www.surgicalneurologyint.com

Surgical Neurology International

Editor-in-Chief: Nancy E. Epstein, MD, Professor of Clinical Neurosurgery, School of Medicine, State U. of NY at Stony Brook.

SNI: General Neurosurgery

Editor
Eric Nussbaum, MD
National Brain Aneurysm and Tumor Center, Twin Cities, MN, USA

ScientificScholar®
Knowledge is power
Publisher of Scientific Journals

SNI
Open Access

Technical Notes

Subdural drain with Nelaton catheter and latex glove, a low-cost alternative and how to make it

Héctor Alonso Tirado-Ornelas, Haziel Sandoval-Villalobos, Carlos Antonio Cruz-Argüelles, Juan Pablo Alonso-del Toro, Jorge Arturo Santos-Franco

Department of Neurosurgery, Specialties Hospital, La Raza National Medical Center, Seris y Zaachila S/N, Mexico City, Mexico.

E-mail: *Héctor Alonso Tirado-Ornelas - hector.alonso.7@hotmail.com; Haziel Sandoval-Villalobos - toahazi@gmail.com; Carlos Antonio Cruz-Argüelles - cruz22p@gmail.com; Juan Pablo Alonso-del Toro - jpadt.94@gmail.com; Jorge Arturo Santos-Franco - jasantosfranco@hotmail.com

***Corresponding author:**
Héctor Alonso Tirado-Ornelas, Department of Neurosurgery, Specialties Hospital, La Raza National Medical Center, Seris y Zaachila S/N, Mexico City, Mexico.

hector.alonso.7@hotmail.com

Received: 17 July 2024
Accepted: 17 August 2024
Published: 13 September 2024

DOI
10.25259/SNI_593_2024

Quick Response Code:

ABSTRACT

Background: One of the most commonly encountered surgical pathologies in neurosurgical practice worldwide is subdural hematoma. The use of prefabricated drains following surgical procedures is widely recommended. However, their availability can be inconsistent due to various issues.

Methods: An intensive search was conducted regarding the availability and cost of subdural drains. The Medtronic subdural evacuating port system costs between 100 and 150 USD, the Blake drain costs between 35 and 40 USD, and the Jackson-Pratt drain costs between 25 and 35 USD. We present a low-cost alternative and describe how it can be implemented using materials available in almost every hospital.

Results: A simple step-by-step guide for crafting handmade subdural drains has been created, aiming to make this affordable alternative accessible to every surgeon who may need one due to the unavailability of prefabricated drains in developing countries.

Conclusion: The benefits associated with using a subdural drain during the evacuation of subdural hematomas are well-documented. In cases where prefabricated drains are not available, a handmade alternative can always be utilized. Materials are often readily available in every hospital, and the cost may not exceed 100 MXN (5 USD), making it at least 5 times cheaper than the cheapest prefabricated alternative. This solution is particularly beneficial for developing countries without access to prefabricated drains.

Keywords: Low cost, Neurosurgery, Neurotrauma, Subdural drain, Subdural hematoma

INTRODUCTION

One of the surgical pathologies that are frequently encountered in neurosurgical practice worldwide is the subdural hematoma, which we can classify according to its temporality in acute, subacute and chronic, and in certain moments, this pathology can be resolved through surgical intervention, the use of a prefabricated drain after the surgical procedure is widely recommended.[2] Meta-analysis done by Liu *et al.* demonstrated that a well-placed drain after the surgical removal of a hematoma is superior to other surgical procedures when it is not relied on, and it actually leads to a better outcome than in those patients in which it is not used.[1] Unfortunately, the availability of prefabricated drains can be inconsistent due to various issues. In this article, we describe a low-cost drain made from materials that are accessible in almost

every hospital worldwide. This alternative provides an easy solution to address the accessibility issues associated with subdural drains.

MATERIALS AND METHODS

We performed an intensive search related to the availability and price of subdural drains. Following, you will find prices of the most common prefabricated drains (all prices are based on Google Search):

- Medtronic subdural evacuating port system (SEPS), 2000–3000 MXN (100–150 USD).
- Blake drain, 700–800 MXN (35–40 USD).
- Jackson-Pratt drain, 500–700 MXN (25–35 USD).

We present a low-cost alternative and describe the manner in which it must be realized with materials that are present in almost every hospital. The following materials are needed (all prices are based on Google Search) [Figure 1]:

- Nelaton catheter 14 fr, 20–30 MXN (1–1.5 USD).
- Sterile latex glove, 3–4 MXN (0.15–0.20 USD).
- Insulin syringe 4–5 MXN (0.20–0.25 USD).
- Silk suture 20–30 MXN (1–1.5 USD).

The price of this handmade drain is around 50–70 MXN (2.5–3.5 USD).

