Case Report
Hip Knee J. Vol. 3, No. 2, 2022, pp. 85-89
p-ISSN: 2723-7818
e-ISSN: 2723-7826
http://dx.doi.org/10.46355/hipknee.v3i2.126

TREATMENT OF SEVERE KNEE FLEXION CONTRACTURE AFTER BELOW KNEE AMPUTATION USING HINGED ILIZAROV RING EXTERNAL FIXATOR: A CASE REPORT

Bagus Iman Brilianto[1], Ismail Mariyanto[2]
[1,2] Department of Orthopaedic & Traumatology, Faculty of Medicine, Sebelas Maret University, Prof. Dr. R. Soeharso Orthopaedic Hospital,Surakarta, Indonesia

ABSTRACT

Flexion contracture of the knee is a common complication found after Below Knee Amputation (BKA). This condition is caused by muscle imbalance and prolonged stump malpositioning after BKA. Acute surgical correction of this deformity associated with high rates of complications. A 39-years-old man with chief complaint flexion contracture after BKA 3 months before. Physical examination showed flexion contracture deformity with knee range of motion at 90° to 120° with no possibility of further knee extension. This condition prevented him to use prosthesis and start walking exercises. Gradual correction of flexion deformity was performed using hinged Ilizarov ring external fixator with the rate of distraction was 1mm/day to prevent soft tissue and neurovascular complications. After 90 days of distraction, full extension of the knee joint was achieved with no complications. Gradual correction of knee flexion contracture using hinged Ilizarov device greatly reduced the complications risk of acute deformity correction with open surgery. This technique provides more advantage of minor operative trauma with a gradually controlled correction, permitting the soft tissue to regenerate, thus lowering the risk of neurovascular complications.

Keywords: Below Knee Amputation, disability, flexion contracture.

Article History:
Submission : August 4th, 2022
Revision : August 7th, 2022
Accepted : August 30th, 2022

Corresponding Author:
Bagus Imam Brilianto
Department of Orthopaedic & Traumatology, Faculty of Medicine, Sebelas Maret University, Prof. Dr. R. Soeharso Orthopaedic Hospital Surakarta, Indonesia
bib.ortho@gmail.com

INTRODUCTION

Knee joint contracture is a common occurrence after lower limb amputations especially Below Knee Amputation (BKA). It is a condition where a patient cannot fully straighten the knee. BKA patients are generally less active immediately after their amputations and spend most of their time resting in either a seated or a lying position. Contractures after amputation generally develop as a result of muscle imbalance, facial tightness, from protective withdrawal reflex into knee flexion or as a result of faulty positioning such as prolonged sitting with flexed knee or placing the residual limb over pillow. Unfortunately, often the positions that promote comfort to the patients also promote contractures of the joints (1,2).

Approximately, 13% of persons with an amputation develop a flexion contracture. Ahmad et al reported that 24.13% of patients develop flexion contracture after BKA (2). This condition has significant impacts for amputees who have decided to proceed with prosthesis. The presence of a flexion contracture may prevent the patient from achieving successful prosthesis usage due to the contracture disrupts the prosthesis alignment, which could lead to a number of difficulties during walking (2,3). Many surgical procedures have been proposed to treat fixed flexion contracture of the knee, including casting techniques, soft-tissue release, skeletal traction, and supracondylar osteotomy, alone or in combination. Treatment of the more severe deformities is associated with serious complications such as insufficient correction, skin necrosis, neurovascular problems, leg-length discrepancy, posterior subluxation of the tibia, fractures of the femur or tibia and recurrence of deformity (4). The Ilizarov technique is a method that slowly and steadily distracts the joint and can reduce the risk of skin problems or neurovascular injury. It has become an appealing alternative to open surgery. We presented a case report about gradual correction of flexion contracture using the Ilizarov device.

PRESENTATION OF CASE

We presented a 39-years-old male with chief complaint of severe flexion contracture of the right knee after Below Knee Amputation (BKA) 3 months before at the rural hospital. Physical examination showed flexion contracture deformity with knee range of motion at 90° to 120° with no possibility of further knee extension (Figure 1.).

Figure 1. Flexion contracture of right Knee after Below Knee Amputation.

We prepared cusconsists-hinged Ilizarov device to gradually correct the flexion deformity that consist of 2 rings for femoral fixation, one and half ring for tibial fixation. Hinged rods were placed anteriorly with knee joint line as the fulcrum. The

distraction site was applied posteriorly by two rods (Figure 2.).

Figure 2. Customized Hinged Ilizarov device designed for gradual correction of knee flexion contracture

The hinged Ilizarov device was fixated percutaneously on the femur with Schanz screw and on the tibial side with Schanz screw and Kwire (Figure 2.).

Figure 3. Application of Ilizarov device on the knee joint with flexion contracture at 90°.

Gradual distraction started from the first day postoperatively at a rate of 0.25 mm four times a day (1 mm per day). The rate of distraction was modified according to the patient's discomfort or when neurological complications were presented. Local antiseptic was applied twice a day for pin care. The signs of pin tract infection, peripheral circulation and sensation, and measurement of the knee flexion angle were observed during follow-up (Figure 3.).

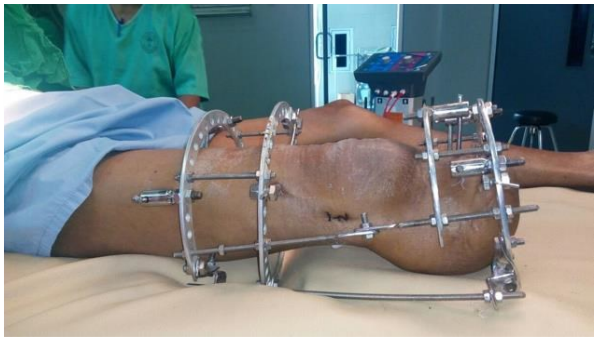

Figure 4. Knee joint full extension was achieved after gradual correction using hinged Ilizarov device.

