UNCERTAINTIES PAGE

Should we advise patients with sutures not to swim?

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This is one of a series of occasional articles that highlight areas of practice where management lacks convincing supporting evidence. The series adviser is David Tovey, editor in chief, the *Cochrane Library*. To suggest a topic for this series, please email us at uncertainties@bmj.com.

Patients often ask when they can swim after a wound has been sutured. Despite such an apparently simple query, evidence supporting any answer seems to be lacking. Many patient information sites advise against swimming after the suturing of wounds[1] but fail to provide evidence to support this recommendation. Advice is broad ranging and inconsistent.[1] Current information ranges from waiting until the sutures are removed and the wound has healed[1] to abstaining from swimming for six weeks postoperatively.[2] Patients with external frame fixators are advised that it is permissible to swim in a chlorinated pool or clean sea water, although in practice this is difficult to ascertain and is far from an objective measure, once the pin sites have healed.[3] Evidence to back up the advice is scarce.

Concerns about the risks of swimming with a sutured wound primarily centre on the potential for infection,[4 5] as opposed to impaired wound healing. The risk of infection depends on the type of wound (for example, an open wound might be said to be at higher risk than an epithelialised wound), comorbidities, the type and quality of water in which patients plan to swim, and the relative risks of complications should the wound become infected. Wound infections can result from exposure to aquatic microbes in treated swimming pools and fresh or marine water.[4-6] The infective organisms vary accordingly.

It is, however, difficult to quantify the risk of infection in sutured wounds and hence giving an evidence based answer when patients ask about swimming is problematic.

What is the evidence of the uncertainty?

To tackle our dilemma on how to advise patients on swimming with sutures, we searched PubMed, Embase, and Cochrane databases for articles on swimming related wound infections using combinations of the key words "swimming", "infection", "wound management", "water", "sutures", "post operative", and "skin". No time or language restrictions were applied, and we screened the references of selected articles.

Out of over 250 screened articles, of all available published evidence, including surveillance reports and case reports, we identified only one case report on infection in a sutured wound attributed to water exposure, which occurred in a hospital rehabilitation pool.[7] Neither the Centers for Disease Control and Prevention, which publishes rates of waterborne infections,[5 8] nor the World Health Organization guidelines for safe recreational water[4] report any infection of sutured wounds caused by swimming.

The highest numbers of dermatological infections from exposure to water arise in swimming pools,[5] yet the greatest risk in this environment is from gastrointestinal infections, related to organisms such as *Escherichia coli* and Cryptosporidium.[8] The commonest dermatological bacterial pathogens in swimming pools are *Pseudomonas aeruginosa* and *Staphylococcus aureus*.[5 9] Marine organisms of concern include *Vibrio* species and *Mycobacteria*.[10] Skin associated illness accounted for only 1.3% (46/3376) of cases of disease outbreaks from exposure to recreational water, none attributed to infection of sutured wounds.

Aquatic microbes can enter the body through breaks in the skin, resulting in a range of conditions from skin irritation to systemic sepsis and limb threatening necrotic infections.[9] Reported infections from marine[10] and fresh water pathogens[6] are predominantly caused by injury sustained within the water or from pre-existing wounds that have not been sutured.[10] Evidence to help in the quantification of the risk of aquatic microbes entering the skin through an adequately closed wound is lacking.

The location chosen for swimming is pertinent as concentrations of bacteria in swimming, fresh, and marine water vary considerably. The bacterial count of the bathing medium is important for calculating the risk of infections. The levels of bacteria in public swimming pools are closely governed to minimise the presence of faecal coliforms, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and other pathogens. In addition, levels of faecal and non-faecal organisms in marine and recreational fresh water are monitored.[4] Despite this the concentration of bacteria in swimming pools often exceeds recommended levels,[11] and up to 100 million bacteria can be present in every litre of sea water.[12] Overall, the risk of infection while swimming in open water seems less than that of a sheltered or recreational pool.[8] The risk of infection from swimming with a wound of any type is, however, still unclear.

The risk of infection depends not only on the nature of the wound[5] and the water in which the patient swims, but also on comorbidities and the virulence of the pathogen.[10] The range of comorbidities that might influence the risk of infection are diffuse, including those that influence local conditions in the skin (for example, eczema) and systemic immunodeficiency (for example, diabetes mellitus).[9] Certain immunodeficiencies are associated with a particular predisposition to infection with aquatic pathogens (for example, iron overload) and infections with *Vibrio*,[13] cellular immunodeficiency (such as chronic granulomatous disease), and mycobacterial infections.[9] Aquatic derived wound infections are rare but can be devastating, resulting in severe illness, septicaemia, limb amputation, or death.[5] Evidence to help in the quantification of this risk for patients with comorbidities is lacking.

