

# Should We Patch Corneal Abrasions? A Meta-Analysis

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**BACKGROUND.** Eye patching is commonly recommended for treating corneal abrasions. This advice seems based more on anecdotes or disease-oriented evidence theorizing that there is faster healing or less pain when the eye is patched. This meta-analysis was performed to determine if eye patching is a useful treatment for corneal abrasions.

**METHODS.** We conducted a comprehensive search of both MEDLINE (1966 to 1997) and Science Citation Index to locate relevant articles. We reviewed the bibliographies of included studies, and ophthalmology and primary care texts. Local ophthalmologists and authors were contacted to identify any unpublished data. Controlled trials that evaluated eye patching compared with no patching in patients older than 6 years with uncomplicated corneal abrasions were considered. The outcomes of interest were healing rates and degree of pain.

**RESULTS.** Seven trials were identified for inclusion, of which five could be statistically combined. Healing rates were similar in the two groups. The summary ratios (95% confidence interval) of healing rates in the patch group as compared with the no-patch group were 0.87 (0.68 to 1.13) and 0.90 (0.75 to 1.10) at days 1 and 2, respectively. Six studies evaluated pain: four found no difference and two favored not patching. No differences in complication rates were noted between the patched and non-patched groups.

**CONCLUSIONS.** Eye patching was not found to improve healing rates or reduce pain in patients with corneal abrasions. Given the theoretical harm of loss of binocular vision and possible increased pain, we recommend the route of harmless nonintervention in treating corneal abrasions.

**KEY WORDS.** Corneal diseases; meta-analysis; treatment; eye. (*J Fam Pract* 1998; 47:264-270)

## CLINICAL QUESTION Should we patch corneal abrasions?

Corneal abrasions, defects of the normal epithelium usually caused by trauma or resulting after removal of a foreign body, account for approximately 10% of the visits to eye hospital emergency departments. Corneal abrasion is also a common problem encountered by physicians in general emergency departments and in primary care outpatient practices. Treatment recommendations vary geographically and include the use of topical antibiotics, midriatic or cycloplegic drops, and eye patching.

Eye patching is hypothesized to produce a stable corneal environment promoting re-epithelialization. Without citing valid evidence demonstrating benefit, several writers in ophthalmology<sup>1-3</sup> and primary care texts<sup>4,6</sup> recommend this treatment. Others argue that even if healing benefit is not proven, patients experience less pain if the affected eye is patched.<sup>7</sup> Yet evidence is also

lacking to support this claim. Theoretical disadvantages of eye patching include decreasing corneal oxygenation, thereby delaying healing and increasing risk of infection by occluding the eye, as well as loss of binocular vision and a resulting lack of depth perception. This meta-analysis was performed to determine whether patching of the eye as opposed to nonpatching is effective in improving healing rates and decreasing symptoms associated with simple corneal abrasions.

## METHODS

To identify potential studies for inclusion, a MEDLINE search (1966 to 1997) was conducted by one author (C.F.) using the terms "cornea" or "corneal disease," and "wounds and injuries" or "abrasion" or "trauma" as MeSH and text words. This was combined with a previously published search strategy to comprehensively identify randomized controlled trials.<sup>8</sup> Using the identified articles as the reference, we performed a citation search using the Science Citation Index. Bibliographies of identified studies and ophthalmology and primary care texts were reviewed. A second author (G.S.) independently searched for relevant articles, and the results of the two searches were compared. Authors and local ophthalmologists were contacted to help identify any unpublished data. Studies were included if they met the following criteria:

- The study subjects were at least 6 years of age and had acute corneal abrasion due to either traumatic

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injury or the removal of a foreign body (the abrasion could not be related to infection or contact lens use);

- Any setting was acceptable;
- The study compared eye patch intervention of at least 24 hours' intended use with no eye patch;
- The study's primary outcomes were time to resolution of the abrasion and pain; a secondary outcome was complication rate; and
- The study design was a randomized controlled trial.

Papers written in a language other than English or presenting previously published data were excluded. For studies in which the data presentation was in a format other than the dichotomous outcome of healing versus nonhealing, the authors were contacted for the original data. If still unavailable, that data was excluded from the analysis but not the review.

