



Original Article

Illustrated dynamic stories behind pediatric neurosurgery

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ABSTRACT

Background: The aim of this paper is to provide a depiction of the surgical technique and dynamic story behind the procedures in pediatric neurosurgery.

Methods: Five standard common pediatric neurosurgeries: endoscopic third ventriculostomy, fronto-orbital advancement for metopic and coronal craniosynostoses, posterior fossa craniotomy, strip craniectomy for sagittal craniosynostosis, and ventriculoperitoneal shunting were chosen to be exemplified in illustrations.

Results: Surgical techniques were depicted in a step-by-step fashion with comic-like style of images. Illustrations enable to highlight specific surgical and anatomical features and also convey surgical procedures in a sequential order from beginning to end as if it is a story.

Conclusion: Surgical illustrations may serve as an educational tool with potentially instructional value for practical application, especially for surgical trainees.

Keywords: Depiction, Neurosurgery, Pediatric, Surgical illustrations

INTRODUCTION

Technology has changed the nature of documentation in medicine. However, despite the realistic quality of photos and videos, illustrations remain a leading position in medical education.^[1,3] From the beginning of medical history, illustrations were used as a tool to promote ideas from one physician to another.^[2,4] The aim of this paper was to emphasize the surgical technique from beginning to end with multiple illustrations. With our ambition to address the complexity of these surgeries, we also embodied the comic-like feature and aspired to create simplicity of this nature.

We selected five common procedures of pediatric neurosurgery, in a series of positioning, surgical intervention, and subintervention [Figures 1-5]. These procedures are examples that show how surgical illustrations can depict the dynamic story, as well as focus on specific surgical nuances. For each operation, we dissected the chronological train of intraoperative sequences to depict from beginning to end flow of surgery. We decided to use comic-like style of depiction to show dynamic story and step-by-step technique, to appreciate techniques with clear details.

In our illustrations, we show one of many ways to perform common pediatric neurosurgical procedures. As the famous Latin proverb says "All roads lead to Rome," procedures might be done differently but with the same result.

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For example, there are several ways to perform a ventriculoperitoneal shunt. As neither anterior or posterior approach for insertion of ventricular catheter has shown significant superiority compare to each other. In most cases, we favor the posterior approach as it requires only two incisions

instead of three in the anterior approach. Similarly, to save time and to achieve a better cosmetic result, we prefer insertion of the peritoneal catheter using trocar to minilaparotomy. In our experience, perforation of abdominal organs or missing abdominal cavity by trocar is extremely rare.

