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TECHNICAL NOTE

Traumatic aneurysm and carotid-cavernous fistula following transsphenoidal approach to a pituitary adenoma: treatment by transcranial operation

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Abstract

A 39-year-old woman presented with galactorrhoea. Magnetic resonance imaging revealed an intrasellar tumour. During transsphenoidal surgery to remove the tumour, arterial bleeding occurred from the right internal carotid artery (ICA). The bleeding was stopped by packing with Surgicel. The operation was discontinued at this point and the intrasellar tumour was not removed. Four-vessel angiography was performed on the third day after the operation, revealing a traumatic (false) ICA aneurysm and a low-flow carotid-cavernous fistula (CCF) on the right side. The patient did not have any neurological deficit, and was re-operated on transcranially. Both the traumatic ICA aneurysm and the CCF were excluded from the circulation by a Sundt–Kees cuff clip. The patency of the ICA was preserved.

Key words: *carotid-cavernous fistula, cavernous sinus, pituitary gland, prolactinoma, transsphenoidal surgery.*

Introduction

When a pituitary tumour is confined to the intrasellar space, the correct approach is transsphenoidal. Harvey Cushing, who performed over 200 transsphenoidal operations for pituitary tumours, not only introduced but also standardized this surgical approach.[1,2] In Europe, the transsphenoidal approach was started by Guiot.[3] Eventually Hardy (by using the operative microscope and intraoperative fluoroscopy) was able to improve the completeness of the tumour resection and to reduce surgical morbidity to such a level that this type of surgery was generally accepted and has since been successfully practiced,[4–6] Through the use of the operating microscope not only resection of pituitary tumours became more complete, but also the preservation of the remaining normal pituitary tissue through selective adenomectomy became possible.[7–12] To further minimize the extent of the surgical procedure an endoscopic sphenoidotomy approach to the sella was introduced.[13]

As not all pituitary tumours can be removed via the transsphenoidal approach, a classical transcranial intradural approach was used until recently, and for large pituitary tumours extending beyond the sella to the parasellar space, as well as to supra- and retrosellar compartments, a new transcranial transcavernous approach was introduced.[14]

Each of the approaches has its limitation(s), and therefore the approach should be selected carefully before surgery. The risk of complications during any of the approaches is very small yet nevertheless exists. The complications, among which an injury of the internal carotid artery (ICA) may be life threatening (repeated catastrophic nose bleeds), should be dealt with accordingly.[15–21]

Case report

A 39-year-old woman was admitted because of 7 months' galactorrhoea. The investigations revealed a serum prolactin of 1408 units (70.4 μg/l). On examination no neurological abnormalities were found, and visual acuity and visual fields were normal. MRI suggested that at some time, she had sustained a haemorrhage into the pituitary gland. There was no evidence of adenoma spreading outside the sella region. A transsphenoidal resection of adenoma was proposed. The operation was complicated. Despite X-ray guidance, sudden bleeding occurred on the right side of the sella which showed no regular shape. The bleeding was controlled by Surgicel packing and

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the patient had no postoperative complications. A postoperative carotid angiography revealed a false ICA aneurysm and a low flow carotid cavernous fistula (CCF) on the right side (Fig. 1a,b).

The patient was operated on for the resulting false aneurysm and low-flow CCF. The fronto-temporal approach, as used by the first author for parasellar lesions,[14–20] was used. The ICA was exposed in the petrous bone and prepared for a proximal temporary clip in case it should be necessary. The anterior loop of the ICA adjacent to the lateral wall of the sphenoid sinus was exposed after complete resection of the anterior clinoid process (ACP), and the superior, lateral and inferior (the optic strut) walls of the optic canal as well. The dural ring (DR) and the proximal ring (PR) were preserved intact, and while the lateral half of the circumference of the anterior loop (AL) of the ICA was exposed; there was no arterial or venous bleeding.

