



Problem definition

The clinical problem that was the origin of this project is straight-forward; literally. The current golden standard for neuroendoscopy, the Minop system, is a straight, rigid instrument. Once the surgeon has inserted the instruments, any therapeutic or diagnostic action can only be carried out in-line with the shaft of the trocar. A tumor, cyst or any other targeted area that lies just a millimeter to the left or right of the axis of the trocar is **unreachable**, without moving the full endoscopic system. This movement possibly **damages** the cortex that is surrounding the shaft of the trocar or even nicks a vein or artery. In current intraventricular neuroendoscopy, only 5% of the potential cases can be treated by endoscopy, rather than craniotomy, because of the reachability problems. In history, the intraventricular procedures have been attempted with a flexible endoscope. However, this instrument was difficult to use and orientation inside the ventricle was impossible. Incorporating steerability in this instrument asks for a completely new handle; the stability of the traditional scissors is completely lost after the addition of a joystick.

Design proposal

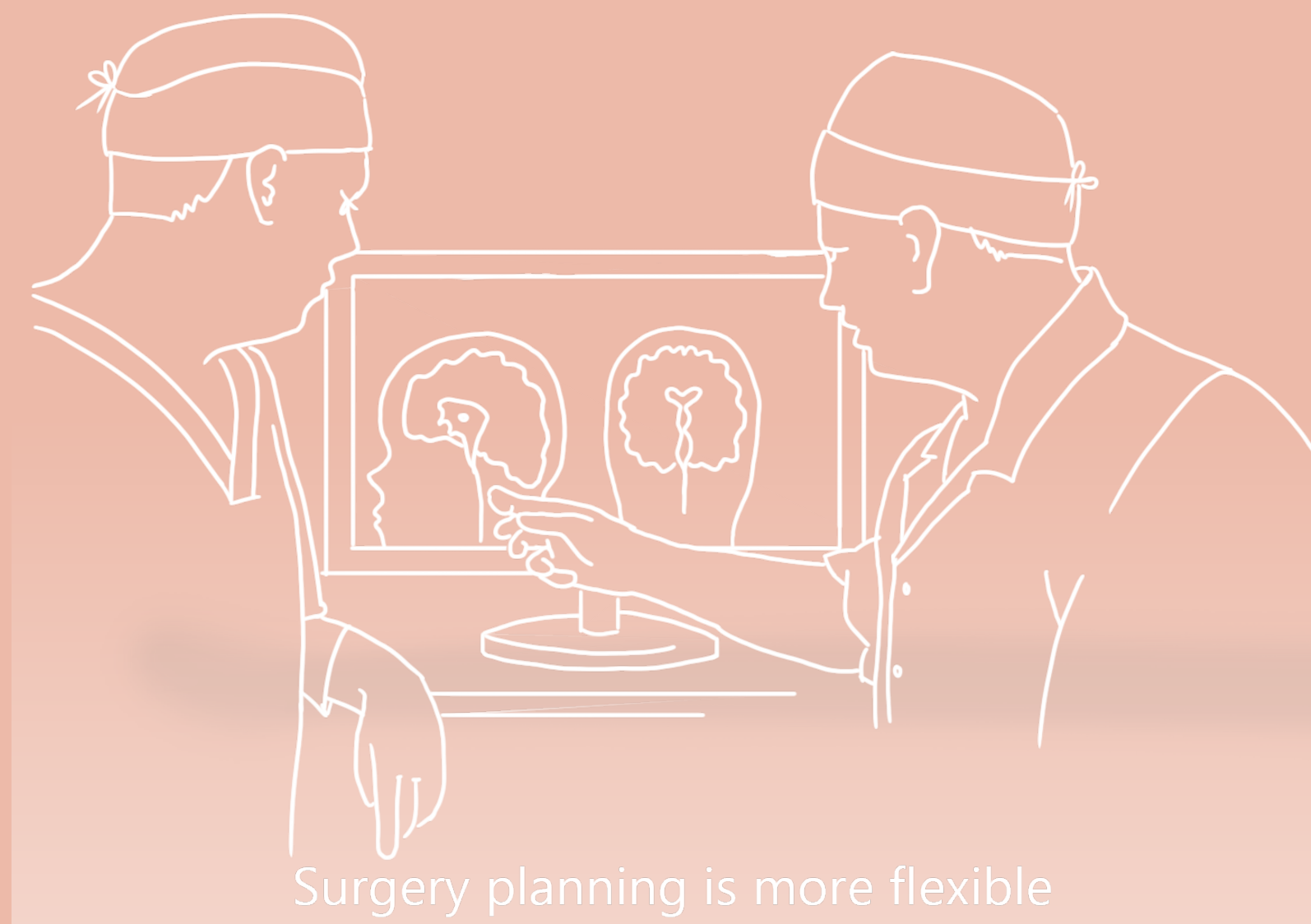
The proposed design is a steerable neuroendoscopic forceps for intraventricular use, designed based on thorough user research and secondary research in literature. Multiple rounds of prototypes were evaluated with the end user. The final prototype was fully functional. A box trainer was developed for the final user evaluation.

