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REVIEW

Quality of Life and Functional Status After Carotid Revascularisation: A Systematic Review and Meta-Analysis

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WHAT THIS STUDY ADDS

Stroke causes significant deterioration in quality of life (QOL) and functional status. Carotid revascularisation by endarterectomy or stenting prevents stroke. The ability to maintain preoperative QOL through revascularisation procedures is an important measure of surgical outcome. This is the first systematic review and meta-analysis of QOL after carotid revascularisation. We provide a useful synthesised modern reference of QOL data that complements currently available data on the success of carotid revascularisation.

Objectives: Stroke causes significant quality of life (QOL) deterioration and functional impairment. Carotid revascularisation by either endarterectomy (CEA) or stenting (CAS) is performed to prevent stroke. The direct effect of revascularisation on QOL is unclear. This study reviews (a) QOL after CEA, (b) QOL after CAS, (c) QOL differences between CEA and CAS, and (d) QOL compared with reference populations.

Methods: Medline and Embase were used for sources of data. The PRISMA guidelines were followed. Clinical studies published after January 1990 were selected using strict eligibility criteria. Quality appraisal and data tabulation were performed using predetermined forms. Data were synthesised by narrative review and random-effects meta-analysis using standardised response means. Heterogeneity and bias were assessed.

Results: Twelve studies (4,224 patients), including two randomised controlled trials, were reviewed. Despite an initial decline in QOL after CEA, quantitative and qualitative analysis of the SF-36 questionnaire showed all domains returned to baseline by 1 year. Preliminary data suggests that QOL after CAS does not have an initial decline, especially in physical health domains. QOL is similar between CEA and CAS at 1 year. Comparisons to reference populations are inconclusive. Meta-analysis was limited by significant statistical and methodological heterogeneity.

Conclusions: Revascularisation by CEA or CAS maintains preoperative QOL. There are minimal differences between CEA and CAS. This review reaffirms the success of carotid revascularisation in preventing the devastating consequences of stroke on QOL and functional status. Guidelines for future studies are provided.

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INTRODUCTION

Stroke is a serious public health problem which commonly causes persistent disability and poor quality of life (QOL),[1–3] QOL being defined as a patient's perception of health as assessed in multiple domains.[4,5] Carotid revascularisation is performed to prevent stroke. In ischaemic stroke, 18–29% are attributable to carotid artery disease[6,7] and are preventable by revascularisation.[8]

Several key trials have provided strong evidence for CEA in stroke prevention. NASCET showed CEA is most effective for symptomatic patients with greater than 70% stenosis.[9] Similar results were reported in the ECST trial.[10] Findings from ASCT[11] and ASCT-1[12] suggest the outcomes of CEA in asymptomatic patients depend on factors including comorbidities, institutional perioperative stroke and mortality rates, and life expectancy.

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Even though CEA is still the preferred method in most patients,[13] the emergence of CAS has triggered key trials comparing CAS with CEA. CAS may be more appropriate for younger patients with favourable anatomy and symptomatic patients at high risk of complications from CEA.[14] The SAPPHIRE[15] and CREST[16] trials, and Carotid Stenting Trialists' Collaboration meta-analysis[17] showed CAS prevents strokes and is not inferior to CEA. The CREST investigators[16] demonstrated a higher periprocedural risk of stroke in CAS and myocardial infarct in CEA. This has been an important cause of concern in CAS.

Current data show the combined periprocedural mortality and stroke rate after CEA is 3.2—6.7% in symptomatic patients[9,13,16,17] and 1.4—3.1% in asymptomatic patients.[11,12,16] After CAS for both asymptomatic and symptomatic patients, periprocedural mortality and stroke are reported at 4.1—7.7%.[13,15—17]

Postoperative QOL assessment is recognised by the World Health Organization and numerous authors as an important measure of surgical outcome.[18—20] QOL data provide a patient-focused assessment that complements traditional outcome measures. Current data on the direct effect of carotid revascularisation on QOL is unclear. This review aims to ascertain if QOL after carotid revascularisation is maintained and reflects the benefits of stroke prevention and associated post-stroke QOL decline. Hence, the current investigators conducted a systematic review and meta-analysis to evaluate (a) QOL after CEA, (b) QOL after CAS, (c) QOL differences between CEA and CAS, and (d) QOL compared with reference populations.

MATERIALS AND METHODS

This review was written in accordance with previously defined guidelines including the PRISMA checklist.[21,22]

Definition and measurement of quality of life

QOL can be assessed by study-designed questionnaires, and disease-specific or generic instruments. These instruments assess an individual's physical, emotional and, psychological health as well as social and functional status.[4,5]

Individual study-designed questionnaires are constructed by study authors as arbitrary measures of QOL outcomes.[23—26] Disease-specific QOL instruments are validated QOL scoring systems that measure the effect of an illness or treatment on a specific condition.[5] Generic QOL instruments are validated QOL scoring systems that measure QOL in a broad range of health domains and allow comparisons with other conditions and reference populations.[5] Generic scoring systems used by studies in this review are Medical Outcomes Short Form 36 (SF-36),[27] Sickness Impact Profile (SIP),[28] Hospital Anxiety and Depression Scale (HAD),[29] Katz Index of Independence in Activities of Daily Living (ADL),[30] European Quality of Life EQ-5D Questionnaire (EQ-5D),[31] and the Multidimensional Index of Life Quality Questionnaire (MILQ).[32]

Descriptions of each instrument are detailed in the electronic supplementary table.

Selection criteria

Studies considered for review had the following predetermined inclusion criteria: (a) all patients over 18 years of age, (b) asymptomatic or symptomatic carotid stenosis, (c) ipsilateral CEA or CAS as the procedure, and (d) data recorded on postoperative QOL data compared to preoperative QOL, reference populations, or other interventions. These studies were restricted according to the following report characteristics: (a) published after January 1990, (b) English language, and (c) original research only. The search period was chosen to reflect modern post-procedure outcomes.

Information sources and search strategy

On June 9, 2014, a literature search was conducted independently by two reviewers using MeSH keyword search on PubMed (MEDLINE) (Fig. 1). Strict inclusion criteria for study characteristics were applied as described above. An additional hand search of OVID (MEDLINE) and EBSCOhost (EMBASE) as well as reference lists of each included study was conducted to identify studies not found by the initial MeSH Keyword search.

Study selection

Following the search, two investigators independently performed the first stage of screening titles and abstracts. Studies were excluded if they did not meet eligibility criteria. If the abstract had insufficient information to determine eligibility, a second stage screen was run after data extraction. Consensus for studies to be included was achieved by discussion between the two investigators based on the predetermined selection criteria mentioned above. Investigators were not blinded to any study characteristics.

Data items and extraction

All data items were predetermined and specified as shown in Tables 1 and 2. Data extraction was then performed by two investigators using standardised pilot forms. Study quality was assessed using sample size, study design, use of validated QOL measures, follow-up, and level of evidence based on the Oxford Centre for Evidence Based Medicine[33] (Table 1).

Synthesis of results

Qualitative analysis of QOL was performed based on full data tabulation of results and assessed according to the aforementioned objectives.

A meta-analysis was performed using the random-effects model to estimate standardised mean differences for continuous data across studies. The standardised mean differences and pooled-effects (estimated overall effect [95% confidence interval]) were used as summary measures. These are depicted on Forest plots. An estimated standard deviation could be derived from sample size and 95% confidence interval values using the formula provided by the Cochrane handbook for systematic reviews.[34] The consistency of results across studies was assessed by the Tau^2 and I^2 statistics for statistical heterogeneity.[35,36] A p value <0.05 was