Gentian Violet 1% Solution in the Treatment of Wounds in the Geriatric Patient: A Retrospective Study

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Introduction

Experts in wound healing recognize that some wounds are challenging and, even with long-term management, do not heal. This is especially true in the geriatric sample studied, which may not have had the physical resources to heal open wounds. The purpose of this retrospective study was to consider the impact of using gentian violet 1% (GV) solution to dry and stabilize loose, ineffective scabs and small wounds without depth, and lower extremity eschars of varying sizes that presented on residents at a long-term facility. There is general agreement that large full-thickness eschars on the trunk, especially those occurring over deep soft tissue areas like the sacrum and buttocks, hips, and ischium need to be chemically or surgically debrided. However, uninfected eschars immediately overlaying tendons and bones often do better when kept dry and protected. Most of the wounds falling into this category occur on the lower extremities but can also occur on the trunk, upper extremities, and the head. Specifically, this study suggests careful assessment of wounds and the underlying disease and etiology must be performed. It then proposes the selective application GV solution to some of these wounds and that, by preserving and stabilizing the original eschar, a protective surface impermeable to infectious organisms could be achieved, thus promoting the healing process underneath.

Geriatric patients are particularly vulnerable to injuries of the lower extremities due to possible unsteadiness of gait and falls and to pressure ulcers anywhere on the body related to immobility. The healing of open wounds on the elderly patient is usually slower, making them more susceptible to infection and to becoming “stalled” wounds. Chronically open wounds can delay ambulation and rehabilitation because of bulky dressings that restrict movement, persistent edema, inability to wear appropriate footwear for ambulation, pain, and drainage that wets clothing and macerates normal surrounding skin. Early treatment of small wounds and abrasions can often prevent the development of a vascular ulcer in some patients with underlying vascular incompetence and infections, requiring systemic antibiotic therapies and possibly amputation.

The AHCPR guidelines of 1992 for pressure ulcer prevention and treatment specify that benign heel eschars be maintained intact, dry and free of pressure instead of debriding them. A dry, benign eschar is preferable to an open, draining wound resulting from debridement, especially in the elderly and people who have perfusion deficits in the lower extremities. Debriding heel eschars too often results in an open wound that will not heal despite the battery of treatments and dressings available, simply because after the original blood supply to the heel has been destroyed by pressure, the surrounding collateral supply is inadequate. GV is an agent that provides additional stabilization to these eschars, enabling many of them to heal with minimal scarring and deformities related to scarring.

When GV is applied to eschars and scabs, even if there is a small (<.5 cm.) separation from the normal surrounding skin, the fibrous material of the covering coalesces and shrinks. The surface tightens and contracts. This reaction persists and continues with each application. This mechanical barrier, in addition to its sustained broad antimicrobial activity, is a possible explanation as to how the GV solution works (Figure 7). GV also combines with and stains the material in the eschar covering, imbuing the surface and the skin attachment with the...
antifungal and antimicrobial properties of the solution. The “sealing off” of the wound bed with a hard, dry, stable eschar has the effect of an occlusive dressing that “keeps on giving”—that is, it does not require traumatic dressing changes with stripping that occurs when pulling off the adhesive or an occlusive dressing, factors that increase the inflammatory stage of wound healing, scarring, and infection rates.8,9

Background

GV is a dye that had its beginnings in the microbiology laboratory. It is the essential agent used for determining gram-positive organisms in bodily specimens—the well-know Gram Stain test.9-12 It also has been used for decades by pediatrician and lactation consultants to treat thrush in newborns and young children.13,14

Triple Dye, containing GV as 1 of 3 main ingredients, is widely used as a 1-time application to umbilical cord stumps of newborns. According to one unit-dose manufacturer of Triple Dye (VistaPharm), over 1 million vials of the topical solutions are sold yearly in the United States by this company alone.10 This usage in hospitals is based on research showing the solution’s broad-spectrum bacteriocidal effect on staphylococcal, streptococcal, and pseudomonas organisms including methicillin-resistant Staphylococcus aureus (MRSA) and Pseudomonas aeruginosa.16-18 The old dried cord acts in a similar manner to an eschar on a wound, providing a tough barrier to microbial invasion during healing and falling off when the epithelialization underneath is complete.8,10

