

Procedure for eye irrigation to treat ocular chemical injury

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Abstract Chemical contamination of the eye can cause long-term damage and sight loss. This article describes the procedure for eye irrigation, which aims to remove contamination from the eye and limit long-term complications for the patient.

Citation Gwenhure, T (2020) Procedure for eye irrigation to treat ocular chemical injury. *Nursing Times* [online]; 116: 2, 46-48.

Eye irrigation is undertaken to remove foreign bodies from the eye and to treat chemical injuries (Stevens, 2016). It can also be used pre-operatively to prepare the eye for surgery or to manage infection (Dougherty and Lister, 2015).

Ocular chemical injuries or burns are usually caused by alkaline or acid substances (Fig 1). They are medical emergencies, as they can result in permanent damage to the cornea and conjunctiva (Stevens, 2016). Alkaline substances tend to cause more damage than acids, as they penetrate the ocular surface and can damage internal structures of the eye if irrigation is delayed.

Examples of alkaline substances include:

- Household cleaners;
- Fertiliser;
- Drain and oven cleaners;
- Lime compounds such as cement and plaster.

Example of acidic substances include:

- Sulphuric acid found in car batteries;
- Limescale removers;
- Wart and verruca treatments.

The procedure for eye irrigation can save sight and should be carried out immediately if a patient presents with a chemical injury to the eye (Bagheri and Wajda, 2017).

Patient history

It is vital to obtain as much information about the chemical(s) involved in the injury. However, any problems in obtaining this information should not delay irrigation, which should be started as soon as possible.

It is important to record:

- The time the injury occurred;
- The chemical involved (if known);
- Any action/first aid taken immediately after the injury.

Irrigation fluid

Dougherty and Lister (2015) suggest that sterile water should be used for irrigation – or tap water in an emergency. Sodium chloride 0.9% or Ringer's lactate solution can also be used. Corbett and Bizrah (2017) suggest there is no evidence to support the use of one irrigating fluid in preference to another. The volume of irrigation fluid required depends on the contamination and may vary from 1-2L to as much as 8-10L.

Equipment

Fluid can be delivered to the eye using:

- Undine eye irrigation unit – this container is specifically designed for irrigation and allows a steady flow of the irrigation fluid thereby preventing further damage (Fig 2);
- Intravenous giving set – fluid delivery can be controlled using the tubing clamp.

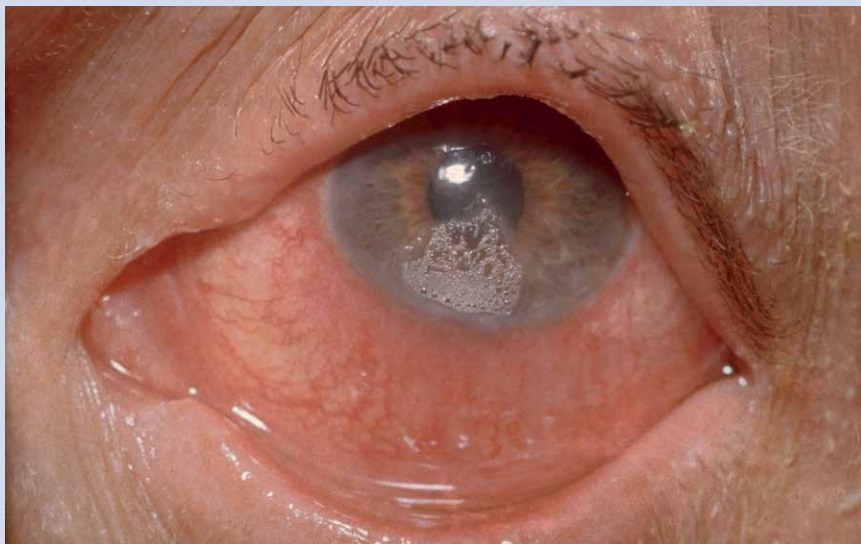
Some units also use a Morgan Lens – this resembles a contact lens connected to tubing; it sits over the eye and can be attached to an intravenous infusion set (Dougherty and Lister, 2015).

The method used will depend on local policy and availability of equipment. This procedure describes the use of an undine and of an intravenous infusion set.

Patient comfort

Chemical contamination of the eye can be extremely painful; instilling anaesthetic eye drops before starting irrigation can make the procedure more comfortable. An eye injury can also be frightening, and the patient may have concerns about loss of

Fig 1. Chemical burn to the eye



Clinical Practice

Practical procedures

vision. It is important to carefully explain each step of the procedure to the patient and offer reassurance when the eye is being irrigated, as they may not be able to see what is happening to them.

Checking pH of the eye

The pH scale is used to measure how acidic or alkaline a solution is on a scale of 1 (very strong acid) to 14 (very strong alkali), with 7 as neutral. The normal pH of tears is between 7.0-7.4 (Corbett and Bizrah, 2018).

