Advanced Emergency Nursing Journal
Vol. 45, No. 4, pp. 290–294

PROCEDURAL COLUMN

Column Editor: Jennifer Wilbeck, DNP, RN, FNP-BC, ACNP-BC, ENP-C, FAANP, FAAN

Cast Removal: Pearls and Methods

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ABSTRACT
Cast removal is a common procedure that can involve risks to the patient and should be done by a qualified and experienced provider. Indications for removal, assessment parameters, and careful procedural steps should be understood by all technicians, practitioners, and physicians who will participate in the removal of casting materials. Because this procedure can also produce anxiety for the patient and their family members, it is good practice to thoroughly inform the patient and answer any questions in advance to help reduce anxiety and promote cooperation from all during the process. This article describes common techniques for cast removal and provides tips to facilitate safe and efficient outcomes during this procedure. **Key words:** cast removal, orthopedics, patient safety, practice-based learning

THE REMOVAL of casting material is a procedure that is done by a qualified and experienced provider using appropriate equipment (Johnston, Garcia-Rodriguez, & Longino, 2018). Although this procedure can be a significant milestone in the healing process, it can involve risks of injury to the patient and should be done with the utmost expertise and care possible (Johnston et al., 2018). Cast removal is often done as a routine follow-up or in more emergent situations such as compartment syndrome with the cast in situ. Health care personnel should also be extremely cautious when removing casts if they are uncertain about the undercast padding and skin protection in place. Discussions and explanations of possible damage to skin in some circumstances should also be given to patients prior to removal. Here, we discuss methodology and pearls for cast removal to assist in desirable outcomes for this often difficult and anxiety-producing experience.

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Disclosure: *The authors report no conflicts of interest.*

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DOI: 10.1097/TME.0000000000000483

INDICATIONS FOR REMOVAL

There are several indications for removal of a circumferential shell of casting material (see Figure 1). A cast may be removed when the period of the prescribed immobilization is complete or when there are concerns prior to this immobilization completion. When a patient experiences numbness, tingling, increasing pain, or any other sensation in or

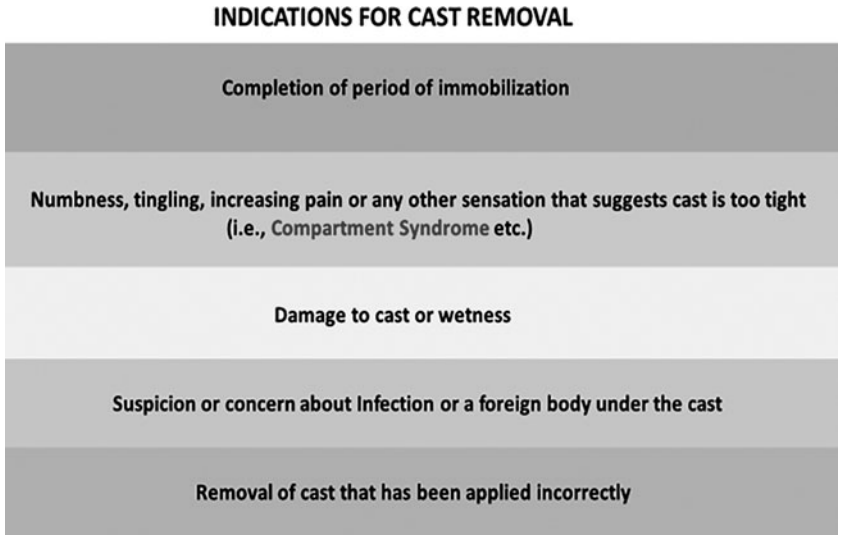

Figure 1. Indications for cast removal.

around the cast area, it could suggest that the cast is too tight or possible swelling of the area (i.e., compartment syndrome, etc.) and removal may be indicated to determine the next plan of care. Also, if there is damage to the cast or wetness has occurred, the cast will need to be removed. Lastly, if there is a suspicion or concern about infection or foreign body under the cast or if the cast has been applied incorrectly, it will need to be removed (Perry, Potter, & Ostendorf, 2021).

CAST REMOVAL PREPARATION

The provider should ensure that the appropriate tools and supplies that are needed to remove a cast safely and efficiently are acquired (see Figure 2). They are as follows:

- Cast saw (oscillating saw with vacuum)
- Surgical grade scissors with rounded of blunt safety edges
- Cast spreader
- Medium grade gauze
- 70% isopropyl alcohol
- Gloves
- Supportive bandages
- Zip stick cast remover
- Appliances
- Suitable assistant for younger children

Also, there are things that provider should consider to prevent obstacles that may present themselves while removing a cast:

- *Type of cast*—Not all casts require the same techniques in their removal; therefore, having a specific and customized plan will help the medical professional explain to the patient what is about to take place.
- *Age of the patient*—Some patients as young as a few months old can be put in casts and young children will be nervous upon just the site of the blade and the removal tools. Parents may be encouraged to apply noise-canceling headphones to their child prior to removal. Parents/guardians should also be encouraged to help their child through the removal process.
- *Stability of the patient*—Most casts are removed with the patient in a seated position or lying prone if in long leg casts or in hip spica casts (both common in young children). The provider must ensure that the patient remains stable or in a supported position because cast saws can slip if not applied properly and cause unnecessary injury.
- *Mental awareness of the patient*—The patient should be prepared to understand that they should not reach for the cast

