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Technical Note

## **Drain type and technique for subdural insertion after burr hole evacuation of chronic subdural hematoma**

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### **Declaration**

The research has not been and will not be submitted simultaneously to another journal nor presented at a conference, in whole or in part. The paper reports previously unpublished work. All those named as authors have made a sufficient contribution to the work. Authors have full consent from their employers and funding bodies to submit this manuscript.

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## Abstract

Strengths and limitations of subdural versus subperiosteal drain location after burr hole evacuation of chronic subdural hematoma (CSDH) are currently debated. The safety of subdural placement of a drain has been questioned in a recent study by Soleman *et al* from 2019, showing a misplacement rate of 17%, and these results have been further highlighted by the same authors, with a slightly lower misplacement rate of 15.8%, in the recent paper “When the drain hits the brain”. The safety of subdural drainage for CSDH depends to a high degree on type of drain and surgical technique. In this technical note, we describe drain type and technique for drain placement which is standardized in Denmark.

## Introduction

Since the randomized controlled trial of Santarius *et al.* (Santarius *et al.*, 2009), most neurosurgeons have used postoperative drainage after burr hole evacuation of chronic subdural hematoma (CSDH). Santarius *et al.* used subdural drains, but it remains to be established if this position is superior to the subperiosteal position. In our 2010-2012 national cohort, a subperiosteal drain predicted a higher recurrence rate than a subdural drain (Andersen-Ranberg *et al.*, 2019). In an attempt to clarify this, Soleman *et al.* carried out a two-center randomized trial (Soleman *et al.*, 2019). In the report from the trial it was noted and emphasized, that it appears to be more dangerous to insert a drain in the subdural space than in the subperiosteal space (17% versus 0% misplaced drains). A figure with a computed tomography (CT) scan with a drain penetrating into the right hemisphere caught our attention. This type of complication is likely to be avoided by using a soft drain and our technique for insertion, as we describe in this note.

## Methods and materials

We use subdural drainage at all neurosurgical departments in Denmark. We use a multichannel soft silicone drain (Spiral Drain, Redax™, figure 1). The technique for insertion is illustrated in figure 2 and can be used regardless of the width of the subdural space. The drain is “doubled up” with a pair of anatomy forceps and introduced in the burr hole. As the grip is released, the drain will unfold on the surface of the inner hematoma membrane/brain. Once the drain tip is in the subdural space, it can be advanced a few centimeters without penetration of internal hematoma capsule or brain. We use a single 13 mm burr hole and a subdural drain length of ideally 5 cm, but shorter if needed.

## Discussion

Variables like properties of the drain, insertion technique, experience of the surgeon, length of the subdural drain segment and width of the subdural space are likely to influence the risk of brain injury and hemorrhage caused by insertion of a subdural drain. The first four variables can be altered, whereas the width of the subdural space after evacuation cannot. As such, when discussing potential variables of importance for misplacement of subdural drains, one needs to assess all of the above and not only address the width of the subdural space as is the case in current literature (Kamenova *et al.*, 2020).

The authors of this technical note constitute the steering group of the Danish Chronic Subdural Hematoma Study (DACSUHS). We represent all neurosurgical departments in Denmark and we are in charge of national guidelines for CSDH (Ronn Jensen *et al.*, 2018), as well as national standardization of the surgical technique implemented in 2018. In Denmark, 756 patients underwent surgery for CSDH since the standardization. We do see complications, including intraoperative brain injury and hemorrhage, which may lead to introduction of even a soft drain in the parenchyma, but our impression is that primary misplacement of the drain is very rare. We acknowledge that if a postoperative CT was routinely performed, we would probably identify more clinically insignificant irregularities, including suboptimal drain position as reported in other retrospective studies, to support the findings of Soleman *et al.* (Sjavik *et al.*, 2017). Nevertheless, in Denmark we reserve control CT for symptomatic cases only.

Considering the 12.5% rate of symptomatic drain misplacements reported by Kamenova *et al.*, we believe that the present note can potentially save many patients from complications caused by misplaced subdural drains.



## Funding

No funding was received for this research.

