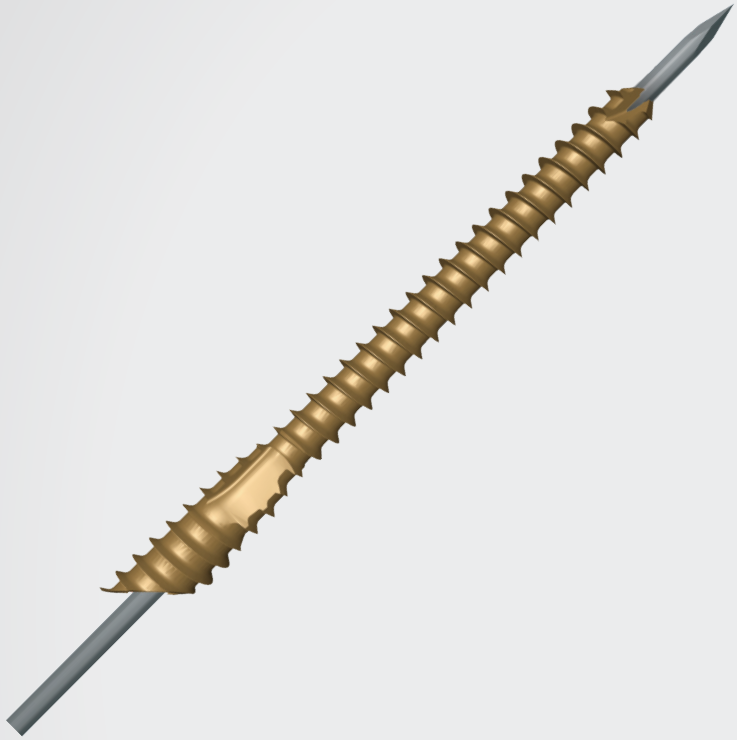
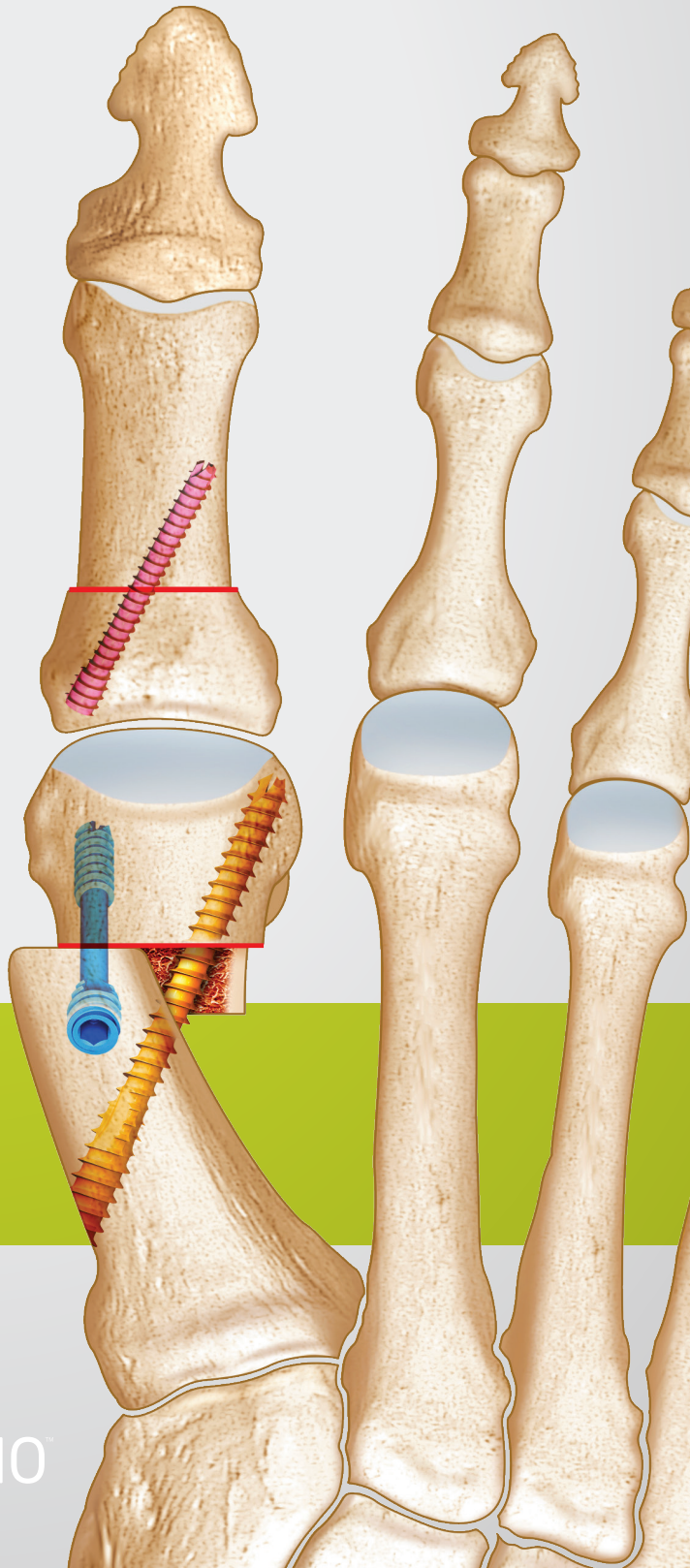
FOOT



