Sono-Eyes: Get Sonographic Vision

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Advantages and Challenges of Ultrasound Imaging

Ultrasound offers precise and safe real-time imaging at low cost. Point-of-care ultrasound enables clinicians to treat patients wherever they are located (Ref. 1). To fully harness the capabilities of ultrasound, the following challenges must be solved:

- Overcome the disconnect between the ultrasound image on screen and the location of the probe
- Get rid of screens that are bulky and need sterilization in operating rooms
- Provide real time needle guidance for ultrasound procedures such as needle insertions (Ref. 2)

Figure 1. Microsoft Hololens mixed reality headset.

Sono-Eyes: *In-situ* Mixed Reality Ultrasound

- Sono-Eyes is a ultrasound solution designed to eliminate current shortcomings with the help of mixed reality. The software runs on a headset worn by the clinician (Fig. 1)
- The clinician can now see the ultrasound image at its anatomical position, which completely eliminates the disconnect between screen, patient and clinician (Fig. 2)
- A virtual screen can be enabled at any time, which provides a larger image that follows the clinician's gaze without obstructing the line of sight to the patient
- Operating an ultrasound device hands-free is key when performing sterile interventions: Settings are adjusted using gazable buttons (Fig. 3)
- To assist ultrasound-guided needle insertions, Sono-Eyes provides visual guidance for an optimal needle path (Fig. 4)

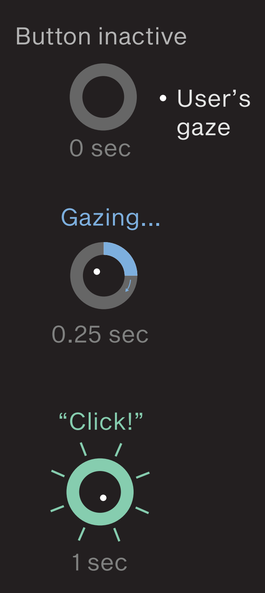

Figure 3. Gazable button.

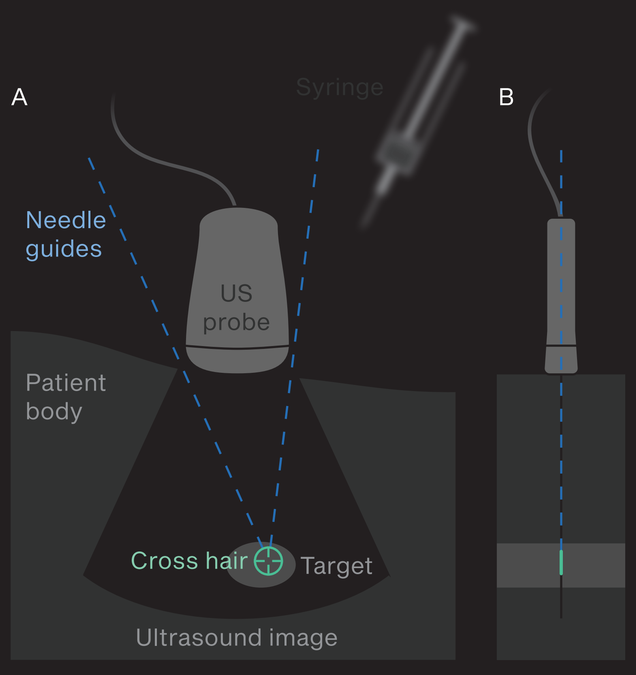

Figure 4. A) Frontal view of needle guides. B) Lateral view.

Sono-Eyes Facilitates Needle Insertions

Sono-Eyes provides measurable value for ultrasound training (Ref. 3):

- A preliminary study demonstrates faster needle insertions for non-radiologists (Fig. 5A) when using Sono-Eyes
- Non-radiologists also have a higher percentage of single-pass insertions with Sono-Eyes compared to using classical US (Fig. 5B)

Outlook

- Integrate ultrasound devices fully such that all device functions can be operated through the mixed reality of Sono-Eyes
- Planned *in-vivo* studies
- Advancements in headsets will further accelerate the integration of mixed reality for daily clinical use

Figure 2. Sono-Eyes *in-situ* ultrasound.

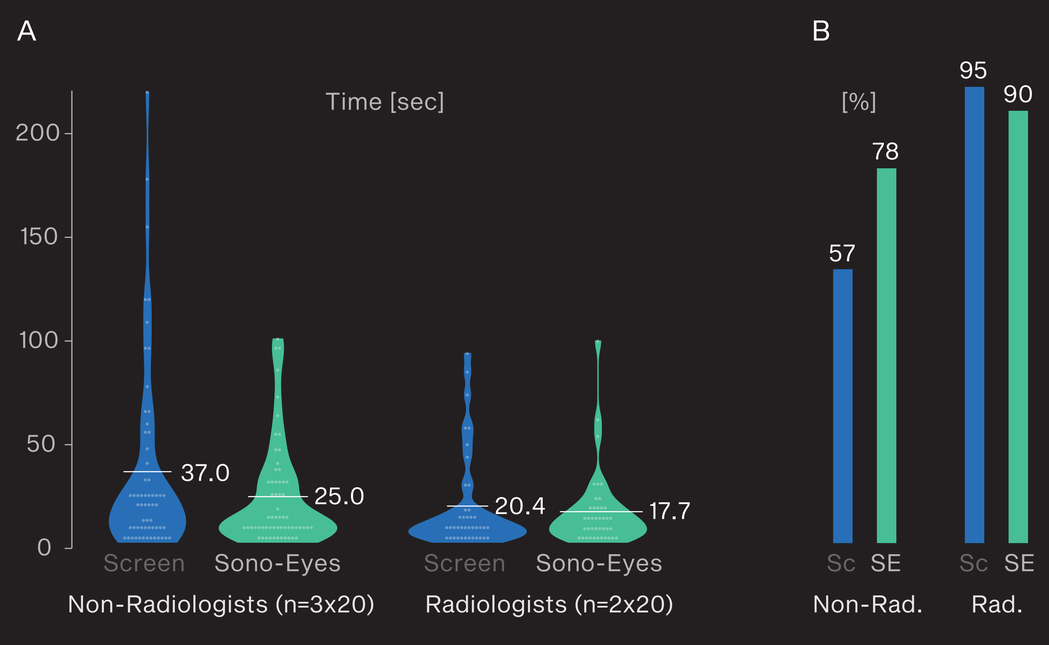

Figure 5. A) With non-specialists, Sono-Eyes reduces needle insertion time for ultrasound-guided procedures when compared to using a traditional ultrasound screen. B) Sono-Eyes increases the percentage of single-pass insertion attempts.

References and Acknowledgments

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