The Journal of Neurological and Orthopedic Medicine and Surgery
Available online at www.aanos.org

Total Knee Arthroplasty After Chronic Stroke: A Case Report

Carlos González Blum, PT, DPT, M.Sc.

Abstract

This report describes the case of a 59-year-old female patient in the chronic phase after stroke who underwent a total knee arthroplasty (TKA) of her non-hemiparetic knee. Evaluation of spatio-temporal gait parameters and functional mobility assessments (Performance oriented mobility assessment, dynamic gait index and timed up and go) were carried out initially, after 24 months of physical therapy (PT) and 8 months after TKA replacement. Comfortable walking speed after the TKA decreased by 23.4% compared to after 24 months of PT. Measurement comparisons indicated an increased risk of falling after TKA. In addition, the patient reported an increase in pain frequency and intensity of the knee and a reduction of activities and participation. These results might be useful in identifying potential consequences following the replacement of the non-hemiparetic knee in chronic stroke, which may warrant more intense consideration before a TKA of the non-hemiparetic knee is carried out.

Key words: stroke; knee arthroplasty; postural control; fall risk; pain

Background and purpose

Although acute ischemic stroke is a known medical complication *following* total knee arthroplasty (TKA), the literature regarding patients who have suffered a stroke and who *later* receive a TKA is lacking. This case report describes a case of TKA after chronic stroke.

Case description

A 59-year-old woman, who had suffered a right hemisphere stroke of the medial cerebral artery 17 years earlier began developing knee pain in the non-paretic knee. MRI investigation confirmed pronounced, diffuse damage to the medial meniscus of the knee as well as developed gonarthrosis and intraarticular joint effusion. She was prescribed physical therapy as well as cryotherapy and lymph drainage for the affected knee. In addition, she was prescribed shoe insoles.

She began physical therapy at our therapy center. On initial assessment she described her chief complaint as a load and movement-related pain of the non-paretic knee, occurring several times throughout her day while standing and walking for longer periods of time, generally after about an hour. She described her pain intensity in those moments as a numerical rating scale (NRS) 4/10. Her standing and walking stability she described generally as slightly unstable. She ambulated with a walking stick, which she held in her non-paretic arm. Despite the pain, she was able to participate in activities of daily living, such as riding a bicycle with her husband, walking to the city center, shopping and taking part in a weekly neurorehabilitation movement course with other stroke survivors. She reported no history of falling.

Several initial assessments were carried out prior to beginning the treatment (See Tables 1, 2, 3 and 4). These were: spatio-temporal gait parameters e.g. speed, cadence and stride length, timed up and go (TUG), Tinetti-Test also known as the performance-oriented mobility assessment (POMA) and Dynamic Gait Index (DGI). These assessment tools are considered valid in the investigation of locomotion, mobility and postural control in stroke patients. She received the following scores: comfortable walking speed: 0.67 m/sec, cadence: 80 steps/min and stride length: 1.0 meters. POMA: 16/28 points, TUG: 13 sec and DGI: 18/24 points. In addition, a medical research council (MRC) manual muscle test of the non-paretic knee and range of motion (ROM) evaluation were carried out. The MRC score was 5/5 in all muscle groups. ROM: Flexion/Extension 140°/0°/0°.

Table 1. Spatio-temporal assessments of gait

	Initial	24 mo.	Post TKA
Speed	0.67 m/sec	0.77 m/sec	0.59 m/sec
Cadence	80 steps/min	83 steps/min	78 steps/min
Stride	1.0 m	1.11 m	0.91 m

Table 1. Assessments completed at the initial assessment, 24 months after training and after TKA of the non-paretic knee. On the second and final assessment, the patient wore an ankle-foot orthosis on her hemiparetic leg.

Table 2. POMA- Performance -Oriented Mobility Assessment

POMA			
Item	Initial	24 mo.	Post TKA
1.	1	1	1
2.	1	1	1
3.	1	2	1
4.	2	2	2
5.	2	2	2
6.	0	2	0
7.	0	0	0
8.	1	1	1
9.	1	1	1
10.	1	1	1
11.	1	1	1
12.	0	1	0
13.	0	0	0
14.	1	1	0
15.	2	2	1
16.	0	0	0
17.	1	1	1
18.	0	0	0
19.	0	0	0
20.	1	2	1
Total	16/28	21/28	14/28

Table 3. DGI-Dynamic Gait Index

DGI			
Item	Initial	24 mo.	Post TKA
1.	2	2	1
2.	2	2	2
3.	2	2	1
4.	2	2	1
5.	3	3	1
6.	2	2	2
7.	3	3	3
8.	2	2	1
Total	18/24	18/24	12/24

Table 4. TUG-Timed Up and Go

TUG			
	Initial	24 mo.	Post TKA
Total	13 sec	10 sec	18 sec

Tables 2, 3 and 4 show scores on the postural control/mobility assessments completed at the initial assessment, 24 months after training and after TKA of the non-paretic knee. On the second and final assessment, the patient wore an ankle-foot orthosis on her hemiparetic leg.

The focus of therapy was to address both the hemiparetic leg, as well as the non-paretic, painful knee and decrease the risk of falling. An activity and context-based gait and strengthening program was used to strengthen the lower extremities and improve postural control mechanisms while standing and walking. One goal was the reduction of stress on passive structures of the knees, especially on the non-paretic side.

