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Michael Forsting
Chairman of the Institute of Radiology and Neuroradiology at the University Clinics Essen, Germany

Introduction

Michael Forsting, Editor

Dear Neurointerventionalists all over the world

It is my pleasure to present the latest issue of the Neurointerventional Newsletter. For more than a decade we have been providing you with an overview of the newest literature along with with personal comments of experts in the field of neurointervention.

This newsletter covers two major fields of neurointerventional work: stroke therapy and aneurysm therapy, clearly the two big shots of our work. With numerous studies revealing the advantage of endovascular recanalization compared to systemic intravenous thrombolysis, intraarterial therapy is growing fast. We still have some unsolved problems, mainly regarding the time window, but in general the endovascular therapy is the treatment of choice.

The same story is true for endovascular therapy of aneurysms. For nearly 20 years it has been accepted that patient outcome is better after endovascular occlusion of the aneurysm compared to clipping. With further development of new techniques – like flow diverters – we are increasingly able to treat formerly "untreatable" aneurysms. However, we should not forget that there are "simple" therapeutic options in some patients that proved to be safe and effective, for example. parent vessel occlusion.

I really hope that you will enjoy this latest newsletter and I am looking forward to hearing your comments and opinions.

Best regards,

Michael Forsting

Contributions to this issue: Tommy Andersson, Alain Bonafé, Michael Forsting, Alejandro Garcia González, Jorge Olier, Rodrigo Rivera and Leonard Yeo.

Critical Review of Literature Acute Ischemic Stroke

Direct Mechanical Intervention Versus Combined Intravenous and Mechanical Intervention in Large Artery Anterior Circulation Stroke: A Matched-Pairs Analysis

Broeg-Morvay A, Mordasini P, Bernasconi C, Bühlmann M, Pult F, Arnold M, Schroth G, Jung S, Mattle HP, Gralla J, Fischer U.
Stroke. 2016 Apr;47(4):1037-44. Epub 2016 Feb 23.

We are in a new age of treatment for stroke after the success of mechanical thrombectomy, which revolutionized the field. Nonetheless intravenous tPA has been used for almost 20 years and is still a proven modality. The next logical step is to question how effective a combination of IV tPA and mechanical thrombectomy (MT) is compared to pure mechanical thrombectomy. The authors of this paper have elegantly tried to answer this very clinically relevant question with a small cohort of 40 patients treated purely with MT matched to a group of 167 patients with bridging IV tPA and MT.

These 40 patients were within the 4.5hr time window with no contraindications to tPA use. The treating team decided against tPA treatment for the proximal occlusion based on clinical grounds and relied purely on MT. This allowed patients in the purely MT arm to be properly matched to the control arm (IV tPA + MT). Only hypercholesterolemia, incidence of coronary heart disease and shorter interval from symptom onset to intervention were different in both arms. Of note is the fact that the NIHSS at times was lower than established guidelines for MT (range 4-38) and the authors acknowledged that the collateral circulation was not considered in the analysis.

In this interesting hypothesis generating article, the authors showed the advantages of using multivariate matching techniques. When the entire control arm was compared with the pure MT arm, using univariate analysis, the only outcomes that were significantly different was more bleedings and, in particular, asymptomatic bleedings in the control arm (IV tPA & MT).

Continued on next page

However, when the authors performed a matched pair analysis there was a significant difference in mortality in favor of pure mechanical thrombectomy.

The authors also state correctly that this is the right time period in which to perform such a study. In the past all patients who presented within 4.5hrs were treated with IV tPA and it was ethically wrong to withhold such treatment without proper contraindications.

It is only recently that the weight of evidence has started to shift with five positive MT trials offering an alternative modality to IV tPA.

Nonetheless, these positive trials still used IV tPA when there were no contraindications, which has led to a lack of evidence to illuminate whether MT alone is a viable choice.

IV tPA and MT were thought to be possible complementary treatment modalities and there has been a report that prior IV tPA may actually act synergistically with thrombectomy by facilitating clot extraction.[1] It is important that the current study lends weight to the prospect that MT on its on is a viable strategy so that further clinical trials can be done.

Personal comment

In this study the major advantages of mechanical thrombectomy over intravenous thrombolysis have translated into a mortality benefit rather than an improved functional outcome, which is unusual for stroke trials.

