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Short communication

Symptoms of depression and cognitive impairment in young adults after stroke/transient ischemic attack

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ABSTRACT

Depression and cognitive complaints are common after stroke; these issues have been studied in older populations, but not in the young. Two hundred and seventy four eligible stroke and TIA patients consented to participate and complete the Center for Epidemiologic Studies Depression Scale, and National Institute of Neurological Disorders and Stroke – Canadian Stroke Network 30-min neuropsychological battery; 57 (21%) were ≤ 50 years of age. Younger patients reported greater symptoms of depression and less executive dysfunction than older patients. This study highlights age differences in post-stroke depression symptoms and cognitive impairment, and emphasizes the need for screening across ages.

1. Introduction

Stroke in the young accounts for up to 15% of all strokes and is becoming increasingly prevalent among young adults (Singhal et al., 2013). Younger stroke survivors often have good physical recovery (Varona et al., 2004), but frequently report reduced quality of life and social dysfunction (Singhal et al., 2013). Reasons for this disconnect – poor quality of life despite good physical recovery – have not been identified. But it has been well established that depressive symptoms and cognitive impairment are common after stroke/TIA (Gottlieb et al., 2002; Hennerici, 2009; Luijendijk et al., 2011)—even in those with excellent physical recovery (Kapoor et al., 2017)—and are associated with reduced quality of life, social dysfunction and difficulty returning to work (Edwards et al., 2017; Kim et al., 1999). Some previous studies exploring post-stroke/TIA mood and cognitive outcomes in younger stroke survivors have reported frequencies up to 48% for depression symptoms (Maaijwee et al., 2016; Neau et al., 1998) and more than 35% for cognitive deficits in one or more domains (van Rooij et al., 2014). However, few have compared depressive and cognitive outcomes between younger and older patients. In this study, we aimed to characterize the prevalence of post stroke depressive and cognitive symptoms in young adults (18–50) as compared to older stroke/TIA patients (50+).

2. Methods

All consecutive new referrals to the Sunnybrook Stroke Prevention Clinic over a two-year period (April 2012 to April 2014) who spoke English, were not severely aphasic, could see and write well enough to complete a screening tool, and received a probable or definite diagnosis of ischemic stroke or transient ischemic attack (TIA) by a neurologist were eligible to participate. The final diagnosis was made by the treating stroke neurologist, with access to advanced neuroimaging (MRI, CT angiography where appropriate) and all clinical data (Easton et al., 2009). Baseline patient characteristics, including stroke severity (assessed using modified Rankin Scale (mRS) (Bonita and Beaglehole, 1988; Rankin, 1957), which measures extent of disability on scale from 0 (no disability) to 5 (severe disability)), were abstracted from patient charts. Consent was obtained to undergo depression and cognitive assessments during the first post-stroke outpatient clinic visit

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Table 1
Patient Characteristics.

	Young (N = 57)	Old (N = 217)	p-value
Event Type, n (%)			.040
Stroke	35 (61.4)	100 (46.1)	
TIA	22 (38.6)	117 (53.9)	
Male, n (%)	22 (38.6)	119 (54.8)	.029
Completed Mood Assessments, n (%)	53 (93.0)	204 (94.0)	.775
Completed Neuropsychological Battery, n (%)	52 (91.2)	194 (89.4)	.685
Hypertension, n (%)	17 (29.8)	144 (66.4)	<0.001
Diabetes, n (%)	5 (8.8)	45 (20.7)	.037
Atrial Fibrillation, n (%)	2 (3.5)	39 (18.0)	.006
Age, M (SD)	40.9 (8.1)	68.8 (10.5)	<0.001
Education, M (SD)	16.7 (3.0)	15.5 (4.0)	.016
Modified Rankin Score, Mdn (IQR)	1.0 (2.0)	0.0 (1.0)	.081

(Median time from stroke to initial clinic visit = 55 days, IQR = 94). History of prior stroke was not an exclusion. “Young” was defined as 50 years of age or younger. This study was approved by the local Research Ethics Board.

Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression Scale (CES-D) and cognitive testing was based on the 30-min battery recommended by the National Institute of Neurological Disorders and Stroke – Canadian Stroke Network (NINDS-CSN) harmonization paper (Hachinski et al., 2006). All scores were normalized (z-score or scaled score) for age using age-matched norms from each respective test manual. CVLT and Animal Naming were also education- standardized. Scaled scores ranged from 0 to 19 (M = 10).

Linear regression were used to assess the relationship between age (≤ 50 vs. 50 +) and depressive or cognitive symptoms. All models were adjusted for stroke severity, education, sex, event type, hypertension, diabetes, and atrial fibrillation. Significance threshold was set at p = .05.

3. Results

A total of 274 stroke and TIA patients consented to participate (Table 1). Among included patients, 121 (44.2%) received a diagnosis of definite ischemic stroke, 55 (20.1%) definite TIA, 14 (5.1%) possible/query stroke and 84 (30.7%) possible query TIA. Linear regression revealed an effect of age on CES-D scores in univariate (β = 5.32; 95% CI = 2.25, 8.40; p = .001) and multivariable analysis (β = 3.84; 95% CI = 0.52, 7.16; p = .024; Supplemental Table 1), with younger patients having higher depression scores (M = 15.1, SD = 13.9) compared to older patients (M = 9.8, SD = 9.0).

Age category was not a predictor of semantic or phonemic fluency, symbol digit encoding, trail making A or CVLT short or long delay. However, linear regression revealed an effect of age on trail making B scaled scores (β = 1.11, 95% CI = 0.17, 2.06; p = .021), with younger patients having higher scaled scores (M = 10.0, SD = 2.5) compared to older patients (M = 8.7, SD = 3.0), even after accounting for stroke severity, education, sex, event type, hypertension, diabetes, and atrial fibrillation. Complete results for all cognitive tests can be found in Supplemental Table 2.

4. Discussion

Previous research suggests that old age is associated with post-stroke depression as well as cognitive impairment (Leys et al., 2005; Naess et al., 2005). However, previous studies have not compared such outcomes between younger (≤50 years of age) and older (50+) patients. The current study elucidates that young stroke survivors are more likely to experience symptoms of depression and less likely to experience executive dysfunction, despite equivalent disability. Given that younger patients are in a period of their lives characterized by more dynamic growth and change (e.g. raising families, career development etc.), it is possible they may feel the impact of losses or changes in these areas more acutely. These changes may contribute to the greater symptoms of depression that were reported by younger adults in our study. It has been shown that depression is more than twice as common in young stroke survivors as age- and sex- matched controls (Waje-Andreassen et al., 2013), and our study adds to these findings by suggesting that depression may be even more common among younger than older stroke survivors.

Using scores on the Trail Making B test, we found that younger patients were less likely to have executive dysfunction compared to older patients, but were equally as likely to be impaired in other domains. Executive dysfunction is often reported as one of the most impacted cognitive functions in stroke patients (Cumming et al., 2013), however these results may be based on samples of older patients. This study is, therefore, one of the first to highlight the difference in executive function between young and old stroke survivors. These results suggest that the impact of stroke on executive function is potentially greater for older patients, even after accounting for age and mRS.

Post-stroke depression and vascular cognitive impairment are associated with functional impairment (Kapoor et al., 2019; Leys et al., 2005; Nannetti et al., 2005), higher mortality (Naess et al., 2010; Oksala et al., 2009), reduced quality of life (Kim et al., 1999), social dysfunction (Clarke et al., 1999) and difficulty returning to work (Edwards et al., 2017). Brief screening tools such as the DOC screen (Swartz et al., 2017) are feasible, valid and can easily be implemented in stroke clinics to screen patients for such conditions. This study emphasizes the need for post-stroke depression and cognitive screening across ages, and for approaches to post-stroke mood and cognitive symptoms that can improve long-term function and quality of life.

Conflict of interest/disclosures

The authors declare that they have no conflict of interest.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2019.06.022.

