SURGICAL MANAGEMENT OF PARALYTIC VALGUS ANKLE

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ABSTRACT

The aim of this work is to determine the protocol of treatment of paralytic valgus ankle secondary to poliomyelitis in twenty-two patients. Hindfoot valgus can occur at subtalar joint, ankle joint or at both sites. Valgus ankle is characterized clinically by prominent medial malleolus and radiologically by a triade of: Fibular shortening, lateral wedging of the distal tibial epiphysis and lateral talar tilt. Sixteen cases were treated by supramalleolar osteotomy, four cases by fibular-achilles tenodesis and three cases by internal fixation for fibular pseudarthrosis (one of them was followed by supramalleolar osteotomy). There was improvement of hindfoot valgus and talar tilt in all cases.

MATERIAL AND METHODS

Twenty-two patients with twenty-two paralytic ankle valgus secondary to poliomyelitis were treated at Poliomyelitis Institute and Ain Shams University Hospitals in the period between September 1992 and September 1995. There were fourteen females and eight males, ranging in age from 5 years, 6 months to 13 years, 7 months at the time of surgery. All cases were ambulants. Eleven cases used hip, knee, ankle foot orthoses (HKAFO), seven cases used ankle foot orthoses (AFO) and four cases used ordinary shoes. There were twelve cases with flail ankle and foot muscles. Five cases had active triceps surae grading 3 to 4 according to Medical Research Council scale, 1943, four of them had active peronei (grade 4 to 5) and one case has active extensor hallucis longus (grade 3). Two cases had active peroneii (grade 3 to 5) and extensors of the toes, two cases had active extensors and flexors of the toes (grade 3) and the last one had active extensor hallucis longus (grade 3) and peroneus tertius.

The main complaint of all patients was pain on the medial malleolus by pressure of orthoses or shoes.

Surgical indication was clinical significant ankle valgus with pain on the prominent medial malleolus in ambulatory patient. Management depended on the degree of ankle valgus, age, muscle power and presence or absence of fibular pseudarthrosis.

(A) Supramalleolar osteotomy (SMO) was done if talar tilt was more than or equal to 15° with grade II or III wedging of the distal tibial epiphysis (Malhotra et al. 1984) and also if there was significant external tibial torsion more than 20°, (Stevens and Toomey, 1988).

(B) Fibular-achilles tenodesis (F.A.T) was done if talar tilt was more than 5° with
abnormal fibular station (grade I to III) in growing child between 4 and 10 years of age with flail calf muscles, (Stevens and Toomey, 1988).

(C) Internal fixation (I.F) with iliac cortico-cancellous graft was done for cases with fibular pseudarthrosis, (Hsu et al, 1974 and Muller et al, 1991).

(D) In combined ankle and subtalar valgus, the previous operations will be combined at the same time or followed later by either Grice Green or triple arthrodesis according to age, (Stevens and Toomey, 1988). All patients had hindfoot valgus with the medial malleolus was the most prominent medial bony prominence.

Preoperative weight-bearing X-ray included anteroposterior and lateral views of both ankles and feet. In anteroposterior view the following items were recorded:

1) The degree of talar tilt (T.T.) as described by Snearly and Peterson (1989) and Malhotra et al. (1984) ranged from 7°-34°, mean 14°; the T.T was more than 20° in seven cases, 15°-19° in six cases, 10°-14° in eight cases and less than 10° in one case only.

2) Fibular level (F.L) as described by Malhotra et al. (1984) was grade III in eight cases, grade II in nine cases and grade I in five cases.

3) The Lower tibial epiphysel level (L.T.E.L) as described by Malhotra et al. (1984) was grade II in fourteen cases, grade I in seven cases and grade III in one case.

In lateral view X-ray, lateral talo-calcaneal angle was recorded (Vanderwild et al. 1989) ranging from 39°-72° mean 53°.

If talar tilt was more than 10°, the X-ray beam is caudally tilted accordingly on lateral view in order to obtain true lateral talo-calcaneal angle and if the angle was more than 50° it denotes combined subtalar and ankle valgus (Stevens 1988). In our work, ten cases had combined ankle and subtalar valgus and twelve cases had ankle valgus only, seven of them had previous subtalar fusion. Calcaneus deformity was present in nine cases and six cases had external tibial torsion (range from 30° to 60°).

Follow up ranged from 6 to 28 months mean 14 months. The patients were assessed clinically and radiologically every 2 months.

