Application Time for a Novel Total Contact Cast Designed for Diabetic Plantar Ulcer Off-Loading

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Introduction:

Effective off-loading is an integral component of successful management of diabetic plantar ulcers, with total contact casts (TCCs) considered as the gold standard.[1-5] However, this modality is underutilized due to lack of prior application experience, the time and complexity involved with application, the period of non-weight-bearing ambulation required for hardening of cast layers, and possible wound and cast complications.[2, 6-8, 9, 10] A novel TCC system consisting of a multilayered fiberglass clamshell design with cross-locking straps and a supportive CAM boot was developed to aid in the prevention and management of conditions of the plantar surface by reducing plantar pressure. Due to the inherent strength designed into the TCC system, non-weight-bearing ambulation for hardening is not required. Use of this novel TCC design by physicians and clinicians has the potential to considerably decrease total patient time in the clinic because the patient can immediately walk once supportive CAM boot is in place and there is no need for a waiting period to allow the cast to dry. The purpose of this study was to evaluate the application time of the design to establish a potential time range that may be reasonably expected for system application.

Methods:

- Nine healthy subjects volunteered to participate in the study. All were deemed healthy per self-reporting, did not have diabetic/ischemic ulcers on lower extremities or feet, and were cleared for participation by the investigating physician.
- Two clinicians and a physician with varying TCC application experience each applied the novel TCC design (FastCast™ total contact cast system, US Arthro, Pierceton, IN) **(Figure 1)** to three subjects following a standardized protocol and in accordance to manufacturer guidelines.
- Time was recorded using a standard stopwatch, beginning with soft goods application and stopping at completion of cast application.
- Time was converted into seconds and a descriptive statistical analysis was performed using SigmaPlot™, version 13.0 (Systat Software, Inc., San Jose, CA).

Figure 1:

The FastCast total contact cast system is comprised of a multilayered fiberglass clamshell design with cross-locking straps, customizable footplate, low-level compression sock and a supportive CAM boot.

Results:

- The overall soft goods, clamshell cast, and total application times for the study population are summarized below:

	Soft Goods Application Time (seconds) N = 9	Cast Application (seconds) N = 9	Total Application Time (seconds) N = 9
Mean ± SD*	116.6 ± 18.7 (1 min, 56 s ± 18.7 s)	329.1 ± 64.1 (5 min, 29 s ± 1 min, 4 s)	445.7 ± 78.7 (7 min, 26 s ± 1 min, 19s)
Median	119.0 (1 min, 59 s)	326.0 (5 min, 26 s)	445.0 (7 min, 25 s)
Range (min – max)	84.0 – 139.0 (1min, 24 s – 2 min, 19 s)	252.0 – 428.0 (4 min, 12 s – 7 min, 8 s)	336.0 – 551.0 (5 min, 36 s – 9 min, 11 s)

*SD = Standard Deviation

Discussion:

Total contact casts are considered the gold standard in off-loading. They distribute pressure uniformly over the entire plantar surface of the foot during walking, may reduce or control edema that may interfere with healing, and may improve patient compliance since the device is not easily removable.[2, 3, 4]

In this study, the clinicians and physicians had a mean application time of 7 min 26 seconds on 9 healthy subjects. This is a useful reference point for potential application times in clinics.

The observed application time for the system in this study is comparable to that of other TCC systems. However, one advantage of this TCC system over other systems is that there is no need to wait for the cast to dry.[11] Other systems do not account for this factor in reporting application times. Thus, this system has the potential to reduce overall patient time in clinic.

Conclusions:

In this preliminary analysis of application time for a novel TCC design by clinicians and a physician with varying levels of experience applying TCCs, a potential application time range of approximately 5 to 10 minutes was observed. This particular TCC system is unique in that it does not require a period of non-weight-bearing ambulation for cast hardening, which has hindered the use of TCCs in the past. When the cast hardening time of traditional TCCs is taken into account, the results of this study suggest that the use of this novel TCC system has the potential to considerably decrease total patient time in the clinic, which is beneficial to patient satisfaction and clinic efficiency. Further study is needed to assess its effect on this and other potential healing outcomes.

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