Peripherally Inserted Central Catheter Cushioning: A Pilot Study Comparing Gauze With Silicone Foam

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At a Glance
• Peripherally inserted central catheters (PICCs) usually remain in place for the duration of chemotherapy treatment with dressings changed on a weekly basis.
• A gauze cushioning barrier may be used to protect the skin against the PICC hub; however, guidelines recommend that gauze is changed every 24–48 hours.
• Silicone foam may be superior to gauze as a cushioning barrier and is appropriate for weekly dressing maintenance.

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Literature Review

Gauze is one of the materials used in Australia as a cushion under the PICC hub; however, little evidence exists to support its widespread use internationally. The practice is mentioned in guidelines produced by one children’s hospital in the United States to assist parents in the care of their child’s PICC at home (Muñoz, Vesper, & Schroeder, 2010). Although this practice is not evidence-based, it has most likely developed in an attempt to enhance comfort and reduce skin irritation for patients who are required to maintain a long-term PICC.

PICCs require weekly dressing maintenance (Kutzscher, 2012). Evidence-based guidelines for PICC maintenance and dressing change recommend the replacement of transparent dressings every 5–7 days and gauze dressings every 24–48 hours (Adams et al., 2007; Dougherty et al., 2010; Infusion Nurses Society, 2011; O’Grady et al., 2011). Although the guidelines do not refer specifically to the use of gauze as a cushioning material under the PICC hub, the Infusion Nurses Society’s (2011) standards of practice state that “placement of a gauze dressing under a transparent dressing should be considered a gauze dressing and changed every two days” (p. 865). Based on the recommendation to change gauze every 24–48 hours and the anecdotal evidence from practice covering the external components of a PICC and the attachments to the PICC can cause these components to exert pressure on the skin, which can result in pressure areas and loss of skin integrity. Therefore, a cushioning barrier often is used to prevent pressure on the skin caused by the PICC.

Healthcare providers in the authors’ healthcare organization, which includes five public hospitals and other healthcare services, use gauze as a cushioning material under the transparent semipermeable dressing (TSM) for peripherally inserted central catheters (PICCs) for patients receiving chemotherapy. When dressings are changed on a weekly basis, patients often present with dressings that are loose, as well as with evidence of irritation and perspiration under the cushioning gauze. In addition, leaving gauze dressings in place for a week contradicts national and international recommendations. Therefore, an alternative cushioning material was piloted that would be more comfortable for patients and consistent with evidence-based guidelines.

PICCs are commonly used for long-term vascular access for the administration of chemotherapeutic agents (Baiocco & Silva, 2010). The PICC remains in place for the duration of chemotherapy treatment, often as long as 12 months. Stabilization of the PICC is vital to ensuring the line is secure, preventing migration or accidental removal (Infusion Nurses Society, 2011). However, the dressing
that PICC dressings were sometimes not intact after seven days, nurses in the chemotherapy outpatient unit sought an alternative cushioning material that was more suitable for weekly maintenance.

A soft silicone foam product was identified by the infection control department at the authors’ organization as a suitable alternative to the gauze cushion being used. Soft silicone dressings are considered atraumatic (Meuleneire & Rücknagel, 2013) because they have a nonadherent wound contact layer and can be removed easily without damaging the skin (Meuleneire & Rücknagel, 2013; Thomas, 2003). In addition, they are suitable to leave in place for seven days, consistent with a weekly dressing maintenance schedule (Kutzscher, 2012).

**Methods**

The aim of this pilot study was to compare the soft silicone foam dressing with the gauze as a cushioning material to protect the skin from the silicone tubing and PICC attachments.

**TABLE 1. Sample Characteristics**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Silicone (n = 20)</th>
<th>Gauze (n = 19)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treatment cycle</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>2–3</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>4 or more (maximum 21)</td>
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<td>6</td>
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<td><strong>Diagnosis</strong></td>
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<td></td>
</tr>
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<td>1</td>
</tr>
<tr>
<td>Breast</td>
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<td>–</td>
</tr>
<tr>
<td>Colorectal or metastatic colorectal</td>
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<td>6</td>
</tr>
<tr>
<td>Gastric</td>
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<td>2</td>
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<tr>
<td>Lung or lung carcinoid</td>
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<td>–</td>
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<tr>
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<td>1</td>
</tr>
<tr>
<td>Esophageal</td>
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<td>4</td>
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<tr>
<td>Esophageal and lung</td>
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<tr>
<td>Rectal</td>
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<td>4</td>
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<tr>
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<tr>
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<td>8</td>
</tr>
<tr>
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<td><strong>Age (years)</strong></td>
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</tr>
<tr>
<td>80–89</td>
<td>–</td>
<td>1</td>
</tr>
</tbody>
</table>

Note. Data were sourced from patients’ medical records.

The mean age for the patients using Mepilex® (silicone foam) was 57 years (SD = 8.3), and the mean age for those using gauze was 60.05 years (SD = 10.95). Success was measured by less patient-reported itch or discomfort, more nurse-reported ease of dressing removal, and less nurse-reported visible skin irritation.

