

Low-field portable MRI: what are the clinical benefits for imaging?

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Introduction

In recent years, several research projects have focused on the development of portable MRI with a low magnetic field intensity. Some of them resulted in commercial products approved by the FDA like the Hyperfine Swoop® (Figure 1). Those low-field systems offer numerous advantages such as less safety concerns, less artifacts, more affordable, etc. Despite all those advantages, it seems that low field struggles to make its place in the current clinical landscape.

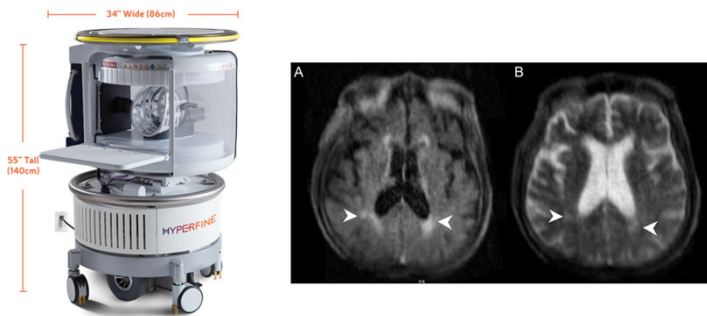


Figure 1. From Hyperfine Swoop®, 2022 Figure 2. Brain MRI acquired with Hyperfine Swoop®. From Hovis et al., 2021

Hyperfine Swoop® is a low-field portable brain MRI with:

- Field intensity of 64 mT
- 8-channel head RF coil
- Spatial resolution of 1.5 X 1.5 X 5 mm³
- Contrast : T1 / T2 / FLAIR / DWI

Purpose

The aim of our research is to identify the obstacles to the democratization of low-field portable brain MRI.

Methods

Creation of a semi quantitative research targeting radiology services in Western Switzerland. This research was conducted through an online survey between March and May 2022, which included 20 questions related to low-field MRI and parameters optimizing image quality.

In parallel, a qualitative research was conducted through semi-structured interviews about clinical applications, with 2 radiographers and 4 radiologists working in public and private institutions in Geneva. The interviews took place between March and April 2022.

Benefits

- Safety
- Accessibility
- Artifact
- Emergency rooms/ICU
- SAR
- T1 Contrast
- Price
- Ecology
- Acoustic noise
- User friendly

Disadvantages

- SNR
- Acquisition time
- Spatial resolution
- Homogeneity
- Unfeasible sequences
- External electromagnetic interference

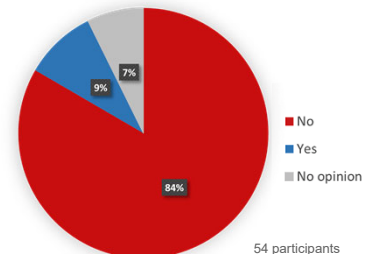
Figure 3. Disadvantages and benefits found in several studies about low-field portable MRI

Results

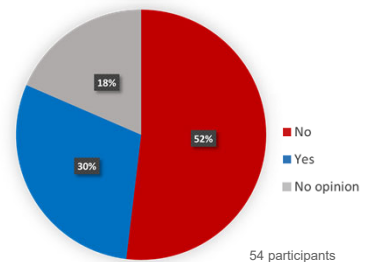
Through the review of the littérature, many benefits were highlighted regarding the use of low-field portable MRI in clinical practice. However, some important disadvantages were also underlined such as a low SNR, low spatial resolution and longer acquisition times (Figure 3).

With our quantitative research (54 participants) we identify a lack of interest in democratizing low-field portable MRI in clinical practice in Switzerland. Nonetheless, we can discern a significant percentage of participants welcoming the prospect of democratizing those MRI scanners to improve the accessibility of a MRI for patients in ICU or emergency rooms or patients in developing countries.

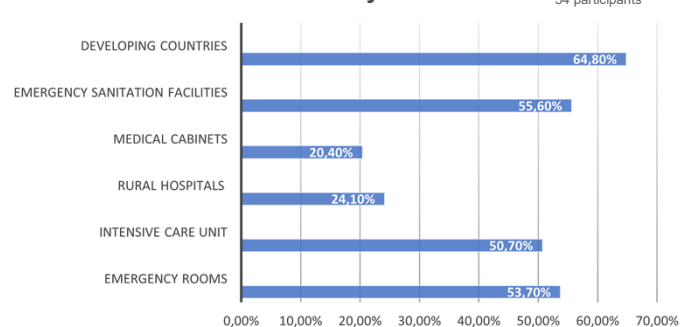
Would you see any value in using a portable MRI in your practice ?



In the near future, do you think that portable MRI could become widespread in clinical practice in Switzerland?



Which settings would benefit from a portable low-field system?



Conclusion

Important obstacles were identified such as the image quality expected from radiologists for a reliable diagnosis, the high number of MRI scanners in Switzerland and the unfeasible protocols on a portable MRI. The economic factor also plays an important role. The Swiss public can afford expensive machines. As for the private sector, there is a competitive nature between the multiple institutions which results in a lack of interest in offering services inferior to those of their competitors.

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References

- Figure 1. Hyperfine Swoop® Portable MR imaging. (2021). Hyperfine. <https://hyperfine.io/clinical/>
 Figure 2. Hovis, G., Langdorf, M., Dang, E., & Chow, D. (2021). MRI at the Bedside : A Case Report Comparing Fixed and Portable Magnetic Resonance Imaging for Suspected Stroke. Cureus. <https://doi.org/10.7759/cureus.16904>