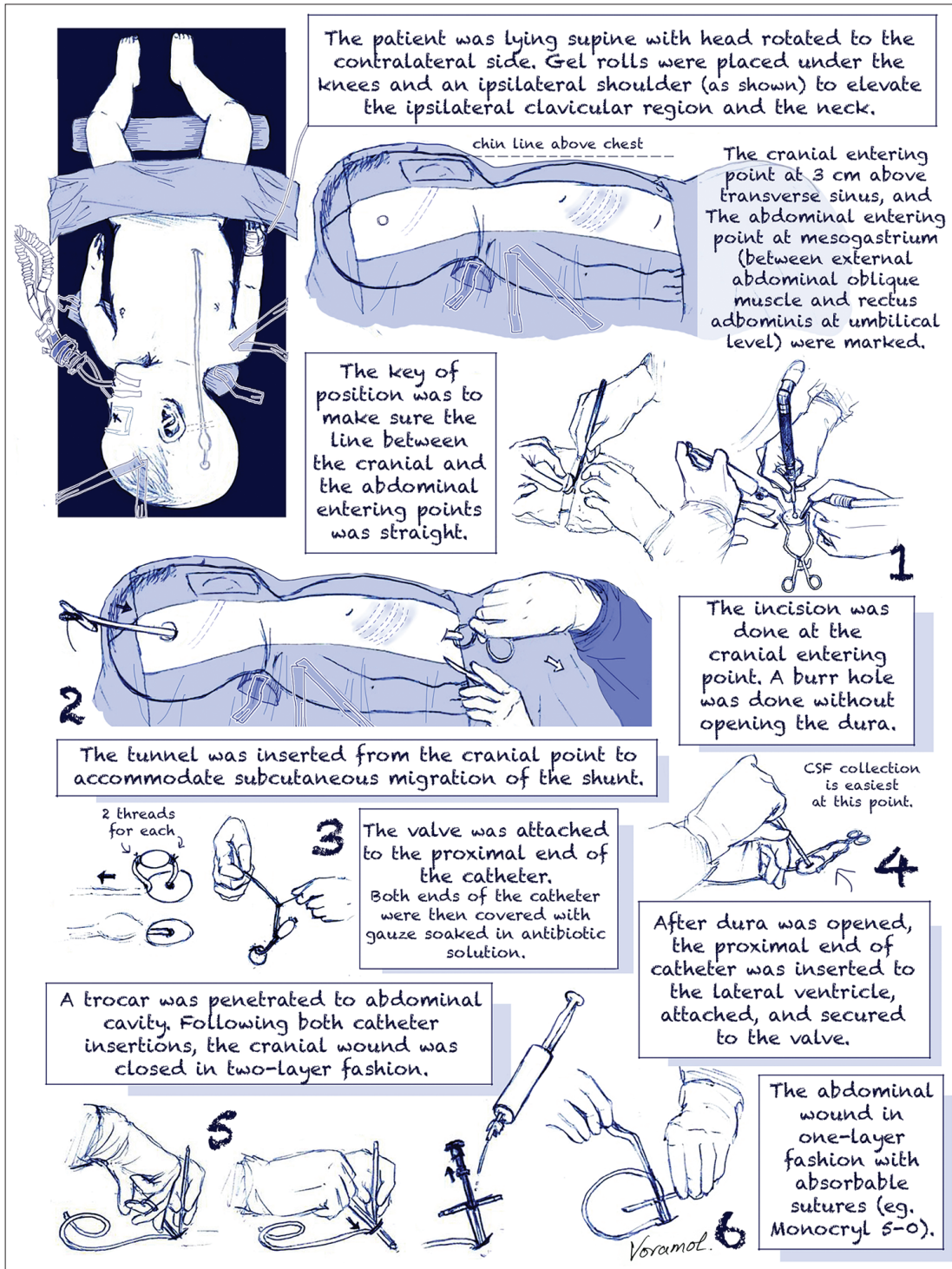


Figure 1: Ventriculoperitoneal shunting.

