

**Original Article****Managing the Neglected and the Residual Clubfeet with the New Operative Procedure (Hussain's Procedure) – An Experience of Six-Month Fellowship**Rajesh Bahadur Lakhey<sup>1\*</sup>, Afzal Hussain<sup>2</sup>

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Article Received: 15<sup>th</sup> September, 2020; Accepted: 20<sup>th</sup> May, 2021; Published: 30<sup>th</sup> June, 2021

DOI: <http://dx.doi.org/10.3126/jonmc.v10i1.37982>

**Abstract****Background**

Pakistan Society for Rehabilitation of the Disabled Orthopedic Hospital is renowned for the correction of orthopedic deformities including foot and ankle deformities. Dr. Afzal Hussain, a consultant orthopedic surgeon in the hospital, pioneers in treatment of foot and ankle deformities and he has developed a new operative procedure for congenital clubfoot. Working with the surgeon for 6 months during the fellowship, management of the neglected and the residual congenital clubfeet with the new operative procedure and their follow-ups were assisted by the first author.

**Materials and Methods**

Operative procedure of the neglected and the residual congenital clubfeet, which were performed with the new operative procedure by Dr. Hussain, were assisted by the first author and a minimum of 5 years follow up was done by the senior author (Afzal Hussain). Cumming's modification of Laavag and Ponseti score was applied for the calculation of the results at the follow-ups.

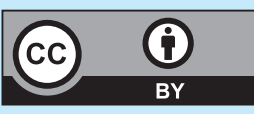
**Results**

During the follow-ups of 11 cases of neglected congenital clubfeet and 9 cases of residual clubfeet (operated earlier with posteromedial release) which had been operated by the new operative procedure, Cumming's modification of Laavag and Ponseti scores of the operated clubfeet were calculated and the results were found to be excellent.

**Conclusion**

Early results of the new operative procedure by Dr. Afzal Hussain for congenital clubfoot in the neglected and the residual congenital clubfeet were found to be excellent.

**Keywords:** Classification, Congenital clubfoot, Surgery

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**Citation**

Lakhey RB, Hussain A, Managing the Neglected and the Residual Clubfeet with the New Operative Procedure (Hussain's Procedure) – An Experience of Six-Month Fellowship, JoNMC.10:1(2021) 55-60.



## Introduction

Pakistan Society for Rehabilitation of the Disabled Orthopedic Hospital is renowned for the correction of orthopedic deformities including foot and ankle deformities. Dr. Afzal Hussain, a consultant orthopedic surgeon working in the hospital, pioneers in treatment orthopedic deformities and he has developed a new operative technique for congenital clubfoot. A lot of cases of the neglected clubfeet in walking age group children, who have never been treated before and the residual clubfeet, post Posteromedial release (PMR) surgery, get referred to the surgeon from far and wide for the management of the deformity. He initially manages the cases with casting and operates for the remaining existing deformities.

Neglected clubfoot in older children is a problem frequently encountered in the developing countries. A lot of the neglected clubfoot cases have to undergo surgeries for the correction of the deformity. Similarly, many patients who had had surgical correction like PMR surgery of clubfoot have to undergo revision clubfoot surgery. The new method defining the deformities in a clubfoot and the new method of clubfoot correction which has been developed by Dr. Hussain, objectively describes (vide infra) three different existing deformities i.e. dorsolateral hump, midfoot crease and equinus, and corrects the three deformities by three different steps for surgery i. e. lateral release, abductor and planter release; and posterior and medial release respectively. This is a new development in 'a la carte' approach for clubfoot surgery and helps the surgeon to make the decision of the surgical procedure easy.

The procedure is used by the surgeon for the correction of the neglected congenital clubfeet and residual clubfeet post-PMR surgery till the age of 9 years, as a single-stage surgery and without the need of any bony corrections like osteotomies and arthrodesis. Working with the surgeon for 6 months from February to August 2009, management of the neglected and the residual congenital clubfoot by the new operative procedure and their follow-ups with Dr. Hussain, were assisted by the author. The objective of the study was to study about the results of the procedure developed by the senior author (Afzal Hussain) which would be useful for management of neglected and residual clubfeet.

