



A Prospective Evaluation of Patient Experiences and Skin Conditions During and After Cast Immobilization

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Abstract

Immobilization via casting for closed fractures is an accepted and common practice, which can lead to skin becoming dry, itchy, and odorous. The purpose of this study was to discover how burdensome, if any, are casts with respect to itch, perspiration and odor. Fifty patients with closed undisplaced wrist fractures were recruited to participate in the study. Patient demographics were collected on the day of cast application. After cast treatment, skin conditions were evaluated by the investigators in addition to eliciting information regarding discomfort, itch, perspiration and odor from the patients. Quantitative analysis was undertaken using descriptive statistical tests. Age ranged from 16 to 66 years (mean 37) and 54% were female. The levels of discomfort, itch, perspiration, and odor while wearing a cast were 40%, 71%, 47% and 53% respectively. Discomfort ($r=0.33492$, $p=0.0214$) and perspiration ($r=0.48056$, $p=0.0006$) were found to be correlated with odor. Skin conditions upon cast removal as observed by the investigators were as follows: 24% excellent, 48% good, 25% average and 3% poor. This study conclusively illustrates that patients requiring cast immobilization can expect to experience mild to moderate itching, perspiration and odor significant enough to be of bother.

Introduction

Immobilization via casting for closed fractures is an accepted and common practice, but there are drawbacks that accompany this form of treatment. Perhaps the most significant drawback endured by the patient is the compromise to the skin underneath the cast. Anecdotally, it is well accepted that encasing a limb in a rigid dressing for a prolonged period creates a hos-

pitabile breeding ground for bacteria and generally results in the skin becoming dry, itchy, and odorous (Harkess et al. 49). This anecdotal notion however, has not been scientifically supported in the literature. In fact, an extensive review of the literature (MEDLINE [1966 to present] and CINAHL [1982 to present]) yielded no published work assessing patient experiences and skin conditions during and after conventional cast immobilization. Therefore, the purpose of this investigation was to discover, delineate and document patient experiences and skin conditions underneath conventional casts.

Patients and Methods

Study Cohort and Treatment of the Injury

The study was conducted at the fracture clinic in a large level 1 trauma teaching hospital over the course of a three-month period. Prior to study commencement, the study methodology was reviewed to ensure hospital patient confidentiality protocols were followed. To be eligible for the trial, patients had to give informed consent, be 16 years old or more with a closed undisplaced wrist fracture requiring immobilization in cast for 4 to 6 weeks. Patients were not included if they were unable to communicate in English or cognitively impaired. Patients were also not included if there were any abnormal skin findings or if they had a history of allergies. Similarly, patients living outside of the city were not included to minimize loss of follow up.

Two types of cast padding and stockinette were used in this study: Clinitex[®] Synthetic Cast Padding and Stockinette with Microban[®] antimicrobial protection (FLA Orthopedics, Inc., Miami Lakes, Florida) and Protouch[®] Synthetic Orthopaedic Padding (BSN Medical, Charlotte, North Carolina) and cotton stockinette without antimicrobial protection. All casting tape used was of a non-fiberglass nature, either polyester or polypropylene. Patients were randomly assigned

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TABLE 1: PATIENT SATISFACTION

Variable	Patients (n=47)
Wet Cast	4%
Discomfort	40%
Itch	71%
Perspiration	47%
Odor	53%
Mean Overall Score	2.7

*Patient satisfaction was unreported for 3 patients

to receive a cast utilizing Microban™ impregnated padding and stockinette or a cast utilizing Protouch™ orthopaedic padding and cotton stockinette, according to a computer-generated randomization schedule. Randomization was conducted in order to allow for a comparative analysis between Microban™ and Protouch™, the results of which have been published elsewhere (Maxwell et al. 8-12). After randomization, patients had a short arm cast applied using standard casting techniques (Harkess 32). Upon completion of the cast patients were instructed on conventional cast care (Farrell 66). At the conclusion of cast treatment, the cast was removed using a standard bi-valving technique.