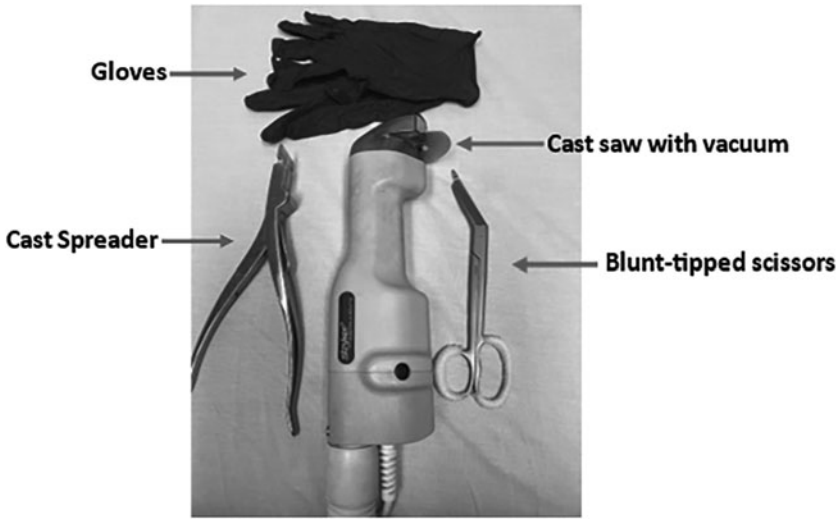

Figure 2. Equipment needed for cast removal.

saw because it will burn or scrape skin if grabbed. If needed, the medical professional should ask for assistance from other individuals to keep all other hands from the blade.

- *Duration of removal process*—The thickness of the cast will differ from patient to patient, so examine the cast noting its thickness and length in different spots to not push the saw deeper than necessary. The cast saw running for a long period will also cause the blade to heat up and cause discomfort to the patient.
- *Examination of cast padding*—Make sure the padding of the cast is still in good condition. If the padding has shifted, moved, or been removed, the provider will need to be aware of the possibility of exposed skin underneath, thus increasing the probability of the patient feeling the heat of the saw, or the saw blade touching exposed skin (i.e., waterproof casts will not have cast padding, but cast removal steps are otherwise the same except on cast padding removal).

CAST REMOVAL STEPS

The provider will explain the risks, benefits, and process for the cast removal to patients (or parents in the event of minors), and review the reasons for removal and any further treatment to follow (re-casting, imaging, braces, appliances etc.) before obtaining verbal consent. Next, it is good practice to demonstrate how the saw oscillates by turning it on and demonstrating by touching it to your hand to show it does not cut the skin. This will also let them hear the sound it makes to help reduce anxiety and fear about the removal process. The provider should also explain there will be a slight vibration that they will feel and to inform them when the procedure becomes concerning (such as feeling the saw heating up too much) or uncomfortable in any way.

Cast Saw Use

- Step 1: Before applying the saw to the cast, maintain control of the cast with your opposite hand that is holding the blade. Next, turn on the blade and confirm with the patient that you are going to begin the removal process.
- Step 2: With the saw running, start at the proximal part of the cast on the lateral side, making sure to place two fingers inside the cast as a barrier for the initial cut through the fiberglass end and the end of the cast (see Figures 3 and 4).

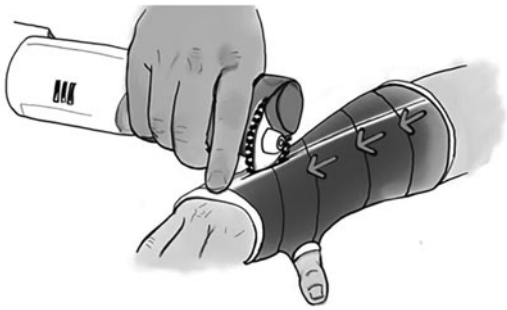

Figure 3. Cast removal technique.

- Step 3: Insert and withdraw the blade once you feel the tension from the cast material give way, drawing a straight line moving 5–10 mm distally with each insertion of the blade. It is safer to not cut through the entire cast on the first cut than to cut too deeply.
- Step 4: Continue this process until the distal end of the cast is reached; the cast will begin to split and loosen as the cut is complete.

