultation for these residual symptoms.

Jackson 1960 reviewed participants over a two-month period following the conclusion of their study. During the initial healing process, one participant in the patch group developed corneal ulceration with hypopyon, requiring hospital admission, but was not included in the final cohort of participants analysed. Another 3 patients were reported to have developed complications after healing had occurred. One participant developed an acute conjunctivitis on the sixth day following the initial presentation while two other participants in the patch group (total number in patch group= 77) experienced recurrent corneal abrasions; one at four days, and another at five weeks from the first presentation.

Kaiser 1995 reported a follow-up period of between seven to 12 months. During this period, a participant from the patch group presented with a new corneal abrasion eight months after the initial treatment. This was included as part of our analysis. However, the authors were unable to confidently ascertain if this was a true

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recurrent erosion, or secondary to subsequent mechanical trauma. Two other participants returned with a diagnosis of viral conjunctivitis, however this was not thought to have been related to the previous corneal abrasion or its management.

Kirkpatrick 1993 described a follow-up period of 27 weeks, during which one participant who had initially presented with a corneal foreign body in the no-patch group (total number in no-patch group = 42) experienced two episodes of recurrent corneal erosions in the same eye. The presence of a dendritic ulcer was also identified in the affected eye of the patient in the no-patch group.

Participants in Menghini 2013 who were reviewed one week following their initial presentation did not experience any adverse effects (total number in patch group = 46). One participant experienced a second corneal foreign body in the same eye and was excluded from subsequent analysis.

Agostini 2004 (total number of evaluated participants = 54), Campanile 1997 (total number of evaluated participants = 64), Michael 2002 (total number of evaluated participants = 35) reported no complications in either group during the follow-up periods.

Neither the presence or absence of adverse effects were discussed by Hulbert 1991, Le Sage 2001 Patterson 1996 or Rao 1994,. Analysis of trials reporting adverse effects (see Analysis 1.11) suggested an increased risk of adverse events in the patch group but the confidence intervals were wide and also compatible with fewer adverse events in the patch group (RR 3.24, 95% CI 0.87 to 12.05, 660 participants)

Subgroup analysis

Size of corneal abrasions

The number of participants with large abrasions (more than 10 mm^2) were limited in the trials. No trials specifically included or excluded participants with large abrasions so we were unable to do a subgroup analysis.

Two trials reported results for large abrasions separately (Campanile 1997; Kaiser 1995).

In Kaiser 1995 16 (13%) participants had large abrasions. The no-patch group showed longer mean time to healing with 4.20 days compared to the patched group with 3.45 days (P > 0.08). Results were not presented separately for the small abrasion group.

In Campanile 1997 13 people had large abrasions, 8 in the patch and 5 in the no-patch group. Six out of eight participants in the patch group were healed after 24 hours compared to two out of five participants in the no-patch group (RR 1.88, 95% CI 0.8, 5.90)). 51 people had small abrasions, 23 in the patch and 28 in the no-patch group. 15 out of 23 people in the patch group were healed after 24 hours compared to 25/28 in the no-patch group (RR 0.73, 95% CI 0.53, 1.01). These two risk ratios were very similar (test for interaction P value = 0.12) but the low numbers of participants in these analyses means that the power to detect a difference is low.

Abrasions caused by the removal of foreign bodies

We compared studies that included abrasions caused by removal of foreign bodies (Campanile 1997; Hulbert 1991; Le Sage 2001; Patterson 1996) to studies that excluded abrasions caused by removal of foreign bodies (Arbour 1997; Jackson 1960; Kirkpatrick 2003) for the primary outcome: complete healing after 24 hours. There was no evidence of any difference in effect between these two groups of trials (Analysis 1.12).

One trial reported foreign body abrasions separately (Kaiser 1995). Similar results were seen in people with foreign body abrasions compared to those with traumatic abrasions; participants healed faster and had less pain when they were not patched.

Sensitivity analysis

Table 3 shows the results of the sensitivity analysis excluding trials that were at high risk of bias, either because they were quasi-randomised (Agostini 2004; Le Sage 2001) or because they were not masked (Hulbert 1991; Kirkpatrick 1993) or both (Jackson 1960). In general effect estimates were similar after excluding these trials. Any differences favoured the no-patch group. This is perhaps unsurprising as it may be that participants and investigators were expecting patching to be beneficial.

DISCUSSION

Summary of main results

There was little evidence of demonstrable differences across primary and secondary outcomes for both patched and non-patched groups. This may have been attributable in part to a high attrition rate in some studies, which may affect eventual analyses. It is therefore reasonable to conclude that patching of the eye is not useful for the treatment of simple, traumatic corneal abrasions.

Overall completeness and applicability of evidence

Wearing a patch renders an individual acutely monocular. This has important consequences for functional tasks requiring depth perception. These activities include walking or step climbing. Disorientation with sudden monocular vision may also limit other activities which require breadth of field, such as driving.

Acute corneal abrasions cause considerable pain which can impact upon visual acuity. This may be alleviated to an extent through

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patching, which theoretically obviates mechanical stimulation of the lesion by the eyelids during blinking. Interestingly, not patching was associated with a larger, albeit small, reduction in pain compared to patching. The authors here recognise the presence of other factors leading to ocular discomfort following a corneal abrasion, such as ciliary spasm, which may be alleviated via cycloplegics. We have also observed visual acuity to be conversely normal despite any pain. Although the study by Menghini 2013 showed an apparent improvement in BCVA in the patch group and none in the no-patch group, this may have been related to a state of co-operability during initial assessment correlating with the degree of pain (noted to be higher in the patch versus the non-patch group). Final visual acuities were noted to be similar in both groups as we would expect most corneal abrasions to be fully healed by the first week, barring any complications. Most patients also experience a rapid recovery of their vision, and the exclusion of a patch in their management may facilitate attendance at follow-up visits, if required, as they would not require accompaniment.

There were qualitative differences in the adjunctive treatment options applied to different treatment arms in each trial (see Table 4). These differences include the use of cycloplegics, analgesics and antibiotics. In the patch group, antibiotics were often administered prior to patching and at times re-administered a day later with removal of the patch for clinical assessment during follow-up. In contrast, the control group often received antibiotic drops or ointment more regularly during the day. Agostini 2004 instructed participants in the no-patch group to use an antibiotic ointment three times daily either for five days or until closure of the lesion, while the patch group only received application of the ointment prior to being patched daily. Similarly, in studies by Arbour 1997, Campanile 1997, Kirkpatrick 1993, Le Sage 2001, Menghini 2013, Michael 2002 and Patterson 1996, participants in the no-patch group applied topical antibiotics to the affected eye several times daily, while those in the patch group often had a single instillation of this treatment prior to application of the patch. It is possible that the use of the cycloplegics or ophthalmologic antibiotics may affect healing rates sufficiently to overshadow any benefit of patching. The use of cycloplegics may additionally induce comfort and reduce further mechanical trauma from rubbing.

Another theoretical problem associated with patching that has been proposed is that the warm, moist environment may support bacterial proliferation (Parrish 1988). Other problems include decreased oxygenation of the cornea, reduced epithelial turnover and decreased elimination of cellular metabolism waste products, which may interfere with the washout of bacteria. However, the complication of infection was reported in such low numbers in the trials that it would require much larger numbers of participants enrolled in the studies to demonstrate a difference, if any, between patching and no patching.

Furthermore, this review has revealed a lack of evidence to offer recommendations in the management of large corneal abrasions (that is, more than 10 mm^2). In these circumstances, some practitioners may advocate the use of a patch with the rationale that this may promote epithelial proliferation and migration. This treatment option has however not been investigated satisfactorily in randomised controlled trials. Only one trial performed a subgroup analysis (Kaiser 1995). Even though this was one of the largest trials included in this review, there were insufficient large abrasions to make the subgroup analysis informative. Kaiser 1995 recommends that people with large abrasions as well as deeper stromal and partial-thickness defects should be managed with the currently accepted standard of care of an antibiotic ointment, mydriatic drops and a pressure patch. However, as mentioned, this treatment regimen is not evidence-based.

Quality of the evidence

The overall quality of the evidence was moderate to low. The certainty of the effect estimates was downgraded on the basis of study limitations and imprecision. Two of the studies were quasi-randomised, two were not masked and one study was quasi-randomised and not masked. Lack of masking may be problematic, especially as assessment of the outcome consisted of a subjective component. The other trials were generally poorly reported. Only one trial was judged to be at low risk of bias in all domains. In general the results of the studies were consistent. Excluding studies at high risk of bias, either because they were quasi-randomised or not masked, did not affect the conclusions of the study.

Potential biases in the review process

Many of the included trials in this review are not recent studies. This has complicated the process of both retrieving unpublished data and seeking clarification from the authors of these studies. Previous attempts at contacting authors of the relevant studies were unsuccessful. Although we have tried to identify all relevant trials available, the search strategies adopted for this review have mostly revolved around electronic searches. Such an approach may result in the omission of unpublished data, which could result in the introduction of publication bias.

Agreements and disagreements with other studies or reviews

This review contains a more thorough search of the grey literature than either of the previous reviews on this topic (Flynn 1998; Yamada 2001) and has included studies published in non-English journals. This is important because exclusion of even a small number of trials could alter the results of this meta-analysis. This review also corrects errors in both aforementioned reviews, with respect to the trial by Jackson 1960, where data were incorrectly assigned to day two rather than day one in the meta-analysis. However,

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the findings of this review are in agreement with the conclusions of these reviews (Flynn 1998; Yamada 2001), which have neither demonstrated an improvement in healing rates nor a reduction in pain with patching compared to non-patching.

AUTHORS' CONCLUSIONS

Implications for practice

The results of this current review do not support patching of corneal abrasions. However, the meta-analysis should be interpreted cautiously, as we identified differences between treatment regimes, such as the frequency of antibiotic dosing. Furthermore, limited data exists for the treatment of large (> 10 mm^2) corneal abrasions.

Implications for research

It would be helpful for future studies in this area to focus on minimising possible confounding variables in the management of participants with corneal abrasions without patching. Only by standardising the management of participants in either treatment arm and minimising the number of differences can we confidently determine the efficacy of eye patching.

It would also be helpful to develop a sufficiently powered trial to investigate either large corneal abrasions or corneal abrasions with partial-thickness defects involving the deeper stromal tissue, which would answer some useful and practical questions. A trial designed around this topic would need to take into account the flaws that we found in the trials included in this review.

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REFERENCES

References to studies included in this review

Agostini 2004 ***{published data only}***
Agostini RM, da Rocha GMS, Miranda JC, de Aguiar DV, Netto JA. Comparative study between eyepad and no eyepad in the treatment of corneal abrasion secondary to removal of corneal foreign body [Estudo comparativo entre oclusao e nao–oclusao no tratamento de abrasao corneana apos retirada de corpo estranho da cornea]. *Arquivos Brasileiros de Oftalmologia* 2004;**67**:107–10.

Arbour 1997 ***{published data only}***
Arbour JD, Brunette I, Boisjoly HM, Shi ZH, Dumas J, Guertin MC. Should we patch corneal erosions?. *Archives of Ophthalmology* 1997;**115**(3):313–7.

Campanile 1997 ***{published data only}***
Campanile TM, St. Clair DA, Benalm M. The evaluation of eye patching in the treatment of traumatic corneal epithelial defects. *Journal of Emergency Medicine* 1997;**15**:769–74.

Hulbert 1991 ***{published data only}***
Hulbert MF. Efficacy of eyepad in corneal healing after corneal foreign body removal. *Lancet* 1991;**337**(8742):643.

Jackson 1960 ***{published data only}***
Jackson H. Effect of eye-pads on healing of simple corneal abrasions. *British Medical Journal* 1960;**2**(5200):713.

Kaiser 1995 ***{published data only}***
Kaiser PK. A comparison of pressure patching versus no patching for corneal abrasions due to trauma or foreign body removal. *Ophthalmology* 1995;**102**(12):1936–42.

Kirkpatrick 1993 ***{published and unpublished data}***
Kirkpatrick JNP, Hoh HB, Cook SD. No eye pad for corneal abrasion. *Eye* 1993;**7**(Pt 3):468–71.

Le Sage 2001 ***{published and unpublished data}***
Le Sage N, Verreault R, Rochette L. Efficacy of eye patching for traumatic corneal abrasions: a controlled clinical trial. *Annals of Emergency Medicine* 2001;**38**(2):129–34.

Menghini 2013 ***{published data only}***
Menghini M, Knecht PB, Kaufmann C, Kovacs R, Watson SL, Landau K, et al. Treatment of traumatic corneal abrasions: a three-arm, prospective, randomized study. *Ophthalmic Research* 2013;**50**(1):13–8.

Copyright © 2016 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

Michael 2002 *{published data only}*
Michael JG, Hug D, Dowd MD. Management of corneal abrasion in children: a randomised clinical trial. *Annals of Emergency Medicine* 2002;**40**(1):67–72.

