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Original Article

Impact of Age on Early Complications of Carotid Endarterectomy In Pakistani Population

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ABSTRACT

Objective: To identify the impact of age on early complications after carotid endarterectomy.
Study Design: Prospective longitudinal study
Place and Duration of Study: Department of Vascular Surgery Combined Military Hospital Rawalpindi Pakistan from January 2020 to September.
Methodology: All patients undergoing carotid endarterectomy regardless of age and gender were included in study. Patients with concomitant CABG, recurrent carotid stenosis, prior neck surgery or irradiation were excluded from the study. All patients were followed till 3rd post-operative day for any complications specially designed structured proformas were used to enter patient data and outcomes.
Results: A total of 80 patients were enrolled in the study. Total complicated cases were 12(15%) out of 80. Sixty-eight (85%) patients did not develop any complications. The mean age for complicated group was 67.00±7.68 years and for uncomplicated group was 66.32±6.24 with *p*-value of 0.739.
Conclusion: Age is not associated with development of complications in patients undergoing carotid endarterectomy.

Keywords: Carotid endarterectomy, Carotid stenosis, Stroke

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INTRODUCTION

Stroke is a debilitating illness causing considerable morbidity and mortality. It leads to paralysis and long term dependency. The incidence of stroke in Pakistani population is 95/100,000.[1] Carotid artery stenosis is one of the common causes of stroke.[2] Stroke is usually seen in patients with advancing age.

Carotid artery stenosis is usually caused by atherosclerotic plaque which reduces the blood flow to the brain and can result in thromboembolic stroke.

Carotid endarterectomy is the standard treatment for both asymptomatic and symptomatic carotid artery stenosis .It is usually performed in stenosis > 50 % with symptoms and > 60 % without symptoms.[3] The reported postoperative complications are neck hematoma, marginal mandibular nerve neuropraxia, hypoglossal, vagus and glossopharyngeal nerve injury,[4] and stroke.[5]

Carotid stenosis requiring carotid endarterectomy usually occurs in old age groups. The old age patients may have co morbid medical illnesses like diabetes mellitus and hypertension. Many of them have had coronary interventions. They are more prone to develop complications after undergoing surgical intervention.

Limited data is available in Pakistan regarding any relationship of age with occurrence of post-operative complications in patients undergoing carotid endarterectomy. Therefore there is no evidence based guideline supporting the relationship of age and postoperative complications in Pakistani population.

This study was designed to fill this gap and provide an evidence based conclusion to support the decision of carotid endarterectomy with respect to age in Pakistani population.

The objective of the study was to identify the occurrence of postoperative complications with respect to age of patients undergoing carotid endarterectomy in Pakistani population.

METHODOLOGY

This Prospective longitudinal studywas conducted at Department of Vascular Surgery Combined Military Hospital Rawalpindi, Pakistan from January 2020 to September 2021 with IERB number 205/01/20. Our calculated sample size was 80. The sampling technique was non probability convenient sampling. The sample size was calculated using the WHO sample size calculator keeping a

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confidence level of 95%, an absolute precision of 0.039 and an anticipated population proportion of 0.023.[6]

Inclusion Criteria: All patients undergoing carotid endarterectomy regardless of age and gender were included in study.

Exclusion Criteria: Patients with concomitant CABG, recurrent carotid stenosis, prior neck surgery or irradiation were excluded from the study.

All cases were operated by consultant vascular surgeon as operator and a vascular fellow as assistant. The anesthesia used was superficial cervical block with intravenous sedation. Vertical incision on the anterior border of the sternocleidomastoid muscle was made. After gaining vascular control, anti-coagulation was given and the vascular clamps were applied. The sequence of clamping was internal carotid artery, followed by common carotid artery and then external carotid artery. The carotid artery was opened by anteriorly placed arteriotomy and the atheroma was removed with the feathering technique. At arteriotomy closure it was assessed whether to close the arteriotomy primarily or using a patch. Both are accepted techniques and depends upon surgeons' preference and institutional experience.[7- 10] We closed primarily in 68 patients and by Dacron patch in 02 patients. JAVID Shunt was used for per-operative neurological symptoms if required. Suction drain was placed in all patients and removed after 24 hours.

All patients were given anti-coagulation by heparin post-operatively and all patients were admitted in intensive care or high dependency unit for the first 24 hours post-operatively and subsequently shifted to inpatient floors for a further 24 hours. In the absence of any complication all were discharged on third post-operative day.

Specially designed structured proforma were used to enter patient data and complications observed after carotid endarterectomy.

Specially designed structured proforma were used to enter patient data and outcomes. Data was analyzed by using SPSS 25.00.Chi square test was used to find the association between the variables. The *p*-value ≤ 0.05 was taken as significant. Student t test was used to evaluate the relationship of age and complications.