## Materials and Methods

A new method of defining the existing deformities in the clubfoot has been proposed by Dr. Hussain. This consists of recording the following existing deformities in the foot.

- A dorsolateral hump
- B1 half midfoot crease
- B2 full midfoot crease
- C equinus
- D thin skin
- E short first ray

Dorsolateral hump is the talar head which is palpable on dorsolateral aspect of clubfoot while midfoot crease is the crease on the sole. Record of whether the dorsolateral hump is reducible i.e. whether it disappears on abducting the foot with firm pressure over the bony prominence or it is rigid/irreducible is made. Reducibility of mid-foot crease i.e. whether it disappears on supinating first ray is also noted. Reducibility of equinus i. e. whether the foot can be brought into normal dorsiflexion by manipulation is also noted.

## The operative procedure

The operation is tailored according to the existing/persisting deformities thus defined. Lateral release is done to reduce the rigid dorsolateral hump, posterior and medial release is done in the presence of the rigid equinus, while abductor/planter release is done for rigid mid-foot crease. For example, when the clubfoot has rigid mid-foot crease and equinus, and reducible dorsolateral hump, the surgeon would opt for abductor-planter release and posterior-medial release Extreme caution is taken while elevating skin flaps in the presence of the thin skin. The operation is done by 3 different incisions. The lateral release is done by Ollier's approach (vide infra), posterior and medial release is done through a longitudinal incision and abductor/planter release is done through a horizontal incision along the first metatarsal extending proximally to first metatarso-cuneiform joint.

## Lateral release

A straight incision is given from a point 1cm below the lateral malleolus to the dorsolateral hump. Flaps of skin are elevated protecting the sural nerve. Release of the peroneal tendon sheath is done from the lateral border of foot to the superior peroneal retinaculum. This serves two other purposes: the peroneus longus tendon can then be mobilized and protected while releasing the inferior capsule of the calcaneocuboid joint; the lateral capsule of the subtalar joint lying beneath the peroneal tendon sheath can also be released. Extensor digitorum brevis is elevated from its origin. Lateral, superior, medial and inferior capsules of calcaneocuboid joint are released. Bifurcate and cubonavicular ligaments are also released. The dorsal, lateral, medial and inferior capsules (along with the spring ligament) of the



talonavicular joint are released under direct vision. Extreme care is taken to not to dissect in the neck of talus so as to preserve the vascularity of the bone. The extensor digitorum longus tendons and the dorsalis pedis artery and nerve are protected during the release. Lateral capsule of the subtalar joint is released. Interosseous talocalcaneal ligaments are not released. Postero-lateral part of the capsule of the subtalar joint along with the calcaneo-fibular ligament and the talofibular ligament are released.

### Posterior and medial release

A longitudinal incision of 5-6 cm is given mid-way between medial malleolus and tendoachilles. The distal extent of the incision is curved medially just proximal to the insertion of tendoachilles. Approach is made to the tendoachilles and the skin flap is elevated along with the sheath of the tendoachilles. This assures the adequate thickness of the skin flap- thus preventing flap necrosis. The sheath of the tendoachilles is sharply incised. Plantaris is released if present. Z-lengthening of the tendoachilles is done. Tibialis posterior and flexor digitorum longus tendon sheaths are exposed and sharply opened up. Release of the superficial deltoid ligament is done. Z-lengthening of tibialis posterior tendon is done. Z lengthening or tenotomy of the flexor digitorum longus tendon is done as required, depending upon the severity of the deformity. Flexor hallucis longus tendon sheath is opened up with a sharp incision. The sheath is opened up from the region above the ankle to the canal of flexor hallucis longus below the talus. The tendon is reflected along with the neurovascular bundle anteriorly. The dissection of the neurovascular bundle is not done. Ankle and subtalar joint capsulotomies are done. The location of the flexor hallucis longus tendon helps to identify the subtalar joint. In extreme equinus, the subtalar joint is released first, since the talus is wedged anteriorly due to equinus of calcaneus. The release of ankle joint is meticulously done. Z-lengthening of flexor hallucis is done. The deep part of deltoid is generally not released. The posterior one- third of the deep part of deltoid ligament is released in a most rigid clubfeet only.

