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الجمعية السعودية لجراحة العظام
Saudi Orthopedic Association

Journal of Musculoskeletal Surgery and Research

Case Report

Outcomes of total knee arthroplasty in a patient with poliomyelitis and distal femur malunited fracture

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Received: 29 Nov 2020
Accepted: 24 Feb 2021
EPub Ahead of Print: 31 Mar 2021
Published Online: 31 July 2021

DOI:
10.4103/jmsr.jmsr_133_20

Quick Response Code:

ABSTRACT

Severe deformity of the distal femur due to malunited fracture in a poliomyelitis patient is a rare entity. No reports are available in the literature about the results of total knee arthroplasty (TKA) in such cases. We report a 4-year follow-up of TKA in a 52-year-old woman who had postpoliomyelitis syndrome with malunited distal femur fracture associated with severe deformity and degenerative arthritis. TKA in poliomyelitis patients could reveal a good short-term functional improvement. We aim to demonstrate that even with the presence of deformity from previous trauma in polio cases, TKA would improve functional abilities. However, long-term follow-up is needed for similar cases.

Keywords: Deformity, Knee arthroplasty, Malunion, Poliomyelitis, Postpolio syndrome

INTRODUCTION

Poliomyelitis is a highly infectious viral disease, which predominantly affects young children and can lead to a long-standing sequelae in adult life known as postpolio syndrome.[1] Polio has no cure and could be prevented effectively by vaccination that has been introduced in the 1950s. During the last 30 years, the World Health Organization, through the Global Polio Eradication Initiative, has reduced the number of wild polio cases from 350,000 across 125 countries to 33 in two countries in 2018.[2]

Lower limb deformities are common sequelae of poliomyelitis. The associated deformity could be angular deformity, tibial external rotation deformity, genu recurvatum, femoral and tibia intramedullary canal narrowing, and poor bone quality. In addition, associated soft tissue abnormalities may include ligament laxity, impaired quadriceps strength, flexion contractures, and patella Baja.[2-4] Despite the limited number of articles concerning total knee arthroplasty (TKA) in poliomyelitis patients, in general, we could not find any similar cases with a significant deformity. Our patient had poliomyelitis that affected the right lower limb since childhood. In addition, she had a malunited distal femur fracture and severe deformity that prevented her from bearing weight on that limb for 4 years. We did a TKA in January 2017, and we present the results and follow-up as of January 2021 with a literature review. The aim of this

How to cite this article: Alqarni AS, Alzahrani KH, Qutbuddeen HS. Outcomes of total knee arthroplasty in a patient with poliomyelitis and distal femur malunited fracture. J Musculoskelet Surg Res 2021;5(3):196-200.

report is to present the outcome of TKA for posttraumatic deformity in a polio patient.

CASE REPORT

We presented a case of a 52-year-old woman not known to have any medical illness. She presented to the clinic complaining of right knee pain and inability to walk for the last 4 years due to gross instability, which made her wheelchair-bound. In 2012, she had a trauma to her right knee after a simple fall at home and was diagnosed as supracondylar/intercondylar right femur comminuted fracture. She underwent an open reduction and internal fixation using a plate and screws. She received multiple physiotherapy courses. In 2015, she underwent another surgery to remove the plate and screws and had manipulation under the same anesthesia, which failed to improve her symptoms or functional status. Before the injury, she was an active homemaker with no symptoms apart from her minimal limping since childhood, which she did not seek any medical advice for, as it was not affecting her daily life activities.

Clinically, her body mass index (BMI) was 35 kg/m^2, and she had 3 cm leg length discrepancy in the affected side with a healed scar at the lateral aspect of the distal thigh. Her right knee and ankle look externally rotated with 25° genu varus and severe varus thrust that prevent the patient from walking. The active range of motion (ROM) of the right knee was severely limited to 15° of flexion and no active extension, while the passive ROM was 0°–25°. She could do minimal right knee flexion (3/5), but her active knee extension was 0/5 with significant quadriceps muscle atrophy. The power of her hip movement was flexion and extension of 5/5, adduction of 3/5, and abduction of 4/5. Her ankle power was 5/5 of dorsiflexion and plantar flexion 4/5, while the left side was completely normal. Severe dynamic varus bowing was noticed when she was attempting to put weight on her right lower limb. The peripheral vascular examination was unremarkable for acute or chronic vascular disease.

The radiographs and computed tomography (CT) scan showed significant metaphyseal osteopenia with malunion of distal femur fracture and proximal migration of the lateral femoral condyle with a valgus joint line along with an apparent varus of the femur [Figure 1]. The distal femur rotational profile was 45° of external rotation compared to the normal side [Figure 2]. There was apparent fatty degeneration of the quadriceps and hamstring muscles but not the adductors, as shown in the CT scan [Figure 2]. Overall, there were no signs of chronic infection or active reactions clinically, radiologically, and in the laboratory workup. Magnetic resonance imaging of the lumbar spine showed only L4–L5 global disc bulge with mild stenosis.

