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Comparison of psychological symptoms in post-cryptogenic cerebral-vascular accident (CVA) and/or transient ischemic attack (TIA) patients who have undergone foramen ovale closure, and in post-CVA patients

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ABSTRACT

The patent foramen ovale (PFO) is a controversial risk factor for CVA or TIA. In our center, adult PFO patients diagnosed with post cryptogenic CVA/TIA undergo trans-catheter closure of the PFO to decrease the risk of recurrent stroke. The aim of the study was to compare levels of functioning, depression and anxiety in post PFO closure patients following cryptogenic CVA/TIA and in other patients post CVA/TIA without PFO. Eighty-nine patients who had undergone trans-catheter PFO closure and 56 non-PFO post-CVA patients completed demographic, functioning, anxiety and depression questionnaires. Additional medical data were recorded from the medical files. Patients who had undergone trans-catheter PFO closure post CVA or TIA reported better level of functioning and substantially lower levels of depression and anxiety. The 70% of depression and 55% of anxiety variances were explained by female gender, older age, lower education, lower functioning level and additional health problems. Functioning level was the strongest contributor to the explained variance of psychological symptoms. We conclude that patients who have undergone trans-catheter PFO closure following cryptogenic CVA/TIA, which may prevent stroke recurrence, show good functioning and low levels of psychological symptoms. The procedure helps to keep these patients in a good physical and psychological health.

1. Introduction

CVA is one of the major public health problems worldwide, particularly in developed countries (Lloyd-Jones et al., 2010). According to WHO (2010) estimates, 15 million people each year suffer strokes, 5 million are left permanently disabled and 5.5 million deaths from stroke have been recorded worldwide. In Europe, as in developed countries elsewhere, the adjusted annual stroke incidence rates per 100,000 inhabitants are 141.3 (WHO, 2010). Age- and gender-adjusted incidence rates for TIA, a temporary episode of neurologic dysfunction caused by reduced blood flow to the brain, which resolve within 24 h, range from 68.2 to 83.0 per 100,000. Individuals who have experienced TIA have a 10-year stroke risk of 18.8% and a combined 10-year stroke, myocardial infarction or vascular death risk of 42.8% (4%/year) (Lloyd-Jones et al., 2010).

Main risk factors for CVA are arterial hypertension, ischemic heart disease, diabetes mellitus, smoking, hypercholesterolemia and life style. However, about 26% of the strokes are cryptogenic, i.e., occur without preceding risk factors (Sacco et al., 2006). Recent studies showed high prevalence of patent foramen ovale (PFO) in patients with cryptogenic CVA or TIA (Sacco et al., 2006), up to 45%, compared with 25% prevalence in the general population (Overell et al., 2000; Ballerini and Cifarelli, 2007). Also, PFO patients have a higher risk for recurrent strokes than non-PFO patients after cryptogenic stroke (Amarenco, 2005; Hirsch and Streifler, 2006).

PFO is an obligatory fetal morphology. It is an opening in the inter-atrial septum (the wall between the left and the right atriums of the heart) between two overlapping flaps of the septum primum and the septum secundum. It may present in the adult as a small aperture or as a tunnel. There is no significant shunting through this minute or virtual orifice, but it may increase during cough or following the Valsalva maneuver (increasing the intra-thoracic pressure). This increase of intra-thoracic pressure, and right atrial pressure, allows blood or thrombi to cross from the right to the left atrium and eventually may embolize the brain arteries, leading to TIA or CVA (Agmon et al., 1999; Wu et al., 2004).

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A trans-catheter closure of the PFO is safely conducted (Hirsch and Streifler, 2006). PFO closure with Amplatzer PFO occluder (AGA Medical Corporation, 682 Mendelssohn Avenue, Golden Valley, MN 55427, USA), although controversial (Overell et al., 2000), is becoming a common procedure (Hirsch and Streifler, 2006; Van de Wyngaert et al., 2008) and may decrease the risk for recurrent CVAs/TIAs (Hirsch and Streifler, 2006).

In a recent study, we were the first to assess quality of life and psychological characteristics in adult post cryptogenic CVA/TIA patients who had undergone trans-catheter closure of PFO. We reported that these patients experience a good quality of life and low levels of depression and anxiety, similar to those measured in age-matched control, non-CVA/TIA individuals (Cohen et al., 2010). Moreover, the older PFO patients (51 years and over) reported even lower levels of depression than their age-matched counterparts (Cohen et al., 2010). Psychological properties of the specific group of adult patients who had undergone trans-catheter closure of PFO post cryptogenic CVA/TIA were not assessed in comparison to post CVA patients. This comparison is of importance since we assume that PFO constitutes a risk factor for further CVA events (Amarenco, 2005; Hirsch and Streifler, 2006; Sacco et al., 2006). Accordingly, the aim of the present study was to compare levels of functioning, depression and anxiety in post cryptogenic CVA patients who had undergone PFO closure (i.e., PFO group) and in post-CVA patients (i.e., CVA group).

