Subdural Evacuating Port System (SEPS)

- Effectiveness of subdural evacuating port system (SEPS) and middle meningeal artery embolization (MMAE) for chronic subdural hematomas - a multicenter experience
- Effectiveness of subdural evacuating port system (SEPS) and middle meningeal artery embolization (MMAE) for chronic subdural hematomas
- Middle meningeal artery embolization and subdural evacuating port system placement for chronic subdural hematomas: how I do it
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Definition

The **Subdural Evacuating Port System (SEPS)** is a minimally invasive neurosurgical technique used to evacuate chronic subdural hematomas (cSDH). It involves the insertion of a subdural catheter through a twist-drill burr-hole under local anesthesia. The catheter is connected to a closed, low-pressure vacuum drainage system.

SEPS avoids the need for open craniotomy or general anesthesia, making it particularly suitable for elderly or medically fragile patients. Its goal is to reduce hematoma volume, alleviate mass effect, and improve neurological symptoms with minimal procedural risk.

⚙ Types of Subdural Evacuating Port Systems (SEPSs)

SEPSs vary in design, drainage method, and clinical application. Below is a classification of commonly used types:

1. By Drainage Mechanism

- **Gravity-Driven Systems**:
  1. Rely on gravity for fluid evacuation.
  2. Simple but less effective in immobile patients.
- **Vacuum-Assisted Systems**:
  1. Use low negative pressure.
  2. More efficient and controlled drainage.
  3. Example: Medtronic SEPS.

2. By Access Technique

- **Twist-Drill Burr Hole SEPS**:
  1. Minimally invasive.
  2. Bedside procedure under local anesthesia.
- **Trephine-Based Drainage**:
  1. Larger bone opening.
  2. Used when twist-drill SEPS is insufficient.

3. By System Integration

- **Standalone SEPS Kits**:
  1. Pre-packaged sterile kits.
  2. Quick and safe deployment.
- **Custom Modular Systems**:
  1. Built from standard surgical components.
  2. More flexible but higher infection risk.

4. By Manufacturer

- **Medtronic SEPS™**:
  1. FDA-approved, widely studied.
- **Homemade or Off-Label Variants**:

1. Used in resource-limited settings.
2. Often improvised from standard hospital supplies.

http://www.medtronic.com/us-en/healthcare-professionals/products/neurological/critical-care/seps-subdural-evacuation-port-system.html

see Integra™ Subdural Evacuation System.

Twist drill craniostomy (TDC) with closed system drainage and Subdural Evacuating Port System is an effective treatment option for chronic subdural hematoma (CSDH).

In a radiological study, all the branches of the middle meningeal artery ran posterior to the coronal suture and the vascular grooves were also located posterior to the coronal suture at the level of the superior temporal line (STL). The average distance of the vascular grooves was 8.0 +/-5.8 mm. Thirty-five procedures were performed. The coronal suture and the STL could be identified clearly on brain CT scans. The mean thickness of the skull and the CSDH at the proposed point was 8 mm (range 5-13 mm) and 20 mm (range 10-28 mm), respectively. All the TDCs except 1 were congruent with the preoperative brain CT scans. One CSDH recurred 1 month after the first operation and was revised using the same procedure. No other complications occurred.

One centimeter anterior to the coronal suture at the level of the STL is suitable as the normal entry point of the TDC for symptomatic CSDH. The thickness of the CSDH can be measured at this point on a preoperative brain CT scan. Furthermore, the entry point on the scalp can be accurately estimated using surface landmarks [1].

The insertion of a subdural drain was associated with a statistically significant reduction in the risk of symptomatic recurrence and the requirement for further surgical intervention of chronic subdural hematoma after surgical evacuation. Furthermore, it was associated with statistically significant improvements in both short-term and long-term functional outcome [2].

The Subdural Evacuating Port System (SEPS) is a subdural drain that permits the neurosurgeon to drain subacute or chronic subdural hematoma by a method which is minimally invasive, simple and safe to the standard procedure of burr-hole evacuation [3] [4] [5] [6].

The appearance of the winged canula positioned with its tip in the diploic space overlying the subdural space should allow the radiologist to identify it correctly [7].

Because chronic SDH frequently occurs in elderly patients with multiple comorbidities, the bedside approach afforded by the subdural evacuating port system (SEPS) is an attractive alternative method that is performed under local anesthesia and conscious sedation.

A prospectively maintained database of 23 chronic SDHs treated by bur hole or craniotomy and of 23 chronic SDHs treated by SEPS drainage at Tufts Medical Center was compiled, and a retrospective chart review was performed. Information regarding demographics, comorbidities, presenting symptoms, and outcome was collected. The volume of SDH before and after treatment was semiautomatically measured using imaging software.

There was no significant difference in initial SDH volume (94.5 cm(3) vs 112.6 cm(3), respectively; p = 0.25) or final SDH volume (31.9 cm(3) vs 28.2 cm(3), respectively; p = 0.65) between SEPS drainage and traditional methods. In addition, there was no difference in mortality (4.3% vs 9.1%, respectively; p = 0.61), length of stay (11 days vs 9.1 days, respectively; p = 0.48), or stability of subdural evacuation (94.1% vs 83.3%, respectively; p = 0.60) for the SEPS and traditional groups at an average follow-up of 12 and 15 weeks, respectively. Only 2 of 23 SDHs treated by SEPS required further treatment by bur hole or craniotomy due to inadequate evacuation of subdural blood.

This results means thats a safe and effective alternative to traditional methods of evacuation of chronic SDHs and should be considered in patients presenting with a symptomatic chronic SDH [8].

The SEPS is relatively simple to use and may be especially useful to emergency department staff in outlying areas where there is a shortage of neurosurgical coverage [9].

