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Original

Rhotonian microsurgical anatomy and headache course: Revisiting anatomy to understand symptoms and improve procedures

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Introduction
Headache disorders constitute a broad subspecialty within Neurology, traditionally managed pharmacologically. However, interventional procedures have gained traction, shaping the emerging field of Interventional Headache Medicine. The International Rhoton Society (iRS), guided by Prof. Rhoton's principle -"*we study microsurgical anatomy to make what is a delicate, fateful, and awesome experience for our patients more accurate, gentle, and safe*"- advocates for anatomical precision in headache management. This study applies the iRS mission to this evolving domain.

Objective
To detail the creation and implementation of the Rhotonian Anatomy and Headaches Course.

Methods
The course integrates basic sciences, semiology, neurology/neurosurgery, and applied anatomy, structured into three modules: i) Cervical Nerve Plexuses, ii) Trigeminal, and iii) Intermedius Systems. Each module entails a 4–6-hour program combining 2D/3D microneuroanatomy, clinical/surgical applications, practical exercises, and gamification.

Results
Implementation commenced with pre-sessions to streamline contributions, refine time allocations, and assess material needs. A soft-launch involved small groups (12 participants), including students and professionals, yielding a notable increase in knowledge retention—from 42% pre-course to 81% post-course. Refinements led to a full-scale launch within a national three-day event, which gathered positive international reviews, prompting a transition to a 3D format.

Conclusions
Advanced anatomical comprehension is crucial across medical disciplines. As science, technology, and clinical insights evolve, continual reassessment is essential for optimizing established practices. Headache management exemplifies the benefits of the iRS mission, reinforcing the necessity of anatomical precision in both clinical and surgical fields.

Keywords: Applied anatomy, Gamification, Neurology, Neurosurgery.

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Introduction

The study of headache disorders is a vast subespecialty in Neurology. Although it is mostly based on pharmacological treatments, interventional procedures have increasingly been used for both diagnosis and treatment, in selected cases. Following Prof. Rhoton´s motto, The International Rhoton Society (iRS) mission states "*we study microsurgical anatomy to make what is a delicate, fateful and awesome experience for our patients, more accurate, gentle and safe*". This study presents the application of iRS mission to the field of headache management.

Objective

To describe the creation and implementation of the course Rhotonian Anatomy and Headache, its rationale, contents and initial experiences with local, national and international audiences.

Methodology

The core content of this course is the result of the combined experience in basic sciences, semiology, neurology, neurosurgery and applied anatomy of the authors. The contents have been divided into three parts, covering the main systems involved in headache origin: i) Cervical Nerve Plexuses System, ii) Trigeminal System, and iii) Intermedius System. Each of these modules comprises a 4h combination of microneuroanatomy in 2D and 3D, clinical and surgical application of knowledge, practical session and gamification.

Results

The implementation phase (Figures 1 and 2) started with a pre-session for each module, to verify and align each author´s contribution into a coherent didactical module, to test time allocation and check on material demands, and were followed by program adjustments.

A soft-opening schedule for each module was then undertaken, using local groups, no larger than 12 participants (Figure 2 C-E). These groups included graduation and postgraduation students and professionals of several backgrounds including basic science research, physiotherapy, nursing, social service, and medicine. Doctors from different practices, including internal medicine, neurology and neurosurgery composed these groups. The previous knowledge of the content was on average 42%, and post-course immediate retention was on average 81% (Figure 2 C & F).

Further refinements were integrated, and the core course content run within the frame of a national event (I Symposium of Interventionist Management of Headaches) with an international audience, which expanded previous attendee profile to include odontologists, otorhinolaryngologists, radiologists, anesthesiologists and headache specialists, amounting to a group of 59 participants and spanning three days as four sessions of five hours (Figure 2 G). The creation and implementation of a Rhotonian Microsurgical Anatomy and Headaches Course has been presented at the 4th Meeting of The International Rhoton Society (1).

Due to the success of this initial period and positive reviews received from international participants, the course has been adapted to 3D format.

Figures on the next pages

Discussion

For the last 20 years, concerns about the lack of theoretical and applied knowledge in headache disorders have been raised (2,3).

Poor understanding and varying management of headaches have stressed the need for improved headache education in neurology training (4). A WHO report indicates that medical schools worldwide dedicate minimal time (about 4 hours) to headache education, despite headache being a leading cause of disability in people under 50s (4–6).

