

Endovascular versus Open Surgical Repair of Thoracic Aortic Disease: A Meta- Regression Analysis

D Cheng, M Turina, J Martin, J Dunning,
H Shennib, C Muneretto, S Schueler,
L von Segesser, P Sergeant

European Association For Cardiothoracic Surgery

EPICOR, Department of Anesthesia & Perioperative
Medicine, University of Western Ontario, Canada



Presenter Disclosure Information

Davy Cheng, MD, MSc, FRCPC, FCAHS

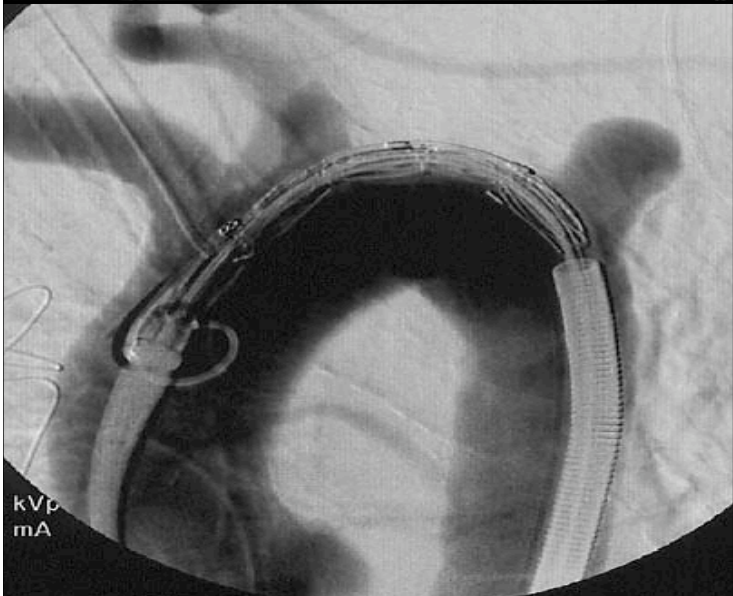
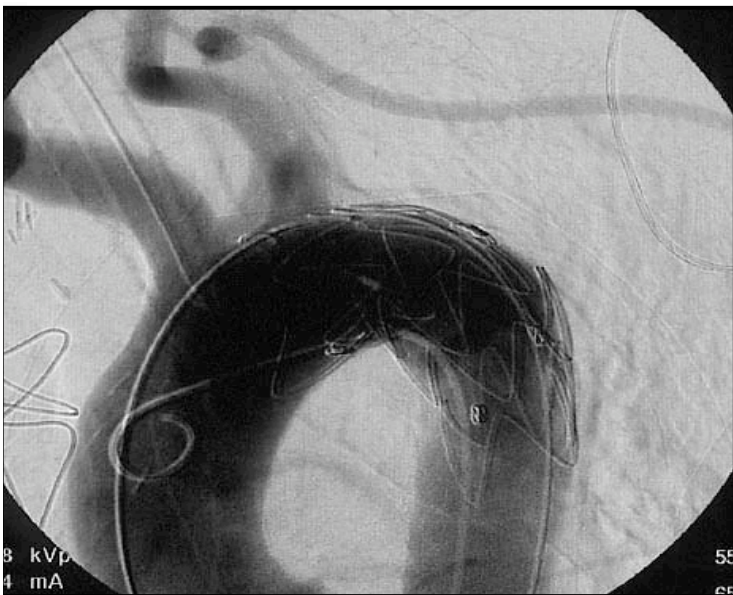
Marko Turina, MD

Janet Martin, PharmD, MSc (HTA)

No relationships to disclose with industries

*Research funding support Eur Assoc Cardiothorac Surg and
Department of Anesthesia & Perioperative Medicine, University
of Western Ontario*





**Degenerative
Dissection
Trauma
IMH
PAU**



Primary Objective

TEVAR vs Open Surgical Aortic Repair:

1. Impact on Perioperative Morbidity/Mortality

(survival, cerebrovascular, neurologic, CVS, organ ischemia, surgical complications, re-operation for bleeding, transfusion, overall complications)

2. Impact on Perioperative Resource Utilization



Methods

- **Trial Identification:** Comprehensive searches of MEDLINE, Cochrane CENTRAL, EMBASE, NICE, CADTH, INAHTA databases, MSAS from **1990 to March 2009**
- **Criteria for Included Trials:**
 - Adult descending thoracic aortic disease (not thoracoabdominal, not aortic arch)
 - Randomized or non-randomized control
 - Comparing TEVAR vs Open
 - Reporting at least one relevant outcome
- In any language



Methods

- **Extraction:** Two reviewers independently identified relevant trials, assessed trial quality, and extracted outcomes data
- **Bias:** Publication bias was explored through visual inspection of funnel plots
- **Software:** Comprehensive MetaAnalysis® version 2.0 was used for statistical analyses
- **Analysis:** Odds ratios [95% CI] were calculated for proportions, and weighted differences [WMD, 95% CI] were calculated for continuous data, using the random effects model.

