ID Design Press, Skopje, Republic of Macedonia
Open Access Macedonian Journal of Medical Sciences. 2018 Mar 15; 6(3):463-466.
https://doi.org/10.3889/oamjms.2018.109
eISSN: 1857-9655
Clinical Science

Carotid Endarterectomy in Women versus Man: Patient Characteristics and Perioperative Complication (<30 Day)

Muhamed Djedović[1*], Bilal Imširović[2], Samed Djedović[3], Amel Hadžimehmedagić[4], Haris Vukas[4], Bekir Rovčanin[5], Ibrahim Kamenjašević[6]

[1]University Clinical Centre of Sarajevo - Clinic of Cardiovascular Surgery, Sarajevo, Bosnia and Herzegovina; [2]General Hospital „Prim. Dr. Abdulah Nakaš" - Radiology, Sarajevo, Bosnia and Herzegovina; [3]BH Heart Center Tuzla, Tuzla, Bosnia and Herzegovina; [4]University Clinical Centre of Sarajevo - Clinic for Cardiovascular Surgery, Sarajevo, Bosnia and Herzegovina; [5]Faculty of Medicine, Sarajevo, Bosnia and Herzegovina; [6]Policlinic "Dr. Kamenjašević", Brčko, Bosnia and Herzegovina

Citation: Djedović M, Imširović B, Djedović S, Hadžimehmedagić A, Vukas H, Rovčanin B, Kamenjašević I. Carotid Endarterectomy in Women versus Man: Patient Characteristics and Perioperative Complication (<30 Day). Open Access Maced J Med Sci. 2018 Mar 15; 6(3):463-466. https://doi.org/10.3889/oamjms.2018.109

Keywords: Perioperative complications; Carotid endarterectomy; Atherosclerosis; Risk factors; Sex

***Correspondence:** Muhamed Djedović. University Clinical Centre of Sarajevo - Clinic of Cardiovascular Surgery, Sarajevo, Bosnia and Herzegovina. E-mail: djedovicm@hotmail.com

Received: 17-Jan-2018; **Revised:** 02-Feb-2018; **Accepted:** 07-Feb-2018; **Online first:** 24-Feb-2018

Funding: This research did not receive any financial support

Competing Interests: The authors have declared that no competing interests exist

Abstract

AIM: Compare the basic characteristics of patients and to examine the existence of higher rates of perioperative complications (0 - 30 days) in women versus men after carotid endarterectomy (CEA).

METHODS: This is a retrospective-prospective study included 270 patients with significant stenosis of carotid in whom CEA was performed, during the period from 2012 to 2017. Patients they were divided: group 1 - 100 female patients, group 2 - 170 male patients.

RESULTS: No statistically significant age difference was observed between the two groups, group 1 - 66.01 years (SD 8.42, 46 to 86 years), group 2 - 66.46 years (SD 8.03, 47 to 85 years) (p = 0.659). Risk factors represent a greater prevalence in group 2, but the observed difference is not statistically significant. The average duration of surgery and the time of carotid artery clamping time were longer in group 1: (p = 0.002; p = 0.005). The number of classic endarterectomy with the patch was higher in women (41 (41%) versus 31 (18. 2%), p = 0.005), while the number of bilateral CEAs was not statistically significant.

CONCLUSION: The results of this study of this study did not indicate a greater presence of perioperative complications (< 30 days) in women versus male patients after CEA.

Introduction

Cerberovascular insult (CVI) is the third most common cause of death in industrialized countries, the most common neurological diagnosis requiring hospitalization [1] and the leading cause of disability in the world [2[[3], while not all CVI - s are caused by atherosclerotic carotid artery disease (stenosis, occlusion).

After the first carotid endarterectomy (CEA) performed by De Bakey, the method was established as a safe and effective way to reduce the risk of CVI in patients with critical stenosis of carotid arteries. Today, CEA is a surgical method with low mortality and acceptable incidence of perioperative complications (30 days) in most centres dealing with this issue [4] [5]. Also, the superiority of surgical treatment in patients with symptomatic [6] and asymptomatic carotid artery stenosis is well known [5] [7]. CEA can cause severe perioperative complications (i.e. stroke, death). It is presumed that women may have an increased risk of perioperative complications and that this risk may negate the overall benefit of the procedure in women, particularly in lower - risk subgroups with medicament therapy for stroke prevention. Current literature provides contradictory evidence of CEA risk in women compared to men. Some studies point to a higher

rate of perioperative complications in women [8] [9] [10], while others found no difference between women and men [6] [11] [12] [13] [14] [15] [16].