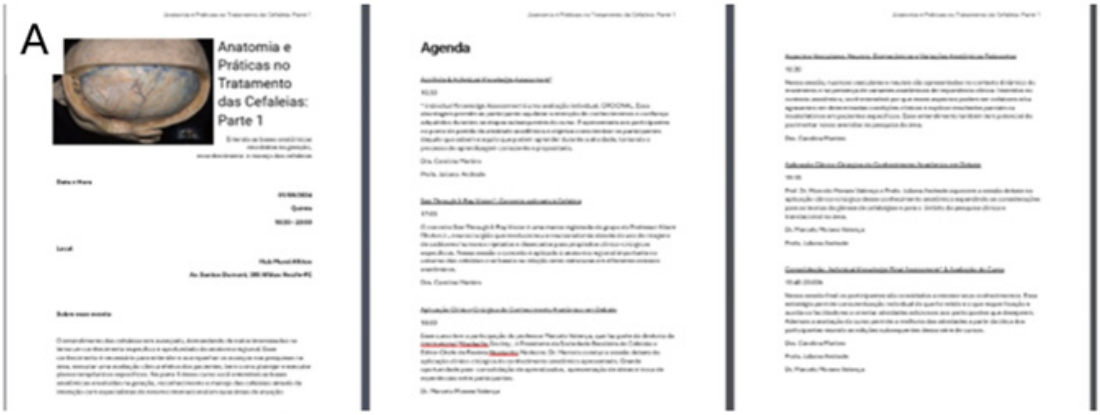
Institutions have responded by updating and improving guidelines for headache education (2,3).

The course "Rhotonian Anatomy and Headache" is designed to comply with these guidelines, offering a blend of theoretical and practical activities over three days. It includes small group sessions, pre- and post-activity evaluations, and includes unique didactic features like electronic gamification for evaluations and Rhotonian anatomical images of human cadaveric specimens to engage participants.

Conclusion

Detailed anatomical understanding is desirable in clinical as much as surgical fields and needs to be revisited every time basic science, technology or clinical understanding of a disease process progress in order to ground established practices and allow for further improvement. Headache management is but one example of a field of knowledge that benefits from iRS mission.

A



B

Course Rhotonian Microsurgical Anatomy and Headaches	Modules	Duration	Content
Part 1	Cervical Plexus System	5h	2D/3D Lecture Practical Activities
Part 2	Trigeminal System	5h	2D/3D Lecture Practical Activities
Part 3	Intermedius System	5h	2D/3D Lecture Practical Activities

Figure 1. Rhotonian Anatomy and Headache Course. A. Course Syllabus for Part 1. Being a new course, highly based on applied anatomy, each course syllabus aimed at detailing the content to be developed and their complementarity (participants were suggested to follow the established sequence, but were free to take the course in any order desired)
B. Course modular strategy. The course was envisioned as three independent, complementary modules. Each of the three modules was prepared taking into consideration a time distribution of up to 6h/day.

