

World Journal of *Clinical Cases*

World J Clin Cases 2023 April 26; 11(12): 2582-2854



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Thrice Monthly Volume 11 Number 12 April 26, 2023

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RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: *Ying-Yi Yuan*; Production Department Director: *Xu Guo*; Editorial Office Director: *Jin-Lei Wang*.

NAME OF JOURNAL

World Journal of Clinical Cases

ISSN

ISSN 2307-8960 (online)

LAUNCH DATE

April 16, 2013

FREQUENCY

Thrice Monthly

EDITORS-IN-CHIEF

Bao-Gan Peng, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati, Ja Hyeon Ku

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/2307-8960/editorialboard.htm>

PUBLICATION DATE

April 26, 2023

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INSTRUCTIONS TO AUTHORS

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<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>



Treatment of talipes equinovarus after triceps surae intramuscular hemangioma surgery by Ilizarov technology in adults: A case report

Zhang-Xin Chen, Meng-Yuan Wang, Cong Zhang, Zhen-Qi Ding, Wei Chen

Specialty type: Medicine, research and experimental

Provenance and peer review: Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): B
Grade C (Good): 0
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: Zang J, China

Received: December 3, 2022

Peer-review started: December 3, 2022

First decision: February 17, 2023

Revised: March 1, 2023

Accepted: March 20, 2023

Article in press: March 20, 2023

Published online: April 26, 2023



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Abstract

BACKGROUND

Postoperative complications of triceps surae intramuscular hemangioma surgery with talipes equinovarus have rarely been described, and the evidence for treatment is limited. The purpose of this case study was to report the new application of the Ilizarov technique, which successfully treated talipes equinovarus in adults after triceps surae intramuscular hemangioma.

CASE SUMMARY

A 29-year-old woman treated with the Ilizarov technique for talipes equinovarus in the right leg after triceps surae intramuscular hemangioma surgery. The equinus deformity was roughly corrected after 2 years of follow-up, without significant secondary sequelae.

CONCLUSION

Talipes equinovarus caused by postoperative sequelae of intramuscular hemangioma was successfully corrected by the Ilizarov technique. The Ilizarov technique may be used for treating talipes equinovarus caused by various causes.

Key Words: Triceps surae intramuscular hemangioma; Ilizarov technique; Talipes equinovarus; Treatment; Case report

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Core Tip: The purpose of this case study was to report the new application of the Ilizarov technique, which successfully treated talipes equinovarus in adults after triceps surae intramuscular hemangioma. The Ilizarov technique may be a surgical method for treating postoperative deformity of limbs, even in adult patients. Physicians should be aware of new uses for this type of treatment.

Citation: Chen ZX, Wang MY, Zhang C, Ding ZQ, Chen W. Treatment of talipes equinovarus after triceps surae intramuscular hemangioma surgery by Ilizarov technology in adults: A case report. *World J Clin Cases* 2023; 11(12): 2803-2810

URL: <https://www.wjgnet.com/2307-8960/full/v11/i12/2803.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v11.i12.2803>

INTRODUCTION

Conditions such as cerebral palsy[1], trauma[2], diabetes mellitus[3], muscular dystrophy[4], maldevelopment, or idiopathic[5] all have the potential to cause spasticity or contractures of the Achilles tendons, leading to clubfoot deformity[6]. Several genetic factors also have the potential to cause clubfoot deformity[3]. Clinical cases of Triceps surae intramuscular hemangioma resulting in ankle Achilles tendon contracture with equinus deformity and toe walking are rare[7-12]. Several surgical approaches have been described for treating the deformity, including serial casting of the ankle and knee[13], primary soft tissue release[14], the Ponseti method[15], Z-plasty, total talus resection, and tibioclavicular fusion with Achilles tendon lengthening[16]. Among them, the serial casting of the ankle and knee for surgical extension, which, like primary soft tissue release, requires surgical release and predisposes to bleeding from damaged vessels and makes full correction difficult in patients with more severe contractures[13,14]. The Ponseti method has good results mainly for congenital idiopathic clubfoot, but there is still a recurrence rate of one in three for clubfoot deformities after angioma surgery[17].