Data Collection and Statistical Analysis

Information regarding patient demographics, injury details and cast assignment was recorded on a standardized abstraction form on the day of cast application. After cast removal, overall skin condition based on any noticeable maceration and scaliness or dryness was evaluated and recorded by the investigators. Overall skin condition was considered to be excellent in the absence of maceration and scaliness/dryness; good when maceration or scaliness/dryness was mild; average when maceration or scaliness/dryness was moderate; and poor when maceration or scaliness/dryness was severe. The patient's assessment of their own experience with the cast was elicited by having the patients complete a patient satisfaction survey that we had developed prior to study commencement. As this was a self-administered survey, a 4-point scale was used for the ordered responses. Although a 5-point scale could have been used, there is no conclusive evidence supporting odd

over even scales (Fink 53). Before administering the patient satisfaction survey, an expert panel consisting of 2 orthopaedic surgeons, 2 orthopaedic technologists and 2 researchers reviewed the items of the survey to ensure content validity. The patient satisfaction survey provided an overall patient satisfaction score out of 12 based on patient discomfort, severity of itch, amount of perspiration and extent of odor experienced. Patients were also asked if they got their cast wet, as it was recognized that this could affect their other responses. The patient satisfaction score was shown to have a reasonable internal consistency reliability of 0.68. Levels of 0.70 or more are generally accepted as representing good reliability (Litwin, 21-31). Although removing the first (patient comfort) of the four questions improved the internal consistency reliability to a level of 0.83, this question was retained as it was felt to capture the patient's general experience.

Statistical analysis was performed using SAS version 8.0. Routine descriptive statistics were used to describe the patient demographics, injury characteristics, skin condition and patient satisfaction outcomes. Pearson's correlation coefficient was used to measure the relationship between the four variables assessed in the patient satisfaction survey. As the patient satisfaction score was the primary variable, the estimated between-subject standard deviation was 3 (sigma=range/4; based on a range of 12, with the best possible score being 0 and the worst possible score being 12).

Results

Study Cohort Demographics

Fifty patients (27 females and 23 males) with a mean age of 37 years (range: 16 - 66) participated in the study. The injury characteristics of patients varied between distal radius fractures, radial styloid fractures, carpal fractures and ephyseal injuries. This distribution is illustrated in Figure 1 (page 7).

Patient Satisfaction

The patient's assessments of their skin conditions during and following cast immobilization are summarized in Table 1 and Figure 2. Thirty-six percent of patients experienced mild discomfort and 4% of patients experienced moderate discomfort. Sixty percent of patients reported that itching was mild, that is they were aware of being itchy but were able to put it out of their minds; 11% responded that their itching was moderate, that

is they were continuously aware of it. Perspiration was a mild problem for 28%, a moderate problem for 17% and a severe problem for 2% of patients. Odor emanating from the cast was a mild problem for 34% and a moderate problem for 17% of patients. Two percent found the odor to be intolerable. An overall patient satisfaction score was calculated based on the sum of the responses to all four questions regarding discomfort, itch, perspiration and odor. The mean overall patient satisfaction score was 2.7 (0=best; 12=worst). Because only one patient randomized to each cast type got their cast wet, it is unlikely that wetness played any role in patient s responses. Using Pearson s correlation coefficient it was found that both discomfort ($r=0.33492$, $p=0.0214$) and perspiration ($r=0.48056$, $p=0.0006$) were moderately correlated with odor.

Skin Condition

The investigators overall ratings for skin condition following cast immobilization are summarized in Table 2 and Figure 3. On cast removal, overall skin condition was excellent in 24% of patients; good in 48% of patients; average in 25% of patients and poor in 3% of patients. Overall skin condition was based on the investigators’ assessment of maceration and scaliness/dryness. Sixty-five percent of patients were noted to have dryness of the skin upon cast removal and 24% were noted to have maceration. None of the study participants developed any type of infection.

Discussion

Our findings suggest that synthetic casts are, in fact, burdensome with respect to itch, perspiration and odor. Although patients did not experience severe degrees of itch, perspiration and odor, the degree experienced was still bothersome. Ironically, overall patient satisfaction while wearing a cast was quite good, but when you look at the variables independently, the truth is better revealed. As one would intuitively expect, our study also found a relationship between odor and perspiration.

This is the first study to measure skin conditions during and following conventional cast immobilization. Previous work by Selesnick analyzing patient satisfaction while wearing waterproof casts found levels of itch and odor to be 19.4% and 7.2% respectively (106-116). Selesnick s findings are substantially lower than ours are (70%, itch; 50%, odor), but the two studies cannot be equally compared since he did not study patients in conventional casts.