RESULTS

A total of 80 patients were enrolled in the study. Total complicated cases were 12(15%) out of 80. Sixty eight (85%) patients did not develop any complications. Among the complicated patients 7(58.3%) were partially dependent because of hemiplegia and speech problems for routine activities and 5(41.6 %) were independent. Regarding co-morbid medical illnesses the patients who had diabetes mellitus and hypertension showed complications in 8(66.6%). The patients with hypertension only showed complications in 2(16.6%) patients and the patients who had hypertension, diabetes mellitus and coronary intervention showed 2(16.6%) cases of complications. Male patients had post-operative complications more in comparison to female but the difference was insignificant with *p* value of 0.152 as shown in Table-I.

Table-I: Demographic and Clinical Characteristics of the Patients

Characteristics	Post-operative outcomes		*p*-value
	Complicated cases (n=12) n(%)	Uncomplicated cases(n=68) n(%)	
Gender Male Female	10(12.5%) 2(2.5%)	43(53.8%) 25(31.3%)	0.152
Smoking Yes No	10(12.5%) 2(2.5%)	41(51.2%) 27(33.8%)	0.194
Co-morbids Diabetes Mellitus Diabetes Mellitus +Hypertension Diabetes Mellitus +Hypertension + Coronary Intervention	2(2.5%) 8 (10.0%) 2(2.5%)	18(22.5%) 27(33.8%) 23(28.7%)	0.218
Dependency Independent Partially dependent	7(8.8%) 5(6.3%)	39(48.8%) 29(36.3%)	0.949

The mean age in complicated group was 67.00±7.68 years and in uncomplicated group was 66.32±6.24 with *p*-value of 0.739 as shown in Table-II.

Table-II: Impact of Age on Post-Operative Outcomes

Age in years (Mean±SD)	Post-operative outcomes		*p* - value
	Complicated cases(n=12)	Uncomplicated cases(n=68)	
	67.00±7.68 years	66.32±6.24 years	0.739

DISCUSSION

Atherosclerotic Carotid artery stenosis is an important cause of ischemic stroke in 20-30 % of patients.[11]

Dr Michael Debakey at Methodists hospital USA did carotid endarterectomy for carotid stenosis in 1953.[12] and since then it is considered as the standard treatment for significant carotid artery stenosis in asymptomatic and symptomatic patients.

One of the famous trials regarding CEA was NASCET trial which was done in 1980s.[13] The benefits of CEA and medical therapy were compared. The risk of stroke and death was found 08 % in surgical group and 19.1 % in medical group.

The overall complications rate in various studies is reported < 03 %.[14] Perioperative mortality in European trial was found 0.8 % and 0.3 % in North America.[15]

The internationally reported incidence of bleeding which requires exploration after CEA is 1.8 % and cranial nerve injury is 1.8 %.[16]

In our study group one patient (1.25%) developed neck hematoma deep to fascia and required exploration. It was evacuated followed by smooth recovery.

Four patients (5%) developed subcutaneous hematomas which were settled without intervention.

There is an international incidence of cranial nerve injuries ranging from 5-6 %.[17] two (2.5%) patients in our group developed neuropraxia of marginal mandibular nerve. These patients had higher bifurcation of common carotid artery and neuropraxia resulted from traction on marginal mandibular nerve.

One of our patients developed myocardial infarction (1.25%).The internationally reported incidence is 02 %.[18]

Our patient was treated by cardiologist and discharged on 5th day post-operative.

Postoperative stroke occurred in 04 patients (5%).Both patients had arm and speech weakness and were followed up by neurologist.

There was no permanent nerve injury and no death occurred in our study group.

Age is an important parameter to consider while making decision in a surgical patient. Advancing age has physiological implications over the patient and certainly the outcome is influenced by age related factors.

Old age patients frequently have co morbid illnesses, compromised pulmonary reserves and suboptimal hepatorenal metabolism and excretion of drugs.

These factors become more important when in patients with vascular diseases because atherosclerosis affects all areas in the body. Specially heart and brain.

So it is quite understandable that surgical interventions in old age patients carries risks.

Carotid endarterectomy is a major intervention because it involves manipulation of a diseased high pressure vessel which is the chief supplier of brain.

In addition to local surgical complications which include perioperative stroke and cranial nerve injuries these patients are at risk of systemic complications including myocardial infarction.

They are also having risks associated with general anesthesia or sedation used with local anesthesia.

Our data suggested that age seems not to be associated with development of complications. The complications observed (names of complications) were in the groups which have almost same age as that of non-complicated group.

Males tend to develop more complications as compared to females.

The patients with effects of CVA were dependent and showed more occurrence of complications than the patients who were independent in their life activities.

Co morbid medical illnesses were an important parameter .Diabetes and hypertension was found to be most dangerous combination regarding development of complications.

Age seems to be not related with the developments of early postoperative complications and it appears that carotid endarterectomy can be performed in all age groups.

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LIMITATIONS OF STUDY

The limitations of our study was small sample size and short duration of study period.

CONCLUSION

Our study concluded that age is not associated with development of complications in patients undergoing carotid endarterectomy.

Conflict of Interest: None.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

KSK: & MJ: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

MAR: & MIK: Data acquisition, data analysis, approval of the final version to be published.