No systemic reviews have assessed the risk of infection from swimming. In the absence of any direct evidence on risks from swimming with sutured wounds, outcomes have to be extrapolated from other evidence related to water and wounds in general. Two Cochrane

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Previous articles in this series

- Whom should we "test and treat" for *Helicobacter pylori*? (*BMJ* 2014;348:g3320)
- Should doctors prescribe cannabinoids? (*BMJ* 2014;348:g2737)
- Is adrenaline safe and effective as a treatment for out of hospital cardiac arrest? (*BMJ* 2014;348:g2435)
- What is the most effective operation for adults with severe and complex obesity? (*BMJ* 2014;348:g1763)
- How effective is tranexamic acid for acute gastrointestinal bleeding? (*BMJ* 2014;348:g1421)

RECOMMENDATIONS FOR FURTHER RESEARCH

Population: non-immunocompromised adults with sutures after elective minor surgical procedures

Intervention: allow swimming with sutures in situ

Comparison: two groups, one allowed to swim with sutures and the other not

Outcome: rates of surgical site infection and delays to wound healing

level meta-analyses can provide some insight.[14 15] In a systematic review of 11 trials, both randomised and quasi-randomised, with 3449 participants combined and a variable risk of bias, infection rates did not differ statistically among wounds cleaned with tap water (which has a known, albeit low, quantity of bacteria) compared with those cleaned with sterile saline solution.[15] Furthermore, the risk of infection does not seem to be increased by timing: another Cochrane review showed that the rate of infection was similar between patients with surgical wounds who showered early (within 12 hours postoperatively) and those who showered late (>48 hours postoperatively).[14] However, this comprised only one prospective randomised trial with 857 patients and was found to have a high risk of bias. The quality of the evidence was, however, poor.[14 15]

Guidelines from the National Institute for Health and Care Excellence on the postoperative care of wounds recommend that sutured wounds should be sufficiently epithelialised at 48 hours to sustain bathing and showering, but they do not mention when swimming might be allowed.[16] Although the rationale purported by NICE for waiting 48 hours before cleansing is to allow time for wounds to re-epithelialise and therefore the integrity of skin to be restored, the evidence for this time point is not stated.[16]

Is ongoing research likely to provide relevant evidence?

Although several studies are underway to reduce the incidence of wound infection and look at intraoperative and postoperative measures to reduce infection, we found none directly relating to swimming. Our search of ClinicalTrials.gov, PubMed, and Centerwatch.com found several studies underway on intraoperative and postoperative measures to reduce infection, but none directly related to swimming. The box outlines recommendations for further research.

What should we do in the light of the uncertainty?

In the absence of quality evidence, common sense solutions have to be arrived at by extrapolating evidence from allied specialties. Once a wound is epithelialised (provided that edges are closely approximated) it can be cleansed, and potentially patients should be able to swim either in the sea or in a swimming pool. The timing is difficult to adequately quantify and so patients should be advised that they can return to swimming once sutures have been removed and the wound is fully healed. This ensures that the integrity of the skin has been restored thereby decreasing the chance of infection from microbial entry through the wound. Showering wounds before 48 hours does not seem to increase the chance of infection.[14] This advice can, conceivably, be viewed as overly cautious.

The timing of suture removal depends on the type and location of the wound, but it is usually within seven to 10 days. Absorbable sutures may persist beyond this time, and vigilance is required to ensure their removal before swimming. Patients with comorbidities that increase the chance of infections are at increased risk and therefore swimming should be discouraged. Swimming before this time exposes patients to a small risk of waterborne infection, which, although potentially tolerable in a healthy cohort of patients, presents an increased risk in those with localised or systemic reasons for delayed wound healing. In general, patients with open wounds or ulcers should refrain from swimming[5]; this does not purport directly to surgical wounds, but through extrapolation should include them.

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10-MINUTE CONSULTATION

Eyelid lumps and lesions

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This is part of a series of occasional articles on common problems in primary care. The *BMJ* welcomes contributions from GPs

A 65 year old roofer presents to his GP with a slow growing lower lid lump of several months' duration. It is not tender but there is involvement of his lid margin.

What you should cover

Eyelid lumps have a variety of causes, ranging from innocuous cysts to malignant lesions. Although sinister pathology is rare, early identification and referral are essential to ensure a good outcome.

History

Is it chronic?—Chronic lesions include papillomas (viral warts), naevi, sebaceous cysts, and molluscum contagiosum. These all have the same appearance as elsewhere on the body. Molluscum near the lid margin can cause a persistent follicular conjunctivitis.

Chalazia (figure 1) are the commonest chronic eyelid lumps. They are caused by a blocked meibomian gland. Chalazia are entirely benign; however, it is important to be suspicious of a recurrent chalazion in the same position as this might represent a malignancy.