TABLE 2: SKIN CONDITION

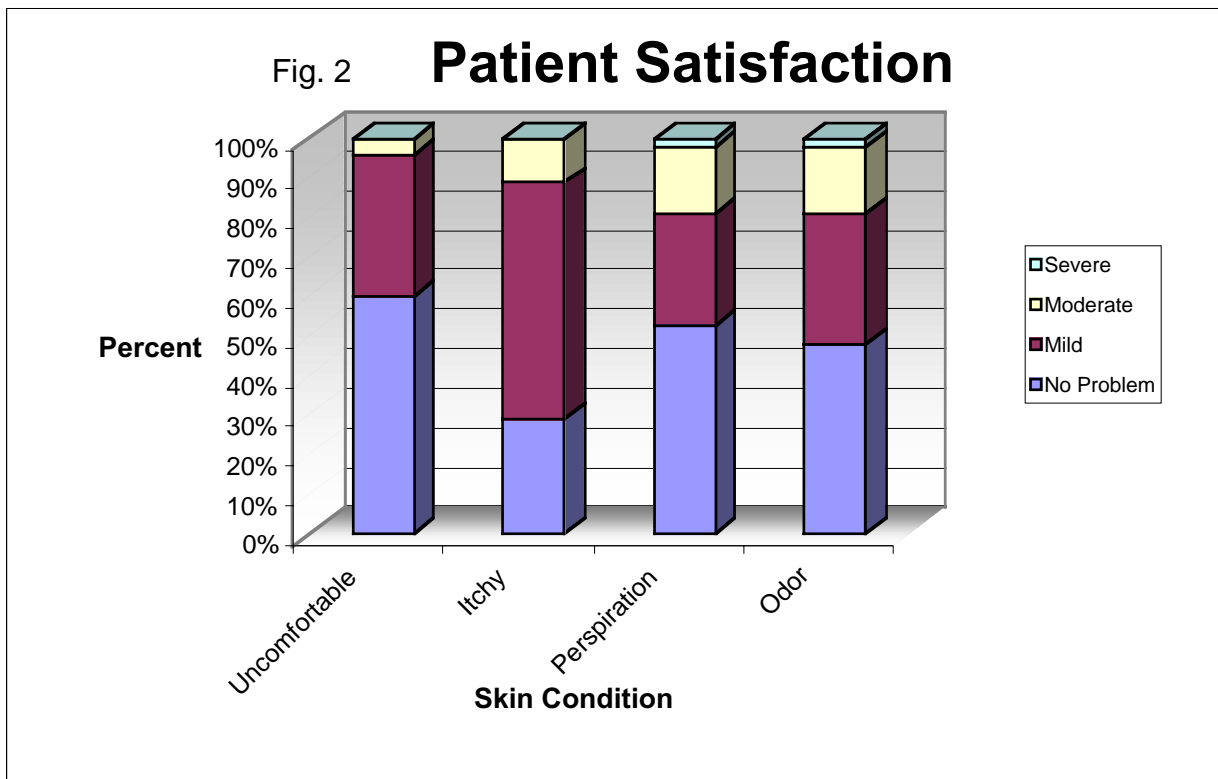
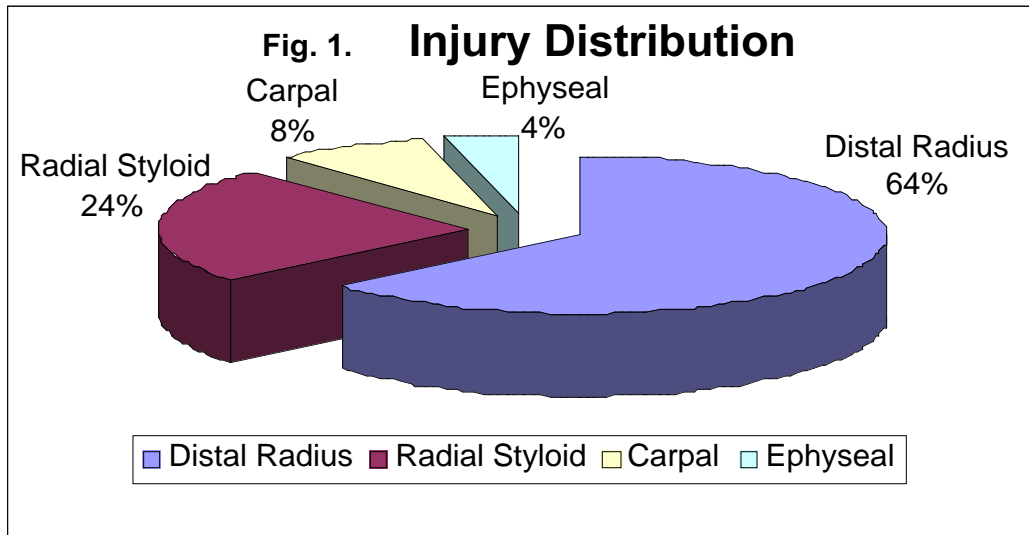
Variable	Patients (n=45)*
Overall grade	
Excellent (%)	24%
Good (%)	48%
Average (%)	25%
Poor (%)	3%
Maceration (%)	24%
Scaliness or Dryness (%)	65%

