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CORR Insights®: Incidence and Risk Factors of Allograft Bone Failure After Calcaneal Lengthening

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Where Are We Now?

Studies in the literature [3–5], including the current study, focus generally on radiographic anatomic indices and measurements for mechanical correction of a pediatric flatfoot. Risk factors for failure of

allograft bone fusion and measures of nutrition and bone metabolism include calcium intake, bone density measurements, serum levels of calcium, phosphate, alkaline phosphatase, total protein albumin, prealbumin, and vitamin D level. Typically, these are not included in such studies.

Identifying metabolic bone conditions like osteopenia or osteomalacia prior to surgery is important. Treating metabolic bone disease prior to surgery increases the likelihood of successful remodeling and helps to promote a healthy fusion environment for calcaneal lengthening procedures.

The current study by Lee and colleagues describes the behavior of allograft after calcaneal lengthening for planovalgus foot deformity. The researchers found that radiographic failure increased with age and that tricortical iliac allograft was superior to the patellar allograft after calcaneal lengthening procedures. Studies on this topic are generally limited to smaller

numbers of pediatric patients, but the current study is based on a larger population representing more than one medical condition in this foot deformity. These medical conditions may include risk factors (other than age, sex, type of allograft material, ambulatory status, and unreported use of antiseizure medication) that could potentially contribute to the graft incorporation environment.

Where Do We Need To Go?

The sum of the biological properties of both the host and graft will determine the rate and characteristics of incorporation. Grafts are more likely to incorporate in healthy vascularized tissue beds and in the presence of stable, rigid fixation. The pediatric patient population in the current study has an advantage of growth potential when stimulation of bone occurs. However, this study also demonstrated that radiographic graft failure is associated with increasing age, even in children. This is an interesting observation, although a possible explanation or reason for this finding was not discussed.

With any pediatric population, and especially those with cerebral palsy or

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other neuromuscular disorders, it is important to know the patient's weightbearing status and relevant metabolic factors that could influence the likelihood a graft might heal. Regarding weightbearing status, does the child ambulate generally daily and with the same force needed to accommodate bone modeling and remodeling? Normal mechanical stimulation of bone is needed for bone remodeling after injury such as graft placement. For metabolic factors, previous studies support osteopenia in children with moderate to severe cerebral palsy as potentially predictive of failure [1, 2].

How Do We Get There?

Lee and colleagues did provide the preliminary structure for future

studies. Future studies could include the risk factors reported in this paper (age, sex, graft material, ambulatory status use of antiseizure medication) and additional presurgery baseline values of bone mineral density measurements, calcium intake, serum levels of calcium, phosphate, alkaline phosphatase, total protein albumin, prealbumin, vitamin D level, and steroid use. A healthy metabolic and mechanically stable environment of a bone graft should result in a successful painless bony union regardless of the age, gender, and race of the child.

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