

### Introduction

Adequate decompression is the main goal in the surgical management of traumatic brain injury (TBI) patients. It is therefore a contra-intuitive concept to apply minimally-invasive strategies to these patients. However, it is a fact that minimally-invasiveness and adequate decompression may be both achieved in the hope to preserve more viable brain tissue and maximize the neurological recovery of these patients. In recent years, minimally invasive neurosurgery (MIN) has been increasingly applied to surgically treat patients with spontaneous intracerebral hemorrhage (ICH). By preserving more normal brain tissue, these patients have faster recovery and improved neurological outcome. With the recent progress in MIN techniques, imaging, optics, devices, and biologics, several groups have applied similar surgical technique to a group of judiciously selected patients with traumatic contusion, epidural hematoma, and subdural hematoma.

### Materials and Methods

The retrospective nonrandomized clinical and radiology-based analysis enrolled 38 TBI patients treated with MIN evacuation. Rebleeding, morbidity, and mortality were the primary endpoints. The percentage of hematoma evacuated was calculated from the pre- and post-operative brain computed tomography (CT) scans. Extended Glasgow Outcome Scale (GOSE) was evaluated at 6 months postoperatively.

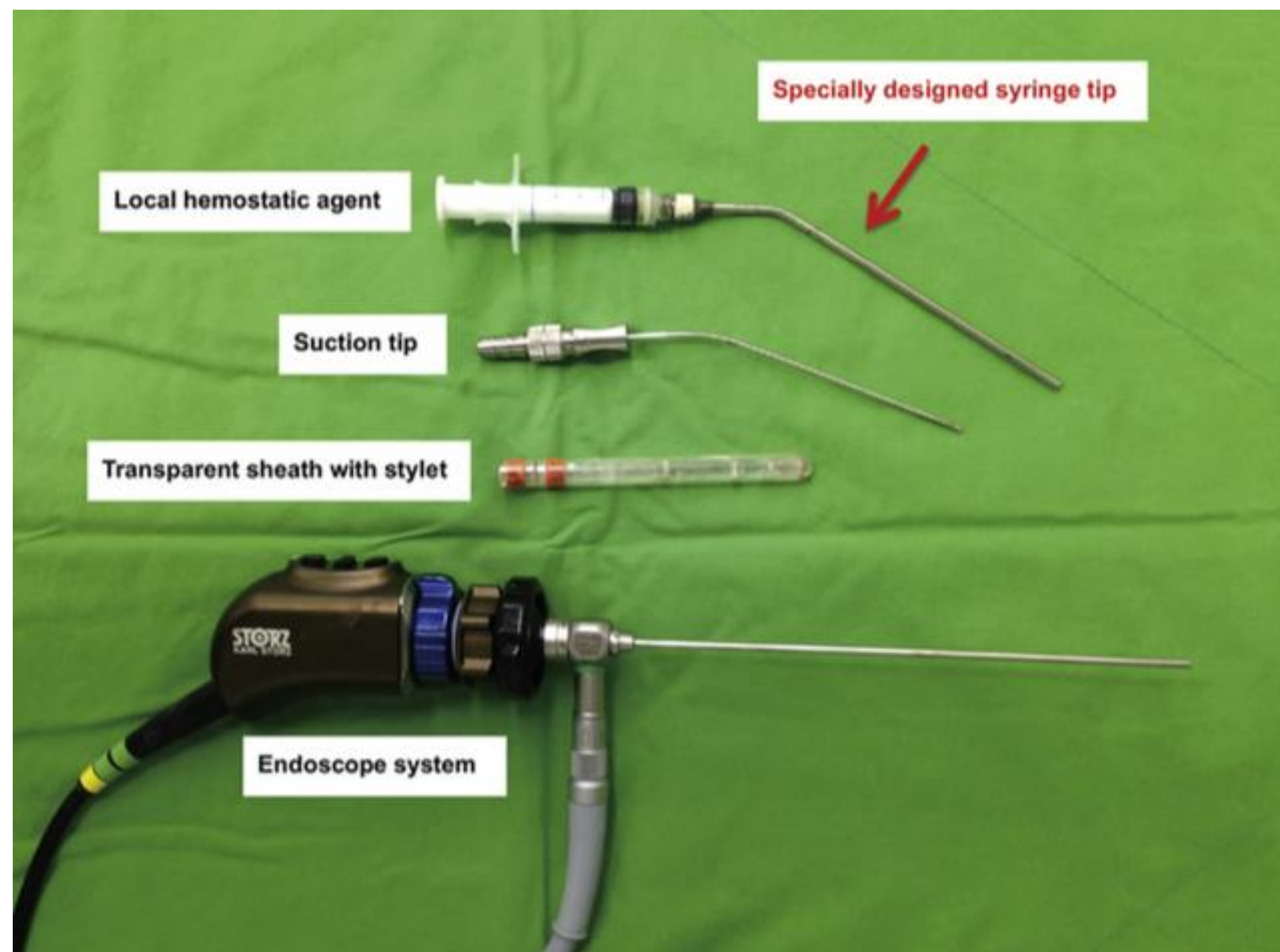


Figure 1. Devices for the MIE evacuation of ICH (especially the specially designed syringe tip for local hemostatic agent application via the narrow sheath).