The study aimed to compare the basic characteristics of patients and to examine the existence of higher rates of perioperative complications (0 - 30 days) in women versus men after CEA.

Patients and Methods

This was a retrospective-prospective observational clinical cohort study conducted in the period from January 2012 to October 2017. Patients with stenosis of carotid arteries in whom CEA was performed at the Clinical Center of the University of Sarajevo were included.

Depending on the sex of the patients were divided into two groups: group 1, consisting of 100 female patients, group 2 - consisting of 170 male patients. The preoperative risk factors were compared between the two groups: hypertension (HTA), hyperlipidemia (HLP), smoking, diabetes mellitus (DM), non - surgical coronary artery disease (CAD) as well as demographic factors, significant stenosis of carotid arteries, the presence of preoperative neurological symptomatology (vertigo, transient ischemic attack (TIA), amaurosis fugax and small CVI). From the perioperative results, the total duration of the operation (time from the first surgical incision to the last suture expressed in minutes), the length of clamping of internal carotid artery (ICA) (expressed in minutes), prosthetic material used in closing the arteriotomy in the classical endarterectomy as well as the history of contralateral side CEA. Of the perioperative complications (< 30 days), CVI and mortality were analysed.

The exclusion criteria included: patients with restenosis of carotid arteries, stenosis of carotid arteries with associated stenosis of supraorbital branches, aneurysms of carotid arteries, carotid artery dissection, CEA and peripheral revascularisation performed in the same patient.

The CEA was performed with the eversion (E - CEA) and the classic (C - CEA) technique with Dacron patch, without the use of a shunt. Surgical treatment is indicated in asymptomatic patients with stenosis of 70 to 99 %, and in symptomatic patients with stenosis > 60 % (criteria for inclusion in the study). Stenosis is determined by Doppler ultrasound and CT angiography or MRI angiography. Basic data sources were computerised databases and standard histories of hospitalised patients (history, operating list, temperature list, letter of release). Anesthesiologists, vascular surgeons, participated in the evaluation of patients' clinical condition independently of each other.

Eversion carotid endarterectomy (E-CEA) technique implied carotid bifurcation level transection and removal of atherosclerotic plaque by artery eversion of ICA, then removal of plaque from an external carotid artery (ECA) and common carotid artery (CCA) and anatomic reimplantation of ACI. Classical carotid endarterectomy (C - CEA) technique was performed by longitudinal arteriotomy of CCA and ICA and by removal of atherosclerotic plaque. Arteriotomy was closed using a prosthetic patch. The later was used in cases of the small diameter of CCA and ICA (< 5 mm).

Statistical analyses

The statistical analyses were performed with SPSS (v. 21.0, SPSS Inc., Chicago, Illinois, USA). We compared clinical characteristics between group 1 and group 2 for qualitative variables using Mann - Whitney U test and Student's t-test. Chi-squared, using Yates correction and Fisher's exact probability test, was used to compare categorical variables. A probability value of < 0.05 was considered statistically significant.

Results

Of the 270 patients involved in the study, group 1 had 100 female patients and in the group 2 170 male pateints. The mean age in group 1 was 66.01 years (SD 8.42, ranging from 46 to 86 years), in group 2 66.46 years (SD 8.03, ranging from 47 to 85 years). Dacron patch (in C - CEA patients) was used in 41 subjects in group 1 (41%) and in 31 group 2 (18.2%). The risk factors (smoking, DM, HTA, HLP, CAD) indicates a higher number in group 2 but the observed difference is not statistically significant: smoking: 46 (46%) versus 73 (42.9%); p = 0.717, HTA: 92 (92%) versus 148 (87.1%); p = 0.295, HLP: 87 (87%) versus 141 (82.9%); p = 0.475, DM: 35 (35%) versus 55 (32.4%); p = 0.751 and CAD: 20 (20%) versus 44 (25.9%); p = 0.342, (Table 1).

Table 1: Patient's demographic data, risk factors, and comorbidities

	Group 1 (N = 100, 37%)	Group 2 (N = 170, 63%)	P-value
Mean age (yr)	66.01 ± 8.42	66.46 ± 8.03	0.659
Arterial hypertension	92 (92%)	148 (87.1%)	0.295
Diabetes mellitus	35 (35%)	55 (32.4%)	0.751
Hyperlipidemia	87 (87%)	141 (82.9%)	0.475
Smoker	46 (46%)	73 (42.9%)	0.717
Coronary artery disease	20 (20%)	44 (25.9%)	0.342

HTA - Arterial hypertension; DM - Diabetes mellitus; HLP - Hyperlipidemia; CAD - Coronary artery disease.