This review specifically excluded patients with corneal abrasions related to contact lens use. Current recommendations do not include the use of eye patching

TABLE 1

### Characteristics of Included Studies in Meta-Analysis of Treatment for Corneal Abrasions

Reference	No. Subjects	Setting	Abrasion Etiology	Method to Assess Healing	Method of Patching	Cycloplegic Use	Antibiotic Use	Analgesia Use
Jackson, 1960	157	Eye hospital ED	Traumatic	Fluorescein	Cotton wool covered with a net held with 2 strips of cellulose tape	1% atropine if necessary	10% sulph-acetam tid*	Not stated
Hulbert, 1991	30	ED	S/p foreign body removal	Fluorescein	Gauze with enough bulk to exert pressure on closed eye; secured with bandage	Not stated	0.5% chloramphenicol qd	Not stated
Kirkpatrick, 1993	44	Eye hospital ED	Trauma	Slit lamp	Double eye pad with bandage	2% homotropine qd*	Chloramphenicol qd*	Acetylsalicylic acid or paracetamol
Rao, 1994	40	Not stated	Not stated	Slit lamp	Firm padding	1% cyclopentolate	1% chloramphenicol	Paracetamol
Kaiser, 1995	201	Eye hospital ED	Trauma and s/p foreign body removal	Slit lamp	One pad folded, a second placed atop, bandaged in place	2.5% phenylephrine with 1% tropicamide	Erythromycin or polysporin ointment tid†	Acetylsalicylic acid, acetaminophen, ibuprofen
Patterson, 1996	33	Community hospital ED	Trauma and s/p foreign body removal	Fluorescein	One pad vertical, a second horizontal, covered with tape	Not stated	Tobramycin ointment q4h*	Ketoprofen 75 mg prn
Arbour, 1997	45 (47 eyes)	Ophthalmology Dept.	Trauma	Slit lamp	2 eye pads taped to prevent lid from opening	2% homatropine	10% sulfacetamide ointment bid*	Acetaminophen or acetaminophen plus codeine

ED denotes emergency department.

\* Medication applied in no-patch group before patching only; medication was prescribed for no-patch group from time of study enrollment.

† Medication applied in patch group before patching, patch removed at 24 hours, and medications prescribed as noted; medication prescribed for no-patch group from time of study enrollment.



TABLE 2

## Validity Assessment of Included Studies in Corneal Abrasion Meta-Analysis

Reference	Method of Randomization	Follow-up	Intention to Treat Analysis	Outcome Assessment Blinded?	Comparability of Patch/No-Patch Groups
Jackson, 1960	Alternate days of enrollment	80.5%	No	Not stated	Yes
Hulbert, 1991	Not stated	100%	Yes	Not stated	Yes
Kirkpatrick, 1993	Not stated	84.1%	No	Not stated	Yes
Rao, 1994	Not stated	100%	Not stated	Not stated	Yes
Kaiser, 1995	Not stated	90.1%	Not stated	Not stated	Yes
Patterson, 1996	Computer-generated table	66%	Not stated	Not stated	Yes
Arbour, 1997	Not stated	97.9%	No	Yes	Yes

Note: All studies were randomized controlled trials.

in those with contact lenses because of to the increased incidence of pseudomonas infection.<sup>9,10</sup>

One author (C.F.), not blinded to publication information, assessed each included study for validity, using published criteria.<sup>11</sup> These data are presented but were not used to rank or exclude any study.

Data abstracted from papers were entered chronologically into Review Manager 3.0 software.<sup>12</sup> Both the summary relative risk estimates and the 95% confidence intervals were calculated using the fixed effects model. The homogeneity of the individual relative risks was assessed with Woolf's method.<sup>13</sup>

## RESULTS

The general MEDLINE search yielded 92 articles; 18 of these addressed the treatment of corneal abrasions. Eleven were excluded—three that were case series describing different methods of treatment;<sup>14,16</sup> one that was published in a language other than English;<sup>17</sup> one that addressed recurrent corneal abrasions;<sup>18</sup> one that compared the use of antibiotic ointment with none;<sup>9</sup> one that compared using nonsteroidal eye drops with none;<sup>19</sup> and four that compared patch with collagen shield or soft contact lens but did not include a no-patch group.<sup>20-23</sup> This resulted in seven trials from the original search that met our inclusion criteria.<sup>24-30</sup> The search strategies of both authors identified each included article. No unpublished data were found.