The study was approved by the organization’s human research ethics committee, and all participants provided informed consent. Forty patients were alternately assigned to either the gauze group (n = 20) or the silicone foam group (n = 20). Data for one patient in the gauze group were incomplete, reducing the sample to 19 in that group. For participants in both groups, the PICC dressing was changed using aseptic non-touch technique in accordance with the organizational procedure, including a chlorhexidine-impregnated dressing at the insertion site. For participants in the gauze group, the sterile gauze in the standard dressing pack was placed under the PICC hub and secured with the TSM (Smith and Nephew, IV3000). For participants in the silicone foam group, a 7.5 x 7.5 cm Mepilex® border was placed under the PICC hub and secured as per the gauze group. The nurses assigned to the patients the following week assessed the dressing sites when changing the dressings and completed the data collection sheets each week for the four-week study period.

**Analysis and Evaluation**

Itch or discomfort was measured by patient reports of itchiness or discomfort under the cushioning material (0 = none, 1 = slight, 2 = moderate). Ease of removal was measured by nurses’ perceptions and self-reports of removing the cushioning materials during the dressing changes (0 = easy, no resistance, 1 = moderate resistance/difficulty, 2 = severe resistance/difficulty). Skin status at the dressing site was measured by nurses’ assessments of the skin under the cushioning material (0 = skin intact, no redness or irritation, 1 = skin showing initial signs of irritation, 2 = skin showing clear signs of irritation). Each scale was then collapsed to describe the data in terms of whether or not each of the three potential problems (i.e., itch or discomfort, difficult removal, and skin irritation) was reported. The number of times each problem was reported for patients in each group over the four-week study period was then compared using an odds ratio. The odds ratio represents the odds, or likelihood, that an outcome (e.g., itch or discomfort) will occur under a certain condition (e.g., silicone foam dressing) compared to the odds of the outcome occurring in the absence of that condition, or under a different condition (e.g., gauze dressing) (Szumilas, 2010).

**Findings**

The characteristics of the participants are outlined in Table 1. No significant differences were noted between the two groups with respect to age, gender, diagnosis, and cycle of therapy.

When the data for the four weeks were combined, a statistically significant difference was noted between patients in the gauze and silicone foam groups with regard to removal of the dressing (see Figure 1). Using the silicone foam reduced the nurse-reported likelihood of the dressings being difficult to remove by 64% (OR = 0.36, 95% confidence interval [CI] [0.14, 0.95], χ² = 4.9, p = 0.027). Dressings need to be adhesive enough to remain in place for the required length of time but easily removed when required (Rippon, White, & Davies, 2007). Ease of removal is particularly important in this patient group, as very fragile, dry skin is common. Difficulty in removing the gauze dressings may increase the risk of small in and out movement of the catheter and increased external catheter length, as well as skin tears, inflammation, and infection (Meuleneire, 2002). These events may decrease patient comfort, satisfaction, and compliance with therapy.

The likelihood of nurse-reported skin irritation was reduced by 44% with the use of silicone foam compared with gauze. The likelihood of patient-reported itching was reduced by 29%, although these reductions were not statistically significant. Skin irritation leading to cutaneous changes around PICC insertion sites occurs frequently in people receiving chemotherapy (Kutzscher, 2012). This may lead to insertion site infections, a
Skin Irritation
Gauze
Silicone foam

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common complication of PICCs (Walshe, Malak, Eagan, & Sepkowitz, 2002). Although other complications of PICCs have been reported, including obstruction, skin irritation, and vein thrombosis (Leroyer et al., 2013; Yap, Karapetis, Leroise, Iyer, & Koczwara, 2006), no research has explored irritation associated with the silicone tubing and attachments resting against the skin. PICC comfort is vital to important patients with cancer who are generally outpatients and attending to daily activities with a PICC in place for as long as 12 months. Although patient comfort levels with PICCs have been reported to be high (Yamada et al., 2010), there may still be a risk of complications if perspiration leading to skin irritation occurs beneath the PICC cushion. Irritation may contribute to patient scratching, destabilization, and infection in this high-risk group (Kutzscher, 2012).

Implications for Practice

The findings of this pilot investigation suggest that silicone foam may be equal, or possibly superior, to gauze in protecting the skin against the external component of the PICC for patients receiving chemotherapy. This finding may provide sufficient impetus to prompt a review of PICC management in the authors’ chemotherapy outpatient unit, but additional study is needed to generate evidence of the efficacy of silicone foam compared with gauze as a cushioning material for PICCs. A large randomized, controlled trial conducted across multiple sites over a longer period of time would enable a more sophisticated analysis and strengthen the conclusions. Future studies should include measurement of the cost-effectiveness of both dressing materials. If the use of silicone foam decreases skin irritation and the associated risk of costly catheter-related bloodstream infection, then reducing just one infection may justify its use. Given that the cost of an individual catheter-related infection has been estimated at $44,000 (U.S.) per episode (Hollenbeak, 2011), this may counteract the cost of the silicone foam cushioning material, which is universally important with the current emphasis on reducing costs in health care.

Conclusions

This pilot study compared two different cushioning materials, gauze versus silicone foam, for use with PICCs in patients receiving chemotherapy. The silicone foam offered easier removal than the gauze with some indication of possible decreased skin irritation and itching, suggesting a possible advantage for patient comfort and satisfaction. The potential to use silicone foam as an alternative to gauze as a PICC cushioning material for patients with cancer needs additional study to evaluate its superiority over less costly and traditional methods of cushioning support, while minimizing infection and incorporating current evidence-based guidelines.

References


REFERENCES


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