

Question 11 evidence tables

**Question 11: For patients with ischaemic stroke with basilar artery occlusion presenting either within 6 hours or between 6-24 hours of stroke onset, does mechanical thrombectomy in addition to best medical therapy improve functional outcome compared to best medical therapy alone?**

*NB Any discrepancies between reviewers in evidence quality and comment were discussed at the corresponding evidence review meeting*

EVT = endovascular therapy, IVT = intravenous thrombolysis, BA = basilar artery, TPA = tissue plasminogen activator, TICl = thrombolysis in cerebral infarction, BAO = basilar artery occlusion, BMT = best medical therapy, CTA = computed tomography angiography, MRI = magnetic resonance imaging, sICH = symptomatic ICH, MT = mechanical thrombectomy, SR = systematic review, MA = meta-analysis, RCT = randomised controlled trial, IPDMA = individual patient data meta-analysis, MDT = multidisciplinary team, PICO = patient/population, intervention, comparison and outcomes, OR = odds ratio, CI = confidence interval, QoL = quality of life, ADL = activities of daily living, OR = odds ratio, RR = relative risk, aOR = adjusted odds ratio, cOR = crude odds ratio, CI = confidence interval, RoB = risk of bias, I2 = heterogeneity statistic.

Ref ID	Source	Setting, design and subjects	Intervention	Outcomes	Results	Evidence quality (SIGN checklist score) and comment
594	A. Giorgianni et al (2018). Endovascular Treatment of Acute Basilar Artery Occlusion: Registro Endovascolare Lombardo Occlusione Basilar Artery (RELOBA) Study Group Experience. Journal of Stroke and Cerebrovascular Diseases. 27: 2367-2374.	RELOBA. Retrospective multicentre collection of patients with acute BAO who underwent endovascular treatment.  Patients presenting within 24 hours.	EVT and IVT or EVT only.  No patients with IVT only	39 patients good outcome at 3 months.( rankin 0 to 2).  Mortality 30%.	39% patients good outcome at 3 months.( rankin 0 to 2).  Mortality 30%.	+
594	A. Giorgianni et al (2018).	Italian registry design. 102 patients included. 5 years.	MT for BA thrombosis.	Good outcome 0-2 mRS at 3 months.	39% good outcome 30% mortality.	This was a reasonable series. About 60% had MT plus tPA. >50% treated >6 hours.

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	Endovascular Treatment of Acute Basilar Artery Occlusion: Registro Endovascolare Lombardo Occlusione Basilar Artery (RELOBA) Study Group Experience. Journal of Stroke and Cerebrovascular Diseases. 27: 2367-2374.				TICI 2b-3 in 62%.  Age, NIHSS and time to recanalisation were related to outcome.	
595	K. Gruber et al (2021). Evaluation of Endovascular Treatment for Acute Basilar Occlusion in a State-Wide Prospective Stroke Registry. Frontiers in Neurology. 12.	Registry data from Hessen, Germany.  Retrospective cohort study of patients included in the Registry with Basilar Artery Occlusion (BAO) between 2017 and 2019.  Adult patients with acute ischaemic stroke and confirmed BAO on arterial imaging were included (without fixed upper limit of time since onset).	403 patients with acute BAO were included. 270 patients (67%) were treated with best medical treatment (including thrombolysis) plus endovascular thrombectomy and 133 patients (33%) were treated with best medical treatment.	Primary outcome variable was mRS 0-3 at hospital discharge Propensity score matching analysis performed in subset of patients with pre-stroke independence and with onset of BAO < 24 hours.	A favorable outcome (mRS 0-3) was observed in 33.8% with best medical treatment and 26.7% with best medical treatment plus thrombectomy [OR.770, CI (0.50-1.2)]. Subgroup analyses for patients with a NIHSS score > 10 at admission to the hospital revealed a benefit from EVT [OR 3.05, CI (1.03-9.01). No significant differences between the two groups was found following propensity score matching analysis.	+  No post hospital outcome data available. No trend to difference following propensity score matching,
595	K. Gruber et al (2021). Evaluation of Endovascular Treatment for Acute Basilar Occlusion in a State-Wide Prospective Stroke Registry. Frontiers in Neurology.	Retrospective cohort study; data retrieved from mandatory regional database in Hessen Germany covering 6.285M population from 2017-2019. 403 patients included; 270 best medical therapy (BMT) plus endovascular therapy (EVT); 133 BMT alone.	Compared those with BMT and BMT plus EVT; MRS 0-3 at discharge. BMT patients were slightly older (73.4 vs 71.1) with fewer functionally independent pre Rx (75.2 vs 84.1%).	MRS at discharge, ICH, decompression, mortality, length of hospitalisation.	33.8% BMT and 26.7% EVT group had favourable outcome. Mortality was 33.8% and 36.2% in the two groups. No sig difference in ICH rates. mRS at discharge was 24.8% and 18.9% overall. In patients with severe stroke (NIHSS>10) mean MRS at	+  Retrospective study and will have usual potential biases but numbers are good and it is a reflection of real-world practice. Result in line with BASICS.