Patterson 1996 *{published data only}*
Paterson J, Fetzer D, Krall J, Wright E, Heller M. Eye patch treatment for the pain of corneal abrasion. *Southern Medical Journal* 1996;**89**(2):227–9.

Rao 1994 *{published data only}*
Rao GP, Scott JA, King A, Blyth C, Ramesh A, Neoh C, et al. No eye pad for corneal abrasion. *Eye* 1994;**8**(Pt 3): 371–2.

References to studies excluded from this review

Alper 1997 *{published data only}*
Alper BS. Using the pressure patch to treat corneal abrasions. *American Family Physician* 1997;**55**(2):442.

Anonymous 2001 *{published data only}*
Anonymous. Patching for corneal abrasions. *Journal of Clinical Excellence* 2001;**3**:41–2.

Daugherty 2002 *{published data only}*
Daugherty RJ. Efficacy of eye patching for traumatic corneal abrasions: a controlled clinical trial. *Clinical Pediatrics* 2002;**41**(8):630.

Douglas 1999 *{published data only}*
Douglas M, Strelnick A. Corneal abrasions need not be patched. *Journal of Family Practice* 1999;**48**(1):8–9.

Easty 1993 *{published data only}*
Easty DL. Is an eye pad needed in cases of corneal abrasion? . *BMJ* 1993;**307**:1022.

Gregersen 1991 *{published data only}*
Gregersen PL, Ottovay E, Kobayashi C, Hansen SE, Bohnstedt J. Management of corneal abrasions [Behandlingen af abrasio corneae]. *Ugeskrift for Laeger* 1991;**153**:2123–4.

Hart 1997 *{published data only}*
Hart A, White S, Conboy P, Quinton D. The management of corneal abrasions in accident and emergency. *Injury* 1997;**28**(8):527–9.

Health 1996 *{published data only}*
Health C, Becker LA. Are eye patches necessary for corneal abrasions?. *Journal of Family Practice* 1996;**42**(5):454.

Hirst 1997 *{published data only}*
Hirst LW. Pressure patching for corneal abrasions. *Ophthalmology* 1997;**104**(2):169.

Jampel 1995 *{published data only}*
Jampel HD. Patching for corneal abrasions. *JAMA* 1995; **274**(19):1504.

Kurt 2003 *{published data only}*
Kurt E, Ozturk F, Inan U, Levent Emiroglu M, Sami Ilker S. Efficacy of eye patching for corneal healing after removal of corneal foreign body. *Annals of Ophthalmology* 2003;**35** (2):114–6.

Le Claire 1996 *{published data only}*
Le Claire JE. Pressure patching versus no patching for corneal abrasions. *Ophthalmology* 1996;**103**(6):866–7.

Mackway-Jones 1999 *{published data only}*
Mackway-Jones K, Carley S. Eye patches and corneal abrasion. *Journal of Accident and Emergency Medicine* 1999; **16**(2):136–7.

Melton 1991 *{published data only}*
Melton NR, Maino JH, Thomas RK. Management of corneal abrasions. *Optometry Clinics* 1991;**1**:119–26.

Mindlin 1996 *{published data only}*
Mindlin AM. Treatment of corneal abrasions. *JAMA* 1996; **275**(11):837.

Olson 1996 *{published data only}*
Olson ER. Pressure patching verus no patching for corneal abrasions. *Ophthalmology* 1996;**103**(6):866–7.

Perlman 2000 *{published data only}*
Perlman EM. Patching the eye improves comfort and healing in patients with corneal abrasions. *Medicine and Health* 2000;**83**(12):395.

Rogers 1995 *{published data only}*
Rogers WB, Jampel JD. Patching for corneal abrasions. *JAMA* 1995;**274**(19):1504.

Sabiston 1972 *{published data only}*
Sabiston DW. Eye-pads. *The Practitioner* 1972;**209**(253): 673–5.

Sabri 1998 *{published data only}*
Sabri K, Pandit JC, Thaller VT, Evans NM, Crocker GR. National survey of corneal abrasion treatment. *Eye* 1998;**12** (Pt 2):278–81.

Schechter 1997 *{published data only}*
Schechter BA. Pressure patching for corneal abrasions. *Ophthalmology* 1997;**104**(2):169–70.

Seiff 1996 *{published data only}*
Seiff SR. Pressure patching versus no patching for corneal abrasions. *Ophthalmology* 1996;**103**(6):865–7.

Slawson 1996 *{published data only}*
Slawson DC, Shaughnessy AF. Treatment of corneal abrasions. *JAMA* 1996;**275**(11):837.

Soli 2001 *{published data only}*
Soli C, Herbert ME. Myth: corneal abrasions require routine patching. *Western Journal of Medicine* 2001;**174**(3): 207.

Solomon 2000 *{published data only}*
Solomon A, Halpert M, Frucht-Pery J. Comparison of topical indomethacin and eye patching for minor corneal trauma. *Annals of Ophthalmology* 2000;**32**(4):316–9.

Spitz 1997 *{published data only}*
Spitz GF. Should we patch corneal erosions?. *Archives of Ophthalmology* 1997;**115**(12):1607.

Yamada 2001 *{published data only}*
Yamada M, Kawai M, Mashima Y. Treatment of corneal erosions. *Folia Ophthalmologica Japonica* 2001;**52**(11): 911–6.

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Additional references

Altman 1996
Altman DG, Bland JM. Detecting skewness from summary information. *BMJ* 1996;**313**:1200.

Catalano 1992
Catalano RA. Foreign bodies and penetrating injuries to the eye. In: Catalano RA, Belin M editor(s). *Ocular Emergencies*. Philadelphia, PA: WB Saunders Co, 1992: 201–3.

CRD 2006
Centre for Reviews and Dissemination. Should we patch corneal abrasions: a meta-analysis. www.crd.york.ac.uk/CRDWeb/ShowRecord.asp?ID=11998001808#.VCq2IBBAeKI (accessed 22 February 2006).

Cullom 1994
Cullom RD, Benjamin C. In: 2nd editor(s). *The Wills Eye Manual*. Philadelphia: JB Lippincott Company, 1994.

DOH 2004
A and E Attendances Data 2002-2003. www.performance.doh.gov.uk/hospitalactivity/data˙requests/a˙and˙e˙attendances.htm (accessed 2 May 2005).

Edwards 1987
Edwards RS. Ophthalmic emergencies in a district general hospital casualty department. *British Journal of Ophthalmology* 1987;**71**(12):938.

Flynn 1998
Flynn CA, D' Amico F, Smith G. Should we patch corneal abrasions? A meta-analysis. *Journal of Family Practice* 1998; **47**(4):264–70.

Glanville 2006
Glanville JM, Lefebvre C, Miles JN, Camosso-Stefinovic J. How to identify randomized controlled trials in MEDLINE: ten years on. *Journal of the Medical Library Association* 2006; **94**(2):130–6.

Higgins 2002
Higgins JP, Thompson SG. Quantifying heterogeneity in a meta-analysis. *Statistics in Medicine* 2002;**21**(11):1539–58.

Higgins 2011
Higgins JPT, Altman DG, Sterne, JAC (editors). Chapter 8: Assessing risk of bias in included studies. In: Higgins JPT, Green S (editors). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 (updated March 2011). The Cochrane Collaboration, 2011. Available from www.cochrane-handbook.org.

Khaw 2004
Khaw PT, Shah P, Elkington AR. Injury to the eye. *BMJ* 2004;**328**(7430):36–8.

Kirkpatrick 2003
Kirkpatrick JN. Personal correspondence 2003.

Lai 2003
Lai YY, Wong VW, Leung GM. Is ophthalmology evidence based? A clinical audit of the emergency unit of a regional eye hospital. *British Journal of Ophthalmology* 2003;**87**(4): 385–90.

Lubeck 1988
Lubeck D, Greene JS. Corneal Injuries. *Emergency Medicine Clinics of North America* 1988;**6**(1):73–94.

McGwin 2005
McGwin G, Owsley C. Incidence of emergency department - treated eye injury in the United States. *Archives of Ophthalmology* 2005;**123**(5):662–6.

Nash 1998
Nash EA, Margo CE. Patterns of emergency department visits for disorders of the eye and ocular adnexa. *Archives of Ophthalmology* 1998;**116**(9):1222–6.

Parrish 1988
Parrish CM, Chandler JW. Corneal Trauma. In: Kaufma HE, Barron BA, McDonald MB, Waltman SR editor(s). *The Cornea*. New York: Churchill Livingstone, 1988: 599–646.

Pavan-Langston 1991
Pavan-Langston D. *Manual of Ocular Diagnosis and Therapy*. Boston, Massachusetts: Little Brown and Co, 1991.

RevMan 2014 [Computer program]
The Nordic Cochrane Centre, The Cochrane Collaboration. Review Manager (RevMan). Version 5.3. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014.

Vartsakis 2014
Vartsakis G, Fahy G. The profile of patients attending a triaged eye emergency service. *Irish Journal of Medical Science* 2014;**183**(4):625–8.

Vaughan 1995
Vaughan D, Asbury T. *General Ophthalmology*. 14th Edition. Norwalk, CT: Lange Medical Publications, 1995.

Webster 1987
Webster RG. Corneal Injuries. In: Smolin G, Thoft RA editor(s). *The Cornea: Scientific Foundations and Clinical Practice*. Boston, Massachusetts: Little, Brown and Co, 1987:517–42.

Wong 1998
Wong TY, Lincoln A, Tielsch JM, Baker SP. The epidemiology of ocular injury in a major US automobile corporation. *Eye* 1998;**12**(5):870–4.

References to other published versions of this review

Turner 2004
Turner A, Rabiu M. Patching for corneal abrasion. *Cochrane Database of Systematic Reviews* 2004, Issue 2. [DOI: 10.1002/14651858.CD004764]

Turner 2006
Turner A, Rabiu M. Patching for corneal abrasion. *Cochrane Database of Systematic Reviews* 2006, Issue 2. [DOI: 10.1002/14651858.CD004764.pub2]

* *Indicates the major publication for the study*

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CHARACTERISTICS OF STUDIES

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

Agostini 2004

Methods	Parallel study design Duration: 4 months Post-randomisation exclusions: 34% (28 patients excluded for not properly following treatment - 14 in patch group and 14 in non-patch group) Outcomes assessor and participants not masked Potential confounder: ointment containing vitamin A used in both groups
Participants	Inclusion criteria • Foreign body only • > 18 years old Exclusion criteria • Contact lens users • Corneal foreign body with infiltrate or organic matter • Other trauma to eye in addition to corneal foreign body • History of corneal eye disease Setting: Brazil Number of participants: 82 Exclusions after randomisation: 28 Total available for analysis: 54 Mean age: 34 years old Sex: Male:Female 53:1
Interventions	• Gauze pads firmly taped to prevent blinking. Used until complete healing • Cyclopentolate 1% administered on initial presentation to both groups. Epitezan (retinol acetate, methionine, amino acids, chloramphenicol ointment) used in both groups 3 times/day for 5 days or until closure of epithelial defect in non-patch group and once/day in patched group with new bandage • Participants in both groups were permitted to use oral analgesics and anti-inflammatories
Outcomes	• Area of erosion, difference in lesion area • Symptoms • Mean time to healing • Pain scores VAS
Notes	Date study conducted: July 2001 to October 2001 Funding: NR Declaration of interest: NR Trial registration number: NR

Risk of bias

Bias	Authors' judgement	Support for judgement

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Agostini 2004 (*Continued*)

Random sequence generation (selection bias)	High risk	Allocation into either treatment group was performed by alternating patients. This represented a quasi-randomisation technique
Allocation concealment (selection bias)	High risk	Likely difficult to conceal method of allocation from investigators involved in treatment. The enrolment of participants and how they were counselled on the treatment process was also not discussed in the paper
Masking of participants and personnel (performance bias) All outcomes	High risk	No information on the masking process was given. In particular, with regards to the allocation process, post consultation and subsequent follow-up visits
Masking of outcome assessment (detection bias) All outcomes	High risk	The use of mydriatics or analgesia may confound results which rely on participants' subjective input, such as the reporting of pain via the pain scale. Was there any information collection on the presence of anterior chamber cells/flare as well as predominant location of corneal abrasion i.e. centrally in line with visual axis or peripherally which may further contribute to the presence of discomfort? Also, no mention was made as to whether patches were taken off prior to consultation (i.e. masking of the assessor) and if the assessors were aware of the defined endpoints of the study
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Drop-out rates (34%) were accounted for and discussed adequately by the authors. However high drop out rates may have influenced the final outcome obtained. There was no mention of an intention to treat approach, which should have been performed
Selective reporting (reporting bias)	Unclear risk	There was no mention about how missing data was dealt with. Authors reported results where both demonstrable and non-demonstrable results were identified