Is it tender?—Tender eyelid lumps and lesions are often acute and associated with infection. Hordeolum externum (a stye) arises from a staphylococcal infection of a lash follicle, presenting as a tender, erythematous, pus filled lesion near the eyelid margin. Hordeolum internum (an infected chalazion, figure 2) presents similarly, but is located away from the lid margin.

Dacryocystitis (figure 3), an infection of the lacrimal sac caused by a blocked nasolacrimal duct, is another periocular tender swelling. It is located beneath the medial canthus, and patients will often give a history of a watery eye.

Is it evolving?—As with skin lesions elsewhere, always consider malignancy. Is there a history of excessive sun exposure, immunosuppression, or skin conditions such as actinic keratosis? These are all risk factors for squamous cell carcinoma (figure 4).

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Previous articles in this series

- Eustachian tube dysfunction in adults (*BMJ* 2014;348:g1647)
- Diagnosis and management of chronic heart failure (*BMJ* 2014;348:g1429)
- Baby with an abnormal head (*BMJ* 2014;348:f7609)
- A feeling of a lump in the throat (*BMJ* 2014;348:f7195)
- Tremor (*BMJ* 2013;347:f7200)

Fig 1 | Lower lid chalazion of the left eye. The lid margin is not distorted and there is no madarosis (loss of eyelashes), suggesting a non-sinister lesion

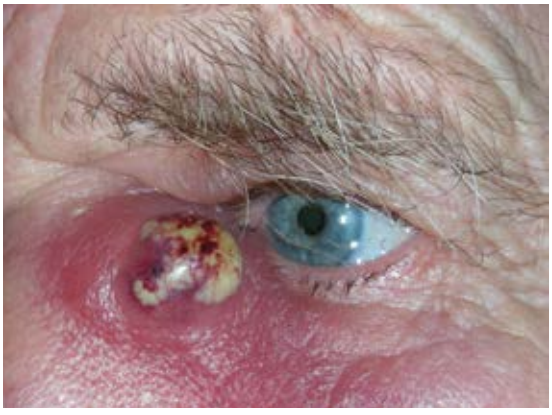

Fig 3 | Acute dacryocystitis of the left medial canthal area with abscess formation and localised cellulitis

Fig 2 | Left upper lid internal hordeolum with limited cellulitis

Fig 4 | Ulcerating squamous cell carcinoma of the right upper lid. Note the madarosis and the irregularity of the lesion

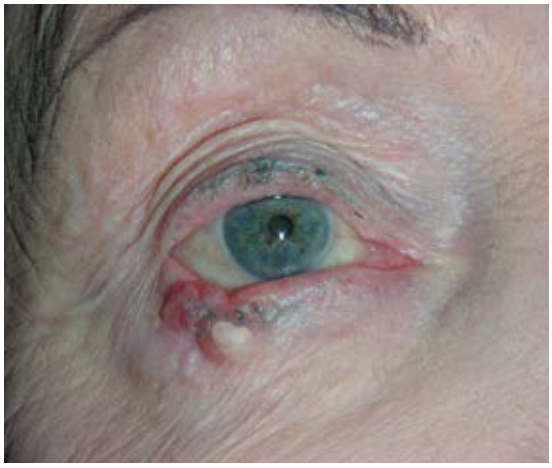

Fig 5 | Nodular basal cell carcinoma of the right lower lid. Note the distorted lid margin, pearlescent rolled edge, and telangiectactic surface vessels

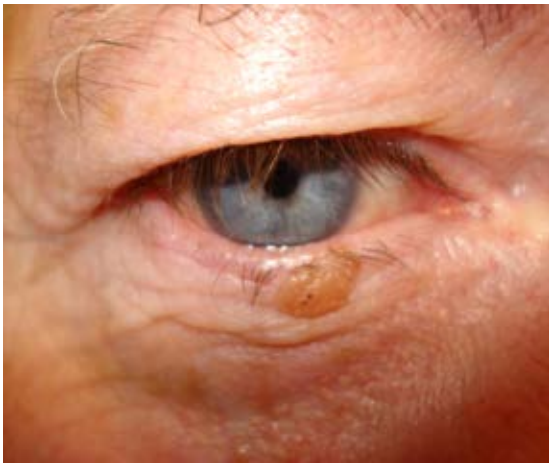

Fig 6 | Right lower lid non-pigmented seborrhoeic keratosis. Note the presence of eyelashes over the lesion and the regularity of the lid margin suggesting a benign lesion

More specific points to ascertain from the history include the following questions. Is there discharge from the eye? (a possible sign of an infective process), and is there blurring of vision? This might indicate an internal lid lesion causing corneal compression or increased tear secretion.

Examination

Location—Although chalazia, basal cell carcinomas, and squamous cell carcinomas can occur on the upper or lower lid, chalazia are more common on the upper lid, whereas basal cell carcinomas and squamous cell carcinomas are more common on the lower lid because of exposure to sunlight. Basal cell carcinomas also have a predilection for the medial canthus.