The incidence of symptomatic stenosis of carotid arteries was not statistically significant

between groups (group 1: (62 (62%) and in group 2: 103 (60.3%), p = 0.921). A statistically significant difference between symptoms of carotid stenosis in groups was observed only in patients with TIA (group 1: 19 (19%) versus group 2: 14 (8.2%), p = 0.016), vertigo (group 1: 23 (23%) versus group 2: 46 (27.1%), p = 0.682), small CVI (group 1: 11 (11%) versus group 2: 24 (4.1%), p = 0.582), amaurosis fugax (group 1: 9 (9%) versus group 2: 19 (11.2%), p = 0.719). There was no statistically significant difference in the number of asymptomatic patients between groups (group 1: 38 (38%) versus group 2: 67 (39.4%), p = 0.92), patients with bilateral stenosis (group 1: 32 (32%) versus group 2: 72 (42.4%), p =0.119) and contralateral occlusion (group 1: 11 (11%) versus group 2: 9 (5.3%), p = 0.137).

The average duration of surgery and clamping time was statistically significantly lower in group 2: duration of surgery (group 1: 103.45 min (SD 15.41) ranging from 75 min to 130 min versus group 2: 97.46 min (SD 13.87) ranging from 75 min to 130 min, p = 0.002), carotid artery clamping time (group 1: 19.58 (SD 5.43) in the range of 11 min to 32 min versus group 2: 17.61 (SD 4.82) in the range of 10 min to 35 min, p = 0.005). In women, the number of C - CEA in which patch was used was statistically significantly higher than in man (41 (41 %) versus 31 (18.2 %), p = 0.005), while the number of bilateral CEAs (formerly CEA contralateral) was not statistically significance between groups (group 1 10 (10%) versus group 2 21 (12.4%), p = 0.695), (Table 2).

Table 2: Clinical and anatomical features and surgical variable

	Group 1 (n = 100)	Group 2 (n = 170)	p – value
Preoperative symptoms	62 (62%)	103 (60.6%)	0.921
TIA	19 (19%)	14 (8.12 %)	0.016
Amaurosis fugax	9 (9%)	19 (11.2%)	0.719
CVI	11 (11%)	24 (14.1 %)	0.582
Vertigo	23 (23%)	46 (27.1%)	0.682
Asimptomatic patiens	38 (38%)	67 (39.4%)	0.92
Bilateral stenosis	32 (32%)	72 (42.4%)	0.119
Contralateral occlusio	11 (11%)	9 (5.3%)	0.137
Time of clamping ICA	19.58 ± 5.43	17.61 ± 4.82	0.005*
Operative time	103.45 ± 15.41	97.46 ± 13.87	0.002*
Patch closure	41 (41%)	31 (18.2%)	0.005*
Bilateral CEA	10 (10%)	21 (12.4%)	0.695

TIA - Transient ischemic attack; CVI - cerebrovascular insult; ICA - internal carotid artery.

Analysis of perioperative complications (< 30 days) CVI and/or mortality did not indicate a statistically significant difference between the analyzed groups 1 and 2 (stoke 7 (7%) versus 6 (3.5%), p = 0.242, death 2 (2%) versus 0.6% p = 0.557; stoke/death 9 (9%) versus 7 (4.1%); p = 0.169, all retrospectively). The total incidence of perioperative complications during the study was 16 (5.9%), (Table 3).

Table 3: Perioperative (< 30 days) complication

	Group 1 (n = 100)	Group 2 (n = 170)	p - value	Total (n = 270)
Stroke	7 (7%)	6 (3.5%)	0.242	13 (4.8%)
Death	2 (2.0%)	1 (0.6%)	0.557	3 (1.1%)
30 - day and Stroke/death	9 (9%)	7 (4.1%)	0.169	16 (5.9%)

Discussion

After the first CEA made by De Bakey [17], the same was established as a safe and effective method for lowering the risk of CVI in patients with significant stenosis of carotid arteries. Today, the CEA is a method with low mortality and incidence of perioperative complications, both in symptomatic [6] and in asymptomatic stenosis of carotid arteries [5] [7]. Two randomised studies of the 1990s have shown CEA's advantages over drug therapy for patients with moderate or severe internal carotid artery stenosis [7] [18]. The benefit of CEA in women remains, still, unclear.