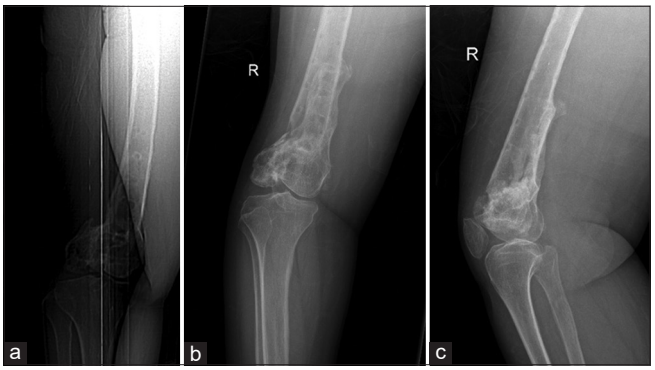

Figure 1: (a) Right knee anteroposterior view showing varus deformity, lateral femoral condyle collapse, and osteopenia. (b) Right knee anteroposterior standing view showing varus and malrotation deformity with osteopenia. (c) Right knee lateral view showing severe patella Baja.

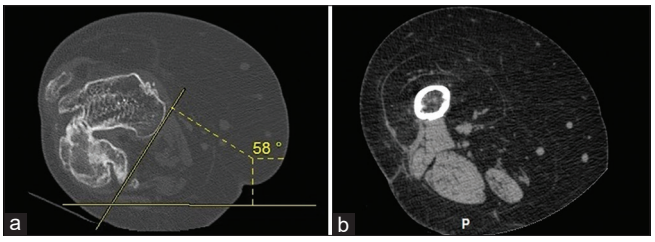

Figure 2: (a) Narrowing of the intercondylar notch, patella hypoplasia, and trochlea large set fragment with distal femur 45° of external rotation compared to the normal side. (b) Obvious fatty degeneration of the quadriceps and hamstring muscles but not the adductors.

The blood workup showed Vitamin D deficiency with slightly elevated parathyroid hormones. Moreover, she had moderate postmenopausal osteoporosis (T-score = −3) on bone densitometry scan, and she has started teriparatide injections after the correction of the Vitamin D deficiency.

The neurological studies, electromyography and nerve conduction study, showed delayed conduction velocity of the peripheral nerves confirming axonal neuropathy and end up with a diagnosis as a sequela of poliomyelitis in the right lower limb. The patient and her family were counseled regarding the diagnosis and the treatment option of total knee replacement. They agreed to proceed with surgery, and she signed the informed consent.

Operative intervention

We utilized a midline incision and a standard medial parapatellar approach. An extensive soft tissue release was performed, including the lateral and medial gutter with quadriceps mobilization of the femur's anterior aspect to facilitate patella's lateral displacement. Soft tissue release medially was performed with a meticulous

subperiosteal release of the medial collateral ligament to the semimembranosus insertion. We removed the scar tissue from the patellar tendon's posterior aspect and carried a subperiosteal release to its insertion. Carful lateral patellar subluxation done with knee flexion to 110° was achieved without much tension on the patellar tendon. We started with the distal femur cut and then proceeded to the tibial cut to ensure that the extension gap is adequate to achieve zero extension. We determined the femoral component's desired rotational profile, according to our tibial cut. After we finished the bony cuts, we measured the flexion gap to ensure that it matched the extension gap. A trial component was satisfactory in terms of ROM and stability. Constrained condylar knee arthroplasty (Triathlon® TS Revision Knee System, Stryker, USA) was implanted with tibia and femur cementless stems and offsets [Figure 3]. Intraoperative knee ROM was 0°–110°. The closure was performed in a standard fashion. According to our arthroplasty unit's protocol, the postoperative rehabilitation program started the next day, including mobilization out of bed on the walker frame. The patient was sent home on a postoperative day 5 after she met the discharge criteria. On postoperative day 13, she was seen in the outpatient department (OPD) and clips were removed, and her ROM was 10°–70°. We encouraged her to be involved in a more aggressive rehabilitation program. At 3 months postoperative, she came for follow-up in the OPD, and she was walking using a cane. The ROM was 0°–100°.

She was seen on regular follow-up for 4 years, with good functional improvement. She could walk with a cane and climb the stairs with a pain score of zero out of 10 on a visual analog scale. The operated knee was stable clinically to varus and valgus stress tests with a 0°–90° ROM. No change of active ROM from the preoperative status as active extension and flexion was 0/5 and 3/5, respectively. However, the improvement of functional ability was mainly related to stability and alignment improvement. Radiographs showed no signs of loosening [Figure 4].