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	12.		33.1% and 16.6% received IVT in BMT and EVT groups respectively.		discharge was 6 in BMT and 5 in BMT/EVT. Those with late onset (6-24h) achieved significantly better outcome after BMT/EVT. On propensity score matching, no significant difference in outcome.	
596	A. Guenego et al (2021). Thrombectomy for Comatose Patients with Basilar Artery Occlusion: A Multicenter Study. Clinical Neuroradiology. 31: 1131-1140.	Cohort study, retrospective analysis of consecutive stroke patients with BAO treated by thrombectomy from the ETIS registry (multicenter prospective French thrombectomy registry). BAO thrombectomy patients dichotomized into 2 groups for analysis, comatose versus non-comatose.  From January 2012 – May 2019, 269 patients, 72(27%) in comatose group, 197 (73%) in non-comatose group	MT in BAO, comatose versus non-comatose patients	Primary outcome: rate of favourable clinical outcome at 3 months (mRS 0-3) Secondary Outcome: mRS 0-2 at 3 months, mortality, rate of intubation at day 1 post MT, haemorrhagic transformation of any type and parenchymal haematoma at day 1, Technical Outcomes: rate of mTICI ≥ 2b, rate of mTICI ≥ 2c, time from puncture to recanalization, onset to recanalization, number passes, need for rescue angioplasty/stent, complications.	Primary outcome: mRS 0-3: 11% comatose, 54% non-comatose (p<0.0001) Secondary outcomes: Mortality: 64% comatose, 34% non-comatose (p<0.0001) Similar procedure characteristics, and similar reperfusion rates between groups 59/72 comatose pts still comatose and intubated at day 1, only 1 of the 59 (1.7%) had a good outcome, and 44(75%) died. 13 comatose no longer comatose or intubated at day 1: 7/13 (54%) of these had good outcome, 2/13 died (15%) Multivariate analysis: predictors of mortality among comatose patients: male sex, older age, higher serum glucose level	+  Retrospective, comatose patients had lower rate of IV thrombolysis, no control best medical therapy group for comparison.  Limited studies in prior literature evaluating outcome in medical management only of BAO, suggest good outcome rate approx. 7% Direct comparison without control group not possible however rates of good functional outcome post BAO are higher than with medical therapy only from literature, particularly if non-comatose or no longer comatose at 1 day.
596	A. Guenego et al (2021). Thrombectomy for Comatose Patients with Basilar Artery Occlusion: A Multicenter Study.	Retrospective ETIS registry review from 6 included centres, all BAO thrombectomy included, 269 patients.	BAO thrombectomy – outcomes dichotomised for comatose vs non-comatose patients.	Primary outcomes - mRS 0-3 at 3 months Secondary clinical outcomes: mRS 0-2 at 3 months mortality at 3 months intubation day 1	mRS 0-3 11% in comatose vs 54% in non-comatose (p<0.001) despite similar recanalization rates mRS 0-2 8% comatose, 44% non-comatose (p<0.001)	+  Retrospective registry analysis only of those BAO proceeding with MT.

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	Clinical Neuroradiology. 31: 1131-1140.			haemorrhagic transformation PH at day 1 Procedural outcomes: mTICI >2b rate of complete recanalization (mTICI >2c).  Timings – puncture to recanal, onset to recanal, procedural complications, no of passes, rescue therapy with angioplasty/stenting	Mortality 64% comatose vs 34% non-comatose (p<0.001) Mortality increased risk with male gender (OR 31.2), older age (OR 1.13) and higher serum glucose (OR 1.54) but main table data does not show these differences (in supplement table) Similar procedural data – reperfusion, parenchymal haematoma.	
597	S. Jung et al (2016). A comparison between mechanical thrombectomy and intra-arterial fibrinolysis in acute basilar artery occlusion: Single center experiences. Journal of Stroke. 18: 211-219.	Retrospective single centre study of cases treated between 2003 and 2015.  57 patients with acute BAO within 12 hours from stroke onset.	24 patients received intra-arterial fibrinolysis and 33 mechanical thrombectomy.  Fibrinolysis involved administration of urokinase plus trioriban or reapro and allowed mechanical disruption with a microwire or angioplasty plus permanent stenting.  Mechanical thrombectomy involved aspiration using a Penumbra catheter or Stent-retrieval using Solitaire.	Time from groin puncture to recanalisation  Rate of complete recanalisation (mTICI ≥2b).  Rate of angioplasty/stenting.  Functional outcome (mRS 0-2 at 90 days).  Symptomatic haemorrhage.  Mortality at 90 days.	Favourable outcome common in the mechanical thrombectomy group but it was not statistically significant (39.4% vs 16.7%; P= 0.06). Time from groin puncture to recanalization was significantly shorter in the mechanical thrombectomy group than in the fibrinolysis group (48.5 [25.3 to 87.8] vs. 92 [44 to 179] minutes; P= 0.02) The rate of complete recanalization was significantly higher in the thrombectomy group than in the fibrinolysis group (87.9% vs 41.7%; P< 0.01).	Low level – single centre retrospective.