Characteristics of the seven studies included are summarized in Table 1. All but one study were done within the last decade. Patients typically presented to an emergency department affiliated with an ophthalmology hospital; none of the studies was specifically

conducted in a primary care setting. In all cases, the etiology of the corneal abrasion involved either trauma or the removal of a foreign body. Four studies used a slit lamp to diagnose the abrasion and evaluate healing; three used fluorescein staining. All patients were concurrently treated with a topical antibiotic; in all but two studies a cycloplegic was also used.

The validity assessment of the studies included in this review is presented in Table 2. Only one study had less than 80% follow-up, and all had good comparability between groups at baseline. Only two identified the method of randomization, and only one specifically reported an intention-to-treat analysis. The most likely threat to validity, however, was the lack of masking in outcome assessment in six of the seven included studies.

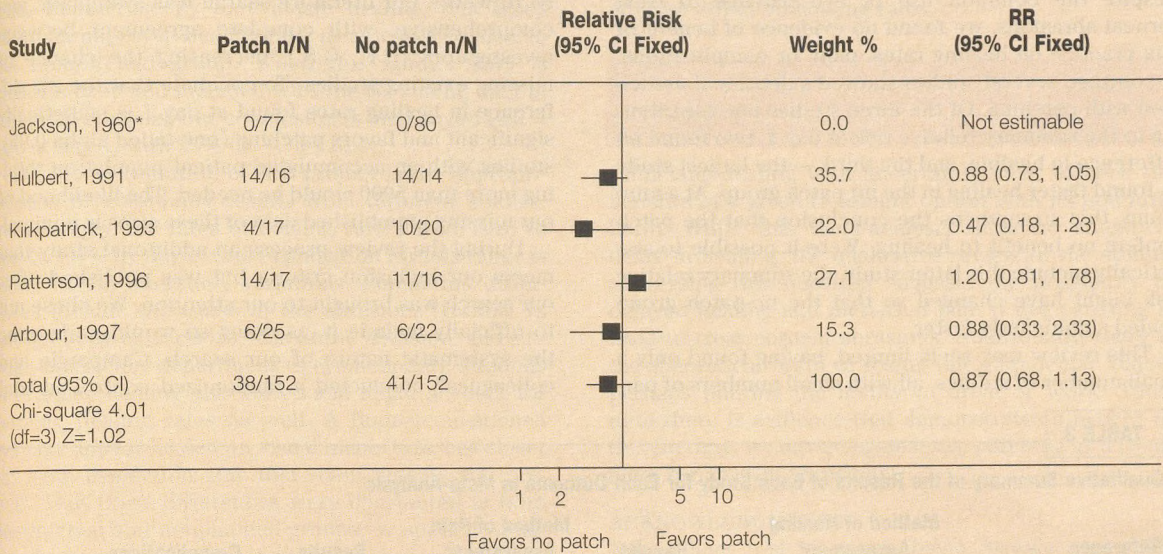
All seven studies referred to in this review evaluated healing as an outcome, but three had data presented in a form not suitable for statistical analysis. One author supplied the original data,<sup>30</sup> resulting in five studies that were statistically manageable. One of these five had healing rates of 0% at day 1 for both experimental and control groups.<sup>24</sup> Another study showed complete resolution of the abrasion at day 2 for both experimental and control groups.<sup>25</sup> In instances when there is either complete response or no response for both groups, the relative risks and confidence intervals cannot be calculated. Thus, these studies could not be included in the overall relative risk estimate (see Figures 1 and 2).

When healing rates were statistically pooled, the no-patch group had a 13% better healing rate at day 1 than the group with the patches (relative risk [RR] = 0.87), although this was not statistically significant (95% confidence interval [CI], 0.68 - 1.13). A similar



FIGURE 1

## Summary of Studies Assessing Healing Rates at Day 1



\*Studies that did not contribute to the summary relative risk because of inability to calculate precision.