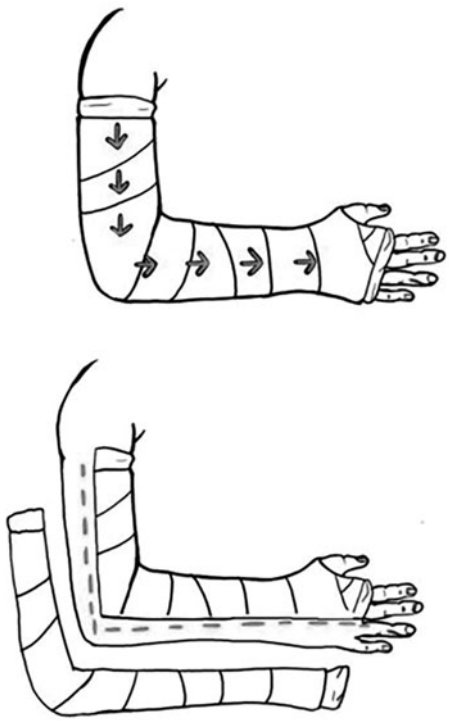

Figure 4. Cast removal guide.

- Step 5: Repeat the same process on the opposite (lateral) side of the cast (see Figure 4).

Always move the blade straight up and down with an "in–out technique," and *never* tilt the blade at an angle (this can increase the temperature of the blade, which can reach 101 °C and cause skin burns). The blade should always contact the cast at a 90° angle (see Figure 3) (Brubacher, Karg, Weinstock, & Bae, 2016; Halanski, 2016).

Cast Spreaders and Blunt Tipped Scissors Use

- Step 6: Starting with the proximal end of the cast, place the nose of the spreaders into the cut in the cast fiberglass. With light pressure applied to the opposite end of the spring-loaded spreaders, the cast should "pop" or "crack" as any remaining fibers of the cast material are separated. Complete this on both sides of the cast to make sure it is completely separated.
- Step 7: If you cannot get the cast to open, proceed to cutting through remaining areas of the intact cast.
- Step 8: Using scissors, cut the anterior stockinette to free the top and bottom portion of the cast (the part that is folded over to form the bumper of the cast). Be sure and cut proximally to distally through the cast padding, making sure to note any changes in color of the padding as to prevent any damage to the underlying skin, surgical pins, stitches, or sores before moving on to cutting the stockinette (see Figure 5).
- Step 9: Cut the stockinette, pulling it away from the skin as you follow the same line. Only cut the padding and stockinet on one side—this will make it easier to fold open the cast and slide it off the patient. *Do not have the patient pull their limb out of the cast as surgical pins may be dislodged and any soreness may be exacerbated with movements and alarm the patient.*
- Step 10: Fold the cast open to expose the limb, noting any skin issues or surgery sites that need to be addressed.

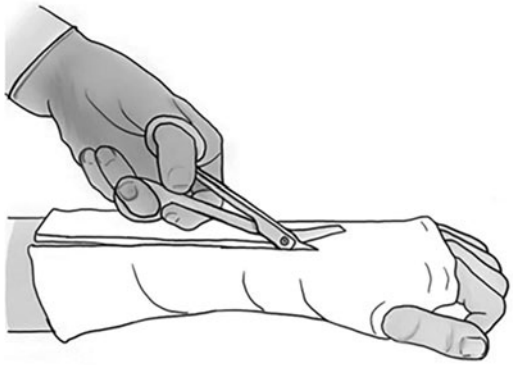

Figure 5. Cast padding/stockinette removal.

- Step 11: Using gloved hands, carefully slide the cast from the patient's limb (*not the other way around*) and have the patient hold their limb completely still. Any movement of the limb should be limited until fully assessed post-removal because further management may be indicated.
- Step 12: Observe the patient's skin, noting any findings that require additional attention.

CAST REMOVAL AFTERCARE

Once the cast is removed, use a soft gauze saturated with 70% isopropyl alcohol to lightly rub the limb where the cast was applied. The alcohol will not only remove the top player of dead skin but will also help the patient feel refreshed after the procedure. Also, encourage the patient not to scratch the cast area because the accumulation of dead skin cells forms a protective layer to the sensitive skin that was covered and scratching with fingernails can cause the patient to dig below that layer causing irritation and possible infection. Patients should also be informed to wash the limb lightly for a couple of days until the possibly sensitive skin can acclimate out of the cast. The affected limb and/or joints may also be sore/stiff for a few days and there may be some mild swelling of the limb and/or muscle atrophy. If recasting is no longer in the care plan, apply a stockinette before applying the brace needed.

After removing a cast, it is important to remember your equipment maintenance as well. A large problem with cast saws is the neglect of required maintenance. The provider should make sure that the blades for the cast saw are changed every month in a busy practice because this will reduce the problem of the blade heating too much during cast removal. Filters for cast saw vacuum also need to be changed approximately every 6 months.

CONCLUSION

Cast removal can be an anxiety-inducing procedure for the patient, family, and provider. It is important to take the time to prepare and plan and thoroughly inform the patient and answer all questions prior to the procedure. It is often quicker and much safer to remove a cast with a cooperative patient and family who are at ease with the procedure. It is also good practice to consider your landmarks for removal under the cast (to avoid bony prominences) as well as to mark with ink where you plan to cut. Lastly, cast saw burns and damage to underlying skin during the cast removal process are avoidable complications that require awareness of clinical risk factors, use of proper technique, education of provider, and proper maintenance of equipment (Larson & Nicolay, 2021).

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