ORIGINAL ARTICLE

Comparison between Water Resistance Padding and Synthetic Cotton Padding, Regarding Patient Comfort Level under the cast for fractures

MUHAMMAD SALEEM, IMRAN MANZOOR, SHAUKAT RABBANI

ABSTRACT

Aim: To establish which cast padding is more in line of comfort with patient's daily routine activities with regards to odor, itching, sweating, ulceration of skin and bathing. One consists of ordinary synthetic cotton and other liner system consists of water resistant polypropylene, nylon and polyester fiber

Study design: Prospective Randomized clinical trial

Setting: Department of Trauma &Orthopedics Shalamar Hospital, Lahore

Methods: It was a Prospective Randomized clinical trial of 40 patients who visited our OPD of Department of Orthopedic, Shalamar Hospital, Lahore ranging from 18 to 60 years who had closed fracture of both upper and lower limb with minimal displacement during a period of 6 months, Aug 2017 to Jan 2018.

Patients were divided into two groups of 20 patients in each group. One group had ordinary synthetic cotton lining and other had water-resistant Synthetic Cotton lining. Both were seen at one week, two weeks, four weeks and six weeks interval. Then cast was removed and patients were examined subjectively and objectively and were given questionnaire and then scoring was done according to Likert's scoring scale of compliance regarding odor, sweating, itching, ulceration of skin and bathing. On the basis of scoring, conclusion was drawn as of which padding was more in line with satisfaction of patient and surgeon. Mean plus S. Daviation was calculated for quantitative variables like age, sex, upper or lower limb fracture. Mean plus S. Daviation were calculated for qualitative variables. Data was stratified and post stratification table was generated to calculate score for odor, sweating, itching, ulceration of skin and difficulty in bathing using Likert scale ranging from 1 to 5 (1 = strongly disagree 2= disagree, 3= neutral, 4 =agree, 5= strongly agree)

Results: Water proof cast liner has better scores with regards to abovementioned 4parameters under study. Parameters Odor (P= 0.000), Sweating (P= 0.000), Itching (P=0.03), difficulty in bathing (P=0.000) but 5th parameter, Ulceration of skin (P= cannot be calculated) did not show any significant difference between the two groups.

Conclusions: Water resistant cast liner had better scores in four parameters of patient and surgeon satisfaction, and one parameter of surgeon satisfaction namely ulceration of skin did not show any significant difference between the two groups. The overall comfort level is significant more in patients who had water resistance cast padding for fractures and we strongly recommend to use this specially in hot weather.

Keywords: Cotton padding, water resistance padding, synthetic cotton padding

INTRODCUTION

Trauma has been a part of human history. Many Traumatic injuries resulted in fractures which need some kind of splintage[1]. The idea of splintage was to reduce pain due to prevention of movements at fracture site and to promote suitable environment for fracture healing and ensure its adequate alignment, angulation and rotation between the fracture segments[2]

Different methods of splintage have been in use since long time. Splints have been found on Mummies during Egyptianexcavations[3]. They are also mentioned by Hippocrates in 350 BC who mentioned the usage of bandages soaked in resins and wax[4]. In 1852 Antonius Mathijsen, a Dutch Military Surgeon introduced the usage of linen dressing mixed with powder gypsum[5].

Plaster of paris was made by heating gypsum to 300-degree F which produced dehydration in gypsum. It was milled into powered form. After water was mixed plaster of paris was set in hard form due to formation of crystalline form of gypsum molecules accompanied by an exothermic reaction[6].

In later half of 20th century fiberglass casts were used which consisted of fiberglass bandages impregnated with polyurethane. These were light and dried much faster than plaster bandages[7].

Plaster of paris casting has traditionally accompanied by a liner padding. Padding is necessary to protect skin from thermal injury because of exothermic reaction during setting of plaster of paris to crystalline form[8].

Over padding does not allow a snuggly fitting application of cast and fracture ends of bone may continue to have movements which will inhibit or impair healing[9].

Casting is usually done with application of stockinette. Over it one or two layers of liner padding is done and then plaster of paris or fiberglass bandages are applied over liner padding. The stockinette and padding are folded back over the edges of plaster of paris or fiber glass to create a rounded smooth edges10.

The liner padding are traditionally done using natural cotton or synthetic cotton. In our environment, especially in summer, lot of patients complain of discomfort and itching

---

Department of Trauma &Orthopedics, Shalamar Hospital / Shalamar Medical & Dental College, Lahore-Pakistan. Correspondence to Dr. M. Saleem, Associate Professor, E-mail msaleem204@live.com Contact # +92300-8456157

under the plaster and we have been looking forward for new materials for padding under the cast.