When chemical contamination of the eye is suspected, the pH of the patient's tears should be assessed using universal indicator paper. This will help identify the cause of the injury and evaluate treatment. If only one eye is affected by contamination, it is important to check the pH in both eyes as the pH of the unaffected eye can be used as a control to evaluate treatment. However, if there are problems testing the pH, this should not delay irrigation. Even if the pH is found to be normal, irrigation should be commenced if chemical injury is suspected (Corbett and Bizrah, 2018).

Glove use

Staff undertaking eye irrigation must wear disposable gloves and apron to protect them from exposure to the chemical that caused the injury, following local policy. These should be disposed of according to local policy after the procedure.

Procedure for eye irrigation

Equipment

- Clean and dry work surface or trolley;
- Dressing pack;
- Towel or waterproof cape;
- Sterile plastic undine (Fig 2) or intravenous infusion set;
- Sterile kidney dish;
- Universal indicator strips;
- Local anaesthetic drops, as prescribed according to local policy;

Sterile irrigating fluid (sodium chloride solution 0.9%, sterile water for irrigation or Ringer's lactate). A bottle of fluid is required to fill the undine and an infusion bag should be used with an infusion set.

The procedure

1. Explain the procedure to the patient, check for any allergies and obtain informed consent.
2. Wash hands with soap and water to ensure there is no risk of a chemical reaction between the decontaminant and the chemical involved in the chemical injury. Put on gloves and an apron.

3. Ensure the patient's privacy by screening the bed or ensuring their room door is closed.

4. Check whether the patient wears contact lenses and, if so, remove these before irrigation (Corbett and Bizrah, 2018).

5. If possible, check the pH of the patient's tears in both eyes by gently pulling down the lower eyelid and inserting a folded end of a universal indicator strip into the space between the eyelid and eyeball (Fig 3). After about 30 seconds, remove the pH paper, compare the colour against the universal indicator chart and record the results for each eye.

6. After checking for allergies, administer local anaesthetic eye drops to the eye following local policy to help relieve distress and discomfort during the procedure (see Shaw (2014) for more information on instillation of eye drops). Instilling the drop at this stage will ensure they work before commencing the irrigation. Anaesthetic drops can be repeated if necessary during the irrigation.

7. Assemble the equipment.

8. Position the patient in a sitting or lying position with their head well supported. A supported position will help minimise discomfort during the procedure (Dougherty and Lister, 2015).

9. Cover the patient's neck and shoulders with a towel or waterproof cape to prevent irrigation fluid soaking their clothing.

10. Remove and dispose of gloves, wash your hands and apply fresh disposable gloves.

11. Open the dressing pack on the clean surface and assemble the equipment on the side of the patient with the eye to be irrigated.

12. If using an undine unit for irrigation, fill it with the chosen irrigation solution.

13. If using an intravenous infusion set, hang the bag of irrigation fluid on an infusion stand and attach and prime the infusion set. The flow of irrigation fluid through the infusion set can be regulated with the tubing clamp (Fig 4).

14. Ask the patient to turn their head towards the affected side and place a

Fig 2. Sterile undine unit is used to irrigate the eye



Fig 3. Test the pH of the patient's tears using universal indicator paper

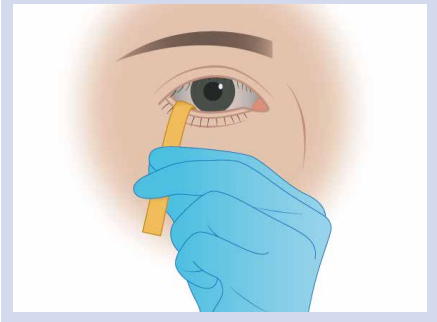


Fig 4. The tubing clamp should be used to control the flow of fluid onto the eye



kidney dish next to their cheek (Fig 5). This will collect the irrigation fluid. The patient may be able to hold the dish but it can be helpful to have a second person to help.

15. Pour a small amount of irrigation fluid from the undine or infusion set across the patient's cheek. This will familiarise the patient with the sensation of the fluid

Fig 5. Position the patient with their head well supported and place a kidney dish against their cheek on the affected side

