Abstract

**Objectives**: The primary goal of this study was to assess the effect of postoperative hair-washing on incision infection and health-related quality of life (HRQOL) in craniotomy patients. The objectives of this study were to 1) determine the effect of postoperative hair-washing on incision infection and HRQOL, 2) provide evidence to support postoperative patient hygienic care, and 3) develop neurosurgical nursing research capacity.

**Research question**: Does hair-washing 72 hours after craniotomy and before suture or clip removal influence postoperative incision infection and postoperative HRQOL?

**Methods**: A prospective cohort of 100 adult patients was randomized to hair-washing 72-hours postoperatively (n = 48), or no hair-washing until suture or clip removal (n = 52). At five to -10 days postoperatively, sutures or clips were removed, incisions were assessed using the ASEPSIS Scale (n = 85) and participants were administered the SF-12 Health Survey (n = 71). At 30 days postoperatively, incisions (n = 70) were reassessed.

**Results**: No differences were found between hair-washing and no hair-washing groups for ASEPSIS scores at five to 10 days and 30 days, and total SF-12 scores at five to 10 days postoperatively (p ≥ 0.05).

**Conclusions**: Postoperative hair-washing resulted in no increase in incision infection scores or decrease in HRQOL scores when compared to no hair-washing in patients experiencing craniotomy.

Introduction

The aim of clinical nursing research is to “generate knowledge to guide nursing practice and to improve the health and quality of life of nurses’ clients” (Polit & Beck, 2004, p. 3). Although research-based practice and evidence-based health care has received a great deal of emphasis in recent years, a relatively small proportion of frontline clinical nurses report the use of research as a basis for their practice (Mulhall, 1998).

Lawler (1991, 1997) described nursing as a profession not merely concerned with just the physical body, but one that takes a more holistic perspective. From Lawler’s perspective, nurses assess and intervene to meet not only the physical needs of patients, but also their more immediate and personal concerns. In so doing, nurses are provided with opportunities to identify unique and innovative ways to assist patients to endure and surpass the illness experience. This professional vantage point provides staff nurses with opportunities to identify research questions and evaluate the impact of interventions designed to meet the concerns of patients on care outcomes. However, in our experience, frontline staff nurses rarely have the opportunity to participate fully in research projects that would put these innovations to the test. A recent survey confirmed this understanding.

Étude sur les effets du lavage des cheveux (shampooing) à la suite d’une craniotomie récente

**Objectifs** : Le but principal de cette étude était d’évaluer les effets, en phase post-opératoire, d’un shampoing sur l’incision et sur la qualité de vie (HRQOL) des patients ayant subi une craniotomie. Les objectifs de cette étude étaient de : 1. déterminer l’effet du lavage des cheveux (shampoing), en phase post-opératoire, au niveau de l’incision et l’effet sur la qualité de vie des patients ayant subi une craniotomie. 2. promouvoir une meilleure hygiène en phase post-opératoire. 3. contribuer au développement de la recherche en nursing neurochirurgical.

**Méthode** : Au cours d’une analyse prospective d’un groupe de 100 patients adultes, certains ont été assignés, au hasard, à recevoir un shampoing 72 heures après la chirurgie (n=48) et un autre groupe (n=52) a du attendre que les sutures ou les agrafes soient enlevées pour recevoir un shampoing. Après 5 à 10 jours, en période post-opératoire, les sutures ou agrafes furent enlevées. La condition des incisions a été évaluée à l’aide de l’ « ASEPSIS Scale » (n=85) et les participants furent administrés le « SF-12 Health Survey » (n=71). Après 30 jours, en phase post-opératoire, toutes les incisions ont été examinées à nouveau.

**Résultats** : Nous n’avons pas observé de différence entre le groupe qui a eu un shampoing et celui qui n’en pas eu en utilisant la méthode « ASEPSIS Score » entre 5 à 10 jours et à 30 jours. De même, le calcul du total « SF-12 Health Survey » n’a pas changé entre 5 et 10 jours en phase post-opératoire. (p ≥ 0.05).