## Conflict of Interest

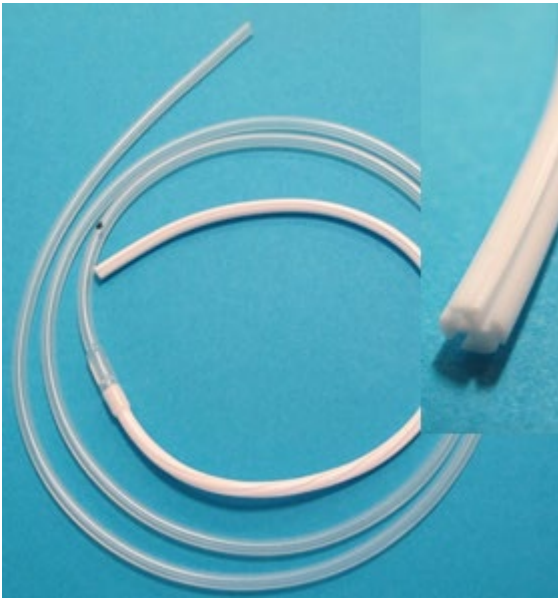
All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

## Ethical approval

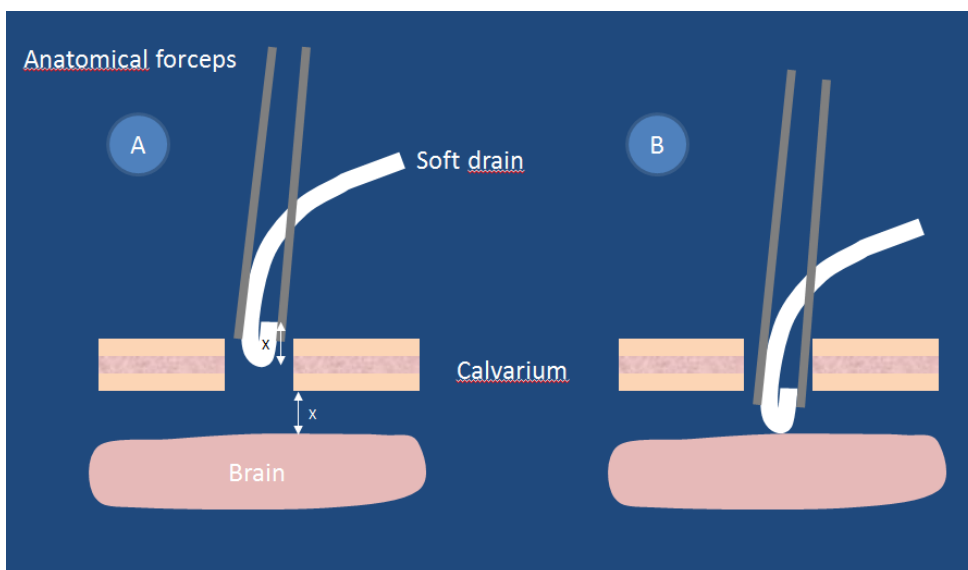
Not relevant, technical note. For this type of study formal consent is not required.

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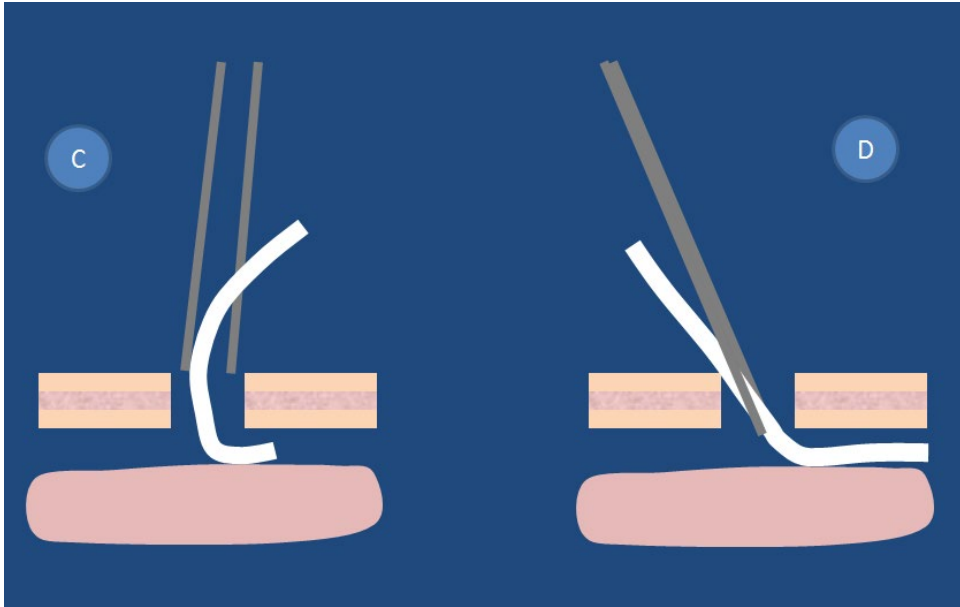
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**Figures with legends**

**Figure 1.** Photograph of the open 4-channel soft spiral drain used for subdural drainage of CSDH in Denmark. The drain is shortened to 5 cm before insertion. Insert (right) shows details of drain profile.







**Figure 2.** The four steps (A-D) of our technique for placement of a soft subdural drain is depicted in drawings. The outer drain diameter is 3.2 mm and the burr hole diameter is 13 mm.