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Arbour 1997

Methods	Randomised controlled trial with parallel design Duration: 22 months Method of randomisation: unclear Post-randomisation exclusions: 2% (1 patient excluded because of non-compliance with treatment (unclear distribution)) Outcomes assessors masked. Fluorescein stain (slit lamp) and photo/template drawing used to assess epithelial erosion Potential confounder: different use of antibiotic ointment in two groups
Participants	Inclusion criteria • Presence of epithelial erosion greater than 1 mm in smallest diameter • Secondary to trauma or recurrent erosion syndrome • Sparing of Bowman membrane Exclusion criteria • Signs of stromal, endothelial or neural corneal involvement (on slit lamp examination) • Previous patch • Corneal abrasion secondary to removal of foreign body • Signs of infection • Contact lens wear • Use of topical or systemic steroids • Inability to comply with daily follow-up • Patient refusal Setting: Canada Number of participants: 46 (48 eyes) Exclusions after randomisation: 1 Total available for analysis: 45 (2 participants had bilateral involvement and 1 eye was subsequently patched while the other eye was not) Mean age: in patched group 41.6 years and 39.8 years in non-patched group. Sex: in patched group 32% female and in non-patched group 36% female
Interventions	• Double eye pad tightly taped with sufficient pressure to prevent lid opening • Homatropine 2% and sulfacetamide 10% were applied topically before patch applied. In non-patch group, homatropine 2% also used, but antibiotic ointment applied twice daily • Oral analgesia (acetaminophen (paracetamol) and codeine, or acetaminophen alone) was prescribed as needed for both groups
Outcomes	• Slit lamp examination for stromal oedema and anterior chamber inflammation • Corneal photograph: analysis of digitised images for linear and surface rates of re-epithelialisation (mm/hour), perimeter, area of erosion, diameter of largest circle included in erosion, shape index (ratio between perimeter and area of erosion) • Discomfort associated with patch • Pain VAS score • Insomnia • Symptoms including: pain, foreign body sensation, photophobia,and tearing • Analgesic requirements

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Arbour 1997 (*Continued*)

Notes	It is noted that participants with recurrent erosion syndrome were included in the study. The proportion of the test group and criteria that was used to classify these participants was not elaborated upon. "Participants with recurrent erosion syndrome" refers to patients with corneas with defective adhesions at the level of the epithelial layer. This may affect healing rates and perception of pain Date study conducted: January 1992 to October 1993 Funding: Quebec Eye Bank Foundation Inc and Fonds de la Recherche en Santé du Québec to the Guy-Bemier Research Centre, Maisonneuve- Rosemont Hospital, Montreal Declaration of interest: NR Trial registration number: NR

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomisation methods utilised in allocating participants was not described. In participants with bilateral corneal abrasions, it was also unclear as to how treatment allocations were made for each eye The authors have described prescribing either acetaminophen or codeine-acetaminophen. However, no information was provided on how analgesic requirements were determined and how "any" differed from mild and strong. No further information was also provided on the type of analgesia given to participants with bilateral involvement
Allocation concealment (selection bias)	Unclear risk	No information was provided about how allocations were performed even though trial has been described as 'randomised' and how concealment of the allocator, if any, was undertaken
Masking of participants and personnel (performance bias) All outcomes	Unclear risk	It is not clear if the two observers, JDA and IB were masked from the 2 intervention arms and the final outcomes of the study
Masking of outcome assessment (detection bias) All outcomes	Unclear risk	The digitised corneal images were assessed by a masked observer. However, the treatment end-point was not clearly defined and it was unclear as to whether re-epithelialisation was determined clinically, or through the assessment of the digitised corneal images. Asessors do not appear to be masked to other study outcomes

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Arbour 1997 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	Low risk	One participant was excluded because of non-compliance with treatment. Fair rationale provided for excluding epithelial defects that had already closed on the first follow-up visit, in calculating the linear and surface speeds of re-epithelialisation
Selective reporting (reporting bias)	Unclear risk	The element of discussion with a resultant applied score may potentially alter the conclusion. No further information was provided on scoring components and discrepancies noted between both observers and reconciliation, if any

Campanile 1997

Methods	Randomised controlled trial with parallel design Duration: 7.5 months Method of allocation: unclear Post-randomisation exclusions: 13.5% (10 participants: 3 removed the patch secondary to discomfort and pain; 3 who were not patched were lost to follow-up; 4 excluded because of deviation from treatment protocol by the provider (unclear distribution)) Outcomes assessors masked (participants asked to remove patch at home and not mention management at follow-up assessment). Fluorescein stain (slit lamp) and grid template/ hand drawing used to assess outcomes Potential confounder: different dosing intervals of erythromycin ophthalmic ointment in 2 groups
Participants	Inclusion criteria • 5 years old and above • Traumatic corneal epithelial defects from corneal abrasion or removal of foreign body Exclusion criteria: • < 5 years old • Corneal disease • Allergy to erythromycin • Ocular infection • Additional trauma-related injuries Setting: USA Number of participants: 74 Exclusions after randomisation: 10 Total available for analysis: 64 Mean age: 31 (range 5-74) Sex: 54.7% male
Interventions	• Double gauze pads with first pad folded in half to prevent eyelid opening • One drop of cyclopentolate 1% on initial presentation • Patched group received 1 dose of erythromycin ointment

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Campanile 1997 (*Continued*)

	• Unpatched group received erythromycin ointment 4 times per day
Outcomes	• Percent healing (24 hours) collected from grid template hand drawing • Mean initial abrasion size
Notes	Date study conducted: May 1995 to January 1996 Funding: NR Declaration of interest: NR Trial registration number: NR

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	It is unclear how randomisation was achieved in the study The baseline characteristics, exclusion and or inclusion criteria for participants was not delineated: mechanism of injury or concomitant injury, or whether any prior treatment was attempted, whether eye received any prior surgery or trauma or any other prior ocular injury How was consent taken and how would patients aged 5-16 (minors) have been counselled?
Allocation concealment (selection bias)	Unclear risk	Information on the randomisation and allocation methods are limited, together with a comparison on baseline characteristics and numbers per age group in each study group
Masking of participants and personnel (performance bias) All outcomes	Low risk	Attempts to mask allocated interventions at initial visit and follow-up were identified
Masking of outcome assessment (detection bias) All outcomes	Low risk	Participants were instructed to remove any traces of being in the patched group prior to presenting for their follow-up assessment. All participants were tasked not to reveal their treatment regime. Furthermore, it is unclear if the assessors were aware of the defined endpoints of the study
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Drop-out rates between both treatment arms appear to be similar. However it is unclear which group the 4 individuals belonged to. The reasons protocol was not fol-

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Campanile 1997 (*Continued*)

		lowed for the 4 excluded individuals could also have been revealed. No ITT analysis was performed Further information on possible reasons for loss to follow-up would have been helpful - as to whether healing was thought to have occurred or worsening of condition with possible re-attendance elsewhere
Selective reporting (reporting bias)	Unclear risk	Limited data reported in the article. How were the individual characteristics (i.e. gender, age) distributed between cases and controls? Was there any demonstrable difference in the distribution between both groups? If so, have these factors been adequately controlled for? "There were no complications associated with either group" The above statement was made without further elaboration on the specifics which may have constituted "complications" - again, may have been lost in those who were excluded from the study. Compliance was also not addressed in the study

Hulbert 1991

Methods	Randomised controlled trial Duration: 3 months Method of allocation: unclear Post-randomisation exclusions: 9.1% (3 patients with persistent residual foreign body or stain (unclear distribution)) Masking of outcomes assessor unclear Fluorescein staining (x 4 magnification) used to assess abrasion size
Participants	Inclusion criteria: • corneal epithelial defects resulting from removal of foreign body Exclusion criteria: • participants in whom residual foreign body or stain remained after first attendance for removal Setting: UK Number of participants: 33 Exclusions after randomisation: 3 Total available for analysis: 30 Age: NR Sex: NR

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Hulbert 1991 (*Continued*)

Interventions	• 2 drops of chloramphenicol 0.5% into affected eye of all patients at each review • Gauze with enough bulk to exert slight pressure on the closed eye for patients in the patch group, secured with bandage
Outcomes	• Number of days for complete healing, marked by absence of corneal staining • Level of discomfort indicated by descriptors "painful" or "painless" on day 1 and 2
Notes	Date study conducted: October 1997 and January 1998 Funding: NR Declaration of interest: NR Trial registration number: NR

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No details on how randomisation was achieved
Allocation concealment (selection bias)	Unclear risk	No information regarding allocation concealment, and how it was performed
Masking of participants and personnel (performance bias) All outcomes	High risk	No masking of participants and personnel to the allocated interventions appears to have been undertaken in this study
Masking of outcome assessment (detection bias) All outcomes	High risk	Was there only one assessor and was the assessor masked to the 2 intervention arms? No masking of the allocated interventions appears to have been undertaken as part of the ongoing assessment and management of study participants. It is also unclear if the assessors were aware of the defined endpoints of the study
Incomplete outcome data (attrition bias) All outcomes	Low risk	All enrolled participants were followed up until study completion. No attrition or loss to follow-up was noted. Fair exclusion criteria applied
Selective reporting (reporting bias)	Unclear risk	No discussion of baseline demographic information of the study population. All outcomes were analysed in the final evaluation

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Jackson 1960

Methods	Quasi-randomised controlled trial Duration: 2 months Method of allocation: alternate days for first attendance Post-randomisation exclusions: 29% (14 patched and 24 non-patched participants lost to follow-up; exclusion of 16 for incomplete records, 6 for non-compliance with treatment, 5 with more serious lesions discovered subsequently) Outcomes assessor not masked. Fluorescein stain (no slit lamp mentioned) was used to assess corneal abrasions Potential confounder: different usage of antibiotic ointment in two groups
Participants	Inclusion criteria • Superficial abrasion of the cornea Exclusion criteria: • Any complicated lesion such as embedded foreign body or any other part of the eye Setting: UK Number of participants: 222 Exclusions after randomisation: 65 Total available for analysis: 157 Age: NR Sex: NR
Interventions	• A cotton-wool pad covered by net, taped on • All participants received sulfacetamide 10% drops and if considered necessary, 1% atropine drops • Participants without the eye pad continued to use sulfacetamide 10% antibiotic drops 3 times per day
Outcomes	• Number of days until complete healing, marked by absence of fluorescein staining
Notes	Date study conducted: NR Funding: NR Declaration of interest: NR Trial registration number: NR

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quasi-randomisation. Allocation based on alternate days of presentation How were participants counselled on the treatment process above and on participation consent in the study?
Allocation concealment (selection bias)	High risk	Participants were allocated to either treatment group based on alternate days of presentation. No evidence of concealment of allocation sequence

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Jackson 1960 (*Continued*)

Masking of participants and personnel (performance bias) All outcomes	High risk	Masking of participants to allocation not possible. However, no masking of assessors to treatment allocations described
Masking of outcome assessment (detection bias) All outcomes	High risk	No masking of assessors to treatment allocations described. Additionally, it is unclear if the assessors were aware of the defined endpoints of the study
Incomplete outcome data (attrition bias) All outcomes	High risk	The authors did not mention what constituted a "more serious lesion" that resulted in exclusion. This may potentially confound results, if for instance, participants with larger abrasions were deliberately removed from the study Marked proportion of participants lost to follow-up, particularly in the non-patched group. ITT analysis should have been performed
Selective reporting (reporting bias)	Unclear risk	No discussion of baseline demographic information of the study population Participants who dropped out from the study were reported. However, no statistical analyses of the results was performed

Kaiser 1995

Methods	Randomised controlled trial with parallel design Duration of trial: unknown Method of randomisation: unknown Post-randomisation exclusions: 9.9% (n = 22 excluded for ineligibility, lost to follow-up or dropped out from study (unclear distribution)) Outcomes assessors not masked. Fluorescein stain (with slit lamp) was used to assess corneal erosions. Vertical and horizontal size of corneal abrasion measured Potential confounder: different mydriatic drops, antibiotic ointments and oral analgesic regimens used across all study participants in both groups
Participants	Inclusion criteria • Traumatic corneal abrasion or removal of superficial foreign body of less than 36 hours' duration • > 18 years old • No history of eye trauma or disease in the affected eye • No other signs of ocular trauma • Simple epithelial defect without stromal oedema, loss, or infiltrate • No treatment before entering the study Exclusion criteria:

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	• Contact lens wearers • Corneal dystrophies Setting: USA Number of participants: 223 Exclusions after randomisation: 22 Total available for analysis: 201 Mean age: 36.17 (SD 11.93, range 19-78 years old) Sex: 71% male
Interventions	• Double eye patch with first pad folded in half, placed over closed eyelids and bandaged. Applied tightly to prevent eye movement. • Patched group received mydriatic drops (2.5% phenylephrine/1% tropicamide) and erythromycin or polysporin antibiotic ointment once only before application of the patch. Told to remove the patch after 24 hours and administer the antibiotic ointment 3 times per day for 5 days or until abrasion healed. • The non-patch group was treated with the same topical agents 3 times per day for 5 days or until abrasion completely healed • Both groups permitted to use mild oral analgesics (including acetaminophen, ibuprofen or aspirin)
Outcomes	• Number of days until complete healing. Healing considered to have occurred if pain score of 2 or below reported, or when only minor non-confluent superficial punctate staining of the corneal epithelium remained following fluorescein administration • Pain scores (0-10) • Daily questions about symptoms such as photophobia, lacrimation, foreign body sensation and blurred vision • Long-term complications, including recurrent erosions (for a period of 7-12 months)
Notes	Date study conducted: NR Funding: NR Declaration of interest: NR Trial registration number: NR