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			Pharmacological therapy could be used if MT failed along with permanent stenting.			
597	S. Jung et al (2016). A comparison between mechanical thrombectomy and intra-arterial fibrinolysis in acute basilar artery occlusion: Single center experiences. Journal of Stroke. 18: 211-219.	Retrospective single centre Korean hospital registry of 57 BAO cases 2003-2015.	Mechanical thrombectomy (n=33) v intra-arterial thrombolysis (n=24).	mRS <3 at 3m TICI 2b-3 recanalisation Time to recanalization Procedural complications SICH.	Shorter time from groin puncture to recanalization with ET (48.5 [25.3 to 87.8] vs. 92 [44 to 179] minutes; P=0.02), higher rate of complete recanalisation with ET (87.9% vs 41.7%; P<0.01). Non-significant but more frequent mRS≤2 at 3m with ET (39.4% vs 16.7%; P=0.06). No differences in SICH, complications, mortality	Low quality single centre retrospective comparison of non-evidence-based treatment v ET.
598	A. H. Katsanos et al (2021). Endovascular treatment for basilar artery occlusion: A systematic review and meta-analysis. European Journal of Neurology. 28: 6 2106-2110.	SR & M-A of EVT for BAO in 2021 PRISMA compliant but not PROSPERO registered 5 studies included – 2 RCTs (BEST & BASICS).  Total N = 1098.	EVT for BAO.	mRS 0-3 at 90/7  Usual safety & secondary outcomes.	neurosurgery trends to better functional outcomes & lower mortality for EVT. Higher SICH with EVT- RR 5.42 (2.74-10.71).	+
598	A. H. Katsanos et al (2021). Endovascular treatment for basilar artery occlusion: A systematic review and meta-analysis. European Journal of Neurology. 28: 6 2106-2110.	Systematic review and meta-analysis.  5 studies: 2 RCTs and 3 cohorts 1098 patients	MT for BA thrombosis.	Stepped mRS scores at 3 months mRS0-2 mRS0-3 All cause mortality.	None were significant.	This was well conducted.  There was heterogeneity comparing the RCTs to the series.
599	L. C. M. Langezaal et al (2021).	BASICS Study: RCT examining effects of MT vs standard care in patients with BA LVO within 6	MT including standard care vs standard care only.	Primary outcome: mRS 0-3 at 90 days	300 patients randomised 154 MT vs 146 Standard	+  RCT

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	Endovascular therapy for stroke due to basilar-artery occlusion. New England Journal of Medicine. 384: 1910-1920.	hours. Conducted over 8 years (2011-2019) (reflecting difficulty in recruiting patients). Efficacy and safety analysis. Multi-centre with blinded outcomes. (23 centres in 7 countries). NIHSS >10 eligible however included patients with lower scores and > 85 years in addition to contraindications to IVT (due to slow recruitment).	Standard care included IVT delivered < 4.5 hours for those only receiving MT.	Safety 90 day mortality sICH < 3 days Secondary outcome (0-2 mRS as excellent) NIHSS at 24 hours QOL at 90 days	Similar characteristics between both groups with low cross over (MT 1.9%) and Standard (4.8%). Higher rates of AF with MT group. NIHSS 21vs 22 (high levels of severity) 79% both groups received IVT ITT analysis: 44% vs 38% (mRs 0-3) with odds ratio 1.18 (0.92 to 1.5) NS No differences in secondary outcomes Safety: sICH 4.5% vs 07% (just NS) 90 day mortality 38.3% vs 43.2% (neurosurgery)	However approximately 30% eligible were not randomised and there generalisability of trial (of these > 70 % treated MT).  5% cross over from standard care to MT (however ITT analysis carried out) Underpowered for meaningful subgroup analysis Time flows I think were fast with IVT and MT metrics in both groups (median time for IVT from onset 2 hours vs 2.3 hours).
599	L. C. M. Langezaal et al (2021). Endovascular therapy for stroke due to basilar-artery occlusion. New England Journal of Medicine. 384: 1910-1920.	Randomised controlled trial from 2011 to 2019 on patients presenting within 6h of BAO. 23 centres, 7 countries. After slow initial recruitment, inclusion criteria extended to include those >85 years.	Patients randomised 1:1 to receive EVT vs BMT via central online portal. Baseline characteristics balanced.	Favourable functional outcome (MRS 0-3) at 90d. Safety outcomes: sICH, mortality. Secondary outcomes: MRS 0-2; NIHSS at 24h; EQ-5D quality of life score at 90d; PC-ASPECTS; BA patency at 24h. Trial requirements were altered due to slow recruitment assuming greater benefit of EVT over BMT and thus reduced numbers required for participation.	154 assigned EVT; 146 BMT. 3/154 (1.9%) crossover EVT to BMT; 7/146 (4.5) BMT to EVT. 78.8% and 79.5% received IVT in EVT and BMT groups respectively. 44.2% EVT and 37.7% BMT had favourable outcome at 90d; RR 1.18 35.1% EVT and 30.1% BMT were MRS 0-2. 72% EVT had successful reperfusion (TICI 2b/3) and CTA patency at 24h was 84.5% EVT and 56.3% BMT group. 90d mortality 38.3% EVT and 43.2% BMT p=0.29.	++  Multi-centre RCT but with slow recruitment. Screening log included 124 patients not randomised, 79% of whom underwent EVT; 5% crossover from BMT to EVT.