References

Bonita, R., Beaglehole, R., 1988. Recovery of motor function after stroke. Stroke 19, 1497–1500.

Clarke, P.J., Black, S.E., Badley, E.M., Lawrence, J.M., Williams, J.I., 1999. Handicap in stroke survivors. Disabil. Rehabil. 21, 116–123. https://doi.org/10.1080/096382899297855.

Cumming, T.B., Marshall, R.S., Lazar, R.M., 2013. Review Stroke, cognitive deficits, and rehabilitation : still an incomplete picture. Int. J. Stroke 8, 38–45. https://doi.org/10.1111/j.1747-4949.2012.00972.x.

Easton, J.D., Saver, J.L., Albers, G.W., Alberts, M.J., Chaturvedi, S., Feldmann, E., Hatsukami, T.S., Higashida, R.T., Johnston, S.C., Kidwell, C.S., Lutsep, H.L., Miller, E., Sacco, R.L., 2009. Definition and evaluation of transient ischemic attack. Stroke 40, 2276–2293. https://doi.org/10.1161/STROKEAHA.108.192218.

Edwards, J.D., Kapoor, A., Linkewich, E., Swartz, R.H., 2017. Return to work after young stroke: a systematic review. Int. J. Stroke. https://doi.org/10.1177/1747493017743059.

Gottlieb, D., Salagnik, I., Kipnis, M., Brill, S., 2002. Post stroke depression, first year post stroke, in middle band patients. Int. J. Geriatr. Psychiatry 17, 486–487.

Hachinski, V., Iadecola, C., Petersen, R.C., Breteler, M.M., Nyenhuis, D.L., Black, S.E., Powers, W.J., DeCarli, C., Merino, J.G., Kalaria, R.N., Vinters, H.V, Holtzman, D.M., Rosenberg, G.A., Wallin, A., Dichgans, M., Marler, J.R., Leblanc, G.G., 2006. National Institute of Neurological Disorders and Stroke-Canadian Stroke Network vascular cognitive impairment harmonization standards. Stroke 37, 2220–2241. https://doi.org/10.1161/01.STR.0000237236.88823.47.

Hennerici, M.G., 2009. What are the mechanisms for post-stroke dementia? Lancet Neurol 8, 973–975. https://doi.org/10.1016/S1474-4422(09)70261-3.

Kapoor, A., Lanctot, K.L., Bayley, M., Herrmann, N., Murray, B.J., Swartz, R.H., 2019. Screening for post-stroke depression and cognitive impairment at baseline predicts long-term patient-centered outcomes after stroke. J. Geriatr. Psychiatry Neurol. 32, 40–48. https://doi.org/10.1177/0891988718819859.

Kapoor, A., Lanctôt, K.L.K.L., Bayley, M., Kiss, A., Herrmann, N., Murray, B.J.B.J., Swartz, R.H.R.H., 2017. "Good Outcome" isn't good Enough: cognitive Impairment, depressive Symptoms, and social restrictions in physically recovered stroke patients. Stroke 48, 1688–1690. https://doi.org/10.1161/STROKEAHA.117.016728.

Kim, P., Warren, S., Madill, H., Hadley, M., 1999. Quality of life of stroke survivors. Qual. Life Res. 8, 293–301.

Leys, D., Hénon, H., Mackowiak-Cordoliani, M.-A., Pasquier, F., 2005. Poststroke dementia. Lancet. Neurol 4, 752–759. https://doi.org/10.1016/S1474-4422(05)70221-0.

Luijendijk, H.J., Stricker, B.H.C., Wieberdink, R.G., Koudstaal, P.J., Hofman, A., Breteler, M.M., Tiemeier, H., 2011. Transient ischemic attack and incident depression. Stroke 42, 1857–1861. https://doi.org/10.1161/STROKEAHA.110.604405.