How to make it

- The first step is to fenestrate the Nelaton catheter; it must be fenestrated on the first 5–7 cm [Figure 2].
- We cut the tip of the insulin syringe [Figure 3].
- If we're using a powdered sterile glove, we must remove any powder left on it with a sterile solution.
- After evacuating the hematoma, we proceed to insert the Nelaton catheter into the correct position, ensuring that all holes are inside the dura [Figure 4]. Subsequently, the distal edge of the catheter must be exteriorized through a new exit wound and clamped to prevent pneumocephalus.
- Once every wound is closed, the syringe must be attached to the distal part of the catheter, and afterwards, the glove must be secured to the distal part of the catheter and syringe and fixed with silk suture [Figures 5-7].
- After securing the drain, it must be unclamped, and the drainage output should be observed [Figure 8].

RESULTS

A simple step-by-step guide for crafting handmade subdural drains has been created, aiming to make this affordable alternative accessible to every surgeon who may need one due to the unavailability of prefabricated drains in developing countries.

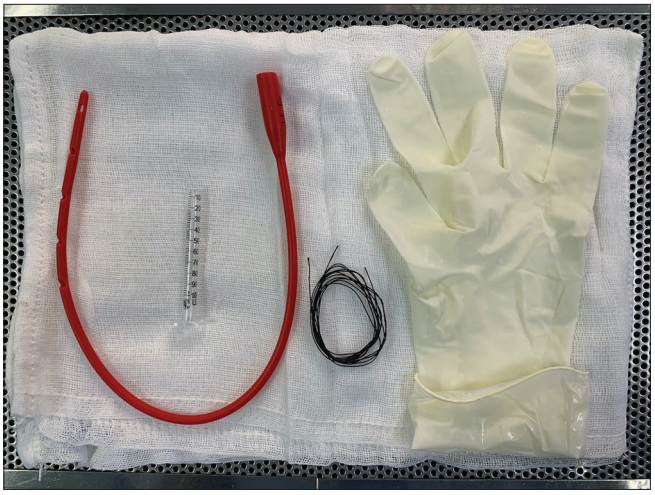

Figure 1: Materials.

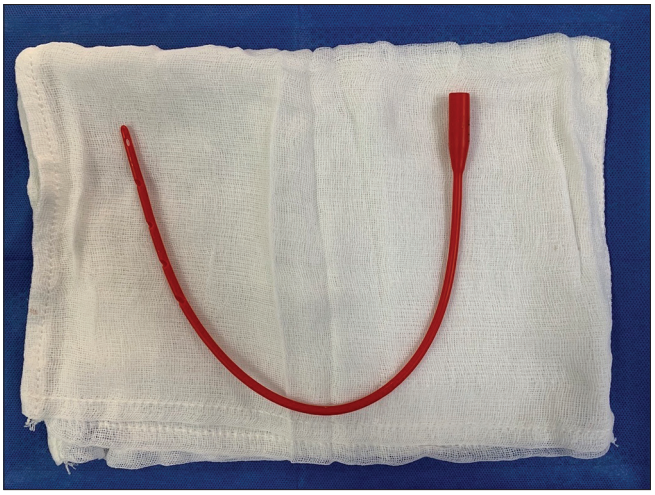

Figure 2: Nelaton catheter.

Figure 3: Insulin syringe.

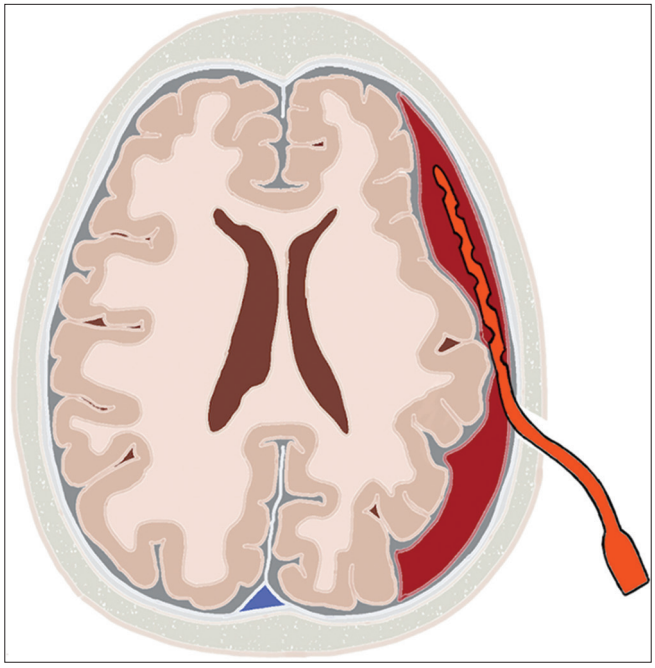

Figure 4: Following evacuation of the hematoma, we proceeded to correctly position the Nelaton catheter correctly, ensuring all holes were inside the dura.