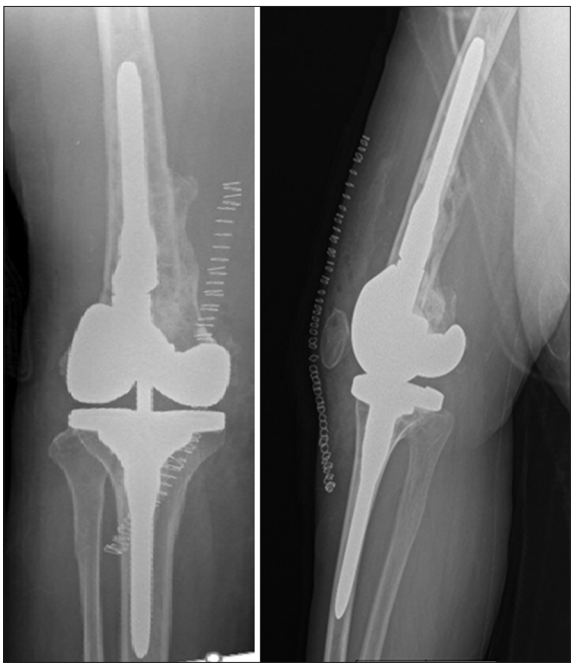

Figure 3: Immediate postoperative anteroposterior and lateral radiographs of the right knee.

DISCUSSION

TKA for degenerative knee arthritis has a high reported success rate in terms of pain relief and functional improvement.[5] Degenerative joint disease can affect patients known to have poliomyelitis as other people who do not have the condition. People who had the disease over the 20th century are nowadays at the age of degenerative joint disease, and they may be candidates for TKA. Moran and Patterson and Insall reported adequate pain relief in poliomyelitis patients treated with TKA.[6,7] Furthermore, TKA could limit patients' functional deterioration and instability with preoperative weak functioning quadriceps muscles.[6,7] The finding of a systematic review conducted by Prasad *et al.* supports the use of the TKA in patients with poliomyelitis as they found that the satisfaction and functional status are similar to the other patients who have no polio, despite the relatively higher percentage of revision.[1]

Lower limb deformities, patella Baja, are common sequelae of poliomyelitis. At the same time, our patient has an additional deformity, a malunited distal femur fracture with a very stiff knee and moderate osteoporosis, making the exposure very difficult. However, we managed to proceed through the surgery without using additional exposure techniques. In

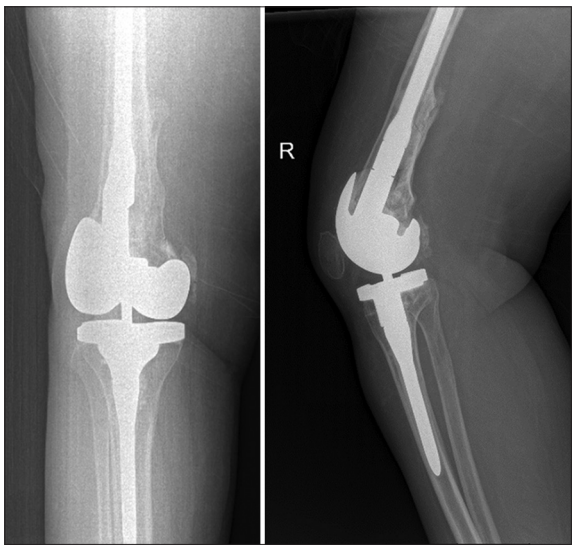

Figure 4: Anteroposterior and lateral view at 3 years postoperative showing proper alignment with no signs of loosening.

Table 1: demographic of poliomyelitis patients included in significant studies and summary of the results.

Study	Number of knees	Average age (years)	Follow-up (years)	Type of implant	Quadriceps strength	Recurrence of recurvatum	Revision rate	Functional outcome
Patterson *et al.* 1992	9	68	6.8	CS/ PS (6) CCK (2) RHK (1)	1/5 (2) 2/5 (2) 3/5 (2) 4/5 (3) 5/5 (1)	25%	33%	AKSS: 84 (65-94)
Giori *et al.*l. 2002	16	63.1	4.4	CR (6) CS/ PS (6) CCK (4)	>3/5 (10) =3/5 (3) <3/5 (3)	38%	0	AKSS: 50 (3-92)
Jordan *et al.* 2007	17	61.5	3.5	CS/ PS (8) CCK (8) RHK (1)	>3/5 (13) =3/5 (2) <3/5 (2)	0	0	AKSS: 85 (73-92)
Tigani *et al.* 2009	10	59	4.3	CS/ PS (1) CCK (2) RHK (7)	0/5 (1) 1/5 (2) 2/5 (1) 3/5 (5) 4/5 (1)	25%	10%	AKSS: 76 (50-92)
Gan *et al.* 2016	16	62	3.7	CR (6) CS/ PS (8) CCK (2)	>3/5 (12) <3/5 (2)	12.5	6%	AKSS: 83 (62-93)

