Research Article

For reprint orders, please contact: info@becaris.com

Journal of **Comparative Effectiveness Research**

Safety of early postoperative showering in level-1 and level-2 surgical wounds: a retrospective study

Yao-ting Chang[‡,1], Chih-Sheng Lai[‡,2,3], Su-lan Liu[1] & Chia-Hsun Chang[*,1]

[1]Department of Nursing, Taichung Veterans General Hospital, Taichung, Taiwan, Republic of China

[2]Division of Plastic & Reconstructive Surgery, Department of Surgery, Taichung Veterans General Hospital, Taichung, Taiwan, Republic of China

[3]Department of Post-Baccalaureate Medicine, College of Medicine, National Chung Hsing University, Taichung, Taiwan, Republic of China

*Author for correspondence: Tel.: +886 4 2359 2525; up2u5400@gmail.com

‡Yao-ting Chang and Chih-Sheng Lai contributed equally to this work

Aim: Surgical site infections pose a significant challenge in postoperative care, traditionally managed by keeping wounds dry. However, recent studies indicate that early postoperative showering may not increase infection risk. This study aimed to assess the impact of permitting tap water showering 24 h after surgery, specifically evaluating its impact on infection rates in level-1 (clean) and level-2 (clean-contaminated) wounds within the field of plastic surgery. **Materials & methods:** Patients from the Plastic Surgery Department at Taichung Veterans General Hospital, Taiwan were selected. All patients underwent surgery by the same surgeon and were permitted to shower 24 h post operation. The primary outcome was the rate of postoperative wound infections. Data collected included demographics, comorbidities, wound characteristics, anesthesia type and surgical details. **Results:** A total of 106 patients were included, with a mean age of 48.5 years and a mean BMI of 24.61 kg/m^2. Males comprised 51.9% of the cohort, with hypertension present in 17.0%, diabetes in 7.5% and smoking in 8.5%. The median albumin level was 4.3 g/dl, and the trunk was the most common injury site (39%). The average operation duration was 40.1 min, with a median wound healing time of 15 days. Remarkably, only one wound infection occurred within 30 days, resulting in an infection rate of 0.9%. **Conclusion:** Early showering after plastic surgery does not compromise infection outcomes, supporting the safety of this practice for patients with level-1 or level-2 wounds.

Plain language summary: Is it safe to shower the day after plastic surgery? A study of 106 patients

What is this article about? This article looks at whether it is safe for patients to take a shower with tap water just 1 day after plastic surgery. Traditionally, patients are told to keep surgical wounds dry to prevent infection. However, new research suggests that early showering may not increase the risk of infection. This study aimed to find out if showering 24 h after surgery causes more wound infections in people who had clean or clean-contaminated wounds.

What were the results? The study included 106 patients who had surgery performed by the same surgeon. All of them were allowed to shower 1 day after their operation. Only one patient developed a wound infection in the 30 days after surgery, meaning the infection rate was less than 1%. Most patients healed well, and the average wound healing time was 15 days.

What do the results mean? Letting patients shower 24 h after plastic surgery appears to be safe for those with low-risk wounds. This finding may help improve comfort and hygiene after surgery, without increasing the risk of infection.

First draft submitted: 28 May 2025; Accepted for publication: 8 August 2025; Published online: 12 September 2025

Keywords: early postoperative showering • surgical site infection • SSI • wound care protocol • wound infection

Becaris PUBLISHING

Surgical site infections (SSIs) are a significant concern in postoperative care, often leading to prolonged hospital stays, increased readmission rates, higher healthcare costs, and severe complications, including disability and mortality [1]. Globally, the incidence of SSIs among surgical patients is approximately 2.5%, accounting for 20% of all healthcare-associated infections [2]. In Taiwan, SSIs are the fourth most common healthcare-associated infection in intensive care units, according to the Taiwan Nosocomial Infections Surveillance System [3].

Traditional postoperative wound care protocols often recommend keeping wounds dry to prevent infection, based on the assumption that water can introduce contaminants [4]. This recommendation has become an unwritten rule in wound care, as emphasized by the CDC in their 1985 guidelines [5]. However, this practice can be inconvenient and uncomfortable for patients, potentially impacting their mental well-being and overall recovery experience. Recent research suggests that proper wound area preparation and disinfection before and during surgery may reduce the risk of infection, even when wounds are exposed to water postoperatively [6,7].