45b screw
Surgical technique

PERCUTANEOUS CHEVRON OSTEOTOMY OF THE 1ST METATARSAL OR MODIFIED PERCUTANEOUS EXTRA-ARTICULAR REVERSE-L CHEVRON

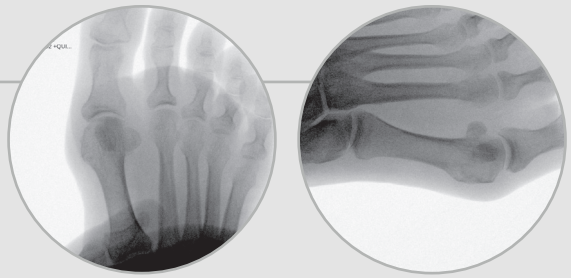
(P.E.R.C.)



GROUP FH ORTHO

INDICATION

Hallux valgus.
And in particular the treatment of minor to severe hallux valgus by percutaneous chevron osteotomy (P.E.R.C - Percutaneous Extraarticular L Reverse Chevron) of which three fixation versions are adapted to the severity of the deformity.
Generally combined with an osteotomy of the proximal phalanx, fixed (3A compressive screw, or Percutaneous).



EQUIPMENT

Unspecific:
Beaver-type scalpel, 3 mm blade, elevator, rasps, motor with speed control, mini-fluoroscope.

Specific:
Osteotomy bone lever that can be used, during a percutaneous approach, to push laterally on the head of the 1st metatarsal. Its shape allows it to fit into the medullary canal and maintain the correction while osteosynthesis is performed ***(fig. 1)***.

fig. 1

Burrs:
A 20 mm long burr is used to perform cuts more easily, a 2x20 burr ***(ref. 264 425)*** is used to create the two lines, a 3x20 burr ***(ref. 258 156)*** is used to shorten the superior line more easily, but must be replaced by a long 2x12 Shannon burr ***(ref. 256 018)*** or a 2x20 chevron burr ***(ref. 264 425)*** for the plantar line ***(fig. 2)***.

fig. 2

Screws:
3A screw (3 mm diam.), 3 mm self-drilling bevelled screw, Percutaneous or 3A screw (diameter 2.5).

PATIENT POSITIONING

No pneumatic tourniquet.
In dorsal decubitus, position the patient so that the foot being operated on hangs over the edge of the table and rests on the image intensifier. The contralateral lower limb is flexed to 90°. Throughout the procedure, surgical acts are monitored by fluoroscopy and manually by feeling the bony contours through the integuments.

