

# Functional ambulation with bent knee prostheses for an adult with bilateral 90 degrees knee flexion contractures—A case report

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### ABSTRACT

An adult male who never stood, ambulating on all four due to bilateral severe knee flexion contractures, since his childhood, was 21 years of age, and not deterred by his condition, was pursuing his higher education. He was coaxed by his friends to seek medical opinion and it was decided to give a trial and let the client have a feel of bipedal stance and ambulation. Although there is a paucity of recent evidence on the use of bent knee prosthesis, the trial successfully restored the dignity.

**Keywords:** Ambulation, bent knee prosthesis, knee flexion contractures, management, physiotherapy

### Introduction

The knee flexion contractures of more than 80°–90° are not frequently seen and, when seen, pose a major challenge due to reported unsatisfactory results of insufficient correction, skin necrosis, neurovascular problems, leg-length discrepancy, posterior subluxation, and recurrence of the deformity<sup>[1-5]</sup>

The restriction of range of motion (ROM) due to contractures impacts negatively the ability to perform activities independently leading to disability and participation restriction.<sup>[2,4,6]</sup> The etiology of these flexion contractures is very complex and multifactorial.<sup>[2-7]</sup>

More than 400 different conditions have been classified as arthrogyposis multiplex congenita with multiple joint

contractures with etiology of fetal akinesia, earlier the onset severe the contractures.<sup>[6]</sup>

For ambulation, one requires the feet to be plantigrade, stability is when the hips are contained and the knees are free. More than 10–15° knee flexion contracture is said to hinder walking.<sup>[8]</sup> Cases with multiple joint contractures require early intervention by physiotherapy, manipulations, and orthotics within hours after birth. Later serial casts and multiple surgeries may be necessary.<sup>[8]</sup>

Primary care physicians are in a position to advocate for early diagnosis, also effectively counsel, educate such patients and their families and guide appropriately.

Prosthetic fittings are known to successfully return cases of lower limb amputations to functional ambulation. However, in cases of below-knee amputations with complications of flexion contractures and fixed deformities, alternatives such as revision of stump is more preferred but in certain cases with coexisting comorbidities, ambulation may be maintained by the use of “bent knee prosthesis (BKP).”

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The BKP treats the patient as a case of knee disarticulation/above knee amputation, the person essentially rests his weight on the bent knee and the weight is distributed to the anterior proximal tibia, the patella tendon, patella, and the thigh corset. The residual limb is forced posterior. This makes the lower thigh look bulkier forcing alterations in the costume worn.<sup>[2,3,4]</sup> The external knee joints are essential to provide sitting.<sup>[9-11]</sup>

Ideally, the adult with fixed bilateral knee flexion contracture would benefit from surgical above-knee amputation to attain effective ambulation provided the hip is functionally good. This case report describes prosthetic management of bilateral knee flexion contractures to restore the dignity, providing bipedal stance, and ambulation to the client who was resistant to any surgical intervention.

### Case Report

A male of 21 years of age, who never stood, belonging to low socioeconomic status, was intelligent man, with good communication skills. He was not deterred by his impairment and had pursued his education and at this point of time when

he was coaxed by his friends for consultation, was pursuing a diploma in Information and Technology Engineering. He was counseled that surgical intervention (bilateral knee disarticulation) might be able to give him effective bipedal status.

The possibility that above-knee amputation/knee disarticulation will allow this patient to ambulate with prosthesis effectively, but his apprehension due to unfavorable experiences in childhood and as he was almost convinced that he would never walk, he hesitated to undergo any kind of surgery. Therefore, he was examined in details and the conservative trial was given.

### Examination

- The patient had fixed flexion deformities of 90° of both the knees with further flexion full [Picture 1]; both legs grossly wasted with nonfunctional severely deformed feet, supinated, almost fully rotated. Left foot has three toes [Video 1].
- Apparently rudimentary feet never borne weight [Picture 2].
- Bilateral hips are free of contractures, X-ray of pelvis showed both hips contained [Picture 3 X-ray]



Picture 1: Sit with full flexion of the knee



Picture 2: Under developed feet due to non-weight bearing



Picture 3: X-ray hips



Picture 4: Bent knee prosthesis (BKP) posteriorly



Picture 5: BKP anteriorly



Picture 6: Standing with BKP in parallel bars



Picture 7: Standing with BKP

- He was capable of standing on knees with support. His hip musculature had atrophy but muscle strength—functional.
- His upper limbs and trunk were functionally good ambulating on all fours, unable to stand with/without support.

At this point conservative/surgical methods of releasing contractures etc., would not only fail but lead to frustration, therefore, try to make him bipedal, make him stand and walk with customized prostheses with modified sockets, with Velcro strap suspension to brace his limbs, with his existing condition. This was necessary to assure him that he could stand, so as to restore his faith.

## Management

The patient was measured and cast with full flexion of knee and hip in extension (fully bend the knee). Inner ethylene vinyl acetate (EVA) foam liner socket with polymer-draped socket assembled on the newly designed, economically viable prosthetic knee joints (“Safe Gait” indigenously made), which has optional locking system for assured stability, extended universal 30 mm Pylon attached to the solid ankle, cushioned heel (SACH) feet. [Picture 4, 5 of BKP]. Optional lock/unlock at will was the need to make him stable at the initial phase of weight-bearing with gait training

He could stand without any discomfort on his own with prosthetic legs with support immediately on the first trial. He required 2 weeks’ physiotherapy sessions and gait training, progressing from parallel bars, eventually to elbow crutch and then independent walking [Pictures 6 and 7, Video 2].

## Result

The patient is now independent for more than a year, taking up a job and comfortable with BKP throughout the day. Training for free knee gait is on.

## Conclusion

The BKP successfully restored the dignity of the patient also it is hoped that the patient now will be able to take favorable steps independently.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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