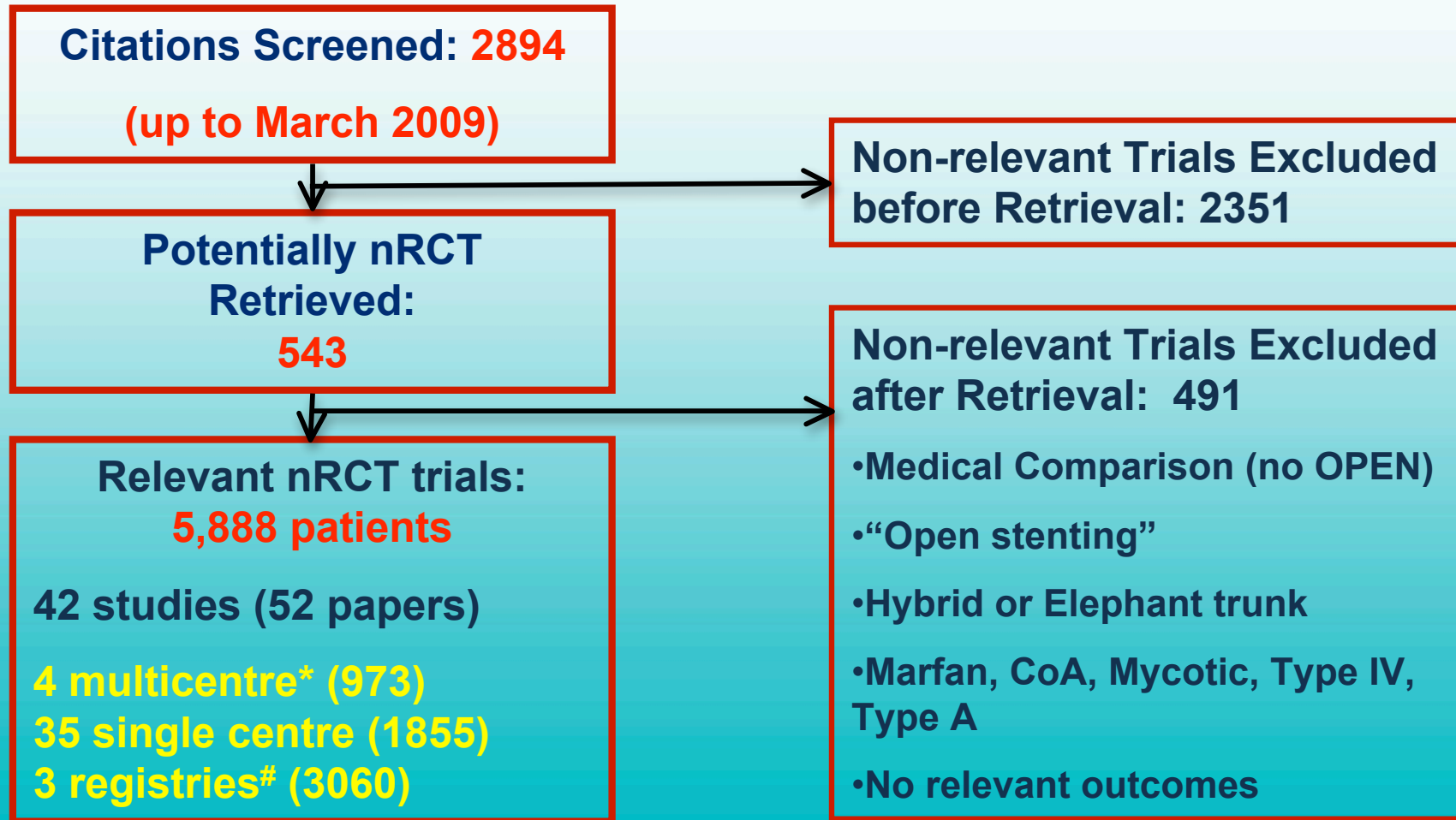


Methods

- Data were subanalyzed by study type (multicenter trials, single centre series, registries)
- Multicentre (MC) and single centre (SC) studies were analyzed separately from registries due to significant potential for overlapping patient series, and heterogeneity within registry data
- Metaregression was performed to evaluate the impact of baseline risk factor imbalances (age, thoracic pathology), and study type



TEVAR vs Open: nRCT [Level B]



* Gore TAG, AAST, TX2, VALOR
IRAD, AHRQ, NTDB



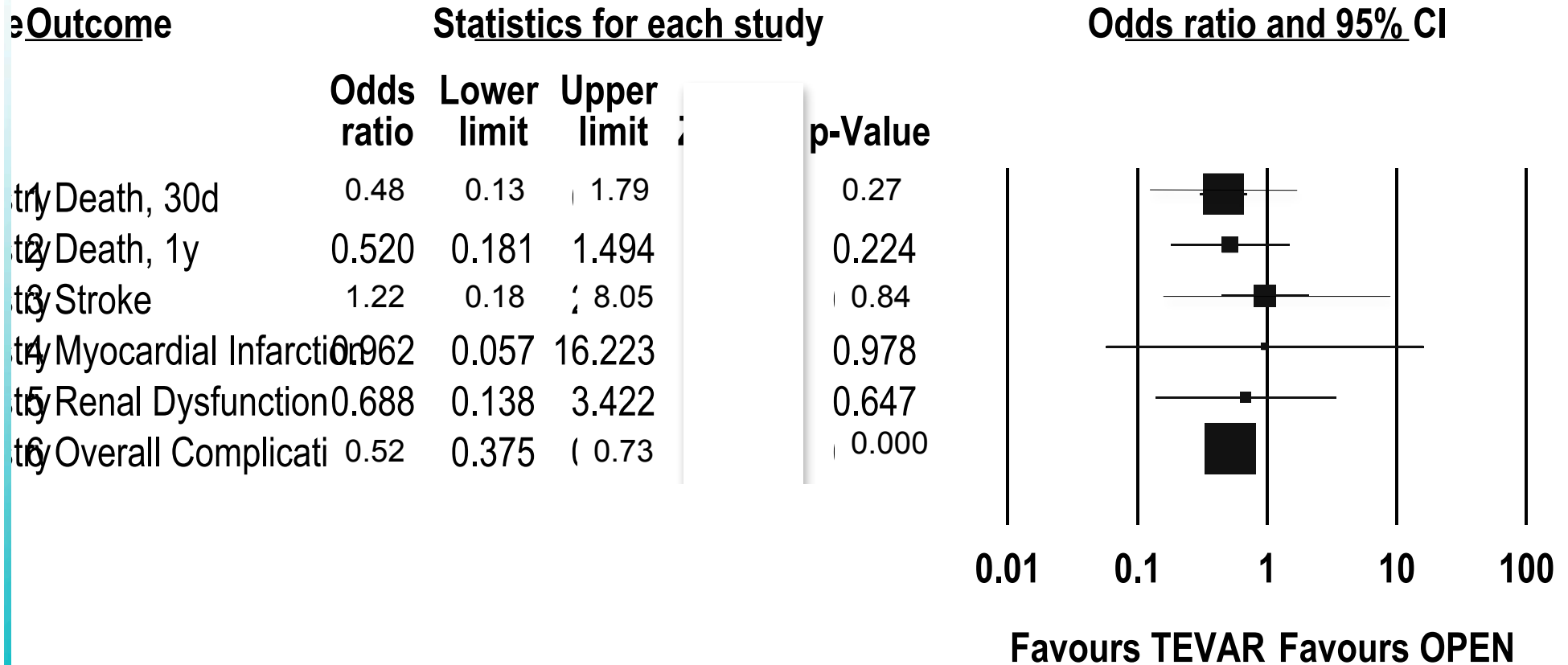
Baseline (Summary)	TEVAR Mean (%)	OPEN Mean (%)	p-value
Male	61.9	67.0	0.84
CAD	41.9	36.2	0.31
Diabetes	13.8	9.1	0.23
COPD	38.1	32.3	0.13
Smoker	76.0	71.1	0.21
Hypertension	79.6	78.3	0.84
Age, yrs	54 (13)	51 (13)	0.001*