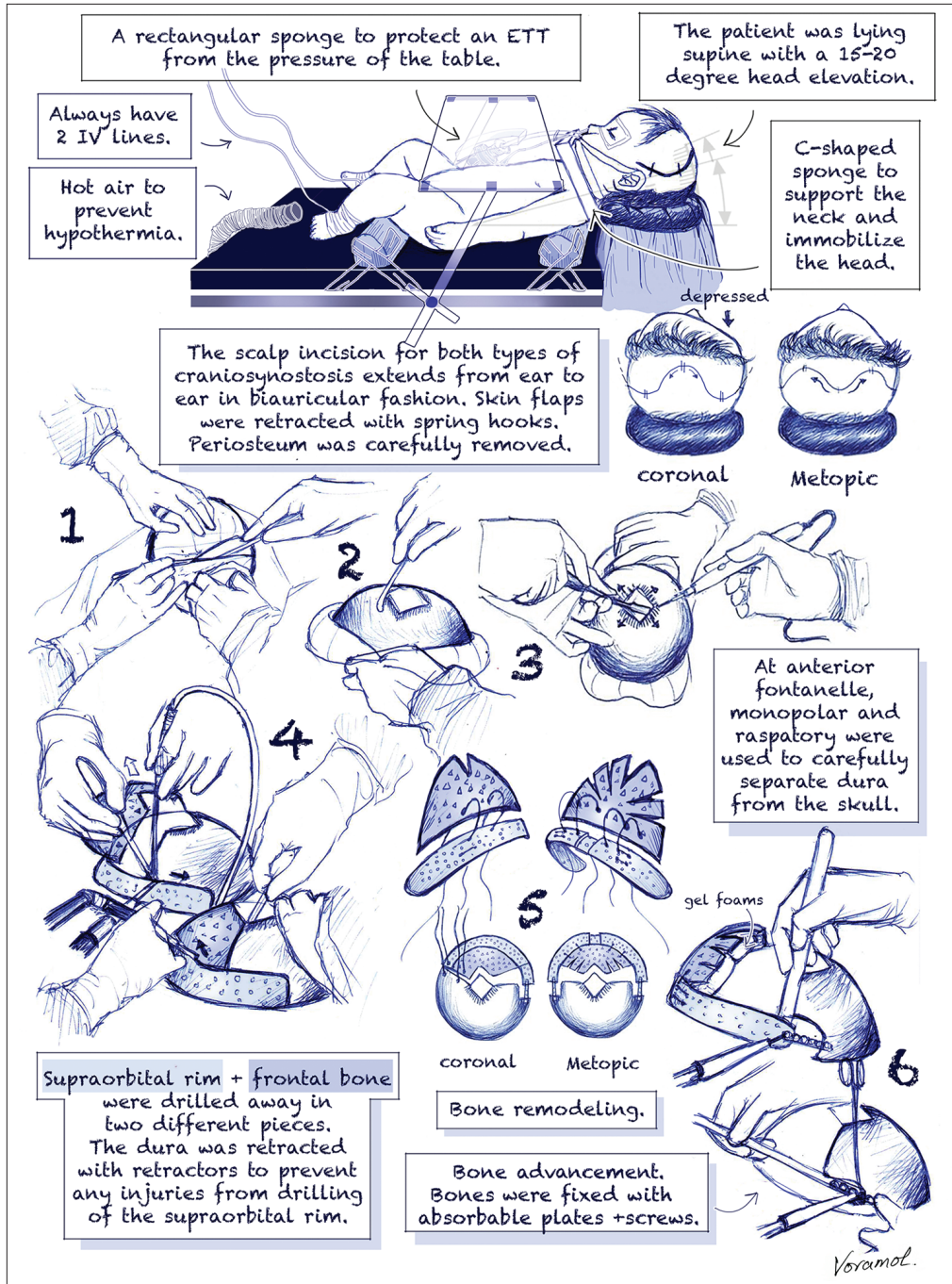


Figure 2: Fronto-orbital advancement for metopic and coronal craniosynostoses.

A ROOM FOR IMPROVEMENT

Max Brödel was the pioneer who famously created the original angle.^[13] In his collaboration with Harvey Cushing for the depiction of transsphenoidal approach, Brödel deliberately depicted the patient in sagittal section to illustrate the heart of this surgery.^[17] His legacy had carved the path and inspired countless innate artists like Cushing,^[5,6] who exceptionally excelled at utilizing his artistic skills as a tool

for surgical documentation, such as his pediatric cases.^[12,14] Their imagination had set a milestone for medical education in neurosurgery, and we have not stopped improving since.

The notably mentioned Rhoton's collection has a special place in modern academic neurosurgery.^[15] From vibrant drawings to the actual dissection of cadavers, Rhoton's careful selection of colors attracts newly scholars, professional neurosurgeons, and many others who are just curious about brain anatomy.

