Expanding contralateral epidural hematoma causing acute intraoperative brain swelling

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Dear Editor,

We have read with enthusiasm the recent paper by Drs Solomiichuk and Drizhdov,[5] and we would like to express some comments.

The presented case is a 28-year-old male with anisocoria and depressed level of consciousness (Glasgow Coma Scale, 5) after head trauma. The initial computed tomography (CT) image provided in the paper shows a low CT cut [Figure 1a] and a relatively large frontal base hemorrhage. We know that frontal base hematomas could be dispersed over a relatively large surface of orbital roof and make surprising pictures of large hematomas, while they are not usually that large. Nevertheless, the local mass effect of the hematoma caused slight midline shift in this case. It seems unlikely that such a lesion could cause uncal herniation and the resultant anisocoria by itself and there should be (i) a quite significant mass lesion in the temporal fossa and/or (ii) severely raised intracranial pressure caused by cerebral edema to cause unilateral mydriasis as a sign of impending uncal herniation. As the authors have provided us with the upper and lower CT cuts, one could see a dispersed left frontal hematoma, a small right frontal contusion along with a quite thin layer of subdural hematoma in the left fronto-parietal region and scant subarachnoid hemorrhage in the left sylvian fissure. There is generalized brain swelling and closure of the basal cisterns. Putting these together with the midline shift measuring more than 5 mm, the most compatible diagnosis would be grade 4 diffuse brain injury. [2] There is no mass lesion in the left temporal region. Thus, it could be concluded that the uncal herniation syndrome is the result of severely raised intracranial pressure. Indeed, the frontal intracerebral hematoma is an important contributor to the malignant process of intracranial hypertension in this case, and its evacuation seems quite mandatory.

Another important finding to be respected is the presence of small blebs of pneumocephalus in the right occipital region as well as scant epidural hematoma in the right posterior parietal region. This sign may alarm the operating team to suspect the evolution/expansion of contralateral hematoma, in case the evacuation of the left sided frontal mass is accompanied by uncontrollable cerebral swelling during surgery.

The authors state that they have observed an acute brain swelling during evacuation of the frontal hematoma. A sign that we think should be respected in a timely fashion. Unexplained brain swelling during craniotomy should prompt the physician to look for a definitive cause.[3] We check the position of the endotracheal tube and monitor the end tidal and/or arterial pressure of CO₂ to rule out hypoventilation and hypercapnia (although we are aware that in certain circumstances, monitoring of end tidal CO₂ is not available to the operating team; therefore, frequent checking of the arterial blood gases and position of the endotracheal tube seems an acceptable substitute...
for capnography). In the second step, we check the degree of head rotation to ensure proper venous return. Head elevation is also increased to further help increase the venous return. If all these measures fail to soothe the swollen brain, we perform a large fronto-temporoparietal craniectomy with augmentative duraplasty and obtain an immediate postoperative head CT to rule out remote lesions including contralateral hematomas. In such cases, the temporal region should be included in the craniectomy flap to ensure maximal chance of recovery from uncal herniation whether or not a temporal mass lesion is found. We observe that the authors have not included the lower temporal region in their craniectomy bone flap [Figure 1b] on the premise there is no mass lesion in the temporal lobe. We do not agree with the authors in the opinion that if there is no mass lesion in the temporal region, one could refrain from temporal craniectomy since in such cases, the clinical picture is compatible with malignant intracranial hypertension and not simply an isolated temporal mass lesion causing mydriasis. The presence of unilateral mydriasis caused by uncal herniation could be deemed as enough evidence to warrant a temporal craniectomy. We do not think that the sole evacuation of the frontal lobe hematoma could give the patient a maximal chance of recovery.

The suggestion of the authors to obtain the CT in the next 24 h needs some form of clarification. We think that the contralateral epidural hematoma as presented by authors is not ‘delayed’; rather, it has expanded right at the time the frontal hemorrhage was evacuated as the tamponade effect of the hemorrhage prevented a small epidural hematoma underneath the contralateral skull fracture to enlarge. Thus, we do support the idea of taking immediate postoperative CT in cases of acute refractory intraoperative cerebral swelling for timely diagnosis and treatment of remote lesions. Nevertheless, in certain circumstances, taking and immediate postoperative CT is not feasible (e.g. due to unstable hemodynamics). In such cases we would perform the postoperative CT as soon as possible, and would not wait until the ominous clinical sign of anisocoria appears. However, since the authors were not able to take immediate postoperative CT, the concept of ‘delayed’ contralateral hematoma can neither be proven nor refuted in this very case.

Another issue to be respected is the rationale for decompressive craniectomy for the secondary contralateral epidural hematoma. Generally, epidural hematomas do not produce as much swelling of the underlying cortex as do subdural hematomas. Furthermore, in this particular case, the authors have previously performed a decompressive craniectomy on the left side to let the brain swell outwards instead of producing deleterious raised intracranial pressure. This safety window seems wide enough to preclude them from doing a craniectomy on the second operation. Placement of an external ventricular drain would nicely let them monitor the intracranial pressure while the excess cerebrospinal fluid could easily egress during the first critical days after operation. This is, of course, again dependent on the available equipments to the surgical team; something that we realize might not be readily accessible by the surgeons in some developing countries, including ours.

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