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REVIEW

Outcome after Interruption or Preservation of Internal Iliac Artery Flow During Endovascular Repair of Abdominal Aorto-iliac Aneurysms

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WHAT THIS PAPER ADDS

In the absence of an adequate iliac artery landing zone, endovascular aneurysm repair (EVAR) requires exclusion of one or both internal iliac arteries (IIAs) and extension of the stent graft to the external iliac artery. This systematic review reports the outcome of internal iliac interruption or preservation during EVAR. A significant risk of persistent ischemic complications in nearly one-quarter of patients was found, and bilateral IIA occlusion was related to significantly higher rates of buttock claudication than unilateral interruption. On the other hand IIA preservation has been associated with high technical success and minimal morbidity, while improving EVAR applicability.

Aim: The aim was to conduct a systematic review of the literature investigating outcomes after interruption or preservation of the internal iliac artery (IIA) during endovascular aneurysm repair (EVAR).

Methods: A systematic review was undertaken using the MEDLINE and EMBASE databases to identify studies reporting IIA management during EVAR. The search identified 57 articles: 30 reported on IIA interruption (1468 patients) and 27 on IIA preservation (816 patients).

Results: The pooled 30 day buttock claudication (BC) rate was 29.2% (95% CI 24.2—34.7). Patients undergoing bilateral IIA interruption had a higher incidence of BC than patients with unilateral IIA interruption (36.5% vs. 27.2%, OR 1.7, 95% CI 1.11—2.6, $p = .01$). During a median follow up of 17 months, the pooled rate of persistent BC was 20.5% (95% CI 15.7—26.2). Of the patients, 93.9% underwent an endovascular revascularization procedure for IIA preservation. Most patients (87.6%) had an iliac branched device, and technical success was 96.2%. Within 30 days of EVAR, 4.3% of internal iliac branches occluded. During a median follow up of 15 months, the pooled occlusion rate at the site of IIA revascularization was 8.8% (95% CI 6.8—11.3). In patients treated with an iliac-branched device, 5.2% of internal iliac branches and 1.7% of external iliac arteries occluded. The pooled BC rate on the side of the IIA revascularization during follow up was 4.1% (95% CI 2.9—5.9). Pooled rates of late device related endoleak type I or III and secondary procedures on the side of the previous IIA revascularization were 4.6% (95% CI 3.2—6.5) and 7.8% (95% CI 5.7—10.7) respectively.

Conclusion: Unilateral or bilateral IIA occlusion during EVAR seems to carry a substantial risk of significant ischemic complications in nearly one quarter of patients. Bilateral IIA occlusion was related to a significantly higher rate of BC. IIA preservation techniques represent a significant improvement in the treatment of aorto-iliac aneurysms and have been associated with high technical success and low morbidity.

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INTRODUCTION

A significant proportion (up to 40%) of patients with abdominal aortic aneurysm (AAA) have an ectatic or aneurysmal common iliac artery (CIA).[1—5] The presence of concomitant abdominal aortic and iliac artery aneurysm has been associated with worse outcome.[5] Iliac limbs up

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to 28 mm are commercially available to land in iliac arteries measuring up to 24 mm, according to the manufacturer's instructions.[6] For larger CIA, other solutions are needed.

In the absence of an adequate iliac artery landing zone, EVAR requires exclusion of one or both IIAs and extension of the stent graft to the external iliac artery. In most of these patients, embolization of one or both IIAs is required to prevent backbleeding from the IIA. IIA sacrifice has been associated with symptoms of pelvic ischemia.[2] Coverage of a single IIA is generally well tolerated, although an incidence of up to 28% of buttock claudication (BC) has been reported.[3,4] Reports of bilateral IIA embolization show an increased risk of more serious ischemic complications, but some articles also conclude that it is safe.[2–4] As patients at high risk for developing adverse complications after IIA interruption have not been clearly defined, most physicians attempt to preserve flow to at least one IIA whenever possible. Several open and endovascular techniques have been described to maintain pelvic perfusion during EVAR.