SN: & AM: Critical review, concept, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Khan MI, Khan JI, Ahmed SI, Haq U. The Epidemiology of stroke in a developing country (Pakistan). J Neurol Stroke. 2018; 8(1): 00275.
2. Arif, S., Nawaz, K., Hashmat, A., Alamgir, W., & Muhammad, W. Burden of carotid artery disease in ischemic stroke patients with and without diabetes mellitus. Pak Armed Forces Med J, (2019) 69(4), 926-30.
3. Saha SP, Saha S, Vyas KS. Carotid Endarterectomy: Current concepts and practice patterns. Int J Angiol. 2015 Sep; 24(3): 223-35.
4. Kakisis JD, Antonopoulos CN, Mantas G, Moulakakis KG, Sfyroeras G, Geroulakos G. Cranial Nerve Injury After Carotid Endarterectomy: Incidence, Risk Factors, and Time Trends. Eur J Vasc Endovasc Surg. 2017 ; 53(3): 320-335. https://doi: 10.1016/j.ejvs.2016.12.026.
5. Halm EA, Tuhrim S, Wang JJ, Rockman C, Riles TS, Chassin MR. Risk factors for perioperative death and stroke after carotid endarterectomy: results of the new york carotid artery surgery study. Stroke. 2009; 40(1): 221-229. https://doi:10.1161/STROKEAHA.108.524785
6. Chiesa R, Melissano G, Castellano R, Tshomba Y, Marone EM, Civilini E, et al. Carotid endarterectomy: experience in 8743 cases. HSR Proc Intensive Care Cardiovasc Anesth. 2009; 1(3): 33-45.
7. Avgerinos ED, Chaer RA, Naddaf A, El-Shazly OM, Marone L, Makaroun MS. Primary closure after carotid endarterectomy is not inferior to other closure techniques. J Vasc Surg. 2016 Sep; 64(3): 678-683.e1. https://doi: 10.1016/j.jvs.2016.03.415. Epub 2016 May 14.
8. Cheng I, Vyas KS, Velaga S, Davenport DL, Saha SP. Outcomes of Carotid Endarterectomy with Primary Closure. Int J Angiol. 2017 Jun; 26(2): 83-88. https://doi: 10.1055/s-0037-1601053.
9. Myers SI, Valentine RJ, Chervu A, Bowers BL, Clagett GP. Saphenous vein patch versus primary closure for carotid endarterectomy: long-term assessment of a randomized prospective study. J Vasc Surg. 1994 ; 19(1): 15-22. https:// doi: 10.1016/s0741-5214(94)70116-4.
10. Pappas D, Hines GL, Yoonah Kim E. Selective patching in carotid endarterectomy: is patching always necessary? J Cardiovasc Surg (Torino). 1999 Aug; 40(4): 555-9.
11. Adams HP Jr. Secondary prevention of atherothrombotic events after ischemic stroke. Mayo Clin Proc. 2009; 84(1): 43-51.
12. Houston Hearts: A history of cardiovascular surgery and medicine and the Methodist DeBakey Heart & Vascular Center Houston Methodist Hospital. Proc (Bayl Univ Med Cent). 2014; 27(4): 381-382.
13. Gary G. Ferguson, Michael Eliasziw, Hugh W. K. Barr, G. Patrick Clagett, Robert W. Barnes, M. Christopher Wallace, D. Wayne Taylor, R. Brian Haynes, Jane W. Finan, Vladimir C. Hachinski, Henry J. M. Barnett and for the North American Symptomatic Carotid Endarterectomy Trial (NASCET) Collaborators Stroke. Stroke. 1999; 30: 1751–1758
14. Sacquegna T, D'Addato M, Baldrati A, Cortelli P, Lamieri C,Merlo Pich E, et al. Long-term prognosis after carotid endarterectomy. Eur Neurol.1986; 25(1): 369.
15. Kragsterman B, Logason K, Ahari A, Troëng T, Parsson H, Bergqvist D. Risk factors for complications after carotid endarterectomy--a population-based study. Eur J Vasc Endovasc Surg. 2004 Jul; 28(1): 98-103.
16. https:// doi: 10.1016/j.ejvs.2004.03.016.
17. Tamaki T, Morita A. Neck haematoma after carotid endarterectomy: risks, rescue, and prevention. Br J Neurosurg. 2019 Apr; 33(2): 156-160.
18. Cnotliwy M, Gasińska M, Petriczko W, Gutowski P, Szych Z. Trwałe miejscowe uszkodzenia nerwów po udroznieniu tetnicy szyjnej wewnetrznej, Permanent local nerve injuries after carotid endarterectomy. Wiad Lek. 2005; 58(7-8): 375-8. Polish.
19. Boulanger M, Camelière L, Felgueiras R, Berger L, Rerkasem K, Rothwell PM, et al. Peri-procedural myocardial infarction after carotid endarterectomy and stenting: Systematic review and meta-analysis. Stroke. 2015 Oct; 46(10): 2843-8.