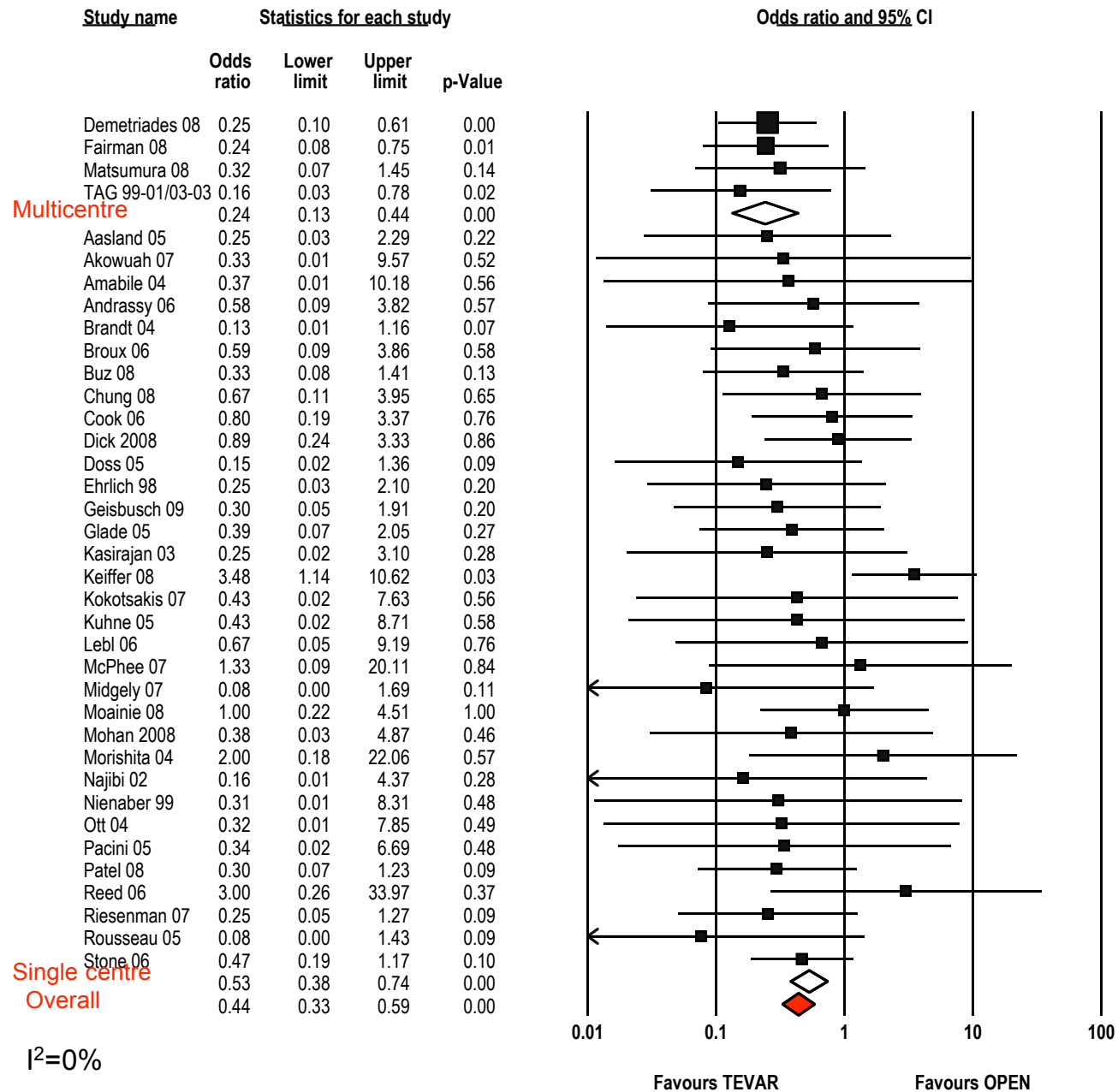
MetaRegression Analysis

- **Metaregression did not show significant impact of baseline age imbalances on outcome estimates**
- **Relative benefit did not differ by:**
 - Pathology
 - Emergent vs Elective
 - Historic vs Concurrent Control
 - Year of Study
 - Study Quality
- **Relative benefit differed by study type (registries were heterogeneous)**