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information on the randomisation process undertaken was provided in the article
Allocation concealment (selection bias)	Unclear risk	No information was provided regarding allocation concealment
Masking of participants and personnel (performance bias) All outcomes	High risk	No information on whether the two observers assessing the study were masked from the interventions received by participants

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Kaiser 1995 (*Continued*)

Masking of outcome assessment (detection bias) All outcomes	High risk	No information on masking. We assume that in absence of reporting on this outcome assessors were not masked
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Approximately 10% of participants were excluded from the study. Further elaboration on this aspect of the study, reporting on how the demographical characteristics of the participants lost to follow-up compared with the rest of the study population would have been helpful
Selective reporting (reporting bias)	Low risk	Apart from the 22 excluded participants, it appears that all other participants were included in analysis. Appropriate discussion pertaining to the limitations of the study

Kirkpatrick 1993

Methods	Randomised controlled trial with parallel design Duration: 5 months Method of randomisation: coin-tossing Post-randomisation exclusions: 15.9% (7 participants in total; 3 from patch group and 2 from non-patched group lost to follow-up. 1 patient in the non-patch group developed a dendritic ulcer and another patient in the non-patch group was patched after reattending the Emergency Department) Outcomes assessors not masked Fluorescein stain (with slit lamp) used to assess abrasion. Approximate area calculated and recorded Potential confounder: different dosing regimen of chloramphenicol antibiotic ointment in 2 groups
Participants	Inclusion criteria • > 18 year old • Simple corneal abrasion within the last 24 hours • No treatment prior to trial inclusion Exclusion criteria • Previous history of eye trauma or disease in affected eye • Signs of significant ocular trauma • Presence of foreign body. Setting: UK Number of participants: 44 Exclusions after randomisation: 7 Total available for analysis: 37 (4 women and 13 men in patch group, 13 women and 7 men in no-patch group) Mean age: 36.1 years old for all participants, 36.3 (SD 11.0) years old in patch group and 35 (SD 11.5) years old in non-patch group

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Kirkpatrick 1993 (*Continued*)

Interventions	• Double eye pad with bandage until healed, then chloramphenicol 4 times per day for 3 days; 1 dose of chloramphenicol ointment and homatropine 2% topically before eye pad applied. • Non-patch group received chloramphenicol ointment 4 times per day and homatropine 2% once per day. Participants told to continue using chloramphenicol ointment 4 times a day for 3 days after complete healing • Permitted to take simple analgesics such as paracetamol and aspirin for pain relief
Outcomes	• Time to complete healing (epithelial edges apposed with only minor fluorescein staining) - number of days • Size of abrasion (maximum and minimum dimensions and approximate area) • Pain score VAS 0-100 to assess level of discomfort
Notes	Date study conducted: August 1991 to December 1991 Funding: NR Declaration of interest: NR Trial registration number: NR

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Adequate randomisation technique adopted utilising a coin-toss method. However, recently published articles have suggested that many variables may in fact influence the results obtained from coin-tossing. Therefore this technique may not truly result in random allocation of participants
Allocation concealment (selection bias)	Unclear risk	A coin-toss method has been reported by the authors. However, no information on how interventions were allocated to participants. Furthermore, it was unclear whilst reading the study, who was involved in assessing and allocating these participants, and whether this could have potentially influenced the allocation of participants to either treatment arm
Masking of participants and personnel (performance bias) All outcomes	High risk	Assessors do not appear to have been masked to the allocated interventions during the study
Masking of outcome assessment (detection bias) All outcomes	High risk	Assessors do not appear to have been masked to the allocated interventions during the study. This may in turn have af-

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Kirkpatrick 1993 (*Continued*)

		fected how findings were documented
Incomplete outcome data (attrition bias) All outcomes	High risk	16% of patients were excluded from the study. The authors have been thorough in documenting the reasons and explaining the rationale behind why participants were excluded from the study. However, attempts to contact participants lost to follow-up should have been made, outcomes established, and an ITT analysis adopted
Selective reporting (reporting bias)	Low risk	Comprehensive coverage of all information available

Le Sage 2001

Methods	Quasi-randomised controlled trial Duration: 21 months Method of randomisation: alternate allocation to groups Pre-randomisation: n = 3 refused to participate, n = 6 did not meet the inclusion criteria Post-randomisation exclusions: 17.2% (n = 17 from patch group (lost to follow-up, but 5 gave information over the telephone) and n = 11 from the non-patched group (lost to follow-up, but 3 gave information over the telephone)) Outcomes assessors masked (patched participants asked to remove patch 30 minutes before presenting for follow-up). Slit lamp used with dimensions of abrasion recorded on standardised form Potential confounder: different usage of antibiotic ointment in two groups, and variability in mydriatics and opioid analgesics prescribed to study participants
Participants	Inclusion criteria • 18-60 years old • Able to report sufficient details of circumstances and timing of trauma • Able to demonstrate corneal fluorescein uptake Exclusion criteria • Corneal perforation • History of glaucoma • Chemical burns • UV keratitis • Bilateral abrasions • Suspected corneal ulcers Setting: Canada Number of participants: 172 eligible participants; 3 refused to participate and 6 met exclusion criteria (final number of participants: 163) Exclusions after randomisation: 28 Total available for analysis: 135 Mean age in patch group 32 (range 28-38) years old and in non-patch group 36 (range 31-46) years old Sex: 82% male in patch group and 90% male in non-patch group

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Le Sage 2001 (*Continued*)

Interventions	• Double occlusive patch (worn until follow-up ceased) • Topical erythromycin ointment was used 4 times per day in non-patch group and once per day in the patch group • Use of mydriatics or opioid analgesics subject to practitioner's discretion • Removal of foreign bodies, siderosis, or both performed when necessary
Outcomes	• Time to complete healing • Dimensions of corneal abrasions • Presence of symptoms • VAS for pain and discomfort • Compliance • Analgesic use • Symptoms • Mydriatics use
Notes	With regards to removal of foreign bodies, siderosis, or both, was a bigger epithelial defect created? What proportion of participants required such intervention and at which stage of follow-up? This may confound the assessment of healing process and participant's assessment of discomfort Date study conducted: January 1995 to September 1996 Funding: Quebec Association of Emergency Medicine; Foundation of the CHA (Enfant-Jesus Hospital), the CHA Research Center, the Quebec Federation of General Practitioners, and the Department of Family Medicine, Laval University Declaration of interest: NR Trial registration number: NR

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	A systematic non random approach was used for allocation
Allocation concealment (selection bias)	High risk	Quasi-randomisation technique adopted in this study may have resulted in the introduction of selection bias. It was also unclear if the research nurse was masked to the randomisation sequence. Otherwise, she could have potentially confounded the selection/allocation process Is there a particular reason why subjects had to be between 18-60 years of age? This may not correspond with the criteria set out in the other studies. insufficient information was provided on the reasons for inclusion and exclusion criteria. Definition of "traumatic corneal abrasion" was also not addressed - an abrasion in response to a mere

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		scratch or corresponding blunt trauma with subsequent reports of discomfort may differ. In addition, the type of corneal abrasion in a population type of particular corneal thickness may not be representative
Masking of participants and personnel (performance bias) All outcomes	Low risk	The authors have described this as a 'single-blind' study. Participants were asked to remove the patch half an hour before presenting to the ED for follow-up It is however not clear if participants were briefed and told not to disclose how they were managed prior to presenting for follow-up. Additionally, ideally the assessor should not have access to previous clinical documentation In participants who were lost to follow-up but were able to provide reliable information over the telephone, how were their VAS scores taken? Numerous studies have demonstrated poor correlation between the VRS and VAS pain scores We have however chosen to give this aspect of the study the benefit of the doubt and have assessed it as possessing a low risk of bias
Masking of outcome assessment (detection bias) All outcomes	Low risk	As above
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	17 (20.7%) of participants in the patched group were lost during follow-up, which represents a significant proportion of participants; 5 (7%) gave information by telephone (no symptoms). 13.6% of participants in the non-patched group were lost during follow-up; 3 (3.7%) gave information by telephone (no symptoms) Table 1 - missing information noted in dropouts for follow-up visits: 16 (out of 82) over 2 follow-up visits in the patched group versus 10 (out of 81) over 2 follow-up visits in the non patched group. How were they accounted for? Was any information collected on the reasons they had declined further up and would persistence in a response predispose to responder bias?

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Le Sage 2001 (*Continued*)

		An ITT analysis approach appears to have been adopted by the authors. However, it is unclear as to how this was performed
Selective reporting (reporting bias)	Unclear risk	It is unclear how participants who were lost to follow-up (especially those that were uncontactable) were accounted for whilst calculating the percentage of those with remaining symptoms at 24 h and 48 h, the cumulative incidences, and reduction in discomfort? (since n = 82 and n = 81 was used)

Menghini 2013

Methods	Randomised controlled trial with 3 parallel study groups Duration: 19 months (October 2008 - April 2010) Pre-randomisation exclusion: exclusion criteria stated but no indication of the proportion of participants excluded based on criteria Post-randomisation exclusion: 4 patients Outcomes assessors masked from allocated intervention. Area of corneal abrasion recorded on a digital anterior segment camera and processed with a measuring tool (Synedra View ®) by two different ophthalmologists
Participants	Inclusion criteria • All adults 18 years or older diagnosed and treated for a superficial corneal foreign body Exclusion criteria • Infectious keratitis • Advanced trauma with stromal loss • Corneal abnormalities including epithelial, stromal or endothelial dystrophies • Chemical trauma • Limbal stem cell deficiency • Use of chronic topical eye medication • Collagen vascular disease • Children (under the age of 16) Setting: Department of Ophthalmology, University Hospital of Zurich, Switzerland Number of participants: 66 Uncertain number of participants excluded pre-randomisation; 3 participants (4.5% 1 patch group (PG) , 2 ointment group (OG) were excluded post-randomisation as they failed to attend their first follow-up visit. 1 patient presented with second corneal foreign body in same eye during 1 week follow-up (unclear which treatment arm this patient belonged to) Total available for analysis: 66 Mean age: 28.7 years in patched group and 34.3 years in non-patch (ointment only) group Sex: all male No demonstrable differences between groups in terms of age, gender, time to presenta-

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	tion, initial corneal abrasion area and initial pain score
Interventions	• PG* (patch group): double-firm pressure patch taped over injured eye after application of ofloxacin ointment • CLG (contact lens group): bandage contact lens inserted and application of ofloxacin eye drops applied 4 times daily • OG* (ointment (non-patch) group): ofloxacin ointment applied 4 times daily • A number of participants in each group (PG 3; CLG 2; OG 7) were noted to have taken oral analgesics. No demonstrable difference in the number of participants in each group *Interventions of interest in this study
Outcomes	Primary outcome measure • reduction in corneal abrasion area from the time of removal of foreign body (documented by photography) Secondary outcome measures • Pain assessed with a modified (10-point) Wong-Baker FACES Pain Rating Scale • Duration of medical leave • Presence of residual corneal opacities (yes/no) • Use of oral analgesics • Visual acuity (Snellen, converted to logMAR) • Conjunctival injection score • Any serious adverse events (e.g. microbial keratitis)
Notes	With regards to removal of foreign bodies, siderosis, or both, was a bigger epithelial defect created? What proportion of participants required such intervention and at which stage of follow-up? This may confound the assessment of healing process and participant's assessment of discomfort Differences in the size of abrasions was noted. This statistical distribution (both intra and intergroup) was however noted to be homogenous Variations in the delivery vehicle of ofloxacin (drops vs ointment) noted. However, the two groups that we are interested in (PG and OG) both used ointments, although the frequency of administration differed due to differences in intervention Populations between treatment arms were not very different. However, it was interesting that only men were recruited into this study. This may impact upon the external validity of the study Date study conducted: October 2008 to April 2010 Funding: no funding received for this study Declaration of interest: reported no conflict of interest Trial registration number: NR

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer based randomisation technique. This randomisation generator randomises subjects to either treatment using a permuted-block randomisation technique.