From a treating physician's point of view, recommending purely MT without IV tPA has several attractive advantages. Firstly, there is a reduction in treatment cost from not using tPA. Secondly, there may be a reduction in the incidence of bleeding in the population, which translates as both less time spent admitted as well as fewer complications attributed to stroke treatment during hospital audits. Finally, tPA itself has cytotoxic properties which can affect the brain parenchyma when the blood brain barrier has been affected by stroke.

Despite its drawbacks, thrombolytic medications such as tPA have several potential advantages in conjunction with MT that should not be underestimated. They can assist in dissolving any distal emboli generated by the procedure. They can likewise reach distal occlusions that MT may not be able to.

It is also important to remember that tPA is not the only thrombolytic drug on the market. The same question as to whether MT on its own is superior to combined treatment may resurrect itself when other medications such as Tenecteplase clear regulatory approval.

What is striking is the ability of the authors to see the opportunities provided in accumulating a small population of representative patients who underwent only MT for clinical reasons, and then extracting a stimulating result through carefully matched pair analysis.

The authors should be praised for their resourcefulness in capitalizing on the data they have collected.

Several meta-analyses have recently been published on the subject and show that MT is beneficial both with and independent of IV tPA.[2,3]

There are several clinical trials underway which may provide more definitive answers on which is the better modality for acute ischemic stroke. The "Trial and cost effectiveness evaluation of intra-arterial thrombectomy in acute ischemic stroke (TRACE)" trial has not yet released the final data although initial analysis have been presented in international conferences.[4] *Even the "Thrombectomy in patients ineligible for IV tPA" (THRILL) trial will provide some insights into this dilemma.*[5]

It is more than likely that the answer will be somewhere in the middle and different subsets of patients will benefit from different treatment strategies.

Further trials would help to define which type of patients might benefit from MT and which type would require a combined approach. This will involve consideration of the effects of comorbidities, age, size and location of thrombus, collateral circulation and perfusion parameters.

Nonetheless, in view of the promising and intriguing results from this study, a proper randomized clinical trial directed at this question is needed - and sooner rather than later.

Leonard Yeo and Tommy Andersson, Kortrijk, Belgium

1. *Guedin, P., A. Larcher, J. P. Decroix, J. Labreuche, J. F. Dreyfus, S. Evrard, et al. 2015. Prior IV thrombolysis facilitates mechanical thrombectomy in acute ischemic stroke. J. Stroke Cerebrovasc. Dis. 24:952–957*
2. *Rodrigues FB, Neves JB, Caldeira D, Ferro JM, Ferreira JJ, Costa J. Endovascular treatment versus medical care alone for ischemic stroke: systematic review and meta-analysis. BMJ. 2016 Apr 18;353: i1754.*
3. *Tsivgoulis G, Katsanos AH, Mavridis D, Magoufis G, Arthur A, Alexandrov AV. Mechanical thrombectomy improves functional outcomes independent of pretreatment with intravenous thrombolysis. Stroke. 2016 Jun; 47(6):1661-4.*
4. *Bracard S, Guillemin F, Ducrocq X. THRACE study: Intermediate analysis results. Int J Stroke 2015;10:31.*
5. *Bendszus, M., G. Thomalla, M. Knauth, W. Hacke, S. Bonekamp, and J. Fiehler. 2015. Thrombectomy in patients ineligible for iv tPA (THRILL). Int. J. Stroke 10:950–955*

Training Guidelines for Endovascular Ischemic Stroke Intervention: An International Multi-Society Consensus Document

J NeuroIntervent Surg neurintsurg-2016-012316.
ePub 2016 Feb 17.

Following the recent RCT, acute ischemic stroke treatment has undergone a major paradigm shift incorporating mechanical thrombectomy in the therapeutic armantorium for stroke with large vessel occlusion.

These results have been obtained:

1) in high volume comprehensive stroke centers capable to carry mechanical thrombectomy on a 24/7 full service,

2) by experienced interventionalists,

3) on image based selected patients,

4) within the therapeutic window of six hours for the vast majority of the patients recruited.

