Satisfaction and long-term use of orthopedic shoes in people with chronic stroke

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Letter to the editor

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Dear Editor,

The most common impairment caused by stroke is motor impairment, which affects about 80% of stroke survivors [1]. About two-thirds of such individuals have gait impairments during the early phase after stroke. At 6 months after stroke, 30% cannot walk independently [2]. Foot and ankle deficiencies such as spastic equinovarus foot can lead to foot drag and ankle instability with a risk of falls. Therapeutic options for these disorders are physiotherapy, local treatment of spasticity, equipment such as ankle orthosis or orthopedic shoes, and surgery.

Orthopedic shoes have been found helpful for temporary use during the subacute phase of stroke [3]: they can improve functional and quantitative gait parameters. After stroke, orthopedic shoes are often prescribed to reduce foot drag, improve hind foot stability, and compensate for foot abnormalities (claw toes or hallux claw, hallux erectus).

However, when orthopedic shoes are prescribed, they are not always worn for a long time [4], so it seems important to focus on users' satisfaction, which affects adherence. To the best of our knowledge, no studies have focused on orthopedic shoes in an ambulatory chronic post-stroke population. The aim of the present study was to assess satisfaction with wearing orthopedic shoes in people after stroke.

We conducted a retrospective, monocentric study in a department of physical and rehabilitation medicine. People with chronic stroke wearing their first orthopedic shoes were recruited. The orthopedic shoes were made by the same podo-orthosist between December 2010 and December 2012. Inclusion criteria were post-stroke hemiplegia, a minimum of 12 months since the stroke, and age > 18 years. Exclusion criteria were other diseases responsible for gait or balance deficiency, cognitive or phasic disorders, and use of an orthotic device. People we could not contact were excluded. Participants were included in the protocol after providing informed consent as required by the Helsinki Declaration (1975). In accordance with French law, at the time of the study, this retrospective study did not require the approval of an ethics committee.

The following data were collected from the medical records for all participants: demographic and clinical data (sex, age, type of stroke, time since stroke, spasticity on the modified Ashworth scale [range 0–5], range of motion), and specifications for orthopedic shoes. Participants were contacted by phone, and information was collected by one physical and rehabilitation medicine specialist.

The primary endpoint was satisfaction with the effect of the orthopedic shoes on walking as measured by a hetero-questionnaire developed by Tyson et al. [5] and used by Eckhardt et al. [3]. Secondary endpoints were the use of orthopedic shoes (how often, how long), satisfaction on the Quebec User Evaluation of Satisfaction with assistive Technology (QUEST) questionnaire [6], and an objective functional assessment of walking performance (based on the modified Functional Ambulation Classification scale) [7].

The scores for the scales are presented as median (interquartile range [IQR]) and continuous data are presented as mean (SD). Statistical analysis involved using SPSS v20.0 (SPSS IBM Inc., New York, USA).

We included 36 people who had a stroke (Fig. 1). Demographic and clinical data are summarized in Table 1. Excluded participants did not differ significantly from the study population.

The specifications most frequently asked of the podo-orthosist were to raise the forefoot (n = 31 participants, 86.1%), stabilize the hind foot (n = 29, 80.6%), and adapt the shoe to a claw toe (n = 26, 72.2%), hallux claw (n = 21, 58.3%), or hallux erectus (n = 3, 8.3%).

The question about rate of shoe wearing was asked at a mean of 2 years (median 24.41 months [IQR 14–33]) after the shoes were delivered; 34 participants (94.5%) were still wearing their shoes, and 2 were not (5.5%). Overall, 22 participants (61.1%) were wearing the shoes daily during the day, 6 (16.7%) were wearing them daily for only outside activity, and 6 (16.7%) were wearing them 3–4 days/week for only outside activity.

Most participants reported that the shoes had positive effects on satisfaction (median score >3) in terms of walking distance, improvement in swing phase, weight bearing during the stance phase, self-confidence, and safety. Most participants reported that walking velocity had not changed.