This technique should be added to the armament of treatment options for a neurosurgeon to treat or temporize a hyperacute SDH with increased intracranial pressure in specific patients [10].

Despite decreasing length of stay LOSs as treatment for cSDH evolved from burr holes BHs to SEPS, the LOS for a cSDH is still longer than that of a patient undergoing craniotomy for brain tumor [11].

The efficacy and safety of SEPS is similar to that of other twist-drill methods reported in the literature. The efficacy of this treatment as measured by radiographic worsening or the need for a subsequent procedure is statistically similar to that of bur hole treatment. There was no difference in mortality or other adverse outcomes associated with SEPS [12].

Specifically, hypodense subdural collections drain more effectively through an SEPS than do mixed density collections. Although significant bleeding after SEPS insertion was uncommon, 1 patient required urgent surgical hematoma evacuation due to iatrogenic injury [13].

The SEPS a first-line treatment for the majority of patients with cSDH, management of cSDH must be tailored to each patient. In mixed density collections with large proportions of acute hemorrhage and in collections with numerous intrahematomal septations, alternative surgical techniques should be considered as first-line therapies [14].

Retrospective multicenter cohort studies

In a retrospective multicenter cohort study Lim et al. from the University at Buffalo Jacobs School of Medicine and Biomedical Sciences, Departments of Neurosurgery, Radiology, Bioinformatics, and Canon Stroke and Vascular Research Center, Gates Vascular Institute, Albany Medical Center, Icahn School of Medicine at Mount Sinai, New York, University of South Florida Morsani College of Medicine, Tampa, Florida, USA – Department of Neurosurgery and Brain Repair Yale University, New Haven, Connecticut, USA – Department of Molecular Biophysics and Biochemistry published in the Journal of NeuroInterventional Surgery to o evaluate the combined effectiveness of the Subdural Evacuating Port System (SEPS) and Middle Meningeal Artery Embolization (MMAE) in chronic subdural hematoma treatment (cSDH). Specifically, the authors aimed to assess: How well the combination of SEPS + MMAE reduces hematoma volume, The safety profile of this combined approach, Predictive factors influencing drainage success and recurrence rates, and concluded that the combined use of SEPS and MMAE is a safe and effective treatment option for patients with chronic subdural hematomas (cSDH). It resulted in significant hematoma volume reduction and a relatively low recurrence rate. Several clinical and radiographic factors were identified as predictors of treatment success [15].

🧨 1. The Myth of Innovation-by-Combination

Pairing **two well-known procedures**—SEPS and MMAE—does not inherently create innovation. Yet, the authors present this as a groundbreaking paradigm, despite:

- No control group (e.g., SEPS alone, MMAE alone),
- No randomization,
- No comparative outcome measures beyond radiographic volume.

It’s procedural layering disguised as progress.

📉 2. Radiographic Fetishism Over Functional Outcomes

While hematoma **volume reduction** is carefully charted with decimal-level precision, **functional neurological outcomes** are glaringly absent. No mRS, no GCS trends, no cognitive follow-up. Just numbers on a CT scan — because nothing says “clinical relevance” like milliliters.

3. The P-Value Machine

This study is a **statistical buffet**, offering P-values for everything from coronary artery disease to embolization laterality. But:

- No adjustment for multiple comparisons,
- No multivariate regression transparency,
- No discussion on effect size or clinical significance.

Just noise disguised as nuance.

4. Conflict of Interest? More Like Conflict of Ecosystem

The disclosure section reads like a **startup incubator brochure**, featuring:

- Consulting ties to every major device company,
- Equity in dozens of neurotech ventures,
- Involvement in trials that would financially benefit from a positive narrative.

This isn't a conflict of interest — it's an **industry echo chamber** wearing a white coat.

5. General Anesthesia for "Minimally Invasive" Procedures

Almost 70% of MMAEs were performed under general anesthesia. So much for the **bedside-friendly, low-risk branding** of SEPS+MMAE. The study touts minimal invasiveness while quietly inflating procedural burden.

⚠ 6. Multicenter ≠ Multistandardized

The multicenter nature of the study brings **heterogeneity**, not strength:

- Different operators, protocols, and thresholds for intervention.
- No mention of interrater reliability for volume measurement.
- An "experience," not a trial — and certainly not a guideline.

Takeaway Message for the Neurosurgeon

This study reflects the **growing trend of procedural maximalism**: if one device is good, two must be better. But without functional outcomes, proper controls, or independent validation, SEPS+MMAE remains a **well-marketed guess** — not an evidence-based protocol.

🧾 Final Verdict

A **radiographically rich but clinically impoverished** study. Technological overreach + conflict-laden enthusiasm = the illusion of progress.

The next time you're asked to combine SEPS and MMAE based on this paper, ask: **Where's the patient in all this data?**

Case series

Carpenter et al. evaluated the experience with middle meningeal artery embolization (MMA) combined with Subdural Evacuating Port System (SEPS) placement as a first-line treatment for patients with chronic subdural hematoma (cSDH). A single-institution retrospective review was performed of all patients undergoing intervention. Patients were stratified by treatment with MMA embolization and SEPS placement, MMA embolization, and surgery, SEPS placement only, and surgery only for cSDH from 2017 to 2020, and cohorts were compared against each other. Patients treated with MMA/SEPS were more likely to be older, be on anticoagulation, have significant comorbidities, have a shorter length of stay, and less likely to have symptomatic recurrence compared to SEPS only cohort. Thus, MMA/SEPS appears to be a safe and equally effective minimally invasive treatment for chronic subdural hematoma patients with significant comorbidities who are poor surgical candidates [16].

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