The multi societies position statement can be summarized as follows :

1) Specific requirements for baseline education of a neurointerventionalist who must spend one year training in clinical neuroscience and neuroimaging, followed by one year dedicated training in a high volume center after graduating from residency. However, accreditation rules, understandably, may vary from country to country so no specific curriculum was addressed for members of "allied" societies eager to participate in acute stroke treatment in countries where there is a shortage of well-trained stroke interventionalists[1].

2) Maintenance of proficiency recommendations calls for:

- a specific continuous medical education program,

- a quality assurance program with tracking of recanalization, complication rates and patient outcome compiled in a registry.

The consensus document closed on hospital requirement without any mention of stroke care organization and expeditious workflow[2]. It must be remembered that positive acute ischemic stroke trials were obtained in centers with optimized in- hospital time metrics processes. We should not forget that symptom onset recanalization time is the most powerful metrics for success in the endovascular treatment of acute ischemic stroke.

Alain Bonafé, Montpellier, France

1. *Ischaemic stroke and ST-segment elevation myocardial infarction: fast-track single-stop approach. P. Lanzer, P. Widinsky, Eur Heart J. 2015 Sep 14;36(35):2348-55.*

2. *Recent endovascular trials: implications for radiology departments, radiology residency and neuroradiology fellowship training at comprehensive stroke centers. M. Goyal et al. Radiology. 2016 Mar;278(3):642-5.*

Endovascular Thrombectomy after Large-Vessel Ischaemic Stroke: A Meta-Analysis of Individual Patient Data from Five Randomised Trials

Goyal M, Menon BK, van Zwam WH, Dippel DW, Mitchell PJ, Demchuk AM, Dávalos A, Majoie CB, van der Lugt A, de Miquel MA, Donnan GA, Roos YB, Bonafe A, Jahan R, Diener HC, van den Berg LA, Levy EI, Berkhemer OA, Pereira VM, Rempel J, Millán M, Davis SM, Roy D, Thornton J, Román LS, Ribó M, Beumer D, Stouch B, Brown S, Campbell BC, van Oostenbrugge RJ, Saver JL, Hill MD, Jovin TG; HERMES collaborators.

Lancet.2016 Apr 23; 387(10029):1723-31. Epub 2016, Feb 18

The authors formed the HERMES collaboration to pool patient-level data from five trials all dealing with thrombectomy in acute stroke. This way they analyzed individual data from 1287 patients, roughly half of them assigned to endovascular thrombectomy and half to control arms. Endovascular thrombectomy led to significantly reduced disability at 90 days compared with controls. The number needed to treat with endovascular thrombectomy to reduce disability by at least one level on mRS for one patient was 2.6. Effect sizes favoring endovascular thrombectomy over control were present in several strata of special interest, including in patients aged 80 years or older, those randomized more than 300 minutes after symptom onset and those not eligible for intravenous alteplase.

Personal comment

In the past we had numerous studies dealing with stroke treatment, and among those thousands of studies dealing with molecular effects, creating protection drugs, a lot of things worked well in animals and nothing ever went into clinical medicine. This was totally different with five studies dealing with a simple thing like thrombectomy in acute stroke

All of the five randomized trials – now the basis of the meta-analysis – indicated that endovascular thrombectomy should be first line treatment in a stroke patient with a large-vessel occlusion. The meta-analysis underlines that this is even true in those patients previously thought not to be good candidates for recanalization; old patients; and those beyond a five hour window.

Specifically the time window needs much more research. I am convinced that the treatment window after symptom onset is very much defined by very individual parameters like blood pressure, collaterals, maybe premedication like ASA, blood glucose levels and so on. As a radiologist I have to believe that imaging might find a solution for the definition of individual time windows.

And the authors emphasize that a lot of patients were initially excluded from the fivethrombectomy studies. And even for these patient groups there might be certain benefits from thrombectomy. This is a large field for research in the future.

Michael Forsting, Essen, Germany

Conscious Sedation versus General Anesthesia during Endovascular Acute Ischemic Stroke Treatment: A Systematic Review and Meta-Analysis

Brinjikji W, Murad MH, Rabinstein AA, Cloft HJ, Lanzino G, and Kallmes DF.
AJNR Am J Neuroradiol 2015 36: 525-52. Epub 2014 Nov 13.

Brinjikji et al. have performed a review and meta-analysis comparing conscious sedation and general anesthesia in the endovascular treatment of patients suffering from ischemic stroke.