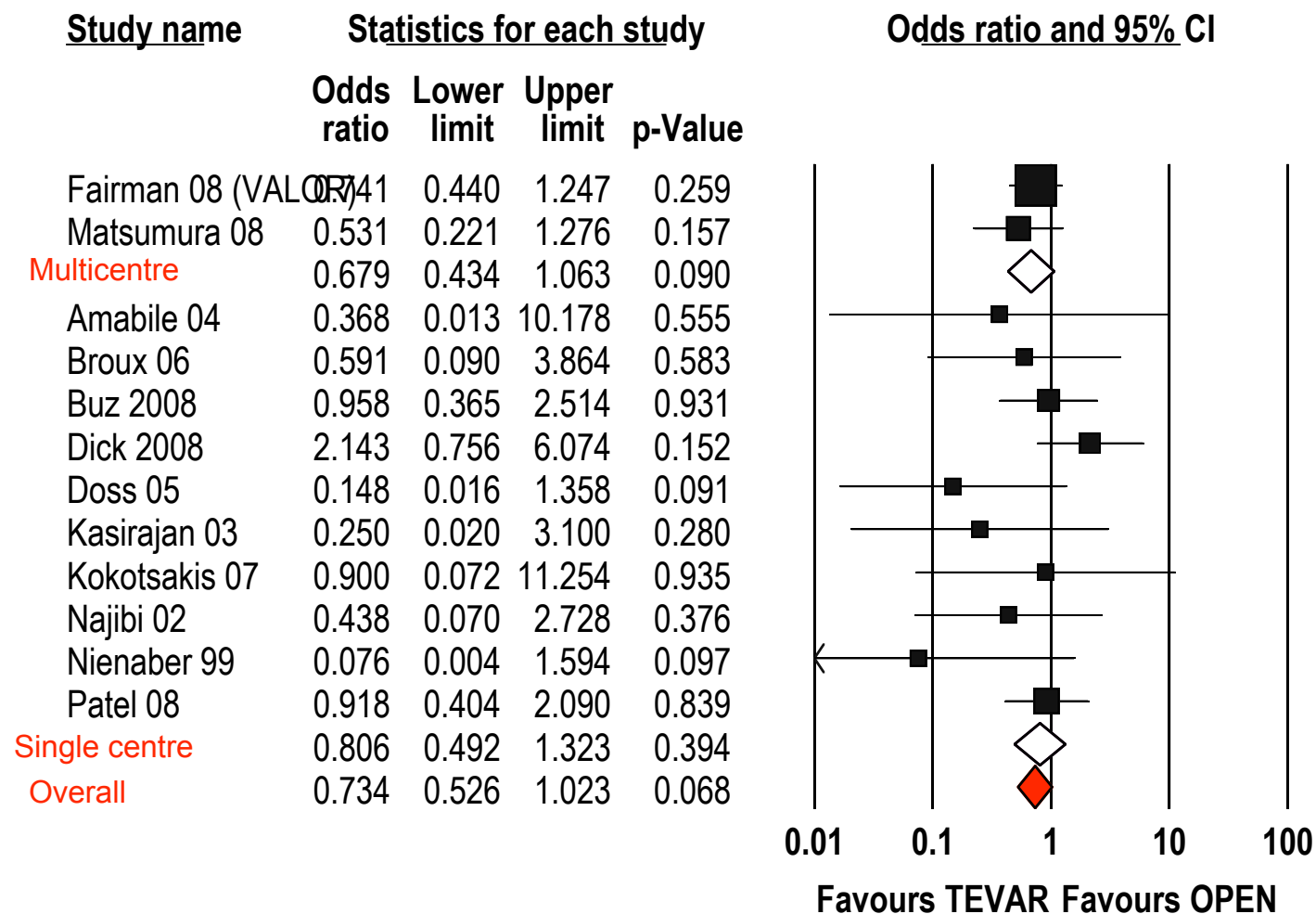
Registry Outcomes: TEVAR vs OPEN



Death at 30 days: TEVAR vs OPEN

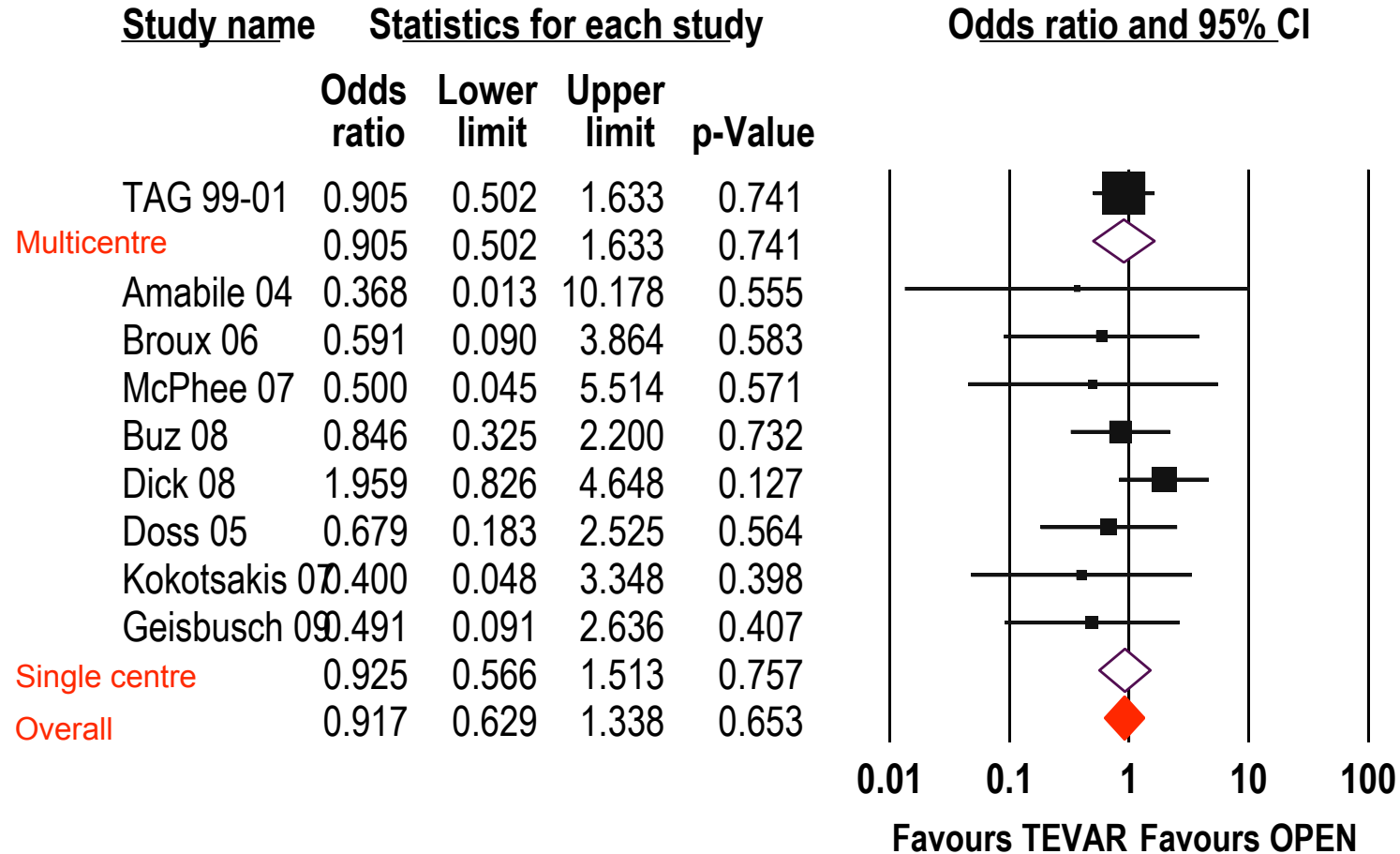


Death at 1 year: TEVAR vs OPEN



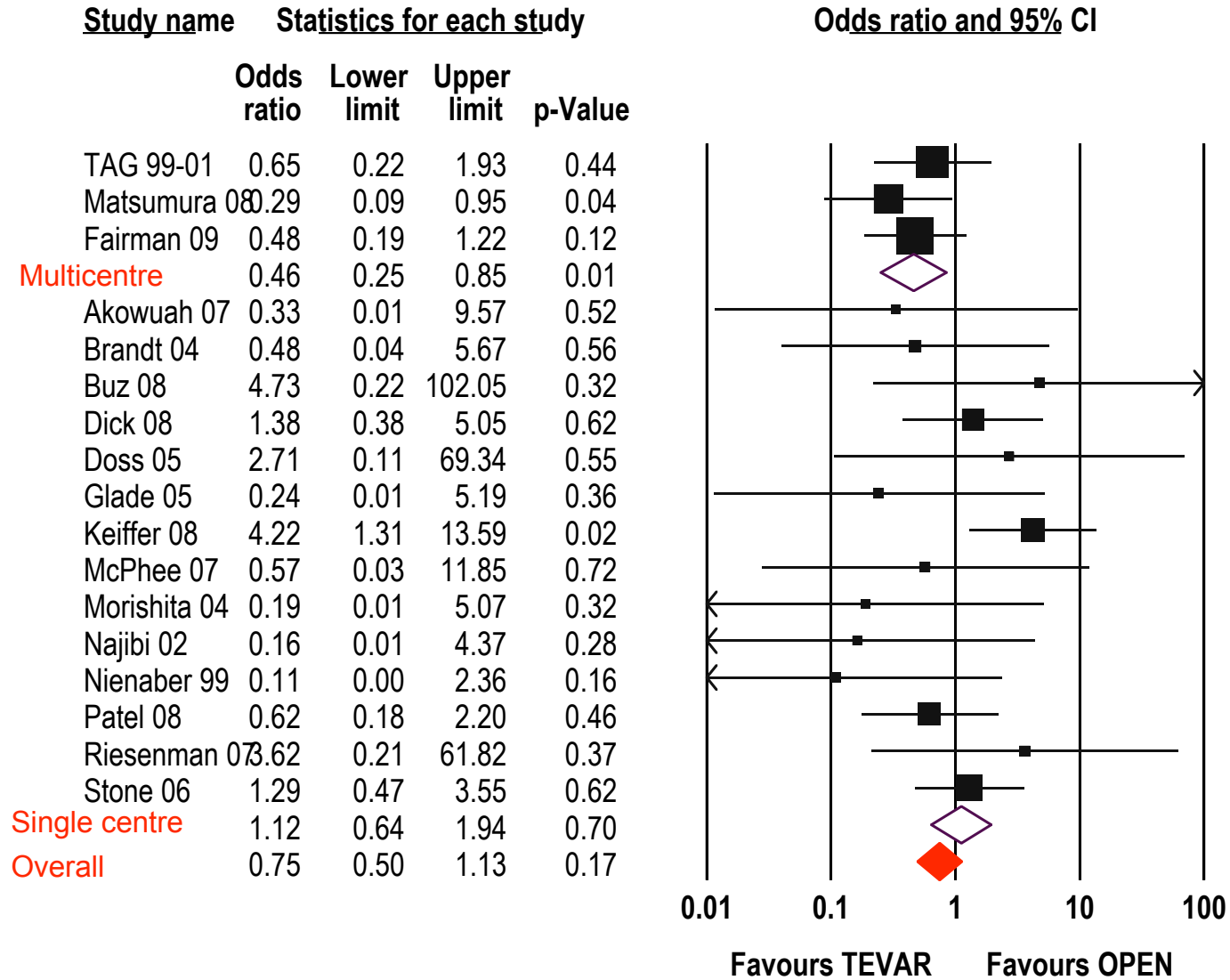
I² = 0%

Death at 2 to 3 years TEVAR vs OPEN



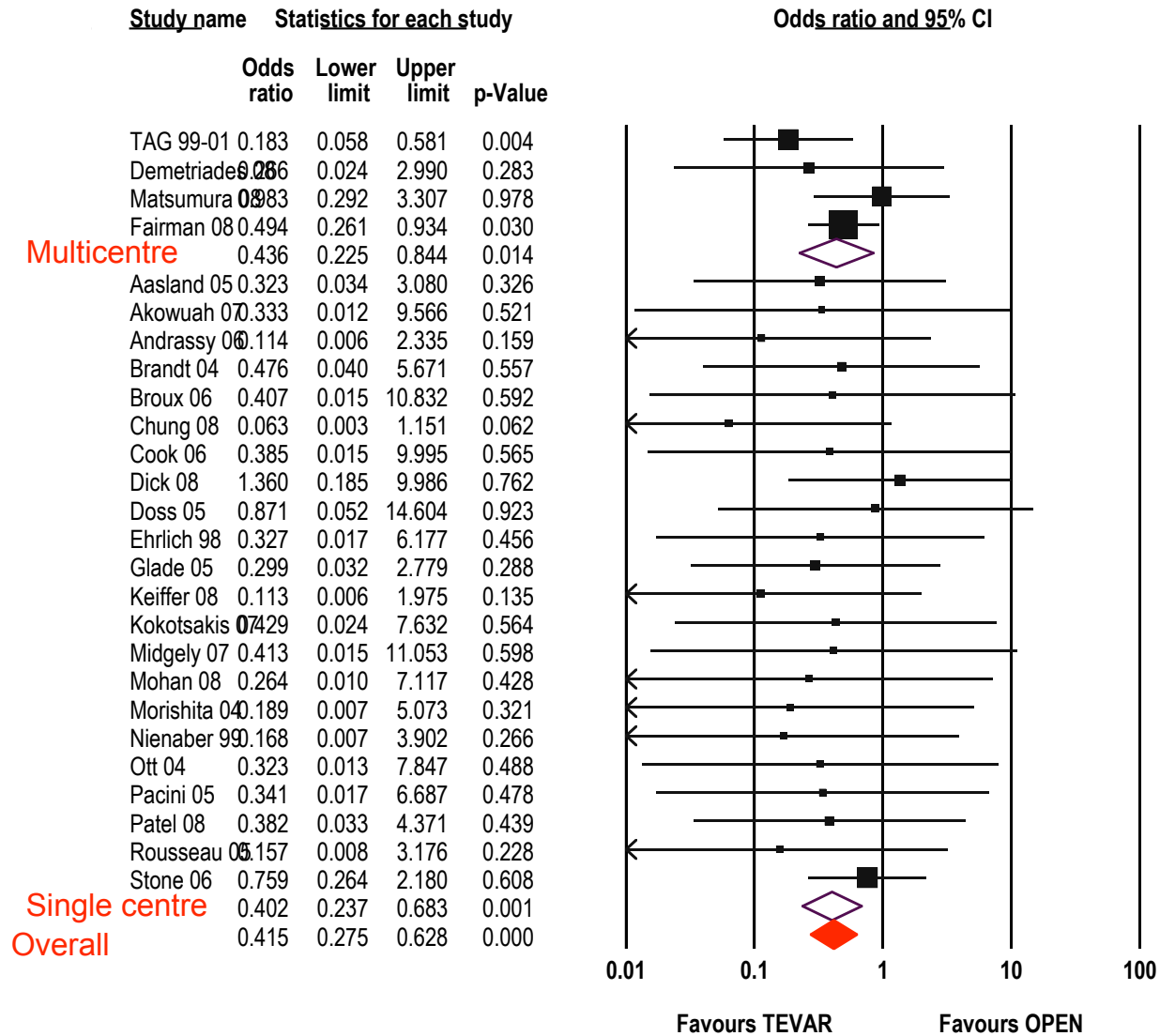
$I^2 = 0\%$

Stroke: TEVAR vs OPEN



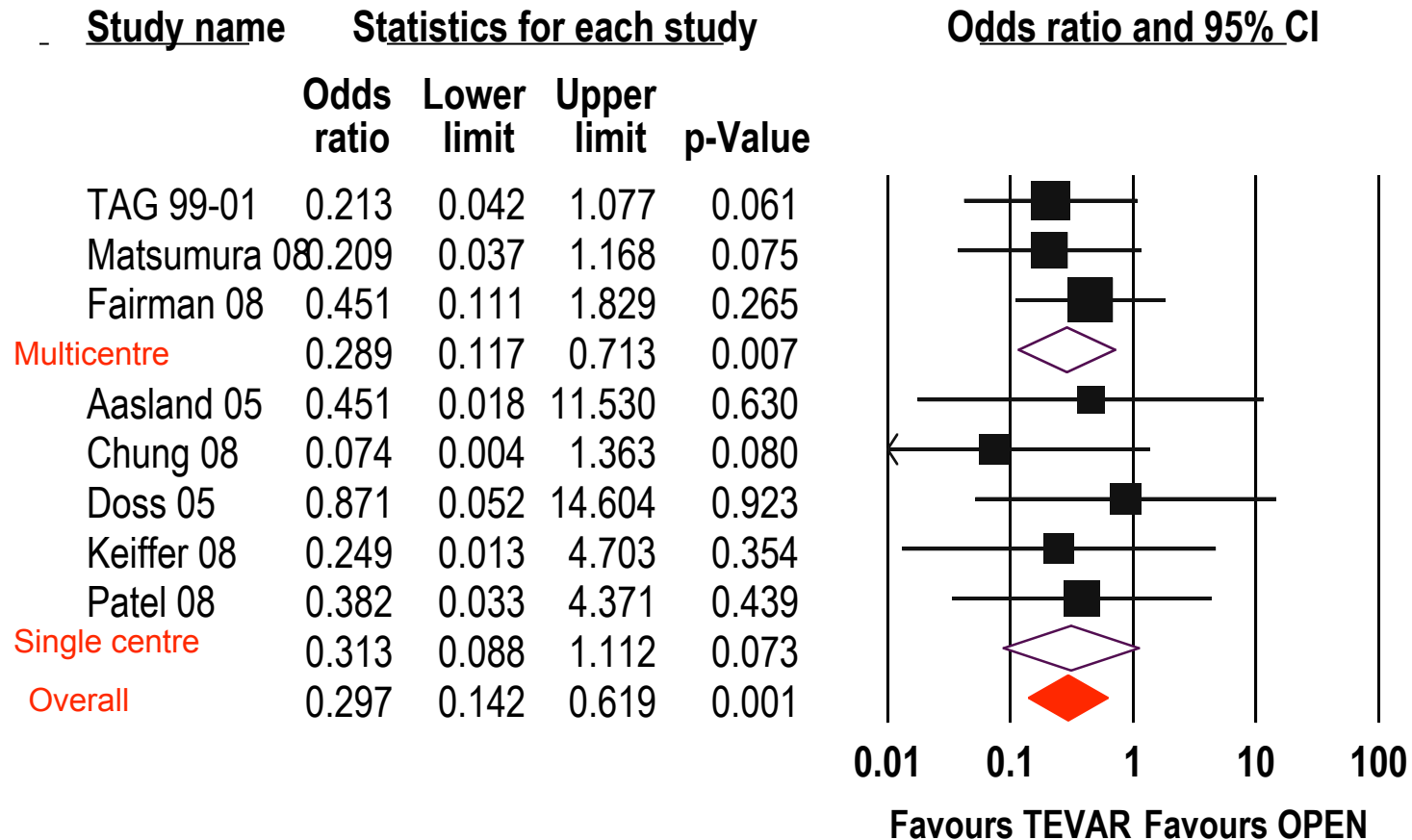
$I^2 = 23\%$

Paraplegia or Paraparesis: TEVAR vs OPEN



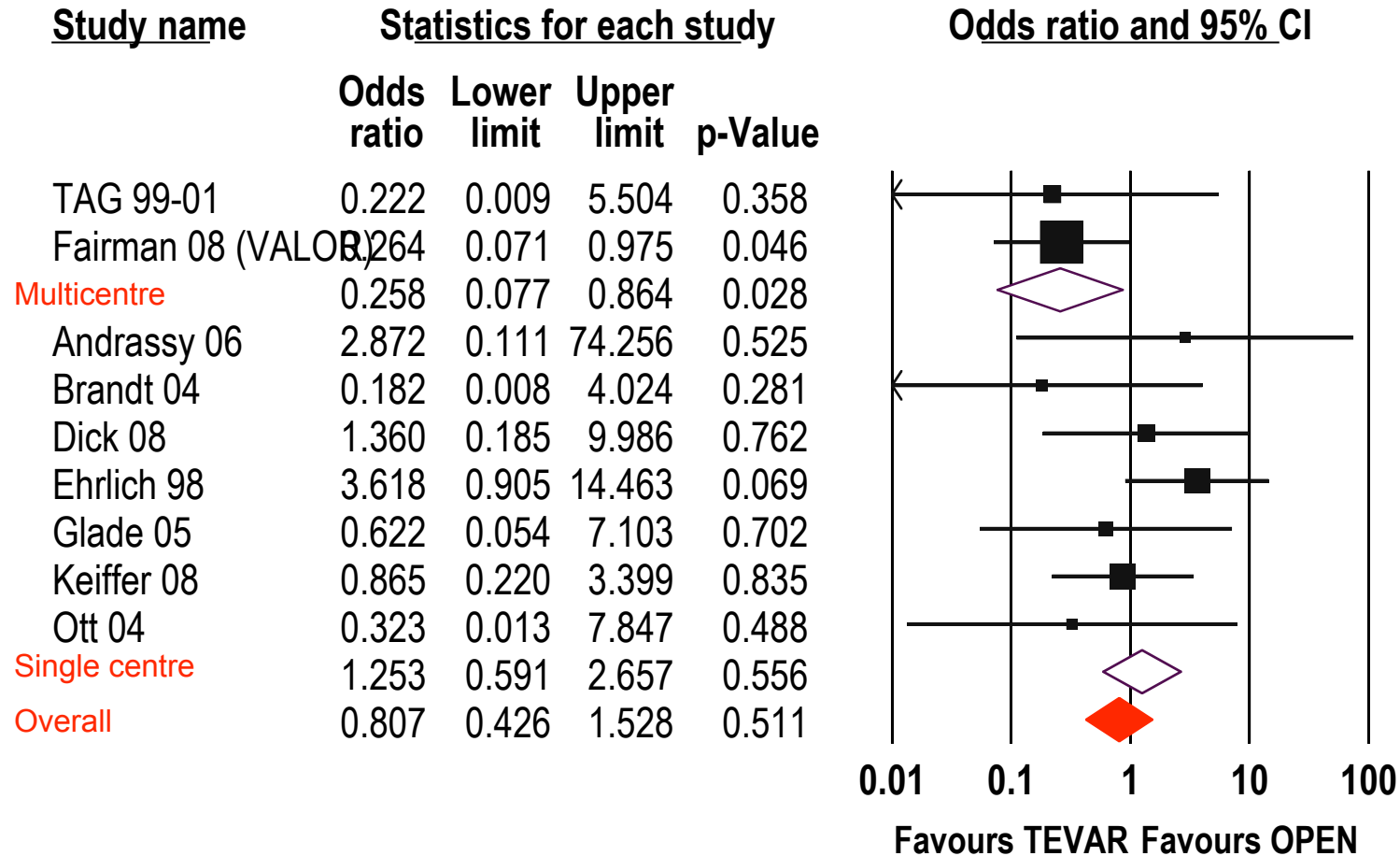
$I^2 = 0\%$

Permanent Paraplegia: TEVAR vs OPEN



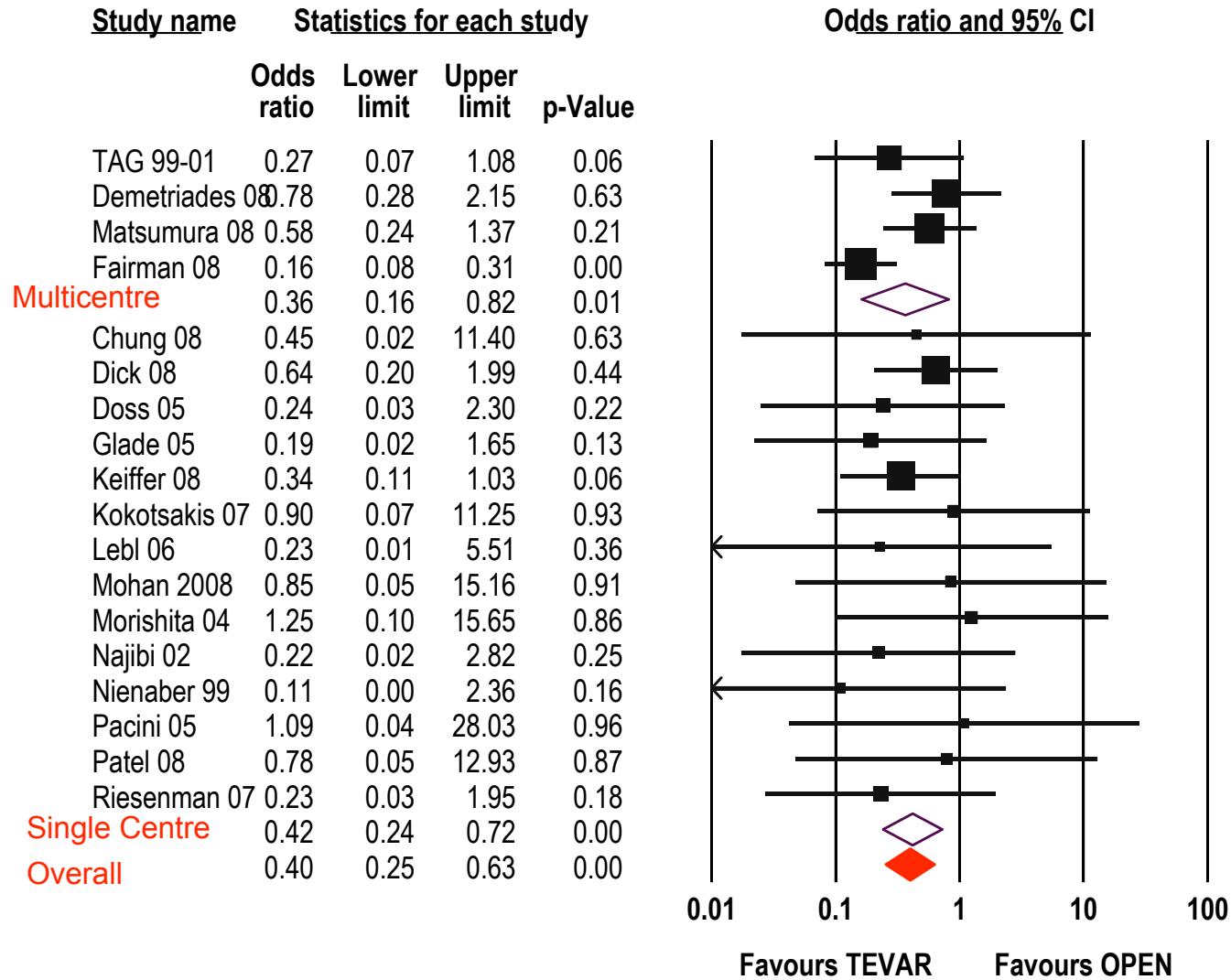
$I^2 = 0\%$

Myocardial Infarction: TEVAR vs OPEN



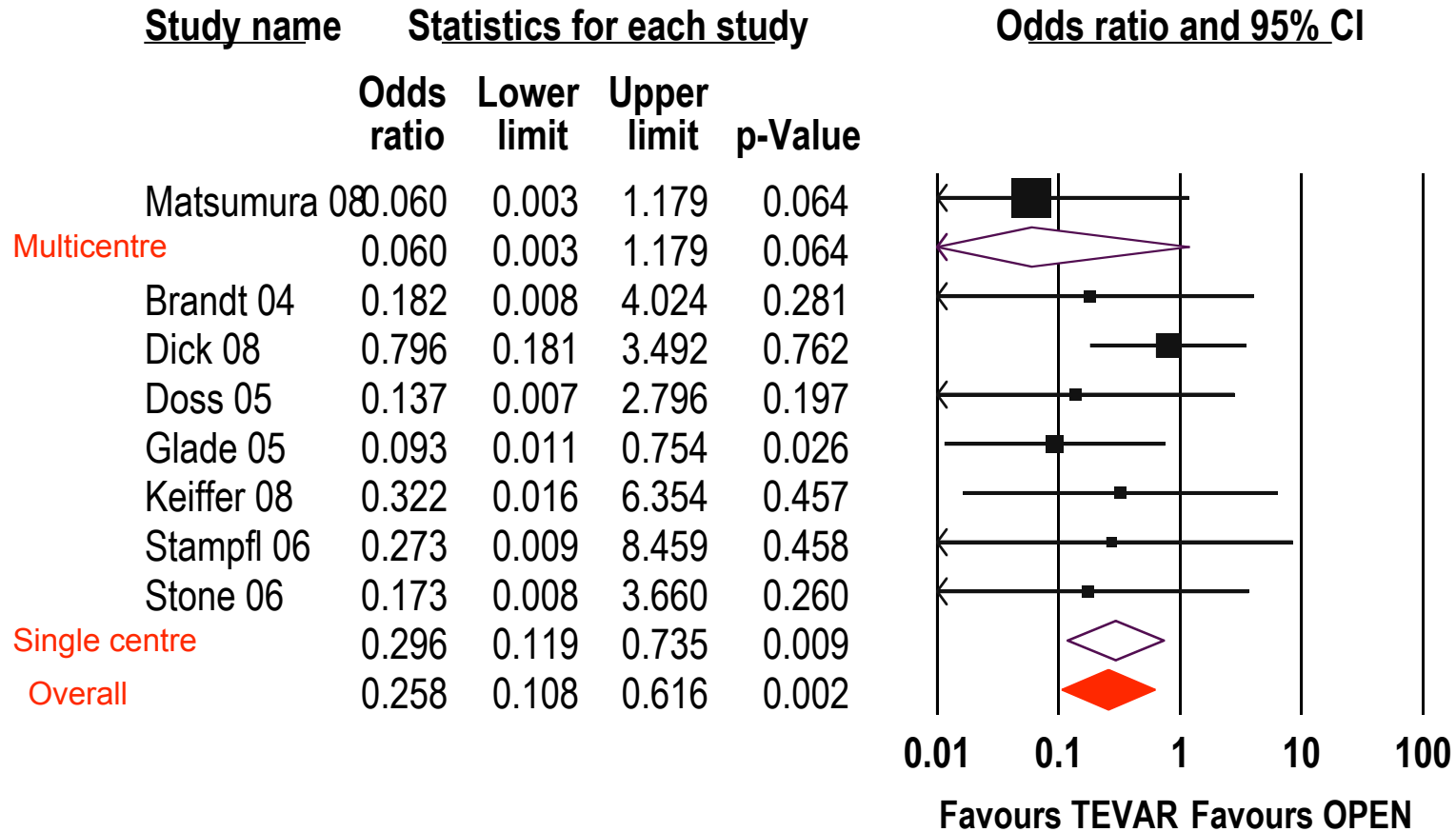