The antifungal and drying effects of GV also makes it a popular agent used by podiatrists. During routine foot care, the podiatrist will often apply the solution to the web spaces when the first signs of maceration or fungal infection are detected. This is done to dry up the infection and has been shown to be effective with no further intervention other than advising the patient to make sure to dry between the toes after bathing and showering.20,21

In response to the challenges associated with MRSA, there have been a number of recent studies using GV.22-24 GV has been effectively used in the treatment of MRSA ear infections, and a study conducted by a wound-care clinician showed the solution’s effectiveness in the elimination of MRSA from open pressure ulcers.25 The effectiveness of GV has also been tested against use of a hydrocolloid for radiation-induced desquamation and found no difference in the incidence of pain, infection, and the healing times.7,25,26

When a study found that tube-site granulomas were implicated in Tenckhoff peritonitis infections, a prospective, nonblinded experimental study was done on patients at San Francisco Hospital in Brazil using GV applied topically to granulomas around their catheters for the purpose of eradication (N = 44). Of these patients, 54.5% healed within the first 30 days, and another 22.7% healed in 60 days. Only 9% took longer than 90 days to heal. The safety of GV applications at Tenckhoff catheter sites was established, and it became the standard treatment of granulomas at the dialysis center.27,28

GV also discourages hypergranulation (i.e., the bulging of granulation tissue above the wound edges), preventing the epithelial cells from bridging the wound surface. One of the study authors has successfully used GV to treat multiple granulomas around stomas, caused by chronic leakage of effluent onto the skin. Fungal infections commonly occurring around stomas also responded well to GV application with each appliance change. Because gentian violet is water-based, the stoma appliance can be applied as soon as the solution is dry, without problems of adherence that occur with treatment with creams.

A number of claims have been made regarding possible carcinogenic properties and tissue toxicity of GV in vitro, creating widespread controversy over the use of Triple Dye and similar brands of disinfecting solutions with GV, for umbilical cord care.25,29 An exhaustive search of the medical literature in the United States going back to 1975 yields only 5 cases of primary carcinoma of the umbilicus, despite more than 1 million vials of Triple Dye plus other brands purchased per year for umbilical cord care by U.S. hospitals.30-35

Costs of Gentian Violet Interventions

A 2-ounce bottle of GV solution costs approximately $5, and when used as proposed in this study, is less than pennies per application. In addition, use of GV usually obviates the need for any cover dressing. This advantage is important, because state-of-the-art dressings are not only expensive but are only rarely and partially covered by residents’ insurance.
Purpose and Study Questions

The purpose of this study was to review the use of GV in a long-term care facility for the treatment of small, open wounds and extremity eschars of all sizes and thickness.

The following research questions were addressed:

1. Did the application of GV provide an alternative, effective treatment for lower extremity abrasions, small nonhealing wounds, and full-thickness eschars on the geriatric patient?
2. Were there any adverse events to the use of GV documented in the chart?

Methodology

This was a retrospective chart study conducted during 2009 of patients receiving wound care with GV during a 1-year period from May 19, 2007 through May 19, 2008.

Setting

The setting for the study was an independently owned 250-bed long-term care skilled nursing facility serving Staten Island, a residential borough of New York City. The study was approved by the facility Institutional Ethics Committee.

Sample

Inclusion criteria: included in the study were wounds that were 1) superficial skin layer eschars, and full-thickness eschars resulting from pressure or direct trauma to the skin and 2) superficial split-thickness wounds (Stage 2) and open, granulated wounds with no depth, treated with topical gentian violet 1%.

Exclusion criteria: areas of periwound maceration, rashes, surgical wounds, staples, and stitches were excluded from the study. These skin disruptions did not fall into categories of pressure ulcers and trauma, which are the wounds at highest risk for cellulitis and nonhealing. Wounds that had additional treatments combined with the gentian violet were also excluded due to the inability to single out GV as the healing agent.