Over the past decade, acute wound care practices have evolved significantly, with cleanliness becoming a crucial aspect of wound management [8,9]. The timing of when a patient should begin showering after a surgical procedure remains inconclusive, with recommendations varying based on the surgical specialty, type of procedure and individual surgeon preferences [10]. Moreover, factors such as the presence of implants or wound drains can further influence these decisions. Some studies suggest that showering as early as 48 h post surgery, once re-epithelialization has occurred, does not increase infection rates and may even enhance patient satisfaction [11,12]. Despite these findings, evidence on the timing of postoperative showering and its impact on infection rates remains limited.

Therefore, this study aims to explore the correlation between the timing of postoperative showering with tap water and the rate of wound infections in patients with level-1 and level-2 surgical wounds, with a specific focus on those undergoing plastic surgery procedures. We seek to contribute to the development of patient-centered wound care protocols that enhance patient comfort and satisfaction without compromising safety

Materials & methods

Study design & data source

This retrospective study utilized data from the medical records of the Plastic Surgery Department at Taichung Veterans General Hospital, a tertiary medical center in Taiwan. This study was approved by the Institutional Review Board (IRB) of the Medical Center (IRB no.: CE23369A).

Study population

The study population included patients who underwent surgical procedures in the Plastic Surgery Department at our institution, performed by the same surgeon (C-S Lai). Patients were selected using purposive sampling based on the following inclusion criteria: level-1 or level-2 surgical wounds; permission from their surgeons to shower; and wound locations including the face, head, trunk and limbs. The exclusion criterion was patients whose surgeons advised against initiating showering within 24 h post surgery. The decision to permit showering was based on the surgeon's judgment.

Sample size calculation

Sample size was calculated using G*Power 3.1.9.2 software. Based on a correlation model with a power (1-β) of 0.9, an alpha (α) level of 0.05, and an effect size of 0.3, the required sample size was calculated to be 88 patients. Additionally, considering a dropout rate of 20%, the final target sample size was set at 106 patients. Additionally, considering a dropout rate of 20%, the final target sample size was set at 106 patients.

Study outcome & data collection

The primary outcome was the rate of postoperative wound infections. Data collected from medical records included patient demographics (age, gender, BMI), comorbidities (hypertension, diabetes mellitus, smoking status, alcohol consumption, end-stage renal disease), wound characteristics (wound location, wound classification [level-1 or level-2]), anesthesia type (general anesthesia [13], local anesthesia [14]), surgical details (operation duration, type of surgical procedure), postoperative care (duration of antibiotic treatment, wound healing time, incidence of wound infection) and albumin levels.

Definitions

- Level-1 wound (clean wound): A wound with no signs of inflammation, not involving the respiratory, gastrointestinal, genitourinary, or reproductive tracts. The wound is primarily closed, and if drainage is necessary, it is performed using a closed system. This classification is in line with the American National Healthcare Safety Network (NHSN) criteria.
- Level-2 wound (clean contaminated wound): A wound involving the respiratory, gastrointestinal, genitourinary, or reproductive tracts under sterile conditions, without signs of active infection or significant breach in aseptic technique. This definition adheres to the established American NHSN standards.
- Showering: The process of washing the wound 24 h postoperatively using soap or a cleansing agent, followed by rinsing with tap water. In our study, patients were instructed to leave their wounds uncovered (i.e., without waterproof dressings) during showering.
- Postoperative wound infection: An infection occurring within 30 days post surgery, characterized by the presence of pus, a positive culture from a previously sterile site, or clinical signs of inflammation such as redness, warmth and swelling at the wound site.

Statistics analysis

Descriptive statistics were used to present patient characteristics and wound infection status. Continuous variables are reported as mean ± standard deviation (SD) or median and interquartile range (IQR), while categorical variables are presented as n (%). All statistical analyses were performed using IBM SPSS Statistics (version 22.0; IBM Corp., NY, USA).

Results

Data from 106 patients were analyzed. A summary of the descriptive statistics for patient characteristics and wound infection rates is presented in Table 1. The mean age was 48.5 years, and 51.9% of the patients were males. The mean BMI was 24.61 kg/m^2. Among the patients, 18 (17.0%) had hypertension, eight (7.5%) had diabetes mellitus, nine (8.5%) were smokers, four (3.8%) consumed alcohol and two (1.98%) had end-stage renal disease.