The incision into the dura was made along the Sylvian tissure. The intradural ICA was well visualized proximal to the posterior communicating artery and distal to the ophthalmic artery for possible distal temporary clipping. After exposure of the petrous ICA and the intradural ICA, further dissection of the AL of the ICA was carried out. The laceration of the ICA was found on its infero-medial side and the ICA was 'repaired' by putting on a single Sundt–Kees cuff clip. It was not necessary to apply the proximal and distal temporary clips in order to place this Sundt–Kees clip. Following the exclusion of the ICA aneurysm and the CCF, the walls of the parasellar space became slack and the membrane posterior to the anterior loop of the ICA covering the parasellar space was cut; no arterial bleeding was present. A slight venous oozing occurred from this opening and was stopped by packing with Surgicel. The whole AL of the ICA was additionally checked on the antero-medial and inferomedial sides, and the diameter of the ICA was found to be normal, while the pulsations of the ICA proximal and distal to the Sundt–Kees clip were also of normal range. The dura along the Sylvian fissure was sutured to be watertight. The postoperative course was uneventful. On the ninth postoperative day, follow-up right-sided angiography was performed and a normal right-sided ICA patency was demonstrated without a persistent traumatic aneurysm and/or CCF (Fig. 1c,d). The sella was not

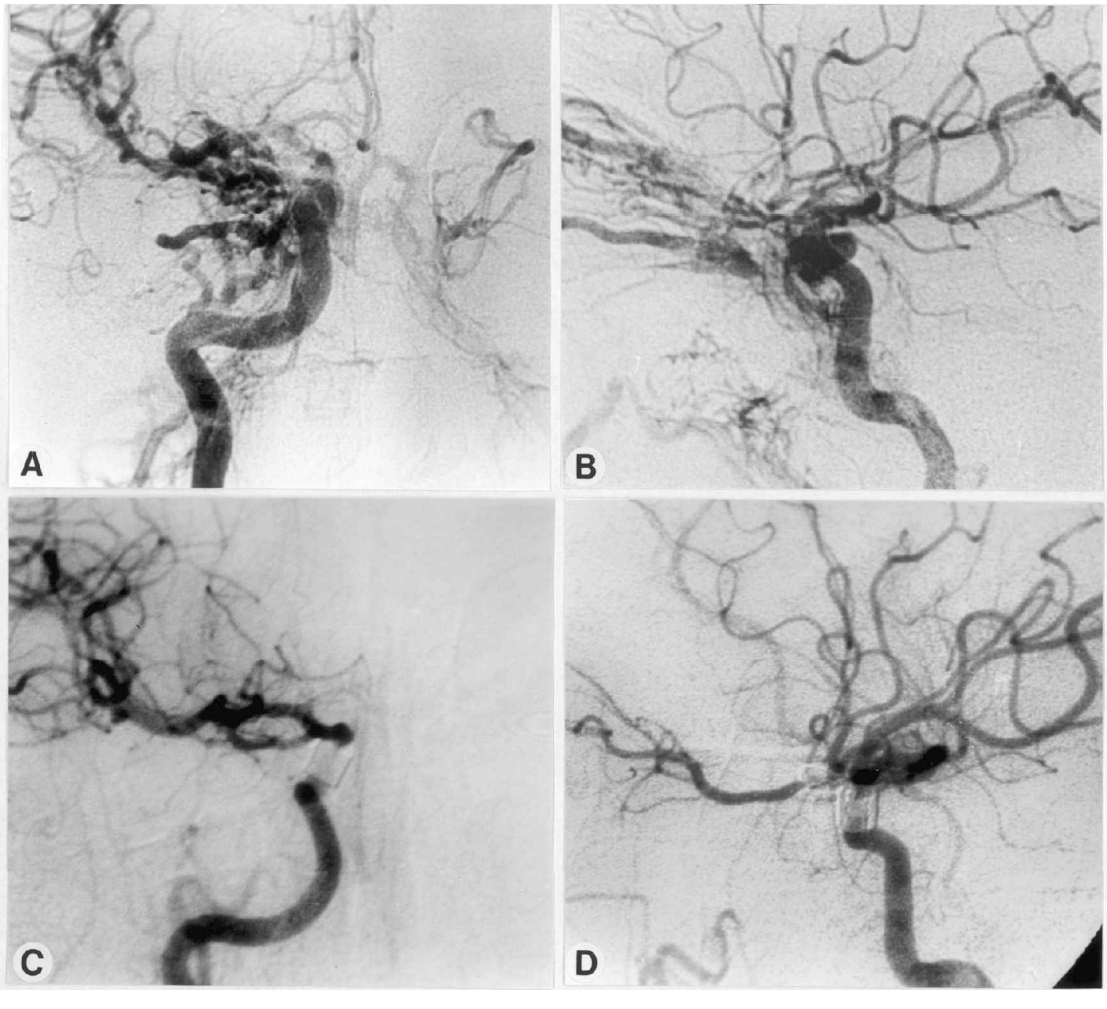

FIG. 1. The right internal carotid angiogram, (A) AP projection and (B) lateral projection preoperatively, showing a traumatic aneurysm located on the anterior loop of the ICA and a low-flow carotid-cavernous fistula on the same side.

The right common carotid angiogram, (C) AP projection and (D) lateral projection postoperatively, showing a cuff clip on the anterior loop of the right ICA, and no aneurysm or CCF.

explored at this time. Further medical treatment for prolactinoma was planned and should the medical treatment not be successful, a transcranial approach to the sella will be performed from the contralateral side. Following the second operation, the patient did not have any visual or oculomotor deficits or a CSF leak. On the tenth postoperative day the patient was discharged from our department and her neurological status was normal.

Discussion

The aim of this report is not to discuss the indications for the surgical treatment of pituitary tumours, nor to speak in favour of or against one or another surgical approach for pituitary tumours.