No clinical evidence can be reported at this time. Z-plasty, total talus resection, and tibioclavicular fusion with Achilles tendon lengthening all appear to provoke limb incongruence, bone loss, and other conditions with some probability of recurrence due to some disruption of the original ankle structure [18]. For patients after sural angioma surgery, there are no cases of Achilles tendon contracture treated with the sequelae of sural angioma surgery using the Ilizarov technique. This case report describes the Ilizarov technique to treat postoperative Achilles tendon contractures resulting from triceps surae hemangioma.

CASE PRESENTATION

Chief complaints

A 29-year-old Chinese woman presented to the orthopedics clinic with the inability to walk for 11 years due to talipes equinovarus.

History of present illness

Symptoms started 11 years before presentation with talipes equinovarus walk after intramuscular hemangioma surgery.

History of past illness

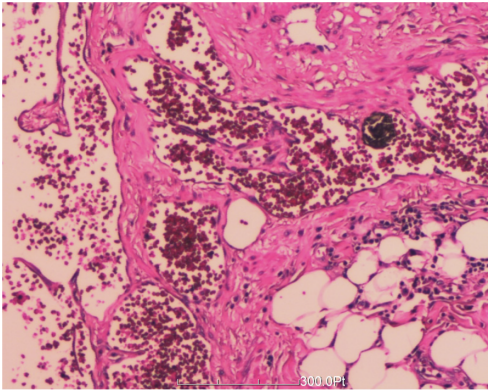
The patient was admitted with a high arch deformity of her right foot. At the age of 11 years, a right lower leg tumor was detected, which was not given special attention. The patient was found to have an increased mass in the right leg at the age of 27 years and attended hospital for magnetic resonance imaging, which indicated abnormal signals in the right thigh. Hemangioma was considered and confirmed as intramuscular hemangioma (Figure 1). After surgery, the patient gradually developed a high arch deformity of the right foot, and could not walk normally. She sought treatment in many hospitals, and most of them suggested amputation of stump and installation of a prosthetic limb, which was rejected by the patient.

Personal and family history

The patient denied any family history of malignant tumors.

Physical examination

A marked 15-cm surgical scar was noted on the right lower leg, which was markedly thin and reduced by 6 cm compared with the contralateral circumference, a high arched right equinus foot, broken skin



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Figure 1 Immunohistochemical results (hemangioma).

on the right foot, flexor plantar deformity of the right ankle, limited dorsiflexor activity, regular movement of the right knee, and normal sensation (Figure 2).

Laboratory examinations

Hemangioma was considered and confirmed as intramuscular hemangioma.

Imaging examinations

Preoperative X-ray showed corrected foot drop deformity, and no signs of fracture, and other bone abnormalities in the ankle joints. Preoperative tibial tuberosity advancement (TTA) was 164° (Figure 3A). The TTA reflects the degree of talus inclination in the sagittal plane and is an indicator of the correction of pronation deformity, which is important for the stability of the entire hindfoot. TTA was measured between the tibial anatomical axis and the axis of the talus[19]. Postoperative X-ray re-examination showed that the right ankle was in a functional position, and an external fixator was in position (Figure 3B). A 1-mo review by postoperative X-ray showed that the right ankle was in a functional position, the ankle joint space was narrowed, and an external fixator was in position (Figure 3C). A 4-mo postoperative review (removal of the external fixator) showed that the right ankle joint had a normal relationship; there were no signs of fracture or other bony abnormalities in the constituted bones (Figure 3D-F). The patient's postoperative changes were consistent with the preoperative assessment and the expected surgical outcome. The surrounding soft tissues were slightly swollen (TTA 113°).

FINAL DIAGNOSIS

Combined with the patient's medical history, the final diagnosis was talipes equinovarus after triceps surae intramuscular hemangioma surgery.