CR: Cruciate Retaining, CS: Cruciate Substitution, PS: Posterior Stabilized, CCK: Constrained Condylar Knee, RHK: Rotating Hinge Knee AKSS: American Knee Society Score

fact, we had a very low threshold to use either quadriceps snip or even tibial tubercle osteotomy if needed. The issue of which implant design should be used and the use of stems or not is debatable. Jordan *et al.* suggested using a constrained prosthesis in elderly patients with grossly unstable knee and/or bone deformity, regardless of the quadriceps' power.[8] Other investigators routinely use stemmed posterior stabilized implant or highly constrained condylar components in patients with at least antigravity quadriceps strength and a history of poliomyelitis.[3] Others suggested using hinged prostheses in severely affected patients with insufficient muscle power to prevent hyperextension recurrence and avoid poor long-term outcome.[1] Tigani *et al.* found that using a hinged prosthesis, which has intrinsic stability on different planes and allowing three degrees of knee hyperextension, could avoid the recurrence of instability and help achieve an acceptable clinical result.[9] Fortunately, in this case, we managed to achieve a stable knee joint that was well balanced in flexion and extension without the need to perform an osteotomy, which should be considered and planned preoperatively in similar cases. In our case, we have used a constrained total knee prosthesis with cementless stems in both femur and tibia. There were multiple reasons to take that decision. The first one was to bypass the malunited distal femur, and the second one was to dissipate the load force proximally and distally as we planned to use a constrained prosthesis. The third reason was the presence of osteoporosis and high BMI (35 kg/m^2). However, we did not know how the knee status was before the injury in terms of hyperextension as those patients' affected knees tend to have a recurvatum to help them in walking, putting in mind that failure to deal with such deformity may have a negative impact on the long-term outcomes. We avoided using a hinged-type prosthesis as she is young, and most probably, she will need another surgical intervention in the future. We think that we have achieved a reasonable result so far with this approach. Longer follow-up is required, considering patients' age and how much the deformity has been corrected in addition to the poor quadriceps muscle function. A summary of TKA results in poliomyelitis patients is in Table 1.

CONCLUSION

TKA in poliomyelitis patients could reveal an excellent short-term result even with the presence of deformities that could result from previous trauma. Patient counseling, meticulous preoperative planning, appropriate implant selection, and suitable surgical technique may improve the results. Long-term follow-up is needed for similar cases.

AUTHORS' CONTRIBUTIONS

ASA conceived and designed the study, conducted research, provided research materials, and collected and organized data. KHA analyzed and interpreted data, wrote the initial and draft of the article, and critically review the final manuscript. HSQ provided logistic support, collected, and organized data. All authors have critically reviewed and approved the final draft and are responsible for the manuscript's content and similarity index.

Declaration of patient consent

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

Financial support and sponsorship

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Prasad A, Donovan R, Ramachandran M, Dawson-Bowling S, Millington S, Bhumbra R, *et al*. Outcome of total knee arthroplasty in patients with poliomyelitis: A systematic review. EFORT Open Rev 2018;3:358-62.
2. Com I. Global Polio Eradication Initiative; 2019. Available from: http://apps.who.int/bookorders. [Last accessed on 2020 Apr 22].
3. Giori NJ, Lewallen DG. Total knee arthroplasty in limbs affected by poliomyelitis. J Bone Joint Surg Am 2002;84:1157-61.
4. Gan ZJ, Pang HN. Outcomes of total knee arthroplasty in patients with poliomyelitis. J Arthroplasty 2016; 31:2508-13.
5. Alzahrani K, Gandhi R, Debeer J, Petruccelli D, Mahomed N. Prevalence of clinically significant improvement following total knee replacement. J Rheumatol 2011;38:753-9.
6. Moran MC. Functional loss after total knee arthroplasty for poliomyelitis. Clin Orthop Relat Res 1996;323:243-6.
7. Patterson BM, Insall JN. Surgical management of gonarthrosis in patients with poliomyelitis. J Arthroplasty 1992;7 Suppl: 419-26.
8. Jordan L, Kligman M, Sculco TP. Total knee arthroplasty in patients with poliomyelitis. J Arthroplasty 2007;22:543-8.
9. Tigani D, Fosco M, Amendola L, Boriani L. Total knee arthroplasty in patients with poliomyelitis. Knee 2009;16:501-6.