After 90 days of gradual correction with distraction of the Ilizarov device, full extension of the knee was achieved, and the device was removed. The prosthesis was measured from now fully extended knee joint and intensive physical rehabilitation was conducted to restore ROM, muscle strengthening, and walking exercises (Figure 4.).

DISCUSSION

A flexion contracture of knee after BKA can be caused by several factors such as muscle imbalance, prolonged immobilization or improper positioning. The immobilization could induce the adhesion of synovial membrane fold, lying supine with a pillow underneath the knee or side-lying with hips and knees flexed can lead to joint flexion contractures. These incorrect positions may be maintained by the patient because of its comfort and unawareness of the contracture risk (4,5).

Many procedures have been proposed to treat knee flexion contracture including casting, soft-tissue release, skeletal traction, and supracondylar extension osteotomy. The appropriate procedure should be chosen carefully according to the

severity of the contracture. Surgical procedures are required for severe contractures with a flexion deformity more than 30° (5,6).

Acute surgical correction of contracture requires extensive soft tissue release which may create an unstable knee. and associated with relatively high risks of serious complications, especially neurovascular injury. Gradual correction of flexion contracture deformity is preferred. Gradual distraction diminishes the risk of nerve traction injuries. Because the surrounding soft-tissue envelope is minimally disturbed (5,6).

The Ilizarov technique allows gradual correction because it continuously and slowly distracts the flexed knee joint, decreases the complications related to open surgery such as neurovascular injury, bone non-union, internal fixation failure and deep infection. The Ilizarov fixation device achieves circumferential 3-dimensional fixation to bones through multidirectional and multiplanar wires and half-pins. Its modular construction allows for gradual deformity correction of angulation, rotation, and translation. The hinges make the fixator unique in its ability to correct deformities in a controlled fashion (7,8).

The rate of correction depends on the severity of the deformity, the degree of contracture, the tolerance of pain, and the presence of vascular or neural complications. Distraction at a daily rate of 1 mm at the knee should be the aim.9 Hyperextension of 5-10° during the external fixation period is recommended to prevent rebound phenomenon, so that full extension is maintained, even if recurrence of the flexion contracture occurred during the follow-up. However, there are still some potential complications such as pin tract infection, loss of knee flexion, recurrence of flexion contracture, and nerve injury due to excessive distraction rate (10).

CONCLUSIONS

Compared to other methods, gradual correction method using Ilizarov device to correct flexion deformity has the advantage of minor operative trauma with a gradually controlled correction, permitting the soft tissue to regenerate. This technique is a very effective for managing severe cases of knee contracture. Progressive correction avoids stretch damage to the neurovascular structures at risk and, more flexible magnitude of correction. The use of the Ilizarov technique can be carried out on complex and compound deformities with accuracy, precision, and control, as well as a safety that is impossible to achieve with conventional techniques with acute correction or open surgery. However, this technique requires great attention to detail not only in the application of the apparatus but also in the preoperative planning and the postoperative management of the patient.

REFERENCES

1. Damsin JP, Ghanem I. Treatment of severe flexion deformity of the knee in children and adolescents using the Ilizarov technique. J Bone Joint Surg Br. 1996 Jan;78(1):140-4. PMID: 8898146
2. Ahmad, A., Islam, H., & Ullah, I. (2018). A Study to Observe the

Incidence of Flexion Contracture at Knee Joint After Below Knee Amputation.
3. Yoo S. Complications following an amputation. Phys Med Rehabil Clin N Am. 2014 Feb;25(1):169-78 doi: 10.1016/j.pmr.2013.09.003. PMID: 24287246.
4. Noam Bor, Guy Rubin, Nimrod Rozen. Ilizarov Method for Gradual Deformity Correction. Operative Techniques in Orthopaedics, Volume 21, Issue 2, 2011, Pages 104-112 doi: 10.1053/j.oto.2011.01.006.
5. Esquenazi A, DiGiacomo R. Rehabilitation after amputation. J Am Podiatr Med Assoc. 2001 Jan;91(1):13-22. doi: 10.7547/87507315-91-1-13.
6. Zhai J, Weng X, Zhang B, Peng H, Bian Y. Management of knee flexion contracture in haemophilia with the Ilizarov technique. Knee. 2019 Jan;26(1):201-206. doi: 10.1016/j.knee.2018.08.006. Epub 2018 Nov 8. PMID: 30415971.
7. Choo YJ, Kim DH, Chang MC. Amputation stump management: A narrative review. World J Clin Cases. 2022 May 6;10(13):3981-3988. doi: 10.12998/wjcc.v10.i13.3981.
8. Ghazali MF, Abd Razak NA, Abu Osman NA, Gholizadeh H. Awareness, potential factors, and post-amputation care of stump flexion contractures among transtibial amputees. Turk J Phys Med Rehabil. 2018 Jul 12;64(3):268-276. doi: 10.5606/tftrd.2018.1668.
9. Kiely PD, McMahon C, Smith OP, Moore DP. The treatment of flexion contracture of the knee using the Ilizarov technique in a child with haemophilia B. Haemophilia. 2003 May;9(3):336-9. doi: 10.1046/j.1365-2516.2003.00753.x.
10. Hägglund G; Rydholm U; Sundén G. Ilizarov Technique in the Correction of Knee Flexion Contracture: Report of Four Cases. Journal of Pediatric Orthopaedics B: Volume 2 - Issue 2 - p 170-172