The types of wounds that met the inclusion criteria were further divided into 3 descriptive groups:

1. Superficial eschars and abrasions, assessed to be limited to the epithelium.
2. Full-thickness eschars (necrotic skin) and open wounds that were <1 cm in diameter with no depth, assessed to have penetrated all layers of the dermis. The open wounds in this category had a healthy, red granular base, and in some cases exhibited hypergranulation (i.e., granulation tissue that has filled the wound cavity and rises above and overflows the skin edges of the wound, preventing the wound from closing).
3. Full-thickness eschars >1 cm (average diameter 3.3 cm) located on the lower extremities.

All wounds were either pressure ulcers with or without arterial insufficiency or traumatic wounds (abrasions).

GV Treatment

The standard pressure relief guidelines for the facility were maintained on all the patients in the study (Table 1, Figure 1). No additional special equipment or pressure relief techniques outside of the guidelines were employed with the patients studied.

The standard methodology for applying GV to wounds is outlined in Table 2.
Data Collection

The charts of the residents were examined retrospectively to determine the types of wounds treated with GV and outcomes of the treatment from May 19, 2007 to May 19, 2008. Photographs of large eschars and open wounds were routinely obtained, and it was possible to evaluate wound progress, including any development of cellulitis and amount of scarring. Data collected was limited to “description and location of the wound,” “date GV was started,” “date the wound was healed,” demographic information, albumin level, comorbidities, and mobility level.

Results

The wounds studied occurred on 70 residents (38 males, 32 females) who resided at the facility between May 19, 2007 and May 19, 2008 (41 of the residents were treated for more than 1 wound). All wounds had multiple daily applications of GV throughout the treatment period. The mean age of the residents was 65.9 years. The average number of comorbidities among the group of residents was 8.1 (Table 3). The average albumin for the residents was 3.7 g/dL, and ethnicity was 57.3% Caucasian, 12.8% African American, and 11.4% Hispanic. Mobility levels are described in Table 4.

The progress of the 111 wounds studied, located on 17 body sites, were reviewed. A total of 103 healed completely (Table 5). Unhealed wounds included 6 wounds on 4 patients who had started treatment with topical GV within 2 weeks of the end of the study period and had not yet healed by the end of the study and 1 patient with bilateral foot eschars who required above-the-knee amputations of both legs (3 months apart) due to extension of her severe arterial insufficiency. None of the wounds treated developed local cellulitis. There were no systemic infections that were attributed to any of the wounds treated. Most of the wounds were on the lower extremities, with only 8 on other parts of the body. The average time for healing including the average time for eschars and scabs to fall off was 24.6 days.

Incidental outcome findings obtained from chart photographs revealed very little or no scarring among the wounds in Group 2 and only small scars in Group 3.

Discussion

This study describes the outcomes associated with the use of GV among common wounds found in older adults. Specifically, we demonstrated that superficial eschars and abrasions, full-thickness eschars of all sizes, and small full-thickness...
wounds with no depth responded well to the application of GV. Care of these wounds required little nursing time and, in most cases, a dressing was not used once GV had been initiated. Further we noted that study participants were generally able to return to partial or full ambulation and engage in therapy, once the GV was started.

Only 5 of the 70 patients with wounds examined and described in this study had albumins that were below normal. It would probably be

Table 2.
Routine Procedure for the Application of Gentian Violet 1%
The standard methodology for daily application of gentian violet 1% for wound care is as follows:
1. Gently cleanse loose debris from the wound area with sterile normal saline, taking care not to disturb scabs and eschars. Pat the area dry with sterile gauze.
2. Gentian violet 1% is supplied from the pharmacy in a multidose, 2-ounce bottle. For each wound, pour a small amount a small, clean medicine cup. A sterile gauze 2 × 2-inch pad or cotton-tipped applicators are used to apply the solution to the wound.
3. Keep the wounds dry and either leave open to the air or apply a light, dry sterile gauze dressing or gauze wrap. The light temporary cover dressings are only used if there was some drainage after the application of the gentian violet 1%. WHEN APPLIED FOR WOUND CARE, AVOID USING "BORDER GAUZE" OR OTHER OCCLUSIVE COVER DRESSING.

