Marsden J (2015) How to undertake irrigation of the eye. Nursing Standard. 30, 23, 36-39.

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Clinical skills

How to …. Undertake irrigation of the eye

Rationale

Chemical injuries to the eye represent a true ophthalmic emergency and are the only eye presentation which should be triaged as red, immediate, when presenting in the emergency department. While not life threatening, they are sight threatening and as the most important intervention in limiting the effect of chemical injury is immediate irrigation, it is vital hat this is skill is understood and performed correctly.

- Chemical injury to the eye is a true ophthalmic emergency. It is as much a risk to the patients vision as a compromised airway is to his life.
- It can be blinding and contact time between the eye and the chemical is important in determining the severity of the injury
- Immediate irrigation is the single most important factor in preventing vision limiting injury

Contributing to Clinical skills

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Preparation and equipment

- A source of irrigating fluid – Fluid giving set or similar plus fluid or a tap or eye wash station
- Topical anaesthetic drops to deal with pain and allow effective irrigation. These should be prescribed or given under patient group direction
- Cotton buds/cotton tipped swabs to remove particles
- A chair or bed where the patient's head can be supported, the patient sitting up rather than lying down
- pH paper if possible

Hand hygiene is paramount in clinical practice and the hands should be washed before irrigation commences. Alcohol gel is not recommended as it takes some time to dry and any alcohol which enter the eye will cause further trauma to tissues. A plastic apron may be used to protect the nurse from both the irrigating fluid, but also from chemical in the irrigating fluid, which although very dilute at this point, should be considered. The use of gloves may also be considered.

Procedure

1. Time is of the essence. This should be the first thing undertaken as the patient walks through the ED door and tells someone he has a chemical injury. There should be no wait for 'booking in' , triage, checking vision or any other procedure. Chemical injury to an eye is as much danger to the sight of the patient as a compromised airway to his life
2. Prior to and throughout the procedure the patient needs continuous information explanations and reassurance. He is in pain and what is worse, his vision is compromised and even at this early stage, it is likely that he is worried about the long term consequences of the injury
3. Chemical injuries are intensely painful and the irrigation procedure is not comfortable. Topical anaesthetic drops should be instilled initially and then whenever the patient is unable to cooperate due to pain. Although long term use of topical anaesthetic drops is known to retard epithelial healing (McGee and Fraunfelder 2007) this is not a consideration here and it is vitally important that chemicals are irrigated from the eye to prevent long term vision loss.
4. A waterproof cape or cover can help to protect the patients clothing from the irrigating fluid, but irrigation should not be delayed to allow this
5. The patient should sit upright with head supported and tilted to the affected side (unless an eye wash station is being used). It is sometimes helpful if the patient holds a receiver to catch irrigation fluid
6. Irrigating patients' eyes while they are lying down ensures only that they will get extremely wet and are less likely to be able to co-operate in the procedure as they strive to prevent themselves from what may feel like 'drowning'.
7. It may be useful to check the pH of the conjunctival sac with indicator paper before irrigation to note whether the chemical is acid or alkaline. As treatment is based on the extent of injury and does not depend on the chemical, this is not vital and irrigation should not be delayed
8. Contact lenses should be removed prior to irrigation
9. Normal saline is often used for irrigation but any fluid that can be delivered in high volume and variable flow is appropriate, including tap water from a jug or tap if no other form of delivery is immediately available
10. The eyelids should be held open, manually or using a speculum and the patient should be encouraged to look in all the areas of gaze, in a systematic way, by the person irrigating, so that all aspects of the eye are irrigated and visually examined
11. Irrigation should, theoretically, move particles and chemical away from the eye and not down into the punctum and hence the lacrimal drainage system, it should be directed

laterally rather than medially however, in practice, this is almost impossible to do at all times

12. The flow of fluid should be constant but the pressure should be low. Do not be tempted to raise the pressure of the irrigating fluid as this may damage delicate tissues and is likely to be significantly more painful for the patient. Use a pressure and flow that is relatively comfortable for the patient. If the irrigations hurts more than the original injury, the patient is not going to be able to cooperate easily
13. All particles of chemical matter should be removed from the surfaces of the eye, by wiping with a cotton tipped applicator if necessary. While cotton wool is not generally used where there are wounds on other parts of the body and gauze or non woven swabs are preferred, on the eye, these materials are harsh, removing epithelial cells even when wet and cotton tipped applicators; cotton buds, are the preferred tool in ophthalmic care. If the cotton bud does leave particles behind, it is not a problem in an intact eye in the way that it is in a wound
14. Lid eversion is a key part of irrigation as particles will be trapped underneath the lid if the injury is with a solid chemical. Until they are removed, they will continue to burn Particles may lodge under the everted upper lid, in the upper fornix. A wet cotton tipped applicator should be swept under the edge of the everted upper lid and up into the upper fornix.
15. Double eversion of the lid should be attempted and can be facilitated using a Desmarres retractor however, adequate irrigation can be achieved without this by irrigating under the fold of the everted lid and swabbing into the upper fornix as described previously
16. There is no ‘right time’ or ‘right amount’ of irrigation.
17. Irrigation may be stopped when clinical judgement tells you that you have done enough. Liquid chemicals wash out easier than solid ones as they are immediately diluted. Solid chemicals rarely dissolve, staying solid and therefore retaining their chemical effect. Therefore, if the chemical is liquid, adequate irrigation is likely to be completed more quickly than if it is solid when it should continue until all particles of the solid have been removed and for some time afterwards.
18. Using indicator paper to show when irrigation should be stopped is dangerous and can lead to the misapprehension of adequate irrigation. If you test immediately, you are testing the irrigation fluid. If you wait for 5 minutes to ensure that you are testing the eye, 2 or 3 minutes of irrigation time may have been wasted along with 2-3 minutes of continued burning.
19. The patient will need a considerable amount of reassurance throughout the procedure

which is uncomfortable and is likely to be painful even though topical anaesthetic is used. He is having to listen to the nurse undertaking the irrigation, do what is needed and may be very frightened of the outcome for vision. The nurses communication skills are paramount in keeping the patient comfortable, informed and panic free and achieving adequate irrigation

