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# MIS Hallux Valgus Surgery – History and Third Generation Surgical Technique

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## ABSTRACT

Forefoot deformities, especially Hallux Valgus is the most common reason for visiting a Foot and Ankle surgeon, and one of the commonest orthopaedic conditions overall. More than 100 procedures have been described over the years for the surgical treatment of Hallux Valgus. The expansion of MIS procedures in medicine, and the patient demand for a functional and cosmetically appealing result has led to the development of percutaneous forefoot surgery techniques. The Third Generation Surgical Technique (Percutaneous Chevron and Akin) is presented in this paper.

**KEY WORDS: Halux valgus; Minimally Invasive Surgery**

Forefoot deformities, especially Hallux Valgus is the most common reason for visiting a Foot and Ankle surgeon, and one of the commonest orthopaedic conditions overall.

It has been reported that about 2-4% percent of the population has a Hallux Valgus deformity, and this might actually be underreported [1]. As a result, we have to estimate that about 400.000 Greeks will have this condition.

More than 100 procedures have been described over the years for the surgical treatment of Hallux Valgus, and 10-20 of them are still being used today. This shows the complexity of the deformity, and the inability of one technique to give high patient satisfaction results for all cases.

A 90% patient satisfaction rate is usually reported as a good result, but in practice we come across worse results, with commonest complications recurrence of deformity, malunion, stiffness, transfer metatarsalgia, inability to wear shoes, prolonged pain and swelling, and unacceptable cosmesis with multiple incisions.

We also have to take into account that for women, appearance (and incision length!) is much more important than we think and want to accept as Orthopaedic Surgeons (**Figs. 1,7**), and that feet is commonly projected as an important extension of their sex appeal. Long incisions are perceived by many of them as a significant cosmetic issue (**Fig. 18**).

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***Figs. 1, 7**: Preop and 1 month postop, mis incisions appearance*

Looking at women fashion shoes, commonly high healed and narrow, obviously uncomfortable for women (that many of them love to wear them daily), we have to consider that maybe pain perception might depend on the looks. And that is even more important if the pre op deformity was small. So where do evidence based medicine come in if this is the case? Should we continue to use functional scoring systems (i.e AOFAS) or should we focus on satisfaction based scoring?

Following the trend of all surgical specialties and other fields of orthopaedics (arthroscopic surgery, mis joint replacement) minimally invasive surgery in the forefoot region gained popularity in the 90s in the United States where the first generation techniques (no fixation Reverdin-Isham) where being used by "podiatrists". An osteotomy that alters only the DMAA, without correction of the IM angle, no sesamoid reduction and no fixation, depending only on the "intact" soft-tissues. In Europe this trend was publicised by De Prado (**Figs. 19,20, 23**). It never gained popularity among Foot and Ankle surgeons because of the high rate of catastrophic complications (**Fig. 10**) and the ignorance of basic orthopaedic principles.

***Fig. 18**: comparison standard incision/mis on the same patient, 1 month postop*

Giannini later published his Bosch-like SERI technique as a second generation technique, with the use of Kirschner wires as temporary fixation, as did Mafulli [2,3,4], but Myerson's team published dissapointing results [5]. (**Figs. 15, 21**)

Redfern and Vernois in the 2010's developed the third generation technique, with the use of