Surface features—Any ulcerating lesion should raise concern. A squamous cell carcinoma is typically an ulcerating or hyperkeratotic lesion (figure 4). Of the many types of basal cell carcinomas, the most common is nodular (figure 5). It exhibits a pearly edge with surface telangiectasia, which might have central ulceration.

Appearance of the surrounding skin—Erythema might indicate a focal infection such as an external hordeolum, internal hordeolum, or dacryocystitis. Diffuse erythema suggests an associated cellulitis.

Mobility of lesion—Mobile lesions include papillomas. Immobile lesions include sebaceous cysts, which are often found at the medial canthus.

Colour/pigmentation—Seborrhoeic keratoses (figure 6) and cutaneous naevi are common benign pigmented periocular lesions. Eyelid melanomas are rare but lethal. A spreading pigmented lesion of the eyelid should raise concern. However, half of eyelid melanomas are clinically non-pigmented, which can raise diagnostic uncertainty. The mnemonic ABCDE (Asymmetry, irregular Border, Colour variegation, large Diameter, Elevation) is a useful aid to remember features suggestive of a malignant melanoma.

Yellow plaques, commonly bilateral and located medially, are likely to be xanthelasma.

Translucency—Suggestive of a cyst of Moll (figure 7), a benign fluid filled swelling arising from an obstructed sweat gland.

Size—It is essential to document the size of the eyelid lump or lesion to aid monitoring of the lesion. Serial photographs can assist in documenting a change in size.

If possible, evert the lower and upper lid because lesions that seem small might have a large component hidden from direct view. Also, examine the regional lymph nodes when suspecting a squamous cell carcinoma—20% of lesions spread to these nodes.

Red flags

- Distortion of the lid margin
- Loss or whitening of eyelashes
- Recurrent "chalazia" in the same position
- Skin ulceration or bleeding
- Diplopia
- Proptosis

These red flags might represent a malignancy. The latter two indicate orbital invasion.

Fig 7 | Cyst of Moll of the right lower lid involving the punctum. The lesion is regular and fluid filled

USEFUL READING

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4 GP Notebook. Pages covering benign and malignant eyelid lesions. www.gpnotebook.co.uk/simplepage.cfm?ID=-1221263288, www.gpnotebook.co.uk/simplepage.cfm?ID=-187695042

What you should do

Conservative management

- Warm compresses applied to closed eyelids might be helpful for small chalazia, internal and external hordeola. The role of topical antibiotics is debatable. Oral antibiotics should be used if there is an associated cellulitis.
- Xanthelasma are unlikely to resolve spontaneously. It is important to check the levels of serum lipid because half of all xanthelasma are associated with raised levels of lipids.
- Reassure patients about papillomas; they are harmless and might resolve spontaneously.
- Ask patients to self monitor naevi and to re-present if there is growth or any change.
- Lubricants might alleviate symptoms from a follicular conjunctivitis associated with molluscum.

Routine referral

Potentially, persistent chalazia, sebaceous cysts, cysts of Moll, and seborrhoeic keratoses can be excised at a local minor operations clinic either in the community or in the hospital, depending on the local contractual arrangement. If no sinister features are present, and the patient does not want cosmetic removal, self observation by the patient is advised.

Urgent referral

Refer urgently to a specialist if any of the red flags are present or there is a suspicion of malignancy.

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ANSWERS TO ENDGAMES, p 36

For long answers go to the Education channel on bmj.com

ANATOMY QUIZ

Radiograph of a 3 year old child's right foot

A: Centre for the right middle cuneiform bone

B: Centre for the right medial cuneiform bone

C: Centre for the right navicular bone

D: Centre for the right lateral cuneiform bone

E: Centre for the right cuboid bone

STATISTICAL QUESTION

What is an open label trial?

Statement *a* is true, whereas *b*, *c*, and *d* are false.

PICTURE QUIZ

Sudden onset double vision

1 Left internuclear ophthalmoplegia. It is caused by impairment of conjugate eye movements owing to injury to the medial longitudinal fasciculus on the side of the impaired eye.

2 The diffusion weighted image shows a small hyperintense lesion in the left upper pons, in the region of the medial longitudinal fasciculus.

3 In older patients with vascular risk factors, internuclear opthalmoplegia is most commonly caused by a vascular brainstem lesion, with an infectious process affecting the brainstem less likely. In younger patients, multiple sclerosis should be suspected; in such cases internuclear opthalmoplegia is often bilateral.

4 Secondary prevention should be initiated, including anticoagulation for atrial fibrillation with a novel oral anticoagulant. The patient should also be referred to occupational therapy and orthoptic services to aid rehabilitation of any persistent visual deficit.