step-off, it was decided intraoperatively that a cancellous bone graft was unnecessary.

REFERENCES

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COMPLEX DORSAL DISLOCATION OF THE INTERPHALANGEAL JOINT OF THE GREAT TOE

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Most dorsal dislocations of the interphalangeal joint of the great toe are easily reduced and maintained by closed measures.1 Irreducible dorsal dislocation is an exceedingly rare event often associated with concomitant fractures and soft tissue interposition.2-4 The major impediments to simple reduction are invagination of the plantar accessory ligament into the joint space and the presence of intact collateral ligaments.5

We report a case of a 16-year-old female with an isolated dorsal-medial dislocation of the interphalangeal joint of the great toe refractive to closed reduction.

CASE REPORT
A 16-year-old female presented to a local emergency room with a dorsal dislocation of her great toe after accidentally striking it against a protruding segment of concrete while running barefoot. An orthopedic consultation was subsequently requested.

Examination revealed a severe deformity with dorsomedial displacement of the distal phalanx of the great toe. The condyle of the proximal phalanx was noted to be tenting the skin in the widened first web space. On gentle palpation, it became apparent that this deformity was rigid and fixed, and repeated attempts at reduction under digital block anesthesia proved unsuccessful. Radiographs (Fig 1) demonstrated a dorsomedial dislocation of the great toe without associated fractures.

The patient was taken to the operating room, where under general anesthesia a transverse plantar incision was made parallel and immediately distal to the plantar crease to expose the interphalangeal joint. The plantar accessory ligament was noted to be invaginated into the interphalangeal joint space, preventing reduction. The plantar accessory ligament was extricated from the joint space and the frayed edges of this structure were sharply debrided. Following this maneuver, the dislocation was easily reduced.

The distal phalanx of the great toe was stressed in the medial-lateral and dorsal direction and noted to be stable. The wound was irrigated with an antibiotic solution and the skin closed with interrupted 5-0 nylon sutures. No attempt was made to repair or reattach the
plantar accessory ligament. The foot was placed in a bulky compression dressing for approximately 2 weeks.

Postoperative radiographs (Fig 2) demonstrated satisfactory reduction of the dislocation and maintenance of the joint space. At 3 years postsurgery, the patient had a satisfactory, painless, and stable range of motion of the interphalangeal joint with no residual sequelae.

**DISCUSSION**

The interphalangeal joint of the great toe is a ginglymus or hinge joint, and is formed by the convex head of the proximal phalanx and the concave base of the distal phalanx. Gray and Clemente\(^6\) compared the distal articular surface of the proximal phalanx to a pulley and the proximal articular surface of the terminal phalanx to a cup-like concavity, which reciprocate with each other. The major structures which stabilize the interphalangeal joint of the great toe consist of two collateral ligaments: the extensor tendons with their expansions, and the plantar accessory ligament.\(^6\)

Motion of the interphalangeal joint of the great toe is restricted predominantly to flexion and extension.\(^6\) While flexion is considerable, extension is limited by the flexor tendons and the plantar accessory ligament.\(^6\)

We believe our case is the first report in the English literature of isolated dislocation of the interphalangeal joint of the great toe without concomitant fracture. Nelson and Uggen\(^3\) reported a case with associated avulsion fracture of the head of the talus and navicular, and a fracture of the proximal phalanx of the second toe. Heckman\(^5\) reported a case of dorsal fracture-dislocation of the interphalangeal joint of the great toe irreducible by closed means.

Analogous dislocations of the metatarsophalangeal joint have been reported.\(^2,4\) The mechanism of injury is identical to our case, but the major impediment to closed reduction is vastly different owing to the differences in anatomy at the metatarsophalangeal joint.\(^4\) With the metatarsal joint dislocation, the proximal phalanx comes to lie dorsally with the metatarsal head trapped between one flexor-hallucis brevis tendon, the abductor hallucis, and the associated sesamoid medially, and between the other flexor hallucis brevis tendon, the abductor hallucis, and the associated sesamoid laterally. In our case, the major impediments to simple closed reduction were the invaginated plantar accessory ligament into the joint space and the intact collateral ligaments.