They reviewed nine articles (retrospective studies) covering 1956 patients, 814 undergoing general anesthesia and 1142 undergoing conscious sedation. The results indicate that, compared with conscious sedation, general anesthesia is associated with higher rates of mortality (OR=2.59) and respiratory complications (OR=2.09), a worse functional prognosis (OR=0.43), and a lower recanalization rate (OR=0.54), though no differences in the symptomatic and asymptomatic hemorrhage rates were observed.

There were no differences for the time measures, and while mean procedure time was 15 minutes shorter for conscious sedation than for general anesthesia, the difference was not significant (P=0.17).

By way of constraints, the studies were retrospective, and the patients who underwent general anesthesia had higher NIHSS scores, although only six of the nine studies contained information on basal NIHSS scores.

Causes for the higher morbidity and mortality cited included an association between inhalation of anesthetic gases and a higher risk of cerebral hypoperfusion. Induction of, and recovery from, general anesthesia are associated with a hypotensive state.

Personal comment

Everyone wants anesthesia, whether conscious sedation or general anesthesia, to be safe and efficacious, capable of achieving patient immobility and a pain-free state.

Further, we all want to prevent patients from experiencing hemodynamic changes, basically on induction of and emergence from anesthesia.

Similarly, everyone is aware that right-sided stroke and left-sided stroke are not the same, that patient age plays a role, and that conscious sedation is sometimes not feasible.

The margins of safety for anesthetics are quite narrow. Drug type and dose needed by patients suffering from ischemic stroke probably differ from those needed by those same patients in a clinical setting other than ischemic stroke.

Why? Because when conscious sedation or general anesthesia is administered, the brain, the target organ for the effects of the drug, is not being monitored. And a brain in an ischemic baseline state probably does not behave the same as one in a non-ischemic state, that is, its responses are probably not the same.

At the same time, we are also aware that there is neither a definition nor a protocol for conscious sedation, and we do not know which drugs should be employed or the doses that should be used.

At this time, the Practical Clinical Guidelines recommend conscious sedation over general anesthesia. In July 2015[1] the American Heart Association (AHA) stated that "it might be reasonable to favor conscious sedation over general anesthesia during endovascular therapy for ischemic stroke.

But ultimate selection should be individualized on the basis of patient risk factors, tolerance to procedure, and other clinical characteristics." The 2015 update to the guidelines of the Society of Neurointerventional Surgery (SNIS)[2] recommends reserving general anesthesia for patients who are not considered able to protect their airways for the procedure while supine or who are too uncooperative for the procedure (IIb, level of evidence C).

We need to bear in mind that patients suffering from ischemic stroke need their own specific protocol for both conscious sedation and general anesthesia based on prospective, randomized trials furnishing all the data needed to be able to opt for one or the other.

Alejandro Garcia González,
Sevilla, Spain

1. *2015 American Heart Association/American Stroke Association Focused Update of the 2013 Guidelines for the early management of patients with acute ischemic stroke regarding endovascular treatment: A guideline for healthcare professionals from the American Heart Association/American Stroke Association. Powers WJ, Derdeyn CP, Biller J, Coffey CS, Hoh BL, Jauch EC, Johnston KC, Johnston et al. Stroke. 2015;46(10):3020-35.*
2. *Initial hospital management of patients with emergent large vessel occlusion (ELVO): report of the standards and guidelines committee of the Society of Neurointerventional Surgery. McTaggart RA, Ansari SA, Goyal M, Abruzzo TA, Albani B, Arthur AJ et al. J Neurointerv Surg. August 2015 [Epub ahead of print].*

Complications in Stent-Assisted Endovascular Therapy of Ruptured Intracranial Aneurysms and Relevance to Antiplatelet Administration: A Systematic Review

Ryu CW, Park S, Shin HS, and Koh JS.

AJNR Am J Neuroradiol 36:1682–88 Sep 2015. Epub 2015, July 2.

Despite the increasing use of stent-assisted coiling for ruptured intracranial aneurysms, there is little consensus regarding the appropriate antiplatelet administration for these procedures. The aim of this review was to provide an overview of complications and their association with the method of antiplatelet administration in stent-assisted coiling for ruptured intracranial aneurysms.

