

## **Author's response to reviews**

**Title:** Endoscopic Management of Hypertensive Intraventricular Hemorrhage with Obstructive Hydrocephalus

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**Version: 2 Date:** 11 December 2006

**Author's response to reviews:** see over

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London, 11 December 2006

**Sub : Response to reviewers' comments**

The authors would like to thank the reviewer for the positive comments and helpful suggestions. We have taken all comments into consideration and accordingly have made revisions to improve the manuscript.

**Reviewer : Andrea Martinuzzi**

**Major Compulsory Revisions**

**Comment #1:** it is not clear why patients with intraventricular haemorrhage and obstructive hydrocephalus with haematoma extending to the surface should be excluded from the procedure, if the main goal was to re-establish quasi-physiological intraventricular CSF flux at least in the third ventricle. Certainly the whole clot would not be suitable for endoscopic removal, but the clearance of the intraventricular blood might represent for these patients an option.

**Response:** Patients with intraventricular haemorrhage and obstructive hydrocephalus with haematoma extending to the surface were treated by microsurgery as majority of parenchymal clot could not be removed. However, we agree with the comment by the reviewer, as the main goal was to treat obstructive hydrocephalus and these patients could have been included in the study. This has now been added to the discussion 3<sup>rd</sup> Paragraph.

**Comment #2:** It is not clear which is the proportion of the intraparenchymal vs the intraventricular portion of the bleeding, this is particularly relevant for the posterior fossa haematoma

**Response:** We agree, it is sometime not possible to know which is the proportion of the intraparenchymal vs the intraventricular portion of the bleeding. Thus, the aim is to gently aspirate intraventricular clot as much as possible and to bypass the obstruction in the third ventricle by aspiration of clot from 3<sup>rd</sup> ventricle and by third ventriculostomy.

**Comment #3:** A more objective evaluation of severity of haemorrhage (such as Graeb score, or indirect volumetry) and of hydrocephalus (ventricular size or ratio) would definitely improve the solidity of the results

**Response:** The details of the 'Haematoma volume' and the 'Ventricular to Hemispheric ratio' of the patients included in the study have been added to the 'Demographic and clinical characteristics of study population' in table 1.

**Comment #4:** It is not clear what the authors mean by "...deemed stable" when referring to the pre-operative status of the patients: a precise indication of the timing of intervention is needed

**Response:** Patients were operated upon as soon as their blood pressure was controlled and were deemed stable. The surgery was performed within 24 hours of diagnosis in 9, between 25 - 48 hours in 12, and 49 - 72 hours in 4 patients. This has now been included in the methods section.

**Comment #5:** It should be indicated the exact timing (mean + range) of CT controls.

**Response:** 'CT scan was performed 24 hours after removal of the EVD [Mean (range): 4.86 (4<sup>th</sup> to 7<sup>th</sup>) post-operative day] and another one at 6 weeks after surgery to confirm the evacuation of haematoma and decompression of hydrocephalus' has been added to the text.

**Comment #6:** Where the patients with posterior fossa haematoma also reached by frontal access?

**Response:** Posterior fossa haematoma was also approached through frontal access, and was evacuated by an infant feeding tube passed through the aqueduct of Sylvius using the technique of gentle irrigation and suction. This has now been clarified in the methods section.

**Comment #7:** Was the infant feeding tube used for IV navigation in all cases or only in some?

**Response:** Clot was aspirated by infant feeding tube in all cases under vision from lateral, 3rd and 4<sup>th</sup> ventricle.

**Comment #8:** GOS usually is expressed in a five point scale: why vegetative state is not included in the table 2 summary?

**Response:** The 'vegetative state' was not observed in any of our patients. To avoid confusion, this has now been included in the results section and table 2 summary

### **Minor Essential Revisions**

**Comment #9:** Gaab is a proper name and should not be capitalized

**Response:** 'GAAB' has been corrected to 'Gaab'

**Comment #10:** The State in which the instrument is manufactured should be indicated

**Response:** The instrument manufacturer - 'Karl Storz GmbH & Co., Tuttlingen, Germany' has been added to the text.

**Comment #11:** A cannula was used? And if this is the case it was used with a holder or free hand?

**Response:** It was used with holder (included in the methods section)

**Comment #12:** The diameter of the operating channel should be indicated, as well as the diameter of the internal catheter

**Response:** Diameter of operating channel of Gaab scope was 3.0 mm. Infant feeding tube (size 6 and 8 Fr) was used, which could be passed through operating channel. This has now been included in the method section.