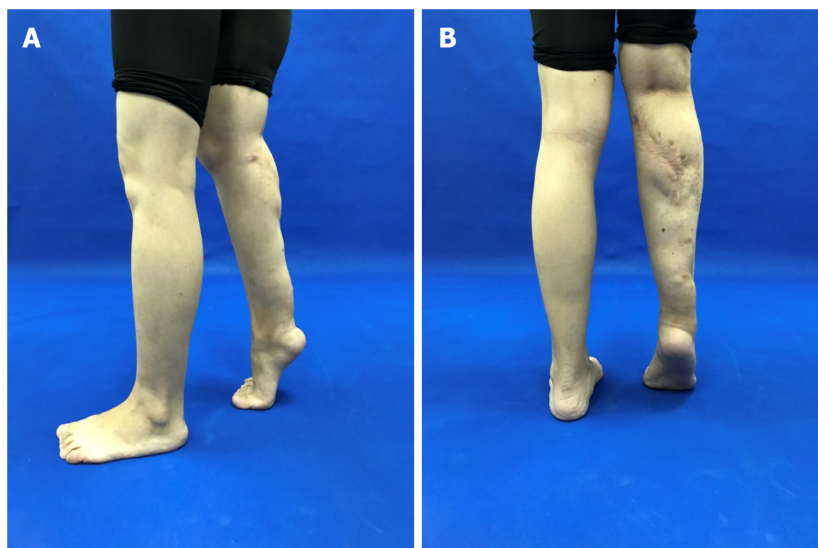
TREATMENT

Preoperative preparation

A routine preoperative examination was performed. According to the length, circumferential diameter, and degree of deformity of the affected limb, the Ilizarov annular external fixator with a three-dimensional orthopedic function was assembled. The orthopedic device was equipped with two full rings in the lower leg, one U-shaped ring, and one-half ring in the foot, which could correct the foot dropping horseshoe high arch deformity.

