Simulated Spinal Cerebrospinal Fluid Leak Repair an Educational Model with Didactic and Technical Components

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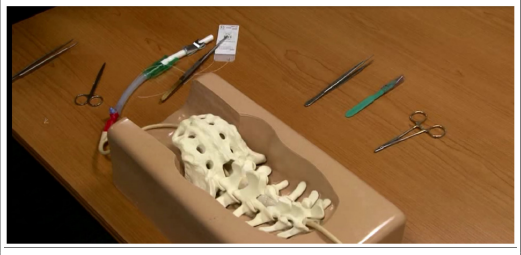
Introduction

In the era of surgical resident work hour restrictions, the traditional apprenticeship model may provide fewer hours for neurosurgical residents to hone technical skills. Spinal dura mater closure or repair is one skill that is infrequently encountered and persistent cerebrospinal fluid leaks are a potential morbidity.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe the importance of didactic and technical components in neurosurgical education 2) Discuss, in the further advancement of education in neurosurgery 3) Understand the process to design and implement an educational algorithm

Durotomy model setup

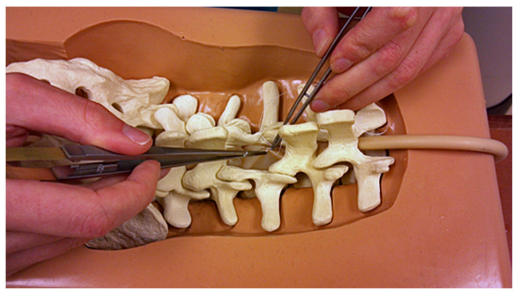


A sawbones model is modified with a laminectomy at L3 along with the insertion of a dural tube and inflated to a specified fluid pressure.

Methods

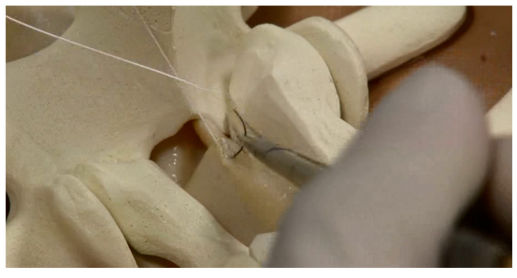
The Congress of Neurological Surgeons (CNS) has developed a simulation based model for durotomy closure with the ongoing efforts of their simulation educational committee. The core curriculum consists of a didactic component with concurrent technical simulation model of dural repair for the lumbar spine

Dural Closure



The opportunity to develop dural closural skills in a practice environment is made possible with this CSF leak repair model.

Spinal Dural Repair



Simulated durotomy closure with 6-0 Gortex Suture.

Durotomy repair.png

CSF Repair model with completed durotomy closure.

Results

Didactic pre-test scores ranged from 4/11 (36%) to 10/11 (91%) median pre- and post-didactic scores 7 and 9, respectively. Post-test scores ranged from 8/11(73%) to 11/11 (100%). Overall, didactic improvements were demonstrated by all particitants (100%, P=0.02). The mean improvement was 1.17(18.5%). The technical component consisted of eleven durotomy closures by six participants, where four participants performed multiple durotomies. Mean time to closure of the durotomy ranged from 490 to 546 seconds in the first and second closures, respectively (P=0.66), whereby the median leak rate improved from 14 to 7 (P=0.34). There were also demonstrative technical improvements by all.

Conclusions

Simulated spinal dura mater repair appears to be a potentially valuable tool in the education of neurosurgery residents. The combination of a didactic and technical assessment appears to be synergistic in terms of educational development.

References

Faulkner ND, Finn MA, Anderson PA. Hydrostatic comparison of nonpenetrating titanium clips versus conventional suture for repair of spinal durotomies. Spine. Apr 20 2012;37(9):E535-539.