

Precut Cast: An Easier and Less Stressful Cast Removal Procedure for Pediatric Patients

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Summary: During hospitalization, pediatric patients or their parents may feel stressed. If patients need to stay in the hospital with a cast, they are prone to feeling more stressed. Fixation using a cast is an important clinical option, particularly in the case of skin grafts wherein fixation of the foot and ankle is essential to ensure the survival of the graft skin. However, the removal of the cast is also stressful for patients because it needs to be removed with a cast saw. To avoid further stress in pediatric patients, we cut the cast intraoperatively and then fixed the cast again using nylon cable ties. One week after surgery, we separated the patient's cast. Instead of using a cast saw, we used only scissors or nippers. Our cast removal method was easy, safe, and less stressful. (*Plast Reconstr Surg Glob Open* 2021;9:e3700; doi: [10.1097/GOX.0000000000003700](https://doi.org/10.1097/GOX.0000000000003700); Published online 16 July 2021.)

INTRODUCTION

To perform skin grafting on the foot, lower leg, and hand lesions, fixation of the affected site is required. In particular, in procedures requiring inserting a wire for a finger or toe, a cast is effective for fixation. Thereafter, removal of the cast is also required 1 or 2 weeks postoperatively. Removal of the cast is stressful for patients, particularly in younger pediatric patients because the shape and loudness of a cast saw can make them feel scared. To reduce stress during cast removal, we used a precut cast (PCC). With the PCC method, casts are cut immediately after being put on a patient's extremity. Then, the cast is fixed again using nylon cable ties. These cables can be cut without a cast saw. (See Video [online], which demonstrates how the nylon ties were cut using scissors to split the cast. These nylon ties were easy to cut. This procedure reduced patient's stress during cast removal.) Cast saws were used only when patients were under general anesthesia. The use of PCC offers the advantage of reduced duration of cast removal and is cost-effective because the nylon cable ties are inexpensive. In this report, we applied PCC for patients who received skin grafts for the toe.

CASE REPORT

Case 1

A two-year-old girl had contracture of the right toe due to a burn scar. The patient received skin grafting for the sole of the foot. However, this resulted in burn contracture of the toes. Ten months after the first surgery, a second surgery was performed. A 6 × 8-cm full-thickness skin graft was harvested from the right groin lesion and fixed to the sole side of the metacarpophalangeal (MP) joint using the 4-0 nylon braid suture (Nurolon; Ethicon, Somerville, N.J.). A 0.7-mm stainless-steel wire (C-wire; Zimmer, Warsaw, Ind.) was inserted from the tip of the toe to the MP joint. PCC was used to fix her foot, ankle, and lower leg. A plastic cast (Scotchcast; 3M, St. Paul, Minn.) was used to fix the toe to the lower leg. Then, the cast was separated using a cast saw (Cast Cutter; Stryker, Kalamazoo, Mich.; Fig. 1). The cast was fixed again using nylon cable ties and a tie gun (Tie gun; TRUSCO, Tokyo, Japan; Fig. 2). Until 1 week postoperatively, nylon cable ties kept tension (Fig. 3). Nylon ties were cut using scissors to split the cast again. The duration of cast splitting was 2 minutes. The skin graft survived completely. Two weeks postoperatively, the patient was allowed to walk.

Case 2

A two-year-old boy had syndactyly of left ring finger and small finger. The separation of fingers was performed under general anesthesia. A 6 × 3-cm full-thickness skin was harvested from the left groin lesion and fixed to the side of ring finger and small finger using the 4-0 nylon braid suture. A 0.5-mm stainless-steel wire (C-wire) was inserted from the tip of the fingers to the MP joint. A plastic cast was used to fix the finger to the

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Fig. 1. After skin grafting was finished, a plastic cast was applied from the toe to the knee joint. The cast was separated using a cast saw under general anesthesia.



Fig. 2. Nylon cable ties were used to fix the cast again.



Fig. 3. One week postoperatively, nylon cable ties still remained. Cables were cut using scissors.