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600	W. Luo et al (2021). Endovascular intervention for basilar artery occlusion in the elderly. Therapeutic Advances in Neurological Disorders. 14.	China. Data from BASILAR. Patients over 75 selected from this study. From 829 patients 182 over 75 were analysed. Patients presenting within 24hs.	Conservative including IVT vs IVT plus EVT.	90 day mRS (0to3),mortality, Symptomatic ICH.	Compared to conservative cohort , the intervention cohort presented with a more favourable outcome ( MRS)28.3% vs 12.7%. and decreased mortality 54.3% vs 76.4%. No difference in SICH .	+
600	W. Luo et al (2021). Endovascular intervention for basilar artery occlusion in the elderly. Therapeutic Advances in Neurological Disorders. 14.	Retrospective BASILAR registry, China, 47 stroke centres, included all BAO within 24 hours of onset with and without MT, tpa if appropriate, 829 patients total, 182 >75 years.	BAO outcomes MT vs conservative management, MT outcomes dichotomised by age (<75 years vs >75 years)	Primary and secondary outcomes not stated Technical outcomes – mTICI 2b/3 Efficacy outcome – mRS 0-3 at 3 months Safety outcomes – mortality at 90 days, SICH (no time period specified).	127/182 >75 years intervention, 55/182 conservative mx >75 years MT improved functional outcomes (mRS 0-3) 28.3% vs 12.7% p=0.023) and reduced mortality (54% vs 76.4%, p=0.005), no difference in SICH rates (4.7% vs 0% p=0.235) Initial NIHSS noted as predictor of poor outcome – no statement of measures/cut off for this item.  >75 years vs <75 years: >75 years higher mortality (54.3 vs 44.2% p=0.041) but comparable rates of favourable outcomes (28.3% vs 32.9% p=0.326) and SICH (4.7% vs 7.5% p=0.270) Mutlivariate analysis >75 years predictor of mortality (OR 1.623 p=0.04), probability of successful outcome decreased with age and probability of mortality increased with age.	+

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601	B. Ramgren et al (2021). Endovascular therapy in basilar artery occlusion in Sweden 2016-2019-a nationwide, prospective registry study. Neuroradiology.	Data from Swedish Stroke Register (RS) and the Endovascular Treatment of Active Stroke Register (EVAS) and merged into RSEVAS Registry.  Observational study of patients included in both Registers between 2016-2019.  All patients > 18 years with large vessel occlusion in the basilar artery were included.	251 patients with basilar artery occlusion demonstrated on catheter angiogram were included and subclassified into proximal (n = 69), middle (n = 73) and distal (n = 109).	Multiple outcomes reported including radiological outcomes, process times, and early and 90 day clinical outcomes.	Patients with proximal basilar artery occlusion were significantly more likely than patients with middle or distal occlusion to be younger, have longer procedure times, have higher 90/7 mortality and require angioplasty or stenting. Overall 90/7 mortality was 38.7%.	Observational study using data from Registry with high capture rate of all treatments performed.  Loss to follow up 16% and data for follow up presented both with and without missing data but no calculation performed to adjust for missing data.
601	B. Ramgren et al (2021). Endovascular therapy in basilar artery occlusion in Sweden 2016-2019-a nationwide, prospective registry study. Neuroradiology.	Observational study, single cohort, Swedish prospective registry data. Combined data from two prospective national registries for stroke care (RS) and endovascular therapy (EVAS). Total of 251 patients underwent EVT for BAO between 2016 and 2019. Also subdivided patients into 3 groups: proximal, mid and distal BAO.	EVT for BAO.	Early outcome: NIHSS score at 24 hours Other outcomes: Mortality at 24 hours, 7, 28, 90 days, sICH, Outcome at 90 days on mRS scale (0-2, 3, 4, 5 or death), procedure related and post procedural complications, workflow/time metrics, successful reperfusion (mTICI 2b-3).	Mean NIHSS score at 24 hours 6 (could be evaluated in 60% of pts)  Mortality: 3.6% at 24 hours, 33.5% at 28 days, 38.6% at 90 days.  154(61.4%) 90 day survivors, lost 40 of these to follow up  sICH 1.1%  Functional outcome when lost to follow up NOT included: mRS 0-2: 29.8% (mRS 0-3: 47.5%) Functional outcome when lost to follow up included: mRS 0-2: 21.9%  mTICI 2b-3 83.1% (lower rate in proximal group 75%) Serious complications (30.3% - but included mass effect	<b>0</b>  No comparison/control group, therefore + at best. Lost relatively large proportion 26% of survivors (40 of 154) to follow up. Did not clearly define primary and secondary outcomes.