We conclude that dorsal irreducible dislocation of the interphalangeal joint of the great toe without associated fractures is a rare entity. The major deforming force is axial load with hyperextension. This dislocation cannot be distinguished clinically or radiologically from simple dislocations except for the fact that it fails to reduce by usual means. The major impediments to closed reduction are invagination of the plantar accessory ligament into the joint space and intact collateral ligaments. While this entity may occur with associated fractures, our case is unique in that adjacent or remote fractures were not present. Gentle closed reduction should be attempted initially. If unsuccessful, open reduction through a plantar or dorsal incision with excision of the plantar accessory ligament should be performed. Internal fixation, reattachment, or repair of the plantar accessory ligament was not necessary.

**REFERENCES**


**EDITORIAL DISCUSSION**

The authors have presented an interesting case of dislocation of the great toe produced by
axial load hyperextension. They are to be com-
mended for bringing this case and reporting it in
the literature.

In considering this condition, readers should
also review the paper by Yasuda on two cases of
irreducible dorsal dislocation of the inter-
phalangeal joint of the great toe (Foot & Ankle,
June 1990), and an article by Miki et al on
irreducible dislocation of the great toe, a report
on two cases, and a review of the literature
(Clinical Orthopaedics, February 1988).

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TRICEPS AVULSION FRACTURE IN A
WEIGHTLIFTER

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Isolated fractures of the olecranon process are
relatively rare. This report involves an unusual
ticeps olecranon avulsion fracture that occurred
during weightlifting.

CASE REPORT

While performing a triceps extension exer-
cise with 250 lbs, a 44-year-old man felt a snap
and sharp pain in his dominant right elbow.
The patient immediately stopped the exercise,
but was able to finish his lower body routine.
He then noted numbness and swelling in his
ebow.

When examined in the emergency room, the
right elbow was tender and swollen posteriorly.
A firm mass was noted 3 cm proximal to
the olecranon process. Sensory examination
revealed no deficits to light touch, pin prick, or
two-point discrimination. On motor examina-
tion, the triceps strength was diminished against
resistance; the biceps strength was normal. The
radial and brachial pulses were intact and
symmetrical. Radiographic examination
showed a .5 cm × 1 cm avulsed and displaced
fragment of the olecranon (Fig).

The patient underwent operative reattach-
ment of the triceps 2 days later with excision of
the avulsed fragment. He was immobilized in
a long arm cast in full extension for 6 weeks. He
regained a full range of motion within 3
months of his injury, and resumed weight
lifting despite advice to the contrary.

DISCUSSION

A review of the current literature shows that
triceps avulsion injuries are rare.1,7 The most
common mechanism of injury reported is a fall
on the outstretched hand with a slightly flexed
ebow. The mechanism of injury in this case was
a forced extension of the forearm against a large
weight. No direct trauma to the elbow occurred.
The patient was using a triceps extension appar-
atus with approximately 200 lbs when the
avulsion occurred. While the patient was ex-
tending his forearm, the entire weight was being
supported by the triceps muscle unit.

Two case reports in the literature involved
triceps avulsions in weightlifters.5,8 In one case,
the patient was performing a snatch lift in which
the weight is lifted directly over the head from the
ground. In the other case the patient was using a
bench press, which involves lying on a bench and
lowering the weight to the chest and then lifting it.
In both cases, the patients had a history of
anabolic steroid use. Studies have shown that the
ultrastructure of tendons in mice is damaged by
anabolic steroid use.9 In the present case, there
was no history of anabolic steroid use.

Weightlifting involves many inherent risks,
including triceps avulsion fractures. These inju-
ries appear to be best treated by surgical reattac-
hment.1,4 A history of elbow pain with a
palpable gap and swelling about the triceps,
coupled with an inability to extend the arm
against resistance all point to a triceps avulsion.
This may occur with or without radiographic
evidence of an avulsion fracture.

REFERENCES

1. Bennett BS, Triceps tendon rupture, case report and a