$I^2 = 0\%$

Renal Dysfunction: TEVAR vs OPEN



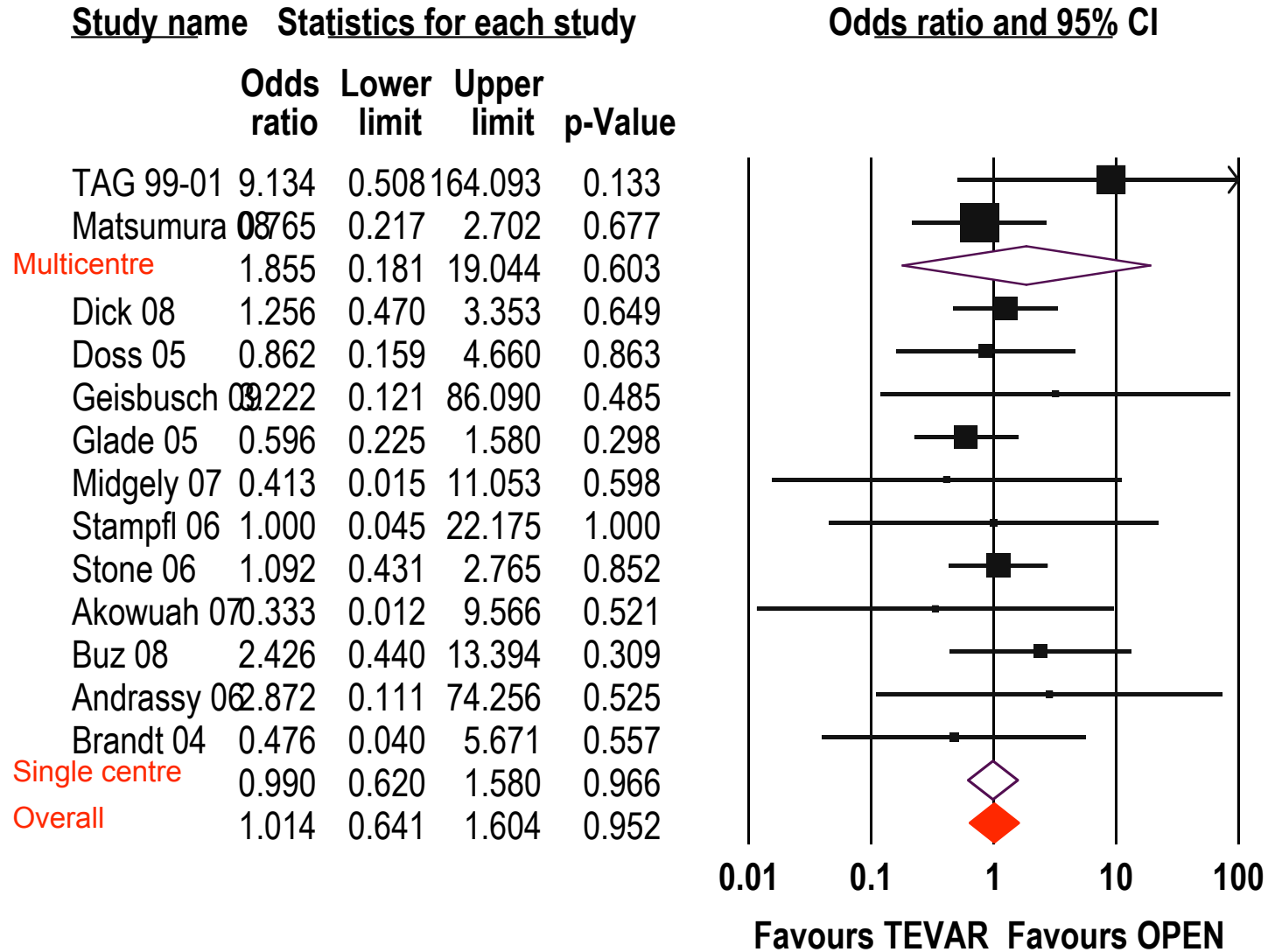
I² = 0%

Reoperation for Bleeding: TEVAR vs OPEN



$I^2 = 0\%$

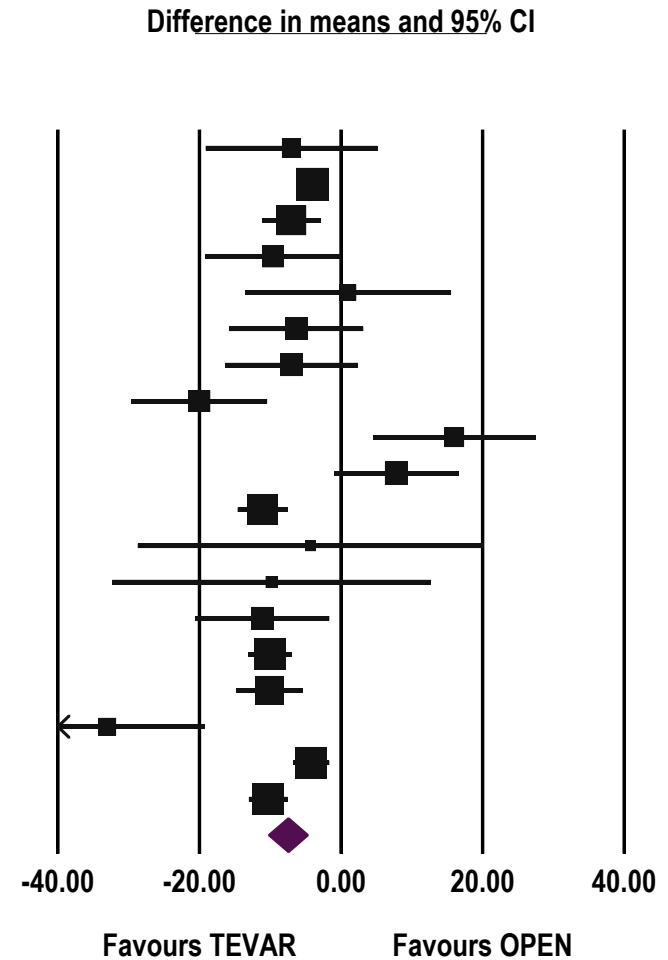
Reintervention: TEVAR vs OPEN



I² = 0%

Hospital Length of Stay: TEVAR vs OPEN

Study name	Outcome	Statistics for each study					p-Value
		Difference in means	Standard error	Variance	Lower limit	Upper limit	
Akowuah 07	HOSP LOS	-7.000	6.187	38.283	-19.127	5.127	0.258
Andrassy 06	HOSP LOS	-4.000	0.609	0.371	-5.193	-2.807	0.000
TAG 99-01	HOSP LOS	-7.000	2.123	4.505	-11.160	-2.840	0.001
Brandt 04	HOSP LOS	-9.600	4.898	23.989	-19.200	-0.000	0.050
Chung 08	HOSP LOS	1.000	7.425	55.133	-13.553	15.553	0.893