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					from infarcts in this, which was most common 'complication')	
602	O. C. Singer et al (2015). Mechanical recanalization in basilar artery occlusion: The ENDOSTROKE study. Annals of Neurology. 77: 415-424.	Observational, international registry of consecutive patients aged 18 years or older treated 2011-2013.  Centres were allowed to retrospectively include patients in the registry if patients were treated within the past 3 years and if clinical follow-up information was available.	All patients had mechanical thrombectomy. Factors impacting on outcome were recorded.	Favourable outcome defined modified Rankin Scale 0-2.	Good clinical outcome (mRS 5 0–2) was seen in 50 (34%) and moderate clinical outcome (mRS 5 0-3) by 62 (42%). Mortality was 35%; 43 patients (29%) died during the hospital stay. TICl 2b–3 recanalization was achieved in 79%. Three clinical factors were identified predicting good clinical outcome: -younger age (p =0.035), -lower initial NIHSS (p < 0.001), -the absence of hypertension (p =0.046). The use of MRI prior to EVT was also associated with significantly better clinical outcomes as compared to CT (p < 0.005).	Low – single arm.
602	O. C. Singer et al (2015). Mechanical recanalization in basilar artery occlusion: The ENDOSTROKE study. Annals of Neurology. 77: 415-424.	ENDOSTROKE STUDY: German and Austrian registry describing outcomes and process of care of patients with BAO and examining factors associated with favourable outcome in 2011-13 (old study). Both prospective and retrospective cases collected.	MT with standard care.	mRS 0-2 (good) and mRS 0-3 (moderate).	148 patients 34% good outcome at 3/12 42% mod outcome at 3/12 59% had IVT prior 79% TICl2b 3 score 90 mortality 35% Collateral status independently associated with outcome	Poor quality.  Old study (both retrospective cases and prospective) Only examined patients with BAO who underwent MT Outcome such as recanalization not blinded Observational
603	T. Yoshimoto et al (2020). Treatment Outcomes by Initial Neurological Deficits in Acute Stroke Patients with	Japanese registry of consecutive LVO patients. Oct 2014-Sep 2016 in 46 units.  BAO subgroup N=182 but 177 with data for analysis.	Comparison of EVT with BMT by bNIHSS (0-9 and 10+)  0-9: 22 BMT & 18 EVT	mRS 0-3 at 90/7 Usual safety outcomes  No independent assessment of outcomes (usual data used)	Mild group – BMT neurosurgery better (86% vs 72%) Severe group EVT better 54% vs 12%, p<0.01.	+  Old data

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	Basilar Artery Occlusion: The RESCUE Japan Registry 2. Journal of Stroke and Cerebrovascular Diseases. 29.		10+: 22 BMT & 115 EVT  7 were IA lysis only.  Clear selection biases.		Also better for 0-2.	
603	T. Yoshimoto et al (2020). Treatment Outcomes by Initial Neurological Deficits in Acute Stroke Patients with Basilar Artery Occlusion: The RESCUE Japan Registry 2. Journal of Stroke and Cerebrovascular Diseases. 29.	Japanese Registry. RESCUE 2 Suggested outcomes might be different depending on the severity of initial presentation. Baseline population 2420 46 centres, 167 patients.	MT for BA thrombosis in those below NIHSS 10 compared to those on or above 10.	mRS 0-3 at 3 months Compared people who received MT from those who did not.	In the severe group (NIHSS = 10+), favourable outcome in 54% with MT v 12% with BMT.  In the milder group, favourable outcome was 72% with MT v 86% with BMT.	This was based on patients taken from a large registry and can be considered exploratory. There is obvious bias in the groups.
604	X. Liu et al (2020). Endovascular treatment versus standard medical treatment for vertebrobasilar artery occlusion (BEST): an open-label, randomised controlled trial. 19: 115-122.	Multicentre PROBE trial in 28 centres in China (2015-17). Stopped early after 131 randomised (of 344 planned).	Thrombectomy+ best medical care (n=66) v best medical care alone (n=65) in patients within estimated 8h of basilar (or V4) occlusion on angiography.	Primary outcome: mRS<4 at day 90. Primary safety outcome: mortality at d90. Secondary safety endpoints: SICH, device-related complications, and SAEs.	TT: no difference in mRS 0–3 at d90 (42% intervention group vs 32% control; adjusted odds ratio [OR] 1.74, 95% CI 0.81–3.74). Secondary analyses, higher rate of mRS 0–3 at d90 with EVT compared to medical care per-protocol (28 [44%] of 63 patients with intervention vs 13 [25%] of 51 with standard therapy; adjusted OR 2.90, 95% CI 1.20–7.03) and as-treated (36 [47%] of 77 patients with intervention vs 13 [24%] of 54 with standard therapy; 3.02, 1.31–7.00) populations.	+ Trial result confounded by early termination, very high crossover rate (22% in medical arm), low alteplase use (around 30%).

