Surgical Treatment for Kirner’s Deformity—Single Osteotomy through a Palmar Approach

Background: Patients with Kirner’s deformity often seek medical attention for aesthetic improvement when they reach the age of approximately 10 years, when the deformity becomes evident. The operative technique described in textbooks is the palmar opening-wedge with multiple osteotomies through a mid-lateral incision, which is technically demanding. The purpose of this article was to introduce our surgical technique of a single transverse osteotomy through a palmar approach and to present the short-term outcomes of this technique.

Methods: The surgical outcomes of 7 digits in 4 children were retrospectively reviewed. The deformed distal phalanx was approached with an oblique incision of the pulp, and the palmar cortex was incised at the apex of the curvature. The dorsal cortex was only partially incised and broken manually when correcting the deformity by a palmar opening-wedge. The dorsal aspect of the phalanx was not exposed, and the nail plate was left intact. The fragments were fixed with Kirschner wires.

Results: There was no postoperative complication, and the osteotomy sites all healed uneventfully. None of the patients complained about scar pain or hypersensitivity of the finger pulp. The patients and their parents were satisfied with the aesthetic results.

Conclusions: A single palmar opening-wedge osteotomy at the apex sufficiently corrected the main curvature, and the subtle curvature remaining at the tip of the phalanx did not affect the appearance. This technique is simple and easy; therefore, it is recommended as a reliable procedure for patients with Kirner’s deformity who are approaching puberty.

The operative technique described in textbooks is the palmar opening-wedge with multiple osteotomies through a mid-lateral incision. Removal of the temporal nail plate is often recommended to correct the deformity. Performing multiple osteotomies for the distal phalanx of the pediatric small finger is technically demanding due to the small size of the bone, and there are risks including necrosis of the fragments or nonunion of the osteotomies. A further complication exists from exposing the distal phalanx from the mid-lateral incision, which may damage the nail matrix and the nail bed, which could result in nail deformity. The purpose of this article was to introduce our surgical technique of a single transverse osteotomy through a palmar approach and to present the short-term outcomes of this technique.

PATIENTS AND METHODS

Four patients, 3 girls and a boy, were operated on at our hospital between 2012 and 2015. Among the 4 patients, 7 digits were operated on. The age at the time of operation

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ranged from 11 to 12 years in the girl patients and 13–14
years in the boy patient. The time until the bony union,
postoperative complications, range of motion of the distal
interphalangeal joint (DIPJ), and patient satisfaction were
noted from the medical records. The pre- and postopera-
tive lengths of the distal phalanx were measured radio-
graphically with the lateral view and expressed as the ratio
to the proximal phalanx. Preoperatively, the linear length
between the tip and the base of the curved distal phalanx
was evaluated, intending to approximate the appearance.
Objective measurement of the deformity was expressed
as the angle between a line connecting the tip and the
midpoint of the articular surface and a line connecting
the palmar and the dorsal edges of the articular surface
on the lateral view of the radiograph (Fig. 1). Wilcoxon
signed-rank test was used for statistical analysis and the sig-
nificance level was defined as $P < 0.05$. This study was con-
ducted with an approval of the institutional review board.

**Surgical Technique**

An oblique incision was made on the pulp of the digit
and the palmar surface of the distal phalanx was exposed
with blunt dissection, protecting sensory nerve branches.
The insertion of the flexor digitorum profundus tendon
was identified and marked with a thin needle (Fig. 2A).
The level was then confirmed with fluoroscopy (Fig. 2B),
which was usually located at the physis when it was open.

The transverse osteotomy was performed just distal to the
needle that marked the flexor digitorum profundus ten-
don and at the apex of the curvature. A single transverse
osteotomy was performed with a small chisel, sparing the
dorsal cortex and periosteum. The palmar curvature was
corrected manually, and a small Kirschner wire was inserted
to maintain the correction. In most digits, the dorsal
cortex broke with the manual correction of the deformity.
The DIPJ of the digit with Kirner’s deformity often exhib-
its hyperextension (Fig. 3A), which compensates for the
flexion deformity of the distal phalanx itself. Therefore,
the DIPJ should be stabilized either by an extension block
or a temporary joint transfixation pin before the osteotomy
(Fig. 3B).

Temporary removal of the nail plate was unnecessary
to achieve sufficient correction because the level of the
osteotomy was always located at the proximal nail fold,
where the nail plate becomes soft and thin. The wound
was closed in a routine manner, and no splint was applied.

**RESULTS**

The results are summarized in Table 1. The osteoto-
my healed and the wires were removed 4–9 weeks post-
operatively. Patients were followed up with for a median
of 18 months and at least until the physis of the phalanx
was closed. There were no complications with wound or
bony healing, and no patient complained about scar pain
or hypersensitivity of the finger pulp. Flexion of the DIPJ
ranged between 50 and 85 degrees, and all but one digit
showed full extension. None of the patients experienced
disability in daily activities. The median of the relative
length of the distal phalanx was 41.5% preoperatively and
was 42.2% postoperatively. There was no significant differ-
cence between pre- and postoperative lengths ($P > 0.10$).
The angulations of the distal phalanx were significantly
improved from 49 degrees preoperatively to 85 degrees
postoperatively ($P < 0.05$). All patients and families were
satisfied with the aesthetic results (Fig. 4).

