Stent Design in Management of Extracranial Carotid Stenosis

Thesis
*Submitted for Partial Fulfillment of **MD** Degree*
In Neurology

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بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا
عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

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Ayman Hassan El Sudany

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List of Abbreviations

Abbreviation	Meaning
A1	The 1st segment of the anterior cerebral artery
A2	The 2nd segment of the anterior cerebral artery
A3	The 3rd segment of the anterior cerebral artery
ACA	Anterior cerebral artery
ACAS	Asymptomatic carotid artery stenosis
ACE-I	Angiotensin-converting enzyme inhibitors
AChA	Anterior choroidal artery
ACOM	Anterior communicating artery
ACST	Asymptomatic carotid surgery trial
ACT	Activated clotting time
ACT 1	Asymptomatic carotid trial
ADVANCE	Acute Neuropsychological Changes Following Stenting with Distal Protection
AHA	American heart association
ARBs	Angiotensin receptors blockers
BMI	Body mass index
BP	Blood pressure
C1	Cervical segment of the internal carotid artery
C2	Petrous segment of the internal carotid artery
C3	Lacerum segment of the internal carotid artery

Abbreviation	Meaning
C4	Cavernous segment of the internal carotid artery
C5	Clinoidal segment of the internal carotid artery
C6	Ophthalmic segment of the internal carotid artery
C7	Communicating segment of the internal carotid artery
CABG	Coronary artery bypass graft
CAS	Carotid artery stenting
CASES	Carotid artery stenting with emboli protection surveillance
CAVATAS	Carotid and Vertebral Artery Transluminal Angioplasty Study
CC	Common carotid
CCA	Common carotid artery
CDUS	Carotid duplex ultrasound
CEA	Carotid endarterectomy
CEUS	Contrast enhanced ultrasound
CI	Confidence interval
CIN	Contrast induced nephropathy
CM	Centimeter
CREST	Carotid revascularization endarterectomy versus stenting trial
CT	Computed tomography scan
CTA	Computed tomography angiography

Abbreviation	Meaning
DL	Deciliter
DM	Diabetes mellitus
DSA	Digital subtraction angiography
DUS	Duplex ultrasound
DWI	Diffusion weighted imaging
ECA	External carotid artery
ECST	European carotid surgery trial
EPDs	Embolic protection devices
GP	Glycoprotein
HDL-C	High density lipoprotein cholesterol
HR	Hazard ratio
HS	Highly significant
HTN	Hypertension
ICA	Internal carotid artery
ICH	Intra cerebral hemorrhage
ICSS	International carotid stenting study
IMT	Intima-media thickness
ISHD	Ischemic heart disease
ISR	In-stent restenosis
IQR	Interquartile range
IV	Intravenous
KG	Kilogram
LCCA	Left common carotid artery
LDL-C	Low density lipoprotein cholesterol
M1	The 1st segment of the middle cerebral artery

Abbreviation	Meaning
M2	The 2nd segment of the middle cerebral artery
M3	The 3rd segment of the middle cerebral artery
M4	The 4th segment of the middle cerebral artery
MCA	Middle cerebral artery
MES	Micro emboli stemming
Mg	Milligram
MI	Myocardial infarction
mL	Milli-liter
miR	microRNA
mm2	Millimeter square
mmol/L	Milli-mole per liter
MRA	Magnetic resonance angiography
MRI	Magnetic resonance image
NASCET	North American symptomatic carotid endarterectomy trial
NIHSS	National institute of health stroke scale
NPO	Nothing Per Os
NS	Non-significant
P1	The 1st segment of the posterior cerebral artery
P2	The 2nd segment of the posterior cerebral artery
PC	Personal computer
PCA	Posterior cerebral artery

Abbreviation	Meaning
PCOM	Posterior communicating artery
PO	Per Os
RHV	Rotating haemostatic valve
RR	Relative risk
SAPPHIRE	Stenting and angioplasty with protection in patients at high risk for endarterectomy
SBP	Systolic blood pressure
SD	Standard deviation
SES	Self-expandable stents
SLE	Systemic lupus erythematosis
TCD	Transcranial Doppler
TIA	Transient ischemic attack
TMB	Transient monocular blindness
Tpa	Tissue plasminogen activator
UK	United kingdom
Vs	Versus

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Stent Design in Management of Extracranial Carotid Stenosis

Abstract

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Background: Carotid artery stenting (CAS) had become widely used as an alternative to carotid endarterectomy (CEA) in revascularization therapy of carotid artery stenosis, especially in some high risk patients for surgical intervention**.**

Objective: The purpose of this study is to evaluate the effect of carotid artery stent design in the outcome of patients undergoing extracranial carotid artery stenting.

Methods: During a 30 month period , 50 cases were enrolled and underwent carotid artery stenting with open cell (Protégé® - EV3) or closed cell (Wall stent® - Boston scientific) stents . A filter device for embolic protection (Spider filter® - EV3) was used. Clinical assessment with the national institute of health stroke scale (NIHSS) together with post procedural diffusion-weighted magnetic resonance imaging (DW-MRI) were used to determine cerebral embolization.

Results: CAS was performed in 40 symptomatic cases (80%) and 10 asymptomatic cases (20%). A similar number of open-cell and closed-cell stents were used. New acute cerebral emboli were detected with DW-MRI in (6/50) of cases (12%) after the procedure. Three (3/50) cases (6%) showed corresponding clinical deterioration in NIHSS ; two cases developed minor stroke and the third case developed a major stroke.

Conclusion: Cerebral embolization, as detected by brain DW-MRI, occurs more with open cell design than closed cell design stents but this was statistically non-significant. This randomized trial does not support the superiority of any stent design with respect to cerebral embolization..

Key words: Carotid artery stenting (CAS) , brain DW-MRI , NIHSS.