### Abductor and planter release

Abductor and planter release is done through a different medial longitudinal incision along the first metatarsal extending proximally to the metatarso-cuneiform joint. Structures released include the aponeurosis of abductor hallucis brevis, first metatarso-cuneiform joint and the planter fascia. It has been observed that the

aponeurosis of abductor hallucis brevis lies at the planter aspect of the muscle in case of rigid cavus. Tibialis anterior tendon is identified and protected while releasing the first metatarso-cuneiform joint. The release of the planter fascia is done through the same medial longitudinal incision. Reduction of the talonavicular joint is then done under direct vision. Talonavicular joint is fixed with a 1.5mm K-wire if the reduction is unstable. Calcaneocuboid joint also needs fixation if the reduction is unstable. The ends of flexor hallucis longus tendon is sutured with chromic catgut. The tendoachilles is sutured with the foot at 5 degrees dorsiflexion. Tibialis posterior and flexor digitorum longus tendons are realigned in the tendon sheaths and are not sutured. The extensor digitorum brevis muscle origin is snugly repaired with chromic catgut. The subcutaneous tissue and skin are meticulously closed with interrupted sutures. Initial immobilization is done with an above knee back slab in cases with extensive release. If the release is not extensive, corrective above knee cast is applied.

### Postoperative management

Postoperative manipulation and casting is given importance, as this corrects the reducible deformities of the clubfoot which had not been corrected surgically. Removal of stitches along with manipulation is done under general anaesthesia. K-wire is removed after 4 weeks. The cast is changed during these procedures. Gentle manipulation was done in the presence of K-wire to stretch the flexible joints which had not been fixed by K-wire. The next cast is applied after 4 weeks for non-rigid foot and after 2 weeks for the rigid one, which remains for 2 weeks. The final cast is then applied which remains for 2 more weeks. The foot remains in cast for a duration of 8-12 weeks after operation, depending upon its rigidity. Ankle Foot Orthosis is then prescribed. The child wears AFO full time till he/she begins to walk. Then, the child wears the AFO at night or during afternoon naps till the age of 5-6 years. The manual exercises are also taught to the parents. The new method of defining existing deformities and the new operative procedure is used during the neglected clubfoot surgery and residual clubfoot post-PMR too.

### Results

Operations of 11 cases of neglected congenital clubfeet and 9 cases of residual clubfeet, which had been operated earlier with posteromedial release, by the new operative procedure, were assisted by the author during the six-month



period of fellowship. The cases did not have post-operative complications like would breakdown and infections. A minimum of 5 years follow up of the cases was done by the senior author ( Afzal Hussain). Cumming's<sup>1</sup> modification of Laavag and Ponseti<sup>2</sup> scores of the operated clubfeet were calculated during the follow-ups and the results were found to be excellent in all of the cases.

### Cases of neglected congenital clubfoot

The following cases of the neglected congenital clubfeet in the children in the walking age, which had been managed with the new method which was done during the six-month period by Dr. Hussain was assisted by the first author. (Table1)

**Table 1: Children with neglected congenital clubfoot**

Name	Age	Sex	Side
A	5y	male	Right
B	5y	male	Left
C	8y	male	Left
D	5y	male	Left
E	8y	male	Right
F	6y	male	Right
G	5y	male	Left
H	5y	female	Left
I	6y	male	Right
J	5y	male	Right
K	5y	male	Right

In all of the above mentioned cases, posterior, medial, lateral and planter/abductor releases were done. All except Baby H were the idiopathic cases. Baby H had cardiac abnormalities and so classified as syndromic. Master D had calcaneonavicular bar. The operations were performed with the soft tissue releases only, without any bony osteotomies and arthrodeses and performed in as a single stage surgery.

### Cases of residual clubfoot

At PSRD orthopedic hospital, the clubfeet presenting with residual clubfeet post PMR surgery are evaluated with Cummings' [1] modification of Laavag and Ponseti [2] score after a course of casting. The clubfeet scoring less than 60 undergo revision surgery. The findings of the 9 cases of residual clubfoot, which had been managed with the new operative procedure by the senior author (Afzal Hussain), were assisted by the first author in the 6 month period of fellowship (Table 2).