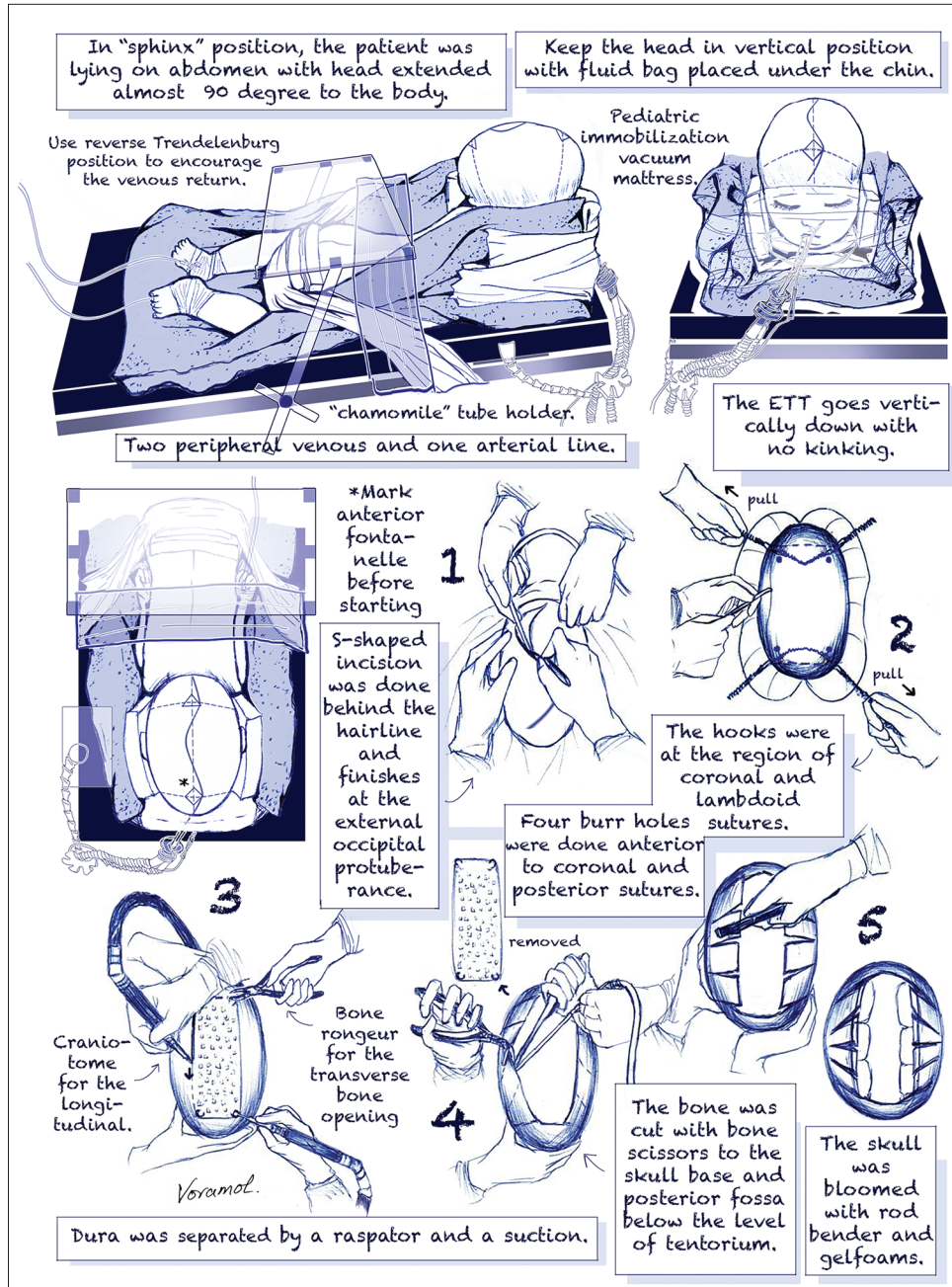


Figure 3: Strip craniectomy for sagittal craniosynostosis.

Another outstanding example of neurosurgical drawing collection is "Operative Neurosurgery" by Kempe.^[8] He masterly depicted a beautiful perspective that neurosurgeon encounters during different neurosurgical operations. Furthermore, he was able to show critical steps each of operations and the way how neurosurgeon handles with different surgical maneuvers.

In the world of anatomical and surgical illustrations, it is impossible not to mention the legendary works of Frank Henry Netter. His atlases of normal anatomy and clinical

subjects have become the most own for several generations of medical students and physicians.^[1,7]

In more recent surgical perspective, Michael T. Lawton's books comprise five different views: surgeon's view, coronal view, other surgical view, real photo view, and imaging view. It has every viable detail which we need to know about the climax of that particular surgery.^[9-11] In this digital age, many other free web-based multimedia, such as Juha Hernesneimi's collection, are dedicated to provide learning material to show "how to do," instead of "what