### Results

Thirty-eight TBI patients were included in this study, among these, 28 patients have TICH (18 isolated and 10 with brain swelling), 6 have EDH and 4 have SDH. Surgery-related mortality was 2.6%. The average percentage of hematoma evacuated was 85%, and the rebleeding rate was 5.3%. The mean operative time was 102.7 minutes and the average blood loss was 68 mL. The mean postoperative GOSE score was 4.55 at 6-months' follow-up.

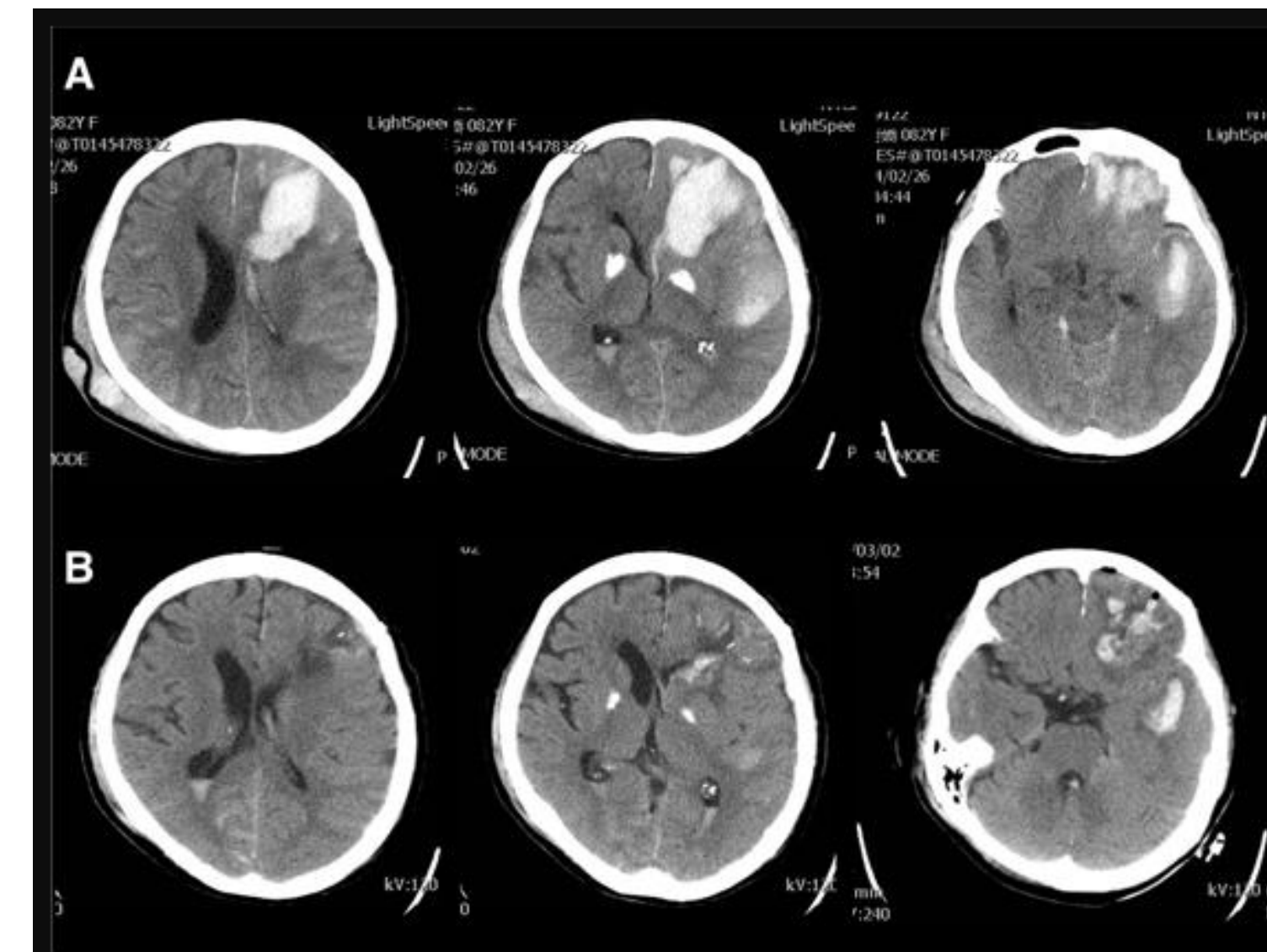


Figure 2. A case of left frontal TICH treated with minimally-invasive surgery with ICP insertion. Pre- (A) and Post- (B) operative CT scan of case 1: isolated TICH.