**Conclusion** : Administrer un shampoing, tôt en phase post-opératoire, aux patients ayant subi une craniotomie, niaugmente pas le risque d’infection au niveau de l’ incision. De plus, il ne semblaient pas avoir une diminution de la qualité de vie (HRQOL) en comparant les deux groupes.
Asimilar study conducted in infections (Kumar & Thomas, 2002; Bekar, Korfali, Dogan, Bismuth, Effenterre, Coriat, et al. (2005) supported the efficacy of using prophylactic antibiotic therapy in reducing wound infection rates in patients undergoing craniotomy. The results of two other studies supported that cranial surgery without hair removal did not increase the rate of post-surgical site infections (Kumar & Thomas, 2002; Bekar, Korfali, Dogan, Yilmazlar, Baskan, & Aksoy, 2001). A similar study conducted by Miller, Weber, Patel, and Ramey (2001) confirmed these results and also suggested that lack of hair removal improved patients’ feelings of confidence and self-esteem during their postoperative recovery. Korinek (1997) identified other risk factors for infection in 2,944 patients with craniotomy: 1) emergency versus elective surgery, 2) clean-contaminated and dirty surgery, 3) operative time greater than four hours, and 4) recent neurosurgery.

Two additional studies reported the effect of early hair-washing or bathing on the development of surgical site infections in spinal and cranial surgical populations. Carragee and Vittum (1996) studied the effect of early bathing on wound infections in 100 patients undergoing lumbar microdiscectomy surgery. An intervention group was allowed to shower two days postoperatively. A control group followed the traditional protocol of no bathing until sutures or clips were removed. A single infection occurred in the control group; no infection was reported in the intervention group.

Goldberg et al. (1981) studied 200 outpatients with clean head and neck lacerations that were surgically repaired in office operating rooms or emergency rooms. All wounds were kept dry overnight (eight to 24 hours) postoperatively. The following day, a randomly selected group of 100 patients was allowed to use any soap available and water to rinse all about and over the incised or lacerated area. Shampooing hair was allowed, but patients were instructed 1) not to scrub over the incision, 2) to let the soap and water run across it, and 3) to apply an antibiotic topical ointment to the incision post-cleansing. The control group was instructed to keep the incision dry until the sutures were removed. No wound infection occurred in any of the 200 patients studied.

Although the evidence reviewed suggested that early cleansing of surgical incisions might not pose additional infection risk in similar patient populations, it was inadequate to answer the research question identified in this study. A pilot research study was designed to provide preliminary evidence to inform clinical decision-making and patient education regarding the effect of hair-washing on craniotomy incision infection rates and HRQOL. The study was approved by the Hamilton Health Sciences Research Ethics Board.

Background

Annually at Hamilton Health Sciences, approximately 400 patients require a craniotomy for a variety of neurosurgical problems. These include 1) brain tumour, 2) subarachnoid hemorrhage, 3) aneurysm, 4) arteriovenous malformation, and 5) traumatic head injury. Surgical site infections (SSI) are always a concern for these patients and preventative measures are in place to minimize this risk. Historically, one such measure that has been reported by nurses to be based on physician preference is the order that patients refrain from hair-washing until sutures or clips are removed at approximately five to 10 days postoperatively. When the proposed study was discussed with neurosurgeons, they agreed with the nursing staff that evidence was needed to identify best practice to inform clinical decision-making and patient teaching in this area.

In the development of this study, frontline neurosurgical nurses reported anecdotal evidence that patients perceived hair-washing after cranial surgery to be important to their self-esteem and feelings of well-being. They also reported that the unclean appearance of their hair after surgery frequently caused patients to be concerned about wound infection and self-care after discharge. Nurses questioned whether the simple act of post-surgical hair-washing had potential to help patients “endure” and “surpass” a major neurosurgical illness experience. In order to evaluate the impact of hair-washing on patient perceptions of well-being and incision infections and inform hygiene health teaching, a research study was proposed.

Research question

Does hair-washing 72 hours after craniotomy and before suture or clip removal influence 1) postoperative incision infection as measured by a wound assessment scale at five to 10 days and 30 days, and/or 2) postoperative HRQOL at five to 10 days?

Literature review

A literature review identified several studies that reported the influence of a variety of risk factors on surgical site infections in neurosurgical patient populations. Findings from a meta-analysis conducted by Barker (1994) and a prospective multi-centred trial conducted by Korinek, Golmard, Elcheick, Bismuth, Effenterre, Coriat, et al. (2005) supported the efficacy of using prophylactic antibiotic therapy in reducing wound infection rates in patients undergoing craniotomy. The results of two other studies supported that cranial surgery without hair removal did not increase the rate of post-surgical site infections (Kumar & Thomas, 2002; Bekar, Korfali, Dogan, Yilmazlar, Baskan, & Aksoy, 2001). A similar study conducted by Miller, Weber, Patel, and Ramey (2001) confirmed these results and also suggested that lack of hair removal improved patients’ feelings of confidence and self-esteem during their postoperative recovery. Korinek (1997) identified other risk factors for infection in 2,944 patients with craniotomy: 1) emergency versus elective surgery, 2) clean-contaminated and dirty surgery, 3) operative time greater than four hours, and 4) recent neurosurgery.

