



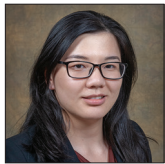
Case Report

Cerebral spinal fluid overdrainage from shunt tap using large bore coring needle: A case report

Shiwei Huang, Daniel Guillaume

Department of Neurosurgery, University of Minnesota, Minneapolis, Minnesota, United States.

E-mail: *Shiwei Huang - huan2256@umn.edu; Daniel Guillaume - dguillau@umn.edu



*Corresponding author:

Shiwei Huang,
Department of Neurosurgery,
University of Minnesota,
Minneapolis, Minnesota,
United States.

huan2256@umn.edu

Received : 02 September 2022

Accepted : 07 December 2022

Published : 23 December 2022

DOI

10.25259/SNI_808_2022

Quick Response Code:



ABSTRACT

Background: Tapping a ventriculoperitoneal shunt percutaneously using a coring needle, such as a butterfly needle, is a common neurosurgical practice despite manufacturers' recommendation to use a Huber type non-coring needle.

Case Description: A 26-year-old woman, with congenital hydrocephalus and history of multiple shunt revision and shunt taps, presented with symptoms consistent with intracranial hypotension. During her shunt revision, cerebrospinal fluid (CSF) was found to be leaking from her shunt reservoir defects which were believed to be caused by prior shunt taps. An *in vitro* study duplicated this finding in which several areas of leak were observed from the valve tapped using the coring needle, while none was observed from the valve tapped using the non-coring needle.

Conclusion: Taping a shunt using a coring needle can damage the shunt reservoir and cause CSF overdrainage.

Keywords: Ventriculoperitoneal shunt, Intracranial hypotension, Huber needle

INTRODUCTION

Strides have been made in hydrocephalus treatment since the first description of this condition. Placement of a ventriculoperitoneal shunt has improved the clinical course and quality of life of patients with hydrocephalus. Accessing the shunt through the reservoir through a percutaneous shunt tap can reveal shunt obstruction and infection. It is less invasive than surgical exploration, well tolerated, and carries low overall risks.^[4,5,7-9] There were no consistencies in the types of the needle in the literature search, and 23G and 25G butterfly needles are the most used ones. However, manufactures recommend using a 25G or smaller Huber type non-coring needle for shunt taps.^[1,2,10] We report a rare case of intracranial hypotension caused by shunt reservoir leakage of cerebrospinal fluid (CSF) from damage caused by prior shunt taps using coring needles.

CASE DESCRIPTION

A 26-year-old female presented with congenital hydrocephalus secondary to congenital aqueduct stenosis status post ventriculoperitoneal shunt placement at 5 years of age. Since then, she required shunt revisions at the age of 8, 12, and 13. During the last shunt revision, a CODMAN® HAKIM® Programmable Valve was placed, she initially reported symptom resolution but over

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, transform, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

©2022 Published by Scientific Scholar on behalf of Surgical Neurology International

the years she intermittently presented to outside hospitals due to headaches, nausea, and vomiting. Given her multiple prior shunt revisions and the fact that those symptoms were similar to her presenting symptoms of shunt malfunction, her shunt was tapped multiple times to assess patency. Outside records showed that her shunt was tapped using 21G and 23G butterfly needles, and the shunt appeared to be patent. Her imaging did not reveal enlarged ventricles, and she ultimately presented to our institution for second opinion. While under the care of our institution, her shunt was tapped once with 21G needle to assess the proximal flow, and two separate nuclear medicine studies were done during which time her shunt was assessed using a 23G butterfly needle and a 25G butterfly needle. All those studies demonstrated, her shunt was functional. She underwent two separate intracranial monitor placement which showed normal to low pressure. In the interim her symptoms, especially the positional headache, worsened, and ultimately her shunt was explored. Intraoperatively, it was discovered that there were multiple areas of leakage from the reservoir presumably from the previous shunt taps. Her proximal catheter was changed, and the valve was replaced with a CODMAN® CERTAS® Plus Programmable Valve. Since the surgery, she reported symptom improvements especially in positional headaches and energy levels.

DISCUSSION

Huber needles are non-coring needles designed to access an implantable venous access device, such as a port without making a “core biopsy” of the port membrane and thus damaging the port membrane.^[3] Comparing to a coring needle with a beveled cutting tip [Figure 1a], a non-coring needle has an angle at the tip of the needle to prevent cutting a hole, “coring,” from the silicone membrane of a port [Figure 1b]. A shunt reservoir has a similar design comparing to a port, access a reservoir requires a similar technique which involves puncturing the skin and the silicone dome. Thus, Huber type non-coring needles are recommended by the shunt valve and reservoir manufacturers, but this is not strictly enforced. In fact, when RICKHAM® Reservoir was first introduced 19G hypodermic needle was recommended for obtaining CSF.^[6] There is no mention in the neurosurgical literature about the effect of coring needle on reservoir. To reproduce our intraoperative findings, CODMAN® HAKIM® Programmable Valve were procured. The reservoirs were each tapped 5 times using a 25G butterfly needle and a 25G non-coring needle. They were then connected to a manometer with 20cm H₂O of fluid column and inspected under the microscope. Leakage was detected in the reservoir tapped by 25G butterfly needle [Figure 2], and no leakage was seen in the 25G non-coring needle [Figure 3].