Supramalleolar Osteotomy (SMO) was done in sixteen cases, twelve were females and four males, ranging in age from 6 to 13 years. The T.T. ranged from 11°-34° mean 19° ± 6°. Nine cases had T.T. more than 15° and seven cases had T.T. 11° to 15°.

F.L. was grade III for five cases, grade II for six cases and grade I for five cases. L.T.E.L was grade II for eleven cases and grade I for five cases. The lateral talo-calcaneal angle ranged from 39°-72°, mean 56° ± 10°.

Closed wedge osteotomy was done for fifteen cases and open wedge for one case. Charnley clamps were used for fourteen cases and staple for two cases. Oblique fibular osteotomy was done in all cases. Preoperative planning was done to determine the site and size of the wedge.
The ostectomy site was predrilled above the level of syndesmosis. One Steinmann pin was inserted on either side of the intended ostectomy site, estimated wedge was removed and Charney clamps were applied. Open wedge was performed in one case with iliac graft but medial cortex got fractured and Charney clamps were applied. Above knee cast was done for 8 weeks except one case for sixteen weeks (case with open wedge). Charney clamps were removed after six weeks. Triple arthrodesis and Grice Green was done for two cases with combined ankle and subtalar valgus after one year of SMO.

Fibular-Achilles tenodesis (F.A.T.) was done in four cases. Two were males and two females ranging in age from 5 years, 6 months to 8 years, ( mean 6 years, 6 months ). The T.T. ranged from 7° to 15°,( mean 13°) . The F.L. was grade III in two cases and grade II in two cases.L.T.E.L. was grade III in one case, grade I in two cases and grade I in one case. The lateral talocalcaneal angle ranged from 53° to 65° mean 58°. All cases had flail triceps surae muscle. Longitudinal splitting of the tendon Achilles was done leaving lateral 20% intact whereas the medial 80% was transected proximally, passed deep to the lateral 20% and fixed to the fibular shaft (about 4 cm proximal to lower fibular physis) under tension keeping the ankle in 5°-10° equinus. The tendon was passed through a slot made in the fibula and sutured to surrounding periosteum in two cases wherease in other two cases the tendon fixed by sutures passed through two drill holes in the fibula as the fibula was thin. Above knee cast was applied for six weeks except in one case where Grice Green operation and peroneal transfer to os calcis was done at the same time of F.A.T., where immobilization continued for ten weeks. Ankle foot orthoses following the cast was used.

Internal fixation for fibular pseudarthrosis (I.F.) was done for three cases with fibular pseudarthrosis following Grice Green operation using one - third tubular plate and cortico cancellous iliac graft one of them was followed by SMO due to residual 17° T.T.

**RESULTS**

Clinically there was no pain on the medial malleolus in all cases after operation and they could fit in orthoses and walk without complaint. There was improvement of hindfoot valgus in all cases. Full correction of valgus heel was present in fourteen cases. Eight cases were undercorrected, two of them complained of pain after one year of SMO due to pressure of orthoses on the head of talus; these were fully corrected by subtalar fusion (triple arthrodesis and Grice Green). Associated calcaneus deformity was corrected after F.A.T. and external tibial torsion was corrected after SMO.

Radiologically the results were graded into excellent, good and unsatisfactory according to the degree of talar tilt correction, fibular level and lower tibial epiphyseal level gain. We considered excellent result if T.T correction was more than 60 % and at least one station gain of F.L and L.T.E.L,
good result if T.T correction between 30-60%, and one station gain of F.L and L.T.E.L and unsatisfactory result if T.T correction was less than 30% and no station gain of F.L and L.T.E.L. According to the previous grading we had fifteen excellent cases (68%), two good (9%) and four unsatisfactory cases (18%).

Eleven of excellent cases followed SMO(Fig.1,2,3), three cases followed F.A.T. (Fig.4) and one followed LF for fibular pseudarthrosis. The two cases graded good, one of them followed SMO and the other followed F.A.T.

Three of the unsatisfactory cases followed SMO (Fig.5) while one followed LF for fibular pseudarthrosis. There was one case with overcorrection of T.T into varus and no station gain of F.L or L.T.E.L but the heel was central as it had combined subtalar and ankle valgus.

There was improvement in T.T in all cases with average correction 68%. The F.L had one station gain in nine cases, two station gain in eight cases and three station gain in one case whereas four cases has no gain. The L.T.E.L had one station gain in seventeen cases, two station gain in four cases and no gain in one case. There is decrease in postoperative lateral talocalcaneal angle into average 45°.