The ACAS study showed a significant reduction of CVI risk in men versus women after CEA (66% versus 17%, retrospectively), most of these differences can be attributed to higher perioperative stroke and mortality rates in women compared to males (3.6 % versus 1.7 %, retrospectively) [7], other studies have reported similar results [4] [18] [19]. Recent large retrospective studies have been performed to assess the benefits and risks of CEA in women. Akbar et al. reported a series of 1298 CEA patients, of which 520 (40%) were women, with no differences in perioperative stroke between women and men (1.2% vs 1.7%, retrospectively). They concluded that female gender is not a risk factor for stroke, death or cardiac morbidity after CEA [15]. Also, Mattos et al. did not report an increased risk to a woman [14]. Similar results were found in our study where there was no statistically significant difference between female and male patients in perioperative complications (< 30 days) (9% versus 4.1%; p = 0.169, retrospectively). Unlike our research, there are newer researchers suggesting an increased risk for women [9]. Our research did not point a statistically significant difference in perioperative complications between men and women. Such results were obtained despite increased comorbidity (HTA, HLP, DM; smoking, CAD) in males, and despite smaller diameter of vessels and increased use of patch in women.

Like our study, Kapral et al. did not report a statistically significant difference in the presence of a contralateral occlusion in patients [20], and other studies did not report the correlation of contralateral occlusion and increased the perioperative risk of CVI and death [21] [22]. Statistically, significantly higher CEA using C - CEA (using prosthetic patch) technique is in women (41 (41%) versus 31 (18.2%), p = 0.005) is associated with a smaller blood vessel diameter (CCA, ICA). There is also a markedly longer time for carotid artery clamping in women than in man (19.58 ± 5.43 versus 17.61 ± 4.82, p = 0.005 retrospectively), and duration of surgery for women than man (103.45 ± 15.4 versus 97.46 ± 13.87, p = 0.002, retrospectively). More gracile blood vessels require the use of patch when

closing the arteriotomy (thereby reducing the possibility of restenosis), which in turn extends the time of clamping and thus the length of the operation. Study Doriga et al. [23] as our does not indicate a significant difference in the prevalence of symptomatic and asymptomatic stenosis of carotid arteries in women.

According to the results of this study, there is no statistically significant difference in perioperative complications (< 30 days) between women and men. Thos results have been confirmed by previous studies. The reason for this kind of results can be found in a relatively small sample of the patients, and in lager studies, there is a possibility for different results.

References

1. Wolf PA, Clagett GP, Easton JD, et al. Preventing ischemic stroke in patients with prior stroke and transient ischemic attack: a statement for healthcare professionals from the Stroke Council of the American Heart Association. Stroke. 1999; 30 (9):1991– 1994. https://doi.org/10.1161/01.STR.30.9.1991 PMid:10471455

2. Paraskevas KI, Mikhailidis DP. Internal carotid artery occlusion: association with atherosclerotic disease in other arterial beds and vascular risk factors. Angiology. 2007; 58(3):329–335. https://doi.org/10.1177/0003319707301754 PMid:17626988

3. Alexander JJ, Moawad J, Super D. Outcome analysis of carotid artery occlusion. Vase Endovasc Surg. 2007; 41(5):409–416. https://doi.org/10.1177/1538574407305095 PMid:17942856

4. Randomised trial of endarterectomy for recently symptomatic carotid stenosis: final results of the MRC European Carotid Surgery Trial (ECST). Lancet. 1998; 351(9113):1379– 1387. https://doi.org/10.1016/S0140-6736(97)09292-1

5. Halliday A, Harrison M, Hayter E, et al. 10-year stroke prevention after successful carotid endarterectomy for asymptomatic stenosis (ACST-1): a multicentre randomised trial. Lancet. 2010; 376(9746):1074–1084. https://doi.org/10.1016/S0140-6736(10)61197-X

6. Barnett H, Taylor W, Eliasziw M, Fox A, Gary F, Brian H. et al. Benefit of Carotid Endarterectomy in Patients with Symptomatic Moderate or Severe Stenosis. North American Symptomatic Carotid Endarterectomy Trial Collaborators. The New England Journal of Medicine. 1998; 339(20): 1415-1425. https://doi.org/10.1056/NEJM199811123392002 PMid:9811916

7. Walker MD, Marler JR, Goldstein M, Grady PA, Toole JF, Baker WH, et al. Executive Committee for the Asymptomatic Carotid Atherosclerosis Study. Endarterectomy for Asymptomatic Carotid Stenosis. The Journal of the American Medical Association. 1995; 273(18): 1421-1428. https://doi.org/10.1001/jama.1995.03520420037035

8. Halliday A, Mansfield A, Marro J, Peto C, Peto R, Potter J, et al. Prevention of disabling and fatal strokes by successful carotid endarterectomy in patients without recent neurological symptoms: randomised controlled trial. Lancet. 2004; 363(9420):1491–1502. https://doi.org/10.1016/S0140-6736(04)16146-1