**Table 2: Children with residual clubfeet**

Name	Age	Sex	Side	Previous operation	Time elapsed since primary surgery	Cummings' score at presentation	Operative release done	Findings seen in residual clubfoot surgery
A	8y	M	left	PMR	7Y	55	PMAL	Flexor hallucis had no distal connection Severe adhesions around the tibialis posterior only rigid dorsolateral hump
B	4y	M	bilateral	PR	2y	55	L	
C	8y	F	right	PMR	7y	50	AL	No rigid equinus, Only tendoachilles lengthening had been done in the previous operation, no release of ankle and subtalar joint had been done
D	8y	M	left	PR	7y	50	PMAL	
E	4y	M	bilateral	Post +med rel.	2y	60	AL	Calcaneonavicular bar
F	4y	F	right	PMR	3m	60	L	Inferolateral loss of articular surface of the talar head and severe calcaneocuboid adhesions.
G	5y	M	right	Post +med release	1.5y	60	L	
H	6y	M	left	PMR	5y	55	PMAL	Extensive scarring around the neurovascular bundle and the tendons of flexor digitorum longus and tibialis posterior.
I	9y	M	right	PMR	8y	55	PMAL	Release of ankle joint hadnot been done in the previous surgery, extensive adhesions around the flexor hallucis longus tendon with tendoachilles

PMR-Posteromedial release, PR- Posterior release, P-posterior, M- medial, A- abductor/planter L-lateral release

### Discussion

Neglected clubfoot in older children is frequently encountered in the developing countries as are other orthopedic problems in general due to the lack of manpower, infrastructure orthopaedic materials [3]. Various authors have written about the management of the neglected clubfoot in the older children. Correction of congenital clubfoot by gradual distraction with the Ilizarov apparatus has been reported by many authors [4-5]. This however needs an expensive apparatus, expertise in management of complications, pin tract care and follow up for a long time. An article has been published about the poor results of the Ilizarov method in the treatment of neglected clubfoot [6]. Correction of neglected clubfoot by two stage operation with the intermittent period of manipulation has been described by HZ Herold and G Torok [7]. This method consists of the posteromedial release in the first stage, followed by the manipulation of the foot with plaster of Paris cast for several times and then second stage operation which consists of bony procedures like wedge excision, bone fusions and



triple arthodesis for the feet with tarsal bone irregularities as seen in X-rays.

H Storen described the correction of the clubfoot by three stage operation [8]. Dwyer has described calcaneal osteotomy for the correction of the heel varus [9]. Pandey and Jha described the T- osteotomy of calcaneus for the correction of neglect clubfeet [10]. C Reize and GU Exner have described the acute correction of the neglected clubfeet with fasciocutaneous flap coverage for the skin defect [3]. Wider use the Ponseti technique has improved the outcome of the non-operative treatment, but surgical treatment may be necessary in resistant or recurrent deformities [11]. Similarly, surgical treatment may be necessary in neglected clubfoot deformities. While specific trends were reported and great variability exists in management of congenital clubfoot, certain principles are found to be universal: initial nonoperative management followed by surgery for persisting deformities [12]. This is especially true for neglected and residual clubfeet. Because there will probably always be patients with clubfoot deformity who are treated surgically, an operative plan that minimizes frequent or invasive surgical intervention may result in greater long-term success [13].

When considering surgery for CTEV, one must first determine what should be released. In the 1980s, McKay [14] and Simons [15] both reported success with aggressive, wide subtalar release. More recent studies have indicated a return to a more limited release for CTEV [1]. Although some think that any surgery requires a comprehensive release of all soft tissues, Carroll [16], Bensahel et al [17], and Grant and Atar [18], among others, plan for and approach each case individually. In his classification scheme, Catterall [16] suggested what Grant and Atar [18] stated, "The surgeon should identify what failed in the conservative treatment" because these are the structures that need release. The new method of defining the existing/ persisting deformities in the clubfoot is of great help in deciding the further operative steps. Extensive surgical release may lead to decreased range of movement in the foot and ankle which compromises the functional result [19]. The essence of the new operation is the evaluation of the reducibility of the deformities in a congenital clubfoot. Only the rigid deformities are corrected by surgery and the reducible deformities are taken care by the post-operative serial casting.