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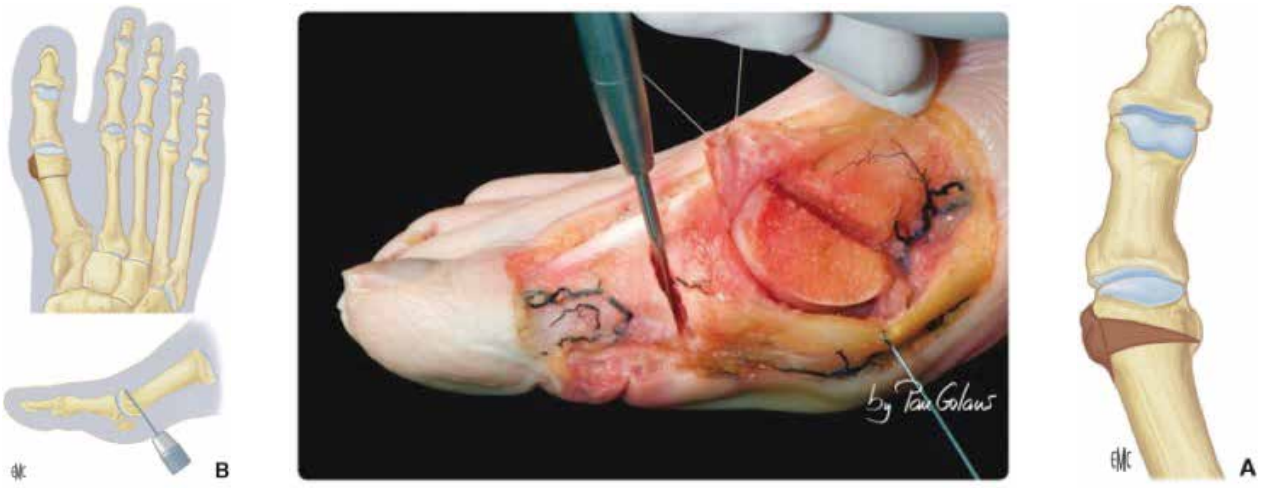
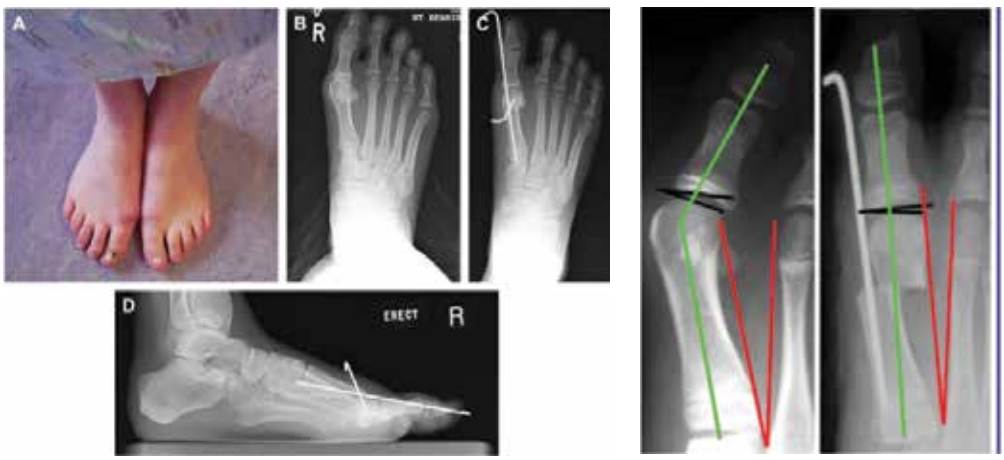



***Figs. 19, 20, 23:*** *Reverdin Isham (first Generation-no fixation technique). From the book ¨Minimally Invasive Foot Surgery", De Prado, Elselvier*

***Fig. 10****: Catastrophic complication of no fixation technique*




***Figs. 15, 21:*** *Second generation techniques, K-wire fixation*

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***Figs. 5-6:*** *Beaver blade*

***Fig.16:*** *High Torque Motor Unit for percutaneous forefoot surgery*

***Fig.8*** *Bone paste*

cannulated screws as fixation devices of a Chevron-Akin osteotomy (MICA) [6].

This technique and its variations is becoming popular between many Foot and Ankle surgeons across Europe and Australia as it combines the minimally invasive approach and excellent cosmesis with the predictability of the basic principles of orthopaedic surgery. The percutaneous Chevron and Akin technique will be described in this paper.

It has shown similar radiological results with Scarf-Akin osteotomies, but with statistically significant less postoperative pain up to 6 weeks, less wound complications, and excellent range of motion [9, 14, 15, 16, 17].

**Learning Curve**

Formal foot and ankle training and specific cadaveric training is mandatory, preferably in more than one courses. We have to keep in mind that orthopaedic surgeons are not familiar with this type of instruments, making these procedures unexplored territory. [10,11]

A step by step approach is advised, starting with the simpler procedures first (Akin osteotomy, Distal Minimally-invasive Metatarsal Osteotomy-DMMO [6, 7, 14]) and only when the surgeon has become familiarised with the technique and equipment after a minimum of 20 cases can proceed to more complex procedures such as the percutaneous Chevron .

**Patient Selection**

Any patient with a mild to moderate deformity that could be treated by an open chevron+Akin or scarf osteotomy, can be a candidate for percutaneous correction. Severe deformities should be treated with basal osteotomies or fusions.

Typical indications/contraindications are similar to open procedures.

**Equipment**

Beaver blades (**Figs. 5-6**), are very useful in creating controlled small cuts, also giving excellent tactile feedback in periosteal elevation and in lateral release.

Small periosteal elevators are used to create a

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***Fig. 9, 13**: Comparison of level of osteotomy in open and percutaneous chevron*

***Fig.14:** avoidance of shortening be distal pointing of the pivot hole*

***Fig.11:** Dispacement of osteotomy*

working space under soft tissues, and bone levers to displace the osteotomy.

Motorised burrs are used to remove the "bunion" and create the osteotomy. The motors are high torque (**Fig. 16**) comparing with conventional motorised units (neurosurgery-arthroscopy) as a result lower motor speed are required. Less RPM results in less soft tissue and bone trauma, but also gives the burr the power not to get stuck in between osteotomies.