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Methods

Phase one

Four neurosurgical nurses and one infection control practitioner, all with greater than five years experience, participated in three craniotomy wound assessment sessions prior to the initiation of the study to establish rater reliability in assessing craniotomy incision using the ASEPSIS Scale (Wilson, Webster, Gruneberg, Treasure, & Sturridge, 1986).

Phase two

Using a randomized controlled trial study design, 100 adult patients were enrolled in the study over a 16-month period at the Hamilton General Hospital site. Included were patients greater than 18 years of age who were scheduled for elective or urgent craniotomy and recruited in a pre-operative clinic, or within 72 hours postoperatively in an intensive care unit or a neurosurgical unit. Exclusion criteria included 1) severely
immunocompromised patients related to recent chemotherapy or radiation treatment, 2) patients who were cognitively impaired without a supportive caregiver or substitute decision-maker, 3) presence of an open head wound or ventricular drain, and/or 4) presence of active infection.

Eligible patients were identified through a daily nursing review of clinic lists and operating room schedules. Once consent was obtained, participants were randomly assigned to the “hair-washing group” after 72 hours (intervention group) or the “no hair-washing group” before suture removal at five to 10 days postoperatively (control group). The nurse assigned to care provided participants in the intervention group or their supportive caregiver with health teaching outlining careful hair-washing technique to be initiated at 72 hours postoperatively. They were also provided with a “shampoo record form” to record the number of times they had washed their hair. All received a supply of a gentle shampoo. Participants in the control group were instructed to keep the incision dry until sutures or clips were removed.

Measures
ASEPSIS Scale. The Additional treatment, Serous discharge, Erythema, Purulent discharge, Separation of deep tissue, Isolation of bacteria, and Stay as an inpatient (ASEPSIS) Scale was used for wound assessment (Wilson et al., 1986). This scale was developed for the purpose of accurately grading surgical wound infections. Wound assessments were conducted using the ASEPSIS Scale at five to 10 days postoperatively, at the time of suture or clip removal and at 30 days postoperatively. Part A of the ASEPSIS Scale provides criteria to grade the incision from 0 to 5 depending on the percentage of the wound that demonstrates characteristics of 1) serous exudate, 2) erythema, 3) purulent discharge, and 4) separation of deep tissues. Grading levels include a) absent, b) < 20%, c) 20-39%, d) 40-59%, e) 60-79%, and f) ≥ 80%. The scoring range is from 0 to 30. Characteristics of purulent exudate and separation of deep tissue are assigned twice the value assigned to serous exudate and erythema at each level.

Part B of the ASEPSIS scale provides for the assignment of points for complications related to wound infection: 1) prescription of antibiotics (10), 2) surgical drainage (5), 3) wound debridement (10), 4) positive wound culture (10), and 5) prolonged stay over 14 days (5). The scoring range is from 0 to 40.

The ASEPSIS Scale was originally created for use in a cardiac patient population, but has since been utilized in a variety of surgical patient populations. Wilson et al. (1986) reported a repeatability coefficient of 4.2 in a sample of 51 sternal wounds and 3.2 in a sample of 34 leg wounds. Wilson, Weavill, Burridge, and Kelsey (1990) compared the ASEPSIS definition of wound infection (score more than 20 points) with other definitions in a sample of 1,029 surgical patients. ASEPSIS scores of > 20 were more sensitive and as specific as the presence of pus in indicating changes in management as an indicator of medical diagnosis of infection.

SF-12 Health Survey. The short form of the MOS SF-36 Health Survey, the SF-12, provided a summary measure of quality of life domains of 1) general health, 2) limitations to activities of daily living, 3) physical health and daily activities, 4) emotions and daily activities, 5) the degree to which pain interfered with work activities, 6) general health perceptions, and 7) social functioning (Ware & Sherbourne, 1992; McHorney, Ware, & Raczek, 1993). Participants were asked to rate their perceptions based on a scale ranking scores from least to most. Each SF-12 item has an individualized rating scale and some items are reverse ordered. For the purpose of this study, reverse-ordered items were reordered to ensure that all lower scores denoted poorer perception and higher scores denoted higher perceptions of quality of life. Using this method, the possible scoring range was from 12 (lowest) to 47 (highest). The SF-12 provided a high degree of correspondence between summary physical and mental health measures when compared to the widely used SF-36 in a European study of 1,483 people (Gandek, Ware, Aaronson, Apolone, Bjorner, Brazier, et al., 1998).

