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Original article

Aim and indications of spinal angiography for spine and spinal cord surgery: Based on a retrospective series of 70 cases

Intérêt et indications de l'angiographie médullaire dans la chirurgie rachi-médullaire : à partir d'une série rétrospective de 70 cas

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ABSTRACT

Aim. – For spinal surgery, computerized tomography (CT scan) and magnetic resonance imaging (MRI) have clear indications and are easily accessible. In contrast, the indications and the use of spinal angiograms (SA) remain unclear, and many centres performing spinal surgery do not have an access to SA. Based on a retrospective study, the role of SA in spinal surgery is assessed and their indications are discussed.

Material and methods. – A retrospective series of 72 SA in 70 patients is presented. No procedural accident occurred. SA was performed under general anaesthesia in 57 cases (82%). In 61 patients, locating the radiculomedullary arteries (RMA) was obligatory and performed in all cases: for 14 patients (21%), RMA were identified using the forecasted surgical approach (4 patients with degenerative disc disease out of 10 in the entire series were included), and modified. No ischaemic complications were observed in the series. Thirty-nine patients were treated for a tumour that was considered hypervascular (based on a histological hypothesis or the MRI data): 20 of them (51%) were preoperatively embolised and in only 8 cases was the operation considered "haemorrhagic" by the surgeon (among which, 3 intramedullary hemangioblastomas were included). No accident was observed during the embolisations. Thirteen patients presented with a vascular or haemorrhagic lesion (4 arteriovenous malformations, 6 dural arteriovenous fistulas, 3 intramedullary cavernomas): in all these cases, the SA was indispensable for the diagnosis and the decision-making process. Seven patients were treated by embolisation. In the last 8 cases, SA was considered for the diagnosis of a clinical worsening myelopathy with a non-contributive MRI, but it was not useful in providing a positive diagnosis.

Conclusions. – SAs were performed with different goals: (i) localization of RMA when a surgical approach between T4 and L2 involved the intervertebral foramen, or when an anterior approach was considered in order to avoid severe ischaemic complications (40% of the degenerative disc patients and 33% of the extramedullary tumour patients in this series); (ii) preoperative embolisation in cases of extramedullary tumours probably considered hypervascular (51% of the cases in the series) or in cases of arteriovenous shunt lesions (7 of 13 patients were treated by embolisation); (iii) as a diagnostic tool, SA is indispensable when MRI can reveal vascular abnormalities; it also provides information about the vascularisation as well as the endovascular possibilities in extramedullary tumours. In contrast, SA was not useful for intramedullary tumours because the RMA preoperative localisation is not mandatory (posterior approach), and embolisation seemed ineffective. SA was also not useful for the diagnosis of myelopathy with normal MRI. In the future, angiograms and MR angiography of the spinal cord may be useful in order to avoid general anaesthesia for a diagnostic procedure, but not practical to obtain access for endovascular treatment.

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RÉSUMÉ

But. – Si le scanner (TDM) et l'imagerie par résonance magnétique (IRM) sont facilement accessibles et font l'objet de recommandations pour la chirurgie rachi-médullaire, l'angiographie médullaire (AGM) reste beaucoup moins répandue et ses indications mal codifiées, alors que la chirurgie spinale se développe dans des structures qui n'y ont pas toujours accès. À partir d'une étude rétrospective, le rôle et l'intérêt de l'AGM sont analysés de façon à codifier son usage et ses indications.

Matériel et méthodes. – Une série rétrospective de 70 patients ayant subi 72 AGM est présentée. Aucun accident procédural n'a été relevé. L'AGM a été réalisée sous anesthésie générale dans 57 cas (82 %). Le repérage des artères radiculomédullaires (ARM) a été obtenu dans tous les cas (61 patients) où il était demandé : pour 14 patients de la série (21 %) dont 4 patients porteurs de pathologie disco-dégénérative (sur 10), une ARM a été repérée sur la voie d'abord envisagée aboutissant à une modification de la décision initiale. Aucune complication ischémique n'a été observée dans cette série. Parmi les 39 patients porteurs de tumeurs rachidiennes ou médullaires présumées hypervasculaires (d'après l'IRM et les hypothèses histologiques), 20 d'entre eux (51 %) ont bénéficié d'une embolisation préopératoire et dans 8 cas seulement l'intervention a été considérée comme hémorragique (parmi eux on relève 3 hémangioblastomes intramédullaires) ; aucune complication procédurale n'a été observée. Treize patients présentaient une lésion vasculaire ou hémorragique (4 malformations artérioveineuses, 6 fistules durales, 3 cavernomes intramédullaires) : dans tous ces cas l'AGM s'est révélée indispensable au diagnostic, à la décision thérapeutique et 7 d'entre eux ont été traités par embolisation. Dans 8 cas, l'AGM a été réalisée devant une symptomatologie clinique de myélopathie évolutive avec une IRM non contributive, mais elle n'a pas permis d'aboutir à un diagnostic positif.