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		Proper randomisation technique utilised Interestingly, only male participants were captured over the duration of this study; a two-year period
Allocation concealment (selection bias)	Low risk	Allocation to treatment modality was conducted by a study nurse using numbered closed envelopes that were randomised before the start of the study
Masking of participants and personnel (performance bias) All outcomes	Low risk	The patch was removed by the study nurse 30 min prior to ophthalmic examination at the follow-up visit. In the CLG, a therapeutic contact lens was inserted and the participants instructed to use ofloxacin eye drops 4 times a day. The bandage contact lens was removed by the study nurse 30 min prior to ophthalmic examination
Masking of outcome assessment (detection bias) All outcomes	Low risk	Documentation of the corneal abrasion area was performed by photography (magnification × 10) using a digital anterior segment camera. The assessment of corneal abrasion area was done by processing the digital photographs by two different ophthalmologists
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low initial drop out rates for initial follow-up. Although the high subsequent dropout rates at 7 days across all 3 treatment arms were initially concerning, with no mention of ITT analysis, subsequent mention of complete corneal abrasion area reduction achieved by day 1 (n = 60) and day 2 (n = 3) demonstrates that participants lost to follow-up on day 7 were not likely to influence the results achieved
Selective reporting (reporting bias)	Low risk	All enrolled participants were reported and accounted for. Authors reported both demonstrable and non-demonstrable differences in results No demonstrable differences were noted in demographics and baseline characteristics between treatment groups. No demonstrable differences between drop-out rates on the second visit, or in both primary and secondary outcome measures were noted

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Michael 2002

Methods	Randomised controlled trial with parallel study design. Duration: 9 months Method of allocation: block randomisation (groups of 4) placed in envelopes and numbered Post-randomisation exclusions: 5.4% (n = 2 from non-patch group (1 lost to follow-up, 1 had a retained foreign body causing new abrasions) Outcomes assessors masked to treatment allocation when measuring per cent healing from photographs. Photographs or eye template diagrams drawn based on slit lamp biomicroscopy findings used to record abrasion size Potential confounder: different antibiotic ointment dosing regimens in both groups. Differences in analgesic regimens, with paracetamol (acetaminophen) taken for breakthrough pain if ibuprofen was insufficient
Participants	Inclusion criteria • Children 3-17 years old • Isolated corneal abrasion • Ability to return for a follow-up examination Exclusion criteria • Any other ocular trauma • Any prior treatment for the corneal abrasion • Erythromycin allergy • Did not speak English • Eye infection, eye injuries or conditions requiring inpatient care • Monocular vision Setting: USA Number of participants: 37 Exclusions after randomisation: 2 Total available for analysis: 35 Mean age of all participants was 10 years Sex: 62.9% (n = 22) were men
Interventions	• Double eye patch with first pad folded in half and placed over closed eyelids, both secured with tape to provide pressure and prevent eyelid opening. • All participants received 1% cyclopentolate (one drop). • In the patched group, 1 application of erythromycin ointment was applied topically. • The non-patched group received erythromycin ointment 3 times per day. • Ibuprofen (10 mg/kg, max 400 mg) was administered to all participants every 6-8 hours as required. Paracetamol (acetaminophen) (15 mg/kg max 500 mg) every 4-6 hours for breakthrough pain
Outcomes	• Per cent healing at 24 hours measured from either digital photograph printouts or eye template diagrams • Visual outcomes • Analgesia use documented in a pain medication diary • Assessment of interference with ADLs either from parent or child on a VAS • School attendance • Any complications (such as infection, inflammation and increased abrasion size)

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Notes	Date study conducted: July 1999 to March 2001 Funding: Katharine B. Richardson Grant Funding Declaration of interest: NR Trial registration number: NR

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Adequate randomisation achieved via the use of permuted block randomisation
Allocation concealment (selection bias)	Low risk	The use of concealment in the selection process with allocation via sealed envelopes appears to be adequate
Masking of participants and personnel (performance bias) All outcomes	Unclear risk	Study personnel were not masked to the allocated interventions. This may be a potential source of bias. However, if most of the participants had their lesions documented photographically rather than from the template, and percentage healing assessed by a masked reviewer, this may mitigate the risk of bias stemming from this issue. However, no information was provided regarding the number of eye template diagrams that had to be used It is notable that attempts for assessment without introducing interviewer bias were made, including the use of the pain medication diary, which required participants to self-report their analgesic use
Masking of outcome assessment (detection bias) All outcomes	Low risk	Personnel assessing study participants at follow-up were not blinded to treatment instituted. However, percentage healing from either digital photograph printouts or eye template diagrams was assessed by a masked reviewer. In light of this, we judged this study as having undergone sufficient measures to minimise detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	Minimal attrition was noted in this study. In addition, an ITT analysis was adopted with available data
Selective reporting (reporting bias)	Low risk	It is notable that attempts for assessment without introducing interviewer bias were

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		made, including the use of the pain medication diary, which required participants to self-report their analgesic use

Patterson 1996

Methods	Randomised controlled trial. Duration: unknown Method of randomisation: allocation according to computer-generated table Post-randomisation exclusions: 34% ("almost equally divided" between groups) No masking of outcomes assessor. Fluorescein examination under 5-power magnification (no slit lamp) used to document lesion Potential confounder: different antibiotic preparations and dosing regimens in two groups
Participants	Inclusion criteria • Eye pain and documented corneal abrasion (on fluorescein staining) • Cause may be foreign body or mechanical disruption Exclusion criteria • Under 12 years of age • Significant coexisting eye disease • Chemical/thermal injuries Setting: USA Number of participants: 50 Exclusions after randomisation: 17 Total available for analysis: 33 Age: NR Sex: NR
Interventions	• Double pressure patch, first patch folded in half, placed over closed eyelids, both patches entirely covered with tape • Patched group received topical tobramycin ointment before application of patch • Non-patched group received tobramycin drops to be used every 4 hours while awake • Ketoprofen 75 mg prescribed as required
Outcomes	• Pain scores VAS • Analgesia use - ketoprofen at 24 hours • Complete healing at 24 hours
Notes	Date study conducted: NR Funding: NR Declaration of interest: NR Trial registration number: NR

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**

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Patterson 1996 (*Continued*)

Random sequence generation (selection bias)	Low risk	No information about the randomisation process undertaken as part of this study was provided beyond describing the use of a computer-generated table. It is assumed that a random generator was used to generate the allocation sequence
Allocation concealment (selection bias)	Unclear risk	No further information given on the allocation process
Masking of participants and personnel (performance bias) All outcomes	Unclear risk	No description of attempts made to mask personnel from treatment allocations made in this study
Masking of outcome assessment (detection bias) All outcomes	Unclear risk	No information was provided
Incomplete outcome data (attrition bias) All outcomes	High risk	A high rate of attrition at 34% (17 participants) was noted. No breakdown of these participants into either treatment arm was provided, except for the statement that participants lost to follow-up were "almost equally divided" between groups. ITT analysis not performed
Selective reporting (reporting bias)	Unclear risk	No discussion of baseline demographic information of the study population

Rao 1994

Methods	Randomised controlled trial Duration of trial: unknown Outcome measurement technique not described Post-randomisation exclusions: 0%. No mention of masking of assessors to treatment allocation Unclear regimen of antibiotic ointment and mydriatic drops Slit lamp biomicroscopy to assess location and size of the corneal abrasion
Participants	Inclusion criteria • Patients with corneal abrasions • No exclusion criteria described Setting: UK Number of participants: 40 Exclusion post-randomisation: 0 Total available for analysis: 40

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Rao 1994 (*Continued*)

Interventions	• Firm padding of the eye. • Both groups received topical cyclopentolate 1% and chloramphenicol ointment 1% • Paracetamol 500 mg with dosing depending on participants' requirements for analgesia
Outcomes	• Dimensions of corneal abrasion • Maximum or minimum length on days 1 and 2 • Daily pain scores on vertical VAS • Analgesic use (quantity)
Notes	Date study conducted: NR Funding: NR Declaration of interest: NR Trial registration number: NR

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No description of the randomisation process undertaken in sequence generation for this study
Allocation concealment (selection bias)	Unclear risk	No further information was provided as to whether any allocation concealment was performed
Masking of participants and personnel (performance bias) All outcomes	Unclear risk	No information about participant and personnel masking was given by the authors
Masking of outcome assessment (detection bias) All outcomes	Unclear risk	Although attempts were made to reduce the effect of responder bias with respect to discomfort level, we are not told if the observer involved in assessing healing of the corneal abrasion was masked to the two treatment arms. Steps to mask assessors to the interventions performed in either group were not described in this article
Incomplete outcome data (attrition bias) All outcomes	Low risk	No patients were lost to follow-up
Selective reporting (reporting bias)	Unclear risk	No discussion of baseline demographic information of the study population was provided The authors appear to have reported the

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Rao 1994 (*Continued*)

		various parameters that were examined as part of this study. However, attrition rates and how this data (if any) was subsequently handled were not addressed in the study. This could potentially skew the results obtained and result in reporting bias

ADLs - activities of daily living
ITT - intention-to-treat
NR - not reported
VAS - visual analogue scale

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

Study	Reason for exclusion
Alper 1997	Letter - no new data presented
Anonymous 2001	Letter - no new data presented
Daugherty 2002	Mini-review - no new data presented
Douglas 1999	Letter - no new data presented
Easty 1993	Letter - no new data presented
Gregersen 1991	There is no control 'no-patch' group. Two different types of patching are compared to each other in the randomised trial
Hart 1997	Retrospective chart review/audit - no new data presented
Health 1996	Letter - no new data presented
Hirst 1997	Letter - no new data presented
Jampel 1995	Letter - no new data presented
Kurt 2003	Randomised controlled trial that included participants who had received an abrasion up to 7 days prior to being included in the study. The mean time to seek ophthalmological attention was 2.1 days. This means the study falls outside the study criteria defined as being abrasion of recent onset (< 48 hours)
Le Claire 1996	Letter - no new data presented
Mackway-Jones 1999	Mini-review - no new data presented

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(*Continued*)

Melton 1991	Letter - no new data presented
Mindlin 1996	Letter - no new data presented
Olson 1996	Letter - no new data presented
Perlman 2000	Letter - no new data presented
Rogers 1995	Letter - no new data presented
Sabiston 1972	Letter - no new data presented
Sabri 1998	National survey of corneal abrasion treatment - no new data presented
Schechter 1997	Letter - no new data presented
Seiff 1996	Letter - no new data presented
Slawson 1996	Letter - no new data presented
Soli 2001	Letter - no new data presented
Solomon 2000	Patching the eye is compared with no patching, however the groups differ significantly. The no-patch group is treated with an alternative therapy (topical indomethacin)
Spitz 1997	Letter - no new data presented
Yamada 2001	A meta-analysis of previous studies. No new data presented

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DATA AND ANALYSES

Comparison 1. Patching versus no patching

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Complete healing after 24 hours	7	531	Risk Ratio (M-H, Random, 95% CI)	0.89 [0.79, 1.00]
2 Complete healing after 48 hours	6	497	Risk Ratio (M-H, Random, 95% CI)	0.97 [0.91, 1.02]
3 Complete healing after 72 hours	4	430	Risk Ratio (M-H, Random, 95% CI)	1.01 [0.97, 1.05]
4 Number of days to complete healing	6	642	Mean Difference (IV, Random, 95% CI)	0.14 [0.00, 0.27]
5 Pain at 24 hours	2	193	Risk Ratio (M-H, Fixed, 95% CI)	1.51 [0.86, 2.65]
6 Analgesic use	3	256	Risk Ratio (M-H, Fixed, 95% CI)	0.95 [0.69, 1.32]
7 Photophobia	3	418	Risk Ratio (M-H, Fixed, 95% CI)	0.80 [0.45, 1.42]
8 Lacrimation	2	255	Risk Ratio (M-H, Fixed, 95% CI)	1.04 [0.64, 1.68]
9 Foreign body sensation	3	418	Risk Ratio (M-H, Fixed, 95% CI)	0.98 [0.63, 1.55]
10 Blurred vision	2	255	Risk Ratio (M-H, Fixed, 95% CI)	0.99 [0.48, 2.07]
11 Adverse events	8	660	Risk Ratio (M-H, Random, 95% CI)	3.24 [0.87, 12.05]
12 Complete healing after 24 hours: subgroup analysis	7	724	Risk Ratio (M-H, Random, 95% CI)	0.88 [0.80, 0.97]
12.1 Studies including abrasions caused by removal of foreign bodies	4	290	Risk Ratio (M-H, Random, 95% CI)	0.89 [0.78, 1.03]
12.2 Studies excluding abrasions caused by removal of foreign bodies	3	241	Risk Ratio (M-H, Random, 95% CI)	0.87 [0.67, 1.12]
12.3 Studies only including abrasions caused by removal of foreign bodies	2	193	Risk Ratio (M-H, Random, 95% CI)	0.87 [0.73, 1.03]

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Analysis 1.1. Comparison 1 Patching versus no patching, Outcome 1 Complete healing after 24 hours.