**Comment #13:** The size of the microforceps should be indicated (it is quite surprising that much clot could be removed with an endoscopic forcep)

**Response:** Most of the Clots were aspirated by catheter. Larger clots were crushed using the grasping forceps (diameter - 2.1mm) and then aspirated. The size of the grasping forceps has been now mentioned in the text.

**Comment #14:** Why it was necessary to use an electric cauterizer if most of the blood is usually completely clotted?

**Response:** There was some minor visible bleeding sometime after aspiration of clot which was cauterized with bipolar forceps.

**Comment #15:** It is not clear how it was possible by double approach to simultaneously remove the blood from the third, perform the third ventriculostomy, and evacuate the haematoma from the lateral ventricle if both cavities were inundated

**Response:** We did not work simultaneously on both sides. The side opposite to haematoma was approached first. The clot from lateral ventricle body, frontal horn and third ventricle was aspirated and the third ventriculostomy was performed by burr hole placed just anterior to coronal suture. Subsequently, the other side was approached. This has now been included in the methods (Operative technique) section.

**Comment #16:** The third ventriculostomy appears as a reasonable choice for the supratentorial lesions, but it may result very difficult and even dangerous in infratentorial lesions

**Response:** We agree with the comment by the reviewer. One has to be cautious while performing a third ventriculostomy in infratentorial lesions, which might be very difficult and even dangerous, especially in cases with large parenchymal haematoma. Thus, careful case selection is crucial. For that reason, infratentorial lesion patients included in our study had minimal parenchymal blood and mainly intraventricular blood, that could be aspirated and the third ventriculostomy easily accomplished. This comment has been added to the discussion.

**Comment #17:** The images should be enriched with the case of supratentorial inundation; it is surprising that the image shown be taken after just 5 days post op: is it correct?

**Response:** We have now included pre- and post-op figures for a case of supratentorial inundation. Yes, the image shown was taken 5 days post-op, surgery was done 3 days after the ictus in this case due to delay in referral.

**Reviewer : Claudio Schonauer**

### **Major Compulsory Revisions**

**Comment #1:** The description of the operations could be more detailed; for example the first minutes when approaching clots within ventricles the blood gets vision quite impossible, how do you manage it?

**Response:** We agree by the comment made by the reviewer. Due to the presence of clots and blood, the initial view inside the lateral ventricle was very poor. The vision gradually improved by continuous irrigation and gentle suction

using catheter. The outflow was then closed intermittently for 2-5 seconds to allow visualization of clot and ventricular anatomy. The operation has been described in more detail in the 'operative technique' section which has been added to the methods.

**Comment #2:** Do you use an holder or you perform operations as a free hand procedure?

**Response:** A holder was used.

**Comment #3:** Do you use to change the intensity of the light source during procedure?

**Response:** Change of intensity was not required, intermittently closing outflow for few seconds and continuous irrigation gave fairly good image.

**Comment #4:** What kind of infusion you use, have you ever used medications through irrigation?

**Response:** Lactated Ringer's solution was used for irrigation without any medication.- added to the manuscript.

**Comment #5:** Do clots pass through the channel or you are demanded to take out all the endoscope?

**Response:** Small clot pass through channel but majority of them required gentle aspiration by infant feeding tube.

**Comment #6:** The slices of the explicative CT scans presented in the article does not correspond between pre and post op, could you chose the exact slices for comparison?

**Response:** The CT scans were performed on different days; hence the slices taken were not exactly comparable. We have now included another case (supratentorial hematoma).

### **Minor Essential Revisions**

**Comment #7:** Why you used GCS as post operative parameter and only at 6 months the GOS?

**Response:** The overall clinical outcome at 6 months was recorded on GOS. The GCS was used for immediate post operative status, to compare with the pre-op status.

The operation has been described in more detail in the 'Operative technique' in methods to include the responses to Dr Martinuzzi's comments #10-15 and Dr Schonauer's comments #1-5.

Two new figures (Fig 1: Pre-op and Fig 2: post-op) of a case of Thalamic Haemorrhage with associated hydrocephalus has been added to the manuscript. As a result, the previous two figures have been re-numbered as Fig 3 and 4. The legends have been revised accordingly.

We hope that this manuscript now conforms to the Journal's format requirements and is acceptable for publication.

Yours sincerely,

**GAURAV MUKERJI**