Suture removal and wound assessment using the ASEPSIS Scale Part A, the postoperative administration of the SF-12 Health Survey at five to 10 days, and the 30-day postoperative wound assessment using ASEPSIS Part A and Part B were conducted by the study wound assessment nurses on the inpatient unit or in an outpatient clinic after discharge. In some cases, a physician in another hospital or a family practitioner completed the ASEPSIS Scales. Wound assessment nurses and physicians were blinded to the group assignment of participants.

Results
Phase one
Five craniotomy incision assessments using the ASEPSIS Scale were conducted at each of three testing sessions resulting in a total of 15 assessments performed by each of four nurses and one infection control practitioner acting as a control. Percent interrater reliability was established as a function of agreements at 89.72% (reliability coefficient 0.89) (Polit & Beck, 2004).

Phase two
Descriptive statistics. The mean age of participants was 52.68 years (SD = 14.24 years). Fifty-seven per cent were female and 43% were male. Sixty-three per cent of surgeries were performed for brain tumour, 18% for cerebrovascular problems, and 29% for other neurosurgical problems. Fifty-three per cent had an ICU stay immediately postoperatively. Mean length of ICU stay was 2.54 days (SD = 4.28). Mean length of hospital stay, including on-site rehabilitation for some participants, was 10.13 days (SD = 8.83; range one to 40 days). Of those participants (n = 68) who completed the full 30-day wound assessment (Part A and Part B), three (4%) had total scores of > 20 indicating presence of infection based on ASEPSIS criteria (Wilson et al., 1990).

Of the 100 participants recruited to the study, 48 were randomized to the “hair-washing group” and 52 to the “no hair-washing group”. The ASEPSIS Part A wound assessment at five to 10 days was completed for 85 participants. The SF-12 at five to 10 days was completed for 70 participants. Fourteen participants were unable to complete the SF-12 at five to 10 days due to decreased level of consciousness and/or cognitive or sensory deficits, and one survey was incomplete.

At 30 days postoperatively, the ASEPSIS Part A was completed for 70 participants and Part B was completed for 68 parti-
pants. Difficulties occurred in obtaining complete ASEPSIS Part A and Part B data for eight participants who were transferred to other facilities. Eleven participants withdrew from the study for the following reasons: 1) deteriorating health (three participants), and 2) undefined reasons (eight participants). Protocol errors occurred for four participants who were either not provided with instructions appropriate to their study group (three participants) or did not follow the prescribed hair-washing routine (one participant). Four participants were deceased before follow-up. Five operations were cancelled.

Group comparisons. A student’s test demonstrated no differences between the “hair-washing group” and the “no hair-washing group” means on ASEPSIS Part A scores at five to 10 days (n = 85), total SF-12 scores at five to 10 days (n = 70), ASEPSIS Part A scores at 30 days (n = 70), and ASEPSIS Part B Scores at 30 days (n = 68) (p > 0.05). Means on only one of the seven SF-12 subscales demonstrated significant differences between the groups (p < 0.05). Higher mean scores on the single-item bodily pain subscale in the “no hair-washing group” indicated that pain had interfered to a lesser degree with their normal work (including both work outside the home and housework) in the past week when compared with the “hair-washing group” (p = 0.031). Table one summarizes these results.

Developing capacity in neurosurgical nursing research
A total of 14 neurosurgical nurses participated in the research process. Included were those in the following practice roles: staff nurses (five) advanced practice (two), operating room first assistant (one), preoperative clinician (one), managers (two), infection control practitioner (one), post-diploma student (one), and data analyst (one). Research roles assumed by these nurses included 1) study design, 2) the development of patient education tools, 3) staff education, 4) identification of eligible patients, 5) consent-taking, 6) wound assessment, 7) survey administration, 8) data collection, 9) data input, 10) data analysis, and 11) reporting of results.

Although the overall research experience was reported by frontline staff nurse researchers to be a positive one, barriers to their participation included difficulty in ensuring continuity of coverage for the study associated with shift work and the competing priorities of patient assignments and other duties. Although study funding provided backfill for study nurses, and management provided unlimited support, staffing challenges frequently made their full participation difficult. Additionally, it was identified that pre-study training including a review of basic research methods and data management would have enriched the research experience for nurses and improved protocol efficiency.

