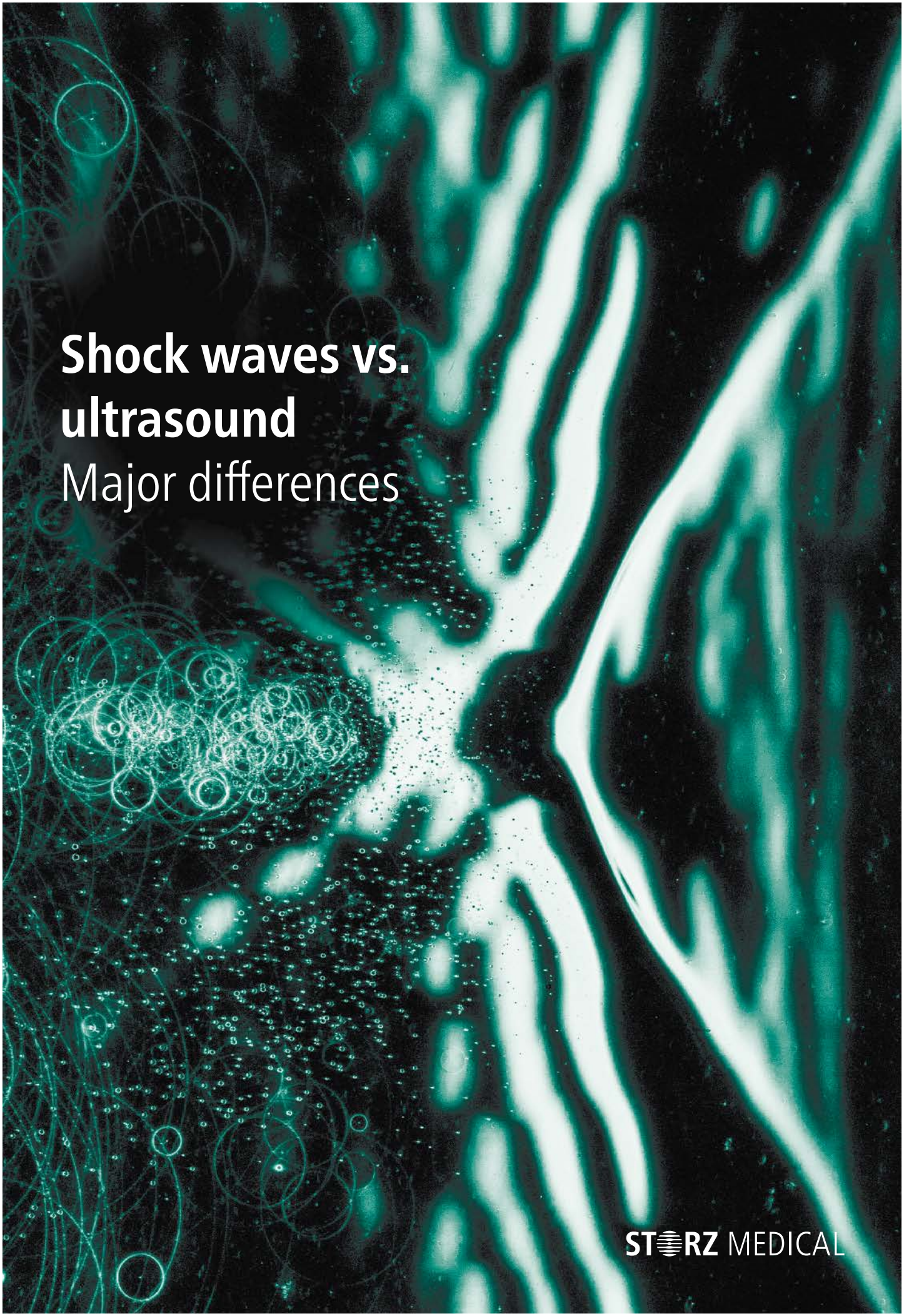
Shock waves vs.
ultrasound
Major differences
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Shock waves vs. ultrasound – major differences

Shock waves and ultrasound waves work in the same frequency range. A closer look, however, reveals that the two technologies are fundamentally different.

