Are Cast Application and Maintenance of Complications a Lost Art?

Commentary on an article by Christian J. Zaino, MD, et al.: “The Effectiveness of Bivalving, Cast Spreading, and Webril Cutting to Reduce Cast Pressure in a Fiberglass Short Arm Cast”

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Nonoperative treatment of fractures with a cast is an art form that is transferred to each generation of orthopaedic surgeons and, now, advanced practice professionals (physician assistants, nurse practitioners, cast technicians, and medical assistants). With newer and advanced methods and emphasis on surgical intervention, this art form is being taught less frequently and with less emphasis or, sometimes, not at all. Furthermore, many emergency departments have nonorthopaedic professionals perform the initial attempt at closed reduction of fractures before sending the patient home or scheduling the patient for surgery. In addition, the traditional and moldable plaster of Paris has been replaced with the inextensible fiberglass cast material. fiberglass casting is more durable and less prone to pressure sites with application and comes in patient-friendly assorted colors. With potentially higher numbers of patients selecting nonoperative treatment of fractures to avoid higher out-of-pocket expenses, a perfect storm of inadequately trained musculoskeletal medical professionals who have less experience with nonoperative fracture treatment may be upon us. Therefore, appropriate cast application and the treatment of ensuing problems of edema, pain, and increasing compartmental pressure are paramount. The excellent article “The Effectiveness of Bivalving, Cast Spreading, and Webril Cutting to Reduce Cast Pressure in a Fiberglass Short Arm Cast” is one that all medical providers taking call, providing emergency services, or applying casts should read. Ninety wrists (forty-five subjects with bilateral involvement) were randomized to a cast-cutting method group for a fiberglass short arm cast. With an intravenous fluid bag under the cast simulating high-risk injury or patient factors such as swelling, infused air increased skin surface pressures to 11.4 mm Hg at 10 mL and 92.5 mm Hg at 50 mL. Therefore, small changes in post-injury and fracture reduction edema or swelling can affect cast pressure and can potentially create irreversible changes. The triple-cut method (92 mm Hg or 99.9%), the double-cut method (79 mm Hg or 85%), or the single-cut method (65.5 mm Hg or 71%) of cast cutting decreased skin surface pressures. Therefore, in high-risk patients, a short arm cast should potentially be triple-cut to decrease potentially untoward effects of swelling. Unexpectedly, Ace (elastic) bandage application increased skin surface pressure for each cast-cutting method, with the greatest effect noted with the triple-cut and double-cut settings. Women had significantly higher skin surface pressure than men. This could arise from differences in forearm size, muscularity, and obesity.

A small but important weakness of this article is the lack of evaluation of casting in the differentiated groups of normal, obese, or muscular individuals. No control for body mass index, muscularity, age (with regard to less muscle with older age), or forearm size was performed. Obesity is a relative contraindication for fracture reduction maintenance in a cast. In addition, another weakness of this study is that a single experienced individual applied and cut the casts. The ability to apply a cast without overcompression, wrinkles, or pressure areas is a learned skill. Furthermore, no mention of arm position during cast application, cutting, Ace application, and pressure measuring was noted. Limb position can affect both the inflow (elevation) and outflow (dependency) of blood; therefore, the position of the limb can affect the compartmental pressures and theoretically the cast tightness.

In conclusion, this article reinforces the important and learned skills of cast management that can potentially affect patient and injury outcome. Skin surface pressures and compartmental pressures are fluid and change on the basis of swelling, limb position, and cast tightness. Triple-cut casts result in the biggest change in skin surface pressure but are affected most adversely by Ace application. If the casts are too tight, irreversible soft-tissue changes can occur. If the casts are too loose, the fracture reduction can displace, leading to suboptimal outcome or the need for surgical intervention. Cast management should be taught, evaluated, and maintained as much as surgical skills.

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