As is seen in our cases, the neglected clubfeet in children aged 9 years or less have been corrected with the new method with the soft tissue

surgery only. The recognition of the exact existing/persisting deformity and the meticulous soft tissue release has precluded any bony procedures. It is to be noted that clubfoot surgery with bony procedures in neglected clubfoot causes shortening of already short feet. The correction has been achieved in a single stage surgery. There has not been any problem of skin coverage. This is due to the fact that the new operative procedure is performed through three incisions.

The clubfeet presented in this article had excellent results calculated by the Cummings<sup>1</sup> modification of the Laavag and Ponseti [2] score as noted in the minimum 5 years of follow-up. Thus it has been pointed out that meticulous evaluation of the existing components of a neglected clubfoot as pointed out by the new method and dealt with the new operative procedure can correct the neglected clubfoot without any bony procedure in the children aged 9 or less than 9 years, in a single stage procedure. The primary clubfoot surgery sometimes fails to give a complete and lasting correction with one operation. About 25% (range 13% to 50%) of the recurrence of the clubfoot has been reported [20-21]. The recurrence of the clubfoot may be because of incomplete correction, failure to maintain correction, or due to tarsal bone remodeling, abnormal scar formation with tethering of tendons, and tarsal coalition that was either idiopathic or missed during the primary surgical procedure [21]. There is also a high recurrence rate in neurogenic and syndromic clubfeet. At PSRD orthopedic hospital, the clubfeet presenting with residual clubfeet post PMR surgery are evaluated with Cummings [1] modification of Laavag and Ponseti [2] score., after a course of casting. The clubfeet scoring less than 60 undergo revision surgery. The residual clubfeet are evaluated by the new method proposed and they undergo the operative procedure tailored according to the deformity.

With this method, it is easy to recognize which structures should be dealt with the revision surgery and which should not be. This, thereby, helps to prevent the damage to the vital structures, as these would not be approached if not needed. This also prevents overcorrection, as the recomplete release is not done and only the relapsed component is released. The tarsal coalition, iatrogenic or missed idiopathic, are would least likely be missed again while following this operative method, as all the joints are released under direct vision. During the surgeries reported in this article, it was noticed that all the



deformities could be corrected by soft tissue procedures only and no bony procedures were required. This is a new finding as in the protocols commonly used for the revision clubfoot surgery, the bony procedures are generally used. This is a good development as clubfoot surgery with bony procedures in residual clubfeet causes shortening of already short feet.

A protocol being used for the correction of residual clubfoot is that given by Atar, Lehman et al [22], which consists of recomplete soft-tissue release alone or combined with the plantar release, calcaneocuboid fusion, and capsulotomies of navicular-first cuneiform –first metatarsal joint in children depending upon the time after the primary surgery. Another protocol given by Rabb and Kraupse [23] consists of recomplete soft tissue release and joint preserving osteotomies like cuboid decancellation and calcaneal osteotomy in children less than or at 8-10 years of age. The problem with skin closure in revision clubfoot surgery is well-known. It was noted that there was no problem with skin closure in a most rigid clubfoot while following the new operative method. The surgery was done through 3 incisions according to the residual component.

The residual clubfeet had excellent results by Cummings [1] modification of Laavag and Ponseti [2] score as noted in minimum of 5 years of follow up. The poor results arising from the bone resection, and joint resection and fusion in a residual clubfoot was avoided by this operative procedure. Thus it has been pointed out that meticulous release of the components pointed out by the new method and dealt with the new operative procedure can correct the residual clubfoot without any bony procedure in the children aged 9 or less than 9 years.

## Conclusion

Early results of the new operative procedure by Dr. Afzal Hussain for congenital clubfoot in the neglected and the residual congenital clubfeet were found to be excellent.

**Conflicts of interests:** None

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