Updated Management of Extracranial Carotid Occlusive Disease

An Essay

Submitted For Partial Fulfillment of Master Degree **In General Surgery**

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List of Abbreviations

(ACST)	:	Asymptomatic Carotid Surgery Trial
(BMI	:	Body Mass Index
2-d TOF	:	Two- dimensional time-of-flight
3-d TOF	:	Three-dimensional time-of- flight
ACAS)	:	AsymptomaticCarotid Atherosclerosis Study
ADP	:	Adenosine diphosphate
AF	:	Atrial fibrillation
ASA	:	Acetylsalicyclic acid
CA	:	Carotid arteriography
CADASIL	:	Cerebral dominant arteriopathy with subcortical infarcts and leucoencaphalopathy
CAS	:	Caotid artery stenting
CAVATAS	:	Carotid and Vertebral Artery Transluminal Angioplasty Study
CEA	:	Carotid endarterectomy
COPD	:	Chronic obstructive pulmonary disease
COX II	:	Cyclo oxygenase II

CREST	:	Carotid Revascularization Endarterectomy vs. Stenting Trial

List of Abbreviations (Cont…)

CT	:	Computed tomography
CTA	:	Computed tomography angiography
DM	:	Diabetes Mellitus
DSA	:	Digital subtraction angiography
EPD	:	Embolic prevention devices
EVA-3S	:	Endarterectomy versus Angioplasty in Patients with Severe Symptomatic Carotid Stenosis
FMD	:	Fibromuscular dysplasia
GP	:	Glycoprotein
GSM	:	Gray Scale Median
HDL	:	High density lipoproteins
ICA	:	Internal carotid artery
IVDSA	:	Intravenous digital subtraction angiography
LDL	:	Low density lipoproteins
MI	:	Myocardial infarction
MRA	:	Magnetic resonance angiography
NASCET	:	North American Symptomatic Carotid Endarterectomy Trial

NINDS : National Institute of Neurological Disorders and Stroke

List of Abbreviations (Cont…)

PET : Positron emission tomography

PTFE : Polytetrafluoroethylene

PTT : Partial thromboplastin time

RIND : Reversible ischemic neurologic deficit

SAPPHIRE: Stenting and Angioplasty with Protection in Patients at High Risk for Endarterectomy

SHEP : Systolic Hypertension in the Elderly Program

SPACE : Stent-Supported Percutaneous Angioplasty of the Carotid Artery versus Endarterectomy

Syst-Eur : Systolic Hypertension in Europe

T.I.As : Transient Ischemic Attacks

VCAM-1 : Vascular endothelium adhesion molecule

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INRODUCTION

Vascular surgeon has become a key member of health care involved in treatment of patient with cerebrovascular disease and by far carotid occlusive disease one of most common causes of cerebrovascular disease. This involvement in the care of such patients has been the direct effect of successful reconstruction of the carotid and vertebral arteries for relief of stenotic or ulcerated arterial lesions aneurysms and vascular tumors located in the neck *(Bails & Julian et al., 2002)*.

Clinical syndromes of cerebrovascular insufficiency vary from few minor symptoms to catastrophic stroke with paralysis and coma. A number of diagnostic tools have been developed over the past decade that facilitate the non invasive evaluation of cerebral ischemia *(Thompson & Blackenberg, 2006).*

Pathology of cerebrovascular disease of extra cranial origin can be divided into flow restrictive lesions and lesions of embolic potential. By far the most common lesion is the atherosclerotic in the carotid bifurcation. Other pathological lesions are

fibromuscular dysplasia, coils, kinks, aneurysms and arteritis *(Bogousslavasky et al., 1981).*

The goals of treatment are to relieve transient ischemic symptoms, to improve neurological function and to prevent occurrence of strokes in patients with extra cranial cerebrovascular occlusive disease *(Lanzino et al., 2001)*.

AIM OF THE WORK

The aim of the work is to highlight the causes, diagnosis & variety of approaches that have been described for treatment of Extracranial Carotid Occlusive Disease.

Anatomy of Extra cranial Carotid Circulation

The surgical approach for treatment of cerebrovascular diseases requires an understanding of the vascular anatomy that begins with the aortic arch with the principal intracranial arteries *(Deuttsch, 2005).*

Aortic arch and its branches:

The normal aortic arch curves smoothly upwards into the superior mediastinum, running from right to left and anterior to posterior, with its apex at approximately the mid-manubrium. It passes to the left of the trachea, arching over the pulmonary artery bifurcation and the left main bronchus, descending to the left of the esophagus. The ligamentum arteriosum, the fibrous remnant of the fetal ductus arteriosus, tethers the concave undersurface of the aortic arch to the proximal left main pulmonary artery, attaching at a point just distal to the left subclavian artery *(Deuttsch, 2005).*