The median serum albumin level was 4.3 g/dl. The most common site of surgery was the trunk (n = 42, 39%), and 86% of patients underwent local anesthesia. The mean operation duration was 40.1 min. The median duration of antibiotic treatment was 7 days (IQR: 5–9 days), and the median wound healing time was 15 days (IQR: 14–22 days). At the 30-day postoperative follow-up, only one case of wound infection was documented, resulting in an infection rate of 0.9% (Table 1).

Discussion

This study investigated the association between showering with tap water starting 24 h postoperatively and the rate of postoperative wound infections in patients with level-1 or level-2 surgical wounds. Among 106 patients, only one case of wound infection was documented at the 30-day postoperative follow-up, resulting in an infection rate of 0.9%. This rate is notably lower than the 1–5% infection rate for clean wounds reported by the CDC, suggesting that early showering with tap water does not increase the risk of postoperative wound infections [15].

Surgical procedures inherently disrupt the skin and mucous membranes, which serve as the body's primary defense against microbial invasion. This disruption makes wounds susceptible to bacterial contamination, potentially leading to SSIs. Several factors contribute to the risk of SSIs, including patient-related factors such as comorbidities (e.g., diabetes and obesity), the type and urgency of surgery and the surgical technique employed [16,17]. Traditionally, water exposure has been considered a potential source of contamination and subsequent infection, raising concerns in postoperative care.

Wound healing is a well-established process that typically occurs in three phases: the inflammatory phase, the proliferative phase and the remodeling phase [18]. The inflammatory phase begins immediately after injury and lasts for approximately 2 days, during which the body works to prevent further blood loss and clear necrotic tissue. The proliferative phase, which spans from 48 h to 14 days post-injury, involves tissue regeneration and re-epithelialization. Finally, the remodeling phase, which can last from weeks to years, is characterized by collagen reorganization and tissue strengthening. Historically, it was believed that exposing wounds to water too early in this process could increase the risk of SSIs [19].

However, recent studies have challenged this traditional view, suggesting that early postoperative showering, as soon as 24–48 h after surgery, does not increase the risk of SSIs [20]. Our study supports this finding, demonstrating

Table 1. Characteristics of 106 patients with level-1 or level-2 surgical wounds who underwent various types of anesthesia.

Characteristics	Valid, n	Statistics
Age, years	106	48.5 ± 17.48
Sex	106	
Female		51 (48.1)
Male		55 (51.9)
BMI, kg/m^2	90	24.6 ± 4.59
Hypertension	106	18 (17.0)
DM	106	8 (7.5)
Smoking	106	9 (8.5)
Alcohol drinking	106	4 (3.8)
ESRD	106	2 (1.9)
Albumin, g/dl	22	4.3 (4.1–4.6)
Mode of anesthesia	106	
GE		16 (15.1)
GM		4 (3.8)
LA		86 (81.1)
Surgical site	106	
Upper limb		20 (18.9)
Lower limb		7 (6.6)
Head		28 (26.4)
Trunk		42 (39.6)
Multiple Sites		9 (8.5)
Operation duration, min	106	40.1 ± 38.56
Duration of antibiotic treatment, day	106	7 (5–9)
Wound healing time, day	105	15 (14–22)
Infection	106	1 (0.9)

DM: Diabetes mellitus; ESRD: End-stage renal disease; GE: General endotracheal anesthesia; GM: General mask anesthesia; LA: Local anesthesia.

that showering with tap water 24 h postoperatively is safe and does not increase the risk of wound infection. This aligns with the growing evidence emphasizing the importance of patient comfort and satisfaction without compromising safety.

In our study, the only documented case of infection involved a patient with a facial epidermoid cyst, from which *Staphylococcus epidermidis* was isolated. It is crucial to clarify that this was an endogenous infection related to the cyst itself rather than one attributable to water exposure. The wound management for the patient in the single reported infection case strictly adhered to the established standard care protocol, with no deviations observed in dressing changes, hygiene practices or the timing of the initial postoperative shower compared with other patients. Furthermore, we hypothesize that the low infection rates associated with early postoperative showering may be attributed to two key factors: the high quality of tap water in Taiwan and recent advancements in wound-dressing technology.

