

Awareness of cast complications among fracture patients in Aseer region, Saudi Arabia

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Abstract

Background: A fracture is a break in the bone that is either partial or entire. The use of a plaster cast to immobilize damaged bones causes a progressive loss of motion range and muscular strength as well as skin and circulation complications. There is much research on prevalence of complications of casts but there has been no study done on awareness or prevalence of cast complications.

Objective: The objective was to determine the prevalence of awareness of cast complications among fracture patients.

Methods: This cross sectional study was conducted in Aseer region of Saudi Arabia. Sample size of 350 was calculated by self-made questionnaire. Quantitative analysis was done on Social Package of Statistical Sciences.

Results: Results showed a lack of awareness of cast complications; only half of the respondents knew that gypsum casts may cause skin ulcers (50.0%) and joint stiffness (48.0%). Most respondents were unaware that a cast may cause skin burns (74.3%) and ischemia (61.7%).

Conclusion: It is concluded that most of the participants were not aware of the complication of cast, so it is necessary to provide information of those patients who have fractures and will go for a cast so that we can diagnose complications and treat on time.

Key words: fracture patients, cast complications, Saudi Arabia

Introduction

A fracture is a break in the bone that is either partial or entire. Whenever a fracture occurs, it can be open or closed. A complex fracture is an open fracture; a serious wound exposing the bone through skin, or the bone pierces through all the skin. Although the bone is usually shattered, the skin may stay unchanged. Fractures go by many different names. Transverse, Spiral, Oblique, Compression, Comminuted and Segmental fractures are some of the most prevalent types which may occur (1).

Bone fractures often trigger serious functional impairments and are a major contributor to the manifestations of disability and disease load in all parts of the world. However not particularly evaluated as bone fractures, unintended accidents and transportation traumas both had a 20% to 17% decline in age-standardized DALY (disability-adjusted life years) percentages from 1990 to 2015, according to the Global Burden of Disease Study 2015. Considering significant reductions in age-standardized injury burden, overall rate of advancement for such sources of DALYs has indeed been comparably moderate, resulting in small alterations in the proportion of the total burden owing to injuries over the past two decades(2).

The independent contribution of pathophysiologic mechanisms to injury-related fractures varies by gender and ethnicity throughout the age spectrum. Males had a greater fracture frequency until about the age of 62, when it began to split in women from around age of 45. Hospitalization data for automobile traffic-related fractures is skewed. Ambulatory fractures were likely multifactorial in all populations during the average lifespan, contributing to 8.8 percent and 2.5 percent of all fractures, respectively(3,4).

The surgeon should address the difficulties in establishing appropriate stabilization in addition to the problems associated with inadequate formability while treating the musculoskeletal damage. External fixation with fine-wire fixators and a ring frame may remain a possibility in fracture with severe bone attrition to facilitate soft-tissue repair, especially in weight-bearing regions or around movable joints. Plating is yet another option for internal fixation in open lower - limb fractures. However it is potentially infectious and may impair osseous blood flow. Nevertheless, plating has been used as an adjuvant to support intra - medullary nailing in the current therapy of open tibial fractures(5).

The use of a plaster cast to immobilize damaged bones causes a progressive loss of motion range and muscular strength. As a culminate, it is fair to expect that a shorter time of immobilization in a plaster cast will result in a better functional status. Several investigations have demonstrated that early mobilization resulted with the same radiographic results as standard plaster cast stabilization in displaced or mildly displaced distal radius fractures. Reduced distal radius fractures can also be treated with plaster cast removal at three weeks or with physical bracing without endangering the fracture location. Furthermore, there is some dispute about the impact on functional outcomes(6).

Hook splints position is critical because incorrect position might result in excessive discomfort, malreduction, and tissue disintegration. Plaster cast soft tissue issues are the second leading iatrogenic reason for recommendation to surgery, following fractures. Poor splinting procedures are frequent, with one research finding that 93% of individuals had inadequate splinting(7). A cast can be excessively tight or too loose and the patient should be advised to notify any such situation in order for the cast to be changed. Casting problems must be logged and reported, and the practitioner should not ignore them. The recognition of these issues is critical to their management(8).