In approximately 95% of all individuals, the aortic arch gives rise to three major branches: the right brachiocephalic trunk (formerly designated the innominate artery), the left common carotid artery and

the left subclavian artery. One of the most common variants is the common ostial origin of the brachiocephalic and the left common carotid arteries which occurs in approximately 10% of individuals and has been termed (bovine trunk) because of its occurrence in animal. However, few millimeters in length that then divides into the right brachiocephalic and the left common carotid arteries is relatively rare. Originating of the left vertebral artery dividing from the aorta proximal to the left subclavian artery is another common anatomic variant, occurring in approximately 5% of individuals *(Deuttsch, 2005).*

Right brachiocephalic trunk (innominate artery):

The right brachiocepalic trunk is the first major branch of the thoracic aorta and the largest of its branches. It originates in the superior mediastinum posterior to the mid-point of the sternal manubrium and passes superiorly and posteriorly for a distance of 4-6 cm, and then bifurcates into the right common carotid and right subclavian arteries in the root of the neck posterior to the right sternoclavicular joint. Whereas the proximal segments of the other major branches of the aortic arch are usually relatively straight, the right brachiocephalic trunk and the proximal segments of the right common carotid and subclavian arteries are often rather tortuous in elderly

patients. Such tortuousity, especially when it involves the right subclavian artery at the base of the neck, often can mimic aneurysmal dilatation on physical examination and angiography ***(Deuttsch, 2005).***

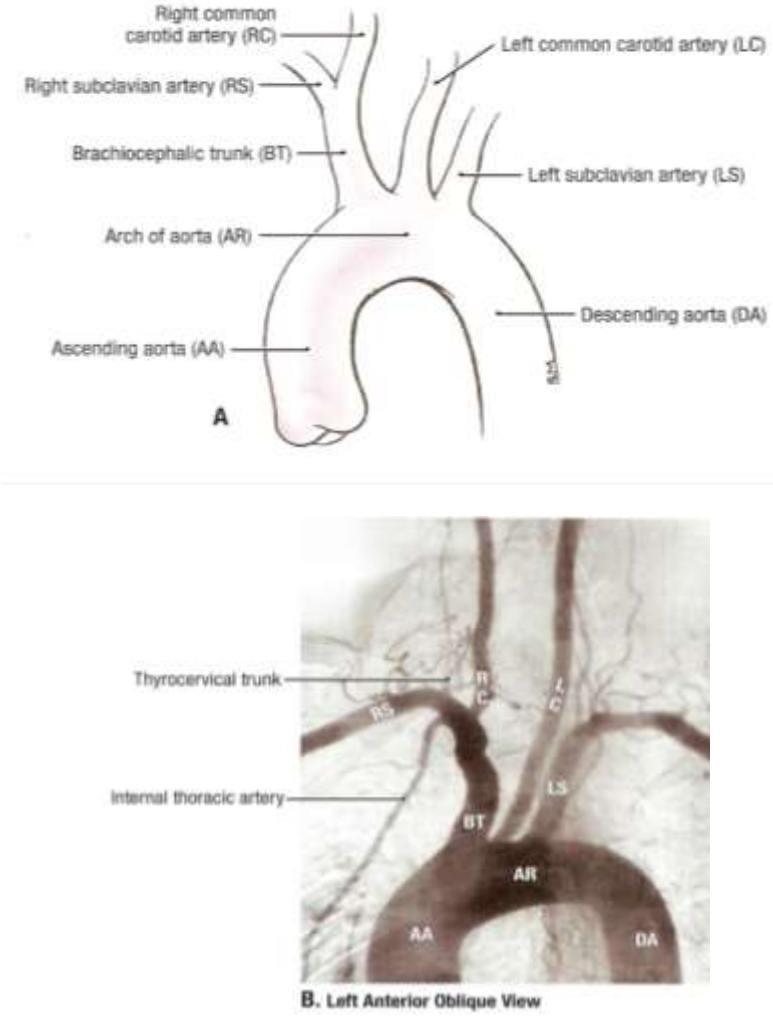

Figure (1): A) *Aortic ach and its branches. B) Angiogram of the aortic arch.* ***(Anne and Arthur, 2005)***

Figure (2): Common variation of aortic arch anatomy is the bovine arch with the take-off of the left common carotid artery from the shared innominate artery *(Osborn et al., 1998)*.

Subclavian arteries:

The right subclavian artery originates from the right brachiocephalic trunk and arches laterally and posteriorly, passing behind the anterior scalene muscle. The left subclavian artery originates directly from the aorta and is usually its third branch. It ascends vertically within the mediastinum and then arches laterally in the root of the neck, also to pass behind the anterior scalene muscle. Both subclavian