Utilizing Elevated Vacuum Socket Technology to Manage Residual Limb Wounds in Persons with Transtibial Amputation: A Case Series

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INTRODUCTION

Elevated vacuum (EV) assisted suspension appears to produce conditions that are theoretically less disruptive to wound healing inside a prosthetic socket. However, there are only a few studies that have explored this possibility. Traballesi et al. (Traballesi, Averna et al. 2009) published a case report of a 60-year-old male with a transtibial amputation due to type II diabetes who was able to participate in gait training while a large wound on his residuum healed. Brunelli et al. (Brunelli, Averna et al. 2009) compared seven persons with transtibial amputation and residual limb wounds managed with an EV prostheses to 17 persons with transtibial amputation without wounds managed with patella tendon bearing (PTB) sockets. Most recently, Kannenberg et al. reported that wound healing success did not differ between EV and suction prosthesis groups in a randomized controlled trial, even though those in the EV were more active and used their prostheses for longer periods of time. All of these studies calculated wound size using linear measurements of the longest and shortest axes. Unfortunately, it has been suggested that this method has some inaccuracy and is especially inappropriate for irregularly shaped wounds (Goldman and Salcido 2002). The purpose of this case series was to measure changes in residual limb wound size over time in persons with transtibial amputation using prostheses with EV.

METHOD

Subjects: Six transtibial amputees (1 Female, 5 Male) were involved in this study (Age 66.3 ± 8.3 years) with mass 209 ± 45 pounds; 5 diabetic and 1 Trauma non-diabetic. Each subject had a wound present on their residual limb and was fitted with an EV socket at the start of intervention.

Apparatus: The surface area of the wound was tracked over a period of time using the image processing software, ImageJ. Written informed consent to track and report wound healing was obtained from each subject prior to data collection.

Procedures: A picture of the wound was taken at each patient’s appointment. Average sample rate was 1-2 weeks. The picture was a direct shot and had a ruler above or below the wound.

Data Analysis: The area was calculated twice by two researchers and the mean was used for data tracking.

RESULTS

The six subjects were able to continue activities of daily living or rehabilitation progress by using elevated vacuum and all eventually reached wound closure (167 ± 91.9 days).

<table>
<thead>
<tr>
<th>Subject</th>
<th>Start Surf. Area cm²</th>
<th>Days to closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.2</td>
<td>170</td>
</tr>
<tr>
<td>2</td>
<td>1.69</td>
<td>178</td>
</tr>
<tr>
<td>3</td>
<td>1.58</td>
<td>120</td>
</tr>
<tr>
<td>4</td>
<td>2.23</td>
<td>180</td>
</tr>
<tr>
<td>5</td>
<td>1.95</td>
<td>388</td>
</tr>
<tr>
<td>6</td>
<td>3.29</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 1. Chart of patient progress.

DISCUSSION AND CONCLUSION

The data collected offers support that EV socket systems provide an environment that is conducive to wound healing and that wound closure is possible without limiting activity level or rehabilitation progress. This is extremely important as it allows for wound management while maintaining use of the prosthesis.

REFERENCES

Kannenberg et al. JOP AAOP. Atlanta, GA. March 21-24, 2012.