Maaijwee, N.A.M.M., Tendolkar, I., Rutten-Jacobs, L.C.A., Arntz, R.M., Schaapsmeerders, P., Dorresteijn, L.D., Schoonderwaldt, H.C., van Dijk, E.J., de Leeuw, F.-E., 2016. Long-term depressive symptoms and anxiety after transient ischaemic attack or ischaemic stroke in young adults. Eur. J. Neurol. 23, 1262–1268. https://doi.org/10.1111/ene.13009.

Naess, H., Lunde, L., Brogger, J., Waje-Andreassen, U., 2010. Depression predicts unfavourable functional outcome and higher mortality in stroke patients: the Bergen stroke study. Acta Neurol. Scand. Suppl. 34–38. https://doi.org/10.1111/j.1600-0404.2010.01373.x.

Naess, H., Nyland, H.I., Thomassen, L., Aarseth, J., Myhr, K.-M., 2005. Mild depression in young adults with cerebral infarction at long-term follow-up: a population-based study. Eur. J. Neurol. 12, 194–198. https://doi.org/10.1111/j.1468-1331.2004.00937.x.

Nannetti, L., Paci, M., Pasquini, J., Lombardi, B., Taiti, P.G., 2005. Motor and functional recovery in patients with post-stroke depression. Disabil. Rehabil. 27, 170–175. https://doi.org/10.1080/09638280400009378.

Neau, J.P., Ingrand, P., Mouille-Brachet, C., Rosier, M.P., Couderq, C., Alvarez, A., Gil, R., 1998. Functional recovery and social outcome after cerebral infarction in young adults. Cerebrovasc. Dis. 8, 296–302. https://doi.org/10.1159/000015869.

Oksala, N.K.J., Jokinen, H., Melkas, S., Oksala, A, Pohjasvaara, T., Hietanen, M., Vataja, R., Kaste, M., Karhunen, P.J., Erkinjuntti, T., 2009. Cognitive impairment predicts poststroke death in long-term follow-up. J. Neurol. Neurosurg. Psychiatry 80, 1230–1235. https://doi.org/10.1136/jnnp.2009.174573.

Rankin, J., 1957. Cerebral vascular accidents in patients over the age of 60. II. Prognosis. Scott. Med. J. 2, 200–215. https://doi.org/10.1177/003693305700200504.

Singhal, A.B., Biller, J., Elkind, M.S., Fullerton, H.J., Jauch, E.C., Kittner, S.J., Levine, D.A., Levine, S.R., 2013. Recognition and management of stroke in young adults and adolescents. Neurology 81, 1089–1097. https://doi.org/10.1212/WNL.0b013e3182a4a451.

Swartz, R.H., Cayley, M.L., Lanctôt, K.L., Murray, B.J., Cohen, A., Thorpe, K.E., Sicard, M.N., Lien, K., Sahlas, D.J., Herrmann, N., 2017. The "DOC" screen: feasible and valid screening for depression, Obstructive Sleep Apnea (OSA) and cognitive impairment in stroke prevention clinics. PLoS ONE 12, e0174451. https://doi.org/10.1371/journal.pone.0174451.

van Rooij, F.G., Schaapsmeerders, P., Maaijwee, N.A.M., van Duijnhoven, D.A.H.J., de Leeuw, F.-E., Kessels, R.P.C., van Dijk, E.J., 2014. Persistent cognitive impairment after transient ischemic attack. Stroke 45, 2270–2274. https://doi.org/10.1161/STROKEAHA.114.005205.

Varona, J.F., Bermejo, F., Guerra, J.M., Molina, J.A., 2004. Long-term prognosis of ischemic stroke in young adults. Study of 272 cases. J. Neurol. 251, 1507–1514. https://doi.org/10.1007/s00415-004-0583-0.

Waje-Andreassen, U., Thomassen, L., Jusufovic, M., Power, K.N., Eide, G.E., Vedeler, C.A., Naess, H., 2013. Ischaemic stroke at a young age is a serious event–final results of a population-based long-term follow-up in Western Norway. Eur. J. Neurol. 20, 818–823. https://doi.org/10.1111/ene.12073.