PHASE ONE : METATARSAL OSTEOTOMY (1ST LINE)

Perform the first medial incision behind the head of the first metatarsal (M1) at the junction of 1/3 superior – 2/3 inferior, in an extra-articular position ***(fig. 3)***. The choice of the initial burr depends on the metatarsal index, whether or not shortening is needed, and how the surgeon has chosen to perform it.

fig. 3

If the surgeon wants to shorten the first metatarsal (plus or plus minus index):
- The use of a 3x20 mm burr oriented perpendicular to the axis of the first metatarsal results in an automatic shortening of 3 mm or more, by increasing the width of the line in the proximal part of M1.
- An obliquely oriented 2x20 mm chevron burr can also be used in the horizontal plane from medial distal to lateral proximal. The obliqueness of the line will result in shortening of the metatarsal during translation of the metatarsal head.

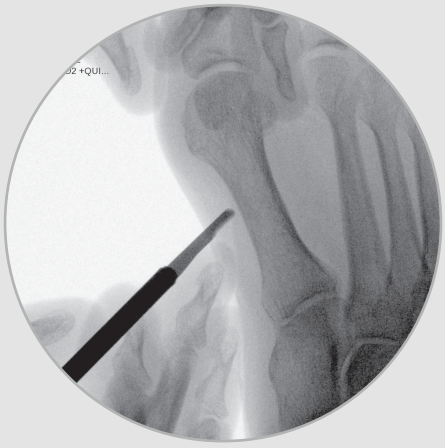


fig. 4

If the surgeon does not want a shortening effect (minus index):

- The use of a 2x20 mm chevron burr is preferable. The cutaneous incision can be offset 2 or 3 mm more proximally in order to incline the burr about ten degree from medial proximal to lateral distal in the horizontal plane to cancel out the shortening induced by cutting *(fig. 4)*.

In all scenarios, once the cutaneous incision has been performed, the blade of the Beaver scalpel will come in contact with the bone without performing detachment. In direct alignment with the incision that has been performed, use a chevron burr to create a bicortical tunnel at the junction between the dorsal third and the plantar two-thirds of the diaphysis *(fig. 5a)*. In the frontal plane, the burr remains parallel to the inferior cortex of M1 just as a saw blade would be in an open technique. While remaining perpendicular to the diaphysis and turning the handle upward, first make the upper line of the chevron starting from the initial bicortical tunnel *(fig. 5b)*.
Depending on the needed amount of correction of the DMAA, the resection of the medial edge can be accentuated in order to obtain a DM2AA equal to 0.

PHASE TWO : METATARSAL OSTEOTOMY (2ND LINE)

Make the plantar line by changing to a Shannon burr (2x12 or 2x20) or a 2x20 mm chevron burr if a 3 mm burr was used before, or by keeping the same burr if a 2x20 mm burr was used.

Reposition the burr in the starting tunnel in order to retain the same centre of rotation. Make the oblique plantar line from below and proximally by turning the handle in the horizontal plane while remaining parallel to the sole of the foot *(fig. 6)*.
Once the osteotomy has been performed, the head is translated by introducing the specific instrument into the diaphysis so that the flattened portion pushes against the medial face of the head *(fig. 7a)*.
The head of M1 must be solidly impacted against the diaphysis, without flexing it *(fig. 7b)* and its orientation must be monitored with fluoroscopy (DMAA correction). For this reason, arthrolysis must not be performed because it destabilises the joint and makes it difficult to mobilise the head.
During this maneuver, the pronation of the head is intuitively corrected if it needs to be: the nail must be parallel to the ground and in the same plane as its neighbors.

PHASE THREE : 3 MM DORSAL SCREW FIXATION (STANDARD PERC)

Once the desired movement has been performed and maintained, make the second approach using the Beaver scalpel, between the lateral edge of the long tendon and the lateral edge of the short extensor of the hallux *(fig. 8)*, 2 cm proximal of the osteotomy.
Carefully split the subcutaneous area as far as the periosteum, which is exposed in the zone of screw penetration.
Introduce the k-wire (1 mm diam.) from proximal to distal and from lateral to medial so that the compression of the screw assists in achieving the desired lateral movement *(fig. 9a-b)*. In the worst case scenario, it must be axial to neutralise the movement. Use a compressive screw that is 3 mm in diameter *(fig. 10)*.
For a displacement of less than 30%, this fixation is sufficient.