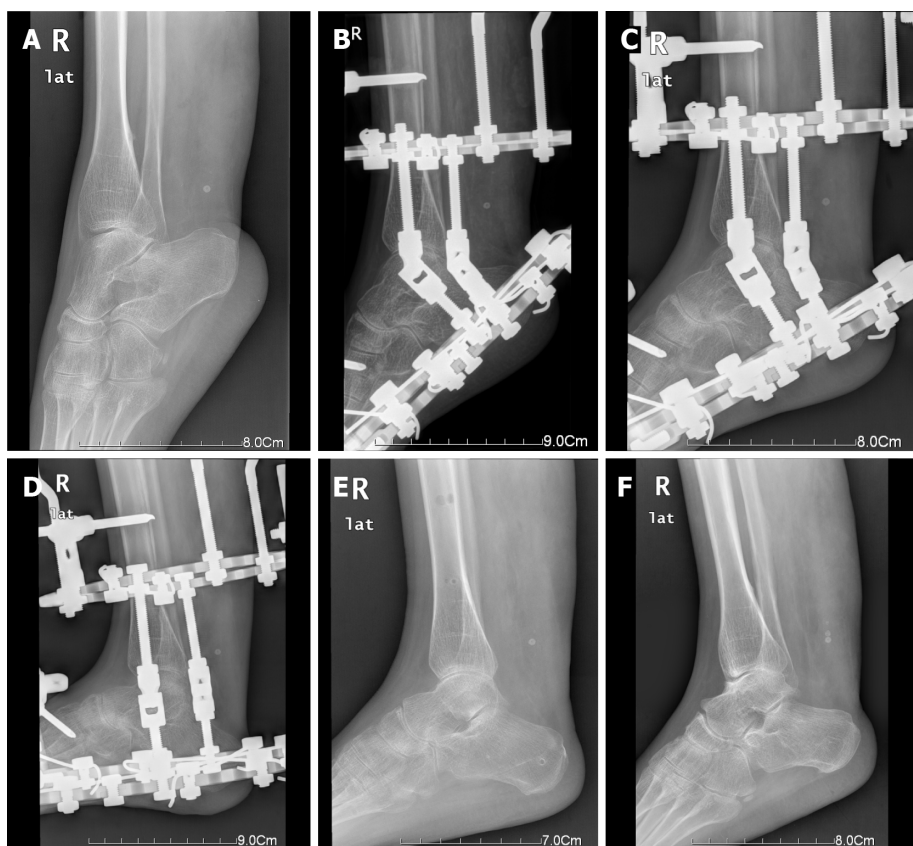
Surgical procedure

Under anesthesia, the patient was lied in supine position, and a tourniquet was placed on the middle and upper third of the right thigh (pressure 55 KPa). After routine disinfection, a sterile cavity towel was placed. After making a 6-cm long incision along the medial side of the calf, the subcutaneous fascia was separated to expose the tendon. The tendon was extended by about 4 cm in a "Z" incision. When overlapping sutures of the Achilles tendon, the ankle ring holder was put on, the external ring fixator was adjusted with the axis in line with the middle course of the affected limb, and two and two half whole stitches were passed through the calf segment, respectively. One full needle was inserted in the



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Figure 2 Preoperative photo. A: Profile; B: Back.



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Figure 3 X-ray. A: Preoperative X-ray (TTA 164°); B: Postoperation X-ray (1 d); C: Postoperation X-ray (1 mo); D: Postoperation X-ray (2 mo); E: Postoperation X-ray (4 mo); F: Postoperation X-ray (1 yr).

forefoot, one-half needle in the heel, and two full needles across the heel. The medial and lateral hinges were located at the medial and lateral malleolus (*i.e.*, the rotation centerline of the ankle joint). The front and rear tie rods and adjusting areas were installed to stabilize the annular fixator in the appropriate position of the right foot to avoid the high skin tension caused by surgical incision (Figure 4).

Postoperative treatment

After surgery, the wound was kept dry until routine healing, and on the 7th postoperative day, the



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Figure 4 Ilizarov technique external fixation used the patient view from front.

anterior and posterior bars were adjusted to correct the deformed stump. The stump could be turned and walk with the protection of the external fixation frame and the help of the orthopedic insole. Four weeks after the operation, the foot drop was corrected roughly, the ankle movement was expected, after which the external fixator was continued to perform the flexion-extension exercise. There was no pain and discomfort in the ankle joint, and at 4 mo after surgery, after removal of the external frame, the abduction was discarded and the patient walked on her own, with normal ankle movement and no dysmorphic activity (Figure 5).

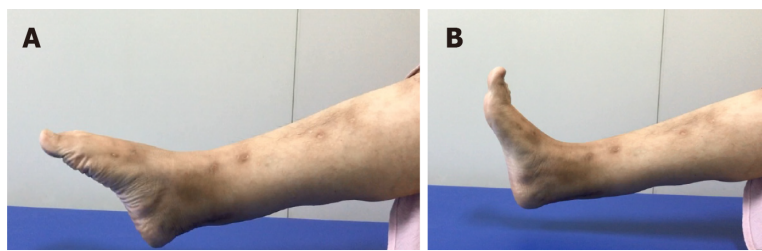
OUTCOME AND FOLLOW-UP

TTA 164° was measured by preoperative radiography. Two physicians performed grading according to the American Orthopedic Foot and Ankle Society Ankle Hindfoot Scale (AOFAS-AHFS)[19], which yielded a mean score of 22.5, illustrating that the patient had poor ankle movement preoperatively, and 4 mo after corrective surgery, TTA was 113°. After return to normal angulation, the average AOFAS-AHFS score was 90.0, the ankle function returned to normal, the dorsiflexion activity was significantly improved, and there was adequate ankle activity at 2 year's follow-up, with no other complications.

