CUSTOM SILICONE SOCKET USER SURVEY

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ABSTRACT

The use of High Consistency Rubber (HCR) silicones has been shown to be clinically advantageous for use in upper extremity prosthetics [1,2,3]. Until now, no formal review of patient feedback has been reported. Anecdotally, one of the primary reasons that these custom silicone sockets have been preferred by users is the improved comfort they afford. Prosthesis discomfort is often associated with prosthesis abandonment. In order to better understand user's impressions and to determine if wearers do indeed find custom silicone sockets to be more comfortable than non-silicone sockets, a survey was developed. This survey was administered to 25 upper-limb amputees fitted by eleven different Hanger Clinic Upper Limb Specialists.

Amputation levels including six wrist disarticulations, sixteen transradials and four transhumeral amputation were represented including one bilateral with wrist disarticulation and transradial amputations. Prosthesis types represented were three passive, seven body powered, and seventeen myoelectric (two users were provided with two types of prostheses using HCR silicone sockets). Eighteen of the twenty-five users reported the silicone socket to be more (n=7) or much more (n=11) comfortable than their previous non-silicone socket. While four reported the same comfort and one user reported less comfort, none reported much less comfort.

INTRODUCTION

Socket designs using HCR silicone technology have been previously described (figure 1) [3,4]. HCR silicone offers several different material characteristics that should improve user comfort compared to non-silicone socket materials including; elasticity, multiple stiffness options that can be seamlessly blended to achieve a customized compression profile, and high coefficient of friction for better socket retention. A survey was developed to seek user input regarding their perceptions of prosthetic sockets made using HCR silicone techniques compared to non-silicone sockets. All of the users were clients of Hanger Clinic. Inclusion criteria was wearers of upper limb prostheses who had been fit with a HCR socket and previously wore a non- silicone socket. In a review of our patient records, one hundred and sixty persons were found who met the inclusion criteria. A total of twenty-five users completed the questionnaire during the period from September 2016 through February 2017. Verbal informed consent was secured from each respondent prior to the administration of the questionnaire. All levels between wrist disarticulation and shoulder disarticulation were accepted. Survey respondents included fourteen males and eleven females, seven were congenitally limb deficient and eighteen had acquired amputations. The age range was from fourteen to seventy nine years old with a mean age of fifty three. Regarding prosthesis wear experience, we found that users reported having worn a prosthesis from between one to sixty years with a mean of twenty-three years. Silicone sockets had been worn from six months to eleven years with a mean of four years. Daily wear time was reported to be from occasional use to eighteen hours a day with the majority, seventeen users, reporting daily wear.

RESULTS

Custom silicone interfaces have been noted to provide protection for fragile skin in such cases as severe burns and in the presence of skin grafts [5]. Two questions were asked to shed light on the topic of skin irritation and pain. When asked: Since switching to a silicone socket, have you experienced {more, less, same, didn't have before} skin breakdown or irritation? Three, 13%, users reported more breakdown or irritation, while six, 27%, respondents reported less breakdown or irritation. The remainder, 60%, reported either the same breakdown or irritation or they didn't experience breakdown or irritation with their previous prosthetic socket. Significantly, all three who reported more breakdown or irritation also reported that their silicone socket was much more comfortable than their previous non- silicone socket. When asked: Since switching to a silicone socket, have you experienced {more, less, same, didn't have before} pain? Only one user, (5%), reported more pain and eight users, (36%), reported less pain. Again the remainder didn't have pain or the pain was same as with the non- silicone socket.

Prosthesis wearers often comment about the temperature of their limb being hot. There have been attempts, currently and in the past to address heat retention by changing the socket material or modifying the material to reduce heat retention. Therefore users were asked to compare their silicone socket to their non-silicone socket in this regard. Four individuals, (17%), reported that their residual limb felt cooler. Ten, (42%), felt it was warmer,

and another ten said it was the same. Interestingly, eight of the users who reported the socket to be warmer also stated that the socket was more comfortable than their non-silicone socket.

USER COMMENTS

"This is the best system that I have ever used and I have used them all. I can keep it turned on and I don't have to worry about it activating when I don't want it to or falling off when I perspire."

"I sweat a lot. The silicone socket holds the sweat in. Silicone itself is hot. I dump the sweat out. I like the silicone socket. I would not go back to the old socket."

"I love love love my arm. Closest thing to having a real arm. It's part of me."

"My newer myoelectric arm is much more comfortable and lighter than my previous one without the silicone."

There was lots of migration in the skin (with non-silicone) and the silicone socket fits much better than non-silicone.

"I prefer the non-silicone socket because it's more rigid and loses electrode placement from using the silicone socket, it's too loose."

"Nicer in cold weather. Retains body temp."

"Maybe the same or a little warmer. I do not seem to sweat in my silicone socket, but it is not summer yet."

CONCLUSIONS

This survey confirms our hypothesis that HCR custom silicone upper limb sockets provide more comfort and are preferred by users (Table 1). The survey reveals that users of HCR silicone sockets tend to have less skin irritation and less pain than with their non-silicone sockets if they experienced irritation or pain prior to being fit with silicone. Although there is a definite tendency to perceive that the silicone is warmer, further investigation in that specific topic is needed to better understand this issue. Some of the user comments suggest that even though the silicone socket was perceived to be warmer, the presence of perspiration was less of a problem in the silicone socket as long as the socket was not too loose. Based on our clinical experience and the results of this user survey, we recommend that HCR custom silicone socket technology be considered for all levels of upper limb prostheses.

Table 1: Results of comfort question

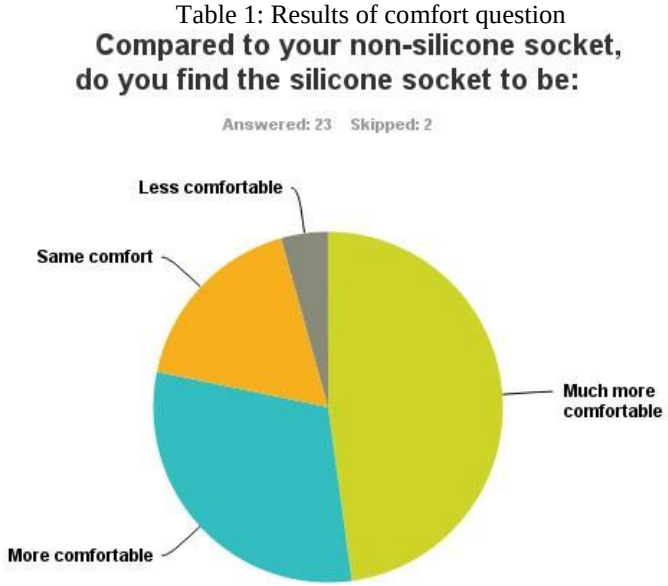

Figure 1: Example of a HCR silicone socket for transradial prosthesis with ¾ design. The brim dimension is maintained by incorporation of a carbon strut integrated between layers of silicone. The transhumeral example on the right shows the silicone socket removed from the prosthesis during trial.

REFERENCES

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