Review: Patching for corneal abrasion

Comparison: 1 Patching versus no patching

Outcome: 1 Complete healing after 24 hours

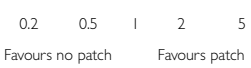
Study or subgroup	Patch n/N	No Patch n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Arbour 1997	6/25	6/22		1.5 %	0.88 [0.33, 2.33]
Campanile 1997	21/31	27/33		17.3 %	0.83 [0.62, 1.11]
Hulbert 1991	14/16	14/14		30.8 %	0.88 [0.71, 1.10]
Jackson 1960	42/77	48/80		20.0 %	0.91 [0.69, 1.19]
Kirkpatrick 1993	4/17	10/20		1.6 %	0.47 [0.18, 1.23]
Le Sage 2001	42/82	49/81		19.5 %	0.85 [0.64, 1.11]
Patterson 1996	14/17	11/16		9.3 %	1.20 [0.81, 1.78]
Total (95% CI)	**265**	**266**		**100.0 %**	**0.89 [0.79, 1.00]**

Total events: 143 (Patch), 165 (No Patch)

Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 4.33$, df = 6 (P = 0.63); $I^2 = 0.0\%$

Test for overall effect: Z = 1.94 (P = 0.053)

Test for subgroup differences: Not applicable



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Analysis 1.2. Comparison 1 Patching versus no patching, Outcome 2 Complete healing after 48 hours.

Review: Patching for corneal abrasion

Comparison: 1 Patching versus no patching

Outcome: 2 Complete healing after 48 hours

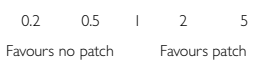
Study or subgroup	Patch n/N	No patch n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Campanile 1997	28/31	33/33		17.4 %	0.90 [0.80, 1.03]
Hulbert 1991	16/16	14/14		18.2 %	1.00 [0.88, 1.13]
Jackson 1960	61/77	65/80		11.8 %	0.98 [0.83, 1.14]
Kirkpatrick 1993	13/17	19/20		3.6 %	0.80 [0.61, 1.07]
Le Sage 2001	64/82	67/81		12.4 %	0.94 [0.81, 1.10]
Menghini 2013	18/18	28/28		36.7 %	1.00 [0.92, 1.09]
Total (95% CI)	**241**	**256**		**100.0 %**	**0.97 [0.91, 1.02]**

Total events: 200 (Patch), 226 (No patch)

Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 4.19$, df = 5 (P = 0.52); $I^2 = 0.0\%$

Test for overall effect: Z = 1.30 (P = 0.19)

Test for subgroup differences: Not applicable



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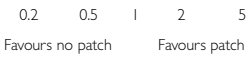
Analysis 1.3. Comparison 1 Patching versus no patching, Outcome 3 Complete healing after 72 hours.

Review: Patching for corneal abrasion

Comparison: 1 Patching versus no patching

Outcome: 3 Complete healing after 72 hours

Study or subgroup	Patch n/N	No patch n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Campanile 1997	31/31	33/33		47.4 %	1.00 [0.94, 1.06]
Jackson 1960	70/77	71/80		15.4 %	1.02 [0.92, 1.14]
Le Sage 2001	75/82	71/81		15.4 %	1.04 [0.94, 1.16]
Menghini 2013	18/18	28/28		21.9 %	1.00 [0.92, 1.09]
Total (95% CI)	**208**	**222**		**100.0 %**	**1.01 [0.97, 1.05]**
Total events: 194 (Patch), 203 (No patch)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 1.03$, df = 3 (P = 0.79); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.49 (P = 0.63)					
Test for subgroup differences: Not applicable					



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Analysis 1.4. Comparison 1 Patching versus no patching, Outcome 4 Number of days to complete healing.

Review: Patching for corneal abrasion

Comparison: 1 Patching versus no patching

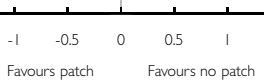
Outcome: 4 Number of days to complete healing

Study or subgroup	Patch N	Mean(SD)	No patch N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Agostini 2004	27	1.22 (0.42)	27	1.33 (0.55)		16.9 %	-0.11 [-0.37, 0.15]
Hulbert 1991	16	1.12 (0.34)	14	1 (0.1)		26.2 %	0.12 [-0.05, 0.29]
Jackson 1960	77	1.79 (1.1)	80	1.74 (1.12)		11.3 %	0.05 [-0.30, 0.40]
Kaiser 1995	101	2.627 (0.7824)	100	2.34 (0.6248)		23.5 %	0.28 [0.09, 0.48]
Kirkpatrick 1993	17	2 (0.71)	20	1.55 (0.61)		8.1 %	0.45 [0.02, 0.88]
Le Sage 2001	82	1.79 (0.97)	81	1.67 (0.99)		14.0 %	0.12 [-0.18, 0.42]
Total (95% CI)	**320**		**322**			**100.0 %**	**0.14 [0.00, 0.27]**

Heterogeneity: $Tau^2 = 0.01$; $Chi^2 = 7.93$, df = 5 (P = 0.16); $I^2 = 37\%$

Test for overall effect: Z = 2.02 (P = 0.044)

Test for subgroup differences: Not applicable



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Analysis 1.5. Comparison 1 Patching versus no patching, Outcome 5 Pain at 24 hours.

Review: Patching for corneal abrasion

Comparison: 1 Patching versus no patching

Outcome: 5 Pain at 24 hours

Study or subgroup	Patch n/N	Control n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Hulbert 1991	12/16	4/14		27.8 %	2.63 [1.09, 6.30]
Le Sage 2001	12/82	11/81		72.2 %	1.08 [0.50, 2.30]
Total (95% CI)	**98**	**95**		**100.0 %**	**1.51 [0.86, 2.65]**

Total events: 24 (Patch), 15 (Control)

Heterogeneity: Chi^2 = 2.30, df = 1 (P = 0.13); I^2 =56%

Test for overall effect: Z = 1.43 (P = 0.15)

Test for subgroup differences: Not applicable

Analysis 1.6. Comparison 1 Patching versus no patching, Outcome 6 Analgesic use.

Review: Patching for corneal abrasion

Comparison: 1 Patching versus no patching

Outcome: 6 Analgesic use

Study or subgroup	Patch n/N	Control n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Arbour 1997	21/25	18/22		66.8 %	1.03 [0.79, 1.33]
Le Sage 2001	4/82	4/81		14.0 %	0.99 [0.26, 3.82]
Menghini 2013	3/18	7/28		19.1 %	0.67 [0.20, 2.25]
Total (95% CI)	**125**	**131**		**100.0 %**	**0.95 [0.69, 1.32]**

Total events: 28 (Patch), 29 (Control)

Heterogeneity: Chi^2 = 0.65, df = 2 (P = 0.72); I^2 =0.0%

Test for overall effect: Z = 0.29 (P = 0.77)

Test for subgroup differences: Not applicable

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Analysis 1.7. Comparison 1 Patching versus no patching, Outcome 7 Photophobia.

Review: Patching for corneal abrasion

Comparison: 1 Patching versus no patching

Outcome: 7 Photophobia

Study or subgroup	Patch n/N	No patch n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Agostini 2004	7/27	13/27		61.7 %	0.54 [0.25, 1.14]
Kaiser 1995	1/39	1/42		4.6 %	1.08 [0.07, 16.63]
Kaiser 1995	4/62	2/58		9.8 %	1.87 [0.36, 9.83]
Le Sage 2001	5/82	5/81		23.9 %	0.99 [0.30, 3.28]
Total (95% CI)	**210**	**208**		**100.0 %**	**0.80 [0.45, 1.42]**

Total events: 17 (Patch), 21 (No patch)

Heterogeneity: $Chi^2 = 2.25$, df = 3 (P = 0.52); $I^2 = 0.0\%$

Test for overall effect: Z = 0.76 (P = 0.45)

Test for subgroup differences: Not applicable

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Analysis 1.8. Comparison 1 Patching versus no patching, Outcome 8 Lacrimation.

Review: Patching for corneal abrasion

Comparison: 1 Patching versus no patching

Outcome: 8 Lacrimation

Study or subgroup	Patch n/N	No patch n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Agostini 2004	10/27	8/27		31.9 %	1.25 [0.58, 2.68]
Kaiser 1995	8/62	10/58		41.2 %	0.75 [0.32, 1.76]
Kaiser 1995	8/39	7/42		26.9 %	1.23 [0.49, 3.08]
Total (95% CI)	**128**	**127**		**100.0 %**	**1.04 [0.64, 1.68]**

Total events: 26 (Patch), 25 (No patch)

Heterogeneity: $Chi^2 = 0.92$, df = 2 (P = 0.63); $I^2 = 0.0\%$

Test for overall effect: Z = 0.15 (P = 0.88)

Test for subgroup differences: Not applicable

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Analysis 1.9. Comparison 1 Patching versus no patching, Outcome 9 Foreign body sensation.

Review: Patching for corneal abrasion

Comparison: 1 Patching versus no patching

Outcome: 9 Foreign body sensation

Study or subgroup	Patch n/N	No patch n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Agostini 2004	7/27	13/27		43.2 %	0.54 [0.25, 1.14]
Kaiser 1995	16/62	8/58		27.5 %	1.87 [0.87, 4.04]
Kaiser 1995	5/39	5/42		16.0 %	1.08 [0.34, 3.44]
Le Sage 2001	2/82	4/81		13.4 %	0.49 [0.09, 2.62]
Total (95% CI)	**210**	**208**		**100.0 %**	**0.98 [0.63, 1.55]**

Total events: 30 (Patch), 30 (No patch)

Heterogeneity: $Chi^2 = 5.85$, df = 3 (P = 0.12); $I^2 = 49\%$

Test for overall effect: Z = 0.07 (P = 0.95)

Test for subgroup differences: Not applicable

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Analysis 1.10. Comparison 1 Patching versus no patching, Outcome 10 Blurred vision.

Review: Patching for corneal abrasion

Comparison: 1 Patching versus no patching

Outcome: 10 Blurred vision

Study or subgroup	Patch n/N	No patch n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Agostini 2004	7/27	8/27		69.1 %	0.88 [0.37, 2.07]
Kaiser 1995	2/39	0/42		4.2 %	5.38 [0.27, 108.58]
Kaiser 1995	2/62	3/58		26.8 %	0.62 [0.11, 3.60]
Total (95% CI)	**128**	**127**		**100.0 %**	**0.99 [0.48, 2.07]**

Total events: 11 (Patch), 11 (No patch)

Heterogeneity: $Chi^2 = 1.57$, df = 2 (P = 0.46); $I^2 = 0.0\%$

Test for overall effect: Z = 0.01 (P = 0.99)

Test for subgroup differences: Not applicable

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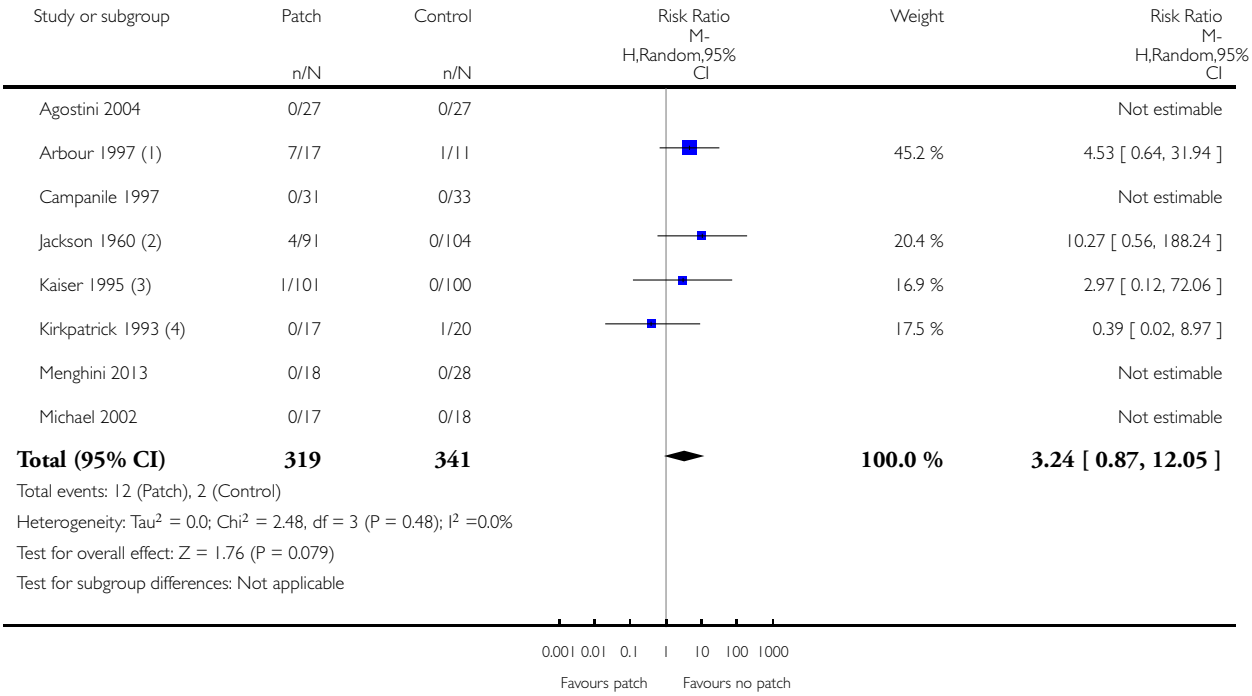
Analysis 1.11. Comparison 1 Patching versus no patching, Outcome 11 Adverse events.

