Ultrasonography is the method of choice for imaging the peripheral nervous system [1]. Clinically, imaging especially of small peripheral nerves is relevant for the following purposes: (i) their localization for avoiding harm during surgical or other invasive procedures [2–4], (ii) the targeting of therapeutics or surgical procedures at these nerves [5–9], and (iii) the measuring of their caliber for assessing compressive, inflammatory or degenerative neuropathies [12–18].

In the recent decade high-frequency (15–25 MHz) and ultrahigh-frequency (30–70 MHz) ultrasound probes became available for medical diagnostic use, that allowed, along with advanced image post-processing, for the improved visualization of small nerves and nerve fascicles (▶Table 1) [19]. This has opened the door to a more precise diagnostic assessment of small subcutaneous sensory nerves, especially the detection of its entrapment or traumatic lesion [20–23]. High-resolution ultrasonography also allows for the detection of gender-related differences of nerve calibers and may reveal fiber-type specific changes of small nerves with aging and in neurodegenerative disorders [24]. Local inflammation of small nerve branches has been visualized [25]. First data suggest that ultra-high resolution ultrasonography may enable a more detailed assessment of inflammatory neuropathies thanks to the better display of single nerve fascicles [19]. High-resolution ultrasound-guided anaesthetic blockade of small subcutaneous nerves is increasingly applied to relieve and prevent local pain [26, 27].

Nerve ultrasound is a good example for the swift transfer of technological advances into clinical applications by multiple clinical disciplines. Many more new diagnostic and therapeutic applications of nerve ultrasonography can be expected.
mend angewendet, um lokale Schmerzen zu lindern bzw. zu verhindern [26, 27].


References


Walter U. How small can... Ultraschall in Med 2019; 40: 400–402

Table 1 Comparison of ultrasound frequency, image resolution, and exemplary nerves.

<table>
<thead>
<tr>
<th>Frequency [MHz]</th>
<th>image resolution¹</th>
<th>imaging depth [mm]</th>
<th>typical nerve/structure</th>
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<tbody>
<tr>
<td></td>
<td>Axial [mm]</td>
<td>lateral [mm]</td>
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<tr>
<td>5</td>
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<td>1.0</td>
<td>100</td>
</tr>
<tr>
<td>10</td>
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<td>0.6</td>
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<tr>
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<td>0.2</td>
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</tr>
<tr>
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<td>9</td>
</tr>
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</tr>
<tr>
<td>50</td>
<td>0.03</td>
<td>0.07</td>
<td>4</td>
</tr>
</tbody>
</table>

¹ Given are rough values that can vary depending on tissue composition, quality of ultrasound transducer, and image post-processing technology.