9. Sarac TP, Hertzer NR, Mascha EJ, O'Hara PJ, Krajewski LP, Clair DG, et al. Gender as a primary predictor of outcome after carotid endarterectomy. J Vasc Surg. 2002; 35:748–753. https://doi.org/10.1067/mva.2002.120375 PMid:11932674

10. Bond R, Narayan SK, Rothwell PM, Warlow CP, European Carotid Surgery Trialists' Collaborative Group. Clinical and radiographic risk factors for operative stroke and death in the European Carotid Surgery Trial. Eur J Vasc Endovasc Surg. 2002; 23:106–116. https://doi.org/10.1053/ejvs.2001.1541 PMid:11863327

11. Sternbach Y, Perler BA. The influence of female gender on the outcome of carotid endarterectomy: a challenge to the ACAS findings. Surgery. 2000; 127:272–275. https://doi.org/10.1067/msy.2000.104120 PMid:10715981

12. Rockman CB, Castillo J, Adelman MA, Jacobowitz GR, Gagne PJ, Lamparello PJ, et al. Carotid endarterectomy in female patients: are the concerns of the Asymptomatic Carotid Atherosclerosis Study valid? J Vasc Surg. 2001; 33:236–241. https://doi.org/10.1067/mva.2001.111804 PMid:11174773

13. James DC, Hughes JD, Mills JL, Westerband A. The influence of gender on complications of carotid endarterectomy. Am J Surg. 2002; 182: 654–657. https://doi.org/10.1016/S0002-9610(01)00787-5

14. Mattos MA, Sumner DS, Bohannon WT, Parra J, McLafferty RB, Karch LA, et al. Carotid endarterectomy in women: challenging the results from ACAS and NASCET. Ann Surg. 2002; 234:438–445. https://doi.org/10.1097/00000658-200110000-00003

15. Akbari CM, Pulling MC, Pomposelli FBJ, Gibbons GW, Campbell DR, LoGerfo FW. Gender and carotid endarterectomy: does it matter? J Vasc Surg. 2000; 31:1103–1109. https://doi.org/10.1067/mva.2000.106490 PMid:10842146

16. Ballotta E, Renon L, Da Giau G, Sarzo G, Abbruzzese E, Saladini M, et al. Carotid endarterectomy in women: early and long-term results. Surgery. 2000; 127:264–271. https://doi.org/10.1067/msy.2000.103161 PMid:10715980

17. De Bakey ME, Crawford ES, Cooley DA, Moriss CG Jr. Surgical considerations of occlusive disease of innominate, carotid, subclavina and vertebral arteries. Ann Surg l959; 149(5): 690-710.

18. North American Symptomatic Carotid Endarterectomy Trial (NASCET) Investigators. Benefit of carotid endarterectomy for patients with highgrade carotid stenosis. N Engl J Med. 1991; 325:445-453. https://doi.org/10.1056/NEJM199108153250701 PMid:1852179

19. MRC Asymptomatic Carotid Surgery Collaborative Group. Prevention of disabling and fatal strokes by successful carotid endarterectomy in patients without recent neurological symptoms: randomised controlled trial. Lancet. 2004; 363:1491-1502). https://doi.org/10.1016/S0140-6736(04)16146-1

20. Kapral MK, Wang H, Austin PC, et al. Sex differences in carotid endarterectomy outcomes: results from the Ontario Carotid Endarterectomy Registry. Stroke. 2003; 34:1120–1125. https://doi.org/10.1161/01.STR.0000066681.79339.E2 PMid:12690225

21. AbuRahma AF, Robinson P, Holt SM, Herzog TA, Mowery NT. Perioperative and late stroke rates of carotid endarterectomy contralateral to carotid artery occlusion: results from a randomized trial. Stroke. 2000; 31:1566-1571. https://doi.org/10.1161/01.STR.31.7.1566 PMid:10884455

22. Pulli R, Dorigo W, Barbanti E, Azas L, Russo D, Matticari S, et al. Carotid endarterectomy with contralateral carotid artery occlusion: is this a higher risk subgroup? Eur J Vasc Endovasc Surg. 2002; 24:63-68. https://doi.org/10.1053/ejvs.2002.1612 PMid:12127850

23. Dorigo W, Pulli R, Marek J, et al. Carotid endarterectomy in female patients. J Vasc Surg. 2009; 50:1301–1307. https://doi.org/10.1016/j.jvs.2009.07.013 PMid:19782512