CHAPTER 19

AUSTIN BUNIONECTOMY WITH COMPRESSION STAPLE FIXATION

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INTRODUCTION

Hallux abducto valgus deformity may be corrected through a variety of procedures, but the most common procedure used today is the chevron bunionectomy. The chevron bunionectomy was first described by Austin and Leventen in 1968 where they described a 60° V-shaped osteotomy made in the metaphyseal bone of the metatarsal head. The chevron osteotomy was designed to increase stability of the capital fragment as ground reactive forces promote impaction. Because the chevron bunionectomy was thought to be intrinsically stable, fixation was not indicated in the original procedure. Hetherington reported good results without the use of fixation. The osteotomy, though, only imparts some stability in the sagital plane, and even less in the transverse plane. With the goals of early weight-bearing and functional rehabilitation of the metatarsal phalangeal joint, surgeons have had to seek additional forms of either internal or external fixation to prevent movement and subsequent displacement of the osteotomy.

TYPES OF FIXATION

There have been countless methods of fixation described. One of the earliest and simplest forms of fixation is the insertion of a Kirschner-wire (K-wire). K-wire fixation is often used by surgeons today as a form of either internal or external fixation, in part dependent on the patient's desire to have retained hardware and on surgical preference. External wires require additional postoperative care, and can lead to pin track infections. Internal wires can be sources of irritation and require a subsequent surgery for removal. The K-wire can be placed in various orientations, and is a simple and effective means of imparting additional stability.

Probably the most popular form of fixation for the chevron bunionectomy is rigid internal screw fixation. Screw fixation is often preferred over external wire fixation due to the perception that rigidity increases the rate and speed of bone healing. There are no studies demonstrating these advantages over other forms of fixation. Probably more important than the type of fixation is the direction in which the fixation is oriented. Chang noted on bone models that when an upward force is placed upon the distal metatarsal, the head appears to pivot on the apex of the osteotomy causing compression of the dorsal surface and distraction of the plantar arm. Fixation placed through the dorsal arm of the osteotomy weakened the construct and this was the point of failure. The most effective fixation began in the proximal metatarsal and was oriented plantarly, into the metatarsal head. Screws additionally have the disadvantage of adding bulk, which often necessitates their removal.

Other forms of fixation include miniplates with screws, absorbable pins, and screws, Mitek anchors, suture materials, and various forms of staples. Recently, the use of compression staples has gained popularity. The memory compression staple is a form of fixation that creates adequate compression across the osteotomy site while allowing for a small incision site and minimal dissection. Memory compression staples are made of a nickel titanium (Ni-Ti) alloy commonly referred to as Nitinol. The novel property of this alloy is known as the shape memory effect, describing its ability to change shape with a change in temperature. The staples are produced with the legs in a prebent position. After insertion, an electrical heat source is applied and the legs become closer together, producing dynamic compression across the osteotomy or fracture site.

Buehler first introduced the idea of a shape memory alloy in 1965. However, it was not until 1981, that memory compression staples were first

used in vivo to repair patellar fractures. Limited lower extremity applications have since been described, including first metatarsal arthrodesis, ankle fractures, triple arthrodesis, proximal first metatarsal arthrodesis, and phalangeal fractures.

A review of the literature revealed no reports of memory compression staple use in the fixation of Austin bunionectomies. We believe the staples provide an excellent choice of fixation when performing a minimal dissection, medial approach to the Austin bunionectomy.

PROCEDURE

The bunion is approached through a medial incision beginning at the joint line and extending proximally, slightly plantarly, to the metatarsal neck. If the incision is properly placed, it will be below the dorsal medial proper digital nerve. Dissection is carried to the capsule, which is incised along the course of the skin incision. The deep incision is below the epicondyle and therefore no dissection is required to open the plantar metatarsophalangeal joint. A small amount of periosteum is dissected dorsally in order to retract the EHL, which prevents inadvertent severing with the bone saw.

Choosing the apex of the ostetomy is critical to ensure proper seating of the staple. The apex needs to be in the dorsal-proximal aspect of the metatarsal head to ensure enough bone to accept the staple. The osteotomy is completed and transposed. A 0.035-inch or 0.045-inch K-wire is inserted percutaneously to stabilize the fragment. The proximal eminence of the first metatarsal is then cut flush with the medial side of the metatarsal head, and the staple is inserted. It is angulated from proximal-dorsal to plantar-distal thereby compressing the plantar arm, which tends to distract with weightbearing. The K-wire is then removed and the staple is compressed. The wound is then closed in layers.

DISCUSSION

Compression staples offer a simple, effective method of stabilizing an Austin bunionectomy. The procedure can be performed through a small incision with minimal dissection. One of the fundamental principles of bone healing is to preserve blood supply to the surgical site by limited, atraumatic dissection. By fixating the osteotomy with one medially-placed staple, the procedure can be performed through a small medial incision. We believe this decreases the chance of postoperative avascular necrosis, delayed union, and aids in the rehabilitation by limiting postoperative scarring. The biggest problem to date has been unidentified cystic changes in the metatarsal neck, which makes stable fixation unsuitable. To date, no staples have had to be removed due to medial prominence. Although there are several theoretical advantages to compressive staple fixation, it is not clear that it produces better postoperative results than a screw or simple K-wire fixation.