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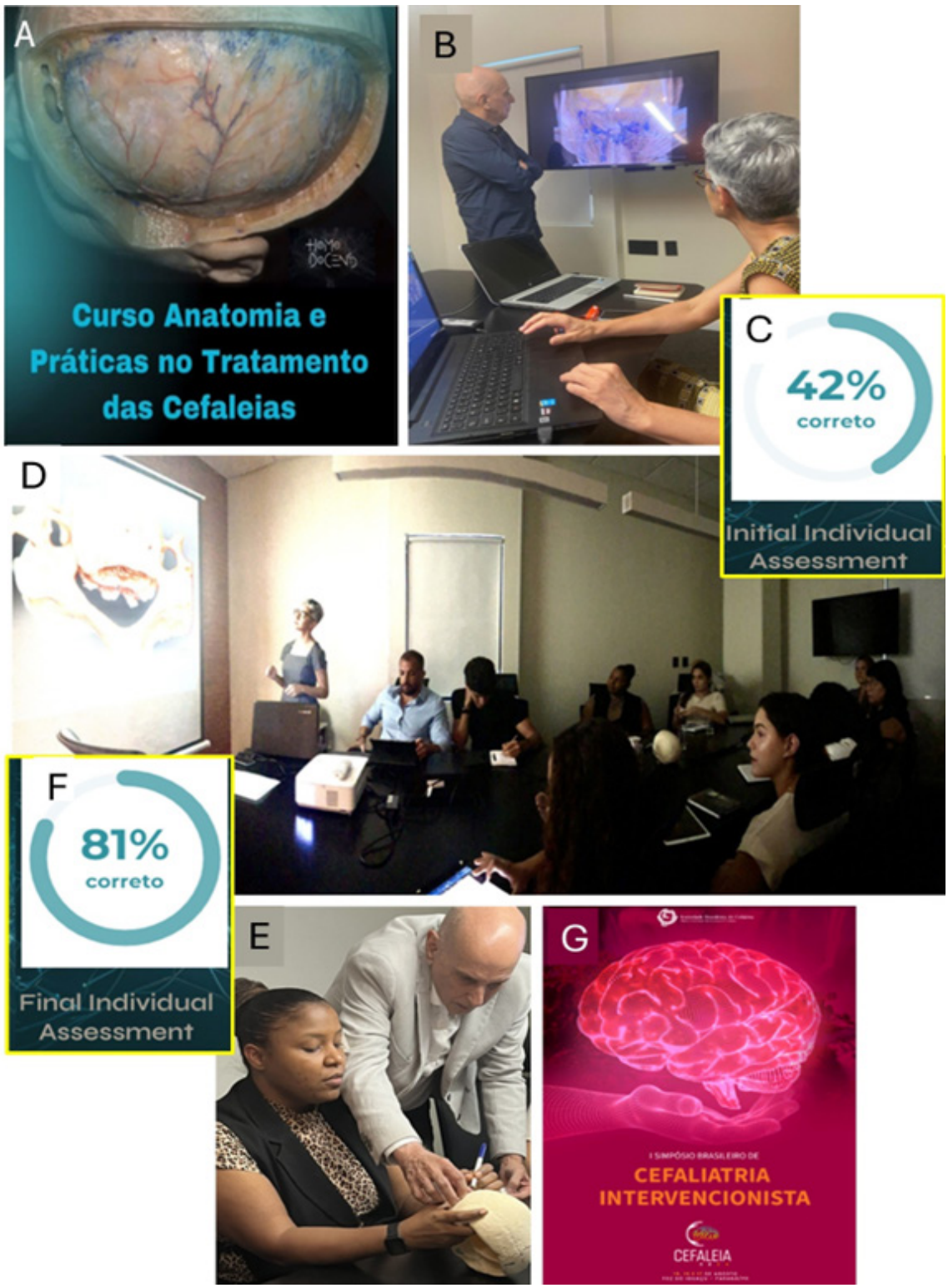

Figure 2. A. Rhotonian Anatomy and Headache Course stages of preparation. A. Electronic Flier. B. The implementation phase started with a pre-session for each module, to verify and align each author´s contribution into a coherent didactical module, to test time allocation and check on material demands, and were followed by program adjustments. C. Each session started with evaluation of previous knowledge, using electronic gamification. This allowed for detailed auditing. Participants' previous knowledge of the anatomy important to understand and treat headaches were on average 42%. D and E. Each module involved an interplay of theoretical and practical activities. F. After lectures, exercises and debate of practical situations, the immediate retention of knowledge rated on average 81%. G. Part of this course has been tested within the frame of a national course, supported by the Brazilian Headache Society.

References

1. Valença M, Martins A, Andrade J, Martins C. Rhotonian microsurgical anatomy and headache:Revisiting anatomy to understand symptoms and improve procedures. In: Proceedings of the 4th International Rhoton Society Meeting. NS&A; 2024. p. 46. [accessed 14 Jun 2025] Available from: https://neurosurgeryanatomy.com/journal/issue/view/3/1
2. Kristoffersen ES, Faiz KW, Winsvold BS. Neurology residents' knowledge of the management of headache. Cephalalgia. 2019;39(11):1396–406. doi: 10.1177/0333102419847973
3. Antonaci F, Láinez JM, Diener H-C, Couturier EGM, Agosti R, Afra J, et al. Guidelines for the organization of headache education in Europe: the headache school. Funct Neurol. 2005;20(2):89–93.
4. Jensen R, Mitsikostas DD, Valade D, Antonaci F. Guidelines for the organization of headache education in Europe: the headache school II. J Headache Pain. 2010;11(2):161–5. doi: 10.1007/s10194-010-0195-2
5. World Health Organization. Migraine and other headache disorders. 2024. [accessed 14 Jun 2025] Available from: https://www.who.int/news-room/fact-sheets/detail/headache-disorders
6. World Health Organization. Intersectoral global action plan on epilepsy and other neurological disorders. Seventy-fifth World Health Assembly. Geneva: WHO; 2022. [accessed 14 Jun 2025] Available from: https://apps.who.int/gb/ebwha/pdf_files/WHA75-REC1/A75_REC1_Interactive_en.pdf

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