The shape of the handle uses the palm of the hand for stability instead of the thumb. The user can choose to use one or two fingers to stabilise at the other side. The thumb controls the joystick by pressing, tilting and releasing in the desired position. Once in position, the trigger can be actively closed and opened. The dimensions of the controls are either derived from the old instrument or based on human factor guidelines.

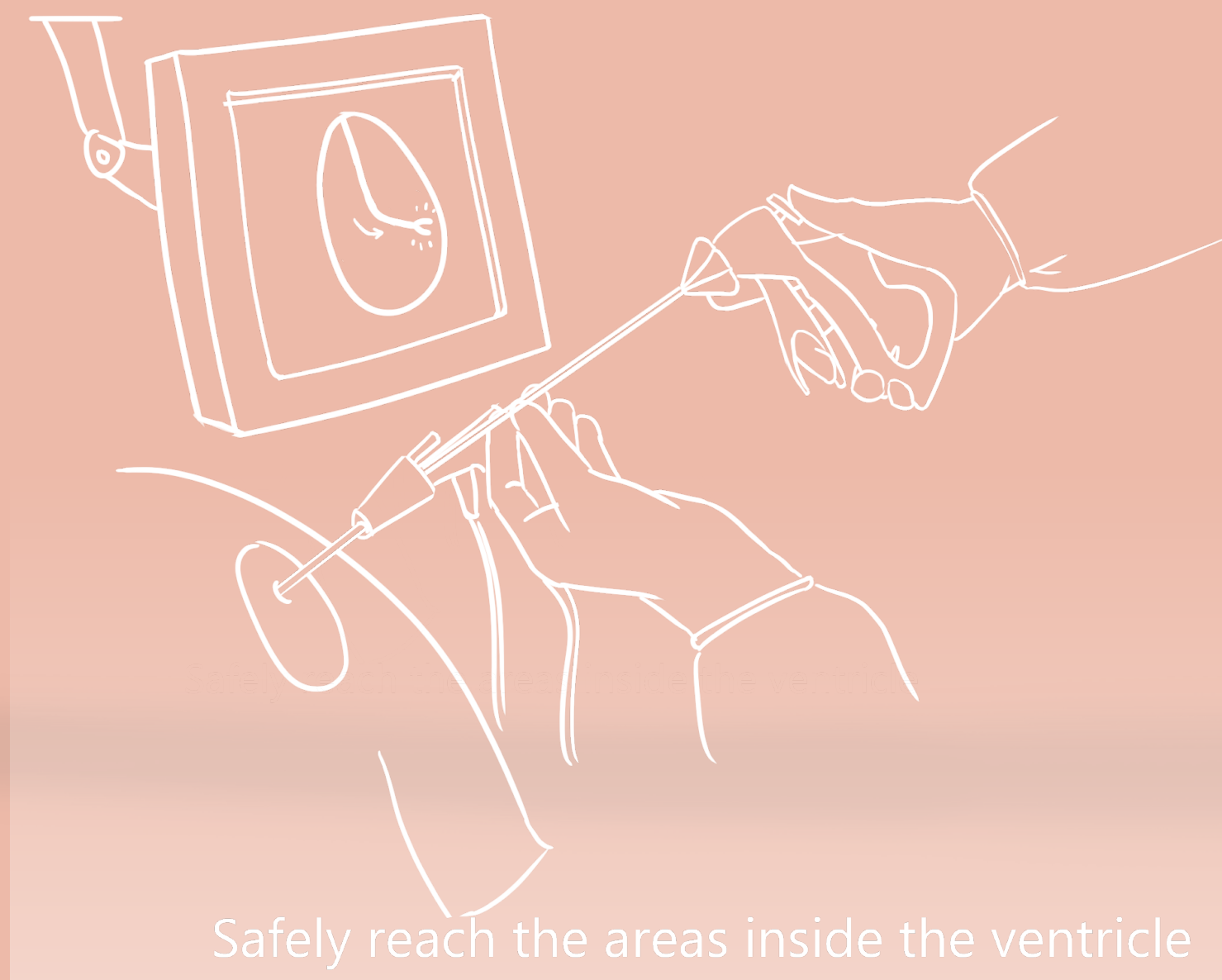
The results of the user evaluation were promising. Additionally, a significant decrease of movement in the sagittal plane compared to the old instrument was observed during use.

EXPANDING THE REACH

a steerable neuroendoscopic forceps with ergonomic handle



Surgery planning is more flexible



Safely reach the areas inside the ventricle

Maike M. Weber
Steerable Neuroendoscopic Biopsy Forceps:
expanding the reach
16/10/20
Integrated Product Design

Committee Dr. ir. Johan F. M. Molenbroek
Prof. dr. Jenny Dankelman
Dr. ir. Helen Yuan
Company DEAM