Tissue deterioration, extreme pain, skin conditions, pressure sores, compartment syndrome, soft tissue infections, cast saw burns, non-union, malunion, prolonged union, limb edema, and partial paralysis can all result from inadequate pre-, intra-, and post-casting treatment. A survey of individuals with casts found that 25% of them had cast-related problems. A prospective study found that several patients wearing casts visit emergency rooms owing to issues such as a damp cast, a broken, tight or loose cast, and soreness(9,10).

Casting is repeatedly alluded to as a conservative therapy, however clinicians and clinicians-in-training must keep in mind that this alternative is not without risks. Moreover, the goal of this research is to advise the patient and family or caregivers about the complications of cast immobility. Such communication will diminish the presumption that these procedures are risk-free and will assist the patient and family/caregiver to notice the warning indications of difficulties.

Location of fracture	Children and adolescents	Adult	Elderly
Skull and Facial	21.5%	14.3%	4.2%
Lower extremity	37.5%	48.5%	66.9%
Upper extremity	30.2%	22.7%	15.1%
Neck and trunk	10.8%	14.%	13.5%

Methodology

It was a cross-sectional study which was done in Aseer Region of Saudi Arabia. The population included in this study were those patients or caregivers of those patients who had any type of fracture and any type of cast that was applied for the treatment. All age groups and both genders were included. Patients who had open reduction or internal fixation and those who did not reside in Aseer region were excluded. Non probability convenient sampling technique was used for data collection and sample of 350 participants was collected by a custom-designed questionnaire and survey through Google forms was done on those who met our inclusion and exclusion criteria. Data was entered in SPSS version 25. Mean and standard deviation was used for quantitative while frequency and percentage were used for qualitative variables. Graphs were formulated afterwards and prevalence of awareness of cast complication among fractured patients in Aseer Region was assessed.

Results

The study enrolled 350 participants; 61.4% were male. Age groups ranged from < 18 years to 80 years, and most respondents (39.1%) being aged 18-25 years. Socio-demographic details of the study sample are shown in Table 1.

Table 2 shows the clinical data of the study sample. A total of 15.4% reported having chronic disease. One-third (33.4%) had hand injury, one-fourth (25.1%) had ankle and foot injury, and the remaining reported injuries were in different body parts. Duration of Gypsum cast ranged from one week (5.4%) to more than six weeks (16.0%), and most respondents reported a cast duration of three weeks (22.6%) and four weeks (20.9%) (Table 2).

A total of 30.9% had complications related to gypsum cast. The analysis of perceived knowledge of gypsum cast related complications revealed that 21.1% perceived their knowledge as weak. Only 38.3% reported being informed about complications of treatment with a gypsum cast by the treating team.

The study questionnaire included seven main questions testing knowledge of the most frequent complications of gypsum cast. Responses are summarized in Table 4. Awareness of gypsum cast complications was lacking in most questions. Only a half of the respondents knew that gypsum casts may cause skin ulcers (50.0%) and joint stiffness (48.0%). Most respondents were not aware that a cast may cause skin burn (74.3%) and ischemia (61.7%). In addition, nearly a half (48.0%) responded with "I do not know" to the question about complications of gypsum cast that they know. An illustration of self-reported gypsum complications is shown in Figure 1.

Independent samples t-test for the sex category and analysis of variance for the age category showed that there was no difference in the mean score of knowledge of gypsum cast complications between male and female respondents ($t = -1.09$, $P = .28$) and between different age groups ($F = 1.09$, $P = .39$).

Variables	Frequency	Percent
Sex		
Male	215	61.4
Female	135	38.6
Age group (years)		
< 18	104	29.7
18-25	137	39.1
26-40	71	20.3
41-60	32	9.1
61-80	6	1.7

Table 2. Clinical data of the study sample (n = 350).

Variables	Frequency	Percent
Do you suffer from chronic diseases?		
No	296	84.6
Yes	54	15.4
Type of orthopedic injury		
Hand injury	117	33.4
Ankle and foot injury	88	25.1
Leg injury	55	15.7
Forearm injury	36	10.3
Elbow injury	21	6.0
Knee injury	16	4.6
Humerus injury	10	2.9
Shoulder injury	7	2.0
Duration of cast		
One week	19	5.4
Two weeks	50	14.3
Three weeks	79	22.6
Four weeks	73	20.9
Five weeks	32	9.1
Six weeks	41	11.7
> Six weeks	56	16.0

Table 3. Information about gypsum cast treatment and its complications (n = 350).