A C-arm is used throughout the procedure.

**Surgical Technique**

A 3-5 mm incision is created with the beaver blade, just proximal of the 1st metatarsal neck. A working space is created dorsally and plantarly, and also distally over the bunion, using the beaver and the periosteal elevator.

Using a 3-4 mm wedge burr a bunionectomy is performed, with a "peeling" wrist movement. The amount of bone removed is checked with the C-arm, and should not be more than it would be in an open procedure, always respecting the sesamoid groove. Bone paste is easily extracted through the portal. (**Fig. 8**)

Next, the apex of the osteotomy is created using a 3X20mm chevron burr. It should be extracapsular, located just proximal to the neck of the osteotomy (**Figs. 9, 13**). Plantar direction of the osteotomy is similar to the open procedure, ie. parallel to the plantar surface of the 1st metatarsal, or pointing at the head of the 5th metatarsal.

The burr will remove about 2-3 mm of metatarsal. In order to compensate for the resulting shortening the pivot hole can be made with an appropriate distal direction. [12,13] (**Fig. 14**)

The dorsal and the plantar part of the osteotomy is then completed, always respecting the vital structures that surround the metatarsal.

It is again noted that appropriate cadaveric training, foot and ankle experience and exposure to simpler percutaneous techniques (ie Akin osteotomy) is mandatory in order to avoid catastrophic complications.

Displacement is achieved by an intramedullary bone lever or a simple Kirchner wire (1.6-1.8mm) (**Fig. 11**). Dorsal/plantar angulation is checked with the C-arm.

The fixation is performed by two parallel cannulated compression screws, the most proximal

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***Fig. 2:*** *proximal screw engages three cortices for extra stability, by exiting the proximal metatarsal through its lateral cortex.*

***Fig. 22:*** *Taping*

***Figs. 3, 4:*** *Percutaneous Akin Osteotomy*

***Fig.12:*** *Percutaneous lateral release*

one entering the metatarsal just distal to the cuneiform-metatarsal joint. It is advised that this proximal screw engages three cortices for extra stability, by exiting the proximal metatarsal through its lateral cortex. (**Fig**. **2**)

The second more distal screw enters the displaced head in a parallel fashion.

Stability of the displacement is checked.

The Akin osteotomy follows if indicated. Approximately at the 1/3 to mid shaft of the first phalanx a skin incision is performed, and the soft tissues dorsally and plantarly are elevated in order to create the required working space.

A 2-3 mm bone wedge is removed pointing parallel or slightly proximally, respecting the lateral cortex. The osteotomy is displaced and fixed with a cannulated screw. (**Figs. 3, 4**)

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A soft tissue lateral release might be frequently needed (**Fig. 12**). The adductor, suspensory ligament, lateral head of the flexor brevis can be released all or selectively through a lateral dorsal portal, appropriately placed. Again training and experience is needed in order to avoid damaging neuromuscular structures.

Taping (**Fig. 22**) is an important part of the procedure, and should not be neglected. Its not a surprise that every training course has a practical session on taping. Appropriate taping guarantees optimal soft tissue healing, avoidance of overcorrection, stiffness, and controls postoperative oedema.

A heel weightbearing shoe is used for 5-6 weeks postoperatively, and following that period comfortable sport shoes or well made sandals are used for 1-2 months. Sporting activities (running-jumping) are not allowed for a minimum of three months.

***Conflict of interest:***

*The authors declared no conflicts of interest.*

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# ΠΕΡΙΛΗΨΗ

Οι παραμορφώσεις του προσθίου ποδός, και ειδικά ο Βλαισός Μέγας Δάκτυλος είναι η συχνότερη αιτία που οι ασθενείς επισκέπτονται εναν Ορθοπαιδικό Χειρουργό Ποδοκνημικής και Άκρου Ποδός. Περισσότερες απο 100 διαφορετικές τεχνικές έχουν περιγραφεί για την χειρουργική θεραπεία του Βλαισού. Η επέκταση των τεχνικών ελάχιστης παρεμβατικότητας (MIS) στην Ιατρική, αλλά και η απαίτηση των ασθενών για καλαίσθητο και λειτουργικό αποτέλεσμα οδήγησε στην ανάπτυξη των διαδερμικών τεχνικών στην χειρουργική του προσθίου ποδός. Σε αυτό το άρθρο παρουσιάζεται η τρίτη γενιά διαδερμικής διόρθωσης του Βλαισού: η Διαδερμική Chevron και Akin

**ΛΕΞΕΙΣ ΚΛΕΙΔΙΑ: Βλαισός Μέγας Δάκτυλος, Τεχνικές Ελάχιστης Παρεμβατικότητας**