Review: Patching for corneal abrasion

Comparison: 1 Patching versus no patching

Outcome: 11 Adverse events



(1) 6 months: "Persistent symptoms in the affected eye, including pain, foreign body sensation, photophobia, tearing."

(2) 2 months: 1 case of corneal ulceration; 1 case of conjunctivitis; 2 recurrence

(3) 12 months: 1 possible recurrent abrasion

(4) 6 months: 1 case of recurrent erosion

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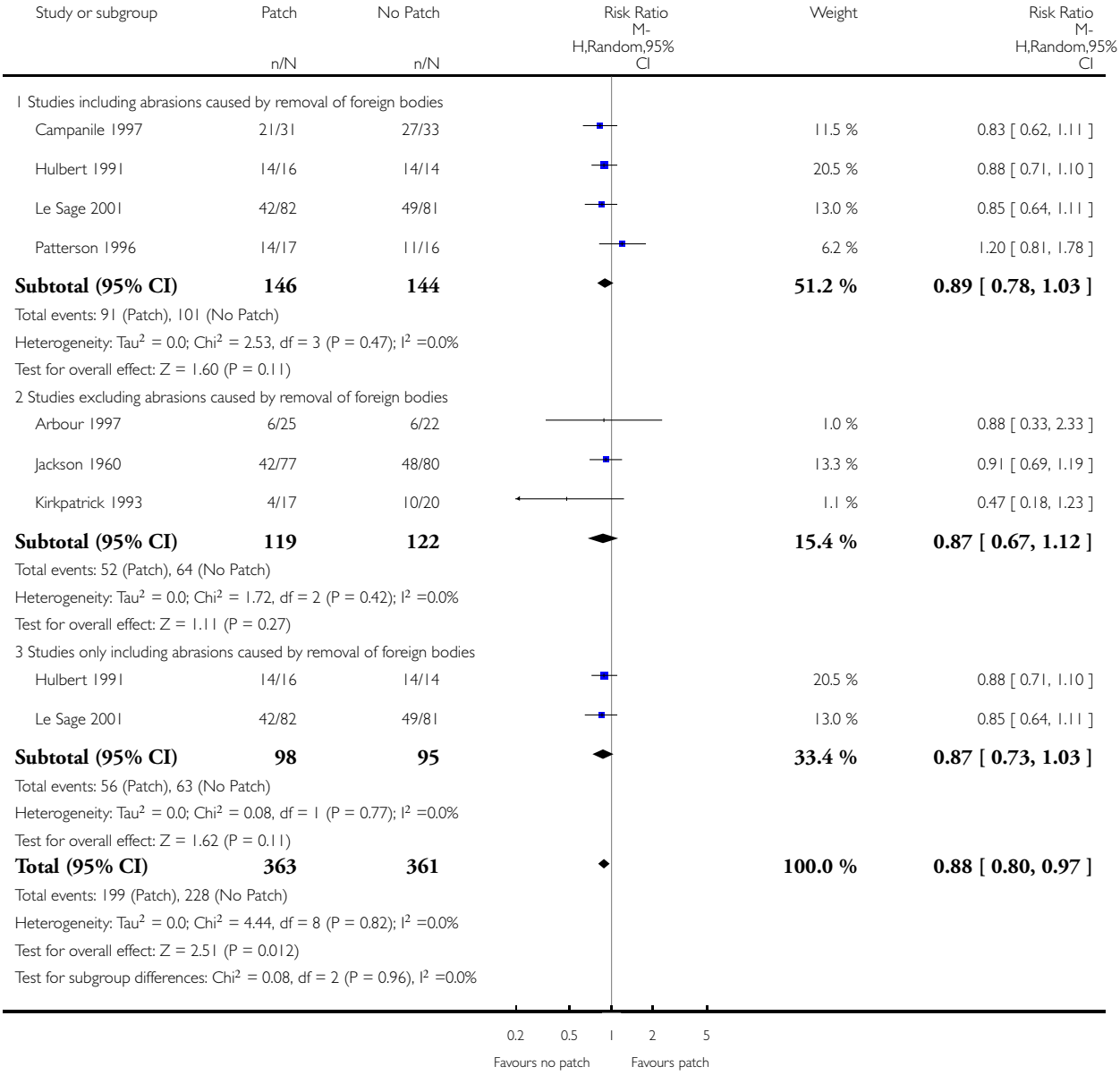
Analysis 1.12. Comparison 1 Patching versus no patching, Outcome 12 Complete healing after 24 hours: subgroup analysis.

Review: Patching for corneal abrasion

Comparison: 1 Patching versus no patching

Outcome: 12 Complete healing after 24 hours: subgroup analysis



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ADDITIONAL TABLES

Table 1. Pain outcomes

'Study name	Method of measuring pain *or definition of pain (higher number on the scale indicating worse pain)*	Continuous variables					Dichotomous variables				
		Patching		No patching		P value	Patching		No patching		P value
		Number in group	Median or mean score (SD or IQR)	Number in group	Median or mean score (SD or IQR)		Number in group	Number (%) with pain	Number in group	Number (%) with pain	
Agostini 2004	0-10 pain scale	27	5.59 (2.11)	27	6 (1.86)	0.455	-	-	-	-	-
Arbour 1997	100 mm VAS (mean score)	25	15.4 (15.9)	22	23 (18.9)	0.15	-	-	-	-	-
Arbour 1997	100 mm VAS (mean of maximum score)	25	23.7 (22.8)	22	33.9 (27.3)	0.18	-	-	-	-	-
Hulbert 1991	Painful vs painless at 24h	-	-	-	-	-	16	12 (75%)	14	4 (29%)	0.03
Kaiser 1995 (Traumatic)	Pain score at presentation	62	5.35 (2.07)	58	4.91 (1.69)	0.207	-	-	-	-	-
Kaiser 1995 (Traumatic)	Pain score Day 1	62	2.84 (1.99)	58	1.89 (1.03)	0.003	-	-	-	-	-
Kaiser 1995	Pain score	62	2.39 (1.44)	58	1.79 (1.42)	0.217	-	-	-	-	-

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Table 1. Pain outcomes (*Continued*)

(Traumatic)	Day 2										
Kaiser 1995 (Traumatic)	Differences in pain score at 24 h	62	2.51 (0.08)	58	3.02 (0.66)	< 0.05	-	-	-	-	-
Kaiser 1995 (FB)	Pain score at presentation	39	5.28 (1.19)	42	5.07 (1.88)	0.552	-	-	-	-	-
Kaiser 1995 (FB)	Pain score Day 1	39	2.53 (1.25)	42	1.80 (0.99)	0.009	-	-	-	-	-
Kaiser 1995 (FB)	Pain score Day 2	39	1.65 (0.98)	42	1.58 (1.08)	0.859	-	-	-	-	-
Kaiser 1995 (FB)	Differences in pain score at 24 h	62	2.75 (0.06)	58	3.27 (0.89)	< 0.05	-	-	-	-	-
Kirkpatrick 1993	0-100 VAS (differences in pain score 24 h)	17	-20.8 (20.3)	20	-27.6 (24.2)	0.37	-	-	-	-	-
Le Sage 2001	Pain (% initial visit)	-	-	-	-	-	82	44 (54%)	81	38 (47%)	-
Le Sage 2001	Pain (% 24 h)	-	-	-	-	-	82	12 (15%)	81	11 (14%)	-
Le Sage 2001	Pain (% 48 h)	-	-	-	-	-	82	0 (0%)	81	2 (2%)	-
Le Sage 2001	12 cm-VAS	82	6.0 (4.5-9.4)	81	5.7 (3.9-7.7)		-	-	-	-	-

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Table 1. Pain outcomes (*Continued*)

Michael 2002	FACES pain scale at presentation	Unclear 3-10 years old	4.7	Unclear 3-10 years old	5.7	-	-	-	-	-	-
Michael 2002	VAS at presentation	Unclear 11-17 years old	5.6	Unclear 11-17 years old	6.6	-	-	-	-	-	-
Menghini 2013	Wong-Baker FACES Pain Rating Scale (presentation)	-	4.8 (1.7)	-	3.9 (1.5)	0.243*	-	-	-	-	-
Menghini 2013	Wong-Baker FACES Pain Rating Scale (3 h)	-	3.7 (2.4)	-	4.5 (3.3)	0.694*	-	-	-	-	-
Menghini 2013	Wong-Baker FACES Pain Rating Scale (4 h)	-	0.8 (1.6)	-	1.7 (2.7)	0.227*	-	-	-	-	-
Menghini 2013	Pain relief at 24 h	18	4.1 (2.0)	28	2.2 (3.0)	0.04*	-	-	-	-	-
Patterson 1996	VAS pretreatment (mean)	17	4.2	16	5.2	-	-	-	-	-	-
Patterson 1996	VAS (24 h)	17	1.11	16	2.47	-	-	-	-	-	-

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Table 1. Pain outcomes (*Continued*)

Patterson 1996	VAS (mean difference 24 h)	17	3.09	16	2.77	> 0.50	-	-	-	-	-
Rao 1994	VAS vertical (at presentation)	-	7.5 (6.35)	-	5.15 (5.15)	-	-	-	-	-	-
Rao 1994	VAS vertical (D1)	-	2.5 (3.17)	-	1.4 (2.29)	-	-	-	-	-	-
Rao 1994	VAS vertical (D2)	-	0.2 (0.74)	-	0.1 (0.64)	-	-	-	-	-	-

FB: corneal epithelial defects secondary to foreign body removal
IQR: Interquartile range
Mean baseline pain scores given in Michael 2002
SD: standard deviation
Traumatic: Traumatic corneal abrasions
VAS: Visual analogue scale
*Menghini 2013 provided P values for the comparison between 3 groups (patched, therapeutic contact lens, and ointment only)

Table 2. Adverse effects

Adverse effects	Patched participants experiencing symptoms	Total number of patched participants	Non-patched participants experiencing symptom	Total number of non-patched participants
Photophobia				
Agostini 2004	7	27	13	27
Arbour 1997*	-	-	-	-
Kaiser 1995 (Traumatic corneal abrasions)**	4	62	2	58
Kaiser 1995 (Corneal foreign body)**	1	39	1	42
Le Sage 2001**	5	82	5	81

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Table 2. Adverse effects (*Continued*)

Total	17	210	21	208
Lacrimation				
Agostini 2004	10	27	8	27
Arbour 1997*	-	-	-	-
Kaiser 1995 (Traumatic corneal abrasions)**	8	62	10	58
Kaiser 1995 (Corneal foreign body)**	8	39	7	42
Total	26	128	25	127
Foreign body sensation				
Agostini 2004	7	27	13	27
Arbour 1997*	-	-	-	-
Kaiser 1995 (Traumatic corneal abrasions)**	16	62	8	58
Kaiser 1995 (Corneal foreign body)**	5	39	5	42
Le Sage 2001**	2	82	4	81
Total	30	210	30	208
Blurred Vision				
Agostini 2004	7	27	8	27
Arbour 1997*	-	-	-	-
Kaiser 1995 (Traumatic corneal abrasions)**	2	62	3	58
Kaiser 1995 (Corneal foreign body)**	2	39	0	42

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Table 2. Adverse effects (*Continued*)

Total	11	128	11	127
Insomnia				
Arbour 1997	9	25	8	22
Dendritic Ulcer				
Kirkpatrick 1993	0	20	1	24
Hypopyon				
Jackson 1960	1	91	0	104
Recurrent Corneal Erosion				
Jackson 1960***	-	-	-	-
Kirkpatrick 1993	0	20	1	24
Discomfort				
Hulbert 1991	12	16	4	14
Kirkpatrick 1993	4	20	0	24
Total	16	36	4	38
Irritation				
Le Sage 2001e**	10	82	7	81

*Arbour 1997: 7 out of 25 patients (28%) in the patch group and 1 out of 22 patients (4.5%) in the non-patch group complained of persistent symptoms in the affected eye, including pain,foreign body sensation, photophobia, and tearing. However, no further breakdown of these symptoms were provided.

**Both Kaiser 1995 and Le Sage 2001 have provided the number of participants experiencing symptoms at presentation, day 1 and day 2. Number of participants experiencing symptoms at day 2 have been included in this table

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***Jackson 1960: 1 patient experienced a recurrent corneal abrasion at 4 weeks. No information was provided regarding the treatment arm which this patient belonged to.