Statements	Frequency	Percentage
Self-reported assessment of knowledge of gypsum cast related complications		
Weak	74	21.1
Good	92	26.3
Very good	99	28.3
Excellent	85	24.3
Were the complications of treatment with a gypsum cast and ways to prevent them explained by the treating physician or the technician applying the gypsum cast?		
No	216	61.7
Yes	134	38.3
Have you had any complications as a result of the cast treatment?		
No	242	69.1
Yes	108	30.9

Figure 1. Self-reported complications of Gypsum cast (n=350).

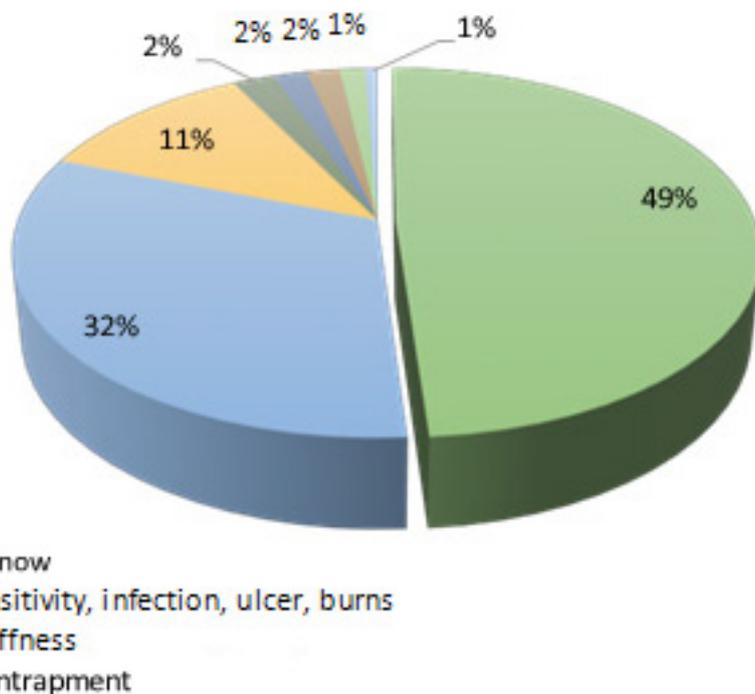


Table 4. Knowledge about different gypsum cast complications (n=350).

Complications	Frequency	Percent
Skin ulcer		
No	175	50.0
Yes	175	50.0
Skin burns		
No	260	74.3
Yes	90	25.7
Lack of blood perfusion to the cast area		
No	216	61.7
Yes	134	38.3
Joint stiffness		
No	182	52.0
Yes	168	48.0
Hypertension and damage to the peripheral nerves		
No	241	68.9
Yes	109	31.1
Skin infection/allergy		
No	211	60.3
Yes	139	39.7
Failure to stabilize the broken bone		
No	174	49.7
Yes	176	50.3

Table 5. Knowledge about gypsum cast complications in different study groups (n=350)

Category	Mean \pm SD	t or F value	P value
All subjects	2.83 \pm 2.19		
Sex			
Male	2.73 \pm 2.73	-1.09	.28
Female	2.99 \pm 2.99		
Age group (years)			
< 18	2.60 \pm 2.05	1.04	.39
18-25	3.09 \pm 2.23		
26-40	2.65 \pm 2.17		
41-60	2.78 \pm 2.37		
60-80	3.50 \pm 2.81		
SD: standard deviation; t: independent samples t-test; F: one-way analysis of variance.			

Discussion

This study was designed to know the awareness of cast complications following fractures. According to results of our study only half of the respondents knew that gypsum casts may cause skin ulcers (50.0%) and joint stiffness (48.0%). Most respondents were not aware that a cast may cause skin burn (74.3%) and ischemia (61.7%). In addition, nearly a half (48.0%) responded with "I do not know" to the question about complications of gypsum cast they know. This percentage is clearly telling us that awareness of cast complications is low and it is a responsibility for healthcare professionals to briefly describe the complications before applying cast to avoid severe complication.

