How do spatiotemporal gait parameters change from the acute phase to 3 months following stroke?

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Background

- Independent ambulation is considered the most self-stated rehabilitation goal for people after stroke
- Reduced gait speed, cadence, step length, and increased asymmetry are all known changes following stroke
- Knowledge about gait changes are important to provide best possible rehabilitation to regain independent gait

Aim

The aim of this study was to examine whether spatiotemporal gait parameters changed from the acute to the sub-acute phase after stroke, and which gait parameters that can be associated with balance and walking capacity in the acute and sub-acute phase

Method

Study design

Between March 2012 and October 2014, 79 diagnosed stroke patients admitted to the stroke unit at Trondheim University Hospital, Norway, were recruited while hospitalized, with a follow-up three months later

Participants

- No more than fourteen days since onset of symptoms
- Modified Rankin Scale (mRS) score 0-3 points
- Capable to walk with or without walking aid or support from another person for 10 meters
- Less than 58 points on Scandinavian Stroke Scale (SSS)

Gait assessment

Walking back and forth on a 7.6 meter long GAITRite® mat (CIR systems Inc. Sparta, US) at preferred gait speed.
Gait speed, step length, stride width, time in single support, cadence, walk ratio, and asymmetry (| (LN(L/R)) |*100) for both step length and single support were calculated

Outcomes:

- **Changes in spatiotemporal gait parameters from the acute phase to three months later**
- **Association between spatiotemporal gait parameters and balance as measured by Berg Balance Scale (BBS) or walking capacity as measured by 6 minutes walking test (6MWT) in the acute and the sub-acute phase**

Data analysis

Changes in gait parameters were assessed using paired sample t-tests, and association with balance and walking capacity using bivariate linear regression

Results

Demographic data for included patients in mean (SD)

	Mean (SD)
Age (years)	75.4 (8.48)
Days hospitalized	6.5 (3.3)
Male gender , N (%)	44 (55.7)
Type of stroke	
LACI, N (%)	28 (35.4)
PACI, N (%)	20 (25.3)
TACI, N (%)	3 (3.8)
POCI, N (%)	14 (17.7)
Unclassified	10 (12.7)
Hemorrhagic	4 (5.1)

	Acute (N=79)	Sub-acute (N=79)
Modified Rankin Scale (0-6)	2.7 (0.95)	1.7 (0.86)
Barthel index (0-100)	85.7 (14.78)	95.6 (8 .22)
Scandinavian Stroke Scale (0-58)	51.8 (4.56)	55.2 (3.04)
BBS (0-56 points)	37.7 (15.5)	48.0 (10.0)
6MWT (meters)	400.9 (177.8)	473.1 (195.7)
Walking aids		
None, N (%)	45 (57.0)	54 (68.4)
Only outside, N (%)	2 (2.5)	8 (10.1)
Crutch(es)/cane, N (%)	8 (10.1)	7 (8.9)
Walker, N (%)	9 11.4)	9 (11.4)
Personal assistance, N (%)	15 (19.0)	1 (1.3)

Change in gait parameters from acute to sub-acute phase

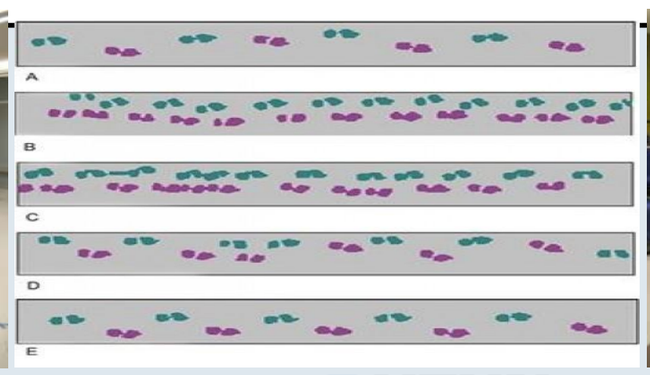
	Acute	Sub-acute	Change scores	
	Mean (SD)	Mean (SD)	Mean (95 % CI)	p-value
Step length (cm)	55.66 (12.89)	62.34 (13.12)	6.68 (4.47, 8.60)	**<0.000**
Stride width (cm)	8.12 (3.09)	7.61 (3.54)	-0.50 (-1.15, 0.15)	0.129
Single support (sec)	0.43 (0.07)	0.41 (0.04)	-0.02 (-0.03, -0.01)	**<0.001**
Gait speed (m/s)	0.92 (0.32)	1.10 (0.30)	0.18 (0.13, 0.23)	**<0.001**
Cadence (steps/min)	96.50 (16.66)	104.19 (11.96)	7.68 (4.98, 10.39)	**<0.001**
Asymmetry step length (%)	7.37 (9.29)	4.92 (4.08)	-2.45 (-4.09, -0.81)	**0.004**
Asymmetry single support (%)	5.92 (6.54)	4.81 (4.66)	-1.11 (2.42, -0.21)	0.098
Walk ratio (step length/cad)	0.58 (0.11)	0.60 (0.11)	0.02 (0.01, 0.03)	**0.010**

Results from the regression anaysis

- Gait speed was associated with improved balance and walking capacity in both the acute and the sub-acute phase ($p<0.001$ for all)
- When controlling for gait speed, step length was significantly associated with balance (0.61 (95 % CI 0.17, 1.05) p=0.008) in the acute phase
- In the sub-acute phase, no significant associations between gait parameters and balance or walking capacity were found when controlling for gait speed

Conclusion

- Patients walked with significantly longer steps, higher cadence and gait speed, spend more time in single support and with decreased step length asymmetry in the sub-acute compared to the acute phase
- Increased walk ratio from acute to sub-acute phase indicates that patients increased step length more than cadence
- Controlled for gait speed, only step length in the acute phase were associated with balance



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