Table 3. Sensitivity analysis excluding studies at high risk of bias

Analysis	Including all trials	Excluding studies at high risk of bias*
Complete healing after 24 hours**	RR 0.89, 95% CI 0.79 to 1.00; studies = 7	RR 0.94, 95% CI 0.74 to 1.21; studies = 3
Complete healing after 48 hours**	RR 0.97, 95% CI 0.91 to 1.02; studies = 6	RR 1.00, 95% CI 0.92 to 1.09; studies = 1
Complete healing after 72 hours**	RR 1.01, 95% CI 0.97 to 1.05; studies = 4	RR 1.00, 95% CI 0.92 to 1.09; studies = 1
Days to complete healing§	MD 0.14, 95% CI 0.00 to 0.27; studies = 6	MD 0.29, 95% CI 0.09 to 0.48; studies = 2
Analgesic use¶	RR 0.95, 95% CI 0.69 to 1.32; studies = 3	RR 0.95, 95% CI 0.69 to 1.29; studies = 2
Adverse events¶	RR 3.24, 95% CI 0.87 to 12.05; studies = 8	RR 5.01, 95% CI 0.91 to 27.44; studies = 4

RR: Risk ratio; MD: Mean difference SMD: standardised mean difference
*These were studies that were quasi-randomised (Agostini 2004; Le Sage 2001) or not masked (Hulbert 1991; Kirkpatrick 1993) or quasi-randomised and non masked (Jackson 1960).
**RR of less than 1 favours no-patch group
§ MD of greater than 0 favours no-patch group i.e. longer time to heal in patch group
¶ RR of less than 1 favours patch group

Table 4. Additional treatments

	Mydriatics			Antibiotics			Analgesics		
Study	**Patch**	**No Patch**	**Differences**	**Patch**	**No Patch**	**Differences**	**Patch**	**No Patch**	**Differences**
Agostini 2004	G. cyclopentolate Hydrochloride 1% before discharge	G. cyclopentolate hydrochloride 1% before discharge	No differences	Epitezan (amino acids 25 mg; chloramphenicol 5 mg; methionine 5 mg; retinol acetate 10.00 IU) at presentation and once daily	Epitezan (amino acids 25 mg; chloramphenicol 5 mg; methionine 5 mg; retinol acetate 10.00 IU) TDS for 5 days or until closure	Frequency of administration	Allowed to use oral analgesics and anti-inflammatories	Allowed to use oral analgesics and anti-inflammatories	No differences

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Table 4. Additional treatments (*Continued*)

				with a new bandage every 24 h until healed	of the epithelial defect				
Arbour 1997	G. homatropine hydrobromide 2% before discharge	G. Homatropine Hydrobromide 2% before discharge	No differences	Oc. sulfacetamide sodium 10% before application of eye patch	Oc. sulfacetamide sodium 10% BDS	Frequency of administration	PO acetaminopher (325-650 mg) or codeine-acetaminopher (30/300 mg) 1-2 tablets QDS	PO acetaminopher (325-650 mg) or codeine-acetaminopher (30/300 mg) 1-2 tablets QDS	No differences
Campanile 1997	G. cyclopentolate hydrochloride 1% (one drop)	G. cyclopentolate hydrochloride 1% (one drop)	No differences	Oc. erythromycin once before application of eye patch	Oc. erythromycin Q6H (24 h)	Frequency of administration	Not specified	Not specified	Inadequate information
Hulbert 1991	Not specified	Not specified	Inadequate information	G. chloramphenicol 0.5% 2 drops at each review	G. chloramphenicol 0.5% 2 drops at each review	No differences	Not specified	Not specified	Inadequate information
Jackson 1960	G. atropine 1% PRN	G. atropine 1% PRN	Inadequate information	Oc sulfacetamide 10% TDS PRN	Oc sulfacetamide 10% TDS PRN	Inadequate information	Not specified	Not specified	Inadequate information
Kaiser 1995	G. phenylephrine 2.5%/tropicamide 1% before application of eye patch	G. phenylephrine 2.5%/Tropicamide 1% TDS	Frequency of administration	Oc. erythromycin/polysporin once for 24 h, then remove patch and instil ointment TDS for 5 days or until	Oc. erythromycin/polysporin TDS for 5 days or until complete healing	Frequency of administration	Mild oral analgesics including acetaminopher ibuprofen, or aspirin	Mild oral analgesics including acetaminopher ibuprofen, or aspirin	No differences

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Table 4. Additional treatments (*Continued*)

				abrasion is completely healed					
Kirkpatrick 1993	G. homatropine hydrobromide 2% before application of eye patch	G. homatropine hydrobromide 2% once daily	Frequency of administration	Oc. chloramphenicol once before application of eye patch	Oc. chloramphenicol QDS for 3 days after complete healing	Frequency of administration	Simple analgesics such as aspirin and paracetamol	Simple analgesics such as aspirin and paracetamol	No differences
Le Sage 2001	Mydriatics PRN	Mydriatics PRN	Inadequate information	Oc. erythromycin at initial visit and at each review	Oc. erythromycin QDS	Frequency of administration	Opioid analgesic PRN	Opioid analgesic PRN	No differences
Menghini 2013	NA	NA	No differences	Oc. ofloxacin before application of eye patch	Oc. ofloxacin QDS	Frequency of administration	Oral analgesics PRN	Oral analgesics PRN	Inadequate information
Michael 2002	G. cyclopentolate hydrochloride 1% (one drop)	G. cyclopentolate hydrochloride 1% (one drop) e	No differences	Oc. erythromycin before application of eye patch	Oc. erythromycin TDS until follow-up	Frequency of administration	PO ibuprofen (10 mg/kg per dose to a maximum dose of 400 mg) Q6-8gh PRN and Acetaminopher (15 mg/kh per dose to a maximum of 500 mg) q4-6 h for breakthrough pain	PO Ibuprofen (10 mg/kg per dose to a maximum dose of 400 mg) q6-8gh PRN and Acetaminopher (15 mg/kh per dose to a maximum of 500 mg) q4-6 h for breakthrough pain	Inadequate information

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Table 4. Additional treatments (*Continued*)

Patterson 1996	Not specified	Not specified	Inadequate information	Oc. tobramycin before application of eye patch	G. tobramycin Q4H while awake	Frequency of administration	PO Ketoprofen 75 mg PRN	PO Ketoprofen 75 mg PRN	Inadequate information
Rao 1994	G. cyclopentolate hydrochloride 1%	G. cyclopentolate hydrochloride 1%	Inadequate information	Oc. chloramphenicol 1%	Oc. chloramphenicol 1%	Inadequate information	PO Paracetamol PRN	PO Paracetamol PRN	Inadequate information

APPENDICES

Appendix 1. CENTRAL search strategy

#1 MeSH descriptor Cornea
#2 MeSH descriptor Corneal Diseases
#3 MeSH descriptor Epithelium, Corneal
#4 MeSH descriptor Eye Injuries
#5 (#1 OR #2 OR #3 OR #4)
#6 MeSH descriptor Wounds and Injuries
#7 injur* or abrasion* or erosion* or trauma* or wound* or foreign bod*
#8 (#6 OR #7)
#9 eye* or cornea*
#10 (#8 AND #9)
#11 (#5 OR #10)
#12 MeSH descriptor Occlusive Dressings
#13 patch* or bandage* or plaster* or wool* or dress* or pad* or gauze or occlusi*
#14 (#12 OR #13)
#15 (#11 AND #14)

Appendix 2. MEDLINE (OvidSP) search strategy

1 randomized controlled trial.pt.
2 (randomized or randomised).ab,ti.
3 placebo.ab,ti.
4 dt.fs.
5 randomly.ab,ti.
6 trial.ab,ti.
7 groups.ab,ti.
8 or/1-7
9 exp animals/

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10 exp humans/
11 9 not (9 and 10)
12 8 not 11
13 exp cornea/
14 exp corneal diseases/
15 exp epithelium corneal/
16 exp eye injuries/
17 or/13-16
18 exp “wounds and injuries”/
19 (injur$ or abrasion$ or erosion$ or trauma$ or wound$ or foreign bod$).tw.
20 or/18-19
21 (eye$ or cornea$).tw.
22 20 and 21
23 17 or 22
24 exp occlusive dressings/
25 (patch$ or bandage$ or plaster$ or wool$ or dress$ or pad$ or gauze or occlusi$).tw.
26 or/24-25
27 23 and 26
28 12 and 27
The search filter for trials at the beginning of the MEDLINE strategy is from the published paper by Glanville (Glanville 2006).

Appendix 3. EMBASE (OvidSP) search strategy

1 exp randomized controlled trial/
2 exp randomization/
3 exp double blind procedure/
4 exp single blind procedure/
5 random$.tw.
6 or/1-5
7 (animal or animal experiment).sh.
8 human.sh.
9 7 and 8
10 7 not 9
11 6 not 10
12 exp clinical trial/
13 (clin$ adj3 trial$).tw.
14 ((singl$ or doubl$ or trebl$ or tripl$) adj3 (blind$ or mask$)).tw.
15 exp placebo/
16 placebo$.tw.
17 random$.tw.
18 exp experimental design/
19 exp crossover procedure/
20 exp control group/
21 exp latin square design/
22 or/12-21
23 22 not 10
24 23 not 11
25 exp comparative study/
26 exp evaluation/
27 exp prospective study/
28 (control$ or prospectiv$ or volunteer$).tw.
29 or/25-28

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30 29 not 10
31 30 not (11 or 23)
32 11 or 24 or 31
33 exp cornea/
34 exp cornea disease/
35 exp cornea epithelium/
36 exp eye injury/
37 or/33-36
38 exp injury/
39 (injur$ or abrasion$ or erosion$ or trauma$ or wound$ or foreign bod$).tw.
40 or/38-39
41 (eye$ or cornea$).tw.
42 40 and 41
43 37 or 42
44 (patch$ or bandage$ or plaster$ or wool$ or dress$ or pad$ or gauze or occlusi$).tw.
45 43 and 44
46 32 and 45

Appendix 4. LILACS search strategy

injur$ or abrasion or erosion or trauma or foreign bod$ and eye$ or cornea$ and patch$ or bandage$ or plaster$ or wool$ or dressing$ or pad$ or gauze or occlus$

Appendix 5. OpenGrey search strategy

(cornea OR eye) AND (patch OR bandage OR plaster OR wool OR dressing OR pad OR gauze OR occlusion)

Appendix 6. ISRCTN search strategy

(cornea OR eye) AND (injury OR abrasion OR erosion OR trauma) AND (patch OR bandage OR plaster OR wool OR dressing OR pad OR gauze OR occlusion)

Appendix 7. ClinicalTrials.gov search strategy

(cornea OR eye) AND (injury OR abrasion OR erosion OR trauma) AND (patch OR bandage OR plaster OR wool OR dressing OR pad OR gauze OR occlusion)

Appendix 8. ICTRP search strategy

(cornea OR eye) AND (patch OR bandage OR plaster OR wool OR dressing OR pad OR gauze OR occlusion)

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Appendix 9. Glossary

This section contains a list of abbreviations that are used in this systematic review.
ADLs - Activities of Daily Living, routine daily self-care activities which include eating, dressing, toileting, the ability to transfer or walk as well as maintain continence
BCVA - Best Corrected Visual Acuity
BDS (Latin: *bis die sumendum*)-Two times daily
G. (Latin: *guttae or gutta*)- Drops or drop
ITT - Intention To Treat
I.U - International Units
NA- Not Applicable
Oc. (Latin: *oculentum*)- Ointment
PRN (Latin: *pro re nata*)- As required
Q4H (Latin: *quaque quarta hora*)- Every 4 hours
Q6H (Latin: q*uaque sexta hora*)- Every 6 hours
TDS (Latin: *ter die sumendum*)- Three times daily

WHAT'S NEW

Last assessed as up-to-date: 9 May 2016.

Date	Event	Description
9 May 2016	New citation required but conclusions have not changed	The risk of bias tables and text of the review have been updated
9 May 2016	New search has been performed	An updated search of the literature was performed in May 2016. One new study (Menghini 2013) was identified and incorporated into this review.

HISTORY

Protocol first published: Issue 2, 2004

Review first published: Issue 2, 2006

Date	Event	Description
26 October 2008	Amended	Converted to new review format.

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CONTRIBUTIONS OF AUTHORS

Original review

Conceiving the review: AT
Designing the review: AT, MR
Co-ordinating the review: AT
Undertaking manual searches: AT, MR
Screening search results: AT, MR
Organising retrieval of papers: AT
Screening retrieved papers against inclusion criteria: AT, MR
Appraising quality of papers: AT, MR
Abstracting data from papers: AT, MR
Writing to authors of papers for additional information: AT
Obtaining and screening data on unpublished studies: AT, MR
Data management for the review: AT, MR
Entering data into RevMan: AT, MR
Analysis of data: AT, MR
Interpretation of data: AT, MR
Writing the review: AT

2016 update

Screening search results: CL, BL
Organising retrieval of papers: CL, BL
Screening retrieved papers against inclusion criteria: CL, BL
Appraising quality of papers: CL, BL
Abstracting data from papers: CL, BL
Data management for the review: CL, BL
Entering data into RevMan: CL, BL
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DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The protocol for this review was originally published in 2004 (Turner 2004). Since that time there have been improvements in Cochrane methods, in particular the assessment of risk of bias and production of 'Summary of findings' tables and GRADE assessment. These new methods have been incorporated.

We have included the following additional outcomes: insomnia assessments and duration of medical leave and have added 72 hours follow-up for complete healing.

INDEX TERMS

Medical Subject Headings (MeSH)

*Corneal Injuries; *Occlusive Dressings; Eye Foreign Bodies [complications]; Randomized Controlled Trials as Topic

MeSH check words

Humans

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