The authors conducted a comprehensive search of the literature in the data bases to identify studies reporting complications of stent-assisted coiling for ruptured intracranial aneurysms. The event rate of thromboembolisms, hemorrhages, and mortality was estimated. Subgroup analyses were performed by the method of antiplatelet administration (pre-, post-procedural, and modified). Meta-analysis was conducted to compare periprocedural complications and mortality between ruptured intracranial aneurysms and unruptured intracranial aneurysms.

Of the 8476 studies identified, 33 with 1090 patients were included. The event rates of thromboembolism and intra- and post procedural hemorrhage were 11.2% (95% CI, 9.2%–13.6%), 5.4% (95% CI, 4.1%–7.2%), and 3.6% (95% CI, 2.6%–5.1%) respectively. Subgroup analyses of thromboembolism showed a statistically significant difference between groups (P .05). In the periprocedural and modified antiplatelet groups, the risk for thromboembolism in stent-assisted coiling for ruptured intracranial aneurysm was not significantly different from that for unruptured intracranial aneurysm, though this risk of the post-procedural antiplatelet group was significantly higher in ruptured intracranial aneurysms than in unruptured intracranial aneurysms.

On the basis of current evidence, complications of stent-assisted coiling for ruptured intracranial aneurysm may be affected by the method of antiplatelet administration.

Personal comment

Although various methods of antiplatelet administration have been used, there is little consensus regarding the appropriate and safe timing for the administration of antiplatelet agents. However, this meta-analysis revealed that the clinical results of stent-assisted coiling for ruptured intracranial aneurysms would be affected by antiplatelet administration. Therefore, reliable guidelines for antiplatelet therapy in stent-assisted coiling for ruptured aneurysms should be determined by the results of future research. The results of this review can guide prospective case-control study design to identify more appropriate antiplatelet therapy in stent-assisted coiling of ruptured intracranial aneurysms. In general, it might be a good advice to use stent-assisted coiling in acute ruptured aneurysms only in those patients without a surgical alternative. In most cases this will be true for patients with aneurysms of the posterior circulation and for those with proximal intradural ICA aneurysms.

Michael Forsting, Essen, Germany

Therapeutic Internal Carotid Artery Occlusion for Large and Giant Aneurysms: A Single Center Cohort of 146 Patients

Bechan RS, Majoie CB, Sprengers ME, Peluso JP, Sluzewski M, van Rooij WJ.

AJNR Am J Neuroradiol 37:125–29 Jan 2016.Epub 2015, Aug 20.

At the institution of the authors, patients with large or giant ICA aneurysms are preferably treated with endovascular ICA balloon occlusion. Alternative or conservative treatment was offered only for those patients who could not tolerate permanent ICA occlusion. In this observational study, the authors report the clinical and imaging results of ICA occlusion for aneurysms in a large single-center patient cohort.

Between January 1995 and January 2015, occlusion of the ICA was considered in 146 patients with large or giant ICA aneurysms. Ninety-six patients (66%) passed the angiographic test occlusion, and, in 88 of these 96 patients (92%), the ICA was permanently occluded. In 11 of 88 patients with angiographic tolerance, ICA occlusion was performed with the patient under general anesthesia without clinical testing.

There was one hypoperfusion infarction after hypovolemic shock from a large retroperitoneal hematoma (complication rate 1.1% [95% CI, 1%–6.8%]). The mean imaging and clinical follow-up was 35 months (median 18 months; range, 3–180 months). On the latest MR imaging, 87 of 88 aneurysms (99%) were completely occluded and 61 of 80 aneurysms (76%) were decreased in size or completely obliterated. Of 62 patients who presented with cranial nerve dysfunction by mass effect of the aneurysm, 30 (48%) were cured, 25 (40%) improved, 6 (10%) were unchanged, and 1 patient (2%) was hemiplegic after a complication.

ICA occlusion for large and giant aneurysms after angiographic test occlusion was safe and effective. Two-thirds of eligible patients passed the angiographic test. Most aneurysms shrunk, and most cranial nerve dysfunctions were cured or improved.

