Cutting a Plaster of Paris Cast using Twisted Wire Compared with and Electrical saw a safe, new, and cheapness Device

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Background: Plaster of Paris is a material, used for immobilization when the patients have fractures or muscle injuries or dislocation of the joints. Cast removal will be done after finished treatment. The common tool for removing the plaster of Paris cast is an electrical saw. However, the noise and dust produced during the process of cutting are undesirable and most of the patients are scared of the noise and the moving saw blade of the electrical saw. Moreover, the electrical saw is an expensive tool. New methods to conserve energy and to reduce pollution in the office are proposed. Objective to evaluate the efficacy of a new device, twisted wire, compared with the electrical saw for removing the plaster of Paris cast.

Study design: Non-randomized experimental study.

Setting: The outpatient clinic number 1 at Siriraj hospital.

Subjects: Sixty patients with fracture and ligamentous injuries of the extremities were included in this study; fifty-three males and seven females. The mean age was 26 years old (15-43 years). The four groups of fifteen patients each consisted of those with short arm casts, long arm casts, short leg and PTB casts, and long leg and cylindrical casts.

Results: The mean and standard deviation of duration for cutting the short arm cast using the electrical saw and twisted wire were 10.02 ± 2.15 seconds and 3.00 ± 1.80 seconds respectively (p < .005). The mean and standard deviation of duration for cutting the long arm cast by using the electrical saw and twisted wire were 17.00 ± 4.35 seconds and 6.10 ± 3.38 seconds respectively (p < .005).
Plaster of Paris is a material, used by orthopedic surgeons for casts around the world. The common tool for the removing the plaster of Paris cast is an electrical saw. This technique is convenient for the casting technician. However, the noise and dust produced during the process of cutting are undesirable and most of the patients are scared of the noise and the moving saw blade of the electrical saw. New methods to conserve energy and to reduce pollution in the office are proposed. This new device for removing the plaster of Paris cast, therefore, has been developed to overcome these undesirable effects. The new device is a twisted wire, made from two wires each 0.2 centimeters in diameter. This report aims to present the efficacy of this new device as compared to the electrical saw alone.

Materials and Methods

Sixty patients with fracture and ligamentous injuries of the extremities were enrolled in this study. The criteria for selecting the patients was the need for a plaster of Paris casting for the treatment of fractures or ligamentous injuries of the extremities. The four groups of fifteen patients who were selected consisted of a short arm cast group, a short leg and PTB casts group, a long arm cast group, and a long leg and cylindrical casts group.

Two wires were twisted together with a tension of ten pounds (Figure 1). The lengths of the wires were: fifty centimeters for the short arm casts, seventy centimeters for long arm and short leg casts, and a pair of seventy centimeter wires for the long leg casts. Loops were formed at both ends of the twisted wires for holding by the two hook handles (Figure 1).

The fracture reduction and padding were done as usual and the twisted wire was placed over the padding at the dorsal side of both upper and lower extremities. One layer of padding at both the lower and upper ends of the twisted wire were used to hold the wire in place. Then the plaster of Paris bandages were applied in the normal way (Figure 2). The long leg casts required two sets of twisted wire one set for the lower leg and another set for the thigh (Figure 2).

Figure 1. The twisted wire and the hook handles.

The mean and standard deviation for cutting the short leg and PTB casts using the electrical saw and the twisted wire were 15.12 ± 2.36 seconds and 9.86 ± 0.66 seconds respectively (p<0.05). The mean and standard deviation for cutting the long leg cast using the electrical saw and twisted wire were 58.23 ± 9.86 seconds and 15.35 ± 3.49 seconds respectively (p<0.05). The mean and standard deviation to the overall satisfaction of the patients with the electrical saw and twisted wire were 52.25 ± 27.15 and 83.75 ± 8.57 respectively (p<0.05).

Conclusion: The twisted wire cutting cast is a new and effective device for removing a plaster of Paris cast which is easy to produce and use, safe, cheapness, and noiseless.
For the cutting technique of the twisted wire, one technician holds both loops of the twisted wire using the hook handles. One hand of the technician holds the cast while the other pulls the one hook handle smoothly, so the twisted wire will cut the cast from inside to outside until it is cut completely. Action is repeated on another hook.

All the patients were treated with both cutting techniques first with the twisted wire then with the electrical saw. The times used in both techniques were recorded from the beginning until completion of the cut. The satisfaction of the patients after the cutting of the casts was completed by each technique was measured by using a visual analog scale 0-100 scales (0= unsatisfied and 100=satisfied). The data recorded in the window excess, and paired T-test was used for comparing the duration and patient satisfaction of the two techniques.

Results
The study included fifty-three males and seven females whose means age was 26 years old (15-43 years). Most of the injuries were caused by motor vehicle accidents (50 cases); the rest were sport injuries.

Ten patients with closed fracture tibia and five cases with ligamentous injuries of the knee were included in the group of long leg and cylindrical casts. The group with short arm casts consisted of 10 patients with fracture at the distal end of the radius arch with patients with undisplaced fracture of the scaphoid. Twelve patients with undisplaced fracture of the forearm and three patients with elbow dislocation were included in the group of long arm casts. Ten patients with sprained ankles and five patients with clinical healed fractures of the tibias were in the group of short leg cast and PTB cast.

The mean and standard deviation of duration for cutting the various casts by using the electrical saw and twisted wire were presented in the table 1. The time taken to cut the casts with the twisted wire was statistically significant less than with the electrical saw (p<0.005). The mean and standard deviation of the overall satisfaction of the patients with the electrical saw and twisted wire were 52.25 ± 27.15 and 83.75 ± 9.57 respectively (p<0.05).

Discussion
The plaster of Paris bandage was made from the sheath of cotton thread and powder of plaster of Paris. The twisted wire has an uneven surface, which can cut the cotton threads by the shearing action of a seesaw motion. The twisted wire technique used less time than the electrical saw technique and was noiseless. Since the twisted wire cut from the inside to outside of the cast, the

Figure 2. Applying the twisted wire over the padding and holding the wire by padding at proximal and distal ends.

Figure 3. The short leg cast (A), and long leg cast (B) with twisted wires.
Table 1. Duration for cutting the casts by electrical saw and twisted wire.

<table>
<thead>
<tr>
<th>Type of cast</th>
<th>Electrical saw (seconds)</th>
<th>Twisted wire (seconds)</th>
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</thead>
<tbody>
<tr>
<td>Short arm cast</td>
<td>10.02 ± 2.50</td>
<td>3.00 ± 1.80</td>
</tr>
<tr>
<td>Long arm cast</td>
<td>17.00 ± 4.35</td>
<td>6.10 ± 1.36</td>
</tr>
<tr>
<td>Short leg and FTB casts</td>
<td>15.12 ± 2.56</td>
<td>5.01 ± 1.65**</td>
</tr>
<tr>
<td>Long leg and cylindrical</td>
<td>58.23 ± 9.86</td>
<td>15.35 ± 2.69**</td>
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</tbody>
</table>

*p<0.005
** p=0.05

Dust produced during the cutting process was less. Moreover, patients were less frightened by this technique than with the electrical saw as the action was coming outward toward the limb and was noiseless. There were no skin complications during the period of wearing the cast and the cutting process by the twisted wire. Not surprisingly, this technique had a high level of patient satisfaction. The twisted wire can be reused many times and requires no electricity; therefore it saves cost for the institute. It can not totally replace the electrical saw because it can only be used for cutting fiberglass or for windowing or wedging the plaster of Paris cast.

In conclusion, the twisted wire cutting cast is a new and effective device, which is easy to produce and use, safe, cheap, and noiseless.

Reference