Fig. 4. A plastic cast was applied from the finger to the elbow joint. The cast was separated using a cast saw under general anesthesia.

elbow joint. Then, the cast was separated using a cast saw. The cast was fixed again using nylon cable ties and a tie gun (Fig. 4). Until 1 week postoperatively, nylon cable ties maintained tension. Nylon ties were cut using scissors to split the cast again. (See Video.) The duration of cast splitting was 2 minutes. The skin graft survived completely.

DISCUSSION

Hospitalization is stressful for both pediatric patients and their parents.¹⁻⁴ We believe we should try to decrease their stress levels. However, we often fix the extremities of patients having received skin grafting or bone fixation using a cast. In such cases, fixation using a cast is essential to achieve good postoperative results.⁵

However, some researchers have recommended early mobilization and rehabilitation of the lower leg after skin grafting.⁶⁻¹⁵ Unna's boots are also useful for the fixation of the lower leg after surgery.^{13,14} Choi et al also reported the effectiveness of soft casting.¹⁵ These soft casts allowed early ambulation in patients. However, these reports did not account for pediatric patients and did not describe whether skin grafts were performed for joint lesions or not.

Furthermore, Ricks and Meagher reported that the fixation of the lower extremities using a cast after skin grafting is important,⁵ particularly in young pediatric patients if their operative sites contain joint lesions for which fixation of the joint using a cast is an important therapeutic option. However, removal of the cast is also required and is a stressful event for patients. Katz et al reported a case wherein an 18-month-old boy who had cardiomyopathy died after the removal of a cast using a cast saw.¹⁶ In this case, malignant arrhythmia was caused due to the anxiety induced by the noise from cast saw. They further examined the heartbeats of other pediatric patients during cast removal. In their study, heartbeats were increased in about 27% of patients during cast removal.

Several authors have reported ways to decrease stress during cast removal. Schlechter et al reported that the presence of a certified child life specialist can decrease the anxiety associated with cast removal.¹⁷ Therapeutic play,¹⁸ watching children's videos,¹⁹ and music therapy²⁰ were also found to reduce the anxiety associated with cast removal. However, during cast removal, patients may see cast saws and hear loud noises. Katz et al reported that the anxiety associated with cast removal was due to

the noise from the cast saw. They also reported that hearing protection and noise reduction headphones were useful in decreasing patient anxiety.^{21–23} Ko et al reported the effectiveness of using an iPad and games during cast removal.²⁴ Jivraj et al used a virtual reality monitor in addition to games.²⁵

We tried to separate a cast without having to use a cast saw in the cast room. In our method, casts were separated and then fixed again using nylon cable ties while the patient was still under general anesthesia. These nylon ties are soft and easy to cut apart. To cut open our cast, only scissors or nippers were required, and the process took about one minute. Our method decreased the duration of cast removal. To apply a PCC, expensive devices or advanced skill are not needed. In this report, we described the use of a PCC for the lower extremity.

In our cases, patients felt minor pain during the removal of the surgical sutures and stainless-steel wires. Other authors did not assess anxiety or pain when removing surgical sutures. Some authors reported usefulness of skin closure using absorbable sutures.^{26–29} However, in our cases, we did not use absorbable sutures for either the skin grafting site or the donor site because delayed absorption of the absorbable suture,²⁶ suture-related pseudo-infection²⁷ and pigmentation after inflammation²⁸ were reported. As a result, patients felt mild pain during the removal of surgical sutures. The closure of the donor site and fixation of skin graft using absorbable sutures may decrease pain during treatment. Further studies are needed to eliminate pain where possible. We feel the need for trying to avoid skin suture using nonabsorbable suture and finger fixation using stainless-steel wires. And if our method is combined with music therapy, game play, or therapeutic play, we can further reduce anxiety or pain. Although in this report we presented only cases wherein cast fixation was done after skin grafting, we believe PCC is useful for bone surgery. We also believe our method is effective, technically simple, and capable of reducing stress and anxiety during cast removal.

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