The median total satisfaction score on the QUEST was 50 [49–52]. Satisfaction was positive (total score >36) for 34 participants

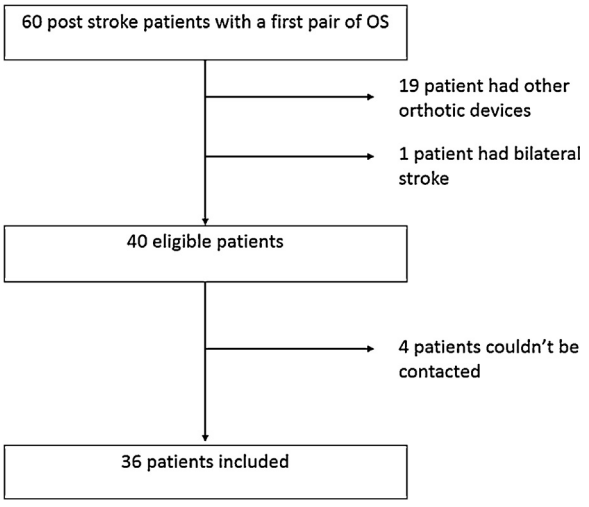

Fig. 1. Flow of participants in the study.

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(94.5%) but was negative or neutral (total score ≤ 36) for 2 (5.5%) (Table 2). A median score of 4 or 5, corresponding to "quite satisfied" or "very satisfied" was obtained for all items except repair services. Items on which most of the participants were satisfied were the robustness of the shoes, their ease of use, quality of the professional services provided and quality of follow-up, size of the shoes, ease of adjustment, and efficiency in terms of objectives. The item for which the participants were the most dissatisfied was the weight of the shoes.

Table 1
Demographic data for participants with stroke included and excluded in the study of wearing orthopedic shoes.

	Included $n=36$	Excluded $n=4$
Sex (M/F)	15/21	2/2
Mean age (years)	62	59
Stroke type (ischemic/hemorrhagic)	29/7	4/0
Stroke side (right/left)	20/16	*
Time since stroke (months), mean	76	60
Time since OS delivery (months), mean	24	*
Modified Ashworth Score (/5)		
Gastrocnemii 2	6	0
3	21	3
4	7	1
Soleus 1	2	0
2	24	3
3	10	1
Tibialis posterior 1	34	3
2	2	1
Range of motion of talocrural dorsiflexion, mean		
knee extended (degree)	0	−8
knee flexed (degree)	+10	0
Subtalar joint mobility (normal, limited, augmented)	28/6/2	3/1/0

OS, orthopedic shoes.

The 2 participants with a negative QUEST score were the same 2 who had abandoned their shoes; their global QUEST score was lower than for the other participants (−13.8 to −16.8, $P < 0.001$). Participants who wore their shoes daily and those who used them occasionally did not differ in total QUEST score (−2.7 to 7.2, $P = 0.32$), nor did participants who wore their shoes all day and those who wore them only outside (−0.9 to 5.7, $P = 0.17$).

The modified Functional Ambulation Classification score was significantly improved for participants who wore their shoes versus went barefoot: median 6 versus 4 ($P < 0.001$) (Table 3).

The self-reported qualitative improvement in gait after wearing orthopedic shoes focused on walking distance, improvement in the swing phase, weight bearing during the stance phase, self-confidence when walking, and safety. A study also using this scale found similar results [3]: more than 90% of participants reported improved walking distance, self-confidence, and safety. Concerning secondary endpoints in our study, overall satisfaction with the orthopedic shoes was very good: the global median QUEST score was 50. Overall, 94.5% of the participants had a total QUEST score >36, corresponding to positive satisfaction. Participants were most dissatisfied with the weight of the shoes, which is known in our clinical practice to be a recurring reason for dissatisfaction, despite the progress in making materials lighter. Most participants were "more or less satisfied" with the quality of the repair services, simply because they had not needed their shoes repaired. Van Netten et al. [4,8] studied participants' satisfaction with orthopedic shoes but gave no details about the specifications or the limits. Satisfaction was estimated on the basis of the shoe design (which was not included in the QUEST score): the overall score was 54/100; the quality of the professional services was 82/100 in terms of communication with the doctor and 84/100 in terms of communication with the podo-orthosist. These results agree with our findings on participants' satisfaction with the

Table 2
Satisfaction with wearing orthopedic shoes on the Quebec User Evaluation of Satisfaction with assistive Technology (QUEST) questionnaire.