The patient received physical therapy twice per week for 24 months. An ankle orthosis was additionally prescribed to control the stability of her hemiparetic ankle/foot. Compliance to physical therapy and the exercise program was satisfactory. After this time period, several measures of gait and mobility improved: comfortable walking speed: 0.77 m/sec, cadence: 83 steps/min, stride length: 1.11 meters. POMA: 21/28 points, TUG: 10 sec., however the patient reported neither an improvement nor worsening of her pain and she eventually visited an orthopedic specialist, who recommended an

arthroscopic intervention of the knee for cartilage and meniscus surgery and the option for a knee arthroplasty was also discussed. She did not undergo this procedure, however three months later, she received a cemented TKA for the non-paretic knee. The procedure and the post-operative treatment course were described as being without complications. The TKA was post-operatively assessed and deemed stable with a ROM measurement of 115°/0°/0° (Flexion/Extension). The post-operative rehabilitation was conducted in a specialized center. According to discharge reports, the controlled unloading of the operated knee was challenging, as the patient was unable to unload the knee with crutches or a walker, due to the spastic, hemiplegic upper extremity. A forearm-supported walker was given to the patient for post-operative ambulation, which the patient found very difficult to use and ultimately did not use. The patient subsequently resumed outpatient physical therapy at our therapy center. 8 months after the operation, the patient consulted the orthopedic specialist due to unrelenting pain in the operated knee throughout the day. The stability of the TKA was again confirmed and the given diagnosis for the continued pain was synovitis and synovial irritation, for which radiosynoviorthesis therapy was administered.

At this time (8 months post TKA intervention), the patient was reassessed by the same therapist as on the initial and second assessments. Comfortable walking speed, wearing the same orthosis as with the second assessment, decreased to 0.59 m/sec, cadence to 78 steps/min and stride length to 0.91 meters. Other assessments also showed lower scores in comparison to the first two measurements demonstrated through POMA: 14/28 points, TUG: 18 sec and DGI: 12/24 points. MRC score was 5/5 in all muscle groups of the non/paretic leg. NRS score when not loading knee e.g. in sitting: 4/10, and movement-related pain: 5/10. She reported having few moments in the day where she was pain-free in her knee. Since the operation, she reported having fallen twice. On one occasion, she described a fall in her home several months after the operation when she had to wait for her husband to come home, since she was unable to place weight on her painful, non-hemiparetic knee to get up by herself. In addition, she reported a decrease in her activity and participation level. She, for example rarely participated in her exercise group, since the exercises were too painful and negatively affected her balance. Climbing and descending stairs was completely avoided, as this too aggravated her symptoms.

Discussion

Postural control has been shown to be impaired in persons who have suffered a stroke and this requires a thorough evaluation. Perhaps the most important item of the spatio-temporal investigation is gait speed. The patient's comfortable walking speed after the TKA decreased by 23.4%, 0.18 meters/second, respectively compared to after PT. It has been shown, that a reduction of walking speed is corelated with increased risk of falling, which increases anxiety. [1] Through mobility and postural control assessments (TUG, POMA and DGI), it was more clearly revealed that the risk of falling for this patient had indeed increased.

One important aspect to consider is the weight distribution and loading behavior of the lower extremities after stroke. Knee osteoarthritis commonly occurs in stroke patients and it is thought to be a result of compensatory behavior of the non-paretic leg [2] Hemiplegic patients show, for example that weight distribution of the lower limbs is asymmetric, as the person favors loading the non-paretic lower limb.[3] Also, studies have demonstrated that the proprioception of osteoarthritic knees is poorer than that of knees replaced by a TKA, [4] which would then eventually contribute to improved postural control upon replacement. Since measures of postural control did not improve for this patient, but actually worsened, other factors may have contributed to reduced performance of the tested measures, for example pain. It has been shown, that pain of the knee may lead to impaired proprioception and postural stability [5] and that this increases the risk of falling [6].

Summary

Recently, a review with patients who received a TKA after osteoarthritis of the knee demonstrated that a TKA can positively influence fear of falling and the actual incidence of falls [7]. However, there may be differences with stroke survivors, as was the case with the patient described in this report. The complexity of a stroke patient who has pain in the non-paretic knee, but who has been also initially assessed as at risk of falling might warrant further consideration before a TKA of the non-paretic knee is carried out. These patients should be informed of the potentially serious risks involved.

References

1. Baer HR, Wolf SL: Modified emory functional ambulation profile: an outcome measure for the rehabilitation of poststroke gait dysfunction. Stroke. 2001; 32: 973–979.
2. Yang CP, Lee CL, Chen TW, et al. Ultrasonographic findings in hemiplegic knees of stroke patients. Kaohsiung J Med Sci. 2005; 21: 70–77.
3. Marigold DS, Eng JJ. The relationship of asymmetric weight- bearing with postural sway and visual reliance in stroke. Gait Posture. 2006;23:249-55.
4. Swanik CB, Lephart SM, Rubash HE. Proprioception, kinesthesia, and balance after total knee arthroplasty with cruciate-retaining and posterior stabilized prostheses. J Bone Joint Surg Am. 2004 Feb;86-A(2):328-34.
5. Messier SP, Glasser JL, Ettinger WH, Jr., Craven TE, Miller ME. Declines in strength and balance in older adults with chronic knee pain: a 30-month longitudinal, observational study. Arthritis Rheum. 2002; 47:141-148.
6. Foley SJ, Lord SR, Srikanth V, Cooley H, Jones G. Falls risk is associated with pain and dysfunction but not radiographic osteoarthritis in older adults: Tasmanian Older Adult Cohort study. Osteoarthritis Cartilage. 2006; 14:533-539.
7. Moutzouri, M., Gleeson, N., Billis, E. et al. Knee Surg Sports Traumatol Arthrosc. 2017; 25: 3439.

This work is not under review elsewhere and has not been previously published

There are no conflicts of interest

Corresponding author: Carlos González Blum

Contact Address: Parkweg 18. 79312 Emmendingen, Germany

E-mail: gblum@gssw.eu, gonzalezblum@hotmail.com

Telephone: 0049 15785899232