

# A Novel Application of the Integra Camino Bolt for the Drainage of Chronic Subdural Hematoma: A Technical Note

## Abstract

**Background:** Chronic subdural hematoma (cSDH) is a common neurosurgical pathology associated with older age and complicated by antiplatelet/anticoagulant therapies. With improving medical care in an aging population, the incidence of cSDH will likely increase over the next 25 years, placing a burden on health care costs. **Aims:** A simple and inexpensive treatment option for cSDH is desirable. **Material and methods:** We report a basic, but novel, technique to drain cSDH with an Integra Camino bolt. **Results:** This technique was employed in two patients, where the significant resolution of cSDH and associated clinical symptoms were observed without complications. **Conclusions:** Our technique is simple and effective. It incorporates readily available materials, which reduces costs. Such characteristics are necessary, given the increasing incidence of cSDH.

**Keywords:** Chronic subdural hematoma, hollow screw, Integra Camino bolt, subdural evacuating port

## Introduction

Chronic subdural hematoma (cSDH) is a common neurosurgical pathology associated with older age and complicated by the antiplatelet/anticoagulant therapies. With improving medical care in an aging population, the incidence of cSDH will likely increase over the next 25 years,<sup>[1]</sup> placing a burden on health care costs. Traditional options, particularly craniotomy or burr holes for drainage, require general anesthesia, which may not be optimal for high-risk patients. Alternatively, bedside twist-drill craniotomy with blind catheter insertion may cause acute subdural hematomas due to inadvertent injury to cortical vessel or brain parenchyma.<sup>[2,3]</sup>

Consequently, simple, safe, and inexpensive treatment options are desirable. Recent bedside techniques exploit a hollow screw mechanism, which obviates the need for blind catheter insertion.<sup>[4,5]</sup> Although results have been promising, materials are costly and not commonly available. As a result, the hollow screw mechanism is not routinely utilized. We report a basic, but novel and effective, technique to drain cSDH, where a modified Integra Camino bolt functions as a hollow screw device. As

these materials are ubiquitously available, costs remain temporized.

## Methods

The Integra Camino bolt is placed at an entry point that correlates with the thickest portion of the cSDH. To ensure penetration of the subdural space, the bolt is tightened until its wing contacts the skin. A strain relief sheath is attached to the compression cap of the bolt. Then, a Jackson-Pratt drain is connected to the other end of the strain relief sheath, and suction is applied to promote drainage. A computed tomography (CT) of the head can be performed to confirm whether the bolt tip resides within the subdural space [Figure 1].

## Results

### Patient 1

A healthy 42-year-old female presented with aphasia and right hemiparesis. CT of the head showed a left cSDH with effacement of cortical sulci, suggesting significant mass effect [Figure 2]. Drainage was recommended, and consent was obtained for the off-label use of the Integra Camino bolt. Once the device was applied, more than 100 ml of oil-like fluid was cumulatively collected. An interval CT

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of the head revealed satisfactory evacuation [Figure 2]. Her right hemiparesis and aphasia completely resolved on the postprocedure day 1. The bolt was removed on the postprocedure day 2. She was discharged to home after 3 days of admission.

## Patient 2

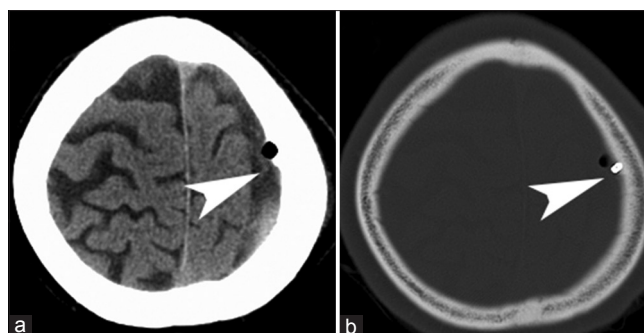
A 48-year-old female, history of factor V Leiden mutation (on chronic Coumadin), presented with headaches for 1 week. CT of the head revealed a 1 cm mixed density lesion, associated with 1.5 cm midline shift and effacement of the basal cisterns. Unfortunately, she had been given 1 mg IV hydromorphone for headaches before the scan, and subsequently deteriorated, becoming obtunded with a right fixed, dilated pupil. She was promptly intubated, and 50 g of mannitol was given. Her exam improved – pupils were reactive bilaterally, and she was following simple commands in all four extremities. Although initial International Normalized Ratio was 9, this was corrected to 1.3. A repeat CT of the head was similar to the prior scan, except for a new “Duret” hemorrhage in the pons, suggesting a herniation event [Figure 3]. Drainage was recommended, and consent was obtained for the off-label use of the Integra Camino bolt [Figure 3]. Once the device was applied, approximately 40 ml of chronic-appearing blood was cumulatively collected. A follow-up CT of the head revealed near complete resolution of the midline shift and a significant contraction of the chronic component of the subdural collection, from 10 to 5 mm in the axial plane [Figure 3]. Following extubation, the patient exhibited an intact neurological exam. Her headache also improved. She was discharged home on postprocedure day 10 and promptly returned to work within 2 weeks. At 3 months, complete resolution of the right SDH was noted on a follow-up scan [Figure 3d].