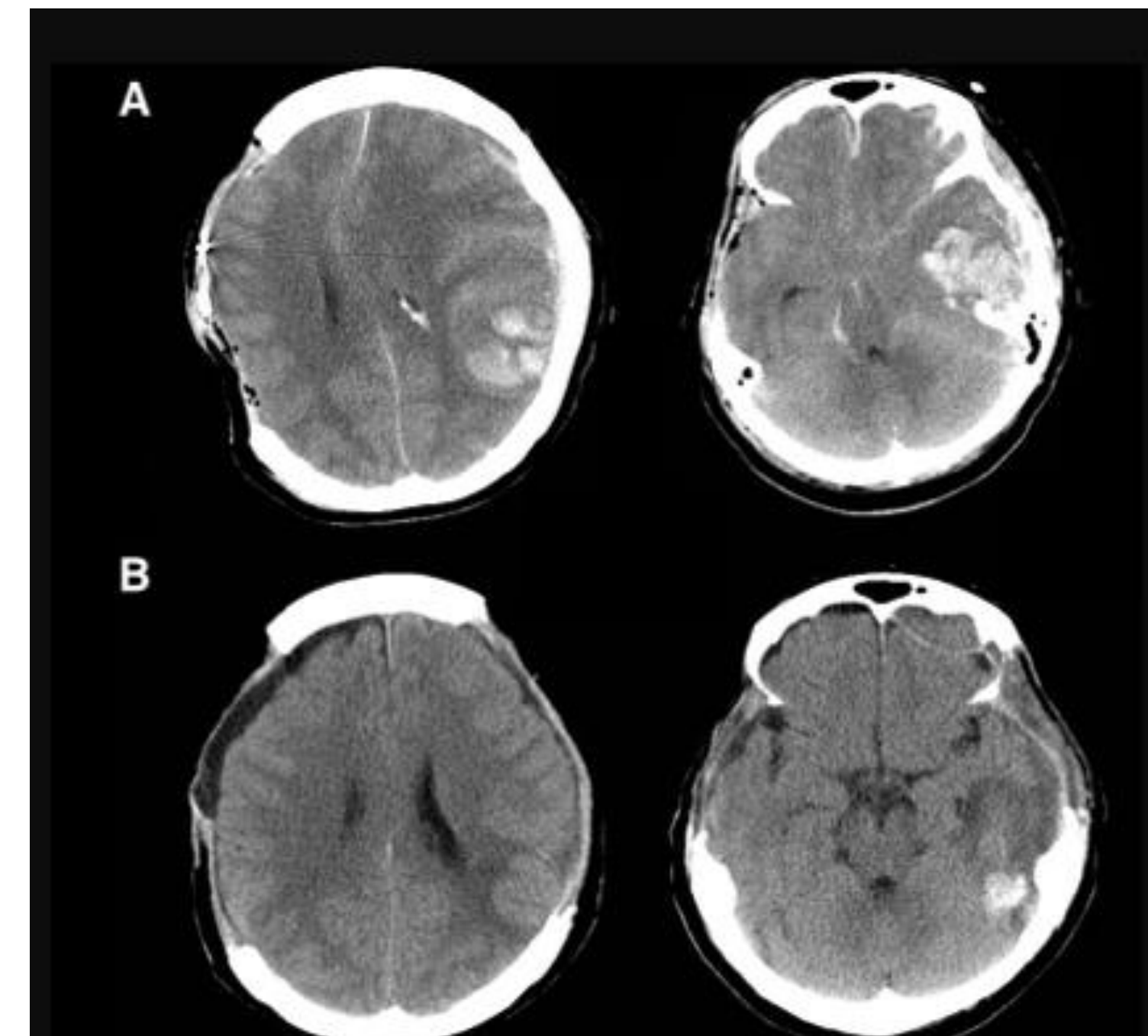


Figure 3. A case of left temporal TICH treated with craniectomy and ,minimally-invasive surgery with ICP insertion. Pre- (A) and post- (B) operative CT scans of case 2: TICH with severe brain swelling.

### Conclusions

MIN is safe and effective in carefully selected cases of TBI. It is especially useful for removal of TICH. However, it is crucial to determine the need of decompression craniotomy.

1. Kuo LT, Chen CM, Li CH, Tsai JC, Chiu HC, Liu LC, Tu YK, Huang AP. (2011) Early endoscope-assisted hematoma evacuation in patients with supratentorial intracerebral hemorrhage: case selection, surgical technique, and long-term results. *Neurosurg Focus*.  
2. Huang AP, Huang SJ, Hong WC, Chen CM, Kuo LT, Chen YS, Lu YJ, Chuang HY, Tu YK, Tsai JC. (2012) Minimally invasive surgery for acute noncomplicated epidural hematoma: an innovative endoscopic-assisted method. *J Trauma Acute Care Surg*.