

Rotational and Opening Wedge Basal Osteotomies

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- Ludloff • Proximal opening wedge osteotomy • Hallux valgus • Basal osteotomies
- Rotational osteotomy

KEY POINTS

- The Ludloff and proximal opening wedge osteotomies are powerful basal rotational osteotomies, very effective in correcting moderate to severe hallux valgus deformities.
- With the advent of modern fixation options and revised surgical techniques, these osteotomies are technically easier, stable, and reproducible, representing valuable additions to the surgeon's armamentarium in approaching the complex deformity known as hallux valgus.
- Unfortunately there is no singular procedure that can address all deformities. By not stretching indications and choosing the appropriate procedure, patient satisfaction can be maximized and risks minimized.

ROTATIONAL OSTEOTOMY

Introduction

Carl Heuter¹ first described the term Hallux Valgus in 1871. Hallux valgus usually occurs from the second to fifth decade, with a peak incidence in the third decade. Coughlin and Jones² found that 83% of patients had a positive family history and 84% had bilateral deformities. He also found that only 34% of cases were as a result of constrictive shoes and occupation. More than 150 procedures have been described for the treatment of hallux valgus, indicating the complexity of the deformity. Treatment options are usually guided by the severity of the deformity. Moderate to severe hallux valgus has traditionally been managed with a shaft or proximal osteotomy together with distal soft-tissue release.

Proximal osteotomies can be classified as translation or rotational osteotomy, the latter of which is geometrically more powerful.³ The commonly described proximal

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osteotomies are the crescentic, proximal chevron, Ludloff, Mao, and opening or closing wedge. The crescentic osteotomy was popular but had its drawbacks. Technically it is difficult to perform and to obtain stable fixation, as a result of which dorsal malunions and shortening became common, with the risk of causing transfer metatarsalgia. The literature reports up to 28% incidence of this complication.⁴⁻⁸ The proximal chevron is easy to fix but can be difficult to translate because of the proximal flare of the first metatarsal. The Ludloff osteotomy, first described in 1918, used no fixation for stabilization.⁹ Because of the inherent instability of this osteotomy together with the lack of fixation, it did not gain much popularity. The addition of fixation to the osteotomy by Cisar and colleagues¹⁰ resulted in surgeons revising this procedure, and a renewed enthusiasm followed. Trnka and colleagues¹¹ found the Ludloff osteotomy to be significantly more rigid than the crescentic and proximal chevron osteotomies. Myerson then published a modified Ludloff technique with stable fixation and good reproducible results, which led to an increased interest in the Ludloff osteotomy and subsequent numerous publications.¹²⁻¹⁸ The Mao osteotomy is, in essence, a reverse Ludloff osteotomy. Although theoretically more stable, it is difficult to maintain the point of rotation proximally enough, resulting in shortening and a bowing effect of the metatarsal. The basal opening wedge osteotomy was first described in 1923 by Trethowan, whose technique made use of a bone block and no fixation, as he believed that maintaining the lateral cortex gave the osteotomy sufficient stability.¹⁹ This technically demanding procedure was abandoned due to concerns about instability and nonunions.^{20,21} This osteotomy was historically used in adolescent hallux valgus with questionable results.²²⁻²⁴ The use of a mini Hoffman external fixator, suggested by Amarnek and colleagues²⁵ in the 1980s, was, as expected, not well accepted. With the advent of special opening wedge plates, however, this procedure has started to gain favor. This article mainly considers 2 rotational osteotomies, the Ludloff and opening wedge, although the principles are transferable to other variations of the proximal first metatarsal osteotomy.

Preoperative Assessment

All patients presenting with hallux valgus should have a thorough history and full clinical examination undertaken.

The most significant factors to be elicited from the history are:

1. Positive family history (often present).
2. Ask about the presence of any neuromuscular disorders, which is a contraindication to performing corrective osteotomies. It may be preferable to fuse the first metatarsophalangeal (MTP) joint.
3. Inflammatory arthropathies such as rheumatoid arthritis (RA). One must be cautious in these patients, as recurrence is much higher because of poor quality of the soft tissue. Some surgeons may argue that owing to modern-day biologics used in treating RA, this is no longer a relative contraindication.
4. Smoking increases the risk of nonunion in osteotomies. Myerson and colleagues reported that the risk of nonunion was up to 4 times higher.
5. Diabetes also increases the risk of nonunion. Shibuya and colleagues reported a 25.4% bone-healing complication rate in diabetics undergoing foot and ankle surgery.²⁶

The most important features of the clinical examination are:

1. Assess for the presence of arthritis in the first MTP joint. Patients with Grade 1 (Hattrup and Johnson) hallux MTP arthritis can be managed as a hallux valgus patient. Patients with Grade 2 arthritis need to be carefully assessed, and appropriate

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