**DISCUSSION**

Paralytic hindfoot valgus can occur at the level of subtalar joint, the ankle joint or at both levels. If it occurs at the level of the ankle, subtalar fusion will not correct the deformity but even make it worse. It is essential to differentiate between ankle and subtalar valgus preoperatively. Valgus ankle is characterized by prominent medial malleolus whereas in subtalar valgus the head of talus is the most medial bony prominence, (Stevens and Toomey, 1988). On weight bearing x-ray there is triad of deformity in ankle valgus: Lateral talar tilt, wedging of the lower tibial epiphysis and fibular shortening, (Makin, 1965 and Malhotra et al, 1984). The difficulty comes in the diagnosis of combined ankle and subtalar valgus. Stevens, (1988) recommended caudal tilt of x-ray beam on lateral view by the same degree of talar tilt to obtain true lateral talo-calcaneal angle and if the angle is more than 50° it denotes combined subtalar and ankle valgus. Depending on the lateral talocalcaneal angle to diagnose combined ankle and subtalar valgus is not always true as the lateral talocalcaneal angle has wide normal range from 15° to 60° (Vanderwild et al, 1988), it increases with calcaneus deformity, the talus is difficult to define in the presence of subtalar fusion and the other limb can not be taken as reference as it is usually affected in polio. Although it is difficult to differentiate ankle valgus from combined ankle and subtalar valgus, the plane of management will be the same in that we start treatment of ankle valgus and then reevaluate the case according to patient complaint and residual deformity because:

(1) If we start by subtalar fusion, it will produce a leverage effect that will tend to increase ankle valgus, (Malhotra et al, 1984), or the calcaneus will go into varus
A) Anteroposterior weight bearing Preoperative X-ray showing left valgus ankle in 9 years old child with T.T. 21°, F.L. grade II and L.T.E.L. grade II.

B) 9 months after SMO (closed wedge) with T.T. 6°, F.L. grade I and L.T.E.L. grade I. (Excellent result).
Fig (2)

A) Anteroposterior weight bearing Preoperative X-ray showing right valgus ankle in 6 years old child with T.T. 22°, F.L. grade III and L.T.E.L. grade II.

B) 12 months after SMO (closed wedge) with T.T. 6°, F.L. grade I and L.T.E.L. grade (0) (Excellent result).
Fig (3)
B) 3 months after I.F. for fibular pseudarthrosis with residual T.T. 17°
C) 10 months after SMO with T.T. 0, F.L. grade II and L.T.E.L. grade I.
(Excellent result)
A) Anteroposterior weight bearing Preoperative X-ray showing left valgus ankle in 5.5 years old child with T.T. 14°, F.L. grade III and L.T.E.L. grade III.

B) 17 months after F.A.T. with T.T. (0), F.L. grade I and L.T.E.L. grade I.

(Excellent result).
Fig (5)

(A) Anteroposterior weight bearing Preoperative X-ray showing left Valgus ankle in 11 years old child with T.T. 15°, F.L. grade I and L.T.E.L. grade I

B) 15 months after SMO (open wedge) with T.T. 12°, F.L. grade I and L.T.E.L. grade I. (Unsatisfactory result)
with respect to the talus in order to bring the calcaneus into line with the tibia and that will lead to supinated adducted painful foot (Smith and Westin, 1968).

(2) All cases with ankle valgus presented with pain on medial malleolus due to pressure by shoes or orthoses that can not correct or prevent the progression of the deformity in growing child, (Wiltse, 1972 and Stevens and Toomey, 1988).

(3) It is not advisable to treat combined ankle and subtalar valgus at the same time because (a) subtalar valgus is mostly painless and the patient may not complain of it (b) cases may be falsely diagnosed as combined ankle and subtalar valgus depending on the lateral talo-calcaneal angle as mentioned before and become completely corrected after treatment of ankle valgus (c) treating ankle and subtalar valgus at the same time may lead to overcorrection of associated calcaneus deformity into equinus that occurred in one case after F.A.T and Grice Green with peroneal transfer to os calcis.

Valgus ankle must be suspected in every case of hindfoot valgus and differentiated clinically and radiologically depending on weight bearing x-ray, as the treatment by subtalar fusion will not compensate for ankle deformity but make it worse.

REFERENCES


Surgical management of ....


العلاج الجراحي لإنموذج الوحشي لمفصل الكاحل نتيجة شلل الأطفال

سامح إسماعيل شلتوت
قسم جراحة العظام بكلية الطب - جامعة عين شمس

قام الباحث بعلاج أثنتين وعشرين حالة إنموذج وحشي عند مفصل الكاحل، نتيجة شلل الأطفال.

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