The most prevalent age for fracture according to literature is 9.20% in children and adolescents, 32.20% in adults and 58% in the elderly (3). In comparison our study shows that the percentage of participants who had fractures and had cast application was, children and adolescent 29.7%, adults 68.5% and elderly 1.7% which is not supported by the previous literature.

The most prevalent sites of fracture are forearm and hand 37.4%, ankle 13.8%, tibia and fibula 7.7%, and other areas like spine, ribs, face and skull 41.1%(11). Our study shows that one-third (33.4%) had hand injury, one-quarter (25.1%) had ankle and foot injury, and the remaining reported injuries were in different body parts. Casts do not come devoid of risks and problems; and the chance of complications increases when casting is done by inexperienced practitioners. Specific methods and materials of appropriate cast and splint placement are indicated to reduce complications and morbidity in individuals who are at a high incidence of casting and splinting issues. The comatose multi trauma patients, the patient with diabetes and hypertension, the patient with a history of trauma, the intellectual and developmental disabilities patient, and the patient with spasticity are all

at significant risk(12). In relation to this, our study tells us that 15.4% of participants suffered from chronic diseases like HTN, Diabetes, Hyperthyroidism, Asthma, Multiple sclerosis and history of orthopedic injuries and almost thirty percent develop complications after cast application. Also gypsum cast was used in those participants who were included and cast application was done by trained physicians.

Whenever casts are applied to immobilize bones after a fracture, significant problems might occur. A custom-designed survey was used to interview 109 patients of more than eighteen years from three Western Australian hospital systems. The retrieval of seven areas of information, particularly pain, edema, cast care, itchiness, neurological signals, vascular indications, and exercise or rest, was employed to assess patients' comprehension of cast care and potential consequences. Patient memory of knowledge on cast care and potential problems was less than 60%. The availability of written material was strongly connected with a greater knowledge of potential consequences(13). In relation our study included 350 participants of the age group of 0 to 80 years and our result also significantly correlates with this study as almost 55-60% participants overall had awareness regarding cast complications.

Soft-tissue injuries secondary to casting occur frequently, and can occur at any time during the casting period (14). Including all patients, the predicted risk of cast-related cutaneous or neurological problems was 8.9 every 1,000 casts administered. The whole pre - intervention sample had a rate of 13.6 every 1,000 castings, which reduced to 6.6 in the post - intervention group. In the heel-only group, the rate remained 17.1 per 1,000 lower extremity casts administered prior to intervention and 6.8 after treatment(15). In contrast, our study included those who had cast related complications but did not ask the frequency of complications separately.

The most noticeable effect of casting and splinting is compartment syndrome. It is a phenomenon of elevated pressure within a tight area that impairs blood circulation and tissue perfusion, resulting in hypoxia and possibly irreversible harm to the soft tissues inside that area, and most individuals are unaware of how to evaluate problems(16). In relation to this our study results show that only 38.3% of respondents had awareness about this complication.

Thermal damage to the skin as well as ulceration can develop as a result of the casting and splinting procedure. Skin breakdown was the most frequent cause, often induced by focus point stress from a creased, balconette, or underpadded region over a bony prominence or underpinning soft tissue, and clients who suffered from this type of injury were unaware prior to and after applying cast; that may also pertain to research, that only half of the participants were cognisant(17).

Individuals were unaware of the bacterial and fungal infections, as well as the pruritic dermatitis that can occur underneath a splint or cast. An exposed wound is more vulnerable to infection, but the wet, warm environment of a splint or cast might be excellent for infection. Furthermore, joint stiffness is an unavoidable side effect of immobilisation(16). In contrast our study did not ask about bacterial or fungal infection but joint stiffness related to cast was one of our variables which showed that 48.0% participants had awareness of this.

Conclusion

Patient comprehension and awareness of cast care and possible complications was 51%. The availability of basic information was significantly associated with a greater knowledge of potential consequences. The findings suggest that there is a need to develop proper information guidelines regarding cast complications for the patients and caregivers.

Limitations and Recommendations

- Sample size of this study was small so there should be a large sample size because a larger sample size would have shown more clear results.
- It is recommended to conduct a study like this on a larger scale including more hospitals and more regions.
- Adding more variables like socioeconomic status and level of education of participants is recommended to conduct further studies because these variables were relatable to awareness.

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