Conclusions. – L'AGM peut être réalisée dans plusieurs buts : (i) repérage d'une ARM dès qu'un abord chirurgical compris entre T4 et L2 concerne un foramen intervertébral ou une voie antérieure : 40 % des patients porteurs de pathologie disco-dégénérative et 33 % des patients porteurs de tumeurs extramédullaires ont vu leur indication chirurgicale modifiée en raison d'un risque de complication ischémique identifié sur l'AGM ; (ii) embolisation préopératoire pour des tumeurs extramédullaires présumées hypervasculaires : 51 % des cas de notre série en ont bénéficié, ou lésions vasculaires artérioveineuses : 7 patients sur 13 ont été traités par voie endovasculaire ; (iii) à titre diagnostic : l'AGM est indispensable au diagnostic dès que l'IRM révèle des anomalies de signal de type vasculaire, par ailleurs elle permet d'évaluer la vascularisation et les possibilités éventuelles d'embolisation préopératoire pour les tumeurs extramédullaires. Par contre l'AGM semble inutile dans les lésions intramédullaires (en dehors de la pathologie vasculaire) car le repérage d'une ARM n'est pas utile (voies postérieures) et l'embolisation préopératoire ne semble pas efficace. L'AGM ne s'est pas révélée contributive non plus dans le diagnostic positif de myélopathies avec une IRM non contributive. Les développements actuels de l'angioscanner et de l'angioMR de moelle épinière permettront peut-être d'éviter dans certains cas un examen diagnostique nécessitant une hospitalisation et une anesthésie générale, mais ils ne fourniront pas un accès à un traitement endovasculaire.

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1. Introduction

Spine surgery and spinal cord surgery are performed by neurosurgeons and orthopaedic surgeons, at different types of institutions where spinal angiography (SA) is not always available.

The place of CT scan and of magnetic resonance imaging (MRI) for the diagnosis and preoperative planning is slightly controversial, guidelines are available, and both examinations are well known. In contrast, the place and the indications of the SA are not codified and are variable depending on the habits of the surgeons.

A retrospective single centre study is presented, focusing on the indications, the aim, and the modalities of SA in spinal and spinal cord surgery. Its aim is to develop a decision-making process for SA.

2. Material and methods

All the patients referred to the neurosurgical, neurological and orthopaedic departments of Dijon University Hospital (France), between 2001 and 2011, having previously undergone a SA after a spinal MRI or CT scan were included in our series. During the same period, 4127 patients were operated on for a spinal disco-degenerative pathology and 558 patients were operated on for spinal tumours (mainly metastatic). Patient's records were obtained by using the computerized coding of the Common Classification of Medical Procedures of the institution. All the SAs were performed in the neuroradiology department of our institution by 2 neuroradiologists. All the SAs of the presented series were assessed (Figs. 1 and 2). The injected contrast agent used was Visipaque® 320 mg Iod/ml (iodixamol), (GE Healthcare SAS). Collected data were: age, clinical status, results of MRI, SA indication, type of anaesthesia, SA complications, results of the SA, all consequences regarding the forecasted operation, combined embolisation and the results. SA exploring less than 8 metameric levels, focused on a lesion localized by MRI or CT scan, was defined as "targeted" SA.

3. Results

Between 2001 and 2011, 92 SAs were performed (2% of all 4685 spinal surgeries); 70 cases with 72 SAs were included in this series (2 patients underwent 2 SAs). The average age of the patients studied was 50.3 years (range 15–81 years). The distribution by gender was balanced with a male:female sex ratio of 1.12 (37:33).

SA was performed under general anaesthesia in 59 cases (82%), and under local anaesthesia in 13 cases (18%). Among these 13 patients, only one patient previously had a SA with embolisation, and the other 12 had a standard SA:

- 21 targeted SAs (29%) were carried out versus 51 (71%) complete SAs;
- in 9 procedures of targeted SAs, the anterior spinal artery (ASA) and the radiculomedullary arteries (RMA) were not detected but

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