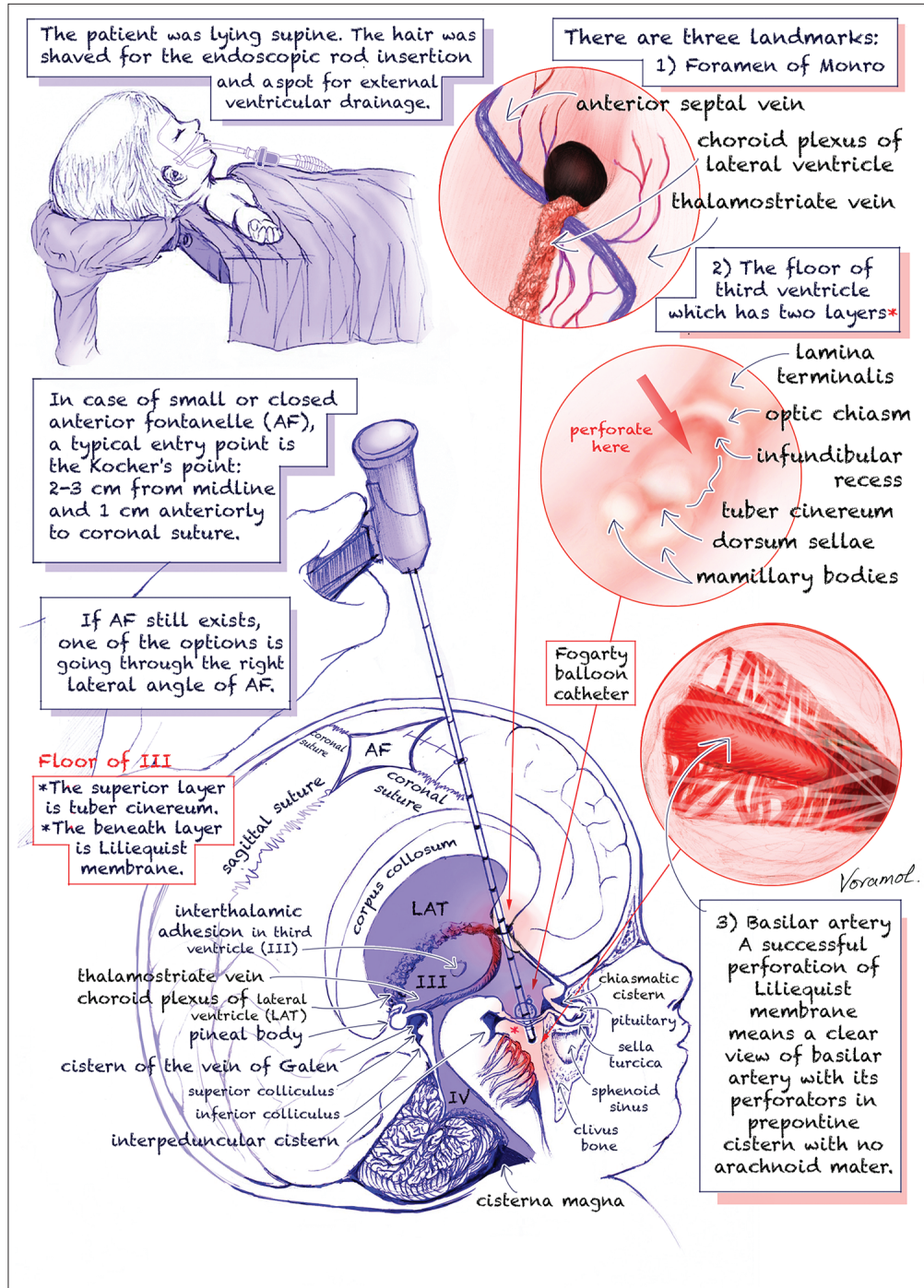


Figure 4: Endoscopic third ventriculostomy.

to do” instruction.^[3,4] These collections present mostly videos and drawings of the real operations, which only demonstrate the operative highlights, to keep the length of the videos and a number of pages to a minimum. In Shillito and Mantson’s book,^[16] despite the static property in terms of visual sensation, illustrations could reflect a real flow of the procedure in one single page. For trainees and anyone

who have only just begun their way in neurosurgery, small details such as the position of the endotracheal tube, lines of tapes, different supportive devices, and other equipment needed in the field have a special point of interest. While digitized images can undermine the patient’s confidentiality, illustration continues to be a guardian of a new production. Its transparency allows it to be publicized