Nurses are advised not to aggressively lift off scabs and eschars that are being treated with gentian violet 1% or to squeeze them to check for “pus” under the eschar.
Assess the wound area for periwound redness extending out from the wound margin for >1cm, induration, and pain.
Follow routine and customized techniques (when necessary) for pressure relief and protection of the area from trauma.

Table 3.
Description of Sample Comorbidities by Occurrence, N = 70

<table>
<thead>
<tr>
<th>Comorbidities</th>
<th>n (%)</th>
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</thead>
<tbody>
<tr>
<td>Cardiopulmonary disease with decreased ambulation</td>
<td>65 (92.85)</td>
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<tr>
<td>Neurological disease with decreased mobility in all 4 extremities</td>
<td>49 (70)</td>
</tr>
<tr>
<td>Psychosocial disabilities with decreased ambulation</td>
<td>41 (58.6)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>34 (48.6)</td>
</tr>
<tr>
<td>Vision impaired</td>
<td>23 (32.85)</td>
</tr>
<tr>
<td>History of sepsisiania (other than wounds)</td>
<td>16 (23.8)</td>
</tr>
<tr>
<td>History of wound infections prior to study</td>
<td>15 (21.4)</td>
</tr>
<tr>
<td>Peripheral vascular disease without amputation</td>
<td>14 (20)</td>
</tr>
<tr>
<td>Anemia</td>
<td>12 (17.0)</td>
</tr>
<tr>
<td>Terminal cancer</td>
<td>6 (8.6)</td>
</tr>
<tr>
<td>Arthritis with decreased ambulation</td>
<td>5 (7)</td>
</tr>
<tr>
<td>Peripheral vascular disease with h/o amputation</td>
<td>4 (5.7)</td>
</tr>
<tr>
<td>Average number of comorbidities per subject</td>
<td>8.1</td>
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</table>

Table 4.
Summary of Sample Demographics (N = 70)

<table>
<thead>
<tr>
<th>Average Age</th>
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<tr>
<td>Male/Female</td>
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<tr>
<td>Ethnicity</td>
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<tr>
<td>Caucasian</td>
<td>53</td>
</tr>
<tr>
<td>African American</td>
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<td>Hispanic</td>
<td>8</td>
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<tr>
<td>Asian</td>
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<tr>
<td>Serum Albumin (g/dL)</td>
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<td>&lt;1.8</td>
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<td>3.9–4.5</td>
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<td>&gt;4.5</td>
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<tr>
<td>Average</td>
<td>3.7</td>
</tr>
<tr>
<td>% &lt;3.8</td>
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<tr>
<td>Mobility Levels</td>
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<td>Bedrest</td>
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<tr>
<td>Wheelchair 2-person assist</td>
<td>10</td>
</tr>
<tr>
<td>Wheelchair 1-person assist</td>
<td>27*</td>
</tr>
<tr>
<td>Ambulatory with assistive devices</td>
<td>15</td>
</tr>
<tr>
<td>Ambulatory without assistance</td>
<td>7</td>
</tr>
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</table>

*Eight patients in wheelchair to offload foot ulcers.
Table 5. Study Results by Wound Classifications and Site (N = 70)

<table>
<thead>
<tr>
<th>Site</th>
<th>S/T Scabs</th>
<th>F/T Eschar &lt; 1 cm</th>
<th>F/T Eschars &gt; 1 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot, toes, heels</td>
<td>23</td>
<td>25</td>
<td>18</td>
</tr>
<tr>
<td>Ankles, lower legs, lower</td>
<td>10</td>
<td>22</td>
<td>5</td>
</tr>
<tr>
<td>extremity stump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sacrum, ischium, buttocks</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Total (%)</td>
<td>37 (52.8)</td>
<td>50 (71.4)</td>
<td>24 (34.2)</td>
</tr>
<tr>
<td>No. healed (%)</td>
<td>37 (100)</td>
<td>45 (90.0)</td>
<td>21 (87.5)</td>
</tr>
</tbody>
</table>

F/T = full-thickness, involving the entire dermis; S/T = split-thickness, limited to epithelium and not penetrating the dermis.

