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ORIGINAL ARTICLE

Endovascular treatment of intracranial aneurysms as the first thérapeutic option

Traitement endovasculaire de première intention des anévrysmes intracrâniens

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KEYWORDS
Intracranial aneurysm;
Endovascular treatment;
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Abstract
Background and purpose. — To prospectively evaluate the results of endovascular treatment (EVT) of intracranial aneurysms when it is considered as first-intention treatment.
Methods. — From April 2004–October 2006, 167 consecutive patients with 202 aneurysms were treated in our institution. Five patients with a ruptured aneurysm with an associated haematoma were excluded. In 162 patients with 197 aneurysms, EVT was considered as first-intention treatment.
Results. — Surgical clipping was performed in 25 aneurysms (25/197 = 12.7%) including 22 aneurysms excluded from EVT and three EVT failures. EVT was thus attempted in 144 patients with 175 aneurysms and successfully performed in 141 patients with 172 aneurysms (172/197 = 87.3%). EVT failure rate was 1.7%. Clinical outcome according to the modified Glasgow Outcome Scale was: Excellent, 81.5%; Good, 7%; Poor or Fair, 3.5%; Death, 8%. Procedural complications occurred in 17 cases (10%). Balloon- or stent-assisted techniques were used in 60 cases (34.9%) and were not associated with higher complication rate. Overall procedural morbidity and mortality rates were 4.2 and 2.1%. Initially, complete occlusion was obtained in 68%, neck remnant in 23%, and incomplete occlusion in 9% of aneurysms. Follow-up (mean 11 months) was obtained in 119 aneurysms and showed major recanalisation — that required re-treatment — in 13 cases (11%) and minor recanalisation in 17 cases (14.3%).
Conclusion. — Our findings suggest that new endovascular techniques allow proposing EVT as first-intention treatment in 87.3% of patients with intracranial aneurysms. This therapeutic strategy is associated with good clinical results. However, anatomical results are not improved and remain the EVT limiting factor.
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MOTS CLÉS
Anévrisme intracrânien ;
Traitement endovasculaire ;
Coils détachables

Résumé
Objectif. — Évaluer prospectivement les résultats du traitement endovasculaire (TEV) des anévrismes intracrâniens lorsqu'il est considéré comme traitement de première intention.
Methode. — Entre avril 2004 et octobre 2006, 167 patients consécutifs avec 202 anévrismes ont été traités dans notre institution. Cinq patients présentant un anévrisme rompu associé à un hématome ont été exclus. Chez 162 patients avec 197 anévrismes, le TEV a été considéré comme traitement de première intention.
Resultats. — Vingt-cinq anévrismes (25/197 = 12,7 %) ont été traités par chirurgie : 22 ont été récusés pour un TEV et trois ont été des échecs du TEV. Un TEV a donc été tenté chez 144 patients avec 175 anévrismes et réalisé avec succès chez 141 patients avec 172 anévrismes (172/197 = 87,3 %). Le taux d'échec du TEV était de 1,7 % (3/175). L'évolution clinique, selon l'échelle modifiée de Glasgow, était le suivant : excellent (81,5 %), bon (7 %), pauvre ou mauvais (3,5 %), décès (8 %). Des complications liées au TEV sont survenues dans 17 cas (10 %). Les techniques de *remodeling* ou de *stenting* ont été utilisées dans 34,9 % des cas et n'ont pas été associées à des taux plus élevés de complications. Les taux de morbidité et de mortalité, liés au TEV, étaient respectivement de 4,2 et 2,1 %. Initialement, une occlusion complète a été obtenue dans 68 % des cas, un collet résiduel dans 23 % des cas et une occlusion incomplète dans 9 % des cas. Le suivi (durée moyenne de 11 mois) par imagerie a été obtenu pour 119 anévrismes et a montré 13 recanalisations majeures (11 %) — nécessitant un retraitement — et 17 recanalisations mineures (14,3 %).
Conclusion. — Nos résultats suggèrent que les nouvelles techniques endovasculaires permettent de proposer le TEV comme traitement de première intention dans 87,3 % des cas avec de bons résultats cliniques. Cependant, les résultats anatomiques ne sont pas améliorés et restent le facteur limitant du TEV.
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Introduction

Endovascular treatment (EVT) by endosaccular coiling has been accepted as an alternative to surgical clipping for the treatment of unruptured and ruptured intracranial aneurysms [10–12]. Until recently, EVT was mostly applied in patients with small aneurysm (diameter < 12 mm) with a small neck (neck < or = 4 mm or neck/sac ratio < 0.7). In this particular subgroup of patients EVT has the same efficacy as surgical clipping, but it is associated with lower morbidity and mortality rates [10–12]. Therefore, EVT is now considered as the first therapeutic option in such patients in most centres [4,7,10–12,23,25,31]. Indeed, small aneurysms with a small neck have an anatomical configuration that prevents coil protrusion within the parent vessel and are associated with stable long-term anatomical results [11]. However, these results cannot be extrapolated to more than this subgroup of patients and surgical clipping still remains the standard treatment for more complex aneurysms such as wide-necked aneurysms or aneurysms with a branch arising from the sac. Nevertheless, thanks to the recent development of new endovascular techniques and tools, more and more aneurysms are amenable to EVT. New coils, remodelling balloons, and self-expandable stents allow to treat complex aneurysms including wide-necked aneurysms, fusiform aneurysms, and aneurysms with a branch arising from the sac [1,2,15,17–19,22]. These new techniques have thus enlarged EVT indications but the question remains as to whether these techniques justify EVT as first-intention treatment in all aneurysms. To our knowledge, there are only two series that have prospectively evaluated aneurysm treatment results when EVT is considered as the first therapeutic option in all patients [21,26]. Raftopoulos et al. [26] have published a series of 103 patients treated between 1996 and 1999 when none of these new techniques and tools was used. This paper reported a high number of failures and poor outcomes in patients treated by endovascular approach. Six years later, Mejdoubi et al. [21] have published a similar series of 230 patients treated between 1998 and 2002 when these techniques were more frequently used. This paper reported good results in most patients and a very low EVT failure rate. Nowadays, balloon- and stent-assisted techniques may routinely be used in a very specialised neurovascular centres. The aim of our study was thus to prospectively evaluate, over a 30-month period in a single centre, the feasibility and results of EVT as first-intention treatment for all patients with intracranial aneurysms.

Patients and methods

Therapeutic protocol

Since April 2004, daily interventional neuroradiology is available in our institution and a multidisciplinary therapeutic protocol has been established for the management of patients with ruptured and unruptured intracranial aneurysms. For all patients, EVT is considered as the first therapeutic option by the multidisciplinary team if it is judged feasible by the senior neurointerventionalist (BL) except for ruptured aneurysms associated with a compressive haema-

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