DISCUSSION

Most intramuscular tumors with fatty rings are benign, and peripheral nerve sheath tumor is the most common tumor type[20,21]. Two major categories of lesions emerged from the study of Mulliken and Glowacki[22] in 1982: Hemangioma and vascular malformation. For hemangioma treatment, percutaneous sclerotherapy is often used, which may cause equinus[23]. When sclerotherapy fails, the embedded hemangioma is usually treated by resection. Most muscle tissue needs to be removed simultaneously with tumor resection. This may lead to patients without average muscle mass, muscle strength reduction, and stress contracture of the Achilles tendon, leading to the limitation of the ankle joint activity and appearance of equinus[24].

Equinus correction using the Ilizarov technique provides the benefits of early weight bearing. The unique advantage is to promote regeneration of soft tissue around the bone, including skin, muscle, and neurovascular structures. Its versatility allows correction of the foot position by adjusting the frame postoperatively[25]. The Ilizarov technique can enhance the direct total load capacity and promote osteogenesis because of its unique biomechanical principles[26]. Applying the Ilizarov technique in postoperative adjustment and tissue regeneration under slow drafting after surgery does not cause paralysis of nerves and blood vessels and skin necrosis, thus avoiding scar formation. The Ilizarov technique can be used for all causes of Achilles tendon contracture. Our patient had a rare case of muscle fibrosis and scarring due to surgical excision following invasion of the muscle by a hemangioma.



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Figure 5 Postoperative ankle joint. A: Postoperative straight; B: Postoperative back stretch.

The Ilizarov technique may provide a new solution for foot drop due to muscle scarring from various causes or muscle necrosis due to osteofascial syndrome.

In this study, the Achilles tendon can be extended acutely during the operation due to the Z-shaped incision. However, the length of skin, blood vessels, and neuroanatomy[19] are limited, and their elasticity is finite, so they cannot be extended acutely during the operation. Skin, blood vessels, and neuroanatomy can only develop slowly after the procedure, ensuring that the hinges are correctly positioned during surgery. When adjusting the external fixator postoperatively, it is important to adjust the distance between the anterior and posterior bars after opening the joint gap. At the same time, postoperative lengthening can adjust it in accordance with the patient's tolerance. In this process, in protecting the outer frame hinge, we advocate postoperative ankle flexion and extension exercise to prevent joint stiffness, ensure the stability of the ankle joint, and restore the function of the ankle. Follow-up with regular postoperative radiography can prevent traumatic arthritis due to anterior ankle impingement.

CONCLUSION

We report a case of postoperative sequelae of triceps surae hemangioma that caused Achilles tendon contracture, which was successfully corrected by the Ilizarov technique. The tolerance of skin, nerve, and blood vessels should be considered when acute lengthening of the Achilles tendon is performed interactively. The patient's postoperative orthopedic exercises were performed interactively. Meanwhile, foot and ankle flexion and extension exercises were performed under the protection of the hinge, guaranteeing foot and ankle functional recovery. In this case, good outcomes were achieved, with the range of motion of the ankle roughly restored and ability to walk normally with no toe-walking. This case may advise physicians to correct talipes equinovarus by the Ilizarov technique.

ACKNOWLEDGEMENTS

We want to express our gratitude to all physicians and nurses involved in the management of the patient.

FOOTNOTES

Author contributions: Chen ZX drafted the manuscript and collected clinical data; Wang MY and Zhang C edited the manuscript; Chen W and Ding ZQ were the surgeons of the patient, evaluated the study and participated in manuscript revision; all authors participated in manuscript preparation and approved the final version.

Supported by Zhangzhou Natural Science Foundation Projects in 2019, No. ZZ2019J19.

Informed consent statement: All study participants, or their legal guardian, provided informed written consent prior to study enrollment.

Conflict-of-interest statement: All the authors report no relevant conflicts of interest for this article.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

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Country/Territory of origin: China

ORCID number: Zhang-Xin Chen 0000-0003-3416-7637; Wei Chen 0000-0003-2850-9776.

S-Editor: Gao CC

L-Editor: A

P-Editor: Zhao S

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