**Skin condition was unreported for 5 patients*

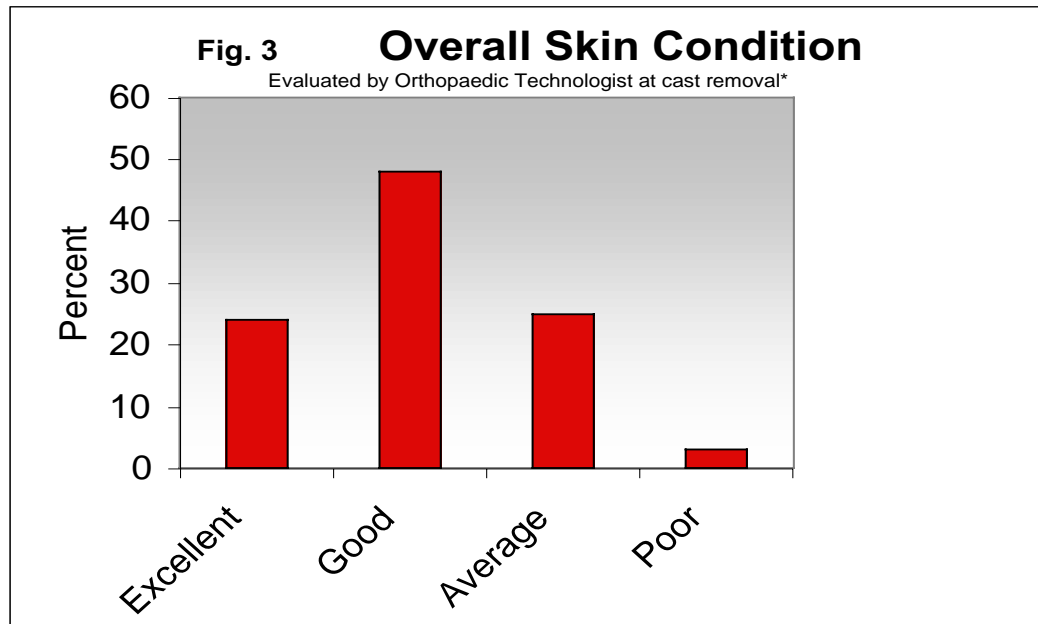
With patient experiences and skin conditions during cast immobilization now scientifically documented, it is hoped that this will provide the impetus for manufacturers of casting products to research and develop materials that minimize the inherent burden of wearing a cast. Until then, existing mechanisms to limit and control conditions of itch, perspiration and odor should be articulated to patients.

Our study does suffer from limitations. First, the data we collected was highly subjective. Nonetheless, the patient satisfaction survey represents the feelings of patients and documents the experience of wearing a cast by a patient —this is no longer anecdotal. Second, cast duration was not assessed as an independent variable. It is possible that duration in cast may affect patient experiences and skin conditions. Third, the measurement tool we used had an internal consistency reliability of 0.68, just less than 0.70, which is generally considered a level representing good reliability. Although the internal consistency reliability was not above 0.70, our survey is very similar to surveys in previous studies examining similar variables in waterproof casts (Gabaldo 1327; Selesnick 106-116; Selesnick & Griffiths 67-74).

In conclusion, our study illustrates that patients immobilized in synthetic casts are subject to mild to moderate degrees of itching, perspiration and odor that are significant enough to be of bother during the course of their treatment.



*Patient satisfaction was unreported for 3 patients



*Skin condition was unreported for 5 patients

ABOUT THE AUTHORS



Dion G. Maxwell is a Registered Orthopaedic Technologist employed at the Sunnybrook and Women's College Health Sciences Centre. He is a long-standing member of the Canadian Society of Orthopaedic Technologists (CSOT). In addition to his clinical duties, he is actively engaged in various research projects and regularly publishes and presents in this arena.



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