Personal comment

Large and giant aneurysms of the internal carotid artery can be located intradurally from the ophthalmic segment upward or extradurally in the cavernous sinus. Intradural aneurysms may be symptomatic by SAH or decreased visual acuity by mass effect on the optic nerve or chiasm. During the past decades, endovascular techniques have largely replaced surgery for these aneurysms. Endovascular treatment can consist of ICA balloon occlusion, selective coiling with or without balloon or stent assistance, or parent ICA reconstruction with flow diverters. The

authors are probably one of the most experienced physicians in treating these aneurysms and since years they clearly favorite endovascular vessel occlusion for this specific group. However, you really have to be experienced in the test occlusion. The authors criteria were: Apart from clinical tolerance in awake patients, synchronous opacification of the cortical cerebral veins in the territories of the examined and occluded vessels was considered indicative of tolerance to permanent occlusion.

In patients with large and giant ICA aneurysms, ICA occlusion, when tolerated, remains a very safe and effective therapy. Tolerance to ICA occlusion can be reliably predicted by the angiographic test occlusion, also in patients under general anesthesia.

I remember very well an oral statement of both senior authors on a congress debate, when "high-end" procedures for these aneurysms were discussed: Don't play!

Michael Forsting, Essen, Germany

Autosomal Dominant Polycystic Kidney Disease and Intracranial Aneurysms: Is There an Increased Risk of Treatment?

Rozenfeld MN, Ansari SA, Mohan P, Shaibani A, Russell EJ, and Hurley MC.
AJNR Am J Neuroradiol 37:290 –93 Feb 2016. Epub 2015, Sep 3.

BACKGROUND AND PURPOSE:
Autosomal dominant polycystic kidney disease is associated with an increased risk of intracranial aneuysms. Our purpose was to assess whether there is an increased risk during aneurysm coiling and clipping.

MATERIALS AND METHODS:
Data was obtained from the National Inpatient Sample (2000–2011). All subjects had an unruptured aneurysm clipped or coiled and were divided into polycystic kidney (n 189) and control (n 3555) groups. Primary end points included in-hospital mortality, length of stay, and total hospital charges. Secondary end points included the International Classification of Diseases, Ninth Revision codes for iatrogenic hemorrhage or infarction; intracranial hemorrhage; embolic infarction; and carotid and vertebral artery dissections.

RESULTS:
There was a significantly greater incidence of iatrogenic hemorrhage or infarction, embolic infarction, and carotid artery dissection in the patients with polycystic kidney disease compared with the control group after endovascular coiling. There was also a significantly greater incidence of iatrogenic hemorrhage or infarction in the polycystic kidney group after surgical clipping. However, the hospital stay was not longer in the polycystic kidney group, and the total hospital charges were not higher. Additional analysis within the polycystic kidney group revealed a significantly shorter length of stay but similar in-hospital costs when subjects underwent coiling versus clipping.

CONCLUSIONS:
Patients with polycystic kidney disease face an increased risk during intracranial aneurysm treatment, whether by coiling or clipping. This risk, however, does not translate into longer hospital stays or increased hospital costs. Despite the additional catheterization-related risks of dissection and embolization, coiling results in shorter hospital stays and similar mortality compared with clipping

Personal comment:

This is a very interesting paper about the risk of aneurysm treatment in autosomal dominant polycystic kidney disease (ADPCKD). Although this disease has been largely related to aneurysm formation, its real relationship with treatment risk has not been well explored.

Using a large database in United States (National Impatient Sample –NIS-) the authors present a retrospective analysis and comparison between ADPCKD and non-ADPCKD patients, and the risk of endovascular or microsurgery treatment.

The results are consistent. There is clearly a higher risk in treating unruptured aneurysms in ADPCKD patients by endovascular or microsurgical technique,when compared to control group. Both treatments present morbidity and peri-procedural complications due to treatment in the ADPCKD group, although coiling presents more dissections or embolisms in comparison to the clipping group, but hospital stay is shorter than the microsurgical group.

There are some limitations of the study. In first place, it has all the restrictions of a retrospective analysis, thus, to my point of view, the biggest limitation comes from the origin of the data. NIS is a registry that uses ICD-9, and we have no certainty of the criteria that was used to fill each of the codes. There is a mix code that includes iatrogenic hemorrhagic and ischemic complications, thus we neither know the extent nor the degree of the complication. Moreover, we don't know other patient data, such as comorbidity, medication, disease stage, post discharge evolution or long-term outcome. Also, we don't have knowledge of what were the causes of the complications, so we cannot infer specific strategies to decrease morbidity of the procedures.