Like therapeutic ultrasound, shock waves are mechanical waves. Whereas therapeutic ultrasound is essentially a continuous wave with frequent oscillations chiefly in the megahertz range (Fig. 1), shock waves have a different distinguishing characteristic, namely a single pressure pulse lasting about 1 microsecond followed by a tensile wave with a relieving effect that is of lower amplitude and has a duration of about 4 – 5 microseconds (Fig. 2). Both technologies work in a similar frequency range.

In ultrasound, the mainly periodic oscillations constitute a high-frequency alternating load exerted on the tissue. These oscillations lose part of their energy due to absorption by tissue, and cause an increase in temperature. Accordingly, procedures such as the high-intensity focused ultrasound (HIFU) technique can be used to heat spatially confined tissue regions, resulting in coagulation. Significant tissue heating is, however, not observed in medical applications of shock waves.

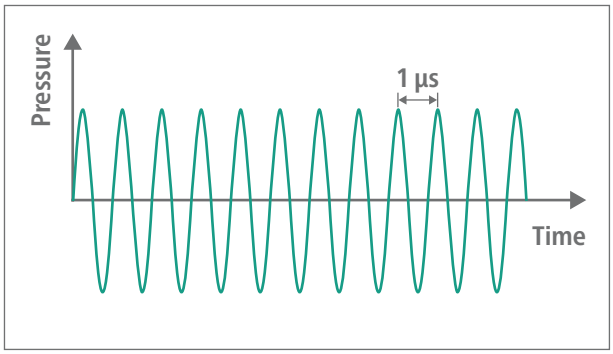

Fig. 1: Ultrasound wave profile over time

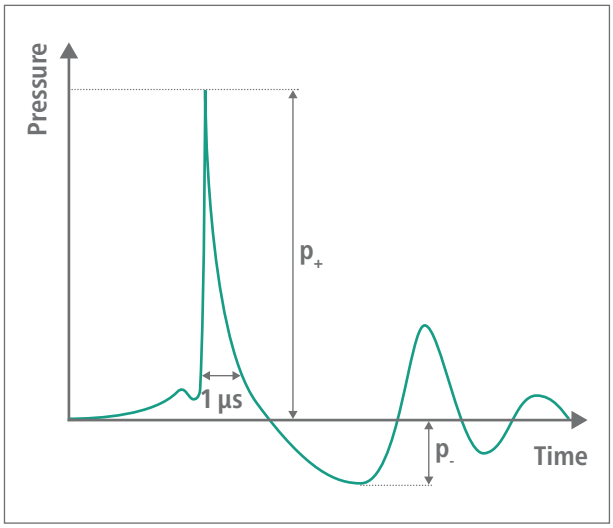

Fig. 2: Shock wave profile over time

Shock wave	Ultrasound
Mechanical wave	Mechanical wave
Ultrasound gel for transmission	Ultrasound gel for transmission
Single pressure pulse (lasting about 1 microsecond, megahertz range) followed by a tensile wave with a relieving effect that is of lower amplitude (duration of about 4 – 5 microseconds)	Continuous wave with frequent oscillations chiefly in the megahertz range
The asymmetrical pulse form of the shock wave ensures that both successive momentums cannot compensate for each other, and a reciprocal effect with high pressure and low tension is generated.	During continuous ultrasound, the alternating tension and pressure phases largely cancel each other out, so that the resulting momentum is relatively small in magnitude.
No significant tissue heating	High-frequency alternating load exerted on the tissue; oscillations lose part of their energy due to absorption by tissue; increase in temperature
Shock waves are sensed as brief sensory events	Ultrasound is not perceived as brief pulses

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