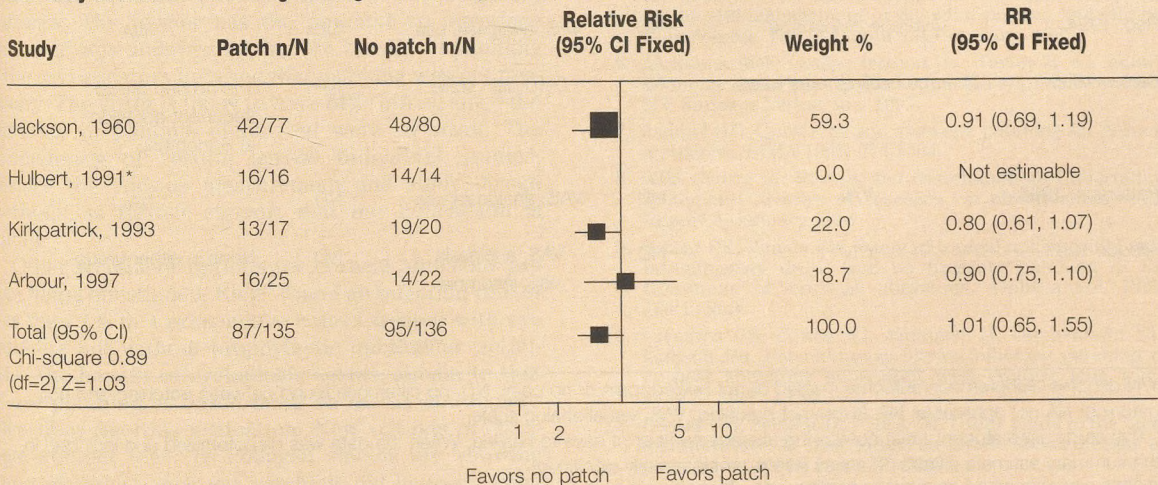
modest trend toward faster healing was found for those without eye patching at day 2, with (RR = 0.90 (95% CI, 0.75 - 1.10)). Studies combined meta-analytically met criteria for homogeneity ( $P = .21$  at day 1;  $P = .33$  at day 2).

Qualitative results for healing, pain, and complications are presented in Table 3. Two of the seven studies found faster healing in the no-patch group, while five

found no difference. Six of the seven included studies evaluated pain. Four of these found no difference in pain scores between those with and those without patching; two found statistically less pain in the no-patch group. Four of the seven studies followed patients beyond the acute phase for complications. No clear advantage was noted for either patching or not patching.

FIGURE 2

## Summary of Studies Assessing Healing Rates at Day 2



\*Studies that did not contribute to the summary relative risk because of inability to calculate precision.



## DISCUSSION

Despite the common use of eye patches to treat corneal abrasions, we found no evidence of benefit of this practice on healing rates, pain, or complications. In contrast, several studies showed a detriment associated with patching. Of the three studies not contributing to the summary relative risk at day 1, two found no difference in healing, and the third — the largest study — found faster healing in the no-patch group. At a minimum, this strengthens the conclusion that the patch confers no benefit to healing. Were it possible to statistically include this latter study, the summary relative risk might have changed so that the no-patch group healed significantly faster.

This review may seem limited, having found only a small number of studies, all with small numbers of par-

ticipants, and may seem further limited by our being able to combine only some of these studies statistically. However, our literature search was systematic and comprehensive, with complete agreement between investigators (C.F., G.S.), decreasing the chance of missing existing studies. To conclude that the 2% difference in healing rates found at day 1 is statistically significant and favors patching (one-tailed alpha 0.05), studies with an accumulated patient population totaling more than 5000 would be needed. The likelihood of our missing unpublished data of these sizes is minimal.

