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PRACTICE

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

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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 level meta-analyses can provide some insight.[14 15] In a systematic review of 11 trials, both randomised and quasirandomised, 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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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

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