fig. 5a


fig. 5b


fig. 6

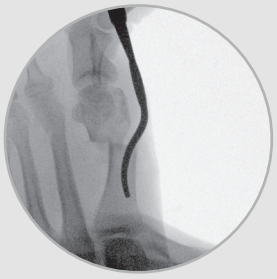


fig. 7a


fig. 7b

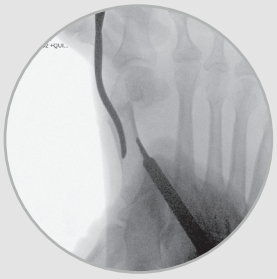


fig. 8


fig. 9a


fig. 9b

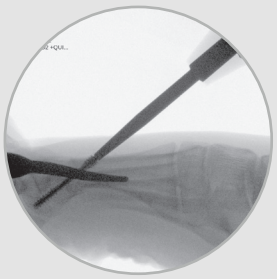


fig. 10

PHASE FOUR : 3MM LATERAL BEVELLED SCREW (MODIFIED PERC)

If the displacement is comprised between 30% and 80% or if the assembly needs to be more stable, stabilisation can be supplemented with a 2nd bevelled transversal screw having 3 fixation points; Remove the translator in order to position a 2nd k-wire (1 mm diam.) from medial to lateral and from proximal to distal crossing under the screw in place. Its point of entry must be at least at mid-diaphysis ***(fig. 11a-b)***. It must pass through the two cortices of M1 and arrive in the head. Even if the screw is self-drilling, it is recommended to use the drill up to the lateral cortex (or plantar if the screw is introduced quite dorsally, allowing in particular to check the absence of conflict with the dorsal screw) ***(fig. 12)***, especially in the case of dense bone. The measured beveled screw is introduced with the motor ***(fig. 13a-b)***.

PHASE FIVE : LATERAL ARTHROLYSIS (OPTIONAL)

Once fixation of the metatarsal osteotomy has been completed, make sure that there are no residual joint incongruences linked to a retraction of the lateral ligament plane, which is usually the case for old and evolved deformities.
In this case, perform a 3rd dorsolateral incision directly below the joint. The 1mm Beaver blade severs the suspensory ligament of the sesamoid on the lateral surface of the head of M1. Then, if necessary, this is expanded for the base of the phalange of the transverse adductor of the hallux.

PHASE SIX : OSTEOTOMY OF THE PROXIMAL PHALANGE (OPTIONAL)

Depending on the shape of the forefoot, the presence or absence of a lateral arch or a residual hallux pronation, an Akin-type percutaneous osteotomy ***(fig. 14a-b-c)*** may complete the procedure ***(fig. 15a-b)***.

EXOSTECTOMY (EXCEPTIONAL CIRCUMSTANCES)

Superior and medial bony protrusions from the head of the metatarsal are not systemically resected. It depends on the ability of the induced movement to make the protrusion disappear without a surgical act that would cause intraarticular stiffness. It can be destabilising to perform it after osteosynthesis and it is better to plan for it before the chevron procedure, if it must be done. It is performed using the Wedge 4.1 burr.


fig. 11a

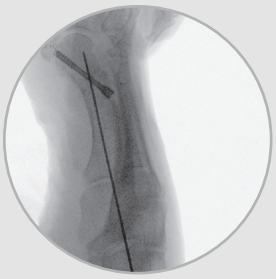


fig. 11b


fig. 12


fig. 13a


fig. 13b

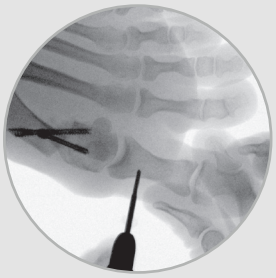


fig. 14a


fig. 14b


fig. 14c


fig. 15a


fig. 15b

EXTREME DISPLACEMENTS (PERC XL)

For cases where the displacement exceeds 80% making dorsal screwing impossible, a double medial beveled screwing is necessary. The two screws can be pulled through a single centimeter incision. The proximal screw is more distal than in the MICA technique. To increase the medial displacement of M1 and facilitate the translation of its head, the translator can be placed against the lateral face of the metatarsal, which is particularly resistant ***(fig. 16)***. The steps of the osteosynthesis remain the same ***(fig. 17a-b-c)***.
This fixation creates a medial diaphyseal bone protrusion that must be removed, using a 2x12 Shannon burr from the cutaneous approach of the screws after preparing a working chamber by having detached the soft parts of the bone using the elevator ***(ref. 258 160)***. The fragment thus released is pushed as an autograft into the osteotomy focus ***(fig. 18a-b-c)***.