This study, focused on the plastic surgery setting, underscores the need for future research across various surgical specialties. Controlled trials with comparison groups are crucial for providing more robust evidence on the safety of early postoperative showering. Such studies would help refine guidelines for optimal patient care.

Strength & limitations

This study has several strengths, including the use of real-world data from a medical center in Taiwan, which enhances the generalizability and practical relevance of the findings. The study outcomes were clearly defined, allowing for precise measurement and interpretation of the results. However, this study also has several limitations, such as the lack of a control group. Excluding patients based on the surgeon's decision to prohibit showering could introduce selection bias, as these patients may have undergone more complex procedures or had higher risk factors for postoperative infection. As a result, the observed low infection rate may reflect a healthier or lower-risk

population, rather than the safety of early showering *per se*. This limitation restricts the generalizability of the findings to low-risk patients and warrants caution in applying the results to broader surgical populations. Furthermore, different types of surgeries and individual patient factors (e.g., comorbidities and wound characteristics) could introduce additional bias that was not fully accounted for in this study. Additionally, the 30-day follow-up period might not capture all instances of wound infection, particularly those that manifest later. Future research could consider extending the follow-up period to more comprehensively identify late-onset infections. Variable adherence to the postoperative showering protocol among patients may also confound the analysis. Moreover, the retrospective design inherently limits control over potential biases and uncontrolled variables. Overall, while this study provides valuable insights, further research with a randomized, prospective design and multicenter participation is needed to validate these findings.

Conclusion

In individuals with level-1 or level-2 surgical wounds, showering with tap water starting 24 h after surgery does not appear to increase the risk of wound infections. Our results support the safety and potential benefits of this practice, with an infection rate of only 0.9% at the 30-day follow-up. Allowing patients to shower early after surgery can enhance their comfort and satisfaction without compromising wound healing, while also reducing the burden on hospital nursing staff. However, the exclusion of patients based on surgeon discretion may have introduced selection bias, potentially underestimating infection risk. Further prospective studies with control groups and broader inclusion criteria are needed to confirm the safety of this practice across diverse surgical populations and establish more definitive guidelines for postoperative wound care.

Summary points

- Surgical site infections are a major concern in postoperative care and significantly impact patient outcomes and healthcare costs.
- Traditional postoperative wound care often discourages early showering due to concerns about contamination and infection risk.
- This study assessed the safety of allowing patients to shower with tap water 24 h after plastic surgery for level-1 and level-2 surgical wounds.
- A total of 106 patients were included, and the postoperative wound infection rate was only 0.9%.
- The single infection case was unrelated to water exposure and followed standard wound care protocols.
- The low infection rate may be attributable to high tap water quality and modern wound dressing materials.
- Early postoperative showering may enhance patient comfort and satisfaction without increasing infection risk.
- Findings support the development of evidence-based guidelines for safe, patient-centered postoperative wound care, though prospective controlled studies are needed.

Author contributions

Conceptualization: Y-t Chang, C-S Lai; data curation: Y-t Chang, C-H Chang; formal analysis: Y-t Chang, C-S Lai, C-H Chang; funding acquisition: Y-t Chang, C-S Lai; investigation: Y-t Chang, C-S Lai, C-H Chang; methodology: Y-t Chang, C-H Chang; project administration: S-l Liu; resources: Y-t Chang, C-S Lai, C-H Chang; software: Y-t Chang, C-H Chang; supervision: C-S Lai, S-l Liu; validation: C-S Lai, S-l Liu; visualization: C-S Lai, S-l Liu; writing – original draft: Y-t Chang, C-H Chang; writing – review and editing: Y-t Chang, C-S Lai.

Financial disclosure

The authors received no financial and/or material support for this research or the creation of this work.

Competing interests disclosure

The authors have no competing interests or relevant affiliations with any organization or entity with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

Writing disclosure

No funded writing assistance was utilized in the production of this manuscript.

Ethical conduct of research

This study was approved by the IRB of the Medical Center (IRB no.: CE23369A). All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008 (5).