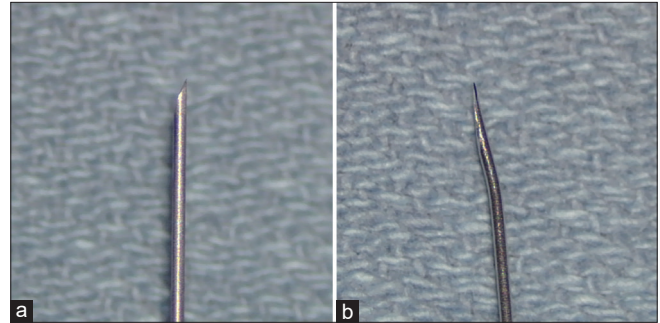


Figure 1: (a) Microscopic view of a 25G butterfly (coring) needle showed beveled tip. (b) Microscopic view of a 25G non-coring needle showed an angle at the end of the needle that prevents shearing plugs from the port during insertion.

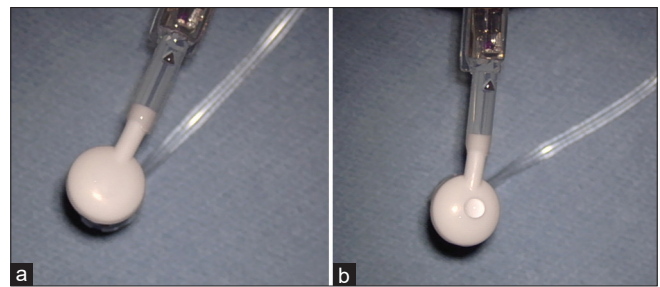


Figure 2: (a) Microscopic view of Rickham reservoir after it was tapped 5 times by 25G butterfly needle. (b) Microscopic view of Rickham reservoir showed leakage from puncture sites after valve was connected with a manometer with 20 cm of H₂O column.

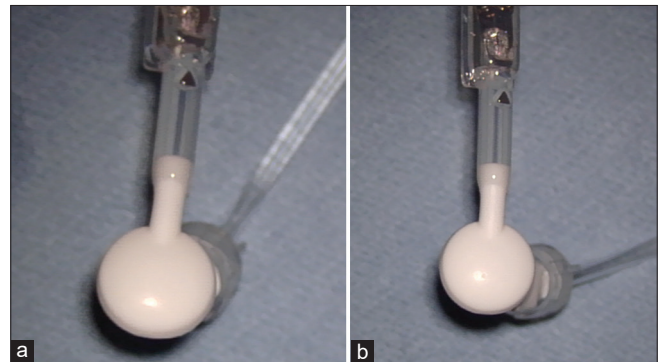


Figure 3: (a) Microscopic view of a second Rickham reservoir after it was tapped 5 times by 25G non-coring Huber needle. (b) Microscopic view of Rickham reservoir showed no leakage from punctures site after valve was connected with a manometer with 20 cm of H₂O column.

CONCLUSION

Shunt taps should always be performed with small bore non-coring Huber type needles as recommended by manufacturers to avoid damaging the shunt system.

Declaration of patient consent

Patient's consent not required as patient's identity is not disclosed or compromised.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. CODMAN CERTAS® Plus Programmable Valve CODMAN CERTAS® Tool Kit; 2010. Available from: <https://www.integralife.com/file/general/1596745162.pdf> [Last accessed on 2021 Sep 17].
2. CODMAN HAKIM® Programmable Valves; 2019. Available from: <https://www.integralife.com/file/general/1592942265.pdf> [Last accessed on 2021 Sep 17].
3. Fougo JL. Huber Needle: Different Types, Uses, Prevention of Accidents. Total Implant Venous Access Devices. Milano: Springer; 2012. p. 29-33.
4. Miller JP, Fulop SC, Dashti SR, Robinson S, Cohen AR. Rethinking the indications for the ventriculoperitoneal shunt tap. *J Neurosurg Pediatr* 2008;1:435-8.
5. Noetzel MJ, Baker RP. Shunt fluid examination: Risks and benefits in the evaluation of shunt malfunction and infection. *J Neurosurg* 1984;61:328-32.
6. Rickham P. A ventriculostomy reservoir. *Br Med J* 1964;2:173.
7. Rocque BG, Lapsiwala S, Iskandar BJ. Ventricular shunt tap as a predictor of proximal shunt malfunction in children: A prospective study. *J Neurosurg Pediatr* 2008;1:439-43.
8. Sood S, Kim S, Ham SD, Canady AI, Greninger N. Useful components of the shunt tap test for evaluation of shunt malfunction. *Childs Nerv Syst* 1993;9:157-61.
9. Spiegelman L, Asija R, Da Silva SL, Krieger MD, McComb JG. What is the risk of infecting a cerebrospinal fluid-diverting shunt with percutaneous tapping? *J Neurosurg Pediatr* 2014;14:336-9.
10. Strata® Products; 2018. Available from: https://www.manuals.medtronic.com/content/dam/emanuals/st/contrib_250941.pdf [Last accessed on 2021 Sep 17].

How to cite this article: Huang S, Guillaume D. Cerebral spinal fluid overdrainage from shunt tap using large bore coring needle: A case report. *Surg Neurol Int* 2022;13:592.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Journal or its management. The information contained in this article should not be considered to be medical advice; patients should consult their own physicians for advice as to their specific medical needs.