The location and size of a pituitary tumour calls for an appropriate surgical approach.[14] Whether or not such an approach is the most convenient should be decided preoperatively according to the imaging findings, CT and/or MRI. Sometimes simple skull radiography gives much information regarding the bony irregularities of the skull base. Coupling these films with the CT and MRI images provides the necessary information about the transphenoidal corridor to the sella. In the pre MRI era it was impossible to obtain information about the ICA coursing at the side of the sella without angiography. The answer to the question whether angiography is necessary prior to transsphenoidal surgery was given by the introduction of MRI. The MRI not only provides information about the position of the ICA on each side of the sella, but also gives more important information about the pituitary tumour itself, hence MRI is necessary preoperatively. In the case presented, the MRI did not reveal any abnormalities regarding the skeletal structures as well as the course of the ICA. It is believed that the decision was correct to stop the transsphenoidal surgery when arterial bleeding occurred. With the appropriate transcranial epidural approach to the false ICA aneurysm and CCF, these were excluded and the ICA was preserved patent. No neurological damage was caused either with the first (transsphenoidal) or with the second transcranial epidural approach.

From the anatomical point of view, this case is interesting owing to the co-existence of a traumatic (false) ICA aneurysm and low-flow CCF. In our opinion, local anatomical relationships dictate the occurrence of a traumatic (false) ICA aneurysm and/or CCF. A traumatic (false) ICA aneurysm can occur only when the local anatomical situation is such that a cavity is created close to the artery. This means that tissue around the artery forms a pseudo aneurysm. If this was not the case, each injury of the ICA would result in a high-flow CCF. In our case one can see that the contrast medium escaping from the ICA through the defect in the ICA wall first fills the false aneurysm and then escapes from it and fills numerous venous canals on the ipsilateral side and also on the contralateral side. It supports the idea that the so-called 'cavernous sinus' is not a simple cavernous structure but a delicate venous network.[22–26]

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