## Discussion

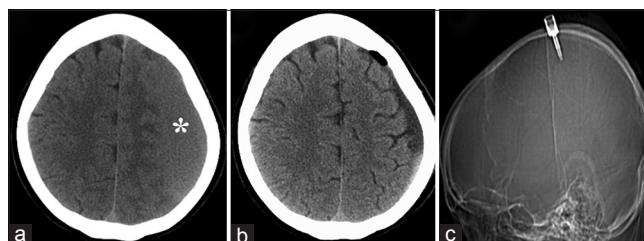
A recent systemic review found that the hollow screw mechanism is safe and effective for evacuating cSDH when compared to other surgical treatment methods.<sup>[6-8]</sup> The mechanism has a success rate of 77.6% compared to 67.8–93.5% for other surgical treatments;<sup>[2,3,6]</sup> moreover, recurrence was 22% compared to 10–33%, respectively.<sup>[2,3,6]</sup> In addition, the mechanism has been associated with decrease hospital length of stay and hospital costs.<sup>[9]</sup>

There are two commercially available products that employ the hollow screw mechanism for drainage of cSDH: The SEPS by Medtronic Inc., Minneapolis, Minnesota, USA and the hollow screw by Teleflex Medical. However, these devices are costly (SEPS costs twice as much comparing to the Camino bolt, per personal communication), and are not commonly available. In contrast, the Integra Camino bolt is readily available at most institutions that treat traumatic brain injury.

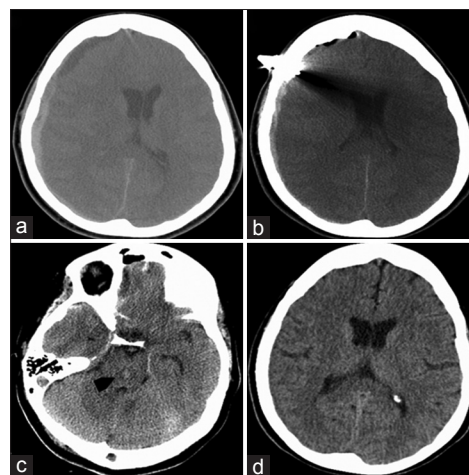
Our method also incorporates the hollow screw mechanism. The bolt tip can access the subdural space at various depths



**Figure 1:** The computed tomography of the head without contrast reveals the tip of the left bolt enters the subdural space and in direct contact with the chronic subdural hematoma in (a), the brain window, and (b), the bone window. The tip of the bolt is indicated by the arrow



**Figure 2:** Computed tomography of the head without contrast: (a) The initial scan on presentation reveals the chronic subdural hematoma, indicated by the asterisk; (b) computed tomography of the head following the placement of the left bolt demonstrates the almost complete resolution of the left chronic subdural hematoma; (c) the scout image of the computed tomography of the head followed the placement of the left bolt. Following the placement of the bolt, the brain experiences less mass effects as evident by the more prominent sulci comparing to the initial scan



**Figure 3:** Computed tomography of the head of patient two without contrast revealing: (a) The right subdural mixed density hematoma; (b) the resolution of the midline shift and the improvement of the right subdural collection after being drained for 1 day with the Camino bolt; (c) the pontine Duret hemorrhage as indicated by the arrow; (d) complete resolution of the right subdural hematoma at 3-month follow-up

by tightening or loosening the screw [Figure 2]. Similar to the SEPS, the wing of the bolt prevents the screw from penetrating the cortical surface or injuring cortical vessels.<sup>[4,5]</sup> Patient one had a left cSDH that contained both acute and

chronic components. CT of the head clearly showed the tip of the bolt was in the subdural space. Furthermore, the liquid component of the subdural hematoma was almost completely drained [Figure 2]. Similar results were achieved with the second patient [Figure 3].

The benefits of our proposed modification are related to the lower cost and higher availability of the Integra Camino bolt compared to commercially available systems. In addition, the entailed steps are familiar to all neurosurgeons who also place intracranial pressure monitors.

As such, the entire process should take <30 min to perform. This method has resulted in excellent clinical outcomes, which are comparable to outcomes obtained with other surgical methods.

### Conclusion

Our technique is simple and effective. It incorporates readily available materials, which reduces costs. Such characteristics are necessary, given the increasing incidence of cSDH. With two patients, this technique has resulted in good outcomes without complications.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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