The aim of the present study was to review all studies on IIA sacrifice during EVAR and analyze the clinical effect of IIA interruption. Furthermore, all reported cases that involved preservation of IIA were reviewed to investigate technical and clinical outcome.

METHODS

Eligibility criteria

The objectives, methodology of the systematic review and analysis, and the inclusion criteria for study enrollment were pre-specified. Standard Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed and documented in advance in a formal protocol.[7] Ethics approval was not required. Data extraction and methodological assessment were accomplished by two independent investigators (G.K., A.K.). Studies considered for inclusion and full text review fulfilled the following criteria: (1) they reported IIA preservation or sacrifice during EVAR, (2) they included at least five patients, and (3) they provided data on 30 day clinical outcome. The same reviewers (G.K., A.K.) evaluated the eligibility of studies for inclusion in this review independently in an unblinded standardized manner. Disagreements between reviewers were arbitrated by discussion.

Search

An electronic search of the English language medical literature from 1991 to September 2015 was conducted using MEDLINE and EMBASE databases to find studies relevant to IIA interruption and preservation during EVAR. Search terms included "internal iliac artery" OR "hypogastric artery" AND "preservation", "embolization", "exclusion", "coverage", "EVAR", and "abdominal aneurysm". Related articles suggested by the PubMed search engine and reviews on this subject were searched for additional relevant articles. Further articles were also identified by examination of the references cited in the initially identified reports. The following data were extracted from each study: publication year, country of origin, number of patients, age, gender, AAA anatomic characteristics, procedure for IIA preservation or exclusion, 30 day outcome, length of follow up and outcome during follow up. Ischemic complications were assigned a severity score as mild (Grade 1), moderate (Grade 2), or severe (Grade 3), according to the SVS reporting standards.[8]

Quality assessment

The quality of observational studies was assessed using the Newcastle–Ottawa Quality Assessment Scale (NOS) for case-control studies or cohort studies (as applicable).[9] This tool evaluates three main methodological elements of cohort studies: selection methods (representativeness of the exposed cohort, selection of the non exposed cohort, ascertainment of exposure and demonstration that outcome of interest was not present at start of study), comparability of cohorts on the basis of the design or analysis, and assessment of outcome (ascertainment of outcome, adequacy of follow up). The scale uses a star system, with a maximum of nine stars; studies achieving six or more stars were considered to be of higher quality.

Data synthesis and analysis

Means of outcome parameters were weighted and data pooled after significant outcome heterogeneity was excluded. Data analysis was performed using SPSS 20 software (IBM Corp, Armonk, NY, USA). A meta-analysis was performed separately for studies reporting interruption or preservation of the IIA. Pooled estimates were calculated as the back transformation of the weighted mean of the transformed proportions using the random effects model proposed by DerSimonian–Laird.[10] Binary outcome measures for comparisons of occurrence of BC in unilateral versus bilateral IIA interruption were calculated and reported as the odds ratio (OR) and 95% confidence interval (CI). The random effects model was applied to calculate the pooled treatment effect, as considerable clinical heterogeneity among studies was anticipated. A forest plot for each treatment effect was created. Inter-study heterogeneity was assessed visually using the forest plots. Furthermore, heterogeneity was assessed using the Cochran Q test (chi-square) and by measuring inconsistency (I) of the effects of intervention; I^2 values $< 50\%$ were considered to indicate low heterogeneity, 50–75% moderate heterogeneity, and $>75\%$ significant heterogeneity. A funnel plot was constructed to visually assess publication bias. Meta-analyses were performed using the Review Manager 5.3 (Cochrane Information Management System; available at: http://ims.cochrane.org/revman) and the Comprehensive Meta-Analysis software, version 2.0 (Biostat, Englewood, NJ, USA).

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