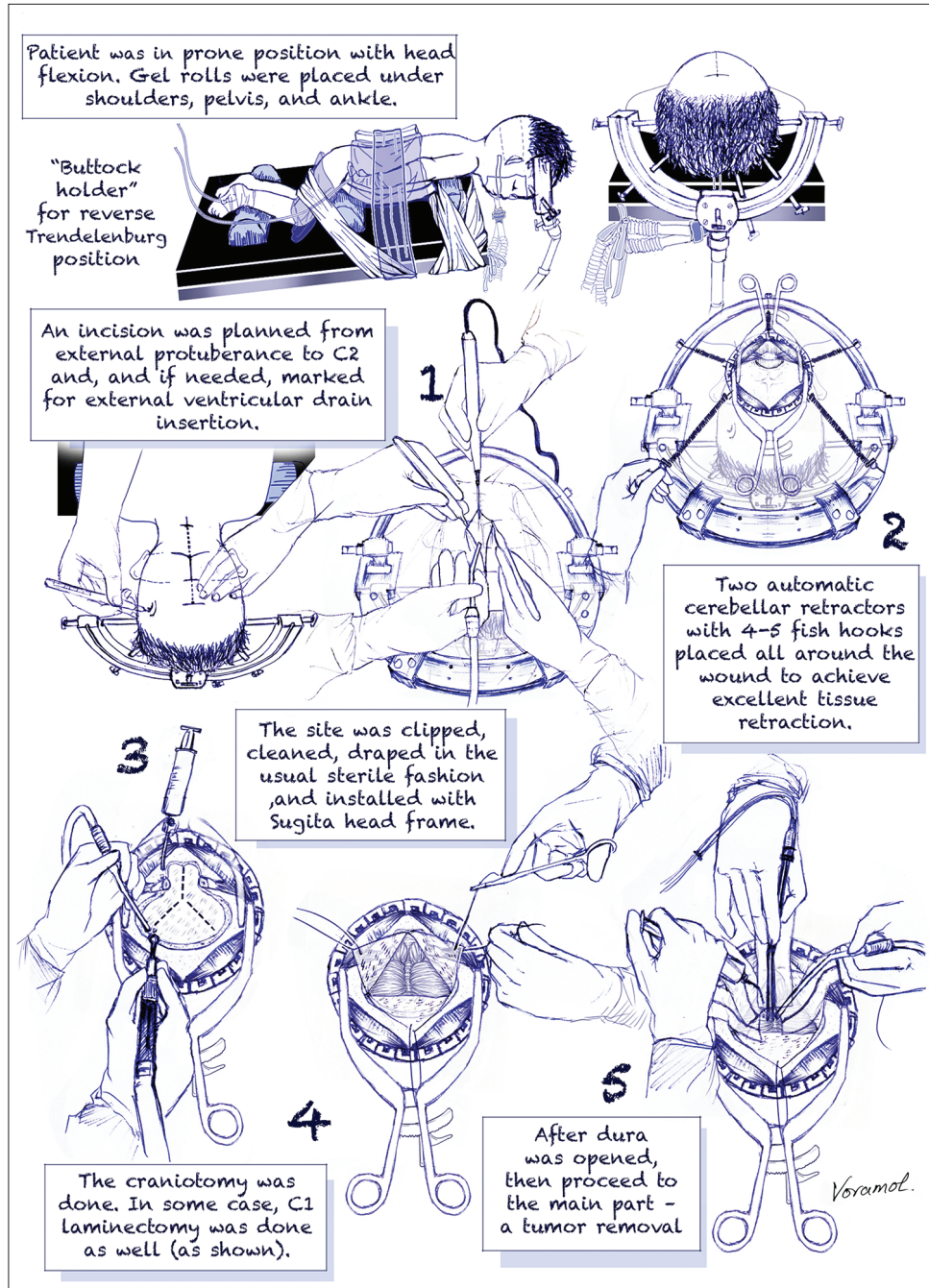


Figure 5: Posterior fossa craniotomy.

and may reach the larger scale of audiences, even outside medicine.

CONCLUSION

While digitized images can undermine the patient's confidentiality, illustration continues to be a guardian of a new production. Its transparency allows it to be publicized and may reach the larger scale of audiences, even outside medicine.

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Dr. Rochanaroon has illustrated and presented this work as a poster and won the Best Student Poster Award at the 46th Annual Meeting of International Society for Pediatric Neurosurgery 2018 in Tel Aviv, Israel.

Conflicts of interest

There are no conflicts of interest.

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