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					The 90-day mortality was similar between groups (22 [33%] of 66 patients in the intervention vs 25 [38%] of 65 in the control group; p=0.54) despite a numerically higher prevalence of sICH in the intervention group.	
604	X. Liu et al (2020). Endovascular treatment versus standard medical treatment for vertebrobasilar artery occlusion (BEST): an open-label, randomised controlled trial. 19: 115-122.	Multicentre China.  Randomised.  Up to 8 hours	IVT and EVT vs IVT.	mRS < 3 at 90 days.  Mortality at 90 days . sICH.	288 assessed, 131 randomised. 66 EVT, 65 control.  Study stopped due to poor recruitment and high crossover to EVT. In the intention to treat analysis .No difference in mRs. 42% EVT vs 32% control.  90 day mortality the same. Higher sICH in intervention group.	+
605	H. F. Sang et al (2021). Association between time to endovascular therapy and outcomes in patients with acute basilar artery occlusion. Neurology. 97.	Retrospective BASILAR registry, China, 47 stroke centres, included all BAO with MT intervention, 639 patients.	MT for BAO.	Primary outcome – mRS 0-3 at 90 days (favourable outcome) Secondary outcomes – mRS 0-2 at 90 days (good outcome), mortality at 90 days, sICH within 48 hours.  Onset to puncture times in 4 categories (0-4 hours, 4-8 hours, 8-12 hours, >12 hours) and 0-9 hours vs >9 hours associated with outcomes.	Primary outcome - 32.2% mRS 0-3 at 90 days Secondary outcomes - 46% mortality at 90 days, 27.5% mRS 0-2 at 90 days, sICH 7.2%.  Adjusted analysis – compared to patients <4 hours, the 4–8 hours OPT were less likely to have favourable outcome (0.63 [0.40–0.98] Treatment 4-8 hours less likely to have favourable outcome than <4 hours (OR .46, 0.22-0.97).	+

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					Mortality and SICH no statistically sig difference in 4 time windows <9 hours, the adjusted OR per 1-hour delay was 0.87 (0.77–0.97) for 90-day mRS 0–3, 0.86 (0.76–0.97) for 90-day mRS 0–2, and 1.11 (1.01–1.23) for mortality, no sig difference in SICH Continuous time–benefit curves - probability of achieving 90-day favorable outcome declined from 46.5% at 1 hour to 26.0% at 9 hours (2.3% decrease per 1 hour delay).	
605	H. F. Sang et al (2021). Association between time to endovascular therapy and outcomes in patients with acute basilar artery occlusion. Neurology. 97.	Observational study, single cohort. Data from Endovascular Treatment for Acute Basilar Artery Occlusion multicentre registry in China (BASILAR) between January 2014 and May 2019. Aim: evaluate how onset to puncture time (OPT) affects the efficacy and safety outcomes of EVT in patients with acute BAO in current clinical practice. For analysis subdivided into groups depending on OPT of ≤4 hours, >4 to ≤8 hours, >8 to ≤12 hours, and >12 hours. Eligible patients had BAO, EVT + BMT, and recorded OPT Included 639 of 829 patients in the BASILAR registry. Median age 64 years (IQR, 56–73), baseline NIHSS score 27 (IQR, 17–33).	EVT + BMT for BAO.	Primary outcome: favourable functional outcome (mRS 0–3) at 90 days Secondary outcomes: 90-day functional independence (mRS 0–2), freedom from disability (mRS 0–1) at 90 days.  Safety outcomes.  mortality within 90 day, SICH within 48 hours, any haemorrhage within 48 hours.	Primary outcome: mRS 0-3 at 90 days: 32.2% Secondary and other outcomes and analysis: mRS 0-2 at 90 days 27.5%, mortality 46.0%, sICH 7.2%, successful reperfusion 80.8%, median OPT 328 min.  Rates of mRS 0-3 best for OPT <4 hour, numerically lower in later time windows, and significantly least between 8 and 12 hours (p = 0.046).  OPT 4–8 hours and 8–12 hours associated with lower rates of mRS 0-3 compared with < 4 hours OPT had L-shaped associations with mRS 0-3 (p nonlinearity = 0.028) and	+  Real world registry data, single cohort, no control group, retrospective analysis of prospectively collected data.

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					<p>mRS 0-2 (p nonlinearity = 0.025), with significant benefit loss throughout the first 9 hours, but then levelled off.</p> <p>Probability of achieving 90-day mRS 0-3 declined from 46.5% at OPT 1 hour to 26.0% at 9 hours with 2.3% decreased probability per hour delay.</p>	
606	W. Zi et al (2020). Assessment of Endovascular Treatment for Acute Basilar Artery Occlusion via a Nationwide Prospective Registry. JAMA Neurol. 77: 561-573.	Prospective cohort study at 47 centres in China; patients with BAO <24h from onset.	ET + best medical care (n=647) v best medical care alone (n=182).	<p>Primary: mRS distribution at d90 (adjusted).</p> <p>Secondary: mRS &lt;4 at d90</p> <p>Safety: SICH, mortality</p>	ET associated with better d90 mRS (acOR 3.08 [95%CI, 2.09-4.55]; P < .001), higher rate of d90 mRS<4 (acOR 4.70 [95%CI, 2.53-8.75]; P < .001); lower d90 mortality (acOR 2.93 [95%CI, 1.95-4.40]; P < .001) despite increased SICH (7.1% vs 0.5%; P < .001).	- Unclear how representative the population is. 26% IVT use. Male predominant.
606	W. Zi et al (2020). Assessment of Endovascular Treatment for Acute Basilar Artery Occlusion via a Nationwide Prospective Registry. JAMA Neurol. 77: 561-573.	<p>BASILAR Chinese group in JAMA Neurol 2020.</p> <p>"Nationwide" cohort study in 47 centres in China. Consecutive adult patients with BAO presenting within 24H &amp; ps mRS 0-2.</p> <p>N=829 (of 1254 with BAO screened) so &gt;1/3 excluded.</p>	<p>EVT +/- IVT versus BMT.</p> <p>Not randomised.</p>	<p>linded local neurologist assessment of mRS at 90/7 (SHIFT).</p> <p>Usual secondary &amp; safety outcomes</p> <p>Major group differences in age, baseline PC-ASPECTS, BP all adverse for control (BMT). Only 26% of controls got IVT yet 83% presented within 9h &amp; 71% within 6h.</p> <p>Did do propensity score matching to try and address these.</p>	<p>ad cOR = 3.08 2.09-4.55 favouring EVT</p> <p>Also sig favours EVT for multiple dichotomised mRS analyses sICH v.sig higher for EVT (0.5 vs 7%).</p> <p>Mortality lower for EVT (but not matched groups); ad cOR=2.93 (1.95-4.4).</p>	<b>0</b> Numerous concerns.