Figure 2. A diabetic foot ulcer being treated with total contact casting shows hypergranulation and maceration. GV was started to the maceration around the wound and between toes (A). After drying (a few minutes) a stomahesive barrier (cut from a stoma bag) was applied around the wound to further protect the skin for the week under the cast (B). GV was also applied to the wound to discourage hypergranulation, and a dry dressing was applied over the wound and stomahesive (C)(D). Then the cast was reapplied. After three more weekly cast changes, the same dressing procedure, the wound is greatly reduced (E) After three more weekly cast changes, same dressing procedure, the wound is healed (F).
correct to assume that normal albumins affected healing results. However, 3 of the 5 patients with low albumins were among 4 patients who expired in the time period covered in the study, and it was noted that their wounds were also healed at the time they expired. Although interesting, no conclusions can be attributed to this.

Although not considered in this study, there are other ways in which GV solution can be

Figure 3. A healing Stage 4 pressure ulcer had stopped healing and had a macerated edge that resisted hydrocolloid and foam dressings. GV was started and the wound healed in 21 days.

Figure 4. A diabetic foot ulcer was auto-grafted (orange arrow). The graft opened over the calcaneus and the wound partially healed (green arrow) and stopped, leaving a non-healing wound (red arrow) despite silver dressings and foam dressings.

Figure 5. The wound healed after 5 weeks of GV application.
used. Specifically, there is evidence of effectiveness when GV is used to treat fungal infections and maceration of the periwound skin under negative pressure wound therapy dressings and other occlusive dressings. This is effective because it promotes essential sealing of the dressing while treating the skin. Maceration can also be a problem inside total contact casts that are only changed once a week. The accumulating wound drainage causes blistering and erosion of the periwound skin. The use of GV in combination with stoma adhesive barrier for this problem is shown in Figure 2.

Figure 6. This chronic open wound related to osteomyelitis was being treated with IV antibiotics (top photo). When GV is applied the following week (a demonstration of shrinkage achieved with GV), the wound is reduced from its chronic size of .31cm$^2$ to .01cm$^2$. The wound did not close completely until the infection was eradicated.
The authors are not suggesting that every eschar can be converted to a stable covering with GV solution. Forensic pathologists write that the dead skin overlying thick areas of soft tissue on a decedent will decompose and slough, whereas the dead skin over joints, hands, and feet where there is little soft tissue underneath will cling tenaciously until the corpse is skeletonized in most cases. The greater the amount of decomposing soft tissue present underneath an eschar on a living person, the greater the autolysis and release of tissue-digesting enzymes.6,37,38 This applies to eschars on the trunk of a living person versus those on the extremities. Most large eschars on the trunk respond better to debridement and standard wound care, especially if they are exposed to excessive moisture, as in the areas affected by fecal and urinary incontinence.4,39

Summary and Conclusion

The findings from this study suggest that GV is an effective topical agent for healing small, superficial wounds and pressure ulcer eschars on the lower extremities of geriatric patients. The minimal manipulation of the wounds that is characteristic of GV topical treatment may be the key to a shortened inflammatory healing stage, earlier resumption of ambulation programs, and reduced scarring.

This study was limited by the fact that it is retrospective and thus other factors that may have affected wound healing were not considered. Moreover, there was no attempt to compare treatment of wounds with GV to similar wounds treated with alternative products.40 However, this work can serve as a springboard for future prospective studies that will control and address multiple factors.

This study provides useful information for nurses in long-term care settings by providing a cost-effective and easy-to-use treatment for eschars and wounds without depth. Future research might address a prospective study of GV use compared with other treatments commonly used for these types of wounds, including patient feedback.

Uncited Figures

Figures 3 to 6, 8
References


Uncited References


ACKNOWLEDGMENT

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