Lately new liner materials made with polypropylene, nylon and polyester fibers have been introduced which allow unrestricted access to water during routine bathing and washing. The manufacturer also claims highly comfortable padding without stockinette, which can reduce skin complications and resistance to saw penetration while removing the plaster.

The aim of this study was to compare the results of 2 types of cotton liners (i.e. synthetic cotton vs water resistant padding) qualitatively and quantitatively in patient's comfort level with regards to odor, itching, sweating, ulceration and difficulty in bathing in daily life activities.

We hypothesize that synthetic water-resistant cast liners will provide better patient scores with regards to above mentioned qualitative parameters and better surgeon score with regards to ulceration of skin.

MATERIALS & METHODS

From August 2017 to January 2018,patients with closed fractures with minimal displacement and mild swelling of both upper and lower limbs, which are treated conservatively, patients from 18 year to 60years of age with sound medical and physical condition with healthy preexisting skin of the affected area were included. These patients were initially treated in emergency department with the back slab along with pain management and referred to our Orthopedic OPD for definitive management. For this prospective randomized clinical trial, randomization was done by making equal number of 40 papers folded in a box. 20 were assigned as "Patients for water resistant padding fiber glass cast" and 20 were assigned as "Patients for simple synthetic padding fiber glass cast".

The patients with dementia, grave medical and surgical conditions with low life expectancy like advanced metastatic cancer, advanced liver disease with hepatic encephalopathy, advanced renal failure who were on dialyses were excluded from study. Similarly, we also excluded the patients with pre-existing skin conditions, open sinuses or open exuding wounds.

Inclusion and exclusion criteria, as mentioned above, were made and patient was asked to pick the folded paper from the box and orthopedics resident was assigned the type of cast padding that patient was going to have.

At the time of cast removal (5 to 6 weeks according to physician decision for removal of cast after union of fracture), the patient was given a questionnaire having Likert scoring system for assessing the qualitative parameters odors, itching, sweating, and difficulty in bathing and lastly the surgeon was required to fill questionnaire for assessing the qualitative parameter, the ulceration of skin.

RESULTS

Total 40 patients were inducted in study, mean age of our study group was 39 years. Twenty patients were given water resistance padding cast plaster and 20 patients were given Ordinary Synthetic Cotton padding Cast Plaster. There were 26 male patients and 14 female patients. Out of 40 patients 22 patients had upper limb fracture and 18 patients had lower limb fracture. All were adult patients because response to questionnaire was expected to be better for subjective parameters as mentioned before namely odor, itching, sweating, and difficulty in bathing from adults as compared to Pediatrics patients.

Water proof cast liner has better scores with regards to below mentioned 4 parameters under study. Parameters, Odor (P= 0.000highlysignificant), Sweating (P= 0.000 highly significant), Itching (P= 0.03 significant), difficulty in bathing(P= 0.000 highly significant) but fifth parameter, Ulceration of skin (P= cannot be calculated) did not show significant difference between the two liner systems

Table 1: Water proof liner with satisfaction score using Likert scale (1 to 5)

Pts	Odor	Itching	Sweating	Ulceration	Ease in Bathing
1	1	2	2	1	2
2	1	2	3	1	2
3	2	1	3	1	1
4	3	1	1	1	3
5	1	2	1	1	3
6	4	2	1	1	1
7	3	2	2	1	3
8	2	2	3	1	3
9	2	2	1	1	1
10	2	2	1	1	2
11	2	3	1	2	1
12	3	1	2	1	2
13	5	5	3	1	2
14	1	1	5	1	2
15	2	5	1	1	2
16	5	3	4	1	1
17	4	1	1	1	1
18	1	3	2	3	2
19	1	4	3	1	2
20	2	2	1	1	2

Ordinary Synthetic Cotton liner with satisfaction score using Likert scale (1 to 5) Table – 2

Pts	Odor	Itching	Sweating	Ulceration	Difficulty in Bathing
1	4	3	5	2	5
2	3	4	5	5	4
3	5	4	4	1	5
4	4	5	5	1	3
5	2	2	5	2	5
6	5	3	4	1	5
7	5	1	4	2	4
8	3	3	4	1	5
9	4	3	5	1	3
10	5	4	3	2	5
11	5	3	2	1	5
12	5	3	2	2	4
13	3	4	3	2	5
14	5	3	5	2	1
15	5	1	4	1	5
16	3	3	5	1	2
17	4	2	4	1	4
18	3	1	4	1	5
19	4	4	4	1	4
20	4	4	5	1	5