**DISCUSSION**

Patients with Kirner’s deformity usually seek medical
attention around the age of 10 years, when the deformity
becomes evident. Because the goal of the treatment is
esthetic improvement, surgical complications, either
functional or aesthetic, should be avoided. A palmar
opening-wedge with multiple osteotomies of the distal
phalanx is technically demanding because of the small
size of the distal phalanx.3,4 A mid-lateral incision usually
requires temporary removal of the nail plate to expose the
distal phalanx fully.1 However, there is the risk of nail ma-
trix and/or nail bed injury due to the proximity to those
structures, which can cause postoperative nail deformity.
Although meticulous dissection of the nail matrix and bed
from the distal phalanx minimizes the risk of the nail de-
formity, it may disturb the blood supply to the tiny bone
fragments, which can result in avascular necrosis or non-
union.

A single palmar opening-wedge osteotomy through a
palmar approach has several advantages over the conven-
tional technique. For example, it is easy to expose the volar aspect of the distal phalanx from the oblique incision on the pulp with this technique. Furthermore, it is unnecessary to dissect the dorsal side of the phalanx because the dorsal cortex can be left intact, or notched from the palmar side, before performing the manual correction of the deformity. In most digits, the dorsal cortex broke during the manual correction; however, it did not compromise the correction, and the osteotomy healed uneventfully.

The simplicity of a single osteotomy can also be emphasized as an advantage. The transverse osteotomy was consistently performed at a location just distal to the physis. This was always close to the apex of the deformity and was therefore efficient for correcting the curvature. Some
Table 1. Details of the Cases

| Case  | Side | Sex | Age | Bone Union (w) | Follow-up Period (m) | Postoperative ROM (flex/ext) (°) | Preoperative Length (%) | Postoperative Length (%) | Preoperative Deformity (°) | Postoperative Deformity (°) |
|-------|------|-----|-----|----------------|---------------------|----------------------------------|-------------------------|--------------------------|----------------------------|----------------------------|
| 1     | R    | F   | 11  | 9              | 13                  | 70/0                             | 45.4                    | 42.2                     | 51                        | 77                        |
|       | L    |     |     | 6.5           | 24                  | 70/0                             | 41.5                    | 42.2                     | 54                        | 82                        |
| 2     | R    | F   | 12  | 6              | 34                  | 50/0                             | 42.1                    | 45.3                     | 45                        | 92                        |
|       | L    |     |     | 8              | 30                  | 50/0                             | 43                      | 41.4                     | 43                        | 91                        |
| 3     | R    | M   | 13  | 4              | 18                  | 80/5                             | 37.1                    | 36.3                     | 52                        | 91                        |
|       | L    |     |     | 5              | 15                  | 85/-5                            | 39.3                    | 41.6                     | 48                        | 73                        |
| 4     | R    | F   | 12  | 4              | 12                  | 50/0                             | 40.7                    | 43                       | 49                        | 89                        |

R: right; L: left; F: female; M: male; ROM: range of motion; flex: flexion; ext: extension; pre- and postoperative length: relative distal phalanx length to the proximal phalanx.

Fig. 4. A, The preoperative appearance of the right little finger of case 4. B, The preoperative lateral view of plain radiograph of the digit. C, Twelve-month postoperative appearance. D, The postoperative lateral view of plain radiograph of the digit.
surgeons recommend that the nail plate must be removed to achieve sufficient correction of the deformity. However, the nail plate did not interfere with the correction because it is adequately flexible in this age group, and the level of the osteotomy was proximal to the nail fold, where the nail plate was softer. This is demonstrated in Figure 2B. Additionally, the nail plate grows along the shape of the distal phalanx; therefore, the nail plate deformity resolved spontaneously with the correction of the distal phalanx. The preserved nail plate also worked as a splint and provided extra stability to the Kirschner wire fixation after the osteotomy. We used only 1 Kirschner wire to fix the 2 fragments, but the construct was stable with the nail plate and an additional external splint was not necessary.

Benatar proposed that an abnormal distal insertion of the flexor digitorum profundus tendon was the cause of Kirner’s deformity. Another advantage of our technique is that the insertion of flexor tendon can be examined before the osteotomy, although we did not identify any abnormalities in our cases. Fairbank et al. reported an L-shaped physis as the cause of Kirner’s deformity, and we support their findings. In our patients, the apex of the curvature was found consistently at an L-shaped physis, and a single palmar opening-wedge osteotomy at this level sufficiently corrected the main curvature. The subtle curvature remaining at the tip of the phalanx did not affect the appearance.

The key to successful correction and fixation was to stabilize the proximal fragment before the osteotomy by either an extension block or a temporary fixation pin at the DIPJ. We have not experienced any functional deficits postoperatively, including scar pain or hypersensitivity of the pulp. Because the treatment goal is aesthetic improvement, this was also a great advantage.

A potential downside of this procedure is premature closure of the physis. The physis closed postoperatively in all the digits. However, the closure was expected considering the ages of our patients, and the physis itself was abnormal, at which growth may be disturbed regardless. Therefore, if any growth disturbances resulted from the procedure, they were likely minimal. Patients with bilateral involvement underwent the second operation 3–12 months after the first operation, but there was no significant difference in the length of the phalanx between the left and right sides. In some patients, the follow-up period was short, but we believe the deformity will not recur following physis closure. In adult patients, this procedure may not work as well due to slower healing, less remodeling capacity, and the rigidity of the dorsal cortex and nail plate.

**CONCLUSIONS**

A single palmar opening-wedge osteotomy through a palmar approach is a simple and easy technique that resulted in no postoperative complications and positive aesthetic results with high patient satisfaction. This technique is recommended as a reliable technique for patients with Kirner’s deformity who are approaching puberty.

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