Data sharing statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Reference

Papers of special note have been highlighted as: • of interest; •• of considerable interest

1. Seidelman J, Anderson DJ. Surgical site infections. *Infect. Dis. Clin. North Am.* 35(4), 901–929 (2021).
2. Owens CD, Stoessel K. Surgical site infections: epidemiology, microbiology and prevention. *J. Hosp. Infect.* 70(Suppl. 2), 3–10 (2008).
3. Chiang CH, Pan SC, Yang TS *et al.* Healthcare-associated infections in intensive care units in Taiwan, South Korea, and Japan: recent trends based on national surveillance reports. *Antimicrob. Resist. Infect. Control.* 7, 129 (2018).

•• **Emphasizes the significance of surgical site infections (SSIs) as a major healthcare-associated infection in hospitals across Taiwan.**

4. Zhao D, Liang GH, Pan JK *et al.* Risk factors for postoperative surgical site infections after anterior cruciate ligament reconstruction: a systematic review and meta-analysis. *Br. J. Sports Med.* 57(2), 118–128 (2023).
5. Herman TF, Bordoni B. *Wound Classification*. StatPearls Publishing, FL, USA (2024).

• **Describes traditional postoperative wound care protocols as recommended by the CDC.**

6. Andersen BM. Prevention of postoperative wound infections. *Prev. Control Infect. Hosp.* 25, 377–437 (2018).
7. Papadakis M. Wound irrigation for preventing surgical site infections. *World J. Methodol.* 11(4), 222–227 (2021).
8. Gillespie BM, Walker R, Lin F *et al.* Wound care practices across two acute care settings: a comparative study. *J. Clin. Nurs.* 29(5–6), 831–839 (2020).
9. Yang C, Yang C, Chen Y, Liu J, Liu Z, Chen H-J. The trends in wound management: sensing, therapeutic treatment, and "theranostics". *J. Sci. Adv. Mat. Dev.* 8(4), 100619 (2023).
10. Copeland-Halperin LR, Reategui Via YRML, Levy J, Shank N, Funderburk CD, Shin JH. Does the timing of postoperative showering impact infection rates? A systematic review and meta-analysis. *J. Plast. Reconstr. Aesthet. Surg.* 73(7), 1306–1311 (2020).

•• **Highlights the current uncertainty regarding the optimal timing for patients to resume showering after surgery.**

11. Rousselle P, Braye F, Dayan G. Re-epithelialization of adult skin wounds: cellular mechanisms and therapeutic strategies. *Adv. Drug Deliv. Rev.* 146, 344–365 (2019).
12. Orsted HL, Keast DK, Janet Kuhnke B *et al.* Prevention and management of open surgical wounds. *Wound Care Canada* 8(1), 6 (2010).
13. Sasso RC, Garrido BJ. Postoperative spinal wound infections. *J. Am. Acad. Orthop. Surg.* 16(6), 330–337 (2008).
14. Costabella F, Patel KB, Adepoju AV *et al.* Healthcare cost and outcomes associated with surgical site infection and patient outcomes in low- and middle-income countries. *Cureus* 15(7), e42493 (2023).
15. Mioton LM, Jordan SW, Hanwright PJ, Bilimoria KY, Kim JY. The relationship between preoperative wound classification and postoperative infection: a multi-institutional analysis of 15,289 patients. *Arch. Plast. Surg.* 40(5), 522–529 (2013).

•• **Reports infection rates for clean wounds under traditional postoperative wound care protocols as a reference for comparison in this study.**

16. Bucataru A, Balasoiu M, Ghenea AE *et al.* Factors contributing to surgical site infections: a comprehensive systematic review of etiology and risk factors. *Clin. Pract.* 14(1), 52–68 (2023).
17. Harrop JS, Styliaras JC, Ooi YC, Radcliff KE, Vaccaro AR, Wu C. Contributing factors to surgical site infections. *J. Am. Acad. Orthop. Surg.* 20(2), 94–101 (2012).
18. Dealey C. *Wound Management*. John Wiley & Sons, NY, USA (2009).
19. Gonzalez AC, Costa TF, Andrade ZA, Medrado AR. Wound healing – a literature review. *An. Bras. Dermatol.* 91(5), 614–620 (2016).
20. Anderson DJ, Podgorny K, Berríos-Torres SI *et al.* Strategies to prevent surgical site infections in acute care hospitals: 2014 update. *Infect. Control Hosp. Epidemiol.* 35(6), 605–627 (2014).

•• **Discusses evidence showing that early postoperative showering, as soon as 24–48 h after surgery, does not increase the risk of SSIs.**