Ref ID	Source	Setting, design and subjects	Intervention	Outcomes	Results	Evidence quality (SIGN checklist score) and comment
607	C. Tao et al (2022). Endovascular treatment for acute basilar artery occlusion: A multicenter randomized controlled trial (ATTENTION). International Journal of Stroke.	ATTENTION is an investigator-initiated, multicenter, prospective, randomized, controlled clinical trial with open-label treatment and blinded outcome assessment (PROBE) .	EVT versus best medical management (BMM).	The primary effect parameter is a modified Rankin Score of 0–3 at day 90.	Not available (but presented at ESOC).	Excellent. The main issue is the choice of outcome measure being mRS 0-3 rather than 0-2.
607	C. Tao et al (2022). Endovascular treatment for acute basilar artery occlusion: A multicenter randomized controlled trial (ATTENTION). International Journal of Stroke.	Protocol	Multi-centre prospective, randomised CCT, open-label Rx with blinded outcome (PROBE) EVT plus BMT vs BMT alone with MRS 0-3 at 90d. i.e. similar to BASICS. However, includes patients up to 12h and NIHSS>10 Randomisation 2:1 EVT:BMT 342 patients across 36 centres in China. Included all patients with BAO >18years with seemingly no upper age cut-off. NIHSS >10; PC-ASPECTS<6 for patients <80 and <8 for >80 years.	24h outcome. Video assessment of 20% baseline and 24hr assessment included. Primary outcome is MRS 0-3 at 90d. Secondary outcomes: MRS 0-2 at 90d; MRS ordinal shift; NIHSS 24-72h and 5-7 post discharge. mRS; EuroQol-5, Barthel Index at 90d.  Safety: SICH; mortality  Radiologic: Recanalisation at 24-72h on CTA; Vol of cerebral infarction on CT; ICH		+
608	C. Li et al (2021). Basilar Artery Occlusion Chinese Endovascular Trial: Protocol for a	Protocol.  Multi centre RCT open label blinded endpoint study involving Chinese Population	MT plus standard care vs standard care including provision of IVT.	mRS 0-3 primary outcome at 90 days	No results presented in abstract.  However from ESOC 2022 (analysis from 227 patients).	No publication yet or pre-print available

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	prospective randomized controlled study. International Journal of Stroke.	examining effects of the safety and efficacy of MT plus standard care vs standard care in patients with BAO (or occlusion of intracranial portion of VA) 6-24 hours after symptom onset. NIHSS > 6 without evidence of large baseline infarction. Pre stroke mRS ≤1.		Secondary outcomes: NIHSS improvement at 24 hours  mRS dichotomised at 90 days (0-2 vs 3-6)  Safety sICH at 24 hours  90 mortality.	Interim analysis (MT plus standard care resulted in increased odds of favourable outcome OR 2.92 (1.56 to 5.47). 22.1% difference in primary outcome.	
608	C. Li et al (2021). Basilar Artery Occlusion Chinese Endovascular Trial: Protocol for a prospective randomized controlled study. International Journal of Stroke.	Protocol  Prospective, multicentre, randomized, controlled, open-label and blinded end point trial, conducted in China. Randomization 1:1 to EVT (with solitaire) + BMT vs BMT alone Subjects: planned 318 patients, presenting with BAO or both intracranial vertebral segments, who can be within 6-24 hours of onset or LSW. Interim analysis planned at 212 patients. Inclusion criteria: NIHSS ≥ 6, baseline mRS ≤ 1 Exclusion criteria: pc-ASPECTS < 6, pons-midbrain index ≥ 3, ICH, complete cerebellar infarct with significant mass effect, complete unilateral or bilateral thalamic infarction.	BMT + EVT with solitaire stent retriever (with or without adjunctive manual aspiration), control group for comparison is BMT alone.	Primary outcome: proportion of patients achieving favourable outcome mRS 0-3 at 90 days.  Secondary outcomes: dramatic early favourable response (NIHSS 0-2 or ≥ 8 pt improvement at 24 hr), dichotomized mRS (0-2 vs 3-6) at 90 days, dichotomized mRS (0-4 vs 5-6) at 90 days, mRS shift analysis at 90 days, Barthel index at 90 days, NIHSS at 90 days, MOCA at 90 days, Quality of life analysis at 3 & 6 & 12 months.  Core lab neuroimaging points (infarct volume and volume change, recanalization in both groups at 24 hours with AOL grade, TIC1 on post MT angio),	August 2016 to June 2021, 218 patients enrolled. Mean age 64 years, 73% were male, median NIHSS 20 (IQR, 14-29). Randomization within 6-12 hours occurred in 135 (62.2%) patients. Primary outcome: rate mRS 0-3 at 90 days 24.3% in BMT group, 46.4% in EVT + BMT group. Adjusted OR 2.92, statistically significant (P = .001). NNT 4.5.  Secondary outcomes: similar benefit in mRS shift analysis, with adjusted common odds ratio of 2.64. Outcome of mRS 0 to 2 also showed statistically significant benefit in the thrombectomy group, with nearly 25% absolute difference (39% vs 14%) Mortality: 11% absolute difference in favour of thrombectomy (30.9% versus 42.1%), which did not reach significance.	++ RCT, data from conference presentation, full publication of outcomes awaited.