20. Following irrigation, visual acuity should be checked before a full eye examination

Evidence base

Acids in the eye damage the ocular surface by altering the pH and cause protein denaturation and coagulation. The protein denaturation tends to prevent deeper penetration into the ocular tissues. Alkaline substances denature cell membrane fatty acids and interact with the collagen in the cornea, allowing deeper penetration of the cornea and into the anterior segment of the eye. It is vital therefore that the contact time of these substances on tissue is minimised. Solvent injury (alcohol, petrol etc.) may cause damage, but this is usually minor, although still very painful ,especially initially. It is not necessarily the 'strength' of the chemical but the time between injury and irrigation which causes injury (Pfister 1983) Pain is not a good indicator of injury as nerve endings may have been damaged so serious injury may cause little pain. If damaged, regeneration may take some time, causing hypo or hyperaesthesia (Yanoff and Duker 2009). The clinician may be encouraged to irrigate back to 'neutral' (pH 7) however, the pH of tears is anything between 6.9 and 7.4 (Forester et al 2008) so 'neutral' is not necessarily normal for the patient. Patients who work with chemicals, such as those in the building industry, may have an normally higher eye pH than might be expected because of their continuing exposure to chemical (Schrange 2011). pH testing has its limitations. It is, at best, not reliable (it is hard to differentiate between 7 and 8 on indicator paper and there is no differentiation ta all of the range in between) and at worst, if irrigation is delayed to check pH or the attempts are made to irrigate back to an unachievable neutral, potentially damaging as undamaged epithelium is damage by non isotonic fluid (Schrange 2011, Smith and Marsden 2013). The longer the irrigation, the more corneal swelling may result and this can be mistaken for chemical injury. Kompa (2002) showed that tap water causes less oedema than Normal Saline, and recommended its use however, it is often not available in general settings in a easily deliverable container as N Saline is, so this continues to be the irrigation fluid of choice for most areas. It must be remembered that there is the potential for damage through over irrigation so it should be proportionate to the strength of the chemical, the presenting pH. and the presence of solids (Smith and Marsden 2013).

An irrigating device such as a "Morgan lens' is sometimes used in emergency departments as it can be used 'hand free' however, it does not allow particle removal, does not ensure that the operator everts the lid and there is no check that comprehensive irrigation has been performed. It may have value in irrigating out a liquid chemical, but should not be used if the chemical was solid and is no substitute for a skilled clinician. Eye wash and irrigation stations are available, combining air with high volumes of water to form a 'soft' spray which is tolerated well. Again, manual removal of solid matter is still required.

Once irrigation is complete, a full ophthalmic examination should be carried out at a slit lamp to assess both the extent of injury and the completeness of particle removal. If anything

other than minor injury (localised epithelial loss from conjunctiva or cornea with no tissue blanching or ischaemia) is found, the patient should be referred to ophthalmology for further assessment.

Appropriate and timely irrigation is the key factor in the minimising preventable vision loss from chemical injury

Literature

References [10-15 max]

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3. Yanoff M & Duker JS (2009) Ophthalmology 3rd edition Mosby
4. Kompa S, Scharek B,Tympner J,Wustemeyer H ,Schrage N (2002). Comparison of Emergency Eye-Wash Products in Burned Porcine Eyes. *Grafes Archive of Clinical & Experimental Ophthalmology.* 2002 240(4) 308-13
5. Smith J Marsden J (2013) Chemical Eye injury: basic science and implications for practice IJOP 4,2 74-79
6. McGee HT Fraunfelder FW (2007) Toxicities of topical ophthalmic aneasthetics Expert opinion on Drug Safety 6,6 637-640
7. Schrage N (2011) Rinsing Therapy of Eye Burns Ch 6 In: Schrage N, Burgher F , Blomet J et al. eds, *Chemical Ocular Burns*. Springer, London

Further reading and useful links [5 max]

1. Ophthalmic Approach to Chemical Burns http://emedicine.medscape.com/article/1215950-overview#a0104
2. Marsden J (2007) ed *An Evidence Base for Ophthalmic Nursing Practice* John Wiley, Chichester.
3. **Marsden J** (1999) Ocular burns A&E *Emergency Nurse* 6,10. 20-24

Reflective activity

1. How do you, or are you going to ensure immediate irrigation of chemical eye injury in your department (before registration or triage)?
2. If you have irrigated an eye in the past, think about how you knew that you had irrigated for long enough and reflect on whether this new knowledge would change or amend your decision or the knowledge base for it

[[FOOTER SECTION]]

Please note that information provided by Nursing Standard is not sufficient to make the reader competent to perform the task. All clinical skills should be formally assessed at the bedside by a

nurse or nursing student's peers, educators and mentors. It is all nurses' responsibility to ensure their practice remains up to date and reflects the latest evidence.