Discussion
Given the reported low prevalence of incision infection rates of 4% for neurosurgical procedures reported by Korinek (1997) and confirmed by the findings reported here, the small sample size utilized limits the generalizability of the results of this study. Replication of this study in other neurosurgical patient populations is recommended to validate these results. However, the findings of this study are consistent with evidence previously described that supported the cleansing of surgical wounds in superficial cranial and other than cranial locations.

Although the number of participants who were lost to five- to 10-day follow-up was less than 20%, the study team experienced significant challenges in ensuring that participants were followed up at 30 days. This resulted in only 68% of participants completing all steps in the study process and a lost-to-full-follow-up rate of 32%.

The study team has suggested that several measures to improve follow-up be implemented in future neurosurgical nursing research to include: 1) limiting recruitment to patients living within the immediate hospital area, 2) randomization in the perioperative or immediate postoperative phase of care, 3) routine telephone contact by the study nurses during the course of the study, and 4) investigating the possibility of obtaining follow-up data from neurosurgeons at the patient’s post-discharge appointment at six weeks. However, in a patient population where postoperative morbidity and mortality, and multiple care provider management are the norm, it is suggested that follow-up challenges may be difficult to avoid.

Although all participants in the intervention group washed their hair at least once in the period between their operation

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<th>Table One. Comparison of “hair-washing” and “no hair-washing” groups</th>
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* p = < 0.05  
<sup>a</sup> higher scores indicate greater % of wound characteristics meet definition of infection  
<sup>b</sup> higher scores indicate higher SF-12 ratings of HRQOL
and suture or clip removal at five to 10 days postoperatively, the shampoo records providing a measure of frequency were not consistently completed and many were not returned. Unfortunately, these data were inadequate to provide reliable results and were excluded from the analysis. Full data would have provided a measure of how the frequency of hair-washing influenced scores on the ASEPSIS and SF-12 measures. It is recommended that future studies include measures to ensure the collection of hair-washing frequency data.

A strength of this study was the resultant close monitoring and consistent reporting of wound assessment and infection data over time. This resulted in improved wound assessment skills and a heightened awareness of the need for diligent wound surveillance on the part of all members of the interdisciplinary team. The increased awareness extended to the standardization of health teaching materials and procedures related to patient hygienic self-care before and after hospital discharge, and increased follow-up monitoring.

The 30-day follow-up visit provided staff nurses with an opportunity to ensure that pre- and post-discharge care met patient and family needs. At the 30-day visit, study nurses reported that many participants required interventions ranging from monitoring medication levels and assessing for urinary tract infections to arranging semi-urgent appointments for attendance at the neurosurgeon’s office or the regional cancer centre to address outstanding concerns. Since these findings were communicated to the neurosurgical staff, their referrals of patients to the nurse-led follow-up clinic have increased.

It is a concern that those participants in the “hair-washing group” reported significantly more pain-related limitations to their work (including work outside the home and housework) activities in the past week (p = 0.03), as measured by scores on the single-item SF-12 pain subscale. It is recognized that the SF-12 Health Survey measures pain indirectly through its effect on work and other normal activities rather than directly. It is recommended that future research supplement the single-item SF-12 bodily pain measure with a direct measure of self-reported pain in order to validate this result. Additionally, it would be important to collect these self-report data at regular intervals during the postoperative period and before suture or clip removal in the “hair-washing” or “no hair-washing” groups. Evidence-based management of postoperative pain while the patient is in hospital and during the early discharge period is a priority concern for neurosurgical nurses.

Conclusions

It can be concluded from the results of this pilot study, that in a group of 100 participants undergoing craniotomy, hair-washing at 72 hours postoperatively resulted in no increase in wound infection rating scores when compared with no hair-washing. Additionally, postoperative hair-washing did not affect total scores on a health-related quality of life measure. Further study is indicated to replicate the results of this study in other neurosurgical patient populations.

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Approvals

This study was approved by the Hamilton Health Sciences Research Ethics Board.

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Break new ground with us as an RN.

This is an exciting time to join Trillium as a Neurosciences or Musculoskeletal RN, as we enter a new phase in our commitment to transform the health care experience. Work has begun on a new wing that will integrate creative architecture, the best clinical practices, state-of-the-art technology and patient-centred care. This physical transformation, which will allow for new and enhanced services and programs in many areas, is one more way in which Trillium continues to re-invent itself as an innovator.

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