Table 3: Ratings between Synthetic cotton and waterproof lining materials

	Synthetic Cotton	**Water Proof**	
Parameter	Median (IQR)	Median (IQR)	P (two tailed)
Itching	3	4	0.03 (significant)
Odor	4	2	0.000 (highly significant)
Sweat	4	2.5	0.000 (highly significant)
Difficulty in bathing	5	2	0.000 (highly significant)
Physician's rating regarding Ulceration of skin	1	1	Cannot be calculated

DISCUSSIONS

This study investigated as to which cast padding had better scores then the other, qualitatively and quantitatively, regarding patient satisfaction in view of odor, sweating, irritation, ulceration of skin and bathing.

Previous studies have shown that water resistant cast liner had better patient and surgeon satisfaction. In our study comparing the results of both types of liners, Likert scoring system was taken into account which measures subject agreeing or disagreeing for satisfaction or dissatisfaction with particular parameters like odor, itching, sweating, ulceration and ease of bathing. The scoring is based on maximum score of 5 for one parameter and minimum score of 1 for the same.

Likert score takes into account as scores in ascending order i.e.1=strongly disagree, 2=disagree,3= neutral, 4=agree, 5=strongly agree.

Likert scoring system is simple but has its limitation is being subjective. Another limitation of our study is that it did not take into account the ease or difficulty in application of cast with water resistant or ordinary synthetic cotton liner as application is experience dependent and surgeon or cast technician biasness cannot be ruled out. Another limitation in our study is that it evaluates only 5 parameters i.e. odor, itching, sweating, ulceration of skin and bathing.

Our study has advantage that it was done on adults only as the subjective scoring of various parameters is more reliable. In children it is difficult to ascertain if the scoring assigned to a particular parameter is fully accurate as in children the subjective parameters evaluation is less reliable.

It further has the advantage that it took into account the fracture of lower limbs also, where both type of cast liner are used. Hygiene, especially in lower limb is more difficult to maintain. Our aim was that if this study proves better hygienic parameters like odor, itching, sweating in lower limbs, its indication can be extended to its use as hip spica cast where keeping healthy skin conditions are more difficult to maintain especially because of cast proximity to perineum.

Our study is in line with previous studies as having water resistant cast liner with higher scores in regard to above mentioned 5 parameters.

CONCLUSION

Water resistant cast padding has better scores in 4 parameters of patientsatisfactionnamely odor, itching, sweating and bathing, but fifth parameter of surgeon satisfaction namely ulceration of skin both groups did not show any significant difference. Patient had more libertywith especially bathing which was a big advantage since the time old instruction to patient for keeping the cast dry in order to maintain skin hygiene is difficult for the patient,and liberty of bathing at will is more easily obtainable by using water resistant cast liner.

The only disadvantage of water resistance cast liner is its high cast and the need for surgeon and cast technician to acquire experience in application of cast. The overall comfort level is significant more in patients who had water resistance cast padding for fractures and we strongly recommend to use this specially in hot weather.

REFERENCES

1. Browner B.D., Jupiter J.B., Levine A.M., Trafton P.G., Krettek C., Green N.E. Skeletal Trauma. Saunders; 2008. The history of fracture treatment. pp. 1–32.
2. Boyd AS, Benjamin HJ, Asplund C. Principles of casting and splinting. Am Fam Physician. 2009;79(1):16–2
3. Ellis H. History of surgery. University Press, Cambridge, 2009.
4. 4 Masic I. History of medicine in Bosnia and Herzegovina. Avicena, Sarajevo, 2011.
5. Staff. "CaSO4, ½ H2O". LaFargePrestia. Archived fromthe original on November 20, 2008. Retrieved 27 November2008
6. Wytch R, Ross N. Glass fibre versus non-glass fibre splinting bandages. Injury 1992;23:101-6.
7. Shannon EG, DiFazio R, Kasser J, Karlin L, Gerbino P. Waterproof casts for immobilization of children's fractures and sprains. J PediatrOrthop. 2005;25(1):56–59. [PubMed
8. Haley CA, DeJong ES, Ward JA, Kragh JF., Jr Waterproof versus cotton cast liners: a randomized, prospective comparison. Am J Orthop (Belle Mead NJ) 2006;35(3):137–140. [PubMed]