2. Subjects and methods

2.1. Participants

Participants were 89 patients who had undergone trans-catheter PFO closure post cryptogenic CVA or TIA, a group on whom a report has been previously published (Cohen et al., 2010), and 56 age-matched post-CVA/TIA patients. The 89 PFO patients constituted 78.1% of the 114 patients aged 20 and older who had undergone the PFO closure at the Pediatric Cardiology Department of the Rambam Medical Center since 1998. Of the 114 patients, 19 were not located, and five refused or could not participate, and one patient had died. The CVA patients were selected from the computerized data of outpatient clinic for CVA follow up, and were matched by age range (20–74), gender and years since the cardiovascular event (up to nine years) by the following procedure. The first 20 patients admitted to the neurological department because of CVA/TIA every year from 2000 to 2008, meeting the criteria of mild to severe CVA, up to nine years since diagnosis, and aged 24–70 years were to be approached, a total of 180 patients. Of these 20 had died, 15 did not speak Hebrew, two refused, and 87 could not be located.

Demographic characteristics of patients in both groups are shown in Table 1. The PFO group had a higher percent of women, and its participants were on average five years younger than the CVA patients. About 75% of patients in both groups were married, with an average of three children. Years of education were on average two years more in the PFO group, and more of them were employed, but the two groups were similarly distributed over the three income categories. Patients in both groups were on average about four years after the CVA/TIA event. More than double the occurrence of additional health problems was reported by the CVA group.

2.2. Procedure

Upon giving informed consent, patients completed questionnaires administered by one of the authors (D.M.), a senior social worker. Medical data were obtained from medical files. The hospital's ethics board approved the study.

Table 1
Demographic characteristics of PFO and CVA patients, *n* (%), mean ± S.D. (range).

Variables/groups	PFO	CVA	χ^2-test, or *t*-test
Number	89	56	
Female	52(58.4)	19(33.9)	8.26**
Age, years	53.9 ± 11.5 (29–82)	59.0 ± 9.0 (24–79)	$t(143) = -2.8$**
Number of children	2.9 ± 1.3 (0–7)	3.1 ± 1.8 (0–9)	$t(143) = 0.5$
Education, years	13.2 ± 3.2 (2–20)	11.4 ± 2.8 (2–16)	$t(143) = 3.5$**
Family status			0.08
Married/has partner	68(75.5)	43(76.8)	
Unmarried	6(6.7)	3(5.4)	
Divorced	10(11.1)	5(8.9)	
Widow/er	6(6.7)	5(8.9)	
Employed	47(52.8)	15(27.3)	9.0***
Economic status			3.6
Above average	32(36.0)	13(23.2)	
Average	24(27.0)	15(26.8)	
Below average	33(37.1)	28(50.0)	
Years since PFO/CVA	3.8 ± 2.5 (0–9)	4.3 ± 2.3 (1–9)	$t(143) = 0.2$
Other health problems	18(20.2)	28(50)	17.69***

Notes: *$p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

2.3. Questionnaires

Demographic data included age, gender, family status, education, employment and economic status. Medical data were recorded from medical files, with patients' permission. They included details on PFO closure and co-morbidities. Controls were asked to list their major diseases.

Hospital anxiety and depression scale (HADS) is a 14-item scale for identifying anxiety (7 items) and depression (7 items) in patients at hospital clinics (Snaith and Zigmond, 1994). It has proven psychometric properties, and has been extensively used in hospital and primary care patients (Herrmann, 1997; Bjelland et al., 2002). Raw scores from 8 to 10 identify mild cases, from 11 to 15 moderate cases, and from 16 and above, severe cases (Snaith and Zigmond, 1994). Internal reliability (α) was 0.92 for the depression scale and 0.90 for the anxiety scale.

Level of functioning scale was measured by 15 items adapted from the self-reported stroke impact scale (Duncan et al., 1999). Participants were asked to rate their activities of daily living (ADL) and instrumental ADL (IADL), mobility, memory and communication. Answers ranged from 1 = not difficult at all, to 5 = extremely difficult. Internal reliability (α) of the scale was 0.95.

2.4. Statistical analysis

Data were analyzed with SPSS 15. Descriptive statistics were calculated. The χ^2- and *t*-tests were used to assess differences between the groups in demographic and study variables. Pearson correlations were used to describe associations between study variables. Hierarchical regression analyses were conducted to assess the contribution of demographic variables and level of functioning to the explained variance of depression and anxiety levels. Of the demographic variables, gender, age, education and financial status were significantly associated with depression or anxiety, hence were entered into the regression analysis. Time since PFO closure or CVA was not significantly related to the outcome variables, hence not entered. In the first step, the demographic variables and additional health problems were entered, and in the second step level of functioning was added. A significance level of $p < 0.05$ was used.