Effects of preoperative warming on the incidence of wound infection after clean surgery

Andrew C Melling et al The Lancet, Vol 358, September 15, 2001

Wound infection after clean surgery is an expensive and often underestimated cause of patient morbidity, and the benefits of using prophylactic antibiotics have not been proven. Warming patients during colorectal surgery has been shown to reduce infection rates. This study aimed to assess whether warming patients before short duration, clean surgery would have the same effect.

This randomised trial to investigate the effects of preoperative warming using a local warming device and a warm air blanket involved patients having clean breast, varicose vein or hernia surgery. Clean surgery is defined as uninfected, operative surgery, where no inflammation is encountered and the respiratory, alimentary, and genitourinary tracts are not opened.

Wound infection is one of the most common causes of morbidity in the surgical patient despite advances in surgical practice and the use of prophylactic antibiotics. The average cost of a surgical wound infection is difficult to estimate, but hospital costs alone may be over £1500 per patient.

The costs of treatment after discharge from hospital, where most wound infections are now diagnosed, or the cost to the patient in prescription charges, loss of earnings and a reduced quality of life, are rarely taken into account

The surgical episode and the first few hours afterwards have been widely accepted as the key period when a wound infection is likely to become established. This paper suggests that the hour before surgery may be just as important.

Most studies suggest that the infection rate in clean surgery is 5% or lower but some have shown that if patients are followed up intensely for 6 weeks after surgery, and the definition of infection is not only limited to the presence of a purulent discharge, then infection rates might be nearer 10%.

Many factors reduce the incidence of surgical wound infection. Intraoperative hypothermia increases the risk because it is likely to cause a reduction in peripheral circulation, which may increase tissue hypoxia and make the wound more susceptible to infection. The process of warming using a warm air blanket is becoming common practice for most major surgery. An alternative may be to warm patients before short duration, usually day case, surgery.

Study methods

The patients were randomly assigned to either a nonwarmed (standard) group or one of two warmed groups (local and systemic). Warming was applied for at least 30 minutes before surgery.

Patients were followed up and assessments made at 2 and 6 weeks. Patients assigned to the non-warmed (standard) group received the usual preoperative care, which does not include any active temperature control. Patients in the systemic warming group received the same standard preoperative care, plus the addition of a minimum 30 minutes preoperative warming to the whole body using a forced-air, warming blanket. Patients in the local warming group also received the standard care and a minimum 30 minutes preoperative warming to just the planned wound area using a noncontact, radiant heat dressing. Both warming devices were left in situ until just before surgery.

A trained observer, unaware of treatment allocation, reviewed patients at 2 and 6 weeks, observing wounds directly and interviewing patients briefly about their wound history. A patient diary was given to all patients and aided the process of wound surveillance. Wounds were swabbed for microbiological analysis if a purulent discharge was present at review. Wounds were classed as infected if there had been a purulent discharge or a painful erythema that lasted for 5 days and was treated with antibiotics within 6 weeks.

The effects of preoperative warming on primary outcomes were tested by combining the systemic and local warming groups into one warmed group, which was then compared with the non-warmed group. The two warmed groups were also compared individually with the non-warmed group and also compared with each other to identify any differences in outcome.

Main findings

- Analysis was done on an intention-to-treat basis. There were 19 wound infections in 139 non-warmed patients (14%) but only 13 in 277 (5%) who received warming. Wound scores were also significantly lower in warmed patients.
- There was no significant difference in the development of haematomas or seromas after surgery but the non-warmed group were prescribed significantly more postoperative antibiotics.
- Warming patients before clean surgery seems to aid the prevention of postoperative wound infection. If applied according to the manufacturer's guidelines these therapies have no known side-effects and might, with the support of further studies, provide an alternative to prophylactic antibiotics in this type of surgery.

Core temperatures

The characteristics of the three groups were similar. Core temperatures were significantly increased by both local warming and systemic warming. The mean core temperature after surgery was within normal limits. Patients who were assigned to the local warming group received a significantly longer period of warming than the systemic warming group.

The overall rate of surgical wound infection was 8%. There was a lower rate of wound infection in the combined warming group when compared with the group of patients who were not warmed.

Individually both systemic warming and local warming had a significant effect on the rate of wound infection. Less wound infection was reported in patients who were locally warmed compared with those in the systemically warmed group, however, this was not significant.

Preoperative warming did not significantly reduce other wound complications such as haematoma, seroma, and wounds requiring aspiration but fewer patients who were warmed were given postoperative antibiotics than those who received no warming.

This study showed that a 30 minute period of warming, before surgery, reduces infection rates from 14% to 5%

The length of surgery was short and core temperatures in the recovery room did not suggest that patients were hypothermic but due to the whole surgical episode: anxiety, fasting, anaesthetic and surgery, the patients were likely to have had reduced peripheral circulation before, during and immediately after surgery.

A previous study on healthy volunteers showed that tissue oxygen partial pressure can be increased by local radiant heating, which persisted for 3 hours after removal. If applied, as in this study, before short duration surgery, the 3 hours of increased partial pressure of oxygen could be long enough to sustain the patient's host defences through the decisive period where infection is most likely to become established.

Pre-warming patients appeared to have no adverse side-effects. Initial concerns were raised by some surgeons, who felt that patients bled more at the beginning of their operations but this does not appear to have caused any complications.

There was no difference in outcome between the two types of warming. Both methods increased core temperature by a significant amount, but the patients in the local warming group were warmed for significantly longer periods – probably due to local warming not relying upon a mains supply, which meant it could be transported with the patient and remain in place until skin preparation.

The simple addition of two different types of warming, applied for at least 30 minutes before surgery, clearly reduced infection rates and the need for additional treatment. Preoperative warming may be an alternative to the use of prophylactic antibiotics that avoids the associated risks of allergy and resistance.

Find out more at www.molnlycke.com

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