During the review process an additional study that meets our inclusion criteria but was published after our search was brought to our attention. We chose not to officially include it, as doing so would undermine the systematic nature of our search. Campanile and colleagues<sup>31</sup> conducted a randomized controlled trial

TABLE 3

## Qualitative Summary of the Results of Each Study for Each Outcome in Meta-Analysis

Reference	Method of Healing Assessment	Results	Method of Pain Assessment	Results	Complications
Jackson, 1960	Y/N	ND	NA	NA	3 in padded group (1 conjunctivitis, 2 recurrent abrasions at day 4 and week 5)
Hulbert, 1993	Y/N	ND	Y/N	NP	NA
Kirkpatrick, 1993	Y/N	NP	0-100 pain score	ND	1 in padded group (dendritic ulcer; pt was excluded) 1 in no pad group (recurrent abrasion x 2)
Rao, 1994	Average defect size	ND	VAS; analgesia use	ND	NA
Kaiser, 1995	Average healing rates (days)	NP	0-10 pain scale	NP	1 in no pad group (recurrent abrasion at 8 months)
Patterson, 1996	Y/N	ND	VAS; analgesia use	ND	NA
Arbour, 1997	Y/N*	ND	VAS; analgesia use; insomnia	ND	None in either group

Y/N denotes dichotomous outcome (healed or not healed; pain or no pain); ND, no difference found between patching and not patching; NA not applicable; NP, favors not patching; VAS, visual analog scale.

\* This study used student *t* test comparing average number of days to healing. When the data was dichotomized and included in the summary estimate (Figure 1), it was no longer statistically significant.

† Data was presented as average healing rate; dichotomous outcome was supplied by author.



comparing patching with no patching in 64 patients with nontraumatic corneal epithelial defects. Using slit lamp biomicroscopy to evaluate healing, this study found an improved healing rate, as assessed by size, in the nonpatched group. When this study's data is dichotomized and included with the remaining data in this meta-analysis, our conclusion is unchanged (RR = 0.90 at day 1, with 95% CI, 0.75 - 1.24).

A second limitation of this project is the appropriateness of combining results from different studies. Interestingly, the rates of healing varied from zero to nearly 100% by day 1. One explanation for this range is found in the interstudy variations. Population differences include the cause of the abrasions (trauma vs foreign body extraction), size of the abrasion, and setting (emergency department vs eye hospital). Methods to evaluate healing also varied and might account for variable healing rates as well. A fluorescein-stained eye may appear healed on visual inspection, but closer slit lamp inspection may find small defects still present. That these differences were distributed in both the patched and nonpatched groups, or applied equally to both, minimizes the chance that they would interfere with combining data statistically. And the included studies met statistical criteria for homogeneity. A third qualitative difference in study protocol was the use of adjunct medications, which was not equally applied to both comparison groups (see Table 1 footnote). While it is possible that the use of cycloplegics or ophthalmologic antibiotics may affect healing rates significantly enough to mask the benefit of patching, such an explanation is unlikely to account for our findings.

The validity of any meta-analysis depends in part on the validity of the original studies. Overall, most were well designed. However, six studies did not blind outcome assessment; others excluded noncompliant patients. The former has the potential to introduce bias, perhaps underestimating the benefit of patching if the investigators believed that patching was not necessary. The latter is likely to have little effect, since the numbers of patients eliminated were so small. The consistency of results across individual studies, despite the various measurement and study design methods, is further support that our conclusion is sound.

Other treatment options for corneal abrasions are also being questioned. King<sup>15</sup> found an infection rate of less than 1% in a prospective cohort treated with eye patching but without prophylactic ophthalmic antibiotic. The benefit of cycloplegic agents, similar to that of eye patching, is based more on theory and experience than rigorous evaluation. New options of "bandage contact lens" or collagen shields are showing some advantage over eye patching, but have not been compared with the no-patch option.<sup>9,15,21</sup> Finally, a recent study found that treatment with ketorolac oph-

thalmic solution without patching resulted in less pain and quicker return to normal activities, without an adverse effect on healing rates.<sup>19</sup>

## RECOMMENDATIONS FOR CLINICAL PRACTICE

Clinicians dealing with uncertainty must balance the benefits of a given treatment option with its potential harm. While this meta-analysis finds no statistical delay in healing, the qualitative review of the studies addressing this question suggests the possibility of delayed healing and increased pain if eye patching is used to treat corneal abrasions. Additionally, there is the theoretical harm of losing one's binocular vision, perhaps limiting the ability to drive or work. Thus, until there is evidence that demonstrates a benefit of this therapy, we advise against eye patching as a treatment for corneal abrasions.

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