POSTOPERATIVE FOLLOW-UP

Immediate loadbearing is authorised on the condition that the patient wears flat post-operative shoe for 3 to 4 weeks after the surgery, which will facilitate walking while at the same time protecting the fixation assembly.
Prophylactic antithrombotic and anticoagulant treatment with LMWH is not necessary unless a particular risk factor has been assessed by the anaesthesiologist or the surgeon (in which case, it lasts several days).
The first dressing should be changed after 15 days.
In the event of non-fixation of the osteotomy of the proximal phalange, a customised orthoplasty is performed on the day of the first dressing to maintain the correction 8 to 15 days longer. It may be replaced by strips of support tape, particularly in the case of a more global forefoot surgery.
Physical therapy is generally prescribed, according to a pre-established protocol, starting after the 3rd week.


fig. 16


fig. 17a

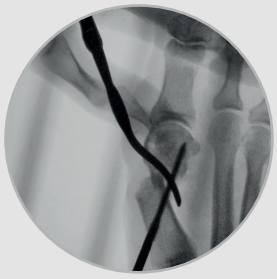


fig. 17b


fig. 17C


fig. 18a


fig. 18b


fig. 18c

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   Quelles limites pour la chirurgie percutanée dans le traitement de l'hallux valgus ? Rev. Chir. Orthop Traum (2024) 10.1016/j.rcot.2024.08.002

IMPLANTS REFERENCES

Ref.	Designation
270 681	bePOD bevelled cannulated 45B screw Ø3 LG16 mm
270 682	bePOD bevelled cannulated 45B screw Ø3 LG18 mm
270 683	bePOD bevelled cannulated 45B screw Ø3 LG20 mm
270 684	bePOD bevelled cannulated 45B screw Ø3 LG22 mm
270 685	bePOD bevelled cannulated 45B screw Ø3 LG24 mm
270 686	bePOD bevelled cannulated 45B screw Ø3 LG26 mm
270 687	bePOD bevelled cannulated 45B screw Ø3 LG28 mm
270 688	bePOD bevelled cannulated 45B screw Ø3 LG30 mm
267 823	bePOD bevelled cannulated 45B screw Ø3 LG32 mm
267 824	bePOD bevelled cannulated 45B screw Ø3 LG34 mm
267 825	bePOD bevelled cannulated 45B screw Ø3 LG36 mm
267 826	bePOD bevelled cannulated 45B screw Ø3 LG38 mm

Ref.	Designation
267 827	bePOD bevelled cannulated 45B screw Ø3 LG40 mm
267 828	bePOD bevelled cannulated 45B screw Ø3 LG42 mm
267 829	bePOD bevelled cannulated 45B screw Ø3 LG44 mm
267 830	bePOD bevelled cannulated 45B screw Ø3 LG46 mm
267 831	bePOD bevelled cannulated 45B screw Ø3 LG48 mm
267 832	bePOD bevelled cannulated 45B screw Ø3 LG50 mm
270 689	bePOD bevelled cannulated 45B screw Ø3 LG52 mm
270 690	bePOD bevelled cannulated 45B screw Ø3 LG54 mm
270 691	bePOD bevelled cannulated 45B screw Ø3 LG56 mm
270 692	bePOD bevelled cannulated 45B screw Ø3 LG58 mm
270 693	bePOD bevelled cannulated 45B screw Ø3 LG60 mm

INSTRUMENTATION

267 807 - Motor screwdriver

267 808 - Manual screwdriver

267 809 - Drill

267 811 - Measurer

254 920 - K-wire D1 L130

269 057 - K-wire D1,5 L150

INSTRUMENTATION MIS 2 - OPTIONAL

258 163 - Percut osteotomy lever MIS II

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