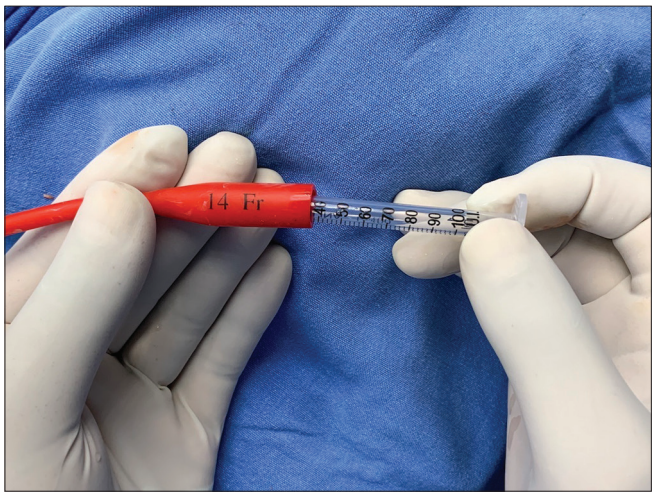

Figure 5: Once all wounds are closed, the syringe should be attached to the distal end of the catheter.

DISCUSSION

There are several alternatives relating evacuation of subdural hematomas; several techniques implicate 1 or 2 burr holes, craniotomy, or other procedures, all depending on the characteristics of the hematoma and the surgeon's preference.[4] Prefabricated drains in our country and many other developing countries are difficult to acquire and costly, making them inaccessible for a large amount of the population.

Figure 6: The glove must be secured to the distal part of the catheter.

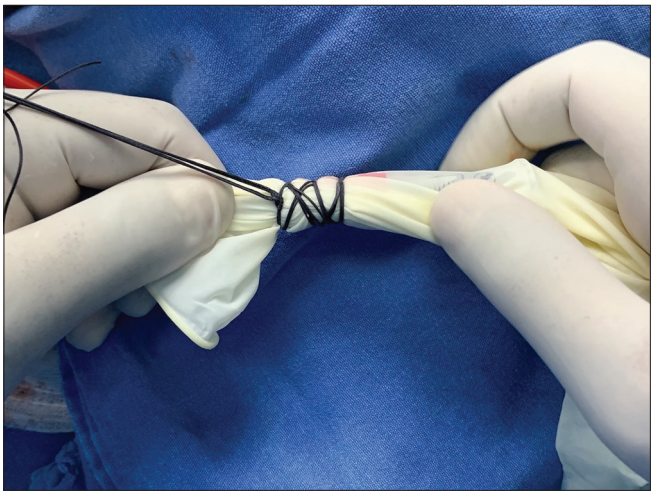

Figure 7: The glove is fixed to the Nelaton catheter and the insulin syringe with silk suture.

Figure 8: Low-cost subdural drain.

While low-cost alternatives have been reported,[3] step-by-step instructions for making these drains have not been described, leading to confusion when attempting replication.

CONCLUSION

The benefits associated with using a subdural drain during the evacuation of subdural hematomas are well-documented. In cases where prefabricated drains are not available, a handmade alternative can always be utilized. Materials are often readily available in every hospital, and the cost may not exceed 100 MXN (5 USD), making it at least 5 times cheaper than the cheapest prefabricated alternative. This solution is particularly beneficial for developing countries without access to prefabricated drains.

Ethical approval

The Institutional Review Board approval is not required.

Declaration of patient consent

Patient's consent was not required as there are no patients in this study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

REFERENCES

1. Liu W, Bakker NA, Groen RJ. Chronic subdural hematoma: A systematic review and meta-analysis of surgical procedures. J Neurosurg 2014;121:665-73.
2. Santarius T, Kirkpatrick PJ, Ganesan D, Chia HL, Jalloh I, Smielewski P, *et al*. Use of drains versus no drains after burr-hole evacuation of chronic subdural haematoma: A randomised controlled trial. Lancet 2009;374:1067-73.
3. Sarica C, Ozgunduz A, Ucler N, Dolas I, Kilinc S. Surgical drains in chronic subdural hematoma surgery: From cheapest to most expensive drains. World Neurosurg 2018;112:284-6.
4. Soleman J, Kamenova M, Lutz K, Guzman R, Fandino J, Mariani L. drain insertion in chronic subdural hematoma: An international survey of practice. World Neurosurg 2017;104:528-36.

How to cite this article: Tirado-Ornelas H, Sandoval-Villalobos H, Cruz-Argüelles C, Alonso-del Toro J, Santos-Franco J. Subdural drain with Nelaton catheter and latex glove, a low-cost alternative and how to make it. Surg Neurol Int. 2024;15:334. doi: 10.25259/SNI_593_2024