Demetriades 08	HOSP LOS	-6.300	4.826	23.294	-15.760	3.160	0.192
Ehrlich 98	HOSP LOS	-7.000	4.775	22.798	-16.358	2.358	0.143
Glade 05	HOSP LOS	-20.000	4.884	23.854	-29.573	-10.427	0.000
Kasirajan 03	HOSP LOS	16.000	5.836	34.062	4.561	27.439	0.006
Kokotsakis 07	HOSP LOS	7.830	4.485	20.118	-0.961	16.621	0.081
Matsumura 08	HOSP LOS	-11.100	1.798	3.232	-14.624	-7.576	0.000
McPhee 07	HOSP LOS	-4.300	12.468	155.441	-28.736	20.136	0.730
Midgely 07	HOSP LOS	-9.800	11.461	131.360	-32.264	12.664	0.393
Moainie 2008	HOSP LOS	-11.100	4.825	23.279	-20.556	-1.644	0.021
Morishita 04	HOSP LOS	-10.000	1.565	2.448	-13.067	-6.933	0.000
Najibi 02	HOSP LOS	-10.100	2.389	5.707	-14.782	-5.418	0.000
Nienaber 99	HOSP LOS	-33.000	6.982	48.750	-46.685	-19.315	0.000
Orandi 09	HOSP LOS	-4.200	1.296	1.680	-6.741	-1.659	0.001
Fairman 08 (VALOR)	HOSP LOS	-10.300	1.382	1.909	-13.008	-7.592	0.000
		-7.420	1.362	1.854	-10.088	-4.751	0.000



SUMMARY: MC and SC Trials

	TEVAR (%)	OPEN (%)	OR [95%CI]	p
Death, 30d	6	15	0.44 [0.33-0.59]	<0.0001
Death, 1 yr	16	22	0.73 [0.53-1.02]	0.07
Death, 2-3 yrs	24	25	0.92 [0.63-1.33]	0.65
Stroke	5	7	0.75 [0.50-1.13]	0.17
Paraplegia	4	9	0.42 [0.28-0.63]	<0.0001
Permanent Paraplegia	1	5	0.30 [0.14-0.62]	<0.001
Myocardial Infarction	3	7	0.81 [0.43-1.53]	0.51
Renal Dysfunction	6	16	0.40 [0.25-0.63]	<0.0001
Transfusion	4	84	0.01 [0.002-0.04]	<0.0001
Reintervention	8	9	1.01 [0.64-1.60]	0.95

Limitations

- No RCT TEVAR vs OPEN data available
- Some nRCTs were retrospective, historical control, ? overlapping across studies
- Inadequate description of procedure
- Patient inclusion criteria (selection bias)
- Some studies with differential duration of follow-up



Conclusion

TEVAR compared to Open Surgery, regardless of type of pathology:

- **Reduces early mortality and paraplegia**
- **Reduces postoperative renal insufficiency, reexploration (bleeding), transfusions and hospital LOS**
- **May reduce postoperative stroke and myocardial infarction (multicenter trials)**
- **Survival benefit beyond 1 year not proven**