Nevertheless, to reach such a number of ADPCKD patients with treated aneurysm is quite a challenge, and that it is a good contribution of this paper. The message to take away is: take all the precautions when treating these patients, either with microsurgery or endovascular management.

Rodrigo Rivera, Santiago, Chile

Clipping and Coiling of Unruptured Intracranial Aneurysms among Medicare Beneficiaries, 2000 to 2010

Jalbert JJ, Isaacs AJ, Kamel H, Sedrakyan A.
Stroke. 2015 Sep;46(9):2452-7. Epub 2015, Aug 6.

This article presents a retrospective analysis of trends in treating unruptured intracranial aneurysms in Medicare beneficiaries during the period 2000-2010. Based on the historical information recorded, the authors selected two groups from among patients admitted for clipping or coiling of unruptured cerebral aneurysms - a utilization cohort (2001-2010) in patients ≥65 years of age and an outcomes cohort (2000-2010) in patients ≥66 years of age.

During the period in the age groups analysed, aneurysms were clipped in 4357 patients and coiled in 7942 patients. The 30-day mortality, in-hospital complications, and 30-day readmissions were lower in the patients embolized with coils than in the clipped patients.

Overall, morbidity and mortality rates for the procedures decreased with time, reaching their lowest levels between 2008 and 2010. Between 2000 and 2010 the treatment rate per 100 000 inhabitants rose from 1.4 to 6.0, mainly because of a rise in endovascular procedures, which increased 15 fold between 2000 and 2010. Despite the increase in the number of procedures, SAH incidence remained steady.

In their discussion the authors state that operative morbidity and mortality rates did not warrant certain interventions in the age group considered.

They stress that overall the increase in the procedure rate did not decrease the overall incidence of SAH, and they affirm that there is no evidence that routine treatment of unruptured intracranial aneurysms yields any net clinical benefit.

They end by recommending randomized clinical trials comparing the different therapeutic modalities, including conservative treatment.

Personal comment

We agree with the authors that certain circumstances, for example advanced age or the features of an individual aneurysm, can increase the risk of treatment morbidity and mortality. Unquestionably, selecting patients who are suitable candidates for treatment is basic to achieving overall success and individual clinical outcomes.

This study has the merit of having analysed a very large quantity of data and of taking up the issue of the importance of a benefit/risk balance in elderly patients, on account of both morbidity and mortality and their lower life expectancies.

Nevertheless, this retrospective study has not considered important data, such as the percentage of symptomatic unruptured aneurysms, outcomes in the other age groups, and patient pre and post-procedure Rankin scores, a potential source of statistical bias.

In addition, the method employed to determine whether SAH rates stayed the same is not discussed[1].

Predicting the overall and individual risk of rupture of cerebral aneurysms is a recurring topic in the specialized literature and a matter that has not yet been conclusively settled.

Many different morphological, clinical, and epidemiological factors have been postulated, but all of us involved in the field can cite any number of frequent exceptions to these rules[2].

With this in mind, and given that SAH is an often devastating entity, treatment of an incidental lesion should not depend on a statistically significant overall benefit as suggested by the authors of this study.

A ten-year period of treating unruptured intracranial aneurysms is probably not enough time to yield an appreciable decrease in the prevalence of SAH. It should be noted that a slight decrease in the SAH rate could well be made worthwhile by such sociological factors as population growth in urban areas and/or increased individual life expectancy.

Some considerations can be made based on the epidemiological data reported by the authors, i.e., a 3% prevalence of aneurysms[3], an annual incidence of SAH of 20/100 000 inhabitants, and treatment of six patients with unruptured aneurysm per 100 000 inhabitants each year, and taking an individual life expectancy of 80 years.

1) A total of 3 000 individuals would harbour cerebral aneurysms of every 100 000 inhabitants.

2) in 80 years 1 600 aneurysms would rupture of every 100 000 inhabitants.

3) over those 80 years 480 patients would be treated, that is, 16 % of individuals with aneurysm on that population.