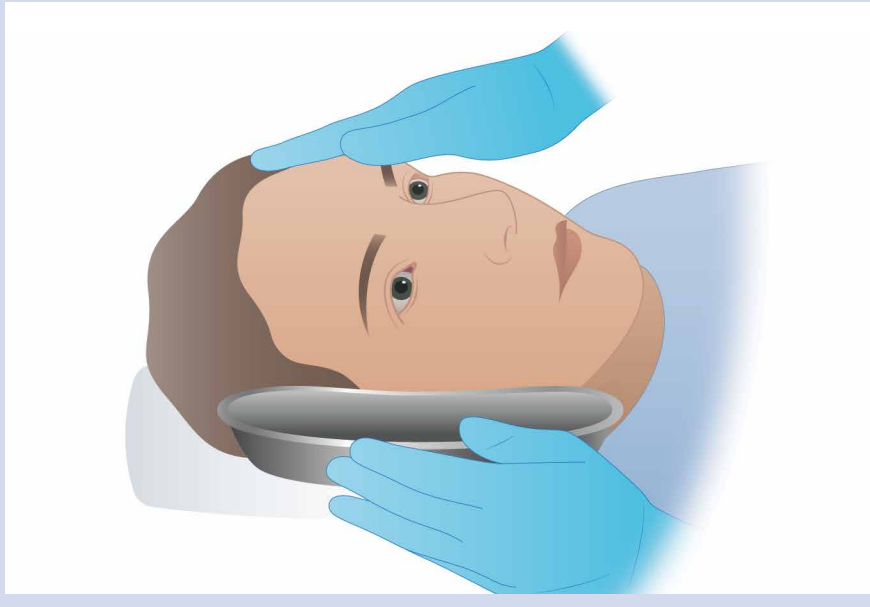
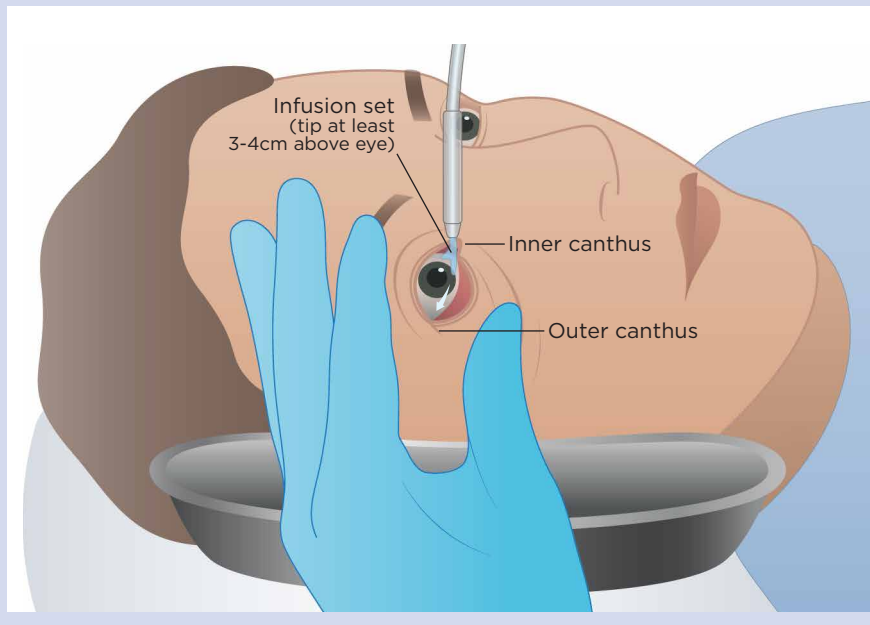


Fig 6. Irrigate the eye from the inner canthus to the outer canthus



before starting the procedure (Dougherty and Lister, 2015).

16. Tell the patient that irrigation is going to start. Irrigate from the inner canthus to the outer canthus. Irrigating in this direction will aid the drainage of fluid and reduce the risk of contamination of the patient's other eye (Fig 6). The spout of the undine or tip of the infusion set should be at least 3-4cm away from the eye to protect the eye from being damaged by the force of the irrigation fluid.

17. Continue irrigation for 30 minutes, asking the patient to look in all directions to ensure the whole eye surface has been irrigated. Evert the upper and lower eye

Professional responsibilities

This procedure should be undertaken only after approved training, supervised practice and competency assessment, and carried out in accordance with local policies and protocols.

lids to wash away the chemical contamination. A moistened cotton bud can be used to remove any solid debris.

18. Stop the irrigation after 30 minutes, use a low-lint swab to dry the eyelids and make the patient comfortable. Ensure they are warm and dry.

19. After 5 minutes, retest the pH of the tears. This interval ensures that the irrigation fluid has been cleared from the eyes and the pH of the tears is being assessed rather than that of the irrigation fluid. If the pH of the eye is outside the normal range, irrigation should be recommenced and continue until a normal pH of 7.0-7.4 is achieved (Corbett and Bizrah, 2018). If only one eye is affected, the pH in the unaffected eye can be used as a control.

20. When the procedure is completed, remove the towel or cape from the patient's shoulders and dispose of equipment according to local policy.

21. Make the patient comfortable. Ensure they are warm and dry and explain the outcome of the procedure.

22. Remove and dispose of your apron and gloves according to local policy. Decontaminate your hands and record the procedure and outcome in the patient's notes. This should include the amount of irrigation fluid used, the length of the irrigation and the pH readings.

Post-irrigation care

Following the procedure, the pH of the patient's eye should be checked every 15 minutes over the course of an hour. If the pH falls outside of the normal range, then irrigation should recommence until the pH returns to normal (Corbett and Bizrah, 2018).

After the procedure, the patient's vision must be assessed and any relevant history recorded. **NT**

References

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