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				Safety end points (mortality at 9 days, ICH, sICH, procedure complications)	sICH: trend toward higher rate in the thrombectomy group (6% vs 1%), not reaching statistical significance. Prespecified subgroup analyses no modification of treatment effect according to age, baseline NIHSS score, or randomization time window (before or after 12 hours).	
674	Jovin, T. G., et al. (2022). "Trial of Thrombectomy 6 to 24 Hours after Stroke Due to Basilar-Artery Occlusion." <i>New England Journal of Medicine</i> 387(15): 1373-1384	<p>Prospective randomised controlled trial conducted in China over 5 years testing the effectiveness of MT plus BMT vs BMT in patients presenting with BAO between 6-24 hours. Randomisation 1:1</p> <p>Sites selected &gt; 30 MT per year</p> <p>Inclusion: 18-80 years, 6-24 hours, pre-stroke modified RS 0-1, NIHSS ≥ 10 but then expand to ≥ 6, PC ASPECTS ≥ 6, pons midbrain index ≤ 2</p> <p>Note that during trial after 215 enrolled (primary outcome changed from mRS 0-4 to 0-3) at 90 day before unblinding to steering committee.</p>	MT plus BMT vs BMT in patients BAO presenting between 6-24 hours.	<p>Primary outcome initially mRS 0-4 at 90 days but changed before unblinding to 0-3</p> <p>mRS 0-4 became secondary outcome</p> <p>Primary safety outcomes</p> <p>sICH 24 hours</p> <p>90 day mortality</p>	<p>537 screened but 218 randomised and 217 analysed</p> <p>110 MT 107 BMT</p> <p>Age: 64 vs 63</p> <p>mRS of 0 77% vs 83%</p> <p>Majority proximal and middle BAO</p> <p>NIHSS 20 vs 19</p> <p>IVT 14% vs 21%</p> <p>Onset to randomisation: 664 vs 662 minutes</p> <p>Primary outcome: 46% vs 24% (ms (0-3) [1.81 - 95% [ 1.26 to 2.6] 55% vs 43% (secondary outcome)</p>	<p>Level 1 evidence and similar absolute differences in primary outcomes but there are a number of bias</p> <p>1 Selective population with slow recruitment 2 Changed inclusion criteria after 61 patients (NIHSS) 3 Before unblinding altered primary outcome 4 Chinese population with higher rates of intracranial disease noted 5 Smaller trial compared with ATTENTION and lower numbers for subgroup analysis noted with wider CI.</p>



Ref ID	Source	Setting, design and subjects	Intervention	Outcomes	Results	Evidence quality (SIGN checklist score) and comment
					<p>SICH 6% vs 1%</p> <p>90&amp; mortality 31% vs 42%</p> <p>Procedural complications 11%</p>	
674	Jovin, T. G., et al. (2022). "Trial of Thrombectomy 6 to 24 Hours after Stroke Due to Basilar-Artery Occlusion." <i>New England Journal of Medicine</i> 387(15): 1373-1384	<p>Chinese RCT 1:1</p> <p>Key eligibility:</p> <ul style="list-style-type: none"> <li>-18-80</li> <li>-Pre stroke mRS 0-1</li> <li>-bNIHSS 6+ (modified part way through from 10+)</li> <li>-6-24h after onset</li> <li>-Good PC-ASPECTS &amp; Pons –</li> </ul> <p>Midbrain Index scores</p>	MT+BMT vs BMT in BAO (or bilat intracranial VA occlusion).	<p>10 Endpoint mRS 0-3 (modified part way through).</p> <p>217 randomised at median 663 mins after onset.</p> <p>Low IVT rate – only 18% so query over applicability of “BMT” in this trial.</p>	<p>46% 0-3 in EVT arm vs 24% in control.</p> <p>Ad RR 1.81; 1.26-2.6, P&lt;0.001 (original primary outcome had strong trend but NS favouring MT).</p> <p>Trend to lower mortality &amp; Increased SICH with MT.</p>	<p>Some issues re bias in selection and changes to inclusion criteria &amp; primary outcome measure during trial.</p> <p>However consistent with ATTENTION results</p> <p>Include within meta-analysis</p> <p>Few enrolled in key subgroups: NIHSS 6-9, 12-24h (41%; 76) &amp; no over 80y/mRS 2+</p>