Minimally Invasive Osteotomies

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KEYWORDS

• Hallux valgus • Bunion • Minimally invasive • Percutaneous • MICA • Chevron

KEY POINTS

- Specific cadaveric training is mandatory for any surgeon considering performing minimally invasive surgical techniques.
- Cadaveric training is absolutely vital in avoiding unnecessary complications and minimizing the surgeon's learning curve.
- Available data suggest that the minimally invasive Chevron-Akin procedure is a safe alternative to open techniques for hallux valgus correction, although whether minimally invasive techniques such as this offer significant advantages for patients in terms of postoperative morbidity, reduction of stiffness, return to function, and outcome requires further scientific scrutiny.
- Minimally invasive surgical techniques for correction of a wide variety of forefoot and hindfoot abnormalities are currently gaining popularity among European surgeons, and this is an interesting area of development.

INTRODUCTION

During the past 20 years, surgery has seen an inexorable trend toward less invasive and keyhole approaches. For instance, in the field of general surgery, laparoscopic cholecystectomy and appendicectomy have become firmly established as the surgical gold standards. If an equivalent technical result to an open surgical procedure is possible to achieve with a safe but less invasive approach, then better patient outcomes ought to follow, and the profession should continue to strive in this direction.

Orthopedics has not been left behind in this less invasive evolution. Arthroscopic ankle cheilectomy and arthroscopic ankle fusion are replacing open approaches. However, minimally invasive hallux valgus surgery has been slower to establish. In fact, the number of proposed open procedures to treat this condition continues to increase. However, the Arbeitsgemeinschaft für Osteosynthesefragen (AO) group's principles of minimizing soft tissue trauma and periosteal stripping are just as relevant to hallux valgus surgery as they are to fracture management.

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Perhaps this reluctance to embrace minimally invasive techniques in hallux valgus correction is partly explained by the general perception that bunions are "easy to do and easy to get wrong."

In fact, a literature review shows that approximately 85% of patients report good outcome after open hallux valgus correction. Analysis of the remaining 15% reveals frequent issues with stiffness and pain related to the soft tissues rather than purely osteotomy issues. Thus, perhaps the key to improving outcome after hallux valgus surgery lies in a less invasive soft tissue approach rather than which of the myriad described osteotomies is used. That said, early minimally invasive techniques failed to adhere to the AO principles of rigid internal fixation and early mobilization and have been associated with poor outcomes, adding fuel to concerns that "minimally invasive" equates to "easier to get it wrong."

PRINCIPLES OF MINIMALLY INVASIVE SURGERY

The term *minimally invasive* refers to the skin incision/approach, not the type of osteotomy used. Despite this, several disparate operations using minimally invasive techniques are frequently grouped together under the "minimally invasive" banner in a way that does not make sense and does not occur when referring to open techniques. The ability to differentiate between different techniques is important for meaningful and rational comparison to be made.

EVOLUTION OF MINIMALLY INVASIVE FIRST METATARSAL OSTEOTOMIES

Less invasive procedures were promoted by Wilson[1] and Bösch and colleagues[2] in the 1980s. The latter was a more percutaneous approach and used a subcapital Hohmann osteotomy[3] through a short vertical incision at the level of the neck of the metatarsal. However, the first truly minimally invasive technique to gain prominence was a modification of the Reverdin osteotomy[4] developed by Stephen Isham[5] published in 1985 (and more recently popularized by Mariano De Prado in Spain).[6] Isham[5] developed a modification of the Shannon burr with end and side cutting performance to perform an oblique medial closing wedge osteotomy of the head of the first metatarsal. The osteotomy was extra-articular but intracapsular. He combined this with a minimally invasive Akin operation, bunionectomy, and adductor release. He believed that this construct was sufficiently stable that no internal fixation was required, and used postoperative rehabilitation as for a minimal incision Silver-Akin procedure, using postoperative splint dressings to stabilize the correction.

Isham and Nunez[7] stated that a marked improvement of short-term and long-term results were immediately apparent. However, although these investigators acknowledge that the average shortening is 5 mm and that this can be greater, they do not describe any related complications.

The lack of fixation and the degree of shortening inherent in this procedure are causes for concern, and the results have not been reproduced[8] despite the large-scale uptake by podiatrists in the United States in the 1970s to1990s. In fact, sparse independent literature exists on the Reverdin-Isham procedure.

Perhaps because of poor experiences associated with these early minimally invasive techniques,[9] little interest has been shown in minimally invasive surgery in the United States in recent years. The next stage of development has occurred in Europe, where several centers have been developing minimally invasive techniques and showing positive results with reduced inpatient stay and better recovery,[10] which has served to reignite interest and add momentum to the evolution.