This means that over a period of 80 years the incidence of SAH per 100 000 inhabitants should decline by 16%. This figure is more than 10 times higher than the morbidity and mortality rate for procedures to treat unruptured cerebral aneurysms endovascularly in suitably selected patients carried out by technically well-trained teams[4], which should add overall profitability to the individual benefit to each patient treated. Time will tell.

Jorge Olier, Pamplona, Spain

1. *Zacharia BE, Hickman ZL, Grobelny BT, et al. Epidemiology of aneurysmal subarachnoid hemorrhage. Neurosurg Clin N Am 2010; 21(2):221-33*
2. *Ishibashi T, Murayama Y, Saguchi T, et al. Justification of unruptured intracranial aneurysm repair: A single-center experience. AJNR 2013; 34:1600-05.*
3. *Curtis SL, Bradley M, Wilde P, et al. Results of screening for intracranial aneurysms in patients with coarctation of the aorta. AJNR 2012; 33:1182-86.*
4. *Oishi H, Yamamoto M, Shimizu T, et al. Endovascular therapy of 500 small asymptomatic unruptured intracranial aneurysms. AJNR 2012; 33:958-64*

Endovascular Treatment of Ruptured Blister-Like Aneurysms: A Systematic Review and Meta-Analysis with Focus on Deconstructive versus Reconstructive and Flow-Diverter Treatments

Rouchaud A, Brinjikji W, Cloft HJ, and Kallmes DF

AJNR Am J Neuroradiol 36:2331–39, Dec 2015, Epub 2015, Sep 17.

Various endovascular techniques have been used to treat blister-like aneurysms. The authors performed a systematic review to evaluate endovascular treatment for ruptured blister-like aneurysms and performed a comprehensive literature search and subgroup analysis and compared deconstructive versus reconstructive techniques and flow diversion versus other reconstructive options.

Thirty-one studies with 265 procedures for ruptured blister-like aneurysms were identified. Endovascular treatment was associated with a 72.8% (95% CI, 64.2%–81.5%) mid- to long-term occlusion rate and a 19.3% (95% CI, 13.6%–25.1%) retreatment rate. Mid- to long-term neurologic outcome was good in 76.2% (95% CI, 68.9%– 8.4%) of patients. 240 procedures (90.6%) were reconstructive techniques (coiling, stent-assisted coiling, overlapped stent placement, flow diversion) and 25 treatments (9.4%) were deconstructive. Deconstructive techniques had higher rates of initial complete occlusion than reconstructive techniques (77.3% versus 33.0%, P.0003) but a higher risk for perioperative stroke (29.1% versus 5.0%, P.04). There was no difference in good mid- to long-term neurologic outcome between groups, with 76.2% for the reconstructive group versus 79.9% for the deconstructive group (P .30). Of 240 reconstructive procedures, 62 (25.8%) involved flow-diverter stents, with higher rates of mid- to long-term complete occlusion than other reconstructive techniques (90.8% versus 67.9%, P .03) and a lower rate of retreatment (6.6% versus 30.7%, P.0001).

Endovascular treatment of ruptured blister-like aneurysms is associated with high rates of complete occlusion and good mid- to long-term neurologic outcomes in most patients. Deconstructive techniques are associated with higher occlusion rates but a higher risk of perioperative ischemic stroke. In the reconstructive group, flow diversion carries a higher level of complete occlusion and similar clinical outcomes.

Personal comment

Blister-like aneurysms (BLAs) are intracranial arterial lesions originating at nonbranching sites of the dorsal supraclinoid internal carotid artery and basilar artery. BLAs account for 0.3%–1% of intracranial aneurysms and 0.9%–6.5% of ruptured aneurysms. Ruptured BLAs have a high mortality rate. Furthermore, treatment of these lesions is technically difficult because they often lack a defined neck and the aneurysm sac has a very thin wall. The authors did a very important meta-analysis of the literature and carefully figured out that endovascular therapy is suitable in most of these patients. Use of either deconstructive or reconstructive endovascular treatment seems to be safe and effective if the clinical setting is analyzed correct. When one opts for the reconstructive treatment, flow diversion appears to be a reasonable choice despite the need for antiplatelet treatment. The main problem for deconstructive techniques is post-treatment ischemia or stroke. We still have problems in predicting these risks for an individual given patient.

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