	Median score	Satisfaction		
		Positive (score >3)	Neutral (score = 3)	Negative (score <3)
Technological aspects of shoes				
Size	4	31 (86.1)	0	5 (13.9)
Weight	4	23 (63.9)	2 (5.5)	11 (30.6)
Easy to adjust	4	31 (86.1)	3 (8.4)	2 (5.5)
Safe to wear	5	25 (69.4)	11 (30.6)	0
Robustness	5	32 (89)	2 (5.5)	2 (5.5)
Easy to use	4	32 (89)	2 (5.5)	2 (5.5)
Comfort	4	29 (80.6)	5 (13.9)	2 (5.5)
Efficiency	5	31 (86.1)	5 (13.9)	0
Services provided				
Prescription procedure	4	30 (83.3)	3 (8.4)	3 (8.4)
Repair services	3	14 (38.9)	22 (61.1)	0
Professional services	5	32 (89)	0	4 (11)
Quality of follow-up	4	32 (89)	4 (11)	0

Data are *n* (%).

Table 3
Participants' qualitative assessment of their own gait when wearing orthopedic shoes based on the modified Functional Ambulation Classification scale.

	Median score	Positive effect	No effect	Negative effect
Walking distance	4	28 (77.8)	6 (16.7)	2 (5.5)
Gait speed	3	14 (36.1)	21 (61.1)	1 (2.8)
Foot lifting	3	17 (47.3)	15 (41.7)	2 (5.5)
Swing phase	4	25 (69.4)	11 (30.6)	0
Weight bearing during stance phase	4	31 (86.1)	5 (13.9)	0
Self confidence	4	33 (91.7)	1 (2.8)	2 (5.5)
Safety	4	25 (69.4)	11 (30.6)	0

Data are *n* (%).

quality of the professional services and with follow-up, with a median score of 4/5. In terms of adherence, after 2 years of follow-up, 94.5% of the participants were still wearing their shoes regularly. These results agree with Van Netten et al. [4], who reported 86% of participants still wearing their shoes after 1.5 years. However, that study included people with different pathologies.

As well, we found improved modified Functional Ambulation Classification scores: under barefoot conditions, the median score was 4 but 6 with orthopedic shoes.

The first limitation of our study is that it was a retrospective study by phone survey. It assessed the satisfaction of people who had a stroke "in real life and after a long time", which is of importance for this type of device because it is well known that only satisfaction induces people to wear the equipment. Another limitation is the lack of comparison between orthopedic shoes and usual shoes. However, there are no exact definitions for normal and factory shoes, and the walking conditions are likely to vary considerably among participants. In our everyday practice, the gait of people who had a stroke is often assessed when they are wearing their "usual" shoes, but these shoes differ considerably: they can have low or high uppers, open or closed foreparts, and low or high heels. Another limitation is that we did not consider the esthetics of orthopedic shoes. Concerning the population, the people included did not have severe orthopedic deformations and had quite good autonomy, with a Functional Ambulation Classification score of 4 before putting on the shoes. People excluded had more severe deformations, and their adaptation to the shoes may have been more difficult and therefore lower satisfaction. A further prospective study with a larger cohort including people who had a stroke with the first-ever orthopedic shoes prescribed, comparing orthopedic shoes, usual shoes, and the barefoot condition with quantitative gait analysis would be of interest.

Orthopedic shoes are an efficient means of improving gait and correcting impairments such as foot drag, hind-foot instability, and foot deformities in people after a stroke. Adherence to and satisfaction with wearing the shoes seem to be good.

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Disclosure of interest

The authors declare that they have no competing interest.

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